Finnigan® LXQ™

Preinstallation Requirements Guide

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For Research Use Only
Not for use in Diagnostic Procedures

Analyze • Detect • Measure • Control™

Thermo ELECTRON CORPORATION

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IMPORTANT PREINSTALLATION INFORMATION... PLEASE READ

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Finnigan LXQ MS Detector Installation Request Form

Dear User:

Read the Finnigan LXQ Preinstallation Requirements Guide, and then 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

- ❑ 1. All laboratory remodeling has been completed.
- ❑ 2. Your LXQ MS Detector is on site.
- ❑ 3. Principal operator will be available during the installation / certification period.
- ❑ 4. Doorways, hallways, etc. are a minimum width of 94 cm (37 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 [191 kg (420 lbs)] 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 NEMA type: _____
- ❑ 12. Voltage of power outlet has been measured. Note ***measured*** voltage: _____
- ❑ 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, between 15 and 27 °C (59 and 81 °F).
- ❑ 15. Relative humidity is between 40% and 80% with no condensation.
- ❑ 16. System work area is free from magnetic disruption and electrostatic discharge.
- ❑ 17. All gases required (helium and nitrogen) are on site, gas lines are installed, and appropriate gas regulators are available.
  List gases and purity: _____
- ❑ 18. New or recently cleaned HPLC system is available that produces pulse-free, continuous flow from 100 to 1000 µL/min.
- ❑ 19. HPLC grade water, methanol, acetonitrile and isopropyl alcohol are available for testing the performance of your instrument.
- ❑ 20. There is a suitable exhaust system present that is separate from solvent waste.
- ❑ 21. Provision has been made for collecting solvent waste from API source.
- ❑ 22. One voice telephone line is installed near the system.
- ❑ 23. All relevant safety regulations are complied with.

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:

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Offices for Thermo Electron San Jose Products

North America

Northeastern Region

265 Davidson Avenue, Suite 101
Somerset, NJ 08873
Phone.....[1] (732) 627-0220
Fax .....[1] (732) 627-0260

Southern Region

665 Molly Lane, Suite 140
Woodstock, GA 30189
Phone .....[1] (770) 516-5589
Fax .....[1] (770) 516-6916

Central Region

1201 E. Wiley Road, Suite 160
Schaumburg, IL 60173
Phone.....[1] (847) 310-0140
Fax .....[1] (847) 310-0145

Western Region

355 River Oaks Parkway
San Jose, CA 95134
Phone.....[1] (408) 965-6000
Fax .....[1] (408) 965-6123

Canada

5716 Coopers Avenue, Unit 1
Mississauga, Ontario, L4Z 2E8
Phone.....[1] (905) 712-2258
Fax .....[1] (905) 712-4203

Europe

Austria

Wehlistrasse 27b
A-1200 Wien
Phone.....[43] (01) 333 50 34-0
Fax .....[43] (01) 333 50 34-26

Belgium

Technologiestraat 47
B-1082 Brussels
Phone.....[32] (02) 482 30 30
Fax .....[32] (02) 482 30 31

France

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

16 Avenue du Québec
Silic 765
Z.A. de Courtaboeuf
F-91963 Les Ulis Cédex
Phone.....[33] (01) 60 92 48 00
Fax .....[33] (01) 60 92 49 00

Germany

Im Steingrund 4-6
D-63303 Dreieich
Phone.....[49] (06103) 408 0
Fax .....[49] (06103) 408 1222

Italy

Strada Rivoltana
I-20090 Rodano (Milano)
Phone.....[39] (02) 95059 226
Fax .....[39] (02) 95320 370

Netherlands

Takkebijsters 1
4817 BL Breda
Nederland
Phone.....[31] (076) 587 8722
Fax .....[31] (076) 571 4171

Spain

Sepulveda 7 A
ES-28108 Alcobendas (Madrid)
Phone.....[34] (091) 657 4930

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.A., 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.

Offices for Thermo Electron San Jose Products - Continued

Europe - Continued

Spain

Acer 30-32
Edificio Sertram – Planta 2, Modulo 3
ES-08038 Barcelona
Phone.....[34] (093) 223 0918
Fax .....[34] (093) 223 0982

Sweden

Pyramidbacken 3
S-141 75 Kungens Kurva (Stockholm)
Phone.....[46] (08) 556 468 00
Fax .....[46] (08) 556 468 08

United Kingdom

Stafford House
1 Boundary Park
Boundary Way
Hemel Hempstead
Hertfordshire HP2 7GE
Phone .....[44] (01442) 233 555
Fax .....[44] (01442) 233 667

Australasia and Asia

Australia

P.O. Box 239 Rydalmere
Unit 14, 38 - 46 South Street
Rydalmere, N.S.W. 2116
Phone.....[61] (02) 9898-9000
Fax .....[61] (02) 9898-9800

Japan

C-2F
3-9 Moriya-cho, Kanagawa-ku
Yokohama, Kanagawa 221-0022
Phone.....[81] (45) 453-9100
Fax .....[81] (06) 453-9110

Esaka Grand Building
2-3-1 Esaka-cho, Suita City
Osaka 564 - 0063
Phone.....[81] (06) 6387-6681
Fax .....[81] (06) 6387-6641

P.R. China

Room 901, Ping-an Mansion
No. 23, Jin Rong Street
Xi Cheng District
Beijing 100032
Phone.....[86] (010) 6621 0839
Fax .....[86] (010) 6621 0851

23/F Peregrine Plaza
1325 Middle Huaihai Rd.
Shanghai 200031
Phone.....(8621) 5465-7588 ext 212
Fax .....(8621) 6445-7830

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Regulatory Compliance

Thermo Electron San Jose 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 below.

EMC Directive 89/336/EEC

EMC compliance has been evaluated by U.L. Underwriter's Laboratory Inc.

EN 55011	1998	EN 61000-4-3	2002	EN 55011	1998
EN 61000-3-2	1995, A1; 1998, A2; 1998, A14; 2000	EN 61000-4-4	1995, A1; 2001, A2; 2001	EN 61000-3-2	1995, A1; 1998, A2; 1998, A14; 2000
EN 61000-3-3	1998	EN 61000-4-5	1995, A1; 2001	EN 61000-3-3	1998
EN 61326-1	1998	EN 61000-4-6	1996, A1; 2001	EN 61326-1	1998
EN 61000-4-2	2000	EN 61000-4-11	1994, A1; 2001	EN 61000-4-2	2000
FCC Class A, CFR 47 Part 15 and Part 18	2005	CISPR 11	1999, A1; 1999, A2; 2002	FCC Class A, CFR 47 Part 15 and Part 18	2005

Low Voltage Safety Compliance

This device complies with Low Voltage Directive EN 61010-1:2001.

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 Electron. To ensure continued compliance with EMC and safety standards, replacement parts and additional components, options, and peripherals must be ordered from Thermo Electron or one of its authorized representatives.

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 UNDESIRED OPERATION.

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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 Electron San Jose Instruments

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

Notice on the Proper Use of Thermo Electron San Jose Instruments

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

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

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Preface

About This Guide

Welcome to the Thermo Electron LXQ™ system. The LXQ™ system is a member of the Thermo Electron family of mass spectrometer (MS) detectors.

This Preinstallation Requirements Guide provides information to assist in planning and preparing your lab site for the system prior to delivery and installation. Read each section carefully to be sure that your laboratory is ready for the installation of your system.

Related Documentation

In addition to this guide, Thermo Electron provides the following documents for the LXQ as .PDF files:

- LXQ Getting Connected
- LXQ Hardware
- LXQ Getting Started

Help is also available from within the software.

Safety and Special Notices

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 avoid damage to software, loss of data, invalid test results, or information critical for optimal performance of the system.

Note Highlights information of general interest.

Tip Helpful information that can make a task easier.

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Phone: 1-800-532-4752
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To suggest changes to this guide or to the Online Help, use either of the following methods:

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

Chapter 1 Introduction

The LXQ™ MS detector is designed to operate under carefully controlled environmental conditions.

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

Operating a system 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 standard warranty and service contract coverage.

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

Chapter 2 Site Preparation

Note It is your responsibility to provide an acceptable installation site.

Before your instrument can be installed by the service engineer, the site must be prepared. The hallways and doors must be wide enough to allow passage of the instrument. The workbench must be large enough and strong enough to support the instrument, computer and LC system. A telephone must be installed within reach of the workbench. For a summary of site preparation requirements see Table 1. More information on each of the requirements is available on the page indicated in the table.

Table 1. Site preparation requirements

Requirement	Page
Entrance: For the system to be delivered to the site, your entrances and hallways must be a minimum of 94 cm (37 in.) wide for passage of the instrument.	4
Space and Load Requirements: Two workbenchs are required. The MS detector workbench must have minimum dimensions of 1 × 1.53 m (3 × 5 ft). The data system workbench must have minimum dimensions of 1 x 1.22m (3 x 4ft). The MS detector workbench must be capable of supporting the weight of the LXQ MS detector [105 kg (230 lbs)] plus the weight of your liquid chromatograph and any options. The data system workbench must be capable of supporting the weight of the data system and printer [48 kg (105 lbs)]. **Note.** The MALDI ion source for the LXQ MS detector weighs approximately 45 kg (100 lbs). If you purchase this option take the weight into account when designing your workbench.	5
Telephone: A telephone line must be installed near the workbench.	8

Entrance

The entrance to your facility and the width of all hallways, elevators, etc., must be a minimum of 94 cm (37 in.).[1] However, additional room must be allowed for maneuvering the system around corners, into elevators, or through doorways.

The LXQ and accessories are shipped in a container with the following dimensions: *l* 102 cm (40 in.), *w* 92 cm (36 in.), *h* 117 cm (46 in.). The container and its contents weigh approximately 160 kg (350 lb). Other modules—such as the computer, forepump, monitor, and options—are shipped in their own containers. Their dimensions and weights are less than that of the container for the LXQ.

[1]If the instrument shipping container, Shock Watch, or other indicator shows any evidence of damage or mishandling during shipment do NOT open the container. Call your Thermo Representative for instructions on what to do. If there is no evidence of shipping damage or mishandling then you can proceed with the instructions that follow. Your instrument is shipped in a shipping container with a smallest dimension of 92 cm (36 in.). If the entrance to your laboratory will not accommodate a 92 cm container, you can remove the individual modules from the container before moving them into the room. If you remove the instrument from its shipping container before it is delivered to the lab site, be sure that all the contents of the container remain with the instrument.

Space and Load Requirements

The recommended layout for the LXQ system is shown in Figure 1. The space requirements and weights of the components of the typical LXQ system are given in Table 2.

Place the LXQ system on two separate workbenchs that are next to each other. One workbench will hold the LXQ, the LC, and any other MS/LC options and must have minimum dimensions of 1 × 1.53 m (3 × 5 ft). This workbench must also be capable of supporting the weight of the LXQ [105 kg (230 lbs)] plus the weight of the liquid chromatograph and any options. The second workbench will hold the data system and printer and must have minimum dimensions of 1 × 1.22 m (3 × 4 ft). This second workbench must be capable of supporting the weight of the data system and printer (48kg, 105lb). Allow about 8 cm (3 in.) of clear space behind the system for proper air circulation and for clearance of the gas lines and electrical connections. In addition, allow at least 92 cm (36 in.) of vertical clearance between the top of the LXQ and any shelves above it.

Install the forepumps on the floor close to the LXQ. (The total length of the vacuum hose connecting the LXQ to the forepumps should not exceed 8 ft.) There are two options for locating the forepumps and for connecting the vacuum hose from the LXQ to the pump. They are as follows:

- If the workbench has space beneath it, place the forepumps under the workbench immediately behind the LXQ. (See the tabletop layout in Figure 1.) Either run the vacuum hose behind the workbench or make a 64 mm (2.5 in.) diameter hole through the bench for the vacuum hose. Allow for room to run the power cords from the forepumps through the hole.
- If there is no space under or at the end of the workbench, the pumps can be placed on the floor in front of the LXQ.
- Table 2 gives the approximate space and weight requirements of the various components of the system.

CAUTION Whenever possible, provide space under the workbench for the forepump. If the pumps are placed in front of the LXQ, they can block access to drawers and cabinets and can represent a trip hazard.

Note Do not route exhaust tubing from the pumps vertically toward the ceiling. To maintain pump integrity, route the tubing from the exhaust ports down to the floor.

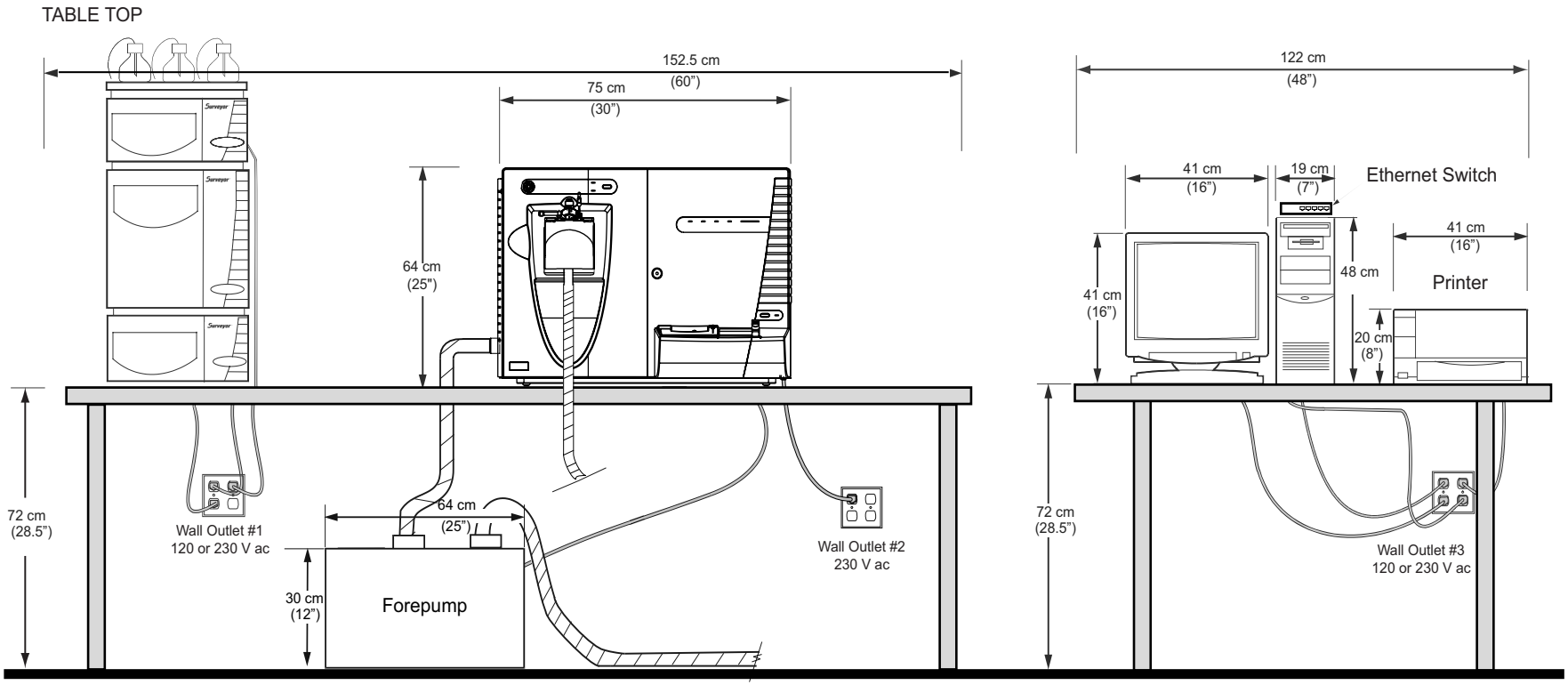

Figure 1. LXQ system installation and space requirements

Table 2. LXQ space and weight requirements*

	Height		Width		Depth		Weight	
Module	**cm**	**in.**	**cm**	**in.**	**cm**	**in.**	**kg**	**lb**
LXQ	56	22	79	31	59	23	105	230
Liquid chromatograph*	61	24	76	30	61	24	45	100
Minitower computer	48	19	18	7	43	17	14	30
Monitor	41	16	41	16	43	17	17	38
Keyboard	5	2	48	19	20	8	1	2
Forepumps (each)	30	12	20	7	64	25	34	75
Laser printer*	20	8	41	16	46	18	7	16

*Approximate. The actual values depend upon your equipment.

Telephone

Install a telephone in your laboratory near the instrument so that, if necessary, you can conveniently operate the system while you are working by telephone with Thermo Electron Technical Support. Place the voice telephone outlet within 2 m (6 ft) of your system.

Chapter 3 Operating Environment

Note It is your responsibility to provide the operating environment necessary for proper LXQ operation.

Attention to the operating environment will ensure continued high performance of your LXQ system. Any expenditures for air conditioning are more than offset by good sample throughput and reduced repair costs. Refer to Figure 3 for more information on operating environment requirements.

Table 3. Summary of Operating Environment preinstallation requirements

Requirement	Page
Temperature The laboratory room temperature must be maintained between 15 and 27 °C (59 and 81 °F). Also, ensure that the temperature does not fluctuate by more than ±5 °C to ensure good performance.	10
Humidity The relative humidity of the operating environment must be between 40% and 80%, with no condensation.	11
Vibration Workbench must be free from vibration.	12
Lighting Adequate lighting for instrument operation is required. A high intensity lamp for instrument maintenance is also recommended.	13
Particulate matter Air should contain fewer than 100,000 particles per cubic foot (3,500,000 particles per cubic meter) in excess of 5 μm.	14
Electrostatic discharge Precautions are recommended, especially when operating the system at the lower end of the relative humidity range listed above.	15

Temperature

For precision instrumentation such as the LXQ, the temperature stability of the environment in which the instrument is installed can affect performance. The laboratory room temperature must be maintained between 15 and 27 °C (59 and 81 °F). The optimum temperature of operation is between 18 and 21 °C (65 and 70 °F).

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

There must be a good flow of room air around the system, and the air conditioning system must be capable of maintaining a constant temperature in the immediate vicinity of the system.

Note Do not locate the LXQ under an air duct, near windows, or near heating and cooling sources. Temperature fluctuations of 5 °C or more over a 5 min period of time can affect performance.

The air conditioning load for a basic LXQ system (with a typical LC) is approximately 2300 W (8,000 Btu/h). Refer to your LC manual for the heat output of your LC equipment.

Table 4 shows the approximate heat output of each module.

Table 4. Heat output

Module	Heat output (in Watts)	Heat output (in Btu/h)
LXQ	2,300	8,000
Liquid chromatograph*	1,060	3,690
Monitor	240	820
Computer	470	1,640
Laser printer*	350	1,230
Total	4,420	15,380

*Approximate. The actual values depend upon your equipment.

Humidity

The relative humidity of the operating environment must be between 40% and 80%, with no condensation.

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

It is recommended that your laboratory be equipped with a temperature / humidity monitor to insure that your laboratory is always within the required temperature and humidity specifications.

Vibration

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

Because of the natural vibration of the forepumps during operation, install the pumps on the floor beneath the LXQ and not near the system on the workbench.

Lighting

Good lighting makes any work area more enjoyable. A small, high-intensity lamp is recommended for cleaning the mass spectrometer components.

Particulate Matter

The air in your laboratory must not have excessive dust, smoke, or other particulate matter. For reference, the air should contain fewer than 100,000 particles per cubic foot (3,500,000 particles per cubic meter) in excess of 5 µm.

Dust can clog the air filters, causing a reduction in air flow around 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.

Electrostatic Discharge

Electrostatic discharge (ESD) can damage the electronic components of your LXQ system.

LXQ instruments are designed to withstand ESD up to 15 kV (air discharge) and 8 kV (contact discharge) with all panels in place. However, if the panels are removed and the PCBs are handled without proper precautions, the electronic components might be damaged or fail prematurely.

Static electricity can develop in a variety of ways. A few examples of how electrostatic charge can develop are as follows:

- When walking across a carpet in a room that is at 20% relative humidity, as much as 35,000 V of electrostatic potential can be generated on the surface of your body. A similar trip in a room at 80% relative humidity generates about 1,500 V of electrostatic potential.
- Sitting and working in a chair padded with polyurethane foam in a room at 20% relative humidity can cause as much as 18,000 V of electrostatic potential to develop on your skin or 1,500 V at 80% relative humidity.
- Working in laboratory coats and clothing made of synthetic fibers can cause the accumulation of static electricity on your skin.
- Using Styrofoam® cups and packing materials which typically have a considerable electrostatic charge on them.

The discharge of static electricity is not perceptible to humans until the potential is at least 4,000 V. Many electronic components can be damaged by a discharge of electrostatic potential of as little as 50 V. ESD damage can be catastrophic, causing your system to cease functioning. More commonly, however, ESD damage might cause latent problems that are detrimental to sensitive electrical components, causing premature failures.

Therefore, the following precautions are recommended, especially when operating your system at the lower end of the relative humidity specification on page 11.

- Use a static-dissipating floor covering (such as tile or conductive linoleum) in the room that houses your instrument.
- Use laboratory chairs covered with natural fibers or other static-dissipating material.
- wear a laboratory coat and clothing made of natural fiber or other static-dissipating material when you are operating the instrument.

- Keep Styrofoam cups or packing materials away from the instrument.

Chapter 4 Line Power

The performance and longevity of your system can be affected by the quality of line power delivered to the system. In order to ensure that your instrument performs optimally and is not damaged by line power fluctuations, verify that your lab electrical supply complies with all power quality requirements. Refer to Table 5 for a summary of line power requirements. More information on each of the requirements is available on the page indicated in the table.

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

Table 5. Summary of line power preinstallation requirements

Requirement	Page
Quality of Power Line power must be free from: • Long-term changes in average root mean square (RMS) voltage level, with durations greater than 2 s. • Sudden changes in average RMS voltage level, with durations between 50 ms and 2 s. • Brief voltage excursions of up to several thousand volts with durations up to 50 ms.	19
Power Monitoring Devices Before connecting your LXQ to its line power, it is strongly recommended that the power line be monitored 24 hours a day for seven consecutive days.	20
Power Conditioning Devices To free line power from voltage changes, sags, surges and transients, the following devices are available: • Noise suppression transformer • Buck/boost transformer • Power conditioning	21

Table 5. Summary of line power preinstallation requirements, continued

Requirement	Page
Available Outlets For systems installed where there is 110 and 230 V: • Nominal voltage of 120 V ac, +6% to -10% and 230 V ac, ±10% and free from voltage variations above or below this operating range • **Systems installed in areas with 208 V power will experience voltage sags during high use periods that might place the line voltage below the operating parameters discussed in this section.** In this case, it is required that you protect your instrument by using a buck/boost transformer to ensure that power is within the specified parameters at all times. • Frequency of 50/60 Hz • Two fourplex outlets (single-phase power) with a minimum power rating of 20 A (120 V ac) • One fourplex outlet (single-phase power) with a minimum power rating of 16 A (230 V ac) • Earth ground hard-wired to the main panel **For systems with only 230 V line power** • Nominal voltage of 230 V ac, ±10% (**Note:** For systems installed in areas with 208 V ac nominal line power, you are required to use a buck/boost transformer to keep your line power within operating parameters.) • Frequency of 50/60 Hz • Three fourplex outlets, with a minimum power rating of 16 A at each fourplex outlet (In the U.S., only 15 and 20 A power rating options are available, therefore you **must** choose the 20 A option.) • Earth ground hard-wired to the main panel	26
Connecting the LTQ XL, LC, and Other Modules to Wall Outlets Balance the current load on the circuits to which your system is connected.	26
Uninterruptible Power Supply Systems installed in areas with intermittent line power must have uninterruptable power supplies installed.	27
Technical Assistance Contact Thermo Electron for additional assistance in monitoring line power or selecting a line conditioner.	28

Quality of Power

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

The following are definitions for the most common voltage disturbances:

- Slow average is a gradual, long-term change in average root mean square (RMS) voltage level, with typical durations greater than 2 s.
- Sags and surges are sudden changes in average RMS voltage level, with typical durations between 50 µs and 2 s.
- Transients (or impulses) are brief voltage excursions of up to several thousand volts with durations up to 50 µs.

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 fail catastrophically or to degrade and eventually shorten the lifetime of your system. Therefore, it is important to establish the quality of the line voltage in your laboratory before your LXQ system is installed.

Power Monitoring Devices

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

These devices provide a continuous record of line performance by analyzing and printing out data on three types of voltage disturbances:

- slow average
- sag and surge
- transient.

In the first two cases, the duration and the amplitude of the disturbance are indicated by time interval recording. A power line disturbance analyzer is a device capable of detecting and recording most types of line power problems The The Dranetz® [1] system is an example of a suitable analyzer. Line monitors can be rented from electrical equipment suppliers.

Monitor the power line 24 hours a day for seven consecutive days. If inspection of the printout indicates disturbances, terminate the test and take corrective action. Monitor the power again as previously described.

[1]Thermo Electron Corporation 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

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

CAUTION Any conditioning devices installed with your system must be able to deal with the potentially high currents that are drawn during the initial startup of the system. For example, each forepump can draw as much as 30 A during startup. Contact your Service Engineer for more information.

When the line voltage is free from voltage sags, surges, and impulses but is more than 10% outside of the voltage specifications, the line voltage can be lowered (bucked 10%) or raised (boosted 10%) by using a buck/boost transformer.

The buck/boost transformer kit (P/N OPTON-01460) can be ordered from the Thermo Electron San Jose.

Each buck/boost transformer is encased in a metal housing approximately 13 × 13 × 26 cm (5 × 5 × 10 in.) and is equipped with a 2 m (6 ft) power cable. The installation instructions for the transformer are included.

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

Note For compliance and safety, ensure that your power conditioning devices are certified by recognized domestic and international organizations, such as UL, CSA, TÜV, VDE, etc.

Available Outlets

The LXQ is designed to operate at a nominal voltage of 230 V ac, 50/60 Hz. Line voltages can vary between a minimum of 207 V ac and a maximum of 253 V ac.

CAUTION Systems installed in areas with 208 V power will experience voltage sags during high use periods that might place the line voltage below the operating parameters discussed in this section. In that case, it is required that you protect your instrument by using a buck/boost transformer to ensure that power is within the specified parameters at all times.

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

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

For systems installed in regions with both 120 V ac and 230 V ac service, the basic power requirements for a LXQ system consist of the following :

- Nominal voltage of 120 V ac, +6% to -10% and 230 V ac, ±10% and free from voltage variations above or below this operating range
- Frequency of 50/60 Hz
- Two fourplex outlets (single-phase power) with a minimum power rating of 20 A (120 V ac)
- One fourplex outlet (single-phase power) with a minimum power rating of 16 A (230 V ac). (In the U.S., only 15 and 20 A power rating options are available, therefore you must choose the 20 A option.)
- Earth ground hard-wired to the main panel
- For systems installed in areas with 230 V ac only service, the basic power requirements for a LXQ system consist of the following:
- Nominal voltage of 230 V ac, ±10%
- Frequency of 50/60 Hz
- Three fourplex outlets, with a minimum power rating of 16 A at each fourplex outlet

- Earth ground hard-wired to the main panel

Note

1. The LXQ system must have an earth ground hard-wired to the main panel. The interconnected power outlets for the LXQ system are to have a common point to one ground connector. If there are two such points, each of which is connected to separate external ground, they can cause noise current to flow through the ground system via the ground loop that is formed.

2. Power must remain On. The LXQ system should remain On and pumping continuously for optimum performance.

3. Additional power outlets might be required for test and cleaning equipment, such as an oscilloscope and ultrasonic bath. It is recommended that there be several additional power outlets close to the workbench space within your laboratory.

Figure 1 on page 2-6 shows the optimum location of the power outlets.

The power cable from the LXQ is 3 m (9 ft) and the cables from the personal computer, monitor, and printer are approximately 2 m (6 ft) long.

The LXQ is shipped with a NEMA 6-15P plug, which is rated at 15 A and 250 V ac. The data system is shipped with a NEMA 5-15P plug, which is rated at 15 A and 125 V ac. The printer is shipped with either a NEMA 5-15P plug or with a 220 V ac European CEE 7/7 (Schuko) plug. Local codes in your area might require that another type of plug and receptacle be installed. The Thermo Electron Field Engineer for your country provides the appropriate power plugs.

The NEMA plugs and their corresponding outlets are shown in Figure 2.

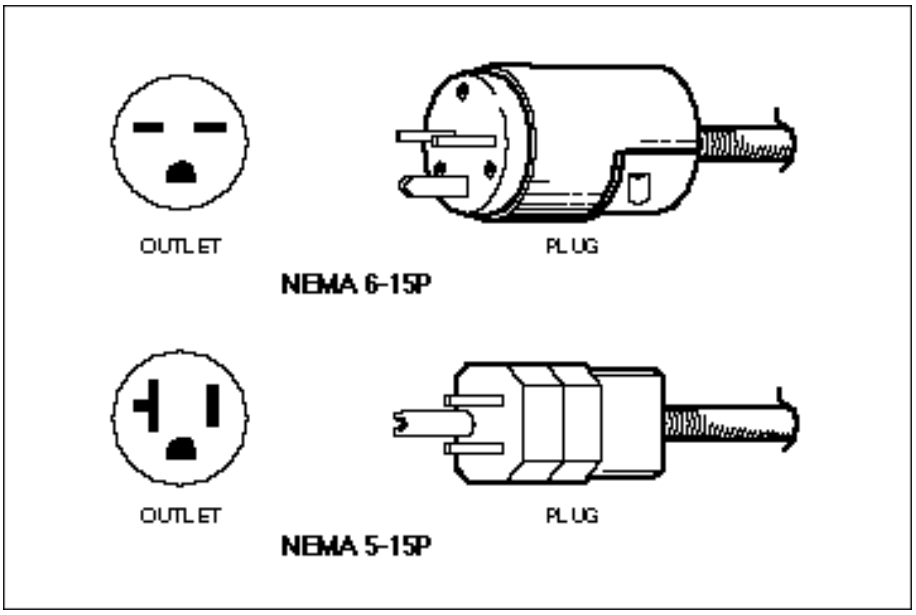

Figure 2. NEMA 6-15P and NEMA 5-15P power plugs and their respective outlets.

Table 6 shows the maximum current required by each component of a typical LXQ system. The LXQ operates with 230 V ac only. Other components can be manually set to 120 V ac or 230 V ac or can be ordered as a 120 V ac or 230 V ac option

CAUTION The values listed in Table 6 are the average currents drawn by each of the listed components. Any conditioning devices installed with your system must also be able to deal with the potentially high currents drawn during the initial startup of the system. For example, each forepump can draw as much as 30 A during startup. For more details on the surge requirements for your system, consult the forepump manuals or your Service Engineer.

Table 6. Maximum current (single phase) for a LXQ at 230 V ac, an LC at 120 or 230 V ac, and the data system (with printer) at 120 or 230 V ac

Module	Voltage 120 V ac Current (in amperes)	Voltage 230 V ac Current (in amperes)
LXQ (230 V only)		3-5 (5 A inrush)
Forepumps (each)		5 (30 A inrush)
Liquid chromatograph	10	5
Monitor	2	1

Table 6. Maximum current (single phase) for a LXQ at 230 V ac, an LC at 120 or 230 V ac, and the data system (with printer) at 120 or 230 V ac,

Module	Voltage 120 V ac Current (in amperes)	Voltage 230 V ac Current (in amperes)
Computer	4	2
Laser printer*	3	2

*Approximate. The actual value depends on your equipment.

Note Refer to your LC equipment manual for power requirements and specifications.

Installation of a complete LC/MS system can require extensive electrical resources. The number of outlets required to connect and power all of your equipment can easily exceed your line power's ability to deliver what you need if you have not planned your power system properly. Refer to Table 7 for an example of the number of outlets that might be necessary in your laboratory.

Table 7. A sample laboratory setup*

Item	Outlets
HPLC Sytem	
• Autosampler	1
• Heater	1
• Pump	1
• PDA Detector	1
• External Controller	1
mass spectrometer	
• Mass spectrometer	1 (230V)
• Ion source (MALDI, APPI, NSI)	2
Data system	
• CPU	1
• Monitor	1
• Printer	1
High intensity lamp (Optional: For help in instrument maintenance)	1
Laboratory stereoscope for inspecting fused-silica parts (Optional-useful when performing nanoflow or microfluidic experiments)	1
Total outlets required for this configuration	**13**

*Your setup might vary and depends upon the line voltages and current supplied

Connecting the LTQ XL, LC, and Other Modules to Wall Outlets

Care must be taken to ensure that the wall outlet specifications are not exceeded. The maximum load for a 120 V ac fourplex outlet is typically 20 A, and the maximum load for a 230 V ac fourplex outlet is typically 16 A. Refer to Table 6 for the maximum current ratings for the LXQ system and the data system.

Table 8 and Table 9 show examples of how to balance the power load among three wall outlets without exceeding their specifications. (See Figure 1 on page 2-6 for a typical installation.)

The specifications for the modules in your system might vary from those in this guide. The power specifications on the module always supersede those in the guide.

Table 8. Suggested power connections for a LXQ at 230 V ac, an LC at 120 V ac, and the data system (with printer) at 120 V ac

Module	Outlet #1	Outlet #2	Outlet #3
LXQ		15 A	
Liquid chromatograph*	10 A		
Monitor			2 A
Computer			4 A
Laser printer*			3 A
Total	10 A	15 A	9 A

*Approximate. The actual value depends on your equipment.

Table 9. Suggested power connections for a LXQ, an LC, and the data system (with printer) at 230 V ac

Module	Outlet #1	Outlet #2	Outlet #3
LXQ		15 A	
Liquid chromatograph*	5 A		
Monitor			1 A
Computer			2 A
Laser printer*			2 A
Total	5 A	15 A	5 A

*Approximate. The actual value depends on your equipment.

CAUTION The mass spectrometer and LC should never be connected to the same electrical wall outlet circuit.

Uninterruptible Power Supply

If your local area is susceptible to corrupted power or power disruptions, install an uninterruptible power supply (UPS) in your laboratory.

Technical Assistance

Occasionally, line power sources of unacceptable quality are encountered that adversely affect the operation of a LXQ system. Correcting line power problems is your responsibility. Contact your Thermo Electron office for assistance in monitoring the line voltage in your laboratory 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 your Thermo Electron office for assistance in locating a power consultant in your area.

Chapter 5 Gases and Solvents

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

Your instrument requires high purity gases and solvents. The Service Engineer might also require certain solvents for the installation verification of your system. Refer to Table 10 for a summary of gas and solvent requirements. More information on each of the requirements is available on the page indicated in the table.

Table 10. Summary of solvent and gas preinstallation requirements

Requirement	Page
Fittings All fittings and parts necessary for connecting gases during the installation of your system.	30
Gases: Ultra-high purity (99.995%) helium gas with less than 1.0 ppm each of water, oxygen, and total hydrocarbons. The required gas pressure is 275 ± 70 kPa (40 ±10 psi).	31
High purity (99%) nitrogen gas. The required gas pressure is 760 ± 70 kPa (110 ± 10 psi).	30
Solvents and modifiers Any solvents and modifiers necessary for the installation of your system.	33

Fittings and Parts

Table 11 lists the minimum parts that are required to connect your LTQ XL MS detector to your gas delivery system. Connections and gas delivery systems might vary. It is your responsibility to supply any fittings or connections necessary during installation.

Table 11. Gas connection hardware requirements

Description	LXQ P/N (in Accessory kit P/N 97055-62003)
1/4-in. OD PFA (Teflon®-like material) hose	2 m (6 ft) provided. You might require additional length.
Brass Swagelok®-type 1/4-in. nut	00101-12500
2-piece brass 1/4-in. ferrule	00101-10000 (front) 00101-04000 (back)
Connection for the opposite end of the Teflon hose to the nitrogen gas source	Not provided in kit. You supply these parts.
1/8-in. OD copper	2 m (6 ft) provided. You might require additional length.
Brass Swagelok-type 1/8-in. nut	00101-15500
2-piece brass 1/8-in. ID ferrule	00101-08500 (front) 00101-02500 (back)
Connection for the opposite end of the tubing to the helium gas source	Not provided in kit. You supply these parts.

Gases

Your system can use large amounts of gases during daily operations. It is essential that the gases are delivered with the necessary pressure and purity. Refer to the following topics for information on the purity and pressure that your system requires:

- Helium
- Nitrogen

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

Helium

Helium for LTQ XL MS detector damping gas:

Ultra-high purity (99.999%) with less than 1.0 ppm each of: water, oxygen, and total hydrocarbons. The required gas pressure is 275 ± 35 kPa (40 ±5 psi). Particulate filters can be a source of contamination, they are not recommended.

Helium can be dispensed from a tank (such as one containing 245 ft^3 of helium) using a regulator suitable for helium[1].

Gas lines for helium should be copper or stainless steel. All gas lines should be free of oil and preferably flame dried. The gas lines should run to the back of the LTQ XL MS detector system. Helium gas supply lines should terminate with 1/8-in., female, Swagelok®-type connectors.

Note

1. Do not shut off the helium gas. A continuous flow of helium is required for the optimum performance of the MS detector.
2. If you intend to use helium for sparging your LC solvents, a second tank and regulator is required. The helium gas line should run to the left side of the LXQ MS detector system. Helium gas supply lines should terminate with a 1/8-in., female, Swagelok®-type connector.

[1]For more information, visit: http://www.matheson-trigas.com or a consult a regulator supplier of your choice.

Nitrogen

The nitrogen for the API sheath gas and auxiliary/sweep gas needs to be high purity (99%). The required gas pressure is 760 ± 70 kPa (110 ± 10 psi).

Note To calibrate the LTQ XL MS detector nitrogen gas proportioning valves, a nitrogen gas regulator must be available that can be adjusted from 0 to 900 kPa (0 to 130 psi).

Run the nitrogen gas line to the back of the LTQ XL MS detector system. Terminate the nitrogen gas supply line with a 1/4-in., female, Swagelok-type connector. Particulate filters can be a source of contamination; they are not recommended.

Typical nitrogen gas consumption (nitrogen On 24 hours per day) is 5,560 L (200 ft^3) per day. Maximum usage can be up to 26,700 L (960 ft^3) per day. Therefore, it is recommended that nitrogen be supplied from one of the following sources:

- A large, sealed, thermally insulated cylinder containing liquid nitrogen from which the nitrogen gas is boiled off. The 230 psi model is recommended. The 35 and 80 psi models do not provide sufficient gas pressure. A typical cylinder of size 240 L yields 143,850 L (5,080 ft^3) of gas. The replacement frequency is approximately once every month.

Note Liquid nitrogen conversion factors:

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

- A nitrogen generator with a minimum capacity of 5,560 L (200 ft^3) per day at 99% purity with 100 psi at the side panel. Maximum consumption of nitrogen gas is 21 L/min (40 ft^3/h). Nitrogen generators require an air compressor. Some models of air compressor are quite noisy. Therefore, be careful to select a quite compressor. This is a continuous source; no replacement is required.

Note When the LXQ turns On, the initial nitrogen surge may exceed the capacity of the nitrogen generator. This causes a flow rate drop that can trigger a low nitrogen warning from the LXQ. If this happens frequently, call your Thermo Customer Service Representative.

Solvent Recommendations

The solvents listed in Table 12 can be used in operating and maintaining your LTQ XL MS detector system. Installation of the LTQ XL MS detector instrument requires HPLC-grade methanol and water. Solvent modifiers might also be required during the installation of some systems.

Note Some solvent impurities are transparent to UV/Vis detectors. Therefore, some HPLC grade solvents might contain contaminants that interfere with the performance of the mass spectrometer. For operation of your LTQ XL MS detector, choose high purity solvents with minimum contamination.

Table 12. Solvents and reagents and modifiers

Solvents / Reagent	Specifications
Methanol	HPLC grade
Acetonitrile	HPLC grade
Water	HPLC grade
Isopropyl alcohol	HPLC grade
Acetic acid (modifier)	A.C.S. reagent

Note Do not filter solvents. Filtering solvents can introduce contamination.

Note It is recommended that solvents from the following manufactures are used: Merck, Mallinckrodt, or Burdick & Jackson.

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

Chapter 6 Waste and Exhaust

Note It is your responsibility to provide the proper waste and exhaust systems that are required for the operation of the system.

The proper performance of your system can be affected by the waste and exhaust arrangements for the instrument. Vacuum and solvent wastes must be vented separately, and wastes must be collected and disposed of properly. See Table 13 for a summary of exhaust and waste system requirements. More information on each requirement is available on the page indicated in the table.

Table 13. Summary of waste and exhaust preinstallation requirements

Requirement	Page
Exhaust system Vacuum pumps and solvent wastes must both be vented to fume exhausts. The pumps must be connected to a fume exhaust system that is separate from that to which solvents are vented.	36
Solvent waste A suitable container for the solvent wastes must be installed with the system.	37

Exhaust System

It is your responsibility to provide an adequate exhaust system.

Much of what is introduced into the LTQ XL MS Detector is eventually exhausted from the forepumps, along with the small amount of oil vapor that these pumps characteristically emit. Therefore, the pumps should be connected to a fume exhaust system.

Note An efficient fume exhaust system is required for the proper operation of your forepumps. Most atmospheric pressure ionization (API) applications contribute to the accumulation of solvents in the forepumps. These solvents must be purged from the mechanical pump oil periodically by opening the ballast valves located on the top of the pumps. When the ballast valves are opened, a large volume of volatile solvent waste might enter the fume exhaust system. Therefore, your fume exhaust system must be able to accommodate the periodic purging of the solvents. The frequency of the purging is dependent on the throughput of your system.

The forepumps have two functions:

3. Providing a vacuum for the capillary skimmer of the API source

4. Providing backing pressure for the turbomolecular pump.

The rotary-vane pumps requires a 25 mm (1 in.) exhaust port. The exhaust system for the forepumps must be able to accommodate a continuous flow rate of 1 L/min and an initial inrush flow rate of several times this.

Solvent Waste

The Ion Max API source can accommodate high flow rates. Therefore, provisions must be made to collect the waste solvent in a manner that avoids pressure build up in the source. The Ion Max API source is fitted with a 25.4 mm (1.0 in.) OD outlet for solvent drainage. A 25.4 mm to 12.7 mm (1 in. to 0.5 in) reducing fitting (P/N 00101-03-00001) is supplied to allow connection to the waste container (P/N 00301-57020) supplied with the system. The 1 in. diameter hose from the API source drain to the reducing fitting (P/N 00101-03-00001) should be as long as possible to avoid pressure build up in the source. The 25.4 mm (1 in.) diameter Tygon PVC tubing (P/N 00301-22922) supplied with the system is 1.52 m (5 ft.) long.

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

Chapter 7 Installation

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

When your lab site preparation is completed, the LTQ XL MS detector Installation Request Form has been mailed or faxed to your local office for Thermo Electron San Jose products, and the system is delivered, please call your Thermo Electron office to arrange for an installation date. Refer to the Installation Request Form at the front of this guide. Telephone and fax numbers for Thermo Electron San Jose offices are listed in the **Preface** of this guide and immediately following the Installation Request Form. See Table 14 for a summary of information about installing your system. More information on each of the items is available on the page indicated in the table.

Table 14. More information on the installation of your system

	Page
Preinstallation Survey The Installation Request Form at the front of this guide must be completed and faxed or mailed to your local service representative before the Service Engineer arrives to install your system.	40
Installation Kits Some kits are supplied to help you complete the installation of your system. You might require additional parts or chemicals to complete the installation of your system.	42
Installation The Service Engineer will complete the installation of the system and demonstrate that your system meets specifications. Do not plan to use the system before the engineer has demonstrated that your system operates within specifications.	43
Preventive Maintenance You are responsible for the proper maintenance of your system.	44

Preinstallation Survey

Verify that your lab meets the following list of preinstallation requirements before your instrument is installed. Use the LXQ MS Detector Installation Request Form at the front of this guide to check off each item as it is completed or verified.

Note If the instrument shipping container, Shock Watch, or other indicator shows any evidence of damage or mishandling during shipment do NOT open the container. Call your Thermo Representative for instructions on what to do. If there is no evidence of shipping damage or mishandling, proceed with the instructions that follow in this Note. Your instrument is shipped in a shipping container, the smallest dimension of which is 92 cm (36 in.). If the entrance to your laboratory will not accommodate a 92 cm container, remove the individual modules from the container before moving them into the room. If you remove the instrument from its shipping container before it is delivered to the lab site, all the contents of the container must remain with the instrument.

1. All laboratory remodeling has been completed.
2. Doorways, hallways, etc. are a minimum width of 94 cm (37 in.).
3. Available floor area is sufficient and flooring will support the load.
4. Sufficient bench space is available for all of the equipment. List the following:

   Width:
   Depth:
   Height:

5. Workbench can support the load of the system [202 kg (445 lbs)] and is free from vibration.
6. One voice telephone line is installed near the system.
7. Air conditioning is adequate for temperature, humidity, and particulate matter control. The laboratory can be maintained at a constant temperature, between 15 and 27 °C (59 and 81 °F).
8. Relative humidity is between 40% and 80% with no condensation.
9. Lighting is adequate.
10. System work area is free from magnetic disruption and electrostatic discharge.

11. Main power is installed and is in compliance with local electrical codes.

12. Power for test and cleaning equipment is installed.

13. Power outlets are of the correct configuration.
    NEMA type:

14. Voltage of power outlet has been measured.
    Measured voltage:

15. Power is free from fluctuations due to slow changes in the average voltage or changes due to surges, sags, or transients.

16. All required gases (helium and nitrogen) are on site, gas lines are installed, and appropriate gas regulators are available.
    List gases and purity:

17. New or recently cleaned HPLC system is available that produces pulse-free, continuous flow from 100 to 1000 µL/min.

18. HPLC-grade water, methanol, acetonitrile, isopropyl alcohol, and acetic acid are available for testing your instrument.

19. A suitable exhaust system is present that is separate from the solvent waste exhaust.

20. Provision has been made for collecting solvent waste from API source.

21. All relevant safety regulations are complied with.

22. Your LXQ is on site.

23. The principal operator will be available during the installation and certification period.

Installation Kits

The following kits are shipped with the LTQ XL MS detector:

- Ship Kit (P/N 97055-62008), which contains installation components such as vacuum pump oil, exhaust and waste tubing, power cords, instrument lifting kit, etc.
- Accessory Kit (P/N 97055-62003), which contains parts such as fuses, fittings, tubing, tools, gloves, etc.
- Standard Chemicals Kit (P/N 97000-62042) which contains the necessary chemicals for demonstrating system performance specifications. (The Chemicals Kit is located in the Accessory Kit box.)

Note It is your to replace any consumables used during the installation.

Installation

When your new LTQ XL MS detector system is on site and is ready for installation, a Thermo Electron Field Service Engineer will install it.

During the installation, the Field Engineer will demonstrate the following:

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

Note To receive maximum benefit from this on-site training opportunity, the instrument's operator(s) should be available during the entire installation process.

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

Preventive Maintenance

Routine and preventive maintenance of LTQ XL MS detector and data system is your responsibility.

Regular preventive maintenance is essential. It increases the life of the system, maximizes the uptime of your system, and provides optimum system performance. Maintenance techniques are covered in the following manuals:

- LTQ XL Hardware Manual
- Ion Max API Source Hardware Manual
- Manuals that come with your LXQ MS detector, computer or other modules of your system

Chapter 8 Instrument Arrival

LTQ XL MS detectors are shipped by electronic equipment carriers who specialize in the handling of delicate machinery. However, equipment occasionally gets damaged in transit.

Take the following precautions when receiving 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. The driver should sign (or initial) next to your comments to signify agreement with your observations.
- Contact the Traffic Department, telephone [1] (408) 965-6000, at the Thermo Electron office in San Jose, California USA to report the damage.

Note Freight insurance requires that obvious damage be noted on the receiving documents.

Domestic Shipments: Instruments are shipped domestically by one of the following methods:

- FOB (freight on board) San Jose, California, USA
- FOB destination

The method of shipment determines who has responsibility for filing a claim against the carrier if the system is damaged in transit. If the instrument shipping container, Shock Watch, or other indicator shows any evidence of damage or mishandling during shipment do NOT open the container. Call your Thermo Representative for further instructions.

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

If the system is shipped FOB destination, Thermo Electron San Jose will file a claim against the carrier.

Note Thermo Electron San Jose will not accept liability for damage if materials are received with obvious damage and the damage is not recorded on the receiving documents.

When your system arrives, move it to a protected location indoors. If you have questions about moving your system, contact your local office for Thermo Electron San Jose products. Telephone and fax numbers for the offices are listed in the **Preface** of this guide.

International Shipments: Instruments shipped outside of the USA are shipped CIP (carriage and insurance paid to) destination unless specified differently. If the system is shipped CIP destination and if any damages are incurred in shipment, Thermo Electron San Jose will file a claim against the carrier.

Note Thermo Electron San Jose will not accept liability for damage if materials are received with obvious damage and the damage is not recorded on the receiving documents.

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