

LTQ Series

Preinstallation Requirements Guide

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Software version: Thermo LTQ Tune Plus 2.7.0 and later; Microsoft Windows 7 Professional (32 bit) SP1—Thermo Foundation 2.0 and later, and Thermo Xcalibur 2.2 and later; Windows XP Workstation SP3—Foundation 1.0.2 SP2 or earlier, and Xcalibur 2.1 SP1 or earlier

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



LTQ Series Installation Request Form

Dear User:

Read the *LTQ Series Preinstallation Requirements Guide*, and then print and complete the following installation request form. After all items on the form are fulfilled, sign and date the form. Then, mail or fax this form to your local Thermo Fisher Scientific sales/service office. The address and fax number for your local office are located on the following pages.

- 1. All laboratory remodeling has been completed.
- 2. Your *LTQ Series* mass spectrometer is on site.
- 3. The principal operator will be available during the installation/certification period.
- 4. Doorways, hallways, and so on are a minimum width of 99 cm (39 in.).
- 5. Available floor area is sufficient and flooring will support the load.
- 6. Sufficient bench space is available for all of the equipment. List the following:
Width: _____; Depth: _____
Height: _____
- 7. Workbench can support the load of the system (202 kg [445 lb]) and is free from vibration.
- 8. Lighting is adequate.
- 9. Main power is installed and is in compliance with local electrical codes.
- 10. Power for test and cleaning equipment is installed.
- 11. Power outlets are of the correct configuration.
Note type: _____
- 12. Voltage of power outlets have been measured.
Note **measured** voltage:
AC line-to-ground: _____ V
AC neutral-to-ground: _____ V
AC line-to-neutral: _____ V
- 13. Power is free from fluctuations due to slow changes in the average voltage or changes due to surges, sags, or transients.
- 14. Air conditioning is adequate for temperature, humidity, and particulate matter control. The laboratory can be maintained at a constant temperature of 15–27 °C (59–81 °F).
- 15. Relative humidity is 40–80%, noncondensing.
- 16. System work area is free from magnetic disruption and electrostatic discharge.
- 17. All gases that are required (helium and nitrogen) are on site, gas lines are installed, and appropriate gas regulators are available.
List purity levels for the following:
Helium: _____ %
Nitrogen: _____ %
Additional ultra-high-purity source for the ETD module only:
75% Nitrogen/25% Helium mixture: _____ %
–or– 100% Nitrogen: _____ %
- 18. New or recently cleaned HPLC system is available that produces pulse-free, continuous flow of 100–1000 µL/min.
- 19. LC/MS-grade water, methanol, acetonitrile, and isopropyl alcohol are available for testing the performance of your instrument.
- 20. A suitable exhaust system is 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.
- 21. Provisions have been made to collect solvent waste from the API source.
- 22. One voice telephone line is installed near the system.
- 23. All relevant safety regulations are complied with.
- 24. For a MALDI LTQ XL system, you have specified an appropriate delivery site for the chemical kit.
- 25. For systems with a MALDI module, the following equipment and materials are necessary for proper installation of your MALDI source. They are also required for many routine operational tasks described in the *MALDI Source Getting Started Guide*.
Equipment:
Analytical balance, microcentrifuge, pipettors (recommend 2.5, 200, and 1000 µL), sonicator (capacity for 1 L beaker), and vortexer
Consumables:
Can of compressed difluoroethane (“compressed air” for dust removal), microcentrifuge tubes (500 µL), optical lens wipes or soft clean room wipes, and pipettor tips
Chemicals and Solvents:
Acetone, acetonitrile, 20–30% ammonium hydroxide solution, isopropyl alcohol, methanol, trifluoroacetic acid (TFA), and water

CONTINUED ON THE BACK OF THIS PAGE

LTQ Series Installation Request Form (Page 2 of 2)

Have any special acceptance specifications been agreed to in the contract? Yes No

If **YES**, attach full details of specifications.

Is there any additional equipment that needs to be interfaced to the system? Yes No

If **YES**, attach full details of additional equipment.

Note: We reserve the right to invoice against the engineer's time if the installation requirements are not met on the date of the installation.

Print your name, company name, and company address clearly below:

Name _____

Company _____ Telephone _____

Address _____

Address _____

City _____ State _____ Country _____

E-mail address (optional) _____

Signature _____ Date _____

Chromatography and Mass Spectrometry Offices

For up-to-date contact information, visit www.thermoscientific.com/wps/portal/ts/contactus.

North America

United States

1400 North Point Pkwy #10
West Palm Beach, FL 33407

E-mail:

us.customer-support.analyze@thermofisher.com

Phone [1] 800 532 4752

Fax [1] 877 373 4006

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2845 Argentia Road, Unit 4
Mississauga, Ontario, L5N 8G6

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Europe

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Phone [45] (70) 236267

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Finland—see “Sweden, Norway, and Finland”

France

(Also representing French-speaking North Africa, Algeria, Morocco, and Tunisia)

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Silic 765

Z.A. de Courtaboeuf

F-91963 Les Ulis Cédex

E-mail: service.sid.lesulis@thermofisher.com

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Fax [49] (0) 6103 408 1213

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E-mail: assistenza.technica.it@thermofisher.com

Phone Numero Verde (800) 823 162

Fax [39] (02) 95320 225

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NL-4817 BL Breda

E-mail: service.sid.benelux@thermofisher.com

Phone [31] (0) 76 579 55 55

Fax [31] (0) 76 581 09 61

Norway—see “Sweden, Norway, and Finland”

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C/Valportillo I, nº22 1a Planta
Edificio Caoba
ES-28108 Alcobendas - Madrid

E-mail: service.sid.spain@thermofisher.com

Phone [34] (914) 845 965

Fax [34] (914) 843 598

Notes: The country code is enclosed in square brackets []. The city code or area code is enclosed in parenthesis (). For countries other than the U.S., when you are dialing from within the specified country, dial the 0 of the city code. For countries other than Italy, when you are dialing from outside the country, do not dial the 0 of the city code.

Chromatography and Mass Spectrometry Offices (Continued)

Europe—continued

Sweden, Norway, and Finland

Pyramidbacken 3
S-141 75 Kungens Kurva (Stockholm)
Sweden
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Fax[61] 9763 1169

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3-9 Moriya-cho, Kanagawa-ku
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E-mail: analyze.jp@thermofisher.com
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Fax[81] (45) 453 9110

P.R. China

7/F Building F, Tower West, Younghe Plaza
No. 28, Andingmen East Street
Dong Cheng District
Beijing 100007
E-mail: analyze.cn@thermofisher.com
Phone[86] (010) 8419 3588
Fax[86] (010) 8419 3589

Regulatory Compliance

Thermo Fisher Scientific performs complete testing and evaluation of its products to ensure full compliance with applicable domestic and international regulations. When the system is delivered to you, it meets all pertinent electromagnetic compatibility (EMC) and safety standards as described in the next section or sections by product name.

Changes that you make to your system may void compliance with one or more of these EMC and safety standards. Changes to your system include replacing a part or adding components, options, or peripherals not specifically authorized and qualified by Thermo Fisher Scientific. To ensure continued compliance with EMC and safety standards, replacement parts and additional components, options, and peripherals must be ordered from Thermo Fisher Scientific or one of its authorized representatives.

Regulatory compliance results for the following Thermo Scientific products:

- [LXQ Mass Spectrometer \(February 2005\)](#)
- [LTQ XL Mass Spectrometer \(September 2006\)](#)
- [LTQ XL/ETD System \(November 2008\)](#)
- [MALDI LTQ XL System \(August 2007\)](#)
- [LTQ Velos Mass Spectrometer \(August 2008\)](#)
- [LTQ Velos/ETD System \(November 2008\)](#)
- [Velos Pro Mass Spectrometer \(April 2011\)](#)
- [Velos Pro/ETD System \(April 2011\)](#)

LXQ Mass Spectrometer (February 2005)

EMC Directive 89/336/EEC as amended by 92/31/EEC and 93/68/EEC

EMC compliance has been evaluated by Underwriters Laboratories, Inc.

EN 55011: 1998	EN 61000-4-3: 2002, A1: 2002
EN 61000-3-2: 1995, A1: 1998, A2: 1998, A14: 2000	EN 61000-4-4: 1995, A1: 2001, A2: 2001
EN 61000-3-3: 1995	EN 61000-4-5: 1995, A1: 2001
EN 61326-1: 1997	EN 61000-4-6: 1996, A1: 2001
EN 61000-4-2: 1995, A1: 1998, A2: 2001	EN 61000-4-11: 1994, A1: 2001
FCC Class A, CFR 47 Part 15, Subpart B: 2004	CISPR 11: 1999, A1: 1999, A2: 2002

Low Voltage Safety Compliance

This device complies with Low Voltage Directive 73/23/EEC and harmonized standard EN 61010-1:2001.

LTQ XL Mass Spectrometer (September 2006)

EMC Directive 89/336/EEC

EMC compliance has been evaluated by TÜV Rheinland of North America, Inc.

EN 55011: 1998, A1: 1999, A2: 2002	EN 61000-4-3: 2002
EN 61000-3-2: 1995, A1: 1998, A2: 1998, A14: 2000	EN 61000-4-4: 1995, A1: 2001, A2: 2001
EN 61000-3-3: 1995, A1:2001	EN 61000-4-5:1995, A1: 2001
EN 61326-1: 1997, A1: 1998, A2: 2001, A3: 2003	EN 61000-4-6: 2003
EN 61000-4-2: 2001	EN 61000-4-11: 2001
FCC Class A, CFR 47 Part 15: 2005	CISPR 11: 1999, A1: 1999, A2: 2002

Low Voltage Safety Compliance

This device complies with Low Voltage Directive 73/23/EEC and harmonized standard EN 61010-1:2001.

LTQ XL/ETD System (November 2008)

EMC Directive 89/336/EEC

EMC compliance has been evaluated by TÜV Rheinland of North America, Inc.

EN 61000-3-2: 2006	EN 61000-4-4: 2004
EN 61000-3-3: 1995, A1: 2001, A2: 2005	EN 61000-4-5: 2005
EN 61326-1: 2006	EN 61000-4-6: 2007
EN 61000-4-2: 1995, A1: 1999, A2: 2001	EN 61000-4-8: 1993, A1: 2001
EN 61000-4-3: 2006	EN 61000-4-11: 2004
FCC Class A, CFR 47 Part 15: 2007	CISPR 11: 1999, A1: 1999, A2: 2002

Low Voltage Safety Compliance

This device complies with Low Voltage Directive 73/23/EEC and harmonized standard EN 61010-1:2001.



MALDI LTQ XL System (August 2007)

EMC Directive 2004/108/EC

EMC compliance has been evaluated by TÜV Rheinland of North America, Inc.

EN 55011: 1998, A1: 1999, A2: 2002	EN 61000-4-3: 2002
EN 61000-3-2: 2000	EN 61000-4-4: 1995, A1: 2000, A2: 2001
EN 61000-3-3: 1995, A1: 2001	EN 61000-4-5: 2001
EN 61326-1: 1998, A2: 2001, A3: 2003	EN 61000-4-6: 2003
EN 61000-4-2: 2001	EN 61000-4-11: 2001
FCC Class A, CFR 47 Part 15: 2006	CISPR 11: 1998, A1:1999, A2: 2002

Low Voltage Safety Compliance

This device complies with Low Voltage Directive 2006/95/EC and harmonized standard EN 61010-1:2001.

Safety of Laser Products

Compliance with safety of laser products is declared under Thermo Fisher Scientific sole responsibility. This device complies with the harmonized standard IEC/EN 60825-1/A2: 2001.

LTQ Velos Mass Spectrometer (August 2008)

EMC Directive 2004/108/EEC

EMC compliance has been evaluated by TÜV Rheinland of North America, Inc.

EN 55011: 2007, A2: 2007	EN 61000-4-3: 2006
EN 61000-3-2: 2006	EN 61000-4-4: 2004
EN 61000-3-3: 1995, A1: 2001, A2: 2005	EN 61000-4-5: 2005
EN 61326-1: 2006	EN 61000-4-6: 2007
EN 61000-4-2: 1995, A1: 1999, A2: 2001	EN 61000-4-11: 2004
FCC Class A, CFR 47 Part 15: 2007	

Low Voltage Safety Compliance

This device complies with Low Voltage Directive 2006/95/EEC and harmonized standard EN 61010-1:2001.

LTQ Velos/ETD System (November 2008)

EMC Directive 2004/108/EEC

EMC compliance has been evaluated by TÜV Rheinland of North America, Inc.

EN 61326-1: 2006	EN 61000-4-4: 2004
EN 55011: 2007	EN 61000-4-5: 2005
EN 61000-3-2: 2006	EN 61000-4-6: 2007
EN 61000-3-3: 2005	EN 61000-4-11: 2004
EN 61000-4-2: 2001	FCC Part 15: 2007
EN 61000-4-3: 2006	

Velos Pro Mass Spectrometer (April 2011)

EMC Directive 2004/108/EEC

EMC compliance has been evaluated by TÜV Rheinland of North America, Inc.

EN 61326-1: 2006	EN 61000-4-3: 2006
EN 55011: 2007, A2: 2007	EN 61000-4-4: 2004
CFR 47, FCC Part 15, Subpart B, Class A: 2009	EN 61000-4-5: 2005
EN 61000-3-2: 2006	EN 61000-4-6: 2007
EN 61000-3-3: 1995, A1: 2001, A2: 2005	EN 61000-4-11: 2004
EN 61000-4-2: 1995, A1: 1999, A2: 2001	

Low Voltage Safety Compliance

This device complies with Low Voltage Directive 2006/95/EEC and harmonized standard EN 61010-1:2001.

Velos Pro/ETD System (April 2011)

EMC Directive 2004/108/EEC

EMC compliance has been evaluated by TÜV Rheinland of North America, Inc.

EN 61326-1: 2006	EN 61000-4-3: 2006
EN 55011: 2007, A2: 2007	EN 61000-4-4: 2004
CFR 47, FCC Part 15, Subpart B, Class A: 2009	EN 61000-4-5: 2005
EN 61000-3-2: 2006	EN 61000-4-6: 2007
EN 61000-3-3: 1995, A1: 2001, A2: 2005	EN 61000-4-8: 1993, A1: 2001
EN 61000-4-2: 1995, A1: 1999, A2: 2001	EN 61000-4-11: 2004

Low Voltage Safety Compliance

This device complies with Low Voltage Directive 2006/95/EEC and harmonized standard EN 61010-1:2001.

FCC Compliance Statement

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRE OPERATION.



CAUTION 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 Fisher Scientific instrument *requires a team effort* to lift and/or move 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: Use of this instrument in a manner not specified by Thermo Fisher Scientific could impair any protection provided by the instrument.

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.

For manufacturing location, see the label on the instrument.

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 or disposal companies in each European Union (EU) Member State, and these companies should dispose of or recycle this product. See www.thermoscientific.com/rohswее for further information on Thermo Fisher Scientific's compliance with these Directives and the recyclers in your country.

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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Conformité DEEE

Ce produit doit être conforme à la directive européenne (2002/96/EC) des Déchets d'Équipements Électriques et Électroniques (DEEE). Il est marqué par le symbole suivant:



Thermo Fisher Scientific s'est associé avec une ou plusieurs compagnies de recyclage dans chaque état membre de l'union européenne et ce produit devrait être collecté ou recyclé par celles-ci. Davantage d'informations sur la conformité de Thermo Fisher Scientific à ces directives, les recycleurs dans votre pays et les informations sur les produits Thermo Fisher Scientific qui peuvent aider la détection des substances sujettes à la directive RoHS sont disponibles sur www.thermoscientific.com/rohsweee.

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Preface

The *LTQ Series Preinstallation Requirements Guide* provides information for planning and preparing your laboratory before delivery and installation of your Thermo Scientific™ LTQ™ Series mass spectrometer (MS). Read each section carefully to ensure that your lab is ready for the system.

The LTQ Series mass spectrometers are part of the Thermo Scientific family of mass spectrometers and include the following models:

- LXQ™, a single-segment 2D linear ion trap mass spectrometer
- LTQ XL™, a three-segment 2D linear ion trap mass spectrometer
- LTQ Velos™, a dual-cell 2D linear ion trap mass spectrometer
- Velos Pro™, a dual-cell 2D linear ion trap mass spectrometer

In addition, use this guide to configure the following LTQ Series systems:

- LTQ XL/ETD system, where the ETD module is physically coupled to the back of the LTQ XL mass spectrometer
- LTQ Velos/ETD system, where the ETD module is physically coupled to the back of the Velos Pro mass spectrometer
- Velos Pro/ETD system, where the ETD module is physically coupled to the back of the Velos Pro mass spectrometer
- MALDI LTQ XL system, with the [MALDI \(matrix-assisted laser desorption ionization\)](#) sample and control modules connected

The optional [atmospheric pressure ionization \(API\)](#) kit provides the hardware for liquid chromatography (LC)/MS applications with [electrospray ionization \(ESI\)](#), [atmospheric pressure chemical ionization \(APCI\)](#), and so on.

Contents

- [Related Documentation](#)
- [Safety and Special Notices](#)
- [Contacting Us](#)

Related Documentation

The software CD included with the LTQ Series mass spectrometers provides complete documentation. In addition to this guide, you can access the following documents from the data system computer for the LTQ Series mass spectrometers:

- *LTQ Series Getting Connected Guide*
- *LTQ Series Getting Started Guide*
- *LTQ Series Hardware Manual*
- *ETD Module Getting Started Guide* (with the MS/ETD system)
- *ETD Module Hardware Manual* (with the MS/ETD system)
- *MALDI Source Getting Started Guide* (with the MALDI LTQ XL system)
- *MALDI Source Hardware Manual* (with the MALDI LTQ XL system)

To access the manuals for the mass spectrometer, from the Microsoft™ Windows™ taskbar, choose **Start > All Programs > Thermo Instruments > Manuals > *model***, where *model* is your specific model, and then click the PDF file you want to view.

Note For Thermo Xcalibur™ version 2.0.7 or earlier (Microsoft Windows XP operating system), choose **Start > All Programs > Xcalibur > Manuals > LTQ > *model***.

The LTQ Series software also provides Help. To access the Help, choose **Help** from the menu bar.

Safety and Special Notices

Make sure that you follow the precautionary statements presented in this guide. The safety and other special notices appear in boxes. Safety and special notices include the following.



CAUTION Highlights hazards to humans, property, or the environment. Each CAUTION notice is accompanied by an appropriate CAUTION symbol.




IMPORTANT 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 system.

Note Highlights information of general interest.

Tip Highlights helpful information that can make a task easier.

Table 1 lists additional caution-specific symbols that appear in the *LTQ Series Preinstallation Requirements Guide*.

Table 1. Caution-specific symbols and their meanings

Symbol	Meaning
	Chemical: Hazardous chemicals might be present in the instrument. Wear gloves when handling carcinogenic, corrosive, irritant, mutagenic, or toxic chemicals. Use only approved containers and procedures for disposing of waste oil.
	Eye Hazard: Eye damage could occur from splattered chemicals or airborne particles. Wear safety glasses when handling chemicals or servicing the instrument.
	Trip Hazard: The forepumps might present a trip hazard. Be aware of the pumps' location and how you route all power supply cords and tubings.

Contacting Us

There are several ways to contact Thermo Fisher Scientific for the information you need.

❖ To contact Technical Support

Phone	800-532-4752
Fax	561-688-8736
E-mail	us.techsupport.analyze@thermofisher.com
Knowledge base	www.thermokb.com

Find software updates and utilities to download at mssupport.thermo.com.

❖ To contact Customer Service for ordering information

Phone	800-532-4752
Fax	561-688-8731
E-mail	us.customer-support.analyze@thermofisher.com
Web site	www.thermo.com/ms

❖ To get local contact information for sales or service

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❖ **To suggest changes to documentation or to Help**

- Fill out a reader survey online at www.surveymonkey.com/s/PQM6P62.
- Send an e-mail message to the Technical Publications Editor at techpubs-lcms@thermofisher.com.

Introduction

The Thermo Scientific LTQ Series mass spectrometers (MSs) operate under carefully controlled environmental conditions.

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



CAUTION Operating a system or maintaining it outside the power specifications and operating environment 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

- For additional information, request specific preinstallation support directly through your local Thermo Fisher Scientific office.
- Unless otherwise noted:
 - For the LTQ mass spectrometer, follow the LTQ XL information.
 - For the LTQ Velos mass spectrometer, follow the Velos Pro information.
- The “Glossary” on [page 47](#) defines some of the terms used in this guide.

Site Preparation

Before a Thermo Fisher Scientific field service engineer can install your LTQ Series mass spectrometer, make sure your laboratory meets these requirements:

- When transporting the equipment to the designated site, you have a wide turning radius through entrances, hallways, elevators, and so on. Consider the width of the device transporting the shipping container to the lab.
- You have workbenches that are strong enough to support the weight of the instruments.
- You have a telephone installed within reach of the mass spectrometer.

You are responsible for providing an acceptable installation site before the Thermo Fisher Scientific field service engineer arrives.

Contents

- [Shipping Containers](#)
- [Space and Load Requirements](#)
- [Forepumps](#)
- [Telephone](#)

Shipping Containers

Table 2 lists the overall dimensions and weights of the shipping containers for the various LTQ Series system configurations that are too large to carry by hand. Use this information to determine how to transport the boxes and remove their contents. Other equipment, such as the [data system](#) and peripherals, have their own smaller shipping containers and do not require special considerations. The chemicals kit typically arrives earlier than the other parts of your order.

See “[Installation Kits](#)” on [page 42](#) for the kit part numbers.

Table 2. Shipping container dimensions and weights ^a

Instrument	Box	Size	Weight	Content
LTQ Series mass spectrometer	1	104 × 94 × 135 cm (<i>l × w × h</i>) (41 × 37 × 53 in.) (<i>l × w × h</i>)	181 kg (400 lb)	Mass spectrometer in the system crate
	2	71 × 71 × 132 cm (<i>l × w × h</i>) (28 × 28 × 52 in.) (<i>l × w × h</i>)	62 kg (136 lb)	Data system and accessories (in utility box located in system crate)
	3	79 × 31 × 46 cm (<i>l × w × h</i>) (31 × 12 × 18 in.) (<i>l × w × h</i>)	50 kg (110 lb)	Forepump #1
	4	79 × 31 × 46 cm (<i>l × w × h</i>) (31 × 12 × 18 in.) (<i>l × w × h</i>)	50 kg (110 lb)	Forepump #2 (not for the LXQ)
LTQ XL or Velos Pro with the ETD module	1	104 × 94 × 135 cm (<i>l × w × h</i>) (41 × 37 × 53 in.) (<i>l × w × h</i>)	181 kg (400 lb)	Mass spectrometer in the system crate
	2	97 × 71 × 97 cm (<i>l × w × h</i>) (38 × 28 × 38 in.) (<i>l × w × h</i>)	95 kg (210 lb)	ETD module in the system crate
	3	69 × 59 × cm (<i>l × w × h</i>) (27 × 23 × 22 in.) (<i>l × w × h</i>)	23 kg (50 lb)	Data system and accessories
	4	79 × 31 × 46 cm (<i>l × w × h</i>) (31 × 12 × 18 in.) (<i>l × w × h</i>)	50 kg (110 lb)	Forepump #1
	5	79 × 31 × 46 cm (<i>l × w × h</i>) (31 × 12 × 18 in.) (<i>l × w × h</i>)	50 kg (110 lb)	Forepump #2
MALDI LTQ XL system	1	125 × 94 × 135 cm (<i>l × w × h</i>) (49 × 37 × 53 in.) (<i>l × w × h</i>)	197 kg (435 lb)	Mass spectrometer in the system crate
	2	119 × 86 × 147 cm (<i>l × w × h</i>) (47 × 34 × 58 in.) (<i>l × w × h</i>)	153 kg (338 lb)	MALDI source, data system, and accessories in the system crate
	3	79 × 31 × 46 cm (<i>l × w × h</i>) (31 × 12 × 18 in.) (<i>l × w × h</i>)	50 kg (110 lb)	Forepump #1
	4	79 × 31 × 46 cm (<i>l × w × h</i>) (31 × 12 × 18 in.) (<i>l × w × h</i>)	50 kg (110 lb)	Forepump #2

^a The height and weight measurements include the shipping pallets.

Space and Load Requirements

Table 3 lists the dimensions and weights for the data system and mass spectrometer system modules. Use this information to ensure that all workbenches are large enough and strong enough to support the modules.

Table 3. Space and load requirements^a for the system modules

Modules	Width (<i>w</i>) cm (in.)	Height (<i>h</i>) cm (in.)	Depth (<i>d</i>) cm (in.)	Weight kg (lb)
Data system				
Computer, tower	17.3 (7)	45 (18)	47 (18.4)	17.3 (38)
Monitor	51 (20.2)	41 (16.2)	19 (7.3)	4.5 (10)
Ethernet switch	20 (8)	4 (1.5)	12 (5)	0.6 (1.3)
(Optional) Printer	45 (18)	32 (12.4)	40 (16)	16 (35)
(Optional) Scanner (in the MALDI tissue imaging kit)	30 (12)	10 (4)	50 (20)	5.4 (12)
LC/MS system				
(Optional) LC system ^b	38 (15)	73 (29)	51 (20)	68 (150)
LTQ Series mass spectrometer	79 (31)	56 (22)	51 (20) ^c	105 (232)
Forepump, each (connects to MS)	58 (23)	25 (10)	18 (7)	44 (97)
MS/ETD system ^d	79 (31)	69 (27)	81 (32)	137 (302)
Forepump (connect to the ETD module)	43 (17)	23 (9)	16 (6.2)	24 (53)
MALDI LTQ XL system				
MALDI LTQ XL mass spectrometer without the XYZ mechanism	99 (39)	56 (22)	59 (23)	197 (434)
MALDI control module with grounding bracket	50 (20)	35 (14)	45 (18)	11 (24)
MALDI XYZ mechanism (with brackets and connected to its stand for maintenance)	60 (24)	53 (21)	53 (21)	27 (60)

^a These values are approximate.

^b These values are for an LC system consisting of a Thermo Scientific Accela™ PDA Detector, Accela Autosampler, and Accela pump and excludes the solvent bottles and tubing.

^c Excludes the API source housing.

^d LTQ XL/ETD or Velos Pro/ETD systems.

This section discusses the following:

- [Workbench Requirements](#)
- [Data System Layout](#)
- [Mass Spectrometer System Layouts](#)

Workbench Requirements

Table 4 and Table 5 list the recommended minimum surface dimensions and load capacities for each system's workbench. For the MALDI LTQ XL system, if you plan to switch between the MALDI and API sources, use one workbench to hold the mass spectrometer and separate movable workbenches for the MALDI control module and LC system.



CAUTION Only a Thermo Fisher Scientific field service engineer or personnel with the appropriate training can perform the conversion process between the MALDI source and Ion Max™ API source. If personnel without the appropriate training attempt to convert a MALDI LTQ XL system to an LTQ XL API system, instrument damage as well as personal injury can occur.

The MALDI LTQ XL system (P/N 97355-60500) does not contain an API source. The API Kit (P/N 97155-62123) contains the parts required to convert a MALDI LTQ XL system to an LTQ XL API system.

Note Thermo Fisher Scientific recommends that workbenches have a load capacity of at least twice the combined weight of all expected devices.

Table 4. Minimum workbench surface dimensions and load capacities

Equipment	Surface	Load capacity
Data system	122 × 91.4 cm (4 × 3 ft)	77 kg (170 lb)
Data system with the scanner for the optional MALDI source	152 × 91.4 cm (5 × 3 ft)	87 kg (192 lb)
LC system and LTQ Series mass spectrometer	152 × 91.4 cm (5 × 3 ft)	410 kg (904 lb)

Table 5. Minimum workbench surface dimensions system and load capacity for a MALDI LTQ XL

Equipment	Surface	Load capacity
LC system (only)	91.4 × 91.4 cm (3 × 3 ft)	— ^a
MALDI control module (only)	91.4 × 91.4 cm (3 × 3 ft)	22 kg (49 lb)
MALDI LTQ XL without the XYZ mechanism	152 × 91.4 cm (5 × 3 ft)	394 kg (869 lb)

^a Refer to your equipment manuals and double the total system weight for the minimum load capacity.

Place the data system modules on one workbench and the LC/MS or LC/MS/ETD system on a second workbench. Follow these clearance guidelines for the workbenches:

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



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

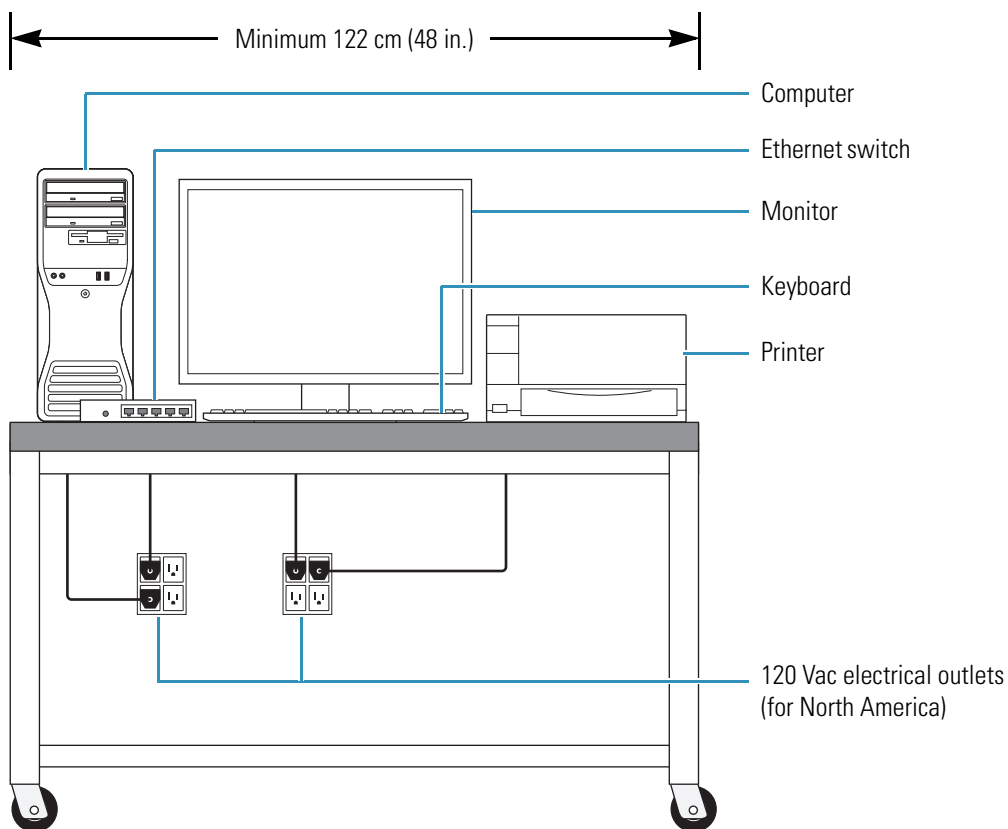
- For all systems, allow for 92 cm (36 in.) minimum vertical clearance between the top of the mass spectrometer and any shelves above it.
- For an LC/MS or MALDI LTQ XL system, allow for 8 cm (3 in.) minimum horizontal clearance between the wall and the back of the mass spectrometer for proper air circulation and clearance of the installed gas lines and tubing.
- For an LC/MS/ETD system, allow for 79 cm (31 in.) minimum horizontal clearance between the wall and the back of the ETD module; the *recommended* clearance is 94 cm (37 in.). Or, 31 cm (12 in.) minimum horizontal clearance between the wall and the fully extended ion volume insertion/removal tool (P/N 98000-60028) installed on the back of the ETD module; the *recommended* distance is 46 cm (18 in.).

Data System Layout

Figure 1 shows the recommended layout for the data system modules.

Note Not all connections are shown; for connection information, refer to the *LTQ Series Getting Connected Guide*.

Figure 1. Workbench for data system modules



Mass Spectrometer System Layouts

Figure 2, and Figure 3 on page 10 show the recommended layouts for the LC/MS system. Figure 4 on page 11 shows the recommended layout for the MS/ETD system. Figure 5 on page 12 shows the recommended layout for the MALDI LTQ XL system.

Note Not all connections are shown; for connection information, refer to the *LTQ Series Getting Connected Guide*.



CAUTION For information about the Accela LC drainage systems, refer to the *Accela UHPLC Getting Connected Guide*.

Figure 2. Workbench for the optional Accela LC system and LXQ mass spectrometer

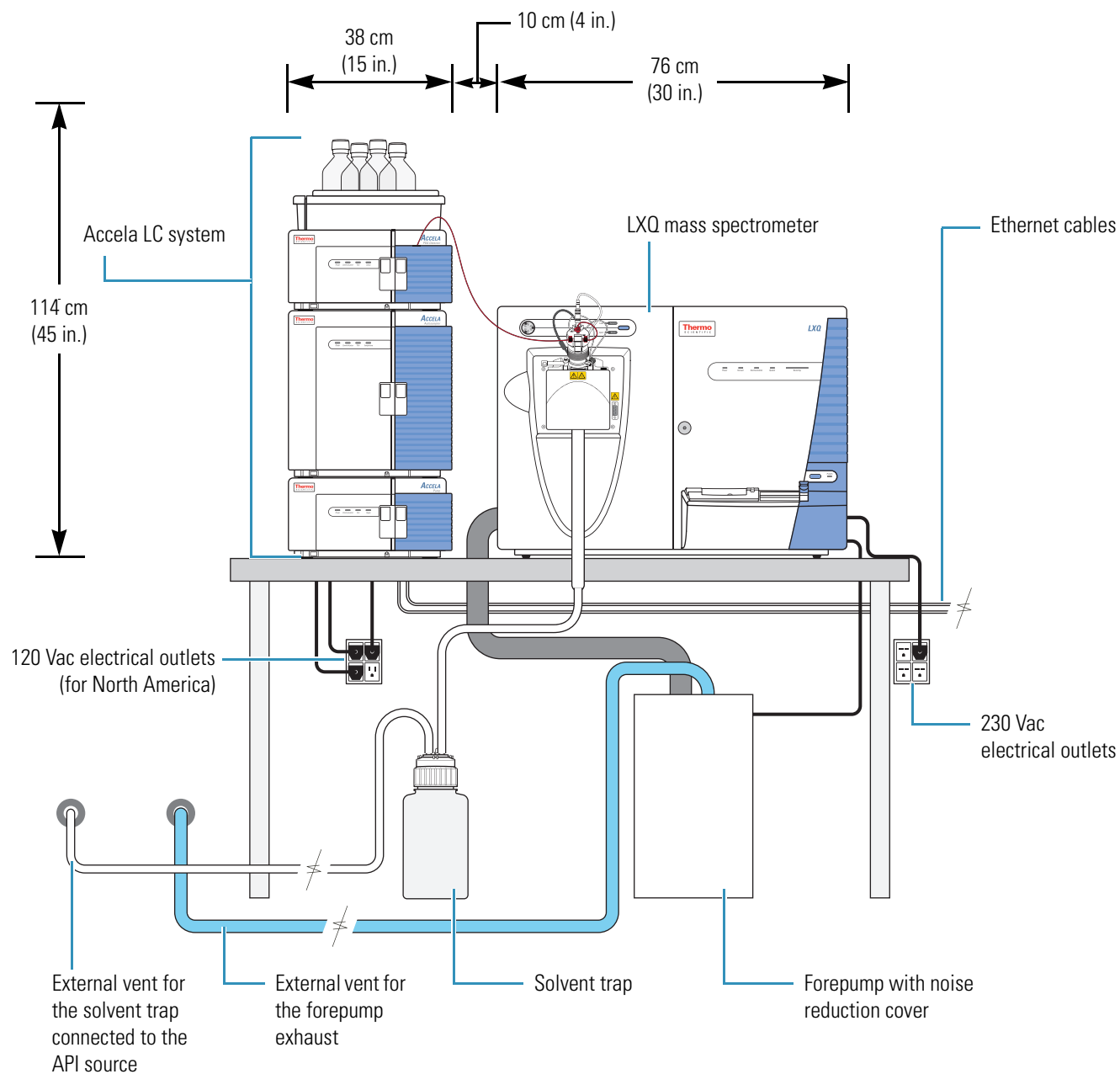


Figure 3. Workbench for the optional Accela LC system and LTQ XL or Velos Pro mass spectrometer

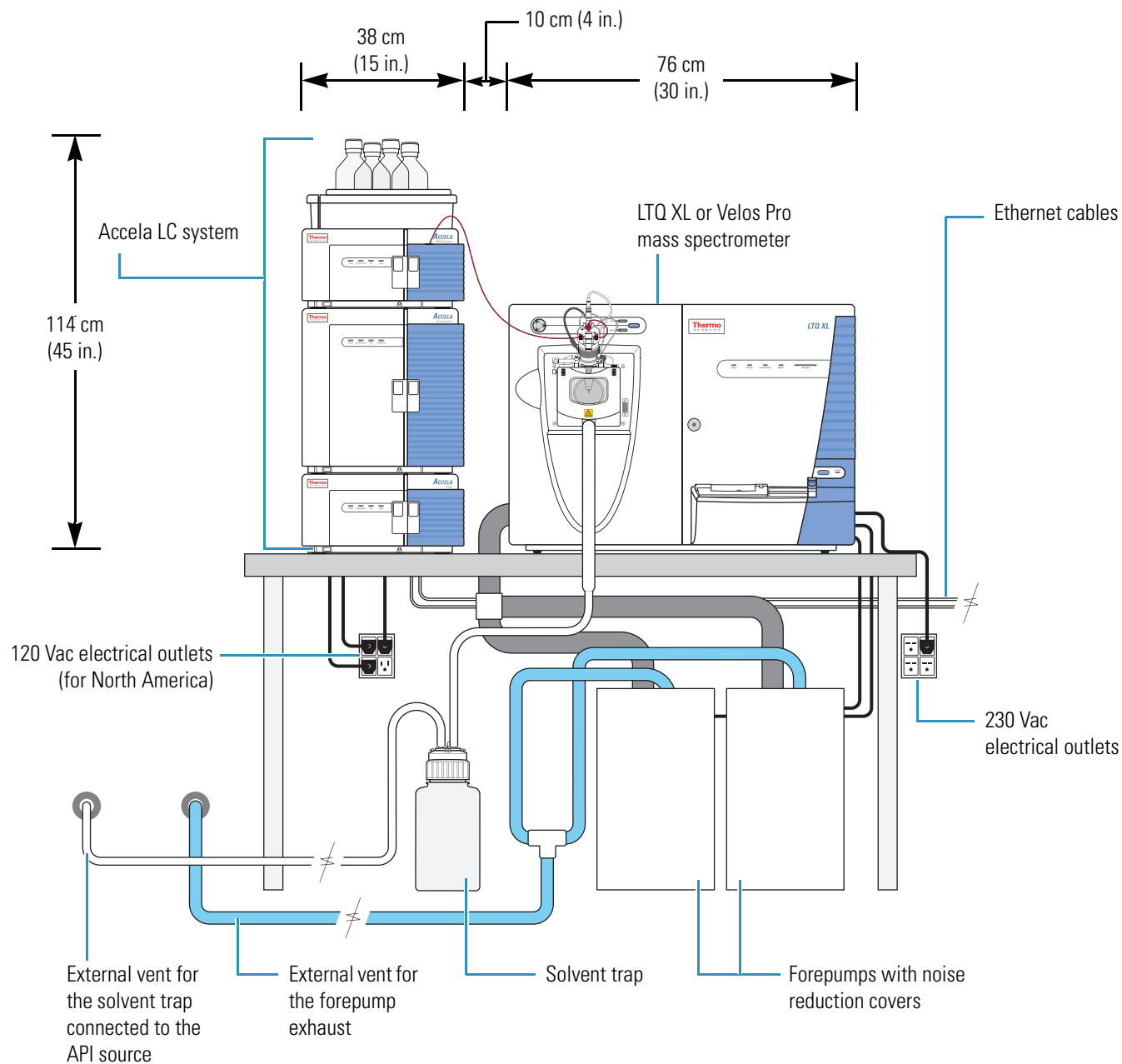


Figure 4. Workbench for the optional Accela LC system and MS/ETD system

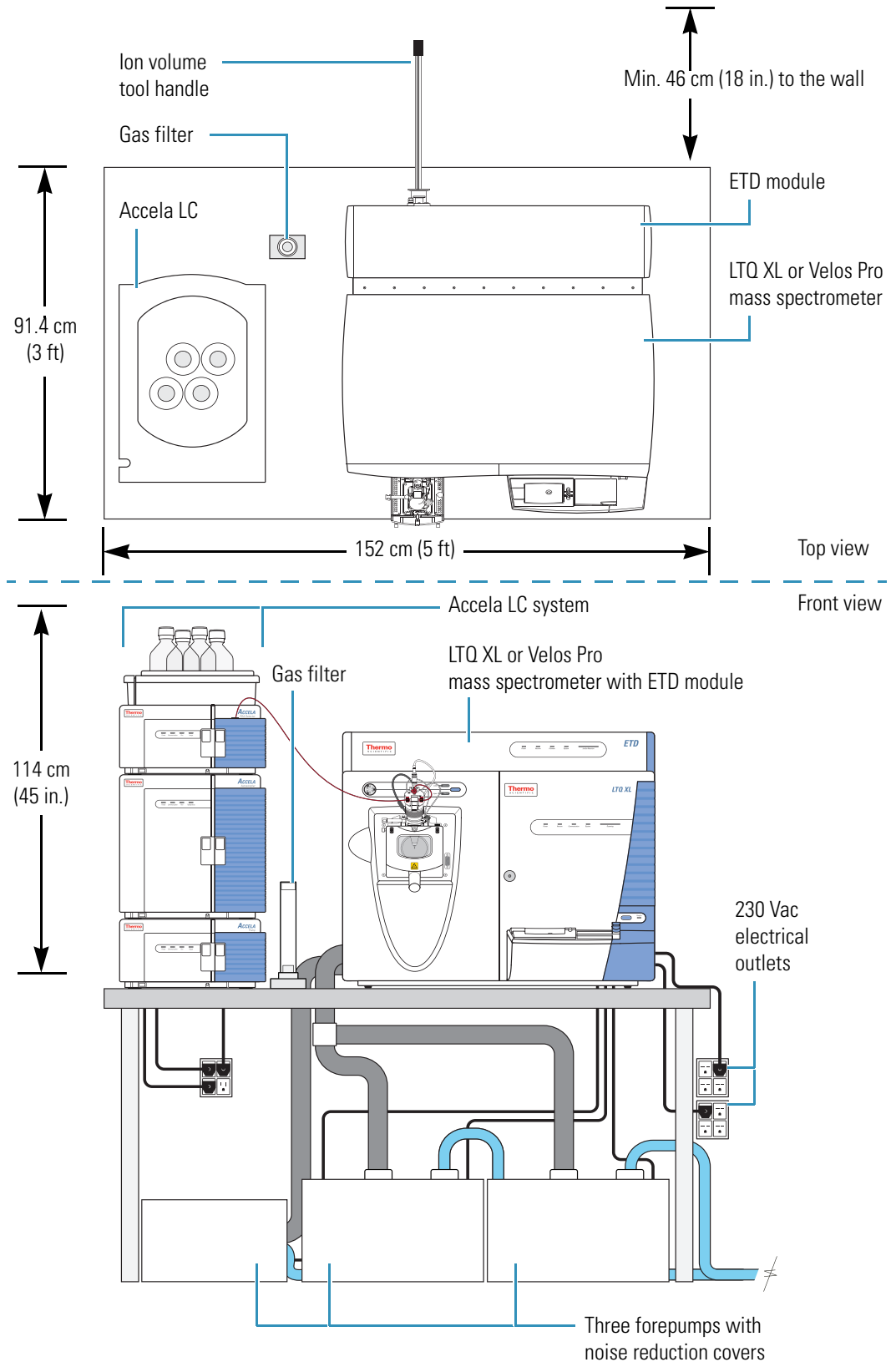
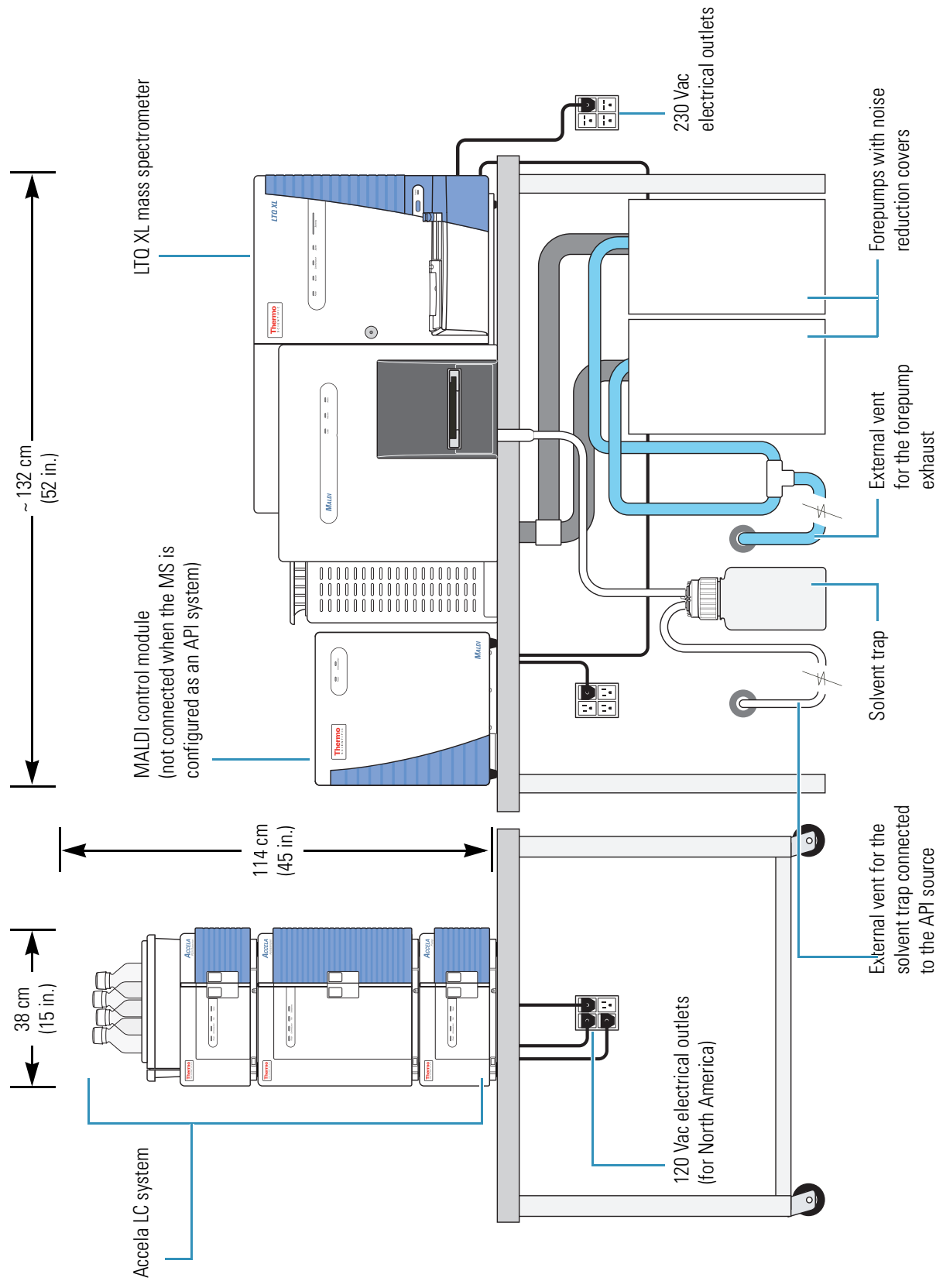


Figure 5. Workbenches for the optional LC system and MALDI LTQ XL system¹



¹ You can use one or two tables for the MALDI MS system. When configuring the instrument with an API source, place the MALDI control module on another table out of the way.

Forepumps

The LXQ system includes one **forepump**. The LTQ XL and Velos Pro systems (with an API source) include two forepumps. The MALDI LTQ XL system also includes two forepumps; however, one forepump connects to the mass spectrometer and the other connects to the evacuated load lock (lower) chamber inside the MALDI sample module. The MS/ETD system includes three forepumps: the two large forepumps connect to the mass spectrometer (LTQ XL or Velos Pro) and the smaller forepump connects to the ETD module.

Depending on available space, you have two options for the placement of the forepump or forepumps and for connecting the vacuum hose from the mass spectrometer to the forepump or forepumps:

- If there is space below the workbench, place the forepumps underneath, immediately behind the mass spectrometer. Either run the vacuum hose behind the workbench or make a 6.4 cm (2.5 in.) diameter hole through the workbench for the vacuum hose and the power supply cord from the forepumps.
- If there is no space below the workbench, place the forepumps on the floor in front of the mass spectrometer.



CAUTION TRIP HAZARD Whenever possible, provide space under the workbench for one or both forepumps. If placed in front of the mass spectrometer, the forepumps become a trip hazard.

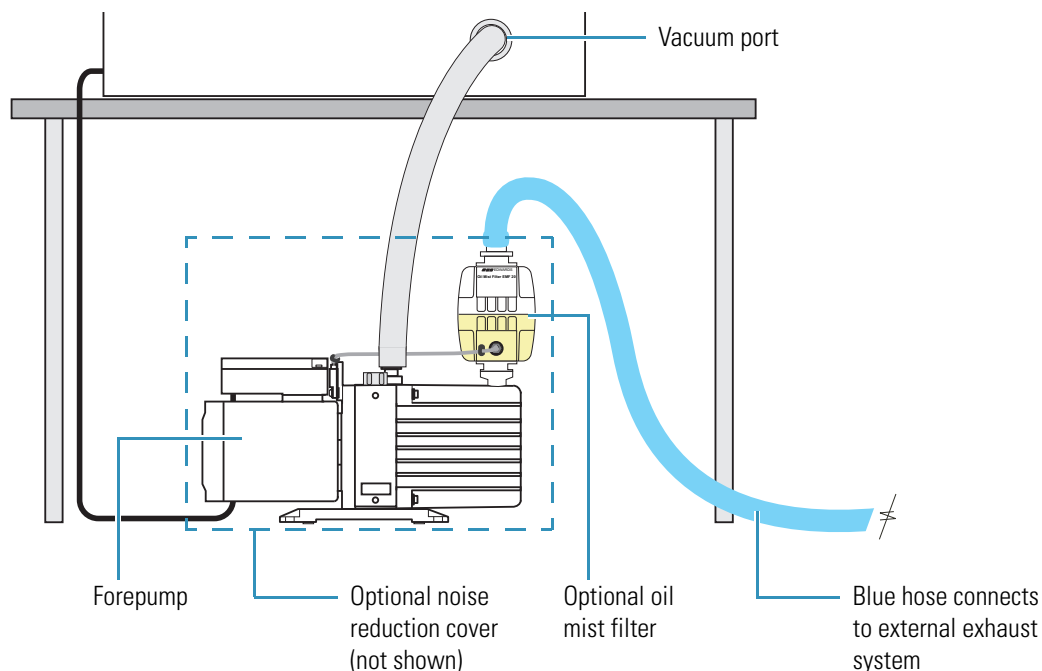


CAUTION

- Do not place the forepumps on a shelf or other surface connected to the workbench. Vibration from the pumps can affect system performance.
- The exhaust hose tubing acts as a trap for exhaust fumes that would otherwise recondense in the forepump oil.
 - 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 exhaust hoses at floor level for a minimum of 2 m (79 in.) before they reach the external exhaust system.

Figure 6 shows the blue exhaust hose connected to the optional oil mist filter, which connects to the exhaust port of the forepump.

Figure 6. Forepump connections (LXQ)



For information about connecting the forepump, refer to the *LTQ Series Getting Connected Guide* and the installation instructions provided with the forepump.

Telephone

Install a telephone in the lab near the system so that, if necessary, you can operate the mass spectrometer while you are on the telephone with Thermo Fisher Scientific Technical Support. Make sure that the telephone jack is within 1.8 m (6 ft) of the mass spectrometer.

IMPORTANT The system 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.

Operating Environment

Attention to the operating environment ensures continued high performance of your Thermo Scientific LC/MS system. Any expenditures for air conditioning are more than offset by good sample throughput and reduced repair costs.

You are responsible for following the instructions in this guide and providing the operating environment necessary for proper operation of the system.

Contents

- [Summary of Environmental Requirements](#)
- [Electrostatic Discharge](#)
- [Humidity](#)
- [Lighting](#)
- [Particulate Matter](#)
- [Temperature](#)
- [Vibration](#)

Summary of Environmental Requirements

Table 6 lists the environmental requirements for the designated laboratory.

Table 6. Summary of environmental requirements

Parameter	Specification
Electrostatic Discharge (ESD)	Follow the stated precautions to help prevent ESD.
Humidity	40–80%, noncondensing
Lighting	<ul style="list-style-type: none">• Operating: Typical laboratory lighting• Cleaning: Use a small, high-intensity lamp
Particulate Matter	Does not exceed 3 500 000 particles per cubic meter (100 000 particles per cubic foot).
Temperature	<ul style="list-style-type: none">• Standard performance: 15–27 °C (59–81 °F)• Optimum performance: 18–21 °C (65–70 °F)• Ambient temperature: Fluctuations of less than 1 °C (2 °F) over a one-hour period
Vibration	Choose a lab location and workbench that are vibration-free.

Electrostatic Discharge

Electrostatic discharge (ESD) can damage the electronic components of the LTQ Series mass spectrometer.

Most Thermo Scientific instruments are designed to withstand ESD up to 4 kV (air discharge) and 4 kV (contact discharge) with all panels in place. However, removing the panels and handling the printed circuit boards (PCBs) without proper precautions might damage the electrical components or cause them to fail prematurely.

Your work environment can create static electricity, as in these situations:

- Walking across a carpet in a room that is at 20 percent relative humidity can generate as much as 35 000 V of electrostatic potential on your skin. At 80 percent relative humidity, the electrostatic potential can be as much as 1500 V.
- Sitting and working in a chair padded with polyurethane foam in a room at 20 percent relative humidity can generate as much as 18 000 V of electrostatic potential on your skin. At 80 percent relative humidity, the electrostatic potential can be as much as 1500 V.
- Working in laboratory coats and clothing made of synthetic fibers can cause the accumulation of static electricity on your skin.
- Using Styrofoam™ cups and packing materials result in a considerable electrostatic charge.

The discharge of static electricity is not perceptible to humans until the potential is at least 4000 V. However, a discharge of electrostatic potential as little as 50 V can damage many electronic components. While ESD damage can be catastrophic and cause your system to cease functioning, more commonly, ESD damage might cause latent problems that are detrimental to sensitive electrical components, causing premature failures.

Because of ESD, Thermo Fisher Scientific recommends the following precautions, especially when operating the system at the lower end of the relative humidity specification:

- Use a static-dissipating floor covering (such as tile or conductive linoleum) in the lab.
- Use laboratory chairs covered with natural fibers or other static-dissipating material.
- Wear a laboratory coat and clothing made of natural fiber or other static-dissipating material when operating the instrument.
- Keep Styrofoam cups or packing materials away from the instrument.

Humidity

Maintain the relative humidity in the designated lab at 40–80 percent, without condensation.

Operating a Thermo Scientific mass spectrometer in an environment with very low humidity can cause the accumulation and discharge of static electricity that can shorten the life of the electronic components. Operating the mass spectrometer in an environment with high humidity can cause condensation, oxidation, and short electronic circuits. It can also cause the accumulation of dust that can block filters on the cooling fans.

To ensure that the lab is always within the required temperature and humidity specifications, Thermo Fisher Scientific recommends that you install a temperature and humidity monitor in the lab.

Lighting

Good lighting makes any work area more enjoyable. Thermo Fisher Scientific recommends that you use a small, high-intensity lamp when cleaning the mass spectrometer components.

Particulate Matter

Make sure that the air in the lab is free from excessive dust, smoke, or other particulate matter in excess of 5 μm —that is, fewer than 3500000 particles per cubic meter (100000 particles per cubic foot).

Dust can clog the air filters, causing a reduction in air flow around the electronic components. Dust on electronic components can act as an insulating blanket, which reduces the transfer of heat from the components to the surrounding air.

Temperature

For precision instruments, such as the Thermo Scientific LTQ Series mass spectrometer, maintain the lab temperature at 15–27 °C (59–81 °F). For optimum performance, maintain the lab temperature at 18–21 °C (65–70 °F). Temperature control is vital to acquiring accurate mass measurements. Therefore, make sure that during any one-hour period, ambient temperature fluctuations are less than 1 °C (2 °F).

IMPORTANT

- All electronic components generate heat while operating. This heat must dissipate to the surrounding air for the components to continue to operate reliably.
- Do not locate the mass spectrometer under an air duct, near windows, or near heating and cooling sources. As the lab ambient temperature increases, the LTQ Series system reliability decreases.

There must be good air flow around the system, and the air conditioning system must maintain a constant temperature in the immediate vicinity of the mass spectrometer. [Table 7](#) lists the approximate heat output (power) for the system. For the heat output of your LC equipment, refer to the manufacturer's manuals.

Table 7. Maximum heat output

Module	Heat output (W)	Heat output (BTU/h)
LTQ Series mass spectrometer	2300	7848
MS/ETD systems	2700	9213
LTQ Series mass spectrometer with MALDI source	2650	9042
LC system and data system ^a	1950	6654
Total	4600	15867^b

^a Approximate values. The actual values depend on your installed equipment.

^b The maximum heat output for an MS/ETD system, LC system, and data system.

Vibration

Select a lab location that is free from vibration—floors at ground level usually have less vibration. When selecting the location, be aware of adjacent rooms with equipment that could transmit vibrations through the floor to the mass spectrometer workbench.

Because of the natural vibration of the forepump during operation, install the forepump or forepumps on the floor under the mass spectrometer and not on the workbench.

Line Power

The quality of line power (ac mains power system) delivered to the LTQ Series system can affect its performance and longevity. To ensure that the system performs optimally and is not damaged by line power fluctuations, verify that the lab electrical supply complies with all power quality requirements.

You are responsible for providing a power source of acceptable quality to operate the system.



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 (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

- [Quality of Power](#)
- [Power Monitoring Devices](#)
- [Power Conditioning Devices](#)
- [Uninterruptible Power Supply](#)
- [Circuit Breakers](#)
- [Electrical Outlets](#)
- [Power Supply Cords](#)
- [Technical Assistance](#)

Quality of Power

The quality of power supplied to the LTQ Series system is very important. The line voltage must be 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.

Make sure to establish the quality of the line voltage in the lab before installing the system 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 system 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 system.

Table 8 lists the definitions for the three most common voltage disturbances.

Table 8. Common voltage disturbances

Voltage disturbance	Definition
Slow average	A gradual, long-term change in the average root mean square (RMS) voltage level, with typical durations greater than 2 s
Sags and surges	Sudden changes in the average RMS voltage level, with typical durations between 50 ms and 2 s
Transients or impulses	A brief voltage spike of up to several thousand volts, with typical durations up to 50 μ s

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 (see Table 8).

In the first two cases, the time interval recording indicates the duration and the amplitude of the disturbance. A power line disturbance analyzer detects and records most types of line power problems. The Dranetz™¹ system is an example of a suitable analyzer. In some countries, electrical equipment suppliers have power line analyzers to rent.

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.

¹ 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.

Power Conditioning Devices

You can correct a line voltage problem by using various line voltage conditioning devices. If there is good power regulation but the power line disturbance analyzer shows transient voltages, an isolation/noise-suppression transformer should resolve the problem. If there are both transient and regulation problems, consider the use of power conditioners that can control these problems. See the CAUTION statement on [page 19](#).



CAUTION Any conditioning devices installed with the system must be able to handle the potentially high currents that are drawn during the initial startup of the system. For example, during startup, the forepump can draw a high **inrush current**.

Because the LTQ Series system requires the use of one or two forepumps, it draws an inrush current. The maximum inrush (start) current for each forepump (Edwards Model E2M30) connected to the mass spectrometer is 33 A. If your system includes the optional ETD module, its forepump has a 15 A inrush current. The average duration of the forepumps' inrush current is less than 1 s. Therefore, this initial energy demand from the ac power line is very low.

Thermo Scientific systems are protected from overcurrents with time-delay fuses and active switches. For more information, contact your Thermo Fisher Scientific field service engineer.

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.

To order the Buck/Boost Transformer Kit (P/N OPTON-01460), contact Thermo Fisher Scientific San Jose, and then have a certified electrician install it before you install the system. Each buck/boost transformer is encased in a metal housing approximately 13 × 13 × 26 cm (5 × 5 × 10 in.) and ships with a 2 m (6.5 ft) power supply cord. The installation instructions for the transformer are included.



CAUTION Systems installed in areas with 208 Vac power can experience voltage sags during high use periods. These voltage sags might place the line voltage below the operating parameters discussed in this section. In this case, protect the system by using a buck/boost transformer 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. See the CAUTION statement on [page 19](#).

Circuit Breakers

Make sure that each [circuit breaker](#) is suitably rated so that the equipment connected to the electrical outlets 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

The lab requires several grounded, electrical outlets that are suitably rated. In addition to the required number of electrical outlets for the LTQ Series system, Thermo Fisher Scientific recommends that there be several additional outlets close to the work area for test and cleaning equipment, such as an oscilloscope and sonicator.

Earth Ground

The earth ground connections in the lab must be hardwired to the same 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.

Load Capacity

Electrical outlets are designed with different load capacities. For example, outlets rated for 120 Vac can be rated for either 15 or 20 A. To prevent overloading the outlets, select outlets with a load rating that is suitable for the expected total current draw per outlet.

Installing a complete LTQ Series system can require extensive electrical resources. Plan the power system properly, with numerous outlets, to make sure that you can connect all of the equipment. [Table 9](#) lists the rated voltages and currents for the modules in a typical lab setup. For the LC modules, refer to the manufacturer's manuals.

Note In North America, the LC/MS system requires both 120 and 230 Vac electrical outlets.

Table 9. Electrical ratings and required outlets per module

Module	Voltage (Vac)	Current (A)	Required outlets
Data system			
Computer, tower	115/230	6/3	1
Monitor	100–240	1.5	1
Ethernet switch	100–240	< 1	1
(Optional) Printer, laser	110 –or– 220	8.6 –or– 4.2	1
(Optional) Scanner (in the MALDI Tissue Imaging Kit)	120/230	< 1	1
MS system^a			
LTQ Series mass spectrometer	230	15	1
LTQ Series mass spectrometer with ETD module	230	15	2
MALDI LTQ XL system	230	15	2
Optional devices^b			
High-intensity lamp (for instrument maintenance)	–	–	1
Laboratory stereoscope (for inspecting fused-silica parts)	–	–	1
Total number of electrical outlets^c			9+

^a The current draw excludes the forepump or forepumps.

^b Refer to the equipment manual for the electrical rating.

^c Remember to add the number of outlets required for your LC system.

IMPORTANT After planning the location of the workbenches (see [Chapter 2](#)), consider the following before installing the electrical outlets:

- The location for each module and whether each requires a 120 or 230 Vac outlet (see [Table 9](#))
- The minimum number of outlets needed for a given voltage and adding the number of outlets needed for any additional lab equipment (see [Table 9](#))
- Proximity to the power supply cords (see [Power Supply Cords](#))

Power Supply Cords

Each LTQ Series mass spectrometer ships with two detachable power supply cords: one for North American destinations and the other for international destinations. Both power supply cords measure 2.5 m (8 ft). However, the international power supply cord does not include the plug that connects to the electrical outlet. You must provide a suitable 230 Vac plug that meets your country's compliance requirements. Table 10 lists the plug types and electrical ratings for various countries and territories.

The power supply cords for the data system modules are 1.8 m (6 ft). The power supply cord for the optional laser printer or for the laser scanner in the MALDI Tissue Imaging Kit² (P/N OPTON-20059) has either a NEMA 5-15P plug or a European CEE 7/7 (Schuko) plug, which is rated 16 A, 220 Vac.

Note The electrical code for your area might require the use of another type of plug and receptacle (electrical outlet).

Table 10. Power plug type and rating by country or territory

Destination	Plug type	Electrical rating
North America	NEMA 5-15P	15 A, 125 Vac
	NEMA 6-15P	15 A, 250 Vac
China	GB 2099-1,GB 1002-1	10 A, 250 Vac
Europe	CEE 7/7	10 A, 250 Vac
India	BS 546	15 A, 250 Vac
Japan	JIS 8303	15 A, 125 Vac
Switzerland	SEV 1011	10 A, 250 Vac
United Kingdom and Ireland	BS 1363	5 A, 250 Vac

² Only for MALDI LTQ XL systems.

Figure 7 through Figure 9 show the specific plug configurations listed in Table 10 on page 24.

Figure 7. Plug configurations for North America

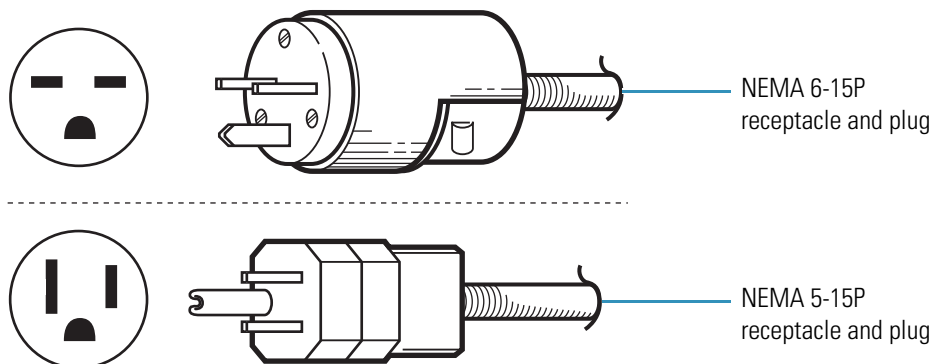


Figure 8. Plug configurations for Europe

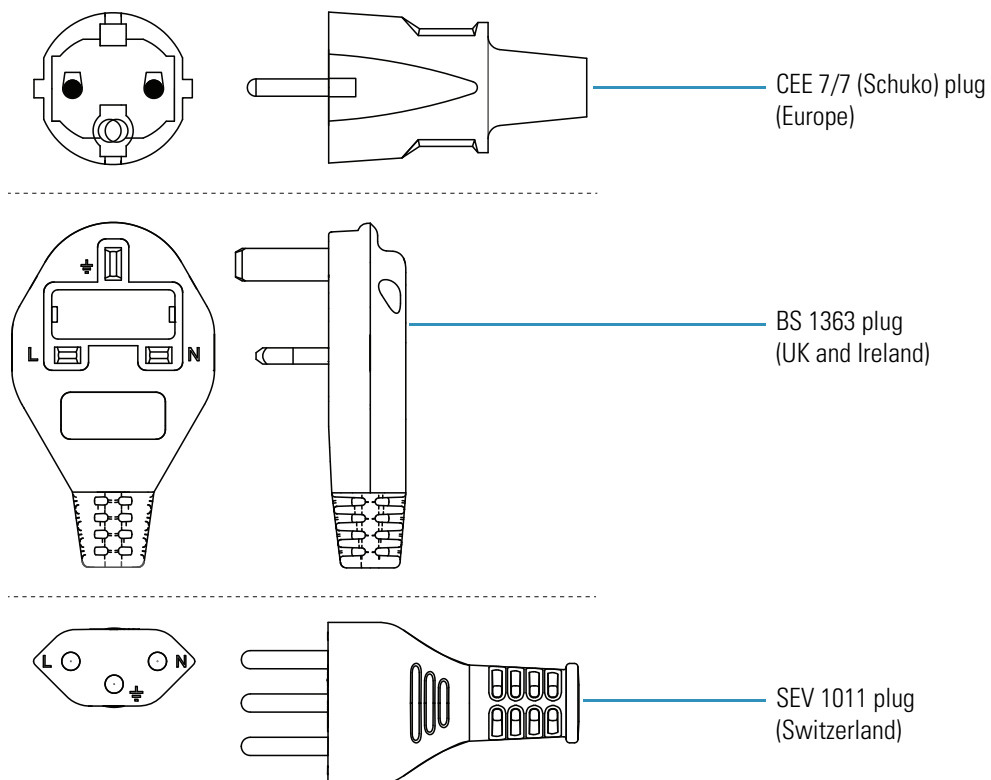
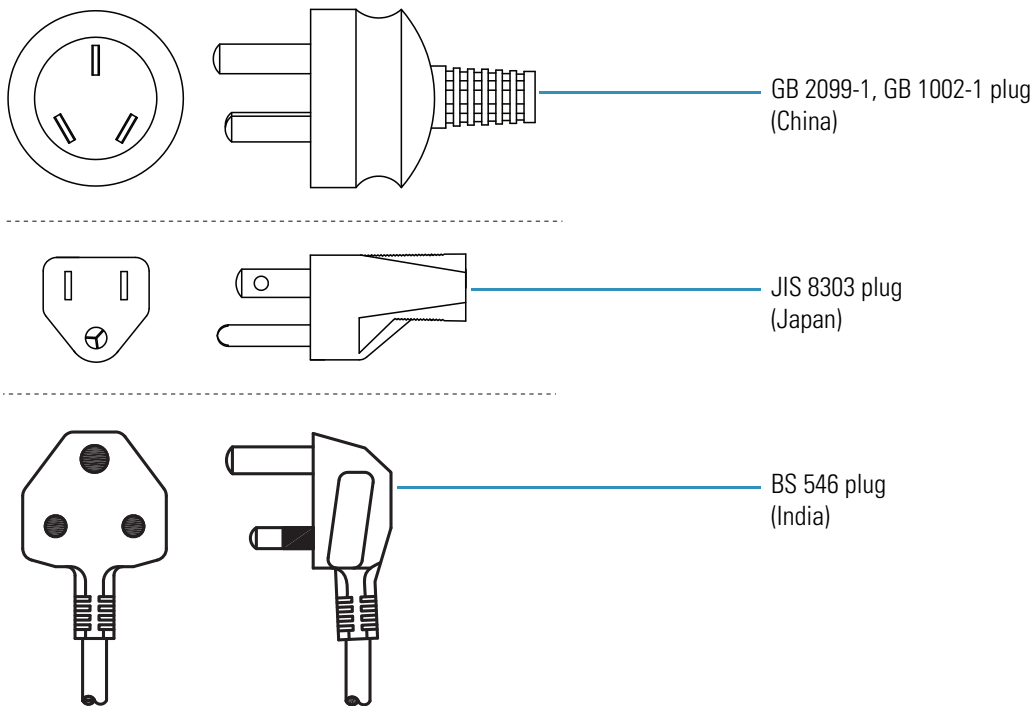


Figure 9. Plug configurations for Asia



Technical Assistance

Occasionally, you might encounter line power sources with unacceptable quality that adversely affect the operation of the LTQ Series system. 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.

Specifying power conditioning equipment is a complex task that is best handled by a company or consultant specializing in that field. Contact Thermo Fisher Scientific for assistance in locating a power consultant in your area.

Gases and Solvents

The LTQ Series mass spectrometers require high-purity (HP) helium and nitrogen gases, and solvents. If your mass spectrometer includes the electron transfer dissociation (ETD) module, it also requires ultra-high-purity (UHP) nitrogen gas. The Thermo Fisher Scientific field service engineer might also require certain solvents for the installation verification of your system.

You are responsible for providing the correct gas, solvent, and regulators to operate the system.

Contents

- [Gases](#)
- [Solvent Recommendations](#)

Gases

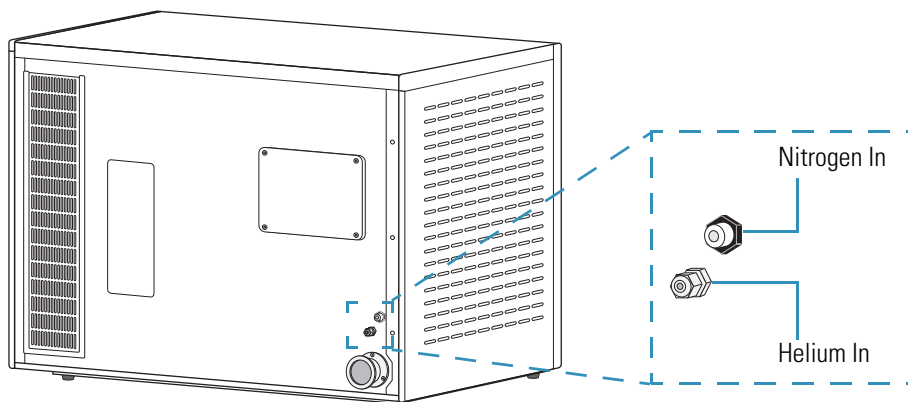
The LTQ Series mass spectrometer uses helium as the [damping gas](#) and [collision gas](#) in the linear trap. Nitrogen is used as the atmospheric pressure ionization (API) [sheath gas](#), [auxiliary gas](#), and [sweep gas](#). The MALDI LTQ XL system uses nitrogen to maintain 75 mTorr in the upper sample chamber of the MALDI source.

The mass spectrometer can use large amounts of gases during daily operations. Make sure that the gases are delivered with the necessary pressure and purity.

[Figure 10](#) shows the location of the gas connections on the back of the mass spectrometer. [Figure 11](#) shows an MS/ETD system with the gas connections on the back of the ETD module, including a port for the reagent carrier gas for the ETD module.

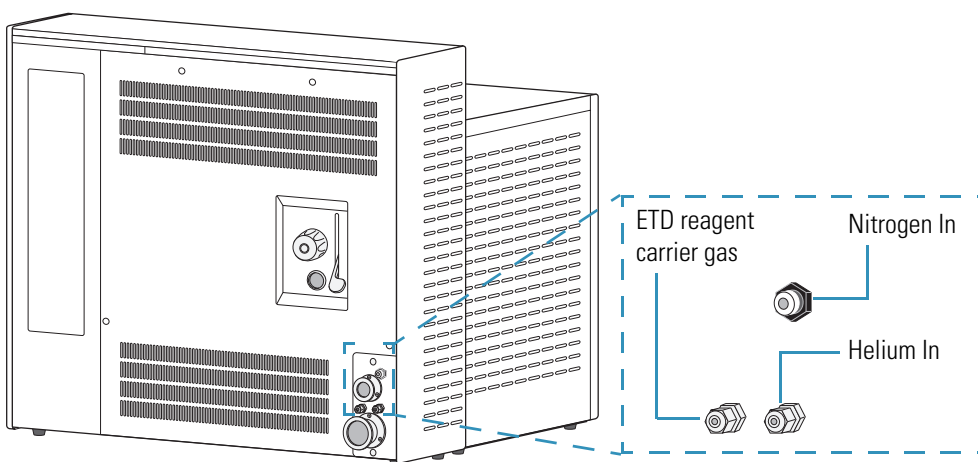
For information about connecting the gas lines, refer to the *LTQ Series Getting Connected Guide*.

Figure 10. Gas connections on the back of the LTQ Series



For the MS/ETD systems, the gas lines connect to the back of the ETD module (Figure 11). The ETD module has an additional port for the reagent carrier gas source; see “Reagent Carrier Gas” on page 30.

Figure 11. Gas connections on the back of the ETD module



CAUTION

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

Helium Supply

The LTQ Series mass spectrometer uses helium as the damping and collision gas. The helium supply requirements are as follows:

- UHP gas of 99.999%, with less than 1.0 ppm each of water, oxygen, and total hydrocarbons
- 275 ±70 kPa (40 ±10 psi) gas pressure

To dispense helium from a tank (such as one containing 245 ft³ of helium), use a regulator suitable for helium. Use either stainless steel tubing or the provided copper tubing for the helium gas line, and make sure that it is free of oil and preferably flame dried.

Note

- After you start using the LTQ Series mass spectrometer, do not shut off the helium gas. Optimum performance requires a continuous flow of helium.
- If you intend to use helium for sparging your LC solvents, you must have a second tank and regulator.

Nitrogen Supply

The LTQ Series mass spectrometer uses nitrogen as the API sheath, auxiliary, and sweep gases. The nitrogen supply requirements are as follows:

- HP gas of 99%
- (Optional) For the ETD module, UHP gas of 99.999%, with less than 3.0 ppm each of water, oxygen, and total hydrocarbons
- 689 ±138 kPa (100 ±20 psi) gas pressure

Note You must provide a regulator for the nitrogen supply that you can adjust over the specified pressure range.

When operating 24 hours a day and 7 days a week, typical daily consumption of nitrogen gas is 11 500–26 700 L (406–943 ft³). Thermo Fisher Scientific recommends one of the following sources for the nitrogen supply:

- A large, sealed, thermally insulated cylinder containing liquid nitrogen from which the nitrogen gas is boiled off. The selected Dewar flask must be able to provide the required gas flows and a head pressure of 689 ±138 kPa (100 ±20 psi) going to the mass spectrometer.
- A nitrogen generator that can generate up to 21 L/min (44.5 ft³/h) of HP nitrogen with a head pressure of 689 ±138 kPa (100 ±20 psi).

Note When you turn on the system, the initial nitrogen surge might exceed the capacity of the nitrogen generator. This sudden surge causes a flow rate drop that can trigger a low nitrogen warning from the mass spectrometer. If low nitrogen warnings happen frequently, call your Thermo Fisher Scientific field service engineer.

Reagent Carrier Gas

The ETD module requires an additional UHP reagent carrier gas that connects to the triple (oxygen/water/hydrogen) gas filter and then to the back of the ETD module as shown in the *LTQ Series Getting Connected Guide*. The gas filter, supplied in the ETD Accessory Kit (P/N 98000-62002), is shown in [Figure 4](#) on [page 11](#). The [reagent carrier gas](#) supply requirements are as follows:

- (Recommended) Mixture of 25% helium and 75% nitrogen

This mixture is available in the United States from Airgas, P/N X02NI75C200F464. The ETD module consumes less than 1 ATM cc/m of reagent carrier gas, so a standard large bottle (205 ft³) of gas should last approximately 2 years.

Note If the helium/nitrogen mixture is not available, use a UHP nitrogen supply with less than 3.0 ppm each of water, oxygen, and total hydrocarbons. Be aware that a nitrogen generator does not produce nitrogen of sufficient purity for use as the reagent carrier gas.

- UHP gas of 99.999%, with less than 3.0 ppm each of water, oxygen, and total hydrocarbons
- 689 ±138 kPa (100 ±20 psi) gas pressure

The helium in this mixture serves as a tracer gas to enable leak checking of gas connections by using conventional thermal conductivity-based leak detectors, which are widely used to check leaks in gas chromatography (GC) equipment.

Note After you start using the MS/ETD system, do not shut off the reagent carrier gas. Optimum performance requires a continuous flow of reagent carrier gas.

The triple gas filter, when installed between the regulator on the gas source and the ETD module, further ensures that the reagent carrier gas (either nitrogen or helium/nitrogen) is better than 99.999% pure with much less than 1 ppm of oxygen, water, and hydrocarbons. Refer to the filter manufacturer's instructions for information about how to monitor the color changes in the filters that indicate when to replace them, and for information about where to order new filters. If there are no leaks in the reagent carrier gas plumbing, the filters should last a year or more. Thermo Fisher Scientific strongly recommends that a Thermo Fisher Scientific field service engineer replace the gas filters.

You must provide a regulator for either gas supply that is suitable for such UHP-grade gas. Generally, a two-stage regulator with a machined brass body and an elastomer-free metal diaphragm is adequate. The regulator should be able to stably output the specified nominal pressure and have a 1/8 in. Swagelok™-type compression fitting output connection. Have your gas supplier recommend a suitable regulator that connects to the high-pressure connection on the gas bottles.

The ETD Accessory Kit contains precleaned copper tubing to connect the carrier gas supply to the gas filter and the gas filter to the back of the ETD module. If your installation requires more copper tubing than is supplied in the kit, use only GC-cleaned copper tubing or flame-dried stainless steel tubing.

Compressed Air

If you intend to connect the Thermo Scientific [FAIMS \(high-Field Asymmetric waveform Ion Mobility Spectrometry\)](#) module to the mass spectrometer during the initial setup or at a later date, plan ahead and have a compressed air supply line installed. You use the compressed air to actively control the temperature of the electrodes in the temperature control module that is part of the FAIMS module assembly. The mass spectrometer does not require compressed air.

The compressed air requirements are as follows:

- 276–414 kPa (40–60 psi) gas pressure
- Supply line tubing, 1/4 in. OD, connected to the FAIMS temperature control port

Note Thermo Fisher Scientific strongly recommends the use of a desiccant air dryer to remove some of the moisture, oil, and dirt that might be present in the compressed gas.

For additional information about the gas connections and operation, refer to the *FAIMS User Guide* provided with the module.

Solvent Recommendations



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). The MSDSs must be freely available to lab personnel to examine at any time. MSDSs 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 for the remedy of spills or leaks.

Read the MSDS 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.

As specified in [Table 11](#), use only LC/MS-grade solvents and reagents for operating and maintaining the LTQ Series system. Installation of the mass spectrometer requires LC/MS-grade methanol and water. Installation of some systems might also require solvent modifiers.

Note Thermo Fisher Scientific recommends solvents sold under its Fisher Chemical™ brand; visit www.FisherLCMS.com for a wide variety of solvents and consumables.

Table 11. Recommended solutions (Sheet 1 of 2)

Product	Grade	Size ^a	Part number
Solvents			
2-Propanol	Optima™ LC/MS	Amber glass, 4 L	A461-4
Acetonitrile	Optima LC/MS	Amber glass, 4 L	A955-4
Methanol	Optima LC/MS	Amber glass, 4 L	A456-4
Water	Optima LC/MS	Amber glass, 4 L	W6-4
Blends			
0.1% FA in Acetonitrile	Optima LC/MS	Amber glass, 4 L	LS120-4
0.1% FA in Water	Optima LC/MS	Amber glass, 4 L	LS118-4
0.1% TFA in Acetonitrile	Optima LC/MS	Amber glass, 4 L	LS121-4
0.1% TFA in Water	Optima LC/MS	Amber glass, 4 L	LS119-4
Additives			
Acetic acid (modifier)	Optima LC/MS	Ampule, 10 × 1 mL	A113-10X1AMP
Ammonium Acetate	Optima LC/MS	Amber glass, 50 g	A114-50

Table 11. Recommended solutions (Sheet 2 of 2)

Product	Grade	Size ^a	Part number
Ammonium Formate	Optima LC/MS	Amber glass, 50 g	A115-50
Formic acid (modifier)	Optima LC/MS	Ampule, 10 × 1 mL	A117-10X1AMP
Trifluoroacetic Acid	Optima LC/MS	Ampule, 10 × 1 mL	A116-10X1AMP

^a Size for the stated part number

IMPORTANT

- Some solvent impurities are transparent to a [UV-Vis detector](#). Therefore, some HPLC-grade solvents might contain contaminants that interfere with the performance of the mass spectrometer. To operate the mass spectrometer, choose HP solvents with minimum contamination.
- Do not filter solvents. Filtering solvents can introduce contamination.

Waste Exhaust

The waste and exhaust arrangements can affect the proper performance of the LTQ Series system. You must vent vacuum and solvent wastes separately, and collect and dispose of wastes properly.

You are responsible for providing the proper waste and exhaust systems that are required to operate the system.

Contents

- [Exhaust System](#)
- [Solvent Waste](#)

Exhaust System

Thermo Fisher Scientific strongly recommends connecting the forepump or forepumps to a fume exhaust system. The forepump eventually exhausts much of what is introduced into the LTQ Series mass spectrometer, including the small amount of oil vapor that a mechanical pump can emit. Be sure to provide an adequate exhaust system.

Note To properly operate the forepump requires an efficient fume exhaust system. Most API applications contribute to solvents accumulating in the forepump. While Thermo Fisher Scientific recommends that you periodically open the ballast valve (on the top of the pump) to purge the accumulated solvents, opening the valve might allow a large volume of volatile solvent waste to enter the fume exhaust system. Choose an exhaust system that can accommodate the periodic purging of these solvents. The frequency of the purging depends on the throughput of the system.

The forepump provides a vacuum for the ion transfer tube–skimmer (LXQ and LTQ XL) or ion transfer tube–S-lens (Velos Pro) region of the API source, for the backing pressure for the internal turbomolecular pump, and for the backing pressure for the turbomolecular pumps in the ETD module.

The forepumps require one 15 mm (0.6 in.) OD exhaust port. The exhaust system for the forepumps must be able to accommodate an initial inrush flow rate of 3 L/min (6.4 ft³/hr) and a continuous flow rate of 1 L/min (2 ft³/hr).

IMPORTANT The port for the lab exhaust system must be close enough to the forepumps so that the exhaust hose is at floor level for a minimum of 2 m (78.7 in.). This hose acts as a trap for exhaust fumes that would otherwise recondense in the forepump oil.

Figure 6 on page 14 shows the forepump tubing connected to the back of the mass spectrometer.



CAUTION Do NOT run the forepump exhaust lines vertically near the forepumps. Solvents and oils can condense in these lines. A vertical run of the exhaust line near the forepumps could allow condensed vapors to flow back into the pumps and cause both damage to the pump and the loss of pump capability.

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. Figure 2 on page 9 shows the solvent waste exhaust tubing connected to the bottom of the API source housing located on the front of the mass spectrometer.

The LTQ Series mass spectrometer comes with parts to collect the waste solvent from the API source. For information about connecting the API source housing drain, refer to the *LTQ Series Getting Connected Guide*.



CAUTION

Follow these guidelines for the API source drain:

- Use the PVC tubing provided with the solvent waste container to connect the solvent waste container to a fume exhaust system. Do not connect silicone tubing to the API source drain. If silicone tubing connects to the outlet drain, you might observe background ions at m/z 536, 610, and 684.
- Use the Teflon Source Drain adapter as described in the getting connected guide. Do not connect Tygon tubing directly to the API source drain. At high temperatures, Tygon releases volatile contaminants.
- To prevent solvent waste from backing up into the mass spectrometer, make sure that all tubing is above the level of liquid in the waste container:
 - Tygon tubing from the mass spectrometer to the solvent waste container
 - PVC tubing from the waste container to the exhaust system

Equip your lab with at least two fume exhaust systems:

- The analyzer optics can become contaminated if the API source drain tube and the (blue) exhaust tubing from one or more forepumps connect to the same fume exhaust system. Route the (blue) exhaust tubing from the forepumps to a dedicated fume exhaust system.
- Do not vent the PVC drain tube (or any vent tubing connected to the waste container) to the same fume exhaust system that one or more forepumps connect to. Vent the waste container to a dedicated fume exhaust system. The exhaust system for the Ion Max or Ion Max-S API source must accommodate a flow rate of up to 30 L/min (64 ft³/h).

Instrument Shipments

Electronic equipment carriers that specialize in the handling and transport of delicate machinery ship the LTQ Series system to your site. However, occasionally equipment is damaged in transit.

Contents

- [Reporting Damage to Shipping Packages](#)
- [Shipment Methods](#)

Reporting Damage to Shipping Packages

Take the following precautions when receiving instruments, supplies, or material:

- Check carefully for obvious damage or evidence of rough handling.
- Note any apparent external damage on all copies of the receiving documents and describe briefly the extent of the damage. Have the driver sign (or initial) next to your comments to signify agreement with your observations.
- Report the damage by contacting your local Thermo Fisher Scientific office; see [“Contacting Us”](#) on [page xix](#).

Note Freight insurance requires that you note obvious damage on the receiving documents.

Shipment Methods

If the system is damaged in transit, the method of shipment determines who has responsibility for filing a claim against the carrier. If the instrument shipping container, ShockWatch™, or other indicators show any evidence of damage or mishandling during shipment, do NOT open the container. Call your Thermo Fisher Scientific representative for further instructions.

Domestic Destinations

For domestic destinations, instruments are shipped by one of the following methods:

- FOB (freight on board) San Jose, California, U.S.

Most instruments are shipped FOB San Jose, and any damage incurred in shipment is the responsibility of the purchaser and the carrier. However, Thermo Fisher Scientific San Jose will assist with claims filing and (billable) repairs if necessary.

- FOB destination

If the instrument is shipped FOB destination and is damaged, Thermo Fisher Scientific San Jose files a claim against the carrier.

Note For domestic shipments, Thermo Fisher Scientific San Jose does 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 indoor location. If you have questions about moving your system, contact your local office for Thermo Fisher Scientific San Jose products. See “[Contacting Us](#)” on [page xix](#) for telephone and fax numbers.

International Destinations

For destinations outside of the United States, instruments are shipped carriage and insurance paid (CIP) to the destination unless specified differently. If the instrument is shipped CIP destination and is damaged, Thermo Fisher Scientific San Jose files a claim against the carrier.

Note For international shipments, Thermo Fisher Scientific San Jose does not accept liability for damage if materials are received with obvious damage AND the damage is not recorded on the receiving documents.

Installation

Complete all preparations described in the previous chapters before your Thermo Fisher Scientific representative installs the LTQ Series system.

IMPORTANT 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 instrument arrives safely, proceed with the following instructions.

After you have completed the laboratory site preparation, mailed or faxed the “[LTQ Series Installation Request Form](#)” on [page iii](#) to your local office for Thermo Fisher Scientific San Jose products, and received the LTQ Series system, call your Thermo Fisher Scientific office to schedule an installation date. See “[Contacting Us](#)” on [page xix](#) for telephone and fax numbers for the Thermo Fisher Scientific San Jose office.

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- [Installation Kits](#)
- [Customer-Supplied Hardware](#)
- [Fluoranthene for MS/ETD Systems](#)
- [Basic On-Site Training](#)
- [Advanced Training Courses](#)
- [Preventive Maintenance](#)

Installation Kits

Your LTQ Series mass spectrometer ships with the following kits:

- MS Accessory Kit (P/N 97055-62055)
Contains additional components, such as fittings, fuses, tools, and tubing.
- MS Setup Kit (P/N 70111-62033)
Contains the installation components, such as the exhaust and waste tubing, and the power supply cords.
- Chemical Kit (P/N 97355-62070 for LXQ and LTQ XL; P/N 97655-62070 for Velos Pro)
Contains the necessary chemicals for demonstrating the system performance specifications.

Depending on your system configuration, you might have other kits with your shipment; see [Table 12](#). For MALDI LTQ XL systems, refer to the MALDI product documentation.

Table 12. Additional accessory kits for specific mass spectrometer models

Kit	Description	Part number
Special Accessory Kit for the LXQ	Contains fittings, fuses, tools, tubing, the ion transfer tube, and other items.	97055-62060
Special Accessory Kit for the LTQ XL	Contains fittings, fuses, tools, tubing, the ion transfer tube, and other items.	97355-62060
Special Accessory Kit for the Velos Pro	Contains fittings, fuses, tools, tubing, the ion transfer tube, and other items.	97655-62060
MS/ETD systems		
ETD Accessory Kit	Contains filaments and other items, the gas filter kit, precleaned copper tubing, and fittings to connect the tubing to the ETD module and the reagent carrier gas supply.	98000-62002
ETD Ship Kit	Contains the air duct hose, tee fitting, and power supply cords.	98000-62004
ETD Reagent Kit	Contains one vial each of fluoranthene and Angiotensin I.	98000-62008

Customer-Supplied Hardware

Thermo Fisher Scientific does not supply all parts, materials, or tools that are required for installation. [Table 13](#) lists the additional parts that you must provide to complete the installation.

Table 13. Customer-supplied hardware for installation

Item	Description
(International destinations only) 230 Vac plug for the detachable power supply cord	See “Power Supply Cords” on page 24 .
Communications cable	Connects from the Ready Out and Start Out pins on the mass spectrometer to a device not controlled by the Xcalibur data system. Referenced in the <i>LTQ Series Getting Connected Guide</i> .
Gas line fitting, helium	Connects the 1/8 in. ID copper or stainless steel tubing to the helium gas supply. Referenced in the <i>LTQ Series Getting Connected Guide</i> .
Gas line fitting, nitrogen	Connects the 1/4 in. OD Teflon™ PFA tubing to the nitrogen gas supply. Referenced in the <i>LTQ Series Getting Connected Guide</i> .
LC system	IMPORTANT If your LC system is manufactured by another company, you must verify that it is suitable for use with the LTQ Series mass spectrometer. 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 LTQ Series mass spectrometer.
LC system, solvents	Used by the Thermo Fisher Scientific field service engineer to calibrate the system during the initial setup. For details, refer to the appropriate manual.
(Optional) Compressed air line fitting	Connection from the compressed air supply to the optional FAIMS module (temperature control module). For details, refer to the <i>FAIMS Operator’s Manual</i> .

Fluoranthene for MS/ETD Systems



CAUTION AVOID EXPOSURE TO POTENTIALLY HARMFUL MATERIALS

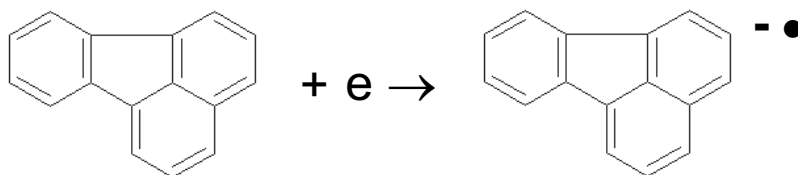
By law, producers and suppliers of chemical compounds are required to provide their customers with the most current health and safety information in the form of Material Safety Data Sheets (MSDSs). The MSDSs must be freely available to lab personnel to examine at any time. MSDSs describe the chemicals 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 for the remedy of spills or leaks.

Read the MSDS 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.

Fluoranthene is used as the electron transfer dissociation (ETD) reagent in the ETD module portion of the LTQ XL/ETD and Velos Pro/ETD systems. Fluoranthene is potentially hazardous. Use it in accordance with its MSDS.

The fluoranthene radical anion is generated according to the reaction shown in [Figure 12](#).

Figure 12. ETD reagent (fluoranthene radical anion) generation from fluoranthene



Fluoranthene

The fluoranthene vial in the LTQ XL/ETD or Velos Pro/ETD system Reagent Kit is Sigma-Aldrich Supelco™ #48535. To obtain another fluoranthene vial, click the MSDS link:

<http://www.sigmaaldrich.com/catalog/search/ProductDetail/SUPELCO/48535>

Basic On-Site Training

When your new LTQ Series system is on site and ready for installation, a Thermo Fisher Scientific field service engineer unpacks and installs it.

During the installation, the field service engineer demonstrates the following:

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

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.

Advanced Training Courses

Thermo Fisher Scientific provides introductory and advanced training courses in analytical techniques, in addition to specialized operation and maintenance courses for Thermo Scientific products.

Thermo Fisher Scientific recommends that the key user receive advanced training for operating and maintaining the LTQ Series system after using it for several months. After this training from Thermo Fisher Scientific, the key user can conduct in-house training for your own staff, certifying them to operate the system.

Preventive Maintenance

You are responsible for the routine and preventive maintenance of the LTQ Series system.

Regular preventive maintenance is essential. It increases the life of the system, maximizes the uptime of the system, and provides optimum system performance. You can find maintenance procedures in the following manuals:

- *LTQ Series Hardware Manual*
- *Ion Max and Ion Max-S API Source Hardware Manual*
- Manuals shipped with other devices for your system

Glossary

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A

atmospheric pressure chemical ionization (APCI) A soft ionization technique done in an ion source operating at atmospheric pressure. Electrons from a corona discharge initiate the process by ionizing the mobile phase vapor molecules, forming a reagent carrier gas.

atmospheric pressure ionization (API) Ionization performed at atmospheric pressure by using atmospheric pressure chemical ionization (APCI), electrospray ionization (ESI), or nanospray ionization (NSI).

auxiliary gas The outer-coaxial gas (nitrogen) that assists the sheath (inner-coaxial) gas in dispersing and/or evaporating sample solution as the sample solution exits the APCI, ESI, or H-ESI nozzle.

C

circuit breaker An electronic switch that automatically shuts off power to its designated circuits when there is a current overload or short circuit condition. Multiple circuit breakers are typically housed within one or more panels for a given area. These devices must be certified for compliance by a recognized organization for your country.

collision gas A neutral gas used to undergo collisions with ions.

computer data system *See* data system.

D

damping gas Helium gas introduced into the ion trap mass analyzer that slows the motion of ions entering the mass analyzer so that the ions can be trapped by the rf voltage fields in the mass analyzer.

data system Consists of a computer, monitor, keyboard, mouse, optional Ethernet switch, and optional printer.

E

electron transfer dissociation (ETD) A method of fragmenting peptides and proteins. In ETD, singly charged reagent anions transfer an electron to multiply protonated peptides within the ion trap mass analyzer. This leads to a rich ladder of sequence ions derived from cleavage at the amide groups along the peptide backbone. Amino acid side chains and important modifications such as phosphorylation are left intact.

electrospray ionization (ESI) A type of atmospheric pressure ionization that is currently the softest ionization technique available to transform ions in solution into ions in the gas phase.

F

FAIMS (high-Field Asymmetric waveform Ion Mobility Spectrometry) An optional module for separating ions at atmospheric pressure. FAIMS provides ion separation by taking advantage of compound-dependent changes in ion mobility at high electric field strengths.

forepump The pump that evacuates the foreline. A rotary-vane pump is a type of forepump. It might also be referred to as a backing, mechanical, rotary-vane, roughing, or vacuum pump.

H

high-energy collision-induced dissociation (HCD)

A method of fragmentation where the projectile ion has laboratory-frame translation energy higher than 1 keV.

I

inrush current The initial current flowing through an inductive load, such as a motor, when it is first turned on. On average, the typical duration is less than 100 ms.

M

MALDI (matrix-assisted laser desorption ionization) A method of ionizing proteins where a direct laser beam is used to facilitate vaporization and ionization while a matrix protects the biomolecule from being destroyed by the laser.

N

nanospray ionization (NSI) A type of electrospray ionization (ESI) that accommodates very low flow rates of sample and solvent on the order of 1 to 20 nL/min (for static nanospray) or 100 to 1000 nL/min (for dynamic nanospray).

R

reagent carrier gas A gas used to produce positive and negative ions of the analyte through a complex series of chemical reactions.

S

sheath gas The inner coaxial gas (nitrogen), which is used in the API source to help nebulize the sample solution into a fine mist as the sample solution exits the ESI or APCI nozzle.

sweep gas Nitrogen gas that flows out from behind the sweep cone in the API source. Sweep gas aids in solvent declustering and adduct reduction.

U

UV-Vis detector Ultraviolet-visible spectroscopy. This type of detector operates in the ultraviolet-visible spectral region.

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