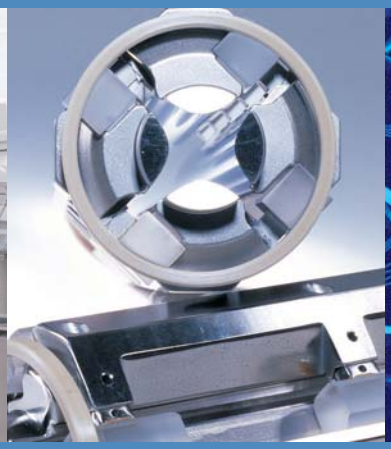
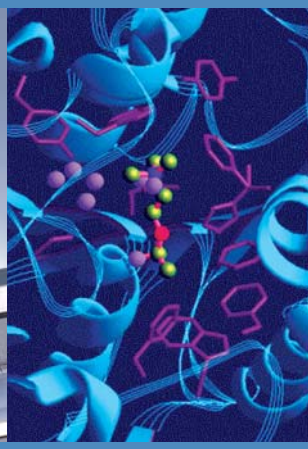
DELTA V Advantage
DELTA V Plus
Preinstallation Requirements Guide

Revision B - 118 5800

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System Configurations and Specifications supersede all previous information and are subject to change without notice.

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DELTA V Advantage/DELTA V Plus Preinstallation Checklist

Circle "Yes" or "No" as to whether the site meets the requirements as specified in this Pre-installation Guide. Provide the additional information where requested.

1: **Yes** **No** All laboratory remodeling has been completed and the space available is sufficient to meet the minimum requirements for the configuration ordered. The floor is certified to meet the load requirements of the system (approximately 300 kg or 660 lb) and is free from abnormal vibrations? Reference section: page 2-4.

2. **Yes** **No** The laboratory can be maintained at a constant temperature, 18-28°C? Drift must be less than 1°C per hour. Reference section: page 2-6.

3. **Yes** **No** Relative humidity is between 20% and 70%, without condensation? Reference section: page 2-6.

4. **Yes** **No** Is the system work area ifree from magnetic disruption and electrostatic discharge? Reference section: page 2-6.

5. **Yes** **No** Has a suitable exhaust system been installed for the rotary vane pumps? Reference section: page 2-7.

6. **Yes** **No** If applicable, there is a suitable exhaust system mounted above ConFlo and/or GC/C if CO and/or H_2 is to be analyzed? Reference section: pages 5-3 and 5-5.

7. **Yes** **No** There is a CO monitor installed if CO is to be analyzed? Reference section: page 5-5.

8. **Yes** **No** All relevant local safety regulations have been met and the equipment installation will not affect compliance?

9. **Yes** **No** Is a working mains supply including a 3-phase CEE-type socket (3*16 A; 3*230 V) available?

10. **Yes** **No** Has a transformer, power conditioner or UPS been purchased, delivered and installed? Reference section: pages 3-1 and 3-2.

Yes **No** Has the electrical power been measured? Reference section: pages 3-1 and 3-2.

Note voltages: _____ Volts AC phase 1 to ground at output of transformer.
Note voltages: _____ Volts AC phase 2 to ground at output of transformer.
Note voltages: _____ Volts AC phase 3 to ground at output of transformer.
Note voltages: _____ Volts AC neutral to ground at output of transformer.

11. **Yes** **No** A minimum of 5 bar (73 psi) compressed air is available for the instrument?

12. **Yes** **No** The required gases are on-site with gas lines installed and appropriate regulators available? Reference section: pages 4-1 and 4-2.

List gases and purity: _____

13. **Yes** **No** Have any special acceptance specifications been agreed within the contract?
If **YES**, attach full details of specifications.

14. **Yes** **No** Is there any additional equipment that needs to be interfaced to the system?
If **YES**, supply details.

15. **Yes** **No** There is a functional telephone close to the system? Phone number: _____

16. **Yes** **No** Your system has been delivered and is either in the laboratory or can be delivered immediately on the arrival of the installation engineer?

17. **Yes** **No** The entrance to the laboratory and the route from the loading dock are at least 87 cm (35 in) wide with additional space at corners? Reference section: page 2-3.

18. **Yes** **No** The principal operator will be available during the installation period and the person with the authority to accept the instrument at the end of the installation will also be available to sign the required acceptance document? Provide names and phone numbers of these individuals:

_____

I, the undersigned, confirm that the site requirements as stated above have been accomplished and the laboratory is prepared for the installation of the Thermo Electron DELTA V Advantage/DELTA V Plus. *I understand that I may be liable for a Field Service Representatives' travel or lodging expense if they are unable to carry out the installation on the pre-scheduled date due to insufficient lab preparation. If circumstance warrants, Thermo Electron will make every effort to reschedule an installation as soon as possible with the next available representative.*

Signed: _____

Print Name: _____

Company Name: _____

Date: _____ Phone: _____

Fax to: Attn: Local Service Manager

Note: After we receive this checklist, your local Field Service Representative will contact you to schedule installation.

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ES-28108 Alcobendas (Madrid)
Phone.....[34] (091) 657 4930
Fax .....[34] (091) 657 4937

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

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Europe - Continued

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ES-08038 Barcelona
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Fax.....[34] (093) 223 0982

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Fax.....[81] (45) 453-9110

P.R. China

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No. 23, Jin Rong Street
Xi Cheng District
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 Electron (Bremen) GmbH

Adresse des Herstellers:
manufacturers address
indirizzo produttore

Hanna-Kunath-Strasse 11
28199 Bremen
Germany

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

Delta V

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 class B

EMV (Störfestigkeit):
EMC (immunity)
EMC (immunità)

EN 61000-3-2, -3; EN 61000-4-2, -3, -4, -5, -6, -11; EN 61000-6-2; 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 EMC directive 89/336/EEC and Low Voltage Directive 73/23/EEC.
Questo produtto rispetta la direttiva 89/336/EEC e la direttiva 73/23/EEC.

Bremen, Germany, 23. März 2005

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Technischer Leiter:
Operations Manager
Direttore fabrizione

ppa. H. Schröder

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 Electron (Bremen) GmbH

Adresse des Herstellers:
manufacturers address
indirizzo produttore

Hanna-Kunath-Strasse 11
28199 Bremen
Germany

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

Delta V plus

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 class B

EMV (Störfestigkeit):
EMC (immunity)
EMC (immunità)

EN 61000-3-2, -3; EN 61000-4-2, -3, -4, -5, -6, -11; EN 61000-6-2; 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 EMC directive 89/336/EEC and Low Voltage Directive 73/23/EEC.
Questo produtto rispetta la direttiva 89/336/EEC e la direttiva 73/23/EEC.

Bremen, Germany, 23. März 2005

Technischer Leiter:
Operations Manager
Direttore fabrizione

Thermo
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ppa. H. Schröder

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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 DELTA V Advantage/DELTA V Plus system! The DELTA V Advantage/DELTA V Plus is a member of the family of mass spectrometer (MS) detectors.

This DELTA V Advantage/DELTA V Plus 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 DELTA V Advantage/DELTA V Plus 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 Requirements" gives details on the physical, electrical, gas, and air conditioning requirements and other laboratory requirements for the IRMS detector and data system.
- Chapter 3: "Electrical Power" describes details on the electrical outlets, power conditioning devices and power supplies required to properly install your system.
- Chapter 4: "Resources Requirements" provides information on the gases, cryogens, solvents and solvent modifiers require to install and operate your system.
- Chapter 5: "Options" describes the requirements for the peripheral options of your DELTA V Advantage/DELTA V Plus.
- Chapter 6: "Instrument Arrival" provides information on insurance claims and on domestic and international shipments.

Changes to the Manual

To suggest changes to this manual, please send your comments to:

Thermo Electron (Bremen) GmbH
Product Marketing
Advanced Mass Spectrometry
Hanna-Kunath-Str. 11

D-28199 Bremen

Germany

documentation@thermo-bremen.com

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

Typographical Conventions

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

- Data input
- Admonitions
- 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 identified by quotation marks: single quotes for single characters, double quotes for strings.
- 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. For example, "click on **Close**".

Admonitions

Admonitions contain information that is important, but not part of the main flow of text.

Admonitions 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 Name

The following headings appear in the left column of each page:

Second Level Topics

Third Level Topics

Fourth Level Topics

Contents

Figures

Figures

Tables

Chapter 1 Introduction

Your DELTA V Advantage/DELTA V Plus instrument is on its way!

The information in this Preinstallation Requirements Guide will help you to prepare a proper site for the installation of your DELTA V Advantage/DELTA V Plus IRMS 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. Refer to"Read This First" on page i-i.

Note 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.

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

Note All specified values in this Preinstallation Requirements Guide may change according to law and quality standards. ▲

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 V Advantage/DELTA V Plus system has been installed, the key operator gets an advanced training for 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, contact the following address or your local Thermo Electron office:

Thermo Electron (Bremen) GmbH
Advanced Mass Spectrometry
Hanna-Kunath-Str. 11
28199 Bremen

Germany

Marketing Assistant

Phone: +49 (0) 421 - 54 93 367
Fax: +49 (0) 421 - 54 93 426
E-mail: training@thermo-bremen.com

Preventive Maintenance

Routine and preventive maintenance of DELTA V Advantage/ DELTA V Plus IRMS 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. Refer also to the manufacturer's manuals delivered with the instrument (especially for maintenance of mechanical pumps and turbopumps).

Regular preventative maintenance is essential. It 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:

- DELTA V Advantage/DELTA V Plus Operating Manual
- Manuals coming with your DELTA V Advantage/DELTA V Plus computer and other modules of your system

Chapter 2 Site Requirements

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

Unpacking and Installing 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 the following ones:

- You are encouraged to locate the Operating Manual 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.

Note DELTA V Advantage/DELTA V Plus 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's components. ▲

When your DELTA V Advantage/DELTA V Plus is on site and ready for installation, a Thermo Electron Service Engineer will install it. During the installation, the Service 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 as specified in the agreement.

Note Consumables sent with the system are intended for use by the Service Engineer during installation. It is the responsibility of the customer to replace any consumables used during installation. ▲

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 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 use your new system for sample analysis until installation is complete and the Acceptance Form has been signed. ▲

Hallways and 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 2-5 on page 2-5.

In addition, 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, refer to "Floor Conditions" on page 2-4.

Floor Space

The dimensions of the instrument and the minimum floor space required for its installation and operation are given in Figure 2-1 to Figure 2-4.

To ensure that operating personnel are easily able to carry out their work (e.g. at the rear panel of the IRMS) and to facilitate heat dissipation, we recommend to select room dimensions considerably larger than the minimum dimensions given in Figure 2-1 to Figure 2-4. The minimum width necessary to transport the unpacked instrument to the installation site is 0.9 m (36 in).

As the IRMS is supported with rolls, one can easily pull it out to the nearest hallway to perform the service operation there. Afterwards, simply push it back to its original place.

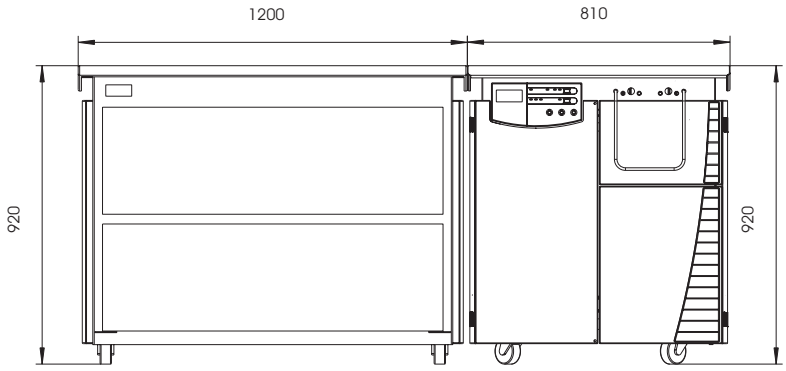


Figure 2-1. Space Requirements of IRMS and Peripherals Table - I

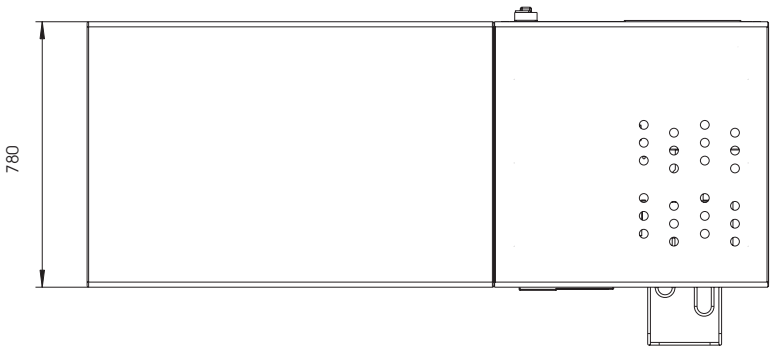


Figure 2-2. Space Requirements of IRMS and Peripherals Table - II

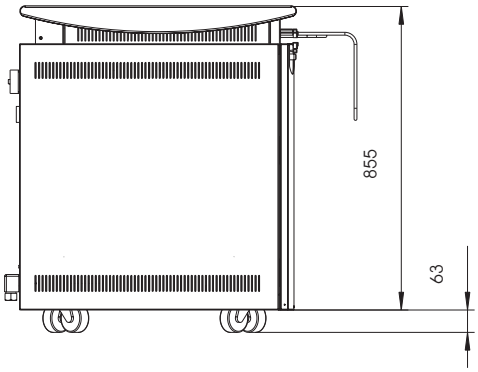


Figure 2-3. Space Requirements of IRMS - Side View I

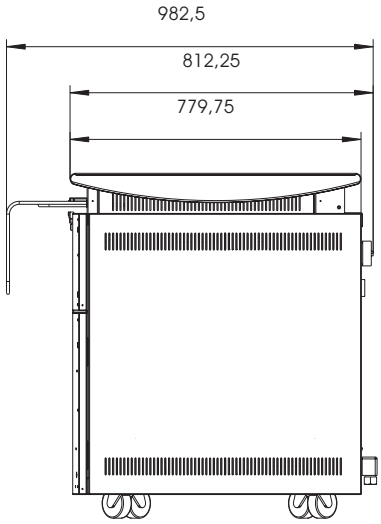


Figure 2-4. Space Requirements of IRMS - Side View II

Fiber Optics Data Cable

The fiber optics data cable connecting your computer to the fiber optics connectors at the rear panel of your IRMS is about 6 m long. This allows you to place the computer even on a desk outside the direct vicinity of the IRMS. For specific space requirements of your peripheral options, refer to "Options" on page 5-1.

Floor Conditions

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

Your DELTA V Advantage/DELTA V Plus is shipped in several boxes. The largest of them has the approximate dimensions of 120 cm*80 cm*130 cm (l*w*h). The box containing the basic unit approximately weighs 300 kg (660 lb). See Figure 2-5.

The box containing an optional Trace GC has the approximate dimensions of 112 cm*83 cm*77 cm (l*w*h). An optional HP GC is either shipped in a box of 104 cm*87 cm*71 cm (l*w*h) or in a cardboard box of 84 cm*74 cm*92 cm (l*w*h).

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.

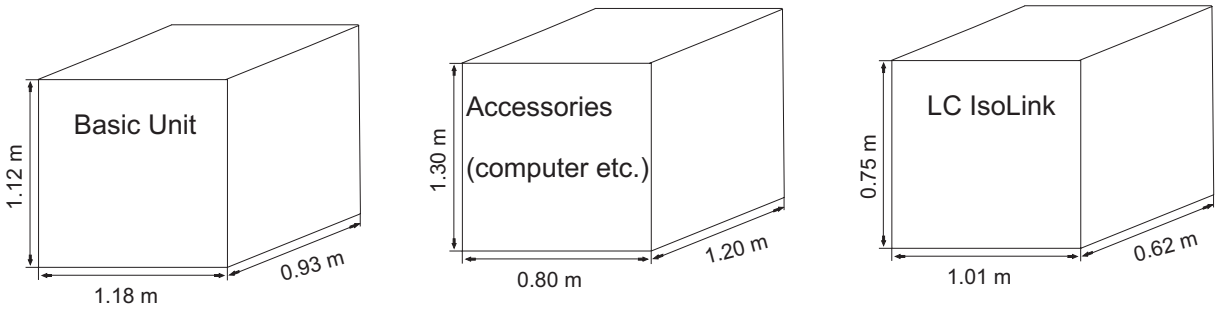


Figure 2-5. Dimensions of Packed Units*

*.LC IsoLink is an option.

Figure 2-6. DELTA V Advantage/DELTA V Plus - Front View

Environmental Requirements

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.

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 or manufacturer's Operating Manual.

Room Temperature

Laboratory temperature must be within the specified limits. Operating at temperatures above those recommended may cause premature failure of transistors and integrated circuits. The maximum permissible ambient temperature of the instrument is 28 °C (82 °F).

Note Heat dissipation of the instrument must be considered in accordance with the power requirements (also for peripherals). See "Power Consumption" on page 3-2 and "Summary of Technical Data" on page 5-1. ▲

Large temperature fluctuations, that is fluctuations caused mainly by air conditioning or draft (only secondarily by direct sunlight), should be avoided while measuring. Temperature changes greater than 1 °C/h should be avoided during measurement.

Humidity

Note 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. ▲

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

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

Air Purity

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

Air Conditioning

We recommend to install 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.

When planning air conditioning, take into consideration the heat dissipated by the instrument during normal operation. Air conditioning must be capable of maintaining a constant temperature (within operable limits) in the immediate vicinity of the instrument.

Note The considerable short-term variations in temperature caused at the air-outlet of mainly newer air conditionings are much more problematic than long-term variations. As considerable temperature differences may exist between adjacent air-conditioned rooms, never place the IRMS near to such a connecting door. The system must never be exposed to air draft! ▲

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.

Electromagnetic Fields

The instrument site must be free of interfering electromagnetic fields. The maximum 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 ▲

Chapter 3 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 at the following topics:

Electrical Power Specification

DELTA V Advantage/DELTA V Plus is designed to operate at a nominal voltage of 230 V ac; 50/60 Hz. The basic power requirements for a DELTA V Advantage/DELTA V Plus are as follows:

- Nominal voltage 230/400 V ± 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 3-1.
- Each phase is fused with 16 A.

Single-Phase Wall Outlets for Options

- nominal voltage 230 V ± 10 %; 50 or 60 Hz ac.
- fused with 10 A or 16 A

Note Four IEC power sockets (nominal voltage 230 V ac, fused with totally 10 A) plus one IEC power socket (nominal voltage 230 V ac, fused with 16 A) are installed in DELTA V Advantage/DELTA V Plus to be used to connect the peripheral options. Therefore, wall outlets are not necessary for them. See also "Power Cables, Connectors" on page 3-2. ▲

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

Power Consumption

Power consumption of DELTA V Advantage/DELTA V Plus is about 1.2 kW in normal operation. For power consumption of the installed peripherals, refer to "Options" on page 5-1.

Power Cables, Connectors

DELTA V Advantage/DELTA V Plus must have a separate "clean" line leading to a main fuse to guarantee disturbance-free operation. The length of the supplied power cable is approximately 3 m (9.8 ft).

Note Additional devices like recirculating chillers or compressors must **not** be connected to the instrument. 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. ▲

Location of Wall Outlets (Power)

The electrical wall outlet for the main power of DELTA V Advantage/DELTA V Plus should be located at the wall behind the intended location of the instrument. See "Electrical Power Specification" on page 3-2.

Location of Auxiliary Wall Outlets

At the rear panel of the IRMS, we provide five (four plus one) IEC power sockets. We recommend to use them to connect peripherals, a computer or test equipment to the IRMS. They guarantee an adequate, undisturbed power supply of the connected devices.

Therefore, in most cases, no additional single-phase 230 V ac (or 110 V ac) outlets are needed for peripherals, a computer or test equipment such as compressor or water chillers, etc.

Note If nevertheless single-phase auxiliary wall outlets are necessary, they should use the same ground as power line of the instrument. ▲

Power Quality

The power quality supplied to your DELTA V Advantage/DELTA V Plus is very important and must be established in your laboratory prior to installing it. The line voltage must be stable and within the specifications listed in this Preinstallation Requirements Guide. It must be free of fluctuations due to slow changes in the average voltage, surges, sags, or transients:

- Constant high or elevated line voltage, impulses or voltage surges can cause overheating and component failures.
- Constant low or too low line voltage or voltage sags 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.

In addition, the voltage between ground and neutral should not exceed 1 V. See Figure 3-1. Notice the definitions for the most common voltage disturbances below:

- 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.

Dysfunctional power 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.

Power Monitoring Devices

Line regulation equipment may be purchased from Thermo Electron or from an appropriate vendor. A 24-hour power supply is necessary to assure proper instrument function.

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 h 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 3-5. If necessary, your local Thermo Electron office can assist in interpretation of the results and recommend appropriate corrective measures.

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, 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 at 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. ▲

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.

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

Delta-to-Y Conversion Transformer

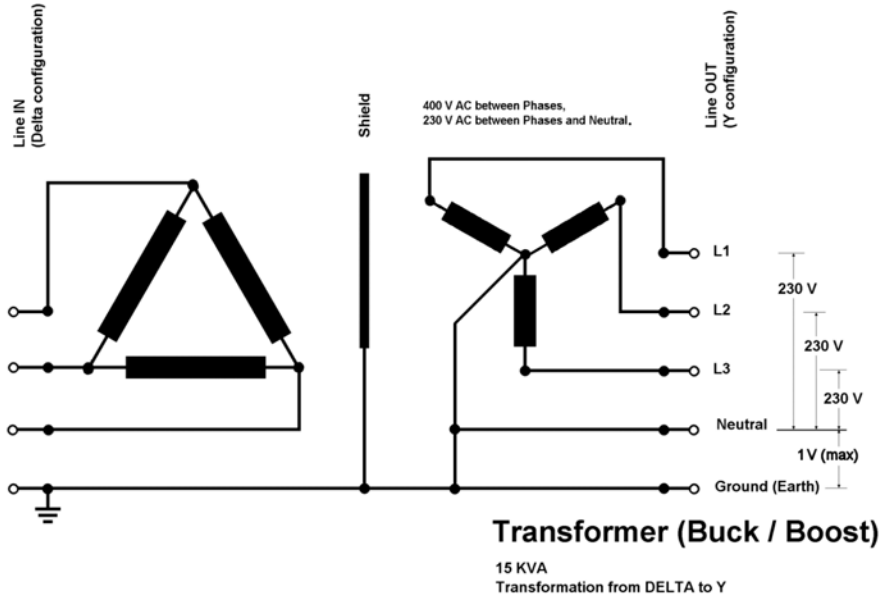


Figure 3-1. Δ-to-Y Conversion

Note In Y configuration, the nominal voltage of 230 V ac must be measured phase to ground. Between the phases, 400 V ac is measured. ▲

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

Chapter 4 Resources Requirements

Note As the user, it is your responsibility to provide correct gas, cryogen and solvent supplies for the operation of your system. ▲

Your instrument could require 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

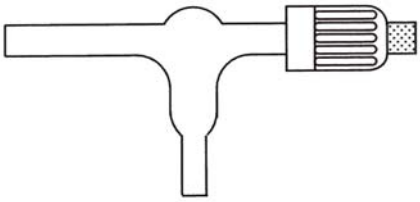
A bottle of argon is required for leak checking. 99.5 % welding argon is sufficient. Additional gases (defined in "Gases for Specification Measurements" on page 4-3) are required for normal operation, if the instrument is connected to a GC or to an elemental analyzer.

Cleaning Agents

We recommend to have available methanol and distilled water as cleaning agents.

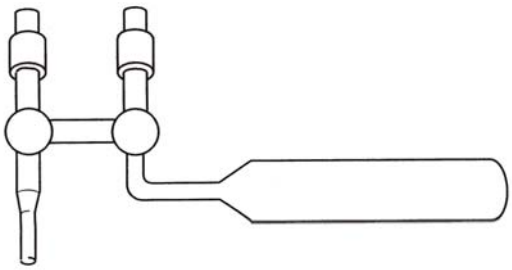
Requirements for Basic Instrument Setup

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 V Advantage/DELTA V Plus inlet system terminates in 1/4" Swagelok connectors. Two standard taper 14/23 male connectors are also provided. Suitable sample vials can be procured from Thermo Electron Bremen.



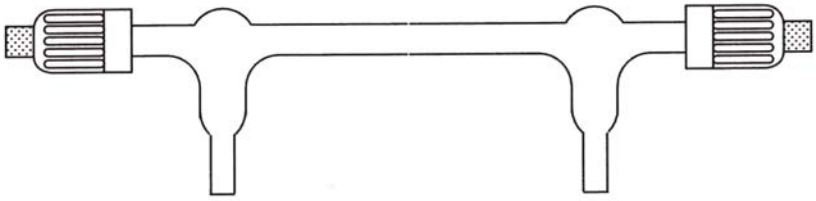
Reference Gas Vial with one Valve and 1/4 " Fitting, ~ 5 ml
Part No. 100 3560

Figure 4-1. Reference Gas Vial I



Reference Gas Vial with two Viton Valves and 1/4 " Fitting, 200 ml
Part No. 025 4650

Figure 4-2. Reference Gas Vial II



Reference Gas Vial with two Valves (Two Ports) and 1/4 " Fitting, ~ 10 ml
Part No. 100 3840

Figure 4-3. Reference Gas Vial III

Gases for Specification Measurements

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

Compressed Air

Compressed air with a pressure of 5 bar (73 psi) is required to operate the pneumatic valves of the instrument. A suitable compressor can be ordered from Thermo Electron Bremen with 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 V Advantage/ DELTA V Plus via the provided PVC tube 6×1 mm.

Cryogenic Coolants

Some DELTA V Advantage/DELTA V Plus options require liquid nitrogen. A suitable stainless steel dewar (either 25 l or 75 l) can be procured from Thermo Electron Bremen.

Chapter 5 Options

Information on the requirements for the peripheral options of the DELTA V Advantage/DELTA V Plus is available at the following topics:

PreCon

PreCon interface is attached to any Thermo Electron isotope ratio mass spectrometer configured for a GC/IRMS interface, either GC-Combustion interface or GC/GP interface.

Site Requirements

In case of GC/GP interface, the required space is approximately 900 mm width*700 mm depth.

In case of GC/Combustion interface, a second table of 250 mm width*700 mm depth is required.

Power Requirements

PreCon will be supplied by the IRMS line distributor. Therefore, the power consumption of the IRMS will increase by 0.5 kW.

Resources Requirements

Table 5-1. Gas Requirements for PreCon Interface

Gas	Purity	Comment
He	5.0, that is 99.999 %	200 bar as carrier gas
CO_2	4.5, that is 99.995 %	60 bar as reference gas

For the LN2-cooled trap provide approximately 3 l 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 m to 1.5 m to the instrument.

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

For the GC separation of gases, provide an appropriately fused silica capillary column (plot fused silica coating Poraplot Q; length of 25 m and ID of 32 mm), e.g. Thermo Electron Bremen with Part No. 017 1911.

Compressed air will be supplied by the compressed air distributor of the IRMS and should be in the range between 40 and 70 psi.

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

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

GC/C III

Site Requirements

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

Power Requirements

GC/C III will be supplied by the IRMS line distributor. Therefore, the power consumption of the IRMS will increase by 2.5 kW.

Resources Requirements

Table 5-2. Gas Requirements for GC/C III*

Gas	Purity	Comment
He	5.0, that is 99.999 %	200 bar as carrier gas
CO_2	4.5, that is 99.995 %	60 bar as reference gas
N_2	5.0, that is 99.999 %	200 bar as reference gas
O_2	4.6, that is 99.996 %	60 bar as reference gas

*.H_2 and synthetic or water- and oil-free compressed air if 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 m to 1.5 m to the instrument.

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

Compressed air will be supplied by the compressed air distributor of the IRMS and should be in the range between 40 and 70 psi.

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

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

Equilibration Unit

Site Requirements

The required space for the equilibration unit and the cooling unit is 1400 mm width*700 mm.

Power Requirements

The equilibration unit will be supplied by the IRMS line distributor. Therefore, the power consumption of the IRMS will increase by 2 kW.

Resources Requirements

Table 5-3. Gas Requirements for Equilibration Unit

Gas	Purity	Comment
H_2	4.5, that is 99.995 %	200 bar as equilibrium; consumption: 1 tank per year
CO_2	4.5, that is 99.995 %	60 bar as equilibrium; consumption: 1 tank per year

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

All regulators should be oil- and grease-free and specified for gases of high purity. The supply lines should terminate with 1/8“ male Swagelok-type connectors. Thermo Electron Bremen recommends to use regulators with an outlet pressure range between 0 and 5 bar (0 and 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 (-94 °F).

Compressed air will be supplied by the compressed air distributor of the IRMS and should be in the range between 40 and 70 psi.

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

ConFlo III and Elemental Analyzer

Site Requirements

ConFlo lll is small enough to be put on top of the IRMS or the elemental analyzer.

The elemental analyzer requires a peripherals support table of 900 mm width*700 mm depth.

Power Requirements

The elemental analyzer will be supplied by the IRMS line distributor. Therefore, the power consumption of the IRMS will increase by 2 kW.

Resources Requirements

Table 5-4. Gas Requirements for ConFlo III and Elemental Analyzer

Gas	Purity	Comment
He	5.0, that is 99.999 %	200 bar as carrier gas and make up gas
N_2	5.0, that is 99.999 %	200 bar as reference gas
CO_2	4.5, that is 99.995 %	60 bar as reference gas
CO	4.7, that is 99.997 %	200 bar as reference gas
H_2	5.0, that is 99.999 %	200 bar as reference gas
O_2^*	4.5, that is 99.995 %	200 bar for sample oxidation
SO_2^{**}	3.8, that is 99.98 %	4 bar as reference gas

*.for the Elemental Analyzer

**.if a sulfur kit is ordered

Use an exhaust line (50 mm ID) with a slight negative 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 m to 1.5 m to the instrument.

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

Compressed air will be supplied by the compressed air distributor of the IRMS and should be in the range between 40 and 70 psi.

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

Warning If ConFlo III is used for CO and/or H_2 measurements, a gas detector with an alarm function must 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 to install a high capacity purifier (Thermo Electron Bremen Part No. 114 0790) to ensure a constant and affordable high quality of the He carrier gas.

TC/EA

Site Requirements

TC/EA (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

TC/EA will be supplied by the IRMS line distributor. Therefore, the power consumption of the IRMS will increase by 1.5 kW.

Resources Requirements

Table 5-5. Gas Requirements for TC/EA

Gas	Purity	Comment
He (in general)	5.0, that is 99.999 %	200 bar as carrier gas
CO (for oxgen measurement)	4.7, that is 99.997 %	200 bar as reference gas
He (for oxygen measurement)	4.6, that is 99.996 % with 2 % H_2	150 bar as auxiliary gas
H_2 (for hydrogen measurement)	6.0, that is 99.9999 % -200 ‰ vs. SMOW	200 bar as 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 m to 1.5 m to the instrument.

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

Compressed air will be supplied by the compressed air distributor of the IRMS and should be in the range between 40 and 70 psi.

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

Warning It is strongly recommended to install the gas tanks firmly! ▲

Warning Because CO and/or H_2 are used, a gas detector with an alarm function must 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 to install a high capacity purifier (Thermo Electron Bremen Part No. 114 0790) to ensure a constant and affordable high quality of the He carrier gas.

GC/TC

Site Requirements

GC/TC (High Temperature Conversion Interface) attached to a Thermo Electron isotope ratio mass spectrometer requires a flat and solid table with 450 mm width*700 mm depth, height 500 mm.

Power Requirements

The power consumption of the IRMS will increase by 0.5 kW.

Resources Requirements

Table 5-6. Gas Requirements for GC/TC

Gas	Purity	Comment
He (in general)	5.0, that is 99.999 %	200 bar as carrier gas
CO (for oxygen measurement)	4.7, that is 99.997 %	200 bar as reference gas
He (for oxygen measurement)	4.6, that is 99.996 % with 2 % H_2	150 bar as auxiliary gas
H_2 (for hydrogen measurement)	6.0, that is 99.9999 % - 200 ‰ vs. SMOW	200 bar as standard 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 m to 1.5 m to the instrument.

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

Compressed air will be supplied by the compressed air distributor of the IRMS and should be in the range between 40 and 70 psi.

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

Warning It is strongly recommended to install the gas tanks firmly! ▲

Warning Because CO and/or H_2 are used, a gas detector with an alarm function must 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 to install a high capacity purifier (Thermo Electron Bremen Part No. 114 0790) to ensure a constant and affordable high quality of the He carrier gas.

GasBench II

Site Requirements

GasBench II is attached to Thermo Electron isotope ratio mass spectrometers and placed on top of the instrument or on a peripherals support table. Required space is 900 mm width*900 mm depth.

Power Requirements

GasBench II will be supplied by the IRMS line distributor. Therefore, the power consumption of the IRMS will increase by 0.5 kW.

Resources Requirements

Table 5-7. Helium Requirements for GasBench II

Gas	Purity	Comment
He (as carrier gas)	5.0, that is 99.999 %	200 bar as carrier gas
He (for acceptance tests)	4.6, that is 99.996 % with 0.3 % CO_2 4.5	150 bar for acceptance tests

For H_2O Equilibration

Table 5-8. Gas Requirements for H_2O Equilibration

Gas	Purity	Comment
He (in general)	4.6, that is 99.996 % with 0.3-1 % CO_2 4.5	150 bar as auxiliary gas
CO_2	4.5, that is 99.995 %	60 bar as reference gas
He (for hydrogen measurement)	4.6, that is 99.996 % with 2 % H_2	150 bar as auxiliary gas
H_2 (for hydrogen measurement)	4.5, that is 99.995 %	200 bar as reference gas

For Carbonates

Table 5-9. CO_2 Requirements for Measurement of Carbonates

Gas	Purity	Comment
CO_2	4.5, that is 99.995 %	60 bar as reference gas

For DIC (Dissolved Inorganic Carbon)

Table 5-10. CO_2 Requirements for Measurement of DIC

Gas	Purity	Comment
CO_2	4.5, that is 99.995 %	60 bar as 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 m to 1.5 m to the instrument.

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

Compressed air will be supplied by the compressed air distributor of the IRMS and should be in the range between 40 and 70 psi.

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

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

Kiel Carbonate IV Device

Kiel Carbonate IV Device is attached to Thermo Electron isotope ratio mass spectrometers equipped with a Dual Inlet system.

Site Requirements

The space required is 900 mm width*900 mm depth. Its height is 1900 mm and it weighs approximately 100 kg (220 lb).

Power Requirements

Kiel Carbonate IV Device will be supplied by the IRMS line distributor. The power consumption of the IRMS will increase by 1.2 kW.

Resources Requirements

Table 5-11. Gas Requirements for Kiel Carbonate IV Device

Gas	Purity	Comment
He		200 bar as sample vial vent gas
N_2		200 bar as sample vial vent gas

For the LN2-cooled trap provide approximately 0.5 l 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 m to 1.5 m to the instrument.

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

Compressed air will be supplied by the compressed air distributor of the IRMS and should be in the range between 40 and 70 psi. Sometimes it may be necessary to check the unit for leaks. Therefore, provide a bottle of argon.

Chapter 6 Instrument Arrival

When your lab site preparation is completed and the system has been delivered, call your local Thermo Electron service organization to arrange for an installation date. Telephone and fax numbers for Thermo Electron offices are listed in the beginning of this Preinstallation Requirements Guide.

Possible Damage during Transport

DELTA V Advantage/DELTA V Plus instruments are transported either by carriers specialized in handling delicate machinery, or for long distance shipment by airfreight. Occasionally however, equipment inadvertently may be damaged in transit.

Take the following precautions when receiving material:

- Carefully check 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 briefly describe 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 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 of the offices are listed in the beginning of this Preinstallation Requirements Guide.

Transportation Risk

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

Glossary

The following abbreviations are used in this and other manuals.

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

***.fasta* file** extension of a SEQUEST search database file

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 (1 048 576 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

V volt

V ac volts alternating current

V dc volts direct current

vol volume

w width

W watt

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