



Orbitrap Exploris Series

**Orbitrap Exploris 120, Orbitrap
Exploris 240, Orbitrap Exploris 480**

Pre-Installation Requirements Guide

BRE0015334 Revision C May 2020

Orbitrap Exploris Series

Orbitrap Exploris 120, Orbitrap
Exploris 240, Orbitrap Exploris 480

Pre-Installation Requirements Guide

BRE0015334 Revision C May 2020

Legal Notices

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Published by:

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

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Release History: Revision A released in February 2019.

Revision B released in May 2019.

Revision C released in May 2020.

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Orbitrap Exploris Series Installation Request Form

Please refer to the *Orbitrap Exploris Series Pre-Installation Requirements Guide* (P/N BRE0015334) for the complete site requirements. Circle "Yes" or "No" as to whether the site meets the requirements as specified in the Pre-Installation Guide. Provide the additional information where requested. 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 (31 ½ 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 the forepump(s) 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)?
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 a suitable exhaust system present that is separate from solvent waste? You must provide one exhaust system for the API source and a second exhaust system for the forepump(s).
19. **Yes** **No** Provision has been made for collecting solvent waste from the API source?
20. **Yes** **No** There is a functional telephone close to the system? Phone number _____
21. **Yes** **No** All relevant local safety regulations have been met and the equipment installed will not affect compliance?
22. **Yes** **No** All required chemicals and equipment for installing the system are on site?
23. **Yes** **No** Have any special acceptance specifications been agreed within the contract?
If **YES**, please attach full details of specification.
24. **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 Series 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: _____

Send to: Attn: Local Service Engineer

Thermo Scientific

Orbitrap Exploris Series Pre-Installation Requirements Guide (P/N BRE0015334, Revision C)

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Technical Data for Orbitrap Exploris 120 Systems and Orbitrap Exploris 240 Systems

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

Table 1. Technical Data for Orbitrap Exploris 120 Systems and Orbitrap Exploris 240 Systems (Sheet 1 of 2)

Parameter	Specification	Value
Instrument Properties		
Mass spectrometer	Length × width × height	763 × 534 × 703 mm
	Weight	120 kg
Forepump ^a	Length × width × height	530 × 330 × 360 mm
	Weight	60 kg
Complete system (incl. data system)	Noise emission	Below 70 dB(A)
	Heat generation	3140 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 ^b 15/16 A (tripping characteristic C)
	Output 4×	208–240 V AC, 50/60 Hz, 3 A total
	Protection type	IP 20
Forepump	Input	Nominal voltage 200–240 V AC, 50/60 Hz
		Power 1.5 kW
		Fuse ^b 15/16 A (tripping characteristic C)
Data system	Input	Nominal voltage 100–240 V AC, 50/60 Hz
		Fuse 15/16 A
Gas Requirements		
Source gas (minimum requirement)	Type	Nitrogen
	Purity	99% or better (high purity)
	Supply rate	max. 45 L/min
	Pressure	0.6 ± 0.05 MPa
HCD gas (mandatory)	Type	Nitrogen
	Purity	99.999% or better (ultra high purity)
	Supply rate	max. 0.03 L/min ^c
	Pressure	0.6 ± 0.05 MPa

Table 1. Technical Data for Orbitrap Exploris 120 Systems and Orbitrap Exploris 240 Systems (Sheet 2 of 2)

Parameter	Specification	Value
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
	Max. altitude	3000 m above sea level
Pump exhaust requirements	Inrush flow rate	10 L/min
	Continuous flow rate	7 L/min
Ion source exhaust requirements	Maximum flow rate	45 L/min

^a Leybold SOGEVAC™ SV 65 BI, or approved equivalent model. Values depend on the actually used pump model.

^b dedicated wall outlet

^c If the Internal Calibration option is installed, the consumption of HCD collision gas increases up to 65 sccm (≈ 0.07 L/min).

Technical Data for Orbitrap Exploris 480 Systems

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

Table 1. Technical Data for Orbitrap Exploris 480 Systems (Sheet 1 of 2)

Parameter	Specification	Value
Instrument Properties		
Mass spectrometer	Length × width × height	763 × 534 × 703 mm
	Weight	120 kg
Source vacuum pump ^a	Length × width × height	731 × 420 × 490 mm
	Weight	82 kg
Auxiliary forepump ^b	Length × width × height	411 × 127 × 191 mm
	Weight	17 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 ^c 15/16 A (tripping characteristic C)
	Output 4×	208–240 V AC, 50/60 Hz, 3 A total
	Protection type	IP 20
Source vacuum pump	Input	Nominal voltage 200–240 V AC, 50/60 Hz
		Power 2.2 kW
		Fuse ^c 15/16 A (tripping characteristic C)
Auxiliary forepump	Input	Nominal voltage 115 V or 230 V AC, 50/60 Hz, single phase
		Power 0.25 kW (50 Hz) / 0.3 kW (60 Hz)
		Fuse ^c 16 A (115 V) / 6 A (230 V), slow
Data system	Input	Nominal voltage 100–240 V AC, 50/60 Hz
		Fuse 15/16 A
Gas Requirements		
Source gas (minimum requirement)	Type	Nitrogen
	Purity	99% or better (high purity)
	Supply rate	max. 45 L/min
	Pressure	0.6 ± 0.05 MPa
HCD gas (mandatory)	Type	Nitrogen
	Purity	99.999% or better (ultra high purity)
	Supply rate	max. 0.03 L/min ^d
	Pressure	0.6 ± 0.05 MPa

Table 1. Technical Data for Orbitrap Exploris 480 Systems (Sheet 2 of 2)

Parameter	Specification	Value
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
	Max. altitude	3000 m above sea level
Pump exhaust requirements	Inrush flow rate	10 L/min
	Continuous flow rate	7 L/min
Ion source exhaust requirements	Maximum flow rate	45 L/min

^a Leybold SOGEVAC™ SV 120 BI, or approved equivalent model. Values depend on the actually used pump model.

^b Pfeiffer DUO 11, or approved equivalent model. Values depend on the actually used pump model.

^c dedicated wall outlet

^d If the Internal Calibration option is installed, the consumption of HCD collision gas increases up to 65 sccm (≈ 0.07 L/min).

Using this Manual

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

The Orbitrap Exploris Series comprises these instruments:

- Orbitrap Exploris 120 MS (gray front cover)
- Orbitrap Exploris 240 MS (silver front cover)
- Orbitrap Exploris 480 MS (black front cover)

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- [About this Manual](#) on page 1-1
- [Typographical Conventions](#) on page 1-2
- [Reference Documentation](#) on page 1-4
- [Contacting Us](#) on page 1-5

About this Manual

This *Orbitrap Exploris 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 Series 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 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 pre-installation 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 Series mass spectrometers includes the following:

- *Orbitrap Exploris 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:

- Forepumps
- Turbomolecular pump
- Syringe 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	
Patent Information	www.thermofisher.com/ms-patents	
Service Contact	www.unitylabservices.com	
EU REACH Statement Health and Safety Form	www.thermoscientific.com/Technicaldocumentation	
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. The PDF versions of our manuals allow adding comments with Adobe Acrobat Reader or other freely available PDF reader programs.	

Using this Manual

Contacting Us

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 Series system before the Thermo Fisher Scientific service engineer arrives.

Contents

- [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 Series system. The instrument (basic unit) is shipped in the largest container. Other modules such as the data system, liquid chromatograph, and accessories are shipped in their own containers. Their dimensions and weight are less than that of the container for the basic unit.

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).

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 *unpacked* instrument fits through a door with a minimum width of 55 cm (21 ⁵/₈ in.). Consider that at least four persons are required to carry the instrument who require considerable space for maneuvering. See “[Moving the Instrument](#)” on [page 2-6](#). Therefore, Thermo Fisher Scientific recommends that you use a pallet jack when you pass the unpacked instrument through a narrow door.

Your Orbitrap Exploris Series 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 (31 ¹/₂ in.). Dimensions and weights of the shipping containers for Orbitrap Exploris Series MS systems are given in [Table 2-1](#).

Table 2-1. Data of packed units of a typical Orbitrap Exploris Series 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 (47 ¹ / ₄ × 31 ¹ / ₂ × 48 in.)	91 kg (201 lb)

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.

Some chemicals that are needed for installation will be shipped in a separate package. See [page 7-4](#) for details.

Space and Load Requirements

The floor of your laboratory should be able to carry the weight of the installed Orbitrap Exploris Series instrument with the forepump(s) and the data system. Also, consider the weight of any other option (liquid chromatograph, for example) that is added to the system and the weights of the workbenches.

Workbench Requirements

The Orbitrap Exploris Series MS is designed to be placed on top of a workbench with its rear panel against a wall. To set up a typical LC/MS system, Thermo Fisher Scientific recommends that you have a minimum of two workbenches. Table 2-2 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 2-2. Minimum workbench surface dimensions

Equipment	Surface
Data system	120 × 100 cm (47¼ × 39⅜ in.)
LC/MS system	150 × 100 cm (59⅛ × 39⅜ in.)

Follow these clearance guidelines for the workbenches:

- Place the data system workbench and the LC/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.
 - 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.



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.

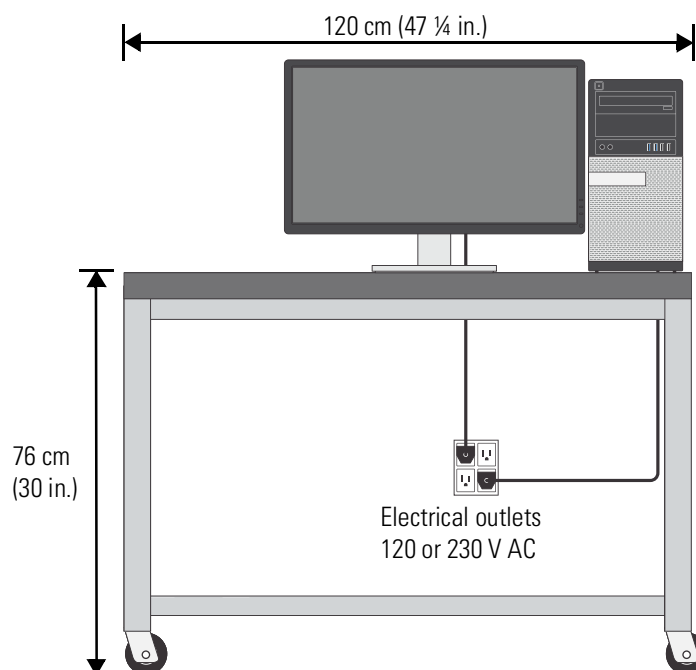


Figure 2-1. Typical data system workbench

See [Table 2-3](#) and [Figure 2-1](#) for the space requirements and weights of the typical data system hardware components.

Table 2-3. Space and weights of typical data system components

Module	Size (l × w × h)	Weight
Monitor	18 × 51 × 46 cm (7 ¹ / ₁₆ × 20 ¹ / ₁₆ × 18 ¹ / ₈ in.)	5 kg (11 lb)
Minitower computer	43 × 18 × 48 cm (16 ¹⁵ / ₁₆ × 7 ¹ / ₁₆ × 18 ⁷ / ₈ in.)	14 kg (30 lb)

Workbench for the LC/MS System

Use the other workbench to hold the mass spectrometer, the LC, and any other LC/MS options. Make sure that this workbench can support the weight of the mass spectrometer (about 120 kg) plus the weight of any option (liquid chromatograph, for example).

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

Table 2-2 shows the dimensions of a workbench for the LC/MS system. If you intend to place the MS separately, use a workbench with minimum dimensions of 1 × 1 m (3 × 3 ft). Thermo Fisher Scientific recommends using a workbench with a width of 1.5 m (59 in.).

Tip The usual place of the LC system is to the left side of the MS. In case of a Thermo Scientific EASY-nLC™ liquid chromatograph, however, the optimal position of the LC would be in front of the MS.

The workbench for the LC/MS system must stand in a secure and level position. Note that only workbenches with 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 2-4. Space and load requirements of Orbitrap Exploris Series LC/MS systems

Place	Module	Height		Width		Length		Weight	
		cm	in.	cm	in.	cm	in.	kg	lb
Workbench	Mass spectrometer	70	27 ¹¹ / ₁₆	53	20 ⁷ / ₈	76	30 ¹ / ₁₆	120	265
	Liquid chromatograph ^a	75	29½	54	21¼	62	24 ⁷ / ₁₆	86	190
Floor	Orbitrap Exploris 120 MS / Orbitrap Exploris 240 MS								
	Forepump	36	14 ³ / ₁₆	33	13	53	21	60	132
	Noise reduction cover	53.5	21 ¹ / ₁₆	50	19 ¹¹ / ₁₆	82.5	32½	10	22
	Orbitrap Exploris 480 MS								
	Source vacuum pump	49	19 ⁵ / ₁₆	42	16 ⁹ / ₁₆	73	28¾	82	181
	Noise reduction cover	53	21	62	24 ³ / ₈	98	38 ⁹ / ₁₆	10	22
	Auxiliary forepump	19	7½	13	5 ¹ / ₈	41	16 ¹ / ₈	17	37½
	Noise reduction cover	43	16 ⁷ / ₈	35	13¾	73	28 ¹¹ / ₁₆	9	20

^a The space and weight requirements listed for the liquid chromatograph are those for a Vanquish system containing a pump, autosampler, detector, and column compartment. Allow at least 116 cm (46 in.) of vertical height for the stack with the pump, autosampler, detector, column compartment, solvent platform, and standard 1 L solvent bottles. This height provision will allow sufficient access to the 1 L solvent bottles in the solvent platform. If you plan to use larger solvent containers, allow more vertical space. See also the note on page 2-5.

Instrument Dimensions

The body of the Orbitrap Exploris Series mass spectrometer has maximum dimensions of h 703 mm ($27\frac{11}{16}$ in.), w 534 mm (21 in.), l 763 mm ($30\frac{1}{16}$ in.). [Figure 2-2](#) shows a schematic view of the instrument with important instrument dimensions.

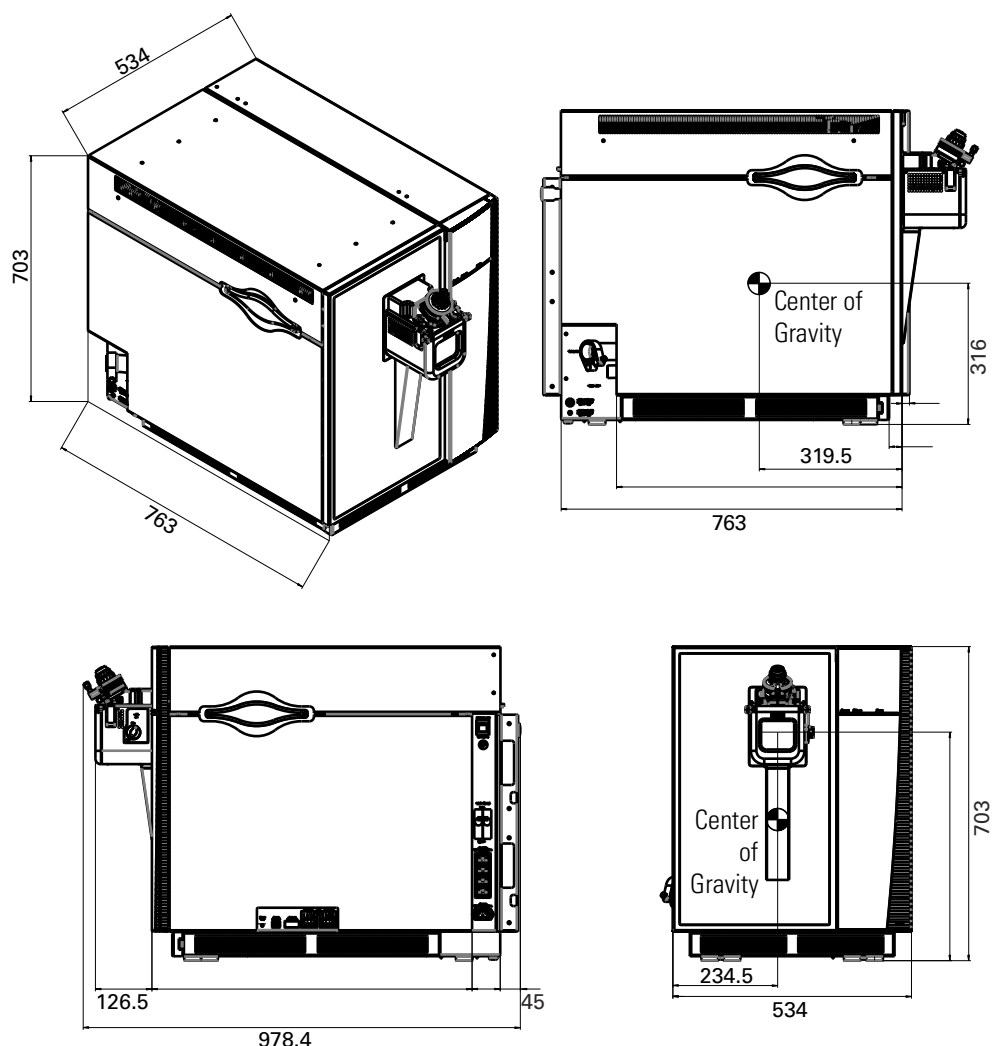


Figure 2-2. Dimensions of Orbitrap Exploris Series MS

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 Series 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 Series Operating Manual* for instructions. Wear steel-reinforced safety shoes when you move the instrument during the installation.

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 Forepumps

The Orbitrap Exploris 480 MS is shipped with a high-throughput source vacuum pump and a low-throughput auxiliary forepump. Both pumps come with separate noise reduction covers. All other instruments are shipped with one forepump and a noise reduction cover for the pump.

CAUTION

Heavy Object. Because of its weight (~60 kg resp. ~80 kg), the source vacuum pump of the Orbitrap Exploris Series MS might move uncontrollably and cause injuries. Wear steel-reinforced safety shoes when you move the pump during the installation.

Install the pumps on the floor below the workbench, immediately behind the MS. If no space for the pumps is available below the workbench, you can place the pumps 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 pumps, Thermo Fisher Scientific strongly recommends that you consider the information contained in “Vibration” on [page 3-4](#).

NOTICE

Do not vent the drain tubing (or any vent tubing connected to the waste container) to the same fume exhaust system to which you have connected the forepumps.

The maximum length for the exhaust hose of the forepumps is 10 m.

NOTICE

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

- When you install a system, first connect the switch cable between the instrument and the forepumps, then connect the power supply cords.
- When you deinstall or service a system, first disconnect the power supply cords, then disconnect the switch cable between the instrument and the forepumps.

Connecting the Forepump of the Orbitrap Exploris 120 MS and the Orbitrap Exploris 240 MS

Connect the power supply cord of the forepump to a wall outlet. See [page 4-8](#). Connect the switch cord of the pump to the port on the control panel at the right side of the MS.

Connect the exhaust hose of the pump to the exhaust system of the laboratory. See [page 6-2](#). Connect the vacuum hose of the pump to the vacuum port at the left side of the MS. The vacuum hose is made of reinforced material. The vacuum hose has an inner diameter of 38 mm (1 ½ in.) and a length of 2.0 m (79 in.). Because of its large bending radius, the actual length of a vacuum hose is significantly shorter.

Connecting the Forepumps of the Orbitrap Exploris 480 MS

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

The vacuum hose of the source vacuum pump has an inner diameter of 38 mm (1 ½ 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 of the auxiliary forepump has an inner diameter of 19 mm (¾ in.). Connect the vacuum hose of the auxiliary forepump to the small vacuum port at the left side of the MS. Both vacuum hoses have a length of 2.0 m (79 in.). They are made of reinforced material. Because of its large bending radius, the actual length of a vacuum hose is significantly shorter.

Connect the exhaust hoses of the forepumps to the exhaust system of the laboratory. Use the T-piece that is shipped with the instrument to join the exhaust lines of both forepumps. See [page 6-2](#).

Both forepumps are switched on and off by a y-cable. Connect the switch cable for the pumps to the port on the control panel at the right side of the MS. Connect the power supply cords of the forepumps to separate wall outlets. See [page 4-8](#).

NOTICE

The auxiliary forepump has a voltage selector switch. Make sure that you have set the correct voltage (115 V or 230 V) before you connect the forepump's power supply cord to the wall outlet.

Option: Dry Pumps

Thermo Fisher Scientific provides dry pumps as alternative to the standard forepumps. The dry pumps have these advantages:

- Lower power consumption
- Less air conditioning needed
- Less acoustic noise
- Smaller footprint
- No regular oil exchange (maintenance every four years by the manufacturers)

Table 2-5 shows the correct dry pump for each Orbitrap Exploris Series mass spectrometer. The dry pump for the Orbitrap Exploris 480 MS has two vacuum ports and replaces both forepumps for the MS.

Table 2-5. Dry pumps for Orbitrap Exploris Series MS

Instrument	Dry Pumps Model
Orbitrap Exploris 120 MS	Leybold ECODRY 65 plus
Orbitrap Exploris 240 MS	
Orbitrap Exploris 480 MS	Edwards nXL110iD

Because of the lower noise level, the dry pumps are shipped without noise reductions covers. The tables 2-6 and 2-7 show important properties of the dry pumps.

Table 2-6. Space and load requirements of dry pumps

Dry Pump	Noise Level	Height		Width		Length		Weight	
	dB(A)	mm	in.	mm	in.	mm	in.	kg	lb
Leybold ECODRY 65 plus	52	287	11 ⁵ / ₁₆	320	12 ⁵ / ₈	600	23 ⁵ / ₈	43	95
Edwards nXL110iD	57	344	13 ⁹ / ₁₆	308	12 ¹ / ₈	654	25 ³ / ₄	78	172

CAUTION

Heavy Object. Use suitable lifting equipment when you move a pump during the installation. For detailed instructions (maximum tilt angle, for example), refer to the manufacturer's documentation that is shipped with the pumps.

Table 2-7. Electrical data of dry pumps

Leybold ECODRY 65 plus		
Nominal voltage	120 V AC	200-240 V AC
Frequency	60 Hz	50/60 Hz
Phases	Single	
Rated current	15 A	10 A
Rated power	1200 VA	
Fuse	15 A (slow blow)	16 A (slow blow)

Table 2-7. Electrical data of dry pumps, continued

Edwards nXL110iD	
Nominal voltage	200–230 V AC, 50/60 Hz, single phase
Input current	8.5 A
Fuse	15/16 A (tripping characteristic C)

Operating Environment

Attention to the operating environment will ensure 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.

Tip You are responsible for providing an acceptable operating environment.

Contents

- [Temperature](#) on [page 3-2](#)
- [Humidity](#) on [page 3-3](#)
- [Lighting](#) on [page 3-3](#)
- [Altitude](#) on [page 3-3](#)
- [Particulate Matter](#) on [page 3-4](#)
- [Vibration](#) on [page 3-4](#)
- [Radio Frequencies](#) on [page 3-4](#)
- [Electrostatic Discharge](#) on [page 3-5](#)

Temperature

The laboratory room temperature must be maintained between 18 and 27 °C (64 and 81 °F).

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 Series LC/MS Systems

The air conditioning load for a typical Orbitrap Exploris Series LC/MS system (with data system, a typical LC, and two forepumps) is approximately 4.5 kW (15 400 BTU/h). Refer to your LC manual for the heat output of your LC equipment. [Table 3-1](#) shows the approximate heat output of each module.

Table 3-1. Heat output for a typical Orbitrap Exploris Series LC/MS system

Module	Heat output [W]	Heat output [BTU/h]
Mass spectrometer	750	2560
Liquid chromatograph	1 080 ^a	3 690 ^a
Source vacuum pump	1 500	5 120
Auxiliary forepump ^b	300	1 020
Data system modules (mini-tower computer, and monitor)	890 ^a	3 030 ^a
Total (LC/MS system with forepump)	4 520	15 420

^a Approximate. The actual value depends on your equipment.

^b In case of an Orbitrap Exploris 480 MS.

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.

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 Series 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.

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.

Altitude

The Orbitrap Exploris Series 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, LC or printer) is suitable for the intended altitude, refer to the peripheral's manual or contact Thermo Fisher Scientific.

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 $5 \mu\text{m}$.

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.

NOTICE

Dust is most critical when you perform instrument maintenance. The best is to keep the instrument under vacuum and the source housing mounted with the automatic source background flow activated.

Open the instrument only when you have to perform maintenance in the instrument. Otherwise, keep the instrument closed.

Vibration

Floors must be free of vibration that is caused, for example, by equipment in adjoining locations.

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.

Radio Frequencies

Orbitrap Exploris Series 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 Series 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.

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 4000 V (air discharge) and 4000 V (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 you operate 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.

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 Series LC/MS 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](#)
- [Quality of Power](#) on [page 4-11](#)

Basic Power Requirements for Orbitrap Exploris Series LC/MS Systems

A Orbitrap Exploris Series LC/MS system has the basic power requirements as shown in [Table 4-1](#). See the sample laboratory setup in [Table 4-3](#) 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 Series mass spectrometers is 25 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
Power	apparent power: 800 VA; effective power: 750 W
Fuse ^a	15/16 A (tripping characteristic C)
Source Vacuum Pump	
Nominal voltage	200–240 V AC, 50/60 Hz, single phase
Power	1.5 kW
Fuse ^a	15/16 A (tripping characteristic C)
Auxiliary Forepump ^b	
Nominal voltage	115 V or 230 V AC, 50/60 Hz, single phase
Power	0.25 kW (50 Hz) / 0.3 kW (60 Hz)
Fuse ^a	16 A (115 V) / 6 A (230 V), slow
Data System (Computer, Monitor, and Ethernet Switch) and LC	
Nominal voltage	100–240 V AC, 50/60 Hz, single phase
Fuse ^a	15/16 A
Syringe Pump and Switching Valves	
The Orbitrap Exploris Series mass spectrometer provides electric power for the syringe pump and the optional switching valve(s).	

^a dedicated wall outlet

^b In case of an Orbitrap Exploris 480 MS.

Power Supply

Orbitrap Exploris Series 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

The instrument is tested and certified for a line voltage between 208 V and 240 V. In some areas of the world, voltage sags during high use periods might decrease the working voltage. For nominal voltages below 208 V or for areas with working voltages below 187 V due to voltage sags, you must protect your instrument by using a suitable power conditioner or an 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.

Voltage Dependency of the Ion Source Heater

The heater of the ion source operates with line voltage. If the main supply voltage drops below its nominal value, the maximum temperature of the heater might not be available anymore. [Figure 4-1](#) shows the derating curve of the maximum vaporizer temperature in dependence of the line voltage and the operating conditions for the HESI source.

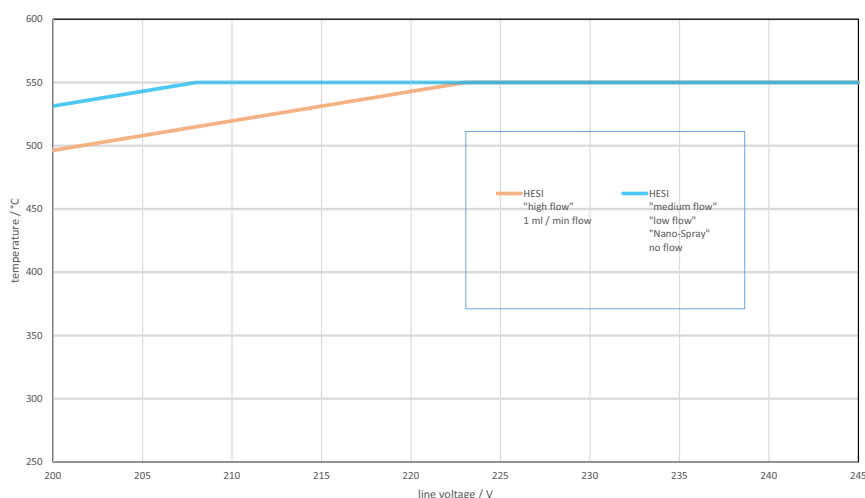


Figure 4-1. Maximum vaporizer temperature vs. line voltage

Power Cords

Thermo Fisher Scientific provides six power cords for the mass spectrometer, forepumps, data system, monitor, and Ethernet switch. They are approximately 2.5 m (8 ft) long. One power cord fits into a standard IEC 60320 C19 socket on the source vacuum pump. The other cords fit into standard IEC 60320 C13 sockets on the mass spectrometer and the other system components.

Tip The MS provides the electric power for the syringe pump. The MS can also supply the electric power for the Ethernet switch (compare [Figure 4-2.](#)). This allows positioning the Ethernet switch near the MS and the LC.

Depending on the location of your laboratory, various types of plugs may be required. [Table 4-2](#) gives an overview of the possible wall outlets. Note the part number of the corresponding country kit in the **Orbitrap Exploris Series Installation Request Form** at the beginning of this guide 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 4-2. Country kits for Orbitrap Exploris Series MS

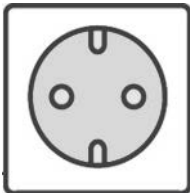
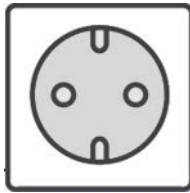
P/N	Designation	Socket for source vacuum pump (cord with C19 plug)	Socket for MS, auxiliary forepump ^a , PC, monitor, and Ethernet switch (cords with C13 plug)	Qty.
BRE0016334	Country Kit Continental Europe, Type A (Afghanistan, Algeria, Angola, Armenia, Austria, Azores [Portugal], Belarus, Belgium, 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)			1+5
		CEE 7 plug	CEE 7 plug	

Table 4-2. Country kits for Orbitrap Exploris Series MS, continued

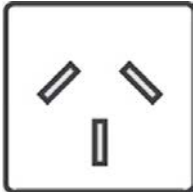
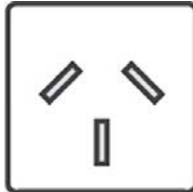
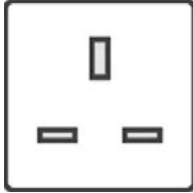
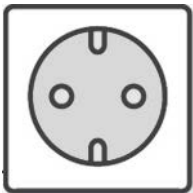
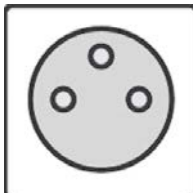
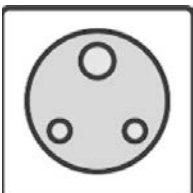
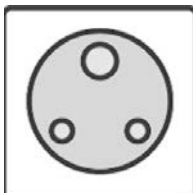
P/N	Designation	Socket for source vacuum pump (cord with C19 plug)	Socket for MS, auxiliary forepump ^a , PC, monitor, and Ethernet switch (cords with C13 plug)	Qty.
BRE0017109	Country Kit Australia/New Zealand, Type C (American Samoa, Australia, Christmas Is. [Austral.], Cocos Is. [Austral.], Cook Is. [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
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

Table 4-2. Country kits for Orbitrap Exploris Series MS, continued

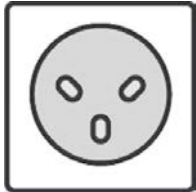
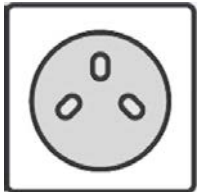
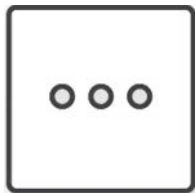
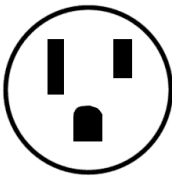
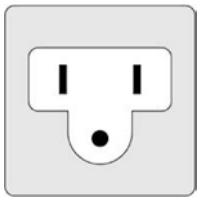
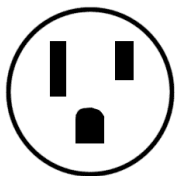
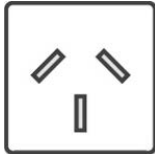
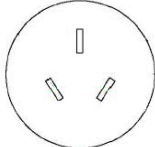
P/N	Designation	Socket for source vacuum pump (cord with C19 plug)	Socket for MS, auxiliary forepump ^a , PC, monitor, and Ethernet switch (cords with C13 plug)	Qty.
BRE0017127	Country Kit Israel, Type H (Israel)			1+5
BRE0017129	Country Kit Italy, Type I (Italy)			1+5
BRE0017132	Country Kit Japan, Type J (Japan)			1+5
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) ^a One socket supplies the source vacuum pump, the other socket supplies the MS.			1+4
				1
BRE0017141	Country Kit Switzerland, Type L (Liechtenstein, Switzerland)			1+5
		SW2-16P	SEV 1011: 2009	

Table 4-2. Country kits for Orbitrap Exploris Series MS, continued

P/N	Designation	Socket for source vacuum pump (cord with C19 plug)	Socket for MS, auxiliary forepump ^a , PC, monitor, and Ethernet switch (cords with C13 plug)	Qty.
BRE0017143	Country Kit Brazil, Type O (Brazil)	 NBR 14136 (BR3-20P)	 NBR 14136 (BR3-20P)	1+5
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

^a In case of an Orbitrap Exploris 480 MS.

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 power line and 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 4-2 shows a block diagram of the line power connections for the components of the Orbitrap Exploris Series LC/MS system.

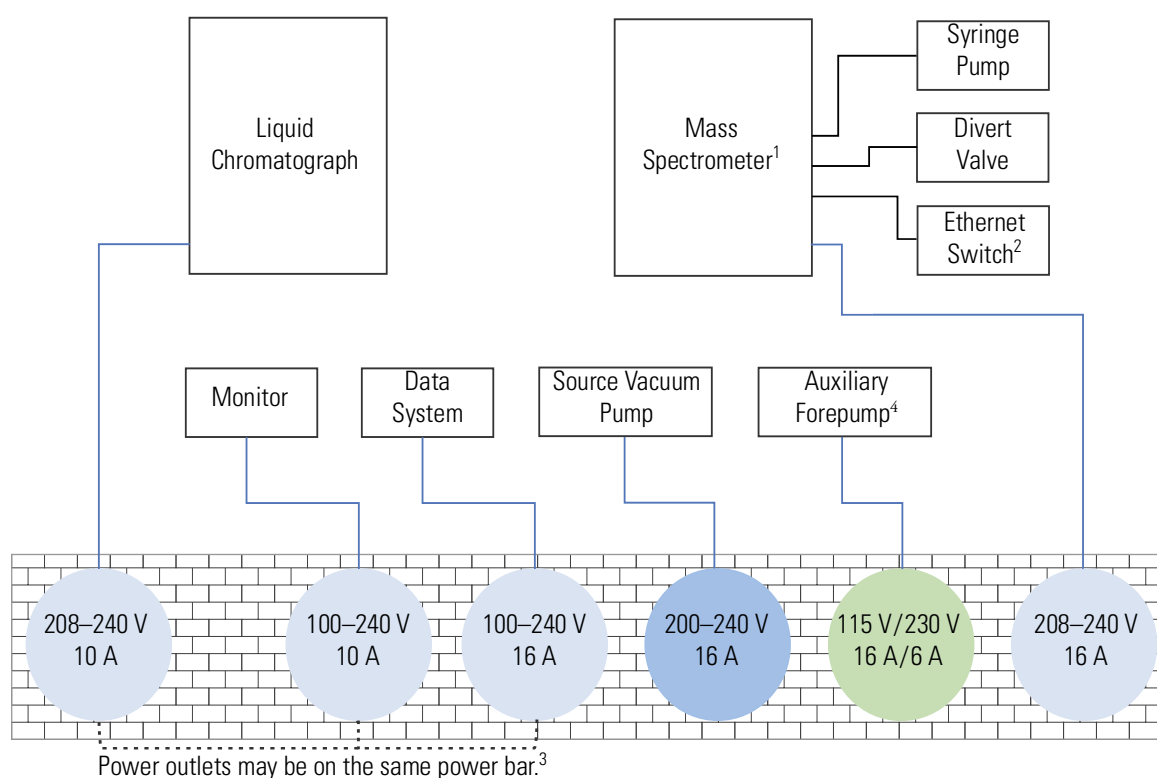


Figure 4-2. Line power installation

NOTICE

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

¹ Four outlets for secondary consumers are available on the MS. The total maximum current of the secondary consumers must not exceed 3 A.

² Or, connect the Ethernet switch to a wall outlet with a power cord that is shipped with the instrument.

³ A power bar is not part of the standard system. You have to provide it.

⁴ In case of an Orbitrap Exploris 480 MS.

Placing the Power Outlets

Place the outlets for the MS system, forepumps, and LC system behind the MS workbench. Place the outlets for the data system—computer, monitor, Ethernet switch, and (optional) printer—behind the data system workbench.

For the liquid chromatograph, use wall outlets. Additional power outlets might be required for test and cleaning equipment, such as an oscilloscope and ultrasonic bath. See [Table 4-3](#) 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 LC/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 4-3](#) for the recommended number of outlets.

Table 4-3. Sample laboratory setup

	Item	Outlets
LC system	Autosampler	1
	LC pump	1
	UV/Vis or PDA detector (optional)	1
	Column heater (optional)	1
	External controller (optional)	1
MS system	Mass spectrometer	1 (208–240 V AC)
	Source vacuum pump	1 (200–240 V AC)
	Auxiliary forepump ^a	1 (115 V or 230 V AC)
	Syringe pump	— ^b
Data System	Data system computer	1
	Monitor	1
	Printer (optional)	1
	Ethernet switch	1

Line Power

Connecting the Mass Spectrometer and the Modules to Wall Outlets

Table 4-3. Sample laboratory setup, continued

	Item	Outlets
Optional	High intensity lamp (for help in instrument maintenance)	1
	Laboratory stereoscope (for inspecting fused-silica parts)	1
	Nitrogen generator	1
	Switching valve(s)	— ^b
Total outlets required for this configuration		7–14

^a In case of an Orbitrap Exploris 480 MS.

^b Power is supplied by the MS.

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 4-1](#) on [page 4-2](#) as guideline for dimensioning a UPS.

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 μ s and 2 s.
- *Transients* (or impulses) are brief voltage excursions of up to several thousand volts with durations of less than 50 μ s.

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. Use power monitoring and conditioning devices to ensure stable performance of the instrument.

Contact your local Thermo Fisher Scientific representative. See “[Technical Assistance](#)” on [page 4-12](#) 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.

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.

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 try 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.

Consumables

Your instrument requires gases and solvents 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

- [Nitrogen Gas](#) on [page 5-2](#)
- [Solvent Recommendations](#) on [page 5-5](#)
- [Cleaning Agents](#) on [page 5-6](#)

Nitrogen Gas

Orbitrap Exploris Series instruments require nitrogen gas for the API sheath gas, API auxiliary/sweep gas, 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

Your laboratory gas supply may provide nitrogen also for other consumers or peripherals. In this case, make sure that the supply for the Orbitrap Exploris Series MS always meets the requirements for pressure, purity, and stability described in this topic.

Your system can use large amounts of gas during daily operations. 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](#) and [Table 5-2](#).

NOTICE

Contaminants that are introduced during the installation of house lines used for gas delivery can cause damage to the system. Make sure that all gas lines that are used with your system have been cleaned of all particulates and oils. You are responsible for any damage to the instrument that is caused by contaminants introduced from your gas delivery system. Because particulate filters can be a source of contamination, we do not recommend their use.

Table 5-1. Nitrogen supply requirements

Gas type	Pressure	Purity	Tubing OD	Maximum Flow	Consumption
Source gas	0.6 ± 0.05 MPa	99%	6 mm	45 L/min	65 000 L/day
HCD collision gas		99.999%	1/16 in.	0.03 L/min ^a	40 L/day

The use of ultra-high purity nitrogen (UHP, 99.999%) for HCD collision gas (and C-Trap bath gas) is mandatory.

^a If the Internal Calibration option is installed, the consumption of HCD collision gas increases up to 65 sccm (≈ 0.07 L/min). Refer to the *Orbitrap Exploris Series Operating Manual*.

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 Series MS.

You can supply the nitrogen for your instrument from one source (single supply) or two sources (dual supply). See [Table 5-3](#) for an overview. Make sure that the maximum flow rate of the nitrogen source of your choice matches the requirements of your applications.

Table 5-2. Typical nitrogen consumption of LC/MS applications

Application	LC Flow Rate (approximate)	Source Settings [psi]	Consumption [L/min] Source gas	HCD collision gas
Nano-Spray		sheath gas = 0, aux gas = 0, sweep gas = 0	0	
Low flow	5 µL/min	sheath gas = 5, aux gas = 0, sweep gas = 0	7	0.03 ^a
Medium flow	200 µL/min	sheath gas = 35, aux gas = 10, sweep gas = 0	15	
High flow	1 mL/min	sheath gas = 60, aux gas = 20, sweep gas = 5	28	

Nitrogen Consumption during a Calibration^b

- Mass calibration (duration about 1 minute): about 200 L.
- Full system calibration (duration about 2 hours): about 1000 L.

^a See footnote in Table 5-1.^b Low-flow settings are used (source gas consumption: 7 L/min). Values include 30 minutes to ensure a stable spray and refer to ambient pressure.**Table 5-3.** Gas supply properties for single supply and dual supply

Supply Type	Nitrogen Purity		Nitrogen Source (Examples)
Single Supply	>99.999% purity (<0.001% oxygen content)		LN2 evaporator, cylinder bundle, PSA nitrogen generator
Dual Supply	Collision gas:	>99.999% purity (5.0)	LN2 evaporator, cylinder bundle, PSA nitrogen generator
		Required: >95% (<5% oxygen content)	Membrane nitrogen generator
	Source gases:	Recommended: >99% (<0.5% oxygen content)	LN2 evaporator, cylinder bundle, PSA nitrogen generator

Fittings and Parts

Table 5-4 lists the minimum parts that are required to connect the mass spectrometer to your gas delivery system. If you wish to use UHP nitrogen exclusively for HCD collision gas, you must supply a sufficient length of 1/16 in. OD stainless steel tubing and corresponding fittings.

Table 5-4. Gas connection hardware required

Description	Provided / Not provided
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.

Consumables

Nitrogen Gas

Tip 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 a 1/8 inch NPT outlet, examples of suitable 1/8-in.-to-6-mm adapters are Swagelok™ part numbers B-6M0-7-2 (female) and B-6M0-1-2 (male).

Solvent Recommendations

Installation of the instrument requires LC/MS grade methanol and water. Solvent modifiers might also be required during the installation of some systems. The following solvents are useful in operating and maintaining your instrument:

- Methanol
- Acetonitrile
- Water
- Isopropanol
- Acetic acid (modifier)
- Formic acid (modifier)
- Trifluoro acetic acid (modifier)

Some solvent impurities are transparent to UV/VIS detectors. Therefore, some LC/MS grade solvents might contain contaminants that interfere with the performance of the mass spectrometer. To operate your instrument, choose high purity solvents with minimum contamination.

You can order LC/MS grade consumables from Thermo Fisher Scientific, which are sold under its Fisher Scientific brand. Visit www.fishersci.com. Use only Optima™ LC/MS grade chemicals for operating your system.



By law, producers and suppliers of chemical compounds are required to provide their customers with the most current health and safety information in the form of Material Safety Data Sheets (MSDSs) or Safety Data Sheets (SDSs). The MSDSs and SDSs must be freely available to lab personnel to examine at any time. These data sheets describe the chemicals and summarize information on the hazard and toxicity of specific chemical compounds. They also provide information on the proper handling of compounds, first aid for accidental exposure, and procedures to remedy spills or leaks.

Read the MSDS or SDS for each chemical you use. Store and handle all chemicals in accordance with standard safety procedures. Always wear protective gloves and safety glasses when you use solvents or corrosives. Also, contain waste streams, use proper ventilation, and dispose of all laboratory reagents according to the directions in the MSDS or SDS.

NOTICE

Do not filter solvents. Filtering solvents can introduce contamination.

Cleaning Agents

We recommend that you have the following agents for cleaning surfaces and equipment available:

- A solvent like isopropanol (in accordance with your local safety practices).
- A detergent, for example, Liquinox™.
- Several liters of distilled water.

NOTICE

Prevent any liquids from entering the inside of the instrument. Leaking liquids might get into contact with electronic components and cause a short circuit.

Exhaust and Waste

The proper performance of your system can be affected by the waste and exhaust arrangements for the instrument. The vacuum waste and the solvent waste must be vented separately, and the wastes must be collected and disposed of properly.

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

Contents

- [Exhaust System](#) on [page 6-2](#)
- [Solvent Waste](#) on [page 6-3](#)
- [Ventilation](#) on [page 6-4](#)

Exhaust System

You must connect each 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.

NOTICE

An efficient fume exhaust system is required for the proper operation of your forepump. Most API applications contribute to the accumulation of solvents in the forepump. These solvents must be purged from the mechanical pump oil periodically by opening the ballast valve. When the ballast valve is opened, a large volume of volatile solvent waste might enter the fume exhaust system. Therefore, your fume exhaust system must be able to accommodate the periodic purging of the solvents. The frequency of the purging is dependent on the throughput of your system.

The forepumps (also referred to as a mechanical, rotary-vane, roughing, or backing pump) provide a vacuum for the API source and backing pressure for the turbomolecular pump in the Orbitrap Exploris Series system. The Orbitrap Exploris 480 MS is shipped with a high-throughput source vacuum pump and a low-throughput auxiliary forepump. All other instruments are shipped with one large forepump.

Connect the exhaust port of each forepump to an exhaust gas line that leads out of the building or to an exhaust system. The inner diameter of the pipe should be at least 25 mm (1 in.). For each forepump, an exhaust hose for connecting it to the exhaust system comes with the system. It has dimensions of 13 mm ($\frac{1}{2}$ in.) ID and 20 mm ($\frac{25}{32}$ in.) OD and is 5 m (16 ft) long. For the Orbitrap Exploris 480 MS, a T-piece to join the exhaust lines of both forepumps is shipped with the instrument.

Table 6-1. Forepumps fume exhaust requirements

Parameter	Requirement
Initial inrush flow rate	10 L/min (21.2 ft ³ /h)
Continuous flow rate	7 L/min (14.8 ft ³ /h)

NOTICE

Do not vent the drain tubing (or any vent tubing connected to the waste container) to the same fume exhaust system to which you have connected the forepumps.

The maximum length for the exhaust hose of the forepumps is 10 m. Do not route the exhaust tubing from the pump vertically toward the ceiling. To maintain the pump integrity, route the tubing from the exhaust port down to the floor.

The exhaust hose should travel at floor level for a minimum of two meters (78½ 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.

Solvent Waste

The mass spectrometer comes with parts to collect the solvent waste from the API source. Because the API source can accommodate high flow rates, you must use a method of collecting the waste solvent that avoids pressure buildup in the source. The solvent drain/waste exhaust port is at the left side of the instrument.

NOTICE

Always operate the API source with the drain tubing assembly mounted to the instrument. The drain tubing must lead to a waste container that is connected to a dedicated fume exhaust system. The exhaust system for the API source must accommodate a flow rate of up to 45 L/min (95 ft³/h).

Do not vent the drain tubing (or any vent tubing connected to the waste container) to the same fume exhaust system to which you have connected the forepumps.

To prevent the laboratory from being accidentally contaminated by solvent waste, protect the waste container against overturning.

Use these guidelines for the API source drain:

- Use the provided Tygon™ tubing to connect the solvent waste container to the instrument.
- Use the provided black spiral tubing to connect the waste container to the exhaust system. Make sure that your lab exhaust system can accommodate this tubing (1 in. ID, 1 ¼ in. OD) without using reducing connectors along the solvent waste path.
- To prevent solvent waste from backing up into the mass spectrometer, make sure that all tubing is above the level of liquid in the waste container as follows:
 - From the mass spectrometer to the solvent waste container.
 - From the solvent waste container to the exhaust system.

Tip The cap adaptor insert of the solvent waste container has a small vent. If the exhaust port of the laboratory is always at negative pressure, Thermo Fisher Scientific recommends that you remove the cap that covers the vent. This makes the atmosphere in the solvent waste container independent of the fume exhaust system.

For additional information, refer to the *Orbitrap Exploris Series Operating Manual*.

Ventilation

A significant amount of the gas that is introduced into the API source can potentially escape into the laboratory atmosphere. Therefore, provide for good air exchange to prevent accumulation of source gas in the laboratory.

Installation

Before the 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, call your Thermo Fisher Scientific representative to arrange for an installation date.

Contents

- [Instrument Arrival](#) on [page 7-2](#)
- [Installation](#) on [page 7-3](#)
- [Advanced Training Courses](#) on [page 7-5](#)
- [Preventive Maintenance](#) on [page 7-5](#)

Instrument Arrival

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.

Equipment Needed for Installation

The mass spectrometer requires a syringe pump for delivering sample solution from a syringe into the API ion source. A suitable syringe pump is shipped with the mass spectrometer. Place the syringe pump next to the API source in the accessories cabinet of the mass spectrometer.

Calibration Solution

The chemicals that are needed for the installation of the instrument do not come with the mass spectrometer. They are shipped separately as part of the Preinstallation Kit.

The Thermo Scientific™ Pierce™ FlexMix™ Calibration Solution is a mixture of 16 highly pure, ionizable components (mass ranges: 40 to 3000 m/z) that is designed for both positive and negative ionization calibration with the Instrument Control Software for the Orbitrap Exploris Series MS and other Thermo Scientific instruments that are powered by Orbitrap™ technology.

The Pierce FlexMix Calibration Solution features include:

- Ready-to-use—reference standard may be directly loaded into a syringe and injected into the instrument
- Stable—store at room temperature for up to 18 months

The stable solution is provided in a leak-proof, high-purity PTFE bottle.

Table 7-1. Available calibration solution packages

Product Name	Unit Size	Product Number
Pierce™ FlexMix™ Calibration Solution	10 mL	A39239

You can order the calibration solution from www.thermofisher.com or www.fishersci.com. The calibration solution is shipped at ambient temperature. Keep it in a dry, cool and well-ventilated place. Keep it in properly labeled containers. Store it in accordance with local regulations.

CAUTION

Hazardous Chemicals. Samples and solvents might contain toxic, carcinogenic, mutagenic, or corrosive/irritant chemicals. Avoid exposure to potentially harmful materials. Always wear protective clothing, gloves, and safety glasses when you handle solvents or samples. Also contain waste streams and use proper ventilation. Refer to your supplier's Material Safety Data Sheet (MSDS) for proper handling of a particular solvent.

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 time 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, contact the following address or your local Thermo Fisher Scientific representative:

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.

Installation

Preventive Maintenance

Legal Documents

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- [FCC Compliance Statement](#) on page A-2
- [WEEE Compliance](#) on page A-3
- [EU REACH Statement](#) on page A-4

FCC Compliance Statement

This equipment has been tested and found to comply with the limits for a Class B 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 required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2012/19/EU. It is marked with the following symbol:



Thermo Fisher Scientific is registered with B2B Compliance (B2Bcompliance.org.uk) in the UK and with the European Recycling Platform (ERP-recycling.org) in all other countries of the European Union and in Norway.

If this product is located in Europe and you want to participate in the Thermo Fisher Scientific Business-to-Business (B2B) Recycling Program, send an email request to weee.recycle@thermofisher.com with the following information:

- WEEE product class
- Name of the manufacturer or distributor (where you purchased the product)
- Number of product pieces, and the estimated total weight and volume
- Pick-up address and contact person (include contact information)
- Appropriate pick-up time
- Declaration of decontamination, stating that all hazardous fluids or material have been removed from the product



This recycling program is not for biological hazard products or for products that have been medically contaminated. You must treat these types of products as biohazard waste and dispose of them in accordance with your local regulations.

EU REACH Statement

The European Commission promulgated legislation that covers the registration, evaluation, authorization and restriction of chemicals within the European Union community under (EC) No 1907/2006. This regulation is commonly known as REACH. Thermo Fisher Scientific is committed to meeting all compliance obligations under REACH. As per Article 33 of the Regulation, this product may include items which contain more than 0.1% by weight of some SVHC Candidate Substance. Some electronic parts and copper alloys can contain lead.



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