Finnigan™ DELTA^{plus} XP

Preinstallation
Requirements Guide

Revision B
199 1001

Thermo
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- ❑ Other _____

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- ❑ Analytical
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- ❑ Clinical / Toxicology
- ❑ 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 DELTA^{plus}XP
Preinstallation Requirements Guide

Revision B
199 1001

	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

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 _____

_____

_____

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Thermo Electron (Bremen) GmbH
Finnigan Advanced Mass Spectrometry
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Barkhausenstr. 2

D-28197 Bremen
Germany

fold

IMPORTANT PREINSTALLATION INFORMATION... PLEASE READ

Thermo
ELECTRON CORPORATION

*Finnigan DELTA^{plus}*XP Installation Request Form

Dear User:

Read the Finnigan DELTA^{plus}XP 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 DELTA^{plus}XP is on site.
- ❑ 3. Key operator will be available during the installation / certification period.
- ❑ 4. Doorways, hallways, etc. are a minimum width of 90 cm (36 in.).
  Note width of laboratory entrance:_____
- ❑ 5. Available floor area is sufficient and flooring will support the load.
- ❑ 6. Lighting is adequate.
- ❑ 7. Main power is installed and is in compliance with local electrical codes.
- ❑ 8. Power for test and cleaning equipment is installed.
- ❑ 9. Power outlets are of the correct configuration.
- ❑ 10. Voltage of power outlet has been measured.
  Note ***measured*** voltage:_____
- ❑ 11. Power is free from fluctuations due to slow changes in the average voltage or changes due to surges, sags, or transients.
- ❑ 12. Air conditioning is adequate for temperature, humidity, and particulate matter control. The laboratory can be maintained at a constant temperature, between 18 and 28 °C (65 and 82 °F).
- ❑ 13. Relative humidity is between 20% and 70% with no condensation.
- ❑ 14. System work area is free from magnetic disruption and electrostatic discharge.
- ❑ 15. A compressed air supply is connected to the instrument.
- ❑ 16. All gases required for the peripheral options are on site. Gas lines are installed, and appropriate gas regulators are available. List gases and purity:_____
- ❑ 17. There is a suitable exhaust system present.
- ❑ 18. One voice telephone line is installed near the system.
- ❑ 19. 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 _____

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Signature _____ Date _____

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Beijing 100032
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Fax .....[86] (010) 6621 0851

Übereinstimmungserklärung gemäß EN 45014
declaration of conformity according to EN 45014
Dichiarazione di conformità alla EN 45014

Name des Herstellers:
manufacturers name:
nome produttore: Thermo Finnigan GmbH

Adresse des Herstellers:
manufacturers address:
indirizzo produttore: Barkhausenstraße 2
28197 Bremen
Germany

erklärt, daß das Produkt
declares that the following product
dichiara che il seguente prodotto

Delta plus XP
Basic Instrument

mit den folgenden Produktspezifikationen übereinstimmt:
complies with the following product specifications:
rispetta le seguenti specifiche del prodotto:

EMV (Störemissionen):
EMC (emissions):
EMC (emissioni): EN 50081-1,
EN 55022, Kl. B

EMV (Störfestigkeit):
EMC (immunity):
EMC (immunità): EN 50082-2,
EN 61000-4-2, -3, -4, -5, -6, -11
EN 50204

Elektrische Sicherheit:
electrical safety:
sicurezza elettrica: EN 61010-1

Ergänzende Informationen:
complementary information:
informazioni complementari:

Dieses Produkt erfüllt die EMV-Richtlinie 89/336/EWG und Niederspannungsrichtlinie 73/23/EWG.
This product complies with the EMC directive 89/336/EEC and the Low Voltage Directive 73/23/EEC.
Questo produtto rispetta la direttiva 89/336/EEC e la direttiva 73/23/EEC.

Bremen, Germany, 21 March 2002

Der Betriebsleiter:
Operations Manager:
Direttore fabrizione:

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Notice on Lifting and Handling of Thermo Electron Bremen Instruments

For your safety, and in compliance with international regulations, the physical handling of this Thermo Electron Bremen 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 Bremen Instruments

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

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Read This First

Welcome to the Thermo Electron, Finnigan™ DELTA^{plus}XP system! The DELTA^{plus}XP is a member of the Finnigan family of mass spectrometer (MS) detectors.

This **Finnigan DELTA^{plus}XP 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.

The **Finnigan DELTA^{plus}XP Preinstallation Requirements Guide** includes the following chapters:

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

Chapter 2: General Recommendations provides additional information about how to prepare your laboratory to provide optimum conditions for instrument operation.

Chapter 3: Site Requirements gives details on the physical, electrical, gas, and air conditioning requirements and other laboratory requirements for the MS detector and data system.

Chapter 4: Electrical Power gives details on the electrical outlets, power conditioning devices and power supplies required to properly install your system.

Chapter 5: Resources Requirements provides information on the gases, cryogens, solvents and solvent modifiers require to install and operate your system.

Chapter 6: Summary of Technical Data provides an overview of the technical data of the DELTA^{plus}XP.

Chapter 7: Options describes the requirements for the peripheral options of the DELTA^{plus}XP.

Chapter 8: Instrument Arrival provides information on insurance claims and on domestic and international shipments.

Chapter 9: Installation provides details on 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
Thermo Electron (Bremen) GmbH
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D-28197 Bremen

Germany

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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
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
FOB	free on board
ft	foot
FTP	file transfer protocol
g	gram
G	Gauss; 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
LHe	liquid helium
LN2	liquid nitrogen
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
SMOW	standard mean ocean water
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
V	volt
V ac	volts alternating current
V dc	volts direct current
vol	volume
w	width
W	watt

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 Bremen 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.
- **Caution** – information necessary to protect your instrument from damage.
- **Warning** – hazards to human beings. Each Warning is accompanied by a Warning 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 Bremen 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 Bremen 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.

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Canada

Phone [1] (905) 712-2258
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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

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Phone: [1] (800) 532-4752
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North America Technical Support Operations

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West Palm Beach, FL 33407

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Training

Thermo Electron Bremen offers valuable training on its instruments and software in North America, in Europe, and in Australia and Asia.

Experience has shown that the maximum value can be derived from a scientific instrument if there is one person, the key 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 Bremen 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 Thermo Electron Bremen offices.

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:

Scientific Instruments Training Institute

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

Phone [1] (800) 765-4532 ext 244
Phone [1] (561) 688-8700 ext 244
Fax [1] (561) 688-8732

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

In Europe

In Europe, training is available from Thermo Electron Bremen field applications chemists. Contact your local office for information.

Wien (Vienna), Austria

Phone [43] (01) 333 50 34-0
Fax [43] (01) 333 50 34-26

Brussels, Belgium

Phone [32] (02) 482 30 30
Fax [32] (02) 482 30 31

Les Ulis, France

Phone [33] (01) 60 92 48 00
Fax [33] (01) 60 92 49 00

Dreieich, Germany

Phone [49] (06103) 408 0
Fax [49] (06103) 408 1222

Milano, Italy

Phone [39] (02) 95059 226
Fax [39] (02) 95320 370

Breda, Netherlands

Phone [31] (076) 587 8722
Fax [31] (076) 571 4171

Madrid, Spain

Phone [34] (091) 657 4930
Fax [34] (091) 657 4937

Barcelona, Spain

Phone [34] (093) 223 0918
Fax [34] (093) 223 0982

Stockholm, Sweden

Phone [46] (08) 556 468 00
Fax [46] (08) 556 468 08

Hemel Hempstead, United Kingdom

Phone [44] (01442) 233 555
Fax [44] (01442) 233 667

For all other countries, contact your local Thermo Electron Bremen Products dealer.

In Australia and Asia

In Australia and Asia, training is available from Thermo Electron Bremen field applications chemists. Contact your local office for information.

Rydalmere, N.S.W., Australia

Phone [61] (02) 9898-9000
Fax [61] (02) 9898-9800

Yokohama, Japan

Phone [81] (45) 453-9100
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

For all other countries, contact your local Thermo Electron Bremen Product dealer.

Chapter 1
Preface

Your Finnigan™ DELTA^{plus}XP instrument is on its way!

The information in this guidebook will help you to prepare a proper site for the installation of your DELTA^{plus}XP MS system.

Some information in this guidebook refers to the continental USA exclusively. Assurances and specifications may differ in other locations. Specific details are available from the local Thermo Electron offices and Dealers (see the **Read This First** chapter of this Preinstallation Requirements Guide).

Systems made by Thermo Electron Bremen are designed to operate reliably under controlled environmental conditions.

Operating a system outside of the operating environment limits listed below might cause failures of many types. The repair of such failures is specifically excluded from the standard warranty and service contract coverage.

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

> **Note.** All specified values in this booklet may change according to law and quality standards.

Chapter 2
General Recommendations

Attention to the operating environment will ensure the continued high performance of your system and help protect your investment. Any expenditures for air conditioning and power supply are normally more than offset by good throughput and reduced repair costs.

Airflow through the system is critical. Air conditioning must be capable of maintaining a constant temperature (within operable limits) in the immediate vicinity of the instrument.

The laboratory temperature must be within the specified limits. When planning air conditioning, please take into consideration the heat dissipated by the instrument during normal operation.

The relative humidity of the operating environment should be within the specified limits.

Operating the system or maintaining it in operational condition outside these limits may cause many types of failures. Their repair is specifically excluded from our standard warranty and service contract coverage.

Operating at temperatures above those recommended may cause premature failure of transistors and integrated circuits.

Operating at very low humidity will cause problems due to the accumulation and discharge of static electricity. Operating at high humidity may cause condensation with associated short circuits.

Elevated line voltage will cause overheating and component failures. At low voltages, the system will function erratically or not at all. Both these conditions can be corrected by installing a new “clean” line, or by using filter transformers or power conditioners. You can arrange with your Thermo Electron service representative to have the quality of your line voltage checked. He will recommend any necessary action.

Line regulation equipment may be purchased from Thermo Electron or from an appropriate vendor.

A twenty-four hour power supply is necessary to assure proper instrument function.

Good lighting makes an area more enjoyable to work in. A small lamp for source inspection and manipulation of small components is recommended.

Once the laboratory environment has been properly adjusted, it is still important to observe some fundamental maintenance principles: make sure panels having air intakes are not obstructed. Air must be allowed to circulate freely in the electronics cabinet. Pumps should be serviced regularly as described in the system's operating manual.

Chapter 3
Site Requirements

More information on each of the requirements is available under the following topics:

- Hallways, Doors
- Floor Space
- Floor Conditions
- Environment Requirements

3.1 Hallways, Doors

In order to move the instrument into the laboratory, the whole way from the loading dock to the desired place (including the entrance to your facility, the width of all hallways, doors, elevators, etc.,) should be wide enough for the instrument. For dimensions of the largest part during transportation inside the building, refer to Figure 3-2 on page 3-4.

In addition, please consider additional room to allow maneuvering of the system around corners and/or through doors.

Elevators and hallways should be able to take the load. For weight information, please refer to **Floor Conditions** on page 3-4.

3.2 Floor Space

The dimensions of the instrument and the minimum floor space required for its installation and operation are given in Figure 3-1.

Please note the minimum distance behind the units. This distance is imperative to allow easy access to the rear of each module for service and repair.

To ensure that operating personnel are easily able to carry out their work and to facilitate heat dissipation, we recommend that room dimensions be selected which are considerably larger than the minimum dimensions given in Figure 3-1.

The minimum width necessary to transport the unpacked instrument to the installation site is 0.9 m (36 in).

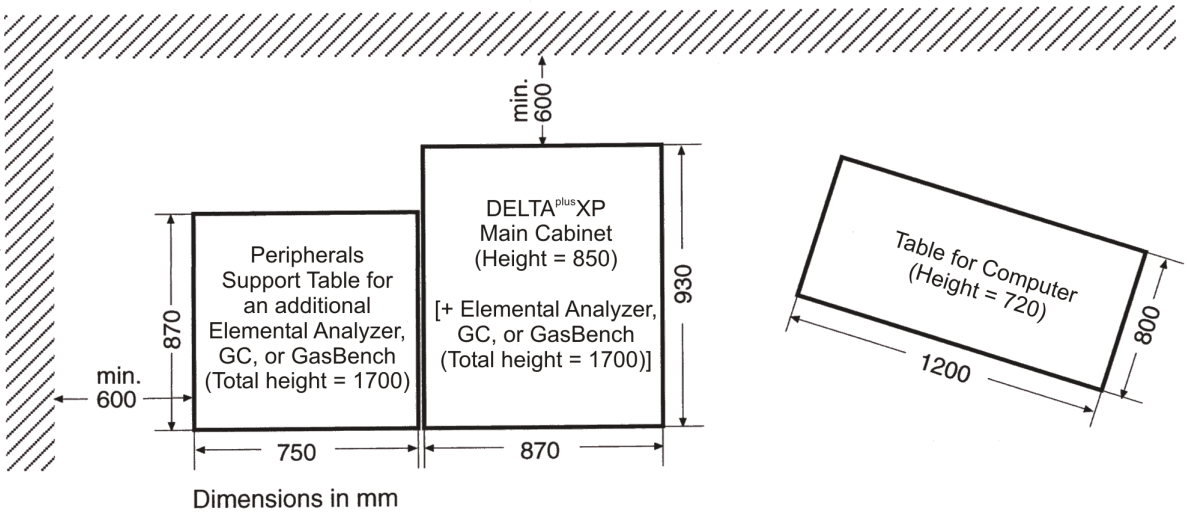

Figure 3-1. Space Requirements

For the specific space requirements of your peripheral options, refer to the corresponding section of **Chapter 7: Options**.

3.3 Floor Conditions

The floor must be level and must be sufficient to carry the instrument's weight of approx. 300 kg (660 lb.). It should be free from shock and vibrations.

The DELTA^{plus}XP is shipped in several boxes (see Figure 3-2). The largest of them has the approx. dimensions of ($l \times w \times h$) 120 × 80 × 137 cm. The box containing the basic unit has the maximum weight of 396 kg.

Owing to the climatic conditions in some tropic regions, some boxes may be replaced by special packings. As a result, the dimensions will differ from those mentioned above.

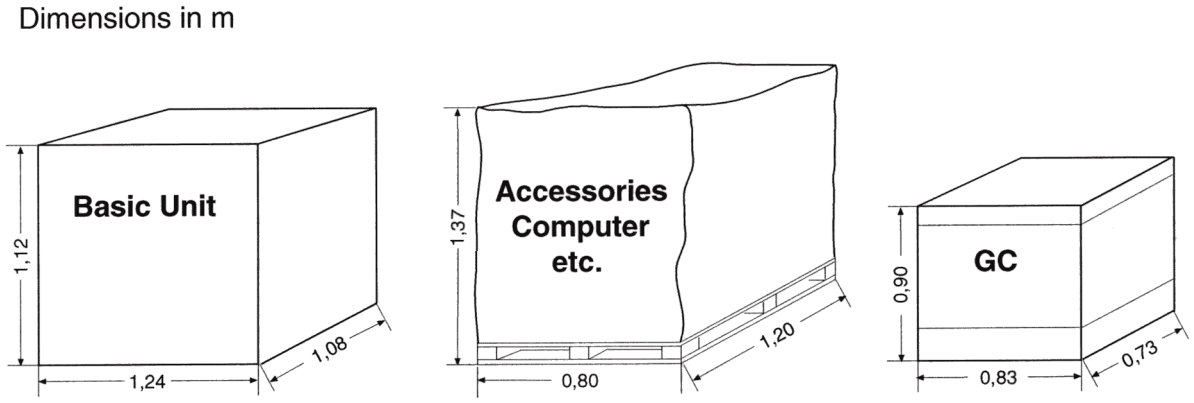

Figure 3-2. Dimensions of Packed Units

Figure 3-3. View of Installed Instrument

3.4 Environment Requirements

Room Temperature

The maximum permissible ambient temperature of the instrument is 28 °C.

Please note: Heat dissipation of the instrument is to be considered in accordance with the power requirements, also for peripherals (see **Power Consumption** on page 4-2 and **Chapter 6: Summary of Technical Data**).

Large temperature fluctuations, i.e. fluctuations caused by direct sunlight or drafts should be avoided while measuring. Temperature changes greater than 1 °C/hour should be avoided during measurement.

Humidity

The relative humidity should be between 20% and 70%. In no case should the humidity be higher than 70% to avoid high ohmic insulator breakdown.

Air Purity

Air must be free of smoke, dust, particulate matter and aggressive vapors.

Air Conditioning

We recommend the installation of an air conditioner, if the specified limits will be exceeded due to unfavorable climatic conditions.

Preferably, the air conditioner should be equipped with a flow controller valve and PID microprocessor control (available e.g. from Landis & Gyr, Polygyr RWX…, see www.landisgyr.com). This ensures temperature drifts within the limits given above.

Lighting

Good lighting makes an area more enjoyable to work in. Since a lot of work is done on the computer terminal, it may be convenient to have a dimmer switch on the lights to reduce eyestrain. A small lamp for source inspection and manipulation of small components is recommended.

Exhaust Fumes

The exhaust port of the rotary pump should be connected to an exhaust gas line leading out of the building. The inner diameter of the pipe should be at least 1.5 cm.

Disturbances

Mechanical Vibrations

The floor in the laboratory must be free of mechanical vibration caused by equipment in adjoining locations. The max. acceptable amplitude is 10 µm (peak to peak) movement for all frequencies > 30 Hz.

Electromagnetic Fields

The instrument site must be free of interfering electromagnetic fields. The max. acceptable field amplitude (AC) for any frequency is 5×10^{-6} T (50 mG).

> **Note.** Sources of disturbing fields are e.g.:
>
> - other analytical instruments (e.g. NMR systems or other mass spectrometers);
> - train, tram, subway;
> - power cables crossing the ceiling;
> - large electric motors (elevators);
> - radio stations nearby.

Radio Frequencies

If strong radio transmitters are operating close to your laboratory, you want to contact your local support for advise. Because of the complexity of such influences, no general suggestion can be given in this booklet.

Poor Power Quality

Disturbances in power can be caused by weather, accidents or utility equipment failure. They can last for milliseconds to seconds or even longer. The resulting production outages, however, can last much longer.

To find possible solutions, it is first necessary to characterize the actual problem. See **Power Quality** on page 4-4 for more information.

> **Note.** If special measurements of electric or magnetic fields should be necessary, please contact your local Thermo Electron support or your local dealer for advice.

Chapter 4
Electrical Power

It is the responsibility of the purchaser to provide a laboratory power supply of acceptable quality and a suitable operating environment for the instrument.

More information on each of the requirements is available under the following topics:

- Electrical Power Specification
- Power Consumption
- Power Cables, Connectors
- Location of the Wall Outlets (Power)
- Power Quality
- Power Conditioning Devices
- Uninterruptible Power Supply
- Technical Assistance
- Delta-to-Y Conversion Transformer

4.1 Electrical Power Specification

The DELTA^plusXP is designed to operate at a nominal voltage of 230 V ac; 50/60 Hz.

The basic power requirements for a DELTA^plusXP consist of the following:

- Nominal voltage 230 / 400 Volts ±10%, 50 or 60 Hz ac,
- Three phases, 5-wire system in Y configuration (neutral wire connected to earth). For further information, refer to Figure 4-1 on page 4-8.
- Each phase is fused with 16 A (recommended for Germany).

Single-phase wall outlets (for Options)

- Nominal voltage 230 Volts ± 10%, 50 or 60 Hz ac.
- Fused with 10 A or 16 A (recommended for Germany)

> **Note.** Installed in the DELTA^plusXP are four outlets (nominal voltage 230 V ac, fused with 10 A) that you can use to connect the peripheral options. Therefore, wall outlets are not necessary for them. See also **Power Cables, Connectors**.

Consider different voltages (e.g. 110 V ac) in other countries. Please check with your local officials and / or your local Thermo Electron office.

4.2 Power Consumption

Power consumption of the DELTA^plusXP is approx. 2.5 kW in normal operation and approx. 4.5 kW during bakeout. For the power consumption of the installed peripherals, see the corresponding section of **Chapter 7: Options**.

4.3 Power Cables, Connectors

The DELTA^{plus}XP must have a separate “clean” line leading to a main fuse to guarantee disturbance-free operation.

The length of the supplied power cable is approx. 1.3 m (4.3 ft.).

Locally supplied personal computer hardware must use the same power line and ground connection as the DELTA^{plus}XP.

Notes.

- Additional devices (like recirculating chillers or compressors) must NOT be connected to the instrument. Please use a wall outlet instead.
- Recirculation chillers or compressors can be noisy, and they blow warm air into the room. Install those devices outside the laboratory.

4.4 Location of the Wall Outlets (Power)

The electrical wall outlet for the main power of the DELTA^{plus}XP (see **Electrical Power Specification** on page 4-2) should be located at the wall behind the intended location of the instrument.

Location of Auxiliary Wall Outlets

Additional single-phase 230 V (or 110 V) AC outlets are needed for options and test equipment such as Compressor or Water chillers, etc. We recommend at least six (6) spare 230 V (110 V) AC outlets behind the system and three (3) close to the workbench space within your laboratory.

Note. All single-phase auxiliary wall outlets should use the same ground as power line of the instrument.

4.5 Power Quality

The quality of power supplied to your DELTA^{plus}XP system is very important. The quality of line voltage must be stable and within the specifications listed in this manual. The line voltage must be free of fluctuations due to slow changes in the average voltage, surges, sags, or transients.

In addition, the voltage between ground and neutral should not exceed 1 Volt (see Figure 4-1 on page 4-8).

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 µs and 2 s.
- **Transients** (or impulses) are brief voltage excursions of up to several thousand volts with durations of less than 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 of a few microseconds 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 DELTA^{plus}XP system is installed.

Power Monitoring Devices

A variety of devices are available to monitor the quality of your line power. The power line disturbance analyzers are capable of detecting and recording most types of power supply problems. These instruments provide a continuous record of line performance by analyzing and printing out information on three types of voltage disturbances:

- Slow average
- Sag and surge
- Transient

In the first two cases, the duration as well as the amplitude of the disturbance are indicated by time interval recording.

The power line must be monitored continuously for seven consecutive days, 24 hours a day. If inspection of the printout indicates disturbances, the test should be terminated and corrective action taken. Then, the power should be monitored again as described above.

Renting Line Monitors

Line monitors can be rented from electrical equipment suppliers (see **Technical Assistance** on page 4-7). If necessary, your local Thermo Electron office can assist in interpretation of the results and recommend appropriate corrective measures.

4.6 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 power conditioners, which can control both of these problems, should be considered.

When nominal voltage is free from voltage sags, surges and impulses but more than ±10% outside the required 230 V, the supply voltage can be lowered (bucked) or raised (boosted) using a buck/boost transformer. Buck/boost transformers are also available from Thermo Electron.

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, TUV, VDE, etc.

4.7 Uninterruptible Power Supply

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

4.8 Technical Assistance

Occasionally, Thermo Electron encounters line-voltage sources of unacceptable quality that adversely affect the operation of the mass spectrometer. Rectifying such power-supply problems is the user's responsibility. However, (upon request) Thermo Electron will attempt to assist in diagnosis, but does not undertake to isolate and correct power-supply quality problems.

Contact your Thermo Electron office for assistance in monitoring the line voltage in your laboratory, in selecting a line conditioner or in locating a power consultant in your area.

Specifying power conditioning equipment is a complex task that is best handled by a company or consultant specializing in that field. A selection of such companies is listed below:

General Electric Company
(Worldwide distribution network)
Internet: www.ge.com

JOVYATLAS
Groninger Str. 29-37
D-26789 Leer / Ostfriesland
Phone: +49 (491) 6002 0
Fax: +49 (491) 6002 10
Internet: www.jovyatlas.de

Junge Störschutz Nord GmbH
Zum Steenshoop 17
D-27412 Tarmstedt / Germany
Phone: +49 (4283) 93030

OnLine Power, Inc.
(Conform to all applicable standards, worldwide)
Internet:www.onlinepower.com

POWERVAR, INC.
Internet:www.powervar.com

SOLA / HEVI-DUTY
Internet:www.sola-hevi-duty.com

Warner Electric
Motors and Controls division
Internet:www.warnernet.com

4.9 Delta-to-Y Conversion Transformer

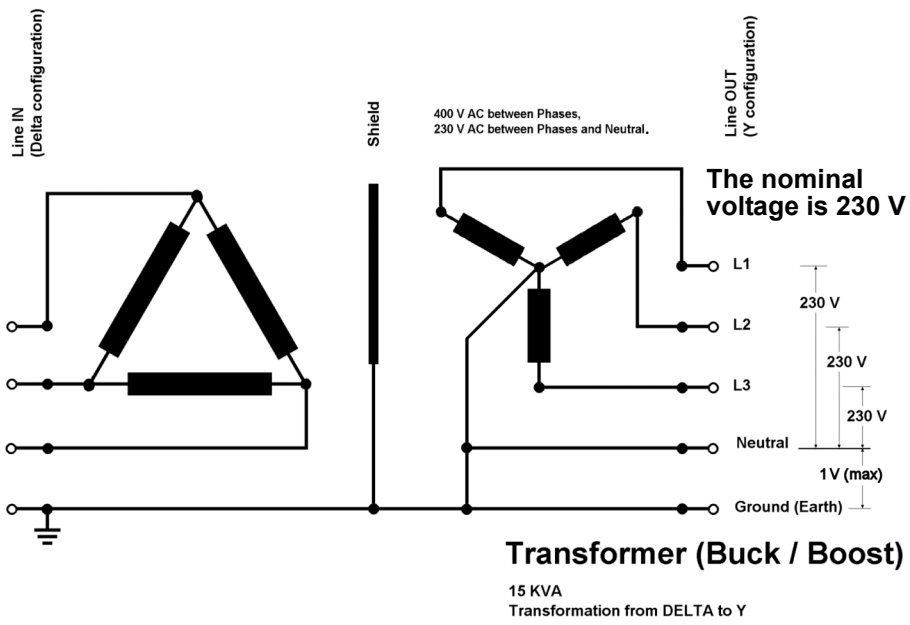

Figure 4-1. Delta-to-Y conversion

> **Note.** In Y configuration, the nominal voltage 230 V ac must be measured phase to ground; between the phases 400 V ac is measured.

In case of a Y configuration in your location (ask the responsible electrician), an isolation transformer is required which steps up the three phases 120 V ac (Delta) to 230 V ac (Y) with respect to ground. A suitable transformer is available from Thermo Electron Bremen. Line conditioners have beside other advantages the same capability.

Chapter 5
Resources Requirements

It is your responsibility as the user to provide correct gas, cryogen and solvent supplies for the operation of your system.

Your instrument requires high purity gases and cryogens. The Service Engineer might also require certain solvents for the installation verification of your system.

More information on each of the requirements is available under the following topics:

- Test Gas
- Cleaning Agents
- Instrument Setup
- Gases for Specification Measurements
- Compressed Air
- Cryogenic Coolants
- Sample Vials

5.1 Test Gas

A bottle of argon is required for leak checking. 99.5% welding argon is sufficient. Additional gases (defined in **Gases for Specification Measurements** on page 5-2) are required for normal operation, if the instrument is connected to a GC or to an elemental analyzer.

5.2 Cleaning Agents

We recommend having the following cleaning agents available:

- Methanol
- A detergent, i.e. RBS 50 (trade name of Messrs. Carl Roth, Karlsruhe, Germany)
- Distilled water.

5.3 Instrument Setup

You will need to supply gas samples for your instrument's installation: either CO_2 or H_2 depending on the type of collector system. The DELTA^{plus}XP inlet system terminates in 1/4 in Swagelok connectors. Two standard taper 14/23 male connectors are also provided.

Suitable sample vials can be procured from Thermo Electron Bremen (see **Sample Vials** on page 5-3).

5.4 Gases for Specification Measurements

All gases needed for specification measurements (international standards) are to be supplied by the customer.

5.5 Compressed Air

Compressed air with a pressure of 5 bar (70 psi) is required to operate the pneumatic valves of the instrument. A suitable compressor can be ordered from Thermo Electron Bremen under Part No. 026 1850.

It is recommended to filter the compressed air in order to remove particulate matter and moisture. The main supply has to be connected to the compressed air service unit of the DELTA^{plus}XP via the provided PVC hose 6×1 mm.

5.6 Cryogenic Coolants

Some DELTA^{plus}XP options require liquid nitrogen. A suitable stainless steel Dewar (either 25 L or 75 L) can be procured from Thermo Electron Bremen.

5.7 Sample Vials

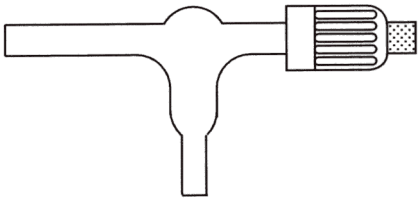

Figure 5-1. Reference gas vial with one valve and 1/4 in.fitting, ~ 5 ml
Part No. 100 3560

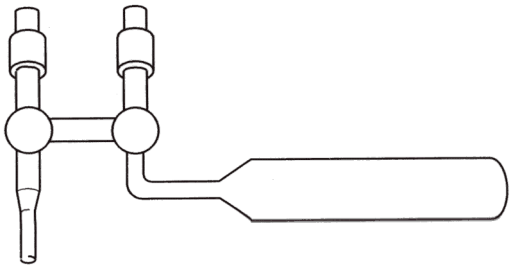

Figure 5-2. Reference gas vial with two Viton valves and 1/4 in. fitting, 200 ml
Part No. 025 4650

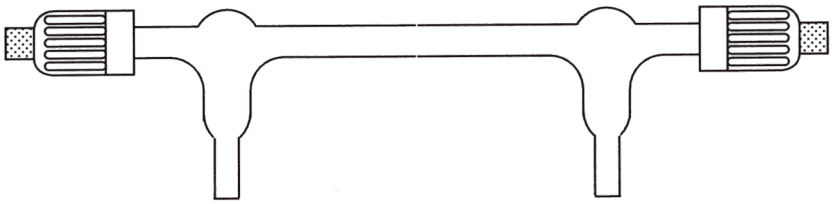

Figure 5-3. Reference gas vial with two valves (two ports) and 1/4 in. fitting, ~ 10 ml
Part No. 100 3840

Chapter 6
Summary of Technical Data

For your convenience, the following Table 6-1 gives a summary of the technical data, which are relevant for planning your installation. The page where details can be found is given in the third column of this table.

Table 6-1. Summary of Technical Data

		Page
Mains voltage	400 V three-phase (single-phase optional)	page 4-2
Mains frequency	50 Hz (60 Hz) ± 2 %	
Harmonics	≤ 20 V_{SS}	
Power consumption	DELTA^{plus}XP 2.5 kW normal operation 4.5 kW during bakeout	page 4-2
Fusing	16 A	page 4-2
Voltage between neutral and ground	< 1 V	page 4-4
Room temperature - range - stability	 18 °C … 28 °C 1 °C per hour	page 3-6
Relative humidity	20 … 70 %	page 3-6

Chapter 7
Options

Information on the requirements for the peripheral options for the DELTA^{plus}XP is available under the following topics:

- PreCon Interface
- GC/C
- Equilibration Unit
- ConFlo ll/lll - Elemental Analyzer
- TC/EA (Temperature Conversion Elemental Analyzer)
- GC/TC (High Temperature Conversion Interface)
- GasBench II
- Kiel II Carbonate Device

7.1 PreCon Interface

Site Requirements

The PreCon attaches to any Thermo Electron, Finnigan™ isotope ratio mass spectrometer configured for a GC/IRMS interface, either GC/combustion interface or GC/GP interface.

In case of the GC/GP interface the required space is approximately 900 mm width x 700 mm depth. And in case of the GC/combustion interface, a second table with 250 mm width x 700 mm depth is required.

Power Requirements

The PreCon will be supplied from the MS line distributor. Therefore, the total MS power consumption will increase by 0.5 kW.

Resources Requirements

Helium:5.0 (99.999%)

200 bar as carrier gas

CO_2: 4.5 (99.995%)

60 bar as standard reference gas

For the LN2 cooled trap provide approximately 3 liter LN2 per day.

All gas lines should be oil free and preferably flame dried. The gas lines or the gas bottles should be at a distance of 1 to 1.5 meter to the instrument.

All regulators should be oil and grease free and specified for purity gases. The supply lines should terminate with 1/8-inch male Swagelok®-type connectors. Thermo Electron Bremen recommends using regulators with an outlet pressure range from 0 to 5 bar (0 to 73 psi).

For the GC separation of gases, provide an appropriately fused silica capillary column. (PLOT FUSED SILICA COATING PORAPLOT Q length 25 m and ID 32 mm), e.g. Thermo Electron Bremen Part. No. 017 1911.

The compressed air will be supplied from the MS compressed air distributor, and should be in the range of 40 to 70 psi.

Sometimes it may be necessary to check the unit for leaks, therefore please provide a bottle of argon.

We also recommend installing a high capacity purifier (Thermo Electron Bremen Part No. 114 0790) to ensure a constant and affordable high quality of the He carrier gas.

7.2 GC/C

Site Requirements

The GC/C III attaches to any Thermo Electron, Finnigan isotope ratio mass spectrometer configured for a GC/IRMS, and will be placed on top of the peripherals support table. Required space is 900 mm width x 700 mm depth.

Power Requirements

The GC/C III will be supplied from the MS line distributor. Therefore, the total MS power consumption will increase by 2.5 kW.

Resources Requirements

Helium:5.0 (99.999%)

200 bar as carrier gas

CO_2: 4.5 (99.995%)

60 bar as standard reference gas

N_2: 5.0 (99.999%)

200 bar as standard reference gas

O_2: 4.6 (99.996%)

60 bar as standard reference gas

H_2 and synthetic or water and oil free pressed air in case using the FID Detector.

All gas lines should be oil free and preferably flame dried. The gas lines or the gas bottles should be at a distance of 1 to 1.5 meter to the instrument.

All regulators should be oil- and grease free and specified for purity gases. The supply lines should terminate with 1/8-inch male Swagelok-type connectors. Thermo Electron Bremen recommends using regulators with an outlet pressure range from 0 to 5 bar (0 to 73 psi).

The compressed air will be supplied from the MS compressed air distributor, and should be in the range of 40 to 70 psi.

Sometimes it may be necessary to check the unit for leaks, therefore please provide a bottle of argon.

We also recommend installing a high capacity purifier (Thermo Electron Bremen Part No. 114 0790) to ensure a constant an affordable high quality of the He carrier gas.

7.3 Equilibration Unit

Site Requirements

For the equilibration unit and the cooling unit are 1400 mm width x 700 mm depth.

Power Requirements

The equilibration unit will be supplied from the MS line distributor. There-fore, the total MS power consumption will increase by 2 kW.

Resources Requirements

H_2: 4.5 (99.995%)

200 bar as equilibrium (consumption 1 tank per year).

CO_2: 4.5 (99.995%)

60 bar as equilibrium (consumption 1 tank per year).

Gas lines should be oil free and preferably flame dried. The gas lines or the gas bottles should be at a distance of 1 to 1.5 meter to the instrument.

All regulators should be oil and grease free and specified for purity gases. The supply lines should terminate with 1/8-inch male Swagelok-type connectors. Thermo Electron Bremen recommends using regulators with an outlet pressure range from 0 to 5 bar (0 to 73 psi).

For the water trap, either provide a cooling device or a mixture of alcohol and dry ice. The temperature should be approximately -70 °C.

The compressed air will be supplied from the MS compressed air distributor and should be in the range of 40 to 70 psi.

Sometimes it may be necessary to check the unit for leaks, therefore please provide a bottle of common argon.

7.4 ConFlo II/III - Elemental Analyzer

Site Requirements

The CONFLO II/III is small enough to put it on top of the MS or the elemental analyzer. The elemental analyzer requires a peripherals support table of 900 mm width x 700 mm depth.

Power Requirements

The elemental analyzer will be supplied from the MS line distributor. There-fore, the total MS power consumption will increase by 2 kW.

Resources Requirements

He: 5.0 (99.999%)

200 bar as carrier and make up gas

N_2: 5.0 (99.999%)

200 bar as standard reference gas

CO_2: 4.5 (99.995%)

60 bar as standard reference gas

CO: 4.7 (99.997%)

200 bar as standard reference gas

H_2: 5.0 (99.999%)

200 bar as standard reference gas

For the Elemental Analyzer

O_2: 4.5 (99.995%)

200 bar for sample oxidation

And in case a sulfur kit is ordered

SO_2: 3.8 (99.98%)

4 bar as standard reference gas

Use an exhaust line (50 mm ID) with a slight under pressure and a suction rate of 50 m^3/h or more.

All gas lines should be oil free and preferably flame dried. The gas lines or the gas bottles should be at a distance of 1 to 1.5 meter to the instrument.

All regulators should be oil- and grease free and specified for purity gases. The supply lines should terminate with 1/8-inch male Swagelok-type connectors. Thermo Electron Bremen recommends using regulators with an outlet pressure range from 0 to 5 bar (0 to 73 psi).

The compressed air will be supplied from the MS compressed air distributor and should be in the range of 40 to 70 psi.

Sometimes it may be necessary to check the unit for leaks, therefore please provide a bottle of argon.

In case the ConFlo is used for CO and/or H_2 measurements, a gas detector with an alarm function has to be installed in the laboratory. Use an exhaust line (50 mm ID) with a slight under pressure and a suction rate of 50 m^3/h or more.

We also recommend installing a high capacity purifier (Thermo Electron Bremen Part No. 114 0790) to ensure a constant and affordable high quality of the He carrier gas.

7.5 TC/EA (Temperature Conversion Elemental Analyzer)

Site Requirements

The Temperature Conversion Elemental Analyzer has the following dimensions: 450 mm width, 700 mm depth and 500 mm height. Its weight is 59 kg.

Place it on a flat and solid table that can carry at least 150 kg.

Power Requirements

The TC/EA will be supplied from the MS line distributor. Therefore, the total MS power consumption will increase by 1.5 kW.

Resources Requirements

He: 5.0 (99.999%)

200 bar as carrier gas

Oxygen:

CO: 4.7 (99.997%)

200 bar as standard reference gas

He: 4.6 with 2% H_2

150 bar as auxiliary gas

Hydrogen:

H_2: 6.0 (99.9999%) (-200‰ vs. SMOW)

200 bar as standard reference gas

All gas lines should be oil free and preferably flame dried. The gas lines or the gas bottles should be at a distance of 1 to 1.5 meter to the instrument. All regulators should be oil and grease free and specified for purity gases. The supply lines should terminate with 1/8-inch male Swagelok-type connectors. Thermo Electron Bremen recommends using regulators with an outlet pressure range from 0 to 5 bar (0 to 73 psi).

The compressed air will be supplied from the MS compressed air distributor, and should be in the range of 40 to 70 psi.

Sometimes it may be necessary to check the unit for leaks, therefore please provide a bottle of argon.

It is strongly recommended to install the gas cylinders firmly.

Because CO and/or H_2 are used, a gas detector with an alarm function has to be installed in the laboratory. Use an exhaust line (50 mm ID) with a slight negative pressure and a suction rate of 50 m^3/h or more.

We also recommend installing a high capacity purifier (Thermo Electron Bremen Part No. 114 0790) to ensure a constant and affordable high quality of the He carrier gas.

7.6 GC/TC (High Temperature Conversion Interface)

Site Requirements

The GC/TC attached to a Thermo Electron, Finnigan isotope ratio mass spectrometer configured for an IRMS, requires a flat and solid table with 450 mm width x 700 mm depth, height 500 mm.

Power Requirements

The MS power consumption will increase by 0.5 kW.

Resources Requirements

He: 5.0 (99.999%)

200 bar as carrier gas

Oxygen:

CO: 4.7 (99.997%)

200 bar as standard reference gas

He: 4.6 with 2% H_2

150 bar as auxiliary gas

Hydrogen:

H_2: 6.0 (99.9999%) (- 200‰ vs. SMOW)

200 bar as standard reference gas

All gas lines should be oil free and preferably flame dried. The gas line or the gas bottles should be at a distance of 1 to 1.5 meter to the instrument.

All regulators should be oil and grease free and specified for purity gases. The supply lines should terminate with 1/8-inch male Swagelok-type connectors. Thermo Electron Bremen recommends using regulators with an outlet pressure range from 0 to 5 bar (0 to 73 psi).

The compressed air will be supplied from the MS compressed air distributor, and should be in the range of 40 to 70 psi.

Sometimes it may be necessary to check the unit for leaks, therefore please provide a bottle of argon.

It is strongly recommended to install the gas cylinders firmly.

Because CO and/or H_2 are used, a gas detector with an alarm function has to be installed in the laboratory, use an exhaust line (50 mm ID) with a slight under pressure and a suction rate of 50 m^3/h or more.

We also recommend installing a high capacity purifier (Thermo Electron Bremen Part No. 114 0790) to ensure a constant and affordable high quality of the He carrier gas.

7.7 GasBench II

Site Requirements

The GasBench II attaches to Thermo Electron, Finnigan isotope ratio mass spectrometers configured for an IRMS, and will be placed on top of the instrument or on a peripherals support table. Required space is 900 mm width x 900 mm depth.

Power Requirements

The GasBench II will be supplied from the MS line distributor. Therefore, the total MS power consumption will increase by 0.5 kW.

Resources Requirements

He: 5.0 (99.999%)

200 bar as carrier gas

He: 4.6 with 0.3% CO_2 4.5

150 bar for acceptance tests

a. For H_2O Equilibration

Oxygen: He 4.6 with 0.3-1% CO_2 4.5

150 bar as auxiliary gas

CO_2: 4.5 (99.995%)

60 bar as standard reference gas

Hydrogen:He: 4.6 with 2% H_2

150 bar as auxiliary gas

H_2: 4.5 (99.995%)

200 bar as standard reference gas

b. For Carbonates

CO_2: 4.5 (99.995%)

60 bar as standard reference gas

c. For DIC (Dissolved Inorganic Carbon)

CO_2: 4.5 (99.995%)

60 bar as standard reference gas

All gas lines should be oil free and preferably flame dried. The gas lines or the gas bottles should be at a distance of 1 to 1.5 meter to the instrument.

All regulators should be oil and grease free and specified for purity gases. The supply lines should terminate with 1/8-inch male Swagelok-type connectors. Thermo Electron Bremen recommends using regulators with an outlet pressure range from 0 to 5 bar (0 to 73 psi).

The compressed air will be supplied from the MS compressed air distributor, and should be in the range of 40 to 70 psi.

Sometimes it may be necessary to check the unit for leaks, therefore please provide a bottle of argon.

We also recommend installing a high capacity purifier (Thermo Electron Bremen Part No. 114 0790) to ensure a constant and affordable high quality of the He carrier gas.

7.8 Kiel II Carbonate Device

Site Requirements

The Kiel II Carbonate Device attaches to Thermo Electron, Finnigan isotope ratio mass spectrometers equipped with a dual inlet system. Required space is 900 mm width x 900 mm depth, height 1900 mm. Its weight is approximately 100 kg (220 lb.).

Power Requirements

The Kiel II Carbonate Device will be supplied from the MS line distributor. Therefore, the total MS power consumption will increase by 1.2 kW.

Resources Requirements

He or N_2

200 bar as sample vial vent gas.

For the LN2 cooled trap provide approximately 0.5 liter LN2 per sample.

All gas lines should be oil free and preferably flame dried. The gas lines or the gas bottles should be at a distance of 1 to 1.5 meter to the instrument.

All regulators should be oil and grease free and specified for purity gases. The supply lines should terminate with 1/8-inch male Swagelok-type connectors. Thermo Electron Bremen recommends using regulators with an outlet pressure range from 0 to 5 bar (0 to 73 psi).

The compressed air will be supplied from the MS compressed air distributor, and should be in the range of 40 to 70 psi. Sometimes it may be necessary to check the unit for leaks, therefore please provide a bottle of argon.

Chapter 8
Instrument Arrival

When your lab site preparation is completed, the Thermo Finnigan DELTA^{plus}XP Installation Request Form has been mailed or faxed to your Thermo Electron office, 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 manual. Telephone and fax numbers for Thermo Electron offices are listed in the **Read This First** chapter of this manual and immediately following the Installation Request Form.

DELTA^{plus}XP instruments are transported either by carriers who specialize in the handling of delicate machinery, or for long distance shipment by airfreight. Occasionally, however, equipment inadvertently does get damaged in transit.

Please take the following precautions when receiving material:

- Check carefully for obvious damage or evidence of rough handling.
- If external damage is apparent, take photographs, 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 appropriate local Thermo Electron office to report the damage and – please – let the Thermo Electron people check for further damage.

> **Note.** Freight insurance requires that obvious damage be noted on the receiving documents. Thermo Electron 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 Thermo Electron Office. Telephone and fax numbers for the offices are listed in the **Read This First** chapter of this manual.

Transportation Risk

Transportation risk depends on the terms of delivery agreed. The terms of shipment determine who has responsibility for filing a claim against the carrier if the system is damaged in transit.

Chapter 9
Installation

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

When your lab site preparation is completed, the Finnigan DELTA^{plus}XP Installation Request Form has been mailed or faxed to your local office for Thermo Electron Bremen 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 offices for Thermo Electron Bremen products are listed in the **Read This First** chapter of this guide and immediately following the Installation Request Form.

More information on each of the requirements is available under the following topics:

- Preinstallation Survey
- Installation
- Advanced Training Courses
- Preventive Maintenance

9.1 Preinstallation Survey

Verify that your lab meets the following list of preinstallation requirements before your instrument is installed. Use the DELTA^{plus}XP Installation Request Form at the front of this booklet to check off each item as it is completed or verified.

1. All laboratory remodeling has been completed.
2. Your DELTA^{plus}XP is on site.
3. Key operator will be available during the installation / certification period.
4. Doorways, hallways, etc. are a minimum width of 90 cm (36 in.). Please note width of laboratory entrance: _____
5. Available floor area is sufficient and flooring will support the load.
6. Lighting is adequate.
7. Main power is installed and is in compliance with local electrical codes.
8. Power for test and cleaning equipment is installed.
9. Power outlets are of the correct configuration.
10. Voltage of power outlet has been measured. Please note measured voltage: _____
11. Power is free from fluctuations due to slow changes in the average voltage or changes due to surges, sags, or transients.
12. Air conditioning is adequate for temperature, humidity, and particulate matter control. The laboratory can be maintained at a constant temperature, between 18 and 28 °C (65 and 82 °F).
13. Relative humidity is between 20% and 70% with no condensation.
14. System work area is free from magnetic disruption and electrostatic discharge.
15. A compressed air supply is connected to the instrument.
16. All gases required for the peripheral options are on site. Gas lines are installed, and appropriate gas regulators are available. List gases and purity:_____
17. There is a suitable exhaust system.
18. One voice telephone line is installed near the system.
19. All relevant safety regulations are complied with.

9.2 Installation

The DELTA^{plus}XP is shipped in several boxes. The largest of them have the approx. dimensions of 108 cm × 124 cm × 112 cm, 73 × 83 × 90 cm and 120 × 80 × 137 cm ($l \times w \times h$). The box with the maximum weight has 396 kg.

> **Note.** The DELTA^{plus}XP comes on wheels, which can be extended. Nevertheless, a forklift and / or a palette-jack will be of great benefit for unpacking and in-house transportation of the instrument components.

Unpacking the System

It is the policy of Thermo Electron that the customer should not unpack the system or accessory items prior to installation of the system.

Two exceptions to this policy are as follows:

- You are encouraged to locate the Operating Manuals and to begin to become familiar with the operation of the instrument.
- Where buck / boost transformers or power conditioning units are supplied, it is the customers responsibility to have these units installed by an electrician prior to instrument installation.

Installing the System

When your new DELTA^{plus}XP system is on site, 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.** Consumables sent with the system are intended for use by the service engineer during the installation. It is the responsibility of the customer to replace any consumables used during the installation.

Key Operator

Experience has shown that the maximum benefit can be derived from a scientific instrument if there is one person, a key operator, who has major responsibility for that instrument. It is recommended that you designate a key

operator to oversee the operation and maintenance of the system in your laboratory. He/she will also be the key figure in the communication between your laboratory and Thermo Electron.

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

9.3 Advanced Training Courses

Thermo Electron provides both introductory and advanced training courses in analytical techniques, together with specialized operation and maintenance courses for Thermo Electron products.

It is also recommended that some months after your DELTA^{plus}XP system has been installed, the key operator receives an advanced training for the operation and maintenance of the system from Thermo Electron. After this training, the key operator can conduct an in-house training program on your site for your own people and certify others to operate the instrument.

For information concerning course schedules and fees, please contact the following address or your local Thermo Electron office:

Thermo Electron (Bremen) GmbH
Finnigan Advanced Mass Spectrometry
Barkhausenstr. 2
D-28197 Bremen

Germany

Attn. Mrs. Susanne Tobin

Phone: +49 (0) 421 - 54 93 325
Fax: +49 (0) 421 - 54 93 426
E-mail: training@thermo-bremen.com

9.4 Preventive Maintenance

Routine and preventive maintenance of DELTA^{plus}XP MS detector and data system is in the user's responsibility. Included in this category is exchange of pump oil, replacement of filters, etc. on a regular basis. Please refer also to the manufacturers manuals delivered with the instrument (especially for the maintenance of mechanical pumps and turbopumps).

Regular preventative maintenance is essential. Regular preventive maintenance will increase the life of the system, result in maximum uptime of your system, and provide you with optimum system performance. Maintenance techniques are covered in the following manuals:

- Finnigan DELTA^{plus}XP Operating Manual
- Manuals that come with your DELTA^{plus}XP computer and other modules of your system

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