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Thermo Scientific

TRACE 1300 and TRACE 1310

Preinstallation Requirements Guide

Gas Chromatographs

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ThermoFisher SCIENTIFIC

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For Research Use Only. Not for use in diagnostic procedures.

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TRACE 1300/TRACE 1310 Installation Request Form

Before completing this installation request form, read all of the *TRACE1300 / TRACE 1310 Preinstallation Requirements Guide*. For laboratories outside the U.S., go to www.thermofisher.com, click **Contact Us**, select the **Instrument Service** option, type the product name, and request to be contacted by email to schedule your instrument installation. You can then send this completed and signed form to the office handling the installation. For laboratories in the U.S., send this completed and signed form to ULSConciergeNA@thermofisher.com.

Laboratory setup

- ❑ All laboratory remodeling is complete and complies with all relevant safety regulations.
- ❑ The TRACE 1300/TRACE 1310 is on site.
- ❑ A principal operator will be on site during the installation/certification period.
- ❑ Doorways, hallways, and so on are a minimum width of 80 cm (32 in.).
- ❑ Laboratory lighting is adequate.
- ❑ Air conditioning is adequate for temperature, humidity, and particulate matter control. The laboratory must remain at a constant temperature between 15–35 °C (59–95 °F).
- ❑ Relative humidity is 40–80%, noncondensing.
- ❑ The work area is free from magnetic disruption and electrostatic discharge.
- ❑ Floor space is sufficient and flooring will support the load.
- ❑ Main power is installed and complies with local electrical codes.
- ❑ Power is free from fluctuations due to slow changes in the average voltage or changes due to surges, sags, or transients.
- ❑ Power outlets are of the correct configuration for the power cords.
  Note NEMA type: _____
- ❑ Voltage of power outlet has been measured.
  Note measured voltage:
  AC line-to-ground: _____ V
  AC neutral-to-ground: _____ V
  AC line-to-neutral: _____ V
- ❑ Power outlets are available for testing and cleaning equipment.
- ❑ One or more RJ-45 wall outlet. To connect your system to your site's LAN network, you must have an additional shielded twisted pair network cable.
- ❑ All required gases are on site, gas lines are installed and terminate within 2 m (6 ft.) of the workbench. All gas line terminate to 1/8 in. compression-type fittings and appropriate gas regulators are available.
  Note gas types and actual purity levels:
  Gas: _____ purity:_____
  Gas: _____ purity:_____
- ❑ All gas lines are clean and have no leaks.
- ❑ For customized GC analyzers, a gas phase analytical standard is onsite and available for use. Composition and concentration must be in line with the system specifications.
- ❑ All relevant safety regulations have been followed.
- ❑ The hydrogen sensor is installed inside the GC when hydrogen is required as carrier gas.
- ❑ Sufficient bench or table space is available for all of the equipment. Note the dimensions:
  Width: _____
  Depth: _____
  Height: _____
  Does the bench (table) have wheels? Yes__ No__
- ❑ Sufficient clearance is provided behind the bench (or table).
- ❑ The bench (or table) can support *twice* the load of the instrument and is free from vibration.

IMPORTANT Thermo Fisher Scientific reserves the right to invoice for the field service engineer's time if the installation requirements are not met by the installation date.

CONTINUED ON THE NEXT PAGE

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For customized installations

Does your contract contain any special acceptance specifications? ❑ Yes ❑ No
If **YES**, attach full details of the specifications.

Does the system require additional equipment? ❑ Yes ❑ No
If **YES**, attach full details of the additional equipment.

I certify that the preinstallation requirements for the TRACE 1300/TRACE 1310 are complete and accurate.

Signature _____ Date _____

Print name _____ Telephone _____

Email address _____

Principal instrument operator:

Print name _____ Telephone _____

Email address _____

Company _____ Telephone _____

Address _____

Address _____

City _____ State _____ Country _____

Sales order number _____

Note This form is intended to cover the essential components of your TRACE 1300/TRACE 1310 installation. However, you must use the information in this guide and any additional information that your Thermo Fisher Scientific field service engineer provides to ensure the proper setup of your system. After receiving this form, the installation can be scheduled.

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Declaration

Manufacturer: **Thermo Fisher Scientific**

Thermo Fisher Scientific is the manufacturer of the instrument described in this manual and, as such, is responsible for the instrument safety, reliability and performance only if:

- installation
- re-calibration
- changes and repairs

have been carried out by authorized personnel and if:

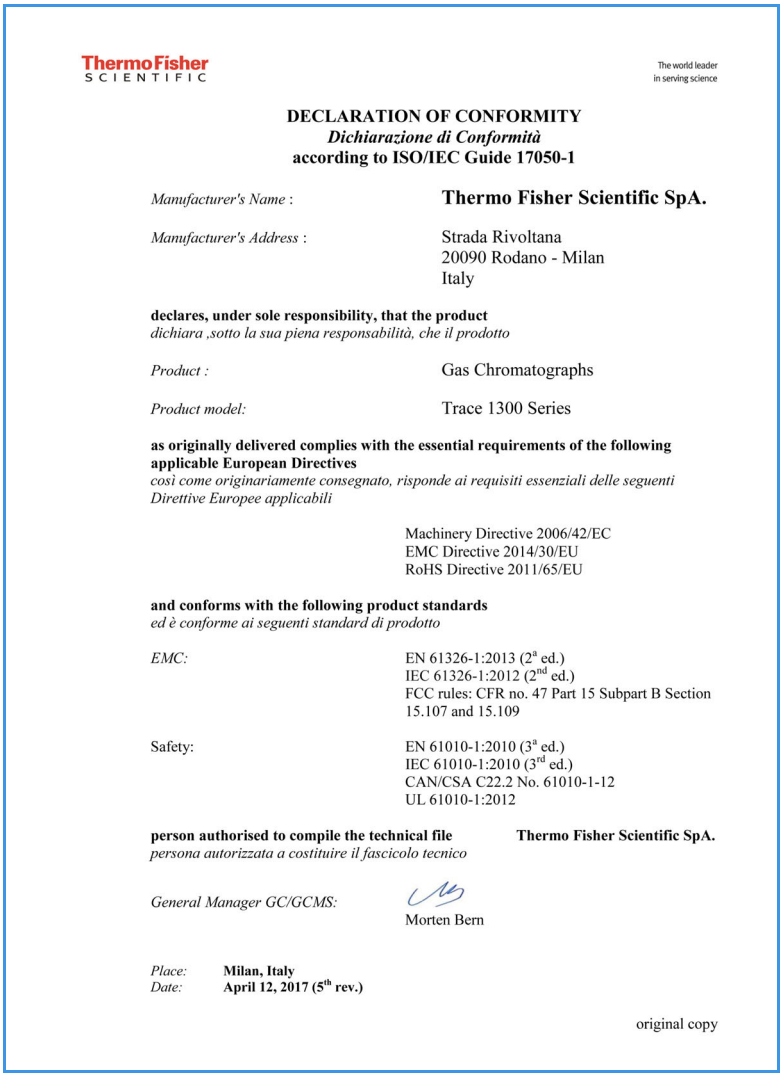
- the local installation complies with local law regulations
- the instrument is used according to the instructions provided and if its operation is only entrusted to qualified trained personnel

Thermo Fisher Scientific is not liable for any damages derived from the non-compliance with the aforementioned recommendations.

Thermo Fisher Scientific S.p.A.
Strada Rivoltana km 4, 20053 Rodano - Milan - Italy — Tel: +39 02 950591 - Fax: +39 02 9505276

Regulatory Compliance

Thermo Fisher Scientific performs complete testing and evaluation of its products to ensure full compliance with applicable domestic and international regulations. When the system is delivered to you, it meets all pertinent electromagnetic compatibility (EMC) and safety standards.



ThermoFisher SCIENTIFIC

The world leader in serving science

DECLARATION OF CONFORMITY
Dichiarazione di Conformità
according to ISO/IEC Guide 17050-1

Manufacturer's Name : **Thermo Fisher Scientific SpA.**

Manufacturer's Address : Strada Rivoltana
20090 Rodano - Milan
Italy

declares, under sole responsibility, that the product
dichiara ,sotto la sua piena responsabilità, che il prodotto

Product : Gas Chromatographs

Product model: Trace 1300 Series

as originally delivered complies with the essential requirements of the following applicable European Directives
così come originariamente consegnato, risponde ai requisiti essenziali delle seguenti Direttive Europee applicabili

Machinery Directive 2006/42/EC
EMC Directive 2014/30/EU
RoHS Directive 2011/65/EU

and conforms with the following product standards
ed è conforme ai seguenti standard di prodotto

EMC: EN 61326-1:2013 (2ª ed.)
IEC 61326-1:2012 (2nd ed.)
FCC rules: CFR no. 47 Part 15 Subpart B Section 15.107 and 15.109

Safety: EN 61010-1:2010 (3ª ed.)
IEC 61010-1:2010 (3rd ed.)
CAN/CSA C22.2 No. 61010-1-12
UL 61010-1:2012

person authorised to compile the technical file **Thermo Fisher Scientific SpA.**
persona autorizzata a costituire il fascicolo tecnico

General Manager GC/GCMS: Morten Bern

Place: **Milan, Italy**
Date: **April 12, 2017 (5th rev.)**

original copy

IMPORTANT: Class A equipment is intended for use in an industrial environment. In others environments there may be potential difficulties in ensuring electromagnetic compatibility, due to the conducted as well as radiated disturbances.

FCC Compliance Statement

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

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

Notice on Lifting and Handling of Thermo Scientific Instruments

For your safety, and in compliance with international regulations, the physical handling of this Thermo Fisher Scientific instrument ***requires a team effort*** to lift and/or move 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: Use of this instrument in a manner not specified by Thermo Fisher Scientific could impair any protection provided by the instrument.

Notice on the Susceptibility to Electromagnetic Transmissions

Do not use radio frequency transmitters, such as mobile phones, in close proximity to the instrument.

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China EEP Hazardous Substances Information

产品中有害物质的名称及含量
China EEP Hazardous Substances Information

部件名称 Component Name	有害物质 Hazardous Substances (TRACE 13x0)					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
(主机:背部接线电路板) Base Unit: PCBA BACKPLANE	X	O	O	O	O	O
(主机：炉箱电路板) Base Unit: PCBA OVEN CPU	X	O	O	O	O	O
(主机: 主控电路板) Base Unit: PCBA CPU	X	O	O	O	O	O
(主机：存储器电路板) Base Unit: PCBA MEMORY	X	O	O	O	O	O
(主机：接口电路板) Base Unit: PCBA EXTERNAL INTERFACE	X	O	O	O	O	O
(主机：电源供应电路板) Base Unit: PCBA POWER SUPPLY	X	O	O	O	O	O
(主机：显示屏控制电路板) Base Unit: PCBA RSR798	X	O	O	O	O	O
(主机：液晶显示屏) Base Unit: DISPLAY LCD	X	O	O	O	O	O
(分流/不分流进样器电路板) PCBA's MODULE SSL	X	O	O	O	O	O
(程序升温进样器电路板) PCBA's MODULE PTV	X	O	O	O	O	O
(火焰离子化检测器电路板) PCBA's MODULE FID	X	O	O	O	O	O
(电导检测器电路板) PCBA's MODULE ECD	X	O	O	O	O	O
(氮磷检测器电路板) PCBA's MODULE NPD	X	O	O	O	O	O
(热导检测器电路板) PCBA's MODULE TCD	X	O	O	O	O	O
(火焰光度检测器电路板) PCBA's MODULE FPD	X	O	O	O	O	O
(辅助温度模块电路板)PCBA's MODULE AUXILIARY TEMPERATURE	X	O	O	O	O	O
(辅助气体模块电路板) PCBA MODULE AUXILIARY GASES	X	O	O	O	O	O
(模拟输出接口电路板) PCBA MODULE AOI	X	O	O	O	O	O
(脉冲放电检测器电路板) PCBA's MODULE PDD	X	O	O	O	O	O
(通用检测器接口电路板) PCBA MODULE GDI	X	O	O	O	O	O
(辅助炉箱电路板) PCBA's AUXILIARY OVEN	X	O	O	O	O	O
(机加工件) MACHINED PARTS	O	O	O	O	O	O
(模具) MOLDED PARTS	O	O	O	O	O	O
(钣金件) SHEETMETAL PARTS	O	O	O	O	O	O
(电机组件) ELECTROMECHANICAL ASSEMBLIES	O	O	O	O	O	O
(电缆组件) CABLE ASSEMBLIES	O	O	O	O	O	O
(标签) LABELS	O	O	O	O	O	O

本表格依据SJ/T11364的规定编制 This table is compiled according to SJ/T 11364 standard.

O: 表示该有害物质在该部件所有均质材料中的含量均在GB/T26572规定的限量要求以下.
Indicates that the concentration of the hazardous substance in all homogeneous materials for the part is below the relevant threshold of the GB/T 26572 standard.

X: 表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T26572规定的限量要.
Indicates that the concentration of the hazardous substance in at least one homogenous material of the part is above the relevant threshold of the GB/T 26572 standard.

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WEEE Directive
2012/19/EU

Thermo Fisher Scientific has contracted with one or more recycling or disposal companies in each European Union (EU) Member State, and these companies should dispose of or recycle this product. See www.thermoscientific.com/rohsweee for further information on Thermo Fisher Scientific's compliance with these Directives and the recyclers in your country.

Directive DEEE
2012/19/EU

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.thermoscientific.com/rohsweee.

WEEE Direktive
2012/19/EU

Thermo Fisher Scientific hat Vereinbarungen mit Verwertungs-/Entsorgungsfirmen in allen EU-Mitgliedsstaaten getroffen, damit dieses Produkt durch diese Firmen wiederverwertet oder entsorgt werden kann. Mehr Information über die Einhaltung dieser Anweisungen durch Thermo Fisher Scientific, über die Verwerter, und weitere Hinweise, die nützlich sind, um die Produkte zu identifizieren, die unter diese RoHS Anweisung fallen, finden sie unter www.thermoscientific.com/rohsweee.

Contents

Preface

This guide contains detailed information for preparing your site for installing a Thermo Scientific™ TRACE 1300™ GC or TRACE™ 1310 GC.

About Your System

Thermo Scientific systems provide high-caliber gas chromatography (GC) instrumentation. Your TRACE 1300/TRACE 1310 GC system can be a stand-alone unit or coupled with other instruments.

GC represents a powerful analytical separation technique. Complex mixtures of individual compounds can be injected into the GC, either manually or by using an autosampler, and then separated the eluate for presentation to the detector. The detector generates signals of the GC eluate and its components. These signals are then processed by a Thermo Scientific Chromatography Data System for qualitative identification, as well as accurate and precise quantification of the individual compounds present in the sample.

IMPORTANT Thermo Scientific systems optimize the separation and detection capabilities of GC by providing high performance analytical capabilities for both research, and routine applications. More information about the use of this system can be found in related documentation sources, and by using the provided contact information.

WARNING Thermo Scientific systems operate safely and reliably under carefully controlled environmental conditions. If the equipment is used in a manner not specified by the manufacturer, the protections provided by the equipment might be impaired. If you maintain a system outside the specifications listed in this guide, failures of many types, including personal injury or death, might occur. The repair of instrument failures caused by operation in a manner not specified by the manufacturer is specifically excluded from the standard warranty and service contract coverage.

WARNING Operation of this system requires the use of chemical substances with different hazard specifications. Before using any chemicals, read the hazard indications and information reported in the Safety Sheet supplied by the manufacturer, referring to the relevant CAS (Chemical Abstract Service) number.

Power Rating

TRACE 1300/TRACE 1310 gas chromatograph

- 120 Vac ±10%, 50/60 Hz, 2000 VA
- 230 Vac ±10%, 50/60 Hz, 2000 VA

Detailed instrument specifications are in the Product Specifications Sheet.

Contacting Us

There are several ways to contact Thermo Fisher Scientific for the information you need.

❖ **To find out more about our products**

Go to http://www.thermofisher.com for information about our products.

❖ **To get local contact information for sales or service**

Go to http://www.unitylabservice.com/en/home.html

Related Documentation

In addition to this guide, Thermo Scientific provides the following documents for the TRACE 1300 and TRACE 1310 gas chromatographs.

TRACE 1300 and TRACE 1310 Document Set, PN 31715000

- *TRACE 1300 and TRACE 1310 Preinstallation Requirements Guide,* PN 31715001
- *TRACE 1300 and TRACE 1310 Hardware Manual*, PN 31715002
- *TRACE 1300 and TRACE 1310 User Guide,* PN 31715003
- *TRACE 1300 and TRACE 1310 Spare Parts Guide*, PN 31715004

Safety Alerts and Important Information

Make sure you follow the precautionary notices presented in this manual. The safety and other special notices appear in boxes.

Special Notices

Notices includes the following:

IMPORTANT Highlights information necessary to prevent damage to software, loss of data, or invalid test results; or might contain information that is critical for optimal performance of the system.

Note Emphasizes important information about a task.

Tip Helpful information that can make a task easier.

Safety Symbols and Signal Words

All safety symbols are followed by **WARNING** or **CAUTION**, which indicates the degree of risk for personal injury, instrument damage, or both. Cautions and warnings are following by a descriptor, such as **BURN HAZARD**. A **WARNING** is intended to prevent improper actions that could cause personal injury. Whereas, a **CAUTION** is intended to prevent improper actions that might cause personal injury, instrument damage, or both. You can find the following safety symbols on your instrument or in this manual:

Symbol	Descriptor
	**BIOHAZARD:** Indicates that a biohazard *will*, *could*, or *might* occur.
	**BURN HAZARD:** Alerts you to the presence of a hot surface that *could* or *might* cause burn injuries.
	**ELECTRICAL SHOCK HAZARD:** Indicates that an electrical shock *could* or *might* occur.
	**FIRE HAZARD:** Indicates a risk of fire or flammability *could* or *might* occur.
	**EXPLOSION HAZARD.** Indicates an explosion hazard. This symbol indicates this risk *could* or *might* cause physical injury.
	**FLAMMABLE GAS HAZARD.** Alerts you to gases that are compressed, liquefied or dissolved under pressure and can ignite on contact with an ignition source. This symbol indicates this risk *could* or *might* cause physical injury.

	**GLOVES REQUIRED:** Indicates that you must wear gloves when performing a task or physical injury *could* or *might* occur.
	**CLOTHING REQUIRED.** Indicates that you should wear a work clothing when performing a task or else physical injury *could* or *might* occur.
	**BOOTS REQUIRED.** Indicates that you must wear boots when performing a task or else physical injury *could* or *might* occur.
	**MATERIAL AND EYE HAZARD.** Indicates you must wear eye protection when performing a task.
	**HAND AND CHEMICAL HAZARD:** Indicates that chemical damage or physical injury *could* or *might* occur.
	**HARMFUL.** Indicates that the presence of harmful material *will, could, or might* occur.
	**INSTRUMENT DAMAGE:** Indicates that damage to the instrument or component *might* occur. This damage might not be covered under the standard warranty.
	**LIFTING HAZARD.** Indicates that a physical injury *could* or *might* occur if two or more people do not lift an object.
	**MATERIAL AND EYE HAZARD:** Indicates that eye damage *could* or *might* occur.
	**READ MANUAL:** Alerts you to carefully read your instrument's documentation to ensure your safety and the instrument's operational ability. Failing to carefully read the documentation *could* or *might* put you at risk for a physical injury.
	**TOXIC SUBSTANCES HAZARD:** Indicates that exposure to a toxic substance could occur and that exposure *could* or *might* cause personal injury or death.
	**LASER HAZARD.** Indicates that exposure to a laser beam *will*, *could*, or *might* cause personal injury.
	**RADIOACTIVE HAZARD.** Indicates that the presence of radioactive material *could or might* occur.
	For the prevention of personal injury, this general warning symbol precedes the **WARNING** safety alert word and meets the ISO 3864-2 standard. In the vocabulary of ANSI Z535 signs, this symbol indicates a possible personal injury hazard exists if the instrument is improperly used or if unsafe actions occur. This symbol and another appropriate safety symbol alerts you to an imminent or potential hazard that *could cause personal injury*.

Instrument Markings and Symbols

Table 1 explains the symbols used on Thermo Scientific instruments. Only a few of them are used on the TRACE 1300/1310, which are annotated with an asterisk below.

Table 1. Instrument Marking and Symbols (Sheet 1 of 2)

	Symbol	Description
		Direct Current
*		Alternating Current
		Both direct and alternating current
		Three-phase alternating current
		Earth (ground) terminal
		Protective conductor terminal
		Frame or chassis terminal
		Equipotentiality
*		On (Supply)
*		Off (Supply)
		Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION (Equivalent to Class II of IEC 536)
*		Instruction manual symbol affixed to product. Indicates that the user must refer to the manual for specific **WARNING** or **CAUTION** information to avoid personal injury or damage to the product.
		Caution, risk of electric shock
*		Caution, hot surface
*		Caution, biohazard
		In-position of a bistable push control
		Out-position of a bistable push control

Table 1. Instrument Marking and Symbols (Sheet 2 of 2)

	Symbol	Description
*		Jack socket
*		Symbol in compliance to the Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE) placed on the European market after August, 13, 2005.

Hydrogen Safety Precautions

Hydrogen is a colorless, odorless, highly flammable gas with the molecular formula H_2 and an atomic weight of 1.00794, making it the lightest element. Hydrogen gas presents a hazard, as it is combustible over a wide range of concentrations; at ambient temperature and pressure, the range is from about 4 to 74.2% by volume.
Hydrogen has a flash point of - 423 °F (- 253 °C) and an auto-ignition temperature of 1040 °F (560 °C).

It has a very low ignition energy and the highest burning velocity of any gas. If hydrogen is allowed to expand rapidly from high pressure, it can self-ignite. Hydrogen burns with a flame that can be invisible in bright light.

WARNING - EXPLOSION HAZARD The use of hydrogen as a carrier gas is dangerous. Hydrogen is potentially explosive and must be used with extreme care. Any use of hydrogen gas must be reviewed by appropriate health and safety staff, and all installations of hydrogen systems must be performed to applicable codes and standards. Thermo Fisher Scientific assumes no liability for the improper use of hydrogen as a carrier gas.

Before you begin using hydrogen, conduct a risk assessment based on the quantity of hydrogen to be used and the conditions of your laboratory. Ask yourself:

"What hydrogen hazards associated with this project are most likely to occur?"

"What hydrogen hazards associated with this project have the potential to result in the worst consequences?"

- Try to reduce or eliminate the higher risks by using the proper ventilation to remove hydrogen gas before an ignitable concentration can accumulate. Also consider purging the hydrogen to further reduce hazards and ensure that anyone working with hydrogen has basic hydrogen safety training.
- As with laboratory safety in general, be sure to wear safety glasses, laboratory coats, gloves, and so on. Typically there are no specific requirements for gaseous hydrogen, other than eye protection when working with a compressed gas. If working with liquid (cryogenic) hydrogen, wear insulated gloves and protective shoes in addition to eye protection.
- Post "No Smoking" and "No Open Flames" signs to identify hydrogen sources and cylinders. Maintain, inspect, and leak-test all hydrogen sources regularly.

- Clearly mark all hydrogen shutoff valves and label permanent hydrogen piping as such at the supply or discharge point and at regular intervals along its length. Where hydrogen gas piping passes through a wall, be sure to label both sides of the wall.
- Have contingency plans in place should an incident occur.
- Ensure that site emergency response team, as well as the local fire department, knows the location of all hydrogen storage tanks.

Using Hydrogen with TRACE 1300/TRACE 1310

The use of hydrogen as a carrier gas, or as fuel gas for certain flame detectors, requires strict attention and compliance with special precautions due to the hazards involved.

WARNING - EXPLOSION HAZARD Hydrogen is a dangerous gas that, when mixed with air, could create an explosive mixture. The use of hydrogen as a carrier gas requires extreme caution. Special precautions must be taken because of the risk of explosion. When hydrogen is used as carrier gas the gas chromatograph must be equipped with a hydrogen sensor.

Never use hydrogen as carrier gas in your TRACE 1300/TRACE 1310 system unless your oven has a hydrogen sensor installed. Thermo Fisher Scientific FSEs are not authorized to install or repair any instrument using hydrogen as a carrier gas unless the instrument is equipped with the appropriate sensor.

If your oven does not have a hydrogen sensor already installed, contact your Thermo Fisher Scientific sales representative. To comply with instrument safety requirements, a Thermo Fisher Scientific FSE or authorized service personnel should install the sensor into your TRACE 1300/TRACE 1310.

Hydrogen is a dangerous gas, particularly in an enclosed area when it reaches a concentration corresponding to its lower explosion level (4% in volume). An explosion hazard could develop in the oven when hydrogen is used as a carrier gas in the case oven elements are not perfectly connected to each other, or when the connection materials are worn out, broken, or otherwise faulty.

Use the following safety precautions when using hydrogen:

- Ensure that all hydrogen cylinders comply with the safety requirements for proper use and storage. Hydrogen cylinders and delivery systems must comply with local regulations.
- Make sure the gas supply is turned completely off when connecting hydrogen lines.
- Perform a leak test to ensure that the hydrogen lines are leak-tight before using the instrument. Repeat this test to eliminate all leaks.
- Ensure your TRACE 1300/TRACE 1310 has a Thermo Scientific hydrogen sensor installed for continuously monitoring the hydrogen level in the oven.

Hydrogen Connection Guidelines

Use the following guidelines to safely connect hydrogen to your system:

- **Piping —** Hydrogen delivery to your equipment must use appropriate piping and be done in such a way as to pose essentially no hazard to end-users. Have a qualified person who istrained and experienced with hydrogen piping systems design and install your hydrogen delivery system.

  For a safe, cost-effective material, use stainless steel. Do not use piping of black iron or copper, as these materials can become brittle with age. Do not use elastomeric/plastic ubing of various plastics and polymers, unless the tubing is approved for use with hydrogen. If you use elastomeric/plastic tubing for hydrogen gas delivery, test the tubing for hydrogen permeability to minimize leakage.

  The hydrogen piping system must be flexible enough to endure routine thermal expansion and contraction. Also, consider how severe conditions of temperature and pressure impact the system while it is in service. Piping and supports must be able to withstand static loading introduced by such things as ice and snow, and dynamic loading from high wind and earthquakes.

  Use caution if burying hydrogen piping. Ensure the use of proper controls to protect against damage and corrosion, and to prevent hydrogen from entering a building if there is leakage.

- **Fittings** — Ensure that all fittings have been designed or approved for use with hydrogen gas. Use as few fittings as possible to minimize the potential for leaks. After installation, ensure that leak testing is carried out prior to system use and then on a regular basis.

  To enhance a seal, do not use polytetrafluoroethylene (PTFE) tape or other products like plumber's putty, as this is more of a detriment to a good seal. Ideally, use stainless steel tubing with appropriate gas-tight fittings for the best installation.

  Instead of mechanical fittings, use welding for joints in hydrogen piping systems. Welding provides a better connection and reduces the potential for leaks compared to mechanical fittings. You cannot use soft solder joints for hydrogen systems (due to the low melting point of soft solder and its potential for brittle failure at cryogenic temperatures). You can use brazed joints, but they require protection against the possibility of external fire.

  Clamp tubing connections to barbed or press-fit type connections. Do not use hose clamps or jubilee clamps.

- **Valves** — All valves must be suitable for hydrogen service and for the specific operating conditions. Do not use valves, including regulators, for hydrogen, unless they are designed and identified for this use. Use ball valves for their superior leak tightness through the valve seat. Use pneumatic operators for remotely operated valves so that potential ignition sources (electricity) are remote from the valve.

Make sure to provide manual shutoff valves within immediate reach near each point of use. If a hydrogen cylinder or hydrogen generation system is located within immediate reach, a separate point-of-use shutoff valve is usually not necessary.

For line regulators that have their source away from the point of use, provide a manual shutoff valve near the point of use.

Provide an emergency gas shutoff device in an accessible location outside the use area, in addition to the manual point-of-use valve in each educational and instructional laboratory space that has a piped gas supply system.

If necessary, ensure that the piping system has uninterruptible pressure relief. Ideally, the pressure relief system provides a discharge rate sufficient to avoid further pressure increase, and vents to a safe, outside location or to a ventilation system exhaust

Purchasing Hydrogen

Use the following guidelines when purchasing hydrogen:

- **Hydrogen Generator** — Because it minimizes the amount of hydrogen present and reduces the degree of hazard, a hydrogen generator (also called an electrolyzer) is the safest way to produce hydrogen in the quantity used in GC/MS.
- However, to minimize the degree of hazard, operate the hydrogen generator in a non-explosive environment only because hydrogen buildup can be ignitable. This means that your ventilation system for the room or lab hood must maintain an air exchange rate that is at least two orders of magnitude greater than the maximum hydrogen production rate of the hydrogen generator. Be sure to follow the manufacturer's directions about proper use and maintenance of the regulator.

  To prevent the accidental release of hydrogen, set the hydrogen generator to shut down if:

  – A loss of flow to the ventilation system.

  – A hydrogen detector alarms at 25% of the lower flammable limit of hydrogen in air. The lower flammable limit of hydrogen in air is 4%.

  In addition, vent the oxygen exhausted by the electrolyzer to the outside.

  IMPORTANT Use a hydrogen generator that uses a palladium dryer, such as the Parker Balston™ H2PD-150 or H2PD-300. Many hydrogen generators use a silica gel dryer, which, for mass spectrometry applications, does not sufficiently remove residual water vapor.

- **Hydrogen Cylinder** — Hydrogen comes in standard laboratory gas bottles or cylinders. Compressed hydrogen gas cylinders have a limited amount of hydrogen in them and are a safe way to transport and store hydrogen; however, like all compressed gas cylinders, they must be secured in an upright position, ideally with a non-combustible chain or cable.

If the cylinder falls over, the valve can be knocked off and the pressurized cylinder can take off like a rocket, which leads to the release of hydrogen and possibly an explosion, severe injury, or death. Never open a hydrogen cylinder valve to remove dust or dirt from fittings prior to attaching a regulator, as there is a risk of self-ignition.

Properly Storing Hydrogen

Storing and handling compressed hydrogen gas or cryogenic liquid hydrogen present potential health and safety hazards. Using proper storage and handling techniques is essential to maintaining a safe work environment.

Use these guidelines when storing or moving hydrogen cylinders and handling bulk hydrogen systems:

- Store spare hydrogen gas cylinders outside and away from doors, windows, building air intake vents, structures, and vehicle routes. This precaution applies when the hydrogen is in use or not. Indoor storage of spare hydrogen cylinders has special requirements, which are beyond the scope of this document. In documenting each cylinder, include a description of the cylinder, a list of available drawings or other documents, the most recent inspection results, and the responsible person's name.
- Prevent spare cylinders from toppling by wrapping them with chains. Make sure to protect the chains against corrosion and excessive heat.
- Separate spare hydrogen cylinders from oxidizing gases (such as oxygen) with a 1.5 m (5 ft) tall fire barrier with a half-hour fire rating, or place the cylinders at least 6 m (20 ft) apart.
- Use these precautions when moving hydrogen cylinders:
  - Remove the regulator and replace the cylinder valve cap before moving.
  - Move cylinders on cylinder carts or with other appropriate transport devices.
  - Never roll or drop a cylinder and never lift a cylinder by its protective cap.
- For some bulk hydrogen systems that include either gaseous or liquid hydrogen in fixed installations, consider using a semi-permanent trailer (tube trailer). Ensure that storage vessels for compressed hydrogen gas or liquid hydrogen are designed, constructed, tested, and maintained in accordance with applicable codes and standards.

  Note Bulk hydrogen systems represent a level of complexity that is beyond the scope of this document; these are general guidelines only.
- Do not place the bulk hydrogen storage system beneath electric power lines, near other flammable gases/liquids, or near public areas. Authorized personnel and delivery equipment must have ready access to the storage system, while it is protected from physical damage or tampering.

Hydrogen Safety Codes, Standards and References

The following list of safety codes, standards, and references is in no way an exhaustive list. In fact, there may be federal, state, or local codes that apply to your specific location. Check with all appropriate agencies with jurisdiction before installing or using a hydrogen system.

- Air Products Safetygram #4 Gaseous Hydrogen
- ANSI/AIAA standard for hydrogen safety guidelines is AIAA G-095-2004, Guide to Safety of Hydrogen and Hydrogen Systems
- ASME B31.1, Power Piping Code
- ASME B31.3, Process Piping Code
- ASME B31.8, Gas Transmission and Distribution Systems
- BCGA Code Of Practice CP4 Industrial Gas Cylinder Manifolds and Gas Distribution Pipework
- BCGA Code Of Practice CP33 The Bulk Storage of Gaseous Hydrogen at Users' Premises
- CGA G-5, Hydrogen
- CGA G-5.4, Standard for Hydrogen Piping Systems at Consumer Locations
- CGA G-5.5, Hydrogen Vent Systems
- CGA G-5.6, Hydrogen Pipeline Systems
- CGA G-5.8, High Pressure Hydrogen Piping Systems at Consumer Locations.
- FM Global Property Loss Prevention Data Sheets 7-50: Compressed Gases in Cylinders
- FM Global Property Loss Prevention Data Sheets 7-91: Hydrogen
- IGC Doc 121/04/E, Hydrogen Transportation Pipelines System Design Features
- NASA
- NSS 1740.16 Safety Standard For Hydrogen And Hydrogen Systems Guidelines for Hydrogen System Design, Materials Selection, Operations, Storage, and Transportation
- NFPA 52, Vehicular Fuel Systems Code
- NFPA 55, Standard for the Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks, 2005 Edition
- NFPA 68, Standard on Explosion Protection by Deflagration Venting
- NFPA 70, National Electrical Code

- NFPA 497, Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas
- NFPA 13, Standard for the Installation of Sprinkler Systems
- NFPA 45, Standard on Fire Protection for Laboratories Using Chemicals
- NFPA 55, Standard for the Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks
- NFPA 68, 2007 Standard on Explosion Protection by Deflagration Venting
- NFPA 69, Standard on Explosion Prevention Systems
- NFPA 91, Standard for Exhaust Systems for Air Conveying of Vapors
- NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials
- OSHA 29CFR1910.103 1910.103 Hydrogen

Hazardous Substances Precautions

WARNING Before using hazardous substances (toxic, harmful, and so on), read the hazard indications and information reported in the applicable Material Safety Data Sheet (MSDS.) Use Personal protection according to the safety requirements.

Venting Toxic Gases

When analyzing toxic compounds be aware that during the normal operation of the GC some of the sample might be vented outside the instrument through the inlet and detector exits; therefore, make sure to vent the exhaust gases to a fume hood. Consult local Environmental and Safety Regulations for instructions in exhausting fumes from your system.

License for Handling Detector Containing Radioactive Source

If you have bought an **Electron Capture Detector (ECD)**, be sure that the laboratory is provided with the **Nuclear License** for the possession of radioactive materials according to the local Standard Regulations.

CAUTION The Electron Capture Detector contains a ^{63}Ni beta-emitting radioactive source at 370 MBq (10 mCi). The detector should never be opened or handled by the user. Any maintenance or service operations involving even partial disassembling of the detector must be performed ONLY by qualified personnel at a laboratory expressly authorized by Thermo Fisher Scientific and specifically licensed to handle radioactive material.

IMPORTANT For customers within the jurisdiction of the United States Nuclear Regulatory Commission (US NRC), you may find a listing of the agreement states and the current contact information for the regulators covering both Generally and Specifically licensed devices like an ECD at http://nrc-stp.ornl.gov/rulemaking.html. This information is maintained by the US NRC.

IMPORTANT For customers within the jurisdiction of the Canadian Nuclear Safety Commission, you may find current contact information for the regulators at http://www.nuclearsafety.gc.ca.

Liquid Nitrogen Safety Precautions

Liquid nitrogen is a colorless, odorless, extremely cold liquid and gas under pressure. It can cause rapid suffocation when concentrations are sufficient to reduce oxygen levels below 19.5%. A Self Contained Breathing Apparatus (SCBA) might be required. Contact with liquid or cold vapors can cause severe frostbite. Cold vapors in the air will appear as a white fog due to condensation of moisture. Oxygen concentrations must be monitored in the release area. All cryogenic liquids produce large volumes of gas when they vaporize.

WARNING Before using Liquid Nitrogen, read the hazard indications and the instructions reported in the Safety sheet supplied by the manufacturer, with reference to the CAS number (Chemical Abstract Service) 7727-37-9.

Use personal protection:

- **Protective gloves**: Loose fitting thermal-insulated or leather gloves.
- **Eye protection**: Full face shield and safety glasses are recommended.
- **Other protective equipment**: Safety shoes when handling containers. Long sleeved shirts and trousers without cuffs. Work clothing that sufficiently prevents skin contact should be worn.

Carbon Dioxide Safety Precautions

Carbon dioxide is a colorless, cryogenic liquid. At low concentrations, is odorless. At higher concentrations carbon dioxide will have a sharp, acidic odor. At concentrations between 2 and 10%, Carbon dioxide can cause nausea, dizziness, headache, mental confusion, increased blood pressure, and increased respiratory rate.
If the gas concentration reaches 10% or more, suffocation and death can occur within minutes. Contact with the cold gas can cause freezing of exposed tissue. Moisture in the air could lead to the formation of carbonic acid that can be irritating to the eyes. All forms of carbon dioxide are noncombustible. Carbon dioxide is heavier than air and should not be allowed to accumulate in low lying areas.

WARNING Before using carbon dioxide, read the indications of hazard and the instructions reported in the Safety sheet supplied by the manufacturer with reference to the CAS number (Chemical Abstract Service) 124-38-9.

Use personal protection:

- **Protective gloves**: Loose fitting thermal insulated or leather gloves.
- **Eye protection**: Full face shield and safety glasses are recommended.
- **Other protective equipment**: Safety shoes when handling containers. Long sleeved shirts and trousers without cuffs. Work clothing that sufficiently prevents skin contact should be worn.

1

Site Preparation

This chapter describes how to prepare your site before the Thermo Scientific Field Service Engineer arrives to install the TRACE 1300/TRACE 1310 gas chromatograph.

Contents

Note In addition to the information in this chapter, you must also obey the building and safety rules and regulations for construction that apply in your area.

Entrance Requirements

Use the following guidelines to make sure the entrance to your site will allow delivery of the TRACE 1300/TRACE 1310 GC.

1. Ensure the width of your delivery door opening is at least 81 cm (32 in.).
2. Make sure you have enough room to move boxes around corners, into elevators, or through doorways. The table below contains the dimensions and weight of shipping boxes, so that you can make accommodations

Table 1. Shipping Box Dimensions and Weight

Box Contents	Depth		Width		Height		Mass (Weight)	
	cm	in.	cm	in.	cm	in.	kg	lbs
TRACE 1300 GC	80	31	80	31	80	31	64	140
TRACE 1310 GC	80	31	80	31	80	31	64	140
TRACE 1310 Auxiliary Oven with pallet	78.4	30.9	52.4	20.6	74.4	29.3	65	143
TRACE 1300/1310 GC + TRACE 1310 Auxiliary Oven with pallet	92.4	36.6	83.4	32.8	74.4	29.3	130	287
TRACE 1300/1310 GC + Compact Aux Oven	92.4	36.6	83.4	32.8	74.4	29.3	75	165.5
TriPlus RSH (standard X-axis)	65	26	100	39	32	13	45-55	99-122
Pallet for TriPlus RSH standard	70	27	105	41	13	5		
TriPlus RSH (extended X-axis)	65	26	136	54	32	13	55-60	122-132
Pallet for TriPlus RSH extended	70	27	140	55	13	5		
TriPlus 100 Liquid Sampler	65	26	100	39	32	13	45-55	99-122
Pallet for TriPlus 100 Liquid Sampler	70	27	105	41	13	5		
TriPlus 300 Headspace Box 1:2	76.5	30	71.5	28	84	33	70	154
TriPlus 300 Headspace Box 2:2	78.5	31	63.5	25	99.6	39	25	55
AI/AS 1310	36	14	51	20	36	14	10	22
AI/AS 1310 with supports	36	14	51	20	40	16	15	33
Accessories	These modules, such as the computer, monitor, and optional instruments are shipped in their own boxes. They could be smaller or bigger and weigh less or more than the TRACE 1300/TRACE 1310 GC box.							

Workbench and Space Requirements

Use the following guidelines to make sure you have enough space for the TRACE 1300/TRACE 1310 GC system.

1. Ensure you have adequate workbench space for the system. Refer to the table below for exact measurements of each component.

   Use the information in the table below to configure the workbench. Be sure to leave at least 30 cm (12 in.), of extra space around the instrument for operators to work besides it and in front of it.

   Keep in mind that the TRACE 1300/TRACE 1310 GC oven vents to the rear. Any material exposed to the oven exhaust must be able to withstand repeated exposure to temperatures of up to 450 °C (842 °F).

Table 2. Workbench and Space Requirements (Sheet 1 of 2)

Instrument	Depth		Width		Height		Mass	
	cm	in.	cm	in.	cm	in.	kg	lbs
TRACE 1300 GC (Main Unit)	60	24	41	16	45	18	35[2]	77[2]
TRACE 1310 GC (Main Unit)[1]	67[1]	26	41	16	45	18	35[2]	77[2]
TRACE 1300 GC + TRACE 1310 Auxiliary Oven	60	24	74.5	29	45	18	95[2-6]	209[2-6]
TRACE 1310 GC + TRACE 1310 Auxiliary Oven	67[1]	26	74.5	29	45	18	95[2-6]	209[2-6]
TRACE 1310 GC + Compact Aux Oven	67[1]	26	52.2		45	18	50[2-8]	110[2-8]
Computer[3]	48	19	20	8	43	17	12	27
Monitor[3]	16	7	46	18	32	13	4	8
Keyboard[3]	23	9	46	18	5	2	1	2
TriPlus RSH standard X axis (Working Range)	80	31.5	99	39	74[5]	29[5]	25	55
TriPlus RSH extended X-axis (Working Range)	80	31.5	135	53	74[5]	29[5]	27	60
TriPlus 100 Liquid Sampler	50.3[7]	19.8[7]	85	33.5	54	21.3	15.3[9]	33.7[9]
TriPlus 300 Headspace	55	22	82	32	73	29	63	139
AI 1310 Autosampler	28	11	23	9	40	16	6	13
AS 1310 Autosampler with 105-position Sample Tray	28	11	41	16	40	16	6	13

Table 2. Workbench and Space Requirements (Sheet 2 of 2)

Instrument	Depth		Width		Height		Mass	
	cm	in.	cm	in.	cm	in.	kg	lbs
AS 1310 Autosampler[5] with 155-position Sample Tray	29	11.4	47	18.5	40	16	7	15

[1] The touch screen protrudes 7 cm from the front of the TRACE 1310 GC.

[2] The mass of the GC is intended without injector/detector modules. The mass of each injector/detector module is 0.8 kg (1.77 lbs).

[3] This item is placed on the floor under the system, thereby reducing the weight requirements for your workbench.

[3] Dimensions vary per manufacturer, therefore approximations are provided.

[4] Mounts on top of TRACE 1300/TRACE 1310 GC.

[5] Dimensions including the support legs (21 cm height).

[6] The TRACE 1310 Auxiliary Oven width is 30 cm (12-in.) while its height and depth are the same of the GC. The mass of the Valve Oven is intended with all the options installed.

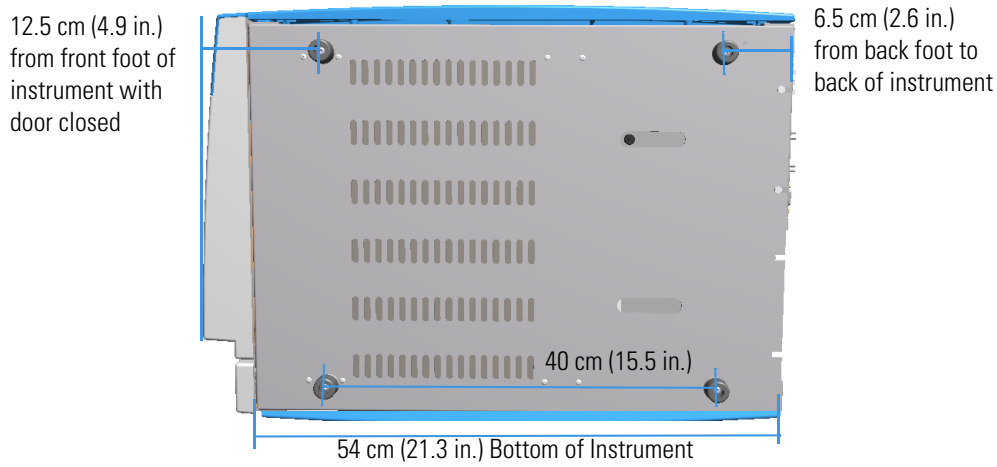
[7] About 20 cm (about 8-in.) of the orthogonal crossrail (Y-axis) are protruding the rear of the GC.

[8] The mass of the Compact Aux Oven is intended with all the options installed.

[9] Mass without accessories.

2. Be sure the TRACE 1300/TRACE 1310 GC instrument's feet fit securely on the workbench. See Figure 1 for the dimensions of the feet on the bottom of the instrument.

Figure 1. Dimensions of Feet on the Bottom of the TRACE 1300/TRACE 1310 GC



3. Supply a 1-in. i.d. hose to a fume hood or other suitable exhaust port. Consult local Environmental and Safety Regulations for instructions in exhausting fumes from your system.

4. Allow at least 30 cm (12 in.) of clearance behind the GC. This space allows for venting of the hot exhaust, clearance of the gas lines, electrical connections, access to power switch, and horizontal movement of the TriPlus RSH/TriPlus 100 Liquid Sampler/TriPlus "Y" axis arm.

5. Make sure you have at least 92 cm (3 ft.) of clearance above the system. This space allows room for optional accessories (such as autosamplers) and proper heat dissipation.

6. Make sure your workbench can support a TRACE 1300/TRACE 1310 GC standard system. Keep in mind, additional instruments add to the total weight.
7. Ensure that your work area is stable and free of vibration from nearby equipment. The TRACE 1300/TRACE 1310 GC system is a sensitive instrument.

Lighting Requirements

Use the following guidelines to check the lighting at your site:

1. Ensure that your work area is properly lit. You may need an overhead lamp to light your work area.
2. You may need a small, high-intensity lamp when you clean the TRACE 1300/TRACE 1310 GC.

Power Requirements

Use the following guidelines to ensure your site is equipped with enough power to support the system.

1. Test the power source quality in your laboratory to offset line voltage problems. Improving power source quality is a complex task best handled by a company or consultant specializing in that field. Contact your regional Thermo Scientific Customer Service office for assistance in locating a power consultant. Having a poor quality power source degrades the system performance. Here are some examples of poor power source quality:
   - Harmonic Distortion is a high-frequency disturbance that appears as distortion of the fundamental sine wave. Total harmonic distortion should be less than 6%.
   - Sags are constant low line voltage, which cause the system to function erratically or not at all.
   - Slow changes are gradual, long-term changes in average root mean square (RMS) voltage level, with typical durations greater than 2 s.
   - Surges are constant high line voltage, which cause overheating and component failure. Sags and surges are slow changes in average root mean square (RMS) voltage level, with typical durations between 50 ms and 2 s.
   - Transients, even of a few microseconds duration cause electronic devices to fail or to degrade and significantly shorten their lives. Transients (or impulses) are brief voltage excursions of up to several thousand volts with durations less than 50 ms.
2. If your laboratory's power source does not meet the previous requirement, you will need a UPS (Uninterruptible Power Supply) or power line conditioner. The UPS system must produce high-quality distortion-free power within our specifications.

A power line conditioner is more suitable for conditions in which a laboratory's power has sags, harmonic distortion, surges and transients. In this situation, a power line conditioner will maintain a smooth and steady power source to the TRACE 1300/TRACE 1310 GC system so that your data will be unaffected by a power surge.

3. Use Table 3 to determine how many circuits and wall outlets you need and for a list of maximum current and power consumption. Keep in mind:
   a. Power must be single phase.
   b. Wall outlets must have earth-ground hard-wired to the main panel.
   c. Included power cords are at least 2 m (9 ft.) long.
   d. Look at your Customer Sales Order to determine if the instrument is 120 Vac or 230 Vac, because it cannot be re-configured once your field service engineer arrives.
   e. Contact your local Customer Service office to discuss power cord sets concerns.

Table 3. System Power Requirements

Equipment	Max. Current (A) at 120 Vac	Max. Current (A) at 230 Vac	Max. Power (VA/W)
TRACE 1300 GC	20	16	2000
TRACE 1310 GC	20	16	2000
TRACE 1310 Auxiliary Oven	6	3	650
Compact Aux Oven	---	---	120
Computer[1]	5	2.6	400
Monitor[1]	2	1	25
TriPlus RSH	---	---	200 W with a single Power Module 400 W with two Power Modules
TriPlus 100 Liquid Sampler	---	---	200 W with a single Power Module 400 W with two Power Modules
TriPlus 300 Headspace	10	6	1300
AI 1310/AS 1310	0.8	0.4	70
TriPlus	2	1	240
AI 3000/AS 3000	0.8	0.4	70

[1]. Power requirements vary by manufacturer.

Note The 230 Vac power cord terminates to bare wires. Inform your local Customer Service office as to your plug type so they can bring the proper power cord or plug.

4. Make sure you have at least three (3) separate circuits. They should be within 2 m (6 ft.) of the instrument.

   For example, use one circuit for the TRACE 1300/TRACE 1310 GC, one circuit for the mass spectrometer, and one circuit for the data system and any options. But, do not connect the TRACE 1300/TRACE 1310 GC and mass spectrometer to the same circuit. The extra outlets are for additional options.

5. Make sure that the instruments you plug in do not exceed the maximum circuits and current rating.

LAN Network Requirements

The connection between the TRACE 1300/TRACE 1310 GC and the Thermo Scientific data system must be carried out via Local Area Network (LAN).

Your lab must be equipped with one or more RJ-45 wall outlets. To connect your system to your site's LAN network, you must have a shielded twisted pair network cable provided.

In the case a LAN is missing, the instrument could be connected directly to the LAN inlet on the PC by using the red cable.

Note We are not responsible for connecting to or establishing communication with your site LAN network. The FSE will test the system's ability to communicate on a mini-hub or LAN switch only (preferable).

Environmental Requirements and Specifications

- Indoor use only.
- Up to 3500 meters altitude over sea level
- Temperature 15 °C – 35 °C (59 – 95 °F)
- Maximum relative humidity between 40% and 80%, non-condensing
- Voltage variations must not exceed the nominal voltage by ± 10%
- Transient overloads in compliance with installation categories II
- Pollution degree according to IEC 664 (3.7.3) 2
- Protection degree IP00
- Sound Pressure Level Limit < 70 dBA (where dBA = A weighted sound pressure level)

The TRACE 1300/TRACE 1310 GC operates in an environment where normally only non-conductive pollution occurs, but in which temporary conductivity due to condensation must be expected. This is a Pollution Degree 2 environment, as specified in International Standard EN 61010-1: 1993 and subsequent amendments.

Use the following guidelines to ensure your site has the proper environmental conditions for the system:

1. Ensure that your room temperature is 5–40 °C (41–104 °F). The analytical performance is only confirmed for temperatures between 15–35 °C (59–95 °F). For best performance, the operating temperature should be constant. Use the table below to calculate the amount of heat your system will generate and ensure your air-conditioning system can handle that amount of heat.

Table 4. Maximum Heat Output

	Instrument	Heat Output (in Btu hr-1)	Heat Output (in W)
Standard Equipment	TRACE 1300/TRACE 1310 GC [120 Vac]	6830	2000
	TRACE 1300/TRACE 1310 GC [230 Vac]	6830	2000
	TRACE 1310 Auxiliary Oven	2220	650
	Compact Aux Oven	410	120
	Computer[1]	1365	400
	Monitor[1]	85	25
Options Equipment	TriPlus RSH	683[2] or 1366[3]	200[2] or 400[3]
	TriPlus 100 Liquid Sampler	683[2] or 1366[3]	200[2] or 400[3]
	TriPlus 300 Headspace	4440	1300
	AI 1310/AS 1310	239	70
	TriPlus	820	240
	AI 3000/AS 3000	239	70

[1] Power requirements vary by manufacturer.
[2] Single Power Module.
[3] Double Power Module.

2. Ensure that the relative humidity in your laboratory is between 40 and 80%, with no condensation. A temperature and humidity monitor in your laboratory helps ensure that the climate is within these specifications.

3. Ensure that the air in your site is free of excess **particulate matter**.

   For reference, the air should contain fewer than 100,000 particles (larger than 5 µm) per cubic meter. If the concentration is larger than this amount, dust can accumulate on electronic components. This accumulation reduces their ability to cool off properly and could cause them to overheat. If your environment is particularly dusty, we recommend that you purchase the optional dust filter for your system.

4. Ensure that your site is free of electrostatic discharge (ESD), which may damage the electronic components of your system. Ensure your static has been discharged before touching internal components of the instrument. ESD can damage sensitive components, resulting in premature failures.

   Take the following precaution to prevent electrostatic discharge:

   - Use a static-dissipating floor covering (such as tile or conductive linoleum) in the room housing your instrument.
   - Use laboratory chairs covered with natural fibers or other static-dissipating material.
   - Wear laboratory coats and clothing made from natural fibers or other static-dissipating material.
   - Do not place polystyrene (foam) cups or packing materials on the instrument.

Gas Equipment Requirements

Use the following guidelines to make sure you have the gas supplies for your system ready far in advance of installation. You will need a supply of ultra-high purity GC gases.

The gases used with the instrument are Helium, Nitrogen, Hydrogen, Air, Argon, Argon/Methane. Other gases are rarely used.

WARNING Before using gases, carefully read the hazard indications and information reported in the Safety Sheet supplied by the manufacturer referring to the CAS (Chemical Abstract Service) number. It is the user's responsibility to see that all local safety regulations for the use of gases are obeyed.

All Thermo Fisher Scientific gas chromatographs normally uses an inert gas as carrier gas. If you wish to use hydrogen as a carrier gas, the hydrogen sensor must be installed. Contact a Thermo Fisher Scientific sales representative if you plan to use hydrogen as the carrier gas in your new TRACE 1300/TRACE 1310 GC. If you don't have the hydrogen sensor, you **must** use an inert carrier gas. Refer to "Using Hydrogen with TRACE 1300/TRACE 1310" on page xxi for details.

CAUTION Secure gas cylinders to an immovable structure or wall. Handle all gases according to local safety regulations.

Do not place gas tanks in the path of the TRACE 1300/TRACE 1310 GC oven exhaust.

1. You must provide the gas supplies for your gas chromatograph. Be sure to order your gases and regulators far enough ahead of time to have them ready for the TRACE 1300/TRACE 1310 GC installation process.

   The following table lists the gas recommendations:

Table 5. Gas Recommendations

Detector Type	Carrier Gas	Fuel Gas	Make-up Gas
FID	Helium, Nitrogen, Hydrogen[1]	Hydrogen + Air	Helium, Nitrogen
NPD	Helium, Nitrogen, Hydrogen[1]	Hydrogen + Air	Helium, Nitrogen
ECD	Helium, Nitrogen, Argon	None	Nitrogen, Argon/5% Methane
TCD	Helium, Nitrogen, Hydrogen[1], Argon	None	Same as carrier
FPD	Helium, Nitrogen	Hydrogen + Air	None
PDD	Helium is the gas used for PDD discharge and carrier supply.		
MS	Helium, Hydrogen[1]	None	None

1. If hydrogen is used as carrier gas, you must install a hydrogen sensor into the TRACE 1300/TRACE 1310 GC.

2. You will need a supply of ultra-high purity GC carrier gas. Typical cylinders are about 23 cm (9 in.) wide by 140 cm (55 in.) tall and output >15,000 kPa (>2200 psig). A single full-size tank contains 8000 L of helium or 6000 L of hydrogen and each will last about three months with a typical usage rate of 50 mL/min.

Table 6. Gas Specifications

Gas Type	Purity[1]	Outlet Pressure	Regulator	Connector[2]
Helium	99.999%	400-1050 kPa (58-150 psig)	Dual stage brass regulator with stainless steel diaphragm. The regulator output pressure should be adjustable from 300 to 1050 kPa (45–150 psig)	CGA-580
Nitrogen	99.999%	400-1050 kPa (58-150 psig)		CGA-580
Hydrogen	99.999%	400-1050 kPa (58-150 psig)		CGA-350
Air	99.999%	400-1050 kPa (58-150 psig)		CGA-590
Argon/5% Methane	99.999%	400-1050 kPa (58-150 psig)		CGA-350

1. Ultra-high purity with less than 1.0 ppm each of water, oxygen, and total hydrocarbons and contained in one tank. Impurities below 1.0 ppm generally do not require purification. Gases with higher impurity levels may require the use of appropriate water, oxygen and hydrocarbon traps.

2. Connectors will vary with cylinder size. Confirm that your regulator will work with your gas tank. All connections to the GC are 1/8 in. Swagelok fittings.

WARNING - FIRE HAZARD When using hydrogen, be aware that it can flow into the oven and create a fire hazard. Turn off the supply until the GC column is in the inlet and the detector. Whenever you use hydrogen, it is critical to test all connections, lines, and valves for leaks before using the instrument. When performing maintenance, be sure to turn off the hydrogen supply.

Oxygen and moisture cannot be prevented from entering the system during cylinder changes. To minimize the impact of these contaminants on the GC system, high purity gas handling equipment should be used. To further protect the system from oxygen and moisture, point-of-use purifiers should be installed in the carrier gas lines just prior to the GC to remove any residual contaminants. See Table 7.

Table 7. Trap Specifications

Traps	Use
Moisture trap	Water in the carrier or fuel gas may damage the analytical column and contaminate the system. Water content should be less than 1 ppm in all cases. If you are using multiple traps, install the moisture trap closest the gas supply, before the hydrocarbon and the oxygen trap.
Hydrocarbon trap	Hydrocarbon traps remove organic materials from gases. If you are using multiple traps, install the hydrocarbon trap after the moisture trap, but before the oxygen trap.
Oxygen trap	Oxygen content in the carrier and gas lines should be less than 1 ppm. To achieve a level of oxygen of less than 1 ppm, install an oxygen-removing trap in the carrier gas line between the gas tank and the TRACE 1300/TRACE 1310 GC. If you are using multiple traps, the oxygen trap should be the last trap in the series.

3. If you have a TriPlus RSH or a TriPlus autosampler with the SPME conditioning station or a TriPlus Headspace autosampler, you need to obtain a low-pressure, single-stage regulator (0-30 psi) for nitrogen purging.

Table 8. Other Gas Specifications

Equipment	Gas Type	Purity	Max. Pressure	Regulator	Connector
TriPlus RSH TriPlus SPME TriPlus HS	Nitrogen	99.999%	200 kPa (30 psig)	Dual stage brass regulator with stainless steel diaphragm.	CGA-580[1]

[1] Connectors will vary with cylinder size. Confirm that your regulator will work with your gas tank. All connections to the GC/MS are 1/8 in. Swagelok fittings.

4. If your TRACE 1300/TRACE 1310 GC and PTV injector will be equipped with a cryogenic cooling option, you will need a supply of coolant, such as liquid nitrogen or carbon dioxide. See the "Cryogenic Cooling" on page 12 for more information.

5. Gas lines should be:

- As short as possible, run to the back or side of the TRACE 1300/TRACE 1310 GC system.
- Made a pre-cleaned copper or stainless steel when using helium and hydrogen.
- Free of oil and moisture.

6. Obtain the proper gas line filters, which help prevent impurities and contaminants from entering your system. Water, oxygen, and total hydrocarbons should be less than 1 ppm to avoid high background noise and prevent contamination. The GC is equipped with intake filters that trap moisture, oxygen, and hydrocarbons.
7. Store gas tanks and bottles properly so they will not damage cables or gas lines. Ensure they are secured in accordance with standard safety practices.

Cryogenic Cooling

If you have purchased a cryogenic cooling option for oven and/or PTV injector to operate at sub-ambient temperature, you will need to provide a coolant supply.
Your TRACE 1300/TRACE 1310 GC is already configured for either liquid nitrogen or carbon dioxide.

- The oven cryogenic system can reach –100 °C with liquid nitrogen or –50 °C with carbon dioxide.
- The PTV cryogenic system can reach –100 °C with liquid nitrogen or –50 °C with carbon dioxide.

Be sure to identify which cryogenic cooling option your instrument is configured for before you order cryogenic coolant.

Using Liquid Nitrogen

Before using liquid nitrogen, read the indications of hazard and the instructions reported in the Safety sheet supplied by the manufacturer with reference to the CAS number (Chemical Abstract Service) 7727-37-9.

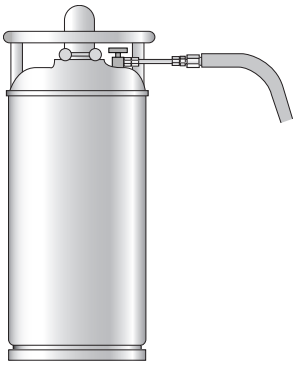
WARNING High pressures and extremely low temperatures make liquid nitrogen a hazardous material. High concentrations of nitrogen in the air can cause asphyxiation hazard. To avoid injury, always follow the safety precautions and delivery system design recommended by your gas supplier.

Use personal protection:

- **Protective gloves**: Loose fitting thermal insulated or leather gloves.
- **Eye protection**: Full face shield and safety glasses are recommended.
- **Other protective equipment**: Safety shoes when handling containers. Long sleeve shirts and trousers without cuffs. Work clothing that sufficiently prevents skin contact should be worn.

Liquid Nitrogen must be supplied at a pressure of 1.5 bar (150 kPa; 21.75 psig). Figure 2 shows the proper configuration for an liquid nitrogen tank.

Figure 2. Liquid Nitrogen Tank Configuration



Plumbing to the GC should be 1/4-inch copper or stainless steel tubing with insulation. It is your responsibility to ensure the liquid delivery connection from the liquid nitrogen cryogenic supply is adaptable to 1/4-inch tubing.

The liquid nitrogen cryogenic valve on the TRACE 1300/TRACE 1310 GC is a 1/4-inch Swagelok fitting.

Using Carbon Dioxide

Before using carbon dioxide, read the indications of hazard and the instructions reported in the Safety sheet supplied by the manufacturer with reference to the CAS number (Chemical Abstract Service) 124-38-9.

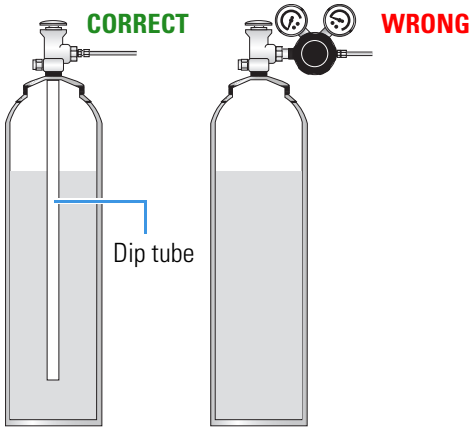
WARNING High pressures and extremely low temperatures make pressurized carbon dioxide a hazardous material. High concentrations of Carbon Dioxide are dangerous. To avoid injury, always follow the safety precautions and delivery system design recommended by your gas supplier.

Use personal protection:

- **Protective gloves**: Loose fitting thermal insulated or leather gloves.
- **Eye protection**: Full face shield and safety glasses are recommended.
- **Other protective equipment**: Safety shoes when handling containers. Long sleeve shirts and trousers without cuffs. Work clothing that sufficiently prevents skin contact should be worn.

Carbon dioxide must be supplied by a high-pressure cylinder with a dip tube. Figure 3 shows the proper carbon dioxide tank configuration.

Figure 3. Carbon Dioxide Tank Configuration



It is your responsibility to ensure the liquid delivery connection from the carbon dioxide cryogenic supply is adaptable to 1/8-inch tubing.

The Carbon Dioxide cryogenic valve on the TRACE 1300/TRACE 1310 GC is a 1/8-inch Swagelok fitting.

Using Hydrogen

To safely use hydrogen, you should have a hydrogen sensor installed in your GC. Field Service Engineers can install a sensor. but they are not authorized to install or repair any instrument using hydrogen as a carrier gas unless the instrument is equipped with the appropriate sensor. The sensor must be calibrated occasionally, as described in the sensor's documentation.

Use the following safety precautions when using hydrogen:

- Ensure that all hydrogen cylinders comply with the safety requirements for proper use and storage. Hydrogen cylinders and delivery systems must comply with local regulations.
- Make sure the gas supply is turned completely off when connecting hydrogen lines.
- Perform a bubble test to ensure that the hydrogen lines are leak-tight before using the instrument. Repeat this test to eliminate all leaks.
- Ensure your GC has a Thermo Fisher Scientific hydrogen sensor installed. A hydrogen sensor continuously monitors the hydrogen level in the oven.
- Remove as many sources of ignition as possible from your laboratory. Sources can include open flames, electrostatic discharges, or devices that spark.
- Do not open a cylinder of hydrogen without a regulator attached because it may self-ignite.

Receiving Instruments

When you receive the TRACE 1300/TRACE 1310 GC system:

1. Inspect the boxes for damage when the instrument arrives. Our instruments are shipped by electronic equipment carriers who specialize in the handling of delicate equipment. Occasionally, however, equipment is inadvertently damaged in transit. If you notice evidence of external damage, do not refuse shipment. Instead, call Customer Service.
2. Once you are finished inspecting your shipment, move the cartons to a protected location, preferably the installation site. Leave the boxes as complete as possible and do not unpack or open the boxes without our Field Service Engineer (FSE) present. Doing otherwise may void your warranty or order.
3. Complete the Installation Request Form located at the front of this guide and forwards it to Customer Support.

What Happens Next?

After the Installation Request Form is received, Customer Support will contact you to schedule the installation of your system. It is important to confirm that all the requirements on the form are met BEFORE the Field Service Engineer arrives.

The Field Service Engineer will install the system and confirm that all performance tests pass.