



thermo scientific

Thermo Scientific

AI 1310 / AS 1310

User Guide

Autosamplers

31716000 Fifth Edition • May 2017

ThermoFisher
SCIENTIFIC

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Tel: +39 02 95059303; Fax: +39 02 95059388

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AI 1310 / AS 1310 User Guide, PN 31716000, Fifth Edition

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The manual is well organized.	1	2	3	4	5
The manual is clearly written.	1	2	3	4	5
The manual contains all the information I need.	1	2	3	4	5
The instructions are easy to follow.	1	2	3	4	5
The instructions are complete.	1	2	3	4	5
The technical information is easy to understand.	1	2	3	4	5
Examples of operation are clear and useful.	1	2	3	4	5
The figures are helpful.	1	2	3	4	5
I was able to operate the system using this manual.	1	2	3	4	5

fold — — If not, please comment below. Attach additional sheets if necessary.

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Editor, Technical Publications
 Thermo Fisher Scientific S.p.A.
 Strada Rivoltana km 4
 20090 Rodano (MI)
 Italy

Editor, Technical Publications
 Thermo Fisher Scientific CMD GC-GC/MS
 2215 Grand Avenue Parkway
 Austin TX 78728-3812
 United States of America

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- installation,
- recalibration, and
- changes and repairs

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- the instrument is used according to the instructions provided, and
- its operation is only entrusted to qualified trained personnel.

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Strada Rivoltana, 20090 Rodano - Milan - Italy — Tel: +39 02 950591 - Fax: +39 02 9505276

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When the system is delivered to you, it meets all pertinent electromagnetic compatibility (EMC) and safety standards.

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DECLARATION OF CONFORMITY <i>Dichiarazione di Conformità</i> according to ISO/IEC Guide 17050-1			
<i>Manufacturer's Name :</i>		Thermo Fisher Scientific SpA.	
<i>Manufacturer's Address :</i>		Strada Rivoltana 20090 Rodano - Milan Italy	
declares, under sole responsibility, that the product <i>dichiara, sotto la sua piena responsabilità, che il prodotto</i>			
<i>Product :</i>		Auto-sampler System	
<i>Product model:</i>		AI/AS 1310	
as originally delivered complies with the essential requirements of the following applicable European Directives <i>così come originariamente consegnato, risponde ai requisiti essenziali delle seguenti Direttive Europee applicabili</i>			
		Machinery Directive 2006/42/EC EMC Directive 2014/30/EU RoHS Directive 2011/65/EU	
and conforms with the following product standards <i>ed è conforme ai seguenti standard di prodotto</i>			
<i>EMC:</i>	EN 61326-1:2013 (2 nd ed.) IEC 61326-1:2012 (2 nd ed.) FCC rules: CFR no. 47 Part 15 Subpart B Section 15.107 and 15.109		
<i>Safety:</i>	EN 61010-1:2010 (3 rd ed.) IEC 61010-1:2010 (3 rd ed.) CAN/CSA C22.2 No. 61010-1-12 UL 61010-1:2012 EN 61010-2-081:2015 IEC 61010-2-081:2015		
person authorised to compile the technical file		Thermo Fisher Scientific SpA.	
<i>persona autorizzata a costituire il fascicolo tecnico</i>			
<i>General Manager GC/GCMS:</i>		 Morten Bern	
<i>Place:</i>	Milan, Italy		
<i>Date:</i>	April 12, 2017 (5th rev.)		
			original copy

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 UNDESIRE 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.

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 (AI/AS1310)					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
(马达驱动电路板) PCBA A3001S	X	O	O	O	O	O
(主控电路板) PCBA A3001M	X	O	O	O	O	O
(接口电路板) PCBA ICN3001M	X	O	O	O	O	O
(接线电路板) PCBA CNS302	X	O	O	O	O	O
(样品盘电路板) PCBA TRAY-AS	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.

WEEE Directive

2012/19/EU



Thermo Fisher Scientific is registered with B2B Compliance ([B2Bcompliance.org.uk](https://www.b2bcompliance.org.uk)) in the UK and with the European Recycling Platform ([ERP-recycling.org](https://www.eurp-recycling.org)) in all other countries of the European Union and in Norway.

If this product is located in Europe and you want to participate in the Thermo Fisher Scientific Business-to-Business (B2B) Recycling Program, send an email request to weee.recycle@thermofisher.com with the following information:

- WEEE product class
- Name of the manufacturer or distributor (where you purchased the product)
- Number of product pieces, and the estimated total weight and volume
- Pick-up address and contact person (include contact information)
- Appropriate pick-up time
- Declaration of decontamination, stating that all hazardous fluids or material have been removed from the product

For additional information about the Restriction on Hazardous Substances (RoHS) Directive for the European Union, search for RoHS on the Thermo Fisher Scientific European language websites.

IMPORTANT This recycling program is **not** for biological hazard products or for products that have been medically contaminated. You must treat these types of products as biohazard waste and dispose of them in accordance with your local regulations.

Directive DEEE

2012/19/EU



Thermo Fisher Scientific s'est associé avec une ou plusieurs sociétés de recyclage dans chaque état membre de l'Union Européenne et ce produit devrait être collecté ou recyclé par celle(s)-ci. Pour davantage d'informations, rendez-vous sur la page www.thermoscientific.fr/rohs.

WEEE Direktive

2012/19/EU



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Preface

This manual contains descriptions of the features and components of the AI 1310/AS 1310 sampling systems. Inside, you will find all of the information necessary for routine operation of your sampling system. This includes operating procedures, sample injection techniques, and diagrams and descriptions of the major components.

This manual is organized as follows:

- [Chapter 1, “Introduction,”](#) provides a basic overview of the features and options of the AI 1310/AS 1310 System. It also describes the available instrument configurations.
- [Chapter 2, “Sampling Unit,”](#) provides a description of the components of the sampling unit of the AI 1310/AS 1310 System.
- [Chapter 3, “Installation,”](#) contains the instructions for the installation of the AI 1310/AS 1310 on the TRACE 1300 Series GC, TRACE GC Ultra and FOCUS GC gas chromatographs, the syringe and the electrical connections with the different units of the gas chromatographic system.
- [Chapter 4, “AI 1310/AS 1310 Control,”](#) provides the information for controlling the AI 1310/AS 1310 through the Chromatography Data System, the TRACE GC Ultra, or the FOCUS GC. The chapter contains also the working procedures with different injectors.
- [Chapter 5, “Maintenance,”](#) provides guidelines for the maintenance of the AI 1310/AS 1310.
- [Glossary](#) contains definitions of terms used in this manual. This also includes abbreviations, acronyms, metric prefixes, and symbols.
- [Index](#) contains an alphabetical list of key terms and topics in this guide, including cross references and the corresponding page numbers.

About Your System



WARNING Thermo Fisher 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 may be impaired. If you maintain a system outside the specifications listed in this guide, failures of many types, including personal injury or death, may 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 When, for technical reasons, it is necessary to work on instrument parts which may involve an hazard (moving parts, components under voltage, etc.) the authorized Technical Service must be contacted. This type of situations can be identified because access to these parts is possible only by using a tool. The removable protective covers bear a warning symbol suggesting to refer to the documentation accompanying the instrument. Should an operator perform a maintenance operation, he/she must have received proper training to carry out that specific action.

WARNING Before using dangerous substances (toxic, harmful, and so forth), read the hazard indications and information reported in the Material Safety Data Sheet (MSDS) supplied by the manufacturer referring to the relevant CAS (Chemical Abstract Service) number.

The AI 1310/AS 1310 sampling system requires the use of several chemical products, which are present in vials and syringes, having different hazard characteristics. Before using these substances or replacing the syringe, please read the hazard indications and information reported in the Safety Sheet supplied by the manufacturer referring to the relevant CAS (Chemical Abstract Service) number.

Environmental Conditions

- Internal use
- Up to 2000 meters altitude
- Temperature 18 °C to 30 °C
- Maximum relative humidity between 30% and 85%
- Voltage variations must not exceed the nominal voltage by $\pm 10\%$
- Transient overloads in compliance with installation categories **II**
- Pollution degree according to IEC 664 (3.7.3) **2**
- Protection degree IP00

Rating

AI 1310/AS 1310 Autosampler

- 24 Vdc through a portable external power supply, level VI efficiency
 - input 100-240 Vac; 50-60 Hz — output 24 Vdc; 3 A - 3.75 A



WARNING YOU MUST ONLY USE THE PORTABLE EXTERNAL POWER SUPPLY FURNISHED WITH THE INSTRUMENT BY THERMO FISHER SCIENTIFIC.

Contacting Us

Thermo Fisher Scientific provides comprehensive technical assistance worldwide and is dedicated to the quality of our customer relationships and services.

- Use <http://www.thermofisher.com> address for products information.
- Use <http://www.gc-gcms-customersupport.com/WebPage/Share/Default.aspx> address to contact your local Thermo Fisher Scientific office or affiliate GC-MS Customer Support.

Safety Alerts and Important Information

Make sure you follow the precautionary notices presented in this guide. Safety and other special notices appear in boxes and include the following:

WARNING This is the general warning safety symbol and safety alert word to prevent actions that could cause personal injury. It highlights hazards to humans or the environment. Each **WARNING** safety alert is preceded with this safety symbol and another appropriate safety symbol (see “[Safety Alerts and Important Information](#)” on [page xvii](#)) Then it is followed with an appropriate safety precautionary message. When you see a safety alert on your instrument or in the publications, please carefully follow the safety instructions before proceeding.

CAUTION This is the safety alert word to prevent actions that may cause personal injury or instrument damage. We use it to highlight information necessary to prevent personal injury or damage to software, loss of data, or invalid test results; or might contain information that is critical for optimal system performance. A **CAUTION** safety alert is always preceded with an appropriate safety symbol (see “[Safety Alerts and Important Information](#)” on [page xvii](#)) Then it is followed with an appropriate safety precautionary message. When you see a safety alert on your instrument or in the publications, please carefully follow the safety instructions before proceeding.

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 and/or instrument damage. 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 may cause personal injury and/or instrument damage. The following safety symbols may be found on your instrument and/or in this guide:




















Symbol	Descriptor
	BIOHAZARD: Indicates that a biohazard <i>will, could, or might</i> occur.
	BURN HAZARD: Alerts you to the presence of a hot surface that <i>could</i> or <i>might</i> cause burn injuries.
	ELECTRICAL SHOCK HAZARD: Indicates that an electrical shock <i>could</i> or <i>might</i> occur.
	FIRE HAZARD: Indicates a risk of fire or flammability <i>could</i> or <i>might</i> occur.
	EXPLOSION HAZARD. Indicates an explosion hazard. This symbol indicates this risk <i>could</i> or <i>might</i> 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 <i>could</i> or <i>might</i> cause physical injury.
	GLOVES REQUIRED: Indicates that you must wear gloves when performing a task or physical injury <i>could</i> or <i>might</i> occur.
	CLOTHING REQUIRED. Indicates that you should wear a work clothing when performing a task or else physical injury <i>could</i> or <i>might</i> occur.
	BOOTS REQUIRED. Indicates that you must wear boots when performing a task or else physical injury <i>could</i> or <i>might</i> 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 <i>could</i> or <i>might</i> occur.
	HARMFUL. Indicates that the presence of harmful material <i>will</i> , <i>could</i> , or <i>might</i> occur.
	INSTRUMENT DAMAGE: Indicates that damage to the instrument or component <i>might</i> occur. This damage might not be covered under the standard warranty.
	LIFTING HAZARD. Indicates that a physical injury <i>could</i> or <i>might</i> occur if two or more people do not lift an object.
	MATERIAL AND EYE HAZARD: Indicates that eye damage <i>could</i> or <i>might</i> 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 <i>could</i> or <i>might</i> put you at risk for a physical injury.
	TOXIC SUBSTANCES HAZARD: Indicates that exposure to a toxic substance could occur and that exposure <i>could</i> or <i>might</i> cause personal injury or death.
	LASER HAZARD. Indicates that exposure to a laser beam <i>will</i> , <i>could</i> , or <i>might</i> cause personal injury.
	RADIOACTIVE HAZARD. Indicates that the presence of radioactive material <i>could</i> or <i>might</i> 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 <i>could cause personal injury</i> .

Instrument Markings and Symbols

Table 1 explains the symbols used on Thermo Fisher Scientific instruments. Only a few of them are used on the AI 1310/AS 1310. See the asterisk.

Table 1. Instrument Marking and Symbols

Symbol	Description
	Direct Current
* 	Alternating Current
	Both direct and alternating current
3 	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
* 	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.

Safety Information and Warnings

This safety guide raises awareness of potential safety issues and general points for consideration for Thermo Fisher Scientific representatives during installation, and repair of the AI 1310 /AS 1310 sampling system., or parts of it (following the life cycle principle), as well as for the end user AI 1310 /AS 1310 sampling system in the lab during the learning phase, and in routine work.



IMPORTANT For reducing the residual risks due to moving parts, read this section first before operating the AI 1310 /AS 1310 Autosamplers.

General Considerations

- Before a unit is put to use, consult the current *User Guide* and related documents under all circumstances.
- Changes or modifications to this unit not expressly approved by the party responsible for compliance, could void your's authority to operate the equipment.
- Be aware that if the equipment is used in a manner not specified by the manufacturer, the protective and safety features of the equipment might be impaired.
- The repair of instrument failures caused by operation in a manner not specified by the manufacturer is expressly excluded from the standard warranty and service contract coverage.
- When, for technical reasons, it is necessary to work on instrument parts which may involve an hazard (moving parts, components under voltage, etc.) the authorized Technical Service must be contacted. This type of situations can be identified because access to these parts is possible only by using a tool. The removable protective covers bear a warning symbol suggesting to refer to the documentation accompanying the instrument. Should an operator perform a maintenance operation, he/she must have received proper training to carry out that specific action.
- Before using dangerous substances (toxic, harmful, and so forth), read the hazard indications and information reported in the Safety Sheet supplied by the manufacturer referring to the relevant CAS (Chemical Abstract Service) number.
The AI 1310/AS 1310 sampling system requires the use of several chemical products, which are present in vials and syringes, having different hazard characteristics. Before using these substances or replacing the syringe, please read the hazard indications and information reported in the Safety Sheet supplied by the manufacturer referring to the relevant CAS (Chemical Abstract Service) number.

Electrical Hazards



Every analytical instrument has specific hazards. Be sure to read and comply with the following pre-cautions. They ensure the safe and long-term use of your AI 1310 /AS 1310 Autosamplers.

The installation over-voltage category is Level II. The Level II category pertains to equipment receiving its electrical power from the local level, such as an electrical wall outlet.

Connect the AI 1310/AS 1310 sampling system only to instruments complying with IEC 61010 safety regulations.

The power line and the connections between the AI 1310/AS 1310 sampling system and other instruments, used in the configuration setup of the total analytical system, must maintain good electrical grounding. Poor grounding represents a danger for the operator, and might seriously affect the performance of the instrument.

Do not connect the AI 1310/AS 1310 sampling system to power lines that supply devices of a heavy duty nature, such as motors, refrigerators and other devices that can generate electrical disturbances.



Pay attention not to leave any cable connecting the AI 1310/AS 1310 sampling system and the chromatographic system, or the power cord close to heated zone, such as the injector or detector heating blocks, or the GC hot air vents.

Always replace any cable showing signs of damage with another one provided by the manufacturer. Safety regulations must be respected.



Do not change the external or internal grounding connections. Tampering with or disconnecting these connections could endanger you and damage the AI 1310/AS 1310 sampling system.

The instrument is properly grounded in accordance with these regulations when shipped. To ensure safe operation, you do not must make any changes to the electrical connections or the instrument's chassis.



Do not turn the instrument on if you suspect that it has incurred any type of electrical damage. Instead, disconnect the power cord and contact a Thermo Fisher Scientific representative for a product evaluation. Do not attempt to use the instrument until it has been evaluated. Electrical damage might have occurred if the AI 1310/AS 1310 sampling system shows visible signs of damage, exposure to any liquids or has been transported under severe stress.



Damage can also result if the instrument is stored for prolonged periods under unfavorable conditions: for example, subjected to heat, moisture, and so on. Ensure that the power supply/controller unit is always placed in a clean and dry position. Avoid any liquid spills in the vicinity.



Before attempting any type of maintenance work, always disconnect the power cords from the power supply if optional devices are installed. Capacitors inside the instrument might still be charged also if the instrument is turned off.

To avoid damaging electrical parts, do not disconnect an electrical assembly while power is applied to the AI 1310/AS 1310 sampling system. After the power is turned off, wait approximately 30 seconds before you disconnect an assembly.



The instrument includes a number of integrated circuits. These circuits might be damaged if exposed to excessive line voltage fluctuations, power surges or electrostatic charges, or both.



Never try to repair or replace any components of the instrument without the assistance of a Thermo Fisher Scientific representative. There are no operator-serviceable or replaceable parts inside the power supply or in the AI 1310/AS 1310 sampling system. If a power supply is not functioning, contact a Thermo Fisher Scientific representative.

Other Hazards



To avoid injury and possible infection through contamination during AI 1310/AS 1310 sampling system operation, keep your hands away from the syringe.



Danger of crushing to fingers and hands. To avoid injury keep your hands away from moving parts during operation. Turn off the power to the AI 1310/AS 1310 sampling system if you must reach inside a mechanically powered system with moving parts.



To avoid injury, observe safe laboratory practice when handling solvents, or operating the AI 1310/AS 1310 sampling system. Know the physical and chemical properties of the solvents you use. See the MSDS (Material Safety Data Sheets) from the manufacturer of the solvents being used.

When using the AI 1310/AS 1310 sampling system, follow the generally accepted procedures for quality control and method development.

Do not operate on the instrument components that form part of the work area of the AI 1310/AS 1310 sampling system when it is in motion.



Do not use vials without a sealing cap without a plate seal. Vapor phase from organic solvents can be hazardous and flammable. Acidic vapor phase can cause corrosion to critical mechanical parts.

Do not reuse the vials. During the process of washing the vial, micro-cracks can form which will weaken the glass wall and increase the chances of the vial breaking.

Working with Toxic or other Harmful Compounds



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

Before using dangerous substances (toxic, harmful, and so on) read the hazard indications and information reported in the Material Safety Data Sheet (MSDS) supplied by the manufacturer, referring to the relevant CAS (Chemical Abstract Service) number. AI 1310/AS 1310 sampling system requires the use of several chemical products with different hazard characteristics, which are present in vials and syringes. Before using these substances or replacing the syringe, please read the hazard indications and information reported in the MSDS supplied by the manufacturer referring to the relevant CAS number.

When preparing the samples, please refer to local regulations for the ventilation conditions of the work room.

All waste materials must be collected and eliminated in compliance with the local regulations and directives in the country where the instrument is used.

Maintenance

Any external cleaning or maintenance must be performed with the AI 1310/AS 1310 sampling system turned off and the power cord disconnected. Avoid using solvents and spraying on electrical parts. For the removal of potentially dangerous substances (toxic, harmful, and so on) read the hazard indications and information reported in the MSDS (Material Safety Data Sheet) supplied by the manufacturer referring to the relevant CAS (Chemical Abstract Service) number. Use proper protective gloves.

When working with hazardous materials such as radioactive, biologically hazardous material, and so on, it is important to train all operators how to respond in case of spills or contamination.

Depending on the class of hazardous material, the appropriate measures have to be taken immediately. Therefore, the chemicals or solvents needed for decontamination have to be on hand.

Any parts of the equipment which can potentially be contaminated, such as the sample vial rack, syringe tool, wash module, and so on, must be cleaned regularly. The waste solvent from cleaning and any hardware which requires to be disposed of has to be properly eliminated with all the necessary precautions, abiding by national and international regulations.

When preparing for decontamination, ensure that the solvent or chemical to be used will not damage or react with the surface, dye (color) of the instrument, table or other nearby objects. If in doubt, please contact your Thermo Fisher Scientific representative to verify the compatibility of the type or composition of solvents with the AI 1310/AS 1310 sampling system.

It is your responsibility to handle hazardous chemicals or biological compounds, including (but not limited to) bacterial or viral samples and the associated wastes, safely and in accordance with international and local regulations.

Disposal



Do not dispose of this equipment or parts thereof unsorted in municipal waste. Follow local municipal waste regulations for proper disposal provisions to reduce the environmental impact of waste electrical and electronic equipment (WEEE).

European Union customers: Call your local customer service representative responsible for the AI 1310/AS 1310 sampling system for complimentary equipment pick-up and recycling.



WARNING The customer has to ensure that the AI 1310/AS 1310 sampling system has not been contaminated by any hazardous chemical or biological compounds.

Any part which had direct contact with the analytical sample must be identified and must undergo an appropriate decontamination procedure prior to shipping for disposal.

Potentially dangerous components are: syringes and vials. Any critical parts sent for disposal must be handled according to national laws for hazardous compounds.

The customer and the service engineer are fully responsible for enforcing these requirements. Thermo Fisher Scientific will hold the representative, customer responsible, or both, if these regulations are not observed.

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.

Introduction

This chapter provides a basic overview of the features and options of the AI 1310/AS 1310. The available instrument configurations are also described.

Contents

- [The AI 1310/AS 1310 Sampling System](#)
- [Configurations of the 1310 Series Autosampler](#)
- [Technical Specifications](#)

The AI 1310/AS 1310 Sampling System

The 1300 Series Autosampler, available as AI 1310 or AS 1310, consists of the following parts, as respectively shown in [Figure 1](#) and [Figure 2](#).

Figure 1. AI 1310 Sampling System

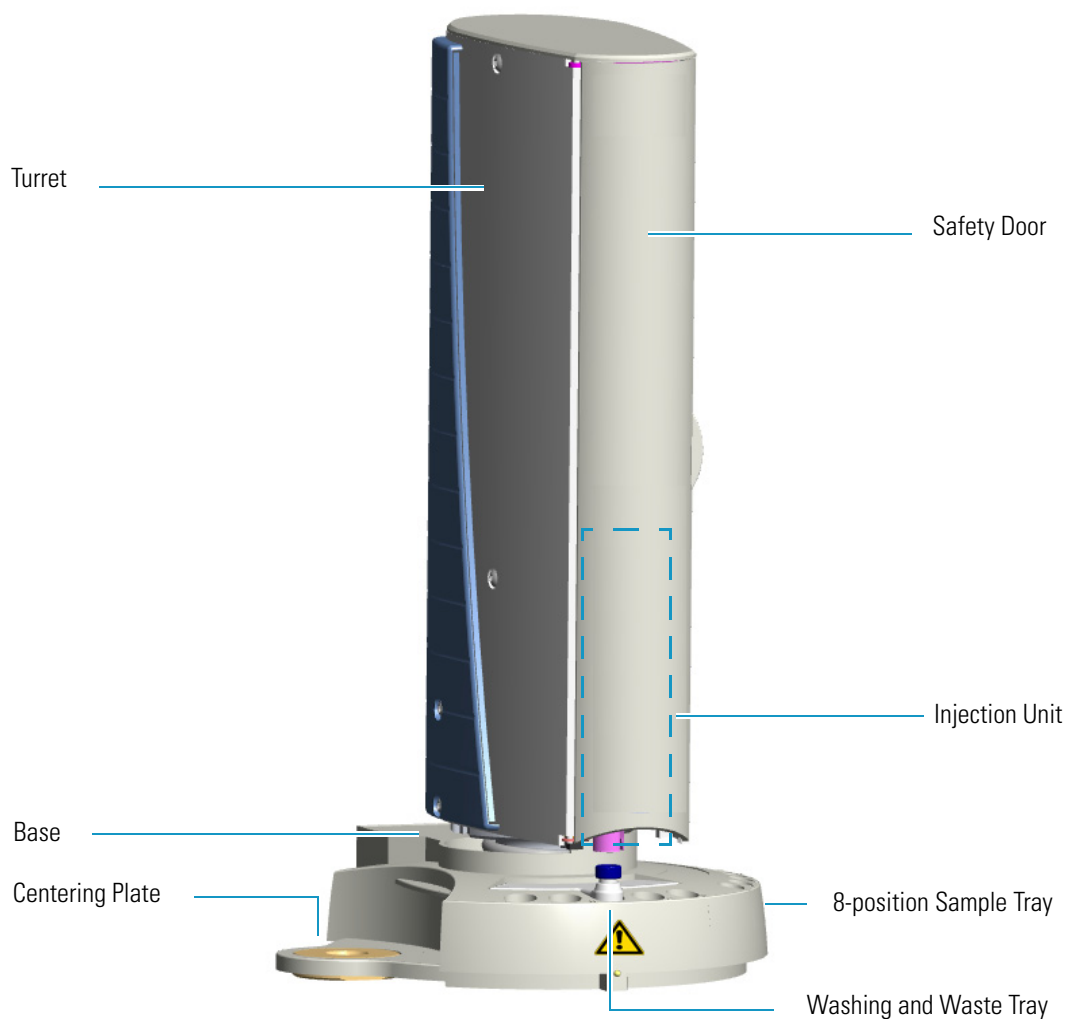
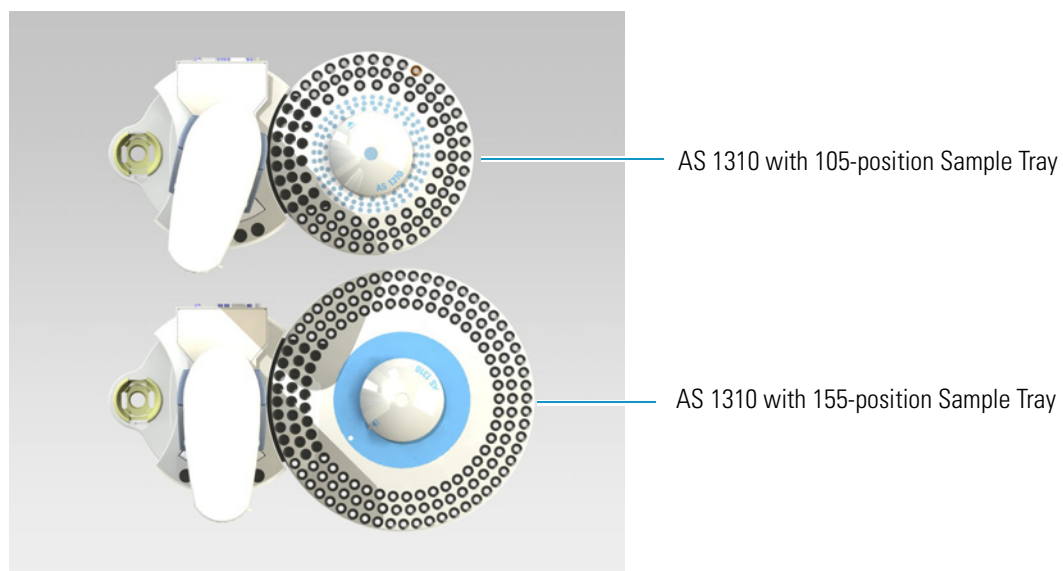
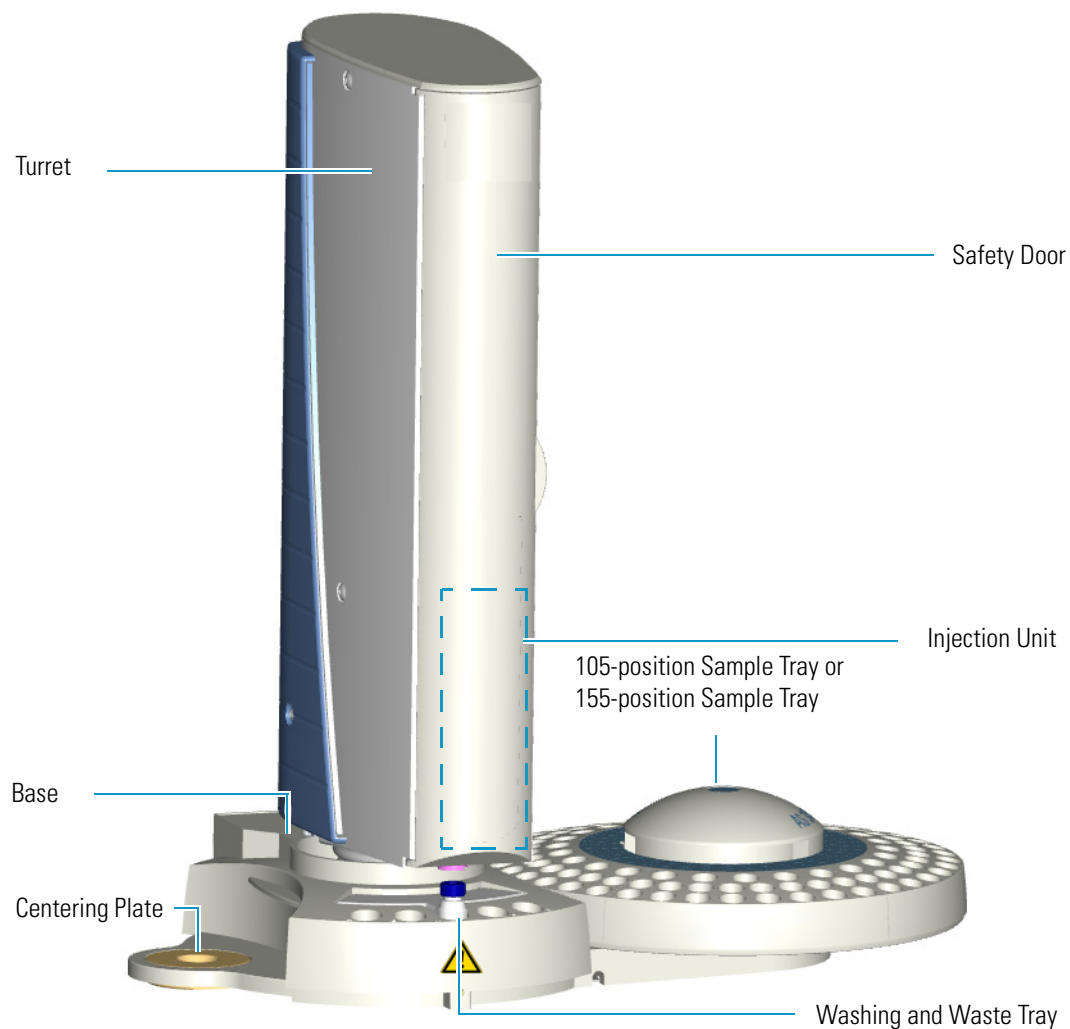


Figure 2. AS 1310 Sampling System



Sampling Unit

The sampling unit consists of the following major components:

Base — This is the structure bearing the sampling unit components.

Turret — Consists of a vertical moving structure that accommodates the injection unit and accomplishes the necessary movements to carry out the three main operating steps: sample drawing, injection, syringe washing. The turret is provided with a safety door allowing access to the syringe.

Injection Assembly — Housed inside the rotating turret, it consists of a moving support (sliding plate) on which the syringe is installed.

Washing and Waste Tray — Accommodate up to four 4 mL vials of solvents to wash the syringe, and a 50 mL plastic container to collect the washing solvents after their use.

Centering Plate — Consists of a plate provided with circular guides to center the sampling unit on the injector nut.

Sample Tray — Contains the seats for the sample vials. Each position is numbered to make the sample identification easy. The following options are available:

- Sample tray for **AI 1310** consisting of an **8-position** fixed support.
- Sample holding assembly for **AS 1310** consisting of a **105-position** turnable mobile tray mounted on a dedicated support plate.
- Sample holding assembly for **AS 1310** consisting of a **155-position** turnable mobile tray mounted on a dedicated support plate.

Sampler Support — Constitutes the supporting base allowing to install the sampler on the gas chromatograph.

User Interface — The functions of the AI 1310/AS 1310 can be controlled through:

- a data processing system for PC with dedicated software.
- the keypad of the TRACE GC Ultra.

For further information, please refer to:

- [“Configurations of the 1310 Series Autosampler” on page 5](#)
- [Chapter 2, “Sampling Unit,” on page 11](#)
- [Chapter 4, “AI 1310/AS 1310 Control,” on page 57](#)

Configurations of the 1310 Series Autosampler

The AI 1310/AS 1310 can be installed on the TRACE 1300 Series GC, TRACE GC Ultra, or FOCUS GC gas chromatographs for sample introduction into the following injectors:

- TRACE 1300 Series GC: SSL, SSLBKF, PTV, and PTVBKF injectors
- TRACE GC Ultra: SSL, PTV, PKD, and PPKD injectors
- FOCUS GC: SSL injector

The sampler is available in the following options:

- [AI 1310 Configuration](#)
- [AS 1310 Configuration](#)
- [Gemini Configuration](#)

AI 1310 Configuration

In this configuration the **8-position** sample tray is used. See [Figure 3](#).

Figure 3. AI 1310 Configuration

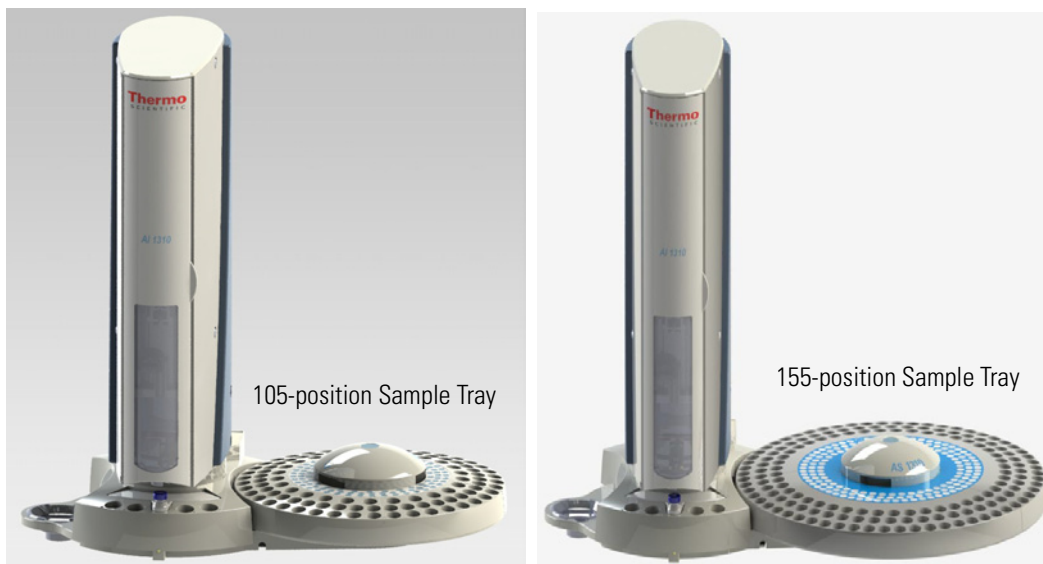


As a function of the right or left installation configuration, the support will be introduced into the relevant side housing on the base of the sampling unit. On the opposite side housing, the proper centering plate will be positioned.

AS 1310 Configuration

In this configuration the **105-position** or **155-position** sample tray is used, mounted on the hub provided on the own dedicated support plate. See [Figure 4](#).

Figure 4. AS 1310 Configuration



The support plates of the tray and the sampler are electrically connected to each other by the proper connecting cable.

As a function of the right or left installation configuration, the support will be introduced into the relevant housing on the base of the sampling unit.

Gemini Configuration

Consists of the installation of two AI 1310/AS 1310 on the same GC.

Note Gemini configuration is not possible with the FOCUS GC.

- With the TRACE 1300 Series GC — the autosamplers are installed on the right side, one on the **Front** injector module, and the other on the **Back** injector module.
- With the TRACE GC Ultra — one sampler is installed on the **left** side of the GC, and the other is installed on the **right** side.

Each sampler operates simultaneously on its own relevant injector. In this configuration, both samplers are ready to inject the sample simultaneously according to the programmed analytical method that could be the same for both or different. See “[Gemini Configuration](#)” on [page 53](#).

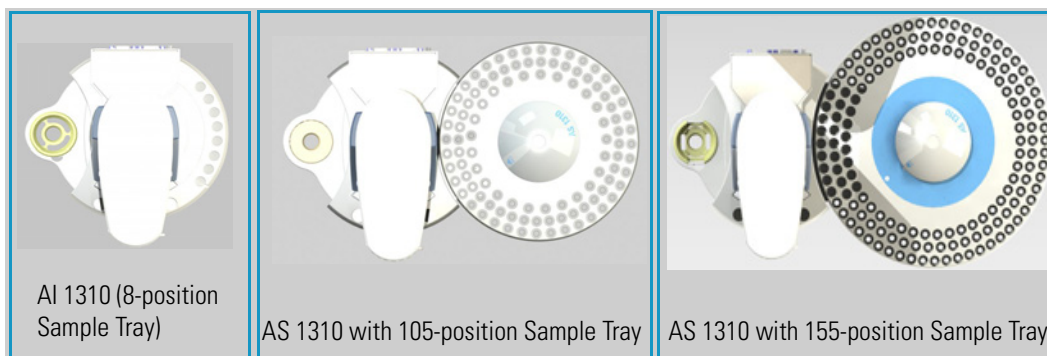
Installation

The AI 1310/AS 1310 can be installed on the right or left side of the GC according to the following indications:

Right Configuration

The right configuration is the default configuration for all the TRACE 1300 Series GC, TRACE GC Ultra, and FOCUS GC units. See [Figure 5](#).

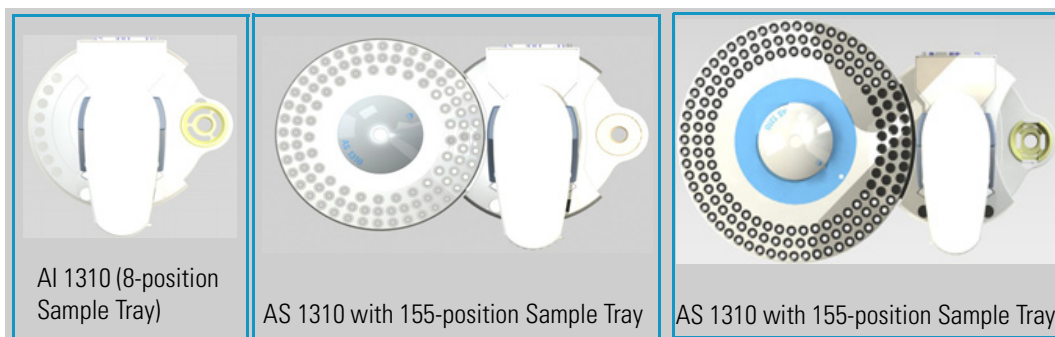
Figure 5. Right Configuration



Left Configuration

The left configuration is only possible with the TRACE GC Ultra. See [Figure 6](#).

Figure 6. Left Configuration



The installation of the AI 1310/AS 1310 requires a dedicated metal support on the base of the sampler support.



WARNING If an existing AI 1310 will be upgraded to AS 1310, it is very important to power off the AI 1310 before to install the 105 or 155-position sample tray and plug-in its electrical cable. This recommendation will prevent a possible driver failure on AI 1310's electronic board.

Gemini Configuration

Two AI 1310/AS 1310 are installed on the same TRACE 1300 Series GC, or TRACE GC Ultra by using their own dedicated supports. Refer to “[Sampling System Support](#)” on [page 27](#).

Technical Specifications

Technical specification of the AI 1310/AS 1310 are listed in [Table 1](#).

Table 1. Technical Specifications (Sheet 1 of 2)

Sample tray capacity	<ul style="list-style-type: none"> • 8 vials in the AI 1310 configuration • 105 vials in the AS 1310 configuration • 155 vials in the AS 1310 configuration
Vials capacity	0.3 and 2 mL (standard) with all 8-, 105-, and 155-position trays
Flushing solvents	4 vials of 4 mL
Waste container capacity	50 mL
Types of syringes	<ul style="list-style-type: none"> • 10 μL syringe (standard) 10 μL syringe for Merlin Microseal Valve (optional) • 5 μL syringe (optional) • 0.5 μL syringe for Nano-volumes injections (optional)
Volumes programming (μ L)	<ul style="list-style-type: none"> • 0 to 5 μL (10 μL syringe) with increments of 0.1 μL • 0 to 2.5 μL (5 μL syringe) with increments of 0.1 μL • 0 to 0.5 μL (0.5 μL syringe) with increments of 0.01 μL
Programmability	Remote
External interface	Serial line RS 232
Power supply rating	<p>24 Vdc through a portable external power supply, level VI efficiency. See WARNING on page 9.</p> <p>Electrical characteristics of the supply</p> <ul style="list-style-type: none"> • input 100-240 Vac; 50-60 Hz • output 24 Vdc; 3 A - 3.75 A

Table 1. Technical Specifications (Sheet 2 of 2)

Dimensions (depth x width x height)	Sampling unit: <ul style="list-style-type: none"> • AI Configuration: approx. 280 x 230 x 400 mm (D x W x H) • AS Configuration with 105-position sample tray: approx. 280 x 410 x 400 mm (D x W x H) • AS Configuration with 155-position sample tray: approx. 290 x 470 x 400 mm (D x W x H)
Mass	<ul style="list-style-type: none"> • AI Configuration: approx. 6 kg • AS Configuration with 105-position sample tray: approx. 6 kg • AS Configuration with 155-position sample tray: approx. 7 kg
Sound Pressure Level	Limit < 70 dBA (dBA = A weighted sound pressure level)



WARNING YOU MUST ONLY USE THE PORTABLE EXTERNAL POWER SUPPLY FURNISHED WITH THE INSTRUMENT BY THERMO FISHER SCIENTIFIC.

Sampling Unit

This chapter provides a description of the components of the sampling unit of the AI 1310/AS 1310 system.

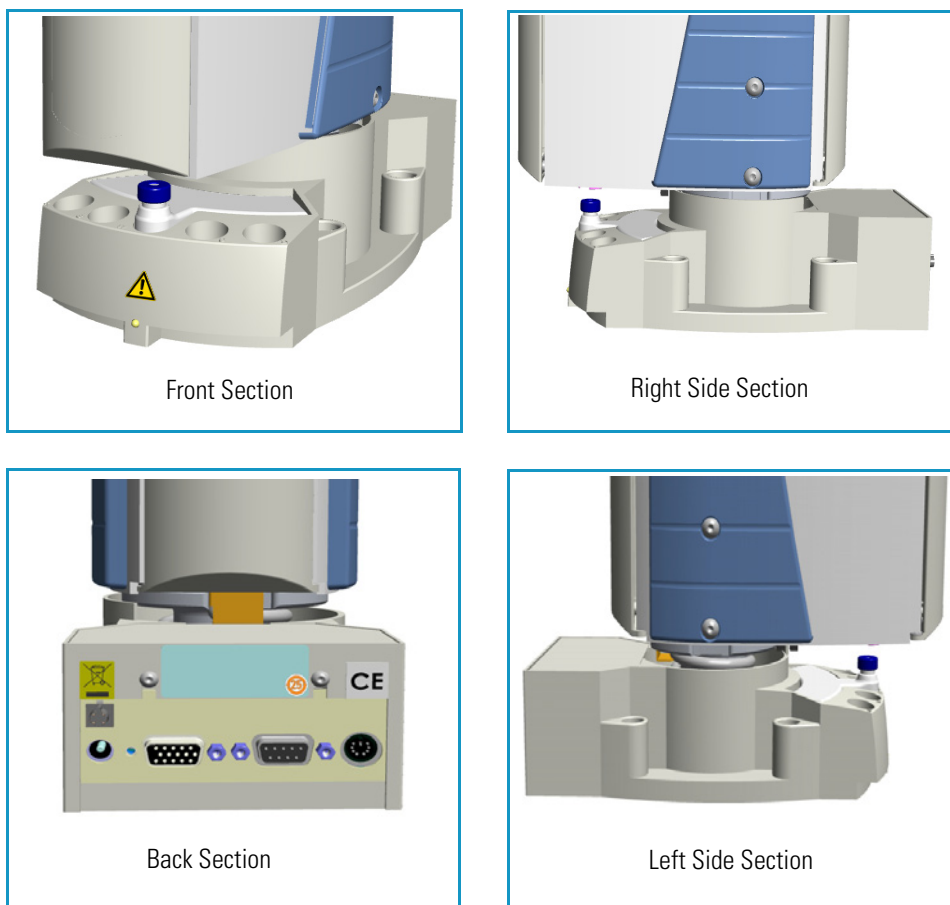
Contents

- Base
- Turret
- Injection Assembly
- Washing and Waste Tray
- Back of the Sampling Unit
- Sample Trays
- Centering Plate
- Status LED

Base

The base is the supporting structure of the instrument on which the sampling unit components and accessories as sample tray, and centering plate, are positioned. The base consists of four sections: **front**, **back**, **left**, and **right**. See [Figure 7](#).

Figure 7. The Sections of the Base



- **Front Section** — Includes the housings for solvents vials and waste container.

On the lower front part there is a LED indicating the instrument status. For details, see the section [“Status LED”](#) on [page 22](#).

- **Right and Left Side Sections** — Accommodates the, 8-position, 105-position, or 155-position sample tray, and the centering plate for the injector.

The position of these accessories depends on the installation configuration of the sampler. See the section [“Configurations of the 1310 Series Autosampler”](#) on [page 5](#).

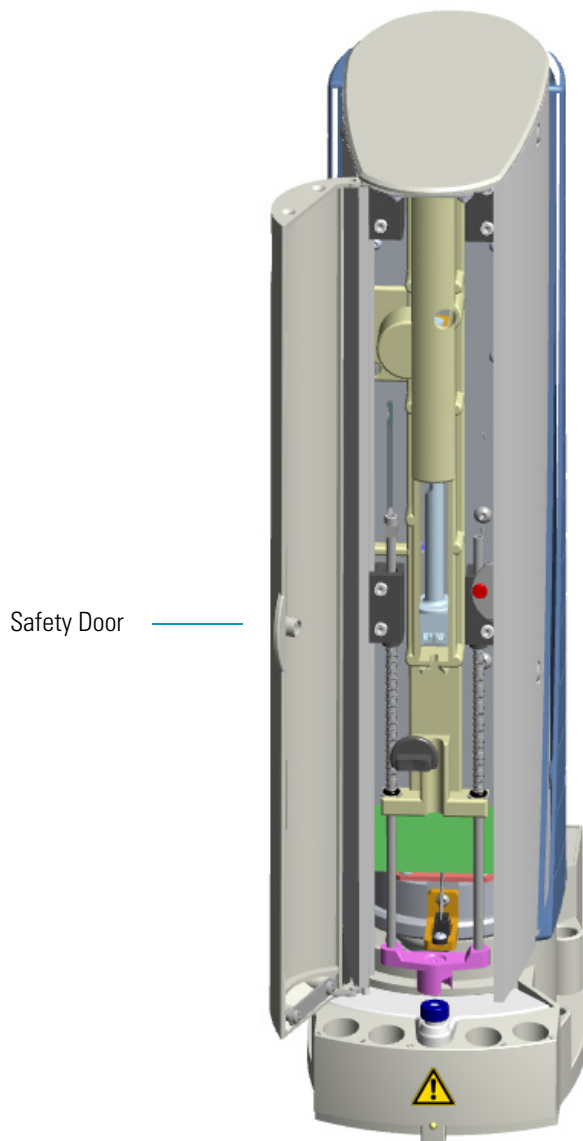
- **Back Section** — Includes the connections of the instrument to the mains, the gas chromatograph, the data system and the sample tray (only for AS 1310), and the connection for the **Gemini** configuration.

Turret

The **turret** consists of a moving structure pivoted on a hub. The rotating movements are carried out by a motor located on the base. An optical sensor determines the turret travel ends.

The front side is provided with a **safety door** for accessing to the injection assembly. The door opening immediately cuts off the power supply to the sampling system.

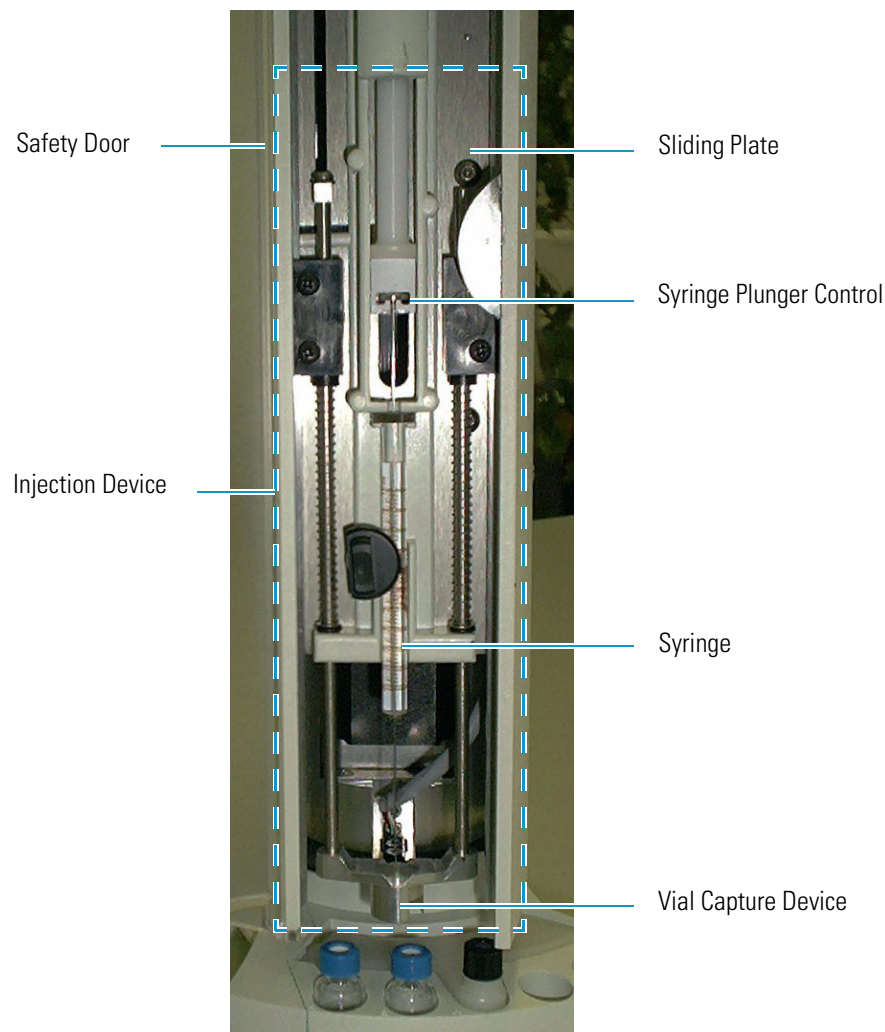
Figure 8. The Turret



Injection Assembly

The injection assembly consists of a **sliding plate** which supports and guides the vertical movements of the **injection device** constituted by the **syringe plunger control**, the **vial capture device**, and the **syringe**. See [Figure 9](#).

Figure 9. Injection Assembly



The vertical movements of the injection device are controlled by motors housed in the turret. The travel ends of the movable parts are defined by a series of sensors.

Inside the turret there are also two electronic boards: one for the motors control and one for the instrument functions control, respectively.

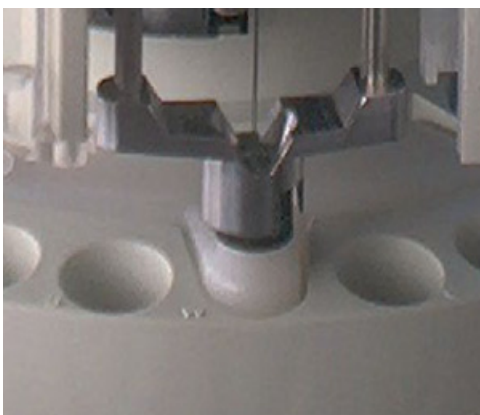
Vial Capture Device

The vial capture device is the lower part of the **injection device**. See [Figure 10](#).

The functions of this device are:

- to guide the syringe needle
- to acknowledge the vial presence
- to acknowledge the injector presence

Figure 10. Vial Capture Device



Syringe

The standard syringe has 10 μL capacity with 50 mm needle length.

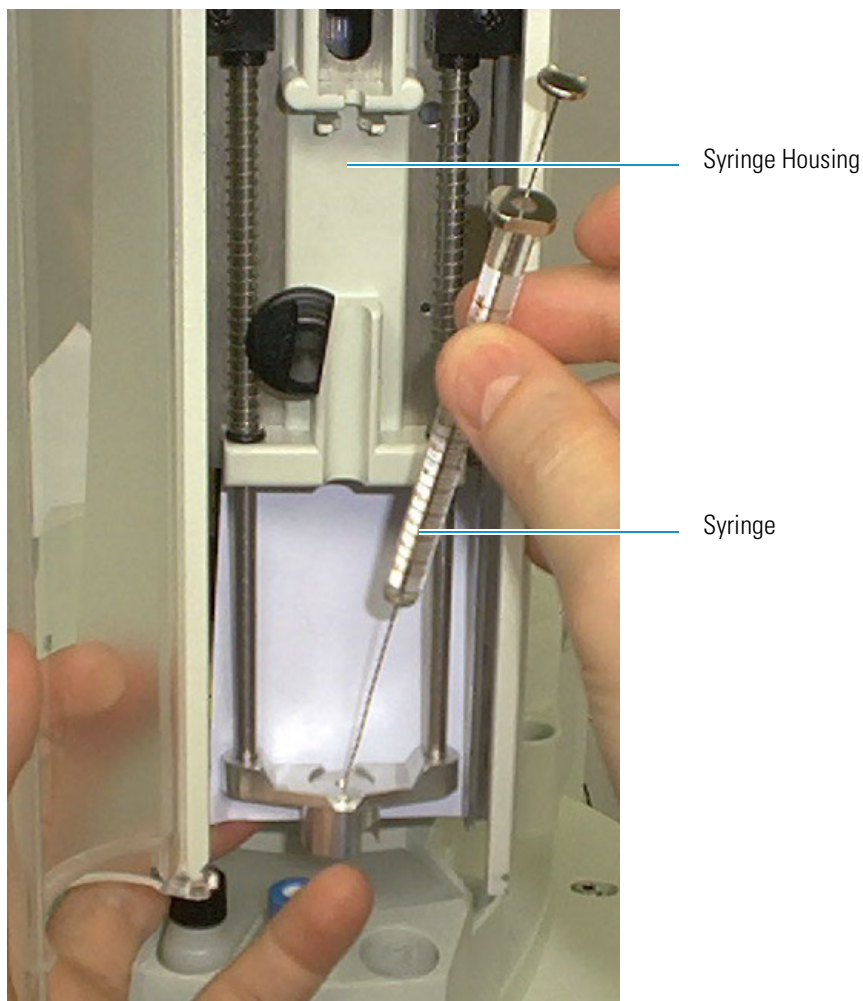
Note 5 and 0.5 μL syringes are optionally available.

A thorough washing of the syringe can be done thanks to the possibility of using up to four solvents. See [Washing and Waste Tray](#).

To install or replace the syringe, please see the [Chapter 3, “Installation,”](#) and the [Chapter 5, “Maintenance.”](#)

[Figure 11](#) shows the syringe housing.

Figure 11. Syringe Housing



Turret Movements

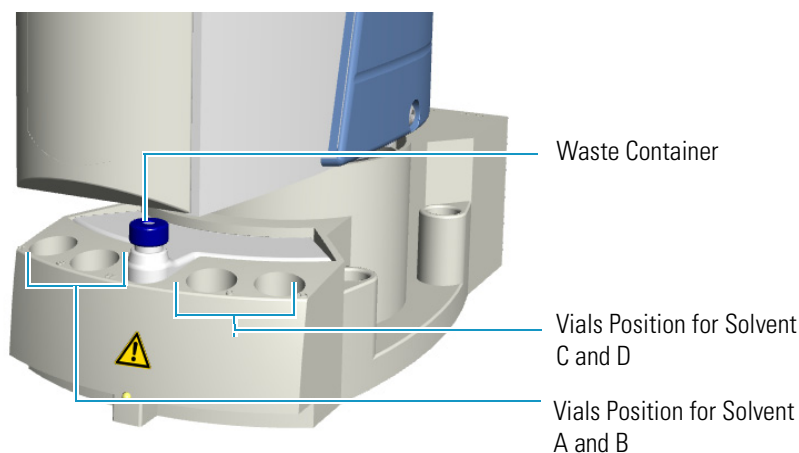
The sequence of the turret movements allows the sampler to perform the following functions:

- **Sample drawing** — The turret positions itself on the selected vial, housed in the sample tray, to allow the syringe to draw the sample it contains.
- **Sample injection** — The turret positions itself on the injector to perform the sample injection.
- **Syringe washing** — The turret positions itself on the solvents vials for the syringe washing. The solvent is automatically withdrawn and discharged into the waste container.

Washing and Waste Tray

The washing and waste tray can contain up to four 4 mL vials and a 50 mL plastic container. See [Figure 12](#).

Figure 12. Washing and Waste Tray



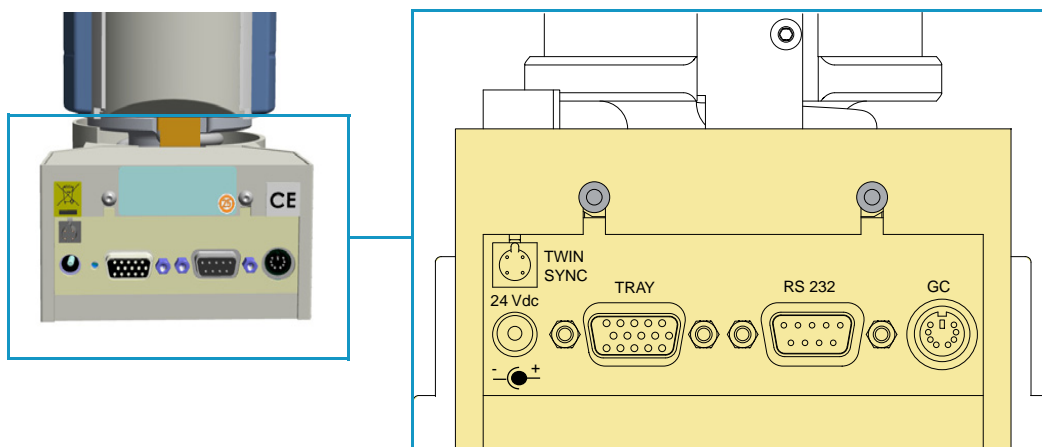
The vials contain the solvent (or the solvents) necessary for the syringe washing, which can take place both before and after the injection. The washing solvent is then collected in the waste container.

The four vials containing solvents for the syringe washing are introduced into the appropriate seats A, B and C, D, respectively on the left and on the right of the WASTE container.

Back of the Sampling Unit

The back side of the sampling unit includes the following components. See [Figure 13](#):

Figure 13. Back of the Sampling Unit



- Jack marked **24 Vdc** for the instrument power supply through the external portable feeder.
- 15-pin female connector (double density) marked **TRAY** for the communication between the sampling unit and the motor actuating the hub positioned on the supporting plate of the 105-position or 155-position sample tray.
- 9-pin female connector marked **RS232** for the communication between the sampler and the GC (connector marked **AUTOSAMPLER**) through a proper cable.
- 6-pin female connector marked **GC** for connecting the sampler to the GC (connector marked **SAMPLER SIGNAL**) through the proper cable.
- 4-pin male connector marked **TWIN SYNC** for the synchronism between two AI 1310/AS 1310 installed in Gemini configuration through the proper cable.

Sample Trays

The AI 1310/AS 1310 can accept three types of sample trays which are accommodated in one of the two side housings on the base. The type of sample tray accessory installed on the instrument (8, 105, or 155 positions) is automatically acknowledged by the sampler when powered on determining the instrument configuration.

- AI 1310 uses the **8-position** sample tray
- AS 1310 uses the **105-position** or the **155-position** sample tray

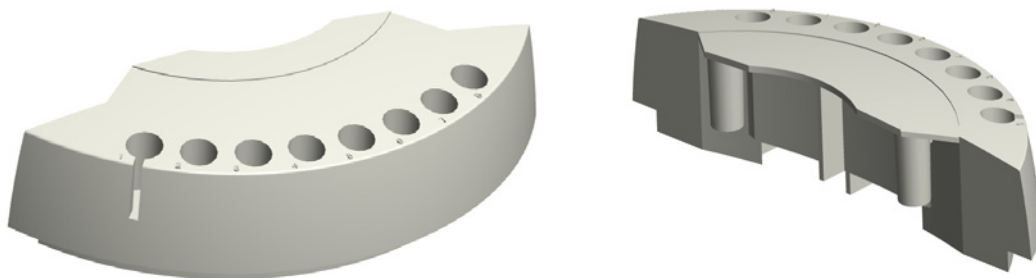


CAUTION The 105-position and the 155-position sample tray require the use of the own dedicated supporting plate.

8-Position Sample Tray

The 8-position tray, see [Figure 14](#), consists of a fixed arc-shaped support and can contain up to 8 vials numbered 1 to 8. The slot present on the tray determines the position 1 and allows to inspect the level of the liquid contained in the vial.

Figure 14. 8-position Sample Tray



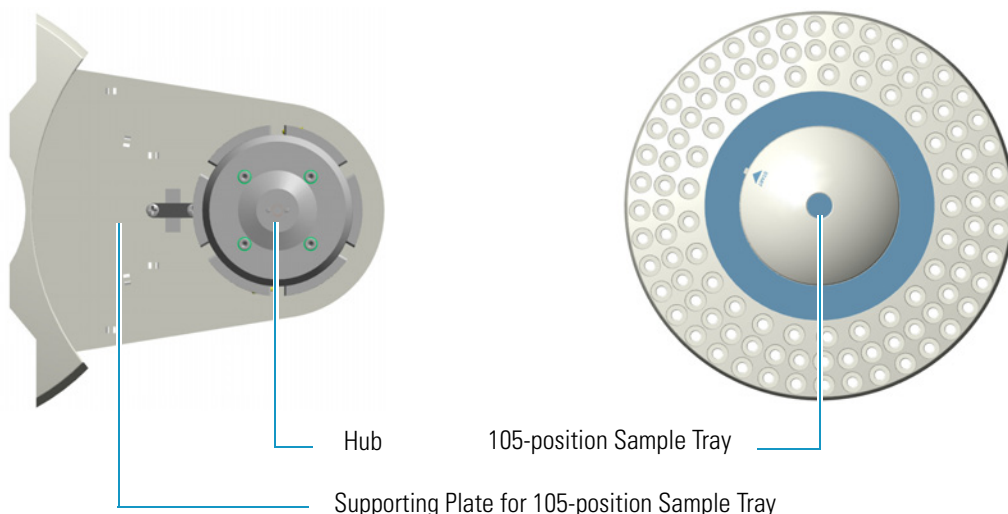
105-Position Sample Tray Assembly

The assembly consists of a dedicated supporting plate provided with a hub and a 105-position removable sample tray. See [Figure 15](#).

The rotation of the tray is accomplished by a motor, located under the supporting plate, which actuates the hub thanks to suitable commands coming from the sampling unit via an interfacing cable.

An optical sensor defines the rotation travel end and the vial position.

Figure 15. Supporting Plate and 105-Position Sample Tray



The tray can contain up to 105 vials numbered **01** to **105** arranged on three circular rows.

- Vials **01** to **40** are placed into the external row.
- Vials **41** to **80** are placed into the middle row.
- Vials **81** to **105** are placed into the internal row.

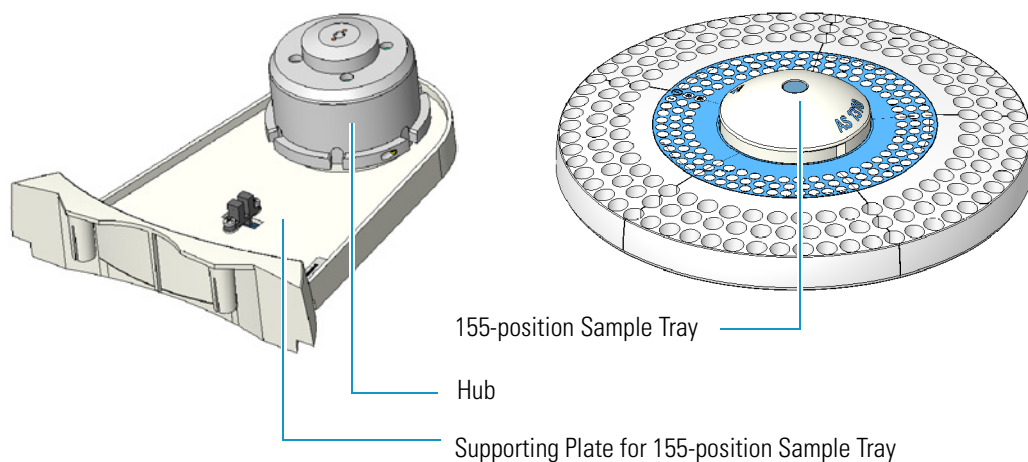
155-Position Sample Tray Assembly

The assembly consists of a dedicated supporting plate provided with a hub and a 155-position removable sample tray. See [Figure 16](#).

The rotation of the tray is accomplished by a motor, located under the supporting plate, which actuates the hub thanks to suitable commands coming from the sampling unit via an interfacing cable.

An optical sensor defines the rotation travel end and the vial position.

Figure 16. Supporting Plate and 155-Position Sample Tray



The tray can contain up to 155 vials numbered **01** to **155** arranged on three circular rows.

- Vials **01** to **60** are placed into the external row.
- Vials **61** to **110** are placed into the middle row.
- Vials **111** to **155** are placed into the internal row.

Vials

Vials of 0.3 and 2 mL capacity can be used.

The 0.3 mL vial is exactly the same as the 2 mL vial, provided inside with a 0.3 mL calibrated insert.



CAUTION Vials must be accurately closed using appropriate septa and ring nuts. Septa must be those recommended by Thermo Fisher Scientific. The use of septa with different characteristics might damage or bend the syringe needle. During the vials preparation, it is recommended to comply with applicable safety regulations, specially as far as the conditions of the workplace ventilation are concerned.

Centering Plate

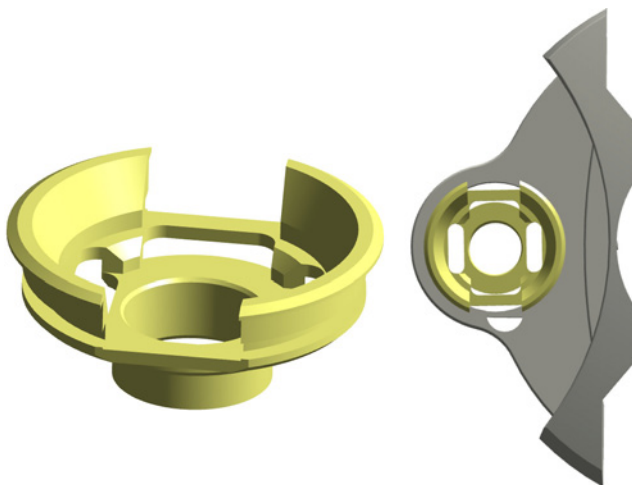
The centering plate consists of a plate provided with circular guides to center the sampling unit on the injector nut.

Centering Plate for TRACE 1300 Series GC

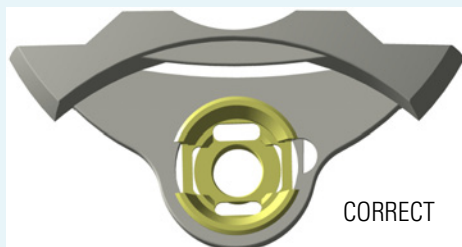
The centering plate is provided with two circular guides to center the sampling unit on the SSL, SSLBKF, PTV and PTVBKF injector nuts.

- To center the sampling unit on the SSL or SSLBKF injector nut, use the circular guide for SSL only. See [Figure 17](#).
- To center the sampling unit on the PTV or PTVBKF injector nut, use the circular guide for PTV only. See [Figure 18](#).

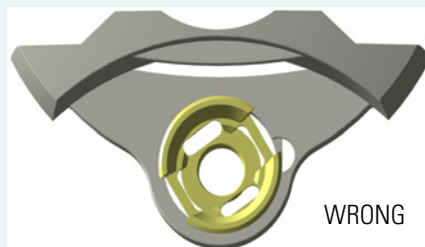
Figure 17. Circular Guide for SSL and SSLBKF



CAUTION The circular guide for SSL and SSLBKF placed in the centering plate must be aligned as shown below:

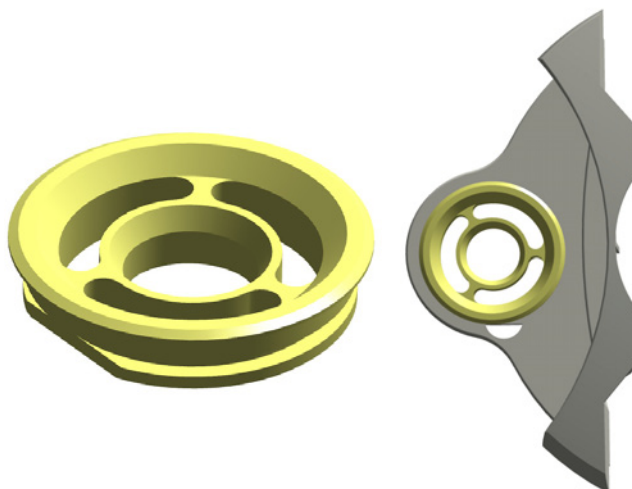


CORRECT



WRONG

Figure 18. Circular Guide for PTV and PTVBKF

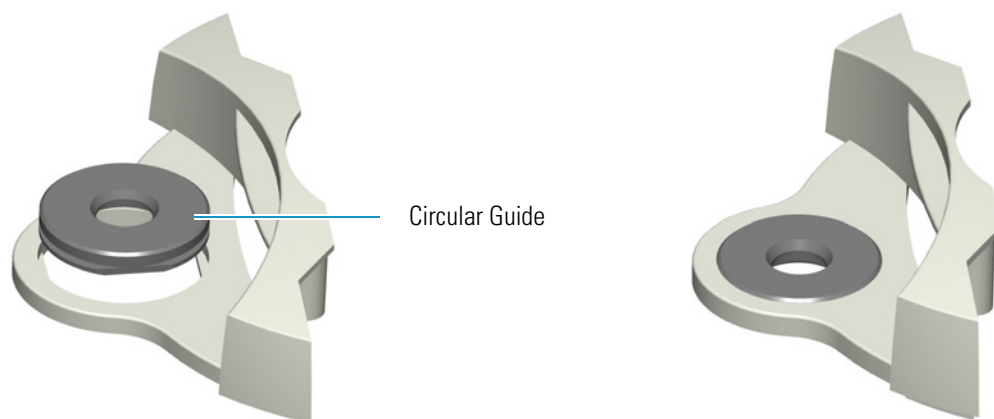


Centering Plate for TRACE GC Ultra and FOCUS GC

Two types of centering plates are available with the GC according to the injector mounted.

- A standard centering plate to center the sampling unit on the SSL, PKD and PPKD injector nut. This centering plate is used also with the FOCUS GC.
- A centering plate to center the sampling unit on the PTV injector nut. It is recognized by a circular slot present on the circular guide. This centering plate is not used with the FOCUS GC.

Figure 19. Centering Plate for TRACE GC Ultra and FOCUS GC



Status LED

The status LED, located on the front side of the sampling unit, see [Figure 20](#), provides the operator with indications on the instrument operating conditions showing a continuous or intermittent light. See [Table 2](#) for details.

Figure 20. The Status LED

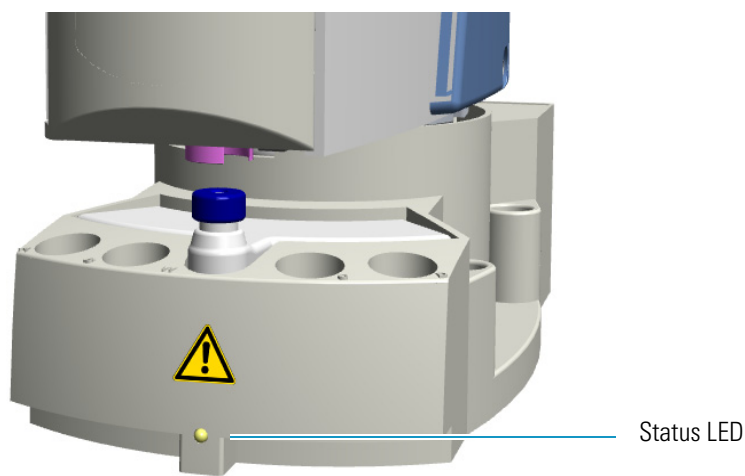


Table 2. Status LED Conditions

Condition	LED
St-by	Lit with continuous green light
Position zeroing, sample preparation, washing, injection	Intermittent green light; 0.5 seconds ON, 0.5 seconds OFF
Run (waiting GC Ready)	Intermittent green-orange lights; 0.5 seconds green, 0.5 seconds orange
Firmware upload	Intermittent orange light; 0.5 seconds ON, 0.5 seconds OFF
Error	Lit with continuous orange light

Buzzer

Two beep monotone; 0.5 seconds ON, 0.5 seconds OFF, 0.5 seconds ON indicates that the start signal is received.

Five consecutive beep, 1 second with interval of 0.5 seconds OFF in case of error condition.

Installation

This chapter contains the instructions for the installation of the AI 1310/AS 1310 on the TRACE 1300 Series GC, TRACE GC Ultra, and FOCUS GC gas chromatographs, the syringe, and the electrical connections with the different units of the gas chromatographic system.

Contents

- [Who Performs the Installation](#)
- [Electrical Requirements](#)
- [How to Lift and Carry the Sampling Unit](#)
- [Sampling System Support](#)
- [Installing the Sampling System Support on the TRACE 1300 Series GC](#)
- [Installing the Sampling System Support on the TRACE GC Ultra](#)
- [Installing the Sampling System Support on the FOCUS GC](#)
- [Installation of the AI 1310/AS 1310 on the GC](#)

Who Performs the Installation

The AI 1310/AS 1310 is installed by authorized Thermo Fisher Scientific field service engineers (FSE), who will check its correct operation. For more details, please contact Thermo Fisher Scientific local representatives. Should the instrument not be installed by Thermo Fisher Scientific personnel, please strictly adhere to the following instructions.

Electrical Requirements

The instrument must be electrically supplied as indicated in the “[Technical Specifications](#)” on [page 8](#).



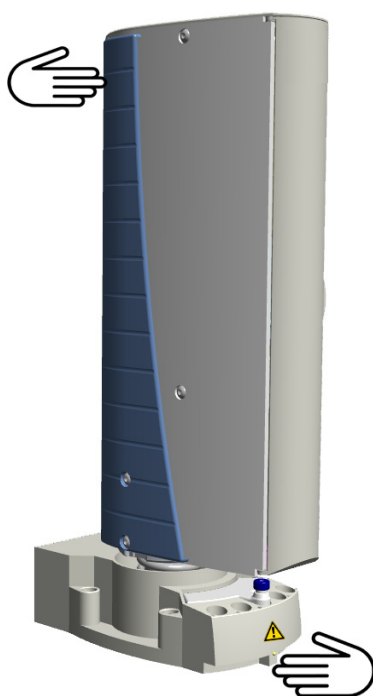
CAUTION The power line and the connections between the instruments must maintain good electrical grounding. Poor grounding represents a danger for the operator and may seriously affect the instrument performance.

Do not connect the AI 1310/AS 1310 to lines feeding devices of a heavy duty nature, such as motors, UV lamps, refrigerators and other devices that can generate disturbances. Pay attention not to leave any cable connecting the sampling unit and the chromatographic system or the power cord close to the GC hot air vents.

How to Lift and Carry the Sampling Unit

The AI 1310/AS 1310 must be lifted and carried by hand. See [Figure 21](#).

Figure 21. How to lift and carry the Sampling Unit



ATTENTION:

Before moving the sampling unit, make sure that the 105- or 155-position sample tray is not installed on the sampling system.

If yes, remove the sampler tray and its supporting plate from the unit. Reinstall the sampler tray only after the sampling unit has been properly installed on the GC.

Sampling System Support

The AI 1310/AS 1310 is installed on the GC using the appropriate support provided.

According to your GC, see the following sections:

- “Sampling System Support for TRACE 1300 Series GC” on page 27
- “Sampling System Support for TRACE GC Ultra” on page 30
- “Sampling System Support for FOCUS GC” on page 32

Note The FOCUS GC MS Version, may accept the AI 1310/AS 1310 also on the left side. Please refer to “Assembling of the Sampling System Support on FOCUS GC MS Version” on page 45.

To reduce the FOCUS GC working area, the AS 1310 may be installed as described in “Space Saving Installation” on page 46.

Sampling System Support for TRACE 1300 Series GC

The AI 1310/AS 1310 can be installed only on the **right** side of the GC on the **front** or **back** injector module or on both when in **Gemini** configuration by using the proper sampling system support.

The sampling unit support consists of a bottom and a top plates.

1. The bottom plate can be **L-shape** (see both front/back installation) or **double** (see Gemini installation). The plate is provided with a series of holes for the corresponding fixing screws and must be fixed on the GC.
2. The movable top plate is mounted over the bottom plate and it is provided with a guide pivot for the accommodation and centering of the sampling unit. The movable top plate can slides over the bottom plate through a sliding slot and a retainer.

This allows moving away the injection device of the sampling unit from the injector module when the latter will require maintenance.

Note After the installation of the sampling unit on the proper sampling system support, it is possible locking its plates if desired.

To use the proper sampling system support on the TRACE 1300 Series GC see the following sections:

- “Support for the Installation on the Front/Back Injector Module” on page 28
- “Support for the Installation in Gemini Configuration” on page 29
- “Support for the Installation When a TSQ Quantum Mass Spectrometer is Coupled with the GC” on page 29

Support for the Installation on the Front/Back Injector Module

The same sampling unit support is used. The L-shape bottom plate must be oriented accordingly before fixing it on the GC. See [Figure 22](#) and [Figure 23](#).

Figure 22. Support Oriented for the Installation on the Front Injector Module

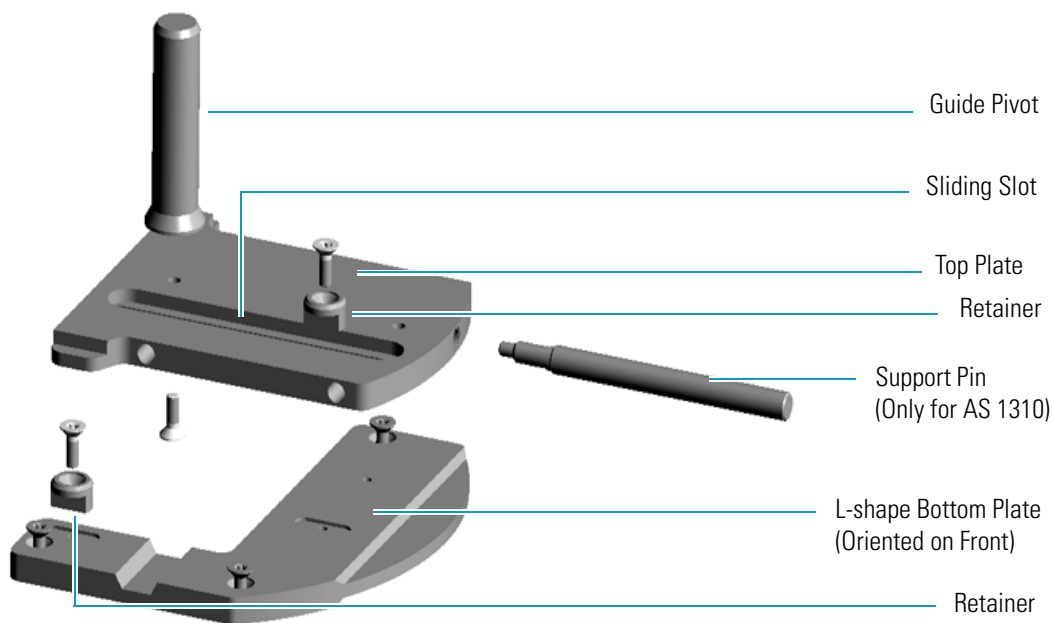
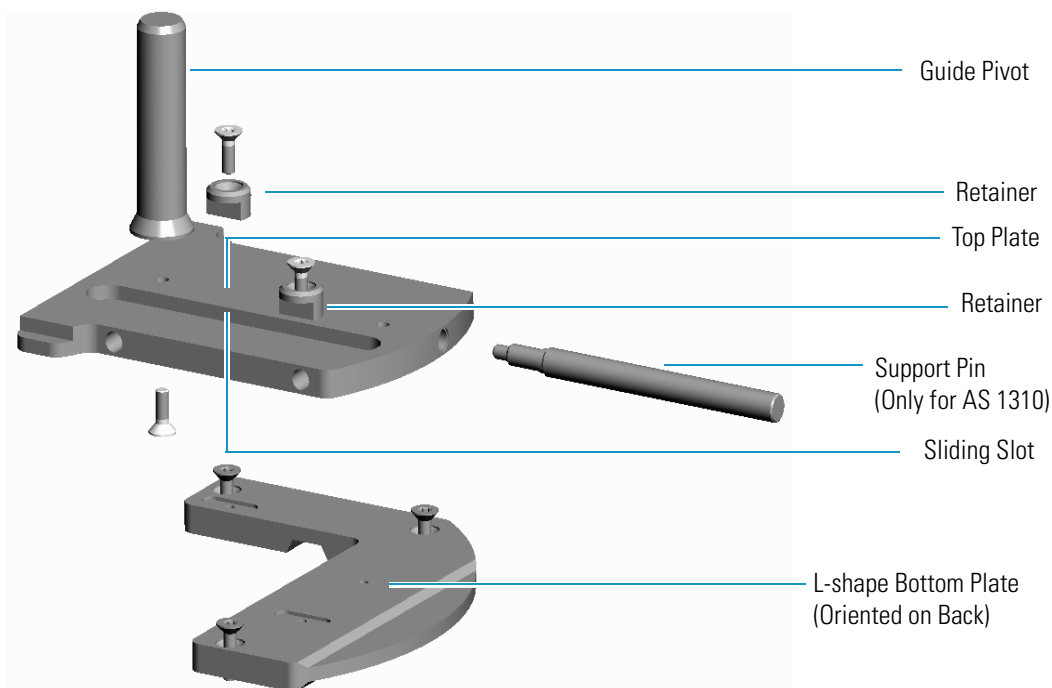


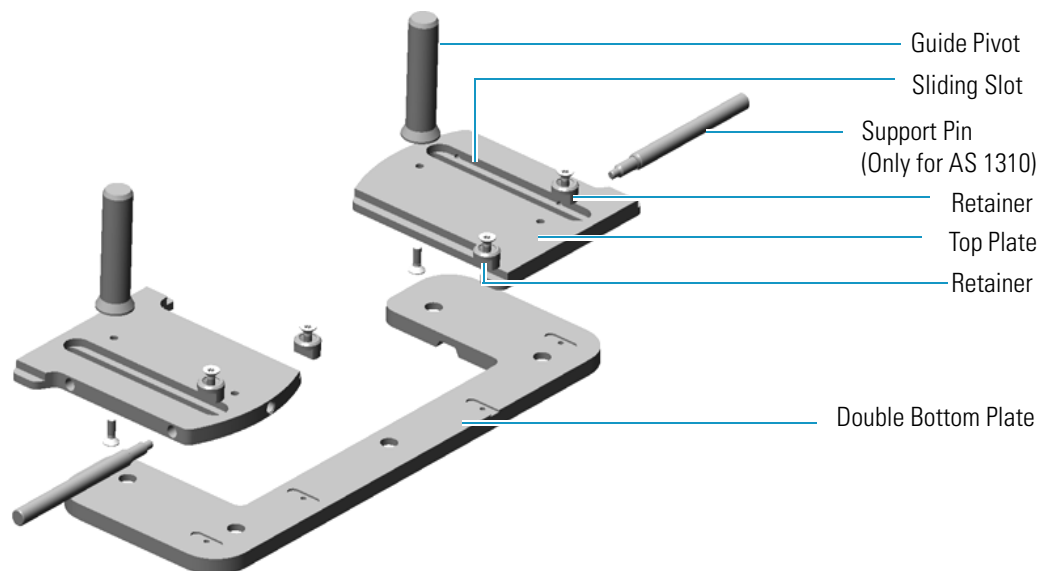
Figure 23. Support Oriented for the Installation on the Back Injector Module



Support for the Installation in Gemini Configuration

This configuration uses a dedicated double bottom plate and two top plates. See [Figure 24](#).

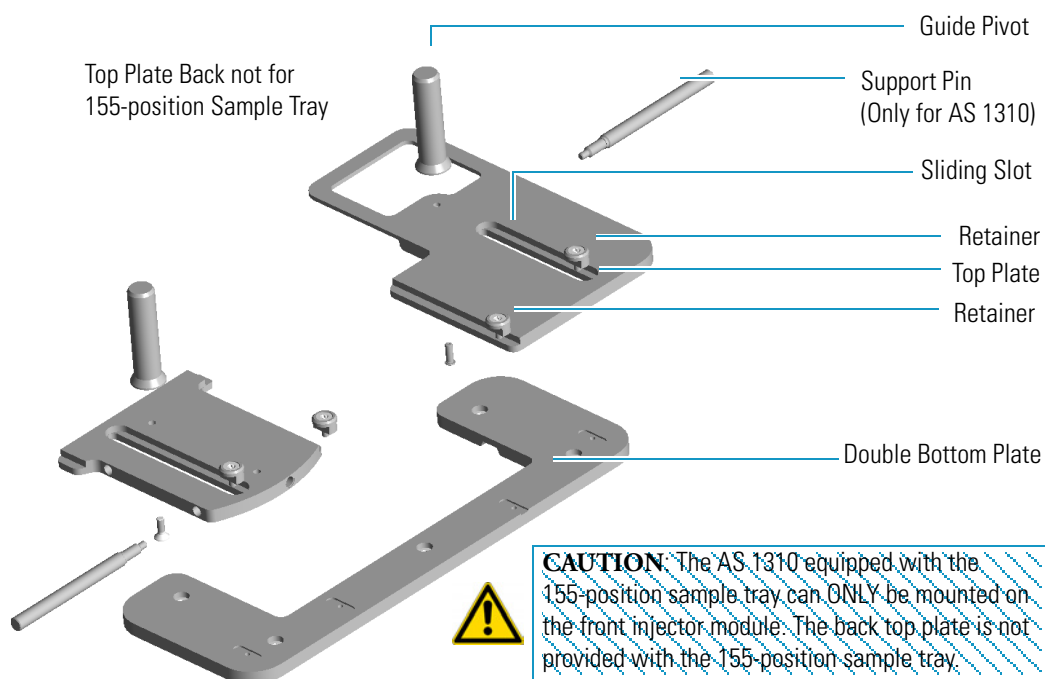
Figure 24. Support for the Installation in Gemini Configuration



Support for the Installation When a TSQ Quantum Mass Spectrometer is Coupled with the GC

This configuration uses a dedicated double bottom plate and two top plates. See [Figure 25](#).

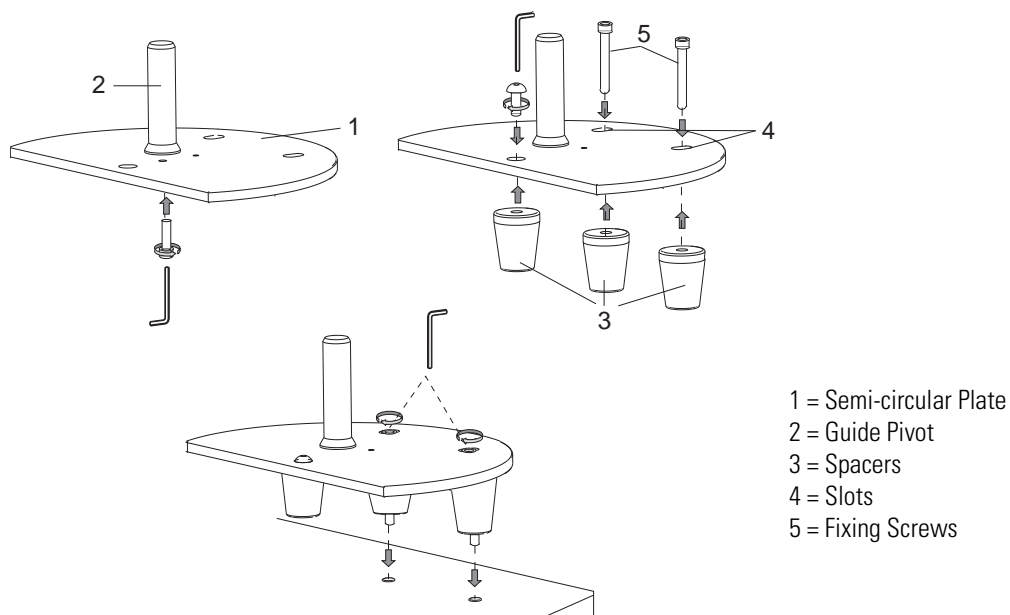
Figure 25. Support for the Installation when a TSQ Quantum is Coupled with the GC



Sampling System Support for TRACE GC Ultra

The support for the installation of the AI 1310/AS 1310 on **right** or **left** side of the TRACE GC Ultra consists of a semi-circular plate resting on three spacers non adjustable in height; see [Figure 26](#). The top surface of the plate is provided with two slots for corresponding fixing screws. In the middle the guide pivot allows the accommodation and centering of the sampling unit.

Figure 26. Support for the Installation of the AI 1310/AS 1310 on the TRACE GC Ultra



The AI 1310/AS 1310 is installed on the **right** or **left** side of the TRACE GC Ultra.

Installation on the Right Side

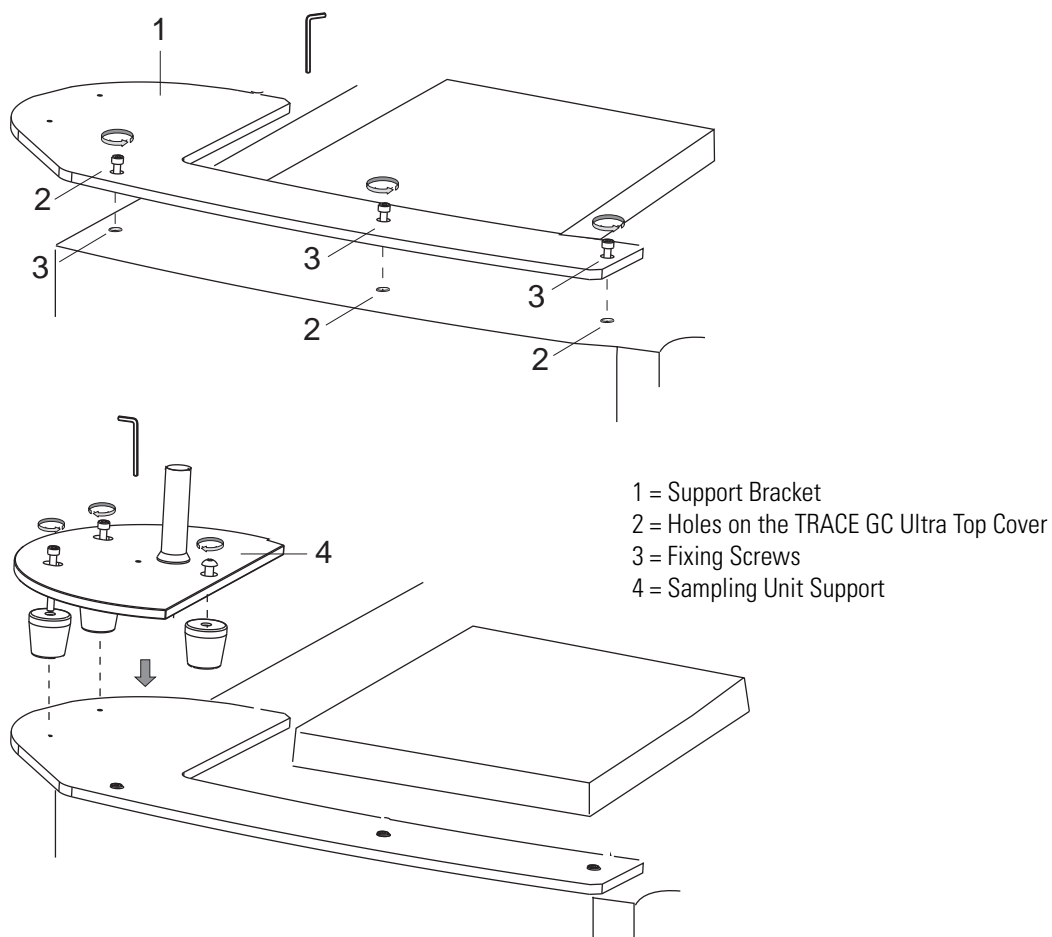
When installing the AI 1310/AS 1310 on the TRACE GC Ultra **right side**, the support is directly mounted on the GC top panel previous installation of the spacer inside the GC. See [Figure 26](#).

Note For details about the installation of the spacer, see the section “[Installing the Spacer Inside the GC](#)” on [page 42](#) for details.

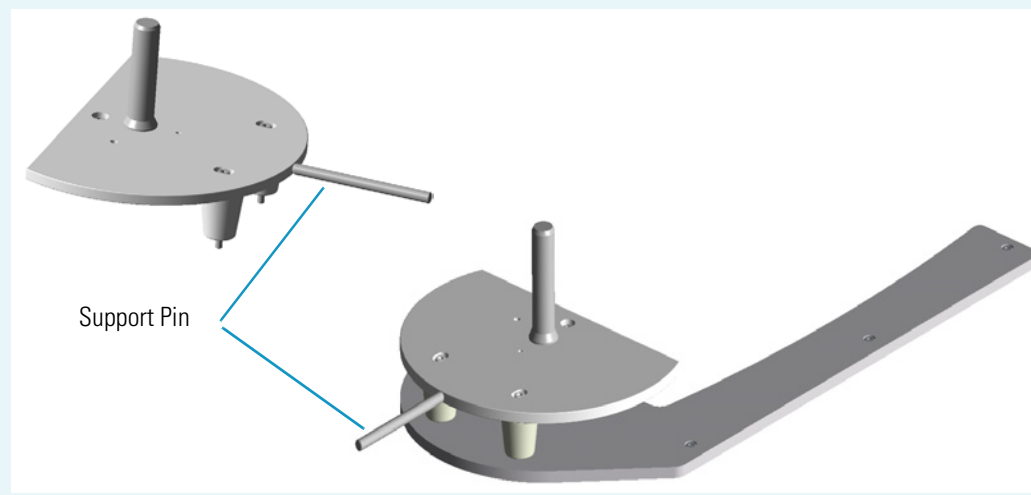
Installation on the Left Side

When installing the AI 1310/AS 1310 on the TRACE GC Ultra **left side**, before to mount the sampling system support, the support bracket must be placed and fixed on the GC top cover. See [Figure 27](#).

Figure 27. Bracket for the Installation of the AI 1310/AS 1310 Support



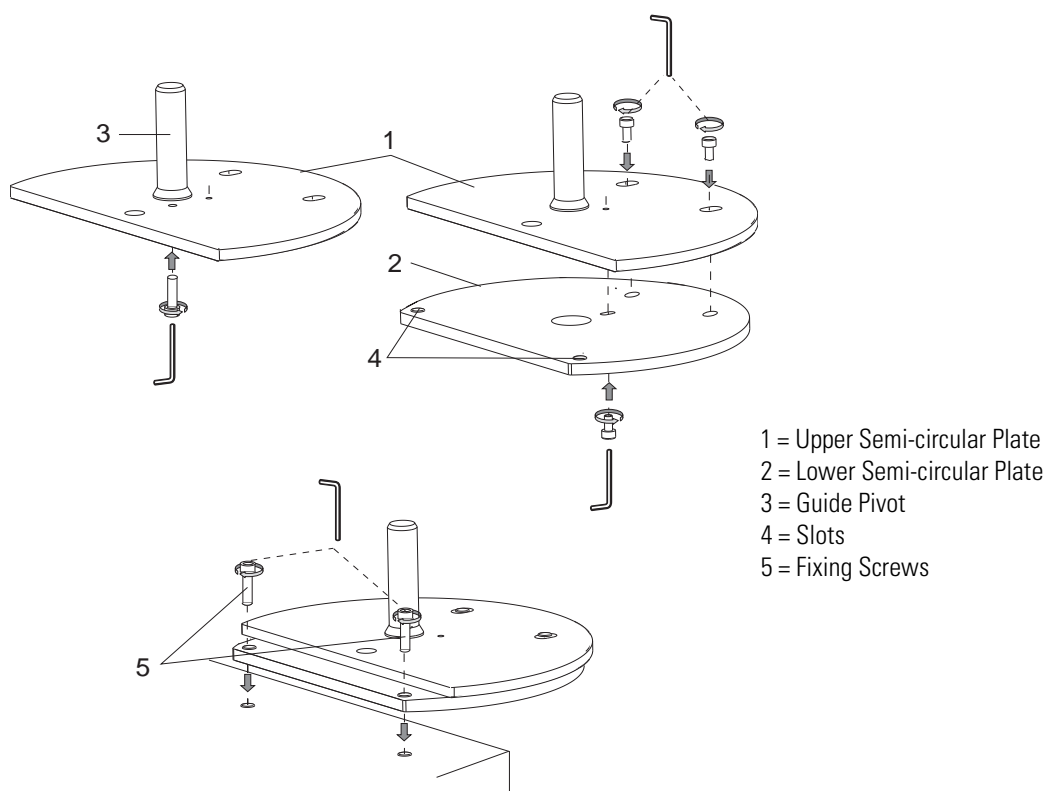
CAUTION If you are installing the sampling system support for the installation of an AS1310 equipped with the 155-position sample tray, make sure that the support pin is screwed into the dedicated hole on the sampling system support. See the images below:



Sampling System Support for FOCUS GC

The support for the installation of the AI 1310/AS 1310 on the right side of the FOCUS GC, consists of two semi-circular plates. See [Figure 28](#). The top surface of the upper plate is provided with two slots for corresponding fixing screws. In the middle the guide pivot allows the accommodation and centering of the sampling unit.

Figure 28. Support for the Installation of the AI 1310/AS 1310 on the FOCUS GC



Note The FOCUS GC MS Version, may accept the AI 1310/AS 1310 also on the left side. See the section [“Assembling of the Sampling System Support on FOCUS GC MS Version”](#) on [page 45](#). To reduce the FOCUS GC working area, the AS 1310 may be installed as described in the section [“Space Saving Installation”](#) on [page 46](#).

References for the Installation

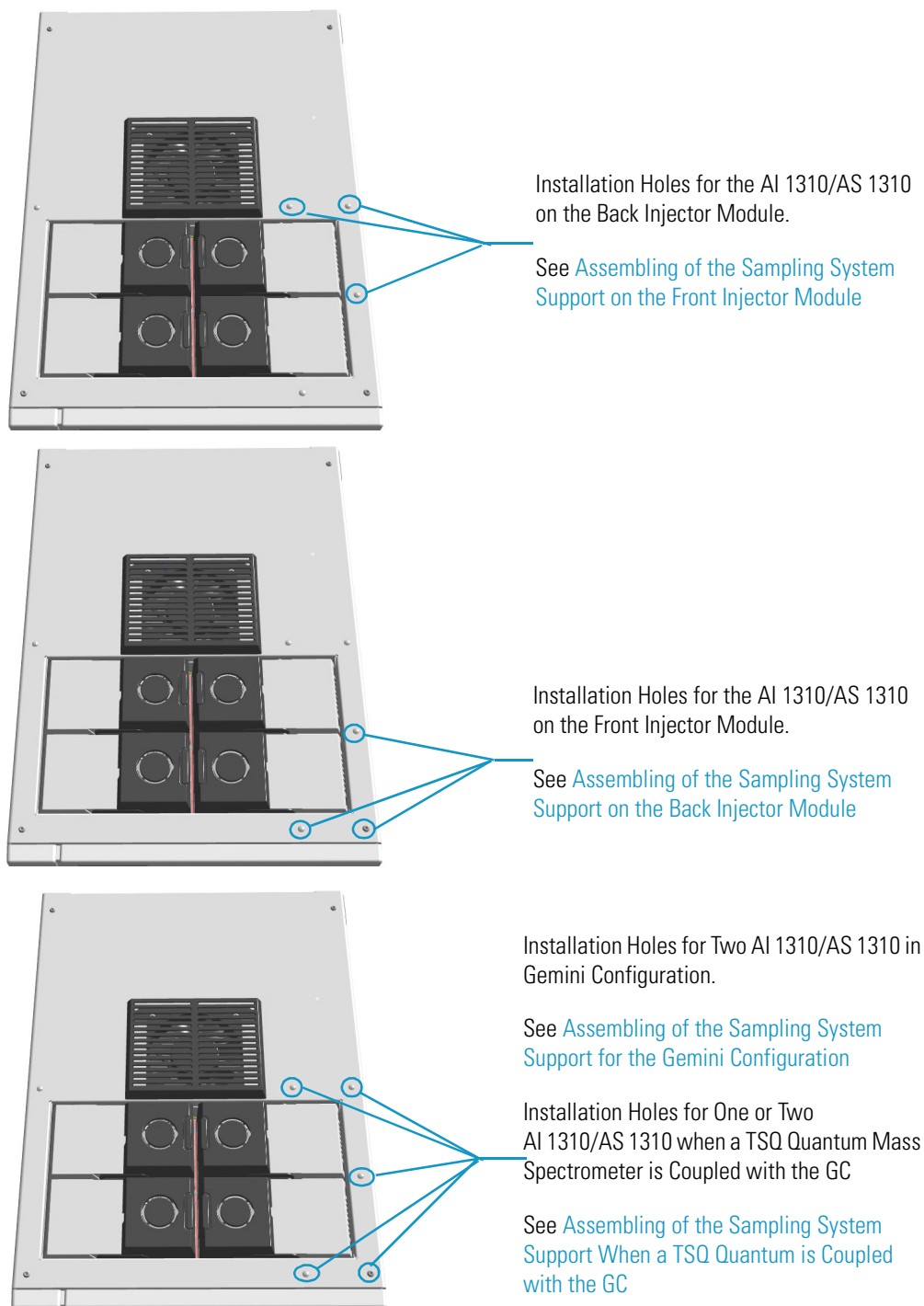
For the installation of the AI 1310/AS 1310, see the following sections:

- [“Installing the Sampling System Support on the TRACE 1300 Series GC”](#) on [page 33](#)
- [“Installing the Sampling System Support on the TRACE GC Ultra”](#) on [page 42](#)
- [“Installing the Sampling System Support on the FOCUS GC”](#) on [page 44](#)
- [“Installation of the AI 1310/AS 1310 on the GC”](#) on [page 48](#)

Installing the Sampling System Support on the TRACE 1300 Series GC

To install the sampling system support on the TRACE 1300 Series GC, please refer to the instructions reported below. [Figure 29](#) shows the installation holes on the top of the GC.

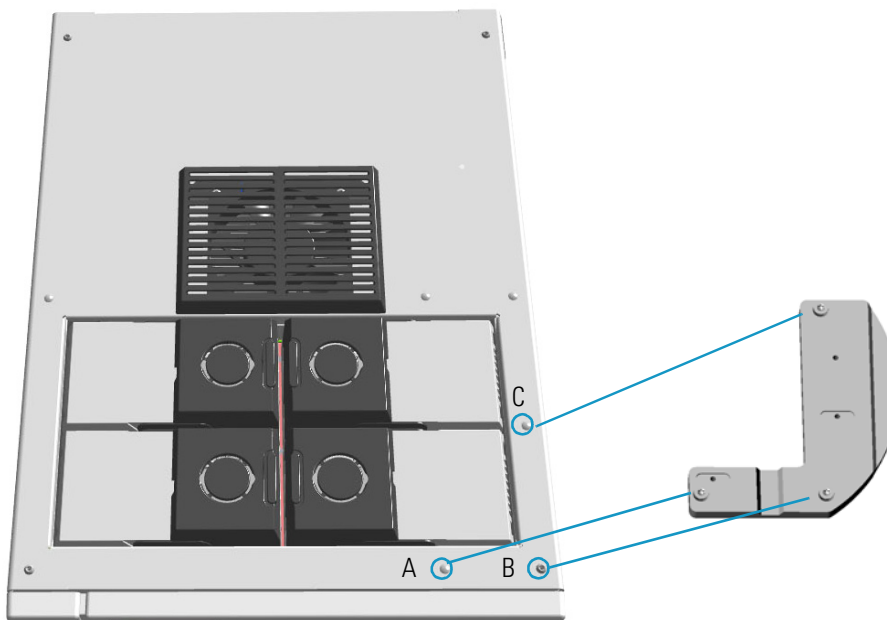
Figure 29. Sampler Unit Support Installation Holes



Assembling of the Sampling System Support on the Front Injector Module

The following is the description of how to mount the sampling system support on the **front** injector module of the TRACE 1300 Series GC. See [Figure 30](#) and [Figure 31](#).

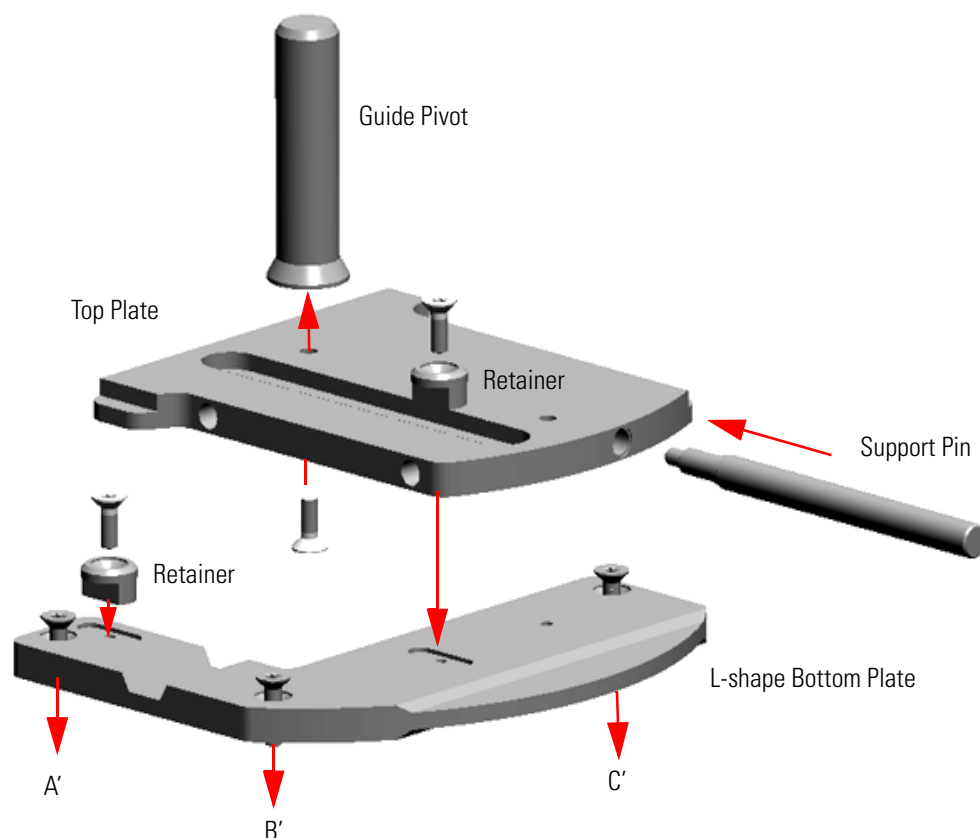
Figure 30. Assembling on the Front Injector Module (1)



1. Remove from the GC top cover the three plastic caps covering the corresponding fixing holes. See A, B, and C.

Note In comparison with the installation on the back injector module, the installation on the front injector module requires to upturn the L-shape bottom plate before fixing it on the GC.

2. Orient the L-shape bottom plate to align the three installation holes to the corresponding fixing holes located on the GC top.
3. Insert the provided fixing screws into the holes present on the L-shape bottom plate.

Figure 31. Assembling on the Front Injector Module (2)

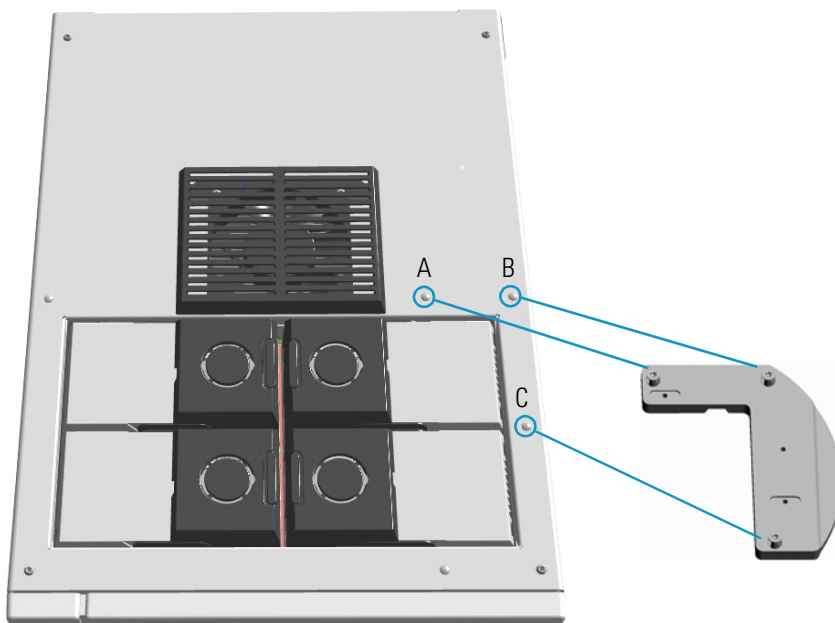
4. Place the L-shape bottom plate on the GC top and guide the three fixing screws into the corresponding fixing holes. See A', B', and C'. Tighten the three fixing screws.
5. If not already done, mount and fix the guide pivot on the top plate by using the proper fixing screw.
6. Place the top plate over the L-shape bottom plate.
7. Guide the retainer and its fixing screw into the sliding slot present on the top plate.
8. Align the retainer fixing screw into the corresponding fixing hole located on the L-shape bottom plate.
9. Tighten the retaining fixing screw.
10. Clamp the two plates guiding the second retainer and its fixing screw into the hole provided on the L-shape bottom plate.
11. If you must install an AS 1310, screw the support pin into the dedicated hole on the top plate.

Note The support pin is NOT required if you must install an AI 1310.

Assembling of the Sampling System Support on the Back Injector Module

The following is the description of how to mount the sampling system support on the **back** injector module of the TRACE 1300 Series GC. See [Figure 32](#) and [Figure 33](#).

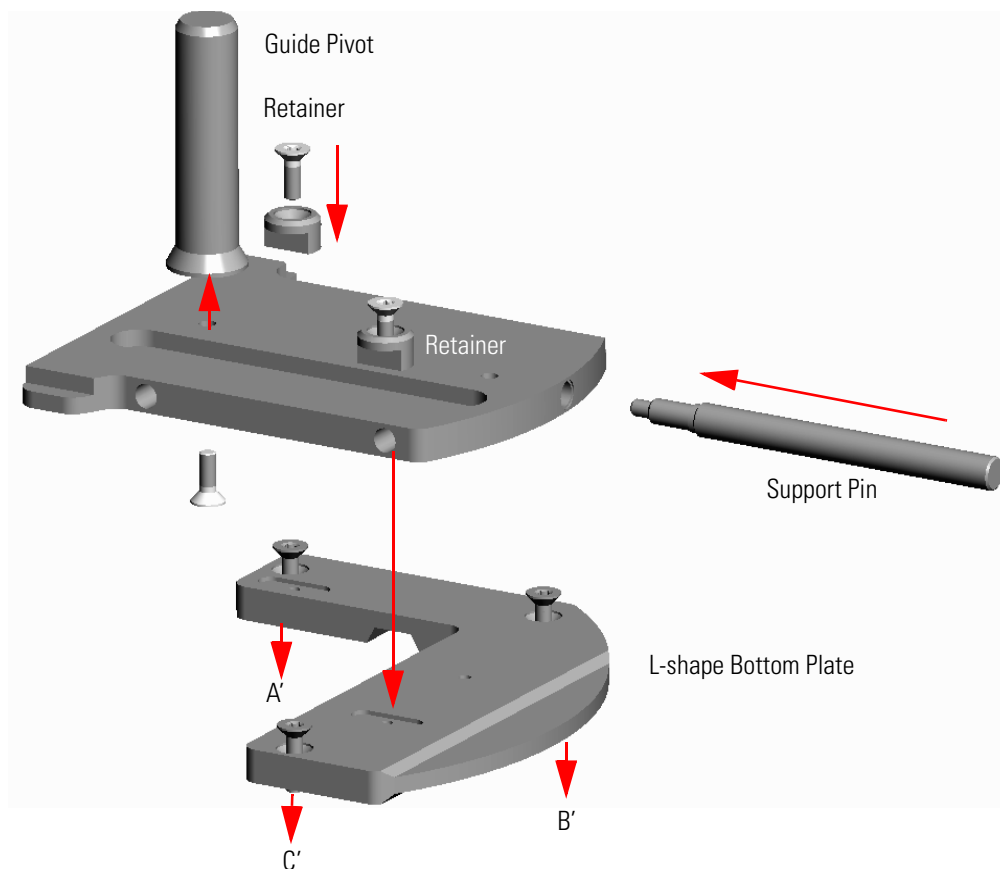
Figure 32. Assembling on the Back Injector Module (1)



1. Remove from the GC top cover the three plastic caps covering the corresponding fixing holes. See A, B, and C.

Note In comparison with the installation on the front injector module, the installation on the back injector module requires to upturn the L-shape bottom plate before fixing it on the GC.

2. Orient the L-shape bottom plate to align the three installation holes to the corresponding fixing holes located on the GC top.
3. Insert the provided fixing screws into the holes present on the L-shape bottom plate.

Figure 33. Assembling on the Back Injector Module (2)

4. Place the L-shape bottom plate on the GC top and guide the three fixing screws into the corresponding fixing holes. See A', B', and C'. Tighten the three fixing screws.
5. If not already done, mount and fix the guide pivot on the top plate by using the proper fixing screw.
6. Place the top plate over the L-shape bottom plate.
7. Guide the retainer and its fixing screw into the sliding slot present on the top plate.
8. Align the retainer fixing screw into the corresponding fixing hole located on the L-shape bottom plate.
9. Tighten the retaining fixing screw.
10. Clamp the two plates guiding the second retainer and its fixing screw into the hole provided on the L-shape bottom plate.
11. If you must install an AS 1310, screw the support pin into the dedicated hole of the top plate.

Note The support pin is NOT required if you must install an AI 1310.

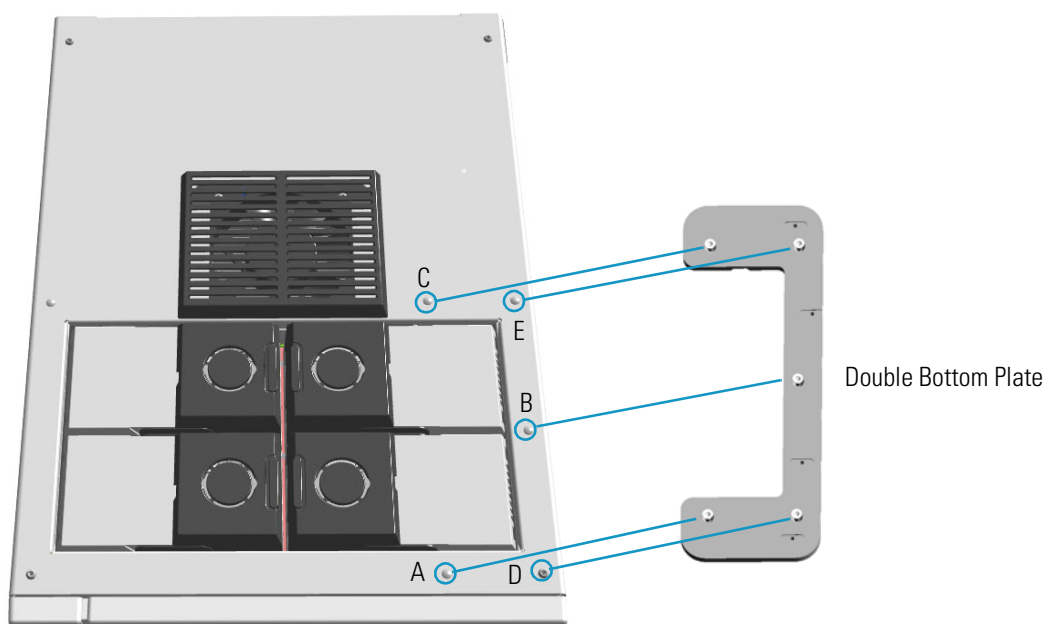
3 Installation

Installing the Sampling System Support on the TRACE 1300 Series GC

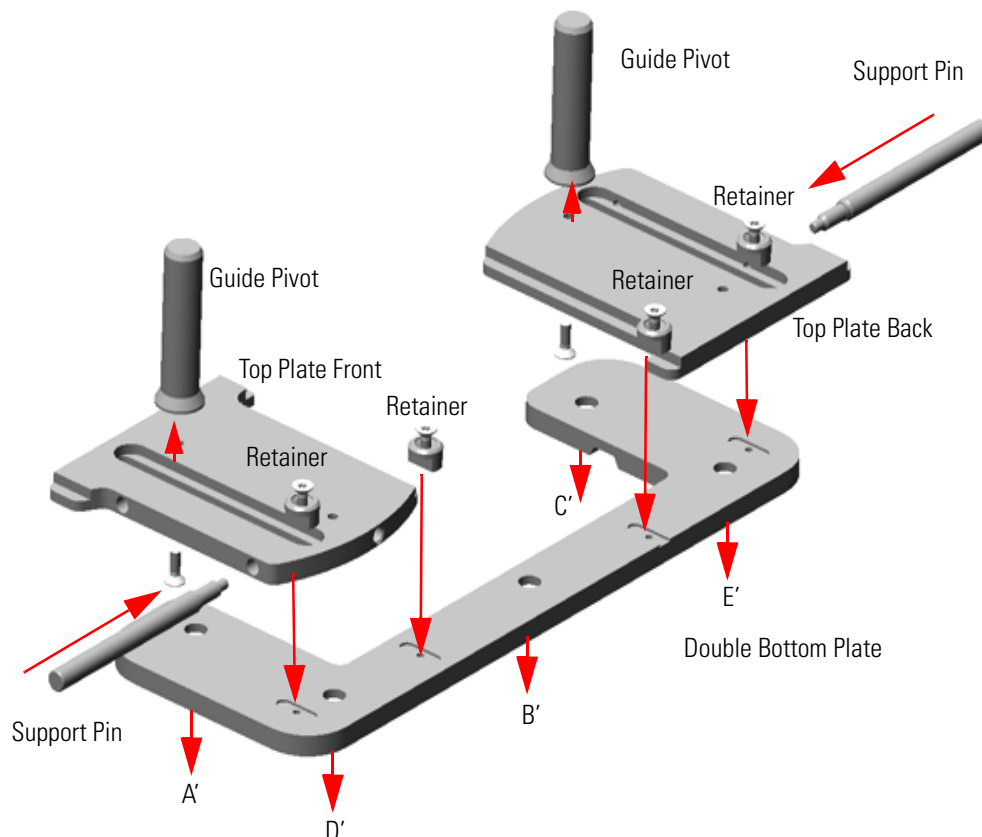
Assembling of the Sampling System Support for the Gemini Configuration

The following is the description of how to mount the sampling system support on the TRACE 1300 Series GC for the installation of two AI 1310/AS 1310 sampling systems in **Gemini** configuration. See [Figure 34](#) and [Figure 35](#).

Figure 34. Assembling In Gemini Configuration (1)



1. Remove from the GC top cover the five plastic caps covering the corresponding fixing holes. See A, B, C, D, and E.
2. Insert the provided fixing screws into the five holes present on the double bottom plate.

Figure 35. Assembling In Gemini Configuration (2)

3. Guide the five fixing screws into the corresponding fixing holes located on the GC top. See A', B', C', D', and E'. Tighten the five fixing screws.
4. If not already done, mount and fix the guide pivot on each top plate by using the proper fixing screw.
5. Place the two top plates over the double bottom plate.
6. Guide each retainer and its fixing screw into the sliding slot present on each top plate.
7. Align each retainer fixing screw into the corresponding fixing hole located on the double bottom plate.
8. Tighten each retainer fixing screw to block the corresponding upper plate to the double bottom plate.
9. Clamp the corresponding plates guiding the second retainer and its fixing screw into the hole provided on each L-shape bottom plate.
10. If you must install an AS 1310, screw the support pin into the dedicated hole of each top plate.

Note The support pin is NOT required if you must install an AI 1310.

3 Installation

Installing the Sampling System Support on the TRACE 1300 Series GC

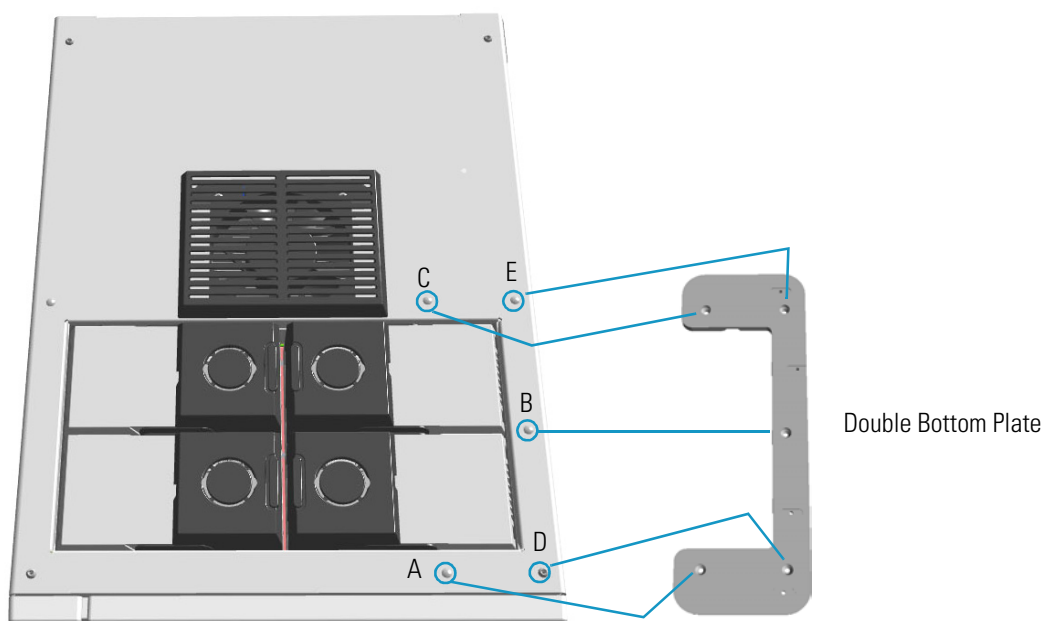
Assembling of the Sampling System Support When a TSQ Quantum is Coupled with the GC

The following is the description of how to mount the sampling system support on the TRACE 1300 Series GC for the installation of one or two AI 1310/AS 1310 sampling systems when a TSQ Quantum mass spectrometer is coupled with the GC. See [Figure 36](#) and [Figure 37](#).

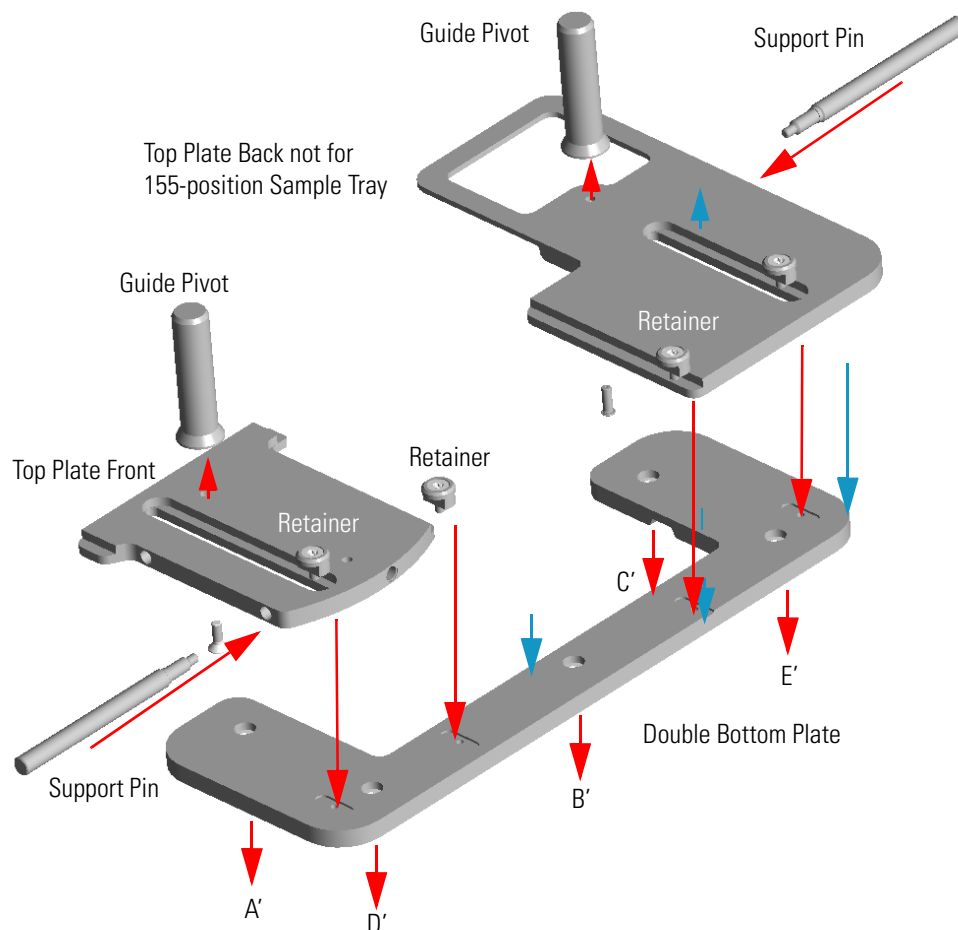


CAUTION The AS 1310 equipped with the 155-position sample tray can ONLY be mounted on the **front** injector module. The back top plate is not provided with the 155-position sample tray.

Figure 36. Assembling (1)



1. Remove from the GC top cover the five plastic caps covering the corresponding fixing holes. See A, B, C, D, and E.
2. Insert the provided fixing screws into the five holes present on the double bottom plate.

Figure 37. Assembling (2)

3. Guide the five fixing screws into the corresponding fixing holes located on the GC top. See A', B', C', D', and E'. Tighten the five fixing screws.
4. If not already done, mount and fix the guide pivot on each top plate by using the proper fixing screw.
5. Place the two top plates over the double bottom plate. Guide each retainer and its fixing screw into the sliding slot present on each top plate.
6. Align each retainer fixing screw into the corresponding fixing hole located on the double bottom plate.
7. Tighten each retainer fixing screw to block the corresponding upper plate to the double bottom plate.
8. Clamp the corresponding plates guiding the second retainer and its fixing screw into the hole provided on each L-shape bottom plate.
9. Screw the support pin into the dedicated hole of each top plate.

Note The support pin is NOT required if you must install an AI 1310.

Installing the Sampling System Support on the TRACE GC Ultra

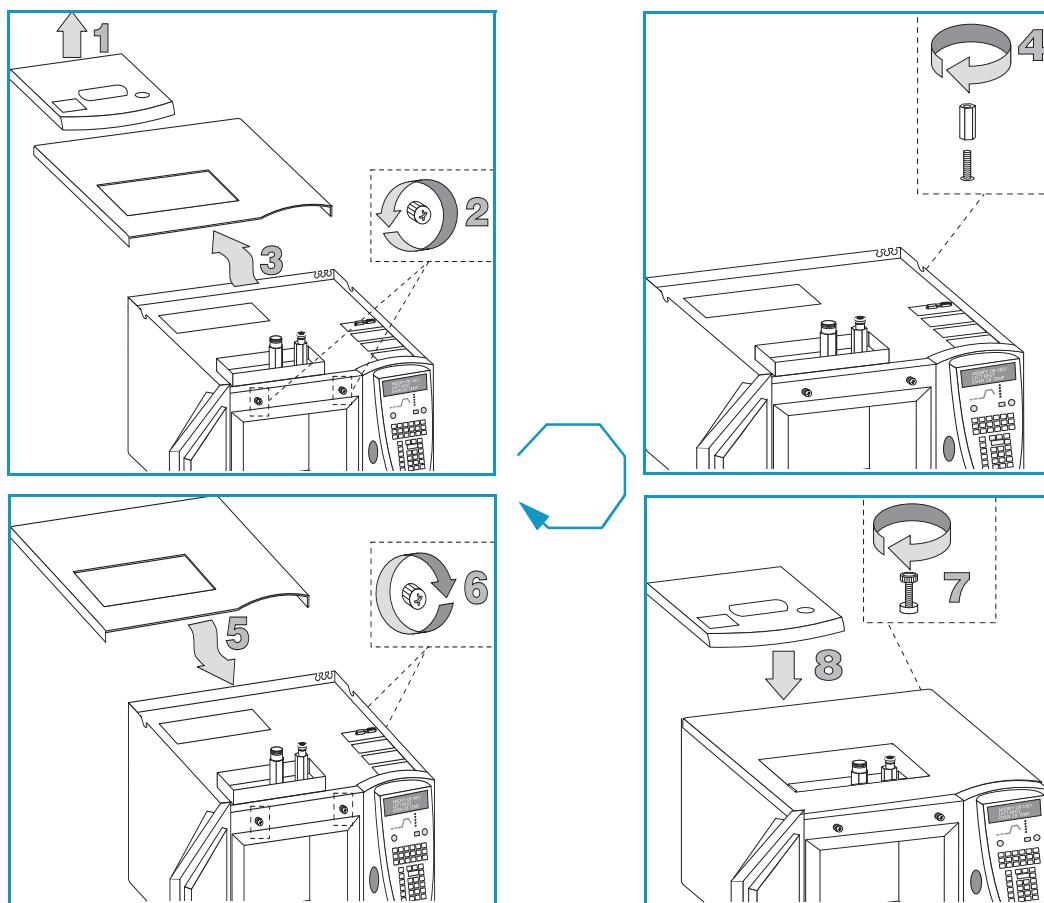
To install the support on the TRACE GC Ultra, please refer to the instructions reported below. Before installing the sampling system support, the spacer should be installed inside the GC, then assembly the sampling system support on the GC according to the required configuration.

- See “Installing the Spacer Inside the GC” on page 42
- See “Assembling of the Sampling System Support on the GC Right Side” on page 43
- See “Assembling of the Sampling System Support on the GC Left Side” on page 44

Installing the Spacer Inside the GC

To installing the spacer should be installed inside the GC proceed as described below. See [Figure 38](#).

Figure 38. Installation of the Spacer Inside the GC



1. Remove the cover and the collar of the injector and detector compartment.
2. Open the column oven door. Loosen the two knobs located in the upper parts.

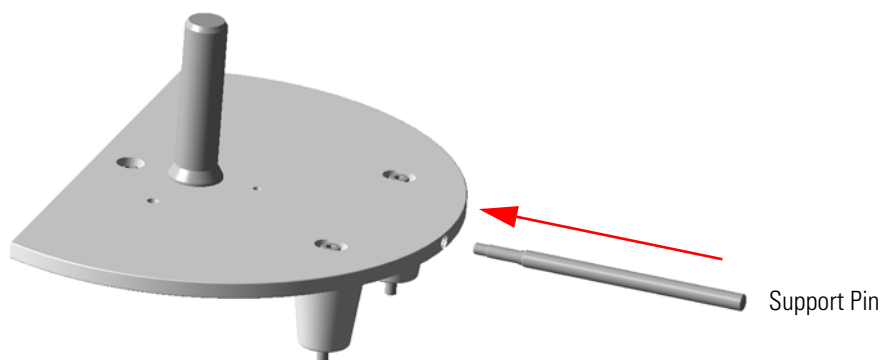
3. Push the cover backwards and remove it.
4. Screw the spacer on the threaded pin.
5. Put the GC cover back in the original position.
6. Tighten the two knobs. Close the column oven door.
7. Mount the spacer fixing Allen screw.
8. Reinstall the cover and the collar of the injector and detector compartment.

Assemble the sampling system support on the GC according to the required configuration.

Assembling of the Sampling System Support on the GC Right Side

The following is the description of how to mount the sampling system support in the default configuration, i.e. on the **right** side of the TRACE GC Ultra.

1. Remove from the GC top cover the two plastic caps covering the corresponding fixing holes.
2. Insert into each slot present on the support the provided fixing screw.
3. Insert each screw into the relevant spacer paying attention to keep its largest surface turned towards the support base.
4. Holding the spacers in position with your hands, rest the support on the GC top cover, with their flat side towards the inside.
5. Guide the two fixing screws located on the external spacers into the corresponding fixing holes.
6. Loosely tighten the screws.
7. If you must install an AS 1310 equipped with the 155-position sampler tray, screw the support pin into the dedicated hole on the sampling system support.

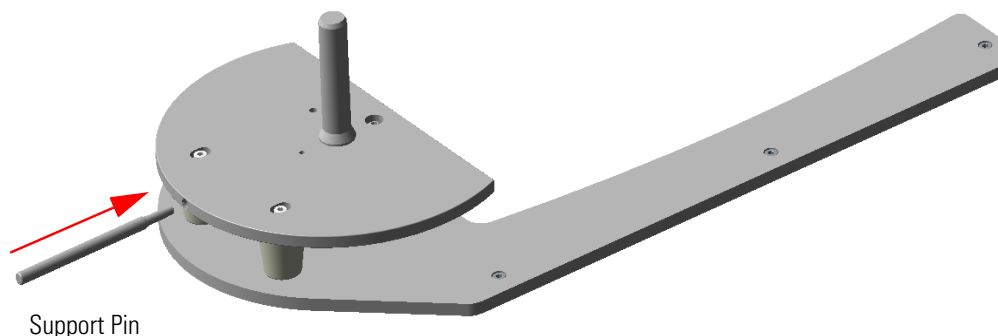


Note The support pin is NOT required if you must install an AI 1310.

Assembling of the Sampling System Support on the GC Left Side

The following is the description of how to mount the sampling system support on the **left** side of the TRACE GC Ultra.

1. Remove from the GC top cover the four plastic caps covering the corresponding fixing holes.
2. Mount the support bracket on the TRACE GC Ultra and fix by using fixing screws provided.
3. Insert into each slot present on the support the provided fixing screw.
4. Insert each screw into the relevant spacer paying attention to keep its largest surface turned towards the support base.
5. Holding the spacers in position with your hands, rest the support on the bracket, with their flat side towards the inside.
6. Guide the two fixing screws located on the external spacers into the corresponding fixing holes located on the bracket.
7. Loosely tighten the screws.
8. If you must install an AS 1310 equipped with the 155-position sampler tray, screw the support pin into the dedicated hole on the sampling system support.



Note The support pin is NOT required if you must install an AI 1310.

Installing the Sampling System Support on the FOCUS GC

To install the support on the FOCUS GC, please refer to the instructions reported below.

- See [“Assembling of the Sampling System Support on the GC right side”](#) on page 45
- See [“Assembling of the Sampling System Support on FOCUS GC MS Version”](#) on page 45
- See [“Space Saving Installation”](#) on page 46

Assembling of the Sampling System Support on the GC right side

The following is the description of how to mount the sampling system support in the default configuration, i.e. on the **right** side of the FOCUS GC.

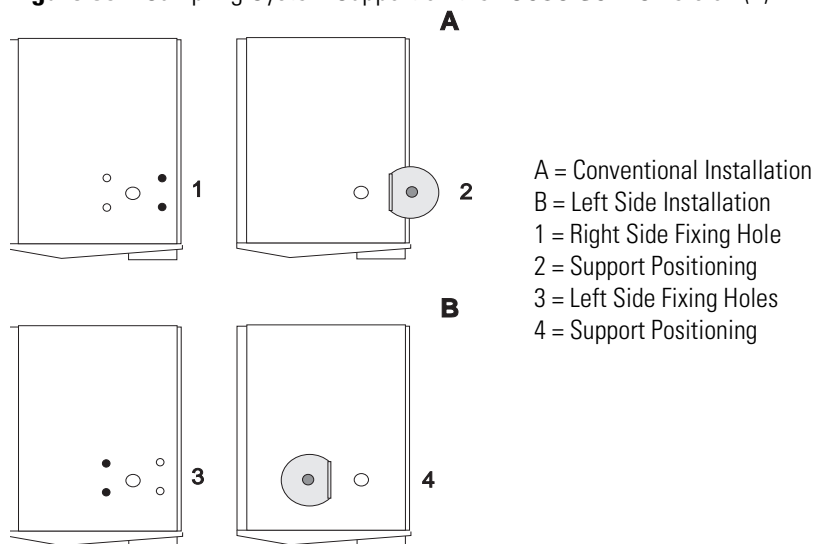
1. Remove from the GC upper cover the two plastic caps covering the corresponding fixing holes.
2. Insert into each slot present on the support the provided fixing screw.
3. Guide the two fixing screws into the corresponding fixing holes located on the GC upper panel.
4. Loosely tighten the screws.

Assembling of the Sampling System Support on FOCUS GC MS Version

The installation on the GC **left** side, instead the conventional installation on the GC right side, may be carried out to reduce the working area of your FOCUS GC MS Version.

See [Figure 39](#).

Figure 39. Sampling System Support on the FOCUS GC MS Version (1)



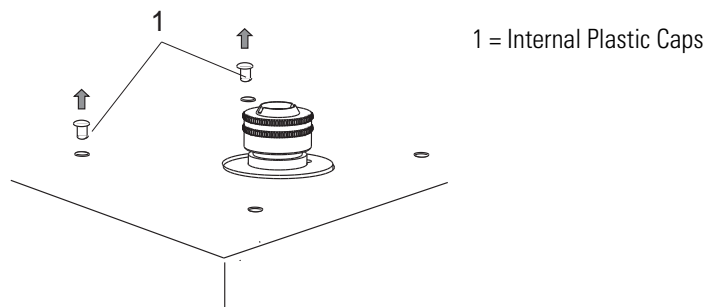
Proceed as follows:

1. Remove from the GC upper cover the two internal plastic caps covering the corresponding fixing holes. See [Figure 40](#).

3 Installation

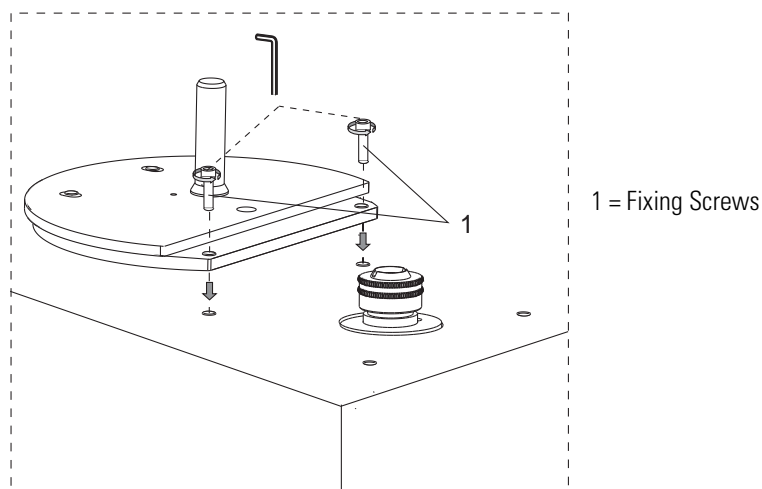
Installing the Sampling System Support on the FOCUS GC

Figure 40. Sampling System Support on the FOCUS GC MS Version (2)



2. Insert the provided fixing screw into each slot present on the support.
3. Guide the two fixing screws into the corresponding fixing holes located on the GC upper panel. See [Figure 41](#).

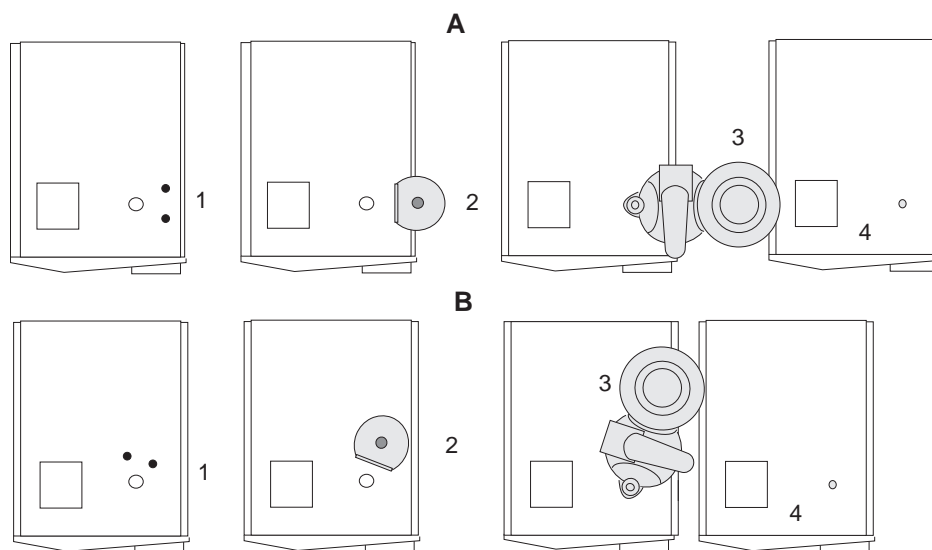
Figure 41. Sampling System Support on the FOCUS GC MS Version (3)



4. Loosely tighten the screws.

Space Saving Installation

This type of installation is suggested to reduce the working area of your FOCUS GC equipped with the AS 1310. This is applicable for example when two or more FOCUS GC units are to be placed on the same workbench. See [Figure 42](#).

Figure 42. Two or More FOCUS Placed on the Same Workbench

A = Conventional Installation
 B = Space Saving Installation
 1 = Fixing Screws
 2 = Sampling System Support
 3 = AS 1310
 4 = Second FOCUS GC

Proceed as follows:

1. Remove from the GC upper cover the two plastic caps covering the corresponding fixing holes.
2. Insert into each slot present on the support the provided fixing screw.
3. Guide the two fixing screws into the corresponding fixing holes located on the GC upper panel.
4. Loosely tighten the screws.

Installation of the AI 1310/AS 1310 on the GC

To install the AI 1310/AS 1310 on the TRACE 1300 Series GC, TRACE GC Ultra, and FOCUS GC gas chromatographs, please refer to the instructions reported below:

The procedure includes the following steps:

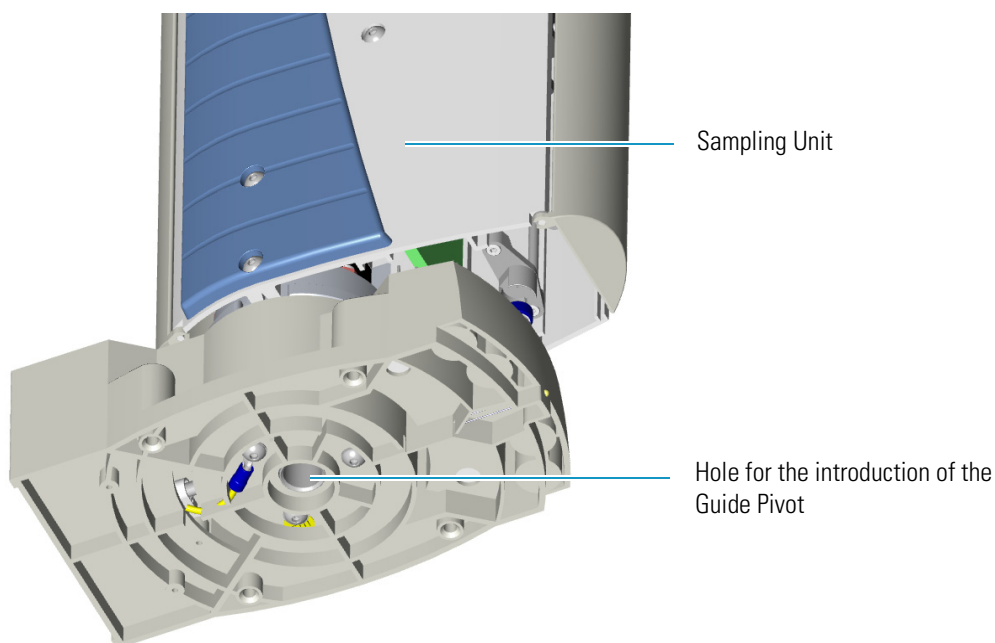
- “Installation of the Sampling Unit” on page 48
- “Installation of the Syringe” on page 51
- “Electrical Connections” on page 52
- “Instrument Start-up” on page 56

Installation of the Sampling Unit

Proceed as follows:

1. Lift the sampling unit, see [Figure 21](#) on [page 26](#), and insert it into the guide pivot located on the sampling system support. Introduce the guide pivot into the hole provided on the bottom of the base. See [Figure 43](#).

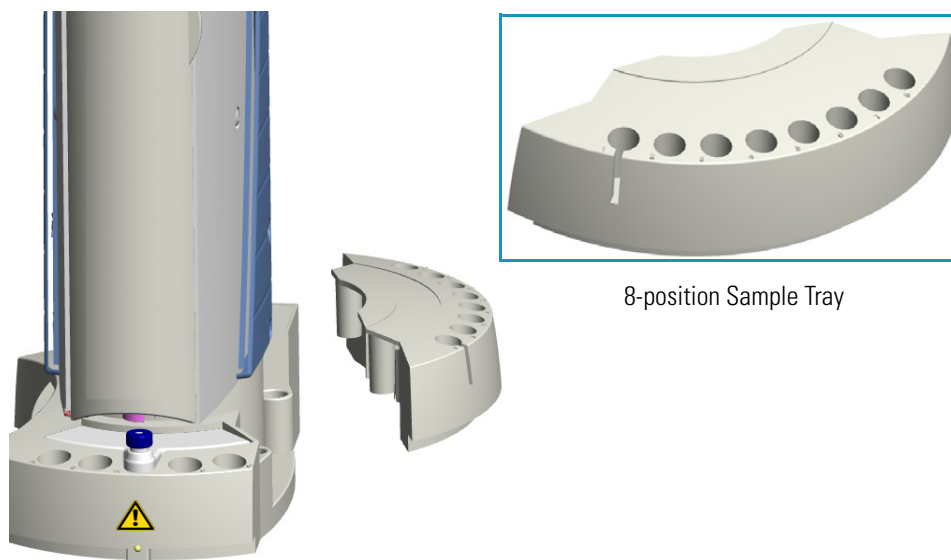
Figure 43. Installation of the Sampling Unit



2. Insert the proper centering plate for TRACE 1300 Series GC or TRACE GC Ultra into its seat of the sampling unit base paying attention that the guide hole, present on the arm of the centering plate, correctly fits the injector nut. See [Figure 44](#).

Figure 44. Centering Plates

3. Check the correct alignment of the sampling system support, then fix it by tightening the proper fixing screws.
4. Insert the sample tray into the sampling unit base.
 - **AI 1310** — Insert the 8-position sample tray into the appropriate housing of the sampling unit base. See [Figure 45](#).

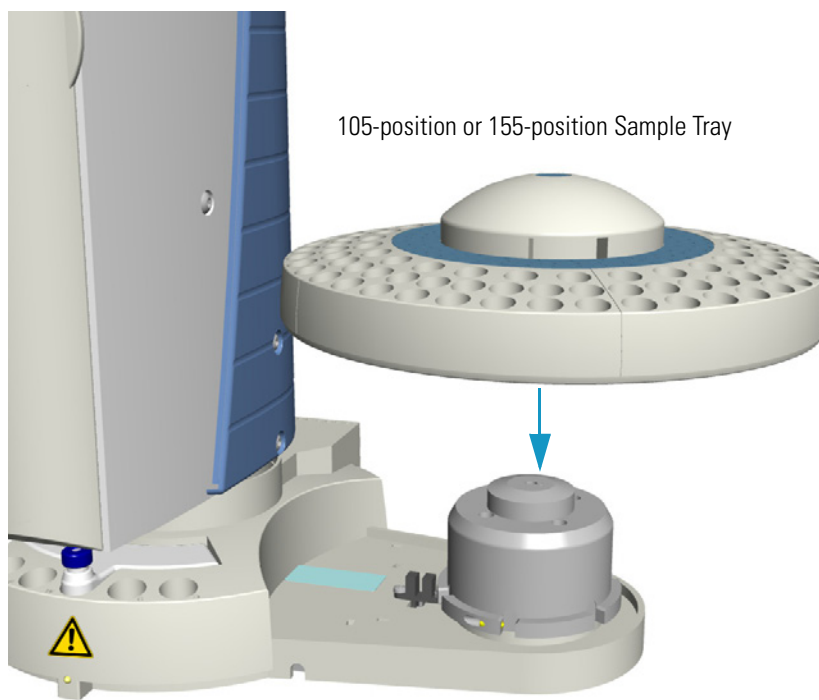
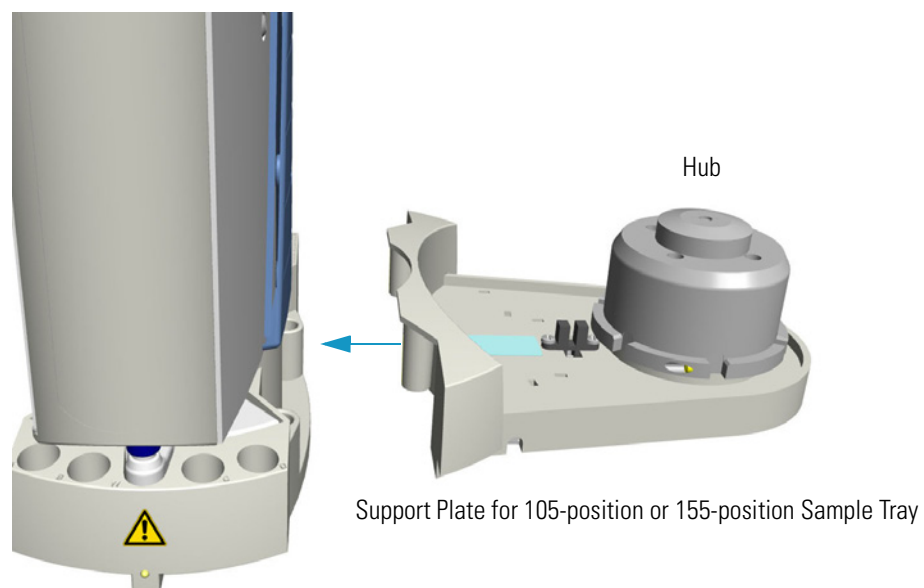
Figure 45. 8-position Sample Tray

3 Installation

Installation of the AI 1310/AS 1310 on the GC

- **AS 1310** — According to the AS 1310 with the **105** or **155-position** sample tray, insert the dedicated support plate into its appropriate housing of the sampling unit base. Place the sample tray on the hub located on the support. The system will automatically recognize the sample tray at the instrument power on. See [Figure 46](#).

Figure 46. 105/155-position Sample Tray



Installation of the Syringe

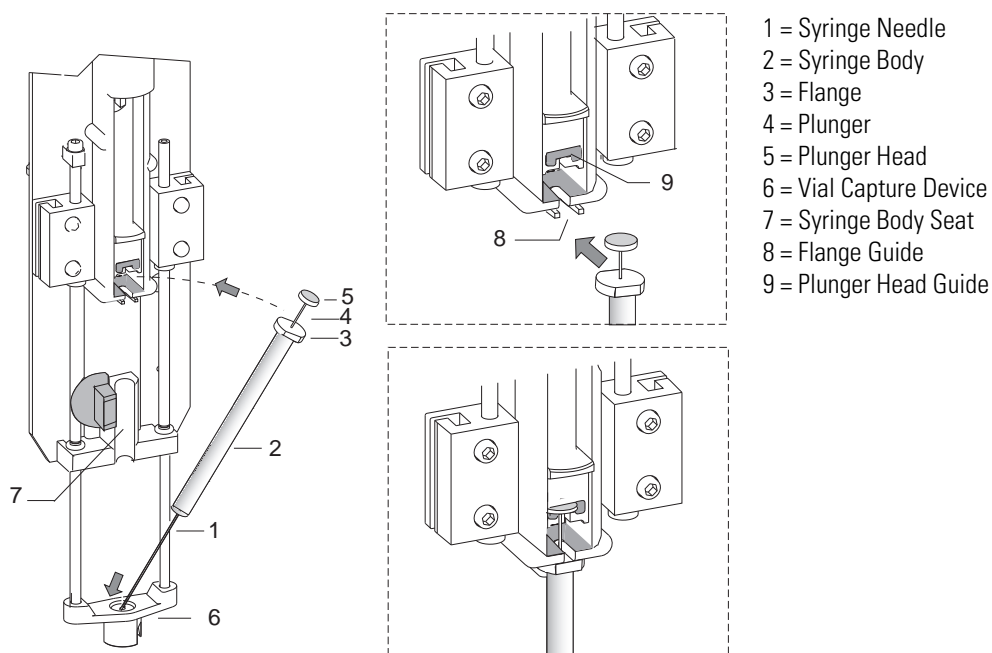
To install the syringe follow the instructions reported below.

The installation of the syringe is a simple operation. However, it must be performed with caution to avoid damages to the syringe needle and ensure an optimal performance of the injection device.

The standard syringe has 10 μL capacity with 50 mm needle length. A 5 μL and a 0.5 μL optional syringes are optionally available.

1. Open the safety door of the turret.
2. Insert the syringe needle into the vial capture device. See [Figure 47](#).

Figure 47. Syringe Installation (1)

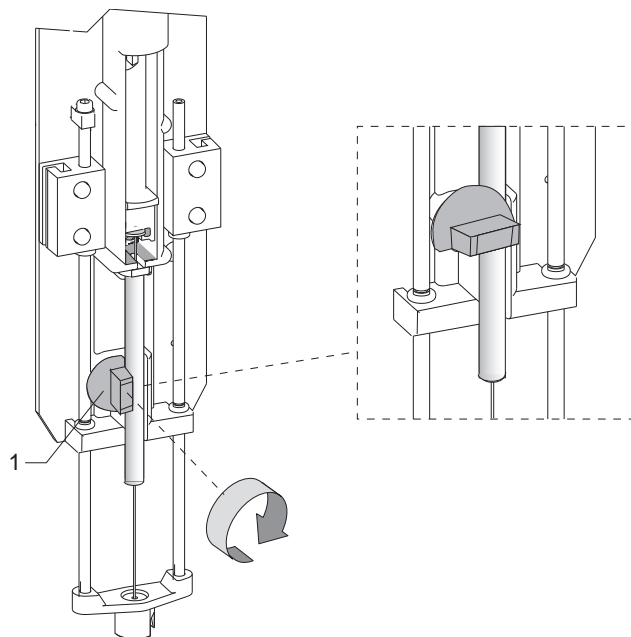


3. Accommodate the syringe body into its seat paying attention to insert simultaneously the flange and head of the syringe plunger into their relevant guides.
4. Lock the syringe by turning clockwise the lock knob by approximately 180°. See [Figure 48](#).
5. Close the safety door of the rotating turret.

3 Installation

Installation of the AI 1310/AS 1310 on the GC

Figure 48. Syringe Installation (2)



Electrical Connections

The instrument must be powered as indicated in “[Technical Specifications](#)” on [page 8](#). Before performing electrical connections, ensure that the requirements reported in paragraph “[Electrical Requirements](#)” on [page 26](#) have been fulfilled.

This section provides the instruction to connect the AI 1310/AS 1310, in standard or Gemini configuration, to a TRACE 1300 Series GC, TRACE GC Ultra or FOCUS GC.

See the following sections:

- “[Standard Configuration](#)” on [page 52](#)
- “[Gemini Configuration](#)” on [page 53](#)

Standard Configuration

Proceed as follows:

1. By using the cable provided, connect the 6-pin female connector marked **GC** located on the sampling unit back side and the connector, located on the back panel of the GC, marked:
 - **AUTOSAMPLER HANDSHAKE** in the case of TRACE 1300 Series GC.
 - **SAMPLER SIGNAL** in case of TRACE GC Ultra and FOCUS GC.

2. By using the cable provided, connect the 9-pin female connector marked **RS232** located on the sampling unit back side to 9-pin connector marked **AUTOSAMPLER** located on the GC back panel.
3. **In case of AS 1310**, connect the 15-pin female connector of the cable coming from the support plate of the 105-position sample tray to the connector marked **TRAY** located on the sampling unit back side.

Gemini Configuration

This section provides instructions for connecting two AI 1310/AS 1310 in Gemini Configuration.

In Gemini configuration, the AI 1310/AS 1310 autosamplers can work in three operating mode:

- **High Throughput Mode** — Processes large batches of samples with the same analytical conditions and double the system productivity.
Typically the same type of column and detector are used on both channels; the samples are injected in the two channels and analyses acquired simultaneously with the same GC method. The vial sequence is not necessarily the same. Each injection will contain the data from one data channel.
- **Single Mode** — Only one AI 1310/AS 1310 autosampler is working.
- **Confirmation Mode** — Typically, two columns with different stationary phases are installed in parallel, use the same or a different detector. The same samples are placed in the same positions on the two sample carousels. The same vial sequence and the same GC method are requested for the two autosamplers. The samples are injected in the two channels and analyses acquired simultaneously. In this case the data acquired by each channel is saved in the same data file.

If Chrom-Card CDS is used, the data acquired by each channel is saved in a proper single file.

Figure 49 and Figure 50 on page 54 shows two possible cables connection (**HWSetup 1** and **HWSetup 2**) of two AI 1310/AS 1310 in Gemini configuration. See also “To perform the HWSetup 1 of two AI/AS 1310 in Gemini Configuration” on page 55 and “To perform the HWSetup 2 of two AI/AS 1310 in Gemini Configuration” on page 56.

Table 3 on page 55 shows which hardware setup must be carried out according to the Thermo Scientific Chromatography Data Systems (CDS) in use and to the operating modes.

3 Installation

Installation of the AI 1310/AS 1310 on the GC

Figure 49. Gemini Configuration Cables Connections - HWSetup 1

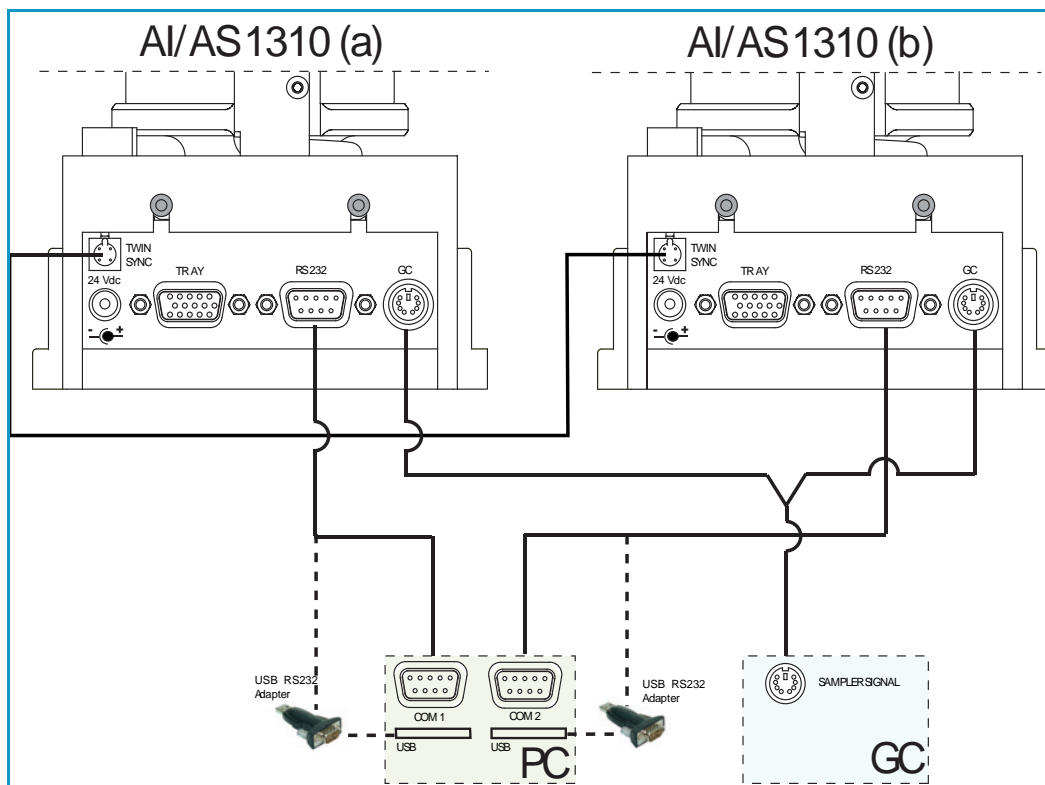


Figure 50. Gemini Configuration Cables Connections - HWSetup 2

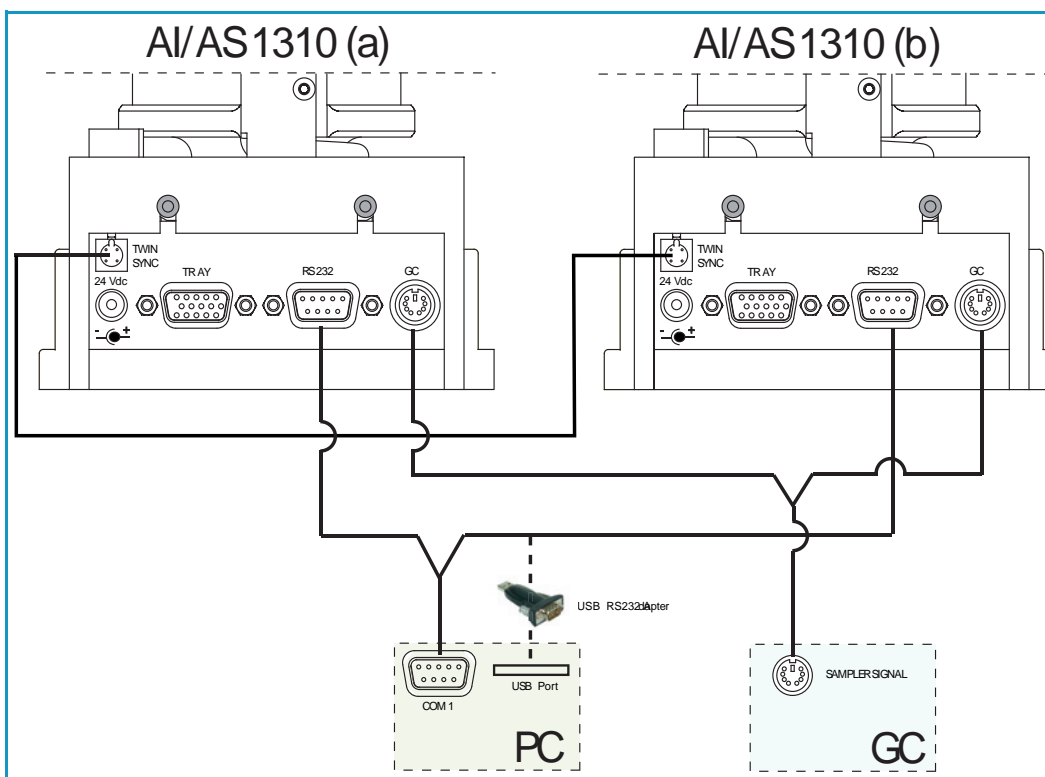


Table 3. Hardware Setup Comparison Table

Chromatography Data System (CDS)	High Throughput Mode	Single Mode *	Confirmation Mode
Chromeleon 7.2	HWSetup 1 See Figure 49	HWSetup 1 See Figure 49	HWSetup 2 See Figure 50
Xcalibur Foundation 3.1; GC driver 3.X	NA**	HWSetup 2 ¹ See Figure 50	HWSetup 2 See Figure 50
TraceFinder 3.2	NA ²	HWSetup 2 ¹ See Figure 50	HWSetup 2 See Figure 50
Chrom-Card 2.12	HWSetup 2 ¹ See Figure 50	HWSetup 2 ¹ See Figure 50	HWSetup 2 See Figure 50
ChromQuest 5; SP2015 R2	HWSetup 1 See Figure 49	HWSetup 1 See Figure 49	HWSetup 1 See Figure 49
EzChrom 3.22; SP2015 R2	HWSetup 1 See Figure 49	HWSetup 1 See Figure 49	HWSetup 1 See Figure 49

* The unplugging of the power cord from the unused AI 1310/AS 1310 autosampler could be required

** Not Applicable

❖ To perform the HWSetup 1 of two AI/AS 1310 in Gemini Configuration

- Using the cable provided (PN 23043672), connect the 4-pin male connector marked **TWIN SYNC**, on the back of the sampling unit of the sampler “a”, to the 4-pin male connector marked **TWIN SYNC** on the back of the sampling unit of the sampler “b”.
- Using the **Gemini Y** shape cable provided (PN 23043623), connect:
 - the 6-pin main connector labelled **GC** to the connector marked **AUTOSAMPLER HANDSHAKE** on the back of the GC.
 - the first branch of the cable, labelled **AI/AS 1**, to the 6-pin female connector marked **GC** on the back of the sampling unit of the sampler “a”.
 - the second branch of the cable, labelled **AI/AS 2**, to the 6-pin female connector marked **GC** on the back of the sampling unit of the sampler “b”.
- Using the RS232 cable (PN 23043453) provided in the standard outfit of each AI/AS 1310, connect:
 - the 9-pin connector marked **RS232** of the first sampler to a PC serial port (e.g. COM 1), or to an USB port, interposing an USB-RS232 adapter not provided.
 - the 9-pin connector marked **RS232** of the second sampler to a second PC serial port (e.g. COM 2), or to an second USB port, interposing a second USB-RS232 adapter not provided.
- Connect the power cable to the autosampler and to the wall outlet.

3 Installation

Installation of the AI 1310/AS 1310 on the GC

❖ To perform the HWSetup 2 of two AI/AS 1310 in Gemini Configuration

1. By using the cable provided, connect the 4-pin male connector marked **TWIN SYNC**, on the back of the sampling unit of the sampler “a”, to the 4-pin male connector marked **TWIN SYNC** on the back of the sampling unit of the sampler “b”.
2. By using the Y shape cable provided, connect:
 - a. the 6-pin female connector marked **GC** located on the sampling unit back side and the connector, located on the back panel of the GC, marked:
 - **AUTOSAMPLER HANDSHAKE** in the case of TRACE 1300/TRACE 1310.
 - **SAMPLER SIGNAL** in case of TRACE GC Ultra and FOCUS GC.
 - b. the first branch of the cable, labelled **AI/AS 1** to the 6-pin female connector marked **GC** on the back of the sampling unit of the sampler “a”.
 - c. the second branch of the cable, labelled **AI/AS 2** to the 6-pin female connector marked GC on the back of the sampling unit of the sampler “b”.
3. By using the Y shape cable provided, connect:
 - a. the 9-pin main connector to a PC serial port (e.g. COM 1) or to an USB port, interposing an USB-RS232 adapter not provided.
 - b. the first branch of the cable, labelled **Primary AI/AS** to the 9-pin female connector marked RS232 on the back of the sampling unit of the sampler “a”.
 - c. the second branch of the cable, labelled **Secondary AI/AS** to the 6-pin female connector marked RS232 on the back of the sampling unit of the sampler “b”.

Instrument Start-up

1. Plug in the Vdc power cable of the external portable power supply into the jack marked **24 Vdc** located on the sampling unit back side.
2. Connect the power cord of the external power supply to the mains outlet.
The AI 1310/AS 1310 will automatically run the self-testing routine during which the following automatic checks and settings are carried out:
 - alignment between AI 1310/AS 1310 and the GC injector
 - acknowledgment of the installed sample tray
 - calculation of the syringe zero

Note The self-test routine is automatically carried out every time that the safety door of the turret is closed.

AI 1310/AS 1310 Control

This chapter provides the information for controlling the AI 1310/AS 1310 through the Chromatography Data System, or the TRACE GC Ultra, or the FOCUS GC. The chapter contains also the working procedures with different injectors.

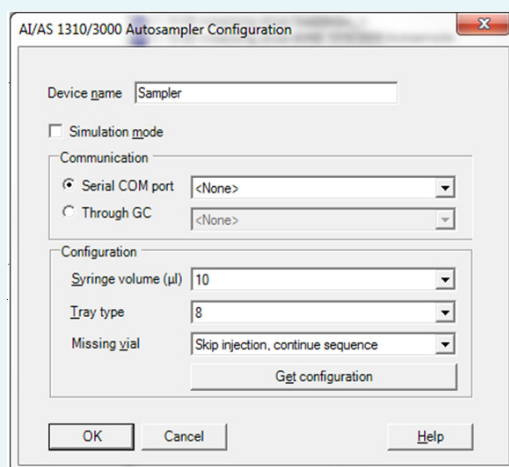
Contents

- [Control Through the Chromatography Data System](#)
- [Control Through the TRACE GC Ultra](#)
- [Control Through the FOCUS GC](#)
- [Guidelines for Programming with Different Injectors](#)

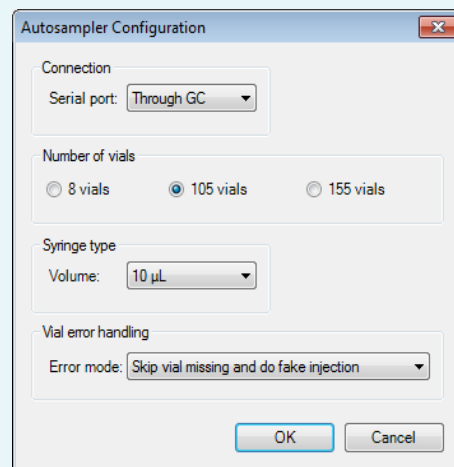
Control Through the Chromatography Data System

The AI 1310/AS 1310 is controlled through a Thermo Scientific™ Chromatography Data System (CDS) installed in the PC and interfaced with the instrument via serial line RS 232. This section describes how to program the instrument operating parameters.

IMPORTANT Before creating a sampler method, in the AI 1310/AS 1310 Configuration page of the Chromatography Data System in use you must configure the communication connection (Through GC or COM), the correct syringe capacity, and the tray in use.



Chromeleon CDS



Xcalibur, Chrom-Card, ChromQuest CDS



CAUTION Configuring the AI 1310/AS 1310 through the GC may slow down the communication performance, since a large amount of data is sent to the GC, and then the GC sends to AI 1310/AS 1310.

The Through GC communication configuration is reliable but significantly slower than connecting AI 1310/AS 1310 directly on a COM port or through LAN.



IMPORTANT In the Autosampler Configuration page of the data system in use, select the function **Error mode/Missing vial** to **Stop on vial missing**.

User Interface

In the user interface, see [Figure 51](#) and [Figure 52](#), the sampler parameters can be set, whereas the sequence of samples to be analyzed and acquired is managed by the data system as a function of the type of sample tray installed.

Note The user interface is visualized previous the selection in the configuration page of the data system in use referring to the relevant manual.

When in Gemini configuration each sampler is controlled by its own dedicated user interface, then two AI/AS method pages will be visualized. The parameters set in each page will be sent to its relevant sampler.

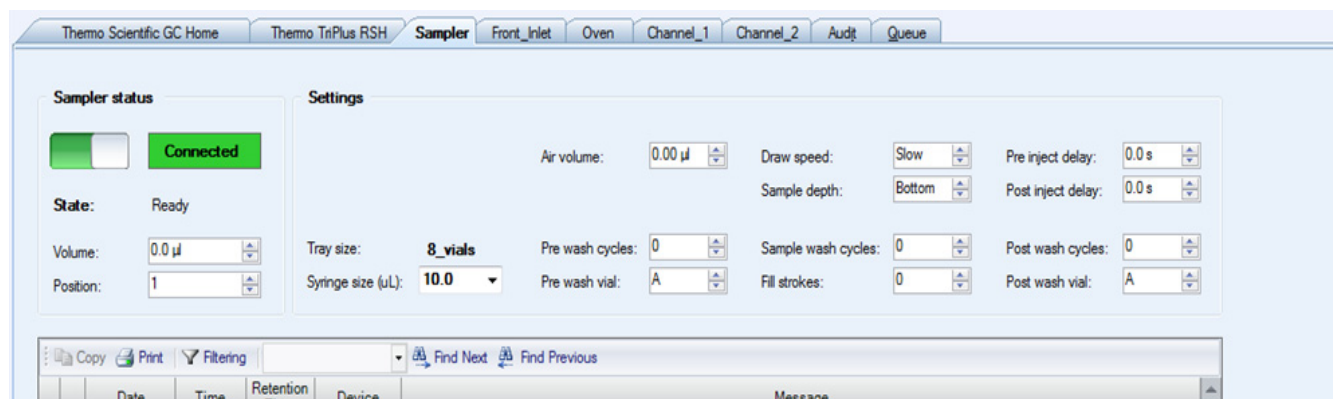
Related Topics

- “Chromeleon CDS User Interface” on page 59
- “Xcalibur, Chrom-Card, and ChomQuest CDS User Interface” on page 61

Chromeleon CDS User Interface

This page is shown in Figure 51.

Figure 51. AI 1310/AS 1310 Autosampler Chromeleon CDS User Interface



Edit the autosampler method using the following parameters:

Air Volume — Specifies the volume of air drawn after pulling the syringe needle out of the vial. This reduces evaporation from the syringe needle. The total of **Air Volume** plus **Volume** must not exceed the syringe volume. The range is 0.0-3.0 µL.

Draw Speed — Determines how fast the sample is draw. The options are:

- **Slow** in case of high viscous samples.
- **Fast** in case of viscous or low viscous samples.

Fill Strokes — Determines how often the syringe plunger is moved up and down before the sample is actually drawn. This eliminates bubbles and thus, enhances reproducibility. The range is 0-15.

Inject Wait Time — Sets the time between the injection command and the response from the autosampler. The range is 0-10.000.000 seconds.

Pre Inject Delay Time — Determines for how long the syringe remains in the injector before the injection. The range is 0-63 seconds.

Post Inject Delay Time — Determines for how long the syringe remains in the injector after the injection. The range is 0-63 seconds.

Note You can also use the Post Inject Delay Time and Pre Inject Delay Time **Properties** to specify the needle depth during the injection. The following settings are available.

- **Standard:** Post Inject Delay Time or Pre Inject Delay Time > 0
- **Minimum:** Post Inject Delay Time and Pre Inject Delay Time = 0

Pre Wash — Specifies the number of pre-injection cleaning cycles. The range is 0-15.

Post Wash — Specifies the number of post-injection cleaning cycles. The range is 0-15.

Pre Wash Vial — Specifies which vials are used for washing the syringe before the injection with the solvents. The options are: **A**, **B**, **C**, **D**, **A+B** and **C+D**.

Post Wash Vial — Specifies which vials are used for washing the syringe after the injection with the solvents. The options are: **A**, **B**, **C**, **D**, **A+B** and **C+D**.

Position — Specifies the vial position in the tray.

Sample Depth — Specifies how deep the needle descends into the vial when drawing the sample for injection. The options are: **Bottom** or **Half**.

Sample Wash — Determines the number of cleaning cycles with sample before injection. The range is 0-15.

State — Indicates the status of the autosampler (ready-only).

- **On** = the injection has been performed.
- **Off** = the injection has not yet been performed.

Syringe Volume — Specifies the total capacity of the syringe: 0.5 µL, 5 µL, or 10 µL. See also the **Configuration** page.

Tray Type — Specifies the tray type: 8, 105, or 155 vials. See also the **Configuration** page.

Volume — Specifies the injection volume.

Commands

The following commands are available:

Connect — Connects the autosampler to the data system.

Disconnect — Disconnects the autosampler from the data system.

Clean — (Obsolete AI/AS 1310 drivers only). Cleans the syringe in combination with the washing parameters.

Inject — Injects the sample. The maximum injection volume must not exceed 50% of the syringe capacity.

Recalculate — Performs the start procedure gain, allowing the autosampler to recalibrate the internal positions, such as injector, wash vial, and tray. This command is required when a new tray was installed.

Stop Inject — Stops a running injection.

Wash — Starts washing the needle.

Xcalibur, Chrom-Card, and ChomQuest CDS User Interface

This page is shown in [Figure 52](#).

Figure 52. AI 1310/AS 1310 Autosampler Xcalibur, Chrom-Card, ChromQuest CDS User Interface

The screenshot displays the 'Autosampler Method' configuration window. On the left is a 3D model of the autosampler syringe assembly. To its right is a vertical syringe icon. The main area contains several parameter groups:

- Sampling:**
 - Sample volume (uL): 1.00
 - Plunger strokes: 1 (dropdown)
 - Viscous sample: No (dropdown)
 - Sampling depth in vial: Bottom (dropdown)
- Injection:**
 - Injection depth: Standard (dropdown)
 - Pre-inj dwell time (sec): 0.00
 - Post-inj dwell time (sec): 0.00
- Pre-injection:**
 - Solvent: A (dropdown)
 - Cycles: 1 (dropdown)
- Sample:**
 - Rinses: 1 (dropdown)
- Post-injection:**
 - Solvent: A (dropdown)
 - Cycles: 1 (dropdown)

At the bottom left, it says 'Status: Not connected'.

Edit the autosampler method using the following parameters:

Sample Volume — Enter a value for the injection volume. The range depends on the size of syringe selected in the Instrument Configuration.

- For a 5 μ L syringe the range is 0.0-2.5 μ L.
- For a 10 μ L syringe the range is 0.0-5.0 μ L.

Plunger Strokes — Select the number of strokes of the syringe plunger used to eliminate any air bubbles from the sample. The range is 1-15.

Viscous Sample — Calculates automatically the speed the sample is pulled-up (withdrawn) from the vial to the syringe.

- Set **No** for no viscous or low viscous sample.
- Set **Yes** for high viscous sample.

Sampling Depth — Choose the position of the needle in the vial from which the aliquot is drawn. The options are **Bottom** (default value), or **Center**.

- When **Bottom** is set the syringe needle penetrates up to the bottom of the vial.
- When **Center** is set, the syringe needle penetrates up to the half of the vial.

Injection Depth — Determines the penetration depth of the syringe needle into the injector. The options are **Standard** or **Minimum** (cold needle technique for TRACE 1300/1310 GC and TRACE GC Ultra). If the Pre and Post -Injection Dwell Time are set to zero, the sampler defaults to the **Minimum** setting.

- When **Standard** is set (default value), the syringe needle penetrates into the injector up the maximum depth limit.
- When **Minimum** is set, the syringe needle penetrates into the injector up to go beyond the septum only.

Pre-injection Dwell Time — The time in seconds the syringe needle is held in the inlet before the injection of sample. When you specify a delay of more than a few seconds, the needle preheats, which makes a *Hot Needle Injection*. Enter a value in the range 0-63 seconds.

Post-injection Dwell Time — The time in seconds the syringe needle is held in the after the injection of sample. A delay of more than a few seconds will heat the needle with the possible effect of driving out those heavier analytes that have condensed in the needle. A solvent flush technique may work better. Enter a value in the range 0-63 seconds.

Pre/Post-Injection

Solvent — Choose a solvent from the relevant drop-down list.

The options are: **A**, **B**, **C**, **D**, **A+B** and **C+D**. These settings correspond to the vials in the Washing and Waste tray.

Cycles — The number of times the syringe is rinsed with the sample before/after the injection. Select a value in the range 1-15.

Sample

Rinse — The number of times the syringe is washed with the sample before the injection. Select a value in the range 1-15.

Commands

The following commands are available:

Get Method from Sampler — Transfers the AI 1310/AS 1310 current method to the GC.

Send Method to Sampler — Transfers the method from the computer to the a AI 1310/AS 1310 and makes the method active.

Start Clean Cycle — Starts a washing cycle.

Inject Single Sample — Starts the injection of a single sample.

Force Auto-injector to Stand-by — Interrupts any current operation and forces the AI 1310/AS 1310 to stand-by condition.

Messages

This section lists the status and error messages that the computer may display according to the status of the AI 1310/AS 1310.

Status Messages

The status messages are listed below:

- Opening Connection
- No connection (Check the serial line connections)
- AI 1310/AS 1310 is in stand-by
- AI 1310/AS 1310 is checking positions
- AI 1310/AS 1310 ready to inject sample in vial n but waiting GC Ready
- AI 1310/AS 1310 is preparing the sample in vial n.
- AI 1310/AS 1310 has injected the sample in vial n.
- AI 1310/AS 1310 front door is open (all operations are paused)

Error Messages

The error messages are listed below:

- AI 1310/AS 1310 error, solvent not found
- AI 1310/AS 1310 position error, cannot find the initial zero positions

Control Through the TRACE GC Ultra

This section describes how to program and control the AI 1310/AS 1310 through the keypad of the TRACE GC Ultra.



ATTENTION The TRACE GC Ultra does not control the AS 1310 with the 155-position sample tray.

Note It is not possible to control the 0.5 μ L syringe through the GC keypad but only through the data system.

Groups of samples can be automatically analyzed under different analytical conditions by programming a *sequence* of samples. The sequence includes a set of information for a group of samples and their position on the sample tray. The sequence also specifies the method to be used to run each group of samples.

Note In an analytical method all the AI 1310/AS 1310 functions can be programmed. To develop an analytical method and activate a sample sequence, refer to the *TRACE GC Ultra Operating Manual*.

Configuring the AI 1310/AS 1310

When the GC is switched on, the presence of the sampler and its configuration is automatically acknowledged.

The type of configuration is displayed by pressing **Config** and selecting **Autosampler**.

The following non editable message is displayed according to the AI 1310/AS 1310 installed:

CONFIG AUTOSAMPLER	
Sample tray	105

for the AS 1310, or

CONFIG AUTOSAMPLER	
Sample tray	8

for the AI 1310.

Note Should the AI 1310/AS 1310 not be installed or correctly connected, the TRACE GC Ultra will display the message NO AUTOSAMPLER INSTALLED.

AI 1310/AS 1310 Menu

To set the parameters of the AI 1310/AS 1310 method, press **Autosampler** key to open the **relevant** menu described in [Table 4](#).

Table 4. Control Through the TRACE GC Ultra: Autosampler Menu (Sheet 1 of 2)

Menu	Range	Comment
AUTOSAMPLER		Displays the menu title.
Sample volume	0–5 µL with increments of 0.1 µL	Sets the sample quantity to be injected.
Sample rinses	0–15	Sets the number of syringe pre-washings with the sample.
Plunger strokes	0–15	Sets the number of plunger strokes to eliminate air bubbles forming during the sample withdrawal.

Table 4. Control Through the TRACE GC Ultra: Autosampler Menu (Sheet 2 of 2)

Menu	Range	Comment
Pre wash solvent	A, B, C, D A+B C+D	Selects the vial, or combination of two vials, containing the washing solvent. Press Mode/Type to select the solvent vial to be used.
Pre wash cycles	0–15	Sets the number of syringe pre-washings with the selected solvent.
Post wash solvent	A, B, C, D A+B C+D	Selects the vial, or combination of two vials, with the washing solvent. Press Mode/Type to select the vial with the solvent to be used.
Post wash cycles	0–15	Specifies the number of syringe post-washings with the solvent selected.
Extended control	See “ Extended Control Menu ” on page 65	Sets optional injection parameters. Press Mode/Type to enter the sub-menu.
When no vial abort	See “ When No Vial Abort Menu ” on page 66	Shows the menu title.

Extended Control Menu

In this menu it is possible to set how long the syringe needle must remain inside the injector without injecting. This allows to avoid discriminations caused by evaporation of the sample contained in the syringe needle. In this way the sample is completely drawn into the syringe and the needle left inside the injector and heated for a few seconds before injecting. See [Table 5](#) for details.

Table 5. Control Through the TRACE GC Ultra: Extended Control Menu (Sheet 1 of 2)

Menu	Range	Comments
EXTENDED CONTROL		Displays the menu title.
Viscous sample	Yes, No	Defines the speed at which the sample is drawn from the vial as a function of the sample viscosity. Select No (default value) if the sample has low viscosity. Select Yes if the sample has high viscosity.
Sampl. depth	Bottom, Center selectable in the sub-menu	Determines the penetration depth of the syringe needle into the vial. Press Mode/Type or Enter to enter the sub-menu. Selecting Bottom (default value) the needle goes down to the vial bottom. Selecting Center the needle goes down to half vial.

Table 5. Control Through the TRACE GC Ultra: Extended Control Menu (Sheet 2 of 2)

Menu	Range	Comments
Inj. Depth	Standard, Minimum selectable in the sub-menu	Determines the penetration depth of the syringe needle into the injector. Press Mode/Type or Enter to enter the sub-menu. Selecting Standard (default value) the needle goes down to the maximum depth allowed. Selecting Minimum the needle enters the injector and stops immediately beyond the septum (Cold Needle Technique).

When No Vial Abort Menu

See [Table 6](#) for details.

Table 6. Control Through the TRACE GC Ultra: When No Vial Abort Menu

Menu	Comments
ON MISSING AS VIAL	Displays the menu title.
Skip to next	When selected, the AI 1310/AS 1310 skips a missing vial and goes to the next one. The sample sequence and the sample table are not affected.
Abort sequence	When selected, the sequence is aborted after a missing vial.

Control Through the FOCUS GC

This section describes how to program and control the AI 1310/AS 1310 through the keypad of the FOCUS GC.



CAUTION The FOCUS GC does not control the AS 1310 with the 155-position sample tray.

The AS 1310 can automatically analyze groups of samples under different analytical conditions when a *sequence* of samples is programmed.

The sequence includes a set of information for the group of samples and their position on the sample tray. The sequence also specifies the method to be used to process each group of samples. See the section [“Sequence of Samples with the AS 1310”](#) on [page 69](#).

Configuring the AI 1310/AS 1310

When the GC is switched on, the presence and type of sampling system installed is automatically acknowledged.

To configure the AI 1310/AS 1310:

1. In Main Menu move the cursor until **Others** is displayed, then press **Enter**.
2. Scroll to select **Configuration**, then press **Enter**.
3. Scroll to **Autosampler**, then press **Enter**.

The following message will be displayed according to the AI 1310/AS 1310 installed:

CONFIG AUTOSAMPLER	
Syringe Volume	10
Sample tray	105

for the AS 1310, or

CONFIG AUTOSAMPLER	
Syringe Volume	10
Sample tray	8

for the AI 1310.

The parameter **Syringe volume** can be modified according to the syringe volume, whereas the parameter **Sample** tray is not editable.

AI 1310/AS 1310 Menu

To set the parameters of the AI 1310/AS 1310 method, in Main Menu move the cursor until **Autosampler** is displayed, then press **Enter** to open the menu. See [Table 7](#) for details.

Table 7. Control Through the FOCUS GC: Autosampler Menu (Sheet 1 of 2)

Menu	Range	Comment
AUTOSAMPLER		Displays the menu title.
Sample volume	0–5 µL, 0–2.5 µL with increments of 0.1 µL	Sets the sample quantity to be injected.
Sample rinses	0–15	Sets the number of syringe pre-washings with the sample.
Plunger strokes	0–15	Sets the number of plunger strokes to eliminate air bubbles forming during the sample withdrawal.
Pre wash solvent	A, B, C, D, A+B, C+D	Selects the vial, or combination of two vials, containing the washing solvent.
Pre wash cycles	0–15	Sets the number of syringe pre-washings with the selected solvent.

Table 7. Control Through the FOCUS GC: Autosampler Menu (Sheet 2 of 2)

Menu	Range	Comment
Post wash solvent	A, B, C, D A+B C+D	Selects the vial, or combination of two vials, with the washing solvent.
Post wash cycles	0–15	Specifies the number of syringe post-washings with the solvent selected.
Viscous sample	Yes, No	Sets the sample drawing speed from the vial as a function of the sample viscosity. Select No (default value) if the sample has low viscosity. Select Yes when the sample has high viscosity.
Sample depth	Bottom, Center, selectable in the sub-menu	Sets the penetration depth of the syringe needle into the vial. If Bottom (default value) is selected, the needle goes down to the vial bottom. If Center is selected, the needle goes down to half vial.
Inj. depth	Standard, Minimum, selectable in the sub-menu	Defines the penetration depth of the syringe needle into the injector. If Standard (default value) is selected, the needle goes down to the maximum allowed depth. If Minimum is selected, the needle enters the injector and stops immediately beyond the septum (<i>Cold Needle Technique</i>).
Pre dwell time	0–63 sec	Specifies how long the syringe needle must remain in the injector before injection (<i>Hot Needle Technique</i>).
Post dwell time	0–63 sec	Specifies how long the syringe needle must remain inside the injector after injection.

Sequence of Samples with the AS 1310

To set the parameters to run a sequence of samples with the AS 1310, in Main Menu move the cursor until **Sequence** is displayed, then press **Enter** to open the menu. See [Table 8](#) for details.

Table 8. Control Through the FOCUS GC: Sequence Menu with AS 1310

Menu	Range	Comments
SEQUENCE		Displays the menu title.
First sample	1 to 105	Indicates the first sample of the sequence.
Last sample	1 to 105	Indicates the last sample of the sequence.
Injection/vial	1 to 99	Indicates how many times the same sample has to be run.
When no vial	See Table 9 .	
Start sequence		Indicates the sequence start.
Stop Sequence		Indicates the sequence end.

Table 9. Control Through the TRACE GC Ultra: When No Vial Abort Menu

Menu	Comments
ON MISSING AS VIAL	Displays the menu title.
Skip to next	When selected, the AI 1310/AS 1310 skips a missing vial and goes to the next one. The sample sequence and the sample table are not affected.
Abort sequence	When selected, the sequence is aborted after a missing vial.

Guidelines for Programming with Different Injectors

To get the best results from your AI 1310/AS 1310, follow these guidelines when programming the sampler method according to the injector in use:

- [SSL Inlet \(TRACE 1300 Series GC\)](#)
- [SSL Inlet \(TRACE GC Ultra/FOCUS GC\)](#)
- [SSL Inlet with a Merlin Microseal™ \(TRACE GC Ultra Only\)](#)
- [PTV Inlet \(TRACE 1300 Series GC, TRACE GC Ultra\)](#)
- [PTV Inlet with a Merlin Microseal™ \(TRACE 1300 Series GC, TRACE GC Ultra\)](#)
- [PKD and PPKD Inlets \(TRACE GC Ultra, FOCUS GC\)](#)

SSL Inlet (TRACE 1300 Series GC)

The AI 1310 /AS 1310 injects into the SSL inlet using the liquid band technique.

The needle penetrates for almost its whole length without pre- and post-dwell time in order to avoid any possible heating, still injecting deep into the liner.

The liquid band technique requires the use of packing material into the liner in order to stop the sample before its vaporization and its transfer towards the column.

Table 10 reports a summary of injection parameters and conditions for the SSL techniques. For your reference the type of liner and the column insertion inside the inlet are also reported.

Table 10. Summary of Injection Parameters and Conditions

Mode	Technique	Column Insertion	Liner Type	AI 1310/AS 1310 Injection Parameters
Split	Cold Needle	10 mm	SSL Split Straight Liner, Deactivated, 4 mm ID x 6.3 mm OD x 78.5 mm Length, Quartz Wool	Injection depth = Standard Pre and Post Inject Delay Time = 0.1 s (<i>Chromeleon CDS</i>)
			PN 453A2265	Pre and Post Injection Dwell Time = 0 s (<i>Xcalibur, Chrom-Card, ChromQuest CDS</i>)
Splitless	Cold Needle	5 mm	SSL Splitless Liner, Single Taper, Deactivated, 4 mm ID x 6.3 mm OD x 78.5 mm Length, Quartz Wool	Injection depth = Standard Pre and Post Inject Delay Time = 0.1 s (<i>Chromeleon CDS</i>)
			PN 453A1925	Pre and Post Injection Dwell Time = 0 s (<i>Xcalibur, Chrom-Card, ChromQuest CDS</i>)
SSL Nano-Volumes ¹	Cold Needle	10 mm in Split 5 mm in Splitless	Depends if split or splitless injection	Injection depth = Standard Pre and Post Inject Delay Time = 0.1 s (<i>Chromeleon CDS</i>) Pre and Post Injection Dwell Time = 0 s (<i>Xcalibur, Chrom-Card, ChromQuest CDS</i>)

¹ Only with 0.5 µL syringe.

Nano-Volumes Injections in TRACE 1300 Series GC SSL Inlet

❖ To create a nano-volumes method

1. Enter the AI/AS 1310 method page provided by your Data System.
2. Adjust all the autosampler parameters.
3. Save the method.

Remarks on the Nano-Volume Method:

- The desired volume must be set in microliter units (1 µL = 10³ nL).

- The Data System will let you choose any volume between 0.010 μL (10 nL) and 0.5 μL in steps of 0.010 μL .
- A default air volume of 0.3 μL is automatically added to the sample volume in order to optimize the syringe plunger movements. This value can not be edited by the user.
- Select **Draw Speed** to **Slow** (*Chromeleon CDS only*).
- Always set the **Viscous** parameter to **Yes** when using the 0.5 μL syringe (*Xcalibur, Chrom-Card, and ChromQuest CDS only*).
- Always set one or more wash with the sample.
- Select a low number of plunger strokes. One or two strokes are sufficient to eliminate residual air. The liquid is entirely housed inside the needle and is not visible through the 0.5 μL syringe glass barrel.
- If you do not program solvent washes in the method, always perform a maintenance cleaning cycle at the end of your sequence of analyses.

SSL Inlet (TRACE GC Ultra/FOCUS GC)

The AI 1310/AS 1310 can inject in a hot SSL inlet using two distinct needle insertion modes: “**Standard**” and “**Minimum**”.

- In **Standard** mode the needle penetrates for almost its whole length and a dwell time is programmed to provide needle heating.
- In the **Minimum** mode the needle penetrates for a minimum depth and for the minimum time allowing to minimize contact of the needle with the hot inlet.

These two needle insertion modes are conceived to optimize respectively the “*Hot Needle*” and the “*Cold Needle*” injection techniques.

- **Cold needle technique** — (Minimum depth mode) prevents boil-out from the needle and lets the sample to enter the injector nearly entirely in liquid phase. This injection technique requires the use of packed liner to stop the liquid run.
- **Hot needle technique** — (Standard depth mode) requires a minimum pre-dwell time to heat the needle (usually 3-5 seconds) to achieve a complete expulsion of the sample from the needle in form of a spray. This technique permits the use of empty liners.

Table 11 reports a summary of injection parameters and conditions for the two SSL techniques. For your reference the type of liner and the column insertion inside the inlet are also reported.

4 AI 1310/AS 1310 Control

Guidelines for Programming with Different Injectors

Table 11. Summary of Injection Parameters and Conditions

Mode	Technique	Column Insertion	Liner Type	Packing of Liner	AI 1310/AS 1310 Injection Parameters
Split	Hot Needle	40 mm	Tubular Liner (3 or 5 mm ID)	Not required	<p>Injection depth = Standard</p> <p>Pre Inject Delay Time = 3-5 s Post Inject Delay Time = 0 s (<i>Chromeleon CDS</i>)</p> <p>Pre Injection Dwell Time = 3-5 s Post Injection Dwell Time = 0 (<i>Xcalibur, ChromCard, ChomQuest CDS</i>)</p>
Split	Cold Needle	40 mm	Tubular Liner (3 or 5 mm ID)	Packing material at half height	<p>Injection depth = Minimum</p> <p>Pre and Post Inject Delay Time = 0 s (<i>Chromeleon CDS</i>)</p> <p>Pre and Post Injection Dwell Time are automatically inhibited (<i>Xcalibur, ChromCard, ChomQuest CDS</i>)</p>
Splitless	Hot Needle	64 mm	Tapered Liner (3 or 5 mm ID)	Not Required	<p>Injection depth = Standard</p> <p>Pre Inject Delay Time = 3-5 s Post Inject Delay Time = 0 s (<i>Chromeleon CDS</i>)</p> <p>Pre Injection Dwell Time = 3-5 s Post Injection Dwell Time = 0 (<i>Xcalibur, ChromCard, ChomQuest CDS</i>)</p>
Splitless	Cold Needle	50 mm	Tapered Liner (3 or 5 mm ID)	Packing material at bottom	<p>Injection depth = Minimum</p> <p>Pre and Post Inject Delay Time = 0 s (<i>Chromeleon CDS</i>)</p> <p>Pre and Post Injection Dwell Time are automatically inhibited (<i>Xcalibur, ChromCard, ChomQuest CDS</i>)</p>
SSL Nano-Volumes ¹	Cold Needle	40 mm	Double Tapered Liner	No	<p>Injection depth = Minimum</p> <p>Pre and Post Inject Delay Time = 0 s (<i>Chromeleon CDS</i>)</p> <p>Pre and Post Injection Dwell Time are automatically inhibited (<i>Xcalibur, ChromCard, ChomQuest CDS</i>)</p>

¹ Only with 0.5µL syringe.

Nano-Volumes Injections in TRACE GC Ultra/FOCUS GC SSL Inlets

Injections of sample volumes below 0.1-0.2 µL in SSL inlets is very attractive when the dilution with a solvent is not desired and/or the main component easily overloads the capillary column even at high split ratios. Examples of such applications are analyses of essential oils or petroleum fractions.

The reduction of the injection volume to the sub microliter range using a standard sampler, like the AI 1310/AS 1310 unit, is achievable by exploiting the low capacity syringe (0.5 µL) and the tapered liner. High accuracy and repeatability injecting nano-volumes are achievable by exploiting the “*Cold Needle*” injection mode.

For injection volumes higher than 0.2-0.3 µL use a 5 (or 10) µL syringe and a standard split or splitless liner (possibly packed with glass wool whenever you inject in “*Cold Needle*” mode). In summary, use the following guideline to choose the best syringe capacity for your injections with the AI 1310/AS 1310 sampler. See [Table 12](#) for details.

Table 12. Syringe Guideline for AI 1310/AS 1310 Autosampler

Injection Volume Range	Suggested Syringe ¹	AI 1310/AS 1310 Injection Parameters
0.5 – 5.0 µL	10 µL	Standard – general purpose
0.2 – 1.0 µL	5 µL	---
0.01 – 0.3 µL	0.5 µL	Plunger-in-needle

¹ See your TRACE GC Ultra and FOCUS GC *Spare Part Catalog* for items part number.

❖ To create a nano-volumes method

1. Enter the AI/AS 1310 method page provided by your Data System.
2. Adjust all the autosampler parameters.
3. Save the method.

Remarks on the Nano-Volume Method:

- The desired volume must be set in microliter units (1 µL = 10³ nL).
- The Data System will let you choose any volume between 0.010 µL (10 nL) and 0.5 µL in steps of 0.010 µL.
- A default air volume of 0.3 µL is automatically added to the sampler volume in order to optimize the syringe plunger movements. This value can not be edited by the user.
- The best repeatability and recovery results are obtained injecting in fast “*Cold Needle*” mode (i.e. “minimum” injection depth with no Pre and Post Inject Delay/Pre and Post Injection Dwell Time).
- Select **Draw Speed** to **Slow** (*Chromeleon CDS only*).
- Always set the **Viscous** parameter to **Yes** when using the 0.5 µL syringe (*Xcalibur, Chrom-Card, and ChromQuest CDS only*).

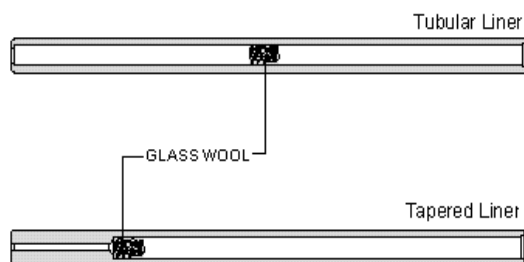
- Always set one or more wash with the sample.
- Select a low number of plunger strokes. One or two strokes are sufficient to eliminate residual air. The liquid is entirely housed inside the needle and is not visible through the 0.5 μ L syringe glass barrel.
- If you do not program solvent washes in the method, always perform a maintenance cleaning cycle at the end of your sequence of analyses.

Packing a SSL Liner

❖ To pack a SSL liner

1. On your TRACE GC Ultra or FOCUS GC keypad, enter the **Oven** menu and switch off the oven temperature. This will avoid heating of the analytical column when carrier is off.
2. Enter the **Injector** menu and switch off the inlet temperature.
3. Enter **Carrier** Menu and switch off the carrier supply.
4. Remove the centering plate of the AI 1310/AS 1310 (if installed).
5. Wait till the injector has reached room temperature and by means of the outfit tool unscrew the septum cap, then remove it together with the septum holder and its plate.
6. Unscrew the liner holder and remove it. Use tweezers to gently extract the liner from the injector.
7. Insert a little plug of packing material (i.e. deactivated glass wool) filling the liner cavity about 5 mm in length. Push the plug till it reaches the position. See [Figure 53](#).

Figure 53. Packing a SSL Liner



8. Insert the liner in its location, then correctly close the injector and restore the GC parameters.

SSL Inlet with a Merlin Microseal™ (TRACE GC Ultra Only)



ATTENTION For TRACE GC Ultra equipped with the Merlin Microseal, no modification of the method compared to the standard septum is required.

This septum-less device offers an effective solution to get rid of traditional rubber septa side effects (impurities released by excessive warming of septa). Since the temperature around the microseal is lower than the rest of the injector, the most suitable injections technique is the cold needle injection. That means no dwell time to warm up the needle. The adapter for Merlin Microseal™ also behaves as a spacer between the needle entrance and the liner, so standard injection depth must be used to fulfill correctly the injection.

Note In order to guarantee long-life performance of the Merlin Microseal™ it is recommended to use syringes with 0.63 mm needle diameter and truncated cone shape on tip. Refer to the TRACE GC Ultra or FOCUS GC Spare Part Catalog for part numbers.

Mode	Technique	Column Insertion	Liner Type	Packing of Liner	AI 1310/AS 1310 Injection Parameters
Split	Cold Needle	40 mm	Tubular Liner (3 or 5 mm ID)	Packing material at half height	Injection depth = Standard Pre and Post Inject Delay Time = 0.1 s (<i>Chromeleon CDS</i>) Pre and Post Injection Dwell Time = 0 s (<i>Xcalibur, Chrom-Card, ChromQuest CDS</i>)
Splitless		50 mm		Packing material at bottom	Injection depth = Standard Pre and Post Inject Delay Time = 0.1 s (<i>Chromeleon CDS</i>) Pre and Post Injection Dwell Time = 0 s (<i>Xcalibur, Chrom-Card, ChromQuest CDS</i>)

See “Packing a SSL Liner” on page 74 for instruction.

PTV Inlet (TRACE 1300 Series GC, TRACE GC Ultra)

Since PTV is cold during sample introduction the syringe needle will not be heated whenever standard or minimum depth is selected or dwell times are set. However standard injection mode is advisable since the sample evaporation is faster in the deeper part of the liner. Optional 1-2 seconds of dwell times will guarantee stable flow condition after the needle introduction. See Table 13.

Table 13. PTV Inlet

Injector	Column Insertion	AI 1310/AS 1310 Injection Parameters
Programmed Temperature Vaporizing Injector (PTV)	30 mm	Injection depth = Standard Pre and Post Inject Delay Time = 1-2 s (<i>Chromeleon CDS</i>) Pre and Post Injection Dwell Time = 1-2 s (<i>Xcalibur, Chrom-Card, ChromQuest CDS</i>)

PTV Inlet with a Merlin Microseal™ (TRACE 1300 Series GC, TRACE GC Ultra)

The above PTV conditions apply also when the Merlin Microseal™ is used.

Note In order to guarantee long-life performance of the Merlin Microseal™ it is recommended to use syringes with 0.63 mm needle diameter and truncated cone shape on tip. Please refer to the spare part catalog for part number.

PKD and PPKD Inlets (TRACE GC Ultra, FOCUS GC)

For injection into packed column the standard insertion depth with 3-5 seconds of pre-injection delay time is suggested. See [Table 14](#).

Table 14. PKD and PPKD Inlets

Injector	AI 1310/AS 1310 Injection Parameters
Packed Injector (PKD) (<i>TRACE GC Ultra</i>)	Injection depth = Standard
Purged Packed Injector (PPKD) (<i>TRACE GC Ultra, FOCUS GC</i>)	Pre Inject Delay Time = 3-5 s Post Inject Delay Time = 0 s (<i>Chromeleon CDS</i>) Pre Injection Dwell Time = 3-5 s Post Injection Dwell Time = 0 s (<i>Xcalibur, Chrom-Card, ChromQuest CDS</i>)

Maintenance

This chapter provides guidelines for the maintenance of the AI 1310/AS 1310.

Contents

- [Current Maintenance](#)
- [Emptying of the Waste Container](#)
- [Cleaning of the Sample Tray Accessory](#)
- [Cleaning the Instrument Externally](#)
- [Replacing the Syringe](#)
- [Cleaning the Syringe](#)
- [Preparing a New Syringe](#)
- [Moving Away the Sampling Unit from the Injector Module](#)

Current Maintenance

The AI 1310/AS 1310 does not generally require maintenance, except emptying of the waste container when full, cleaning of the sample tray and replacement of the syringe. For any other operation, contact Thermo Fisher Scientific Technical Service.



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

Emptying of the Waste Container

❖ **To empty the waste container**

1. If necessary, move the turret to have free access to the washing and waste tray.
2. Take out the container.
3. Remove the cap and empty the container.
4. Put on the cap again and reposition the container into its seat.

Cleaning of the Sample Tray Accessory

The sample tray must be periodically cleaned. Use a water and soap solution or a household non abrasive product. Dry using a clean cloth.

Cleaning the Instrument Externally

Normal usage of the AI 1310/AS 1310 can cause the exterior to get dirty.



WARNING It is your responsibility to avoid that dangerous liquids and/or materials seeping inside the AI 1310/AS 1310 during operation and maintenance. Solvent should not be used. Do not spray on electrical parts.

❖ **To clean the instrument externally**

1. Power off the AI 1310/AS 1310.
2. Externally clean the instrument with a soap and water solution, or with a household non-abrasive product.

- Pay special attention when cleaning the back side of the instrument. Do not spray, but clean using a cloth imbued with the same substance.
 - Carefully avoid seeping of the products used inside the instrument, particularly when cleaning the grid of the back panel.
 - If you just suspect that a substance used for cleaning or a product submitted to analysis has penetrated inside the instrument, immediately shut down the instrument and call an authorized customer support engineer for proper actions. The service engineer must be fully informed on the nature of the concerned substance. In the event that a hazardous material is spilled on or in the instrument, clean the spill according to the procedures reported in the Material Data Sheet for that substance.
3. Dry with a clean cloth.
 4. Power on the AI 1310/AS 1310.

Replacing the Syringe

The replacement of the syringe is a simple operation. However, it must be performed with caution to avoid damages to the syringe needle and ensure an optimal performance of the injection device. The standard syringe has 10 µL capacity with 50 mm needle length.

Note 5 and 0.5 µL syringes are optionally available.

5 and 0.5 µL syringes are optionally available.

❖ To replace the syringe

This operation is possible with the instrument either On or Off.

1. Open the safety door of the turret.

Note If the instrument is On, the power supply is immediately cut off.

2. Turn the syringe locking knob by 180° counterclockwise.
3. Gently take out the syringe plunger head and flange from their relevant guides, then remove the syringe body from its seat.
4. Completely take out the syringe, paying attention while removing the needle from the vial capture device.
5. Take a new syringe.
6. Insert the syringe needle into the vial capture device.
7. Accommodate the syringe body into its seat, paying attention to simultaneously introduce the syringe plunger flange and head into their relevant guides.
8. Lock the syringe by turning the lock wheel by 180° clockwise.

9. Close the safety door of the rotating turret.

Note If the instrument is On, when the door is closed the instrument automatically runs the syringe zero routine.

If the instrument is Off, the operation is performed when it is switched on during the self-test routine.

Cleaning the Syringe

To get the best performance from the syringe installed in the sampler and increase the syringe lifetime here are some useful tips in order or cleaning impact.

❖ To clean the syringe

1. If the sample is not viscous, program in the sampler method one or more rinse with sample to maintain the lubrication of the plunger.
2. Program in the sampler method one or more post-injection wash cycle with solvent.
3. If the sample is viscous, program in the sampler method wash cycles of extra solvents (e.g. A+B, where A is used to clean and B to rinse). The first solvent should have a higher cleaning power than the second solvent. The latter should be chemically similar to the sample scheduled for injection.
4. Perform an automated maintenance cycle every 100 injections (see “Automated Cleaning” on [page 80](#)).
5. Perform a manual maintenance routine every 1000 injections (see “Manual Cleaning” on [page 81](#)).

Automated Cleaning

The syringe maintenance cycle is always advisable after the injection of pure samples, of undiluted mixes, of liquids containing solids in suspension or, at any rate, after long sequence of analyses.

❖ To perform an automated cleaning cycle

1. Fill a 4 mL vial with fresh solvent with high cleaning power (acetone is recommended) and place it in the D position of the washing tray of the AI 1310/AS 1310.
2. From your PC, enter the Data System and then access the AI 1310/AS 1310 method page. Select the following parameters:
 - Pre-injection Solvent: D
 - Pre-injection Cycles: 15
3. Enter the **File** menu and click **Send Method to Sampler**.

4. Enter the **Command** menu and click **Start Clean Cycle**.
5. If necessary, repeat the step 4 of this sequence.

Manual Cleaning



CAUTION This operating sequence is not applicable to the 0.5 μ L syringe.

❖ To perform a manual cleaning cycle

1. Remove the syringe as described in the operating sequence “[Replacing the Syringe](#)” on [page 79](#).
2. Completely take out the syringe plunger and clean it gently using a soft cloth or a paper tissue wetted with high cleaning power solvent (acetone is recommended).
3. Reintroduce the syringe plunger and gently move it repeatedly along its whole travel drawing an organic solvent (e.g. hexane).
4. Reinstall the syringe as described in the operating sequence “[Replacing the Syringe](#)” on [page 79](#).

Preparing a New Syringe

This operating procedure is always advisable before using a new syringe with low capacity (like a 5 or 0.5 μ L) or a new 10 μ L syringe with Teflon tip plunger. The following procedure will allow to obtain the proper lubrication of the plunger.

❖ To prepare a new syringe

1. Fill a 4 mL vial with fresh solvent (hexane is recommended) and place it in the D position of the washing tray of the AI 1310/AS 1310.
2. From your PC, enter the Data System and then access the AI 1310/AS 1310 method page. Select the following parameters:
 - Pre-injection Solvent: D
 - Pre-injection Cycles: 15
3. Enter the **File** menu and click **Send Method to Sampler**.
4. Enter the **Command** menu and click **Start Clean Cycle**.

Moving Away the Sampling Unit from the Injector Module

When the maintenance of the injector module is required, it is necessary to move away the sampling system from the injector module.

Front/Back Configuration

1. Power off the AI 1310/AS 1310.
2. Remove the centering plate from the injector nut and the sample tray from the sampling unit base.

Note It is not necessary to remove the sampling unit from the pivot guide.

3. Carefully push the sampling unit outwards up to reach the end run of the top plate.
4. When the maintenance of the injector module has been performed, restore the position of the sampling unit on the injector module.
5. Reinsert the centering plate into its seat of the sampling unit base paying attention that the guide hole, present on the arm of the centering plate, correctly fits the injector nut.

Gemini Configuration

1. Power off the AI 1310/AS 1310.
2. Remove the centering plate from the injector nut and from its seat on the sampling unit base.
3. Remove the sample tray from the sampling unit base.

Note It is not necessary to remove the sampling unit from the pivot guide.

4. Carefully push the sampling unit outwards up to reach the end run of the top plate.
5. When the maintenance of the injector module has been performed, restore the position of the sampling unit on the injector module.
6. Reinsert the centering plate into its seat of the sampling unit base paying attention that the guide hole, present on the arm of the centering plate, correctly fits the injector nut.
7. Reinsert the sample tray into its seat of the sampling unit base.

Glossary

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

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A

A ampere

ac alternating current

ADC analog-to-digital converter

B

b bit

B byte (8 b)

baud rate data transmission speed in events per second

C

C Carbon

°C Celsius

CDS Chromatography Data System

CIP Carriage and Insurance Paid To

cm centimeter

CPU central processing unit (of a computer)

<Ctrl> control key of the keyboard

D

d depth

DAC digital-to-analog converter

dc direct current

DS data system

E

EMC electromagnetic compatibility

ESD electrostatic discharge

F

°F Fahrenheit

FOB Free on board

FSE Field Service Engineer

ft foot

G

g gram

Glossary:

GC gas chromatography- gas chromatograph

GND electrical ground

H

h height

h hour

harmonic distortion A high-frequency disturbance that appears as distortion of the fundamental sine wave

HV high voltage

Hz hertz (cycles per second)

I

ID inside diameter

Impulse See *transient*

IEC International Electrotechnical Commission

in. inch

I/O input/output

K

k kilo (10^3 or 1024)

K Kelvin

kg kilogram

kPa kilopascal

L

l length

L liter

LAN Local Area Network

lb pound

LED light-emitting diode

M

m meter (or milli [10^{-3}])

M mega (10^6)

μ micro (10^{-6})

min minute

mL milliliter

mm millimeter

N

n nano (10^{-9})

nm nanometer

O

OD outside diameter

P

p pico (10^{-12})

Pa pascal

PCB printed circuit board

PKD Packed Column Injector

PN part number

PPKD Purged Packed Injector

psi pounds per square inch

PTV Programmable Temperature Vaporizing Injector

PTVBKF Programmable Temperature Vaporizing Injector for backflush applications

R**RAM** random access memory**<Return>** <Return> key on the keyboard**RF** radio frequency**ROM** read-only memory**RS-232** industry standard for serial communication**S****s** second**sag** See *surge***slow average** A gradual long-term change in average RMS voltage level, with typical duration greater than 2 s.**source current** The current needed to ignite a source, such as a detector lamp.**SSL** Split/Splitless injector**SSLBKF** Split/Splitless injector for backflush applications**surge** A sudden change in average RMS voltage level, with typical duration between 50 μ s and 2 s.**T****transient** A brief voltage surge of up to several thousand volts, with a duration of less than 50 μ s.**V****V** volt**V ac** volts, alternating current**V dc** volts, direct current**VGA** Video Graphics Array**W****w** width**W** Watt

When a unit of measure has a quotient (e.g. Celsius degrees per minute or grams per liter) this can be written as negative exponent instead of the denominator:

For example:
 $^{\circ}\text{C min}^{-1}$ instead of $^{\circ}\text{C/min}$
 g L^{-1} instead of g/L

