TSQ™ Quantum Access™

Preinstallation Requirements Guide

70111-97130 Revision A July 2006

For Research Use Only
Not for use in Diagnostic Procedures

Analyze • Detect • Measure • Control™

Thermo ELECTRON CORPORATION

Printing History: Revision A printed in July 2006.

IMPORTANT PREINSTALLATION INFORMATION... PLEASE READ

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TSQ Quantum Access Installation Request Form

Dear User:

Read the TSQ Quantum Access 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 your local sales/service office for Thermo Electron San Jose products. The address and fax number for your local office are located on the following pages.

- ❑ 1. All laboratory remodeling has been completed.
- ❑ 2. Your TSQ Quantum Access 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 [205 kg (450 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 (argon 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:

Name _____

Company _____ Telephone_____

Address _____

Address _____

City _____ State _____ Country_____

Signature _____ Date _____

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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.

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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, 92/31/EEC, 93/68/EEC

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

EN 61326-1	(1997)	EN 61000-4-6	(1996, 2001)
EN 55011	(1998)	EN 61000-4-11	(1994, 2001)
EN 61326	(1998)	EN 61000-3-2	(1995)
EN 61000-4-2	(1998)	EN 61000-3-3	(1995)
EN 61000-4-3	(2002)	CFR 47 - Part 15 - Subpart B: 2005 - Class A	
EN 61000-4-4	(1995, 2001)	CFR 47 - Part 18: 2005	
EN 61000-4-5	(1995, 2001)		

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.

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.

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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.

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

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Preface

About This Guide

Welcome to the Thermo Electron, TSQ Quantum Access™ system.

This **TSQ Quantum Access Preinstallation Requirements Guide** provides you with information that will assist you in planning for and preparing your lab site prior to delivery and installation of your system. Please 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 TSQ Quantum Access:

- Getting Connected Manual
- Getting Started Manual
- Hardware Manual
- Help available from within the software

Safety and Special Notices

Make sure 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:

DANGER Highlights laser-related hazards to human beings. It includes information specific to the class of laser involved. Each DANGER notice is accompanied by the international laser radiation symbol.

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.

Contacting Us

There are several ways to contact Thermo Electron.

Assistance

For new product updates, technical support, and ordering information, contact us in one of the following ways:

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www.thermo.com/finnigan

Contact Technical Support

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Changes to the Manual and Online Help

To suggest changes to this guide or to the 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 TSQ Quantum Access™ is a member of the TSQ™ family of mass spectrometers. The TSQ Quantum Access mass spectrometer is designed to operate reliably under carefully controlled environmental conditions.

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 in a condition outside the power and operating environment specifications described in this guide might cause failures of many types. The repair of such failures is specifically excluded from the standard warranty and service contract coverage.

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

Chapter 2 Site Preparation

It is your responsibility as the user 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 workbenchs 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. Refer to Table 1 for a summary of site preparation requirements. 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: Your workbenchs must have a combined minimum dimensions of 1 × 4 m (3 × 12 ft). The workbenchs must be capable of supporting the weight of the TSQ Quantum Access [118 kg (260 lb)] mass spectrometer and the data system (with printer) [39 kg (86 lb)] plus the weight of your liquid chromatograph and any options.	5
Telephone: A telephone line must be installed near the workbench.	7

Entrance

The entrance to your facility and the width of all hallways, elevators, and so on, 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 TSQ Quantum Access mass spectrometer and accessories are shipped in a container with the following dimensions: *l* 104 cm (41 in.), *w* 92 cm (36 in.), *h* 112 cm (44 in.). The container and its contents weigh approximately 180 kg (394 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 TSQ Quantum Access system.

[1] 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, 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 TSQ Quantum Access system is shown in Figure 1. The space requirements and weights of the components of the typical TSQ Quantum Access system are given in Table 2.

Place the TSQ Quantum Access system on a workbench that has minimum dimensions of 1 × 1.5 m (3 × 5 ft). The workbench must be capable of supporting the weight of the TSQ Quantum Access [118 kg (260 lb)] mass spectrometer plus the weight of your liquid chromatograph and any options. 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 TSQ Quantum Access instrument and any shelves above it.

The data system (with printer) [25 kg (56 lb)] can be placed on a second workbench that has minimum dimension of 1 × 1.2 m (3 × 4 ft).

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

- If the workbench has space beneath it, place the forepump under the workbench immediately behind the TSQ Quantum Access instrument. (See the Table Top 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 forepump through the hole.
- If there is no space under or at the end of the workbench, the pump can be placed on the floor in front of the TSQ Quantum Access instrument.

CAUTION Whenever possible, provide space under the workbench for the forepump. If the pump is placed in front of the TSQ Quantum Access instrument, they can block access to drawers and cabinets, and can represent a trip hazard.

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

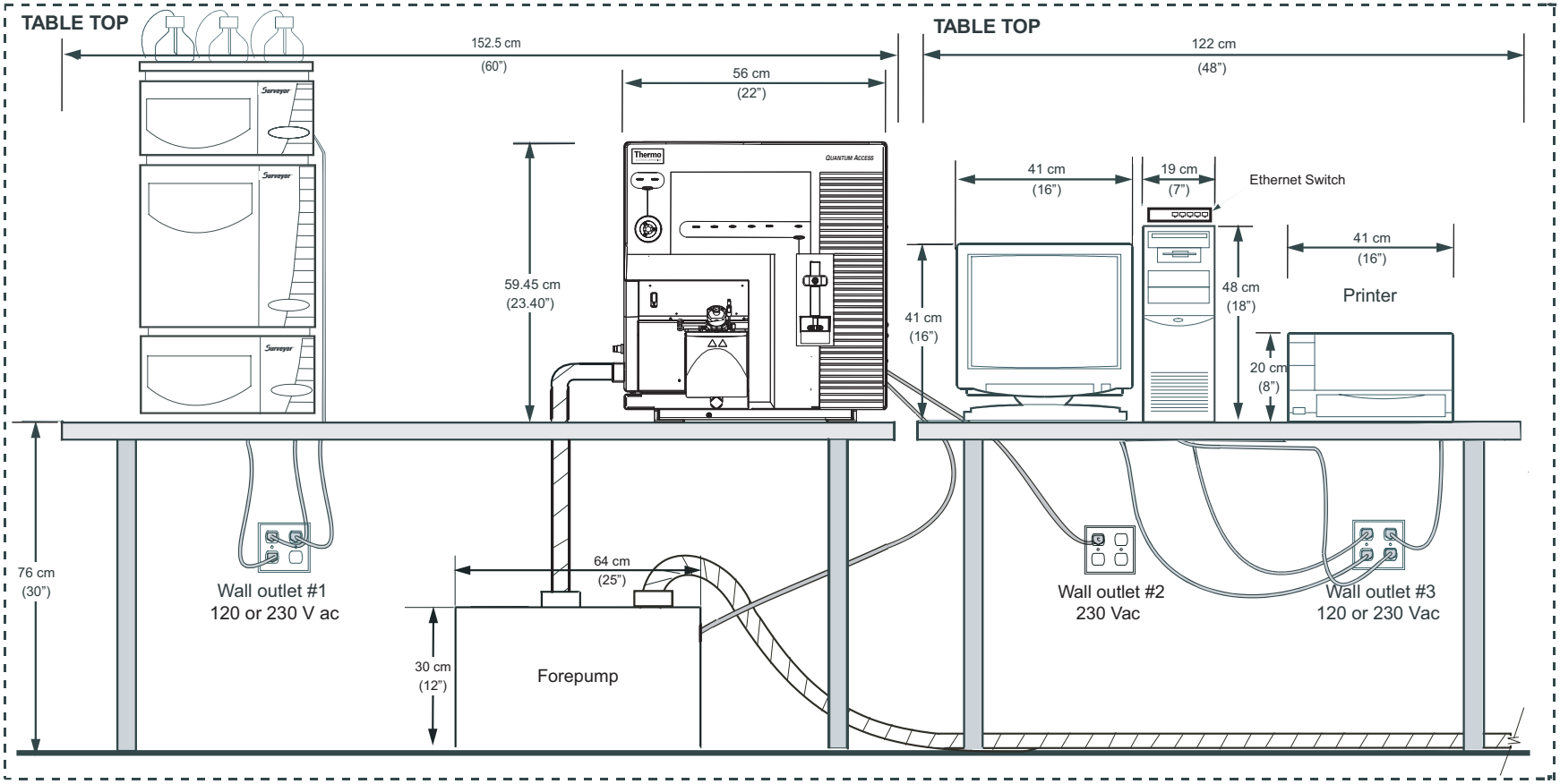

Figure 1. Installation and space requirements for your TSQ Quantum Access system

Table 2. Space and weight requirements for the TSQ Quantum Access mass spectrometer, an LC, a data system (with printer), and the forepump showing space and weight requirements

	Height		Width		Depth		Weight	
Module	**cm**	**in.**	**cm**	**in.**	**cm**	**in.**	**kg**	**lb**
TSQ Quantum Access mass spectrometer	61	24	56	22	79	31	118	260
Liquid chromatograph*	61	24	36	14	47	18.5	45	100
Minitower computer	48	19	18	7	43	17	14	30
Monitor	36	14	36	14	15	16	3.6	8
Keyboard	5	2	48	19	20	8	1	2
forepump	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 Technical Support for Thermo Electron San Jose products. Place the voice telephone outlet within 2 m (6 ft) of your system.

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

Chapter 3 Operating Environment

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

Attention to the operating environment will ensure continued high performance of your TSQ Quantum Access system. Any expenditures for air conditioning are more than offset by good sample throughput and reduced repair costs. Refer to Table 3 for a summary of line power requirements. More information on each of the requirements is available on the page indicated in the table.

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 (±9 °F) to ensure good performance. **For the TSQ Quantum Access instrument, the temperature in the room must not vary at a rate greater than 2 °C/h (3.6 °F/h).** The ideal operating temperature for the TSQ Quantum Access instrument is between 18 and 21 °C (65 and 70 °F). The temperature must be controlled to within 2 °C (3.6 °F).	10
Humidity: The relative humidity of the operating environment must be between 20% and 80%, with no condensation.	11
Vibration: The 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.	12
Particulate matter: The air should contain fewer than 100,000 particles per cubic foot (3,500,000 particles per cubic meter) in excess of 5 μm.	12
Electrostatic discharge: Precautions are recommended, especially when you are operating the system at the lower end of the relative humidity specification listed above.	13

Temperature

For precision instrumentation such as the TSQ Quantum Access system, the temperature stability of the environment in which the instrument is installed can affect mass measurements.

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. The ideal operating temperature is the range between 18 and 21 °C (65 and 70 °F) with a rate of change in temperature not exceeding 2 °C/h (3.6 °F/h).

Note Do not locate the TSQ Quantum Access system 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.

Although the TSQ Quantum Access system can ensure mass stability over the range of 15 and 27 °C (59 and 81 °F), an abrupt change of temperature can cause a temporary shift in the mass scale. This effect is common in precision instrumentation and the magnitude of this effect is related to the magnitude and rate of temperature change and to the thermal characteristics of that particular instrument.

The air conditioning load for a basic TSQ Quantum Access 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 for the TSQ Quantum Access mass spectrometer, an LC, and the data system (with printer)

Module	Heat output (in Watts)	Heat output (in Btu/h)
TSQ Quantum Access mass spectrometer	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 20% and 80%, with no condensation.

Operating a TSQ Quantum Access 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 forepump during operation, install the pump on the floor beneath the TSQ Quantum Access instrument 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 can also form a layer on electronic components that acts as an insulating blanket and thus reduces the transfer of heat from the components to the surrounding air.

Electrostatic Discharge

Electrostatic discharge (ESD) can damage the electronic components of your TSQ Quantum Access system.

TSQ Quantum Access instruments are designed to withstand electrostatic discharges (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.
- Styrofoam® cups and packing materials typically have a considerable electrostatic charge on them.

The discharge of static electricity is not perceptible to a human being until the potential is at least 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 you are operating your system at the lower end of the relative humidity specification listed 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 fiber or other static-dissipating material.
- When you are operating the instrument, wear a laboratory coat and clothing made of natural fiber or other static-dissipating material.
- Do not place Styrofoam cups or packing materials on the instrument.

Chapter 4 Line Power

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

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 you comply 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.

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.	17
Power Monitoring Devices: Before connecting your TSQ Quantum Access system to line power, it is strongly recommended that the power line be monitored 24 hours a day for seven consecutive days.	18
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 conditioner	19

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%, which is 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) • 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, it will be 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	25
Connecting the Mass Spectrometer, LC, and Other Modules to Wall Outlets: Balance the current load on the circuits to which your system is connected.	25
Uninterruptible Power Supply: Systems installed in areas with intermittent line power must have uninterruptible power supplies installed.	26
Technical Assistance: Contact your local office for Thermo Electron San Jose products for additional assistance in monitoring line power or selecting a line conditioner.	26

Quality of Power

The quality of power supplied to your TSQ Quantum Access 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.

Below 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 ms and 2 s.
- Transients (or impulses) are brief voltage excursions of up to several thousand volts with durations up to 50 ms.

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 TSQ Quantum Access 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 information on three types of voltage disturbances: (1) slow average, (2) sag and surge, and (3) transient. In the first two cases, the duration as well as the amplitude of the disturbance are indicated by time interval recording. The Dranetz® power line disturbance analyzer is a device capable of detecting and recording most types of line power problems.[1] 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. Then, monitor the power again as described above.

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

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, and so on.

Available Outlets

The TSQ Quantum Access system 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 TSQ Quantum Access system consist of the following:

- Nominal voltage of 120 V ac, +6% to -10% and 230 V ac, ±10%, which is 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 TSQ Quantum Access 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 pane

CAUTION The TSQ Quantum Access system must have an earth ground hard-wired to the main panel. The interconnected power outlets for the TSQ Quantum Access 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.

Note Power is to remain On. The TSQ Quantum Access system should remain On and pumping continuously for optimum performance.

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

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

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

The TSQ Quantum Access instrument 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 will provide the appropriate power plugs.

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

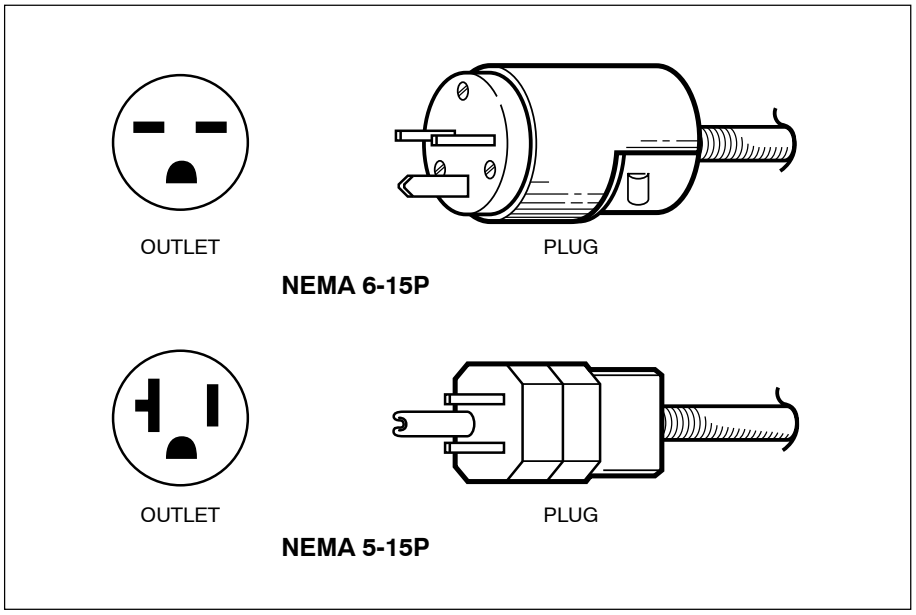

Figure 2. NEMA 6-15P and NEMA 5-15P power plugs and their respective outlets

Table 6 shows the maximum current required by each component of a typical TSQ Quantum Access system. The TSQ Quantum Access mass spectrometer 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, the forepump can draw as much as 30 A during startup. For more details on the surge requirements for your system, consult the forepump manual. Contact your Service Engineer for more information.

Table 6. Maximum current (single phase) for a TSQ Quantum Access mass spectrometer 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)
TSQ Quantum Access mass spectrometer (230 V only)		15
Forepump		15
Liquid chromatograph*	10	5
Monitor	2	1
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 (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 Mass Spectrometer, 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 TSQ Quantum Access 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 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 TSQ Quantum Access mass spectrometer at 230 V ac, an LC at 120 V ac, and the data system (with printer) at 120 V ac

Module	Outlet #1 120 V ac	Outlet #2 230 V ac	Outlet #3 120 V ac
TSQ Quantum Access mass spectrometer		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 TSQ Quantum Access mass spectrometer, an LC, and the data system (with printer) at 230 V ac

Module	Outlet #1 230 V ac	Outlet #2 230 V ac	Outlet #3 230V ac
TSQ Quantum Access mass spectrometer		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 your LC should never be connected to the same electrical wall outlet circuit. (See the CAUTION on page 21.)

Uninterruptible Power Supply

If your local area is susceptible to corrupted power or power disruptions, then 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 TSQ Quantum Access system. Correcting line power problems is the user's responsibility. Contact your local office for Thermo Electron products 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 local Thermo Electron office for assistance in locating a power consultant in your area. (See Note on page 19 “Compliance and Safety”)

Chapter 5 Gases and Solvents

It is your responsibility as the user to provide correct gas and solvent supplies for the operation of your 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 gas and solvent preinstallation requirements

Requirement	Page
Fittings: It is your responsibility to supply all fittings and parts necessary for connecting gases during the installation of your system.	28
Argon gas: Ultra-high purity (99.995%) with less than 1.0 ppm each of water, oxygen, and total hydrocarbons. The required gas pressure is 135 ± 70 kPa (20 ±10 psi).	29
Nitrogen gas: High purity (99%). The required gas pressure is 690 ± 140 kPa (100 ± 20 psi).	28
Solvents, reagents, and modifiers: Installation of the TSQ Quantum Access instrument requires HPLC grade methanol and water. Solvent modifiers might be necessary for the installation of your system.	31

Fittings and Parts

Table 11 lists the minimum parts that are required to connect your TSQ Quantum Access instrument to your gas delivery system. **Your connections and gas delivery system might vary, and it is your responsibility to supply any fittings or connections necessary during installation.**

Table 11. Gas connection hardware required

Description	TSQ Quantum Access P/N (in Accessory kit P/N 70111-62034)
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) 00101-2500 (back)
Connection for the opposite end of the tubing to the argon 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:

- Argon
- Nitrogen

CAUTION Contaminants that are 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 contaminants introduced from your gas delivery system.

Argon

The argon for the collision gas must be ultra-high purity (99.995%) with less than 1.0 ppm each of water, oxygen, and total hydrocarbons. The required gas pressure is 135 ± 70 kPa (20 ±10 psi). Particulate filters can be a source of contamination; they are not recommended.

Argon can be dispensed from a tank containing 245 ft^3 of gas using a Matheson 3120 Series[1] regulator or equivalent tank and regulator.

The gas lines for argon can be copper or stainless steel. All gas lines need to be free of oil and preferably flame dried. Run the gas lines to the left side of the TSQ Quantum Access system. Terminate the argon gas supply lines with 1/8-in., female, Swagelok-type connectors.

[1]For more information, visit: http://www.matheson-trigas.com

Nitrogen

The nitrogen for the API sheath gas and auxiliary/sweep gas needs to be high purity (99%). The required gas pressure is 690 ± 140 kPa (100 ± 20 psi).

Note To calibrate the TSQ Quantum Access nitrogen gas proportioning valves, a nitrogen gas regulator must be available that can be adjusted from 0 to 690 kPa (0 to 100 psi).

Run the nitrogen gas line to the left side of the TSQ Quantum Access 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.

Solvent and Reagent Recommendations

The solvents and reagents listed in Table 12 are useful in operating and maintaining your TSQ Quantum Access system.[2] Installation of the TSQ Quantum Access instrument requires HPLC grade methanol and water. Solvent modifiers might also be required during the installation of some systems.

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

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 TSQ Quantum Access, choose high purity solvents with minimum contamination.

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

Table 12. Recommended Solvent and Reagent Suppliers

Solvent or Reagent	Specifications	Supplier*	Supplier P/N	Quantity
2-Propanol	HPLC grade	J.T. Baker	9095-03	4 x 4 L
OmniSolv® Methanol	HPLC grade	EMD Chemicals	MX0488-1	4 x 4 L
OmniSolv Acetonitrile	HPLC grade	EMD Chemicals	AX0142-1	4 x 4 L
OmniSolv Water	HPLC grade	EMD Chemicals	WX0004-1	4 x 4 L
Formic Acid 88%	ACS reagent	Mallinckrodt	2592-04	500 mL
Acetic Acid, Glacial	ACS reagent	J.T. Baker	9507-02	-
Ammonium Acetate	ACS reagent	Sigma-Aldrich	37,233-1	10 g

*Suppliers listed are for North America only. If you are outside of North America, use an appropriate high-quality supplier.

[2]Thermo Electron Corporation does not endorse any solvent or reagent manufacturer, nor does it endorse products other than its own. Companies and products listed in this guide are given as examples only.

Chapter 6 Waste and Exhaust

It is your responsibility as the user to provide proper waste and exhaust systems for the operation of your 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. Refer to Table 13 for a summary of exhaust and waste system requirements. More information on each of the requirements is available on the page indicated in the table.

Table 13. Summary of waste and exhaust preinstallation requirements

Requirement	Page
Exhaust system: The vacuum pump and solvent waste must both be vented to fume exhausts. Your laboratory must be equipped with at least two fume exhaust systems. Route the (blue) forepump exhaust tubing to a dedicated fume exhaust system. Route the PVC drain tube from the API source to the waste container. Vent the waste container to a dedicated fume exhaust system.	34 and 35
Solvent waste: A suitable container for the solvent wastes must be installed with the system. Do not vent the PVC drain tube (or any tubing connected to the waste container) to the same fume exhaust system to which you have connected the forepump.	35

Exhaust System

It is your responsibility as the user to provide an adequate exhaust system.

Much of what is introduced into the TSQ Quantum Ultra system is eventually exhausted from the forepump, along with the small amount of oil vapor that the pump characteristically emit. Therefore, the pump should be connected to a fume exhaust system.

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

CAUTION Do not vent the PVC drain tube (or any tubing connected to the waste container) to the same fume exhaust system to which you have connected the forepump. The analyzer optics can become contaminated if the API source drain tube and the (blue) forepump exhaust tubing are connected to the same fume exhaust system.

Your laboratory must be equipped with at least two fume exhaust systems. Route the (blue) forepump exhaust tubing to a dedicated fume exhaust system. Route the PVC drain tube from the API source to the waste container. Vent the waste container to a dedicated fume exhaust system.

The forepump has two functions: (1) providing a vacuum for the capillary skimmer of the API source, (2) providing backing pressure for the turbomolecular pump.

The forepump requires a 25 mm (1 in.) exhaust port. The exhaust system for the forepump must be able to accommodate a flow rate of 1 L/min.

Solvent Waste

The API source can accommodate high flow rates. Therefore, provisions must be made to collect the waste solvent. The API source is fitted with a 12 mm (0.5 in.) ID connector for solvent drainage. A 12 mm (0.5 in.) PVC drain tube, which is provided with the system, is connected from the API source to the collection container supplied with the system (P/N 00301-57020).

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 forepump.

Your laboratory must be equipped with at least two fume exhaust systems. Route the (blue) forepump exhaust tubing to a dedicated fume exhaust system. Route the PVC drain tube from the API source to the waste container. Vent the waste container to a dedicated fume exhaust system.

Chapter 7 Instrument Arrival

TSQ Quantum Access instruments are shipped by electronic equipment carriers who specialize in the handling of delicate machinery. Occasionally, however, equipment does inadvertently get damaged in transit.

Take the following precautions when receiving material:

- Check carefully for obvious damage or evidence of rough handling.
- If external damage is apparent, note this fact on all copies of the receiving documents and describe briefly the extent of the damage. The driver should sign (or initial) next to your comments to signify agreement with your observations.
- Contact the 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 using one of the following methods: (a) FOB (free on board) San Jose, California, USA or (b) FOB destination. The method of shipment determines who has responsibility for filing a claim against the carrier if the system is damaged in transit.

Most systems are shipped FOB San Jose, and in this instance any damage 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, however, that 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 front 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, however, that 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.*

Chapter 8 Installation

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

When your lab site preparation is completed, the TSQ Quantum Access 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 the offices for Thermo Electron San Jose products are listed in the Preface chapter of this guide and immediately following the Installation Request Form. Refer to 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 Process: 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 TSQ Quantum Access Installation Request Form at the front of this guide to check off each item as it is completed or verified.

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, 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.

1. All laboratory remodeling has been completed.
2. Doorways, hallways, and so on 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. Please list the following:
   Width: _____
   Depth: _____
   Height: _____
5. Workbench can support the load of the system [202 kg (445 lb)] 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 20% 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.
    Please note NEMA type:

14. Voltage of power outlet has been measured. Please note ***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 gases required (argon and nitrogen) are on site, gas lines are installed, and appropriate gas regulators are available.
    Please 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, ammonium hydroxide, and isopropyl alcohol are available for testing your instrument.

19. There is a suitable exhaust system present that is separate from solvent waste.

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

21. All relevant safety regulations are complied with.

22. Your TSQ Quantum Access system is on site.

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

Installation Kits

The following kits are shipped with the TSQ Quantum Access system:

- Ship Kit (P/N 70111-62033), which contains installation components such as vacuum pump oil, exhaust and waste tubing, power cords, and instrument lifting kit.
- Accessory Kit (P/N 70111-62034), which contains parts such as fuses, fittings, tubing, tools, and gloves.
- Standard Chemicals Kit (P/N 70111-62021) which contains the necessary chemicals for demonstrating system performance specifications. (The Chemicals Kit is located in the Accessory Kit box.)

Note It is the responsibility of the customer to replace any consumables used during the installation.

Installation Process

When your new TSQ Quantum Access system is on site, and it 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 force 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.

Do not plan to 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 the TSQ Quantum Access instrument and data system is your responsibility as the user.

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

- TSQ Quantum Access Hardware Manual
- Ion Max and Ion Max-S API Source Hardware Manual
- Manuals that come with your TSQ Quantum Access computer and other modules of your system

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