

# Orbitrap Fusion Series

## Preinstallation Requirements Guide

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## Orbitrap Fusion Series Installation Request Form

Before completing this installation request form, read all of the *Orbitrap Fusion Series Preinstallation Requirements Guide*. For laboratories outside the U.S., go to [www.thermofisher.com](http://www.thermofisher.com), click **Contact Us**, select the **Instrument Support** option, type the product name, and request to be contacted by email to schedule your instrument installation. You can then send this completed and signed form to the office handling the installation. For laboratories in the U.S., send this completed and signed form to [us.customer-support.analyze@thermofisher.com](mailto:us.customer-support.analyze@thermofisher.com).

### Laboratory setup

- 1. All laboratory remodeling is complete and complies with all relevant safety regulations.
- 2. The instrument is on site.
- 3. A principal operator will be on site during the installation/certification period.
- 4. Doorways, hallways, and so on are a minimum width of 1.4 m (54 in.).
- 5. Laboratory lighting is adequate.
- 6. Air conditioning is adequate for temperature, humidity, and particulate matter control.
- 7. Relative humidity is 40–80%, noncondensing.
- 8. The work area is free from magnetic disruption and electrostatic discharge.
- 9. A step stool is on site.
- 10. (Optional) The laboratory has Internet access.
- 11. Floor space is sufficient and flooring will support the load.

### Power

- 12. Main power is installed and complies with local electrical codes.
- 13. Power is free from fluctuations due to slow changes in the average voltage or changes due to surges, sags, or transients.
- 14. Power outlets are of the correct configuration for the power cords. See [page 2](#).  
Note NEMA type: \_\_\_\_\_
- 15. Voltage of power outlet has been measured.  
Note measured voltage:  
AC line-to-ground: \_\_\_\_\_ V  
AC neutral-to-ground: \_\_\_\_\_ V  
AC line-to-neutral: \_\_\_\_\_ V

- 16. Power outlets are available for testing and cleaning equipment.

### Gas and exhaust

- 17. All required gases are on site, gas lines are installed, and appropriate gas regulators are available. For pressures, see [page 3](#).  
Note gas types and actual purity levels:  
Gas: Helium purity: \_\_\_\_\_  
Gas: Nitrogen #1 purity: \_\_\_\_\_  
Gas: Nitrogen #2 purity: \_\_\_\_\_
- 18. All gas lines are clean and have no leaks.
- 19. A suitable fume exhaust system is separate from the solvent waste and is within 2.4 m (8 ft) of the system. See [page 4](#) and [page 9](#).

### System setup

- 20. Data system computer: The new computer shows no changes to ANY settings and has no additional software.
- 21. System setup provides for collecting solvent waste from the API source.
- 22. A new or recently cleaned HPLC system is available that produces pulse-free, continuous flow of 100–1000  $\mu\text{L}/\text{min}$ .
- 23. Optima LC/MS-grade acetonitrile, isopropyl alcohol, methanol, and water are available for testing the instrument's performance.
- 24. Sufficient clearance is provided behind the instrument's table. See [page 8](#).

**IMPORTANT** Thermo Fisher Scientific reserves the right to invoice for the field service engineer's time if the installation requirements are not met by the installation date.

CONTINUED ON THE NEXT PAGE



**For customized installations**

Does your contract contain any special acceptance specifications?  Yes  No  
If YES, attach full details of the specifications.

Does the system require additional equipment?  Yes  No  
If YES, attach full details of the additional equipment.

**I certify that the preinstallation requirements for the Orbitrap Fusion Series are complete and accurate.**

Signature \_\_\_\_\_ Date \_\_\_\_\_

Print name \_\_\_\_\_ Telephone \_\_\_\_\_

Email address \_\_\_\_\_

Principal instrument operator:

Print name \_\_\_\_\_ Telephone \_\_\_\_\_

Email address \_\_\_\_\_

Company \_\_\_\_\_ Telephone \_\_\_\_\_

Address \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Country \_\_\_\_\_

Sales order number \_\_\_\_\_

**Note** This form is intended to cover the essential components of your Orbitrap Fusion Series installation. However, you must use the information in this guide and any additional information that your Thermo Fisher Scientific field service engineer provides to ensure the proper setup of your system. After receiving this form, the field service engineer contacts you to schedule the installation.

# Contents

	<b>Preface</b> .....	<b>vii</b>
	Requesting Instrument Installation .....	viii
	Accessing Documentation .....	viii
	Special Notices, Symbols, and Cautions .....	ix
	Contacting Us .....	x
<b>Chapter 1</b>	<b>Laboratory Requirements</b> .....	<b>1</b>
<b>Chapter 2</b>	<b>Installation Requirements</b> .....	<b>5</b>
	Shipping Containers .....	5
	Electrical Requirements .....	6
	Workbenches and Clearance Distances .....	7
	Recommended MS Layout .....	9
	Customer-Supplied Hardware .....	10
	Solvent Requirements and Recommendations .....	11
	Mobile Phase Requirements .....	11
	LC Additive Restrictions .....	11
	Recommended Solutions .....	12
<b>Chapter 3</b>	<b>Instrument Shipments</b> .....	<b>13</b>
	Receiving Shipping Packages and Reporting Damage .....	13
	Filing a Damage Claim Against the Carrier .....	14
<b>Chapter 4</b>	<b>Instrument Demonstration</b> .....	<b>15</b>
<b>Appendix A</b>	<b>Line Power Management</b> .....	<b>17</b>
	Power Monitoring Devices .....	17
	Quality of Power .....	18
	Power Conditioning Devices .....	18
	Uninterruptible Power Supply .....	18

## Contents

## Preface

The *Orbitrap Fusion Series Preinstallation Requirements Guide* provides information for preparing your laboratory before delivery and installation of the Thermo Scientific™ Orbitrap Fusion™ Series Tribrid™ mass spectrometer (MS). Read this guide carefully to ensure that your lab is ready for the instrument.



**CAUTION** Operating an instrument or maintaining it 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 Thermo Fisher Scientific standard warranty and service contract coverage.

This guide is intended for the following Thermo Scientific mass spectrometers:

- Orbitrap Fusion (also known as Fusion™) (requires one forepump)
- Orbitrap Fusion Lumos™ (also known as Lumos™) (requires two forepumps)

### Contents

- [Requesting Instrument Installation](#)
- [Accessing Documentation](#)
- [Special Notices, Symbols, and Cautions](#)
- [Contacting Us](#)

### ❖ To suggest changes to the documentation

Complete a brief survey about this document by clicking the button below. Thank you in advance for your help.



## Requesting Instrument Installation

After you complete the laboratory site preparation and after the instrument arrives safely, send the completed and signed “Orbitrap Fusion Series Installation Request Form” on page iii to your local office for Thermo Fisher Scientific San Jose products. After receiving this form, the service engineer contacts you to schedule the instrument installation.

Do not open the shipping containers—the service engineer unpacks, inspects, and installs the system.

**IMPORTANT** If the instrument shipping container, ShockWatch™, or other indicators show any evidence of damage or mishandling during shipment, do NOT open the container. Follow the instructions in Chapter 3, “Instrument Shipments.”

## Accessing Documentation

The Orbitrap Fusion Series mass spectrometer includes complete documentation. For system requirements, refer to the release notes on the software DVD.

### ❖ To view the product manuals

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

### ❖ To view user documentation from the Thermo Fisher Scientific website

1. Go to [thermofisher.com](http://thermofisher.com).
2. Point to **Services & Support** and click **Manuals** on the left.
3. In the Refine Your Search box, search by the product name.
4. From the results list, click the title to open the document in your web browser, save it, or print it.







To return to the document list, click the browser **Back** button.



## Special Notices, Symbols, and Cautions






Make sure you understand the special notices, symbols, and caution labels in this guide. Most of the special notices and cautions appear in boxes; those pertaining to safety also have corresponding symbols. Some symbols are also marked on the instrument itself and can appear in color or in black and white. For complete definitions, see [Table 1](#).


**Table 1.** Notices, symbols, labels, and their meanings

Notice, symbol, or label	Meaning
<b>IMPORTANT</b>	Highlights information necessary to prevent damage to software, loss of data, or invalid test results; or might contain information that is critical for optimal performance of the product.
<b>Note</b>	Highlights information of general interest.
<b>Tip</b>	Highlights helpful information that can make a task easier.
	<b>Caution:</b> Read the cautionary information associated with this task.
	<b>Chemical hazard:</b> Observe safe laboratory practices and procedures when handling chemicals. Only work with volatile chemicals under a fume or exhaust hood. Wear gloves and other protective equipment, as appropriate, when handling toxic, carcinogenic, mutagenic, corrosive, or irritant chemicals. Use approved containers and proper procedures to dispose of waste oil and when handling wetted parts of the instrument.
	<b>Heavy object:</b> The Orbitrap Fusion Series MS, excluding its workbench, weighs over 227 kg (500 lb). Never try to detach and move the instrument from its workbench; you can suffer personal injury or damage the instrument.
	<b>Risk of electric shock:</b> This instrument uses voltages that can cause electric shock and personal injury. Before servicing the instrument, shut it down and disconnect it from line power. While operating the instrument, keep covers on.
	<b>Risk of eye injury:</b> Eye injury can occur from splattered chemicals, airborne particles, or sharp objects. Wear safety glasses when handling chemicals or servicing the instrument.
	<b>Trip obstacle:</b> Be aware of cords, hoses, or other objects located on the floor.


# Contacting Us

There are several ways to contact Thermo Fisher Scientific for the information you need. You can use your smartphone to scan a QR code, which opens your email application or browser.

Contact us	Customer Service and Sales	Technical Support
	(U.S.) 1 (800) 532-4752	(U.S.) 1 (800) 532-4752
	(U.S.) 1 (561) 688-8731	(U.S.) 1 (561) 688-8736
	<a href="mailto:us.customer-support.analyze@thermofisher.com">us.customer-support.analyze@thermofisher.com</a> 	<a href="mailto:us.techsupport.analyze@thermofisher.com">us.techsupport.analyze@thermofisher.com</a> 

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❖ **To find global contact information or customize your request**

  1. Go to [thermofisher.com](http://thermofisher.com).
  2. Click **Contact Us** and then select the type of support you need.
  3. At the prompt, type the product name.
  4. Use the phone number or complete the online form.
- ❖ **To find product support, knowledge bases, and resources**

Go to [thermofisher.com/us/en/home/technical-resources](http://thermofisher.com/us/en/home/technical-resources).
- ❖ **To find product information**

Go to [thermofisher.com/us/en/home/brands/thermo-scientific](http://thermofisher.com/us/en/home/brands/thermo-scientific).

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- Complete a survey at [surveymonkey.com/s/PQM6P62](https://surveymonkey.com/s/PQM6P62).

## Laboratory Requirements

Attention to the operating environment ensures continued high performance of the Thermo Scientific mass spectrometer. Ensure that the laboratory meets the requirements in [Table 2](#).



**CAUTION** All devices connected between the power source and the instrument must be certified by recognized organizations for your country or territory (for example, UL, CSA, SEMKO, VDE, or TÜV). Such devices include the power cords, electrical outlets, circuit breakers, uninterruptible power supplies (UPSs), and so on.

To avoid an electric shock, always have a certified electrician install any new hardwired devices, such as electrical outlets.


**Table 2.** Laboratory requirements (Sheet 1 of 4)

Parameter	Requirement
<b>Environment</b>	
Acoustic level	Less than 80 dBA
Altitude	Up to 2000 m (1.24 miles)
Relative humidity	40–80%, noncondensing
Temperature	<ul style="list-style-type: none"> <li>Operating range: 15–27 °C (59–81 °F)</li> <li>Optimum operating range: 18–21 °C (64–70 °F)</li> <li>Ambient temperature fluctuations: Less than 1 °C or 2 °F over a one-hour period</li> </ul>
Heat output (power)	<ul style="list-style-type: none"> <li>Data system<sup>a</sup>: 889 W (3033 BTU/h)</li> <li>MS system, single-forepump: 3800 W (12 966 BTU/h)</li> <li>MS system, dual-forepumps: 5300 W (18 084 BTU/h)</li> <li>(Optional) Thermo Scientific EASY-nLC™ 1200: 125 W (427 BTU/h)</li> <li>(Optional) Thermo Scientific Dionex™ UltiMate™ 3000 RSLnano system: 265 W (904 BTU/h)</li> </ul>


**Table 2.** Laboratory requirements (Sheet 2 of 4)

Parameter	Requirement
<b>Electrical</b>	
For additional information, see <a href="#">Appendix A, “Line Power Management.”</a>	
AC mains power system (nominal line power)	<ul style="list-style-type: none"> <li>Data system: 120 or 230 Vac single phase, 50/60 Hz</li> <li>Instrument: 230 Vac single phase, 50/60 Hz</li> </ul> <p>For optimal API source performance, the laboratory voltage must be at least 220 Vac. If it is not, order the Buck/Boost Transformer Kit (OPTON-01460) from Thermo Fisher Scientific San Jose. See also <a href="#">page 18</a>.</p>
<b>Note</b> The neutral-to-ground voltage must be 1 Vac or less.	
Transient overvoltages	Category II
Earth ground	Hardwire all earth ground connections to the ground used for the main circuit breaker panel. Multiple external ground points can cause noise current to flow through the ground loop that is formed.
Overcurrent protection (circuit breakers)	Select suitably rated circuit breakers so that the connected equipment does not lose power by triggering a current overload condition. For added protection, install a surge protector at the input to the circuit breaker panel.
Electrical outlets (wall receptacles)	<p>Install outlets with a load rating that is suitable for the expected total current draw per outlet. See <a href="#">Table 4</a>.</p> <p>MS and forepump:</p> <ul style="list-style-type: none"> <li>North America and other countries with the same configuration: NEMA 6-15 (250 Vac, 15 A)</li> <li>Other locations outside North America: 3-pole CEE (250 Vac, 16 A). The International Preinstallation Kit includes three CEE wall receptacles for your laboratory.</li> </ul>
<b>IMPORTANT</b> Connect the mass spectrometer and each forepump to separate electrical outlets that have their own dedicated single-phase, circuit breakers rated 230 Vac, 15 A for North America and 230 Vac, 16 A for other countries and territories. For example, a dual-forepump system requires three separate, dedicated electrical outlets (one for the instrument and two for the forepumps). See <a href="#">Figure 2</a> .	
Power cord lengths	<ul style="list-style-type: none"> <li>For the instrument and forepump: 2.5 m (8 ft)</li> <li>For the other system modules: 1.8 m (6 ft)</li> </ul>

**Table 2.** Laboratory requirements (Sheet 3 of 4)

Parameter	Requirement
<b>Gases<sup>b</sup></b>	
Helium	<ul style="list-style-type: none"> <li>• Ultra-high-purity (UHP) (99.999%) with less than 1.0 ppm each of water, oxygen, and total hydrocarbons</li> <li>• 275 ±70 kPa (40 ±10 psi)</li> <li>• 9.22 L (0.325 ft<sup>3</sup>) typical daily consumption</li> <li>• Tubing provided: precleaned copper, 4.6 m (15 ft), 1/8 in. OD</li> </ul> <p><b>Note</b> If you intend to use helium for sparging LC solvents, you must have a second tank and regulator.</p>
Nitrogen #1	<ul style="list-style-type: none"> <li>• UHP (99.999%) with less than 3.0 ppm each of water, oxygen, and total hydrocarbons</li> <li>• 345 ±70 kPa (50 ±10 psi)</li> <li>• 46 L (1.62 ft<sup>3</sup>) typical daily consumption</li> <li>• Tubing provided: precleaned copper, 4.6 m (15 ft), 1/8 in. OD</li> </ul>
Nitrogen #2	<ul style="list-style-type: none"> <li>• High-purity (99.5%)</li> <li>• 690 ±140 kPa (100 ±20 psi)</li> <li>• 11 500–26 700 L (406–943 ft<sup>3</sup>) typical daily consumption</li> <li>• Tubing provided: Teflon™ PFA, 4.6 m (15 ft), 1/4 in. OD</li> </ul>
 <p><b>CAUTION</b> Contaminants in the laboratory gas lines can cause damage to the instrument. Make sure that all gas lines have been cleaned of all particulates and oils. You must use either copper (provided) or stainless steel for the UHP gas lines. Avoid using particulate filters, as they can be a source of contamination.</p> <p>You are responsible for any damage to the instrument caused by contaminants introduced from your gas delivery system.</p>	

**Table 2.** Laboratory requirements (Sheet 4 of 4)

Parameter	Requirement
<b>System waste and exhaust</b>	
Equip your lab with at least two fume exhaust systems.	
#1: Solvent waste system	<ul style="list-style-type: none"> <li>• API source solvent waste flow rate: maximum 30 L/min (64 ft<sup>3</sup>/h)</li> <li>• Solvent waste tubing: 1-3/8 in. OD, 1 in. ID, and 3 m (10 ft) long</li> </ul>
<p><b>Note</b> Use a method of collecting the solvent waste that is compatible with the provided tubing and avoids pressure buildup in the API source.</p>	
#2: Forepump fume exhaust system	<ul style="list-style-type: none"> <li>• Forepump exhaust tubing:               <ul style="list-style-type: none"> <li>– (for single-forepump systems) 0.75 in. OD, 0.5 in. ID, 3 m (10 ft) long</li> <li>– (for dual-forepump systems) 0.75 in. OD, 0.5 in. ID, 6 m (20 ft) long</li> </ul> </li> <li>• Initial inrush flow rate: 3 L/min (6.4 ft<sup>3</sup>/hr)</li> <li>• Continuous flow rate: 1 L/min (2 ft<sup>3</sup>/hr)</li> </ul>
	<p><b>CAUTION</b> Do not run the forepump exhaust lines vertically near the forepump. Solvents and oils can condense in the line and flow back into the pump, causing pump damage and diminished pump capability. To maintain forepump integrity, route the exhaust tubing from the exhaust port down to the floor, not from the forepump vertically toward the ceiling. Run the hose at floor level for a minimum of 2 m (79 in.) before it reaches the external exhaust system.</p>
	<p>The dedicated exhaust system must be actively vented and be able to accommodate the periodic purging of the accumulated solvents in the forepump. The frequency of the purging depends on the throughput of the instrument.</p>
	<p><sup>a</sup> Mini-tower computer, monitor, and optional laser printer</p> <p><sup>b</sup> If the location of your gas supplies exceeds the length of the provided tubing, you must provide suitable tubing for the gas connections. Consumption values are approximate when operating 24 hours and 7 days a week</p>

## Installation Requirements

Before the Thermo Fisher Scientific service engineer installs the Orbitrap Fusion Series MS, read and understand these specific requirements and recommendations.

### Contents

- [Shipping Containers](#)
- [Electrical Requirements](#)
- [Workbenches and Clearance Distances](#)
- [Recommended MS Layout](#)
- [Customer-Supplied Hardware](#)
- [Solvent Requirements and Recommendations](#)

## Shipping Containers

Table 3 lists the overall dimensions and weights of the shipping containers that are too large to carry by hand. Ensure that the width of all doorways and hallways is a minimum of 1.4 m (54 in.). Transport the container with the mass spectrometer assembly (container #1) to the lab and do not open it until the service engineer is on site.

**Table 3.** Shipping container dimensions and weights<sup>a</sup>

Container	Size	Weight	Content
1	175 × 119 × 160 cm ( <i>l × w × h</i> ) (69 × 47 × 63 in.) ( <i>l × w × h</i> )	493 kg (1087 lb)	Mass spectrometer assembly
2	109 × 76 × 125 cm ( <i>l × w × h</i> ) (43 × 30 × 49 in.) ( <i>l × w × h</i> )	68 kg (150 lb)	Syringe pump, divert/inject valve, and data system components
3	79 × 51 × 51 cm ( <i>l × w × h</i> ) (31 × 20 × 20 in.) ( <i>l × w × h</i> )	66 kg (146 lb)	One forepump <sup>b</sup>

<sup>a</sup> The height and weight measurements include the shipping pallets.

<sup>b</sup> Each forepump has its own shipping container.

## Electrical Requirements

Table 4 lists the electrical ratings for the individual modules and the number of required electrical outlets for the MS and data system. See page 2 for the power cord lengths.

**Table 4.** Electrical ratings and required outlets per system module

Module	Voltage (Vac)	Current (A)	Required outlets
<b>MS system</b>			
Orbitrap Fusion Series MS	230	10	1
SOGEVAC™ SV65BI FC forepump <sup>a</sup>	230	8	1 or 2
Thermo Scientific divert/inject valve	110–220	1.5	1
Thermo Scientific syringe pump	110/220	0.2/0.1	1
<b>Data system</b>			
Computer, mini-tower	100–240	5.4	1
Monitor	100–240	1.5	1
Ethernet switch	100–240	< 1	1
(Optional) Laser printer	110 –or– 220	8.6 –or– 4.2	1
<b>Optional devices<sup>b</sup></b>			
High-intensity lamp (for instrument maintenance)	–	–	1
Laboratory stereoscope (for inspecting fused-silica parts)	–	–	1
<b>Total number of electrical outlets<sup>c</sup>:</b>	<b>10+ (single-forepump system)</b> <b>11+ (dual-forepump system)</b>		

<sup>a</sup> The values are for one forepump.

<sup>b</sup> Refer to the equipment manual for the electrical ratings.

<sup>c</sup> Remember to add the number of outlets required for your LC system.



## Workbenches and Clearance Distances

You must provide workbenches for the LC and data system modules. Workbenches must have a load capacity of at least *twice* the combined weight of all expected devices (Table 5).

The Orbitrap Fusion Series workbench<sup>1</sup> measures approximately 132 cm wide, 74 cm high, and 78.8 cm deep (52 in. wide, 29 in. high, and 31 in. deep) and has a load capacity of 508 kg (1120 lb).



**CAUTION Heavy object.** The Orbitrap Fusion Series MS, excluding its workbench, weighs over 227 kg (500 lb). Never try to detach and move the instrument from its workbench; you can suffer personal injury or damage the instrument. For additional information, contact your local Thermo Fisher Scientific service engineer.

**Note** Place the forepumps under the workbench, which was designed to minimize their noise without the need for sound-dampening boxes. Do not place the pumps on a shelf or other surface connected to the workbench.

**Table 5.** Space and load requirements for the system modules<sup>a</sup>

Equipment	Width ( <i>w</i> ) cm (in.)	Height ( <i>h</i> ) cm (in.)	Depth ( <i>d</i> ) cm (in.)	Weight kg (lb)
<b>LC/MS</b>				
(Optional) EASY-nLC 1200 <sup>b</sup>	36 (14.2)	45 (17.7)	38 (15.1)	35 (77)
(Optional) UltiMate 3000 RSLnano system <sup>b</sup>	42 (16.5)	88 (34.6)	51 (20)	70 (154)
Orbitrap Fusion Series MS <sup>c</sup>	127 (50)	70.31 (27.7)	76.7 (30)	245 (540)
Oerlikon Leybold Vacuum™ SOGEVAC SV65BI FC forepump (each)	32 (12.6)	26.4 (10.4)	48 (19)	52 (115)
<b>Data system</b>				
Computer, mini-tower	17.5 (7)	36 (14.2)	41.7 (16.4)	9.4 (21)
Monitor	64 (25.3)	54 (21) <sup>d</sup>	20 (8)	7 (15.8)
Ethernet switch	15.4 (6.1)	2.9 (1.1)	11 (4.3)	0.17 (0.4)
(Optional) Laser printer	45 (17.6)	31 (12.4)	41 (16.2)	16 (35)

<sup>a</sup> Approximate values

<sup>b</sup> These values exclude the solvent bottles and tubing.

<sup>c</sup> These values exclude the workbench, API source, syringe pump, and modular valve.

<sup>d</sup> Fully extended

<sup>1</sup> Provided with and bolted to the mass spectrometer

Follow these clearance guidelines for the workbenches (Figure 1):

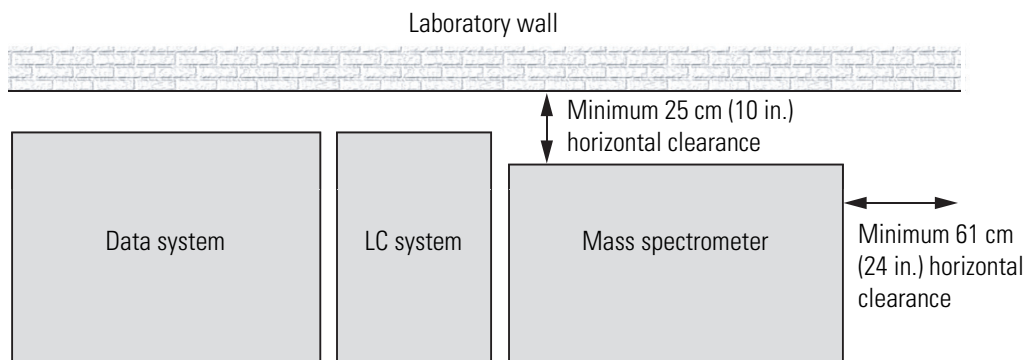
- Place the data system and MS workbenches close to each other to prevent strain on the interconnecting Ethernet communications cables.



**CAUTION** Safety and EMC regulations require the use of Category 5e shielded Ethernet communications cables, maximum 3 m (10 ft) long.

- For the LC and MS systems, allow for a minimum vertical clearance of 92 cm (36 in.) between the top of the system and any shelves above it.
- For the MS system, allow for these minimum horizontal clearances for proper air circulation and for the installed gas lines and tubing:
  - 25 cm (10 in.) behind the instrument
  - 61 cm (24 in.) on the right side of the instrument (between the MS and any solid barrier, such as a wall)

**Figure 1.** Top view (footprint) and recommended placement of the workbenches

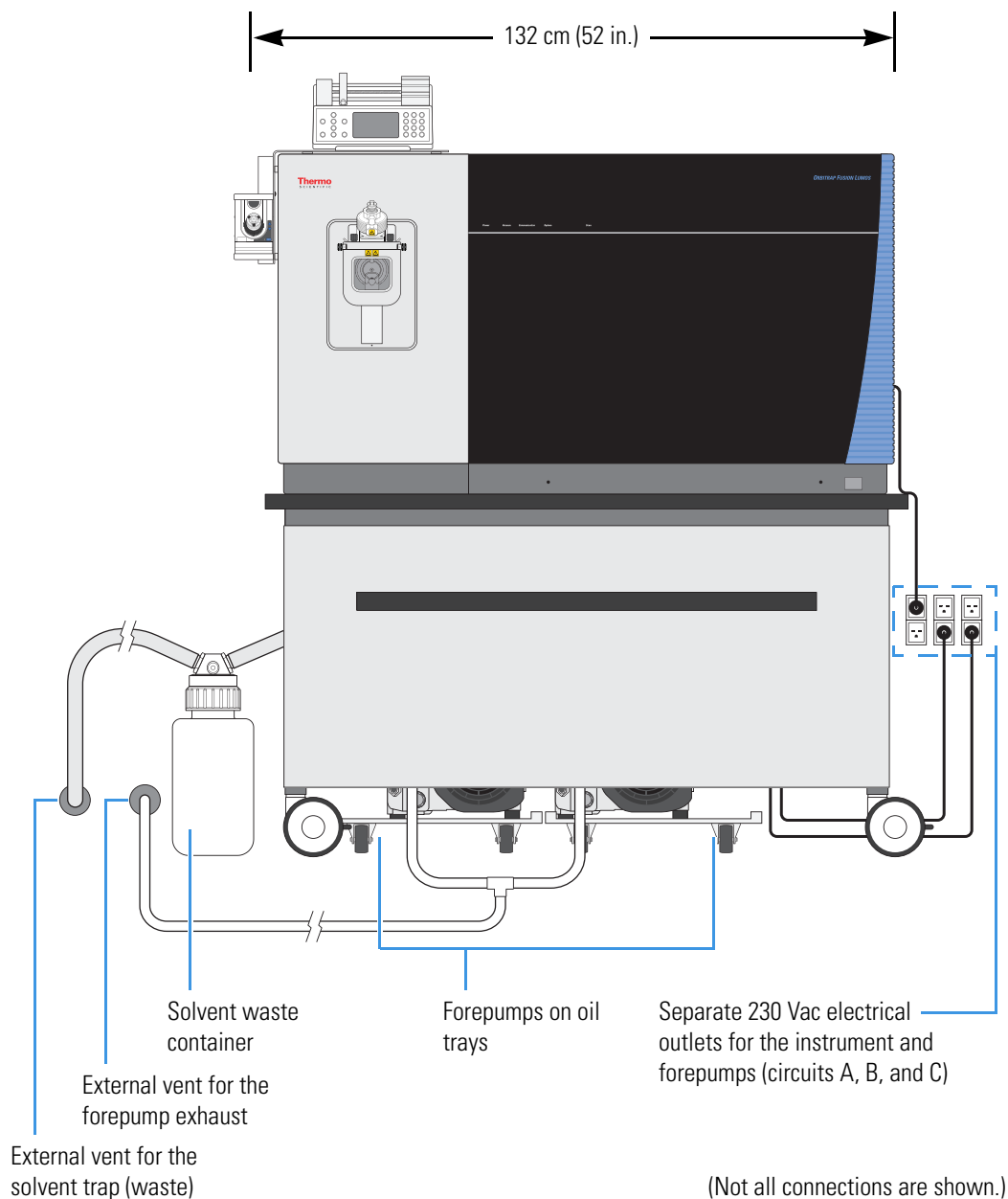


**CAUTION Trip hazard.** Whenever possible, provide space under the workbench for the forepumps. If placed in front of the mass spectrometer, the forepumps become a trip hazard.

## Recommended MS Layout

Figure 2 shows an example of the recommended layout for the Orbitrap Fusion Lumos MS (dual-forepump system). The layout for the Orbitrap Fusion MS is the same, except it has one forepump. Not all connections are shown; for installation instructions, refer to the *Orbitrap Fusion Series Getting Connected Guide*.

**Figure 2.** Workbench for the Orbitrap Fusion Lumos MS



## Customer-Supplied Hardware

Your purchase does not contain all parts, materials, or tools that are required for installation. To complete the installation, you must provide these additional parts (Table 6).

**IMPORTANT** If the location of your gas supplies exceeds the length of the provided tubing, you must provide suitable tubing for the gas connections. See “Gases” on page 3.

**Table 6.** Customer-supplied hardware for installation

Item	Description
Communications cable	Connects from the Ready Out and Injection Hold pins (peripheral control connector) on the mass spectrometer to a device not controlled by one of the Thermo Scientific mass spectrometer applications, such as the Xcalibur™ data system.
Gas line fittings, UHP helium and UHP nitrogen	Connects the 1/8 in. ID copper or stainless steel tubings to the helium and nitrogen (#2) gas supplies.
Gas line fitting, HP nitrogen	Connects the 1/4 in. OD Teflon PFA tubing to the nitrogen (#1) gas supply.
LC system	<b>IMPORTANT</b> If your LC system is manufactured by another company, you must verify that it is suitable for use with the Orbitrap Fusion Series MS. The output (start) signal from the external device must be <i>Normally Hi</i> (+5 Vdc) and momentarily go to <i>Low</i> . If you cannot configure the external device to go from <i>Normally Hi</i> to <i>Low</i> momentarily, you cannot use it with the Orbitrap Fusion Series MS.
LC system, solvents	Used by the service engineer to calibrate the system during the initial setup. For details, refer to the appropriate LC manual.

## Solvent Requirements and Recommendations

Before you start using the Orbitrap Fusion Series MS, make sure that your lab has the necessary solvents and recommended solutions and equipment. Installation and maintenance of the MS requires LC/MS-grade or better methanol and water (see [Table 7](#)).

- [Mobile Phase Requirements](#)
- [LC Additive Restrictions](#)
- [Recommended Solutions](#)

### Mobile Phase Requirements

Ensure the following:

- Use LC/MS-grade or better solvents and additives
- Use dedicated glassware that you clean and store in the lab between uses.
- Clean solvent bottles before refilling them.
- Do not use plastic materials for preparing or storing solvents.
- Do not use Parafilm™ to seal mobile phase solution bottles.

### LC Additive Restrictions

**Note** If your workflow requires the use of any of these reagents, contact Thermo Fisher Scientific Technical Support for advice.

Limit the type of reagents you use:

- Because it reacts with the PEEK material, do not use tetrahydrofuran (THF).
- Because these might cause corrosion of the API source, do not use the following:
  - Alkali-metal bases, such as sodium hydroxide (NaOH)
  - Inorganic acids, such as hydrogen chloride (HCl), phosphoric acid (H<sub>3</sub>PO<sub>4</sub>), or sulfuric acid (H<sub>2</sub>SO<sub>4</sub>)
- Because these reagents can suppress ionization, do not use the following:
  - Detergent solutions
  - Involatile buffer solutions, such as borate, citrate, or phosphate
  - Surfactants or other surface-active agents, such as polyethylene glycol (PEG), sodium dodecyl sulfate (SDS), or Triton X-100
  - Trifluoroacetic acid (TFA) at concentrations (volume/volume %) greater than 0.1

## 2 Installation Requirements

Solvent Requirements and Recommendations

### Recommended Solutions

For a wide variety of LC/MS- and UHPLC/MS-grade solvents and consumables for purchase, visit [www.fishersci.com](http://www.fishersci.com).



#### **CAUTION** Avoid exposure to potentially harmful materials.

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.

**Table 7.** Recommended solutions

Product	Grade	Size <sup>a</sup>	Part number
<b>Solvents</b>			
2-Propanol	Optima™ LC/MS	Amber glass, 1 L	A461-1
Acetonitrile	Optima UHPLC/MS	Amber glass, 1 L	A956-1
Methanol	Optima UHPLC/MS	Amber glass, 1 L	A458-1
Water	Optima UHPLC/MS	Amber glass, 1 L	W8-1
<b>Blends</b>			
0.1% Formic acid in acetonitrile	Optima LC/MS	Amber glass, 1 L	LS120-1
0.1% Formic acid in water	Optima LC/MS	Amber glass, 1 L	LS118-1
<b>Additives</b>			
Acetic acid (modifier)	Optima LC/MS	Ampule, 1 mL	A113-1AMP
Ammonium acetate (modifier)	Optima LC/MS	Amber glass, 50 g	A114-50
Ammonium formate (modifier)	Optima LC/MS	Amber glass, 50 g	A115-50
Formic acid (modifier)	Optima LC/MS	Ampule, 10 × 1 mL	A117-10X1AMP

<sup>a</sup> Size for the stated part number

## Instrument Shipments

Electronic equipment carriers that specialize in the handling and transport of delicate machinery ship the Orbitrap Fusion Series MS to your site. When the instrument arrives, move it to a protected indoor location. If you have questions about moving your instrument, contact your local office for Thermo Scientific San Jose products (see “[Contacting Us](#)” on [page x](#)).

On the occasion when shipments arrive that appear damaged, take these immediate actions.

### Contents

- [Receiving Shipping Packages and Reporting Damage](#)
- [Filing a Damage Claim Against the Carrier](#)

## Receiving Shipping Packages and Reporting Damage

When the shipment packages arrive, visually inspect them for any damage.

### ❖ To visually inspect for damage

Carefully inspect for obvious damage or evidence of rough handling.

If the instrument shipping container, ShockWatch, or other indicators show visible evidence of damage or mishandling, do NOT open the container.

Follow the next procedure, and then call your Thermo Fisher Scientific sales representative for further instructions.

### ❖ To record damages on the receiving documents

1. Read the information in [Filing a Damage Claim Against the Carrier](#) to determine which parties might be responsible for filing a claim against the carrier.
2. On all copies of the receiving documents, note any apparent external damage and briefly describe the extent of the damage.

### 3 Instrument Shipments

#### Filing a Damage Claim Against the Carrier

3. Have the driver sign or initial next to your comments to signify agreement with your observations.
4. Report the list of damages to your Thermo Fisher Scientific representative.

**IMPORTANT** Freight insurance requires that you note obvious damage on the receiving documents. Thermo Fisher Scientific does not accept liability for damage if materials are received with obvious damage AND the damage is not recorded on the receiving documents.

## Filing a Damage Claim Against the Carrier

If the instrument is damaged in transit, the shipment method determines the party who assumes the risk of damage and files a claim against the carrier—Thermo Fisher Scientific or the purchaser. To determine the shipment method for instruments shipped from the San Jose, CA site, check the sales agreement or the sales quote.

Table 8 lists the party who files the damage claim against the carrier for instruments damaged in transit based on the shipment method.

**Table 8.** Shipment methods for delivery from the San Jose, CA site to domestic and international destinations

Destination	Shipment method	Party responsible for filing a damage claim
Domestic (United States)	Destination or Origin—Thermo Fisher Scientific pays the carrier.	Thermo Fisher Scientific
	Origin—The purchaser pays the carrier.	Purchaser
International	Carriage Paid To (CPT) named destination <sup>a</sup>	Purchaser
	Carriage and Insurance Paid (CIP) to named destination <sup>b</sup>	Thermo Fisher Scientific

<sup>a</sup> Unless specified differently, Thermo Fisher Scientific uses this shipment method for international shipments.

<sup>b</sup> Under special circumstances, Thermo Fisher Scientific uses this shipment method for international shipments.



## Instrument Demonstration

When your new Orbitrap Fusion Series system is on site and ready for installation, the service engineer unpacks and installs it.

During the installation, the service engineer demonstrates the following:

- Basics of the instrument operation and routine maintenance
- Marketing specifications that are in effect when you purchased the instrument

**Tip** To receive maximum benefit from this on-site training opportunity, plan for the system operators to be available during the entire installation process.

Do not use the new system for sample analysis until the installation is complete and you have signed the Acceptance Form.

## 4 Instrument Demonstration

## Line Power Management

The quality of line power (ac mains power system) delivered to the mass spectrometer can affect its performance and longevity. You are responsible for correcting any line power problems. Contact Thermo Fisher Scientific for assistance in monitoring the line voltage in your lab and in selecting a line conditioner.



**CAUTION** To support compliance and safety requirements, all devices connected between the power source and the mass spectrometer must be certified by recognized organizations for your country or territory (for example, UL, CSA, SEMKO, VDE, or TÜV).

Such devices include the power supply cords, electrical outlets, circuit breakers, uninterruptible power supplies (UPSs), and so on.

### Contents

- [Power Monitoring Devices](#)
- [Quality of Power](#)
- [Power Conditioning Devices](#)
- [Uninterruptible Power Supply](#)

## Power Monitoring Devices

Several devices are available to monitor the quality of the line power. These devices provide a continuous record of line performance by analyzing and printing out data for the three most common voltage disturbances. Monitor the power line 24 hours a day for seven consecutive days. If inspection of the printout indicates disturbances, stop the test and take corrective action. Monitor the power again as previously described.

A power line disturbance analyzer detects and records most types of line power problems. The Dranetz™ system<sup>1</sup> is an example of a suitable analyzer. In some countries, you can rent power line analyzers from electrical equipment suppliers.

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<sup>1</sup> Thermo Fisher Scientific does not endorse any power monitoring company, nor does it endorse products other than its own. Companies and products listed in this guide are given as examples only.

## Quality of Power

Before the service engineer arrives to install your system, make sure the line voltage is stable and within the recommended specifications. The line voltage must be free of fluctuations due to slow changes in the average sags, surges, transients, or voltage. Establishing the quality of power supplied to the LC/MS system is very important for these reasons:

- 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 equipment to function erratically or not at all.
- Transients—even a few microseconds in duration—can cause electronic devices to degrade or fail catastrophically, shortening the lifetime of the equipment.

## Power Conditioning Devices

If the power regulation is good but the power line disturbance analyzer shows transient voltages, an isolation/noise-suppression transformer can resolve the problem. For both transient and regulation problems, consider the use of power conditioners to control these problems.



**CAUTION** Any conditioning device installed with the mass spectrometer must be able to handle the potentially high currents that are drawn during the initial startup of the system. The maximum system inrush (start) current for one forepump (SOGEVAC SV65BI FC) is 12 A with an average duration of less than 1 s. Therefore, this initial energy demand from the ac power line is very low.

When the line voltage is free from voltage sags, surges, and impulses but is more than 10 percent outside of the voltage specifications, a buck/boost transformer can lower (buck 10 percent) or raise (boost 10 percent) the line voltage as appropriate for the rated voltage.



**CAUTION** Instruments installed in areas with 208 Vac power can experience voltage sags during high use periods that might place the line voltage below the operating parameters discussed in this section. In this case, protect the instrument by ordering a Buck/Boost Transformer Kit (P/N OPTON-01460) to ensure that power stays within the specified parameters.

## Uninterruptible Power Supply

If your local area is susceptible to corrupted power or power disruptions, install an uninterruptible power supply (UPS) in the lab. For additional information, visit [www.thermopowervar.com](http://www.thermopowervar.com). For North American labs, you can order a POWERVAR™ UPS (5.2 kVA, 6.0 kVA, or 8.0 kVA) from [Unity Lab Services](#).