Orbitrap Exploris GC Series

Orbitrap Exploris GC 240, Orbitrap Exploris GC, and Orbitrap Exploris GC S Mass Spectrometers

Pre-Installation Requirements Guide

1R120631-0001 Revision D • January 2026

ThermoFisher SCIENTIFIC

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Published by:
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Release History: Revision A released in March 2021; Revision B released in June 2021; Revision C released in March 2022; Revision D released January 2026.

General Lab Equipment, Not for Clinical, Patient or Diagnostic Use.

Orbitrap Exploris GC Series Installation Request Form

Please refer to the *Orbitrap Exploris GC Series Pre-Installation Requirements Guide* (P/N 1R120631-0001) for complete site requirements. Circle "Yes" or "No" as to whether the site meets the requirements as specified in the Pre-Installation Guide. Provide any additional information where requested. For laboratories outside the U.S., go to www.thermofisher.com, click **Contact Us**, select the **Instrument Service** option, type the product name, and request to be contacted by email to schedule your instrument installation. You can then send this completed and signed form to the office handling the installation. For laboratories in the U.S., send this completed and signed form to ULSConciergeNA@thermofisher.com.

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

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 80 cm (31½ 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: _____
   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** Lighting is adequate?
8. **Yes** **No** Floor vibrations and electromagnetic interferences are below the specified levels?
9. **Yes** **No** Main power is installed and in compliance with local electrical codes?
10. **Yes** **No** Additional power outlets are available for one forepump and three peripherals?
11. **Yes** **No** The power outlets are of the correct configuration?
    Please note the type of country cable kit required: _____
12. **Yes** **No** The electrical power for the MS has been measured?
    Please note voltage: _____ Volts AC input to ground.
    Please note voltage: _____ Volts AC neutral to ground.
    Please note voltage: _____ Volts AC input to neutral.
13. **Yes** **No** Power is free of voltage surges, sags, or transients?
14. **Yes** **No** Air conditioning is adequate for temperature, humidity, and particulate matter control? The laboratory can be maintained at a constant temperature, between 18 and 27 °C (64 and 81 °F)? Temperature fluctuation should be less than 0.5 °C per 10 minutes.
15. **Yes** **No** The relative humidity is between 20% and 80%, with no condensation?
16. **Yes** **No** The system work area is free from magnetic disruption and electrostatic discharge?
17. **Yes** **No** All gases required are on site, gas lines are installed, and appropriate gas regulators are available?
    List gases and purity: _____
18. **Yes** **No** Is there is a suitable exhaust system present for the forepump?
19. **Yes** **No** There is a functional telephone or close to the system, or is cell phone use allowed near the system? Phone number _____
20. **Yes** **No** All relevant local safety regulations have been met and the equipment installed will not affect compliance?
21. **Yes** **No** All required chemicals and equipment for installing the system are on site?
22. **Yes** **No** Have any special acceptance specifications been agreed within the contract?
    If **YES**, please attach full details of specification.
23. **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 Thermo Scientific Orbitrap Exploris GC 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 warrant, 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: _____

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Technical Data for Orbitrap Exploris GC Systems

The table summarizes the most important technical data of the Orbitrap Exploris GC systems. See the respective chapters of the manual for details and additional instrument properties.

Technical Data for Orbitrap Exploris GC Systems (Sheet 1 of 2)

Parameter	Specification		Value
Instrument Properties			
Mass spectrometer	Depth × width × height		1063 × 534 × 703 mm
	Weight		120 kg
Foreline pump	Length × width × height		460 × 200 × 250 mm
	Weight		24 kg
Complete system (incl. data system)	Noise emission		Below 70 dB(A)
	Heat generation		3440 W
Power Requirements			
Mass spectrometer	Input	Nominal voltage	208–240 V AC, 50/60 Hz, 10 A
		Power	apparent power: 800 VA; effective power: 750 W
		Fuse[a]	10 A
	Output	4×	208–240 V AC, 50/60 Hz, 3 A total
	Protection type		IP 20
Foreline pump	Input (110 V)	Nominal voltage	110 V AC, 50 Hz, 6.8 A_{MAX}; 115–120 V AC, 60 Hz, 6.9 A_{MAX}
		Power	450 W
	Input (220 V)	Nominal voltage	220–240 V AC, 50 Hz, 3.4 A_{MAX}; 230–240 V AC, 60 Hz, 3.4 A_{MAX}
		Power	550 W
Data system	Input	Nominal voltage	115–240 V AC, 50/60 Hz
		Fuse[a]	15/16 A
Gas Requirements			
HCD gas (mandatory)	Type		Nitrogen
	Purity		99.999% or better (ultra high purity)
	Supply rate		max. 40 mL/min plus 30 mL/min split to fore vacuum (in On or Standby)
	Pressure		0.6 ± 0.05 MPa (87 ± 7 psi)
Vent gas (mandatory)	Type		Nitrogen
	Purity		99% or better
	Supply rate		175–300 mL/min (during venting); No gas flow (in Off)
	Pressure		0.6 ± 0.05 MPa (87 ± 7 psi)

Technical Data for Orbitrap Exploris GC Systems (Sheet 2 of 2)

Parameter	Specification	Value
Carrier Gas (mandatory)	Type	Helium[b]
	Purity	99.999% Ultra-high purity
	Supply rate	50 mL/min
	Pressure	0.4–0.7 MPa (58–102 psi)
CI Gas[c] (Not available on the Orbitrap Exploris GC S)	Type	Methane[d]
	Purity	99.995% High purity
	Supply rate	1–3 mL/min
	Pressure	0.035–0.24 MPa (5–35 psi)
Operating Environment		
	Laboratory temperature	18–27 °C
	Max. temperature fluctuation	0.5 °C/10 min
	Humidity	20–80%, non-condensing and non-corrosive atmosphere
	Pollution degree	2 (normally non-conducting)
	Max. altitude	3000 m above sea level
Pump exhaust requirements	Inrush flow rate	4.5 m^3/h maximum
	Continuous flow rate	40 mL/min

[a] Dedicated wall outlet

[b] Hydrogen carrier gas is not supported on the system.

[c] Required for installation of systems with chemical ionization and for negative ion calibrations.

[d] While other CI gases can be used with the Orbitrap Exploris GC, only methane is required for CI installation.

1

Using this Manual

Welcome to the Thermo Scientific™ Orbitrap Exploris GC Series system! Orbitrap Exploris GC Series systems are members of the Thermo Scientific family of mass spectrometers (MS) that are powered by Orbitrap™ technology.

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- About this Manual on page 1-2
- Typographical Conventions on page 1-3
- Reference Documentation on page 1-5
- Contacting Us on page 1-6

About this Manual

This *Orbitrap Exploris GC Series 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 Orbitrap Exploris GC instrument. This guide should be retained for future guidance if your instrument needs to be relocated in future.

The purchaser 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 *Orbitrap Exploris GC Series 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 preinstallation support directly through your local Thermo Fisher Scientific representative.

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.

Typographical Conventions

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

Signal Words

Make sure that you follow the precautionary statements presented in this manual. The 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.

Tip Highlights helpful information that can make a task easier.

Safety Symbols

Notices that concern the safety of the personnel who operate the instrument appear different from the main flow of text:

⚠ Always be aware of what to do with and the effect of safety information.

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

⚠**WARNING** Points out a hazardous situation that can lead to severe injury or death if it is not avoided.

⚠**DANGER** Points out a hazardous situation that will lead to severe injury or death if it is not avoided.

Viewpoint Orientation

The expressions *left* and *right* used in this manual always refer to the viewpoint of a person that is 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 Name

Second Level Topics

Third Level Topics

Fourth Level Topics

Reference Documentation

Reference documentation for the Orbitrap Exploris GC mass spectrometer includes the following:

- *Orbitrap Exploris GC Series Operating Manual*

  This manual contains precautionary statements that can prevent personal injury and instrument damage. It also describes the modes of operation and principle hardware components of the instrument. In addition, this manual provides instructions for cleaning and maintaining the instrument.

You can access PDF files of the documents listed above and of this manual from the data system computer. The software also provides Help.

❖ **To view product manuals**

From the Microsoft™ Windows™ task bar, choose **Start > All Programs > Thermo Instruments > model x.x**, and then open the applicable PDF file.

Refer also to the user documentation provided by the manufacturers of third-party components:

- Forepump
- Turbomolecular pump
- Data system computer and monitor
- Safety data sheets

Contacting Us

There are several ways to contact Thermo Fisher Scientific. You can use your smartphone to scan a QR Code, which opens your email application or browser.

Contact	Link / Remarks	QR Code
Brochures and Ordering Information	www.thermofisher.com/orbitrap	
Service Contact	www.unitylabservices.com	
Technical Documentation SharePoint	❖ **To get user manuals for your product** 1. With the serial number (S/N) of your instrument, request access on our customer SharePoint as a customer at www.thermoscientific.com/Technicaldocumentation 2. For the first login, you have to create an account. Follow the instructions given on screen. Accept the invitation within six days and log in with your created Microsoft™ password. 3. Download current revisions of user manuals and other customer-oriented documents for your product. Translations into other languages may be available there as well.	
Customer Feedback	❖ **To suggest changes to this manual** You are encouraged to report errors or omissions in the text or index. Send an email message to the Technical Editor at documentation.bremen@thermofisher.com.	

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.

Tip You are responsible for providing an acceptable installation site for the Orbitrap Exploris GC Series system before the Thermo Fisher Scientific service engineer arrives.

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- Entrance Requirements on page 2-2
- Space and Load Requirements on page 2-3

Entrance Requirements

This section lists data for packed units of a typical Orbitrap Exploris GC Series system. The instrument (basic unit) is shipped in the largest container. Other modules such as the data system, gas chromatograph, and accessories are shipped in their own containers. Their dimensions and weight are less than that of the container for the basic unit.

If the entrance to your laboratory is not wide enough for the container, you can remove the instrument from the container before you move it into the room. The listed shipping containers may be replaced by other packings because of the legal requirements in the receiving countries, the mode of transportation, or the climatic conditions in some tropic regions. As a result, the dimensions and weights will differ from those shown in Table 2-1.

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

Tip Do not remove the instrument from its shipping container unless you are authorized by Thermo Fisher Scientific personnel. Make sure that all the contents of the container remain with the instrument.

The *unpacked* instrument fits through a door with a minimum width of 55 cm (21 5/8 in.). Consider that four persons are required to carry the instrument who require considerable space for maneuvering. See "Moving the Instrument" on page 2-8. Therefore, Thermo Fisher Scientific recommends that you use a pallet jack when you pass the unpacked instrument through a narrow door.

Your Orbitrap Exploris GC instrument is shipped in a container, the smallest dimension of which is 79 cm (31 1/8 in.). To allow moving a packed instrument, the entrance to your facility and the width of all hallways, elevators, etc., should have a minimum width of 80 cm (31½ in.). Dimensions and weights of the shipping containers for Orbitrap Exploris GC systems are given in Table 2-1.

Table 2-1. Data of packed units of a typical Orbitrap Exploris GC system

Module	Size (*l* × *w* × *h*)	Weight
Basic unit	119 × 79 × 89 cm (46 7/8 × 31 1/8 × 35 1/16 in.)	174 kg (384 lb)
Auxiliary box	111 × 69 × 90 cm (43 11/16 × 27 3/16 × 35 7/16 in.)	163 kg (360 lb)
Box on pallet	120 × 80 × 122 cm (47¼ × 31½ × 48 in.)	91 kg (201 lb)

Some chemicals that are needed for installation will be shipped in a separate package.

Space and Load Requirements

The floor of your laboratory should be able to carry the weight of the installed Orbitrap Exploris GC instrument with the forepump and the data system. Also, consider the weight of any other option that is added to the system and the weights of the workbenches.

Workspace Height Requirements

The height requirement for the Orbitrap Exploris GC Series MS system depends on the type of autosampler installed on the system. Table 2-3 lists the workspace height requirements for systems with each autosampler.

Table 2-2. Minimum workspace height dimensions

Equipment	Maximum System Height
GC/MS system with AI/AS 1610 autosampler	99 cm (39 in.)
GC/MS system with TriPlus RSH autosampler	145 cm (57 in.)
GC/MS system with TriPlus 500 HS autosampler	70 cm (28 in.)

Workbench Requirements

The Orbitrap Exploris GC MS is designed to be placed on top of a workbench with its rear panel near a wall. To set up a typical GC/MS system, Thermo Fisher Scientific recommends that you have a minimum of two workbenches. Table 2-3 lists the recommended minimum surface dimensions for each workbench. Thermo Fisher Scientific recommends that workbenches have a load capacity of at least twice the combined weight of all expected devices.

Table 2-3. Minimum workbench surface dimensions

Equipment	Surface (*l* × *d* × *h*)
Data system	120 × 100 cm (47¼ × 39⅜ in.)
GC/MS system	110 × 100 × 76 cm (43⅓ × 39⅜ × 30 in.)
TriPlus RSH autosampler	90 × 85 × 74 cm (35½ × 33 × 29 in.)
AI/AS 1610 autosampler	28 × 40 × 48 cm (11 × 16 × 19 in.)

NOTICE If you have a TriPlus RSH autosampler with the extended X-axis rail option, the workbench must be at least 100 × 192 cm (36 × 76 in.) long for the GC/MS system to accommodate the extra support leg.

Follow these clearance guidelines for the workbenches:

- Place the data system workbench and the GC/MS workbench adjacent to each other to prevent strain on the interconnecting Ethernet communications cables.
- Make sure that you have the following minimum clearances:
  - 900 mm (35½ in.) between the top of the system and any shelves above it.
  - 105 mm (4 in.) between the back of the MS and the wall.
  - 400 mm (16 in.) between the left side and the right side of the instrument and any other components.
  - Spacers at the rear side of the instrument provide sufficient space for airflow.
- The work table must be at least 65.3 cm (25.7 in.) table deep, and the front edge of the table must be at least 75.8 cm (29.8 in.) from any wall. A 30 in. (76.2 cm) bench top supplies sufficient space for the instrument. A 75 cm (29.5 in.) Bench top will work if the wall is not directly touching the bench.

⚠ To allow shutting off the mass spectrometer in an emergency, free access to the power column at the far right side of the instrument must be possible at any time.

NOTICE Do not block the ventilation slots of the instrument. Items may fall behind the instrument, inhibit airflow, and cause the system to overheat.

Workbench for the Data System

Use one workbench to hold the data system computer and the monitor. The recommended surface dimensions provide sufficient place for an optional printer.[1] Make sure that the workbench can support the weight of the data system and the printer, if applicable.

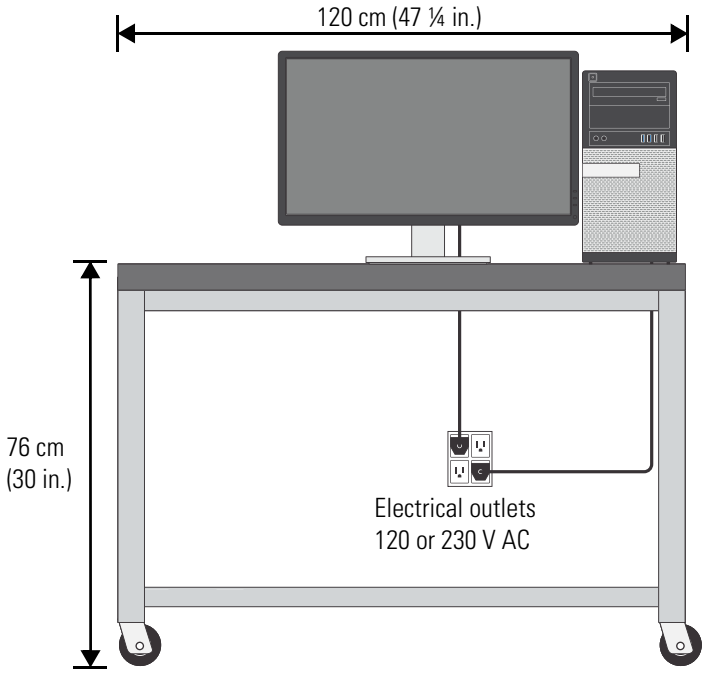

Figure 2-1. Typical data system workbench

See Table 2-4 and Figure 2-1 for the space requirements and weights of the typical data system hardware components.

Table 2-4. Space and weights of typical data system components

Module	Size (*l* × *w* × *h*)	Weight
Monitor (with stand)	19 × 61 × 53.5 cm ($7\frac{1}{2}$ × 24 × $21\frac{1}{16}$ in.)	6.77 kg (15 lb)
Minitower computer	43 × 18 × 48 cm ($16\frac{15}{16}$ × $7\frac{1}{16}$ × $18\frac{7}{8}$ in.)	14 kg (30 lb)

[1] A printer is not a standard part of the data system. The actual values depend upon your equipment.

Workbench for the GC/MS System

Use the other workbench to hold the mass spectrometer, the GC, and any other GC/MS options. Make sure that this workbench can support the weight of the mass spectrometer and the gas chromatograph (about 155 kg) plus the weight of any options (an autosampler, for example).

Table 2-5 shows the dimensions of a workbench for the GC/MS system.

The workbench for the GC/MS system must stand in a secure and level position. Note that only workbenches with at least four legs provide sufficient stability for the instrument. The workbench top must be dry and clean (free of grease). Thermo Fisher Scientific recommends that you use a workbench with a skid proof top.

Table 2-5. Space and load requirements of Orbitrap Exploris GC systems

Place	Module	Height		Width		Depth		Weight	
		cm	in.	cm	in.	cm	in.	kg	lb
Workbench	Mass spectrometer	70	28	53	21	104	41	120	265
	TRACE 1600 GC plus riser[a]	70	28	44	17	60	24	35	77
	TRACE 1610 GC plus riser[a]	70	28	44	17	67	26	35	77
	AI 1610 Auto Injector[b]	40	16	23	9	28	11	6	13
	AS 1610 Autosampler[b]	40	16	47	19	29	11	7	15
	TriPlus RSH standard X axis Autosampler	74[c]	29[c]	85	33	80	32	25[d]	55[d]
	TriPlus RSH extended X axis Autosampler	74[c]	29[c]	121	47	80	32	27[d]	60[d]
	TriPlus 500 Headspace Autosampler plus riser[a]	45	18	31	12	60	24	25	54
	TriPlus 100 Liquid Sampler	50	20	85	34	54	21	15	34
	Direct Probe Controller	58	23	33	13	12	5	6	13
Floor	Foreline Pump	46	18	20	8	25	10	24	52

[a] Add 0.8 kg (1.8 lbs) for each injector/detector module.

[b] Mounts on top of the GC.

[c] About 20 cm (8 in.) of the orthogonal crossrail (Y-axis) protrudes from the rear of the GC.

[d] Weight without accessories.

Instrument Dimensions

The Orbitrap Exploris GC MS systems (including the TRACE 1610 GC) have these dimensions: *height* 703 mm (28 in.)[1], *width* 954 mm (38 in.), *depth* 1036 mm (41 in.). There must also be 105 mm (4 in.) between the system and the wall. Figure 2-2 shows a schematic view of the instrument with important instrument dimensions.

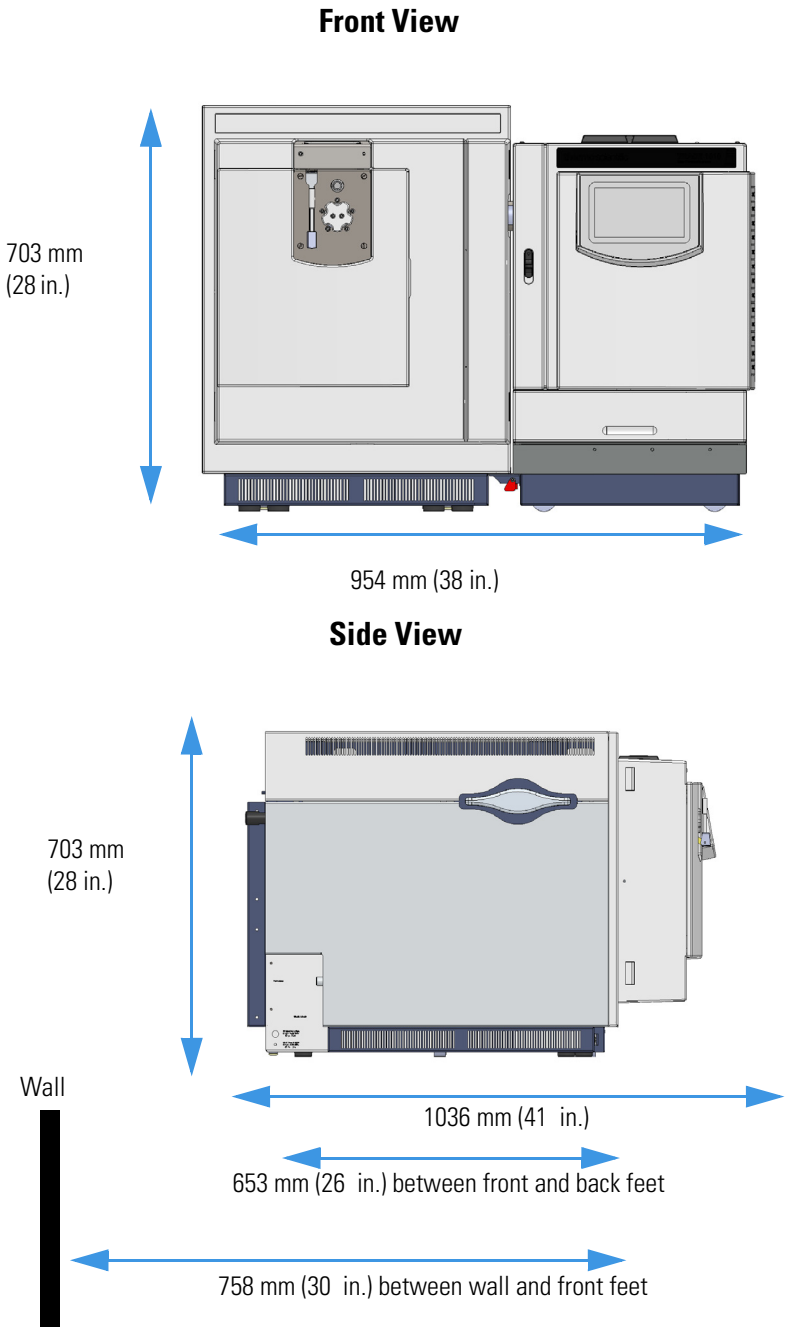

Figure 2-2. Dimensions of Orbitrap Exploris GC MS Systems

[1] The maximum system height depends on the autosampler installed on the system. See "Workspace Height Requirements" on page 2-3 for more information.

Moving the Instrument

For shipment, the instrument is fixed with two brackets on a pallet.

⚠ Because of a weight of about 120 kg, Orbitrap Exploris GC instruments are too heavy for one person alone to handle safely. Lifting and moving an instrument requires the effort of at least *four persons*. Refer to the *Orbitrap Exploris GC Series Operating Manual* for instructions.

The four persons that carry the instrument require considerable space for maneuvering. Therefore, Thermo Fisher Scientific recommends that you use a pallet jack to move the instrument and to lift it to the height of the workbench.

Only two persons are necessary for moving the instrument into its final position on a bench. The rear row of the support points below the instrument consists of synthetic material that has a low frictional resistance and should easily slide above the surface of your work bench. The front row of the support points below the instrument consists of synthetic material that has a high frictional resistance and should keep the instrument safely in position.

Placing the forepump

The Orbitrap Exploris GC MS is shipped with a source vacuum pump.

⚠CAUTION **Heavy Object.** Because of its weight of about 25 kg, the source vacuum pump might move uncontrollably and cause injuries. Wear steel-reinforced safety shoes when you move the pump during the installation.

Install the pump on the floor below the workbench, immediately behind the MS. If no space for the pump is available below the workbench, you can place the pump near the left side of the bench. In this case, the left side of the MS should align with the left side of the workbench. Before you place the pump, Thermo Fisher Scientific strongly recommends that you consider the information contained in "Vibration" on page 3-3.

Connecting the forepump

Install the oil mist filter and return unit of the forepump as described in the pump's manual.

The vacuum hose of the source vacuum pump has an inner diameter of 19 mm (3/4 in.). Connect the vacuum hose of the source vacuum pump to the large vacuum port at the left side of the MS. The vacuum hose has a length of 3.0 m (120 in.). It is made of reinforced material.

Connect the exhaust hose of the forepump to the exhaust system of the laboratory. See "Exhaust System" on page 6-2.

The forepump is switched on and off by a relay. Connect the switch cord for the pump to the port on the control panel at the right side of the MS. Connect the power supply cords of the forepump to separate wall outlets.

NOTICE

To prevent an unwanted operation of the forepump, connect the MS and the forepump to the power supply in the correct sequence:

- When you install a system, first connect the MS to the forepump relay and then connect the power between the forepump and the relay and the outlet and relay.
- The pump has a power switch that should remain off until all cable connections and power are confirmed. The pump has a configuration jumper that is labeled for the line voltage needed. The jumper must be configured so that the label displays the same voltage supplied by the power to the pump relay.
- When you uninstall or service a system, first disconnect the power supply cords, then disconnect the switch cord between the instrument and the forepump.

3

Operating Environment

Attention to the operating environment will ensure continued high performance of your system. 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.

Tip You are responsible for providing an acceptable operating environment.

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- Humidity on page 3-3
- Vibration on page 3-3
- Radio Frequencies on page 3-3
- Altitude on page 3-4

Temperature

The laboratory room temperature must be maintained between 18 and 27 °C (64 and 81 °F) with temperature fluctuations of < 0.5 °C over a 10-minute period.

As the laboratory temperature increases, system reliability decreases. All electronic components generate heat while operating. This heat must be dissipated to the surrounding air for the components to continue to operate reliably.

There must be a good flow of room air around the system, and the air conditioning system must be capable of maintaining a constant temperature (within the temperature specification given above) in the immediate vicinity of the system.

We recommend the installation of an air conditioner if the specified limits will be exceeded due to unfavorable climatic conditions. Preferably, the air conditioner should be equipped with a flow controller valve and PID microprocessor control (available e.g. from Landis & Gyr, Polygyr RWX…, see www.landisgyr.com). This ensures temperature drifts within the limits given above.

NOTICE

Do not put the mass spectrometer under an air duct, near windows, or near heating and cooling sources. Temperature fluctuations of 0.5 °C or more over a 10 minutes period can affect instrument performance.

If the temperature in the laboratory has changed for more than 2 °C since the last mass calibration, Thermo Fisher Scientific strongly recommends that you refresh the mass calibration.

Heat Output of Orbitrap Exploris GC Series Systems

The air conditioning load for a typical Orbitrap Exploris GC system (with data system, a typical GC, and forepump) is approximately 4.5 kW (15400 BTU/h). Table 3-1 shows the approximate heat output of each module.

Table 3-1. Heat output for a typical Orbitrap Exploris GC system

Module	Heat output [W]	Heat output [BTU/h]
Mass spectrometer	750	2560
Gas chromatograph	2000	6830
TriPlus RSH autosampler	200[a] or 400[b]	683[a] or 1366[b]
Foreline pump	450 or 550W	1535 or 1876
Data system modules (mini-tower computer, and monitor)	890	3030
Total (GC/MS system with forepump)	**4290–4590 (GC)**	**16514–15662 (GC)**

[a] With one power module

[b] With two power modules

Humidity

The instrument is designed to be operated in an environment that is rated with pollution degree 2. This means that only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is to be expected.

The relative humidity of the operating environment must be between 20 and 80%, with no condensation. Thermo Fisher Scientific recommends that your laboratory be equipped with a temperature/humidity monitor. This makes sure that your laboratory is always within the required temperature and humidity specifications.

NOTICE

Operating a Orbitrap Exploris GC system 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, and will also block the filters on the cooling fans.

Vibration

Floors must be free of vibration that is caused, for example, by equipment in adjoining locations. The instrument may generate unacceptable data if exposed to vibrations below 1 KHz that measure above 85 dB.

NOTICE

Because of the natural vibration of a forepump during operation, it must not have any mechanical contact to the mass spectrometer with the exception of the vacuum hose. Otherwise, the vibration might affect instrument performance. Therefore, install the pump on the floor below the mass spectrometer and not near the system on the workbench.

Propagation of vibrations and their influence on complex instrumentations are difficult to predict. We encourage you to contact you local Thermo Fisher Scientific representative if you have questions or concerns about your laboratory.

Radio Frequencies

Orbitrap Exploris GC instruments are able to withstand electromagnetic fields of 1 V/m in the frequency range 26 MHz to 1 GHz without any influence to operation.

Orbitrap Exploris GC 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, you should contact your local Thermo Fisher Scientific representative for advice. Because of the complexity of such influences, no general suggestion can be given in this guide.

Altitude

The Orbitrap Exploris GC MS is designed for indoor use at an altitude of up to 3000 m (10000 ft) above sea level. To check whether a peripheral (for example, GC or printer) is suitable for the intended altitude, refer to the peripheral's manual or contact Thermo Fisher Scientific.

4

Line Power

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

Tip You are responsible for providing a source of power of acceptable quality for the operation of your system.

Contents

- Basic Power Requirements for Orbitrap Exploris GC Series Systems on page 4-2
- Power Supply on page 4-3
- Connecting the Mass Spectrometer and the Modules to Wall Outlets on page 4-8

Basic Power Requirements for Orbitrap Exploris GC Series Systems

A Orbitrap Exploris GC system has the basic power requirements as shown in Table 4-1. Pump requirements are shown in Table 4-2. See the sample laboratory setup in Table 4-4 on page 4-9 for the recommended number of power outlets.

Any conditioning devices that are installed with the system must be able to handle the potentially high currents that are drawn during the initial startup of the system. The system inrush (start) current for Orbitrap Exploris GC mass spectrometers is 10 A. The average duration of the forepump's inrush current is less than 1 second. Therefore, this initial energy demand from the AC power line is very low.

Table 4-1. Power requirements

Mass Spectrometer	
Nominal voltage	208–240 V AC, 50/60 Hz, single phase The voltage between neutral and ground should be less than 3 V.
Power	apparent power: 800 VA; effective power: 750 W
Fuse[a]	10 A (tripping characteristic C)
TRACE 1600/1610 GC	
Nominal voltage	230 V AC±10%, 16 AMAX
The GC power requirements cannot be reconfigured in the field.	
Data System (Computer and Monitor) and GC	
Nominal voltage	110–240 V AC, 50/60 Hz, single phase
Fuse[a]	15/16 A

[a] dedicated wall outlet

Table 4-2. Possible Power Requirements for Edwards RV3 Pumps

Nominal Supply Voltage (V AC)	Frequency (Hz)	Power (W)	Full Load Current (A)	Maximum Fuse[a] Rating (A)
220–240	50	450	3.4	5
230–240	60	550	3.0	5
110	50	450	6.8	13
115–120	60	550	6.9	13

[a] Dedicated wall outlet

Power Supply

Orbitrap Exploris GC instruments operate at a nominal voltage of 230 V AC, 50/60 Hz. Line voltages can vary between a minimum of 208 V AC and a maximum of 240 V AC.

Notice for Customers in North America Systems installed in areas with 208 V power experience voltage sags during high use periods that might place the line voltage below the operating parameters discussed in this section. In this case, you must protect your instrument by using a suitable power conditioner or uninterruptible power supply (UPS).

The mass spectrometer must be properly grounded. For this reason, the power cord of the MS must be connected to a wall outlet with grounding pin. Make sure that the grounding pin of this power cord is connected to earth ground, even when a buck/boost transformer or other upstream equipment (for example, UPS) is used.

The interconnected power outlets for the system must have a common point to one ground connector. If there are two such points, each of which is connected to separate external ground, they will cause noise current to flow through the ground system via the ground loop that is formed.

Tip Power is to remain on. The system should remain on and pumping continuously for optimum performance. Nevertheless, the system must be disconnected from mains in case of emergency or for other reasons (for example, maintenance).

Power Cords

Thermo Fisher Scientific provides power cords for the gas chromatograph, mass spectrometer, forepump, data system, and monitor. They are approximately 2.5 m (8 ft) long. One power cord fits into a standard IEC 60320 C19 socket on the GC. The other cords fit into standard IEC 60320 C13 sockets on the mass spectrometer and the other system components.

Depending on the location of your laboratory, various types of plugs may be required. Table 4-3 gives an overview of the possible wall outlets. Note the part number of the corresponding country kit in the **Orbitrap Exploris GC Series Installation Request Form** and send it to the factory before the installation.

NOTICE

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

Table 4-3. Country kits for Orbitrap Exploris GC Systems

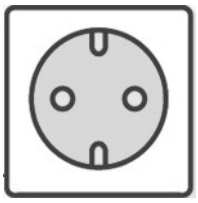
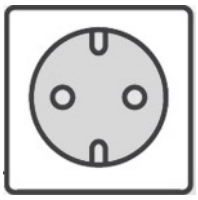
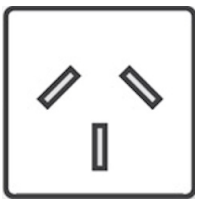
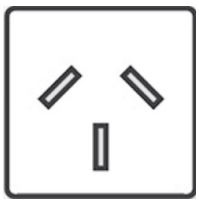
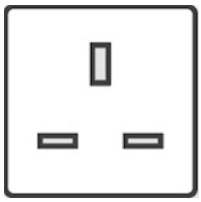
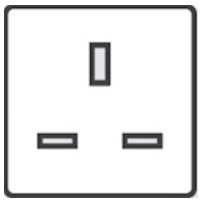
P/N	Designation	Socket for the GC (cord with C19 plug)	Socket for MS, forepump, PC, and monitor (cords with C13 plug)	Qty.
BRE0016334	Country Kit **Continental Europe, Type A** (Afghanistan, Algeria, Angola, Armenia, Austria, Azores [Portugal], Belarus, Belgium, Benin, Bosnia-Herzegovina, Bulgaria, Burundi, Cambodia, Cameroon, Canary Islands [Spain], Cape Verde, Rep. of, Central African Rep., Chad, Chile, Congo, Croatia, Czech. Rep., Rep. of, Djibouti, Egypt, Equatorial Guinea, Estonia, Ethiopia, Finland, France, French Guiana, Gabon, Germany, Greece, Guadeloupe, Guinea, Guinea-Bissau, Hungary, Iceland, Indonesia, Iran, Iraq, Ivory Coast, Jordan, Kyrgyzstan, Laos, Latvia, Lebanon, Liberia, Libya, Lithuania, Luxembourg, Madagascar, Mali, Rep. of, Martinique, Mauritania, Moldova, Monaco, Mongolia, Morocco, Mozambique, Netherlands, New Caledonia, Niger, North Korea, Norway, Oman, Paraguay, Peru, Poland, Portugal, Romania, Russia Federation, Rwanda, Saudi Arabia, Senegal, Slovakia, Slovenia, South Korea, Spain, Svalbard [Norway], Sweden, Syria, Thailand, Togo, Tunisia, Turkey, Ukraine, Uruguay, Vietnam, Yugoslavia)	 CEE 7 plug	 CEE 7 plug	1+5
BRE0017109	Country Kit **Australia/New Zealand, Type C** (American Samoa, Australia, Christmas Is. [Austral.], Cocos Is. [Austral.], Cook Is. [N.Z.], New Zealand, Papua New Guinea, Fiji, Tonga, Western Samoa)	 AS 3112 plug	 AS 3112 plug	1+5
BRE0017112	Country Kit **United Kingdom/Ireland, Type D** (Anguilla [U.K.], Antigua, Bahrain, Bangladesh, Botswana, Burkina Faso, Channel Islands, Cyprus, Dominica, England, Gambia, Ghana, Gibraltar, Grenada, Hong Kong, Ireland, Rep. of [S.], Kenya, Kuwait, Lesotho, Macao, Malawi, Malaysia, Maldives, Malta, Mauritius, Myanmar [formerly Burma], Namibia [W.S.Africa], Nigeria, North Ireland, Qatar, Scotland, Seychelles, Sierra Leone, Singapore, South Africa, Sri Lanka, St. Kitts & Nevis, St. Lucia, St. Vincent, Sudan, Swaziland, Tanzania, Uganda, United Arab Emir., United Kingdom & Ire., Wales, Yemen, Zambia, Zimbabwe)	 BS 1363 plug	 BS 1363 plug	1+5

Table 4-3. Country kits for Orbitrap Exploris GC Systems

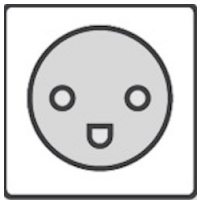
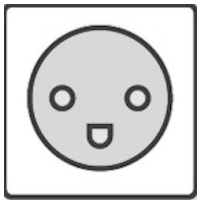
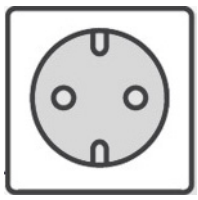
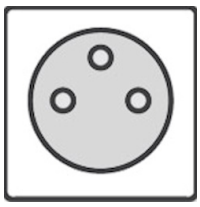
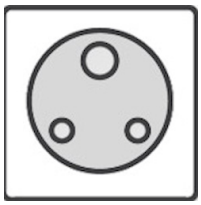
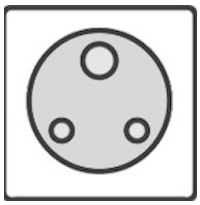
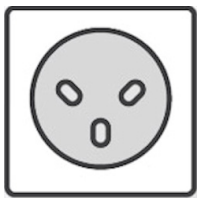
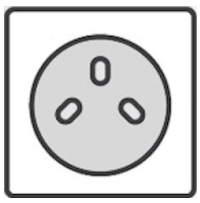
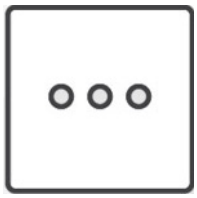
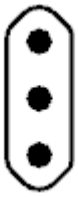
P/N	Designation	Socket for the GC (cord with C19 plug)	Socket for MS, forepump, PC, and monitor (cords with C13 plug)	Qty.
BRE0017114	Country Kit **Denmark, Type E** (Denmark, Greenland [Den.])	 DS 60884-2-D1 plug	 DS 60884-2-D1 plug	1+5
BRE0017116	Country Kit **France/Belgium, Type F** (Belgium, France)	 CEE 7 plug	 CEE 7/7 plug	1+5
BRE0017124	Country Kit **India/ South Africa, Type G** (India, Nepal, Pakistan, Pitcairn Is. [U.K.], Somalia)	 BS 546 15 A	 BS 546 15 A	1+5
BRE0017127	Country Kit **Israel, Type H** (Israel)	 SI 32 plug	 SI 32 plug	1+5
BRE0017129	Country Kit **Italy, Type I** (Italy)	 IT2-16P	 YP-45	1+5

Table 4-3. Country kits for Orbitrap Exploris GC Systems

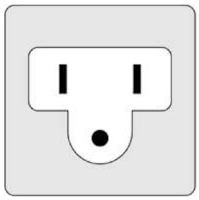
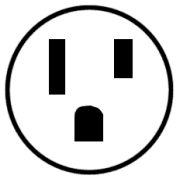
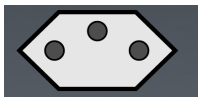
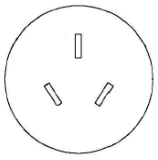
P/N	Designation	Socket for the GC (cord with C19 plug)	Socket for MS, forepump, PC, and monitor (cords with C13 plug)	Qty.
BRE0017132	Country Kit **Japan, Type J** (Japan) * One L6-20 socket supplies the GC (C19) and two L6-20 sockets supply the MS and the forepump (C13).	 NEMA L6-20	 JIS C 8303	1+3
			 NEMA L6-20*	2
BRE0017135	Country Kit **NA, Type K** (Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Curacao Is., Dominican Rep., Ecuador, El Salvador, Guam, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Montserrat, Neth. Antilles, Nicaragua, Panama, Philippines, Puerto Rico, St. Pierre & Miquelon [Fr.], Suriname, Tahiti, Taiwan, Thailand, Trinidad & Tobago, United States, Venezuela, Virgin Islands) * One socket supplies the GC (C 19) the other socket supplies the MS (C 13).	 NEMA L6-20*	 NEMA 5-15	1+4
			 NEMA L6-20*	1
BRE0017141	Country Kit **Switzerland, Type L** (Liechtenstein, Switzerland)	 SW2-16P	 SEV 1011: 2009	1+5
BRE0017143	Country Kit **Brazil, Type O** (Brazil)	 NBR 14136 (BR3-20P)	 NBR 14136 (BR3-20P)	1+5

Table 4-3. Country kits for Orbitrap Exploris GC Systems

P/N	Designation	Socket for the GC (cord with C19 plug)	Socket for MS, forepump, PC, and monitor (cords with C13 plug)	Qty.
BRE0017145	Country Kit **Argentina, Type T** (Argentina)	IRAM2073 AR2-20P	IRAM2073 RA/3	1+5
BRE0017147	Country Kit **China, Type X** (China)	CH2-16P	 PRC/3	1+5

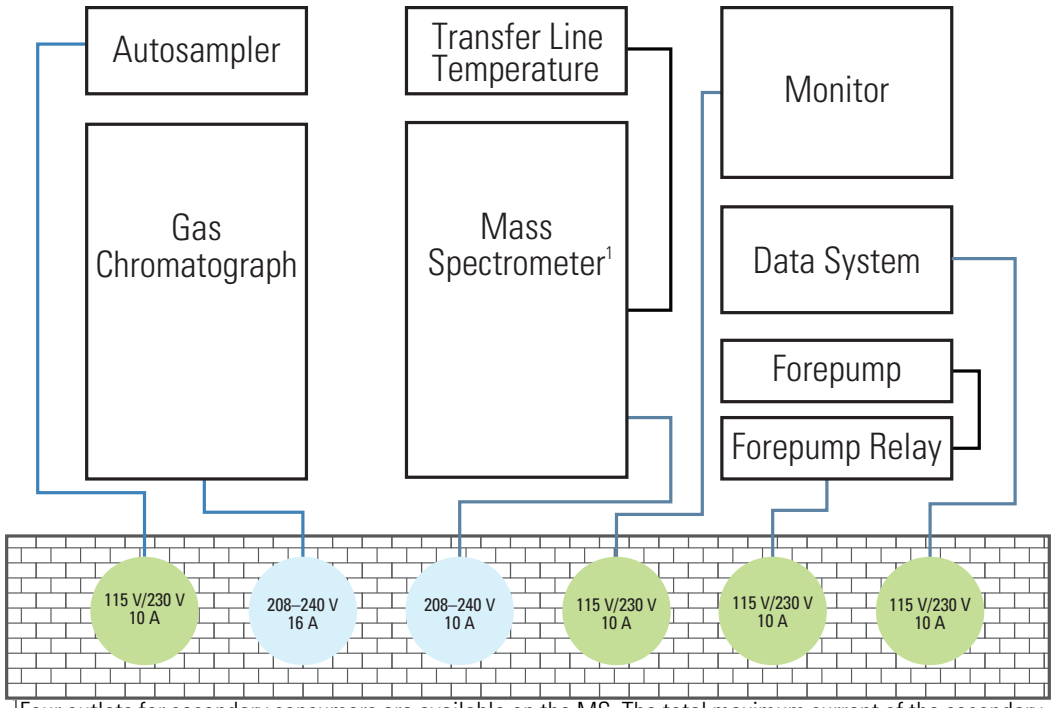
Power cables and connectors for the options are standard equipment delivered by the manufacturers.

Connecting the Mass Spectrometer and the Modules to Wall Outlets

Make sure that the wall outlet specifications are not exceeded. The mass spectrometer must have a separate "clean" line that leads to a main fuse to guarantee disturbance-free operation. Locally supplied personal computer hardware must use the same ground connection as the mass spectrometer.

All single-phase auxiliary wall outlets should use the same ground as the power line of the instrument. The specifications on the individual modules might vary from those in this guide. Refer to the manuals that came with your modules for power requirements and specifications. The power specifications on the module and in the respective manual always supersede those in this guide.

Figure 4-1 shows a block diagram of the line power connections for the components of the Orbitrap Exploris GC Series.



[1]Four outlets for secondary consumers are available on the MS. The total maximum current of the secondary consumers must not exceed 3 A. The transfer line temperature module is rated for 355 VA or 1.6 A at 230 V.

Figure 4-1. Line power installation

NOTICE

To prevent overloading the circuit, do not connect the mass spectrometer and the GC to the same electrical wall outlet circuit.

Placing the Power Outlets

Place the outlets for the MS system, forepump, and GC system behind the MS workbench. Place the outlets for the data system—computer, monitor, and (optional) printer—behind the data system workbench.

For the gas chromatograph, use wall outlets. Additional power outlets might be required for test and cleaning equipment. See Table 4-4 on page 4-9 for a sample laboratory setup.

The maximum load for a 120 V AC fourplex outlet is typically 20 A, and the maximum load for a 230 V AC fourplex outlet is typically 16 A. We recommend at least six (6) spare outlets behind the system and three (3) close to the workbench space within your laboratory.

Power Outlets in Laboratories

Installing a complete GC/MS system can require extensive electrical resources. Plan the power system properly, with numerous outlets, to ensure that you can connect and power all of your equipment. See the sample laboratory setup in Table 4-4 for the recommended number of outlets.

Table 4-4. Sample laboratory setup

	Item	Outlets
GC system	GC	1 (208–240 V AC)
MS system	Mass spectrometer	1 (208–240 V AC)
	Fore vacuum pump	1 (115 or 230 V AC)
Data system	Data system computer	1
	Monitor	1
	Printer (optional)	1
Optional	Autosampler	1
Total outlets required for this configuration		7-8

Tip If your local area is susceptible to corrupted power or to power disruptions, then Thermo Fisher Scientific recommends that you install an uninterruptible power supply (UPS) in your laboratory. Take the values listed in Table 3-1 on page 3-2 as guideline for dimensioning a UPS.

5

Consumables

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

Tip You are responsible for providing correct gas and solvent supplies for the operation of your system.

Contents

- Gases on page 5-2
- Cleaning Agents on page 5-8

Gases

Orbitrap Exploris GC instruments require nitrogen gas for the C-Trap bath gas, and HCD collision gas. Your system can use large amounts of gas during daily operations. It is essential that the gas be delivered with the necessary pressure and purity. This section provides information on the purity and pressure that your system requires.

NOTICE Contaminants introduced during the installation of house lines used for gas delivery can cause damage to the system. Ensure that all gas lines used with your system have been cleaned of all particulates and oils. You are responsible for any damage to the instrument caused by contaminants introduced from your gas delivery system.

NOTICE Do not store gas cylinders where they can damage cables or gas lines, and secure them in accordance with standard safety practices.

Nitrogen Gas

Orbitrap Exploris GC instruments require nitrogen gas for the C-Trap bath gas and HCD collision gas. The required gas pressure is 600 ±50 kPa (87 ±7 psi), the maximum line pressure is 650 kPa (94 psi).

NOTICE The instrument can operate reliably only when the pressure of the source gas stays within the required limits. If your laboratory gas supply provides nitrogen also for other consumers, then you must install a pre-regulator in the gas line that leads to the source gas port of the Orbitrap Exploris GC MS.

Your system can use large amounts of gas when venting the instrument or depending upon some probe or GC configurations. The gas consumption strongly depends on the type of analysis the instrument is used for. It is essential that the gas be delivered with the necessary pressure and purity. See Table 5-1.

Table 5-1. Nitrogen supply requirements

Gas type	Pressure	Purity	Tubing OD	Maximum Flow	Consumption	Regulator	Type
Nitrogen	0.6 ± 0.05 MPa	99.999%	1/16 in.	0.04 L/min	57.6 L/day	Dual-stage brass regulator with stainless steel diaphragm[a]	CGA-580
The use of ultra-high purity nitrogen (UHP, 99.999%) for C-Trap bath gas and HCD collision gas is mandatory.							

[a] Connectors vary with cylinder size. Confirm that your regulator will work with your gas tank. Nitrogen gas tanks may be attached with either a 6 mm or a 1/8 in. Swagelok fitting, however, the 1/8 in. Swagelok fitting is preferred.

Thermo Fisher Scientific recommends one of the following sources for the source gas supply:

- A large, sealed, thermally insulated cylinder containing liquid nitrogen from which the nitrogen gas is boiled off. The selected Dewar flask must be able to provide the required gas flows and a head pressure of 600 ±50 kPa going to the mass spectrometer.

GC Carrier Gas Requirements

You will need a supply of ultra-high purity helium for the GC carrier gas. Typical cylinders are about 23 cm (9 in.) wide by 140 cm (55 in.) tall and output >15,000 kPa (>2200 psig). A single full-size tank will last about three months with a typical usage rate of 50 mL/min. If you have additional detectors or optional accessories, please refer to your GC or autosampler manuals for information about gas requirements. See Table 5-2 for all carrier gas specifications.

NOTICE

Thermo Fisher Scientific installation specifications require helium as a carrier gas and nitrogen as the C-Trap bath gas. You must have one tank of each gas at installation, or the field service engineer will not be able to run specifications on your Orbitrap Exploris GC system.

Table 5-2. Carrier Gas Specifications

Gas Type	Purity[a]	Outlet Pressure	Regulator	Type[b]
Helium	99.999%	400–700 kPa (58–100 psig)	Dual-stage brass regulator with stainless steel diaphragm	CGA-580

[a] Ultra-high purity with less than 1.0 ppm each of water, oxygen, and total hydrocarbons and contained in one tank.

[b] Connectors vary with cylinder size. Confirm that your regulator will work with your gas tank. All connections to the GC/MS are 1/8 in. Swagelok fittings.

NOTICE Do not use hydrogen as a carrier gas. The Orbitrap Exploris GC Series are not designed for use with hydrogen as a carrier gas.

Oxygen and moisture cannot be prevented from entering the system during cylinder changes. To minimize the impact of these contaminants on the GC system, high purity gas handling equipment should be used. To further protect the system from oxygen and moisture, point-of-use purifiers should be installed in the carrier gas lines just prior to the GC to remove any residual contaminants.

GC Chemical Ionization Gas

NOTICE Not applicable to the Orbitrap Exploris GC S system.

The Orbitrap Exploris GC system is equipped with a chemical ionization (CI) reagent gas flow module, and must have the proper CI gas to run the system in CI mode. Typical CI gas flow rates are only 1-3 mL/min, so smaller tanks like lecture bottles can be used. See Table 5-3 for CI gas specifications.

NOTICE Thermo Fisher Scientific installation specifications require methane as a CI gas. You must have one tank of methane at installation, or the field service engineer will not be able to run CI specifications on your Orbitrap Exploris GC system.

Table 5-3. CI Gas Specifications

Gas Type	Purity	Outlet Pressure	Regulator	Type[a]
Methane[b]	99.99% high-purity	35–240 kPa (5–35 psig)	Dual-stage brass regulator with stainless steel diaphragm	CGA-350
Isobutane	99.9% instrument grade	35–240 kPa (5–35 psig)	Dual-stage brass regulator with stainless steel diaphragm	CGA-510
Ammonia	99.99% anhydrous grade	35–240 kPa (5–35 psig)	Consult your gas supplier for specific regulator requirements	CGA-240

[a] Connectors vary with cylinder size. Confirm that your regulator will work with your gas tank. All connections to the GC/MS are 1/8 in. Swagelok fittings.

[b] Only methane gas is required for CI installation.

NOTICE

The gas controller will allow a maximum flow for the following gases:

- Ammonia = 5.41 mL/min
- Nitrogen = 3.06 mL/min
- Methane = 4.98 mL/min
- Isobutane = 7.23 mL/min

NOTICE

Some CI gases, such as methane and isobutane, are flammable. Make sure these gases are properly exhausted and all gas fittings on the system are leak-free. Consult your local Environmental and Safety Regulations for information about how to properly exhaust fumes from your laboratory.

- Some CI gases, such as ammonia, are toxic. Make sure these gases are properly exhausted and all gas fittings on the system are leak-free. Consult your local Environmental and Safety Regulations for information about how to properly exhaust fumes from your laboratory.
- The reagent gas supplied to the instrument is nominally set to 50 kPa (7 psi). Do not exceed 240 kPa (35 psi) or you could damage the CI reagent gas flow module.

Other GC Gas Specifications

If you have a TriPlus RSH SMART autosampler with the SPME conditioning station or a TriPlus 500 Headspace autosampler, you need to obtain a low-pressure, single-stage regulator (0-30 psi) for nitrogen purging.

Table 5-4. Other Gas Specifications

Equipment	Gas Type	Purity	Maximum Pressure	Regulator	Type[a]
Direct Insertion Probe[b]	Air	90%[c]	700 kPa (100 psig)	Dual-stage brass regulator	CGA-590
TriPlus RSH SMART	Nitrogen	99.999%	200 kPa (30 psi)	Dual-stage brass regulator with stainless steel diaphragm	CGA-580
TriPlus 500 Headspace	Nitrogen	99.999%	200 kPa (30 psi)	Dual-stage brass regulator with stainless steel diaphragm	CGA-580

[a] Connectors will vary with cylinder size. Confirm that your regulator will work with your gas tank. All connections to the GC/MS are 1/8 in. Swagelok fittings.

[b] Not applicable to Orbitrap Exploris GC S configuration.

[c] Pure, particle and oil free, and contained in one tank.

Gas lines should be:

- As short as possible and close to the Orbitrap Exploris GC system.
- Made of copper or stainless steel when using helium, methane, or isobutane.
- Made of stainless steel when using ammonia or other corrosive gases.
- Free of oil and moisture.

Obtain the proper gas line filters, which help prevent impurities and contaminants from entering your system. Water, oxygen, and total hydrocarbons should be less than 1 ppm to avoid high background noise and prevent contamination. The GC is equipped with two intake filters that trap moisture, oxygen, and hydrocarbons.

Store gas tanks and bottles properly so they will not damage cables or gas lines. Ensure they are secured in accordance with standard safety practices.

Fittings and Parts

Table 5-5 lists the minimum parts that are required to connect the mass spectrometer to your gas delivery system.

Table 5-5. Gas connection hardware required

	Description	Provided / Not provided
Nitrogen	6 mm OD Teflon™ hose (P/N 0690280)	10 m (33 ft) provided. You might require additional length.
	Connection for the opposite end of the Teflon hose to the nitrogen gas source	**Not provided in kit. You supply these parts.**

NOTICE

Your connections and gas delivery system might vary, and it is your responsibility to supply any fittings or connections necessary during installation.
If the pressure regulator of the laboratory gas supply has an 1/8 inch NPT outlet, examples[a] of suitable 1/8-in.-to-6-mm adapters are Swagelok™ part numbers B-6M0-7-2 (female) and B-6M0-1-2 (male).

[a] 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.

Cleaning Agents

We recommend having the following cleaning agents available:

- A solvent like acetone (in accordance with your local safety practices).
- A detergent such as Alconox and aluminum oxide powder for cleaning (PN 1R32000-60340).
- Several liters of distilled water.

6

Exhaust

The proper performance of your system can be affected by the exhaust arrangements for the instrument.

Tip You are responsible for providing proper exhaust systems for the operation of your system.

Contents

- Exhaust System on page 6-2

Exhaust System

It is mandatory to connect the forepump to a fume exhaust system. The forepump eventually exhausts much of what is introduced into the mass spectrometer, including the small amount of oil vapor that mechanical pumps can emit. It is your responsibility to provide an adequate exhaust system.

Supply a 1 in. i.d. hose to the building exhaust air system, an oil mist filter, or other scrubbing device. The pump exhaust contains carrier gas, solvents, analytes, and a small amount of oil vapor. These materials may be flammable, poisonous, or corrosive. Do not allow the exhaust from the foreline pump, which includes your analytes, to accumulate to unsafe levels in your laboratory. Consult your local Environmental and Safety Regulations for information about how to properly exhaust fumes from your laboratory.

NOTICE An efficient fume exhaust system is required for the proper operation of your forepump. The frequency of the purging is dependent on the throughput of your system.

NOTICE Do not route exhaust tubing from the pump vertically toward the ceiling. To maintain pump integrity, route the tubing from the exhaust port down to the floor.

NOTICE The exhaust hose should travel at floor level for a minimum of two meters (78.5 in.) before it reaches the external exhaust system. This tubing acts as a trap for exhaust fumes that would otherwise recondense in the forepump oil.

NOTICE The pump kit includes an exhaust filter along with a 1 in. o.d. tubing adaptor to be used to connect a user-supplied 1 in. i.d. hose to a suitable exhaust source. The exhaust must be connected to a suitable exhaust source when toxic gasses or samples are used for instrument operation.

Ventilation

When venting the MS, the nitrogen in the Orbitrap Exploris GC escapes into the laboratory atmosphere. Therefore, provide for good air exchange to prevent accumulation of gaseous nitrogen in the laboratory.

7

Installation

Prior to installation, make sure that all preparations described in the previous chapters are complete.

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

Contents

- "Performance Test Samples for Orbitrap Exploris GC Series Systems" on page 7-2

NOTICE

Store the instrument in a protected location indoors. Take the specifications described in "Temperature" on page 3-2 as a guideline for the temperature in the storage room.

Performance Test Samples for Orbitrap Exploris GC Series Systems

The performance test sample packages for the instruments are needed for installation. They do not come with the mass spectrometer but will be shipped separately or supplied by the service engineer. The installation will not begin until all chemicals arrive.

8

General Preinstallation Information

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

Contents

- Instrument Arrival on page 8-2
- Installation on page 8-3
- Operating Environment on page 8-5

Instrument Arrival

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

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

Take the following precautions when receiving material:

- Carefully check 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 briefly describe 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 representative to report the damage and let a certified Thermo Fisher Scientific service representative check for further damage.

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.

Freight insurance requires that obvious damage is 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.

Tip After arrival, move the instrument as packed by Thermo Fisher Scientific to a protected location indoors. The temperature of the storage site must be between –10 and +50 °C (14 and 122 °F). The relative humidity of the storage site must be between 20 and 80%, with a non-condensing and non-corrosive atmosphere. The maximum storage time under these conditions is four months.

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 before the installation of the system.

Tip 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 before instrument installation.

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 certified Thermo Fisher Scientific service representative will install it.

During the installation, the certified Thermo Fisher Scientific service representative 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.

Tip Consumables sent with the system are intended for use by the certified Thermo Fisher Scientific service representative 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.

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

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. Since a lot of work is done on the computer terminal, it may be convenient to have dimmed 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, the sample introduction as well as 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 affect 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 representative. See "Technical Assistance" on page 8-8 for electrical equipment suppliers.

Power Monitoring Devices

Power monitoring devices help to 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.[1]

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

[1] Thermo Fisher Scientific does not endorse any manufacturer or products other than its own. Companies and products listed in this guide are given as examples only.

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, an isolation/noise suppression transformer should be adequate to resolve the problem. If there are both transient and regulation problems, 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.

Tip 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, an uninterruptible power supply (UPS) should be installed in your laboratory.

Tip 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 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 perform actions to isolate and correct power supply quality problems.

Contact your Thermo Fisher Scientific representative 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 8-1.

Table 8-1. Companies specifying power conditioning equipment[a]

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

[a] Thermo Fisher Scientific does not endorse any manufacturer or 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 cause damage to 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 35 000 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 1 500 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 18 000 V of electrostatic potential to develop on your skin, or 1 500 V at 80% relative humidity.
- Working in laboratory coats and clothing made of synthetic fibers can cause 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 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.

Appendix A Legal Documents

Contents

- FCC Compliance Statement on page A-2
- WEEE Compliance on page A-3

FCC Compliance Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the receiver into an outlet on a circuit different from that to which the equipment is connected.
- Consult the dealer or an experienced radio/TV technician for help.

WEEE Compliance

This product is marked with the crossed-out wheeled bin symbol to indicate that it must not be disposed of with household waste. Dispose of this product at designated collection points for the recycling of electronic waste in accordance with your local regulations or contact Thermo Fisher Scientific.

RoHS

For information about the Restriction on Hazardous Substances (RoHS) Directive for the European Union, search for RoHS on the Thermo Fisher Scientific European language websites.

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