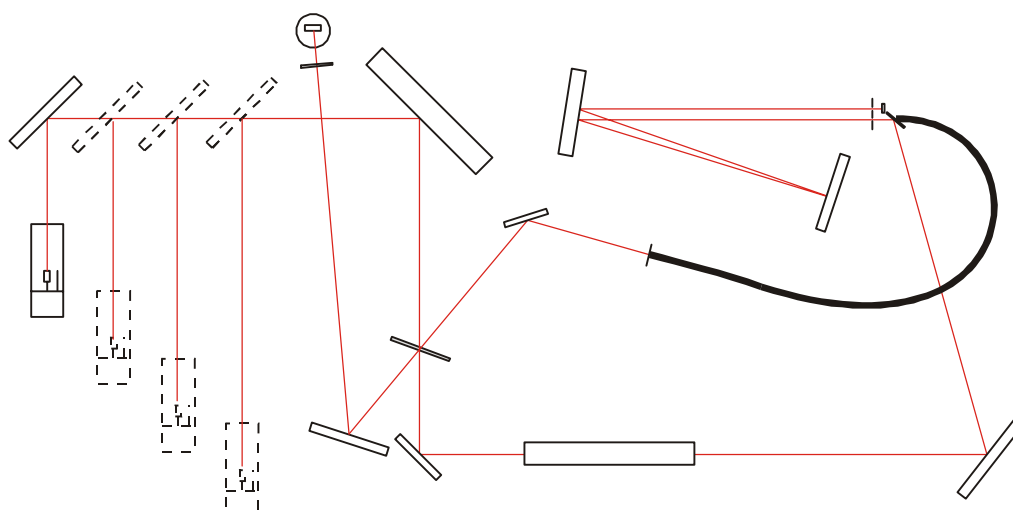


PERKINELMER AANALYST 700 USER MANUAL



AAnalyst 700

Atomic Absorption Spectrometer



User's Guide

AAAnalyst 700

Atomic Absorption Spectrometer

User's Guide



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Certificate No. FM 22178

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Release history

Part Number	Release	Publication Date
0993-5255	1	January 1998
	2	September 1998
	3	June 1999
	4	March 2000
	5	September 2000

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Printed in the Federal Republic of Germany

Technical Documentation

PerkinElmer Bodenseewerk

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Safety and Regulatory Information

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Safety practices and conventions

This instrument has been designed to comply with a wide variety of international standards governing the safety of laboratory equipment. In routine use, the instrument poses virtually no risk to you. If you take some simple, common-sense precautions, you can maintain the continued safe operation of the instrument.

The guide provided with the instrument contains information and warnings that must be followed by the user to ensure safe operation and to maintain the instrument in a safe condition. This advice is intended to supplement, not supersede, the normal safety code of behavior prevailing in the country of operation.

The information provided does not cover every safety procedure that should be practiced. Ultimately, maintenance of a safe laboratory environment is the responsibility of the user and the user's organization.

Possible hazards that could harm the user or result in damage to the instrument are clearly stated at appropriate places throughout this guide.

Any of the following safety conventions can be used throughout this guide:



*This symbol alerts you to situations that could result in **personal injury** to yourself or other persons.*

Details about these circumstances are in a box like this one.



*This symbol alerts you to the risk of **electric shock** that could result in **personal injury** to yourself or other persons.*

Details about these circumstances are in a box like this one.



*This symbol alerts you to the risk of **hot surfaces** that could cause **personal injury** to yourself or other persons.*

Details about these circumstances are in a box like this one.



*This symbol alerts you to the risk of **ultraviolet radiation** that could cause **eye damage** to yourself or other persons. Details about these circumstances are in a box like this one.*

Caution

*The term **CAUTION** alerts you to situations that could result in **serious damage to the instrument** or other equipment. Details about these circumstances are described in a message similar to this one.*

Correct use of the instrument

Before you install or use your instrument, and in order to get the best results, you should be familiar with all of the instruments in the system and know how to operate them. You should also be aware of the safety procedures in force in your laboratory, especially those concerning atomic spectrometry instruments. Consult the guides supplied with the instruments before you start.

If you use the instrument in a manner not specified in the guide, or if you use it for a purpose other than that intended, you may damage the instrument, or compromise your own, or someone else's, safety.

This instrument should only be operated by persons who are suitably qualified and have received adequate training.

Electrical safety



Warning: Unauthorized Adjustments and Servicing

W1.2

Only a PerkinElmer service engineer or similarly trained and authorized person should be permitted to service the instrument.

- *Do not attempt to make adjustments, replacements, repairs, or modifications to this instrument except as described in the documentation supplied with the instrument.*



Warning: Electrical Hazard

W2.1

Any interruption of the protective conductor inside or outside the instrument or disconnection of the protective conductor (earth/ground) terminal is likely to make the instrument dangerous.

Intentional interruption is prohibited.

Lethal voltages are present in the instrument

- *Even with the power switch off, line power voltages can still be present within the instrument.*
- *When the instrument is connected to line power, terminals may be live, and opening covers or removing parts (except those to which access can be gained without use of a tool) is likely to expose live parts.*
- *Capacitors inside the instrument may still be charged even if the instrument has been disconnected from all voltage sources.*

- To ensure satisfactory and safe operation of the instrument, it is essential that the line power cord is connected to a properly installed line power outlet that has a protective conductor (earth/ground).
- Do not attempt to make internal adjustments or replacements except as directed in the guide provided with the instrument.
- Do not operate the instrument with any covers or parts removed.
- Disconnect the instrument from all voltage sources before opening it for any adjustment, replacement, maintenance, or repair.
If, afterwards, the opened instrument must be operated for further adjustment, maintenance, or repair, this must only be done by a skilled person who is aware of the hazard involved.

- Use only fuses with the required current rating and of the specified type for replacement.

Do not use makeshift fuses or short-circuit the fuse holders.

- Whenever it is likely that the instrument is no longer electrically safe for use, make the instrument inoperative and secure it against any unauthorized or unintentional operation.

The instrument is likely to be electrically unsafe when it:

- Shows visible damage.
- Fails to perform the intended measurement.
- Has been subjected to prolonged storage under unfavorable conditions.
- Has been subjected to severe transport stresses.

Note: *The spectrometer is provided with an operational on/off switch and with a circuit breaker.*

The operational on/off switch turns the instrument on and off, but it does not disconnect the instrument from the line power supply.

The circuit breaker functions as a 'disconnecting device' and disconnects the instrument entirely from the line power supply.

Further information on these two switches is provided in 'Switches and connectors on the spectrometer' starting at page 7-6.

Operating conditions

**Warning: Explosive Atmosphere**

W1.3

This instrument is not designed for operation in an explosive atmosphere.

The instrument will operate correctly under the following conditions:

- Indoors.
- Ambient temperature +15 °C to +35 °C (+59 °F to +95 °F), with a maximum change not exceeding 2.8 °C (5 °F) per hour.
- Ambient relative humidity 20% to 80%, without condensation.
- Altitude in the range 0 m to 2000 m (sea level to 6500 feet).
- The location must be free of dust, smoke, and corrosive fumes.
- You can store the instrument safely under the following conditions:
 - Ambient temperature –20 °C to +60 °C (–4 °F to +140 °F).
 - Ambient relative humidity 20% to 80%, without condensation.
 - Altitude in the range 0 m to 12000 m (sea level to 40 000 feet).

Note: *When you remove the instrument from storage and before you put it into operation, allow it to stand for at least a day under the approved operating conditions.*

Laboratory hygiene

- Keep the work area scrupulously clean to avoid contaminating your samples and to maintain a safe working environment. Clean up spilled chemicals immediately and dispose of them properly.
- Do not allow smoking in the work area. Smoking is a source of significant contamination and also a potential route for ingesting harmful chemicals.
- Do not store, handle, or consume food in the work area.

Laboratory ventilation

Toxic combustion products, metal vapor, ozone, etc., can be generated by the system, depending on the type of analyses being performed.

- You must provide an efficient laboratory ventilation system to remove toxic products generated during instrument operation.

Safe handling of chemicals

Some chemicals used with the instrument may be hazardous or may become hazardous after completion of an analysis.

The responsible body¹ must take the necessary precautions to ensure that the surrounding workplace is safe and that instrument operators are not exposed to hazardous levels of toxic substances (chemical or biological) as defined in the applicable national, state, and local health and safety regulations and laws. Venting for fumes and disposal of wastes must be in accordance with all national, state, and local health and safety regulations and laws.

- Use, store, and dispose of chemicals in accordance with the manufacturer's recommendations and the applicable national, state, and/or local regulations.
- Wear appropriate eye protection at all times while handling chemicals. Depending on the types of chemicals you are handling, wear safety glasses with side shields, or goggles, or a full-face shield.
- Wear suitable protective clothing, including gloves if necessary, resistant to the chemicals you are handling.
- When preparing chemical solutions, always work in a fume hood that is suitable for the chemicals you are using.
- Perform sample preparation away from the instrument to minimize corrosion and contamination.
- Clean up spills immediately using the appropriate equipment and supplies, such as spill cleanup kits.
- Do not put open containers of solvent near the instrument.
- Store solvents in an approved cabinet (with the appropriate ventilation) away from the instrument.

1. Definitions from IEC 1010-1:

Responsible body: 'individual or group responsible for the use and maintenance of equipment, and for ensuring that operators are adequately trained.'

Operator: 'person operating equipment for its intended purpose.'

Waste disposal

Contents of waste containers

The materials that you collect in waste containers may include small amounts of the substances that were analyzed and other chemicals used in the analyses. If these materials are toxic, corrosive, or contain organics you may have to treat the collected effluent as hazardous waste. Refer to your local safety regulations for proper disposal procedures.

Disposing of defective lamps

Hollow cathode lamps and electrodeless discharge lamps contain small quantities of the lamp element in a very pure form. If a lamp containing toxic elements becomes defective or otherwise unusable, you must treat it as hazardous waste and dispose of it accordingly. A licensed company in the chemical waste disposal business can provide lamp disposal in accordance with environmental regulatory requirements. Please note that PerkinElmer does not take back defective lamps for disposal.

In addition, hollow cathode lamps and deuterium lamps are maintained under reduced pressure. Handle and dispose of them correctly to minimize the implosion risk.

For information, the quantities of analyte material contained in the cathodes of hollow cathode lamps are listed in the table below:

Quantity of material in the cathode	Single-element hollow cathode lamps	Multi-element hollow cathode lamps
less than 5 g	As, Au, B, Ba, Be, Ca, Dy, Er, Eu, Ga, Gd, Ge, Hf, Ho, In, Ir, K, La, Li, Mg, Na, Nd, Pd, Pr, Pt, Re, Rh, Ru, Sc, Se, Sm, Sn, Ta, Tb, Tm, Yb, Y	Na-K, Pt-Ru
5–10 g	Ag, Al, Bi, Cd, Co, Cr, Mn, Mo, Ni, Sb, Si, Sr, Te, V, W, Zn, Zr	Ca-Mg, Ca-Zn, Ag-Au, Sn-Te, Ca-Mg-Zn, Ca-Mg-Al
10–15 g	Cu, Fe, Hg, Nb, P, Pb, Ti, Tl	all other multi-element HCLs

For EDLs, the quantity of analyte material used is much less than the quantities used in HCLs. Typically, only several milligrams of material are placed in the EDL bulb. No PerkinElmer EDLs (System 1 or 2) contain more than 0.05 g of analyte material.

UV radiation

You should be aware of the health hazard presented by UV radiation.

- When the instrument is on, do not remove any covers unless specifically instructed to do so in the guide since otherwise you may be exposed to potentially hazardous UV radiation.
- Always wear UV-absorbing eye protection when viewing any of these sources:
 - The flame, especially the nitrous oxide/acetylene flame.
 - The graphite furnace when it is heated to incandescence.
 - Hollow cathode or electrodeless discharge lamps.
 - The deuterium background correction lamp.

High temperatures

Burner system

The flame can generate temperatures of up to 2800 °C.

- Do not touch the burner head until it has cooled to room temperature.

Graphite furnace

The HGA graphite furnace can generate temperatures of up to 3000 °C.

- Do not touch any part of the graphite furnace until it has cooled to room temperature.
- Do not attempt to inject a sample into the graphite tube when the furnace is hot. You may be subjected to fumes from the sudden vaporization of the sample, and may damage the pipet.

Quartz tube atomizer cell

The quartz tube atomizer cell (QTA-cell) used for the hydride-generation technique (option) can reach temperatures of up to 1000 °C.

- Do not touch any part of the heating mantle (electrically heated systems), or the cell holder (flame-heated systems), or the QTA-cell until they have cooled to room temperature.

Handling compressed gases

Note: The permanent installation of gas supplies is the responsibility of the user and should conform to local safety and building regulations.

Summary of gas hazards

Hazards associated with the different gases used in atomic absorption spectrometry are presented in the table below:

Gas	Suffocation	Explosion	Spontaneous Decomposition or Combustion
Air	—	—	—
Argon	x	—	—
Nitrogen	x	—	—
Acetylene (ethyne, C ₂ H ₂)	x	x	x
Nitrous Oxide (dinitrogen monoxide, N ₂ O)	x	—	x

Contact the gas supplier for a safety data sheet containing detailed information on the potential hazards associated with the gas.



Warning: Compressed Gases

High pressure gas cylinders can be dangerous if mishandled or misused.

- *Always handle gas cylinders with caution and observe your local regulations for the safe handling of gas cylinders.*

Identifying cylinders

- Legibly mark cylinders to clearly identify the contents and status (full, empty, etc.). Use the chemical name or commercially accepted name for the gas.

Storing cylinders

- Store cylinders in accordance with the applicable national, state, and/or local regulations and standards.
- When gas cylinders are stored in confined areas, such as a storage room, make sure that ventilation is adequate to prevent toxic or explosive accumulations of gas.
The storage room should be well ventilated and dry. This is particularly important in confined areas.
- Do not store cylinders near elevators, gangways, or in locations where heavy moving objects may strike or fall against them.
- Use and store cylinders away from exits and exit routes.
- Locate gas cylinders away from heat sources, including heat lamps.
Compressed gas cylinders should not be subjected to temperatures above 52 °C (125 °F).
- Do not allow ignition sources in the storage area and keep cylinders away from readily ignitable substances such as gasoline or waste, or combustibles in bulk, including oil.
- Store all gas cylinders only in a vertical position, with the valve cap in place, and fastened securely to an immovable bulkhead or a permanent wall.
- If you are storing cylinders outdoors, store them above ground on a suitable floor where they are protected against temperature extremes (including the direct rays of the sun).

Handling cylinders

- Move cylinders with a suitable hand truck after making sure that the valve cap is securely in place and that the cylinder is properly fastened to the hand truck.
- Use only approved regulators, tubing, and hose connectors.
- Arrange gas hoses where they will not be damaged or stepped on and where things will not be dropped on them.
- Do not attempt to refill gas cylinders.
- Check the condition of pipes, hoses, and connectors regularly, and replace any damaged parts.
- Perform periodic gas leak tests at all joints and seals of the gas system by applying an approved gas leak detection solution.

Safety practices for flame atomization

Safety interlocks

PerkinElmer provides a number of safety interlocks on the burner system to monitor gas pressure and check for the proper setup of the burner head, nebulizer, and drain system. In addition a flame sensor checks that the flame is burning.

- Do not attempt to defeat these interlocks; you may compromise your own, or someone else's, safety.

Safe use of burner gases

The seepage of fuel gas or fuel gas mixture from the burner system, the drain system, the gas control system, or the gas connections constitutes a serious fire hazard.

- Make sure that there are no breaks or leaks in any of these systems and that all the seals are correctly installed and in good condition.
- Regularly check for leaks at joints and seals using an approved leak test solution.
- When you perform any maintenance or installation procedures, follow the instructions in the guide exactly.
- Do not attempt to service the gas control system yourself.
A PerkinElmer service engineer, or similarly authorized and trained person, must perform the work.
- When you shut down the instrument, for example at the end of the working day, shut all the gas lines at the cylinder or regulator valves. Bleed the lines between the regulator and instrument to atmosphere before switching off the ventilation system.

Air supply

An air compressor is recommended for the air supply to the burner system. Cylinders of compressed air should only be used as an emergency or short-term solution.

- If you use cylinder air, make sure that it is compressed air and not oxygen-enriched air (e.g. breathing air); the use of oxygen-enriched air can cause a flashback of the flame.
- **Never** use oxygen as the oxidant since this can cause an explosion.

Nitrous oxide

(dinitrogen monoxide, N_2O)

- Tubing and fittings carrying nitrous oxide must be free of all oil, grease, and organic materials.
Spontaneous combustion may occur if nitrous oxide comes into contact with these materials.
- Use a double-stage or heated regulator for nitrous oxide to prevent freezing of the diaphragm and a loss of pressure regulation.
- Do not store nitrous oxide in close proximity to flammable gases, such as acetylene or hydrogen.

Acetylene

- Always use ‘Atomic Absorption Grade’ acetylene (ethyne) dissolved in acetone (propan-2-one). This is satisfactory for all PerkinElmer AA spectrometers.
- Do not store acetylene in close proximity to oxidizing gases, such as nitrous oxide.
- Use approved tubing and fittings for acetylene. Never use copper fittings since acetylene forms an explosive compound with copper.
- Prevent acetylene from coming into contact with copper, silver, mercury or gaseous chlorine.
- Periodically check for the presence of acetylene in the laboratory atmosphere, especially near the ceiling.
- For acetylene, set an outlet gauge pressure of between 90 kPa and 100 kPa (0.9–1.0 bar, 13–14.5 psig). Never allow the outlet gauge pressure to exceed 103 kPa (1.03 bar, 15 psig); acetylene can explode spontaneously above this pressure.
- Solvent Carryover.

If the acetylene cylinder pressure falls to below 600 kPa / 6.0 bar / 87 psig (at 20 °C), some of the solvent used to stabilize the acetylene (such as acetone) may be carried over into the burner. This could influence the characteristics of the burner with a resulting influence on the analytical results.

Change to a new acetylene cylinder when the cylinder pressure falls to below this value.

Safe operation of the flame

- Before you ignite the flame make sure that:
 - The laboratory fume ventilation system is operating;
 - The burner head is installed correctly;
 - The burner end cap is secured firmly;
 - The fuel and oxidant tubing fittings are properly connected;
 - The burner unit contains the necessary solvent-resistant components if you intend to analyze samples containing organic solvents;
 - The atomizer compartment door is closed;
 - The pH of the liquid in the drain vessel is greater than pH 10 if you intend to aspirate cyanide solutions.
- Do not leave the flame unattended. Always make sure that there is a fire extinguisher near the instrument.
- Never change the gas pressure or shut a gas valve while the flame is burning.
- Do not allow the burner head slot to become blocked. This can cause a flashback of the flame.
- Do not place open containers of flammable liquids and solvents near to the flame. Be especially careful with samples that contain highly volatile solvents.
- When you have analyzed samples containing organic solvents, flush all traces of solvent from the burner system.

The drain system

- Always place the drain vessel in a well ventilated place underneath the spectrometer, **in full view** while you are working with the spectrometer. This prevents the build-up of potentially hazardous gases, and allows you to see the liquid level.
- Never use a glass drain vessel.
- Do not kink, fold, or loop the drain tube.
- Never place the drain tube directly into a laboratory sink.
- Empty the drain vessel frequently; especially do not allow the drain vessel to fill with organic solvent.
- Thoroughly flush the drain system, as described in the guide, when you shut down the system.
- Check the condition of the drain tube regularly, especially if you use organic solvents. Replace the drain tube when it first shows signs of cracking or discoloration.

Flashbacks

A flashback is an explosion of the premixed gases in the spray chamber. The safety interlocks normally prevent conditions that could cause a flashback, but if a flashback should ever occur:

- Check that the burner head slot is clean.
- Make sure that you are using compressed air and not oxygen-enriched air.
- Check the flow spoiler or impact bead for damage, and replace any damaged parts.
- Carefully check and tighten all connections to, and seals on, the burner unit, and check the gas flow settings before you attempt to ignite the flame. Seepage of fuel and oxidant from the spray chamber may cause a flashback.
- Check that the burner head is seated correctly.

Hazards with Flame Atomization

Toxic combustion products:

Toxic combustion products can be generated by the system, depending on the type of analyses being performed.

- You must provide an efficient laboratory ventilation system to remove toxic products generated during instrument operation.

High temperatures:

The flame can generate temperatures of up to 2800 °C.

- To avoid serious burns, never touch the burner head until it has cooled to room temperature.

UV radiation:

The flame, especially the nitrous oxide/acetylene flame, emits ultraviolet radiation.

- Keep the atomizer compartment door closed when the flame is burning and never directly view the flame unless you are wearing UV-absorbing glasses.

Acetylides:

If you have aspirated high concentrations of copper, silver, or mercury solutions into an acetylene flame, unstable acetylides may have formed in the spray chamber. If permitted to dry, these compounds may explode.

- Aspirate solution continuously to prevent residues from drying.
- Thoroughly flush the spray chamber and drain system with water immediately after such an analysis.

Cyanide solutions:

If you intend to aspirate cyanide solutions, make sure that the pH of the liquid in the drain vessel is greater than pH 10; toxic hydrogen cyanide gas is formed when cyanides contact acidic solutions.

- Never allow solutions containing cyanides to mix with acidic solutions.

Safety practices for electrothermal atomization

Safety interlocks

PerkinElmer provides a number of safety interlocks on the graphite furnace (electrothermal atomization) system that monitor the gas pressure and the temperature of certain system components.

- Do not attempt to defeat these interlocks; you may compromise your own, or someone else's, safety.

Inert gas

The graphite furnace requires a supply of inert gas. PerkinElmer recommends **argon**.

Although nitrogen can be used, it is not recommended for the inert gas supply. At furnace temperatures above 2300 °C, nitrogen reacts with graphite to form toxic cyanogen gas (CN)₂.

Safety checks

- Before you start an analysis, make sure that:
 - The laboratory fume ventilation system is operating;
 - The inert gas supply is connected and set to the correct pressure;
 - The cooling water supply is turned on;
 - The autosampler waste bottle is empty.

Hazards with electrothermal atomization

Toxic products:

Toxic metal vapors, ozone, etc., can be generated by the system, depending on the type of analyses being performed.

- You must provide an efficient laboratory ventilation system to remove toxic products generated during instrument operation.
- If you use nitrogen as the inert gas, toxic cyanogen gas (CN)₂ will be produced when the furnace temperature is above 2300 °C.

High temperatures:

The HGA graphite furnace can generate temperatures of up to 3000 °C

- To avoid serious burns, never touch the graphite components until the furnace has cooled to room temperature.
- Do not attempt to inject a sample into the graphite tube when the furnace is hot. You may be subjected to fumes from the sudden vaporization of the sample, and may damage the pipet.

UV radiation:

The graphite furnace emits ultraviolet radiation when it is heated to incandescence.

- Never directly view the graphite furnace unless you are wearing UV-absorbing glasses.

Safety practices for FIAS and mercury hydride systems

These systems are offered as options for the spectrometer.

Safety checks

- Before you start an analysis, make sure that:
 - The laboratory fume ventilation system is operating;
 - The tubing in the fluid system is not constricted since this could lead to a pressure build-up in the system;
 - The drain tubing is inserted in the waste container and that this container is empty.
- If you are using a flame to heat the QTA-cell or if you intend to perform flame-FIAS analyses, refer to the information under *Safety Practices for Flame Atomization* before you ignite the flame.

Hazards with FIAS and mercury hydride systems

Toxic products:

Toxic metal vapors, etc., can be generated by the system, depending on the type of analyses being performed.

- You must provide an efficient laboratory ventilation system to remove toxic products generated during instrument operation.

High temperatures:

The QTA-cell used for the hydride-generation technique can reach temperatures of up to 1000 °C.

- Do not touch any part of the heating mantle (electrically heated systems), or the cell holder (flame-heated systems), or the QTA-cell until they have cooled to room temperature.

Hazardous chemicals:

Some of the chemicals required for analyses are corrosive and/or toxic.

- Refer to the information under *Safe Handling of Chemicals* and to the specific warnings in the documentation provided with the system before you start an analysis.

References for laboratory safety practice

- Bretherik, L., *Bretherik's Handbook of Reactive Chemical Hazards*, 4th ed., Butterworth & Co. Ltd., London, UK, 1990.
- *Safe Practices in Chemical Laboratories*, Royal Society of Chemistry, London, UK, 1989.
- *Hazards in the Chemical Laboratory*, 5th edition, Luxon, S.G., ed., Royal Society of Chemistry, London, UK, 1992.
- *CRC Handbook of Laboratory Safety*, 3rd edition, Furr, K., ed., The Chemical Rubber Co. Press, Florida, USA, 1990.
- *Prudent Practices for Handling Hazardous Chemicals in Laboratories*, National Research Council, National Academic Press, Washington D.C., USA, 1981.
- *Sax's Dangerous Properties of Industrial Materials*, 9th edition, Sax, N.I. and Lewis, R.J., eds., Wiley, New York, USA, 1998.
- Pohanish, R.P. and Greene, S.A., *Hazardous Materials Handbook*, Wiley, New York, USA, 1996.
- Compressed Gas Association, Inc., Arlington, VA 22202, USA, various publications.
- Data Sheets provided by chemical manufacturers, e.g.:
 - USA, Material Safety Data Sheets (MSDS),
 - FRG, DIN-Sicherheitsblätter,
 - UK, Hazard Data Sheets.

Regulatory information

IEC 1010 compliance

This instrument has been designed and tested in accordance with EN 61010-1:1993 (IEC 1010-1): *Safety requirements for electrical equipment for measurement, control, and laboratory use*, including Amendments 1 and 2 to this standard, and EN 61010-2-061:1996 (IEC 1010-2-061:1995): *Particular requirements for laboratory atomic spectrometers with thermal atomization and ionization*.

Electrical protection

Insulation

Class I as defined in IEC 1010-1.

Installation category

This instrument is able to withstand transient overvoltage according to Installation Category II as defined in IEC 1010-1 and IEC 664.

Pollution degree

This equipment will operate safely in environments that contain nonconductive foreign matter and condensation up to Pollution Degree 2 as defined in IEC 1010-1 and IEC 664.

Electromagnetic compatibility (EMC)

European Union (EMC Directives)

This instrument has been designed and tested to meet the requirements of the EU Directives 89/336/EEC and 92/31/EEC. It complies with the generic EMC standard EN 61326-1:1997 *Electrical equipment for measurement, control, and laboratory use – EMC requirements – General requirements*.

This instrument has passed the following EMC tests:

Emission of conducted and radiated noise	Electromagnetic compatibility
EN 55011:96	EN61 000-4-2:95
EN 61 000-3-2:95	EN61 000-4-3:95
EN 61 000-3-3:95	EN61 000-4-4:95
	EN61 000-4-5:95
	EN61 000-4-6:96

United States (FCC)

This instrument is classified as a digital device used exclusively as industrial, commercial, or medical equipment. It is exempt from the technical standards specified in Part 15 of FCC Rules and Regulations, based on Section 15.103 (c).

Japan (FCC)

This instrument has been tested and found to comply with the limits of a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Symbols used on the instrument

Any of the following symbols can be used on the instrument:



This symbol indicates that there is a potential hazard and that the user must look in the guide for an explanation of the hazard and how to avoid it.



This symbol indicates the risk of electric shock.



This symbol indicates the risk of hot surfaces.



This symbol indicates the off position of the main power switch or circuit breaker. With the switch in this position, the instrument is disconnected entirely from the line power supply.



This symbol indicates the on position of the main power switch or circuit breaker. With the switch in this position, the instrument is connected to the line power supply but is not necessarily switched on and operational.



This symbol indicates the operational on/off switch.



This symbol indicates alternating current.

Warning Markings on the instrument

Warning markings at the front of the spectrometer



A

Risk of hot surfaces

Risque de surfaces chaudes

Gefahr durch heiße

Oberflächen



B

Warning: Moving Parts – Risk of Injury

Some moving parts of the instrument are accessible in normal operation.

Keep hands, clothing and other objects away from the moving parts of the instrument.

Danger: Parties en mouvement – Risque d'accident corporel

Certaines parties en mouvement de l'instrument sont accessibles en fonctionnement normal.

Tenir les mains, vêtements et autres objets éloignés des parties en mouvement de l'instrument.

Warnung: Bewegliche Teile – Verletzungsgefahr

Bei normalem Betrieb sind bewegliche Teile des Geräts zugänglich.

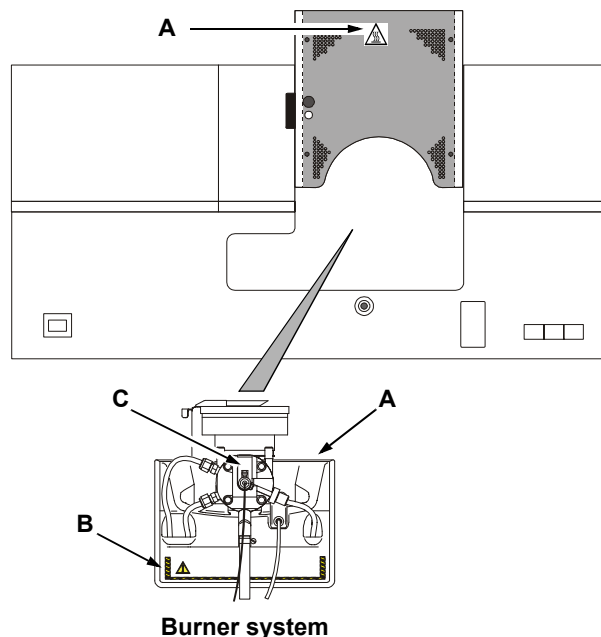
Hände, Kleidung und andere Gegenstände von den beweglichen Teilen des Geräts fernhalten.

C

Nebulizer clamp must be lowered and locked over the nebulizer flange.

La pince du nébuliseur doit être abaissée et verrouillée au-dessus de la bride du nébuliseur.

Die Zerstäuber-Befestigungsplatte muss nach unten geschoben und über dem Flansch des Zerstäubers befestigt sein.



Burner system



A

Risk of hot surfaces
Risque de surfaces chaudes
Gefahr durch heiße
Oberflächen



B

Warning: Moving Parts – Risk of Injury

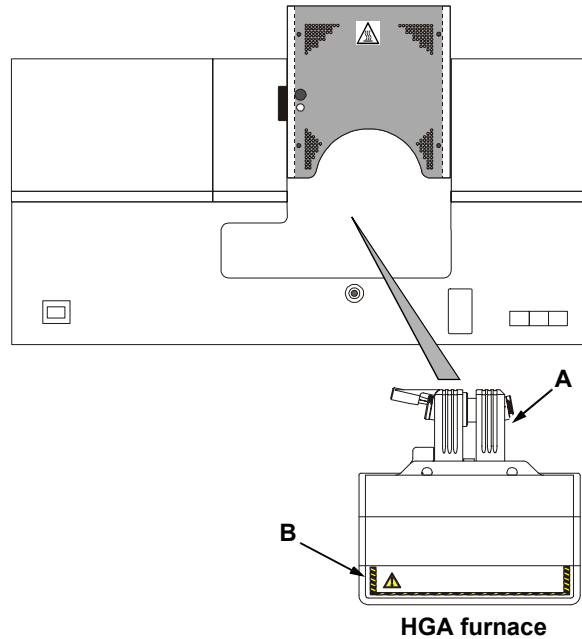
Some moving parts of the instrument are accessible in normal operation.
Keep hands, clothing and other objects away from the moving parts of the instrument.

Danger: Parties en mouvement – Risque d'accident corporel

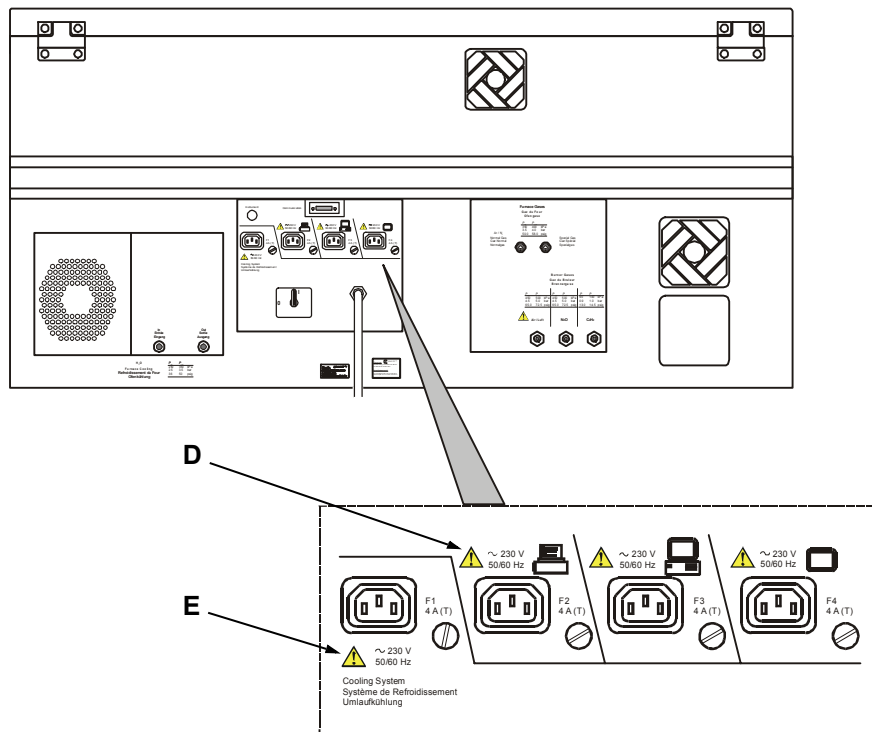
Certaines parties en mouvement de l'instrument sont accessibles en fonctionnement normal.
Tenir les mains, vêtements et autres objets éloignés des parties en mouvement de l'instrument.

Warnung: Bewegliche Teile – Verletzungsgefahr

Bei normalem Betrieb sind bewegliche Teile des Geräts zugänglich.
Hände, Kleidung und andere Gegenstände von den beweglichen Teilen des Geräts fernhalten.



Warning markings on the rear panel



D

Power outlets

Power outlets for a printer, computer, or monitor.

Only connect a printer, a computer, or a monitor to the respective outlet when the instrument requires 230 V, 50/60 Hz.

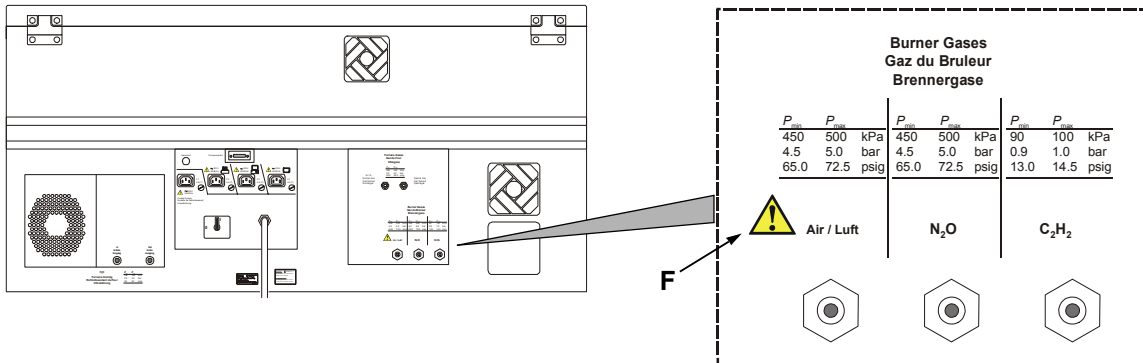
E

Cooling system outlet

Connect the cooling system to this power outlet only.

Do not connect the cooling system to any other supply.

Do not connect other equipment to this power outlet.



F

Burner Gases

Never set the outlet pressure to a value exceeding the maximum pressure (P_{max}).

Warning: Acetylene – Explosion Hazard

Acetylene can decompose explosively at pressures higher than 103 kPa / 1.03 bar / 15 psig.

Always make sure that the acetylene outlet gauge pressure is below this value.

Danger: Acétylène – Risque d'explosion

L'acétylène peut se décomposer de manière explosive à des pressions supérieures à 103 kPa / 1.03 bar / 15 psig.

Toujours vérifier que la pression de l'acétylène sur le manomètre de sortie est inférieure à cette valeur.

Warnung: Acetylen – Explosionsgefahr

Stellen Sie für Acetylen keinen höheren Ausgangsdruck als 103 kPa (1,03 bar) ein.

Bei höheren Drücken kann Acetylen spontan zerfallen und explodieren

Warning: Flashback Hazard

PerkinElmer burner systems are designed for use with compressed air. The use of oxygen can cause an explosion in the burner system, and oxygen-enriched air can cause a flashback of the flame.

Never use oxygen or oxygen-enriched air with PerkinElmer burner systems. Use only compressed air.

Danger: Risque de retour de flamme

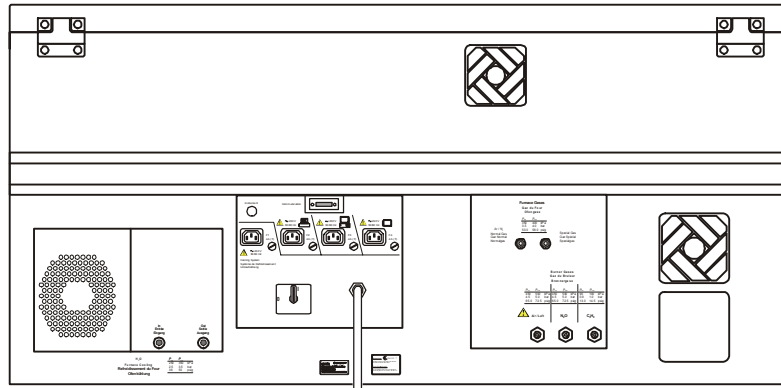
Les systèmes de brûleurs PerkinElmer sont conçus pour être utilisés avec de l'air comprimé.

L'utilisation d'oxygène peut provoquer une explosion dans le système de brûleur, et l'air suroxygéné peut provoquer un retour de flamme.

Ne jamais utiliser d'oxygène ou d'air suroxygéné avec les systèmes de brûleurs PerkinElmer. N'utiliser que l'air comprimé.

Warnung: Sauerstoff und mit Sauerstoff angereicherte Luft

Verwenden Sie für PerkinElmer Brenner nur Druckluft. Sauerstoff oder sogenannte 'Atemluft' sind nicht zulässig. Bei Verwendung von Sauerstoff besteht Explosionsgefahr. Mit Sauerstoff angereicherte Luft kann einen Flammenrückschlag verursachen.



Warning

Disconnect supply before servicing

Avertissement

Couper l'alimentation avant l'entretien

Warning

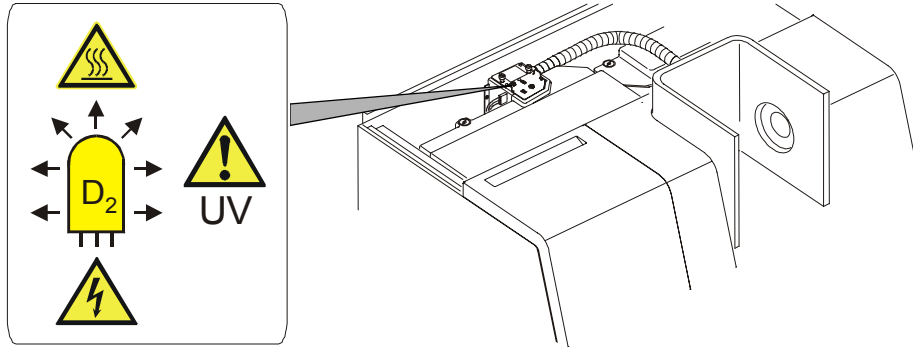
All field wiring must have insulation
suitable for at least 300 V

Avertissement

Le câblage à pied d'œuvre doit être
certifiés pour un minimum de 300 V

Warning markings on the deuterium lamp cover

The warning markings below are visible when you open the top cover of the spectrometer.



High Temperatures – Risk of Burns

The lamp is hot.

Températures élevées

La lampe est chaude.

Verbrenungsgefahr

Die Lampe ist heiß.



UV Radiation – Risk of Eye Damage

The lamp emits intense UV radiation which can damage your eyes.

Do not gaze into a lighted lamp.

Rayonnement UV

La lampe émet un rayonnement UV intense susceptible de provoquer des lésions oculaires.

Ne pas regarder fixement une lampe allumée.

UV-Strahlung – Gefährdung der Augen

Die Lampe emittiert starke UV-Strahlung und kann dadurch Augenschäden verursachen.

Nicht mit ungeschützten Augen direkt in die leuchtende Lampe schauen.



Electrical Hazard

The deuterium lamp operates at high voltage.

To avoid electrical shock, disconnect the line power cord before opening the cover.

Risque d'électrocution

Pour éviter les chocs électriques, débrancher le cordon d'alimentation avant d'ouvrir le couvercle.

Gefährdung durch elektrischen Strom

Die Deuteriumlampe benötigt zum Betrieb gefährlich hohe Spannung.

Um elektrischen Stromschlag zu vermeiden, ziehen Sie die Netzanschlußleitung bevor Sie die Abdeckung öffnen.

Spectrometer Installation

2

Contents	page
Before you install the spectrometer	2-3
Moving and reinstalling the spectrometer	2-4
Preparing the spectrometer to be moved	2-4
Moving the spectrometer	2-5
Reinstalling the spectrometer	2-6
Connecting the burner gases	2-7
Connecting the furnace gases	2-10
To connect the drain system to the burner	2-15
To install the furnace autosampler	2-15
Connecting cooling sources	2-16
Electrical connections	2-22



Before you install the spectrometer

When the spectrometer arrives

- Check the exterior of the shipping crate for obvious signs of damage. If the crate has been damaged, file a claim with the authorized carrier immediately and inform your nearest PerkinElmer office.
- Contact your local PerkinElmer office to arrange for the installation.

Before the service engineer arrives

- You must prepare a suitable site for the spectrometer and any accessories. See *Chapter 6, Laboratory Requirements*, and the guides for any accessories.
- You must make sure that the fume ventilation system and the necessary gas supply lines and regulators are installed.
- Although you should not perform the initial installation yourself, we recommend that you read the installation instructions to learn about the spectrometer and its requirements before you start using it. These instructions are also provided in case you need to alter any of the connections or move the instrument.

When the service engineer arrives

- The service engineer will remove the spectrometer from the crate and check that all parts have been delivered. If anything is missing or damaged, the service engineer will make sure that the respective parts are supplied.
- The service engineer will remove the shipping locks, perform pre-installation checks, install the spectrometer, and make sure that everything functions correctly.

Moving and reinstalling the spectrometer

We recommend that only a PerkinElmer service engineer or a PerkinElmer trained and authorized person moves and reinstalls the spectrometer. Should you attempt to do this yourself, PerkinElmer cannot be held responsible for any damage or malfunctioning of the spectrometer.

The instructions here are primarily intended for occasions where you may want to move the spectrometer **short** distances to a new location within the laboratory. Read the instructions carefully and be sure you understand them thoroughly before you attempt to move the spectrometer. Read the detailed information given in the relevant sections of this chapter before you reinstall the spectrometer. If you intend to transport the spectrometer over a longer distance, contact your local PerkinElmer office since internal shipping locks must be set via the service software, inside the spectrometer.

Preparing the spectrometer to be moved

1. Close the AA WinLab application, then shut down the Windows operating system.
2. Switch off the spectrometer, computer and all the accessories.
3. Disconnect all the electrical cables.
4. Remove the furnace autosampler from the spectrometer (*see 'Removing the autosampler from the spectrometer' in the Graphite Furnace User's Guide*).
5. Disconnect the burner gas supplies.
6. Disconnect the drain system from the burner.
7. Disconnect the furnace gas supplies.
8. Disconnect the cooling water supply.
9. Prepare the computer and other system components for transport as described in their own guides.
10. Attach the original handles securely. Only use the original handles and screws.

Note: *Make sure that the handles are properly secure before you move the spectrometer.*

Moving the spectrometer



Warning: Risk of injury through lifting

W1.4

The instrument weighs approximately 150 kg.

Improper lifting can cause painful and sometimes permanent back injury.

- *Use proper lifting techniques and always use the handles to lift or move the instrument.*

Caution: Risk of damage to the instrument

The spectrometer is a precision optical instrument. Move the spectrometer very carefully and protect it from vibrations and jolts. Do not tilt the spectrometer.

If the spectrometer must be tilted or mechanically lifted, contact your PerkinElmer service representative before moving the spectrometer. The shipping locks must be properly secured to prevent any damage occurring if the spectrometer is tilted or jolted.

Carefully lift the spectrometer onto a movable table to transport it to the new location.

Reinstalling the spectrometer

Reinstall the spectrometer by following exactly the procedures described in this chapter, as summarized in the steps below:

1. Prepare the new site for the spectrometer; see *Chapter 6, Laboratory Requirements*.

Make sure that there will be enough space at the rear and sides of the spectrometer system for air to circulate freely.

2. Remove the handles. Save the handles and screws.
Insert the plastic plugs provided (B015-3803) into the screw holes.
3. Connect the burner and furnace gas supplies.
4. Connect the drain system to the burner.
5. Install the furnace autosampler.
6. Connect the cooling water supply.
7. Make sure that the main power switches of all the instruments are in the off position, then connect the electrical cables.

Connecting the burner gases

The connectors for the burner gases are located on the rear panel of the spectrometer.

What you need to provide:

- Suitable supplies of acetylene, air, and nitrous oxide. The gases must conform with the requirements listed in *Chapter 6, Laboratory Requirements*.
- Suitable pressure regulators and on/off valves near to the spectrometer for the gas supplies.

The gas supply systems must comply with your local safety regulations. Refer also to the information given in *Chapter 1, Safety and Regulatory Information*.



Warning: Flashback Hazard

W5.9

PerkinElmer burner systems are designed for use with compressed air. The use of oxygen can cause an explosion in the burner system, and oxygen-enriched air can cause a flashback of the flame.

- *Never use oxygen or oxygen-enriched air with PerkinElmer burner systems. Use only compressed air.*

What is provided with the spectrometer:

- Gas hose assemblies for acetylene, air, and nitrous oxide.
The fittings on the gas hose assemblies are suitable for connection to most commercially available pressure regulators. These are R 3/8" standard threaded fittings. The fuel (acetylene) fitting has a left-hand thread, while the oxidant (air, nitrous oxide) fittings have right-hand threads.
If you require an adapter for your regulator, contact the gas supplier or the regulator manufacturer, or your local PerkinElmer office.

To connect the gases

Refer to Figure 2-1 when you connect the burner gases.

Air

1. Make sure that the air supply is turned off.
2. Use the black hose assembly to connect a source of clean, dry, and filtered air to the fitting labelled **Air/Luft** on the rear panel of the spectrometer.

Nitrous oxide

1. Make sure that the nitrous oxide supply is turned off.
2. Use the blue N_2O hose assembly to connect a source of clean, dry nitrous oxide to the fitting labelled **N₂O** on the rear panel of the spectrometer.

Acetylene

1. Make sure that the acetylene supply is turned off.
2. Use the red C_2H_2 hose assembly to connect a source of clean, dry acetylene to the fitting labelled **C₂H₂** on the rear panel of the spectrometer.

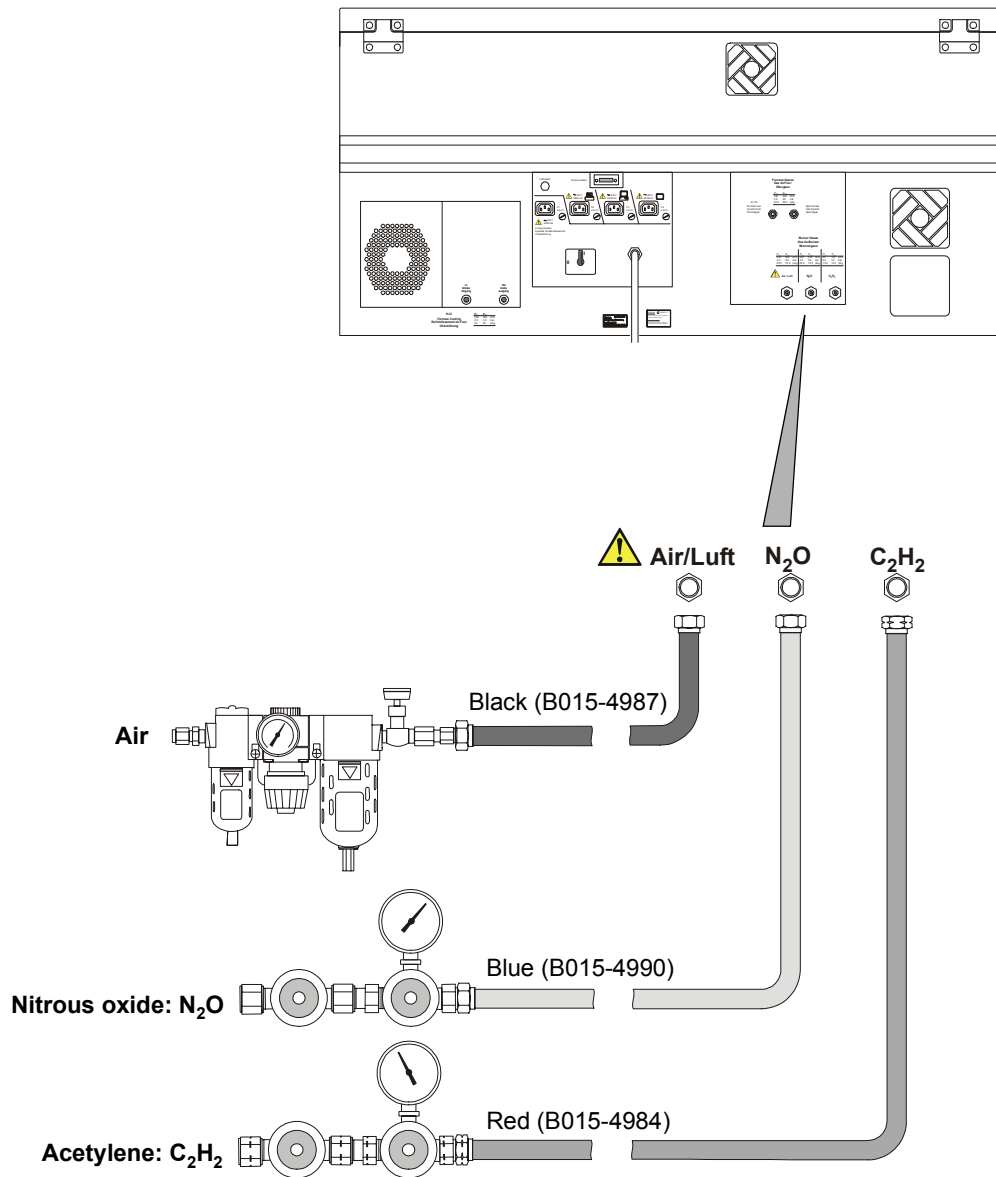


Figure 2-1. Connecting the Burner Gases

Connecting the furnace gases

The connectors for the furnace gases are located on the rear panel of the spectrometer.

Note: *The furnace will operate correctly only if there is gas pressure at both the Normal Gas and Special Gas inlets. If you are using an inert gas only you must connect the gas to both inlets using the Y-connector.*

What you need to provide:

- A suitable supply of argon (or nitrogen) and if necessary a suitable supply of a special gas. The gases must conform with the requirements listed in *Chapter 6, Laboratory Requirements*.
- Suitable pressure regulators and on/off valves near to the spectrometer for the inert and special gas supplies.
- A tube cutter for the special gas tube. This is an optional accessory; Part No. 0992-3183.

The gas supply systems must comply with your local safety regulations. Refer also to the information given under *Chapter 1, Safety and Regulatory Information*.

What is provided with the spectrometer:

- About 10 m of special gas tube, B050-8264.
- A Y-connector with automatic push-fit connectors, 0992-0179.
- Two screw connectors, R ¼" for the gas regulator. These are not supplied with all instrument versions.

To connect argon (or nitrogen) only

Refer to Figure 2-2 on the following page when you connect the furnace gas.

1. Make sure that the argon (or nitrogen) supply is turned off.
2. Use the special tube cutter to cut two, 10 cm lengths of tube from the special gas tube. The ends of the tubes must be cut squarely.
3. Connect the long gas tube to the argon (or nitrogen) pressure regulator. Use the R ¼" screw connector provided or use a connector or adapter suitable for the gas regulator. Make sure that all the connections are secure.
4. Pass the gas tube to the rear of the spectrometer. Make sure that it cannot be damaged or strained.
5. Push the two short tubes and the long tube into the connectors on the Y-connector as shown on the following page.
6. Push the free ends of the two short gas tubes into the **Normal Gas** and **Special Gas** connectors on the manifold as shown.
Push the tubes into the connectors until the tubes butt up to the end of the connector.

Note: *To disconnect the gas tube from a connector:
Carefully push the black locking ring of the connector into the connector and pull the tube out of the connector.*

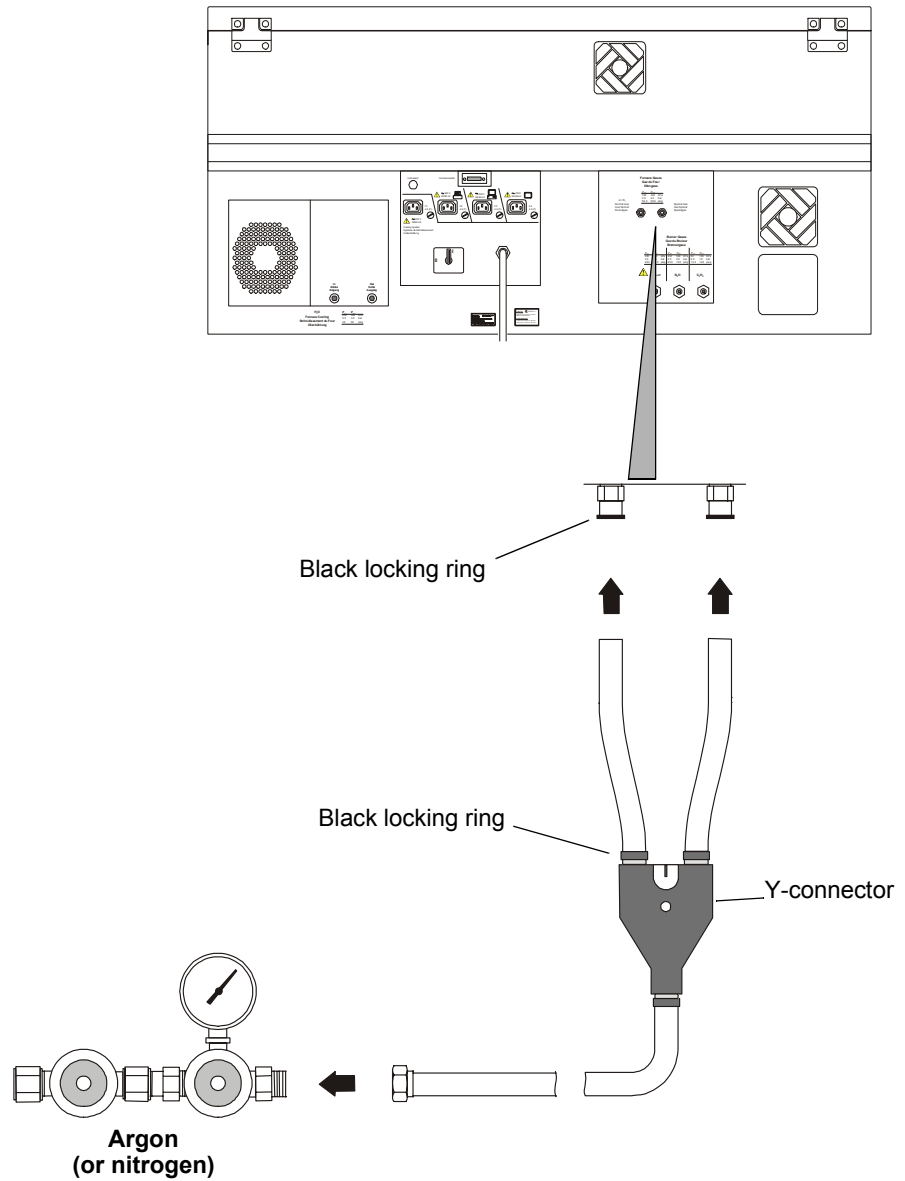


Figure 2-2. Connecting Argon (or Nitrogen) only

To connect both argon and a special gas

Refer to Figure 2-3 on the following page when you connect the furnace gases.

1. Make sure that the gas supplies are turned off.
2. Use the special tube cutter to cut the special gas tube into two pieces for the two gas supplies. The ends of the tubes must be cut squarely.
3. Connect the gas tubes to the argon (or nitrogen) and special gas pressure regulators. Use the R ¼" screw connectors provided or use a connector or adapter suitable for the gas regulator. Make sure that all the connections are secure.
4. Pass the gas tubes to the rear of the spectrometer. Make sure that they cannot be damaged or strained.
5. Push the free ends of the gas supply tubes into the **Normal Gas** and **Special Gas** connectors on the manifold as shown.
Push the tubes into the connectors until the tubes butt up to the end of the connector.

Note: *To disconnect the gas tube from a connector:
Carefully push the black locking ring of the connector into the connector and pull the tube out of the connector.*

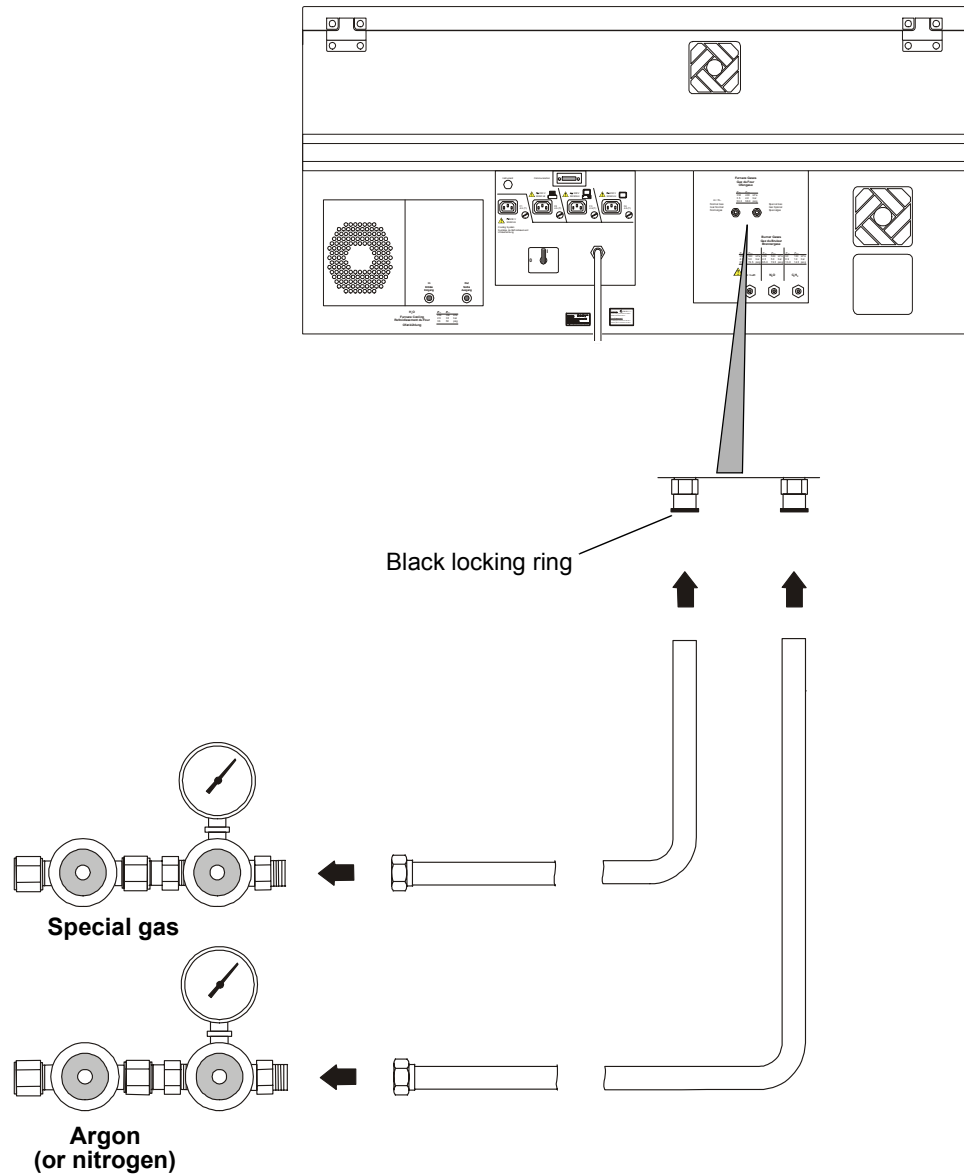


Figure 2-3. Connecting Argon (or Nitrogen) and a Special Gas

To connect the drain system to the burner

Procedures for connecting the drain system to the burner are described in *Maintaining the drain system* in the *Burner System User's Guide*.

To install the furnace autosampler

Procedures for demounting and reinstalling the furnace autosampler are described in *Installing the furnace autosampler* in the *Graphite Furnace User's Guide*.

Connecting cooling sources

Installing the cooling system

PerkinElmer offers a recirculating cooling system as an option for the spectrometer system. This cooling system includes a pressure-sensitive safety device that switches off the pump if the internal pressure in the circulatory system increases to above a safe value (see 'Cooling the furnace' in the *Graphite Furnace User's Guide*).

Connecting and disconnecting the water hoses

The inlet and outlet hoses are permanently attached to the cooling system. They have automatic connectors which are marked with the direction of the water flow.

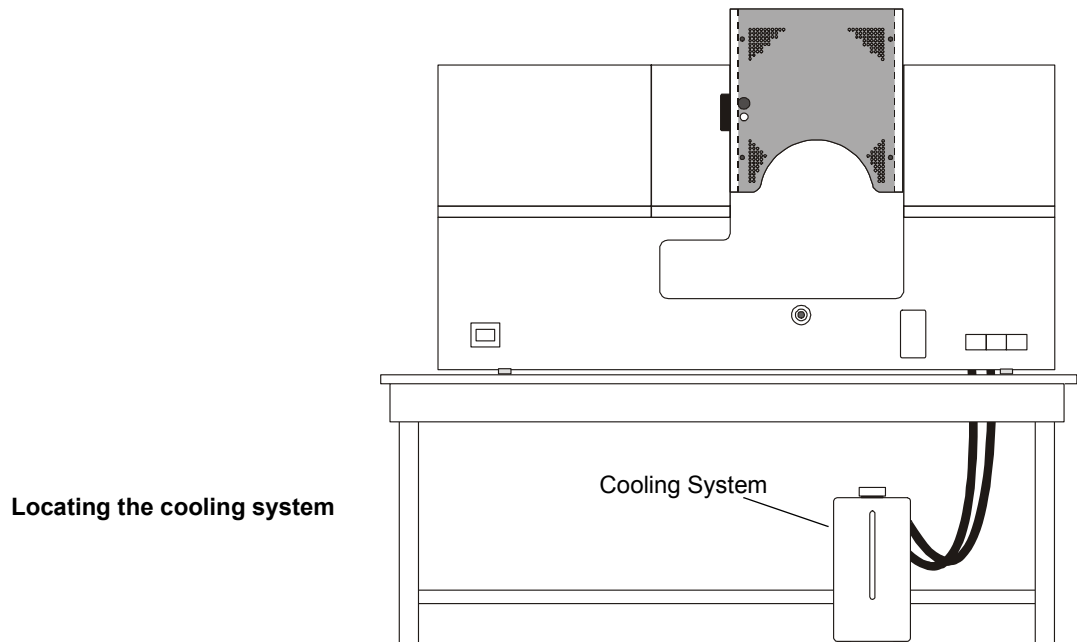
1. Place the cooling system in a convenient position **on the floor** underneath the spectrometer. Do not place the cooling system on the same bench as the spectrometer since vibrations can adversely influence the spectrometer.

Make sure that:

- You can reach the on/off switch at the rear.
 - There is space at the rear and sides of the cooling system for air to circulate freely.
 - There is space to remove the stopper and fill the system.
 - You can see the water level indicator.
2. Pass the two hoses from the cooling system to the rear of the spectrometer. Make sure they are not strained.
 3. Push the hose connectors onto the correct fittings on the spectrometer as shown on the following page.
The connectors are spring loaded. Push them straight onto the fittings until they click into place.

Note: To disconnect the water hoses:

Carefully pull the knurled locking ring down slightly, to release the lock, and pull the connector off the fitting on the spectrometer.



Connecting the hoses

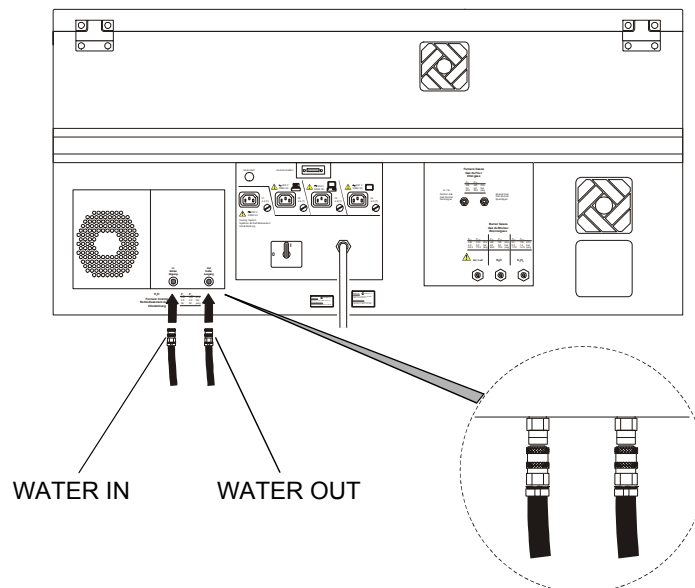


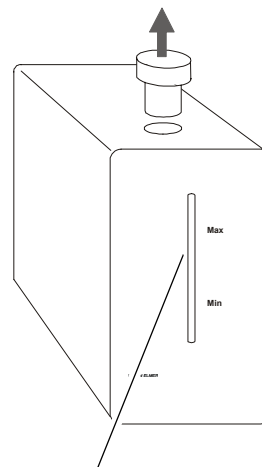
Figure 2-4. Connecting the Cooling System

Filling the cooling system

The cooling system is self-priming; air in the system is removed automatically as the cooling system operates. The coolant is a 1:10 solution of glycerol in water (1 part glycerol plus 9 parts water).

Note: *The cooling system contains 0.5 L glycerol when it leaves the factory. (See 'Cooling system maintenance procedures' in the Graphite Furnace User's Guide for the procedure to follow when you empty and refill the cooling system. Do not use antifreeze.)*

1. Remove the stopper from the top of the cooling system – twist and pull.
2. Fill the system to the **Max** mark with sediment-free drinking water – about 4.5 L.
Do not use deionized water since this can cause corrosion.
3. Replace the stopper securely.



Water level indicator

Connecting external cooling sources

If you intend to run the spectrometer system without the PerkinElmer cooling system, you must connect another suitable source of cooling, such as the main water supply or a laboratory thermostat. If you connect the spectrometer system to the main water supply, make sure that the water pressure is as given in Table 2-1.

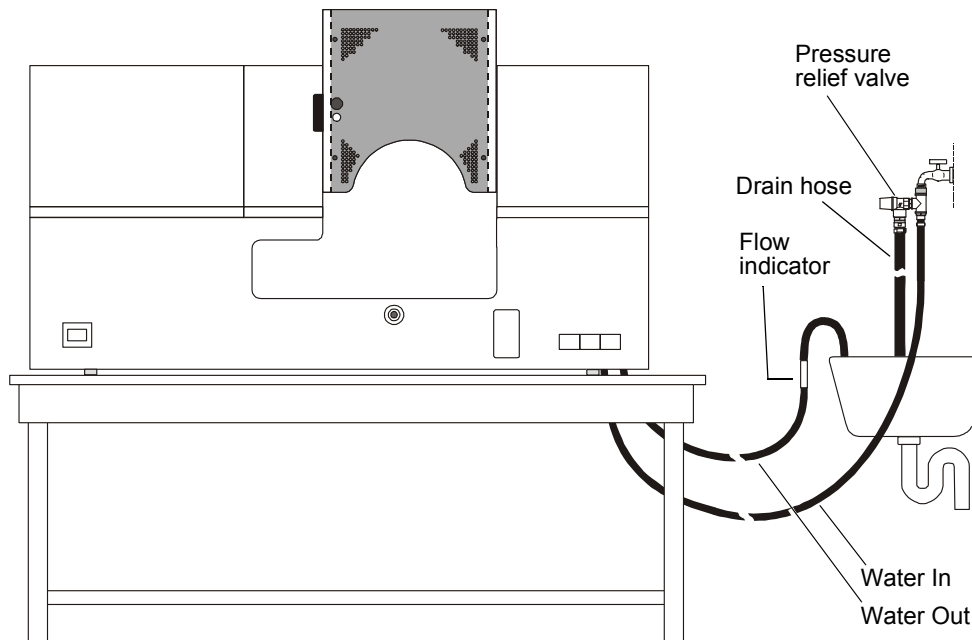


Figure 2-5. Connecting the Main Water Supply

A water hose kit with pressure relief valve is provided with the spectrometer system which you must install in the water supply line to the spectrometer. This valve opens if the water pressure to the furnace system exceeds 4 bar. This feature eliminates the risk of damage to the furnace system through excess water pressure.

The cooling water must conform with the requirements listed in '*External cooling*' on page 6-16.

Caution**Water Pressure – Leaking hose fittings or burst water hoses**

If the water inlet pressure is too high, hose fittings may leak or hoses may even burst.

- *For reliable and safe operation, you must install the pressure relief valve kit B313-0124 in the water supply line.*

The hoses provided in the kit are fitted with automatic connectors that incorporate stop valves; these valves prevent water from running out when the hoses are disconnected. The hoses are marked with the direction of the water flow.

Table 2-1. Pressure for the Cooling Water Supply

Outlet Pressure		
$P_{\min}$	$P_{\max}$	
250	350	kPa
2.5	3.5	bar
36	50	psig

- Check the water pressure to your laboratory and make sure that the water inlet pressure is set to a value between the minimum value ($P_{\min}$) and the maximum value ($P_{\max}$).
 - Make sure that the outlet pressure is **never** set to a value exceeding the maximum pressure ($P_{\max}$).
1. The PerkinElmer service engineer will connect the pressure relief valve to the water tap (faucet).
 2. Make sure that the drain hose from the pressure relief valve hangs down into a suitable laboratory sink or drain.
 3. Connect the inlet hose (marked **WATER IN**) to the fitting at the bottom of the pressure relief valve.
 4. Connect the other end of the inlet hose to the **Furnace Cooling** fitting marked **In** on the spectrometer.
The connectors are spring loaded. Push them straight onto the fittings until they click into place.

5. Connect the outlet hose (marked **WATER OUT**) to the **Furnace Cooling** fitting marked **Out** on the spectrometer.
- Note:** To disconnect the water hoses:
Carefully pull the knurled locking ring down slightly, to release the lock, and pull the connector off the fitting on the spectrometer.*
6. We recommend that you fit a proprietary flow indicator in the outlet hose so that you can easily monitor that cooling water is flowing.
 7. Place the free end of the outlet hose in a suitable laboratory sink or drain. Make sure that the hose cannot slip out.

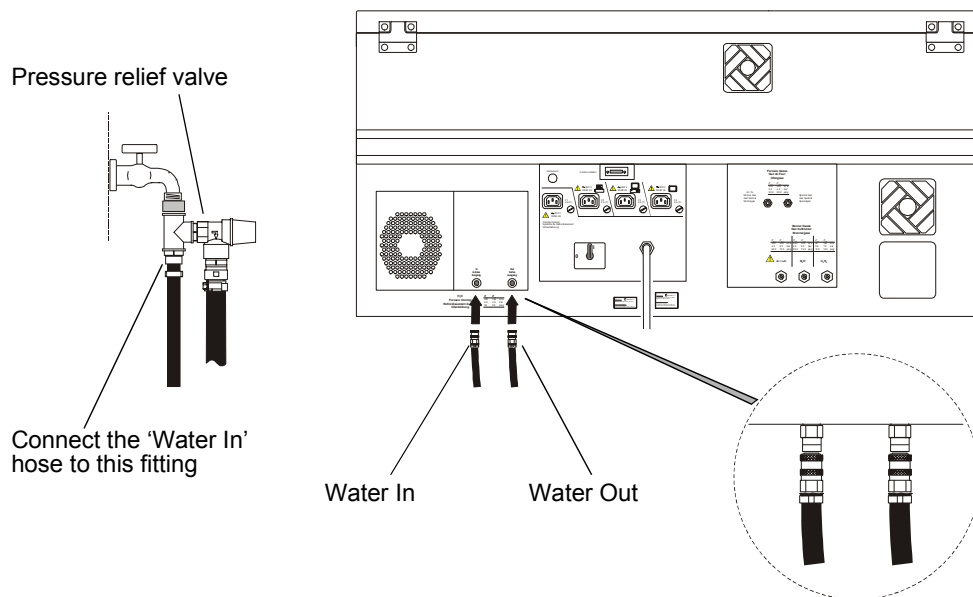


Figure 2-6. Connecting Cooling Water Hoses

Electrical connections



Warning: Electrical Hazard

W2.3

- To prevent potential injury to yourself and damage to the instrument, switch OFF all instruments in the system and disconnect them from the line power supply before you perform the procedures described below.

Read the following instructions very carefully before connecting any cables.

See *Chapter 6, Laboratory Requirements* for the specification of the line power supply.

Summary

1. Make sure that the spectrometer and the cooling system (where applicable) are switched off.
2. Switch the circuit breaker on the rear panel of the spectrometer to the off position (marked ○).
3. Switch off the computer and all other instruments that you will connect to the spectrometer or computer. See the guides for the individual instruments for the procedure to use.
4. Disconnect the line power cords of the spectrometer and all other instruments from the line power supply.
5. Connect the instrument control cables and power cords as shown on the following page.
6. When you have completed all connections, switch on the system (see *'Switching on the system'*, page 3-3).

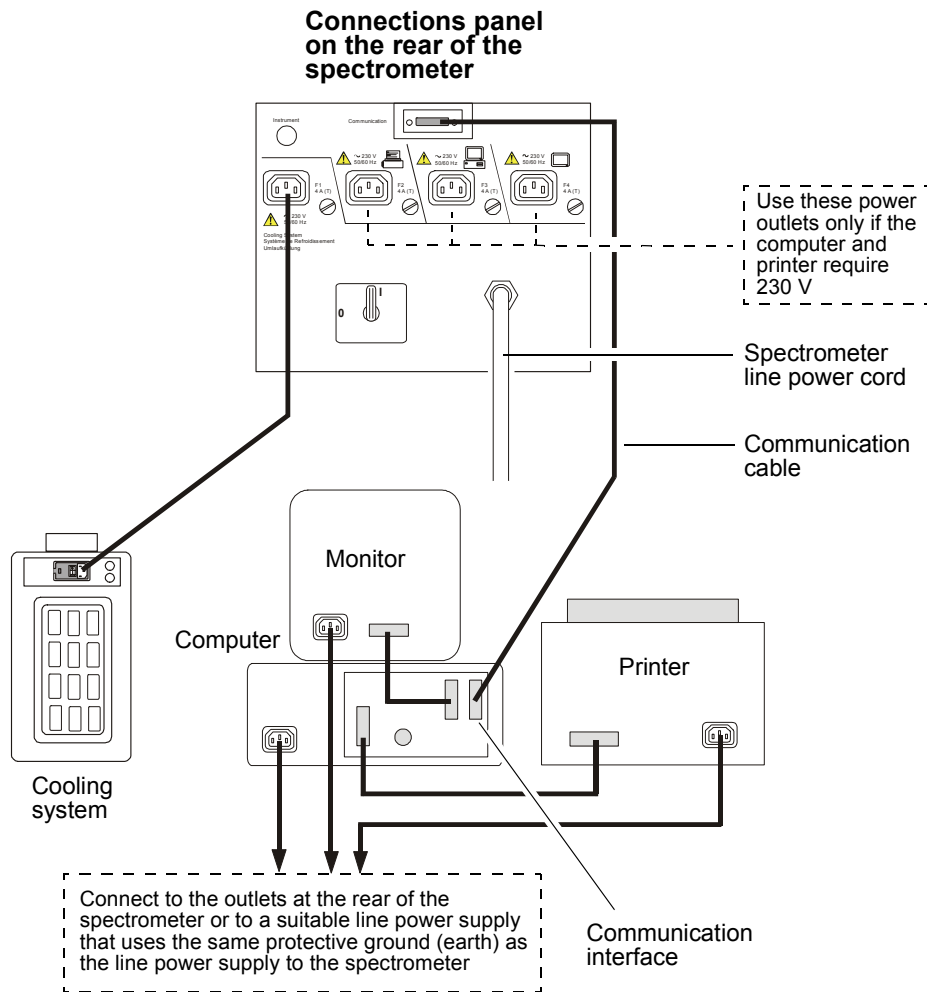


Figure 2-7. Electrical Connections

Preparing the System for Analyses

3

Contents	page
Switching on the system	3-3
Installing lamps	3-7
Installing sample trays	3-11
Shutting down the system	3-12
Emergency shutdown	3-14



Switching on the system

1. Read the safety information at the front of this guide before you operate the system.
2. Make sure that the spectrometer system and other ancillary instruments are correctly installed and connected to their power supplies.
Make sure that the coolant hoses are connected correctly to the spectrometer. Where applicable, make sure that the cooling system is filled to the **Max** mark (see 'Filling the cooling system', page 2-18).
3. Switch on the fume ventilation system for the work area.
4. Turn on the burner gases and adjust the outlet gauge pressures to the recommended values (see Table 3-1 on page 3-5).
Always set the same outlet gauge pressure for air and nitrous oxide.
5. Turn on the inert (and special) gas for the furnace and adjust the outlet gauge pressures to the recommended values (see Table 3-2 on page 3-6).

Note: You must always turn on the air supply since air pressure is required for the internal pneumatic system. If you intend to work with only one atomizer, you only need to additionally turn on the gas supplies for that atomizer.

6. Turn on the cooling water to the system:
 1. If you are using the circulatory cooling system, switch it on by pressing the power switch located on the rear panel.
You can leave this switch permanently in the on position since power is supplied by the spectrometer.
 2. If you are using the main water supply, set a flowrate of approximately 2.5 L/min.
Note: If the water is too cold or flowing too fast, moisture may condense on the graphite contacts or on the furnace windows. Moisture on the graphite contacts leads to shorter lifetimes of the graphite tube and contacts, while moisture on the windows leads to a reduction in the radiant energy.
7. Switch the circuit breaker on the rear panel of the spectrometer to the on position (marked I).
You can leave this switch permanently in the on position during routine operation; you switch the spectrometer system on and off via the operational on/off switch located on the front panel.

8. Switch on the computer.
If your computer has a power management system, switch this off.
9. Install a Lumina hollow cathode lamp in any holder in the lamp compartment (*procedure: page 3-7*).
A hollow cathode lamp must be installed in at least one holder before you switch on the spectrometer.
10. Switch on the spectrometer system with the operational on/off switch located on the front panel.
11. If you need the diluter, autosampler, or flow injection system, switch on the respective systems.
12. If you have changed the configuration of the system, such as installed a different autosampler or added or removed any accessories, use the **Reconfigure** utility to reconfigure the software (*see the Online Help in AA WinLab*).
13. Start AA WinLab: In the AA WinLab group, double click on the AA WinLab icon.
14. Set up the various parts of the system:
 1. Install any further lamps that you require for the analyses (*procedure: page 3-7*).
 2. Set up the burner system
(*see 'Setting up the system for analyses using the flame technique' in the Burner System User's Guide*).
 3. Set up the graphite furnace system
(*see 'Setting up the system for analyses using the furnace technique' in the Graphite Furnace User's Guide*).

Procedures for shutting down the system are described on page 3-12.

In an emergency, you can shut down the system as described on page 3-14.

Table 3-1. Required Pressures for the Burner Gases

Gas	Outlet Gauge Pressure					
	kPa		bar		psig	
	$P_{\min}$	$P_{\max}$	$P_{\min}$	$P_{\max}$	$P_{\min}$	$P_{\max}$
Acetylene (C ₂ H ₂)	90	100	0.9	1.0	13.0	14.5
Air	450	500	4.5	5.0	65.0	72.5
Nitrous oxide (N ₂ O)	450	500	4.5	5.0	65.0	72.5

- Set the outlet gauge pressure for each gas to a value just below the maximum value ($P_{\max}$).
- Always set the same outlet gauge pressure for air and nitrous oxide.
- **Never** set the outlet gauge pressure to a value exceeding the maximum pressure ($P_{\max}$).
- Always turn on the air supply since air pressure is required for the spectrometer's pneumatic system.

**Warning: Acetylene – Explosion Hazard**

W5.7

Acetylene can decompose explosively at pressures higher than 103 kPa/
1.03 bar/15 psig.

- Always make sure that the acetylene outlet gauge pressure is below this value.

Table 3-2. Required Pressures for the Furnace Gases

Gas	Outlet Gauge Pressure					
	kPa		bar		psig	
	$P_{\min}$	$P_{\max}$	$P_{\min}$	$P_{\max}$	$P_{\min}$	$P_{\max}$
Argon	350	400	3.5	4.0	50.0	58.0
Nitrogen	350	400	3.5	4.0	50.0	58.0
Special	350	400	3.5	4.0	50.0	58.0

- Set the outlet gauge pressure for each gas to a value just below the maximum value ($P_{\max}$).
- **Never** set the outlet gauge pressure to a value exceeding the maximum pressure ($P_{\max}$).



Warning: Toxic Gases

W6.1

If you use nitrogen as the inert gas, toxic cyanogen gas (CN)₂ will be produced when the furnace temperature is above 2300 °C.

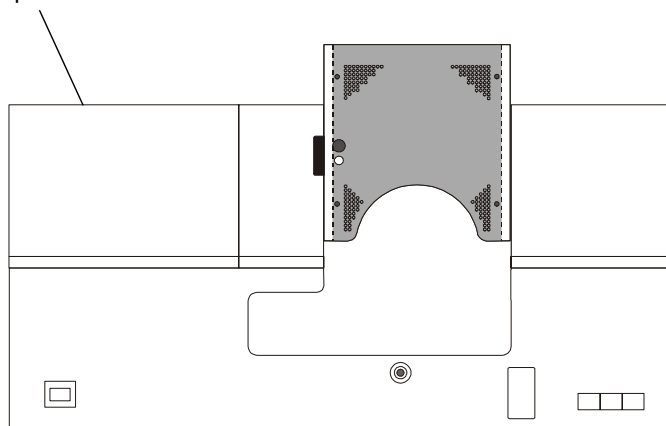
- *Make sure that the main laboratory fume ventilation system removes all gases and fumes emitted by the furnace.*

Installing lamps

Lamp compartment

The lamp compartment is located on the left-hand side of the spectrometer, beneath a hinged cover. The compartment is easily accessible from the front when the cover is open.

Lamp compartment cover



The spectrometer is designed to operate with PerkinElmer Lumina hollow cathode lamps (HCLs) and coded electrodeless discharge lamps (EDLs).

The lamp compartment has holders for up to eight lamps.

You can install Lumina HCLs in all eight holders. The holders incorporate the receptacles for connection of the Lumina lamps.

You can install EDLs in holders 1–4 only. The sockets for the power supplies to the EDLs are located on the left-hand side of the lamp compartment.

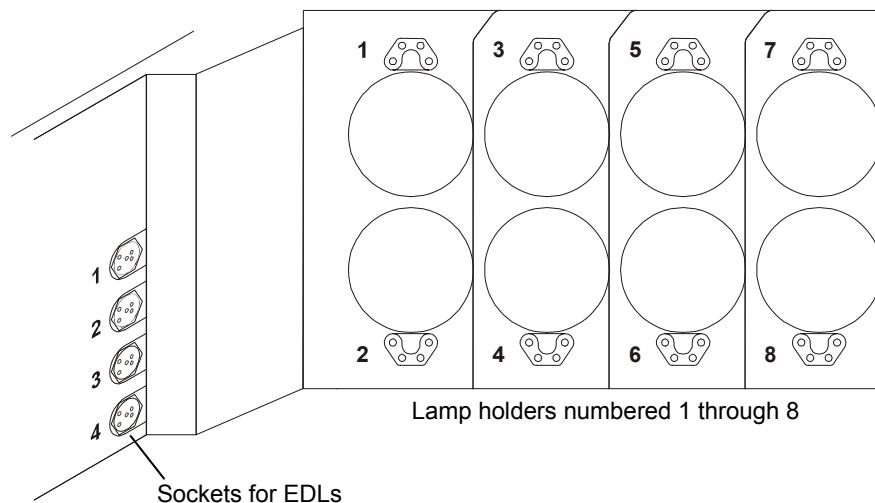


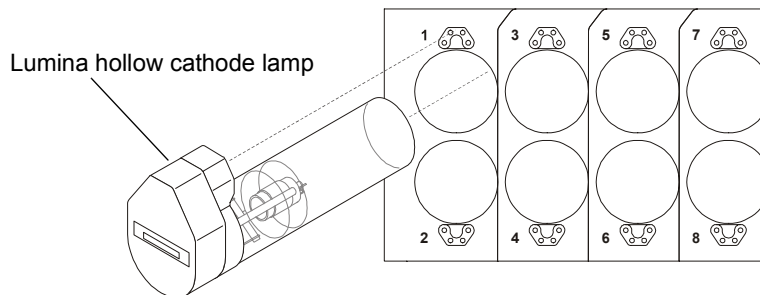
Figure 3-1. Lamp Holders in the Lamp Compartment

Installing and connecting lamps

HCLs

Note: A hollow cathode lamp must be installed in at least one holder before you switch on the spectrometer.

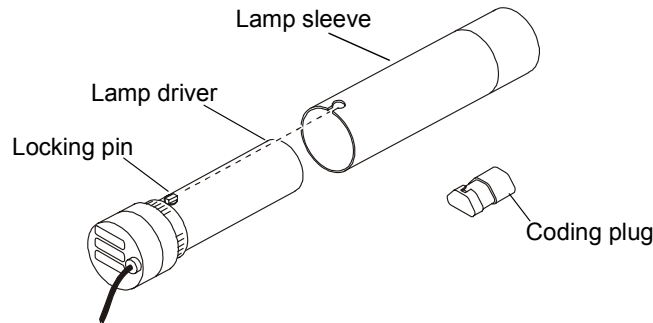
1. Open the lamp compartment cover by lifting it at the front and swinging it back.
2. Slide the Lumina lamp for the required element into the selected lamp holder and make sure that the integrated socket slides fully home over the receptacle on the lamp holder.
3. Close the lamp compartment cover.



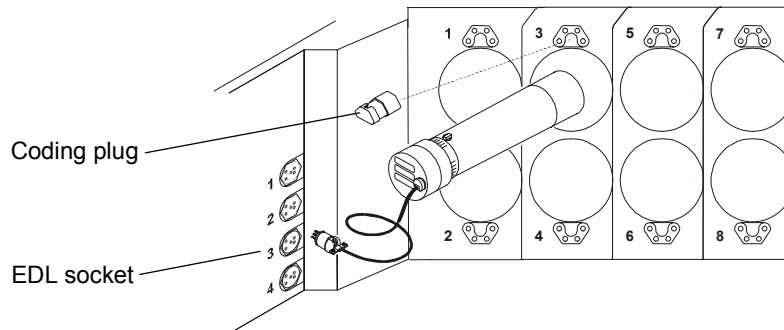
EDLs

You must use the lamp holders numbered 1 through 4 for EDLs.

1. Open the lamp compartment cover by lifting it at the front and swinging it back.
2. If necessary, assemble the lamp by sliding the lamp driver into the lamp sleeve for the required element. Depress the locking pin as the sleeve slides into place and make sure that the locking pin extends through the locating hole in the sleeve.



3. Slide the lamp carefully into the selected lamp holder until it butts up against the end-stop inside the holder.
4. Insert the coding plug over the receptacle on the lamp holder.
5. Insert the lamp connector into the correct EDL socket at the left-hand side of the lamp compartment. Use the receptacle that has the same number as the lamp holder.
6. Close the lamp compartment cover.



Removing lamps

Do not unplug and remove lamps while they are switched on.

1. On the **Toolbar**, click on **Lamps**. The Align Lamps window appears.
2. Make sure that the lamps you want to remove are switched off:
The **On** buttons must *not* be green. If necessary, click on the respective **On** buttons.
3. Close the Align Lamps window.
4. Unplug and remove the lamps. For EDLs, remove the coding plugs as well.

Tips for installing lamps

- Use only PerkinElmer lamps. You can use both hollow cathode and electrodeless discharge lamps.
- Do not touch the front window of the lamp; perspiration or other contamination can reduce the intensity of the radiation.
- If you install more than one lamp containing a particular element, for example, a single-element copper lamp and a multi-element lamp containing copper, the system will use the lamp in the holder with the lower number when you perform determinations of that element. Make sure that you place the preferred lamp in the holder with the lower number.
- With EDLs, connect each lamp plug to the socket that has the same number as the holder of the lamp.
- With EDLs, make sure that you use the correct coding plug and connect it to the receptacle on the lamp holder containing the EDL.
- If you use the wrong coding plug or connect the coding plug to the wrong receptacle, you will cause the spectrometer to malfunction and may cause irreparable damage to the lamp.

Installing sample trays

A sample tray can be inserted into one of three locations in front of the spectrometer – on the left-hand side, in front of the atomizer compartment, and on the right-hand side. You can leave a tray permanently installed on the left-hand side if you wish. You cannot install a tray in front of the atomizer compartment or on the right-hand side as long as the furnace autosampler is installed. When the autosampler is swivelled to the standby position at the right, you can install a tray in front of the atomizer compartment.

The sample trays are robust and can support an accessory, such as a diluter, or a flame autosampler, or a flow injection system.

To install the tray

1. Hold the tray with both hands and position it in front of the location into which you wish to insert it.
2. Insert the tray support posts into the guides at the base of the instrument and slide in the tray until it hits the stop. Then gently lift the front of the tray and slide it finally into place. You can feel it lock into place.

To remove the tray

1. Gently lift the tray at the front and then pull it back to slide it out of the guides.

Shutting down the system

Note: In an emergency, switch off the spectrometer using the operational on/off switch on the front panel.

The flame is automatically extinguished and the gases shut down in a safe sequence.

See page 3-14 for the procedure to follow after an emergency shutdown.

You must shut down each atomizer correctly before you shut down the spectrometer.

To shut down the flame system

1. With the flame still burning, aspirate the correct rinsing solutions to rinse the burner system (see 'Extinguishing the flame' in the Burner System User's Guide for detailed information).

Either aspirate the solutions manually or use the flame autosampler.

2. Extinguish the flame and bleed the gas lines:
 1. In the **Flame Control** window, click on the **Flame** icon.
The system uses a predetermined shutdown sequence to extinguish the flame safely.
 2. Shut down the gases to the spectrometer at source.
 3. In the **Flame Control** window, click on **Bleed Gases** to depressurize the gas lines.

To shut down the furnace system

1. Flush the furnace autosampler rinsing system (see 'Autosampler maintenance procedures' in the Graphite Furnace User's Guide for detailed information).
2. Shut down the furnace gases to the spectrometer at source.

To shut down the spectrometer

1. Exit AA WinLab:
In the **File** menu, click on **Exit**.
2. Switch off the spectrometer at the operational on/off switch on the front panel.
3. Switch off any accessories.
4. If you do not want to use the computer for other tasks, shut down the computer and printer as described in their user's guides.
5. Empty the burner drain vessel (*see 'Emptying the drain vessel' in the Burner System User's Guide*).
6. Empty the furnace autosampler waste bottle.

Note: *Dispose of hazardous or corrosive solutions properly and refer to your local safety regulations for proper disposal procedures.*

Emergency shutdown

If a situation arises where you have to shut down the system quickly and you do not have time to carry out the correct procedure, you can use the procedure described below.

Note: *This procedure is for use in an emergency only. Do not use it as a routine shutdown procedure.*

1. Switch off the spectrometer at the operational on/off switch on the front panel.
2. Shut down the gases to the spectrometer at source.

When you return to the spectrometer, proceed as follows to shut down the system properly:

3. If you were previously running concentrated salt solutions, organic solvents, or solutions containing cyanide, copper, silver, or mercury:
 1. Remove the burner head (*see the Burner System User's Guide*).
 2. Pour a large quantity of deionized water slowly through the neck of the spray chamber to thoroughly flush the chamber and the drain system.
4. Check the burner head.

If there are deposits along the slot, clean the burner head (*see the Burner System User's Guide*).
5. Reinstall the burner head.
6. Switch on and set up the spectrometer system.
7. Ignite the flame.
8. Extinguish the flame properly.

Spectrometer: System Maintenance

4

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PerkinElmer Service

**Warning: Unauthorized Adjustments and Servicing**

W1.2

Only a PerkinElmer service engineer or similarly trained and authorized person should be permitted to service the instrument.

- *Do not attempt to make adjustments, replacements, repairs, or modifications to this instrument except as described in the documentation supplied with the instrument.*

If the spectrometer system does not function correctly...

- Switch off the spectrometer system and make sure that it cannot be operated.
- Contact your local PerkinElmer office.

You should only perform the maintenance procedures described in this guide.

For any other maintenance or service contact your local PerkinElmer office to arrange for a service engineer to visit.

In particular you should only allow a PerkinElmer service engineer or similarly trained and authorized person to perform any work on:

- electrical components inside the instrument;
- the gas connections and gas system pneumatics;
- the monochromator and all other optical system components.

Before the service engineer arrives:

1. Make sure that the instrument and work area are clean.
2. Empty corrosive solutions from the burner drain vessel.
Then add water to the drain trap to activate the function.
3. Empty the furnace autosampler waste bottle.

Troubleshooting

See the *Troubleshooting Guide* supplied with the AA WinLab operating system. This guide includes information on problems that can arise with both the software and the spectrometer system.

Maintenance checklist

Maintenance checklists for the spectrometer system are presented below. Maintenance checklists for the burner system are presented in the *Burner System User's Guide* and for the graphite furnace, cooling system, and the furnace autosampler in the *Graphite Furnace User's Guide*.

General preventative maintenance procedures	
Instrument and work area	For safety reasons, and to avoid contaminating new samples, you should make sure that the instrument and the work area are always absolutely clean. This is especially important when you are working with toxic substances and when you are measuring trace amounts of any elements. Wipe up spills immediately before they can cause further contamination or damage. Before you leave the instrument standing idle for any period of time, make sure that all the components are clean.
Fume ventilation	Make sure that the main fume ventilation system functions correctly. Always switch it on when you are using the instrument.
Environmental conditions	Make sure that the environmental conditions are as described in <i>Chapter 6, Laboratory Requirements</i> .
Acetylene cylinder	Always change to a new acetylene cylinder when the cylinder pressure falls to below 600 kPa (6 bar; 87 psig) (<i>more information: page 4-14</i>).

Spectrometer, maintenance checklist	
External surfaces	Wipe over the surfaces with a lint-free cloth moistened with a dilute solution of laboratory detergent. The surfaces are resistant to dilute acids and alkalis, and to a lesser extent to strong acids and alkalis and organic solvents.
Air filters	Fit new filters yearly or more often in a dusty environment (<i>procedure: page 4-10</i>).
Atomizer compartment windows, lamp end windows	These windows do not normally require cleaning but if they become marked, e.g., with fingerprints, you can clean them (<i>procedure: page 4-5</i>).

Spectrometer maintenance procedures

Procedures described

- Cleaning the windows.
- Changing the air filters.
- Resetting the circuit breaker and changing the fuses.
- Replacing the deuterium lamp.

Cleaning the windows of the optical system

Caution

Risk of damage to optical components

- *Never touch or clean the surfaces of the grating or mirrors. If mirror surfaces are scratched they must be resurfaced. Do not allow cleaning fluids to come into contact with any of the reflecting surfaces.*
-

Most of the optical components are under the main cover of the spectrometer and are protected by the black optics covers.

Usually these components require no maintenance, provided the laboratory fume ventilation system is working correctly and the environmental conditions are as described in *Chapter 6, Laboratory Requirements*.

The only optical parts that are exposed are:

- The atomizer compartment windows.
- The windows of the lamps.
- The furnace windows. Cleaning the furnace windows is described under *System Maintenance* in the *Graphite Furnace User's Guide*.

These windows are important parts of the whole optical system. Handle them carefully, as you would any sensitive optical component. Do not directly touch the windows.

If mirror surfaces need cleaning, this must be done by a PerkinElmer service engineer or a similarly authorized and trained person who knows the special techniques required.

To clean the windows:

This must be done only by a skilled person who knows the special techniques required.

Note: *The more you rub the surface of the windows, the more chance there is of scratching them. You must change scratched windows.*



W3.1

Warning: UV Radiation – Risk of Eye Damage

The lamps may emit UV radiation which can damage your eyes.

- *Do not gaze into a lighted lamp.*
- *Always wear UV-absorbing safety glasses when looking at the radiation from the lamps.*

1. Blow dust off optical surfaces with clean dry air before you attempt to clean them. Do not rub the surfaces.
2. Clean the window surfaces with a soft lint-free cloth moistened with spectroscopic grade alcohol. The window must dry quickly to avoid leaving drying marks.

Keep the cleaning solutions and water away from other parts of the instrument.

Maintaining the electrical components



Warning: Electrical Hazard

W2.3

- *To prevent potential injury to yourself and damage to the instrument, switch OFF all instruments in the system and disconnect them from the line power supply before you perform the procedures described below.*

Parts that may be serviced by the user

The only parts that you should attempt to maintain are those described below. The electronic components in the instrument do not contain any parts which you can maintain yourself. If there is a problem, contact your local PerkinElmer office.

If any fuses blow frequently or if the automatic circuit breaker switch is activated frequently, contact your local PerkinElmer office for advice.

Resetting the automatic circuit breaker

The spectrometer has an automatic circuit breaker which prevents the system from drawing too much current.

When the circuit breaker is activated, the switch flips to the off position (marked O). This can happen while an analysis is running.

To reset the switch, wait a few seconds then put the switch to the on position (marked I).

If this switch is activated frequently, contact your local PerkinElmer office for advice.

Changing the fuses



Warning: Electrical Hazard

W2.9

- *Use only fuses with the correct current rating and of the specified type for replacement.*
- *Do not use makeshift fuses and do not short-circuit the fuse holders.*

1. Switch off the spectrometer and all other instruments in the system as described in the relevant guides.
2. Switch the circuit breaker on the rear panel of the spectrometer to the off position (marked O).
3. Disconnect the spectrometer's line power cord from the line power supply.
4. Disconnect all the line power cords from the sockets at the rear of the spectrometer.
5. To change the fuses numbered F1, F2, F3, F4:
 1. Insert the tip of a suitable screwdriver in the slot of the respective fuse holder and unscrew the fuse holder.
 2. Remove the blown fuse, then insert a new one of the correct type and rating. The correct rating is shown on the label of the fuse on the rear panel of the spectrometer.
 3. Screw the fuse holder into the correct socket.
6. Reconnect the line power cords correctly.

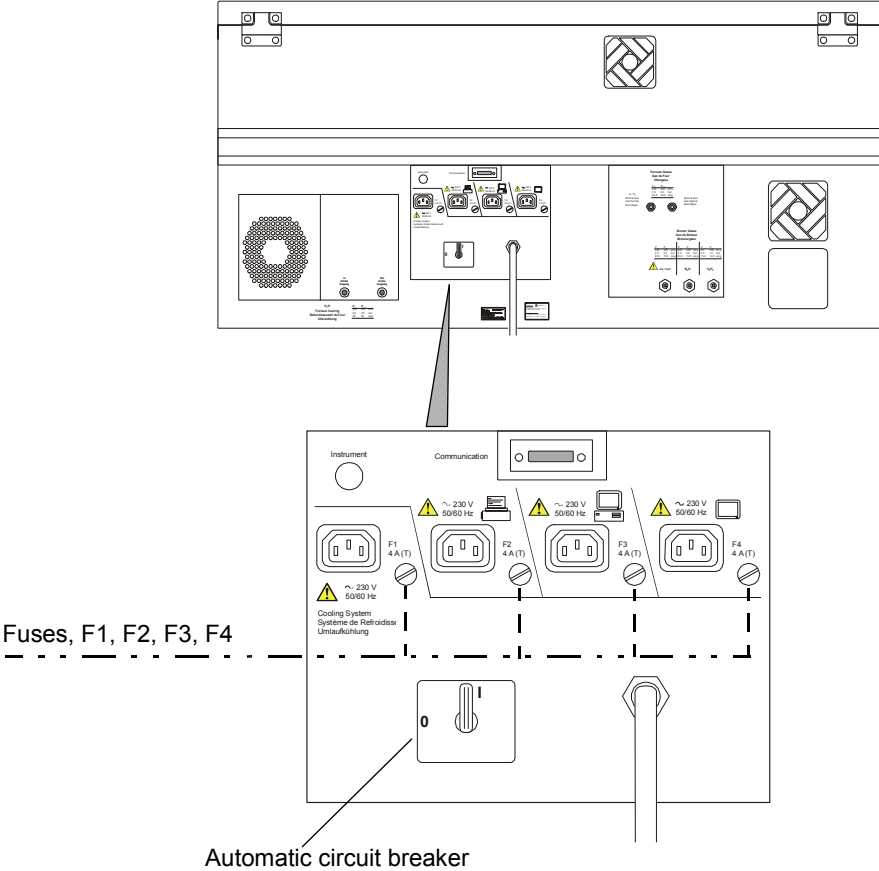


Figure 4-1. Automatic Circuit Breaker and Fuses on the rear panel

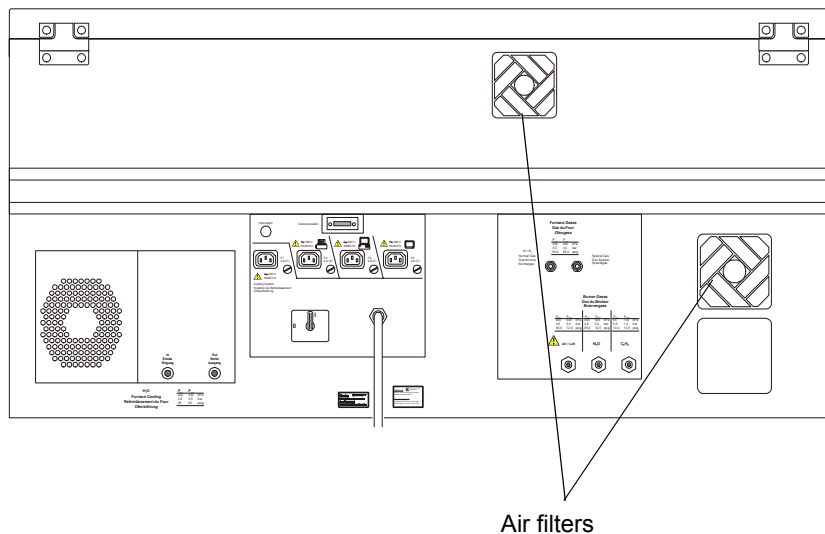
Changing the air filters

To make sure that the electrical components in the spectrometer are properly cooled, the air filters must allow sufficient air into the instrument. Check the filters regularly and change them if they are dirty.

You should not need to change the filters more than once every year if the environmental conditions are as described under *Chapter 6, Laboratory Requirements*.

Replacement filters are available; see *Chapter 5, Parts and Supplies* for the part number.

1. Carefully pull off the snap-on plastic grid that holds the air filter in place.
2. Replace the filter and push the grid back into place.



Replacing the deuterium lamp

The deuterium lamp for the background corrector has a limited lifetime. After a prolonged period of operation the lamp will exhibit decreasing radiant intensity and will ultimately fail.

The lifetime of the deuterium lamp will be prolonged if you do not switch it on and off frequently.

You can replace the deuterium lamp assembly yourself. The replacement lamp is fitted in a prealigned mount.

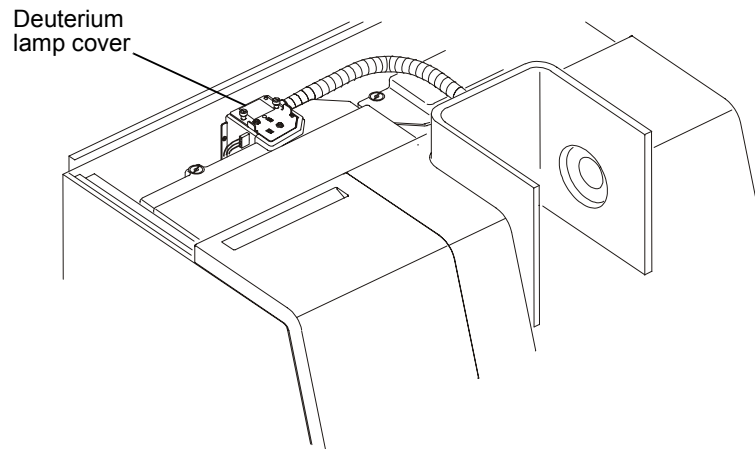


Figure 4-2. Location of Deuterium Lamp inside the Spectrometer



Warning: Electrical Hazard

W2.3

- To prevent potential injury to yourself and damage to the instrument, switch OFF all instruments in the system and disconnect them from the line power supply before you perform the procedures described below.

1. Switch off the spectrometer at the operational on/off switch on the front panel.
2. Switch the circuit breaker on the rear panel of the spectrometer to the off position (marked O).
3. Disconnect the spectrometer from the line power supply.

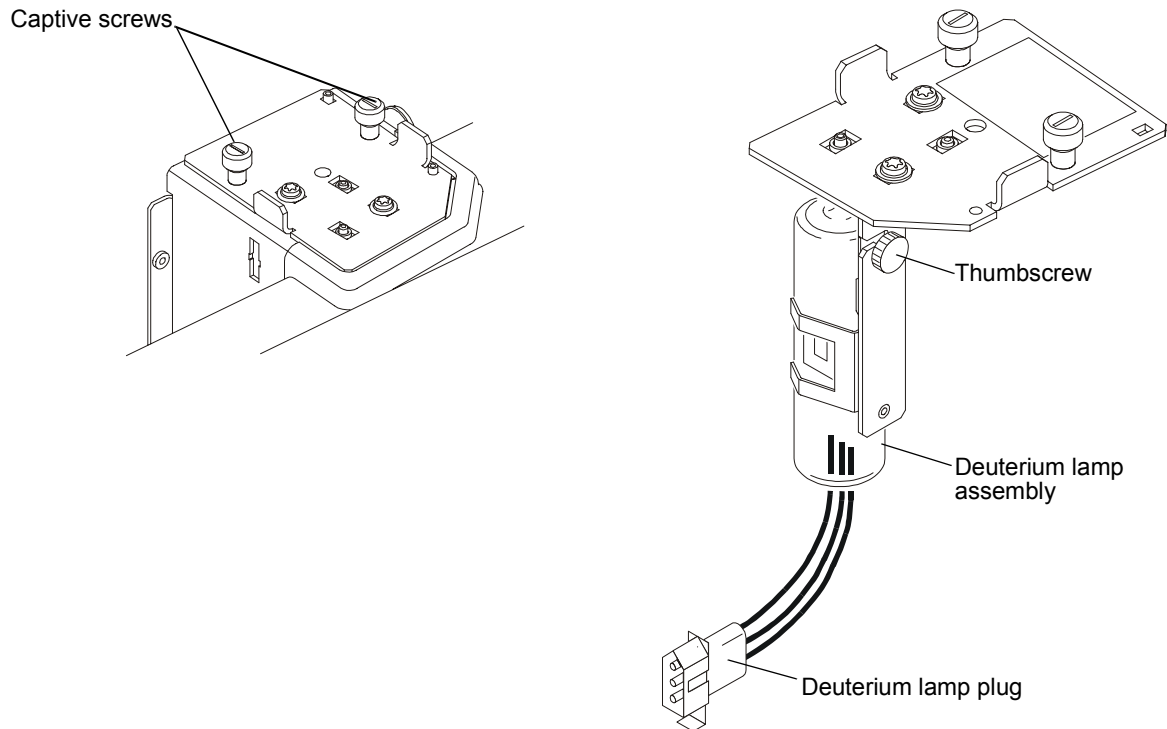


Figure 4-3. Deuterium Lamp Cover and Bracket Assembly

4. Open the top cover of the spectrometer:
 1. Remove the two securing screws; one on the left and one on the right.
 2. Swing back the cover to the open position.
5. Remove the deuterium lamp assembly:
 1. Undo the two captive screws on the deuterium lamp cover.
 2. Carefully lift up the deuterium lamp cover.
The deuterium lamp assembly is attached to a bracket underneath the cover.
 3. Carefully place the complete assembly on top of the black optics cover.
 4. Pull out the deuterium lamp plug from the socket in the lamp compartment.
Do not pull on the deuterium lamp leads.
6. Slacken the thumbscrew on the bracket and remove the old lamp assembly.
Save the thumbscrew for use with the new lamp assembly.

7. Unpack the new lamp assembly, taking care to hold it only by the metal mount to prevent fingermarks on the lamp envelope.
8. Slip the slot at the base of the lamp mount over the stud on the lamp bracket and secure the lamp assembly with the thumbscrew saved in step 6.
9. Wipe the lamp envelope with a soft cloth moistened with alcohol to remove dirt, since this would otherwise be burned in when the lamp is hot.
10. Insert the deuterium lamp plug into the socket in the lamp compartment. The plug is asymmetric and can only be inserted in one direction.
11. Reinstall the lamp assembly:
 1. Carefully lower the deuterium lamp assembly into the lamp compartment until the lamp cover fits in place.
 2. Screw in the two captive screws on the lamp cover.
12. Close the top cover:
 1. Swing down the cover to the closed position.
 2. Screw in the two securing screws; one on the left and one on the right.

Since the deuterium lamp is fitted with as prealigned mount, you do not normally need to align the lamp.

Note: Do not attempt to make adjustments to the lamp bracket assembly. If there is indication that the alignment is not correct (e.g., low energy for the BG bar graph in the Align Lamps or Continuous Graphics windows), please contact your local PerkinElmer office.

Maintaining the acetylene supply



Warning: Acetylene – Explosion Hazard

W5.7

Acetylene can decompose explosively at pressures higher than 103 kPa / 1.03 bar / 15 psig.

- *Always make sure that the acetylene outlet gauge pressure is below this value.*
- You should depressurize both the fuel and oxidant gas hoses at the end of the working day or if you are not going to use the instrument for an extended period. Close the cylinder valves to avoid the possibility of gas hoses being subjected to the full cylinder pressure in the event that a pressure regulator should fail.
- Acetylene is supplied dissolved in a solvent such as acetone, and a small amount of solvent carryover with the acetylene is normal. However, as tank pressure falls, the relative amount of solvent entering the gas stream increases and can give erratic results, particularly for elements such as calcium, tin, chromium, molybdenum and others whose sensitivity is highly dependent on the fuel:oxidant ratio. The pressure drop is not linear with gas removal since the acetylene is dissolved in a solvent, and a pressure of 600 kPa (6 bar; 85 psig) at ambient temperature indicates that the cylinder is nearly empty. For this reason, replace acetylene cylinders when the cylinder pressure drops to about 600 kPa (6 bar; 85 psig).
- Always store and use acetylene cylinders vertically, rather than horizontally, to prevent liquid acetone from reaching the cylinder valve.
- The practice of ‘cracking the valve’ of an acetylene tank (that is, opening the valve slightly for a very short period previous to attaching the regulator) is not recommended. While such an action will clear the valve opening of dust or dirt particles and may remove acetone from the cylinder valve, it is a potentially hazardous practice and one which should never be attempted in the presence of an open flame, sparks or other possible sources of ignition.

Parts and Supplies

5

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Parts provided

PerkinElmer reserves the right to alter the schedule of parts provided without prior notice.

Qty.	Item	Part No.
1	AAAnalyst 700 atomic absorption spectrometer.	B312-0082
1	Read cable.	B312-1302
3	Special line cords	B310-0003
1 pack	Replacement air filters	B050-2706
4	Plugs, for handle screw holes	B015-3803
1 pack	Replacement fuses	B312-1303
1	AS-800 furnace autosampler	B300-1500
1	Swing-arm mount for autosampler.	B312-0922
	<i>Further parts provided with the furnace autosampler are listed under 'Parts and Supplies' in the Graphite Furnace User's Guide.</i>	
1	Fuel hose assembly (red)	B015-4984
1	Air hose assembly (black)	B015-4987
1	Nitrous oxide hose assembly (blue)	B015-4990
10 m	Special gas tube (FLEXO)	B050-8264
1	Y-connector.	0992-0179
1	Hose kit.	B311-0036
1	Drain vessel	B312-1306
1	Sample tube	B015-6272
5	Corkpreen gaskets for burner end cap	0047-2014
1	O-ring for burner end cap	0990-2147
1	O-ring for the spray chamber	0990-2219
1	Burner head cleaning tool.	0303-1573
1 pack	Graphite components	B300-0408
5	Graphite tubes with integrated platforms	B300-0407
1	Tube alignment tool	B008-0112
1 set	Tools for changing graphite contacts	B312-1301
1	Documentation package	B312-0299

Replacement parts

Obtaining supplies, replacement parts, and accessories

Supplies, replacement parts, and accessories can be ordered directly from PerkinElmer, using the part numbers quoted in the guides provided with the instrument.

e-ssentials

PerkinElmer Instruments on-line catalog, your single source for quality supplies and accessories.

<http://essentials.perkinelmer.com/>

PerkinElmer's catalog service offers a full selection of high-quality supplies. To place an order for supplies and many replacement parts, request a free catalog, or ask for information:

- If you are located *within the U.S.*, call toll free **1-800-762-4002**, 8 a.m. to 8 p.m. EST. Your order will be shipped promptly, usually within 24 hours.
- If you are located *outside of the U.S.*, call your local PerkinElmer sales or service office.

What is listed in this section

This section lists the most important replacement parts for your spectrometer system. Parts listed under *Parts provided* are not repeated in this section. Information about other parts and accessories for the system is given in the current PerkinElmer brochures and price lists.

Background corrector

Description	Part No.
Deuterium lamp	B014-8615

Laboratory Requirements

6

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Introduction

The AAnalyst 700 spectrometer has some special requirements that you must consider when setting up the laboratory. The laboratory must fulfil these requirements, described in this chapter, before you can operate the spectrometer correctly.

Brochure no. L-301 – *Preparing Your Laboratory for PerkinElmer Atomic Spectroscopy Instruments* – also contains useful information. This brochure is available from PerkinElmer.

Operating conditions

**Warning: Explosive Atmosphere**

W1.3

This instrument is not designed for operation in an explosive atmosphere.

The instrument will operate correctly under the following conditions:

- Indoors.
- Ambient temperature +15 °C to +35 °C (+59 °F to +95 °F), with a maximum change not exceeding 2.8 °C (5 °F) per hour.
- Ambient relative humidity 20% to 80%, without condensation.
- Altitude in the range 0 m to 2000 m (sea level to 6500 feet).
- The location must be free of dust, smoke, and corrosive fumes.

Note: *When you remove the instrument from storage and before you put it into operation, allow it to stand for at least a day under the approved operating conditions.*

Bench and location requirements

The location you choose for the spectrometer must fulfil the criteria listed below:

- Place the spectrometer on a sturdy bench or trolley (cart) capable of sustaining the weight. The work surface must be level, flat, clean, dry, and free from vibration. It should be strong and stiff enough to bear the weight of the spectrometer system over a long period without warping or bending. A movable table is very convenient, but make sure that the wheels can be securely locked.
- Position the bench or trolley out of direct sunlight and away from radiators and heaters.
- Position the system near to the electricity and gas supply points, and close to a source of cooling water.
- Position the system so that the atomizer compartment is located beneath a suitable fume ventilation system.
- Make sure that there is space at the rear and sides of the system for air to circulate freely.
- Make sure that there is sufficient room for you to work comfortably with the instruments, and that you can reach the connections at the rear of the instruments and the electricity and gas supply points.

Fume ventilation

You must provide an efficient fume ventilation system to remove the fumes generated by the atomizer.

The specification for a suitable system is described in brochure no. L-301 – *Preparing Your Laboratory for PerkinElmer Atomic Spectroscopy Instruments*. This brochure is available from PerkinElmer.



Warning: Toxic Gases – Fume Ventilation System

Without adequate ventilation, potentially toxic vapors can build up in the laboratory.

- *Your laboratory must have a reliable fume ventilation system before you use this instrument.*

Exhaust venting is important for the following reasons:

- It will protect laboratory personnel and the instrument from toxic vapors, which may be produced by some samples.
- It will minimize the effects of room drafts and the laboratory atmosphere on flame stability.
- It will remove heat produced by the flame.

We strongly recommend that you do not place the spectrometer in a chemical hood. If a chemical hood must be used, make arrangements to prevent contamination due to corrosive vapors and backdrafts from other hoods. **Do not** perform sample preparation in the same hood as the spectrometer.

Space requirements for the spectrometer system

The illustrations on the following pages show the dimensions of the spectrometer and the space that you require to accommodate the spectrometer, computer, and ancillary equipment.

Computer and printer

Place the computer near to the spectrometer in a convenient position for working with both instruments. A movable table, specially designed for a computer and printer, may be most convenient.

The printer needs to be in a convenient place with enough room for the paper supply to stand and feed smoothly into the printer.

Accessories

Make sure that there is sufficient room for any accessories near to the spectrometer.

For example, we recommend that you place the (optional) FIAS flow injection system on a movable table in front of the atomizer compartment to minimize the length of the sample transfer tube. Make sure that the wheels of the table can be securely locked.

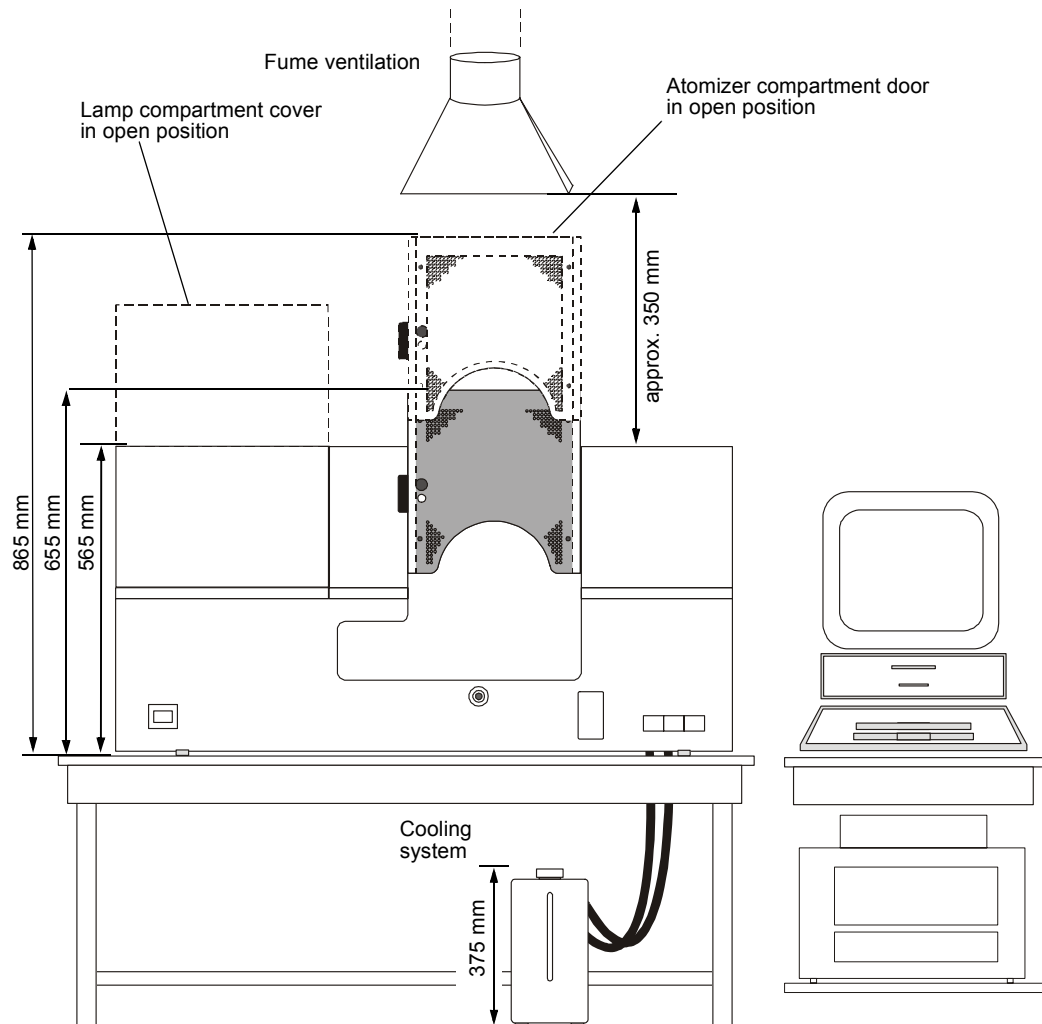


Figure 6-1. Space Requirements for the Spectrometer System (1)

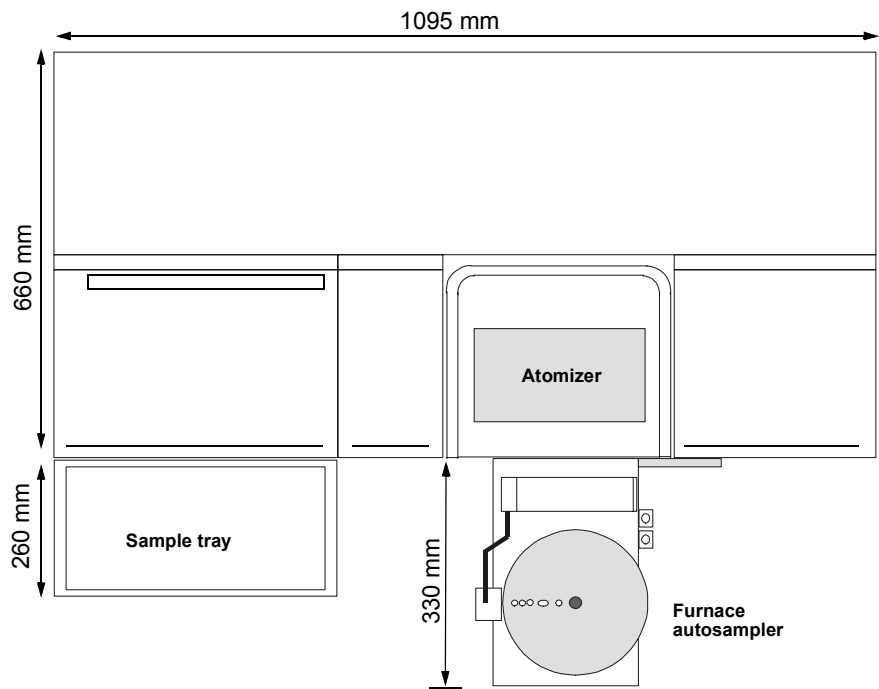


Figure 6-2. Space Requirements for the Spectrometer System (2)

Electrical requirements

The AAnalyst 700 spectrometer requires a stable electrical supply of 230 V, 50 Hz or 60 Hz, capable of delivering 20 A, that has a correctly wired protective earthing system (ground connection).

The line power cable has a 3-pole connector (line + neutral + protective earth), conforming to IEC 309-2, rated for 20 A. The cable is 3 meters long.

The line power supply should be free of line transients in excess of 50 V peak. If the electrical supply voltage produces large AC line voltage fluctuations, a qualified electrician should install a voltage regulator between the electrical outlet and the instrument.

The power demand of the graphite furnace is approximately 3600 VA, the maximum graphite tube temperature is 3000 °C. Monitoring of the energy required for each user-defined furnace program reliably prevents the line power supply from being overloaded.

The line power supply point must be within 3 meters of the rear of the spectrometer.

We recommend that you connect the spectrometer, computer, printer, and any accessories to the same phase of the line power supply and the same protective earth.

The line power supply must conform with local safety regulations and be checked by a qualified electrician before you connect the instrument to line power.

See the guides for the computer and printer and any other instruments for information about their power requirements.

Gas supply requirements

The permanent installation of gas supplies is the responsibility of the user and should conform to local safety and building regulations. PerkinElmer recommends that cylinders be stored outside the laboratory and that gases be piped to the spectrometer system in approved gas lines.

- The user must provide the gas supplies, regulators, connectors, and valves. A double-stage or heated regulator is recommended for nitrous oxide. Either the gas supplier or PerkinElmer can supply the correct regulators and valves.
- You must be able to reach the on/off valves easily and see the pressure indicators.
- Consult *Chapter 1, Safety and Regulatory Information* for recommended safety procedures.

**Warning: Compressed Gases**

High pressure gas cylinders can be dangerous if mishandled or misused.

- *Always handle gas cylinders with caution and observe your local regulations for the safe handling of gas cylinders.*

Burner gases

Two types of flame are commonly used for atomic absorption analyses with flame atomization: the air/acetylene flame and the nitrous oxide/acetylene flame. The specifications and requirements for the burner gases are given below:

Table 6-1. Specifications and Requirements of the Burner Gases

Gas	Purity	Outlet Gauge Pressure					
		kPa		bar		psig	
		$P_{\min}$	$P_{\max}$	$P_{\min}$	$P_{\max}$	$P_{\min}$	$P_{\max}$
Acetylene (ethyne, C ₂ H ₂)	99.996%, atomic absorption grade in acetone	90	100	0.9	1.0	13.0	14.5
Air	oxygen ≤20%; particle free; water free	450	500	4.5	5.0	65.0	72.5
Nitrous oxide (dinitrogen monoxide, N ₂ O)	99.996%	450	500	4.5	5.0	65.0	72.5

- Set the outlet gauge pressure for each gas to a value just below the maximum value ($P_{\max}$).
- Always set the same outlet gauge pressure for air and nitrous oxide.
- **Never** set the outlet pressure to a value exceeding the maximum pressure ($P_{\max}$).



Warning: Acetylene – Explosion Hazard

WS.7

Acetylene can decompose explosively at pressures higher than 103 kPa/ 1.03 bar/15 psig.

- Always make sure that the acetylene outlet gauge pressure is below this value.

Air supply

For the burner system, an air supply that is clean, dry, and oil-free is required. The air supply should provide a minimum of 28 liters/min. (1 cubic foot/min.) at a minimum pressure of 450 kPa (65 psig). The air supply should be suitably filtered to remove oil, water, and solid particles. Since compressors are generally noisy, we recommend that you locate the compressor outside the laboratory.

Cylinders of compressed air should only be used as an emergency or short-term solution.



Warning: Flashback Hazard

W5.9

PerkinElmer burner systems are designed for use with compressed air. The use of oxygen can cause an explosion in the burner system, and oxygen-enriched air can cause a flashback of the flame.

- *Never use oxygen or oxygen-enriched air with PerkinElmer burner systems. Use only compressed air.*

Air Compressor: A small oil-less air compressor meeting the air supply requirements is recommended. The use of an air dryer filter is strongly recommended to remove entrained water, oil, water aerosols, and solid particles from compressed air lines. Water in the air supply can cause severe damage to the pneumatics.

Caution

Risk of damage to the instrument

Water in the air supply can damage to the pneumatics.

- **Use only dry air.** *Bleed compressor tanks to remove water at least once a week.*
-

Acetylene supply

The acetylene supply should be of ‘atomic absorption’ grade.



Warning: Acetylene – Explosion Hazard

Acetylene can decompose explosively at pressures higher than 103 kPa/ 1.03 bar/15 psig.

- *Always make sure that the acetylene outlet gauge pressure is below this value.*

Grade: Suitable acetylene typically has a minimum purity specification of 99.6% with the actual assay being about 99.8%. Acetylene is supplied dissolved in acetone to prevent explosive decomposition. You should not use acetylene that is dissolved in any other solvent. Experience indicates that solvents can be carried through the regulator with the acetylene and can weaken, to the point of rupture, the walls of the tubing carrying the acetylene to the burner, causing a potential hazard.

Cylinder Specifications: A size 1A acetylene cylinder contains about 8500 liters (300 cubic feet) of acetylene and usually lasts about 30 hours of burning time with an air-acetylene flame. With a nitrous oxide-acetylene flame, the same size cylinder will last about 10 hours.

Flash Arrestor: PerkinElmer recommends the use of the Flash Arrestor (P/N N930-0068). The flash arrestor provides a positive shutoff of gas by checking the reverse flow under all conditions. It also stops the gas supply when a flashback occurs. The flash arrestor can be directly connected to the acetylene fuel line.

Piping/Tubing/Fittings: Use galvanized iron, steel, or wrought iron tubing. Never use copper tubing with acetylene. Joints may be welded or made up of threaded or flanged fittings, typically stainless steel or aluminum, or brass composed of less than 65% copper. Rolled, forged, or cast steel or malleable iron fittings may also be used. Cast iron fittings cannot be used safely for acetylene lines.



Warning: Risk of explosion

Acetylene can react with copper to form a readily explosive compound.

- *Never use copper tubing or fittings for acetylene gas lines.*

Nitrous oxide supply

The nitrous oxide supply should be at least 99% pure. A heated regulator is recommended.

Cylinder Specifications: Cylinders of nitrous oxide (99.0% minimum purity) are available from local suppliers.

Nitrous oxide is supplied in the liquid state, initially at a pressure of about 5000 kPa (750 psig). A size 1A cylinder of nitrous oxide contains about 14800 liters (520 cubic feet) and will typically last for 10–12 hours of burning time.



Warning: Nitrous oxide is a strong oxidant and an asphyxiant

Nitrous oxide is an asphyxiant; it can be considered a potential hazard whenever it is stored or used in a confined space.

Spontaneous combustion may occur if nitrous oxide comes into contact with grease, oil, or other organic material.

- *Store nitrous oxide cylinders in a well-ventilated area outside the laboratory.*
- *Do not store nitrous oxide cylinders in close proximity to flammable gases (e.g., acetylene).*
- *Make sure tubing and fittings carrying nitrous oxide are free of grease, oil, or other organic material.*

Heated Regulator: Since the nitrous oxide is in liquid form, the pressure gauge does not give a true indication of how much nitrous oxide remains in the cylinder until the pressure starts to fall rapidly as the residual gas is drawn off. When nitrous oxide is rapidly removed from the cylinder, the expanding gas causes cooling of the cylinder pressure regulator and the regulator diaphragm can freeze. This can create erratic flame conditions or, in the most extreme case, a flashback.

It is therefore advisable to use a regulator with a built-in heater. A heated nitrous oxide pressure regulator is available from PerkinElmer.

Furnace gases

Inert gas

The graphite furnace requires a supply of inert gas to prevent the tube and the analyte atoms from being oxidized when the tube is heated.

Argon is the recommended inert gas.

If you cannot obtain argon, you can use purified nitrogen, but nitrogen does not provide such efficient protection as argon at temperatures above 2000 °C.

Nitrogen can also react with the samples and the graphite tube at typical atomization temperatures.



Warning: Toxic Gases

W6.1

If you use nitrogen as the inert gas, toxic cyanogen gas (CN)₂ will be produced when the furnace temperature is above 2300 °C.

- *Make sure that the main laboratory fume ventilation system removes all gases and fumes emitted by the furnace.*

Special gas

For some applications you may want to use a special gas. A typical example is the use of air during one of the pyrolysis steps to better ash organic materials.

Table 6-2. Specifications and Requirements of the Furnace Gases

Gas	Purity	Outlet Gauge Pressure						Max. Flowrate
		kPa		bar		psig		L/min
		$P_{\min}$	$P_{\max}$	$P_{\min}$	$P_{\max}$	$P_{\min}$	$P_{\max}$	1.2
Argon	99.996%	350	400	3.5	4.0	50.0	58.0	1.2
Nitrogen	99.996%	350	400	3.5	4.0	50.0	58.0	1.2
Special	particle free; water free	350	400	3.5	4.0	50.0	58.0	1.2

- Set the outlet gauge pressure for each gas to a value just below the maximum value ($P_{\max}$).
- **Never** set the outlet pressure to a value exceeding the maximum pressure ($P_{\max}$).

Cooling the spectrometer system

The graphite furnace uses water cooling to allow the graphite tube to return to its equilibrium temperature (approximately ambient) quickly between measurements (see *'Cooling the furnace' in the Graphite Furnace User's Guide*). Cooling coils are also incorporated in the spectrometer's power supply to maintain the electronic components at a comfortable working temperature.

Cooling system

PerkinElmer offers a recirculating cooling system as an option. It provides coolant at a constant temperature and flow rate, to allow the most reproducible analytical conditions. It also makes the system independent of external water supplies and saves water (see *'Cooling the furnace' in the Graphite Furnace User's Guide*). This cooling system includes a pressure-sensitive safety device that opens a bypass if the internal pressure in the circulatory system increases to above a safe value.

Power requirements: 230 V; 50/60 Hz (electrical power is supplied by the spectrometer)

Part Number: B019-8072

External cooling

If you intend to run the spectrometer system without the PerkinElmer cooling system, you must connect another suitable source of cooling, such as the main water supply or a laboratory thermostat. If you connect the spectrometer system to the main water supply, make sure that the water pressure is as given in Table 6-3.

Table 6-3. Requirements for the Cooling Water Supply

Water quality	sediment-free drinking water
Temperature	20–40 °C
Flow rate	not less than 2 L/min
Pressure	2.5–3.5 bar (36–50 psig)
pH	6.5–7.5
Hardness	not greater than 14 °dH or 100 ppm

Unfiltered industrial water should **not** be used.

A water hose kit with pressure relief valve is provided with the spectrometer system which you must permanently install in the water supply line to the system. This valve opens if the water pressure to the system exceeds 4 bar. This feature eliminates the risk of damage to the water hoses and hose fittings in the system through excess water pressure.

The water pressure to the system should be at least 2.5 bar (36 psig). If the pressure is lower, the flow rate of water through the system is reduced and heat will not be removed quickly enough.

The maximum water pressure to the system is 3.5 bar (50 psig); the pressure relief valve opens automatically if the water inlet pressure exceeds 4 bar – the slightly higher pressure of 4 bar allows for minor daily fluctuations in the pressure of the main water supply.

Lamps

These are often called primary source lamps, atomic absorption source lamps, spectroscopic lamps, or line sources.

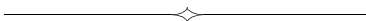
You need to provide the lamps for your particular applications.

Brochure no. L-656 – *Hollow Cathode Lamps and Electrodeless Discharge Lamps for Atomic Absorption*, contains descriptions of all the lamps that are available. This brochure is available from PerkinElmer.

Computer and printer

PerkinElmer offers a suitable computer for controlling the spectrometer and graphite furnace, and a suitable printer. Contact your local PerkinElmer office for more information.

PerkinElmer cannot accept responsibility for incorrect functioning of the spectrometer system if you are not using the computer offered with the spectrometer by PerkinElmer.



Spectrometer: System Description

7

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Switches and connectors on the spectrometer	7-8
Technical data	7-14



The AAnalyst 700 Spectrometer System

Concept

The AAnalyst 700 spectrometer from PerkinElmer is a high performance atomic absorption spectrometer incorporating a burner system for flame atomization and a graphite furnace for electrothermal atomization. The spectrometer is capable of fully automatic single or multi-element analyses. The complete system is operated from the associated computer using the AA WinLab software.

Features of the AAnalyst 700 System

- Double-beam optical system optimized for maximum radiation throughput.
- Two fully integrated atomizers: a burner system for flame atomization and a graphite furnace for electrothermal atomization. Atomizer changeover is automatic at the click of a mouse button.
- Longitudinally-heated graphite furnace featuring full Stabilized Temperature Platform Furnace (STPF) technology.
- Deuterium background correction system.
- Automated self-optimization of the burner system.
- High capacity furnace autosampler.
- Easy-to-use AA WinLab software with which you control the spectrometer system. AA WinLab also incorporates a range of powerful quality control functions.

System components

The AAnalyst 700 is a compact benchtop spectrometer. The major components of the system are:

- The spectrometer, containing the optical system, the electronics, and the atomizer compartment.
- The burner system, mounted on a carriage that can be driven into and out of the atomizer compartment by software command (*see 'Burner design' in the Burner System User's Guide for more information*).
- The graphite furnace, mounted on a carriage that can be driven into and out of the atomizer compartment by software command (*see 'Furnace design' in the Graphite Furnace User's Guide for more information*).
- The furnace autosampler, mounted on a swing arm in front of the atomizer compartment (*see 'Autosampler design' in the Graphite Furnace User's Guide for more information*).
- The (optional) furnace cooling system (*see 'Cooling the furnace' in the Graphite Furnace User's Guide for more information*).
- The computer and the associated AA WinLab software.
- The printer; this is optional but strongly recommended.

System control

To control the spectrometer and perform your analyses, you use the AA WinLab application program, which runs under the Microsoft Windows operating system. The computer keyboard, the screen, and the mouse form the user interface. When you switch on the spectrometer system it performs an initialization procedure to check the instrument. While the spectrometer is operating, the control system continually monitors many instrument functions. It generates appropriate messages when a problem occurs and prevents potentially hazardous situations from arising.

You can obtain more information about the application program in the AA WinLab online help.

Accessories

PerkinElmer offers autosamplers for operation with the burner system, flow injection systems, diluters, and much more. Please contact your local PerkinElmer office to obtain more information.

The optical system

The AAnalyst 700 uses a double-beam optical system as depicted in Figure 7-1. Front-surfaced, reflecting optical components are used throughout. The mirror surfaces are coated with silica for durability.

The lamp compartment has positions for up to eight spectral sources. The radiation from the requested source lamp is reflected by a movable mirror into the optical path.

A beam splitter splits the radiation into a sample beam and a reference beam. The sample beam passes through the atomizer while the reference beam passes around the atomizer and is conducted by a fiber optic. The sample and reference beams are measured simultaneously.

The Littrow-configuration monochromator has a large area reflecting grating blazed at two wavelengths; 236 nm for operation in the UV spectral range and 597 nm for operation in the visible spectral range. The monochromator offers a choice of three spectral slit widths. Two slit heights are available for each slit width. The high slits are used with the flame technique while the low slits are used with the graphite furnace technique. The detector is a segmented array of discrete photodiodes.

For continuum source background correction, the radiation from the deuterium lamp is merged with the source radiation at the beam splitter.

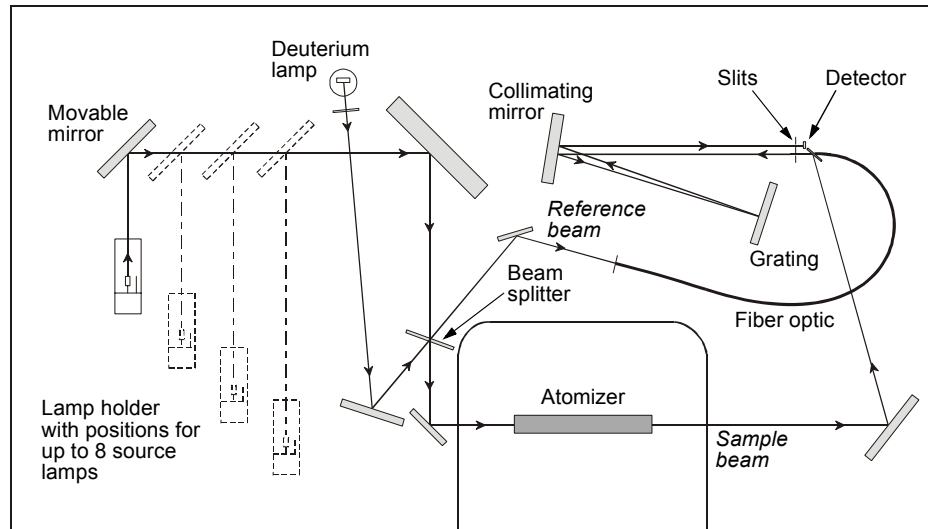


Figure 7-1. Optical System

Switches and connectors on the spectrometer

Operational on/off switches

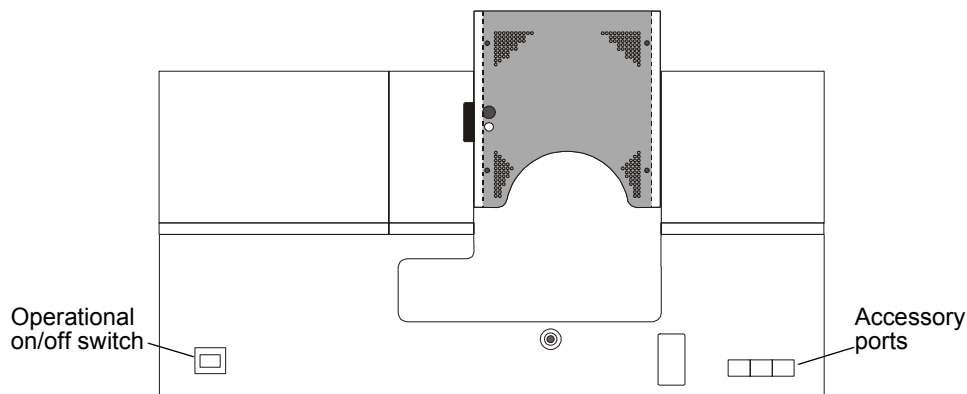


Figure 7-2. Switches and Ports on the Front Panel

Spectrometer

You normally switch the system on and off with the operational on/off switch on the front panel of the spectrometer.

Note: The spectrometer is provided with an operational on/off switch and with a circuit breaker.

The operational on/off switch turns the instrument on and off, but it does not disconnect the instrument from the line power supply.

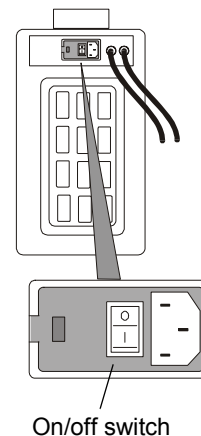
The circuit breaker functions as a 'disconnecting device' and disconnects the instrument entirely from the line power supply.

Cooling system

The (optional) cooling system requires a 230 V line power supply, which is supplied and controlled from the spectrometer. A special line power cord is provided for this purpose. Do not connect the cooling system to an external power source.

You can leave the on/off switch on the cooling system in the 'on' position since the system is controlled from the spectrometer.

Cooling System



Accessory ports

Three accessory ports are located on the front panel of the spectrometer behind slide-up covers. You use these ports to connect certain accessories to the spectrometer, such as the furnace autosampler. The ports provide the electrical supply and control signals for operation of the accessories.

Electrical connectors and controls on the rear panel

Item	Designation	Function
1	Instrument	Socket for a read cable to an external instrument to activate a read cycle.
2	Communication	Socket for the communication cable connecting the spectrometer to the computer.
3	Cooling System ~230 V 50/60 Hz	Power outlet for the (optional) cooling system. Connect the cooling system to this socket only. Do not connect other equipment to this power outlet.
4	 ~230 V 50/60 Hz	Power outlet for a printer.
5	 ~230 V 50/60 Hz	Power outlet for a computer.
6	 ~230 V 50/60 Hz	Power outlet for a monitor.
7		Circuit breaker. An automatic switch that prevents the system from drawing too much current. It can also be used to isolate the spectrometer system from the line power supply.
8		Captive line power cord for the complete system.
9	F1	Fuse for the cooling system power outlet; 4 A slow-blow (T).
10	F2	Fuse for the printer power outlet; 4 A slow-blow (T).
11	F3	Fuse for the computer power outlet; 4 A slow-blow (T).
12	F4	Fuse for the monitor power outlet; 4 A slow-blow (T).

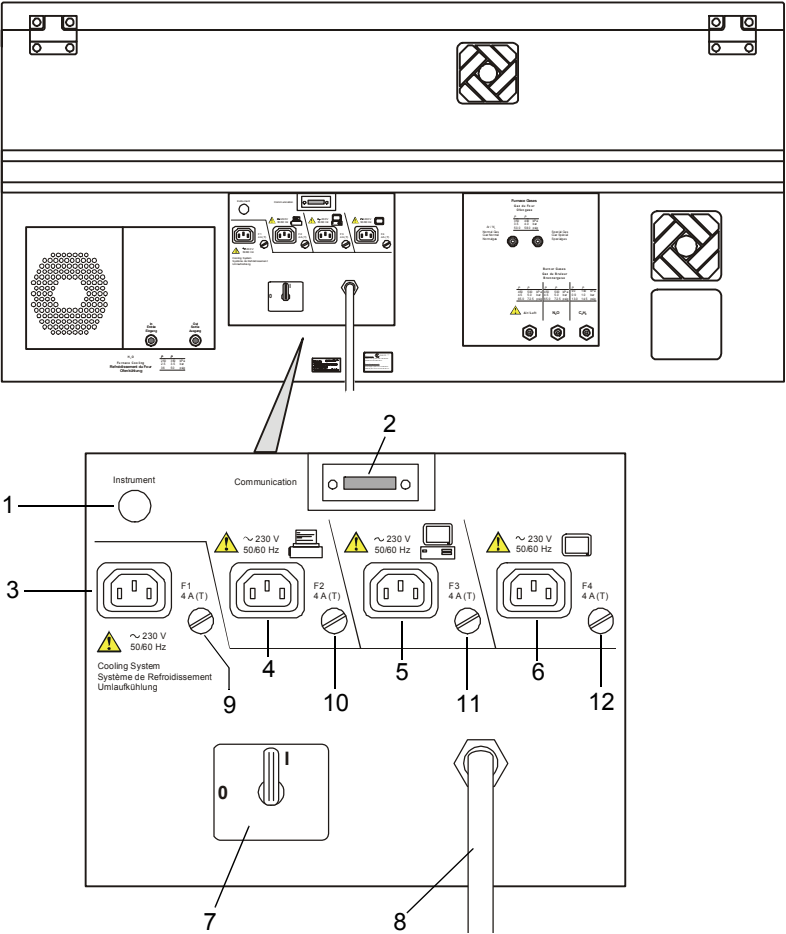


Figure 7-3. Electrical Connectors and Switches on the Rear Panel

The gas and cooling connectors

Item	Designation	Function
Furnace Cooling		
1	In	Fitting for connection of the cooling water inlet hose to the spectrometer.
2	Out	Fitting for connection of the cooling water outlet hose from the spectrometer.
Furnace Gases		
3	Ar/N₂ Normal Gas	Connector for the connection of the normal gas supply to the furnace (argon or nitrogen).
4	Special Gas	Connector for the connection of the special gas supply to the furnace. If you are not using a special gas, you must also connect the normal gas to this connector.
Burner Gases		
5	Air/Luft	Fitting for connection of the air supply to the spectrometer. The air supply is required for the burner and also for the pneumatic system in the spectrometer.
6	N₂O	Fitting for connection of the nitrous oxide supply to the burner.
7	C₂H₂	Fitting for connection of the acetylene supply to the burner.

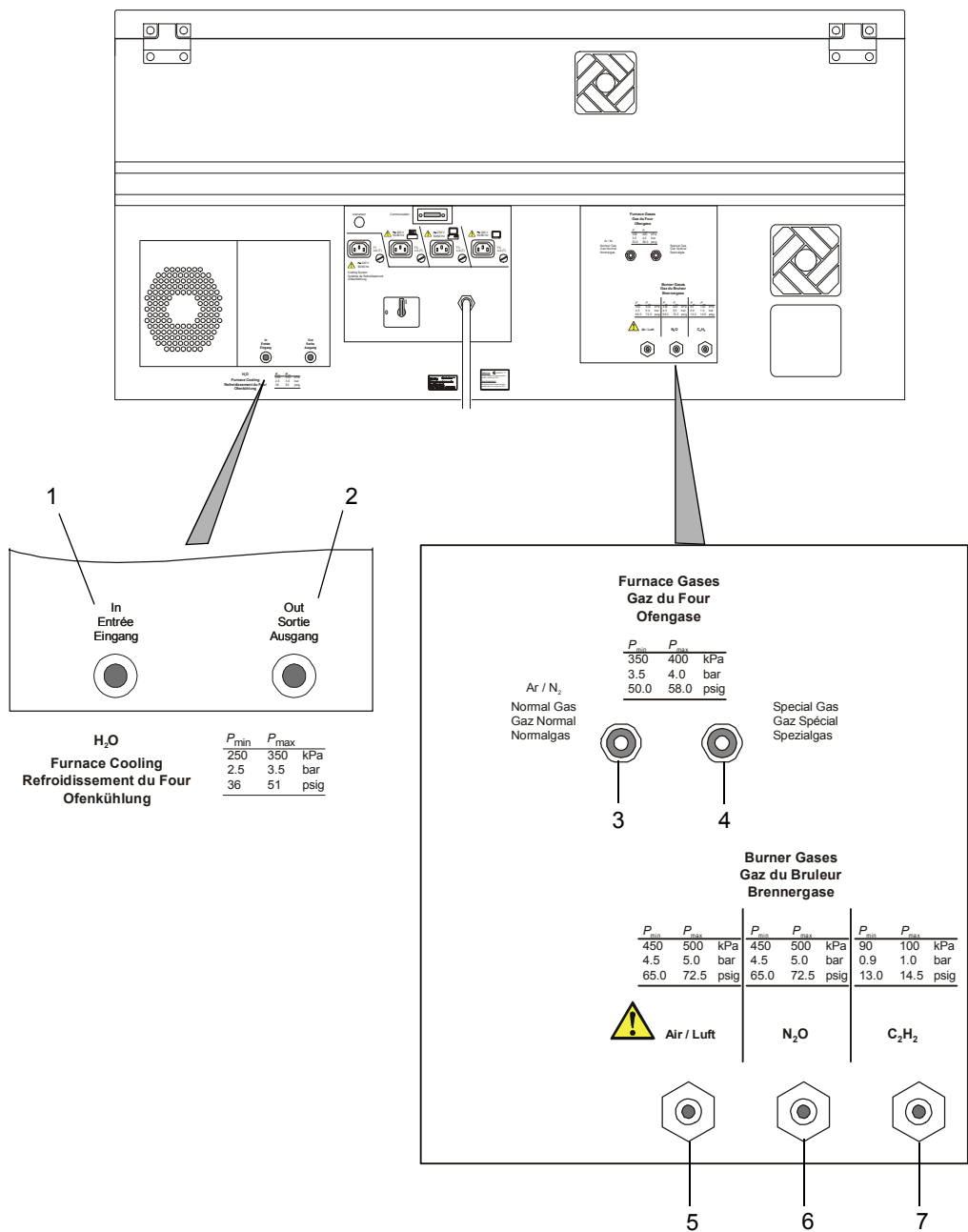


Figure 7-4. Gas and Cooling Connectors on the Rear Panel

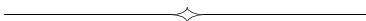
Technical data

Principle	Atomic absorption spectrometer. Computer controlled, using a special application program running under a graphical user interface. Real-time double-beam, all-reflecting optical system. Front-surfaced optics protected by a silica coating. AC modulated spectral line sources.
Monochromator	Littrow configuration grating monochromator. Grating: ruled area: 64 mm x 72 mm, 1800 lines/mm blaze wavelengths: 236 nm and 597 nm Focal length: 267 mm Slit widths: 0.2, 0.7 and 2.0 mm Wavelength range: 190–870 nm Reciprocal linear dispersion: 1.6 nm/mm (nominal)
Detector	Segmented discrete solid-state detector with CMOS charge amplifier array; software-controlled automatic gain control (AGC).
Lamps	Line radiation sources. Positions for up to 8 lamps in lamp compartment. Single- and multi-element hollow cathode lamps (HCLs) and up to 4 electrodeless discharge lamps (EDLs) can be used.
Background correction	Continuum source (deuterium lamp).
Atomizers	Flame atomization: Premix burner system with pneumatic nebulizer and interchangeable burner heads; automatic changeover between air/acetylene and nitrous oxide/acetylene flames. Electrothermal atomization: Longitudinally-heated graphite furnace.

Signal handling	Time average, peak average, peak height, peak area. Measurement ranges: - absorbance: -0.5 to 2.000 - concentration: 0.00001 to 9999 concentration units - expansion factor: 0.01 to 100 - read time: 1 to 60 s - read delay: 0 to 60 s
Calibration	Automatic zeroing, resloping, and recalibration. Calibration/recalibration using up to 15 calibration solutions ('standards'). Calibration coefficients determined by a least squares procedure. Analytical curve technique: - Linear with zero or non-zero intercept. - Non-linear, 2-coefficient, or 3-coefficient, zero or non-zero intercept. Analyte addition technique: - Zero or non-zero intercept. - Additions calibrate (zero intercept)
Application program	Special application program: AA WinLab. Online help function. Hard disk or floppy storage of measurement data, signals, and completed analytical methods. Special Reporter, Reformatter, and Library Manager applications for generating data reports and reformatting data for export to other data handling programs.
Graphics	High resolution display of the signals. Simultaneous display of the corrected analyte signal and the background signal. Calibration curve display. Storage and recall of transient absorbance signals. Hard copy printout of screen graphics on an associated printer.
Power requirements	230 V single-phase, $50/60$ Hz, power consumption 5000 VA.

Spectrometer System Description

Electrical protection	As defined in EN 61010-1-1993 (IEC 1010-1): Insulation: Class I Insulation category (overvoltage category): II Pollution degree: 2		
Safety standards	As defined in EN 61010-1-1993 (IEC 1010-1: 1990 + A1 + A2) and EN 61010-2-061:1996. CSA standards: CAN/CSA-C22.2 No. 1010.1-92, Amendment 1 (1992), 2 (1995), and CAN/CSA 61010-2-061 (1995). UL standards: UL 3101-1 1993 and UL 3111-1 1994. Compliant to the requirements of Canadian Standards Association (CSA) and Underwriters Laboratory (UL) as listed in File No. LR 45111. Certificate of Approval and GS mark from the LGA Bavaria, FRG, Institute of Equipment Safety Testing and Certification, and CSA-NRTL/C mark from CSA, Canada, File No. LR 45111.		
EMC standards	As defined in EN 61326-1:1997.		
Environmental requirements	Ambient temperature: +15 °C to +35 °C 20–80% relative humidity; non-condensing		
Dimensions	Width: 1095 mm	with handles: 1220 mm	
	Height: 655 mm	with door open: 865 mm	
	Depth: 700 mm	with handles: 770 mm	
		with autosampler: 1040 mm	
Mass (weight)	147 kg Spectrometer alone, not including the computer, autosampler, and cooling system.		



Translations of Warnings

8

Contents	page
Translations of Warnings	8-3
Symbols used on the instrument	8-45



Translations of Warnings

This section contains translations of the safety conventions and warnings used in this guide.

<i>dansk</i>	<i>Oversættelser af advarsler</i> <i>Denne del indeholder oversættelserne af de advarsler, som er indeholdt i denne håndbog.</i>
<i>Deutsch</i>	<i>Übersetzungen der Warnungen</i> <i>Dieser Abschnitt enthält die Übersetzungen der in diesem Handbuch verwendeten Warnungen.</i>
<i>español</i>	<i>Traducciones de las advertencias</i> <i>Esta sección contiene traducciones de las advertencias utilizadas en el presente manual.</i>
<i>italiano</i>	<i>Traduzione dei simboli di avvertenza</i> <i>La presente sezione contiene la traduzione dei simboli di avvertenza utilizzati nel presente manuale.</i>
<i>Nederlands</i>	<i>Vertalingen van de Waarschuwingen</i> <i>Dit gedeelte bevat vertalingen van de waarschuwingen gebruikt in dit handboek.</i>
<i>português</i>	<i>Traduções de avisos</i> <i>Esta secção contém traduções dos avisos usados no manual.</i>
<i>suomea</i>	<i>Varoitusten käännökset</i> <i>Tämä osa sisältää tässä käsikirjassa käytettyjen varoitusten käännökset.</i>
<i>svenska</i>	<i>Översättning av varningstexter</i> <i>Detta avsnitt innehåller översättningar av de varningstexter som används i handboken.</i>



This symbol alerts you to situations that could result in **personal injury** to yourself or other persons.
Details about these circumstances are in a box like this one.

<i>dansk</i>	<i>Dette symbol gør Dem opmærksom på situationer, som kan medføre kvæstelser af Dem selv eller andre personer. Detaljer vedrørende disse omstændigheder er indrammet på tilsvarende måde som denne henvisning.</i>
<i>Deutsch</i>	<i>Dieses Symbol warnt vor Situationen, in denen Sie oder andere Personen verletzt werden können. Einzelheiten darüber sind in einem Rahmen wie diesem angegeben.</i>
<i>español</i>	<i>Este símbolo le advierte de situaciones que pueden provocar lesiones corporales a usted o a otras personas. En los recuadros como éste se proporciona información sobre este tipo de circunstancias.</i>
<i>français</i>	<i>Ce symbole vous signale des situations pouvant occasionner des dommages corporels à l'utilisateur ou à d'autres personnes. Les détails sur ces circonstances sont données dans un encadré semblable à celui-ci.</i>
<i>italiano</i>	<i>Questo simbolo segnala situazioni che possono generare incidenti a voi stessi o ad altre persone. Troverete informazioni su tali circostanze in un riquadro come questo.</i>
<i>Nederlands</i>	<i>Dit symbool maakt U attent op situaties die tot verwondingen voor Uzelf of anderen kunnen leiden. Bijzonderheden over deze omstandigheden staan in een kader zoals dit.</i>
<i>português</i>	<i>Este símbolo alerta para situações que poderão causar um ferimento ao usuário. Detalhes referentes a estas circunstâncias encontram-se referidos numa caixa como esta.</i>
<i>suomea</i>	<i>Tämä symboli haluaa kiinnittää huomiotasi tilanteisiin, joiden seurauksena voi olla itsesi tai muiden henkilöiden loukkaantuminen. Yksityiskohtaisia tietoja tällaisista tapauksista on tämäntapaisessa ruudussa.</i>
<i>svenska</i>	<i>Denna symbol används för situationer där det finns risk för personskador om användaren inte följer anvisningarna. Detaljerad information ges i en ruta som denna.</i>



This symbol alerts you to the risk of **electric shock** that could result in **personal injury** to yourself or other persons.

Details about these circumstances are in a box like this one.

<i>dansk</i>	Dette symbol gør Dem opmærksom på risikoen for elektrisk stød, som kan medføre kvæstelser af Dem selv eller andre personer. Detaljer vedrørende disse omstændigheder er indrammet på tilsvarende måde som denne henvisning.
<i>Deutsch</i>	Dieses Symbol warnt vor Gefahr durch elektrischen Stromschlag, durch den Sie oder andere Personen verletzt werden können. Einzelheiten darüber sind in einem Rahmen wie diesem angegeben.
<i>español</i>	Este símbolo le advierte del peligro de descarga eléctrica que puede provocar lesiones corporales a usted o a otras personas. En los recuadros como éste se proporciona información sobre este tipo de circunstancias.
<i>français</i>	Ce symbole vous avertit d'un risque d'électrocution pouvant occasionner des dommages corporels à l'utilisateur ou à d'autres personnes. Les détails sur ces circonstances sont données dans un encadré semblable à celui-ci.
<i>italiano</i>	Questo simbolo vi mette in guardia da folgorazione che può causare incidenti a voi stessi o ad altre persone. Troverete informazioni su tali circostanze in un riquadro come questo.
<i>Nederlands</i>	Dit symbool maakt U attent op het risico van electrische schokken die tot verwondingen voor Uzelf of anderen kan leiden. Bijzonderheden over deze omstandigheden staan in een kader zoals dit.
<i>português</i>	Este símbolo alerta para um risco de um choque eléctrico que poderá causar um ferimento ao usuário. Detalhes referentes a estas circunstâncias encontram-se referidos numa caixa como esta.
<i>suomea</i>	Tämä symboli haluaa kiinnittää huomiotasi sähköiskun vaaraan , jonka seurauksena voi olla itsesi tai muiden henkilöiden loukkaantuminen. Yksityiskohtaisia tietoja tällaisista tapauksista on tämäntapaisessa ruudussa.
<i>svenska</i>	Denna symbol används för situationer där det finns risk för elektriska stötar som kan ge personskador om användaren inte följer anvisningarna. Detaljerad information ges i en ruta som denna.



This symbol alerts you to the risk of **hot surfaces** that could cause **personal injury** to yourself or other persons.
Details about these circumstances are in a box like this one.

<i>dansk</i>	<i>Dette symbol gør Dem opmærksom på risikoen for varme overflader, som kan medføre kvæstelser af Dem selv eller andre personer. Detaljer vedrørende disse omstændigheder er indrammet på tilsvarende måde som denne henvisning.</i>
<i>Deutsch</i>	<i>Dieses Symbol warnt vor Gefahr durch heiße Oberflächen, durch die Sie oder andere Personen verletzt werden können. Einzelheiten darüber sind in einem Rahmen wie diesem angegeben.</i>
<i>español</i>	<i>Este símbolo le advierte del peligro de que las superficies candentes provoquen quemaduras a usted o a otras personas. En los recuadros como éste se proporciona información sobre este tipo de circunstancias.</i>
<i>français</i>	<i>Ce symbole vous avertit d'un risque de surfaces chaudes pouvant occasionner des dommages corporels à l'utilisateur ou à d'autres personnes. Les détails sur ces circonstances sont données dans un encadré semblable à celui-ci.</i>
<i>italiano</i>	<i>Questo simbolo vi mette in guardia da superfici molto calde che possono causare incidenti a voi stessi o ad altre persone. Troverete informazioni su tali circostanze in un riquadro come questo.</i>
<i>Nederlands</i>	<i>Dit symbool maakt U attent op het risico van hete oppervlaktes dat tot verwondingen voor Uzelf of anderen kunnen leiden. Bijzonderheden over deze omstandigheden staan in een kader zoals dit.</i>
<i>português</i>	<i>Este símbolo alerta para um risco de superfícies quentes que poderão causar um ferimento ao usuário. Detalhes referentes a estas circunstâncias encontram-se referidos numa caixa como esta.</i>
<i>suomea</i>	<i>Tämä symboli haluaa kiinnittää huomiotasi kuumiin pintoihin, joiden seurauksena voi olla itsesi tai muiden henkilöiden loukkaantuminen. Yksityiskohtaisia tietoja tällaisista tapauksista on tämäntapaisessa ruudussa.</i>
<i>svenska</i>	<i>Denna symbol används för situationer där det finns risk för varma ytor som kan ge personskador om användaren inte följer anvisningarna. Detaljerad information ges i en ruta som denna.</i>



This symbol alerts you to the risk of **ultraviolet radiation** that could cause **eye damage** to yourself or other persons.

Details about these circumstances are in a box like this one.

<i>dansk</i>	<i>Dette symbol gør Dem opmærksom på risikoen for ultraviolet stråling, som kan medføre ødelæggelse af øjnene for Dem selv eller andre personer. Detaljer vedrørende disse omstændigheder er indrammet på tilsvarende måde som denne henvisning.</i>
<i>Deutsch</i>	<i>Dieses Symbol warnt vor Gefahr durch UV-Strahlung, die bei Ihnen oder anderen Personen zu Augenverletzungen führen können. Einzelheiten darüber sind in einem Rahmen wie diesem angegeben.</i>
<i>español</i>	<i>Este símbolo le advierte del peligro de que usted u otras personas sufran lesiones en los ojos a consecuencia de la radiación ultravioleta. En los recuadros como éste se proporciona información sobre este tipo de circunstancias.</i>
<i>français</i>	<i>Ce symbole vous avertit d'un risque de rayonnement ultraviolet pouvant occasionner des lésions oculaires à l'utilisateur ou à d'autres personnes. Les détails sur ces circonstances sont données dans un encadré semblable à celui-ci.</i>
<i>italiano</i>	<i>Questo simbolo vi mette in guardia da radiazione ultravioletta che può causare lesioni agli occhi a voi stessi o ad altre persone. Troverete informazioni su tali circostanze in un riquadro come questo.</i>
<i>Nederlands</i>	<i>Dit symbool maakt U attent op het risico van ultraviolette straling dat tot verwondingen voor Uzelf of anderen kan leiden. Bijzonderheden over deze omstandigheden staan in een kader zoals dit.</i>
<i>português</i>	<i>Este símbolo alerta para um risco de radiação ultravioleta que poderá causar ferimentos aos olhos do usuário. Detalhes referentes a estas circunstâncias encontram-se referidos numa caixa como esta.</i>
<i>suomea</i>	<i>Tämä symboli haluaa kiinnittää huomiotasi ultraviolettisäteilyn vaaraan, jonka seurauksena voi olla silmävammat itsellesi tai muille henkilöille. Yksityiskohtaisia tietoja tällaisista tapauksista on tämäntapaisessa ruudussa.</i>
<i>svenska</i>	<i>Denna symbol används för situationer där det finns risk för ultraviolett strålning som kan ge ögonskador om användaren inte följer anvisningarna. Detaljerad information ges i en ruta som denna.</i>

Caution:

The term CAUTION alerts you to situations that could result in **serious damage to the instrument** or other equipment.

Details about these circumstances are described in a message similar to this one.

dansk

Bemærk:

Angivelsen CAUTION (BEMÆRK) gør Dem opmærksom på situationer, som kan medføre **alvorlig ødelæggelse af apparatet** eller andet udstyr.

Detaljer vedrørende disse omstændigheder er beskrevet i henvisninger svarende til denne.

Deutsch

Achtung:

Der Ausdruck CAUTION (ACHTUNG) warnt vor Situationen, die eine **ernste Beschädigung des Geräts** oder anderer Systemteile zur Folge haben können.

Einzelheiten darüber sind auf die gleiche Weise wie dieser Text hervorgehoben.

español

Advertencia:

El término CAUTION (ADVERTENCIA) le previene de situacones que pueden provocar **averías graves en éste u otros equipos**.

En los recuadros como éste se proporciona información sobre este tipo de circunstancias.

français

Attention:

Le terme CAUTION (ATTENTION) vous signale des situations susceptibles de provoquer de **graves détériorations de l'instrument** ou d'autre matériel.

Les détails sur ces circonstances figurent dans un message semblable à celui-ci.



→ **Caution** (continued)

italiano

Attenzione:

Con il termine CAUTION (ATTENZIONE) vi si mette in guardia da situazioni che possono comportare **il serio danneggiamento della strumentazione** o di altre apparecchiature. Troverete informazioni su tali circostanze in un riquadro come questo.

Nederlands

Let op:

De term CAUTION (LET OP) maakt U attent op situaties die tot **ernstige beschadigingen aan het instrument** of andere apparaten kunnen leiden. Bijzonderheden over deze omstandigheden worden beschreven in een mededeling gelijk aan.

português

Atenção:

O termo CAUTION (ATENÇÃO) alerta para situações que poderão causar **danificação do aparelho**. Detalhes referentes a estas circunstâncias encontram-se referidos numa caixa como esta.

suomea

Huomio:

CAUTION (HUOMIO) haluaa kiinnittää huomiotasi tilanteisiin, joiden seurauksena voi olla **laitteen** tai muiden varusteiden **vakava vaurioituminen**. Tällaiset tapaukset selostetaan yksityiskohtaisesti tämäntapaisessa huomautuksessa.

svenska

Observera:

Termen CAUTION (OBSERVERA) skall göra användaren uppmärksam på att **apparaten** eller annan utrustning **kan ta allvarlig skada** om anvisningarna inte följs. Detaljerad information ges i en ruta som denna.

		W1.2 Warning: Unauthorized Adjustments and Servicing Only a PerkinElmer service engineer or similarly trained and authorized person should be permitted to service the instrument. Do not attempt to make adjustments, replacements, repairs, or modifications to this instrument except as described in the documentation supplied with the instrument.
dansk	Advarsel: Ikke-tilladte indstillinger og arbejder på apparatet Vedligeholdelse af apparatet er kun tilladt for PerkinElmer kundeservice-ingeniøren eller tilsvarende uddannede og autoriserede personer. Prøv ikke på at foretage indstillinger, udskiftninger, reparationer eller ændringer af apparatet, som ikke er beskrevet i den dokumentation, der er vedlagt apparatet.	
Deutsch	Warnung: Unzulässige Arbeiten am Gerät Wartungs- oder Reparaturarbeiten oder Justierungen, die in der Benutzerdokumentation zum Gerät nicht beschrieben sind, dürfen nur vom PerkinElmer Kundendienst oder von entsprechend ausgebildeten und autorisierten Fachkräften ausgeführt werden.	
español	Advertencia: Ajustes y servicios sin autorización Tan sólo un ingeniero de Servicio Técnico de PerkinElmer o una persona de formación y autorización similares podrán realizar trabajos de revisión y mantenimiento del instrumento. No intente realizar ningún tipo de ajuste, sustitución o reparación en este aparato, a excepción de lo descrito en la Documentación del Usuario que se adjunta.	
français	Danger: Réglages et entretien non autorisés Seul un ingénieur du service après vente PerkinElmer ou une personne autorisée et de même formation sont autorisées à intervenir sur l'instrument. Ne pas essayer d'effectuer des réglages, des remplacements, des réparations ou des modifications sur cet instrument d'une manière autre que celle décrite dans la documentation fournie avec l'instrument.	



	→ Warning (continued)	W1.2
<i>italiano</i>	Pericolo: Regolazioni e manutenzione non autorizzati L'asservimento dello strumento è permesso esclusivamente ad un tecnico di assistenza della PerkinElmer oppure da simile persona addestrata e autorizzata. Non provare ad eseguire regolazioni, sostituzioni, riparazioni o modifiche a questo strumento se non come descritto nella documentazione allegata allo strumento.	
<i>Nederlands</i>	Waarschuwing: Ongeautoriseerde aanpassingen en service Alleen een PerkinElmer service-monteur of een gelijksoortig opgeleid en geautoriseerd persoon mag service verlenen aan het instrument. Probeer niet zelf aanpassingen aan dit instrument aan te brengen, het te repareren of te veranderen behalve zoals beschreven in de documentatie die bij het instrument geleverd is.	
<i>português</i>	Aviso: Trabalhos não permitidos no aparelho Trabalhos de manutenção apenas podem ser executados pelo Serviço Técnico da PerkinElmer ou por pessoal especializado devidamente formado e autorizado. Não tente realizar ajustamentos, substituições, reparações ou modificações neste aparelho que não estejam descritos na documentação fornecida com o aparelho.	
<i>suomea</i>	Varo: Luvattomat säätö - ja huoltotyöt Laitteen huoltotyöt saa antaa vain PerkinElmer -huoltoteknikoiden tai vastaavasti koulutettujen ja valtuutettujen henkilöiden tehtäväksi. Älä tee muita säätö-, vaihto-, korjaus- tai muutostöitä tässä laitteessa kuin sellaisia, jotka on selostettu laitteen mukana toimitetussa dokumentaatiossa.	
<i>svenska</i>	Varning: Icke tillåtna arbeten på apparaten Endast servicepersonal från PerkinElmer eller personal med liknande utbildning och behörighet får utföra servicearbeten på apparaten. Underhålls- eller reparationsarbeten, justeringar eller ändringar som inte finns beskrivna i användarmanualen till apparaten får inte utföras.	



	Warning: Explosive Atmosphere <i>This instrument is not designed for operation in an explosive atmosphere.</i>
<i>dansk</i>	Advarsel: Eksplosive omgivelser <i>Dette apparat er ikke konstrueret til brug i eksplosive omgivelser.</i>
<i>Deutsch</i>	Warnung: Explosionsfähige Atmosphären <i>Das Gerät darf nicht in explosionsfähigen Atmosphären betrieben werden.</i>
<i>español</i>	Advertencia: Atmósfera explosiva <i>Este aparato no está diseñado para utilizarlo en atmósferas explosivas.</i>
<i>français</i>	Danger: Atmosphère explosive <i>Cet instrument n'est pas conçu pour fonctionner dans une atmosphère explosive.</i>
<i>italiano</i>	Pericolo: Atmosfera esplosiva <i>Questo strumento non è concepito per operare in atmosfera esplosiva.</i>
<i>Nederlands</i>	Waarschuwing: Explosiegevaarlijke omgevingen <i>Dit instrument mag niet in een explosiegevaarlijke omgeving gebruikt worden.</i>
<i>português</i>	Aviso: Atmosferas explosíveis <i>O aparelho não pode ser utilizado em atmosferas explosíveis.</i>
<i>suomea</i>	Varo: Räjähdyksaarallinen ympäristö <i>Tätä laitetta ei saa käyttää räjähdysaarallisessa ympäristössä.</i>
<i>svenska</i>	Varning: Explosiv atmosfär <i>Apparaten är inte avsedd att användas i explosionsfarliga miljöer.</i>

W1.3

		Warning: Risk of injury through lifting <i>The instrument weighs approximately 150 kg. Improper lifting can cause painful and sometimes permanent back injury.</i> • <i>Use proper lifting techniques to lift or move the instrument.</i>
<i>dansk</i>		Advarsel: Risiko for kvæstelser ved at løfte <i>Apparatet vejer omtrent 150 kg. Hvis det løftes forkert, kan det forårsage smertefulde og til tider permanente rygskeer.</i> • <i>Benyt korrekte løfteanordninger til at løfte eller flytte apparatet.</i>
<i>Deutsch</i>		Warnung: Verletzungsgefahr durch Heben einer schweren Last <i>Das Gerät hat eine Masse von ca. 150 kg. Falsches Anheben kann schmerzhaft und unter Umständen bleibende Rückenschäden zur Folge haben.</i> • <i>Wenden Sie zum Anheben oder Bewegen des Geräts nur geeignete Techniken an.</i>
<i>español</i>		Advertencia: Peligro de lesiones por alzamiento <i>El aparato pesa 150 kg aproximadamente. Si lo alza de manera indebida puede sufrir usted lesiones dolorosas y en ciertos casos permanentes en la espalda.</i> • <i>Aplique técnicas apropiadas para alzar o mover el aparato.</i>
<i>français</i>		Danger: Risque de blessure lors de la manutention <i>L'instrument pèse environ 150 kg. Une manipulation incorrecte peut entraîner des douleurs au dos risquant de perdurer.</i> • <i>Utiliser des techniques de levage appropriées pour lever ou déplacer l'instrument.</i>



	→ Warning (continued)	W1.4
<i>italiano</i>	Pericolo: Rischio di infortunio in caso di sollevamento Lo strumento pesa all'incirca 150 kg. Se sollevato senza le dovute precauzioni è possibile che si causino dolorosi e permanenti infortuni alla schiena. • Muovere o sollevare lo strumento utilizzando le oopportune tecniche di sollevamento e di spostamento.	
<i>Nederlands</i>	Waarschuwing: Kans op letsel door optillen Het instrument weegt ongeveer 150 kg. Op een onjuiste manier tillen kan tot pijnlijk en soms permanent rugletsel leiden. • Til of verzet het instrument op de juiste manier.	
<i>português</i>	Aviso: Risco de ferimento ao levantar o aparelho O aparelho pesa aprox. 150 kg. O seu levantamento incorrecto poderá causar ferimentos dolorosos e por vezes permanentes nas costas. • Use meios de levantamento adequados para levantar ou movimentar o aparelho.	
<i>suomea</i>	Varo: Loukkaantumisvaara laitetta nostettaessa Laitte painaa noin 150 kg. Epäasianmukaisesta nostamisesta voi olla seurauksena kivuliaat ja mahdollisesti pysyvät selkävammat. • Käytä asianmukaista nostotekniikkaa laitteen nostamisessa ja siirtämisessä.	
<i>svenska</i>	Varning: Risk för personskada vid lyft Apparaten väger ca 150 kg. Felaktiga lyft kan ge svåra och ibland bestående ryggsador. • Använd rätt lyftteknik när apparaten skall lyftas eller flyttas.	

	W2.1 Warning: Electrical Hazard Any interruption of the protective conductor inside or outside the instrument or disconnection of the protective conductor (earth/ground) terminal is likely to make the instrument dangerous. Intentional interruption is prohibited. Lethal voltages are present in the instrument – Even with the power switch off, line power voltages can still be present within the instrument. – When the instrument is connected to line power, terminals may be live, and opening covers or removing parts (except those to which access can be gained without use of a tool) is likely to expose live parts. – Capacitors inside the instrument may still be charged even if the instrument has been disconnected from all voltage sources.
dansk	Advarsel: Fare på grund af elektricitet Enhver afbrydelse af beskyttelseslederen inde i eller udenpå apparatet eller fjernelse af beskyttelseslederen (jord/stel) kan gøre apparatet farligt. Bevidst afbrydelse er forbudt. Der er livsfarlige spændinger i apparatet – Selv når hovedafbryderen er slået fra, kan der stadig være netstrømsspændinger inde i apparatet. – Når apparatet er tilsluttet til strømnettet, kan enhederne være spændingsførende; hvis man åbner afskærmninger eller fjerner dele (bortset fra de dele, man kan komme frem til uden brug af værktøj), kan spændingsførende dele blive blottet. – Selv når apparatet er slukket, og strømforbindelsen er afbrudt, kan kondensatorerne i apparatet være ladet med farlig spænding.
Deutsch	Warnung: Gefährdung durch Elektrizität Das Gerät muß zum Betrieb immer geerdet sein. Auf keinen Fall die Schutzleiter im Gerät oder in der Netzzuleitung trennen oder entfernen. Gefährliche Spannung im Gerät – Auch in ausgeschaltetem Zustand kann an einigen Stellen im Gerät Netzspannung anliegen, wenn das Gerät am Stromnetz angeschlossen ist. – Auch bei ausgeschaltetem Gerät und getrennter Netzverbindung können Kondensatoren im Gerät noch mit gefährlicher Spannung geladen sein.



	→ Warning (continued)	W2.1
<i>español</i>	Advertencia: Peligro eléctrico Cualquier interrupción del conductor de protección dentro o fuera del aparato, o la desconexión del terminal del mismo (toma de tierra) pueden ocasionar serios peligros al manejar el equipo. Prohibida la interrupción intencionada. En el aparato existen voltajes letales – Incluso con el interruptor desconectado puede haber voltaje dentro del equipo. – Cuando el aparato se encuentre conectado a la red eléctrica, los terminales pueden estar bajo corriente y éstos quedar expuestos al abrir las cubiertas o al extraer componentes (exceptuando aquellos a los cuales se puede acceder con la mano). – Los condensadores internos del aparato pueden permanecer cargados incluso cuando el aparato haya sido desconectado del voltaje de línea.	
<i>français</i>	Danger: Risque d'électrocution Toute interruption du conducteur de protection à l'intérieur ou à l'extérieur de l'instrument ou déconnexion du raccord du conducteur de protection (terre) peut rendre l'instrument dangereux. Il est interdit d'interrompre volontairement ce conducteur. Tensions résiduelles mortelles dans l'instrument – Même lorsque l'interrupteur est sur arrêt, des tension résiduelles peuvent encore être présentes dans l'instrument. – Lorsque l'instrument est relié au secteur, les raccords peuvent être sous tension, et des parties sous tension peuvent être découvertes en ouvrant des capots ou en retirant des pièces (à l'exception de celles auxquelles il est possible d'accéder manuellement). – Les condensateurs contenus dans l'instrument peuvent encore être chargés, même si l'instrument a été déconnecté de toutes sources de tension.	
<i>italiano</i>	Pericolo: Rischio di folgorazione Qualsiasi interruzione del conduttore di protezione all'interno o all'esterno dello strumento o il suo scollegamento (terra) può rendere pericoloso lo strumento. Qualsiasi interruzione intenzionale è proibita. All'interno dello strumento sono presenti tensioni mortali – Anche se l'interruttore principale è spento è possibile che all'interno dello strumento siano presenti tensioni simili a quelle di rete. – Quando lo strumento è collegato alla rete elettrica è possibile che i terminali siano lucidi e scoperti; aprendo i coperchi protettivi o staccando dei componenti (fatta eccezione per quelli a cui è possibile accedere senza l'uso di utensili) è possibile esporre parti lucide. – Anche dopo che lo strumento è stato scollegato da qualsiasi sorgente di tensione è possibile che i condensatori all'interno dello strumento siano carichi.	



	→ Warning (continued)	W2.1
<i>Nederlands</i> <i>português</i>	Waarschuwing: Risico's door electriciteit Het instrument moet voor de werking altijd geaard zijn. In geen geval mag de aarding van het instrument of de netvoeding worden onderbroken of worden verwijderd. Er zijn dodelijke voltages in het instrument aanwezig – Ook in uitgeschakelde toestand kan, wanneer het instrument op de netvoeding is aangesloten, op sommige plaatsen in het instrument netspanning staan. – Als het instrument aan lijnvoeding is aangesloten, kan er nog steeds op sommige aansluitpunten netspanning staan, en door het openen van deksels of het verwijderen van onderdelen (behalve die waartoe men toegang heeft zonder gereedschap te gebruiken) kunnen onderdelen die onder spanning staan tevoorschijn komen. – Ook bij uitgeschakeld instrument en in een onderbroken netvoeding kunnen condensatoren in het instrument nog een gevaarlijke lading bevatten. Aviso: Perigo por electricidade Qualquer interrupção dos condutores de protecção à terra no interior ou exterior do aparelho ou o desligamento do condutor de protecção à terra (terra/massa) tornará o aparelho perigoso. Qualquer interrupção deliberada é proibida. Tensão perigosa no aparelho – Mesmo desligado, o aparelho poderá ainda ter tensão de rede em alguns pontos enquanto estiver ligado à rede de corrente. – Enquanto o aparelho estiver ligado à alimentação de corrente os terminais podem estar sob corrente, e o abrir de coberturas ou o retirar de peças (excepto aquelas às quais se pode ter acesso sem ter de usar ferramenta) poderá expor peças sob corrente. – Mesmo com o aparelho desligado e a ligação à rede de corrente interrompida, os condensadores dentro do aparelho ainda poderão ter uma tensão perigosa aplicada.	



	→ Warning (continued)	W2.1
suomea	Varo: Vaarana sähkö Jos suojajohdin keskeytetään laitteen sisä- tai ulkopuolella tai suojajohtimen liitin (maadoitus) irrotetaan, laitteesta tulee vaarallinen. Suojajohtimen tahallinen keskeytys on kielletty. Laitteessa on hengenvaarallista jännitettä. – Vaikka pääkytkin olisikin kytketty pois päältä, laitteessa voi olla vielä paikoittain varautunutta verkkovirtajännitettä. – Verkkovirtaan liitetyn laitteen liittimissä voi olla jännitettä. Jos suojakannet avataan tai osia poistetaan, tällöin voidaan joutua kosketukseen jännitettä johtavien osien kanssa (poikkeuksena osat, joihin pääsee käsiksi ilman työkaluja). – Laitteen sisässä olevat kondensaattorit voivat olla vielä varautuneita, vaikka laite olisikin kytketty irti kaikista jännitelähteistä.	
svenska	Varning: Fara p g a elektricitet Apparaten skall alltid vara jordad. Man får inte under några omständigheter bryta eller avlägsna jordledaren i apparaten eller strömkretsen. Livsfarlig spänning i apparaten – Även när apparaten är avstängd kan nätspänning förekomma inuti apparaten. – När apparaten är ansluten till elnätet kan uttagen i apparaten vara spänningsförande. Om man öppnar höljen eller tar bort delar (förutom de som är åtkomliga utan verktyg) kan spänningsförande delar bli åtkomliga. – Även när apparaten är avstängd och skild från elnätet kan kondensatorerna i apparaten vara laddade med farlig spänning.	

		W2.3	
		Warning: Electrical Hazard	• To prevent potential injury to yourself and damage to the instrument, switch OFF all instruments in the system and disconnect them from the line power supply before you perform the procedures described below.
dansk	Advarsel: Fare på grund af elektricitet	• For at undgå faren for kvæstelser for Dem selv og faren for beskadigelse af apparatet, skal alle apparater i systemet være SLUKKET, og strømforbindelsen skal være skilt, inden De udfører de arbejder, som er beskrevet nedenfor.	
Deutsch	Warnung: Gefährdung durch Elektrizität	• Um Verletzungsgefahr durch elektrische Spannung und Beschädigungsgefahr der Geräte zu vermeiden, schalten Sie alle Geräte des Meßplatzes AUS und trennen Sie die Netzverbindungen, bevor Sie irgendwelche elektrischen Verbindungen herstellen oder ändern.	
español	Advertencia: Peligro eléctrico	• Para evitar posibles daños personales y al equipo, apague todos los módulos del sistema y desconéctelos de la toma de corriente antes de ejecutar las operaciones descritas más abajo.	
français	Danger: Risque d'électrocution	• Afin d'éviter des blessures éventuelles et des détériorations de l'instrument, mettre tous les instruments du système hors tension et les déconnecter de l'alimentation secteur avant d'exécuter les procédures décrites ci-après.	



→ Warning (continued)		W2.3
<i>italiano</i>	Pericolo: Rischio di folgorazione • Prima di procedere alle operazioni descritte sotto , per prevenire lesioni personali o danni allo strumento, spegnete tutti gli strumenti all'interno del sistema e scollegateli dall'alimentazione elettrica.	
<i>Nederlands</i>	Waarschuwing: Risico's door electriciteit • Om gevaar voor letsel aan Uzelf en beschadiging aan het instrument te voorkomen, schakelt U voordat U de handelingen verricht die hieronder zijn beschreven, alle instrumenten UIT en ontkoppelt U de netvoeding.	
<i>português</i>	Aviso: Perigo por electricidade • A fim de evitar o perigo de ferimento por tensão eléctrica e o perigo de danificação dos aparelhos, DESLIGUE todos os aparelhos do sistema e interrompa as ligações à rede antes de realizar os trabalhos seguidamente referidos.	
<i>suomea</i>	Varo: Vaarana sähkö • Jotta loukkaantumisilta ja laitevaurioilta vältytään, kytke kaikki järjestelmän laitteet POIS PÄÄLTÄ ja erota ne verkkovirrasta, ennen kuin suoritat jäljempänä selostettuja toimenpiteitä.	
<i>svenska</i>	Varning: Fara p g a elektricitet • För att undvika eventuella personskador och skador på apparaten skall samtliga apparater stängas AV och skiljas från elnätet innan du utför något av nedanstående arbeten.	

		W2.9	
		Warning: Electrical Hazard • Use only fuses with the correct current rating and of the specified type for replacement. • Do not use makeshift fuses and do not short-circuit the fuse holders.	
<i>dansk</i>	Advarsel: Fare på grund af elektricitet • Sikringerne må kun udskiftes med sikringer med den korrekte spændingsstyrke og af den angivne type. • Benyt ikke nødsikringer, og undlad at kortslutte sikringsholderne.		
<i>Deutsch</i>	Warnung: Gefährdung durch elektrischen Strom • Verwenden Sie nur Sicherungen des gleichen Typs und mit der angegebenen Belastbarkeit. • Verwenden Sie keine Behelfssicherung und schließen Sie nicht den Sicherungshalter kurz.		
<i>español</i>	Advertencia: Peligro eléctrico • Utilice únicamente fusibles con el amperaje correcto y con el tipo especificado para su reemplazo. • No use fusibles improvisados ni cortocircuite los portafusibles.		
<i>français</i>	Danger: Risque d'électrocution • N'utiliser pour le remplacement que des fusibles d'ampérage correct et de type spécifié. • Ne pas utiliser de fusibles provisoires et ne pas court-circuiter les porte-fusibles.		



→ Warning (continued)		W2.9
<i>italiano</i>	Pericolo: Rischio di folgorazione • Se necessario sostituirli, utilizzare esclusivamente fusibili di corretto tipo e valore. • Non utilizzare fusibili di fattura artigianale e non cortocircuitare i tienifusibili.	
<i>Nederlands</i>	Waarschuwing: Risico's door electriciteit • Gebruik ter vervanging alleen zekeringen met het juiste stroombereik en van het aangegeven soort. • Gebruik geen noodzekeringen en sluit de zekeringhouders niet kort.	
<i>português</i>	Aviso: Perigo por electricidade • Ao substituí-los, use apenas fusíveis com a amperagem correcta e do tipo especificado. • Não use fusíveis provisórios e não curto-circuite os porta-fusíveis.	
<i>suomea</i>	Varo: Vaarana sähkö • Käytä vaihtosulakkeina vain sulakkeita, jotka on mitoitettu oikealle virran voimakkuudelle ja joiden tyyppi on ohjeiden mukainen. • Älä käytä apusulakkeita äläkä oikosulje sulakealustoja.	
<i>svenska</i>	Varning: Fara p g a elektricitet • Använd endast rätt typ av säkringar med korrekt strömvärde vid byte. • Använd inte provisoriska säkringar och kortslut inte säkringshållaren.	

		Warning: UV Radiation – Risk of Eye Damage The lamps may emit UV radiation which can damage your eyes. • Do not gaze into a lighted lamp. • Always wear UV-absorbing safety glasses when looking at the radiation from the lamps.		W3.1
dansk	Advarsel: Ultraviolet stråling – farligt for øjnene Lamperne kan emitte ultraviolet stråling, som kan forårsage øjenskader. • Se ikke direkte ind i en tændt lampe. • Bær altid beskyttelsesbriller, som absorberer ultraviolet stråling, når De ser ind i den lysende strålingskilde.			
Deutsch	Warnung: UV-Strahlung – Gefährdung der Augen Die Lampen emittieren UV-Strahlung in unterschiedlicher Stärke und können dadurch Augenschäden verursachen. • Nicht mit ungeschützten Augen direkt in die leuchtenden Lampen schauen. • Tragen Sie eine Schutzbrille, die die emittierte UV-Strahlung ausreichend absorbiert, wenn Sie in die leuchtende Lampe schauen.			
español	Advertencia: Radiación ultravioleta – Peligro de daños a los ojos Las lámparas pueden emitir una intensa radiación ultravioleta que puede ser perjudicial para los ojos. • No dirija la vista a una lámpara encendida. • Use siempre gafas de seguridad que absorban este tipo de rayos.			
français	Danger: Rayonnement UV Les lampes peuvent émettre des UV susceptibles de provoquer des lésions oculaires. • Ne pas regarder fixement une lampe allumée. • Toujours porter des lunettes de protection absorbant les UV pour regarder le rayonnement des lampes.			



→ Warning (continued)		W3.1
<i>italiano</i>	Pericolo: Radiazioni UV – Rischio di lesioni agli occhi Le lampade possono emettere radiazioni UV che possono lesionare gli occhi. • Non guardare direttamente in una lampada accesa. • Se guardate una lampada accesa indossate sempre occhiali di sicurezza in grado di assorbire le radiazioni UV.	
<i>Nederlands</i>	Waarschuwing: Ultraviolette straling – Risico's voor de ogen De lampen kunnen UV-straling uitzenden die Uw ogen kan beschadigen. • Staar niet in een brandende lamp. • Draag altijd een veiligheidsbril die ultraviolette straling absorbeert wanneer U in de brandende stralingsbron moet kijken.	
<i>português</i>	Aviso: Radiação UV – perigo para os olhos As lâmpadas emitem uma radiação UV com intensidades diferentes podendo assim provocar ferimentos aos olhos. • Não olhar directamente para uma lâmpada acesa. • Use sempre óculos de protecção que absorvam suficientemente a radiação UV emitida ao olhar directamente para a fonte de radiação luminosa.	
<i>suomea</i>	Varo: UV-säteily – silmävammojen vaara Lamput saattavat lähettää UV-säteilyä, joka voi vahingoittaa silmiä. • Älä tuijota valaistuun lamppuun. • Käytä aina UV-säteilyltä suojaavia suojasilmälaseja, kun katsot lampuista lähtevää säteilyä kohti.	
<i>svenska</i>	Varning: UV-strålning – risk för ögonskador Strålningskällorna/lamporna alstrar UV-strålning som kan ge ögonskador. • Titta inte in i en tänd strålningskälla/lampa. • Använd alltid skyddsglasögon som absorberar UV-strålar när du tittar in i en tänd strålningskälla/lampa.	

	W4.2 Warning: High Temperatures – Risk of Burns The burner head can reach very high temperatures. • Do not touch the burner head until it has cooled to room temperature.
<i>dansk</i>	Advarsel: Høje temperaturer – Fare for forbrændinger Brænderhovedet kan opnå meget høje temperaturer. • Berør aldrig brænderhovedet, før det er kølet ned til stuetemperatur.
<i>Deutsch</i>	Warnung: Verbrennungsgefahr • Den heißen Brennerkopf nur mit hitzebeständigen Schutzhandschuhen anfassen oder vor dem Anfassen auf Körpertemperatur abkühlen lassen.
<i>español</i>	Advertencia: Altas temperaturas – Riesgo de quemaduras La cabeza del mechero puede alcanzar temperaturas muy altas. • Asegúrese, antes de tocar el mechero, que éste se haya enfriado hasta alcanzar la temperatura ambiente.
<i>français</i>	Danger: Températures élevées – Risque de brûlures La tête de brûleur peut atteindre de très hautes températures. • Ne pas toucher la tête de brûleur avant qu'elle ait refroidi à la température ambiante.
<i>italiano</i>	Pericolo: Alte temperature – Rischio di ustioni La testa del bruciatore può raggiungere temperature estremamente elevate. • Non toccare la testa del bruciatore sino a che non si è raffreddato sino a raggiungere temperatura ambiente.
<i>Nederlands</i>	Waarschuwing: Hoge temperaturen – Verbrandingsgevaar De branderkop kan zeer hoge temperaturen bereiken. • Raak de branderkop pas aan als hij tot kamertemperatuur is afgekoeld.
<i>português</i>	Aviso: Altas temperaturas – perigo de queimaduras A cabeça do queimador pode alcançar temperaturas muito altas. • Não toque na cabeça do queimador até ter alcançado a temperatura.
<i>suomea</i>	Varo: Korkeat lämpötilat – palovammavaara Polttimen pää voi saavuttaa korkeita lämpötiloja. • Älä kosketa polttimen päätä, ennen kuin se on jäähtynyt huoneenlämpötilaan.
<i>svenska</i>	Varning: Höga temperaturer – risk för brännskador Brännaren kan nå mycket höga temperaturer. • Vidrör inte brännarmunstycket förrän det har svalnat till rumstemperatur.

	W4.3 Warning: High Temperatures – Risk of Burns The graphite furnace can generate very high temperatures. Do not touch any parts of the furnace, especially the graphite components, until they have cooled to room temperature.
dansk	Advarsel: Høje temperaturer – Fare for forbrændinger Grafitovnen kan udvikle meget høje temperaturer. Berør aldrig nogen af ovnens dele, især ikke grafitdelene, før de er kølet ned til stuetemperatur.
Deutsch	Warnung: Verbrennungsgefahr Vergewissern Sie sich, daß der Ofen auf Raumtemperatur abgekühlt ist, bevor Sie ihn anfassen oder öffnen.
español	Advertencia: Altas temperaturas – Riesgo de quemaduras El horno de grafito puede alcanzar temperaturas muy altas. Asegúrese, antes de tocar cualquier parte del horno, sobre todo sus componentes de grafito, de que éste se haya enfriado hasta alcanzar la temperatura ambiente.
français	Danger: Températures élevées – Risque de brûlures Le four en graphite peut générer de très hautes températures. Ne toucher aucun des éléments du four, en particulier les composants en graphite, avant qu'ils n'aient refroidi à la température ambiante.
italiano	Pericolo: Alte temperature – Rischio di ustioni Il forno a grafite può generare temperature estremamente elevate. Non toccare nessun componente del forno, soprattutto i componenti in grafite, sino a che essi non si sono raffreddati sino a raggiungere temperatura ambiente.
Nederlands	Waarschuwing: Hoge temperaturen – Verbrandingsgevaar De grafietoven kan zeer hoge temperaturen bereiken. De oven en in het bijzonder de grafietonderdelen pas aanraken als ze tot kamertemperatuur afgekoeld zijn.
português	Aviso: Altas temperaturas – perigo de queimaduras O forno de grafite pode alcançar temperaturas muito elevadas. Não toque em nenhuma peça do forno, especialmente nos componentes de grafite, até terem alcançado a temperatura ambiente.
suomea	Varo: Korkeat lämpötilat – palovammavaara Grafiittiuuni voi kehittää erittäin korkeita lämpötiloja. Älä kosketa mitään uunin osia, tämä koskee erityisesti grafiittikomponentteja, ennen kuin ne ovat jäähtyneet huoneenlämpötilaan.
svenska	Varning: Höga temperaturer – risk för brännskador Grafitugnen kan nå mycket höga temperaturer. Vidrör inte ugnen och framför allt inte grafitdelarna förrän de svalnat till rumstemperatur.

	W5.7 Warning: Acetylene – Explosion Hazard Acetylene can decompose explosively at pressures higher than 103 kPa / 1.03 bar / 15 psig. • Always make sure that the acetylene outlet gauge pressure is below this value.
<i>dansk</i>	Advarsel: Acetylen – Eksplosionsfare Acetylen kan nedbrydes eksplosionsagtigt ved tryk over 103 kPa / 1.03 bar / 15 psig. • Forvis Dem altid om, at acetylen-udgangsmåletrykket ligger under denne værdi.
<i>Deutsch</i>	Warnung: Acetylen – Explosionsgefahr Stellen Sie für Acetylen keinen höheren Ausgangsdruck als 103 kPa (1,03 bar) ein. Bei höheren Drücken kann Acetylen spontan zerfallen und explodieren.
<i>español</i>	Advertencia: Acetileno – Peligro de explosión El acetileno puede descomponerse y ocasionar explosiones a presiones superiores a 103 kPa / 1.03 bar / 15 psig. • Tenga cuidado siempre de mantener la presión del manómetro de acetileno por debajo de este valor.
<i>français</i>	Danger: Acétylène – Risque d'explosion L'acétylène peut se décomposer de manière explosive à des pressions supérieures à 103 kPa / 1.03 bar / 15 psig. • Toujours vérifier que la pression de l'acétylène sur le manomètre de sortie est inférieure à cette valeur.



→ Warning (continued)		W5.7
<i>italiano</i>	Pericolo: Acetilene – Pericolo di esplosione <i>L'acetilene può decomporsi in maniera esplosiva a pressioni superiori a 103 kPa / 1.03 bar / 15 psig.</i> • <i>Assicuratevi sempre che la lancetta del manometro di uscita dell'acetilene rimanga al di sotto di tali valori.</i>	
<i>Nederlands</i>	Waarschuwing: Acetyleen – Explosiegevaar <i>Acetyleen kan spontaan ontbinden bij een druk hoger dan 103 kPa / 1.03 bar / 15 psig.</i> • <i>Zorg er altijd voor dat de druk van de acetyleen-uitlaatmeter niet boven deze waarde uitkomt.</i>	
<i>português</i>	Aviso: Acetileno – perigo de explosão <i>Se a pressão for superior a 103 kPa / 1.03 bar / 15 psig, o acetileno poderá desintegrar-se de repente e explodir.</i> • <i>Assegure-se de que o manómetro de pressão de saída do acetileno indica sempre uma pressão inferior a este valor.</i>	
<i>suomea</i>	Varo: Asetyleeni – räjähdysvaara <i>Asetyleeni voi hajota räjähdysenomaisesti, jos paine on suurempi kuin 103 kPa (1.03 bar).</i> • <i>Varmistu aina siitä, että asetyleenin lähtöpaine painemittarissa on alle tämän arvon.</i>	
<i>svenska</i>	Varning: Acetylen – explosionrisk <i>Acetylen får inte utsättas för högre tryck än 103 kPa / 1,03 bar / 15 psig. Vid högre tryck bryts acetylenet ned och kan explodera.</i> • <i>Se till att utgångstrycket för acetylen ligger under detta värde.</i>	

		Warning: Flashback Hazard <i>PerkinElmer burner systems are designed for use with compressed air. The use of oxygen can cause an explosion in the burner system, and oxygen-enriched air can cause a flashback of the flame.</i> • Never use oxygen or oxygen-enriched air with PerkinElmer burner systems. Use only compressed air.		W5.9
dansk	Advarsel: Flammetilbagestød <i>PerkinElmer brændersystemer er beregnet til brug med trykluft. Brugen af ilt kan forårsage en eksplosion i brændersystemet, og luft med ilttilsætning kan forårsage et flammetilbagestød.</i> • Benyt aldrig ilt eller luft med ilttilsætning ved PerkinElmer brændersystemer. Benyt kun trykluft.			
Deutsch	Warnung: Sauerstoff und mit Sauerstoff angereicherte Luft <i>Verwenden Sie für PerkinElmer Brenner nur Druckluft. Sauerstoff oder sogenannte 'Atemluft' sind nicht zulässig. Bei Verwendung von Sauerstoff besteht Explosionsgefahr. Mit Sauerstoff angereicherte Luft kann einen Flammenrückschlag verursachen.</i>			
español	Advertencia: Peligro de retroceso de la llama <i>Los sistemas PerkinElmer de mecheros están diseñados para funcionar con aire comprimido. El empleo de oxígeno puede ocasionar una explosión en el sistema de mecheros y el aire enriquecido con oxígeno puede provocar la retrogresión de la llama.</i> • No use nunca oxígeno ni aire enriquecido con oxígeno al trabajar con sistemas de mecheros PerkinElmer. Use siempre aire comprimido.			
français	Danger: Risque de retour de flamme <i>Les systèmes de brûleurs PerkinElmer sont conçus pour être utilisés avec de l'air comprimé. L'utilisation d'oxygène peut provoquer une explosion dans le système de brûleur, et l'air suroxygéné peut provoquer un retour de flamme.</i> • Ne jamais utiliser d'oxygène ou d'air suroxygéné avec les systèmes de brûleurs PerkinElmer. N'utiliser que l'air comprimé.			



→ Warning (continued)		W5.9
<i>italiano</i>	Pericolo: Pericolo di ritorno di fiamma <i>I sistemi di combustione della PerkinElmer sono concepiti per funzionare con aria compressa. L'uso di ossigeno può causare l'esplosione del sistema di combustione mentre aria arricchita di ossigeno può causare un violento ritorno di fiamma.</i> • Non utilizzare mai ossigeno o aria arricchita di ossigeno all'interno di sistemi di combustione della PerkinElmer.	
<i>Nederlands</i>	Waarschuwing: Terugslag van de vlam <i>PerkinElmer brandersystemen zijn ontworpen voor gebruik met perslucht. Bij het gebruik van zuurstof bestaat explosiegevaar in het brandersysteem, en zgn. ademlucht kan een terugslaan van de vlam veroorzaken.</i> • Gebruik nooit zuurstof of zgn. ademlucht voor PerkinElmer brandersystemen. Gebruik alleen perslucht.	
<i>português</i>	Aviso: Retrocesso da chama <i>Os sistemas de queimadores PerkinElmer são concebidos para o uso com ar comprimido. O uso de oxigénio poderá causar uma explosão no sistema do queimador. Ar enriquecido com oxigénio pode causar um retrocesso da chama.</i> • Nunca utilizar oxigénio ou ar enriquecido com oxigénio em sistemas de queimadores PerkinElmer. Use unicamente ar comprimido.	
<i>suomea</i>	Varo: Vaarana liekki takaisinlyönti <i>PerkinElmer -poltinjärjestelmät on tarkoitettu käytettäväksi paineilmalla. Hapen käytöstä voi seurata räjähdys poltinjärjestelmässä ja hapen rikastama ilma voi aiheuttaa liekin takaisinlyönnin.</i> • Älä koskaan käytä happea tai hapella rikastettua ilmaa PerkinElmer -poltinjärjestelmissä. Käytä ainoastaan paineilmaa.	
<i>svenska</i>	Varning: Risk för bakeld <i>PerkinElmers brännarsystem är avsedda för användning med tryckluft. Syre kan framkalla explosioner i brännarsystemet och syreanrikad luft kan orsaka bakeld.</i> • Använd inte syre eller syreanrikad luft i PerkinElmers brännarsystem. Använd endast tryckluft.	

	W5.11 Warning: Acetylides – Fire and Explosion Hazard <i>Unstable acetylides may form in the spray chamber when you aspirate silver, copper or mercury solutions into an air/acetylene flame. Acetylides can decompose explosively when allowed to dry.</i> • Aspirate solution continuously to prevent residues from drying. • Thoroughly flush the spray chamber and drain system with water immediately after such an analysis.
<i>dansk</i>	Advarsel: Acetyliddannelse – Eksplosions- og brandfare <i>Der kan dannes ustabil acetylid i sprøjtekammeret ved indsugning af sølv-, kobber eller kviksølvforbindelser i en luft/acetylen-flamme. Acetylid kan nedbrydes eksplosionsagtigt, hvis det får lov at tørre.</i> • Opsug opløsningsmidlet konstant for at forhindre, at restindholdet tørrer. • Skyl sprøjtekammeret grundigt med vand og tøm systemet umiddelbart efter en sådan analyse.
<i>Deutsch</i>	Warnung: Acetylidbildung – Explosions- und Brandgefahr <i>Silber-, Kupfer- und Quecksilberverbindungen können nach dem Einbringen in das Brennersystem Acetylide bilden, die in trockenem Zustand explosionsartig zerfallen können.</i> • Spülen Sie nach dem Einbringen von Lösungen mit hohen Silber-, Kupfer- oder Quecksilbergehalten Brenner und Ablaufsystem gründlich mit entionisiertem Wasser durch, um alle Lösungsreste sicher zu entfernen.
<i>español</i>	Advertencia: Acetiloides – Peligro de incendio y explosión <i>Al aspirar soluciones de plata, cobre o mercurio en una llama de aire/acetileno pueden formarse acetiloides inestables en la cámara de pulverización. Al secarse, los acetiloides pueden descomponerse y ocasionar explosiones.</i> • Succione continuamente la solución para evitar que se sequen los residuos. • Lave cuidadosamente con agua la cámara de pulverización y el sistema de drenaje inmediatamente después de efectuar dicho análisis.
<i>français</i>	Danger: Acétylures – Risque d'incendie et d'explosion <i>Des acétylures instables peuvent se former dans la chambre de pulvérisation lors de l'aspiration de solutions d'argent, de cuivre ou de mercure dans une flamme d'air/acétylène. Ces acétylures peuvent se décomposer de manière explosive si on les laisse sécher.</i> • Aspirer la solution en continu pour empêcher les résidus de sécher. • Rincer soigneusement la chambre de pulvérisation et vidanger le système avec de l'eau immédiatement après une analyse de ce type.



→ Warning (continued)		W5.11
<i>italiano</i>	Pericolo: Acetiluri – Pericolo di incendio e di esplosione Acetiluri instabili possono formarsi nella camera di nebulizzazione se aspirate soluzioni di argento, rame o mercurio all'interno di una fiamma ad aria/acetilene. Se hanno la possibilità di essiccarsi gli acetiluri possono decomorsi in maniera esplosiva. • Aspirate le soluzioni in maniera continua per prevenire residui dovuti all'essiccazione. • Lavate la camera di nebulizzazione e sciacquate con acqua il sistema dopo ogni simile analisi.	
<i>Nederlands</i>	Waarschuwing: Vorming van Acetyliden – Gevaar voor brand en explosie Zilver-, koper- of kwikverbindingen kunnen na het inbrengen in het brandersysteem acetyliden vormen, dat in droge toestand kan ontbinden tot een explosief mengsel. • Zuig voortdurend de oplossing af om te voorkomen dat de resten opdrogen. • Spoel de verstuurkamer en het afvoersysteem grondig met water direct nadat dat geconstateerd is.	
<i>português</i>	Aviso: Formação de acetil – perigo de incêndio e de explosão Podem formar-se acetilas instáveis na câmara de pulverização quando se aspira soluções de prata, cobre ou mercúrio para uma chama de ar/acetileno. Em estado seco, acetilas podem desintegrar-se numa explosão. • Aspire a solução sem interrupção para evitar que os resíduos sequem. • Após uma análise, enxaguar muito bem a câmara de pulverização e o sistema de escoamento com água.	
<i>suomea</i>	Varo: Asetylidit – tulipalo- ja räjähdysvaara Sumutuskammiossa voi muodostua epästabiileja asetylidejä, jos ilma/asetyleeni-liekkiin sumutetaan hopea-, kupari- tai elohopeayhdisteitä. Asetylidit voivat hajota räjähdyksenomaisesti, jos niiden annetaan kuivua. • Sumuta liuotusainetta jatkuvasti, jotta jäänteet eivät kuivu. • Huuhtele sumutuskammio ja poistojärjestelmä perusteellisesti vedellä välittömästi tällaisen analyysin jälkeen.	
<i>svenska</i>	Varning: Acetylenider – explosions- och brandfara Silver-, koppar- och kvicksilverföreningar kan bilda instabila acetylenider i brännaren när de leds in i en luft/acetylenlåga. Acetyleniderna bryts ned och blir explosiva i torrt tillstånd. • Sug upp vätskor med jämna mellanrum så att inga rester hinner torka. • Skölj brännaren och avloppssystemet noggrant med vatten direkt efter analysprover med dessa föreningar.	

	W6.1 Warning: Toxic Gases <i>If you use nitrogen as the inert gas, toxic cyanogen gas (CN)₂ will be produced when the furnace temperature is above 2300 °C.</i> • <i>Make sure that the main laboratory fume ventilation system removes all gases and fumes emitted by the furnace.</i>
<i>dansk</i>	Advarsel: Giftig forbrændingsgas <i>Ved anvendelse af kvælstof som inertgas dannes der giftig dicyan (CN)₂ ved ovntemperaturer over 2300 °C.</i> • <i>Forvis Dem om, at hoved-udsugningsanlægget udsuger de forbrændingsgasser, som emitteres af ovnen.</i>
<i>Deutsch</i>	Warnung: Giftiges Abgas <i>Bei Verwendung von Stickstoff als Inertgas bildet sich bei Ofentemperaturen über 2300 °C giftiges Dicyan (CN)₂.</i> • <i>Es muß sichergestellt sein, daß die aus dem Graphitofen austretenden Abgase von der Haupt-Absauganlage sicher abgesaugt werden.</i>
<i>español</i>	Advertencia: Gases tóxicos <i>Si se utiliza nitrógeno puro como gas inerte, al aumentar la temperatura del horno por encima de 2300 °C se producirá gas cianógeno (CN)₂, que es tóxico.</i> • <i>Cerciórese de que el sistema principal de extracción de humos elimine todos los gases y humos emitidos por el horno.</i>
<i>français</i>	Danger: Gaz toxiques <i>Si de l'azote est utilisé comme gaz inerte, du gaz cyanogène (CN)₂ toxique se forme lorsque la température du four dépasse 2300 °C.</i> • <i>Vérifier que le système principal d'extraction des fumées élimine tous les gaz et fumées émis par le four.</i>



→ Warning (continued)		W6.1
<i>italiano</i>	Pericolo: Gas tossici Se usate l'azoto quale gas inerte allora, quando il forno raggiunge temperature al di sopra di 2300 °C, si formerà del gas cianogeno tossico (CN)₂. Assicuratevi che l'impianto principale di estrazione fumi del laboratorio elimini tutti i gas e le esalazioni emesse dal forno.	
<i>Nederlands</i>	Waarschuwing: Giftig afvoergas Bij gebruik van stikstof als inertiegas wordt bij een oventemperatuur van meer dan 2300 °C het giftige dycyaan (CN)₂ gevormd. Zorg ervoor dat alle gassen en dampen die uit de grafietoven komen, door de hoofdafzuiging worden afgezogen.	
<i>português</i>	Aviso: Gás de escape venenoso Ao utilizar nitrogénio como gás inerte a uma temperatura de forno superior a 2300 °C, forma-se cianeto (CN)₂ venenoso. Assegure-se de que os gases de escape que saem do forno são seguramente aspirados pelo sistema exaustor principal.	
<i>suomea</i>	Varo: Myrkylliset kaasut Jos käytät inerttikaasuna typpeä, syntyy myrkyllistä syaanikaasua (CN)₂, jos uunin lämpötila on yli 2300 °C. Varmistu siitä, että laboratorion savunpoistojärjestelmä poistaa kaikki uunista lähtevät kaasut ja savukaasut.	
<i>svenska</i>	Varning: Giftiga gaser Om kväve används som inert gas bildas en giftig cyangas (CN)₂ när ugnstemperaturen överstiger 2300 °C. Se till att utsugssystemet suger ut alla gaser och ångor som avges i ugnen.	

	W6.5 Warning: Toxic Gases Cyanide solutions release toxic hydrogen cyanide gas when they come into contact with acids. • Before you aspirate cyanide solutions, make sure that the liquid in the drain system is alkaline – pH greater than 10 – to prevent toxic hydrogen cyanide gas from forming.
<i>dansk</i>	Advarsel: Giftig gas Cyanid-opløsninger frigør giftig cyanbrintegas, hvis de kommer i forbindelse med syrer. • Inden indsugningen af cyanid-opløsninger skal man sikre sig at væsken i afløbssystemet er alkalisk – pH over 10 – for at forhindre dannelsen af giftig cyanbrintegas.
<i>Deutsch</i>	Warnung: Giftiges Gas Säuren setzen aus cyanidhaltigen Lösungen giftige Blausäure frei. • Wenn Sie cyanidhaltige Lösungen messen möchten, zuvor den pH-Wert im Ablaufsystem und der Abfallösung auf über 10 einstellen, um sicherzustellen, daß keine Blausäure freigesetzt werden kann.
<i>español</i>	Advertencia: Gases tóxicos Las soluciones de cianuro emiten cianuro de hidrógeno, un gas tóxico, cuando entran en contacto con ácidos. • Antes de succionar soluciones de cianuro cerciórese de que el líquido en el sistema de drenaje es alcalino – con un pH mayor de 10 – para impedir que se forme el gas tóxico de cianuro de hidrógeno.
<i>français</i>	Danger: Gaz toxiques Les solutions cyanhydriques forment de l'acide cyanhydrique gazeux quand elles entrent en contact avec des acides. • Avant d'aspirer les solutions cyanhydriques, s'assurer que le liquide dans le système d'évacuation est alcalin (pH supérieur à 10) afin d'empêcher la formation d'acide cyanhydrique gazeux.



→ Warning (continued)		W6.5
<i>italiano</i>	Pericolo: Gas tossici Le soluzioni di cianuro emettono del tossico idrogenato di cianuro se esse vengono a contatto con degli acidi. • Prima di aspirare soluzioni di cianuro assicuratevi che il liquido nel sistema di drenaggio sia alcalino (pH maggiore di 10) per prevenire la formazione di tossico idrogenato di cianuro.	
<i>Nederlands</i>	Waarschuwing: Giftige gassen Uit cyanide oplossingen komen giftige waterstofcyanidegassen vrij bij contact met zuren. • Voordat cyanide oplossingen afgezogen worden, ervoor zorgen dat de vloeistof in het afvoersysteem uit alkali bestaat – pH hoger dan 10 – om te voorkomen dat giftig waterstofcyanidegas gevormd wordt.	
<i>português</i>	Aviso: Gás de escape venenoso Em contacto com ácidos, as soluções de cianeto liberam gás cianídrico tóxico. • Antes de aspirar soluções de cianeto, assegure-se de que o líquido no sistema de escoamento é alcalino – valor pH superior a 10 – para evitar a formação de gás cianídrico tóxico.	
<i>suomea</i>	Varo: Myrkylliset kaasut Jos syanidiliuokset joutuvat kosketukseen happojen kanssa, niistä vapautuu myrkyllistä sinihappokaasua. • Ennen kuin sumutat syanidiliuoksia, varmistu siitä, että poistojärjestelmässä oleva neste on alkalista – pH suurempi kuin 10 –, jotta myrkyllistä sinihappokaasua ei pysty muodostumaan.	
<i>svenska</i>	Varning: Giftiga gaser Cyanlösningar avger en giftig vätecyanidgas när de kommer i kontakt med syror. • Se till att vätskan i avloppssystemet är alkalisk och att pH-värdet är högre än 10. På så sätt kan inga giftiga vätecyanidgaser bildas.	

	W8.10 Warning: Hazardous Chemicals <i>Some chemicals used with this instrument may be hazardous or may become hazardous after completion of an analysis.</i> • <i>The responsible body must take the necessary precautions to ensure that the surrounding workplace is safe and that instrument operators are not exposed to hazardous levels of toxic substances (chemical or biological) as defined in the applicable national, state, and local health and safety regulations and laws.</i> • <i>Venting for fumes and disposal of wastes must be in accordance with all national, state, and local health and safety regulations and laws.</i>
<i>dansk</i>	Advarsel: Farlige kemikalier <i>Nogle kemikalier, som anvendes med dette apparat, kan være farlige eller kan blive farlige efter færdiggørelsen af en analyse.</i> • <i>De ansvarlige skal sørge for de nødvendige forholdsregler til sikring af, at den omgivende arbejdsplads er sikker, og at apparatets operatører ikke udsættes for farlige mængder af giftige substanser (kemiske eller biologiske) i overensstemmelse med de nationale, statslige og stedlige sundheds- og sikkerhedsforskrifter og love.</i> • <i>Udluftning af forbrændingsgas og bortskaffelse af affald skal opfylde alle nationale, statslige og stedlige sundheds- og sikkerhedsforskrifter og love.</i>
<i>Deutsch</i>	Warnung: Gefährliche Stoffe <i>Manche Chemikalien, die beim Betrieb des Geräts benutzt werden müssen, sind gefährlich oder bilden durch Umsetzungen während des Analysenverfahrens gefährliche Folgeverbindungen.</i> • <i>Der Betreiber des Geräts muß die erforderlichen Vorkehrungen treffen, um sicherzustellen, daß der Arbeitsplatz und seine Umgebung sicher ist und daß die Benutzer des Geräts keinen gefährlichen Konzentrationen von schädlichen chemischen oder biologischen Stoffen ausgesetzt sind.</i> • <i>Die Absaugung von Abgasen und Entsorgung von Abfällen muß entsprechend den einschlägigen nationalen Gesetzen und Richtlinien erfolgen.</i>
<i>español</i>	Advertencia: Sustancias químicas peligrosas <i>Algunas de las sustancias químicas utilizadas con este aparato pueden ser o volverse peligrosas una vez completado un análisis.</i> • <i>La entidad responsable debe tomar las precauciones necesarias para asegurar que el área de trabajo y su entorno sean seguros y que los operadores del aparato no se vean expuestos a niveles peligrosos de sustancias (químicas o biológicas) tal como las definen las normas y prescripciones de seguridad a nivel nacional, regional o local.</i> • <i>La ventilación de humos y la eliminación de residuos deben armonizar con todas las normas y prescripciones de seguridad a nivel nacional, regional o local.</i>



	→ Warning (continued)	W8.10
<i>français</i>	Danger: Produits chimiques dangereux <i>Certains produits chimiques utilisés avec cet instrument peuvent être dangereux ou devenir dangereux une fois l'analyse terminée.</i> • <i>Les personnes responsables doivent prendre les précautions nécessaires pour garantir la sécurité des lieux de travail et s'assurer que les manipulateurs des instruments ne sont pas exposés à un niveau dangereux à des substances toxiques (chimiques ou biologiques) comme défini dans les réglementations et la législation en vigueur sur le plan national, régional et local.</i> • <i>Les systèmes de ventilation pour fumées et les dispositifs d'élimination des déchets doivent être conforme à la législation et aux réglementations en vigueur sur le plan national, régional et local.</i>	
<i>italiano</i>	Pericolo: Sostanze chimiche pericolose <i>Alcune delle sostanze chimiche utilizzate con il presente strumento possono essere pericolose o lo possono diventare al termine dell'analisi.</i> • <i>La persona responsabile deve prendere le opportune precauzioni per assicurare che l'area di lavoro sia sicura e che l'operatore non sia esposto a concentrazioni nocive di sostanze tossiche (chimiche o biologiche) come definito nelle norme di sicurezza e nelle leggi applicabili di livello nazionale, statale e locale.</i> • <i>Il sistema di aspirazione fumi e lo smaltimento dei rifiuti devono soddisfare quanto definito nelle norme di sicurezza e nelle leggi applicabili di livello nazionale, statale e locale.</i>	
<i>Nederlands</i>	Waarschuwing: Gevaarlijke chemicaliën <i>Sommige chemicaliën die met dit instrument gebruikt worden kunnen gevaarlijk zijn of dat worden na het afronden van een analyse.</i> • <i>De verantwoordelijke persoon moet de noodzakelijke voorzorgen nemen om ervoor te zorgen dat de rest van de werkplek veilig is en dat degenen die het instrument bedienen niet blootgesteld worden aan gevaarlijke niveaus van giftige substanties (chemisch of biologisch) zoals vastgelegd in de van toepassing zijnde nationale en plaatselijke regels en wetten betreffende gezondheid en veiligheid.</i> • <i>Ontluchting voor dampen en het weggooien van afval dient in overeenstemming te gebeuren met alle nationale en plaatselijke regels en wetten betreffende gezondheid en veiligheid.</i>	



→ Warning (continued)		W8.10
<i>português</i>	Aviso: Químicos perigosos <i>Alguns dos químicos usados com este aparelho podem ser ou tornar-se perigosos depois de completada uma análise.</i> • <i>O responsável deve tomar as precauções necessárias para assegurar que o lugar de trabalho é seguro e que os operadores do aparelho não são expostos a concentrações perigosas de substâncias tóxicas (químicas ou biológicas) segundo a definição nas regulamentações e leis nacionais aplicáveis em matéria de saúde e segurança.</i> • <i>A ventilação para evacuação de fumos e a remoção de resíduos deve corresponder a todas as regulamentações e leis nacionais, estaduais e locais em matéria de saúde e segurança.</i>	
<i>suomea</i>	Varo: Vaaralliset kemikaalit <i>Muutammat tämän laitteen yhteydessä käytetyt kemikaalit voivat olla vaarallisia tai ne voivat muodostaa vaaran analyysin päätyttyä.</i> • <i>Vastuussa olevan täytyy huolehtia tarpeellisista varotoimenpiteistä, jotta työpaikkaympäristö on varmasti turvallinen ja että laitteen käyttäjät eivät joudu alttiiksi vaaralliselle määrälle myrkyllisiä aineita (kemiallisia tai biologisia), kuten on määritelty sovellettavissa kansallisissa, valtiollisissa ja paikallisissa terveydensuojelu- ja turvamääräyksissä tai lakisääteisesti.</i> • <i>Savukaasun/höyryn poisto sekä jätteiden hävitys täytyy järjestää kaikkien kansallisten, valtiollisten ja paikallisten terveydensuojelu-, turva- ja lakisääteisten määräysten mukaisesti.</i>	
<i>svenska</i>	Varning: Farliga kemikalier <i>En del kemikalier som används tillsammans med apparaten kan vara farliga eller kan bli farliga efter avslutad analys.</i> • <i>Ansvarig användare skall vidta nödvändiga försiktighetsåtgärder så att arbetsplatsen är säker och att operatörerna vid apparaten inte utsätts för farliga halter av giftiga ämnen (kemiska eller biologiska) såsom beskrivs i nationella, regionala och lokala hälso- och säkerhetsföreskrifter och lagar.</i> • <i>Följ nationella, regionala och lokala hälso- och säkerhetsföreskrifter och lagar när det gäller utsug av ångor samt avfallshantering.</i>	

	Definitions to the above warning (from IEC 1010-1): Responsible body: 'individual or group responsible for the use and maintenance of equipment, and for ensuring that operators are adequately trained.' Operator: 'person operating equipment for its intended purpose.'
dansk	Definitioner af ovenstående advarsel (fra IEC 1010-1): Ansvarlige: 'enkeltpersoner eller grupper af personer, som er ansvarlige for brugen og vedligeholdelsen af udstyr og for sikringen af, at operatører uddannes tilsvarende.' Operatør: 'person, som betjener udstyr i overensstemmelse med dets formål.'
Deutsch	Definitionen der obigen Warnung (nach IEC 1010-1): Betreiber: 'Anweisungsperson oder -gruppe, die für die Anwendung und Wartung von Geräten sowie die entsprechende Schulung der Benutzer (Bediener) verantwortlich ist.' Benutzer: 'Person, die das Gerät für den bestimmungsgemäßen Betrieb benutzt.'
español	Definiciones de la advertencia anterior (de IEC 1010-1): Entidad responsable: 'individuo o grupo responsable del uso y mantenimiento de los equipos y de que los operadores reciban entrenamiento adecuado.' Operador: 'persona que maneja un equipo conforme a los fines previstos.'
français	Définitions relatives au message de danger ci-dessus (selon CEI 1010-1): Personne responsable: 'individu ou groupe responsable de l'utilisation conforme et de la maintenance d'un équipement, et devant s'assurer de la formation adéquate des manipulateurs.' Manipulateur: 'personne utilisant un équipement de manière conforme.'



→ Definitions (continued)		W2.1
<i>italiano</i>	Definizioni per il pericolo sopraccitato (secondo IEC 1010-1): Persona responsabile: ‘Responsabile di gruppo o individuale per l'uso e la manutenzione dell'equipaggiamento e per il necessario addestramento del personale.’ Operatore: ‘Persona che comanda l'equipaggiamento per raggiungere l'obiettivo preposti.’	
<i>Nederlands</i>	Definities voor de hiervoor genoemde waarschuwing (uit IEC 1010-1): Verantwoordelijke persoon: ‘persoon of groep van personen verantwoordelijk voor het gebruik en het onderhoud van apparatuur, die tevens dient(en) te zorgen voor adequate training van degene die het apparaat bedient (operator).’ Operator: ‘persoon die apparatuur bedient zoals bedoeld.’	
<i>português</i>	Definições referentes ao aviso supra referido (da CEI 1010-1): Responsável: ‘indivíduo ou grupo responsável pela utilização e manutenção de equipamentos, que deve assegurar que os operadores sejam devidamente treinados.’ Operador: ‘pessoa que opera o equipamento para os fins previstos.’	
<i>suomea</i>	Edellä olevaan varoitukseen liittyviä määritelmiä (lähde IEC 1010-1): Vastuussa oleva: ‘henkilö tai ryhmä, joka on vastuussa laitteiden käytöstä ja huollosta ja siitä huolehtimisesta, että laitteen käyttäjillä on asianmukainen koulutus.’ Laitteen käyttäjä: ‘henkilö, joka käyttää laitetta sen käyttötarkoituksen mukaisesti.’	
<i>svenska</i>	Definitioner till varningen ovan (från IEC 1010-1): Ansvarig användare: ‘enskild person eller grupp som ansvarar för användning och service av utrustningen samt att operatörerna har lämplig utbildning.’ Operatör: ‘person som arbetar med utrustningen för avsett ändamål.’	

	W9.1 Warning: Moving Parts – Risk of Injury <i>Some moving parts of the instrument are accessible in normal operation.</i> • <i>Keep hands, clothing and other objects away from the moving parts of the instrument.</i>
<i>dansk</i>	Advarsel: Bevægelige dele – Fare for kvæstelser <i>Nogle af apparatets bevægelige dele er tilgængelige ved normal betjening.</i> • <i>Hold hænder, tøj og andre genstande borte fra apparatets bevægelige dele.</i>
<i>Deutsch</i>	Warnung: Bewegliche Teile – Verletzungsgefahr <i>Bei normalem Betrieb sind bewegliche Teile des Geräts zugänglich.</i> • <i>Hände, Kleidung und andere Gegenstände von den beweglichen Teilen des Geräts fernhalten.</i>
<i>español</i>	Advertencia: Peligro mecánico <i>Algunas de las partes móviles del aparato son accesibles durante su funcionamiento normal.</i> • <i>Mantenga las manos, la ropa y otros objetos alejados de las partes móviles del equipo.</i>
<i>français</i>	Danger: Parties en mouvement – Risque d'accident corporel <i>Certaines parties en mouvement de l'instrument sont accessibles en fonctionnement normal.</i> • <i>Tenir les mains, vêtements et autres objets éloignés des parties en mouvement de l'instrument.</i>



→ Warning (continued)		W9.1
<i>italiano</i>	Pericolo: Parti in movimento – Pericolo di infortunio <i>Alcune delle parti in movimento dello strumento sono accessibili anche durante il normale funzionamento.</i> • <i>Tenete le mani, gli indumenti e altri oggetti lontano dalle parti in movimento dello strumento.</i>	
<i>Nederlands</i>	Waarschuwing: Bewegende delen – Verwondingsgevaar <i>Sommige bewegende delen van het instrument kunnen aangeraakt worden tijdens de normale werking.</i> • <i>Handen, kleding en andere voorwerpen uit de buurt van de bewegende delen van het instrument houden.</i>	
<i>português</i>	Aviso: Peças móveis – perigo de ferimento <i>Algumas peças móveis do aparelho podem ser acedidas durante o funcionamento normal.</i> • <i>Mantenha afastados das peças móveis do aparelho as mãos, o vestuário e outros objectos.</i>	
<i>suomea</i>	Varo: Liikkuvat osat – loukkaantumisvaara <i>Muutamiin laitteen liikkuviin osiin on mahdollista päästä käsiksi normaalikäytön aikana.</i> • <i>Pidä kädet, vaatteet ja muut esineet loitolla laitteen liikkuvista osista.</i>	
<i>svenska</i>	Varning: Rörliga delar – risk för skador <i>En del rörliga delar på apparaten är åtkomliga vid normal användning.</i> • <i>Se till att händer, kläder eller andra föremål inte kommer i närheten av apparatens rörliga delar.</i>	

Symbols used on the instrument

Any of the following symbols can be used on the instrument:

<i>dansk</i>	<i>De markeringer, som benyttes på dette apparat</i> <i>Enhver af de følgende markeringer kan benyttes på apparatet:</i>
<i>Deutsch</i>	<i>Symbole am Gerät</i> <i>Eines der folgenden Symbole kann sich am Gerät befinden:</i>
<i>español</i>	<i>Pictogramas usados en el equipo</i> <i>Usted puede aplicar al equipo cualquiera de los siguientes pictogramas:</i>
<i>français</i>	<i>Symboles utilisés sur l'instrument</i> <i>Tous les symboles suivants peuvent être utilisés sur l'instrument :</i>
<i>italiano</i>	<i>Contrassegni utilizzati sullo strumento</i> <i>Qualsiasi dei seguenti contrassegni può essere utilizzato sullo strumento:</i>
<i>Nederlands</i>	<i>Markeringen op het Instrument</i> <i>De volgende markingen kunnen op het instrument gebruikt worden:</i>
<i>português</i>	<i>Marcações usadas no aparelho</i> <i>Qualquer uma das marcações seguintes podem ser usadas no aparelho:</i>
<i>suomea</i>	<i>Laitteessa käytetyt merkit</i> <i>Laitteessa voidaan käyttää seuraavia merkkejä:</i>
<i>svenska</i>	<i>Apparatens symboler</i> <i>Följande symboler kan finnas på apparaten:</i>

	This symbol indicates that there is a potential hazard and that the user must look in the guide for an explanation of the hazard and how to avoid it.
<i>dansk</i>	Dette symbol angiver, at der foreligger en mulig fare, og at brugeren skal se i håndbogen efter en forklaring på faren, og hvordan faren kan undgås.
<i>Deutsch</i>	Dieses Symbol bedeutet, daß hier eine mögliche Gefahr besteht und der Benutzer im Handbuch nachschlagen muß, um eine Beschreibung der Gefahr und deren Vermeidung zu erhalten.
<i>español</i>	Este símbolo indica que existe un peligro potencial y que el usuario tiene que consultar el manual para hallar una explicación del peligro y de los modos de evitarlo.
<i>français</i>	Ce symbole indique un danger potentiel et invite l'utilisateur à consulter le manuel d'utilisation pour obtenir un exposé de ce danger et les moyens de l'éviter.
<i>italiano</i>	Questo simbolo indica un pericolo potenziale e che l'operatore deve consultare il manuale per eventuali spiegazioni riguardo ad eventuali pericoli e su come evitarli.
<i>Nederlands</i>	Dit symbool geeft aan dat er gevaar bestaat en dat de gebruiker in het handboek de uitleg daarvan dient na te kijken en hoe het vermeden kan worden.
<i>português</i>	Este símbolo indica que existe um perigo potencial e que o utilizador deve consultar o manual para obter uma explicação sobre o perigo e saber como o pode evitar.
<i>suomea</i>	Tämä symboli merkitsee, että on olemassa potentiaalinen vaara ja että käyttäjän täytyy katsoa käsikirjasta vaaran selitystä ja kuinka se vältetään.
<i>svenska</i>	Symbolen innebär möjlig fara. Användaren skall se i användarhandboken för att få förklaringar och anvisningar om hur faran skall undvikas.



This symbol indicates the risk of electric shock.

<i>dansk</i>	Dette symbol angiver risikoen for elektrisk stød.
<i>Deutsch</i>	Dieses Symbol warnt vor Gefahr durch elektrischen Strom.
<i>español</i>	Este símbolo indica la existencia de riesgo de electrocución.
<i>français</i>	Ce symbole indique un risque d'électrocution.
<i>italiano</i>	Questo simbolo indica il pericolo di folgorazione.
<i>Nederlands</i>	Dit symbool geeft aan dat er gevaar voor een elektrische schok bestaat.
<i>português</i>	Este símbolo indica o perigo de choques eléctricos.
<i>suomea</i>	Tämä symboli varoittaa sähköiskun vaarasta.
<i>svenska</i>	Symbolen innebär fara för elektriska stötar.



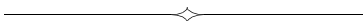
This symbol indicates the risk of hot surfaces.

<i>dansk</i>	Dette symbol angiver risikoen for varme overflader.
<i>Deutsch</i>	Dieses Symbol warnt vor Gefahr durch heiße Oberfläche.
<i>español</i>	Este símbolo indica peligro de tocar superficies candentes.
<i>français</i>	Ce symbole indique un risque de surfaces chaudes.
<i>italiano</i>	Questo simbolo indica il pericolo di superfici molto calde.
<i>Nederlands</i>	Dit symbool geeft aan dat er gevaar voor hete oppervlaktes bestaat.
<i>português</i>	Este símbolo indica o perigo de superfícies quentes.
<i>suomea</i>	Tämä symboli varoittaa kuumista pinnoista.
<i>svenska</i>	Symbolen innebär fara för heta ytor.

	This symbol indicates the off position of the circuit breaker. With the switch in this position, the instrument is disconnected entirely from the line power supply.
<i>dansk</i>	Dette symbol angiver kredsløbsafbryderens slukket-position. Når afbryderen står i denne position, er apparatet fuldstændigt skilt fra strømtilførslen.
<i>Deutsch</i>	Dieses Symbol zeigt die Stellung Aus des Leistungsschalters. Wenn der Schalter auf dieser Position steht, ist das Gerät vollständig vom Netzstrom getrennt.
<i>español</i>	Este símbolo indica que el interruptor principal de la red o del cortacircuitos está desconectado. Cuando el interruptor se encuentra en esta posición, el equipo está desconectado por completo de la toma de corriente.
<i>français</i>	Ce symbole indique que l'interrupteur ou le coupe-circuit principal est en position 'arrêt'. Quand l'interrupteur est dans cette position, l'instrument est complètement déconnecté de l'alimentation secteur.
<i>italiano</i>	Questo simbolo indica la posizione di spento dell'interruttore principale di alimentazione o il separatore di circuito. Se l'interruttore si trova in questa posizione lo strumento è scollegato completamente dall'alimentazione elettrica.
<i>Nederlands</i>	Dit symbool geeft aan dat de hoofdkrachtschakelaar of stroombreker uitstaat. Met de schakelaar in deze stand is het instrument geheel afgesloten van de lijnvoeding.
<i>português</i>	Este símbolo indica a posição desligada do interruptor principal de corrente ou do disjuntor. Estando o interruptor nesta posição, o aparelho é desligado totalmente da rede de fornecimento de corrente.
<i>suomea</i>	Tämä symboli ilmoittaa, että pääkytkin tai katkaisija on pois päältä. Kun kytkin on tässä asennossa, laite on erotettu kokonaan verkkovirrasta.
<i>svenska</i>	Symbolen visar att huvudströmbrytaren eller strömkrets brytaren står i från-läge. När brytaren står i detta läge är apparaten helt fränkopplad från nätet.

	This symbol indicates the on position of the circuit breaker. With the switch in this position, the instrument is connected to the line power supply but is not necessarily switched on and operational.
<i>dansk</i>	Dette symbol angiver kredsløbsafbryderens tændt-position. Når afbryderen står i denne position, er apparatet forbundet med strømtilførslen, men ikke nødvendigvis tændt og driftsklart.
<i>Deutsch</i>	Dieses Symbol zeigt die Stellung Ein des Netzschalters oder Leistungsschalters. Wenn der Schalter auf dieser Position steht, wird das Gerät mit Netzstrom versorgt, muß jedoch nicht notwendigerweise eingeschaltet und betriebsbereit sein.
<i>español</i>	Este símbolo indica que el interruptor principal de la red o del cortacircuitos está conectado. Cuando el interruptor se encuentra en esta posición, el equipo está conectado a la red eléctrica, pero no está necesariamente encendido o en estado operacional.
<i>français</i>	Ce symbole indique que l'interrupteur ou le coupe-circuit principal est en position 'marche'. Quand l'interrupteur est dans cette position, l'instrument est connecté à l'alimentation secteur, mais n'est pas nécessairement en circuit et opérationnel.
<i>italiano</i>	Questo simbolo indica la posizione di accesso dell'interruttore principale di alimentazione o il separatore di circuito. Se l'interruttore si trova in questa posizione lo strumento è collegato all'alimentazione elettrica ma non è necessariamente attivo e operativo.
<i>Nederlands</i>	Dit symbool geeft aan dat de hoofdkrachtschakelaar of stroombreker aanstaat. Met de schakelaar in deze stand is het instrument aangesloten aan de lijnvoeding maar behoeft niet aan te staan en in werking te zijn.
<i>português</i>	Este símbolo indica a posição ligada do interruptor principal de corrente ou do disjuntor. Estando o interruptor nesta posição, o aparelho está ligado à rede de fornecimento de corrente, o que não significa necessariamente que também esteja activado e operacional.
<i>suomea</i>	Tämä symboli ilmoittaa, että pääkytkin tai katkaisija on päälle kytketty. Kun kytkin on tässä asennossa, laite on liitettyä verkkovirtaan, mutta sitä ei ole välttämättä kytketty päälle eikä se ole välttämättä käyttövalmis.
<i>svenska</i>	Symbolen visar att huvudströmbrytaren eller strömkrets brytaren står i till-läge. När brytaren står i detta läge är apparaten ansluten till nätet men inte nödvändigtvis tillslagen och driftklar.

	This symbol indicates the operational on/off switch.
<i>dansk</i>	Dette symbol angiver betjenings-tændt/sluk-kontakt.
<i>Deutsch</i>	Dieses Symbol kennzeichnet den Bereitschaftsschalter.
<i>español</i>	Este símbolo indica el interruptor operacional con./desc.
<i>français</i>	Ce symbole représente l'interrupteur d'arrêt/marche.
<i>italiano</i>	Questo simbolo indica l'interruttore acceso/spento opzionale.
<i>Nederlands</i>	Dit symbool geeft de aan/uit schakelaar aan.
<i>português</i>	Este símbolo indica o interruptor de ligar/desligar o funcionamento.
<i>suomea</i>	Tämä symboli tarkoittaa päälle/pois -käyttökyskintä.
<i>svenska</i>	Symbolen visar apparatens till/från-knapp.
	This symbol indicates alternating current.
<i>dansk</i>	Dette symbol angiver vekselstrøm.
<i>Deutsch</i>	Dieses Symbol kennzeichnet Wechselstrom.
<i>español</i>	Este símbolo indica la existencia de corriente alterna.
<i>français</i>	Ce symbole représente le courant alternatif.
<i>italiano</i>	Questo simbolo indica corrente alternata.
<i>Nederlands</i>	Dit symbool geeft wisselstroom aan.
<i>português</i>	Este símbolo indica corrente alterna.
<i>suomea</i>	Tämä symboli merkitsee vaihtovirtaa.
<i>svenska</i>	Symbolen indikerar växelström.



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Part Number 0993-5255 Release 5

