thermo scientific

iCAP RQ ICP-MS

Pre-Installation Requirements Guide

BRE0009927 Revision A November 2016

ThermoFisher SCIENTIFIC

iCAP RQ ICP-MS

Pre-Installation Requirements Guide

BRE0009927 Revision A November 2016

ThermoFisher SCIENTIFIC

Legal Notices

Published by:
Thermo Fisher Scientific (Bremen) GmbH, Hanna-Kunath-Str. 11, 28199 Bremen, Germany
Tel: +49(0)421 5493 0, Fax: +49(0)421 5493 396

Release History: Revision A released in November 2016.

For Research Use Only. Not for use in diagnostic procedures.

Contacting Us

There are several ways to contact Thermo Fisher Scientific™.

Assistance

For technical support and ordering information, visit:

www.thermoscientific.com/icpms

Service contact details for customers are available under:

www.unitylabservices.com

For brochures, application notes and other material, please visit:

www.thermofisher.com

Visit our customer SharePoint to download current revisions of user manuals and other customer-oriented documents for your product. Translations into other languages and software packages may be available there as well.

With the serial number (S/N) of your instrument, request access as a customer via www.thermoscientific.com/Technicaldocumentation. For the first login, you have to create an account. Follow the instructions given on screen. Please accept the invitation within six days and log in with your created Microsoft™ password.

Suggestions to the Manual

❖ **To suggest changes to this manual**

- Please send your comments to:

  Editors, Technical Documentation
  Thermo Fisher Scientific (Bremen) GmbH
  Hanna-Kunath-Str. 11
  28199 Bremen
  Germany

- Send an e-mail message to the Technical Editor at

  documentation.bremen@thermofisher.com

You are encouraged to report errors or omissions in the text or index. Thank you.

Contents

Technical Data iCAP RQ 1-Channel Instrument

The table summarizes the most important technical data of the iCAP RQ ICP-MS systems. See the respective chapters of the manual for details and additional instrument properties.

Parameter	Specification	Value
Instrument Dimensions		
iCAP RQ ICP-MS	Length × width × height	772 mm × 665 mm × 1102 mm
	Weight	142 kg
Power Requirements		
iCAP RQ ICP-MS	Nominal Voltage	200-240 V AC (50/60 Hz), single phase
	Power	apparent power: 3000 VA; effective power: 2200 W
	Wire	Single-phase, 2-pole, 3-wire grounding
	Fuse	15/16 A (Europe) 20 A (North America, Japan)
	Protection type (acc. IEC 60529))	IP 20
Fore vacuum pump	Voltage	200-240 V ±10% (50 Hz/60 Hz)
	Power	1.6 kW (50 Hz) 1.9 kW (60 Hz)
Operating Environment		
Temperature	Laboratory temperature	15 to 35 °C
	Optimum operation temperature	18 to 21 °C
Exhaust	Exhaust velocity (plasma)	6 to 8 m/s
	Exhaust flow (plasma)	67 to 90 m^3/h
	Exhaust velocity (heat)	4 to 6 m/s
	Exhaust flow (heat)	45 to 67m^3/h
Heat generation[a]	Instrument	350 W-520 W (50 Hz) 350 W-520 W (60 Hz)
	Fore vacuum pump	900 W (50 Hz) 1100 W (60 Hz)
Humidity	20-80%, non-condensing and non-corrosive atmosphere	
Cooling Water Requirements		
Cooling water	Supply rate	> 5.5 L/min
	Temperature	20 to 30 °C, optimum at 21 °C
	Pressure	0.25 to 0.6 MPa (2.5 to 6 bar)
	pH	6-8
	Recommended conductivity	< 1000 µS/cm
	Solid residual	< 50 µm particle size

[a] see Table 3-3 for more information

Plasma and Cooling Gas		
Argon	Purity	99.996% or better
	Max. water content	5 ppmv
	Supply rate	max. 24 L/min
	Pressure	min. 0.55 MPa (5.5 bar)/max. 0.6 MPa (6 bar)
CCT Gas		
Helium (for QCell)	Purity	99.999% or better
	Max. water content	2 ppmv
	Supply rate	max. 10 mL/min per channel
	Pressure	min. 0.05 MPa (0.5 bar)/max. 0.15 MPa (1.5 bar)
Hydrogen mixtures with helium (for QCell)	Max. content of hydrogen	4.5%
	Purity	99.999% or better
	Max. water content	2 ppmv
	Supply rate	max. 10 mL/min per channel
	Pressure	min. 0.05 MPa (0.5 bar)/max. 0.15 MPa (1.5 bar)
Oxygen or mixtures with helium (for QCell)	Purity	99.999% or better
	Max. water content	2 ppmv
	Supply rate	max. 10 mL/min per channel
	Pressure	min. 0.05 MPa (0.5 bar)/max. 0.15 MPa (1.5 bar)
Ammonia or mixtures with helium (for QCell)	Max. content of ammonia	1%
	Purity	99.999% or better
	Max. water content	2 ppmv
	Supply rate	max. 10 mL/min per channel
	Pressure	min. 0.05 MPa (0.5 bar)/max. 0.15 MPa (1.5 bar)
Additional Gas		
Argon	Purity	99.996% or better
	Max. water content	5 ppmv
	Supply rate	max. 1 L/min per channel
	Pressure	max. 0.1 MPa (1 bar)
Pure helium or mixtures with argon	Purity	99.996% or better
	Max. water content	5 ppmv
	Supply rate	max. 1 L/min per channel
	Pressure	max. 0.1 MPa (1 bar)
Pure oxygen or mixtures with helium and/or argon	Purity	99.996% or better
	Max. water content	5 ppmv
	Supply rate	max. 1 L/min per channel
	Pressure	max. 0.1 MPa (1 bar)
Pure nitrogen or mixtures with helium and/or argon	Purity	99.996% or better
	Max. water content	5 ppmv
	Supply rate	max. 1 L/min per channel
	Pressure	max. 0.1 MPa (1 bar)
Methane mixtures with argon	Max. content of methane	4.5%
	Purity	99.996% or better
	Max. water content	5 ppmv
	Supply rate	max. 1 L/min per channel
	Pressure	max. 0.1 MPa (1 bar)

Technical Data iCAP RQ 2-Channel Instrument

The table summarizes the most important technical data of the iCAP RQ ICP-MS systems. See the respective chapters of the manual for details and additional instrument properties.

Parameter	Specification	Value
Instrument Dimensions		
iCAP RQ ICP-MS	Length × width × height	772 mm × 665 mm × 1102 mm
	Weight	142 kg
Power Requirements		
iCAP RQ ICP-MS	Nominal Voltage	200-240 V AC (50/60 Hz), single phase
	Power	apparent power: 3000 VA; effective power: 2200 W
	Wire	Single-phase, 2-pole, 3-wire grounding
	Fuse	15/16 A (Europe) 20 A (North America, Japan)
	Protection type (acc. IEC 60529))	IP 20
Fore vacuum pump	Voltage	200-240 V ±10% (50 Hz/60 Hz)
	Power	1.6 kW (50 Hz) 1.9 kW (60 Hz)
Operating Environment		
Temperature	Laboratory temperature	15 to 35 °C
	Optimum operation temperature	18 to 21 °C
Exhaust	Exhaust velocity (plasma)	6 to 8 m/s
	Exhaust flow (plasma)	67 to 90 m^3/h
	Exhaust velocity (heat)	4 to 6 m/s
	Exhaust flow (heat)	45 to 67m^3/h
Heat generation[a]	Instrument	350 W-520 W (50 Hz) 350 W-520 W (60 Hz)
	Fore vacuum pump	900 W (50 Hz) 1100 W (60 Hz)
Humidity	20-80%, non-condensing and non-corrosive atmosphere	
Cooling Water Requirements		
Cooling water	Supply rate	> 5.5 L/min
	Temperature	20 to 30 °C, optimum at 21 °C
	Pressure	0.25 to 0.6 MPa (2.5 to 6 bar)
	pH	6-8
	Recommended conductivity	< 1000 µS/cm
	Solid residual	< 50 µm particle size

[a] see Table 3-3 for more information

Plasma and Cooling Gas		
Argon	Purity	99.996% or better
	Max. water content	5 ppmv
	Supply rate	max. 24 L/min
	Pressure	min. 0.55 MPa (5.5 bar)/max. 0.6 MPa (6 bar)
CCT Gas		
Helium (for QCell)	Purity	99.999% or better
	Max. water content	2 ppmv
	Supply rate	max. 10 mL/min per channel
	Pressure	min. 0.05 MPa (0.5 bar)/max. 0.15 MPa (1.5 bar)
Hydrogen or mixtures with helium (for QCell)	Purity	99.999% or better
	Max. water content	2 ppmv
	Supply rate	max. 10 mL/min per channel
	Pressure	min. 0.05 MPa (0.5 bar)/max. 0.15 MPa (1.5 bar)
Oxygen or mixtures with helium (for QCell)	Purity	99.999% or better
	Max. water content	2 ppmv
	Supply rate	max. 10 mL/min per channel
	Pressure	min. 0.05 MPa (0.5 bar)/max. 0.15 MPa (1.5 bar)
Ammonia or mixtures with helium (for QCell)	Max. content of ammonia	1%
	Purity	99.999% or better
	Max. water content	2 ppmv
	Supply rate	max. 10 mL/min per channel
	Pressure	min. 0.05 MPa (0.5 bar)/max. 0.15 MPa (1.5 bar)
Additional Gas		
Argon	Purity	99.996% or better
	Max. water content	5 ppmv
	Supply rate	max. 1 L/min per channel
	Pressure	max. 0.1 MPa (1 bar)
Pure helium or mixtures with argon	Purity	99.996% or better
	Max. water content	5 ppmv
	Supply rate	max. 1 L/min per channel
	Pressure	max. 0.1 MPa (1 bar)
Pure oxygen or mixtures with helium and/or argon	Purity	99.996% or better
	Max. water content	5 ppmv
	Supply rate	max. 1 L/min per channel
	Pressure	max. 0.1 MPa (1 bar)
Pure nitrogen or mixtures with helium and/or argon	Purity	99.996% or better
	Max. water content	5 ppmv
	Supply rate	max. 1 L/min per channel
	Pressure	max. 0.1 MPa (1 bar)
Methane mixtures with argon	Max. content of methane	4.5%
	Purity	99.996% or better
	Max. water content	5 ppmv
	Supply rate	max. 1 L/min per channel
	Pressure	max. 0.1 MPa (1 bar)

Chapter 1 Using this Manual

Welcome to the Thermo Scientific™ iCAP™ RQ ICP-MS system! The iCAP RQ system is a member of the Thermo Scientific family of inductively coupled plasma mass spectrometers (ICP-MS).

Contents

About this Manual

This *iCAP RQ Pre-Installation Requirements Guide* is intended primarily for those who are responsible for the site planning of a laboratory in preparation for the installation of a new iCAP RQ ICP-MS instrument. This guide should be retained for future guidance in case your instrument needs to be relocated.

The operator is responsible for providing a suitable location, a suitable operating environment, a source of power of acceptable quality, correct gas and solvent supplies, and proper waste and exhaust systems.

This *iCAP RQ Pre-Installation Requirements Guide* provides information to assist in planning and preparing your lab site for the system prior to delivery and installation. Read each section carefully to be sure that your laboratory is ready for the installation of your system. For additional information, request specific pre-installation support directly through your local Thermo Fisher Scientific office.

Thermo Scientific mass spectrometers are designed to operate reliably under carefully controlled environmental conditions. Operating a system or maintaining it in a condition outside the power and operating environment specifications described in this guide might cause failures of many types. The repair of such failures is specifically excluded from the standard warranty and service contract coverage.

Fill out the "iCAP RQ ICP-MS Installation Request Form" located at the end of this manual and send it to Thermo Fisher Scientific to request installation.

Typographical Conventions

This section describes typographical conventions that have been established for Thermo Fisher Scientific manuals.

Signal Word

Make sure you follow the precautionary statements presented in this manual. Special notices appear different from the main flow of text:

NOTICE Points out possible material damage and other important information in connection with the instrument. ▲

⚠ CAUTION Points out a hazardous situation that can lead to minor or medium injury if not avoided.

Viewpoint Orientation

Left and *right* used in this manual always refer to the viewpoint of a person facing the front side of the instrument.

Data Input

Throughout this manual, the following conventions indicate data input and output via the computer:

- Messages displayed on the screen are represented by capitalizing the initial letter of each word and by italicizing each word.
- Input that you enter by keyboard is identified by quotation marks: single quotes for single characters, double quotes for strings.
- For brevity, expressions such as "choose **File > Directories**" are used rather than "pull down the File menu and choose Directories."
- Any command enclosed in angle brackets < > represents a single keystroke. For example, "press **<F1>**" means press the key labeled *F1*.
- Any command that requires pressing two or more keys simultaneously is shown with a plus sign connecting the keys. For example, "press **<Shift>** + **<F1>**" means press and hold the <Shift> key and then press the <F1> key.
- Any button that you click on the screen is represented in bold face letters. For example, "click **Close**".

Topic Headings

The following headings are used to show the organization of topics within a chapter:

Chapter 1 Chapter Name

Second Level Topics

Third Level Topics

Fourth Level Topics

Chapter 2 Site Preparation

Before your instrument can be installed by the Thermo Fisher Scientific field service engineer, the site must be prepared. The hallways and doors must be wide enough to allow passage of the instrument.

NOTICE It is your responsibility as the operator to provide a suitable location, a source of power of acceptable quality, a suitable operating environment, and a proper exhaust system. ▲

Contents

Entrance Requirements

To allow moving a packed iCAP RQ ICP-MS instrument, the entrance to your facility and the width of all hallways, elevators, etc., should have a minimum width of 89 cm (35.1 in.).

Thermo Fisher Scientific recommends checking whether the container with the instrument fits through the laboratory entrance. Also allow additional room for maneuvering the system around corners, into elevators, or through doorways. Note that it is necessary to use a means of transport (a pallet jack, for example).

NOTICE Do not remove the instrument from its shipping container unless authorized by Thermo Fisher Scientific personnel. Be sure that all the contents of the container remain with the instrument. ▲

Dimensions and Weights

The iCAP RQ ICP-MS instrument is shipped in a container. Other modules such as the fore vacuum pump are shipped in separate containers. For dimensions and weights, see Table 2-1.

Table 2-1. Packing information of a typical iCAP RQ instrument

Module	Weight Gross/Net [kg]	Dimensions L × W × H [cm]
Basic Unit	195/142	133 x 90 x 160
Palette with 8 containers (fore vacuum pump, installation kit, computer, pump oil, etc.)	103/89	120 x 80 x 82
Total Weight	**298/231**	
Storage Space	**2.3 m^3**	

NOTICE Owing to the climatic conditions in some tropic regions, some boxes may be replaced by special packings. As a result, the dimensions will differ from those given in Table 2-1. ▲

Additional weights and the dimensions of auxiliary boxes might be added, depending on the equipment ordered.

The floor of your laboratory must be able to accommodate the weight of the instrument including all components and any options that are added to the system. See also "Placing the System" on page 2-10.

Figure 2-1 shows the external dimensions of the system. All values are given in millimeter.

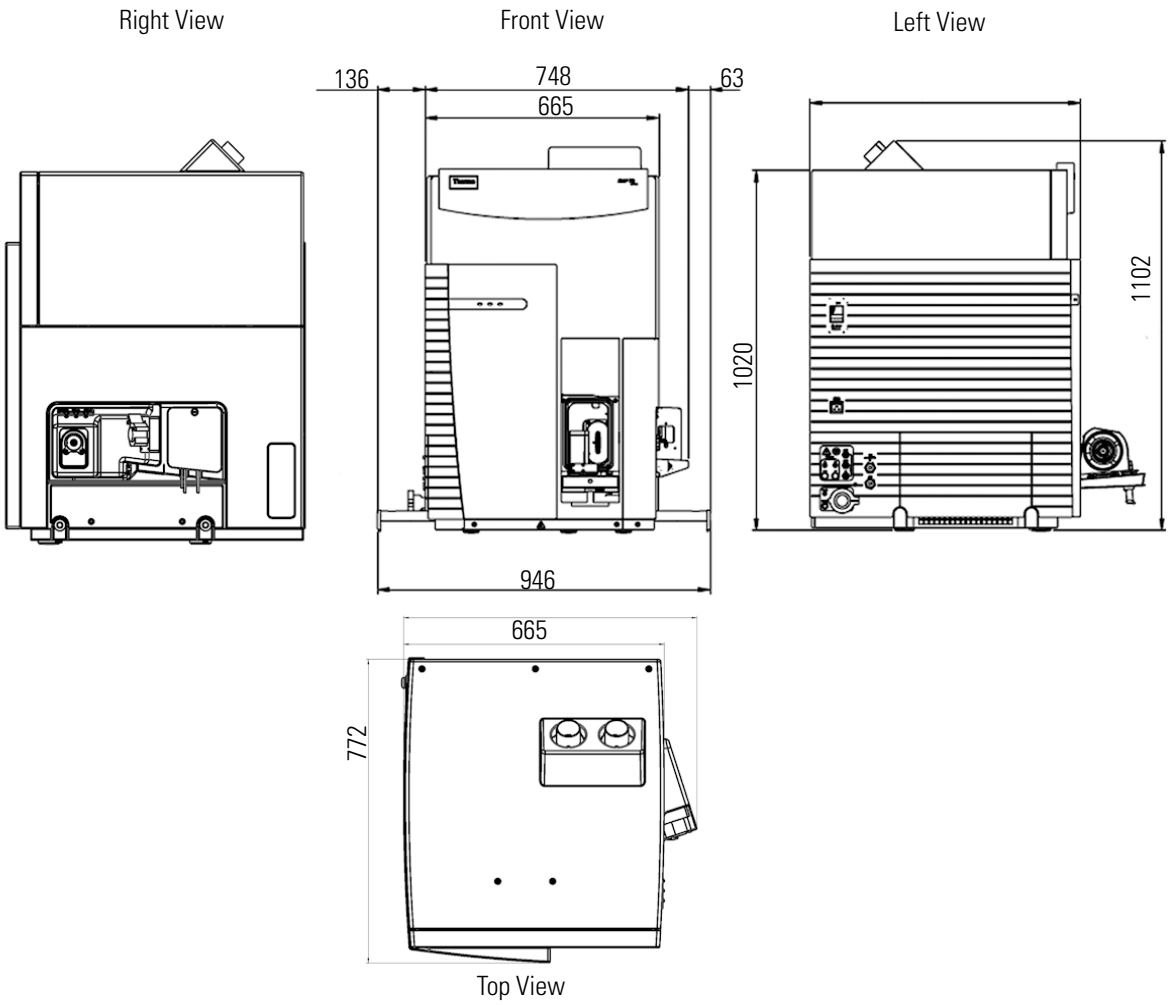


Figure 2-1. Dimensions of iCAP RQ instrument

Ensure that the Thermo Fisher Scientific field service engineer has access to the left and right side of the instrument.

Moving the Instrument

NOTICE After arrival, the iCAP RQ ICP-MS instrument must be stored as packed by Thermo Fisher Scientific for at least 24 hours at an environmental condition of 15 to 35 °C and a relative humidity of 20 to 80% before connecting it to the power supply. ▲

The iCAP RQ ICP-MS instrument is provided with four retractable handles. Each instrument is shipped on a pallet with the handles pulled out and fixed on the pallet, see Figure 2-2. Safety catches prevent the handles from unintentionally being retracted after they have been pulled out.

Figure 2-2. Retractable handles for transport, fixed on the transport pallet

⚠ CAUTION **Heavy Load**. Because of its weight of about 142 kg, handling the instrument alone might cause muscle strain and back injury. Lifting and moving the iCAP RQ ICP-MS instrument requires the effort of at least *four persons* to keep the individual load within acceptable limits (maximum 40 kg for men or 15 kg for women for a duration of 5 seconds). The carriers must be trained in how to carry loads properly (for example, by rising from the knees with a straight back). Thermo Fisher Scientific recommends using a pallet jack to lift the mass spectrometer onto the workbench.

The instrument is shipped with two lifting devices, each providing sufficient space for three persons that are standing side by side to carry the instrument.

An instrument with mounted lifting devices does not fit through a door with a width of 80 cm (32 in.), in contrast to the unpacked instrument alone. Furthermore, the persons that carry the instrument require considerable space for maneuvering. Therefore, Thermo Fisher Scientific recommends using a pallet jack when moving the instrument into another room.

The following instructions assume that the instrument has been moved to the installation site with a pallet jack and the top cover of the transport crate has been removed.

❖ **To mount the lifting device and move the instrument onto the bench**

1. Gather four to six people trained in lifting heavy loads and appoint one person that takes command and gives instructions.

2. With a pallet jack, lift the instrument to the height of the working bench.

3. Remove the four clamps (see Figure 2-2) that fix the instrument to the transport pallet.

4. Hold the lifting device so that the yellow label on the lifting device which advises users to read the manual is visible. Place the lifting device on top of the handles, with the two ends of the twice bent tube pointing toward the instrument.

5. Position the correct holes in the metal sheet of the lifting device above the handles of the instrument, see Figure 2-3.

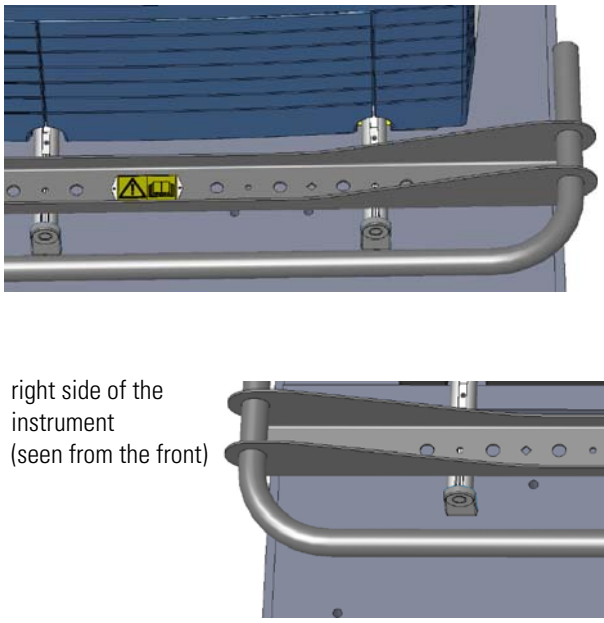
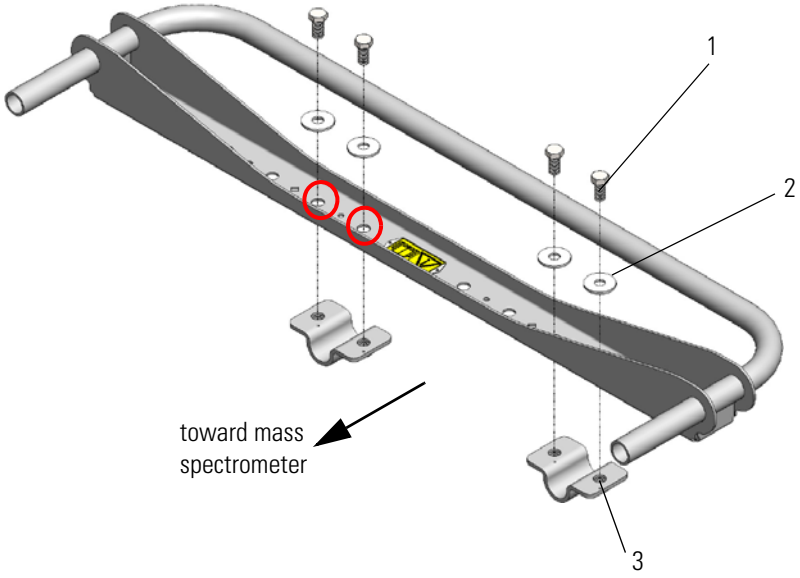


Figure 2-3. Positioning the lifting device above the handle of iCAP RQ instrument

Each lifting device consists of a folded metal sheet with holes and a twice bent tube. It is delivered with four hexagon screws, four washers, and two clamps.

6. To mount a lifting device onto the handles at one instrument side, place a clamp (**3** in Figure 2-4) below each of the two handles.



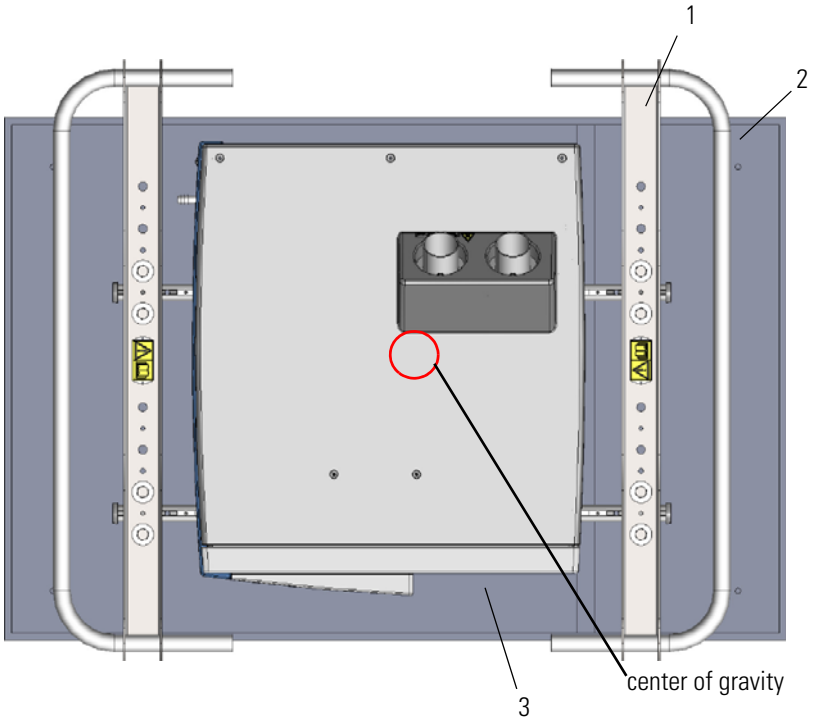
Labeled Components: 1=hexagonal screw (4 ×), 2=washer (4 ×), 3=clamp (2 ×)

Figure 2-4. Lifting device, exploded assembly drawing view

7. Fasten the clamp (**3** in Figure 2-4) with the two screws (**1** in Figure 2-4) with washers (**2** in Figure 2-4) at each side of a hole as shown in Figure 2-3. Fasten the second clamp with the second pair of screws and washers to the second handle.

8. Repeat for the second lifting devices at the other side of the instrument.
   Make sure that the device is aligned parallel to the side of the instrument. Check that the lifting device is tightly attached to the handles.

   The ends of the lifting devices must be aligned with each other as shown in Figure 2-5.



Labeled Components: 1=lifting device (2 ×), 2=transport pallet, 3=front of iCAP RQ system

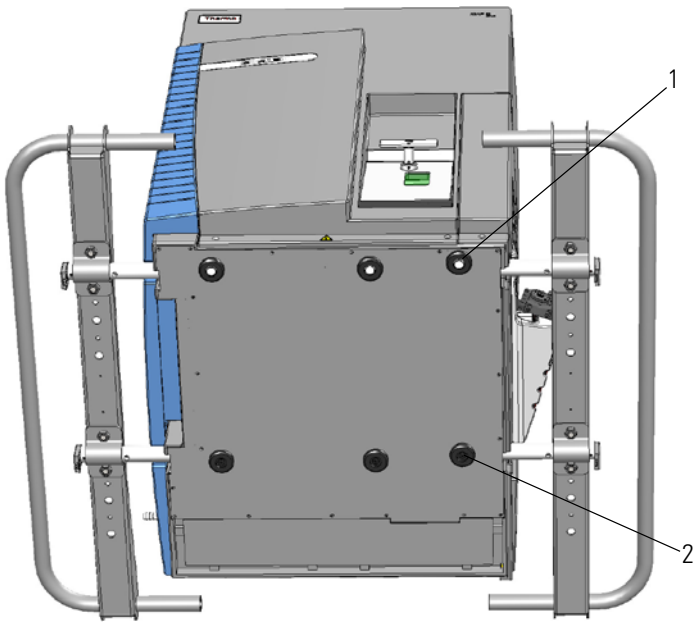
Figure 2-5. Lifting devices attached to instrument (top view)

⚠ CAUTION **Top Heavy Load.** The mass spectrometer might tip over while being moved in the laboratory and cause bodily injury or instrument damage. The instrument's center of gravity is indicated in Figure 2-5: the instrument has a tendency to tilt. When lifting the instrument, support the top of the instrument and keep the tilt angle below 5 degrees; never exceed 10 degrees.

9. Lift the iCAP RQ ICP-MS instrument on command. Make sure that all carriers lift off the instrument simultaneously to prevent uneven load distribution.

10. Rest the back part of the instrument on the bench and slide it into the desired position.

    The rear three of the six support points beneath the iCAP RQ ICP-MS instrument, see Figure 2-6, consist of synthetic material that has a low frictional resistance and should easily slide above the surface of your work bench.



Labeled Components: 1=front support points (3 ×) with high resistance to prevent moving, 2=rear support points (3 ×) with low resistance to easily slide the system on bench top

Figure 2-6. Support points with different resistance

11. When the final position for the instrument is reached, slowly lower the front of the iCAP RQ ICP-MS.
    The front three of the six support points beneath the iCAP RQ ICP-MS consist of synthetic material that has a high frictional resistance and should keep the instrument safely in position.

12. To remove the lifting devices from the handles, continue with "Dismounting the Lifting Device and Securing the Handles" on page 2-8.

Dismounting the Lifting Device and Securing the Handles

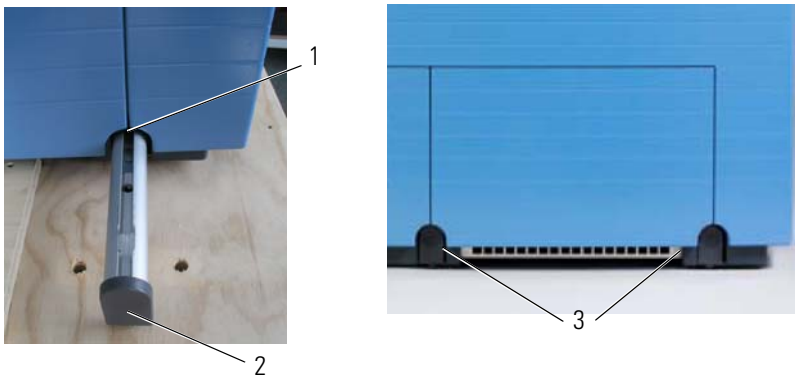
After the iCAP RQ ICP-MS has been moved to the correct position for operation, dismount the lifting device and store away the handles on the left side. At the right side of instrument, the handles can also be used to mount a drip tray.

❖ **To dismount the lifting device**

1. Unscrew the two clamps (**3** in Figure 2-4) of the lifting device.
2. Dismount the lifting device.
3. Repeat for the lifting device on the other side of the instrument.
4. Store away the clamps, washers (**2** in Figure 2-4) and screws (**1** in Figure 2-4) along with the lifting devices for later use.

❖ **To store away the handles**

1. At the left hand side of the instrument, push down the spring (**1** in Figure 2-7) of the handle (**2** in Figure 2-7) by using an screw driver and push the handle into its housing. See **3** in Figure 2-7.

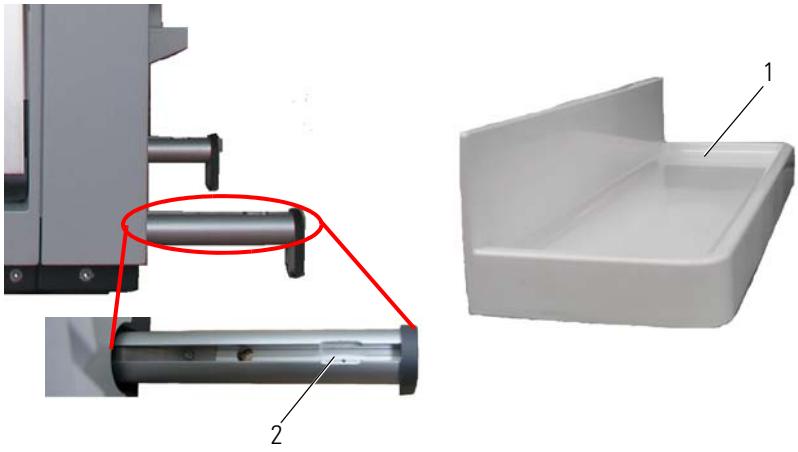


Labeled Components: 1=spring, 2=handle, 3=handles in housing

Figure 2-7. Shoving handle into housing

❖ **To mount the drip tray**

1. At the right side of the instrument, pull the handles outside.
2. To mount the drip tray (**1** in Figure 2-8) onto the handles, place the two bolts at the bottom of the drip tray into the notches of the handles. See **2** in Figure 2-8.



Labeled Components: 1=drip tray, 2=notch

Figure 2-8. Mounting drip tray

Placing the System

Workbench for Instrument

The workbench for the iCAP RQ system must be capable of supporting the weight of the mass spectrometer (**142** kg) plus the weight of any option (autosampler, liquid chromatograph, for example) and stand in a secure and level position.

⚠ Use only workbenches that are able to carry the weight of the iCAP RQ instrument and provide sufficient stability. The workbench must be dry and clean.

The iCAP RQ instrument is designed to be placed on a bench with its rear panel against a wall. The bench surface should ideally be 80 to 85 cm above the floor.

On the left side panel, free access to the mains switch and circuit breaker is needed to allow shutting off the instrument in an emergency at all times. To allow shutting off the instrument in an emergency, free access must be possible at any time to the main power switch and the power connections at the right and left side of the instrument.

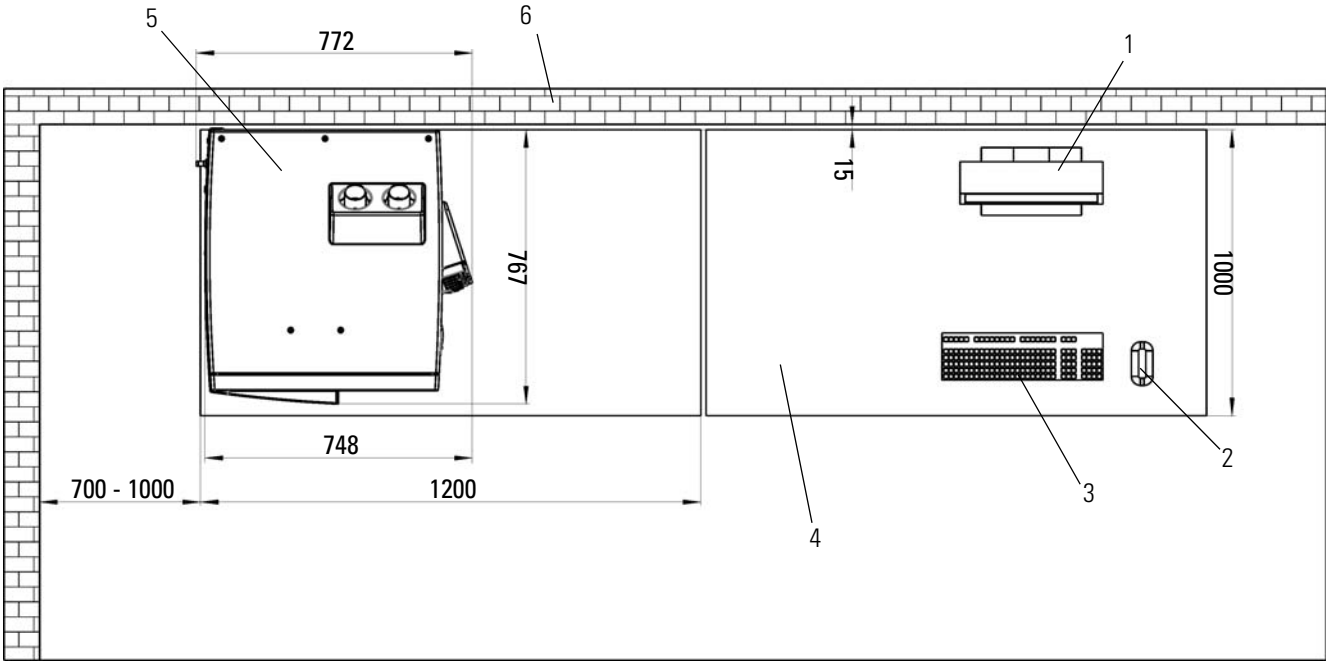
Allow at least 70 to 100 cm of clear space left of the system for clearance of the gas lines, electrical connections, as well as for the exhaust line and vacuum hose of the fore vacuum pump.

It is recommended to leave sufficient space on the right side of the iCAP RQ instrument for the connections to the computer and peripheral devices.

Consider suitable space between the outputs of the fume extraction lines and the inputs on the instrument. Consider the total height of the system when it is located on the table.

Floor Space for the System

Figure 2-9 shows an example of the required floor space for the system. All values are given in millimeter.



Labeled Components: 1=monitor, 2=mouse, 3=keyboard, 4=standard workbench, 5=iCAP RQ MS, 6=wall

Figure 2-9. Required floor space for iCAP RQ instrument

Placing the Fore Vacuum Pump

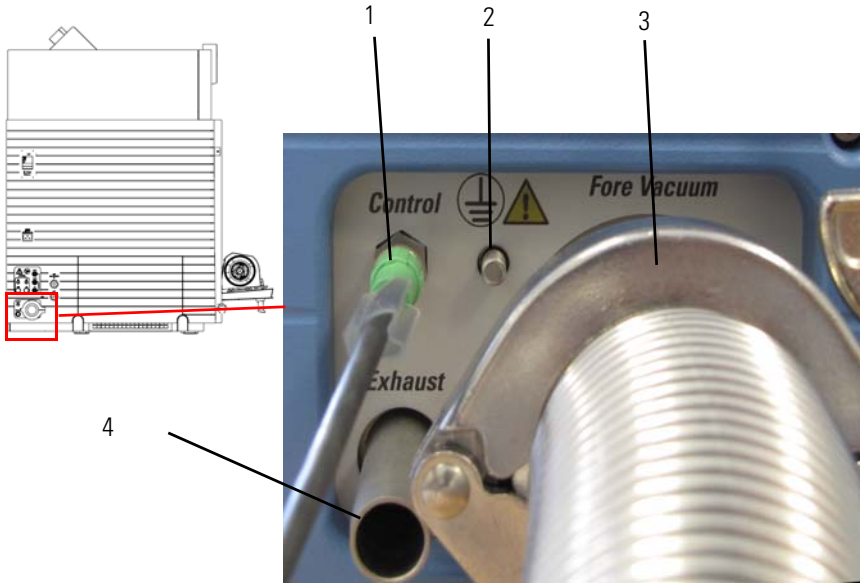
The iCAP RQ ICP-MS instrument is delivered with a fore vacuum pump (Sogevac™ SV40BI), a data cable and a grounding cable for connecting the instrument to the fore vacuum pump, a power cable for connecting the pump to the mains, and an exhaust hose for connecting the fore vacuum pump to the exhaust system (instrument). A noise reduction cover and a drip pan for the fore vacuum pump are available as options.

The fore vacuum pump must be placed on a drip pan of sufficient volume. Order a drip pan at Thermo Fisher Scientific or use a suitable one of your own.

NOTICE Thermo Fisher Scientific recommends the use of the noise reduction cover when installing the fore vacuum pump. ▲

If no space for the pump is available beneath the workbench, you can place the pump near the left side of the bench. In this case, the left side of the iCAP RQ instrument ideally aligns with the left side of the workbench.

Figure 2-10 shows the connections for the fore vacuum pump on the left hand side of the instrument.



Labeled Components: 1=data connection, 2=grounding bolt, 3=fore vacuum connection, 4=exhaust connection

Figure 2-10. Connections for fore vacuum pump

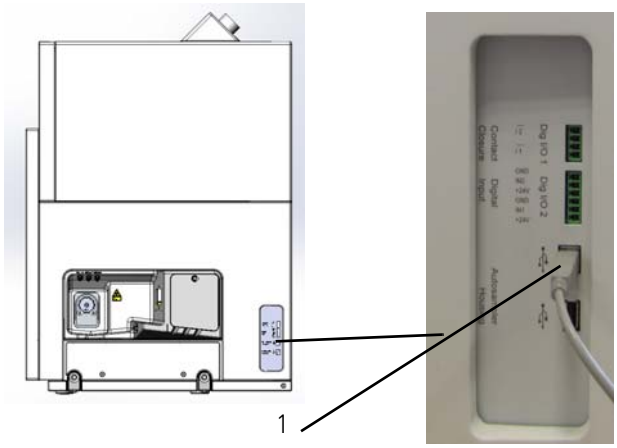
A stainless steel vacuum hose with a length of 2 m and an OD of 52 mm is delivered with the instrument for the vacuum connection (**3** in Figure 2-10). The flange diameter is 40 mm (Iso-KF 40). For the exhaust connection (**4** in Figure 2-10), tubing of 2.7 m length with an OD of 20 mm (ID 13 mm) is delivered with the instrument.

If you need a longer vacuum hose, contact Thermo Fisher Scientific. Because of the large bending radius of the hose, the actual reach of the vacuum hose is shorter than the given length. Either run the vacuum hose left of the workbench or make a cutout through the bench for it. The cutout must have minimum dimensions of 10 cm × 10 cm. Allow for room to run the power cord and the exhaust tubing from the fore vacuum pump through the cutout as well.

For information on the power supply of the fore vacuum pump, see "Fore Vacuum Pump" on page 4-4. For information on the exhaust system, see "Exhaust System" on page 3-3.

Placing the Data System

For the data system, Thermo Fisher Scientific recommends using one workbench with minimum dimensions of 1.00 m × 1.20 m. The workbench must be capable of supporting the weight of the data system and a printer, if applicable. A printer is not delivered with the instrument. The iCAP RQ ICP-MS instrument is connected to the computer via a USB cable, see Figure 2-11.



Labeled Components: 1=data connection to computer

Figure 2-11. Connections for computer

Figure 2-12 shows typical data system hardware components.

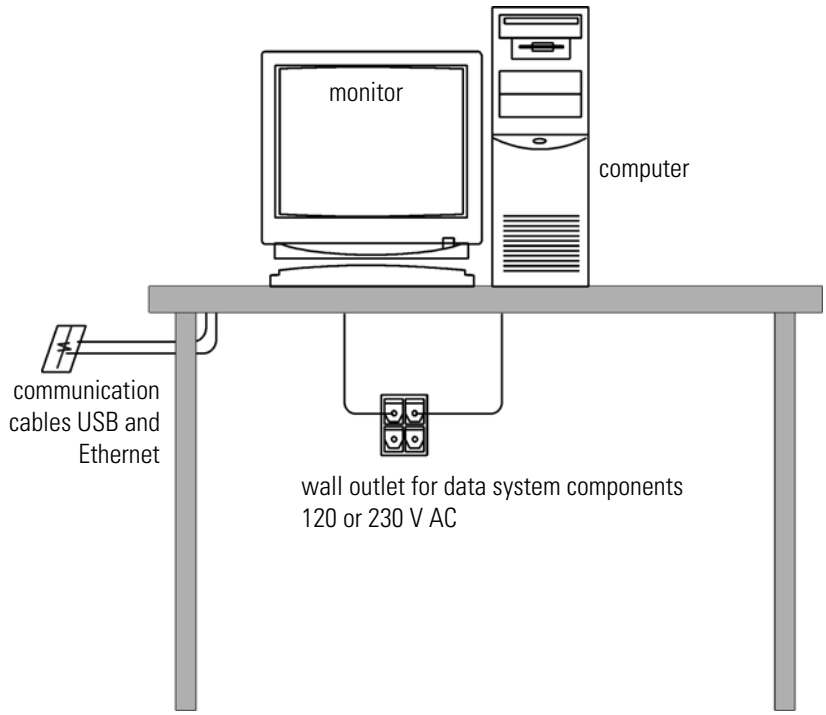


Figure 2-12. Typical data system workbench

Table 2-2 lists space requirements and weights of the typical data system hardware components. The actual values depend upon your equipment.

Table 2-2. Typical data system space and load requirements

Module	Height [cm]	Width [cm]	Length [cm]	Weight [kg]
Monitor	36	41	18	6
Minitower computer	48	18	43	14

The USB communication cables between the computer and the mass spectrometer must be no longer than 3 m each. The workbench that holds the data system must be located next to the workbench that holds the mass spectrometer. For a connection length of more than 3 m, an active hub must be placed between the instrument and the computer. The length of the USB cable between the iCAP RQ ICP-MS instrument and the hub is limited to 3 m, whereas between the hub and the computer a cable length of 5 m can be used. This hub must exclusively be used for the control of the iCAP RQ ICP-MS instrument.

Chapter 3 Operating Environment

Attention to the operating environment requirements ensures continued high performance of your system. Any expenditures for air conditioning are more than offset by good sample throughput and reduced repair costs. The air conditioning must be capable of maintaining a constant temperature in the immediate vicinity of the system without producing excessive draft. The relative humidity of the operating environment must be between 20 and 80%, with non-condensing and non-corrosive atmosphere.

NOTICE It is your responsibility as operator to provide an acceptable operating environment. ▲

Contents

Temperature

NOTICE After arrival, the iCAP RQ ICP-MS instrument must be stored as packed by Thermo Fisher Scientific for at least 24 hours at an environmental condition of 15 to 35 °C and a relative humidity of 20 to 80% before connecting it to the power supply. ▲

The mass spectrometer is designed to operate at the temperatures specified in Table 3-1.

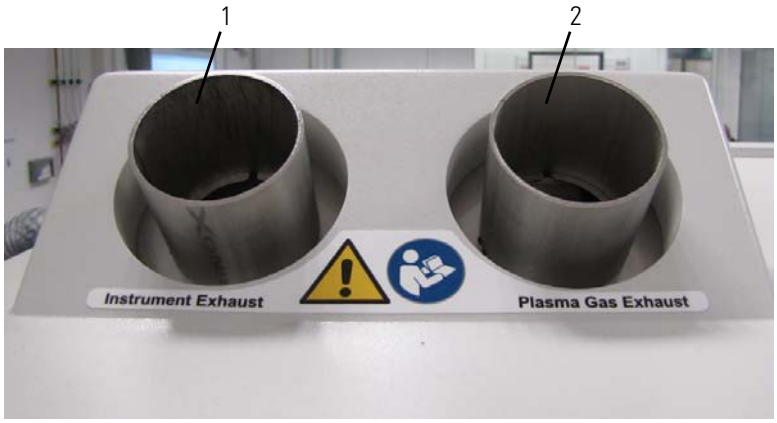
Table 3-1. Temperature requirements for iCAP RQ instruments

Specification	Value
Laboratory Temperature	15 to 35 °C
Optimum Operation Temperature	18 to 21 °C

NOTICE As the laboratory temperature increases, system reliability decreases. All electronic components generate heat while operating. ▲

Exhaust System

An exhaust system is needed for the instrument to remove gases that may contain ozone and other noxious substances. Two exhaust ports are situated at the top of the instrument. See Figure 3-1.



Labeled Components: 1=instrument exhaust, 2=plasma gas exhaust

Figure 3-1. Exhausts of iCAP RQ ICP-MS instrument

The instrument exhaust (**1** in Figure 3-1) is used to remove heat generated by the electronics of the instrument.

The plasma gas exhaust (**2** in Figure 3-1) is used to remove gases and heat generated by the plasma.

NOTICE A flexible exhaust hose must be connected to the exhausts during operation of the instrument. Thermo Fisher Scientific will only install your iCAP RQ system when an adequate exhaust system is present and functioning. Exhaust gas venting must comply with all local environmental codes. ▲

The exhaust ports at the iCAP RQ instruments have an outer diameter of 60.3 mm for both plasma exhaust and heat exhaust. Flexible hoses with 63 mm ID are recommended for connection to the exhaust ports. Thermo Fisher Scientific delivers hoses with a length of 6 m. The exhaust hoses should be equipped with a throttle valve.

The velocity v at the end of the hose with an inner diameter (d) of 63 mm connected to the exhaust port of the iCAP RQ instrument can be measured with an anemometer (values in m/s) and can then be converted to an exhaust flow f (m^3/h) by the following equation:

$$f = \pi \cdot \left(\frac{d}{2}\right)^2 \cdot v \cdot 3600$$

Example: Velocity measured with an anemometer v = 6 m/s, hose diameter d = 63 mm = 0.063 m

$$f = 3.14 \cdot \left(\frac{0.063\ \text{m}}{2}\right)^2 \cdot 6 \cdot \frac{\text{m}}{\text{s}} \cdot 3600 \approx 67\ \frac{\text{m}^3}{\text{h}}$$

The velocity v at the end of a flexible hose with an inner diameter of 63 mm and thus the flow rate should meet the specifications given in Table 3-2.

Table 3-2. Specifications for the iCAP RQ exhaust

Exhaust type	Hose ID [mm]	Exhaust Velocity [m/s]	Exhaust Flow [m^3/h]
Plasma	63	6 to 8	67 to 90
Instrument Heat	63	4 to 6	45 to 67

NOTICE The exhaust system must be tested for leakage before you connect it to the iCAP RQ instrument. ▲

Heat Generation and Dissipation of System

Heat generation and heat dissipation of the system depend on the equipment employed. However, the iCAP RQ system must always be operated with active plasma exhaust. For a description of the exhaust system, see "Exhaust System" on page 3-3.

For estimated values for the average heat dissipation of the mass spectrometer and other heat sources during analysis, see Table 3-3.

Table 3-3. Heat generation for a typical instrument

Module	Heat Generation [W] at 50 Hz	Heat Generation [W] at 60 Hz
Instrument with plasma gas and instrument exhaust port connected	350	350
Fore Vacuum Pump	900	1100
Recirculating Chiller	2650	2650
Monitor	25	25
Computer	75	75

NOTICE Water-cooled chillers minimize the heat dissipation into the laboratory environment. ▲

NOTICE The values listed in Table 3-3 are for a laboratory temperature of 23 °C and a cooling water temperature of 20 °C. A higher room temperature and/or lower cooling water temperature will increase the heat generation. ▲

Air Conditioning

The air conditioning system must be capable of maintaining a constant temperature as specified in "Temperature" on page 3-2 in the immediate vicinity of the system.

Thermo Fisher Scientific recommends the installation of an air conditioner if the specified limits are exceeded due to unfavorable climatic conditions. For reliable operation of the iCAP RQ instrument, a stability of the room temperature < 2 °C/h is required.

NOTICE Do not locate the iCAP RQ instrument under an air duct, near windows, or near heating and cooling sources. Temperature fluctuation of 1 °C or more over a 10 minutes period can affect performance. ▲

Humidity

The relative humidity of the operating environment must be between 20 and 80%, with non-condensing and non-corrosive atmosphere. It is recommended that your laboratory be equipped with a temperature and humidity monitor to ensure that your laboratory is always within the required temperature and humidity specifications.

NOTICE Operating an iCAP RQ instrument at very low humidity might cause the accumulation and discharge of static electricity, which can shorten the life of electronic components. Operating the system at high humidity might cause condensation, oxidation, and short circuits. ▲

Altitude

The iCAP RQ instrument is designed for indoor use at an altitude of up to 2000 m (6500 ft) above sea level. For altitudes above 2000 m, contact Thermo Fisher Scientific.

Vibration

Floors must be free of vibration caused, for example, by equipment in adjoining locations. Propagation of vibrations and their influence on complex instrumentations are difficult to predict. Contact your local Thermo Fisher Scientific representative if you have questions or concerns about your laboratory.

NOTICE The fore vacuum pump must not have any mechanical contact to the mass spectrometer with exception of the vacuum hose during operation. The vibration of the fore vacuum pump might impede the performance of the instrument. Install the fore vacuum pump on the floor beneath the mass spectrometer. Do not install the fore vacuum pump near the system on the workbench. ▲

Airborne Noise Emission

The A-weighted emission sound pressure level created by the iCAP RQ mass spectrometer and fore vacuum pump at work stations does not exceed 70 dB(A).

Radio Frequencies

The iCAP RQ system withstands electric fields of 1 V/m and a frequency range of 80 MHz to 2.7 GHz without any influence to operation.

iCAP RQ instruments are designed to work in a controlled electromagnetic environment. Do not use radio frequency transmitters, such as mobile phones, in close proximity to the instrument.

If strong radio transmitters are operating close to your laboratory, contact your local Thermo Fisher Scientific office for advice.

Magnetic Fields

The instrument site must be free of interfering magnetic fields. The maximum acceptable field amplitude (AC) for any frequency is 5.5 mT.

NOTICE Sources of disturbing fields are, for example, other analytical instruments such as NMR systems or Zeeman AAS, train, tram, subway, high power cables crossing the ceiling, large electric motors (elevators), radio stations nearby. ▲

Solvent Waste

Waste solvents occurring during operation should be collected in an appropriate waste container. This waste container must be provided by the customer.

During installation, the waste container must be inert against 2% nitric acid as well as against 0.5% hydrochloric acid.

NOTICE It is recommended that waste containers be placed in some type of secondary containment, such as a plastic bin, in case of a spill or overflow. To prevent the laboratory to be accidentally contaminated by solvent waste, protect the waste container against overturning. ▲

Chapter 4 Line Power

The performance and longevity of your system can be affected by the quality of line power delivered to the system. To ensure that your instrument performs optimally and is not damaged by line power fluctuations, verify that you comply with all power quality requirements listed in this manual.

NOTICE It is your responsibility as the operator to provide a source of power of acceptable quality for the operation of your system. ▲

Contents

Electrical Power Requirements

The iCAP RQ instrument is designed to operate at a nominal voltage of 200-240 V, 50/60 Hz. For details, see Table 4-1.

Table 4-1. Basic power requirements

Specification	Value
Nominal Voltage	200-240 V AC, 50/60 Hz AC, single phase
Power	apparent power: 3000 VA; effective power: 2200 W
Wire	Single-phase, 2-pole, 3-wire grounding
Fuse	Thermo Fisher Scientific recommends fusing the wall receptacle with 15/16 A (Europe) and 20 A (North America, Japan).

Due to fluctuations, the temporary line voltage can vary between a minimum of 180 V AC and a maximum of 264 V AC.

NOTICE In areas with low line voltage (208 V in North America, 200 V in Japan) during high use periods, voltage sags may occur which exceed the save working voltage range of the instrument. In this case, you must protect your instrument by using a suitable power conditioner or uninterruptible power supply (UPS). ▲

The iCAP RQ instrument must have a separate “clean” line leading to a main fuse to guarantee disturbance-free operation.

Power Connections

The electrical wall outlet for the main power of the iCAP RQ instrument should be located at the wall near the intended location of the instrument, ideally at the left side of the instrument.

The instrument is shipped with a standard IEC 60320 socket and will be shipped with power cables suitable for your country. Depending on your area, different types of plugs and cables may be required.

NOTICE For more information on the correct cable kit, contact your certified Thermo Fisher Scientific service representative. ▲

Power cables and connectors for the options are standard equipment delivered by the manufacturers.

For connecting additional devices such as recirculating chillers, see "Auxiliary Wall Outlets" on page 4-4.

⚠ CAUTION

High Leakage Current. Additional Grounding Required. For safe operation of the instrument and the quality of your measurement, an additional grounding path between the instrument and the fore vacuum pump must be established. The green/yellow grounding cable delivered with the control cable for the fore vacuum pump must be connected to the grounding bolt on the instrument (see Figure 4-1) and the grounding screw on the fore vacuum pump (see Figure 4-2). If you need a longer grounding cable, contact Thermo Fisher Scientific. The mounting instructions delivered with the grounding cable must be strictly observed. Contact your certified Thermo Fisher Scientific service representative for more information.

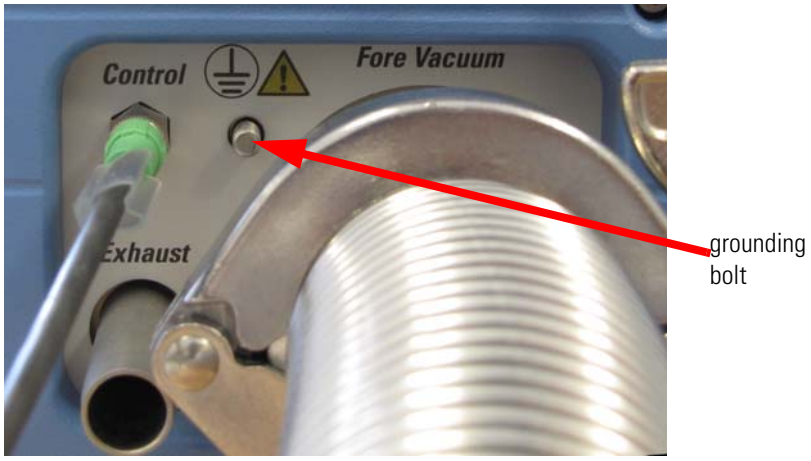


Figure 4-1. Grounding bolt on instrument

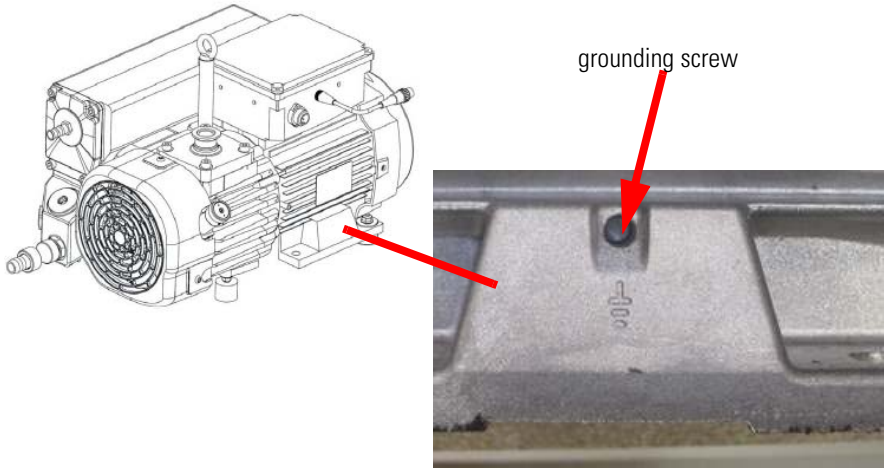


Figure 4-2. Grounding screw on fore vacuum pump

Auxiliary Wall Outlets

Additional single-phase outlets are needed for additional parts such as fore vacuum pump, computer and monitor. Thermo Fisher Scientific recommends at least five spare outlets in the near vicinity of the left side of the system and five close to the workbench space within the your laboratory.

The components of the data system (computer, monitor) require wall outlets at a nominal voltage of 200-240 V AC, 50/60 Hz, also see the manufacturer's manual for more information.

The fore vacuum pump requires a separately fused wall outlet due to the high current of the pump. This wall outlet must be fused with 15 A or 16 A, tripping characteristic 'C' or 'D'.

For information on the power outlet requirements, also see the manufacturer's manuals.

Fore Vacuum Pump

The fore vacuum pump requires a dedicated power outlet that complies with the specifications as indicated on the rating plate of the fore vacuum pump, see Table 4-2.

Table 4-2. Power requirements for fore vacuum pump

Voltage	Frequency	Power
200-240 V ±10%	50 Hz	1.6 kW
200-240 V ±10%	60 Hz	1.9 kW

Quality of Power

The iCAP RQ instrument complies with the requirements listed in Table 4-3. See Chapter 6: "General Pre-Installation Information" for details on the required quality of power.

Table 4-3. Immunity compliance of iCAP RQ ICP-MS

Description	Requirement
Immunity to Electrical Fast Transient/Burst	EN 61326-1, EN 61000-4-4
Immunity to Electrical Slow Transient/Surge	EN 61326-1, EN 61000-4-5
Immunity to Conducted RF Voltage	EN 61326-1, EN 61000-4-6
Immunity to Voltage Dips, Short Interruptions and Voltage Variation	EN 61326-1, EN 61000-4-11

Chapter 5 Consumables

Your instrument requires gases and solvents that must meet defined purity specifications. The Thermo Fisher Scientific field service engineer might also require certain solvents for the installation verification of your system.

NOTICE To prevent delays during installation, make sure to have a sufficient amount of gas available for at least 40 h operation. ▲

NOTICE It is your responsibility as the operator to provide correct gas and solvent supplies for the operation of your system. ▲

Contents

Cooling Water

For operation of the iCAP RQ instruments, cooling of some components, like the interface and the RF generator, is required.

The water used for the coolant set up should be free of suspended matter to avoid clogging of the cooling circuit. An in-line filter is supplied with the instrument to guarantee consistent water quality. See Table 5-1 for the cooling water specifications.

Table 5-1. Cooling water specifications

Cooling Water Specifications	Values
Supply Rate	> 5.5 L/min
Temperature	20 to 30 °C, optimum at 21 °C
Pressure	0.25 to 0.6 MPa (2.5 to 6 bar)
pH	6-8
Recommended conductivity	< 1000 µS/cm
Solid Residual	< 50 µm particle size

The water temperature should be in the range specified in Table 5-1. Lower temperatures could lead to a condensation of atmospheric water vapor.

NOTICE Make sure the specifications in Table 5-1 are met when connecting the instrument to an inhouse water supply. ▲

A water hose (black) with an OD of 12 mm (ID 8 mm) and a length of 10 m is delivered with the instrument. The cooling water connections to the iCAP RQ instrument are shown in Figure 5-1.

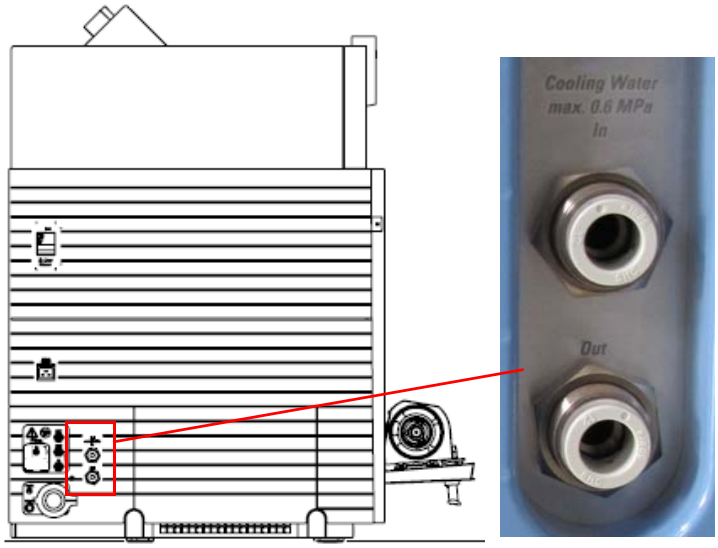


Figure 5-1. Cooling water connections at the left of iCAP RQ system

Technical Data of Recirculating Chiller

The iCAP RQ instrument is optionally delivered with the NESLAB ThermoFlex™ 2500 recirculating chiller with closed circuit, cooled by a refrigerating device. A schematic of the water-circulation including a filter is shown in Figure 5-2.

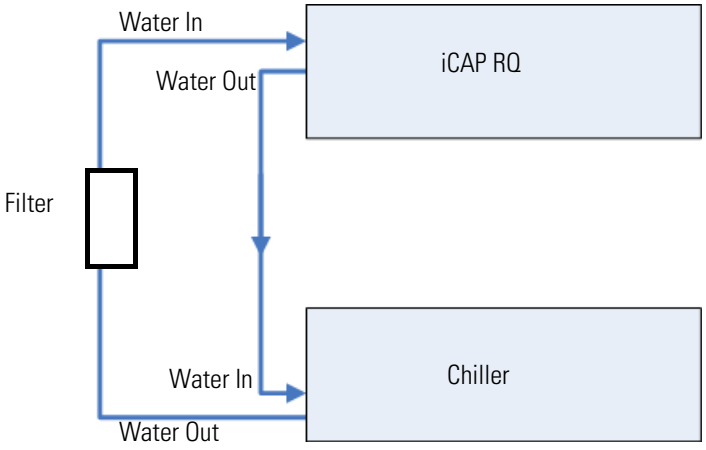


Figure 5-2. Cooling circuit with recirculating water chiller

Table 5-2 lists the technical specifications for the NESLAB ThermoFlex 2500 recirculation chiller, which is optionally shipped with the iCAP RQ instrument.

Table 5-2. Chiller specifications

Chiller Component	Specification
Cooling Capacity (at 20 °C ambient temperature)	2.2 kW (50 Hz); 2.5 kW (60 Hz)
Ambient Temperature	10 to 40 °C
Water Temperature	5 to 40 °C
Stability of Temperature Regulation	±0.1 °C
Reservoir Volume	7.2 L
Flow Rate	
Turbine Pump (60 Hz) Turbine Pump (50 Hz)	13.3 L/min at 0.41 MPa (4.1 bar) 9.5 L/min at 0.41 MPa (4.1 bar)
Unit Dimensions (H × W × L)	73.6 cm × 43.6 cm × 67.3 cm
Unit Weight	79.6 kg

NOTICE For information on the power supply of the chiller, see "Auxiliary Wall Outlets" on page 4-4. ▲

Gas Supply

The iCAP RQ instruments require argon gas to generate the inductively coupled plasma and for controlling internal functions with the aid of pneumatics. Additional gases might be required depending on the type of analysis planned.

The iCAP RQ instruments use approximately 16 L/min (max. 24 L/min) of argon. It is essential that the gases be delivered with the necessary pressure and purity.

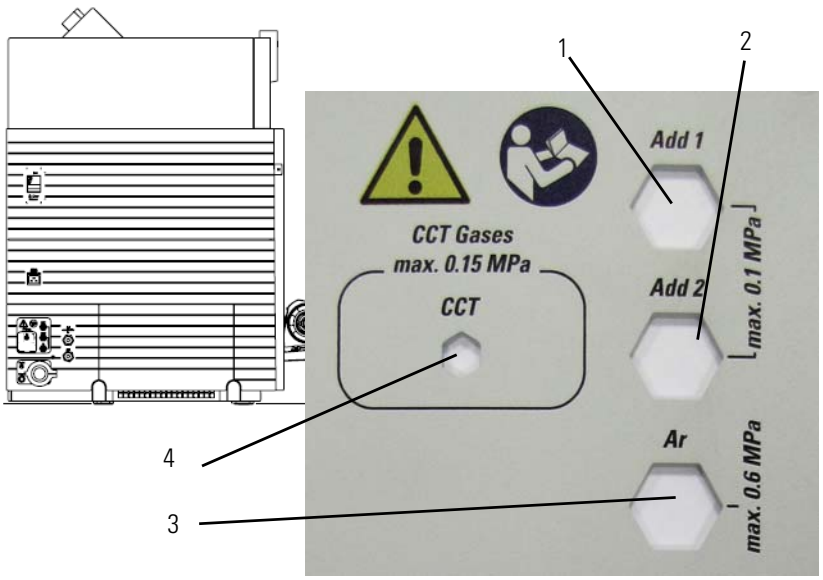
NOTICE All gas flow rates given relate to standard conditions. ▲

NOTICE When operating the iCAP RQ instrument with hazardous gas, an external warning sensor must be installed in the vicinity of the instrument. In case of the iCAP RQ ICP-MS 2-channel systems, a hydrogen sensor must be installed in the vicinity of the instrument. ▲

Gas Supply Connections

NOTICE Note the different torque plates for iCAP RQ 1-channel (Figure 5-3) and 2-channel systems (Figure 5-4). ▲

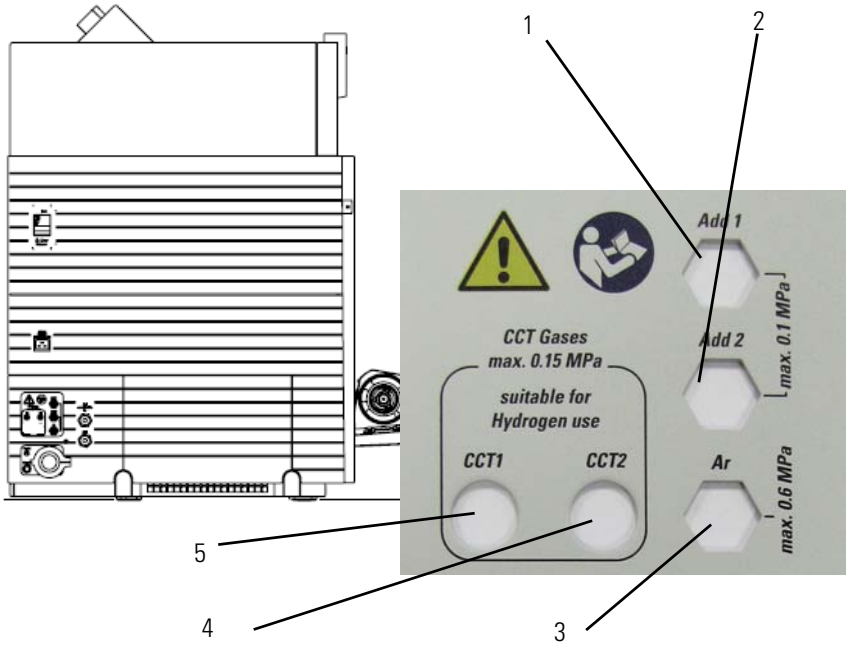
Figure 5-3 shows the torque plate with the gas connections for the iCAP RQ ICP-MS 1-channel systems.



Labeled Components: 1=additional gas 1 inlet, 2=additional gas 2 inlet, 3=argon gas inlet, 4=CCT inlet

Figure 5-3. Gas connection at the left of iCAP RQ 1-channel system

Figure 5-4 shows the torque plate with the gas connections for the iCAP RQ ICP-MS 2-channel systems.



Labeled Components: 1=additional gas 1 inlet, 2=additional gas 2 inlet, 3=argon gas inlet, 4=CCT2 inlet, 5=CCT1 inlet

Figure 5-4. Gas connection at the left of iCAP RQ 2-channel system

NOTICE Depending on the number of additional gas modules installed, the gas connection plate may look different. ▲

Table 5-3 lists the connector types for the gases.

Table 5-3. Gas connections at iCAP RQ ICP-MS

Label	Connection	Tubing/ Capillary
Argon	push-in fitting	6 mm OD
CCT 1	bulk head union	1/16" OD
CCT 2	bulk head union	1/16" OD
Add1	push-in fitting	6 mm OD
Add2	push-in fitting	6 mm OD

Plasma and Cooling Gas

The argon supply to the iCAP RQ instrument must be stabilized. The gas pressure regulator must be qualified for the purity specification of the plasma gas, see Table 5-4.

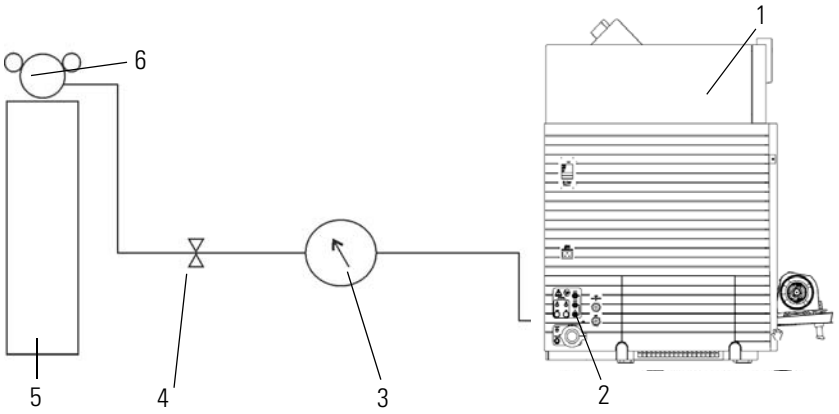
Table 5-4. Argon gas requirements

Gas Requirement	Specification
Purity	99.996% or better
Maximum Water Content	5 ppmv
Supply Rate	max. 24 L/min
Pressure	min. 0.55 MPa (5.5 bar) max. 0.6 MPa (6 bar) using a two-stage pressure regulator (200 bar to 10 bar, 230 bar to 10 bar or 300 bar to 10 bar)

Using a high quality two-stage regulator is recommended, see Table 5-10 on page 11 for suppliers of pressure regulators.

NOTICE The plasma gas regulator must have an outlet pressure of max. 1 MPa (10 bar), and it must fit the maximum primary pressure specification of the argon gas laboratory supply. Check whether your maximum primary pressure is 30 MPa (300 bar), 23 MPa (230 bar), or 20 MPa (200 bar), and choose accordingly. ▲

Connection of the laboratory argon supply to the iCAP RQ instrument is made via a push-in fitting. A recommended set-up for the argon supply is shown in Figure 5-5. 3 m polyurethane tubing will be supplied with the instrument.



Labeled Components: 1=iCAP RQ MS, 2=argon inlet, 3=pressure gauge, 4=shut-off valve, 5=gas source, 6=pressure regulator

Figure 5-5. Argon connection of iCAP RQ system

CCT Gas

The Collision Reaction Cell allows the selective removal of polyatomic interferences.

NOTICE The CCT gas outlet should be located at a maximum distance of 2 to 3 meters to the left of the instrument. Thermo Fisher Scientific supplies 2 x 3 meters of gas tubing with the instrument. ▲

The following services must be supplied by the customer:

- Gas
- Two-stage gas pressure regulator (for 1/16" capillary, 1/4" to 1/16" adapter will be supplied with the instrument)

Helium

A CCT installation test is performed with helium gas to pressurize the QCell™. See Table 5-5 for details of the helium gas requirements.

Table 5-5. CCT gas requirements for helium

Gas Requirement	Specification
Purity	99.999% or better
Maximum Water Content	2 ppmv

Table 5-5. CCT gas requirements for helium, continued

Gas Requirement	Specification
Supply Rate	max. 10 mL/min per channel
Pressure	min. 0.05 MPa (0.5 bar) max. 0.15 MPa (1.5 bar) using a two-stage pressure regulator (200 bar to 3 bar)

iCAP RQ ICP-MS 1-Channel Systems: Hydrogen mixtures with Helium (for QCell)

NOTICE The maximum content for hydrogen is 4.5%. ▲

See Table 5-6 for details of the hydrogen gas requirements.

Table 5-6. Gas requirements for hydrogen 1-channel system

Gas Requirement	Specification
Purity	99.999% or better
Maximum Water Content	2 ppmv
Supply Rate	max. 10 mL/min per channel
Pressure	min. 0.05 MPa (0.5 bar) max. 0.15 MPa (1.5 bar) using a two-stage pressure regulator (200 bar to 3 bar)

iCAP RQ ICP-MS 2-Channel Systems: Hydrogen or mixtures with Helium (for QCell)

NOTICE A hydrogen sensor must be installed in the vicinity of the instrument. ▲

See Table 5-7 for details of the hydrogen gas requirements.

Table 5-7. Gas requirements for hydrogen 2-channel system

Gas Requirement	Specification
Purity	99.999% or better
Maximum Water Content	2 ppmv

Table 5-7. Gas requirements for hydrogen 2-channel system, continued

Gas Requirement	Specification
Supply Rate	max. 10 mL/min per channel
Pressure	min. 0.05 MPa (0.5 bar) max. 0.15 MPa (1.5 bar) using a two-stage pressure regulator (200 bar to 3 bar)

Oxygen or Mixtures with Helium (for QCell)

See Table 5-8 for details of the oxygen gas requirements. All mixture ratios are permitted.

Table 5-8. Gas requirements for oxygen

Gas Requirement	Specification
Purity	99.999% or better
Maximum Water Content	2 ppmv
Supply Rate	max. 10 mL/min per channel
Pressure	min. 0.05 MPa (0.5 bar) max. 0.15 MPa (1.5 bar) using a two-stage pressure regulator (200 bar to 3 bar)

Ammonia Mixtures with Helium (for QCell)

NOTICE The maximum content is 1%. If an ammonia sensor is installed in the lab, the maximum content can be 35%. ▲

See Table 5-9 for details of the ammonia gas requirements.

Table 5-9. Gas requirements for ammonia mixtures

Gas Requirement	Specification
Purity	99.999% or better
Maximum Water Content	2 ppmv
Supply Rate	max. 10 mL/min per channel
Pressure	min. 0.05 MPa (0.5 bar) max. 0.15 MPa (1.5 bar) using a two-stage pressure regulator (200 bar to 3 bar)

Two-Stage Gas Pressure Regulators

The quality of the CCT gas regulator is critical to ensure optimum performance of the instrument. A high quality two-stage pressure regulator is absolutely essential, and it must be qualified for the purity specification of the CCT gas.

NOTICE A gas regulator with two installed pressure gauges is not necessarily a two-stage gas pressure regulator. Inform your local supplier that a two-stage gas pressure regulator is absolutely essential and is a requirement for stable performance of the iCAP RQ instrument. ▲

NOTICE The CCT gas regulator should have a specification of 0.3 MPa (3 bar) outlet pressure (max. 0.8 MPa [8 bar]), and it must fit the maximum primary pressure specification of the CCT gas laboratory supply. Check whether your maximum primary pressure is 30 MPa (300 bar), 23 MPa (230 bar), or 20 MPa (200 bar), and choose accordingly. ▲

Each country has a different standard outlet fitting for its gas supplies and therefore each country will require a different regulator. Examples for regulators are given by region in Table 5-10. If your region is not listed, contact your local Thermo Fisher Scientific service office for advice.

Table 5-10. Regulator suppliers

Country	Manufacturer	Reference Code	Gas Application
Europe	Linde	C 202/2	Plasma
		C 106/2	CCT
		C 200hv/2	CCT
	Spectrolab	LM62	Plasma
US	Matheson	3813-CGA580	CCT
	BOC	HP1700 (CGA580)	CCT

NOTICE Thermo Fisher Scientific does not endorse any manufacturer, nor does it endorse products other than its own. Companies and products listed in this guide are given as examples only. ▲

Additional Gas

Depending on the application, a variety of additional gases may be employed. The use of mass flow controllers is required when working with additional gases.

The gas supply to the additional mass flow controllers of the iCAP RQ instrument must be stabilized. The gas pressure regulator must be qualified for the purity specification of the respective gas, see Tables 5-11 to 5-12. Thermo Fisher Scientific recommends using a high quality two-stage gas pressure regulator.

NOTICE The additional gas regulators must have an outlet pressure of max. 0.1 MPa (1 bar), and they must fit the maximum primary pressure specification of the additional gas laboratory supplies. Check whether your maximum primary pressure is 30 MPa (300 bar), 23 MPa (230 bar), or 20 MPa (200 bar), and choose accordingly. ▲

Argon, Pure Helium or Mixtures with Argon

For some applications, the use of additional gas is beneficial. The gas requirements are detailed in Table 5-11.

Table 5-11. Additional gas requirements

Gas Requirement	Gas Requirement	Specification
Argon	Purity	99.996% or better
	Max. Water Content	5 ppmv
	Supply Rate	max. 1 L/min per channel
	Pressure Regulator Output	max. 1 bar using a two-stage pressure regulator (200 bar to 3 bar)
Helium	Purity	99.996% or better
	Max. Water Content	5 ppmv
	Supply Rate	max. 1 L/min per channel
	Pressure Regulator Output	max. 1 bar using a two-stage pressure regulator (200 bar to 3 bar)

Pure Oxygen or Mixtures with Helium and/or Argon

For the analysis of organic solvents, the use of oxygen may be required. The gas requirements are detailed in Table 5-12.

Table 5-12. Additional gas requirements for oxygen

Gas Requirement	Specification
Purity	99.996% or better
Maximum Water Content	5 ppmv
Supply Rate	max. 1 L/min per channel
Pressure Regulator Output	max. 1 bar using a two-stage pressure regulator (200 bar to 3 bar)

NOTICE A temperature of the spray chamber down to -10 °C will be required for the analysis of organic solvents. This is controlled via the Peltier cooler. ▲

Pure Nitrogen or Mixtures with Helium and/or Argon

For the analysis of organic solvents, the use of nitrogen may be required. The gas requirements are detailed in Table 5-13.

Table 5-13. Additional gas requirements for nitrogen

Gas Requirement	Specification
Purity	99.996% or better
Maximum Water Content	5 ppmv
Supply Rate	max. 1 L/min per channel
Pressure Regulator Output	max. 1 bar using a two-stage pressure regulator (200 bar to 3 bar)

Methane Mixtures with Argon

NOTICE The maximum content of methane is 4.5%. ▲

The gas requirements are detailed in Table 5-12.

Table 5-14. Additional gas requirements for methane

Gas Requirement	Specification
Purity	99.996% or better
Maximum Water Content	5 ppmv

Table 5-14. Additional gas requirements for methane, continued

Gas Requirement	Specification
Supply Rate	max. 1 L/min per channel
Pressure Regulator Output	max. 1 bar using a two-stage pressure regulator (200 bar to 3 bar)

Cleaning Agents

We recommend having the following cleaning agents available:

- A diluted solvent like isopropanol in water (in accordance with your local safety practices).

NOTICE Do not use ethanol for cleaning. ▲

- Distilled water.

Chapter 6 General Pre-Installation Information

This chapter provides general pre-installation information for your instrument.

Contents

Instrument Arrival

When your lab site preparation is completed, and the system is delivered, call your local Thermo Fisher Scientific office to arrange for an installation date.

Thermo Scientific instruments are transported either by carriers who specialize in the handling of delicate machinery, or for long distance shipment by airfreight. Occasionally, however, equipment inadvertently does get damaged in transit.

Take the following precautions when receiving material:

- Check carefully for obvious damage or evidence of rough handling.
- If external damage is apparent, take photographs, note this fact on all copies of the receiving documents and describe briefly the extent of the damage. Drivers should sign (or put their initials) next to your comments to signify agreement with your observations.
- Contact your Thermo Fisher Scientific office to report the damage and—please—let Thermo Fisher Scientific field service engineers check for further damage.

NOTICE If the instrument shipping container, ShockWatch™, or other indicator shows any evidence of damage or mishandling during shipment, do NOT open the container. Call your Thermo Fisher Scientific representative for instructions on what to do. If the system arrives safely, proceed with the following instructions. ▲

NOTICE Freight insurance requires that obvious damage be noted on the receiving documents. Thermo Fisher Scientific will not accept liability for damage if materials are received with obvious damage and the damage is not recorded on the receiving documents. ▲

When your system arrives, **move it to a protected location indoors**, preferably the installation site. Take the specifications described for the laboratory in this guide as a guideline for the temperature and humidity in the storage room. If you have questions about moving your system, contact your local Thermo Fisher Scientific office.

Transportation Risk

Transportation risk depends on the terms of delivery agreed. The terms of shipment determine who has responsibility for filing a claim against the carrier if the system is damaged in transit.

Installation

It is the policy of Thermo Fisher Scientific that the customer should not unpack the system or accessory items prior to installation of the system.

NOTICE Where buck/boost transformers or power conditioning units are supplied, it is the responsibility of the operator to have these units installed by an electrician prior to instrument installation. ▲

NOTICE A forklift or a pallet jack will be of great benefit for unpacking and in-house transportation of the instrument components. ▲

Installing the System

When your new instrument is on site and ready for installation, a Thermo Fisher Scientific field service engineer will install it.

During the installation, the Thermo Fisher Scientific field service engineer will demonstrate the following:

- The basics of equipment operation and routine maintenance.
- The performance specifications that are in force at the time of the purchase of the system.

NOTICE Consumables sent with the system are intended for use by the Thermo Fisher Scientific field service engineer during the installation. ▲

Key Operator

Experience has shown that the maximum benefit can be derived from a scientific instrument if there is one person, a key operator, who has major responsibility for that instrument. Thermo Fisher Scientific recommends that you designate a key operator to oversee the operation and maintenance of the system in your laboratory. The key operator should be available to the installing engineer throughout the installation. This person will also be the key figure in the communication between your laboratory and Thermo Fisher Scientific.

NOTICE Do not plan to use your new system for sample analysis until the installation is complete and the Acceptance Form has been signed. ▲

Advanced Training Courses

Thermo Fisher Scientific provides both introductory and advanced training courses in analytical techniques, together with specialized operation and maintenance courses for Thermo Scientific products.

Thermo Fisher Scientific recommends that some months after your instrument has been installed, the key operator receive an advanced training for the operation and maintenance of the system from Thermo Fisher Scientific. After this training, the key operator can conduct an in-house training program on your site for your own people and certify others to operate the instrument.

For information concerning course schedules and fees, please contact the following address or your local Thermo Fisher Scientific office:

Thermo Fisher Scientific
Hanna-Kunath-Str. 11
28199 Bremen

Germany

Phone: +49 (0) 421 - 54 93 0
Fax: +49 (0) 421 - 54 93 426
E-mail: training.bremen@thermo.com

Preventive Maintenance

Routine and preventive maintenance of the instrument is in the responsibility of the operator. Included in this category are the replacement of worn parts, the exchange of operating resources, and similar activities.

Regular preventive maintenance is essential, and will increase the life of the system, result in maximum uptime of the system, and ensure optimum system performance. Maintenance techniques are covered in the Operating Manual for your Thermo Scientific instrument. Refer also to the manufacturers' manuals shipped with the instrument—especially for the maintenance of mechanical pumps and turbomolecular pumps.

Operating Environment

These general specifications for the operating environment help ensuring continued high performance of the system.

Lighting

Good lighting makes any work area more enjoyable. Because a lot of work is done on the computer terminal, it may be convenient to have a dimmer switch on the lights to reduce eyestrain. A small, high-intensity lamp is recommended for cleaning instrument components, source inspection, and manipulation of small components. Contact your local safety officer for advice and regulations on adequate working place conditions.

Particulate Matter

Particulate matter might contaminate the samples and the ion source and may limit the background level of the instrument.

The air in your laboratory must not contain excessive dust, smoke, or other particulate matter. For reference, the air should contain fewer than 35×10^6 particles per cubic meter (1×10^6 particles per cubic foot) in excess of 5 µm.

Dust can clog the air filters, causing a reduction in air flow around electronic components. Dust will also form a layer on electronic components that will act as an insulating blanket and thus reduce the heat transfer from the components to the surrounding air.

Quality of Power

The quality of power supplied to your system is very important for its performance.

Below are definitions for the most common voltage disturbances:

- *Harmonic distortion* is a high-frequency disturbance that might affect operation of your system. This disturbance appears as distortion of the fundamental sine wave.
- *Slow average* is a gradual, long-term change in average root mean square (RMS) voltage level, with typical durations greater than 2 s.
- *Sags and surges* are sudden changes in average RMS voltage level, with typical durations between 50 µs and 2 s.
- *Transients* (or impulses) are brief voltage excursions of up to several thousand volts with durations of less than 50 µs.

The instrument is tested in accordance to EN 61326. However, excessive distortion, slow average, transients or sags and surges on the power line can effect the quality of the measurement. Non-standard power fluctuations and excessive noise on the power lines will degrade electronic components over time, reducing their life span. Thermo Fisher Scientific recommends using power monitoring and conditioning devices to ensure stable performance of the instrument.

Contact your local Thermo Fisher Scientific office and see "Technical Assistance" on page 6-8 for electrical equipment suppliers.

Power Monitoring Devices

Power monitoring devices help decide whether it is necessary to install a power conditioning device.

Power line disturbance analyzers are capable of detecting and recording most types of power supply problems. These instruments provide a continuous record of line performance by analyzing and printing out information on three types of voltage disturbances:

- Slow average
- Sag and surge
- Transient

In the first two cases, the duration as well as the amplitude of the disturbance is indicated by time interval recording.

The power line must be monitored continuously for seven consecutive days, 24 hours a day. If inspection of the printout indicates disturbances, the test should be terminated and corrective action taken. Then, the power should be monitored again as described above.

A variety of devices is available to monitor power supply quality. The Leibert Corporation Model 3600 and the Dranetz™ 606 Series power line disturbance analyzers are two devices capable of detecting and recording most types of power supply problems.

NOTICE Thermo Fisher Scientific does not endorse any manufacturer, nor does it endorse products other than its own. Companies and products listed in this guide are given as examples only. ▲

Line monitors can be rented from electrical equipment suppliers. If necessary, your local Thermo Fisher Scientific office can assist in interpretation of the results and recommend appropriate corrective measures.

Power Conditioning Devices

Various line voltage conditioning devices are available that can correct your line voltage problem. If you have good regulation but the power line disturbance analyzer shows transient voltages, then an isolation/noise suppression transformer should be adequate to resolve the problem. If there are both transient and regulation problems, then you should consider power conditioners, which can control both of these problems.

Your electrician should install the buck/boost transformer before the installation of your system is started.

NOTICE For compliance and safety, ensure that your power conditioning devices are certified by recognized domestic and international organizations (for example, UL, CSA, TÜV, and VDE). ▲

Uninterruptible Power Supply

If your local area is susceptible to corrupted power or power disruptions, then an uninterruptible power supply (UPS) should be installed in your laboratory.

NOTICE For compliance and safety, ensure that your uninterruptible power supply (UPS) devices are certified by recognized domestic and international organizations (for example, UL, CSA, TÜV, and VDE). ▲

Technical Assistance

Occasionally, Thermo Fisher Scientific encounters line-voltage sources of unacceptable quality that adversely affect the operation of the instrument. Rectifying such power-supply problems is the responsibility of the operator. However, (upon request) Thermo Fisher Scientific will attempt to assist in diagnosis, but does not undertake to isolate and correct power-supply quality problems.

Contact your Thermo Fisher Scientific office for assistance in monitoring the line voltage in your laboratory, in selecting a line conditioner, or in locating a power consultant in your area.

Specifying power conditioning equipment is a complex task that is best handled by a company or consultant specializing in that field.

A selection of such companies is listed in Table 6-15:

Table 6-15. Companies specifying power conditioning equipment

Company	Address or comment	Internet
General Electric Company	Worldwide distribution network	www.ge.com
JOVYATLAS Elektrische Umformtechnik GmbH	Groninger Straße 29-37 26789 Leer, Germany Phone: +49 (491) 6002 0 Fax: +49 (491) 6002 48	www.jovyatlas.info
OnLine Power, Inc.	Conform to all applicable standards, worldwide	www.onlinepower.com
POWERVAR, Inc.		www.powervar.com
Sola/ HD		www.sola-hevi-duty.com

NOTICE Thermo Fisher Scientific does not endorse any manufacturer, nor does it endorse products other than its own. Companies and products listed in this guide are given as examples only. ▲

Electrostatic Discharge

Static charges and electrostatic discharge (ESD) are common natural phenomena that occur in many ways. Although ESD may not always be perceptible to a human being, it can damage the electronic components of your instrument. Thermo Scientific instruments are designed to withstand electrostatic discharges (ESD) up to 4 kV (air discharge) and 4 kV (contact discharge) with all panels in place. However, if the panels are removed and the PCBs are handled without proper precautions, the electronic components might be damaged or fail prematurely. Static electricity can develop in a variety of ways. A few examples of how electrostatic charge can develop are as follows:

- When walking across a carpet in a room that is at 20% relative humidity, as much as 35000 V of electrostatic potential can be generated on the surface of your body. This same motion in a room at 80% relative humidity generates about 1500 V of electrostatic potential.
- Sitting and working in a chair padded with polyurethane foam in a room at 20% relative humidity can cause as much as 18000 V of electrostatic potential to develop on your skin or 1500 V at 80% relative humidity.
- Working in laboratory coats and clothing made of synthetic fibers can cause the accumulation of static electricity on your skin.
- Polystyrene cups and packing materials typically have a considerable electrostatic charge on them.

Many electronic components can be damaged by a discharge of electrostatic potential of as little as 50 V. ESD damage can be catastrophic causing your system to cease functioning. More commonly, however, ESD damage might cause latent problems that are detrimental to sensitive electrical components, causing premature failures. Therefore, Thermo Fisher Scientific recommends the following precautions, especially when you are operating your system at the lower end of the relative humidity specification listed above:

- Use a static-dissipating floor covering (such as tile or conductive linoleum) in the room that houses your instrument.
- Use laboratory chairs covered with natural fiber or other static dissipating material.
- When operating the instrument, wear laboratory coats and clothing made of natural fiber or other static-dissipating material.
- Do not place polystyrene cups or packing materials on the instrument.

Index

U

V

W

iCAP RQ ICP-MS Installation Request Form

Please refer to the iCAP RQ ICP-MS Pre-Installation Requirements Guide (P/N BRE0009927) for the complete site requirements. Circle "Yes" or "No" as to whether the site meets the requirements as specified in the Preinstallation Guide. Provide the additional information where requested.

Please note instrument type: ☐ iCAP RQ - 1-channel instrument
☐ iCAP RQ - 2-channel instrument

1. **Yes** **No** All laboratory remodeling has been completed and the space available is sufficient to meet the minimum requirements for the configuration ordered? The floor is certified to meet the load requirements of the system?
2. **Yes** **No** Your instrument has been delivered and is either in the laboratory or can be delivered immediately on the arrival of the installation engineer?
3. **Yes** **No** The key operator will be available during the installation period. The person with the authority to accept the instrument at the end of the installation will also be available to sign the required acceptance document?
   Please provide the names of these individuals:_____
4. **Yes** **No** The entrance to the laboratory and the route from the loading dock are at least 90 cm (36 in.) wide with additional space at corners?
5. **Yes** **No** Sufficient bench space is available for all of the equipment? List the following:
   Width: _____, Depth: _____, Height: _____
6. **Yes** **No** Workbench can support the load of the system including optional equipment and is free from vibration?
7. **Yes** **No** Main power is installed and in compliance with local electrical codes?
   Note the type of cables required for your area:_____
8. **Yes** **No** The power outlets are of the correct configuration?
9. **Yes** **No** The electrical power for instrument and fore vacuum pump and has been measured?
   Please note voltage (instrument): _____ Volts AC line to ground.
   Please note voltage (fore vacuum pump): _____ Volts AC input to neutral.
10. **Yes** **No** Additional power outlets are available for the fore vacuum pump and other peripherals?
11. **Yes** **No** Air conditioning is adequate for temperature, humidity, and particulate matter control? The laboratory can be maintained at a constant temperature, between 15 and 35 °C (59 and 95 °F)?
12. **Yes** **No** The relative humidity is between 20% and 80%, non-condensation and non-corrosive atmosphere?
13. All gases required are on site, gas lines are installed, and appropriate gas regulators are available?
    List gases and purity: _____
14. **Yes** **No** A hydrogen gas sensor is installed? (iCAP RQ 2-channel instruments)
15. **Yes** **No** Is there is a suitable exhaust system present that is separate from solvent waste? You must provide one exhaust system for the instrument heat exhaust and the plasma exhaust system.
16. **Yes** **No** Provision has been made for collecting solvent waste? A suitable waste container is provided?
17. **Yes** **No** There is a functional telephone close to the system? Phone number _____
18. **Yes** **No** All required chemicals and equipment for installing the system are on site?
19. **Yes** **No** Have any special acceptance specifications been agreed within the contract?
    If **YES**, please attach full details of specification.
20. **Yes** **No** Is there any additional equipment that needs to be interfaced for the system?
    If **YES**, please supply details.

I, the undersigned, confirm that the site requirements as stated above have been accomplished and the laboratory is prepared for the installation of the instrument. I understand that I may be liable for a Field Service Representatives' travel or lodging expenses if they are unable to carry out the installation on the pre-scheduled date due to insufficient lab preparation. If circumstances warrants, Thermo Fisher Scientific will make every effort to reschedule an installation as soon as possible with the next available representative.

Signed: _____ Print Name:_____
Company name: _____ Email: _____
Date: _____ Phone: _____

Fax to: Attn: Local Service Engineer
Note After we receive this checklist, your local Field Service Representative will contact you to schedule installation. ▲

ThermoFisher
SCIENTIFIC