Thermo Fisher Scientific

ELEMENT2/ELEMENT XR

Preinstallation Requirements Guide

Revision E - 1184360

ThermoFisher SCIENTIFIC

Release History: Revision A released in December 2004.
Revision B released in January 2005.
Revision C released in April 2005.
Revision D released in February 2009.
Revision E released in August 2009.

Übereinstimmungserklärung gemäß ISO/IEC 17050-1:2004

Declaration of conformity according to ISO/IEC 17050-1:2004
Dichiarazione di conformità alla ISO/IEC 17050-1:2004

Name des Herstellers:
manufacturers name
nome produttore

Thermo Fisher Scientific

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

ELEMENT 2

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, 2. März 2007

ThermoFisher
SCIENTIFIC

Technischer Leiter:
Director of Operations
Direttore fabrizione

Jörg Behrens

(Jörg Behrens)

Übereinstimmungserklärung gemäß ISO/IEC 17050-1:2004

Declaration of conformity according to ISO/IEC 17050-1:2004
Dichiarazione di conformità alla ISO/IEC 17050-1:2004

Name des Herstellers: manufacturers name nome produttore	Thermo Fisher Scientific
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

ELEMENT XR

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, 2. März 2007

ThermoFisher
SCIENTIFIC

Technischer Leiter:
Director of Operations
Direttore fabrizione

Jörg Behrens

(Jörg Behrens)

ELEMENT2/ELEMENT XR Installation Request Form

Please refer to the ELEMENT2 / ELEMENT XR Preinstallation Requirements Guide (P/N 1184360) for the complete site requirements. Circle "Yes" or "No" as to whether the site meets the requirements as specified in the Preinstallation Guide. Provide the additional information

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? Refer to topic "Space and Load Requirements" on page 2-3.

2: **Yes** **No** Your ELEMENT2/ELEMENT XR instrument has been delivered and is either in the laboratory or can be delivered immediately on the arrival of the installation engineer?

3: **Yes** **No** The key operator will be available during the installation period. Refer to topic "Key Operator" on page 6-3. 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?
Please provide the names of these individuals: _____

4: **Yes** **No** The entrance to the laboratory and the route from the loading dock are at least 90 cm (36 in) wide with additional space at corners? Refer to topic "Entrance Requirements" on page 2-2.

5. **Yes** **No** Laboratory entrance is at a minimum height of 145 cm. Note height of laboratory entrance: _____

6. **Yes** **No** Laboratory ceiling in the region of the magnet is at a minimum height of 275 cm, refer to topic "Placing the MS System" on page 2-3. Note height of laboratory ceiling: _____

7: **Yes** **No** Lighting is adequate?

8: **Yes** **No** Floor vibrations and electromagnetic interferences are below the specified levels? Refer to topic "Vibration" on page 3-3.

9: **Yes** **No** Main power is installed and in compliance with local electrical codes?

10: **Yes** **No** The power outlets are of the correct configuration? Refer to topic "Electrical Power" on page 4-2.

11: **Yes** **No** The electrical power has been measured?
Please note voltages:_____Volts ac input to ground.
Please note voltages:_____Volts neutral to ground.
Please note voltages:_____Volts ac input to neutral.

12: **Yes** **No** Power is free from fluctuations due to slow changes in the average voltage or changes due to surges, sags, or transients?

13: **Yes** **No** Air conditioning is adequate for temperature, humidity, and particulate matter control? The laboratory can be maintained at a constant temperature, between 18 and 24 °C (~64 and 75 °F)? Refer to topic "Temperature" on page 3-2.

14: **Yes** **No** The relative humidity is between 50% and 60%, with no condensation? Refer to topic "Humidity" on page 3-2.

15: **Yes** **No** The system work area is free from magnetic disruption and electrostatic discharge? Refer to topic "Electrostatic Discharge" on page 3-5.

16: **Yes** **No** All gases required are on site, gas lines are installed, and appropriate gas regulators are available? Refer to topic "Argon Supply" on page 3-7. List gases and purity:_____

17: **Yes** **No** Is there is a suitable exhaust system present? Refer to topic "Exhaust System" on page 3-6.

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

19: **Yes** **No** All relevant local safety regulations have been met and the equipment installed will not affect compliance?

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

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

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 Scientific, ELEMENT2/ELEMENT XR instrument. I understand that I may be liable for a Field Service Representatives' travel or lodging expenses if they are unable to carry out the installation on the pre-scheduled date due to insufficient lab preparation. If circumstances warrants, Thermo Fisher Scientific will make every effort to reschedule an installation as soon as possible with the next available representative.

Signed: _____ Print Name: _____
Company name: _____ E-mail: _____
Date: _____ Phone: _____

Fax to: Attn: Local Service Engineer

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

Blank

Offices for Thermo Scientific Products

North America

Northeastern Region

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

Southern Region

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

Central Region

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

Western Region

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

Canada

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

Europe

Austria

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

Belgium

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

Denmark

Fruebjergvej 3
DK-2100 København, Denmark
Phone ..... [45] (0) 70 23 62 60 (sales)
[45] (0) 70 23 62 67 (service)
Fax ..... [45] (0) 70 23 62 63

France

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

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

Germany

Im Steingrund 4–6
63303 Dreieich, Germany
Phone ..... [49] (06103) 408 0
Fax ..... [49] (06103) 408 1222

Italy

Strada Rivoltana
20090 Rodano (Milano), Italy
Phone ..... [39] (02) 95 059 1
Fax ..... [39] (02) 95 059 219

Netherlands

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

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

Offices for Thermo Scientific Products - Continued

Europe - Continued

Spain

Valportillo I, 22 1ª Planta, Edificio Caoba
28108 Alcobendas (Madrid), Spain
Phone ..... [34] (091) 4 845 965
Fax ..... [34] (091) 4 843 597

Spain

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

Sweden / Norway / Finland

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

United Kingdom

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

Australia and Asia

Australia

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

Japan

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

Japan

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

P.R. China

Room 912-916, Ping-an Mansion
No. 23, Jin Rong Street
Xi Cheng District
Beijing 100032
Phone ..... [86] (010) 6621 0839
Fax ..... [86] (010) 6621 0851

P.R. China

23/F Peregrine Plaza
1325 Middle Huaihai Rd.
Shanghai 200031, P.R.China
Phone ..... [86] (21) 5465-7588 ext 212
Fax ..... [86] (21) 6445-7830

ThermoFisher
SCIENTIFIC

WEEE Compliance

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC. It is marked with the following symbol:

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

WEEE Konformität

Dieses Produkt muss die EU Waste Electrical & Electronic Equipment (WEEE) Richtlinie 2002/96/EC erfüllen. Das Produkt ist durch folgendes Symbol gekennzeichnet:

Thermo Fisher Scientific hat Vereinbarungen getroffen mit Verwertungs-/Entsorgungsanlagen in allen EU-Mitgliederstaaten und dieses Produkt muss durch diese Firmen wiederverwertet oder entsorgt werden. Mehr Informationen über die Einhaltung dieser Anweisungen durch Thermo Fisher Scientific, die Verwerter und Hinweise die Ihnen nützlich sein können, die Thermo Fisher Scientific Produkte zu identifizieren, die unter diese RoHS Anweisung fallen, finden Sie unter www.thermo.com/WEEERoHS.

ThermoFisher
SCIENTIFIC

Conformité DEEE

Ce produit doit être conforme à la directive européenne (2002/96/EC) des Déchets d'Equipements Electriques et Electroniques (DEEE). Il est marqué par le symbole suivant:

Thermo Fisher Scientific s'est associé avec une ou plusieurs compagnies de recyclage dans chaque état membre de l'union européenne et ce produit devrait être collecté ou recyclé par celles-ci. Davantage d'informations sur la conformité de Thermo Fisher Scientific à ces directives, les recycleurs dans votre pays et les informations sur les produits Thermo Fisher Scientific qui peuvent aider la détection des substances sujettes à la directive RoHS sont disponibles sur www.thermo.com/WEEERoHS.

Read This First

Welcome to the Thermo Scientific, ELEMENT2 system! The ELEMENT2 and the ELEMENT XR are a members of the Thermo Scientific family of advanced mass spectrometer (MS) detectors.

About This Guide

This *ELEMENT2 / ELEMENT XR Preinstallation Requirements Guide* provides information to assist in planning and preparing your lab site for the system prior to delivery and installation. Read each section carefully to be sure that your laboratory is ready for the installation of your system.

Who Uses This Guide

This *ELEMENT2 / ELEMENT XR Preinstallation Requirements Guide* is intended primarily for those who are responsible for the site planning of a laboratory in preparation for the installation of a new instrument. This guide should be retained for future guidance if your instrument needs to be relocated in future.

Scope of This Guide

The *ELEMENT2 / ELEMENT XR Preinstallation Requirements Guide* includes the following chapters:

- Chapter 1: "Introduction" describes the purchaser's responsibilities for installation and maintenance of the system.
- Chapter 2: "Site Preparation" gives details on the physical, electrical, gas, and air conditioning requirements and other laboratory requirements for the MS detector and data system.
- Chapter 3: "Operating Environment" provides additional information about how to prepare your laboratory to provide optimum conditions for instrument operation.
- Chapter 4: "Line Power" gives details on the electrical outlets, power conditioning devices and power supplies required to properly install your system.

- Chapter 5: "Instrument Arrival" provides information on insurance claims and on domestic and international shipments.

- Chapter 6: "Installation" provides details on the final preparations necessary before the arrival of the Service Engineer for installation of the system.

Related Documentation

In addition to this guide, Thermo Fisher Scientific provides the following documents for ELEMENT2/ELEMENT XR:

- *ELEMENT2 / ELEMENT XR Operating Manual*

- *ELEMENT2 / ELEMENT XR Hardware Manual*

You can access PDF files of the documents listed above from the data system computer.

Contacting Us

There are several ways to contact Thermo Fisher Scientific.

Assistance

For technical support and ordering information, **visit us on the Web**:

www.thermo.com/advancedms

Customer Information Service

cis.thermo-bremen.com is the Customer Information Service site aimed at providing instant access to

- latest software updates
- manuals, application reports, and brochures.

Note Thermo Fisher Scientific recommends that you register with the site as early as possible. ▲

To register, visit register.thermo-bremen.com/form/cis and fill in the registration form. Once your registration has been finalized, you will receive confirmation by e-mail.

Changes to the Manual

To suggest changes to this manual, please send your comments (in German or English) to:

Editors, Technical Documentation
Thermo Fisher Scientific
Hanna-Kunath-Str. 11

28199 Bremen

Germany

documentation.bremen@thermofisher.com

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

Typographical Conventions

This section describes typographical conventions that have been established for Thermo Fisher Scientific manuals.

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**".

Topic Headings

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

Chapter 1 Chapter Name

Second Level Topics

Third Level Topics

Fourth Level Topics

Safety and EMC Information

In accordance with our commitment to customer service and safety, this instrument has satisfied the requirements for the European CE Mark including the Low Voltage Directive.

Designed, manufactured and tested in an ISO9001 registered facility, this instrument has been shipped to you from our manufacturing facility in a safe condition.

Note Read and understand the various precautionary notes, signs, and symbols contained inside this manual pertaining to the safe use and operation of this product before using the device. ▲

Notice on Lifting and Handling of Thermo Scientific Instruments

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

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

Safety and Special Notices

Make sure you follow the precautionary statements presented in this guide. The safety and other special notices appear different from the main flow of text. Safety and special notices include the following:

Warning Warnings highlight hazards to human beings. Each Warning is accompanied by a Warning symbol. ▲

Caution Cautions highlight information necessary to protect your instrument from damage. ▲

Note Notes highlight information that can affect the quality of your data. In addition, notes often contain information that you might need if you are having trouble. ▲

Identifying Safety Information

This guide contains precautionary statements that can prevent personal injury, instrument damage, and loss of data if properly followed. Warning symbols alert the user to check for hazardous conditions. These appear throughout the manual, where applicable. The most common warning symbols are:

Warning This general symbol indicates that a hazard is present that could result in injuries if it is not avoided.
The source of danger is described in the accompanying text. ▲

Warning High Voltages capable of causing personal injury are used in the instrument. The instrument must be shut down and disconnected from line power before service is performed. Do not operate the instrument with the top cover off. Do not remove protective covers from PCBs. ▲

Warning Treat heated zones with respect. Parts of the instrument might be very hot and might cause severe burns if touched. Allow hot components to cool before servicing them. ▲

Warning Wear gloves when handling toxic, carcinogenic, mutagenic, or corrosive/irritant chemicals. Use approved containers and procedures for disposal of waste solution. ▲

In addition to the above described, every instrument has specific hazards. So, be sure to read and comply with the precautions described in the subsequent chapters of this guide. They will help ensure the safe, long-term use of your system.

Blank

Contents

Chapter 1 Introduction 1-1

Chapter 2 Site Preparation 2-1

Entrance Requirements 2-2
Space and Load Requirements 2-3
Load 2-3
Placing the MS System 2-3
Telephone 2-5

Chapter 3 Operating Environment 3-1

Temperature 3-2
Air Conditioning 3-2
Humidity 3-2
Vibration 3-3
Electromagnetic Fields 3-3
Lighting 3-3
Particulate Matter 3-3
Radio Frequencies 3-4
Electrostatic Discharge 3-5
Exhaust System 3-6
Exhaust Port 3-6
Argon Supply 3-7
Cooling System 3-8
Cooling Water 3-8
Technical Data Recirculating Chiller 3-9
Overview Connections 3-9

Chapter 4 Line Power 4-1

Electrical Power 4-2
Delta-To-Y Conversion Transformer 4-2
Average Power Consumption 4-3
Power Cables 4-3
Location of Wall Outlets 4-4
Quality of Power 4-5
Power Monitoring 4-6
Renting Line Monitors 4-6
Power Conditioning Devices 4-7
Uninterruptible Power Supply 4-7
Technical Assistance 4-8

Chapter 5 Instrument Arrival 5-1
Transportation Risk 5-2

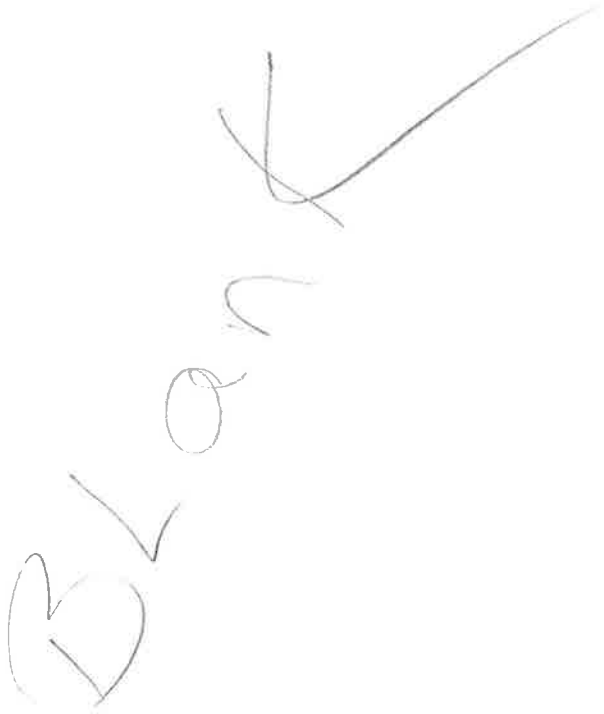
Chapter 6 Installation 6-1
Preparing the Installation 6-2
Unpacking the System 6-2
Installing the System 6-2
Key Operator 6-3
Advanced Training Courses 6-4
Preventive Maintenance 6-4

Glossary G-1

Index I-1

Figures

Footprint of the ELEMENT2/ELEMENT XR 2-3
Example of a typical ELEMENT2 installation 2-4
Cooling circuit with recirculating water chiller 3-8
Recommended location of gas, water, exhaust lines (top view) 3-9
Delta-to-Y conversion 4-2
Recommended location of wall outlets 4-4


BLANK

Tables

Packing information of a typical ELEMENT2/ELEMENT XR system . 2-2
Average power consumption 4-3

Blank

Chapter 1 Introduction

Information in this guidebook will help you to prepare a suitable site for installation of your system. The ELEMENT2/ELEMENT XR detectors are designed to operate reliably under carefully controlled environmental conditions.

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

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

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

Chapter 2 Site Preparation

Before your instrument can be installed by the service engineer, the site must be prepared. The hallways and doors must be wide enough to allow passage of the instrument. A telephone must be installed within reach of the workbench.

Note It is your responsibility as the user to provide a suitable location, a source of power of acceptable quality, a suitable operating environment, and a proper exhaust system. ▲

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

- "Entrance Requirements" on page 2-2
- "Space and Load Requirements" on page 2-3
- "Telephone" on page 2-5

Entrance Requirements

To move the instrument parts into the laboratory, the whole way from the loading dock to the desired laboratory place (including the entrance to your facility, the widths of hallways, doors, elevators, etc) should be wide enough for the instrument parts.

Note In general, uncrating will be done by the service engineer during installation. Do not remove the instrument from its shipping container unless authorized by Thermo Fisher Scientific personnel. Be sure that all the contents of the container remain with the instrument. ▲

In addition, consider additional room to allow manoeuvring of items around corners and through doors. Elevators and hallways should be able to take the load.

The ELEMENT2 and ELEMENT XR basic units are shipped in a container. Other modules such as the magnet, the data system and accessories are shipped in separate containers. For dimensions and weights see Table 2-1.

Table 2-1. Packing information of a typical ELEMENT2/ELEMENT XR system*

Module	Weight Gross/ Net [kg]	Dimensions W x L x H [cm]
Basic unit	723 / 533	114 x 203 x 168
Magnet	158 / 118	77 x 58 x 65
Auxiliary box†	201 / 121	80 x 122 x 102
Total weight	**1082 / 792**	

*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 shown in the table.

†The weight and the dimensions of the auxiliary box may change depending on the equipment (e.g. optional water chiller) ordered.

Space and Load Requirements

Load

The floor of your laboratory should be able to carry the weight of the installed instrument with data system of about 745 kg (~1656 lb).

The floor of the laboratory should be able to accommodate the weight of the instrument including all components and any options that are added to the system.

Placing the MS System

The footprint of the ELEMENT2/ELEMENT XR is shown in Figure 2-1. Both instruments have the following dimensions (H x W x L): 1410 x 1740 x 880 mm.

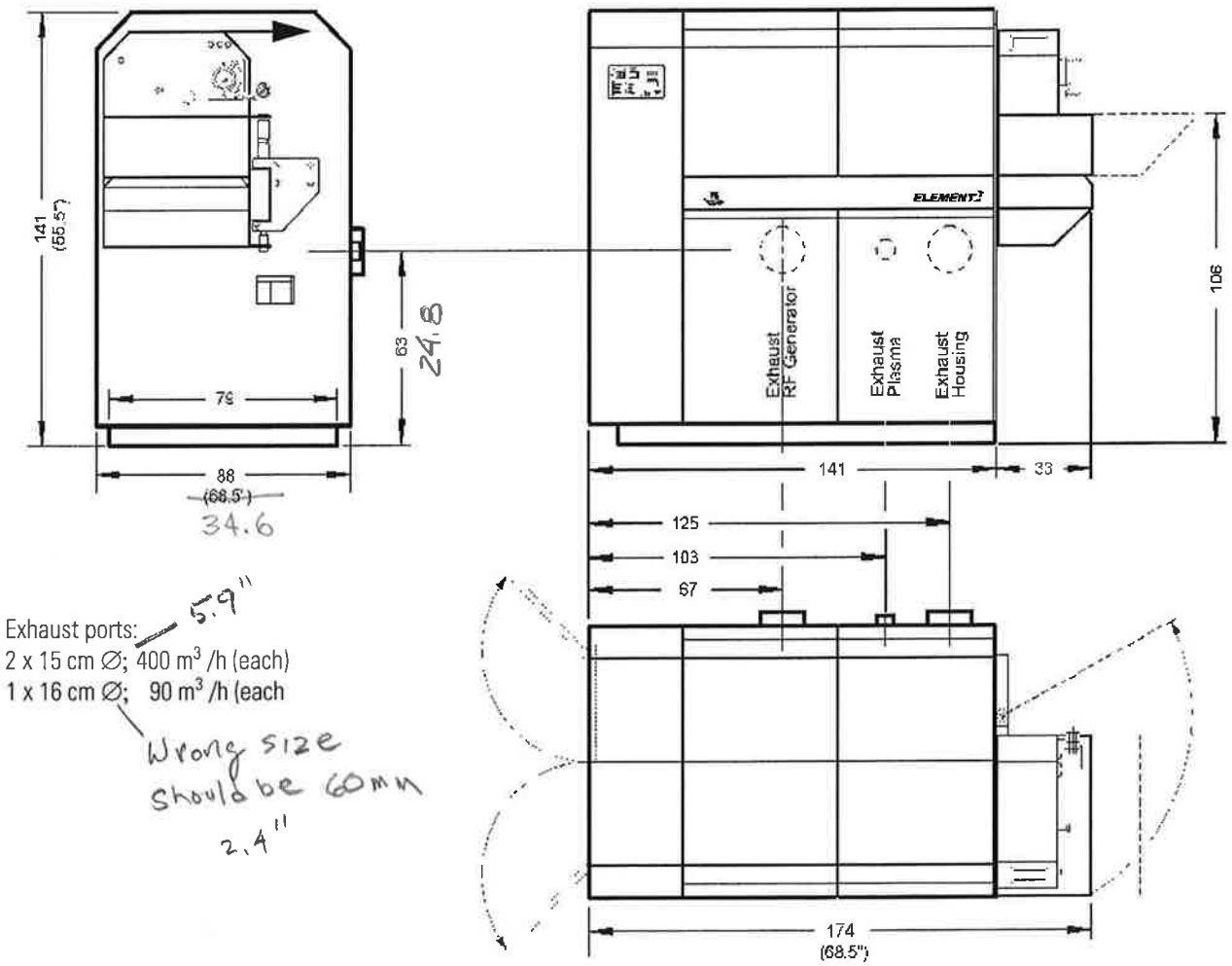


Figure 2-1. Footprint of the ELEMENT2/ELEMENT XR

Allow at least 80 cm (~2.6 ft) of clear space behind the system for proper air circulation and for clearance of the gas lines and electrical connections. This also facilitates 'heat dissipation.

Note During installation, the magnet is lifted onto the table with a crane. Therefore, a ceiling height of 2.75 m (~9 ft) is required to allow enough room for the crane. ▲

For information on the minimum floor area for the system (excluding options), see Figure 2-2.

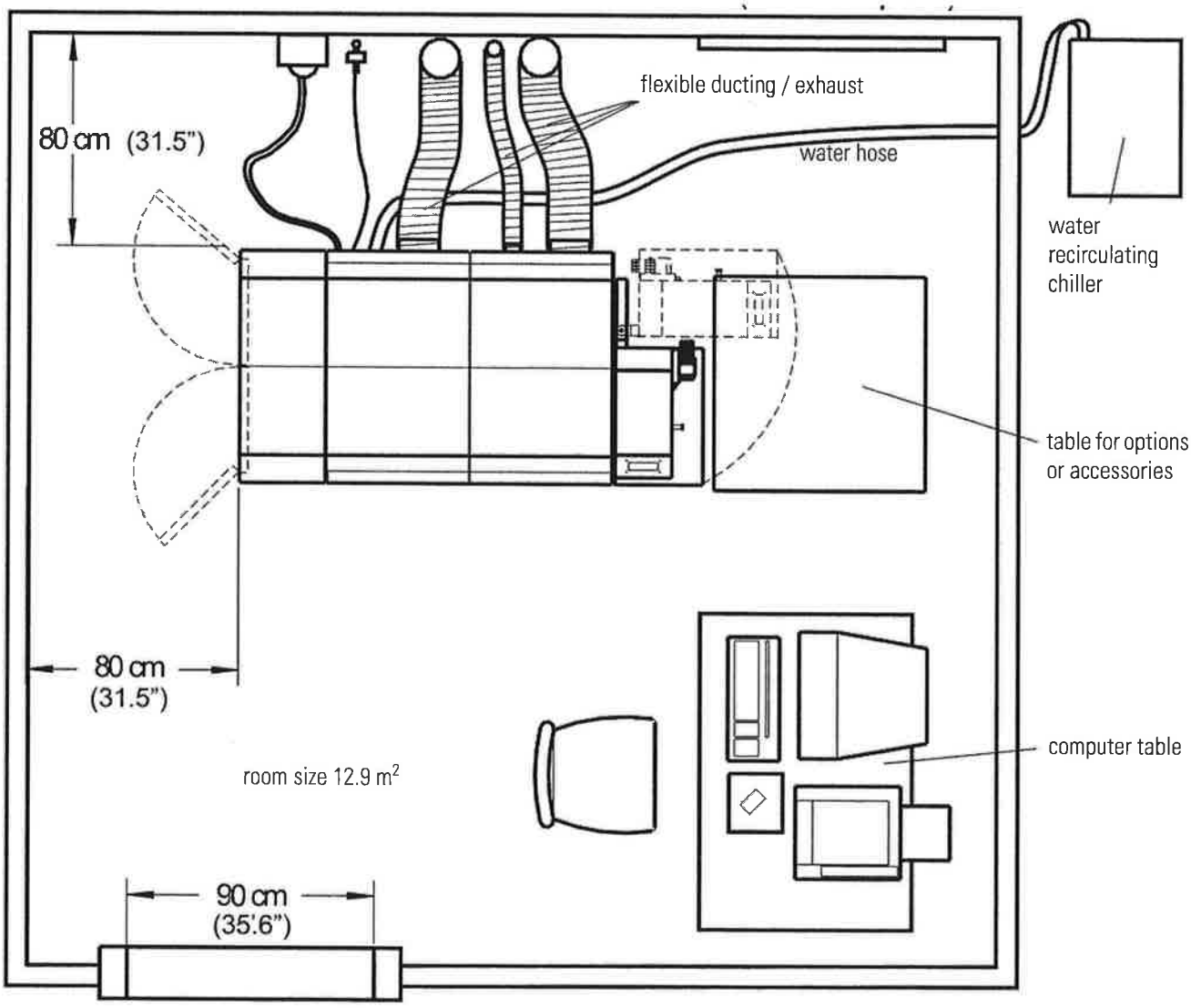


Figure 2-2. Example of a typical ELEMENT2 installation

Note The maximum distance of the optional water recirculating chiller to the instrument is 20 m (at a slope of 0%). ▲

Telephone

It is recommended to install a telephone line in your laboratory near the instrument so, if necessary, you can conveniently operate the system while you are on the phone to a Thermo Fisher Scientific Customer Service Engineer.

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

Blank

Chapter 3 Operating Environment

Attention to the operating environment will insure continued high performance of your ELEMENT2/ELEMENT XR system. Any expenditures for air conditioning are more than offset by good sample throughput and reduced repair costs. The air conditioning must be capable of maintaining a constant temperature in the immediate vicinity of the system without producing excessive draft.

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

Operating environment includes the following:

- "Temperature" on page 3-2
- "Humidity" on page 3-2
- "Vibration" on page 3-3
- "Lighting" on page 3-3
- "Particulate Matter" on page 3-3
- "Radio Frequencies" on page 3-4
- "Electrostatic Discharge" on page 3-5
- "Exhaust System" on page 3-6
- "Argon Supply" on page 3-7
- "Cooling System" on page 3-8

Temperature

The laboratory room temperature must be maintained between 18 °C and 24 °C (64 °F and 75 °F).

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

The average power dissipation of the mass spectrometer during analysis is approx. 4 kW (3.8 BTU/s); other heat sources have to be added (e.g. water recirculating chiller with approx. 2 kW(1.9 BTU/s)).

Air Conditioning

There must be a good flow of room air around the system, and the air conditioning system must be capable of maintaining a constant temperature (within the temperature specification given above) in the immediate vicinity of the system without producing excessive draft.

As a rule of thumb, the basic load for the air conditioning in a room containing one instrument is approx. 6 kW (5.7 BTU/s).

Thermo Fisher Scientific recommends the installation of an air conditioner, if the specified limits will be exceeded due to unfavorable climatic conditions. Thermo Fisher Scientific recommends a stability of the room temperature of <2 °C/h (<3.6 °F/h) during analyses.

Do not locate the ELEMENT2 instrument under an air duct, near windows, or near heating and cooling sources. Temperature fluctuations of 1°C or more over a 10 min. period of time can affect performance. ▲

Humidity

The relative humidity of the operating environment must be between 50 and 60%, with no condensation and non-corrosive atmosphere. It is recommended that your laboratory be equipped with a temperature/humidity monitor to insure that your laboratory is always within the required temperature and humidity specifications.

Caution Operating an ELEMENT2/ELEMENT XR system at very low humidity might cause the accumulation and discharge of static electricity, which can shorten the life of electronic components. Operating the system at high humidity might cause condensation, oxidation, and short circuits, and will also block the filters on the cooling fans. ▲

Vibration

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

The maximum 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.

Note Sources of disturbing fields[1] are for example: other analytical instruments (for example NMR systems or Zeeman AAS); train, tram, subway; power cables crossing the ceiling; large electric motors (elevators), radio stations nearby or cell phones. ▲

Lighting

Good lighting makes any work area more enjoyable. 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, high-intensity lamp is recommended for cleaning MS detector components, source inspection, and manipulation of small components.

Particulate Matter

The air in your laboratory must not have excessive dust, smoke, or other particulate matter. For reference, the air should contain fewer than 3500000 particles per cubic meter (100000 particles per cubic foot) in excess of 5 µm.

Dust can clog the air filters, causing a reduction in air flow around electronic components. Dust will also form a layer on electronic components that will act as an insulating blanket and thus reduce the transfer of heat from the components to the surrounding air.

Particulate matter may contaminate the samples and the ion source and may limit the background level of the instrument.

[1]The ELEMENT2 and the ELEMENT XR comply with with EMC specification given in EN 50082-2, see also the Declaration of Conformity at the beginning of this guide.

Radio Frequencies

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

Electrostatic Discharge

Electrostatic discharge (ESD) can damage the electronic components of your system. Thermo Scientific instruments are designed to withstand electrostatic discharges (ESD) up to 4 kV (air discharge) and 4 kV (contact discharge) with all panels in place. However, if the panels are removed and the PCBs are handled without proper precautions, the electronic components might be damaged or fail prematurely. Static electricity can develop in a variety of ways. A few examples of how electrostatic charge can develop are as follows:

- When walking across a carpet in a room that is at 20% relative humidity, as much as 35000 V of electrostatic potential can be generated on the surface of your body. This same motion in a room at 80% relative humidity generates about 1500 V of electrostatic potential.

- Sitting and working in a chair padded with polyurethane foam in a room at 20% relative humidity can cause as much as 18000 V of electrostatic potential to develop on your skin or 1500 V at 80% relative humidity.

- Working in laboratory coats and clothing made of synthetic fibers can cause the accumulation of static electricity on your skin.

- Styrofoam cups and packing materials typically have a considerable electrostatic charge on them.

The discharge of static electricity is not perceptible to a human being until the potential is at least 4000 V. Many electronic components can be damaged by a discharge of electrostatic potential of as little as 50 V. ESD damage can be catastrophic causing your system to cease functioning. More commonly, however, ESD damage might cause latent problems that are detrimental to sensitive electrical components, causing premature failures. Therefore, Thermo Fisher Scientific recommends the following precautions, especially when you are operating your system at the lower end of the relative humidity specification listed above:

- Use a static-dissipating floor covering (such as tile or conductive linoleum) in the room that houses your instrument.

- Use laboratory chairs covered with natural fiber or other static dissipating material.

- When operating the instrument, wear laboratory coats and clothing made of natural fiber or other static-dissipating material.

- Do not place Styrofoam cups or packing materials on the instrument.

Exhaust System

The exhaust system for the ELEMENT2/ELEMENT XR must be able to remove 890 m^3 of air in total.

Note Active draft is required for all three exhaust connections. ▲

The ELEMENT2 and ELEMENT XR have three different exhaust circuits:

- Source enclosure: 90 m^3/h (adjustable)

Warning Gases removed from the source enclosure might contain toxic substances. They must be removed from the laboratory. ▲

- RF generator exhaust only 400 m^3/h, warm air from RF generator
- Housing exhaust: 400 m^3/h, warm air from roughing pumps and electronics

Exhaust Port

- The port for Exhaust 1 (source enclosure) is 60 mm inside diameter (ID); it must be possible to adjust the draft (e.g. via a butterfly valve)
- The port for Exhaust 2 (RF generator) and the port for Exhaust 3 ((pumps, electronics) are 150 mm ID.

For the location of the exhaust port, see Figure 2-2.

Note Make sure the exhaust lines can be closed if the ELEMENT2/ELEMENT XR is switched off. ▲

Argon Supply

The argon supply for the ELEMENT2/ELEMENT XR should meet the following requirements:

- Purity required: 99.996% (industrial grade)
- Supply rate: ~20 L/min
- Pressure: 8-10 bar (116-145 psi)

The tubing for the argon connection is delivered with the instrument: 3 m (10 ft.) Polyurethane (PU) tubing, ID 4 mm, OD 6 mm.

All argon lines in the laboratory should be free of oil and preferable flame dried. The argon supplies should be mounted at the wall behind the instrument.

For the recommended location of the argon port, see Figure 3-2.

Warning Gas bottles should not be stored where they can damage cables or gas lines. They should be secured in accordance with standard safety practices. ▲

Cooling System

The turbo pump, the magnet, the ICP interface, and the torch box and the load coil are water-cooled.

To make the mass spectrometer independent of any inhouse cooling water supply, a closed loop cooling system is recommended.

A suitable water chiller is available from Thermo Fisher Scientific.

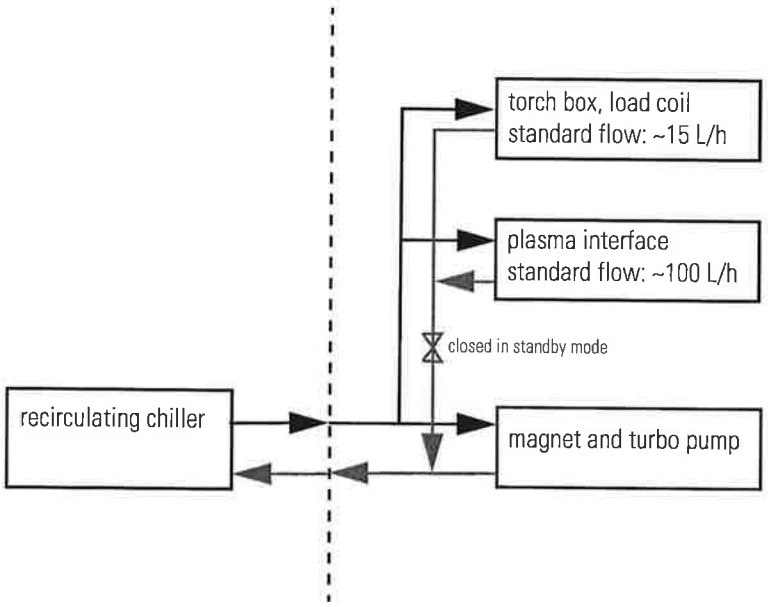


Figure 3-1. Cooling circuit with recirculating water chiller

Cooling Water

The cooling water must meet the following requirements:

- Conductivity: < 200 µS/cm (> 1 MOhm x cm)
- Solid residual: < 0.1 mg / 100 g water

It is recommended to use distilled water rather than de-ionized water due to lower concentration of bacteria and residual organic matter.

In special cases, an in-line filter is recommended to guarantee consistent water quality.

Technical Data Recirculating Chiller

- Cooling capacity: 2.3 kW
- Water temperature: 10 - 20 °C (50 - 68 °F)
- Stability of temperature regulation: ±1 °C (±1.8 °F)
- Flow rate: 7.5 L/min at 6 bar
- Pump capacity: 4 - 6 bar (58 - 87 psi)

Two water hoses (black), ID 9 mm, wall thickness 3 mm, length approx. 3 m are delivered with the instrument.

Overview Connections

Recommended location of gas connection, water connections and exhaust lines:

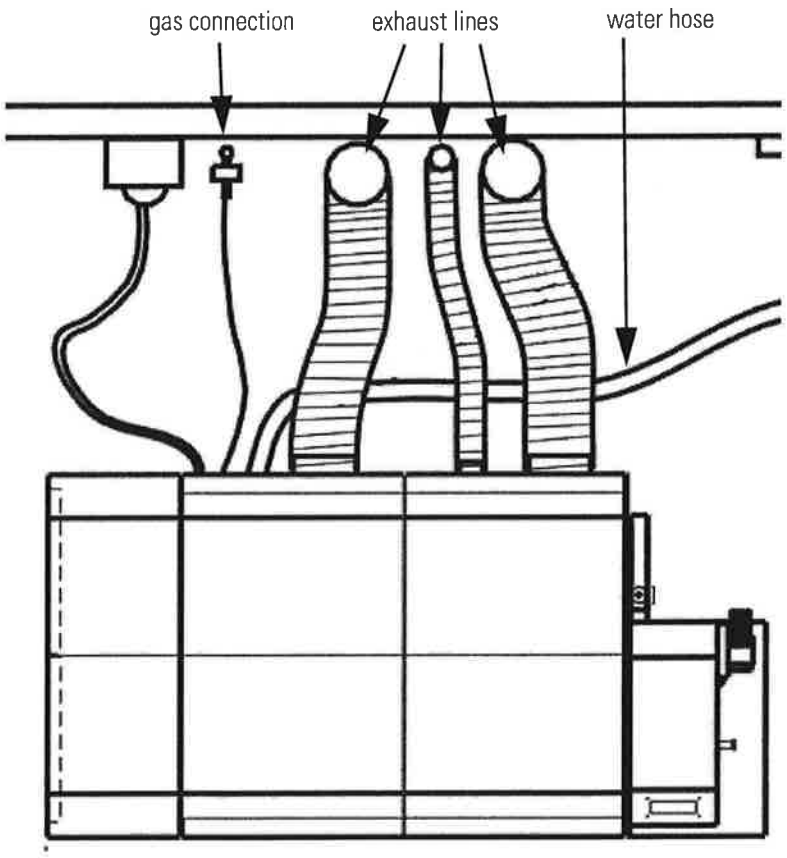


Figure 3-2. Recommended location of gas, water, exhaust lines (top view)

Blank

Chapter 4 Line Power

The performance and longevity of your system can be affected by the quality of line power delivered to the system. To ensure that your instrument performs optimally and that is not damaged by line power fluctuations verify that you comply with all power quality requirements.

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

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

- "Electrical Power" on page 4-2
- "Average Power Consumption" on page 4-3
- "Power Cables" on page 4-3
- "Quality of Power" on page 4-5
- "Power Monitoring" on page 4-6
- "Power Conditioning Devices" on page 4-7
- "Uninterruptible Power Supply" on page 4-7
- "Technical Assistance" on page 4-8

Electrical Power

The basic power requirements for the ELEMENT2/ELEMENT XR are

- Nominal voltage 230/400 Volts ±10%, 50 or 60 Hz AC
- Three-phase, 5-wire system in 'Y' configuration (neutral wire must be connected to earth)
- Following the regulation in Germany, Thermo Fisher Scientific recommends to fuse each phase with 32 Amps.

Note If the instrument is connected to an UPS unit, all chillers have to be connected to an external power line. Check with the local Thermo Fisher Scientific official that the chillers are compatible with your voltage suppliers. ▲

Note Consider other voltages (for example 110 V AC). Check with your local officials and your local Thermo Fisher Scientific dealer. ▲

Delta-To-Y Conversion Transformer

In case of an Δ (Delta) configuration at your location (ask the responsible technician), 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 Fisher Scientific.

In Y configuration, the nominal voltage of 230 V AC must be measured phase to ground; between the phases 400 V AC is measured.

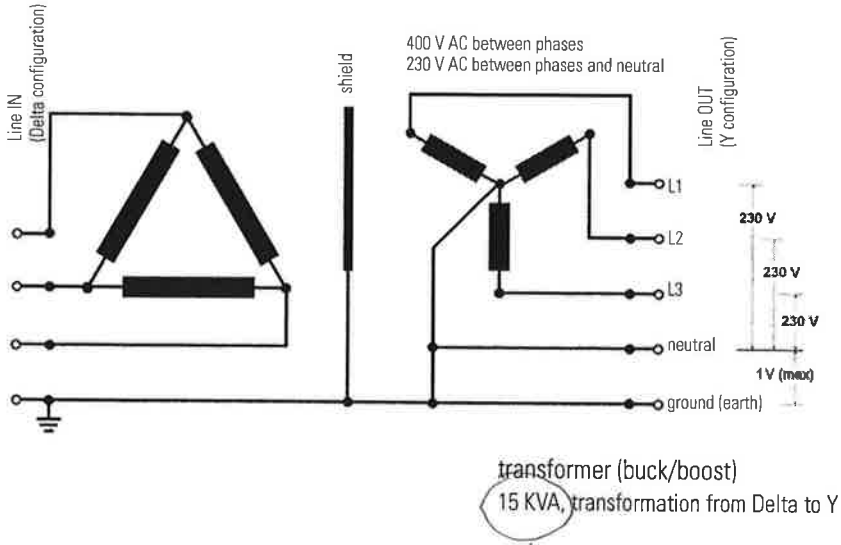


Figure 4-1. Delta-to-Y conversion

Average Power Consumption

The average power consumption of the system is listed in Table 4-1.

Table 4-1. Average power consumption

Components	power consumption
ELEMENT2/ELEMENT XR	approx. 9-12 Amps per phase
computer system	approx. 3 Amps, single phase
Options:	
2.3 kW water chiller	approx. 10 Amps, single phase
0.6 kW water chiller (spray chamber)	approx. 7 Amps, single phase
1 kW chiller for laser probe	approx. 10 Amps, single phase
laser probe	approx. 10 Amps, single phase

Power Cables

The power cable for the ELEMENT2/ELEMENT XR mass spectrometer is a 5-wire cable, length approx. 3 m (10 ft). A CECON plug, 5 poles, certified for 400 Volts, 32 Amps, is mounted to the cable.

A corresponding socket for wall mounting will be delivered together with the order acknowledgement.

Power cables and connectors for the options are standard equipment delivered by the manufacturers.

The computer and the monitor feature power lines and can be connected to the instrument as well as to a wall outlet.

Note Additional devices (like recirculating chillers) must NOT be connected to the instrument. Use a wall outlet instead. ▲

Location of Wall Outlets

The electrical wall outlets for the main power of the ELEMENT2 should be located at the wall behind the instrument.

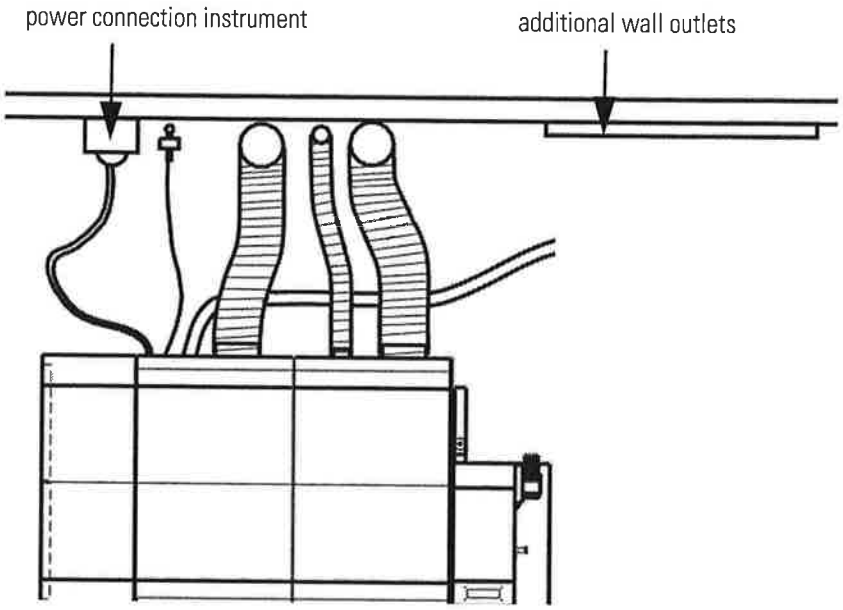


Figure 4-2. Recommended location of wall outlets

Auxiliary Wall Outlets

Additional single-phase 230 V (or 110 V) AC outlets are needed for additional parts such as water chillers. Thermo Fisher Scientific recommends at least six (6) spare 230 V (110 V) outlets behind the system and three (3) close to the sample inlet area within the your laboratory.

Note Single-phase auxiliary wall outlets should use the same ground as (for) the instrument itself. ▲

Quality of Power

The quality of power supplied to your ELEMENT2/ELEMENT XR 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.

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.

Caution 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 ELEMENT2/ELEMENT XR system is installed.

Power Monitoring

A variety of devices is 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, and
- Transients

In the first two cases, the duration as well as the amplitude of the disturbance is 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 4-8. If necessary, your local Thermo Fisher Scientific 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, then an *isolation/noise suppression transformer* should be adequate to resolve the problem.

- If there are both transient and regulation problems, then you should consider *power conditioners*, which can control both of these problems.

- 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 Fisher Scientific. 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 (for example, UL, CSA, TÜV, and VDE). ▲

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.

Note For compliance and safety, ensure that your uninterruptible power supply (UPS) devices are certified by recognized domestic and international organizations (for example, UL, CSA, TÜV, and VDE). ▲

Technical Assistance

Occasionally, Thermo Fisher Scientific 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 Fisher Scientific will attempt to assist in diagnosis, but does not undertake to isolate and correct power-supply quality problems.

Contact your Thermo Fisher Scientific 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[1] is listed below:

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

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

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

[1]Thermo Fisher Scientific does not endorse any manufacturer, nor does it endorse products other than its own. Companies and products listed in this guide are given as examples only.

Chapter 5 Instrument Arrival

When your lab site preparation is completed, the Thermo Scientific Installation Request Form has been mailed or faxed to your Thermo Fisher Scientific office, and the system is delivered, please call your Thermo Fisher Scientific office to arrange for an installation date. Refer to the "ELEMENT2/ELEMENT XR Installation Request Form"at the beginning of this guide. Telephone and fax numbers for Thermo Fisher Scientific offices are listed immediately following the Installation Request Form.

Thermo Fisher Scientific 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 Fisher Scientific office to report the damage and – please – let the Thermo Fisher Scientific people check for further damage.

Note Freight insurance requires that obvious damage be noted on the receiving documents. Thermo Fisher Scientific 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, preferably the installation site. Take the specifications described in topic "Temperature" on page 3-2 as a guideline for the temperature in the storage room. If you have questions about moving your system, contact your local Thermo Fisher Scientific Office.

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 6 Installation

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

Note If the instrument shipping container, Shock Watch, or other indicator shows any evidence of damage or mishandling during shipment, do NOT open the container. Call your Thermo Fisher Scientific representative for instructions on what to do. If the system arrives safely, proceed with the following instructions. ▲

When your lab site preparation is completed, the "ELEMENT2/ELEMENT XR Installation Request Form" has been mailed or faxed to your local office for Thermo Scientific products, and the system is delivered, please call your Thermo Fisher Scientific office to arrange for an installation date. Refer to the Installation Request form at the beginning of this guide. Telephone and fax numbers for Thermo Fisher Scientific offices are listed immediately following the Installation Request Form.

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

- "Preparing the Installation" on page 6-2
- "Advanced Training Courses" on page 6-4
- "Preventive Maintenance" on page 6-4

Preparing the Installation

This topic provides advice for preparing the installation of the instrument.

Caution Store the instrument in a protected location indoors. Take the specifications described in topic "Temperature" on page 3-2 as a guideline for the temperature in the storage room. ▲

Unpacking the System

It is the policy of Thermo Fisher Scientific 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 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 The ELEMENT2/ELEMENT XR comes on wheels, which can be extended. Nevertheless, a forklifts or a palette-jack will be of great benefit for unpacking and inhouse transportation of the instrument components. ▲

Installing the System

When your new ELEMENT2/ELEMENT XR system is on site, ready for installation, a Thermo Fisher Scientific 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. This person will also be the key figure in the communication between your laboratory and Thermo Fisher Scientific.

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

Advanced Training Courses

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

It is also recommended that some months after your ELEMENT2/ELEMENT XR system has been installed, the key operator receive an advanced training for the operation and maintenance of the system from Thermo Fisher Scientific. 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 Fisher Scientific office:

Thermo Fisher Scientific
Hanna-Kunath-Str. 11
28199 Bremen

Germany

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

Preventive Maintenance

Routine and preventive maintenance of ELEMENT2/ELEMENT XR is in the user's responsibility. Included in this category are replacement of the torch, the cones, exchange of pump oil, replacement of filters, etc. on a regular basis. 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.

Glossary

This section lists and defines terms used in this manual. It also includes acronyms, metric prefixes, symbols, and abbreviations.

A

A ampere

ac alternating current

ADC analog-to-digital converter

AP acquisition processor

ASCII American Standard Code for Information Interchange

B

b bit

B byte (8 b)

baud rate data transmission speed in events per second

C

°C degrees Celsius

cfm cubic feet per minute

CIP carriage and insurance paid to

cm centimeter

cm^3 cubic centimeter

component An identified compound in a mixture.

conversion dynode A highly polished metal surface that converts ions from the mass analyzer into secondary particles, which enter the electron multiplier.

See also electron multiplier.

CPU central processing unit (of a computer)

<Ctrl> control key on the terminal keyboard

D

d depth

Da dalton

DAC digital-to-analog converter

dc direct current

detection limit The point at which the signal and noise become statistically indistinguishable. In practice, this is often taken as the point at which the amplitude of a peak is only two to three times the amplitude of the average baseline noise.

See also sensitivity.

dilution factor A factor that specifies how much a sample was diluted during preparation. This factor is used to calculate the amount or concentration in the original (undiluted) sample.

E

EI electron ionization

electron multiplier A device used for current amplification through the secondary emission of electrons. Electron multipliers can have a discrete dynode or a continuous dynode.

See also electron multiplier voltage.

electron multiplier gain The gain of the electron multiplier. The ratio of the signal out of the electron multiplier to the signal in:
Gain = signal out / signal in (or amps out / amps in).

See also electron multiplier and electron multiplier voltage.

electron multiplier voltage A dc voltage applied to the cathode of the electron multiplier. The higher the cathode voltage, the greater the electron multiplier gain.

See also electron multiplier and electron multiplier gain.

<Enter> Enter key on the terminal keyboard

ESA electrostatic analyzer

ESD electrostatic discharge

eV electron volt

external lock mass A lock that is analyzed in a separate MS experiment from your sample. If you need to run a large number of samples, or if accurate mass samples will be intermingled with standard samples, you might want to use external lock masses. These allow more rapid data acquisition by eliminating the need to scan lock masses during each scan.

external standard A component (not added to the target sample) used to correct for instrument detection errors.

See also internal standard (ISTD).

F

f femto (10^{-15})

°F degrees Fahrenheit

firmware Software routines stored in read-only memory. Startup routines and low-level input/output instructions are stored in firmware.

forepump The pump that evacuates the foreline. A rotary-vane pump is a type of forepump.

FPGA Field Programmable Gate Array

FOB free on board

ft foot

FTP file transfer protocol

G

g gram

G Gauss; giga (10^{9})

GC gas chromatograph; gas chromatography

GC/MS gas chromatograph / mass spectrometer

GD glow discharge

GND electrical ground

GUI graphical user interface

H

h hour

h height

header information Data stored in each data file that summarizes the information contained in the file.

HI high intensity

HR high resolution

HV high voltage

Hz hertz (cycles per second)

I

ID inside diameter

IEC International Electrotechnical Commission

IEEE Institute of Electrical and Electronics Engineers

in inch

internal lock mass A lock that is analyzed during the same MS experiment as your sample and is contained within the sample solution or infused into the LC flow during the experiment. Internal lock masses provide the most accurate corrections to the data.

internal standard (ISTD) A component added to a sample to correct for injection errors and sample preparation errors. It is assumed that the ratio of the target compound to the internal standard compound is constant for a given calibration standard. The concentration or amount of an internal standard in any solution used in quantitation remains constant.

See also internal standard (ISTD) calibration, internal standard (ISTD) response ratio.

internal standard (ISTD) calibration A calibration in which known amounts of standard components are added to the sample to be analyzed.

internal standard (ISTD) response ratio The ratio of the signal response of an unknown peak to the response of the corresponding internal calibration peak at a specified calibration level.

ion optics Focuses and transmits ions from the ion source to the mass analyzer.

ion source A device that converts samples to gas-phase ions.

ISTD See internal standard (ISTD) calibration.

K

k kilo (10^3, 1000)

K kilo (2^{10}, 1024)

kg kilogram

L

l length

L liter

LAN local area network

lb pound

LED light-emitting diode

lock mass A known reference mass in the sample that is used to correct the mass spectral data in an accurate mass experiment and used to perform a real-time secondary mass calibration that corrects the masses of other peaks in a scan. Lock masses with well-defined, symmetrical peaks work best. You can choose to use internal lock mass or external lock mass.

log file A text file, with a .log file extension, that is used to store lists of information.

M

µ micro (10^{-6})

m meter; 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

MSDS Material Safety Data Sheet

MS/MS MS^n power: where n = 2

MS^n MS^n power: where n = 1 through 10

m/z Mass-to-charge ratio. An abbreviation used to denote the quantity formed by dividing the mass of an ion (in u) by the number of charges carried by the ion. For example, for the ion $C_7H_7^{2+}$, m/z=45.5.

N

n nano (10^{-9})

NCBI National Center for Biotechnology Information (USA)

NIST National Institute of Standards and Technology (USA)

O

OD outside diameter

Ω ohm

P

p pico (10^{-12})

Pa pascal

PCB printed circuit board

peak area The area obtained by integrating peak intensities from the start to the end of the peak.

peak detection The process of finding the locations and amplitudes of local maxima and minima in a signal that satisfies certain properties.

See also peak start and peak end.

peak end The end of a chromatographic peak occurs whenever the detection signal decreases to a value less than the current threshold criteria.

See also peak start.

peak height (peak dimension) The distance from the peak maximum to the peak base, measured perpendicular to the ordinate.

See also conversion dynode and tailing factor.

peak integration In this analysis of a chromatogram the area of each peak is determined.

peak start The start of a chromatograph peak occurs whenever the detection signal increases to a value greater than the current threshold criteria.

See also peak end.

peak width The distance across a peak measured at a selected peak-height level, in minutes or mass units. The peak-height level is usually specified as a percentage of the maximum peak height.

See also peak width at half height.

peak width at half height The full width of a peak at half its maximum height, sometimes abbreviated FWHM.

See also peak width and peak end.

PFK Perfluorokerosene

PID proportional / integral / differential

P/N part number

p-p peak-to-peak voltage

ppm parts per million

psig pounds per square inch, gauge

PTFE Polytetrafluoroethylene

Q

quadrupole A symmetrical, parallel array of four hyperbolic rods that acts as a mass analyzer or an ion transmission device. As a mass analyzer, one pair of opposing rods has an oscillating radio frequency (RF) voltage superimposed on a positive direct current (dc) voltage. The other pair has a negative dc voltage and an RF voltage that is 180 degrees out of phase with the first pair of rods. This creates an electrical field (the quadrupole field) that efficiently transmits ions of selected mass-to-charge ratios along the axis of the quadrupole rods.

quantitation The process of determining the amount of a component in a sample.

quantitation mass A specific mass-to-charge ratio (for example, *m/z* 502) or range of mass-to-charge ratios to be used when determining the peak area and peak height of a compound. Usually, a quantitation mass (quan mass) is chosen that is characteristic of the compound.

See also peak area and peak height.

R

RAM random access memory

resolution The ability to distinguish between two points on the wavelength or mass axis.

RF radio frequency

RF voltage An ac voltage of constant frequency and variable amplitude that is applied to the rods of a multipole. Because the frequency of this ac voltage is in the radio frequency (RF) range, it is referred to as RF voltage.

RMS root mean square

ROM read-only memory

rotary-vane pump A mechanical vacuum pump that establishes the vacuum necessary for the proper operation of the turbomolecular pump. (Also called a roughing pump or forepump.)

RS-232 An accepted industry standard for serial communication connections. This Recommended Standard (RS) defines the specific lines and signal characteristics used by serial communications controllers to standardize the transmission of serial data between devices.

RT An abbreviated form of the phrase *retention time (RT)*. This shortened form is used to save space when the retention time (in minutes) is displayed in a header, for example, RT: 0.00-3.75.

S

s second

SEM secondary electron multiplier

sensitivity The signal obtained per amount of sample introduced. Different measures of sensitivity are recommended, depending on the nature of the sample and the required inlet system.

See also detection limit.

serial port An input/output location (channel) for serial data transmission.

signal-to-noise ratio (S/N) The ratio of the signal height (S) to the noise height (N). The signal height is the baseline corrected peak height. The noise height is the peak-to-peak height of the baseline noise.

SIM selected ion monitoring

SRM selected reaction monitoring

T

T Tesla

tailing factor A peak integration parameter that constrains the peak width of an asymmetric chromatogram peak that has a tailing trace.

See also conversion dynode and peak height.

TCDD 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin

Torr torr

tune parameters Instrument parameters whose values vary with the type of experiment.

turbomolecular pump A vacuum pump that provides a high vacuum for the mass spectrometer and detector system.

U

u atomic mass unit

unknown sample type A sample type that is not a Calibration Sample, Calibration Blank, Quality Control Sample, or Quality Control Blank.

V

V volt

V ac volts alternating current

V dc volts direct current

vacuum system Components associated with lowering the pressure within the mass spectrometer. A vacuum system includes the pumps, pressure gauges, and associated electronics.

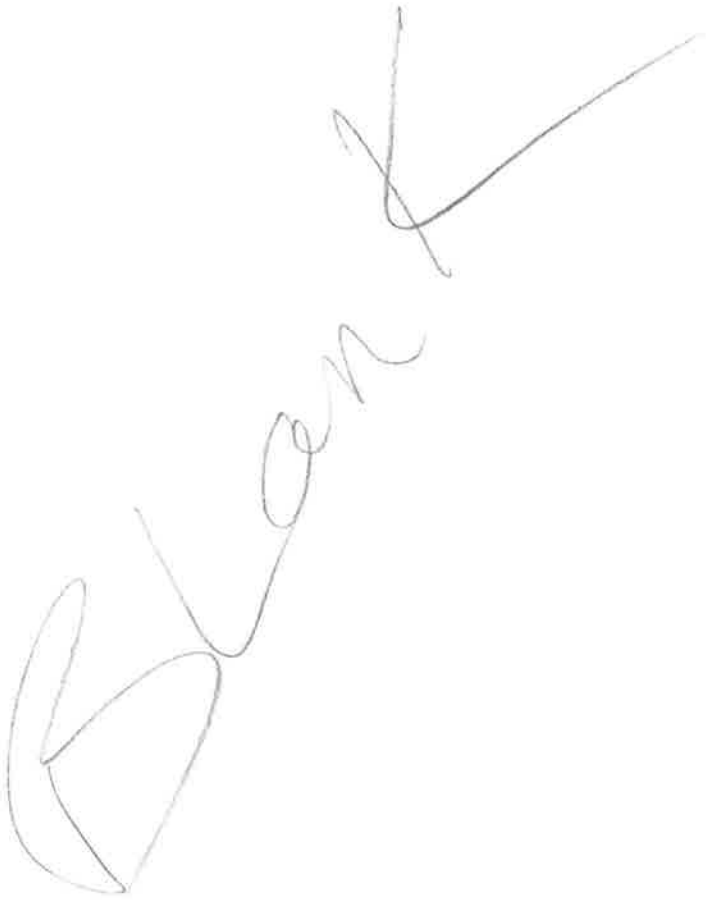
vent valve A valve that allows the vacuum manifold to be vented to filtered air or to the gas supply. A solenoid-operated valve.

vol volume

W

w width

W watt



Index

A

acceptance form 6-3
air
  circulation 2-4
  duct 3-2
air conditioning
  humidity 3-2
  particulate matter 3-3
  temperature 3-2
argon purity 3-7
argon supply 3-7

B

buck/boost transformer 4-7

C

calibration compound G-1
ceiling height 2-4
cell phones 2-5
certification, of power conditioning devices 4-7
chemicals
  for installation 6-2
closed loop cooling system 3-8
component G-1
constrain peak width G-1
consumables 6-2
container
  dimensions 2-2
  weights 2-2
cooling capacity 3-9
cooling system 3-8
cooling water 3-8
crane 2-4
Customer Service Engineer 2-5

D

damages
  documenting 5-1
  equipment 5-1
  to electronic components 3-5
data system
  placing 2-3
  shipping container 2-2
delivery terms 5-2
detection limit G-1
dimensions, of packed units 2-2
dust 3-3

E

electromagnetic fields 3-3
electron multiplier G-1
  gain G-2
  voltage G-2
electronic components 3-2–3-3, 3-5
electrostatic discharge 3-5
entrance requirements 2-2
equipment
  for power conditioning 4-8
ESD
  damage 3-5
  precautions 3-5
exception peak G-2
exhaust ports 2-3

F

failures, repair 1-1
floor covering 3-5
forepump G-2
  location 2-5
freight insurance 5-1

H

harmonic distortion 4-5
heat
  removal 3-2
heat dissipation 2-4
humidity 3-2
  monitor 3-2

I

ICP interface 3-8
in-line filter 3-8
installation
  scope 6-2
Installation Request Form 5-1
instrument
  failures 1-1

repair 1-1
storing after arrival 5-1
weight 2-3
internal standard G-3
calibration G-3
response ratio G-3
isolation/noise suppression transformer 4-7
ISTD G-3
calibration G-3
response ratio G-3
IT
G-3

K

key operator 6-3–6-4

L

laboratory
air 3-3
chairs 3-5
coats 3-5
floor 2-3
lighting 3-3
telephone 2-5
lighting 3-3
load coil 3-8
locating, the instrument 3-2
location of supply lines 3-9
lock mass G-3
log file G-3

M

magnet 3-8
marketing specifications 6-2
minimum floor area 2-4
mobile phones 2-5
moving, the instrument 2-5, 5-1

O

Operating Manuals 6-2

P

packing materials 3-5
particulate matter, in air 3-3
peak
area G-4
end G-4
height G-4
integration G-4
peak width at half hight G-4
start G-4
width G-4
power
conditioning devices 4-7
conditioning equipment 4-8
monitoring 4-6, 4-8
quality 4-5
sags and surges 4-5
slow average 4-5
transients 4-5
power line disturbance analyzers 4-6
preventive maintenance 6-4

Q

quantitation G-4
quantitation mass G-4

R

radio frequencies 3-4
radio frequency 3-4
recirculating chiller 3-9
reference peak G-4
removing the instrument, from shipping container 2-2
replacing, consumables 6-2
room temperature 3-2

S

sensitivity G-5
shipment terms 5-2
short circuits 3-2
space requirements 2-3
static electricity 3-2, 3-5
storing
instrument and installation equipment 6-2
Styrofoam cups 3-5
supply lines 3-9
system reliability 3-2

T

tailing factor G-5
technical assistance 4-8
technical data recirculating chiller 3-9
telephone 2-5
temperature
fluctuations 3-2
monitor 3-2

torch box 3-8
training courses 6-4
transformers
  buck/boost 4-7
  installation 6-2
  isolation/noise 4-7
transient voltages 4-7
transportation risk 5-2
turbo pump 3-8

U

uninterruptible power supply (UPS) 4-7
unpacking, the system 6-2
user's responsibilities 1-1, 2-1, 3-1, 4-1, 4-8, 6-4
using, your new instrument 6-3

V

vibration 3-3
voltage
  disturbances 4-6

W

water chiller 3-8–3-9
weights
  equipment 2-2
  instrument 2-3