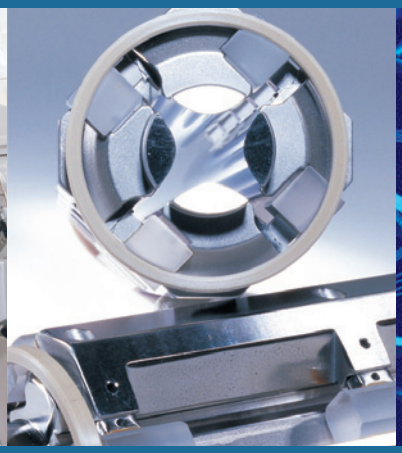
Thermo Fisher Scientific

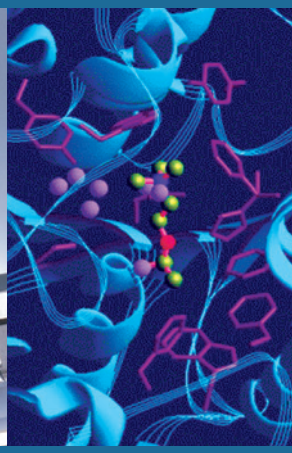
Exactive™ Series

Exactive™ and Q Exactive™

Preinstallation Requirements Guide

Revision A - 1288110





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Exactive Series Installation Request Form

Please refer to the Exactive Series Preinstallation Requirements Guide (P/N 1288110, Revision A) for the complete site requirements. Circle "Yes" or "No" as to whether the site meets the requirements as specified in the Preinstallation Guide. Provide the additional information where requested.

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? See "Space and Load Requirements" on page 2-4.

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. See "Key Operator" on page 8-5. The person with the authority to accept the instrument at the end of the installation will also be available to sign the required acceptance document?
Please provide the names of these individuals: _____

4: **Yes** **No** The entrance to the laboratory and the route from the loading dock are at least 90 cm (36 in.) wide with additional space at corners? See "Entrance Requirements" on page 2-2.

5: **Yes** **No** Sufficient bench space is available for all of the equipment? List the following:
Width: _____, Depth: _____, Height: _____

6: **Yes** **No** Workbench can support the load of the system including optional equipment and is free from vibration? See "Space and Load Requirements" on page 2-4.

7: **Yes** **No** Lighting is adequate?

8: **Yes** **No** Floor vibrations and electromagnetic interferences are below the specified levels? See "Vibration" on page 3-4.

9: **Yes** **No** Main power is installed and in compliance with local electrical codes?

10: **Yes** **No** The power outlets are of the correct configuration? See "Available Outlets" on page 4-2.

11: **Yes** **No** The electrical power has been measured?
Please note voltages: _____ Volts ac input to ground.
Please note voltages: _____ Volts neutral to ground.
Please note voltages: _____ Volts ac input to neutral.

12: **Yes** **No** Power is free from fluctuations due to slow changes in the average voltage or changes due to surges, sags, or transients?

13: **Yes** **No** Air conditioning is adequate for temperature, humidity, and particulate matter control? The laboratory can be maintained at a constant temperature, between 15 and 26 °C (59 and 78 °F)? See "Temperature" on page 3-2.

14: **Yes** **No** The relative humidity is between 40% and 70%, with no condensation? See "Humidity" on page 3-4.

15: **Yes** **No** The system work area is free from magnetic disruption and electrostatic discharge? See "Electrostatic Discharge" on page 3-6.

16: **Yes** **No** All gases required are on site, gas lines are installed, and appropriate gas regulators are available? See "Gases" on page 5-3.
List gases and purity:_____

17: **Yes** **No** Is there is 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. See "Exhaust System" on page 6-2.

18: **Yes** **No** Provision has been made for collecting solvent waste from the API source?

19: **Yes** **No** There is a functional telephone close to 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? See "Preparing the Installation" on page 8-2.

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 Exactive 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: _____

Fax to: Attn: Local Service Engineer

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

Offices for Thermo Scientific Products

United States

Fax.....+1 561 688 8731
E-mail ...us.customer-support.analyze@thermofisher.com

Canada

2845 Argentia Road, Unit 4
Mississauga, Ontario
L5N 8G6
Phone....+1 800 530 8447
Fax.....+1 905 890 5775
E-mail ...analyze.ca@thermofisher.com

Europe

Austria

Wehlistrasse 27b
1200 Wien
Phone....+43 1 333 50340
Fax.....+43 1 333 503426
E-mail ...analyze.au@thermofisher.com

Belgium

Z3 Doornveld 172
1731 Zellik
Phone....+32 2 482 30 30
Fax.....+32 2 482 30 31
E-mail ...analyze.be@thermofisher.com

Denmark

Fruebjergvej 3
2100 København
Phone....+45 2 70 23 62 60
Fax.....+45 2 70 23 62 63
E-mail ...analyze.dk@thermofisher.com

France

(also representing French speaking N. Africa, Algeria, Morocco, and Tunisia)

16 Avenue du Québec
Silic 765
Z.A. de Courtaboeuf
91963 Les Ulis Cédex, France
Phone....+33 1 60 92 48 00
Fax.....+33 1 60 92 49 00
E-mail ...analyze.fr@thermofisher.com

Germany

Im Steingrund 4–6
63303 Dreieich, Germany
Phone.... +49 6103 408 1050
Fax ..... +49 6103 408 1213
E-mail ... analyze.de@thermofisher.com

Italy

Strada Rivoltana
20090 Rodano (Milano)
Phone....Numero Verde 800823162
Fax .....+39 2 950 59 225

Netherlands

Takkebijsters 1
4817 BL Breda, Netherlands
Nederland
Phone.... +31 76 579 55 55
Fax ..... +31 76 571 41 71
E-mail ... analyze.nl@thermofisher.com

Spain

Valportillo I, 22 1a Planta, Edificio Caoba
ES-28108 Alcobendas (Madrid)
Phone.... +34 914 845 965
Fax ..... +34 914 843 598
E-mail ... analyze.es@thermofisher.com

Spain

Acer 30-32
Edificio Sertram – Planta 2, Modulo 3
ES-08038 (Barcelona)
Phone.... +34 93 223 0918
Fax ..... +34 93 223 0982
E-mail ... analyze.es@thermofisher.com

Sweden, Norway, and Finland

Pyramidbacken 3
SE-141 75 Kungens Kurva (Stockholm)
Phone.... +46 8 556 468 00
Fax ..... +46 8 556 468 08
E-mail ... analyze.se@thermofisher.com

Switzerland

Neuhofstrasse 11
4153 Reinach
Phone.... +41 61716 77 00
Fax ..... +41 61716 77 20
E-mail ... analyze.ch@thermofisher.com

Offices for Thermo Scientific Products—Continued

Europe - Continued

United Kingdom

Stafford House
1 Boundary Park
Boundary Way
Hemel Hempstead
Hertfordshire HP2 7GE
Phone ....+44 1442 233 555
Fax.....+44 1442 233 667
E-mail ...analyze.uk@thermofisher.com

Other Europe, Middle East, and Africa

Wehlistrasse 27b
A-1200 Wien
Phone ....+43 1 333 50 34 0
Fax.....+43 1 333 50 34 26
E-mail ...analyze.au@thermofisher.com

Australia and Asia

Australia

P.O. Box 239 Rydalmere
Unit 14, 38 - 46 South Street
Rydalmere, N.S.W. 2116
Phone.... +61 2 8844 9500
Fax ..... +61 2 8844 9599
E-mail ... analyze.au@thermofisher.com

Japan

C-2F 3-9 Moriya-cho, Kanagawa-ku
Yokohama, Kanagawa 221-0022
Phone.... +81 45 453 9197
Fax ..... +81 45 453 9235
E-mail ... analyze.jp@thermofisher.com

Japan

6F, Ryokuchi-eki Building
2-4-1 Terauchi, Toyonaka City
Osaka 561-0872
Phone.... +81 6 6863-1551
Fax ..... +81 6 6863-1096
E-mail ... analyze.jp@thermofisher.com

P.R. China

Rm. 702-715, 7F Tower West, Younghe Plaza
No. 28, Andingmen East Street
Beijing 100007
Phone.... 800 810 5118, 400 650 5118 (Free lines)
Fax ..... +86 10 88370548
E-mail ... analyze.cn@thermofisher.com

P.R. China

Building 6
No. 27 Xin Jin Qiao Road
Shanghai 201206m
Phone.... 800 810 5118, 400 650 5118 (Free lines)
Fax ..... +86 21 64457830
E-mail ... analyze.cn@thermofisher.com

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WEEE Compliance

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC. It is marked with the following symbol:

Thermo Fisher Scientific has contracted with one or more recycling/disposal companies in each EU Member State, and this product should be disposed of or recycled through them. Further information on Thermo Fisher Scientific's compliance with these Directives, the recyclers in your country, and information on Thermo Fisher Scientific products which may assist the detection of substances subject to the RoHS Directive are available at www.thermo.com/WEEERoHS.

WEEE Konformität

Dieses Produkt muss die EU Waste Electrical & Electronic Equipment (WEEE) Richtlinie 2002/96/EC erfüllen. Das Produkt ist durch folgendes Symbol gekennzeichnet:

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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.

Read This First

Welcome to the Thermo Scientific Exactive™ Series system! Exactive™ and Q Exactive™ are members of the Thermo Scientific family of mass spectrometer (MS) detectors that are powered by Orbitrap™ technology.

Thermo Scientific Exactive Series instruments are designed to be placed on a bench in the laboratory and comprise the following mass spectrometers:

- The Exactive, an instrument with an API source for LCMS high throughput applications.
- The Q Exactive, an instrument with an API source with S-lens ion optics technology, a quadrupole mass filter for precursor ion selection, and a collision cell for performing MS/MS experiments.

About This Guide

This *Exactive Series Preinstallation 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.

Who Uses This Guide

This *Exactive Series Preinstallation 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 Exactive Series instrument. This guide should be retained for future guidance if your instrument needs to be relocated in future.

Scope of This Guide

The *Exactive Series Preinstallation Requirements Guide* includes the following chapters:

- Chapter 1: “Introduction” describes the purchaser’s responsibilities for installation and maintenance of the system.
- Chapter 2: “Site Preparation” gives details on the physical, electrical, gas, and air conditioning requirements and other laboratory requirements for mass spectrometer and data system.

- Chapter 3: "Operating Environment" provides additional information about how to prepare your laboratory to provide optimum conditions for instrument operation.
- Chapter 4: "Line Power" gives details on the electrical outlets, power conditioning devices and power supplies required to properly install your system.
- Chapter 5: "Consumables" provides information on the gases and other consumables required to install and operate your system.
- Chapter 6: "Exhaust and Waste" describes how to properly ventilate the laboratory for safe operation of the instrument.
- Chapter 7: "Instrument Arrival" provides information on insurance claims and on domestic and international shipments.
- Chapter 8: "Installation" provides details on the final preparations necessary before the arrival of the Thermo Fisher Scientific field service engineer for installation of the system.

Related Documentation

In addition to this guide, Thermo Fisher Scientific provides the following documents for Exactive Series systems:

- *Exactive Operating Manual* or *Q Exactive Operating Manual*
- *Exactive Software Manual* or *Q Exactive Software Manual*
- *Exactive QuickStart Guide* or *Q Exactive QuickStart Guide*
- *Ion Max and Ion Max-S API Source Hardware Manual*
- *HESI-II Probe User Guide*

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

Contacting Us

There are several ways to contact Thermo Fisher Scientific.

Assistance

For technical support and ordering information, **visit us on the Web**:

www.thermoscientific.com/ms

Customer Information Service

cis.thermo-bremen.com is the Customer Information Service site aimed at providing instant access to

- latest software updates
- manuals, application reports, and brochures.

Note Thermo Fisher Scientific recommends that you register with the site as early as possible. ▲

To register, visit register.thermo-bremen.com/form/cis and fill in the registration form. Once your registration has been finalized, you will receive confirmation by e-mail.

Changes to the Manual

❖ **To suggest changes to this manual**

- Please send your comments (in German or English) to:

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

  28199 Bremen

  Germany

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

  documentation.bremen@thermofisher.com

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

Typographical Conventions

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

Data Input

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

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

Topic Headings

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

Chapter 1 Chapter Name

Second Level Topics

Third Level Topics

Fourth Level Topics

Safety and EMC Information

In accordance with our commitment to customer service and safety, this instrument has satisfied the requirements for the European CE Mark including the Low Voltage Directive.

Designed, manufactured and tested in an ISO9001 registered facility, this instrument has been shipped to you from our manufacturing facility in a safe condition.

Read and understand the various precautionary notes, signs, and symbols contained inside this manual pertaining to the safe use and operation of this product before using the device.

Notice on Lifting and Handling of Thermo Scientific Instruments

For your safety, and in compliance with international regulations, the physical handling of this Thermo Scientific instrument *requires a team effort* for lifting and/or moving the instrument. This instrument is too heavy and/or bulky for one person alone to handle safely.

Notice on the Proper Use of Thermo Scientific Instruments

In compliance with international regulations: If this instrument is used in a manner not specified by Thermo Fisher Scientific, the protection provided by the instrument could be impaired.

Notice on the Susceptibility to Electromagnetic Transmissions

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

Safety and Special Notices

Make sure you follow the precautionary statements presented in this guide. The safety and other special notices appear different from the main flow of text. Safety and special notices include the following:

Warning Warnings highlight hazards to human beings. Each Warning is accompanied by a Warning symbol. ▲

Caution Cautions highlight information necessary to protect your instrument from damage. ▲

Note Notes highlight information that can affect the quality of your data. In addition, notes often contain information that you might need if you are having trouble. ▲

Identifying Safety Information

This guide contains precautionary statements that can prevent personal injury, instrument damage, and loss of data if properly followed. Warning symbols alert the user to check for hazardous conditions. These appear throughout the manual, where applicable. The most common warning symbols that appear in Thermo Fisher Scientific manuals are shown below.

In addition, every instrument has specific hazards. So, be sure to read and comply with all precautions described in this guide. They will help to ensure the safe and long-term use of your system.

Warning General Hazard. This general symbol indicates that a hazard is present that could result in injuries if it is not avoided. The source of danger is described in the accompanying text. ▲

Warning Electric Shock Hazard. High voltages capable of causing personal injury are used in the instrument. The instrument must be shut down and disconnected from line power before service is performed. Do not operate the instrument with the top cover off. Do not remove protective covers from PCBs. ▲

Warning Burn Hazard. Treat heated zones with respect. Parts of the instrument might be very hot and might cause severe burns if touched. Allow hot components to cool before servicing them. ▲

Warning Corrosive Material. Wear gloves when handling toxic, carcinogenic, mutagenic, or corrosive/irritant chemicals. Use approved containers and procedures for disposal of waste solution. ▲

General Safety Precautions

Observe the following safety precautions when you operate or perform service on your instrument:

- The system should be operated by trained personnel only. Read the manuals before starting the system and make sure that you are familiar to the warnings and safety precautions!
- Accurate results can be obtained only, if the system is in good condition and properly calibrated.

- Service by the customer should be performed by trained qualified personnel only and should be restricted to servicing mechanical parts! Service on electronical parts should be performed by Thermo Fisher Scientific field service engineers only!
- Before plugging in any of the instrument modules or turning on the power, always make sure that the voltage and fuses are set appropriately for your local line voltage.
- Only use fuses of the type and current rating specified. Do not use repaired fuses and do not short-circuit the fuse holder.
- The supplied power cord must be inserted into a power outlet with a protective earth contact (ground). When using an extension cord, make sure that the cord also has an earth contact.
- Do not change the external or internal grounding connections. Tampering with or disconnecting these connections could endanger you and/or damage the system.
- The instrument is properly grounded in accordance with regulations when shipped. You do not need to make any changes to the electrical connections or to the instrument's chassis to ensure safe operation.
- Never run the system without the housing on. Permanent damage can occur. When leaving the system, make sure that all protective covers and doors are properly connected and closed, and that heated areas are separated and marked to protect for unqualified personnel!
- Do not turn the instrument on if you suspect that it has incurred any kind of electrical damage. Instead, disconnect the power cord and contact a Thermo Fisher Scientific field service engineer for a product evaluation. Do not attempt to use the instrument until it has been evaluated. (Electrical damage may have occurred if the system shows visible signs of damage, or has been transported under severe stress.)
- Damage can also result if the instrument is stored for prolonged periods under unfavorable conditions (for example, subjected to heat, water, etc.).
- Always disconnect the power cord before attempting any type of maintenance.
- Capacitors inside the instrument may still be charged even if the instrument is turned off.
- Never try to repair or replace any component of the system that is not described in this manual without the assistance of your Thermo Fisher Scientific field service engineer.

- Do not place any objects—especially not containers with liquids—upon the instrument. Leaking liquids might get into contact with electronic components and cause a short circuit.

Safety Advice for Possible Contamination

Hazardous Material Might Contaminate Certain Parts of Your System During Analysis.

In order to protect our employees, we ask you to adhere to special precautions when returning parts for exchange or repair.

If hazardous materials have contaminated mass spectrometer parts, Thermo Fisher Scientific can only accept these parts for repair if they have been properly decontaminated. Materials, which due to their structure and the applied concentration might be toxic or which in publications are reported to be toxic, are regarded as hazardous. Materials that will generate synergetic hazardous effects in combination with other present materials are also considered hazardous.

Your signature on the Health and Safety Form confirms that the returned parts have been decontaminated and are free of hazardous materials. Download the form from decon.thermo-bremen.com or order it from the Thermo Fisher Scientific field service engineer.

Parts contaminated by radioisotopes should not be returned to Thermo Fisher Scientific—neither under warranty nor within the exchange part program. If unsure about parts of the system possibly being contaminated by hazardous material, please make sure the Thermo Fisher Scientific field service engineer is informed before the engineer starts working on the system.

Contents

Figures

Tables

Chapter 1 Introduction

Information in this guide will help you to prepare a suitable site for installation of your system. 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.

Note 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. ▲

For additional information, request specific preinstallation support directly through your local Thermo Fisher Scientific office.

Chapter 2 Site Preparation

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

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

More information on each of the requirements is available under the following topics:

- "Entrance Requirements" on page 2-2
- "Space and Load Requirements" on page 2-4
- "Telephone" on page 2-13

Entrance Requirements

This section lists data for packed units of typical Exactive Series systems. 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 the tables.

Note Some chemicals that are needed for installation will be shipped in a separate package. See "Calibration- and Test-Chemicals" on page 8-3 for details. ▲

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

If the entrance to your laboratory will not accommodate the container, you can remove the instrument from the container before moving it into the room. The *unpacked* instrument fits through a door with a minimum width of 80 cm (32 in.). Consider that four persons are required to carry the instrument who require considerable space for maneuvering. See "Moving the Instrument" on page 2-9. Therefore, Thermo Fisher Scientific recommends using a pallet jack when passing the unpacked instrument through a narrow door.

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

Shipping Containers of Exactive Systems

Your Exactive instrument is shipped in a container, the smallest dimension of which is 89 cm (35 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 90 cm (36 in.). The basic unit is shipped in a container with the following dimensions: *h* 117 cm (46 in.), *w* 89 cm (35 in.), *l* 132 cm (52 in.). The container and its contents weigh approximately 222 kg (490 lb). Dimensions and weights of the shipping containers for Exactive LC/MS systems are given in Table 2-1.

Table 2-1. Data of packed units of a typical Exactive system

Module	Height		Width		Length		Weight	
	cm	in.	cm	in.	cm	in.	kg	lb
Basic unit	117	46	89	35	132	52	222	490
Auxiliary box	112	44	80	32	120	47	110	243
Box (Computer)	50	20	60	24	80	32	21	47
Box (Accela LC system)[a]	110	44	60	24	80	32	80	177

[a] optional

Shipping Containers of Q Exactive Systems

Your Q Exactive instrument is shipped in a container, the smallest dimension of which is 90 cm (36 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 91 cm (36 in.).The basic unit is shipped in a container with the following dimensions: *h* 115 cm (46 in.), *w* 90 cm (36 in.), *l* 132 cm (52 in.). The container and its contents weigh approximately 225 kg (496 lb). Dimensions and weights of the shipping containers for Q Exactive LC/MS systems are given Table 2-2.

Table 2-2. Data of packed units of a typical Q Exactive system

Module	Height		Width		Length		Weight	
	cm	in.	cm	in.	cm	in.	kg	lb
Basic unit	115	46	90	36	132	52	225	496
Auxiliary box	88	35	62	25	101	40	34	75
Box (Computer)	88	35	62	25	101	40	61	135
Box (Forepump)	63	25	62	25	96	38	74	164
Box (Accela LC system)[a]	110	44	60	24	80	32	80	177

[a] optional

Space and Load Requirements

The floor of your laboratory should be able to carry the weight of the installed Exactive Series instrument with data system. Also, consider the weight of any other option (liquid chromatograph, syringe pump) that is added to the system and the weights of the workbenches.

To set up a typical LC/MS system, Thermo Fisher Scientific recommends having a minimum of two workbenches.

Placing the Data System

Thermo Fisher Scientific recommends using one workbench with minimum dimensions of 1 × 1.20 m (3 × 4 ft) to hold the data system computer and monitor. Thus, it also provides sufficient place for an optional printer.[1] The workbench must be capable of supporting the weight of the data system [20 kg (44 lb)] and the printer, if applicable.

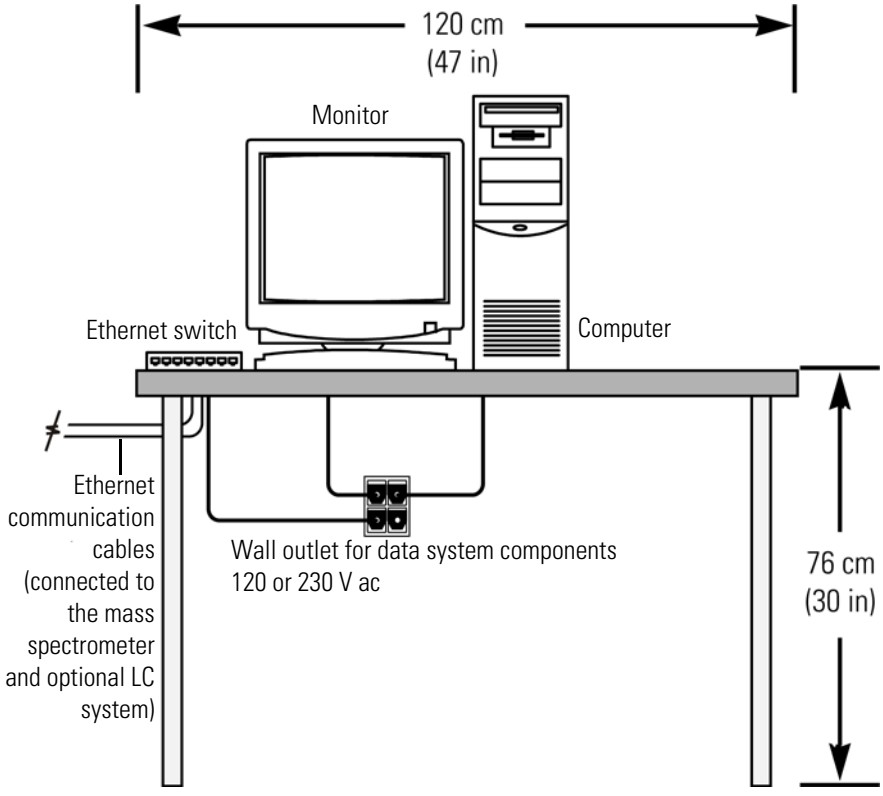


Figure 2-1. Typical data system workbench

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

[1] A printer is not a standard part of the data system.

Table 2-3. Space and load requirements of typical data system hardware components

Module	Height		Width		Length		Weight	
	cm	in.	cm	in.	cm	in.	kg	lb
Monitor	36	14	41	16	18	7	6	13
Minitower computer	48	19	18	7	43	17	14	30
Laser printer[a]	20	8	41	16	46	18	7	16

[a] Not a standard part of the data system. The actual values depend upon your equipment.

The Ethernet communication cables between the Ethernet switch and the mass spectrometer or optional LC system components must be no longer than 3 m (10 ft) each. Therefore, the workbench that holds the data system must be located next to the workbench or workbenches that hold the mass spectrometer and optional LC system.

Caution To ensure compliance with safety and EMC regulations, use category 5, shielded Ethernet cables no longer than 3 m (10 ft) in length. ▲

Placing the MS System

Use the other workbench to hold the mass spectrometer, the LC, and any other MS/LC options. This workbench must have minimum dimensions of 1 × 1.53 m (3 × 5 ft) and be capable of supporting the weight of the mass spectrometer plus the weight of any option (liquid chromatograph or syringe pump, for example). If you intend to place the MS separately, use a workbench with minimum dimensions of 1 × 1 m (3 × 3 ft).

Note The workbench dimensions provide sufficient space for the special holder for the optional syringe pump and switching valve(s). ▲

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 using a workbench with a skid proof top.

Minimum Clearance

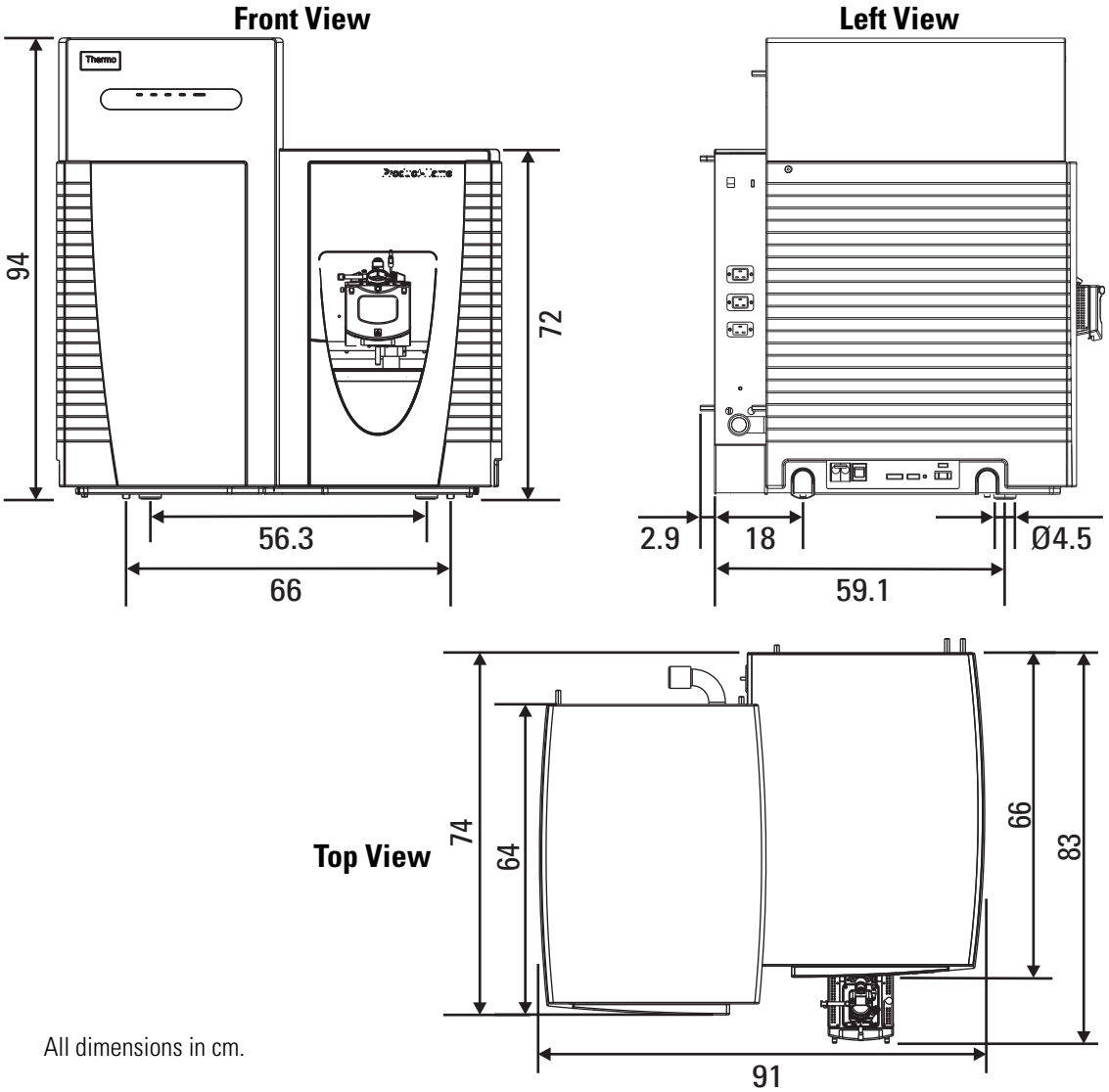
Allow at least 15 cm (6 in.) of clear space behind the system for proper air circulation and for clearance of the gas lines and electrical connections. This also provides sufficient space for accessing the fan filters on the rear side of the MS. In addition, allow at least 92 cm

(36 in.) of vertical clearance between the top of the mass spectrometer and any shelves above it.
To allow shutting off the mass spectrometer in an emergency, free access to the power panel on the left side and to the power column on the rear side of the instrument must be possible at any time.

Caution Avoid blocking the ventilation slots at the rear of the instrument. Items may fall behind the instrument, inhibit airflow, and cause the system to overheat. ▲

Instrument Dimensions

Exactive Series instruments have maximum dimensions of *h* 94 cm (37 in.), *w* 91 cm (36 in.), *l* 83 cm (33 in.). See Figure 2-2.



All dimensions in cm.

Figure 2-2. Instrument dimensions

Placing an Exactive LC/MS System

Figure 2-3 shows a schematic drawing of a typical Exactive LC/MS installation.

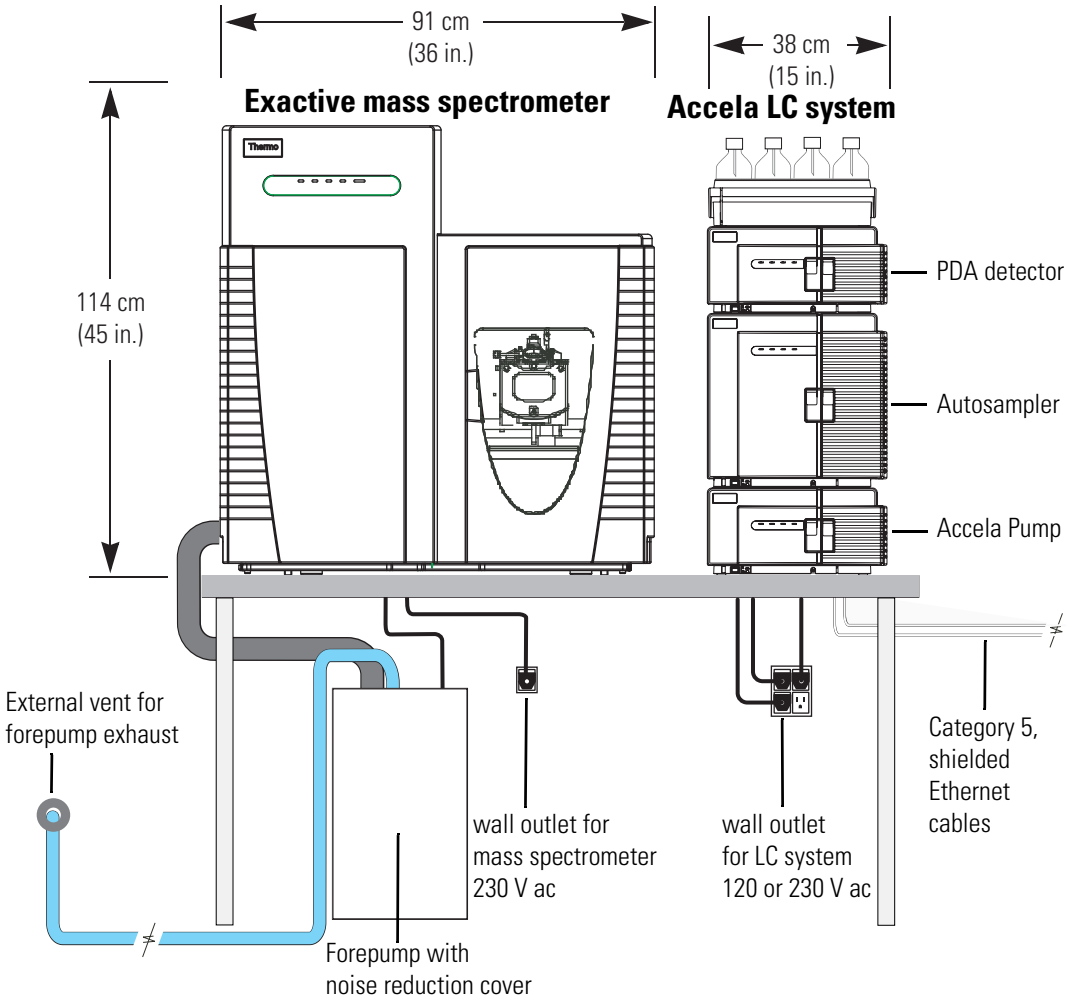


Figure 2-3. Exactive system installation and space requirements

Table 2-5 gives the approximate space and weight requirements of the various components of the Exactive LC/MS system.

Table 2-4. Space and load requirements of an Exactive LC/MS system

Module	Height		Width		Length		Weight	
	cm	in.	cm	in.	cm	in.	kg	lb
Mass spectrometer	94[a]	37[a]	91	36	83	33	174	384
Liquid chromatograph[b]	73	30	38	15	51	20	67	147
Forepump	28	11	29	12	43	17	45	99
Noise reduction cover	45	18	46	18	55	22	10	22

[a] Maximum dimensions. Actual dimensions are 940 mm / 37 inch (left) and 720 mm / 28 inch (right).

[b] The space and weight requirements listed for the liquid chromatograph are those for a system containing an Accela Pump, Accela Autosampler, and Accela PDA Detector. Allow additional height clearance for the solvent platform and solvent bottles.

Placing a Q Exactive LC/MS System

Figure 2-3 shows a schematic drawing of a typical Q Exactive LC/MS installation.

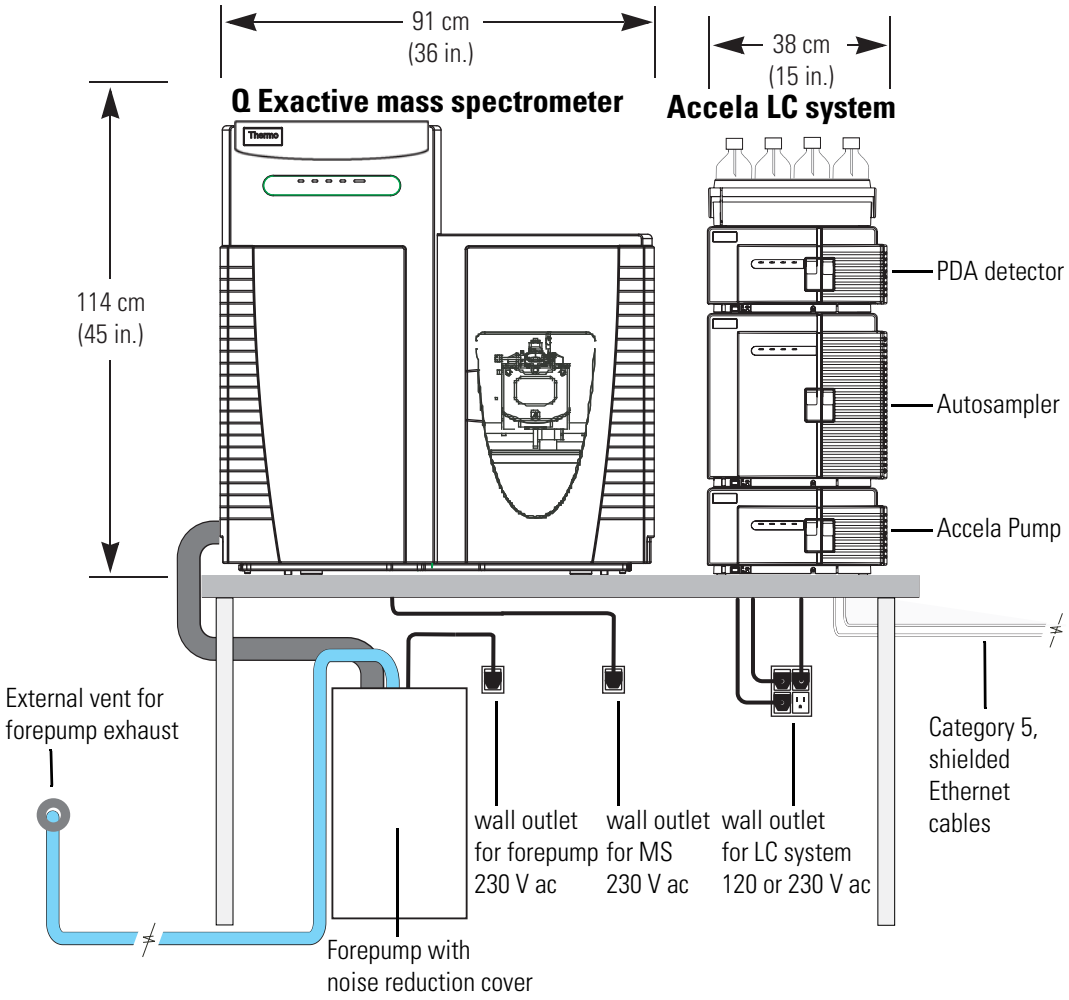


Figure 2-4. Q Exactive system installation and space requirements

Table 2-5 gives the approximate space and weight requirements of the various components of the Q Exactive LC/MS system.

Table 2-5. Space and load requirements of a Q Exactive LC/MS system

Module	Height		Width		Length		Weight	
	cm	in.	cm	in.	cm	in.	kg	lb
Mass spectrometer	94[a]	37[a]	91	36	83	33	182	401
Liquid chromatograph[b]	73	30	38	15	51	20	67	147
Forepump	36	14	33	13	53	21	60	132
Noise reduction cover	53.5	21	50	20	82.5	32	10	22

[a] Maximum dimensions. Actual dimensions are 940 mm / 37 inch (left) and 720 mm / 28 inch (right).

[b] The space and weight requirements listed for the liquid chromatograph are those for a system containing an Accela Pump, Accela Autosampler, and Accela PDA Detector. Allow additional height clearance for the solvent platform and solvent bottles.

Moving the Instrument

Exactive Series instruments are provided with four retractable handles for carrying. Each instrument is shipped on a pallet with the handles pulled out and fixed on the pallet. See Figure 2-5. Safety catches prevent the handles from inadvertently being retracted after they have been pulled out. Inspect the handles to verify that their safety catches are engaged before you start lifting the instrument. Push down the safety catch on a handle to slide it into the instrument.

Figure 2-5. Carry handles, fixed on the transport pallet

Warning Lifting Hazard. The instrument is too heavy for one person alone to handle safely. Lifting and moving the instrument requires the effort of at least four persons. ▲

Warning Tip Over Hazard. The instrument's center of gravity is at the top of the front side: the instrument has a tendency to tilt forward. To avoid risk of bodily injury or instrument damage when lifting the instrument, support the top of the instrument and keep the tilt angle below 5°; never exceed 10°. ▲

The rear pair of the four support points for the instrument consists of wheels. Thus, only two persons are necessary for moving the instrument into its final position on a bench, while holding the two front handles. See Figure 2-2 on page 2-6 for information about the position of the support points.

Placing the Forepump

The instrument is shipped with a forepump, a noise reduction cover for the forepump, a vacuum hose for connecting the MS to the forepump, and an exhaust hose for connecting the forepump to the exhaust system. Install the forepump on the floor beneath the workbench, immediately behind the MS. If no space for the pump is available beneath the

workbench, you can place the pump near the left side of the bench. In this case, the left side of the MS should align with the left side of the workbench.

When placing the forepump, Thermo Fisher Scientific strongly recommends considering the information contained in "Vibration" on page 3-4.

Connecting the Forepump for the Exactive Mass Spectrometer

Connect the power supply cord for the forepump of an Exactive mass spectrometer to the power outlet on the rear side of the MS. See Figure 2-6.

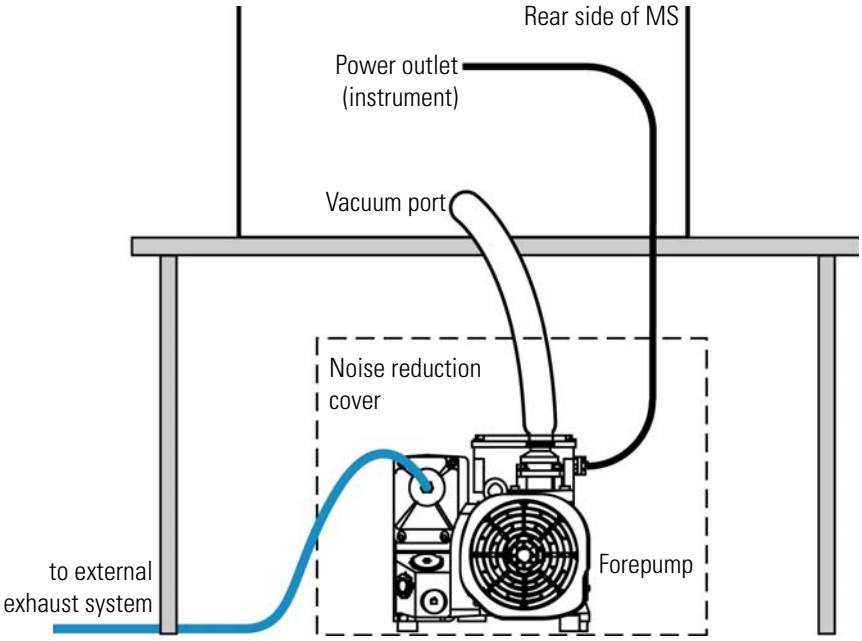


Figure 2-6. Connecting the forepump of an Exactive mass spectrometer

Connecting the Forepump for the Q Exactive Mass Spectrometer

Connect the power supply cord for the forepump of a Q Exactive mass spectrometer to a wall outlet. Connect the pump switch cord of the forepump to the port on the rear side of the MS. See Figure 2-7.

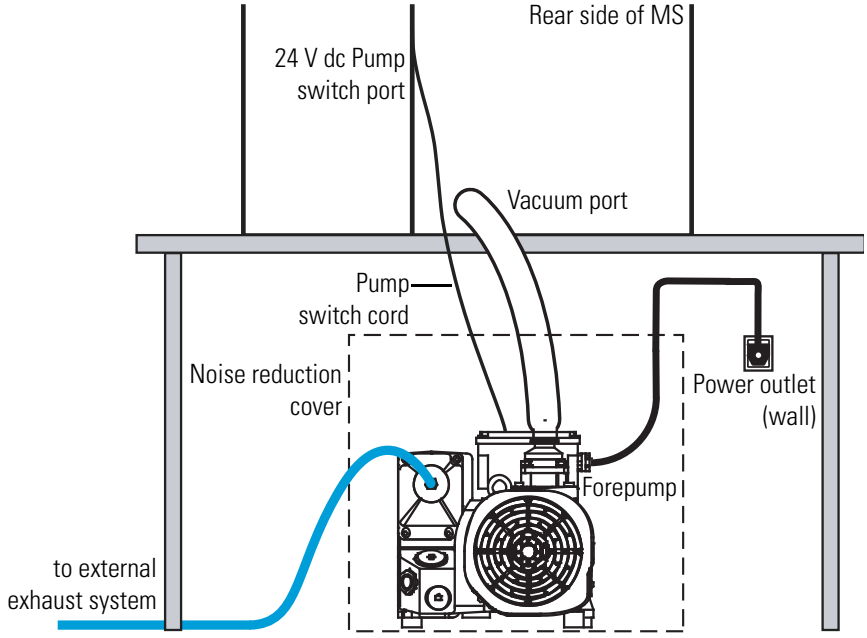


Figure 2-7. Connecting the forepump of a Q Exactive mass spectrometer

Vacuum Hose

The vacuum hose is made of reinforced material. It has a length of 1.6 m (67 in.) for the Exactive forepump and 2.0 m (79 in.) for the Q Exactive forepump.[1] Because of its large bending radius the actual length of the vacuum hose is significantly shorter. Either run the hose behind the workbench or make a cutout through the bench for it. The cutout must have minimum dimensions of 7 × 10 cm (3 × 4 in.). See Figure 2-8 for a schematic drawing.

Allow for room to run an additional cord through the hole: in case of an Exactive mass spectrometer the power cord from the forepump, in case of a Q Exactive mass spectrometer the switch cord from the MS to the forepump.

[1] If you need a longer vacuum hose, contact Thermo Fisher Scientific.

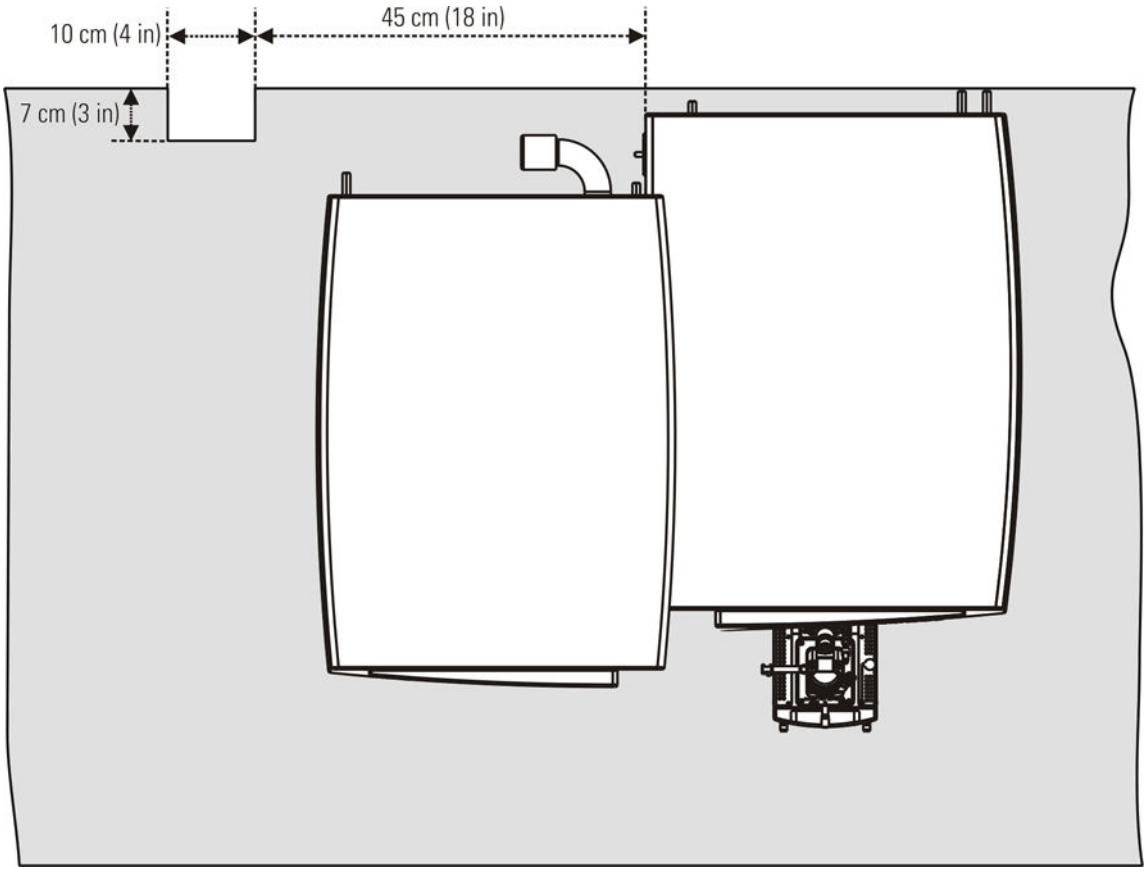


Figure 2-8. Top view of instrument with dimensions of cutout for vacuum hose

For information about the exhaust system, see page 6-2.

Telephone

It is recommended that a telephone be installed in your laboratory near the instrument so, if necessary, you can conveniently operate the system while you are working by telephone with a Thermo Fisher Scientific field service engineer. The voice telephone outlet should be within 2 m (7 ft) of your system.

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

Chapter 3 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.

Note It is your responsibility as the user to provide an acceptable operating environment. ▲

Operating environment includes the following:

Temperature

The laboratory room temperature must be maintained between 15 and 26 °C (59 and 78 °F). The optimum temperature of operation is 18–21 °C (65–70 °F).

Note 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.

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

Heat Output of Exactive LC/MS Systems

The air conditioning load for a typical Exactive LC/MS system (with data system and a typical LC) is approximately 3.7 kW (13000 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 Exactive LC/MS system

Module	Heat output [W]	Heat output [BTU/h]
Mass spectrometer	1800	6140
Liquid chromatograph	1080[a]	3690[a]
Monitor	35	120
Computer	470	1600
Laser printer (optional)	350[a]	1200[a]
Total	**3735**	**12750**

[a] Approximate. The actual value depends on your equipment.

Heat Output of Q Exactive LC/MS Systems

The air conditioning load for a typical Q Exactive LC/MS system (with data system and a typical LC) is approximately 3.5 kW (12000 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 3-2. Heat output for a typical Q Exactive LC/MS system

Module	Heat output [W]	Heat output [BTU/h]
Mass spectrometer	1500	5120
Liquid chromatograph	1080[a]	3690[a]
Monitor	35	120
Computer	470	1600
Laser printer (optional)	350[a]	1200[a]
Total	**3435**	**11730**

[a] Approximate. The actual value depends on your equipment.

Humidity

The relative humidity of the operating environment must be between 40 and 70%, with no condensation. It is recommended that your laboratory be equipped with a temperature/humidity monitor to ensure that your laboratory is always within the required temperature and humidity specifications.

Caution Operating an Exactive 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. ▲

Vibration

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

Caution Because of the natural vibration of the forepump during operation, it must not have any mechanical contact to the mass spectrometer with exception of the vacuum hose. Otherwise, the vibration might impede the performance of the instrument. Therefore, install the pump on the floor beneath 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 us at support.ftms.bremen@thermofisher.com if you have questions or concerns about your laboratory.

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 a dimmer switch on the lights to reduce eyestrain. A small, high-intensity lamp is recommended for cleaning mass spectrometer components, source inspection, and manipulation of small components.

Particulate Matter

The air in your laboratory must not have excessive dust, smoke, or other particulate matter. For reference, the air should contain fewer than 3500000 particles per cubic meter (100000 particles per cubic foot) in excess of 5 µm.

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

Radio Frequencies

Exactive 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.

Exactive 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 us at support.ftms.bremen@thermofisher.com for advice. Because of the complexity of such influences, no general suggestion can be given in this guide.

Electrostatic Discharge

Electrostatic discharge (ESD) can damage the electronic components of your MS system. Thermo Scientific instruments are designed to withstand electrostatic discharges (ESD) up to 4 kV (air discharge) and 4 kV (contact discharge) with all panels in place. However, if the panels are removed and the PCBs are handled without proper precautions, the electronic components might be damaged or fail prematurely. Static electricity can develop in a variety of ways. A few examples of how electrostatic charge can develop are as follows:

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

The discharge of static electricity is not perceptible to a human being until the potential is at least 4000 V. Many electronic components can be damaged by a discharge of electrostatic potential of as little as 50 V. ESD damage can be catastrophic causing your system to cease functioning. More commonly, however, ESD damage might cause latent problems that are detrimental to sensitive electrical components, causing premature failures. Therefore, Thermo Fisher Scientific recommends the following precautions, especially when you are operating your system at the lower end of the relative humidity specification listed above:

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

Chapter 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.

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

More information on each of the requirements is available under the following topics:

Available Outlets

Exactive Series instruments are designed to operate at a nominal voltage of 230 V ac, 50/60 Hz. Line voltages can vary between a minimum of 207 V ac and a maximum of 253 V ac.

Caution 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 buck/boost transformer to ensure that power is within the specified parameters at all times. ▲

The minimum and maximum voltage tolerances are in compliance with IEC 950, Amend 2, 1993, paragraph 1.6.5, as follows:

> "Equipment intended to operate directly from the main supply shall be designed for a minimum supply tolerance of +6% and -10%. If the rated voltage is 230 V ac single phase or 400 V ac three phase, the equipment shall operate safely within a minimum supply tolerance of ±10%."

Note The system must have an earth ground hard-wired to the main panel. The interconnected power outlets for the system are to 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. ▲

Note Power is to remain on. The system should remain on and pumping continuously for optimum performance. ▲

Basic Power Requirements for Exactive LC/MS Systems

The basic power requirements for an Exactive LC/MS system consist of the following:

- For the mass spectrometer, a wall receptacle, fused with 15 A or 16 A (tripping characteristic B)
  Nominal voltage of 230 V ac, ±10%, frequency of 50/60 Hz, single phase

  The instrument has an apparent power of 2070 VA and an effective power of 1800 W.

- Additional single-phase wall outlets for data system (computer, monitor, and Ethernet switch), syringe pump, liquid chromatography, and (optional) switching valve(s)
  Nominal voltage of 230 V ac, ±10%, 50/60 Hz, fused with 10 A, or nominal voltage of 120 V ac, +6% to -10%, 50/60 Hz, fused with 20 A

Basic Power Requirements for Q Exactive LC/MS Systems

The basic power requirements for a Q Exactive LC/MS system consist of the following:

- For the mass spectrometer, a wall receptacle, fused with 15 A or 16 A (tripping characteristic B)
  Nominal voltage of 230 V ac, ±10%, frequency of 50/60 Hz, single phase

  The instrument has an apparent power of 750 VA and an effective power of 700 W.

- For the forepump, a wall receptacle, fused with 15 A or 16 A
  Nominal voltage of 230 V ac, ±10%, frequency of 50/60 Hz, single phase

Note In areas with 208 V ac (nominal 3-phase for North America) line power, an additional transformer for the forepump is not required. ▲

  The forepump has an apparent power of 1250 VA and an effective power of 750 W.

- Additional single-phase wall outlets for data system (computer, monitor, and Ethernet switch) and liquid chromatography
  Nominal voltage of 230 V ac, ±10%, 50/60 Hz, fused with 10 A, or nominal voltage of 120 V ac, +6% to -10%, 50/60 Hz, fused with 20 A

Note The Q Exactive mass spectrometer provides electric power for the syringe pump and the optional switching valve(s). A power strip is shipped with the instrument. ▲

Power Cables and Connectors

The power cable to the mass spectrometer is 5 m (16 ft) long. See left photo in Figure 4-1. This power cable is shipped with the 16 A version of a 3 pole CEE male connector, which is rated at 16 A and 230 V ac. The right photo in Figure 4-1 shows the wall receptacle required for the mass spectrometer (IP 44; 3 poles; 250 Volt; 50/60 Hz; blue;

IEC 60309.1 and 60309.2). The receptacle (P/N 2105500) is provided by Thermo Fisher Scientific as part of the Preinstallation Kit. The power cable (P/N 2112490) is provided by Thermo Fisher Scientific as part of the Installation Kit.

Figure 4-1. Power cable and wall receptacle

Power Cables for the Forepumps

The power cable for the forevacuum pump is shipped as part of the forevacuum pump package.

Power Cable for the Exactive Forepump

The power cable of the forevacuum pump for the Exactive has a length of 2.5 m and is plugged into the mass spectrometer.

Power Cable for the Q Exactive Forepump

The power cable of the forevacuum pump for the Q Exactive has a length of 5 m and is shipped with the 16 A version of a 3 pole CEE male connector, which is rated at 16 A and 230 V ac (analogous to the cable shown in Figure 4-1) . The power cable needs to be plugged into a separate wall receptacle (P/N 2105500) (IP 44; 3 poles; 250 Volt; 50/60 Hz; blue; IEC 60309.1 and 60309.2). The receptacle is provided by Thermo Fisher Scientific as part of the Preinstallation Kit.

Power Cables of Peripherals

The cables for personal computer, monitor, Ethernet switch, and options like syringe pump or switching valve(s) are provided by Thermo Fisher Scientific. They are approximately 2 m (6 ft) long. Local codes in

your area might require the installation of another type of plug and receptacle. The Thermo Fisher Scientific field service engineer for your country provides the appropriate power plugs.

Connecting Mass Spectrometer and Modules to Wall Outlets

Take care to ensure that the wall outlet specifications are not exceeded. The mass spectrometer must have a separate “clean” line leading 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.

The electrical wall outlet for the main power of the mass spectrometer should be located at the wall near the intended location of the instrument.

Power Supply for the Q Exactive Forepump

Connect the power supply cord for the forepump of a Q Exactive mass spectrometer to a dedicated wall outlet. See “Power Cable for the Q Exactive Forepump” on page 4-4.

Power Supply for Other Modules

For liquid chromatograph and data system, please use wall outlets. Additional power outlets might be required for syringe pump, switching valves, and test and cleaning equipment, such as an oscilloscope and ultrasonic bath. See Table 4-1 on page 4-7 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. All single-phase auxiliary wall outlets should use the same ground as the power line of the instrument. To prevent overloading the circuit, connect mass spectrometer, forepump (in case of a Q Exactive mass spectrometer), liquid chromatograph, and data system to separate wall outlets.

Caution To prevent overloading the circuit, never connect mass spectrometer and LC to the same electrical wall outlet circuit. ▲

Note 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. ▲

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. Place the outlets for the MS system (including the forepump for a Q Exactive mass spectrometer), the LC system, the syringe pump, and for the (optional) switching valve(s) behind the MS workbench; place the outlets for the data system (computer, monitor, Ethernet switch, and (optional) printer) behind the data system workbench. See Figure 2-1 on page 2-4 and Figure 2-4 on page 2-8 for the optimum locations for power outlets in the most typical workbench setups.

See the sample laboratory setup in Table 4-1 for the recommended number of outlets.

Table 4-1. 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 (230 V)
	Exactive MS	Forepump	—[a]
		Syringe pump (required)	1
		Switching valve(s) (optional)	1–2
	Q Exactive MS	Forepump	1 (230 V)
		Syringe pump (required)	—[a]
		Switching valve(s) (optional)	—[a]
Data System	Data system computer		1
	Monitor		1
	Printer (optional)		1
	Ethernet switch		1
Optional	High intensity lamp (for help in instrument maintenance)		1
	Laboratory stereoscope (for inspecting fused-silica parts)		1
Total outlets required for this configuration			6–14

[a] Power is supplied by MS.

Quality of Power

The quality of power supplied to your MS system is very important. The quality of line voltage must be stable and within the specifications listed in this manual. The line voltage must be free of fluctuations due to slow changes in the average voltage, surges, sags, or transients.

Below are definitions for the most common voltage disturbances:

- *Harmonic distortion* is a high-frequency disturbance that may affect operation of your instrument. 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.

Harmonic distortion causes noise in the power supply lines and degrades instrument performance. Constant high line voltage, impulses, or surges in voltage can cause overheating and component failures. Constant low line voltage or sags in voltage can cause the system to function erratically or not at all. Transients, even of a few microseconds duration, can cause electronic devices to fail catastrophically or to degrade and eventually shorten the lifetime of your system. Therefore, it is important to establish the quality of the line voltage in your laboratory before your MS system is installed.

Power Monitoring Devices

A variety of devices is available to monitor the quality of your line power. The 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.

Line monitors can be rented from electrical equipment suppliers (see "Technical Assistance" on page 4-11). If necessary, your local Thermo Fisher Scientific office can assist in interpretation of the results and recommend appropriate corrective measures.

Power Conditioning Devices

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

When nominal voltage is free from voltage sags, surges, and impulses but more than ±10% outside the required 230 V, the supply voltage can be lowered (bucked) or raised (boosted) using a buck/boost transformer. Buck/boost transformers are also available from Thermo Fisher Scientific.

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

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

Uninterruptible Power Supply

If your local area is susceptible to corrupted power or power disruptions, then an uninterruptible power supply (UPS) should be installed in your laboratory. Take the values listed in Table 3-1 on page 3-2 as guideline for dimensioning an UPS.

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

Technical Assistance

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

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

Specifying power conditioning equipment is a complex task that is best handled by a company or consultant specializing in that field. A selection of such companies[1] is listed below:

General Electric Company
(Worldwide distribution network)
Internet: www.ge.com

JOVYATLAS
Groninger Str. 29-37
26789 Leer / Ostfriesland
Phone: +49 (491) 6002 0
Fax: +49 (491) 6002 48
Internet: www.jovyatlas.de

OnLine Power, Inc.
(Conform to all applicable standards, worldwide)
Internet: www.onlinepower.com

POWERVAR, INC.
Internet: www.powervar.com

SOLA / HEVI-DUTY
Internet: www.sola-hevi-duty.com

Warner Electric
Motors and Controls division
Internet: www.warnernet.com

[1] 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.

Chapter 5 Consumables

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

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

More information on each of the requirements is available under the following topics:

Fittings and Parts

Table 5-1 lists the minimum parts that are required to connect the mass spectrometer to your gas delivery system.

Table 5-1. 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.**
	T-piece (P/N 1128140)		provided
For Exactive instruments equipped with HCD collision cell:			
Collision gas	Argon:	6 mm OD Teflon hose	**Not provided in kit. You supply this part.**
		Connection for the opposite end of the Teflon hose to the argon gas source	

Note 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[1] of suitable 1/8-in.-to-6-mm adapters are Swagelok™ part numbers B-6M0-7-2 (female) and B-6M0-1-2 (male). ▲

[1] 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.

Gases

Exactive Series instruments require nitrogen gas, which is also applicable as HCD collision gas. The Q Exactive can use only nitrogen, whereas Exactive instruments with the optional HCD collision cell can alternatively use argon for HCD.

Your system can use large amounts of gases during daily operations. It is essential that the gases be delivered with the necessary pressure and purity. This section provides information on the purity and pressure that your system requires.

Caution Contaminates 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 contaminates introduced from your gas delivery system. ▲

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

Nitrogen Gas

The nitrogen for the API sheath gas, API auxiliary/sweep gas, Orbitrap™ bath gas, and HCD collision gas should be high purity (99%). Particulate filters can be a source of contamination, they are not recommended. Table 5-2 shows the pressure requirements for the nitrogen supply.

Table 5-2. Nitrogen pressure requirements

Mass Spectrometer	Nitrogen Pressure
Exactive	760 ± 70 kPa (7.6 ± 0.7 bar, 110 ± 10 psi)
Q Exactive	800 ± 30 kPa (8.0 ± 0.3 bar, 116 ± 4 psi)

Typical nitrogen gas consumption (nitrogen on 24 hours per day) is 5600 L (200 ft^3) per day. Therefore, it is recommended that nitrogen be supplied from one of the following sources:

- A large, sealed, thermally insulated cylinder containing liquid nitrogen, from which the nitrogen is boiled off. The 230 psi model is recommended. The 35 and 80 psi models do not provide sufficient gas pressure. A typical cylinder of size 240 L yields 143850 L (5080 ft^3) of gas. The replacement frequency is approximately once every month.

Liquid nitrogen conversion factors:

- 1.0 lb of liquid nitrogen = 0.5612 L
- 1.0 kg of liquid nitrogen = 1.237 L

- A nitrogen generator with minimum capacity of 5560 L (200 ft^3) per day at 99% purity with 100 psi at the side panel. Worst case consumption of nitrogen gas is 30 L/min (56 Standard Cubic Feet per Hour). Nitrogen generators require an air compressor. Some models of air compressor are quite noisy; therefore, be careful to select a quiet compressor. This is a continuous source with no replacement required.

Argon as Alternative Collision Gas for Exactive

Exactive mass spectrometers that are equipped with the optional HCD collision cell can alternatively use argon for the HCD collision gas instead of nitrogen. The argon should be high purity (99.99%). The required gas pressure is 690 ± 140 kPa (6.9 ± 1.4 bar, 100 ± 20 psi). Particulate filters can be a source of contamination, they are not recommended.

Typical argon gas consumption (argon on 24 hours per day) is 30 L (1 ft^3) per day.

Solvent Recommendations

The solvents listed in Table 5-3 are useful in operating and maintaining your instrument. Installation of the instrument requires LCMS grade methanol and water. Solvent modifiers might also be required during the installation of some systems.

Some solvent impurities are transparent to UV/VIS detectors. Therefore, some LCMS grade solvents might contain contaminants that interfere with the performance of the mass spectrometer. For operation of your instrument, choose high purity solvents with minimum contamination. You can order specific chemicals from Thermo Fisher Scientific, which are sold under its Fisher Chemical brand. As specified in Table 5-3, use only LCMS grade chemicals for operating your system.

Table 5-3. Recommended solvents and reagents

Solvent / Reagent	Specifications	Fisher Chemical P/N
Methanol	LCMS grade	A456-4
Acetonitrile	LCMS grade	A955-4
Water	LCMS grade	W6-4
Isopropyl alcohol	LCMS grade	A461-4
Acetic acid (modifier)	LCMS grade	A507-500 or A35-500
Formic acid (modifier)	99–100% (This acid must be supplied in a glass bottle.)	A117-50

For a complete selection of LCMS grade consumables from Fisher Scientific, visit www.FisherLCMS.com.

Caution Do not filter solvents. Filtering solvents can introduce contamination. ▲

Note Store and handle all chemicals in accordance with standard safety procedures. ▲

Cleaning Agents

We recommend having the following cleaning agents available:

- A solvent like acetone (in accordance with your local safety practices).
- A detergent, for example, RBS 50 (trade name of Messrs. Carl Roth, Karlsruhe, Germany).
- Several liters of distilled water.

Chapter 6 Exhaust and Waste

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

Note It is your responsibility as the user to provide proper waste and exhaust systems for the operation of your system. ▲

More information on each of the requirements is available under the following topics:

Exhaust System

Thermo Fisher Scientific strongly recommends connecting 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.

Note 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 located on the top of the pump. 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 forepump (also referred to as a mechanical, rotary-vane, roughing, or backing pump) provides a vacuum for the API source and backing pressure for the turbomolecular pumps in the Exactive Series system.

The exhaust port of the rotary pump should be connected to an exhaust gas line leading out of the building or exhaust system. See Figure 2-7 on page 2-11. The inner diameter of the pipe should be at least 25 mm (1 in.). An exhaust hose for connecting the forepump to the exhaust system comes with the system (P/N 0690720) and is 5 m (16 ft) long. It has dimensions of 13 mm (1/2 in.) ID and 20 mm (25/32 in.) OD. The exhaust system for the forepump must be able to accommodate an initial inrush flow rate of 3 L/min and a continuous flow rate of 1 L/min.

Note 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. ▲

Note 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. ▲

Ventilation

Most of the nitrogen that is introduced into the API source (about 5000 L or 180 ft^3 per day) escapes into the laboratory atmosphere. Therefore, provide for good air exchange to prevent accumulation of gaseous nitrogen in the laboratory.

Warning Danger of Asphyxiation. Accumulation of nitrogen gas could displace sufficient oxygen to suffocate personnel in the laboratory. Ensure that the laboratory is well ventilated. ▲

Solvent Waste

Because the Ion Max API source can accommodate high flow rates, you must collect the waste solvent in a manner that avoids pressure buildup in the source. The Ion Max API source is fitted with a 25.4-mm (1.0 in.) OD outlet for solvent drainage. A 25.4-mm to 12.7-mm (1 in. to 0.5 in.) reducing fitting (P/N 00101-03-00001) connects to a waste container (P/N 00301-57020), both of which come with the system. To avoid pressure buildup in the source, make sure that the 1-inch diameter hose from the API source drain to the reducing fitting (P/N 00101-03-00001) is as long as possible. The 25.4-mm (1 in.) diameter Tygon™ tubing (P/N 00301-01-00020) that comes with the system is 1.52 m (5 ft) long.

Warning **Health Hazard.** The interior of the Ion Max API source housing contains parts that might be at high temperatures or high voltages. To prevent users from inadvertently touching such parts, always operate the Ion Max API source with the drain tubing assembly mounted to the source housing drain. ▲

Caution 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 forepump. ▲

Chapter 7 Instrument Arrival

When your lab site preparation is completed, the Thermo Scientific "Exactive Series Installation Request Form" has been mailed or faxed to your Thermo Fisher Scientific office, and the system is delivered, please call your Thermo Fisher Scientific office to arrange for an installation date. See the Installation Request Form at the beginning of this guide. Telephone and fax numbers for Thermo Fisher Scientific offices are listed immediately following the Installation Request Form.

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

Please take the following precautions when receiving material:

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

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

When your system arrives, move it to a protected location indoors, preferably the installation site. Take the specifications described in "Temperature" on page 3-2 as a guideline for the temperature in the storage room. If you have questions about moving your system, contact your local Thermo Fisher Scientific office.

Transportation Risk

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

Chapter 8 Installation

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

Note 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. ▲

When your lab site preparation is completed, the "Exactive Series Installation Request Form" has been mailed or faxed to your local office for Thermo Scientific products, and the system is delivered, please call your Thermo Fisher Scientific office to arrange for an installation date. See the Installation Request Form at the beginning of this guide. Telephone and fax numbers for Thermo Fisher Scientific offices are listed immediately following the Installation Request Form.

More information on each of the requirements is available under the following topics:

Preparing the Installation

This section provides advice for preparing the installation of the instrument.

Caution 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. ▲

Equipment Needed for Installation

The mass spectrometer requires a syringe pump for delivering sample solution and/or sheath liquid from a syringe into the API ion source. A suitable syringe pump (Chemyx Fusion 100) is available from Thermo Fisher Scientific (P/N 1245740).

Place the syringe pump next to the API source on the holder that is shipped with the mass spectrometer. See "Power Supply for Other Modules" on page 4-6 for information about the power supply for the syringe pump.

Solvents Needed For Installation

For preparing a calibration solution with the chemicals described in "Calibration- and Test-Chemicals" below, have the following solvents ready at the time of installation:

- Methanol,
- Water,
- Acetonitrile, and
- Glacial acetic acid.

See "Solvent Recommendations" on page 5-5 for information about solvent requirements.

Calibration- and Test-Chemicals

The chemicals listed in Table 8-1 are needed for installation. They do not come with the mass spectrometer but will be shipped separately as part of the Preinstallation Kit.

Note The installation will not begin until the arrival of all chemicals listed in Table 8-1! ▲

Table 8-1. Calibration- and Test-Chemicals

Description	Quantity	Supplier Product Number
Supplier: Sigma™ Chemical Company, see below.		
n-Butylamine[a]	25 mL	471305-25ML
Sodium Dodecyl Sulfate	10 g	L4509-10G
Sodium Taurocholate Hydrate	250 mg	T4009-250MG
Caffeine Methanol Solution	1 mL	C6035-1ML
Met-Arg-Phe-Ala acetate salt	1 mg	M1170-1MG
Buspirone hydrochloride	1 g	B7148-1G
Supplier: ABCR GmbH & Co. KG, see below.		
Ultramark™ 1621 Mass Spec. Standard	250 mg	AB172435

[a] Delivered only for Q Exactive instruments. If ordering elsewhere, use only mass spec grade quality.

To order more of these compounds, contact:

Sigma Chemical Company
P. O. Box 14508
St. Louis, Missouri, USA 63178-9916
Phone (800) 325-3010 (in the USA or Canada)
(314) 771-3750 (outside the USA or Canada)

Web site www.sigma-aldrich.com

or

ABCR GmbH & Co. KG
Im Schlehert 10
D-76187 Karlsruhe, Germany
Phone +49 (0)721 950 61-0
Fax +49 (0)721 950 61-80
Email info@abcr.de

Web site www.abcr.de/english.htm

Unpacking the System

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

Two exceptions to this policy are as follows:

- You are encouraged to locate the Operating Manuals and to begin to become familiar with the operation of the instrument. These manuals are located in the auxiliary box. See Table 2-1 on page 2-3 and Table 2-2 on page 2-3.
- Where buck / boost transformers or power conditioning units are supplied, it is the customer's responsibility to have these units installed by an electrician prior to instrument installation.

Installing the System

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

During the installation, the service engineer will demonstrate the following:

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

Note Consumables sent with the system are intended for use by the service engineer during the installation. It is the responsibility of the customer to replace any consumables used 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. It is recommended that you designate a key operator to oversee the operation and maintenance of the system in your laboratory. This person will also be the key figure in the communication between your laboratory and Thermo Fisher Scientific.

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

Advanced Training Courses

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

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

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

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

Germany

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

Preventive Maintenance

Routine and preventive maintenance of mass spectrometer and data system is in the user's responsibility. Included in this category are exchange of pump oil, replacement of filters, etc. on a regular basis. Please refer also to the manufacturers manuals shipped with the instrument—especially for the maintenance of mechanical pumps and turbomolecular pumps.

Regular preventative maintenance is essential. Regular preventive maintenance will increase the life of the system, result in maximum uptime of your system, and provide you with optimum system performance. Maintenance techniques are covered in the following manuals:

- *Exactive Operating Manual* or *Q Exactive Operating Manual*
- Ion Source Manuals
- Manuals that come with your data system computer and other modules of your system

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Thermo Fisher Scientific Inc.
81 Wyman Street
P.O. Box 9046
Waltham, Massachussetts 02454-9046
United States

www.thermoscientific.com