Finnigan™ TSQ® Quantum

Preinstallation Requirements Guide

70111-97040 Revision A

Thermo
ELECTRON CORPORATION

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Customer Registration... Register now and receive all the privileges associated with being a Thermo Electron, Finnigan product user, including application reports and technical reports.

Name _____

Title _____

Company _____

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City/State/Postal Code _____

Country _____

Telephone _____ **Ext.** _____

Finnigan TSQ Quantum Serial # _____ **Date Purchased**_____

Tell us more... Let us know more about how you use this product:

My Organization Is: (Check one only)

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- ❑ Government lab
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- ❑ Veterinary
- ❑ Other _____

Job Function: (Check one only)

- ❑ Administration
- ❑ Lab Management
- ❑ Operator
- ❑ Other _____

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- ❑ Analytical
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- ❑ Energy
- ❑ Food / Agriculture
- ❑ Forensic / Toxicology
- ❑ Pharmaceutical
- ❑ Research / Education
- ❑ Other _____

Reader Survey... Help us to improve the quality of our documentation by answering a few questions:

Finnigan TSQ Quantum
Preinstallation Requirements Guide

Revision A
70111-97040

	Strongly Agree	Agree	Disagree	Strongly Disagree
The manual is well organized.	1	2	3	4
The manual is clearly written.	1	2	3	4
The manual contains all of the information I need.	1	2	3	4
The instructions are easy to follow.	1	2	3	4
The instructions are complete.	1	2	3	4
The technical information is easy to understand.	1	2	3	4
The figures are helpful.	1	2	3	4
I was able to ensure the adequacy of my facility by using this manual. (If not, please comment below.)	1	2	3	4

Additional Comments: (Attach additional sheets if necessary.)

_____

_____

_____

_____

_____

_____

_____

Tear this sheet from the manual, fold it closed, stamp it, and drop it in the mail.

fold

From _____

_____

_____

Place Stamp Here

EDITOR, TECHNICAL PUBLICATIONS
THERMO ELECTRON SAN JOSE
355 RIVER OAKS PARKWAY
SAN JOSE, CA 95134-1991
UNITED STATES OF AMERICA

fold

IMPORTANT PREINSTALLATION INFORMATION... PLEASE READ

Thermo
ELECTRON CORPORATION

Finnigan TSQ Quantum Installation Request Form

Dear User:

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

- ❑ 1. All laboratory remodeling has been completed.
- ❑ 2. Your *Finnigan TSQ Quantum* 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 [215 kg (470 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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Australasia and Asia

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Fax .....[81] (06) 6387-6641

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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 your system is delivered to you, it meets all pertinent electromagnetic compatibility (EMC) and safety standards as follows:

EMC Certification

EN 55011	(1991)
EN 50082-1	(1992)
EN 61000-4-2	(1995)
EN 61000-4-3	(1996)
ENV 50204	(1995)
EN 61000-4-4	(1995)
EN 61000-4-5	(1995)
FCC Class A	

EMC issues have been evaluated by EMC TECHNOLOGY SERVICES, A Subsidiary of UNDERWRITERS LABORATORY, INC (UL)

Safety Compliance

Low Voltage Directive EN 61010-1 1993/A2

Please be aware that any changes that you make to your system may void compliance with one or more of these EMC and/or safety standards.
Making changes to your system includes replacing a part. Thus, to ensure continued compliance with EMC and safety standards, replacement parts should be ordered from Thermo Electron or one of its authorized representatives.

FCC Compliance Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy. If it is not installed and used in accordance with the instruction manual, it may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference. In this case, the user will be required to correct the interference at his/her own expense.

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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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Read This First

Welcome to the Thermo Electron, Finnigan™ TSQ Quantum system! The TSQ Quantum is a member of the TSQ® family of Finnigan mass spectrometers.

This **Finnigan TSQ Quantum 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.

The **Finnigan TSQ Quantum Preinstallation Requirements Guide** includes the following chapters:

Chapter 1: Introduction describes the purchaser's responsibilities for installation and maintenance of the system.

Chapter 2: Site Preparation describes the physical, electrical, gas, and air conditioning requirements and other laboratory requirements for the mass spectrometer and data system.

Chapter 3: Operating Environment describes how to prepare your laboratory to provide optimum conditions for instrument operation.

Chapter 4: Line Power describes the electrical outlets, power conditioning devices and power supplies required to properly install your system.

Chapter 5: Gases and Solvents describes the gases, solvents and solvent modifiers require to install and operate your system.

Chapter 6: Waste and Exhaust describes how to properly ventilate the laboratory for safe operation of the instrument.

Chapter 7: Instrument Arrival describes insurance claims and domestic and international shipments.

Chapter 8: Installation describes the final preparations necessary before the arrival of the Service Engineer for installation of the system.

Changes to the Manual and Online Help

To suggest changes to this manual or the online Help, please send your comments to:

Editor, Technical Publications
Thermo Electron San Jose
355 River Oaks Parkway
San Jose, CA 95134-1991
U.S.A.

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

Abbreviations

The following abbreviations are used in this and other manuals and in the online Help.

A	ampere
ac	alternating current
ADC	analog-to-digital converter
AP	acquisition processor
APCI	atmospheric pressure chemical ionization
API	atmospheric pressure ionization
ASCII	American Standard Code for Information Interchange
b	bit
B	byte (8 b)
baud rate	data transmission speed in events per second
°C	degrees Celsius
CD	compact disc
CD-ROM	compact disc read-only memory
cfm	cubic feet per minute
CI	chemical ionization
CIP	carriage and insurance paid to
cm	centimeter
cm^3	cubic centimeter
CPU	central processing unit (of a computer)
CRC	cyclic redundancy check
CRM	consecutive reaction monitoring
<Ctrl>	control key on the terminal keyboard
d	depth
Da	dalton
DAC	digital-to-analog converter
dc	direct current
DDS	direct digital synthesizer
DEP™	direct exposure probe
DS	data system
DSP	digital signal processor

EI	electron ionization
EMBL	European Molecular Biology Laboratory
<Enter>	enter key on the terminal keyboard
ESD	electrostatic discharge
ESI	electrospray ionization
eV	electron volt
f	femto (10^{-15})
°F	degrees Fahrenheit
.fasta file	extension of a SEQUEST search database file
FOB	free on board
ft	foot
FTP	file transfer protocol
g	gram
G	giga (10^{9})
GC	gas chromatograph; gas chromatography
GC/MS	gas chromatograph / mass spectrometer
GND	electrical ground
GPIB	general-purpose interface bus
GUI	graphical user interface
h	hour
h	height
HPLC	high-performance liquid chromatograph
HV	high voltage
Hz	hertz (cycles per second)
ICIS™	Interactive Chemical Information System
ICL™	Instrument Control Language™
ID	inside diameter
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
in.	inch
I/O	input/output
k	kilo (10^{3}, 1000)
K	kilo (2^{10}, 1024)
KEGG	Kyoto Encyclopedia of Genes and Genomes
kg	kilogram

l	length
L	liter
LAN	local area network
lb	pound
LC	liquid chromatograph; liquid chromatography
LC/MS	liquid chromatograph / mass spectrometer
LED	light-emitting diode
µ	micro (10^{-6})
m	meter
m	milli (10^{-3})
M	mega (10^{6})
M+	molecular ion
MB	Megabyte (1048576 bytes)
MH+	protonated molecular ion
min	minute
mL	milliliter
mm	millimeter
MS	mass spectrometer; mass spectrometry
MS	MS^n power: where n = 1
MS/MS	MS^n power: where n = 2
MS^n	MS^n power: where n = 1 through 10
m/z	mass-to-charge ratio
n	nano (10^{-9})
NCBI	National Center for Biotechnology Information (USA)
NIST	National Institute of Standards and Technology (USA)
OD	outside diameter
Ω	ohm
p	pico (10^{-12})
Pa	pascal
PCB	printed circuit board
PID	proportional / integral / differential
P/N	part number
P/P	peak-to-peak voltage

ppm	parts per million
psig	pounds per square inch, gauge
RAM	random access memory
RF	radio frequency
RMS	root mean square
ROM	read-only memory
RS-232	industry standard for serial communications
s	second
SIM	selected ion monitoring
solids probe	direct insertion probe
SRM	selected reaction monitoring
SSQ®	single stage quadrupole
TCP/IP	transmission control protocol / Internet protocol
TIC	total ion current
Torr	torr
TSQ®	triple stage quadrupole
u	atomic mass unit
URL	uniform resource locator
V	volt
V ac	volts alternating current
V dc	volts direct current
vol	volume
w	width
W	watt
WWW	World Wide Web

Note. Exponents are written as superscripts. In the corresponding online Help, exponents are sometimes written with a caret (^) or with *e* notation because of design constraints in the online Help. For example:

MS^n (in this manual)	MS^n (in the online Help)
10^5 (in this manual)	10^5 (in the online Help)

Typographical Conventions

Typographical conventions have been established for Thermo Electron San Jose manuals for the following:

- Data input
- Boxed information
- Topic headings

Data Input

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

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

Boxed Information

Information that is important, but not part of the main flow of text, is displayed in a box such as the one below.

> **Note**. Boxes such as this are used to display information.

Boxed information can be of the following types:

- **Note** – information that can affect the quality of your data. In addition, notes often contain information that you might need if you are having trouble.
- **Tip** – helpful information that can make a task easier.
- **Important** – critical information that can affect the quality of your data.
- **Caution** – information necessary to protect your instrument from damage.
- **CAUTION** – hazards to human beings. Each CAUTION is accompanied by a CAUTION symbol. Each hardware manual has a blue CAUTION sheet that lists the CAUTION symbols and their meanings.
- **DANGER** – laser-related hazards to human beings. It includes information specific to the class of laser involved. Each DANGER is accompanied by the international laser radiation symbol.

Topic Headings

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

Chapter 1 Chapter Name

1.2 Second Level Topics

Third Level Topics

Fourth Level Topics

Fifth Level Topics

Reply Cards

Thermo Electron San Jose manuals contain one or two reply cards. All manuals contain a Customer Registration / Reader Survey card and some contain a Change of Location card. These cards are located at the front of each manual.

The Customer Registration / Reader Survey card has two functions. First, when you return the card, you are placed on the Thermo Electron San Jose mailing list. As a member of this list, you receive application reports and technical reports in your area of interest, and you are notified of events of interest, such as user meetings. Second, it allows you to tell us what you like and do not like about the manual.

The Change of Location card allows us to track the whereabouts of the instrument. Fill out and return the card if you move the instrument to another site within your company or if you sell the instrument. Occasionally, we need to notify owners of our products about safety or other issues.

Customer Support

Thermo Electron San Jose products are supported by Thermo Electron San Jose Customer Service Engineers with customer support available in North America, in Europe, and in Australasia and Asia.

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Western Region

Phone [1] (408) 965-6000
Fax [1] (408) 965-6123

Canada

Phone [1] (905) 712-2258
Fax [1] (905) 712-4203

Replaceable Parts

Contact Customer Service Operations to order replaceable parts. The location and telephone and fax numbers for North America are as follows:

North America Customer Service Operations

1400 Northpoint Parkway, Suite 10
West Palm Beach, FL 33407

Phone: [1] (800) 532-4752
Fax: [1] (561) 688-8731

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You can contact Technical Support at the following location, telephone and fax numbers, and e-mail address:

North America Technical Support Operations

1400 Northpoint Parkway, Suite 10
West Palm Beach, FL 33407

Phone: [1] (800) 685-9535
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E-mail: techsupport.finnigan@thermo.com

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In Europe, customer support, replaceable parts, and technical support are available from each of the following offices.

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E-mail techsupport.finnigan@thermo.com

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Thermo Electron San Jose offers valuable training on its instruments and software in North America, in Europe, and in Australasia and Asia.

Experience has shown that the maximum value can be derived from a scientific instrument if there is one person, the principal operator, who has a major responsibility for the instrument. It is recommended that you designate a principal operator to manage the operation and maintenance of your Thermo Electron San Jose instrument in your laboratory. It is also recommended that about one month after your instrument has been installed the principal operator receive training for the operation and maintenance of the system at the Scientific Instruments Training Institute, at your site, or at one of the local offices for Thermo Electron San Jose products.

In North America

In North America, Thermo Electron offers training at the Scientific Instruments Training Institute in Florida. For information on enrollment or courses, please write, call, fax, or visit the web page site listed below:

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West Palm Beach, FL 33407

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Fax [1] (561) 688-8732

Web site: http://www.thermo.com

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Fax [81] (45) 453-9110

Osaka, Japan

Phone [81] (06) 6387-6681
Fax [81] (06) 6387-6641

Beijing, P.R. China

Phone [86] (010) 6621 0839
Fax [86] (010) 6621 0851

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Chapter 1
Introduction

The TSQ Quantum is a member of the TSQ® family of Finnigan™ mass spectrometers. The TSQ Quantum 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 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. Refer to Table 2-1 for a summary of site preparation requirements. More information on each of the requirements is available on the page indicated in the table.

Table 2-1. 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.	2-2
Space and Load Requirements: Your workbench must have minimum dimensions of 1 × 4 m (3 × 12 ft). The workbench must be capable of supporting the weight of the TSQ Quantum mass spectrometer [115 kg (265 lb)] and the data system (with printer) [48 kg (105 lb)] plus the weight of your liquid chromatograph and any options.	2-3
Telephone: A telephone line must be installed near the workbench.	2-6

2.1 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 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 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.

2.2 Space and Load Requirements

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

Place the TSQ Quantum system on a workbench that has minimum dimensions of 1 × 4 m (3 × 12 ft). The workbench must be capable of supporting the weight of the TSQ Quantum mass spectrometer [115 kg (250 lb)] and the data system (with printer) [48 kg (105 lb)] 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 mass spectrometer and any shelves above it.

Install the forepump on the floor close to the TSQ Quantum mass spectrometer. (The length of the vacuum hose that connects the TSQ Quantum mass spectrometer 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 mass spectrometer to the pump. They are as follows:

- If the workbench has space underneath it, place the forepump underneath the workbench immediately behind the TSQ Quantum mass spectrometer. (See the Table Top layout in Figure 2-1.) 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 cord 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 mass spectrometer. (See the Bench Top layout.)

Caution. Whenever possible, provide space under the workbench for the forepump. If the pump is placed in front of the TSQ Quantum mass spectrometer, it can block access to drawers and cabinets, and can represent a trip hazard.

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

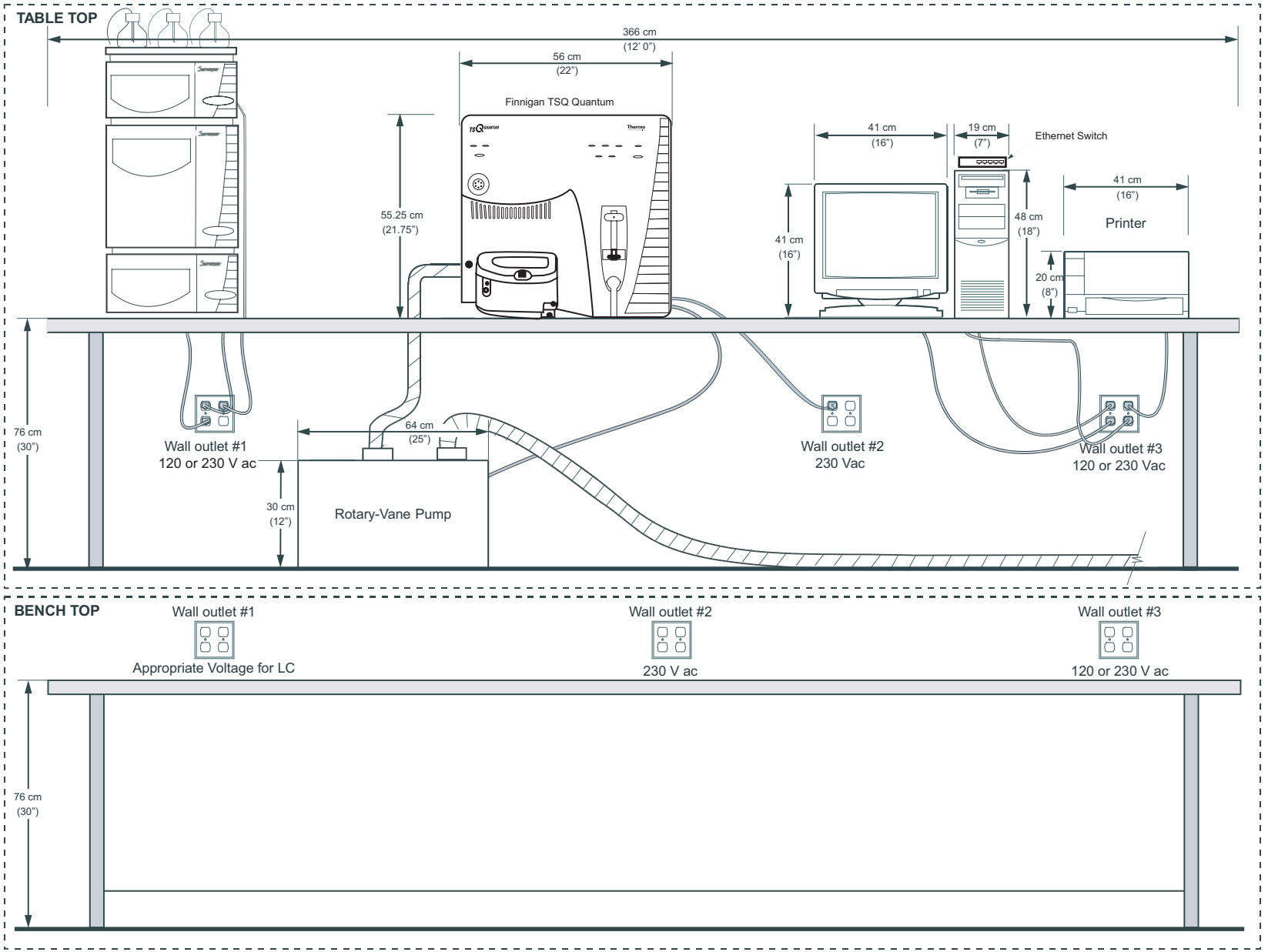

Figure 2-1. Installation and space requirements for your TSQ Quantum system

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

	Height		Width		Depth		Weight	
Module	**cm**	**in.**	**cm**	**in.**	**cm**	**in.**	**kg**	**lb**
TSQ Quantum mass spectrometer	56	22	56	22	79	31	115	250
Liquid chromatograph*	61	24	76	30	61	24	45	100
Mid-Tower Computer)	48	19	18	7	43	17	23	50
Monitor	41	16	41	16	43	17	17	38
Keyboard	3	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.

2.3 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.

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 system. Any expenditures for air conditioning are more than offset by good sample throughput and reduced repair costs. Refer to Table 3-1 for a summary of operating environment requirements. More information on each of the requirements is available on the page indicated in the table..

Table 3-1. 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 AM mass spectrometer, 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 AM system is between 18 and 21 °C (65 and 70 °F). The temperature must be controlled to within 2 °C (3.6 °F).	3-2
Humidity: The relative humidity of the operating environment must be between 40% and 80%, with no condensation.	3-4
Vibration: The workbench must be free from vibration.	3-5
Lighting: Adequate lighting for instrument operation is required. A high intensity lamp for instrument maintenance is also recommended.	3-5
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.	3-5
Electrostatic discharge: Precautions are recommended, especially when operating the system at the lower end of the relative humidity specification listed above.	3-6

3.1 Temperature

For precision instrumentation such as the TSQ Quantum mass spectrometer, the temperature stability of the environment in which the instrument is installed can affect performance. For the TSQ Quantum AM mass spectrometer, temperature control is vital to the success of your accurate mass measurements.

For All TSQ Quantum Systems

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 TSQ Quantum mass spectrometer 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 TSQ Quantum 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 3-2 shows the approximate heat output of each module.

Table 3-2. Heat output for the TSQ Quantum mass spectrometer, an LC, and the data system (with printer)

Module	Heat output (in Watts)	Heat output (in Btu/h)
TSQ Quantum 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 value depends on your equipment.

For TSQ Quantum AM Systems

For the TSQ Quantum AM system, the temperature in the room must not vary at a rate greater than 2 °C/h (3.6 °F/h).

Temperature stability is of great importance to the success of accurate mass measurements. The ideal operating temperature for the TSQ Quantum AM system 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).

Although the TSQ Quantum AM system can ensure mass stability over the range of 18 and 21 °C (65 and 70 °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.

3.2 Humidity

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

Operating a TSQ Quantum 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.

3.3 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 mass spectrometer and not near the system on the workbench.

3.4 Lighting

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

3.5 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.

3.6 Electrostatic Discharge

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

TSQ Quantum 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 in section 3.2.

- Use a static-dissipating floor covering (such as tile or conductive linoleum) in the room that houses your instrument.
- Use laboratory chairs covered with natural fiber or other static-dissipating material.
- When operating the instrument, wear 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 4-1 for a summary of line power requirements. More information on each of the requirements is available on the page indicated in the table.

Table 4-1. 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 μs.	4-3
Power Monitoring Devices: Before connecting your TSQ Quantum system to line power, it is strongly recommended that the power line be monitored 24 hours a day for seven consecutive days.	4-4
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	4-5

Table 4-1. 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	4-6
Connecting the TSQ Quantum Mass Spectrometer, LC, and Other Modules to Wall Outlets: Balance the current load on the circuits to which your system is connected.	4-11
Uninterruptible Power Supply: Systems installed in areas with intermittent line power must have uninterruptible power supplies installed.	4-12
Technical Assistance: Occasionally, line power sources of unacceptable quality are encountered that adversely affect the operation of a TSQ Quantum system.	4-12

4.1 Quality of Power

The quality of power supplied to your TSQ Quantum 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 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 TSQ Quantum system is installed.

4.2 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.

4.3 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.

4.4 Available Outlets

The TSQ Quantum mass spectrometer 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 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 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. The TSQ Quantum system must have an earth ground hard-wired to the main panel. The interconnected power outlets for the TSQ Quantum 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 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 ultrasonic bath. It is recommended that there be several additional power outlets close to the workbench space within your laboratory.

Figure 2-1 on page 2-4 shows the optimum location of the power outlets.

The power cable from the TSQ Quantum mass spectrometer 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 mass spectrometer 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 4-1

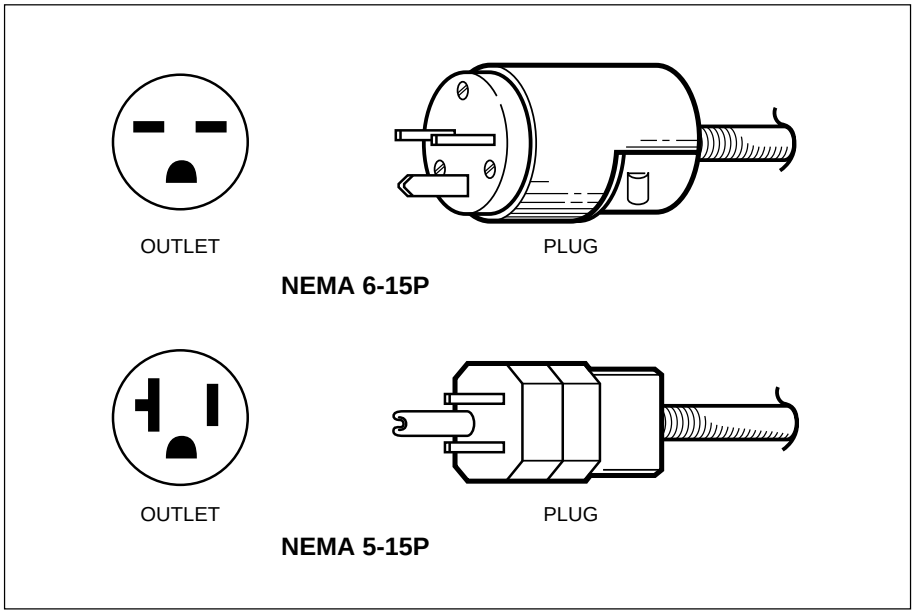

Figure 4-1. NEMA 6-15P and NEMA 5-15P power plugs and their respective outlets.

Table 4-2 shows the maximum current required by each component of a typical TSQ Quantum system. The TSQ Quantum 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 4-2 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 manuals. Contact your Service Engineer for more information.

Table 4-2. Maximum current (single phase) for a TSQ Quantum 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 mass spectrometer (230 V only)		15
Forepump		30
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 4-3 for an example of the number of outlets that might be necessary in your laboratory.

Table 4-3. 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**

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

4.5 Connecting the TSQ Quantum 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 4-2 for the maximum current ratings for the TSQ Quantum system and the data system.

Table 4-4 and Table 4-5 show examples of how to balance the power load among three wall outlets without exceeding their specifications. (See Figure 2-1 on page 2-4 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 4-4. Suggested power connections for a TSQ Quantum 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 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 4-5. Suggested power connections for a TSQ Quantum 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 #3 230 V ac
TSQ Quantum 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.

4.6 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.

4.7 Technical Assistance

Occasionally, line power sources of unacceptable quality are encountered that adversely affect the operation of a TSQ Quantum system. Correcting line power problems is the user's 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 local Thermo Electron office for assistance in locating a power consultant in your area.

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 5-1 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 5-1. Summary of solvent and gas 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.	5-2
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).	5-3
Nitrogen gas: High purity (99%). The required gas pressure is 690 ± 140 kPa (100 ± 20 psi).	5-4
Solvents, reagents, and modifiers: Installation of the TSQ Quantum system requires HPLC grade methanol and water. Solvent modifiers might be necessary for the installation of your system.	5-5

5.1 Fittings and Parts

Table 5-2 lists the minimum parts that are required to connect your TSQ Quantum mass spectrometer 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 5-2. Gas connection hardware required

Description	**TSQ Quantum P/N (in Accessory kit P/N 70111-62008)**
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.

5.2 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 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 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 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.

5.3 Solvent and Reagent Recommendations

The solvents and reagents listed in Table 5-3 are useful in operating and maintaining your TSQ Quantum system.[1] Installation of the TSQ Quantum 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 instrument, choose high purity solvents with minimum contamination.

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

Table 5-3. 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
PEG 200**	-	Sigma-Aldrich	202363-5G	5 g
PEG 400**	-	Sigma-Aldrich	202398-5G	5 g
PEG 600**	-	Sigma-Aldrich	202401-5G	5 g
PEG 1000**	-	Sigma-Aldrich	202428-5G	5 g

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

**For TSQ Quantum AM mass spectrometer only

[1]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 6-1 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 6-1. Summary of waste and exhaust preinstallation requirements

Requirement	Page
Exhaust system: Vacuum pumps and solvent wastes 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.	6-2 and 6-3
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.	6-3

6.1 Exhaust System

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

Much of what is introduced into the TSQ Quantum mass spectrometer is eventually exhausted from the forepump, 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 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 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.

> **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 forepressure for the turbomolecular pump, (2) providing a vacuum for the capillary skimmer of the API source.

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.

6.2 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 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 San Jose office 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 products. Telephone and fax numbers for the offices are listed in the **Read This First** chapter 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 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 **Read This First** chapter of this guide and immediately following the Installation Request Form. Refer to Table 8-1 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 8-1. 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.	8-2
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.	8-4
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.	8-5
Preventive Maintenance: You are responsible for the proper maintenance of your system.	8-6

8.1 Preinstallation Survey

Verify that your lab meets the following list of preinstallation requirements before your instrument is installed. Use the TSQ Quantum 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 [215 kg (470 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 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.
    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 system is on site.
23. The principal operator will be available during the installation / certification period.

8.2 Installation Kits

The following kits are shipped with the TSQ Quantum system:

- Accessory Kit (P/N 70111-62008), which contains parts such as pump oil, fuses, ferrules, tubing, and gloves.
- Standard Chemicals Kit which contains the necessary chemicals for demonstrating the system and meeting the marketing specifications. (The Chemicals Kit is located in the Accessory Kit box.)

In addition, the following kit is included with the TSQ Quantum AM system:

- Accurate Mass Chemicals Kit (P/N 70111-62029S), which contains the calibration standards for accurate mass calibration.

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

8.3 Installation Process

When your new TSQ Quantum 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.

8.4 Preventive Maintenance

Routine and preventive maintenance of the TSQ Quantum 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:

- Finnigan TSQ Quantum Hardware Manual
- Manuals that come with your TSQ Quantum computer and other modules of your system

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