



thermo scientific

Thermo Scientific

AI/AS 1610

User Guide

Autosampler

MI-317000-0010 Revision B October 2023

ThermoFisher
S C I E N T I F I C

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Second edition, released October, 2023.

General Lab Equipment. Not for Clinical, Patient, or Diagnostic Use.

AI/AS 1610 User Guide, P/N MI-317000-0010, Revision B

	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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 United States of America

Declaration

Manufacturer: **Thermo Fisher Scientific**

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

- installation,
- recalibration, and
- changes and repairs

have been carried out by authorized personnel and if:

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

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

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Thermo Fisher Scientific performs complete testing and evaluation of its products to ensure full compliance with applicable domestic and international regulations.

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- Low Voltage Directive:2014/35/EU
- EMC Directive:2014/30/EU
- RoHS Directive 2011/65/EU, including amending Delegate Directive 2015/863/EU

... and conforms with the following product standards:

Safety

This device complies with:

- IEC 61010-1:2010/AMD1:2016, IEC 61010-2-010:2019, IEC 61010-2-081:2019
- CAN/CSA C22.2 No. 61010-1:2012 and UL 61010-1:2012
- EN 61010-1:2020, EN 61010-2-010:2015, EN 61010-2-081:2015

Electromagnetic Compatibility

This device complies with:

- CISPR 11/EN 55011: Group 1 Class A
- IEC 61326:2020
- EN 61326:2022
- FCC part 15, Subpart B, §15.107(a) and §15.109(a)

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.

Declarations of Conformity

-Original-

EU Declaration of Conformity



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Thermo Fisher Scientific S.p.A.
Via San Bovio 3
20054 Segrate Milan
Italy

We hereby declare that the following products

Designation: Autosampler

Model: Thermo Scientific AI/AS 1610

fulfill all the relevant requirements of the following directives:

Low Voltage Directive 2014/35/EU

Electromagnetic Compatibility Directive 2014/30/EU

RoHS Directive 2011/65/EU and (EU) 2015/863

The following relevant harmonized standards were used:

EN 61010-1:2020-03

EN 61326-1:2013-07

Person authorized to compile the technical file:

Giacinto Zilioli
(Director, Strategic Projects)
Thermo Fisher Scientific S.p.A.

Signature

Milan, March 28, 2023

Date

-Original-

UK Declaration of Conformity

**UK
CA**

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Thermo Fisher Scientific S.p.A.
Via San Bovio 3
20054 Segrate Milan
Italy

Declares, under sole responsibility, that products

Designation: Autosampler

Model: Thermo Scientific AI/AS 1610

as originally delivered complies with the essential requirements of the following applicable UK Regulations:

Electrical Equipment (Safety) Regulations 2016

Electromagnetic Compatibility Regulations 2016

The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (ROHS) Regulations 2012

and complies with the following harmonized standards and other technical specifications:

BS EN 61010-1:2010+A1:2019

BS EN 61326-1:2021

Signed for and on behalf of: Thermo Fisher Scientific S.p.A.:

Giacinto Zilioli
(Director, Strategic Projects)
Thermo Fisher Scientific S.p.A.



Signature

Milan, March 28, 2023

Date

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/AS1610)					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
(主马达控制电路板) PCBA MB-CUB	X	O	O	O	O	O
(注射器马达控制电路板) PCBA SL-CUB	X	O	O	O	O	O
(主控电路板) PCBA IO-CUB	X	O	O	O	O	O
(机加工件) MACHINED PARTS	O	O	O	O	O	O
(注塑件) 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
(线束组件) 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.

这些产品的环保使用期为
The Environment Friendly Use Period for these products is:



WEEE Directive 2012/19/EU

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2012/19/EU. It is marked with the following symbol:



This symbol indicates that the equipment must not be thrown into general waste and should be collected separately and processed in accordance with local and state requirements.

Thermo Fisher Scientific is registered with one or more recycling/disposal companies in the UK and 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.

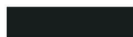
IMPORTANT This recycling program is **not** for biological hazard products or for products that have been medically contaminated. You must treat these types of products as biohazard waste and dispose of them in accordance with your local regulations.

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/AS 1610 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.

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 a hazard (moving parts, components under voltage, etc.) the authorized Technical Service must be contacted. This type of situation can be identified because access to these parts is possible only by using a tool. Removable protective covers bear a warning symbol 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/AS 1610 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

- Indoor use only
- Maximum altitude: 3500 m above sea level
- Operating temperature: 15 °C to 35 °C (59-95 °F)
- Storage temperature: –30 °C to 70°C (–22-158 °F)
- Maximum relative humidity: 80%, non-condensing
- Voltage variations must not exceed the nominal voltage by $\pm 10\%$
- Transient overloads in compliance with installation categories **II**
- Pollution degree: 2
- Protection degree IP00

Rating

The AI/AS 1610 does not require a power supply when connected to a TRACE 1600 Series GC.

The AI/AS 1610 requires a power supply when connected to a TRACE 1300 Series GC:

- 90 W AC-DC single output power adapter:
 - input 90-246 Vac; 47-63 Hz
 - output 24 Vdc



WARNING YOU MUST ONLY USE THE POWER ADAPTER FURNISHED WITH THE INSTRUMENT BY THERMO FISHER SCIENTIFIC.

Contacting Us

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

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

- Visit <http://www.thermofisher.com> for product information.

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

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

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 xix](#)) 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 xix](#)) 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</i> , <i>could</i> , or <i>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, could, or might</i> cause personal injury.
	RADIOACTIVE HAZARD. Indicates that the presence of radioactive material <i>could or 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/AS 1610. See the asterisk.

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



















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.

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

Symbol	Description
	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/AS 1610 sampling system., or parts of it (following the life cycle principle), as well as for the end user AI/AS 1610 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/AS 1610 Autosamplers.

General Considerations

- Before using the instrument, consult all current and related documentation.
- Changes or modifications to this unit not expressly approved by the party responsible for compliance, could void your 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 situation 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 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/AS 1610 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/AS 1610 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/AS 1610 sampling system only to instruments complying with IEC 61010 safety regulations.

The power line and the connections between the AI/AS 1610 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/AS 1610 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/AS 1610 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 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/AS 1610 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/AS 1610 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/AS 1610 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/AS 1610 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/AS 1610 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/AS 1610 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/AS 1610 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/AS 1610 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/AS 1610 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/AS 1610 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/AS 1610 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/AS 1610 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/AS 1610 sampling system for complimentary equipment pick-up and recycling.



WARNING The customer has to ensure that the AI/AS 1610 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/AS 1610. The available instrument configurations are also described.

Contents

- [AI/AS 1610 Sampling System](#)
- [AI/AS 1610 Configurations](#)
- [AI/AS 1610 Septum Cap](#)
- [Technical Specifications](#)

AI/AS 1610 Sampling System

The 1610 Series Autosampler is available as an AI 1610 or AS 1610 and consists of the parts shown in Figure 1 and Figure 2.



CAUTION Components within the autosampler are susceptible to static discharge damage. To prevent damage, industry-standard ESD prevention measures must be employed during installation, maintenance, and operation. Wear a grounded wrist strap or equivalent while servicing the autosampler.



ATTENTION Les composants de l'échantillonneur automatique sont susceptibles d'être endommagés par les décharges électrostatiques. Pour éviter les dommages, des mesures industrielles de prévention contre les décharges électrostatiques doivent être employées lors de l'installation, de la maintenance et de l'utilisation. Portez un bracelet antistatique mis à la terre ou un dispositif équivalent pour procéder à l'entretien de l'échantillonneur automatique.

Figure 1. AI 1610 Sampling System

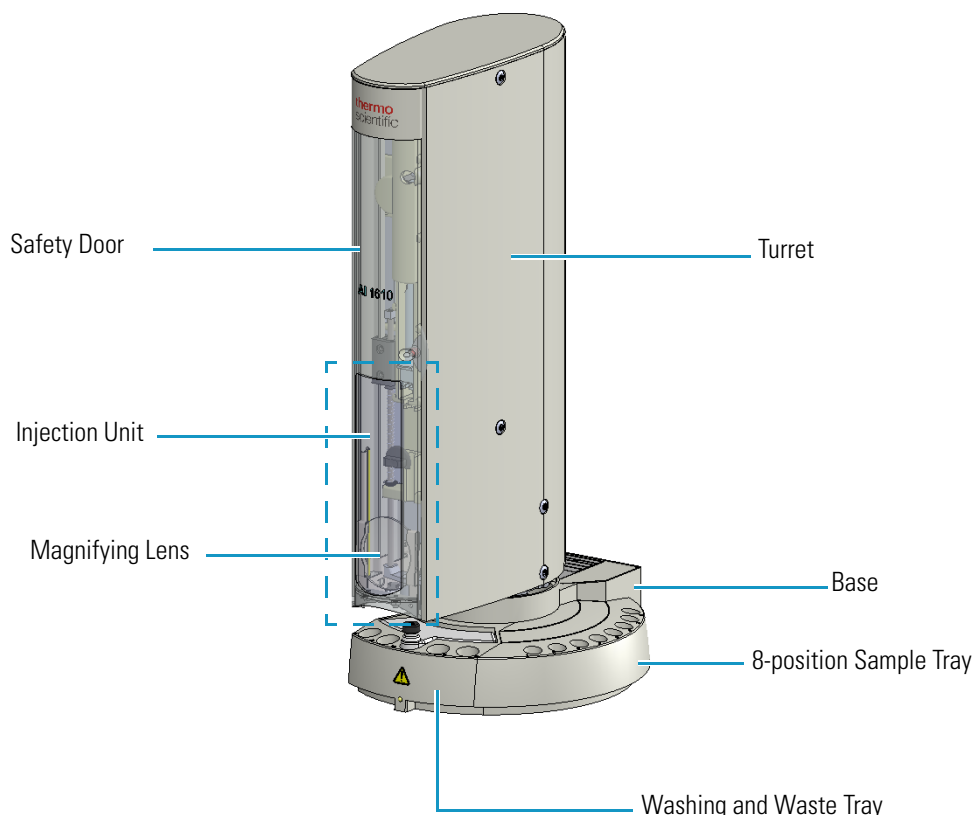
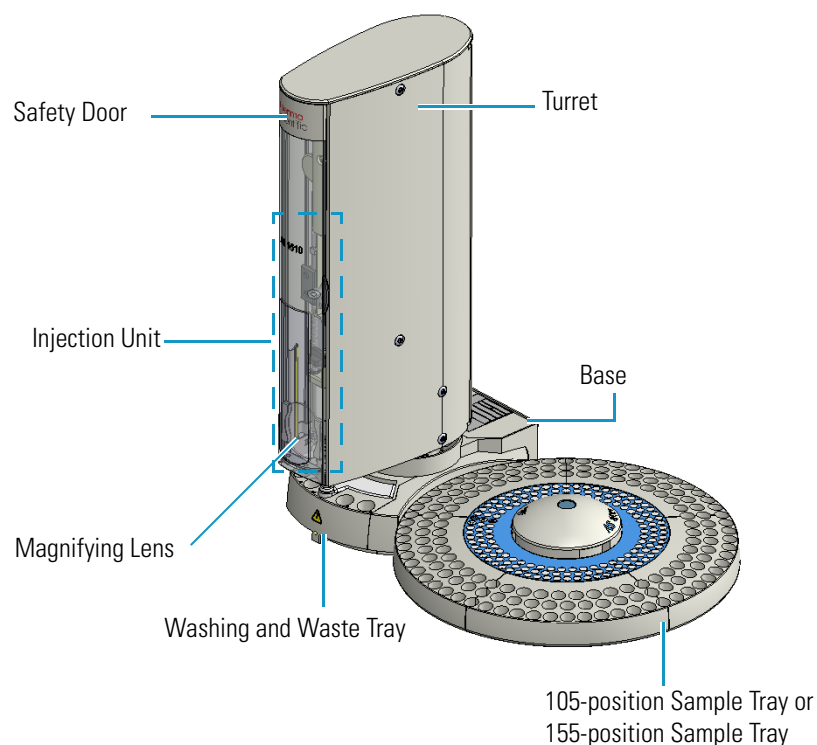


Figure 2. AS 1610 Sampling System



Sampling Unit

The sampling unit includes the following components:

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

Turret — Consists of a vertical moving structure that houses the injection unit and preforms the movements to carry out the three main operating tasks: sample drawing, injection, and syringe washing. The turret has a safety door that allows access to the syringe.

Injection Assembly — Located inside the turret, it consists of a moving support (sliding plate) where the syringe is installed.

Washing and Waste Tray — Provides 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 — A plate with circular guides to center the sampling unit on the injector nut.

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

- Sample tray for **AI 1610** consisting of an **8-position** fixed tray.

- Sample tray for **AS 1610** consisting of a **105-position** rotating tray mounted on a support plate.
- Sample tray for **AS 1610** consisting of a **155-position** rotating tray mounted on a support plate.

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

User Interface — The functions of the AI/AS 1610 can be controlled through a Thermo Scientific Chromatography Data System (CDS).

AI/AS 1610 Configurations

The AI/AS 1610 can be installed on a TRACE 1600 Series GC for sample introduction into the following injectors:

- TRACE 1600 Series GC: SSL, SSLBKF, PTV, PTVBKF, and TSI injectors
- TRACE 1300 Series GC (with interface kit): SSL, SSLBKF, PTV, PTVBKF, and TSI injectors

Note A cabling adapter is required to connect the AI/AS 1610 to a TRACE 1300 Series GC.

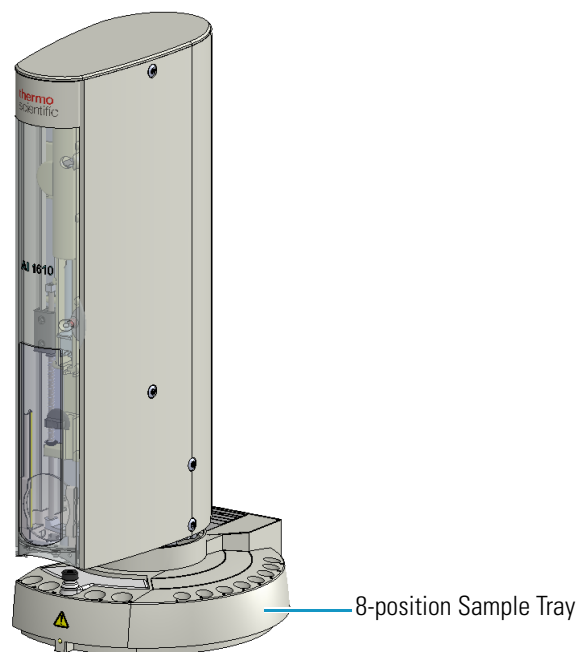
The sampler can be configured in the following ways:

- [AI 1610 Configuration](#)
- [AS 1610 Configuration](#)
- [Gemini Configuration](#)

AI 1610 Configuration

The AI 1610 configuration uses an **8-position** sample tray. See [Figure 3](#).

Figure 3. AI 1610 Configuration

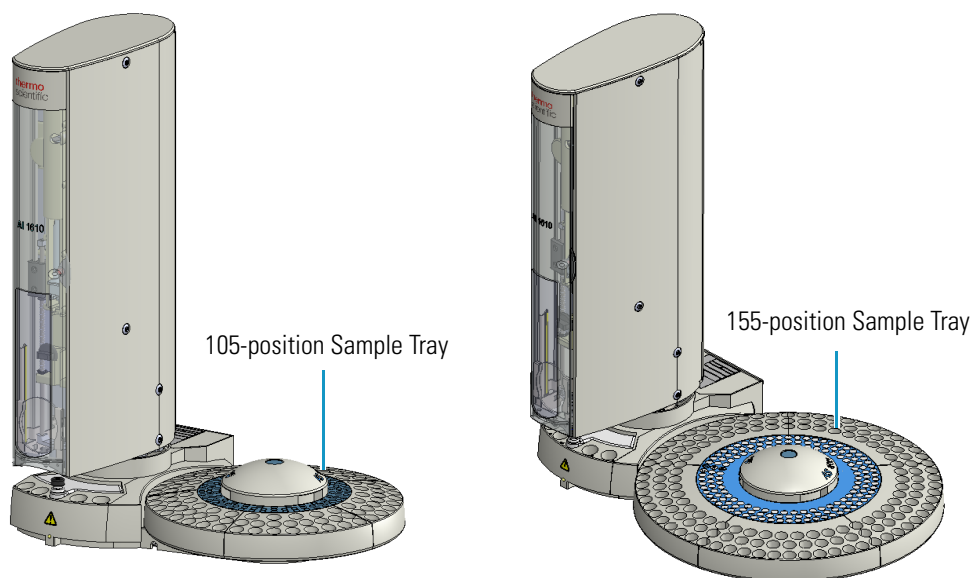


The sample tray is installed on the right side of the sampling unit base. The centering plate is installed on the opposite side.

AS 1610 Configuration

In the AS 1610 configuration, a **105-position** and **155-position** rotating sample tray are mounted on the hub of the support plate. The support plate of the tray and the autosampler are electrically connected to each other by a connecting cable. See [Figure 4](#).

Figure 4. AS 1610 Configurations



Gemini Configuration

The Gemini configuration consists of two AI/AS 1610 autosamplers installed on the same GC.

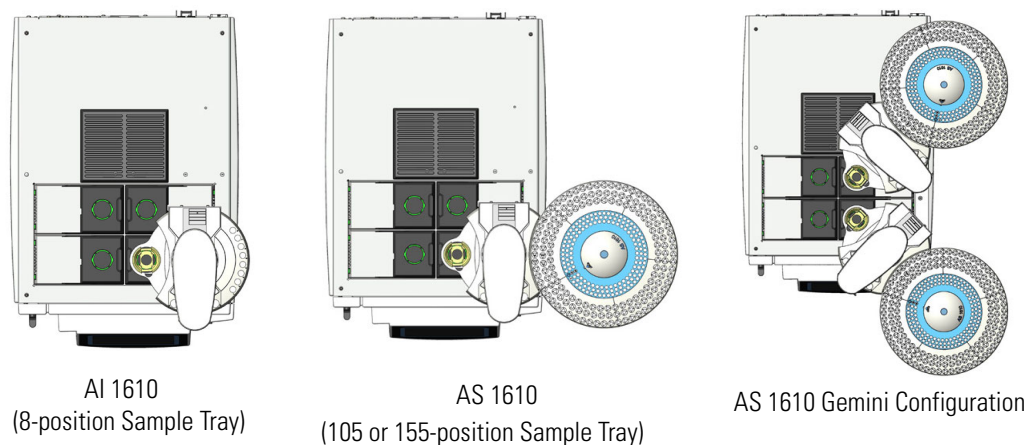
- TRACE 1600 Series GC — both autosamplers are installed on the right side, one on the **Front** injector module, and the other on the **Back** injector module.

Each autosampler operates simultaneously on its own injector. In this configuration, both samplers can inject a sample according to the programmed analytical method that can be the same or different for both. See [“Gemini Configuration”](#) on [page 43](#).

Installation

The AI/AS 1610 is installed on the right side of the GC and requires a metal support on the base of the sampler. See [Figure 5](#).

Figure 5. AI/AS 1610 Placement



WARNING If you upgrade an AI 1610 to an AS 1610, it is important to power off the AI 1610 before you install the sample tray and plug in the electrical cable. This prevents a possible driver failure with the AI 1610's electronic board.



AVERTISSEMENT En cas de mise à niveau d'un AI 1610 vers un AS 1610, il est important de mettre l'AI 1610 hors tension avant d'installer le plateau d'échantillons et de brancher le câble électrique. Cela permet d'éviter une éventuelle défaillance des pilotes sur la carte électronique de l'AI 1610.

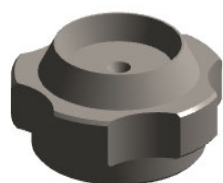
Gemini Configuration

Two AI/AS 1610 autosamplers are installed on the same TRACE 1600 Series GC using dedicated supports. Refer to ["Sampling System Support"](#) on [page 27](#).

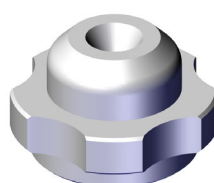
AI/AS 1610 Septum Cap

Before using the AI/AS 1610 sampling system, you need to replace the standard septum cap (P/N 35001820) for the SSL, SSLBKF, HeS-S/SL, PTV, and PTVBKF injectors with the septum cap for the AI/AS 1610 (P/N 35001819) that is provided in the standard outfit of the AI/AS 1610 autosampler.

Figure 6. Septum Cap for AI/AS 1610



Standard Septum Cap



Septum Cap for AI/AS 1610

Technical Specifications

Technical specifications for the AI/AS 1610 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 1610 configuration• 105 vials in the AS 1610 configuration• 155 vials in the AS 1610 configuration
Vial capacity	0.3 (optional) and 2 mL (standard) with 8-, 105-, and 155-position trays
Washing solvents	4 vials of 4 mL
Waste container capacity	50 mL
Syringe types and volumes	<ul style="list-style-type: none">• Compatible with standard, gas-tight and plunger in-needle syringes• Syringe volume: 0.5 μL, 5 μL, 10 μL, 50 μL, and 100 μL (50 mm needle length) with the same syringe holder

Table 1. Technical Specifications (Sheet 2 of 2)

- | | |
|-----------------------|---|
| Volume parameters(μl) | <ul style="list-style-type: none"> • 0 to 0.25 μL (0.5 μl syringe) • 0 to 2.5 μL (5 μl syringe) • 0 to 5 μL (10 μL syringe) • 0 to 40 μl (50 μl syringe) • 0 to 80 μL (100 μL syringe) |
|-----------------------|---|

The resolution is 1% of the syringe volume.

The minimum volume is 2%.

Programmability	Remote
External interface	Mini Delta connector
Power supply rating	<ul style="list-style-type: none"> • No power supply required when installed on TRACE 1600 Series GC • 90W AC-DC single output power adapter (IN: 90~264 VAC 47~63Hz/OUT:24 VDC) when installed on a TRACE 1300 Series GC
Dimensions (depth x width x height)	Sampling unit: <ul style="list-style-type: none"> • AI Configuration: approx. 280 × 230 × 400 mm (D × W × H) • AS Configuration with 105-position sample tray: approx. 280 × 410 × 400 mm (D × W × H) • AS Configuration with 155-position sample tray: approx. 290 × 470 × 400 mm (D × W × H)
Mass	<ul style="list-style-type: none"> • AI Configuration: approx. 6 kg (13.2 lb) • AS Configuration with 105-position sample tray: approx. 6 kg • AS Configuration with 155-position sample tray: approx. 7 kg (15.4 lb)
Sound Pressure Level	< 70 dBA (dBA = A weighted sound pressure level)

Sampling Unit

This chapter provides a description of the sampling unit components in the AI/AS 1610 system.

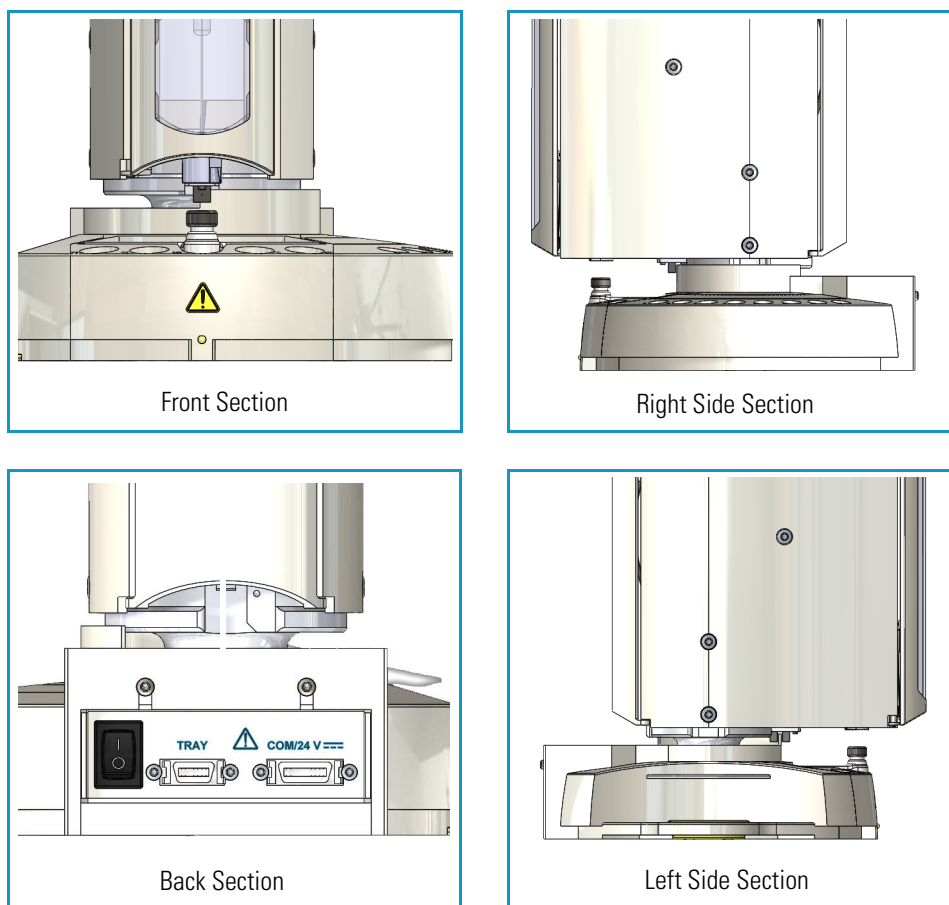
Contents

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

Base

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

Figure 7. Sections of the Base



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

On the lower front portion of the instrument there is a LED indicating the instrument status. For details, see the section “[LED Indicators](#)” on [page 23](#).

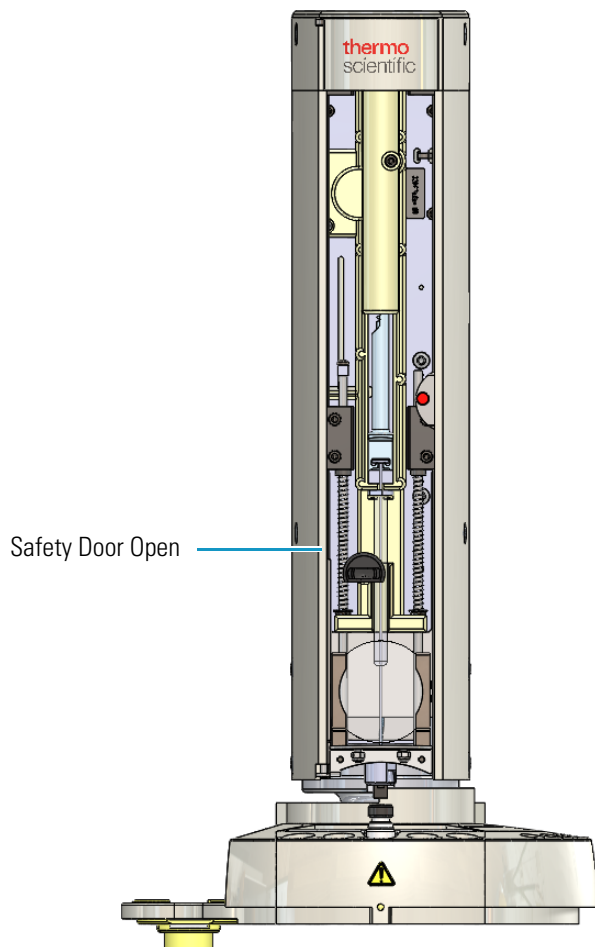
- **Right and Left Side Sections** — The right side is the location of the 8-position, 105-position, or 155-position sample tray. The left side is the location of the centering plate for the injector.
- **Back Section** — Includes connections to the gas chromatograph and the sample tray (AS 1610).

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. Opening the door immediately cuts off the power supply to the sampling system.

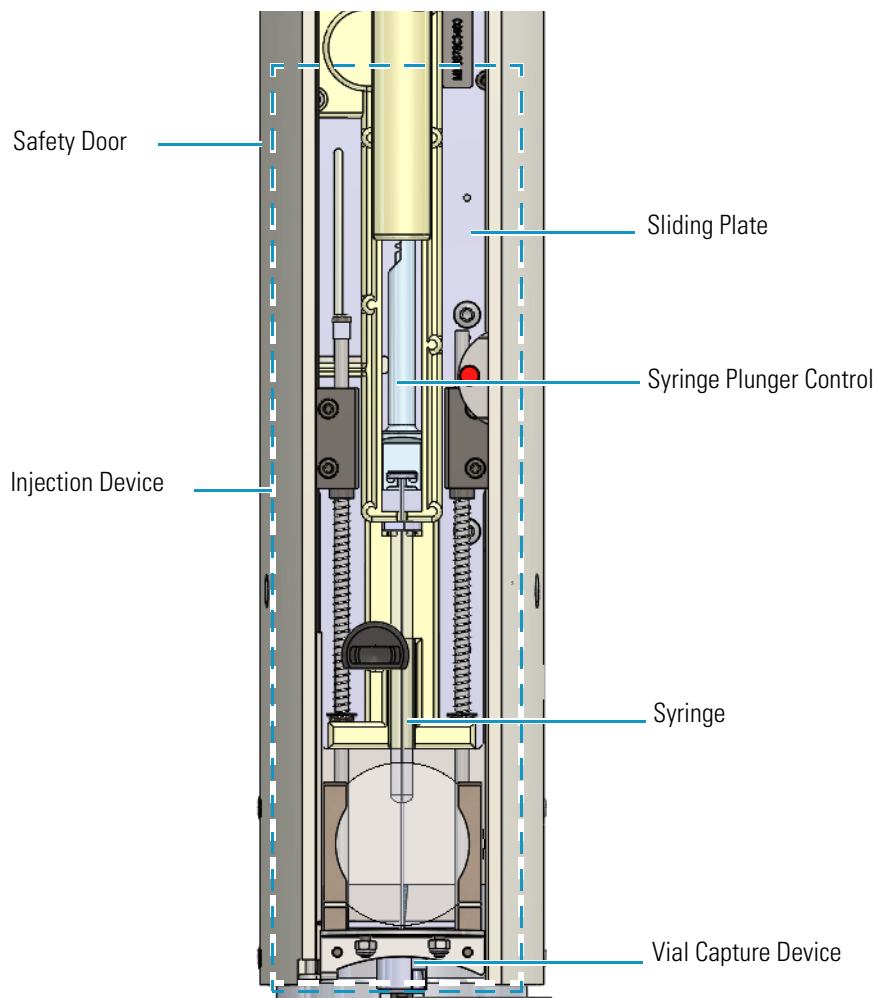
Figure 8. The Turret



Injection Assembly

The injection assembly contains a sliding plate that supports and guides the injection device's vertical movements. The injection device includes the syringe plunger control, the vial capture device, and the syringe. See [Figure 9](#).

Figure 9. Injection Assembly



Motors in the turret control the vertical movements of the injection device. A series of sensors defines the travel ends of the movable parts.

There are two electronic boards inside the turret: one board controls motors, and the other controls instrument functions.

Vial Capture Device

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

The vial capture device functions are:

- guide the syringe needle
- confirm presence of the vial
- confirm presence of an injector

Figure 10. Vial Capture Device



Syringe

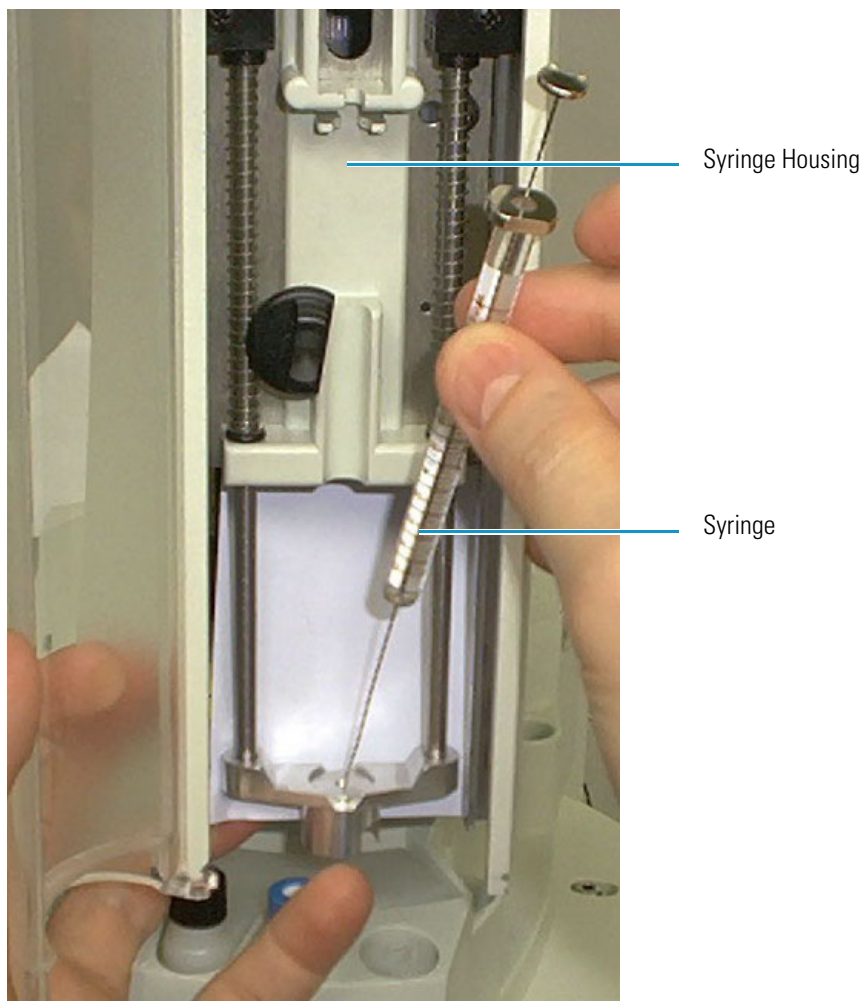
The standard syringe capacity is 10 μ L with a 50 mm needle length.

A thorough washing of the syringe can be done 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

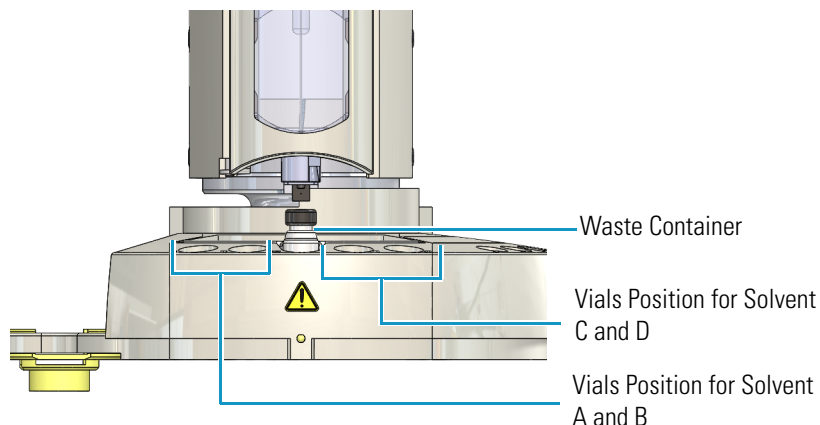
The sequence of turret movements allows the sampler to perform the following functions:

- **Sample drawing** — The turret positions itself on the selected vial 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.

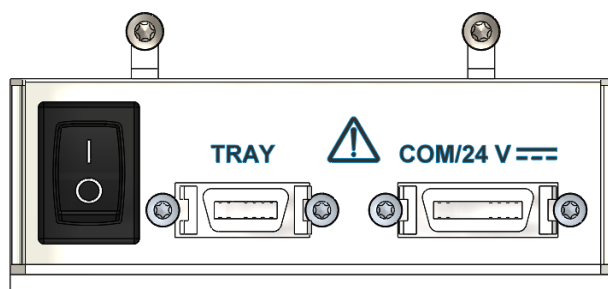
The four vials containing solvents for the syringe washing are introduced into the appropriate seats A, B and C, D, respectively on the left and on the right of the **WASTE** container.

Back of the Sampling Unit

The back of the sampling unit includes the following connectors. See [Figure 13](#) for locations.

- Mini Delta connector marked **TRAY** for communication with the sample tray (105- or 155-position).
- Mini Delta connector marked **COM/24** for the connection with TRACE 1600 Series GC or the adapter for the TRACE 1300 Series GC.

Figure 13. Back of the Sampling Unit



Sample Trays

The AI/AS 1610 can accept three different sample trays in right-side housing on the base. The type of sample tray accessory installed on the instrument (8-, 105-, or 155-position) is automatically recognized by the sampler when powered on, determining the instrument configuration.

- AI 1610 uses the **8-position** sample tray
- AS 1610 uses the **105-position** or the **155-position** sample tray



CAUTION The 105-position and the 155-position sample trays require a supporting plate.

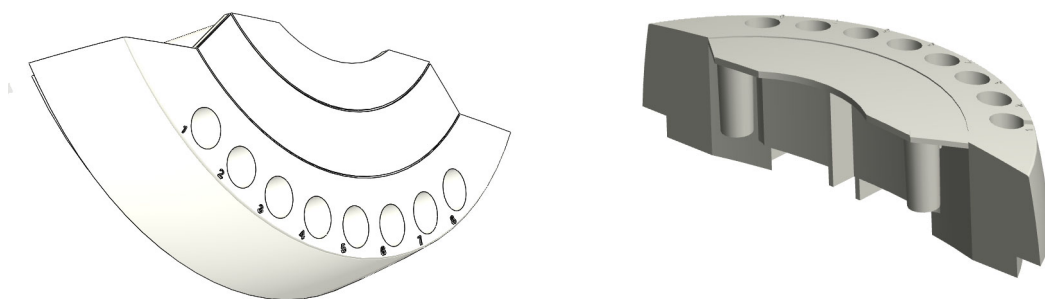


ATTENTION Les plateaux d'échantillons à 105 positions et 155 positions nécessitent une plaque de support dédiée.

8-Position Sample Tray

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

Figure 14. 8-position Sample Tray



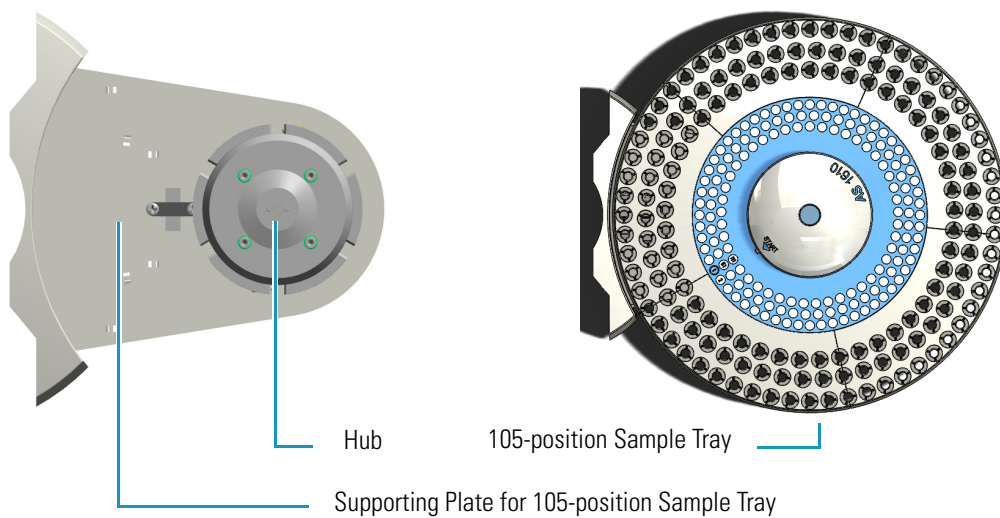
105-Position Sample Tray

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

A motor located under the supporting plate actuates the hub to rotate the tray. Commands come 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 outer row.
- Vials **41** to **80** are placed into the middle row.
- Vials **81** to **105** are placed into the inner row.

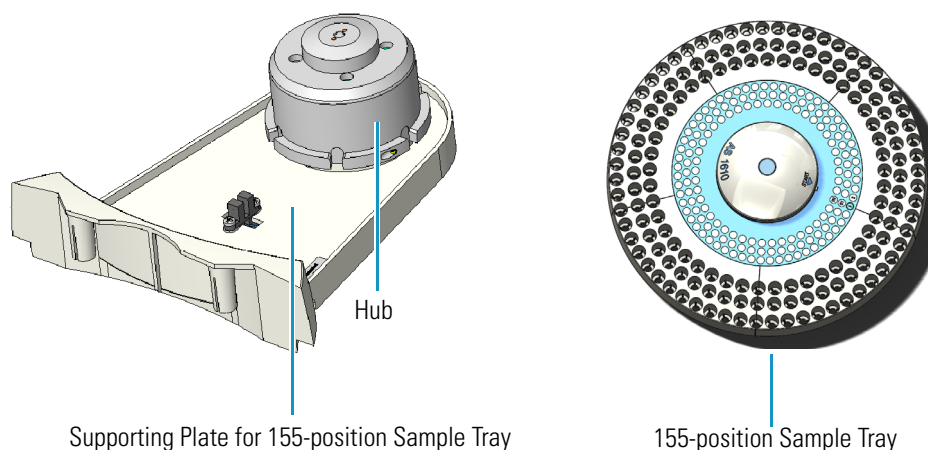
155-Position Sample Tray

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

A motor, located under the supporting plate, actuates the hub to rotate the tray. Commands come 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 outer row.
- Vials 61 to 110 are placed into the middle row.
- Vials 111 to 155 are placed into the inner row.

Vials

You can use vials with 0.3 and 2 mL capacity.

The 0.3 mL vial is the same as the 2 mL vial. The 0.3 mL vial has a calibrated insert inside.



CAUTION Vials must be closed using the appropriate septa and ring nuts. Septa must be those recommended by Thermo Fisher Scientific. Using septa with different characteristics might damage or bend the syringe needle. Adhere to all applicable safety regulations during vial preparation, especially workplace ventilation conditions.



ATTENTION Les flacons doivent être fermés correctement à l'aide de septa et d'écrous appropriés. Les septa doivent être ceux recommandés par Thermo Fisher Scientific. L'utilisation de septa présentant des caractéristiques différentes peut endommager ou tordre l'aiguille de la seringue. Pendant la préparation des flacons, il est recommandé de suivre les réglementations applicables en matière de sécurité, notamment les conditions de ventilation du lieu de travail.

Centering Plate

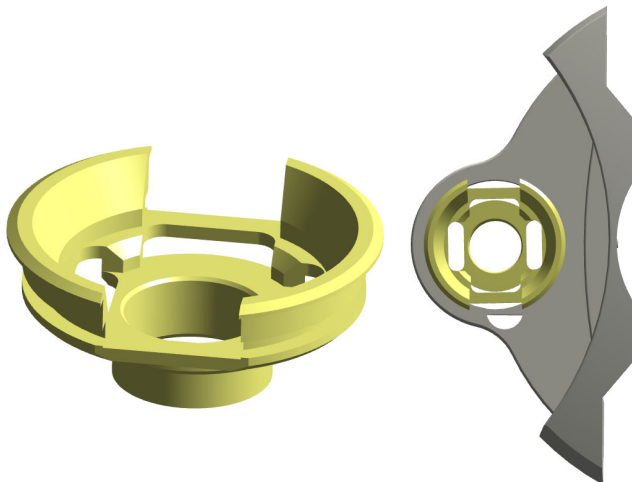
The centering plate consists of a plate with circular guides to center the sampling unit on the injector nut.

Centering Plate for TRACE 1600 Series GC

The centering plate is provided with two circular guides to center the sampling unit on the SSL, SSLBKF, PTV, PTVBKF, and TSI 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](#).
- To center the sampling unit on the TSI injector nut, use the circular guide for PTV only. See [Figure 19](#).

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:

ATTENTION Le guide circulaire pour SSL et SSLBKF placé sur la plaque de centrage doit être aligné comme indiqué ci-dessous :

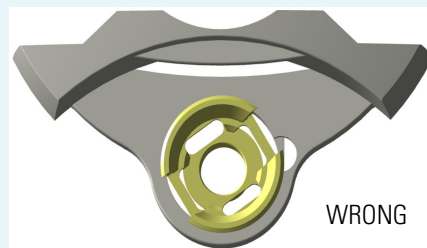
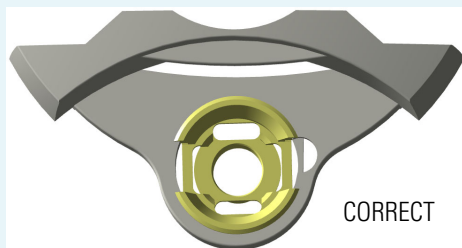


Figure 18. Circular Guide for PTV and PTVBKf

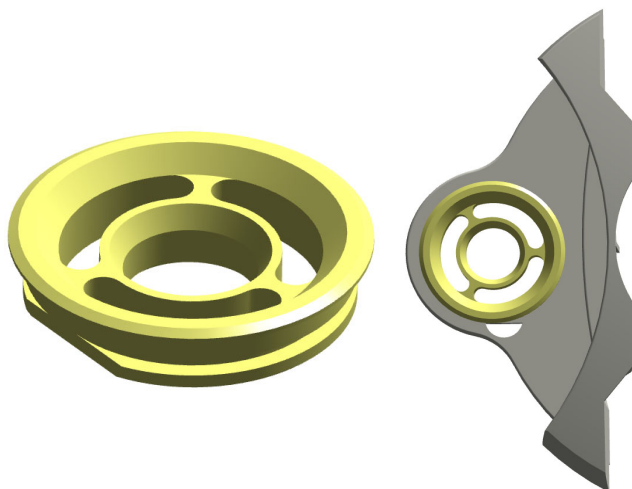
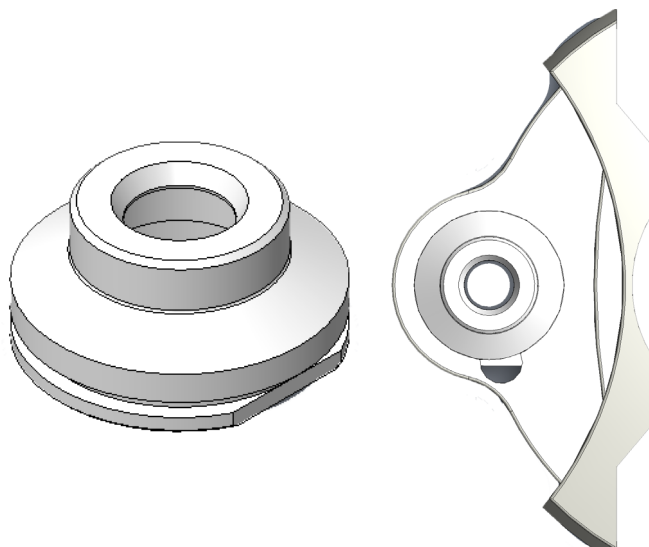


Figure 19. Circular Guide for TSI



LED Indicators

Two LEDs are located on the front side of the sampling unit, see [Figure 20](#). The LEDs provide information about instrument operating conditions by displaying a steady or blinking light. See [Table 2](#) for details.

Figure 20. The Status LED

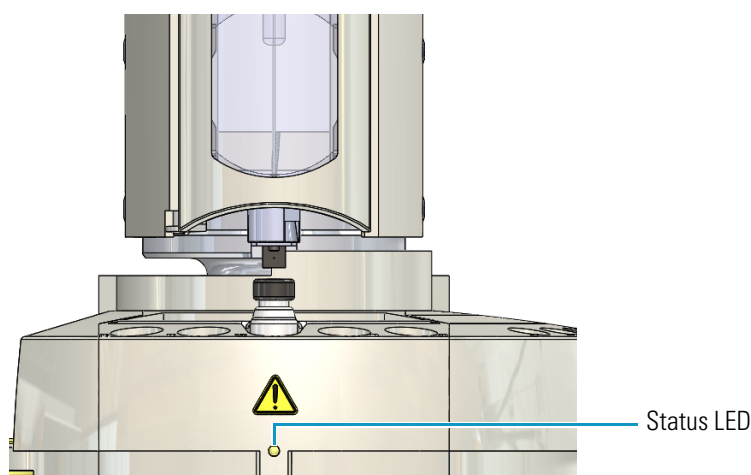


Table 2. LED States

LED	State	Description
Status LED	Steady green	Standby
	Blinking green	Sequence running
	Steady Orange	Error
		Open door
Top RGB LEDs	Steady green	Standby
	Blue	Sequence running
	Blinking orange	Error
	Steady orange	Open door
Syringe White LED	On	Standby
		Sequence running
		Error
	On (high intensity)	Open door

Buzzer

- One beep monotone; after first injection.
- Eight beeps monotone; door is open.

Installation

This chapter contains installation instructions and information about making 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 GC](#)
- [Installing the AI/AS 1610 on the GC](#)
- [Installing the Syringe](#)
- [Electrical Connections](#)

Who Performs the Installation

The AI/AS 1610 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 adhere to the following instructions.

Electrical Requirements

The instrument does not require a power supply when installed on a TRACE 1600 GC.

A 90 W AC-DC single output power adapter is required when installed on a TRACE 1300 Series GC.

- Input: 90-264 VAC, 47-63 Hz
- Output: 24 VDC



CAUTION The power line and 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/AS 1610 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.



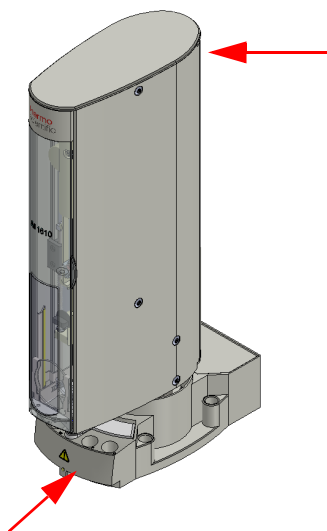
CAUTION La continuité de la mise à la terre de la ligne d'alimentation et les connexions entre les instruments doit être assurée. Une mauvaise mise à la terre représente un danger pour l'opérateur et peut sérieusement compromettre les performances de l'instrument.

Ne branchez pas l'AI / AS 1610 à des lignes alimentant des appareils de qualité industrielle, tels que des moteurs, des lampes à UV, des réfrigérateurs et d'autres appareils pouvant générer des perturbations. Veillez à ne pas laisser les câbles reliant l'unité d'échantillonnage au système de chromatographie ou le cordon d'alimentation à proximité des événements d'air chaud du système GC.

How to Lift and Carry the Sampling Unit

You must lift and carry the AI/AS 1610 by hand. Hold the sampling unit at its base and the top of the turret. See [Figure 21](#).

Figure 21. How to Lift and Carry the Sampling Unit



ATTENTION:

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

Remove the sample tray and its supporting plate from the unit. Reinstall the sample tray after the sampling unit has been installed on the GC.

Sampling System Support

The AI/AS 1610 is installed on the GC using the provided support.

Sampling System Support for TRACE 1300/1600 Series GC

Install the AI/AS 1610 only on the **front** or **back** injector module of the GC or on both when in **Gemini** configuration. Be sure to use the correct sampling system support.

The sampling unit support consists of the bottom and top plate.

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

This allows you to move the injection device of the sampling unit away from the injector module when the module requires maintenance.

Note After the installation of the sampling unit on the sampling system support, it is possible to lock the plates in place.

To install a sampling system support on the TRACE 1300/1600 Series GC see the following sections:

- [“Front/Back Injector Module Support” on page 28](#)
- [“Gemini Configuration Support” on page 29](#)

Front/Back Injector Module Support

Use the same sampling unit support for either the front or back injector. Place the L-shape bottom plate as shown in the following figures before attaching it to the GC. See [Figure 22](#) and [Figure 23](#).

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

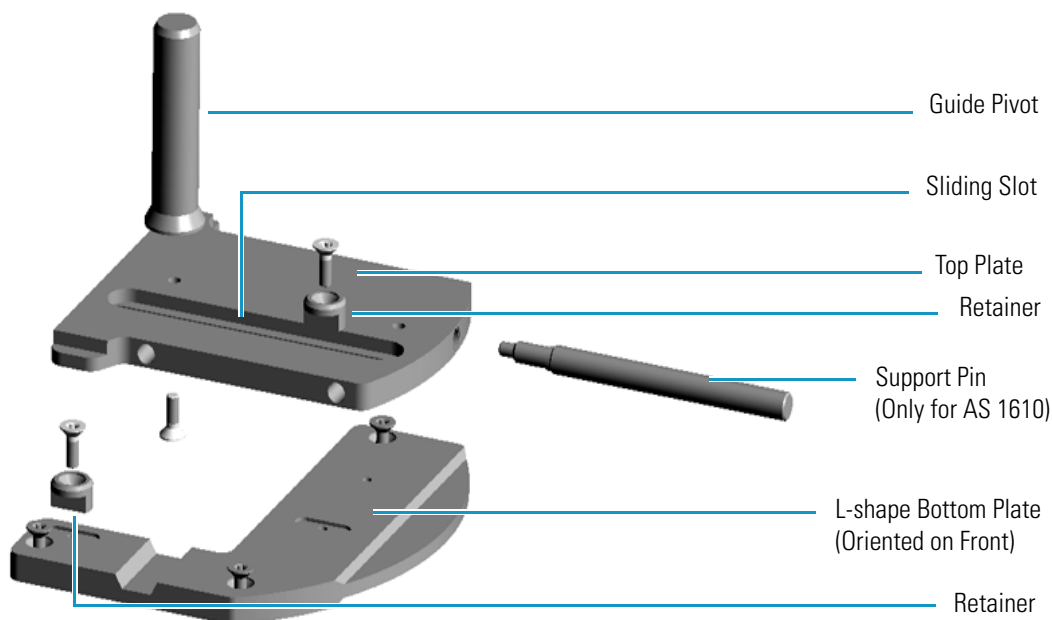
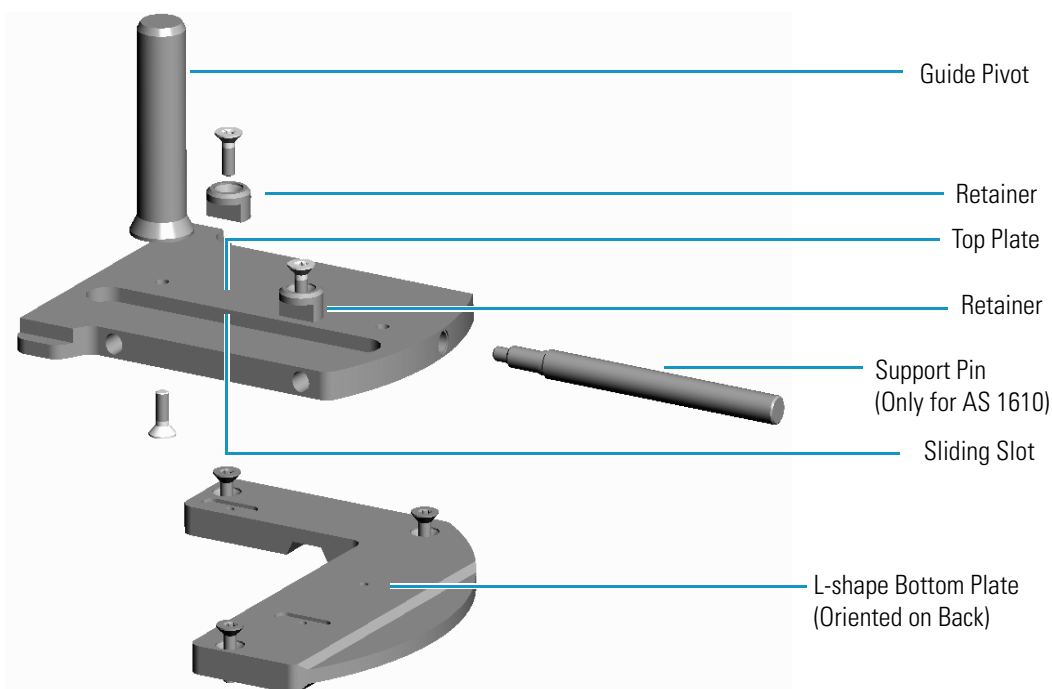


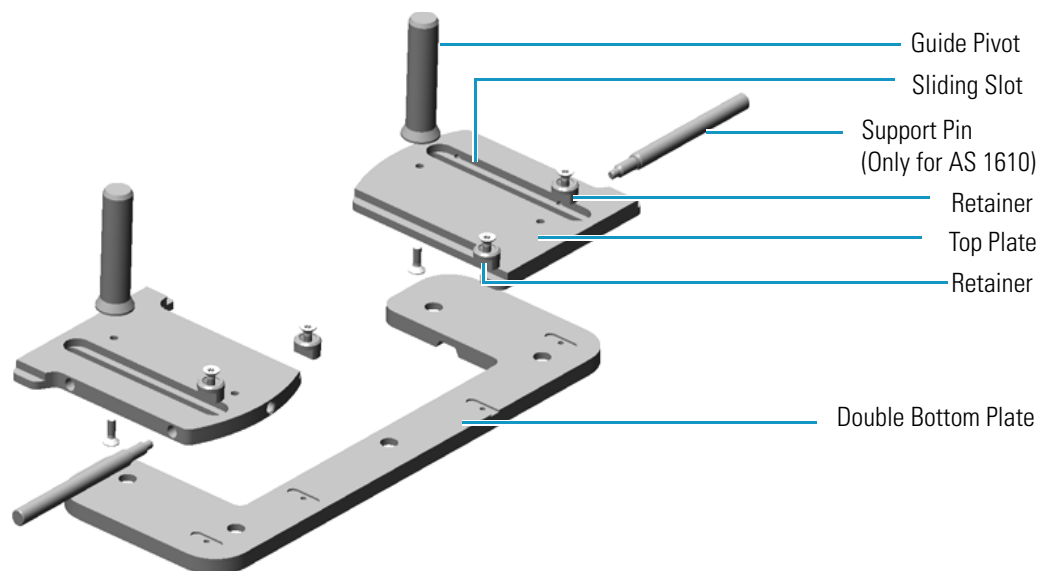
Figure 23. Support Oriented for Installation on the Back Injector Module



Gemini Configuration Support

For a Gemini configuration there is double bottom plate and two top plates. See [Figure 24](#).

Figure 24. Gemini Configuration Support



References for the Installation

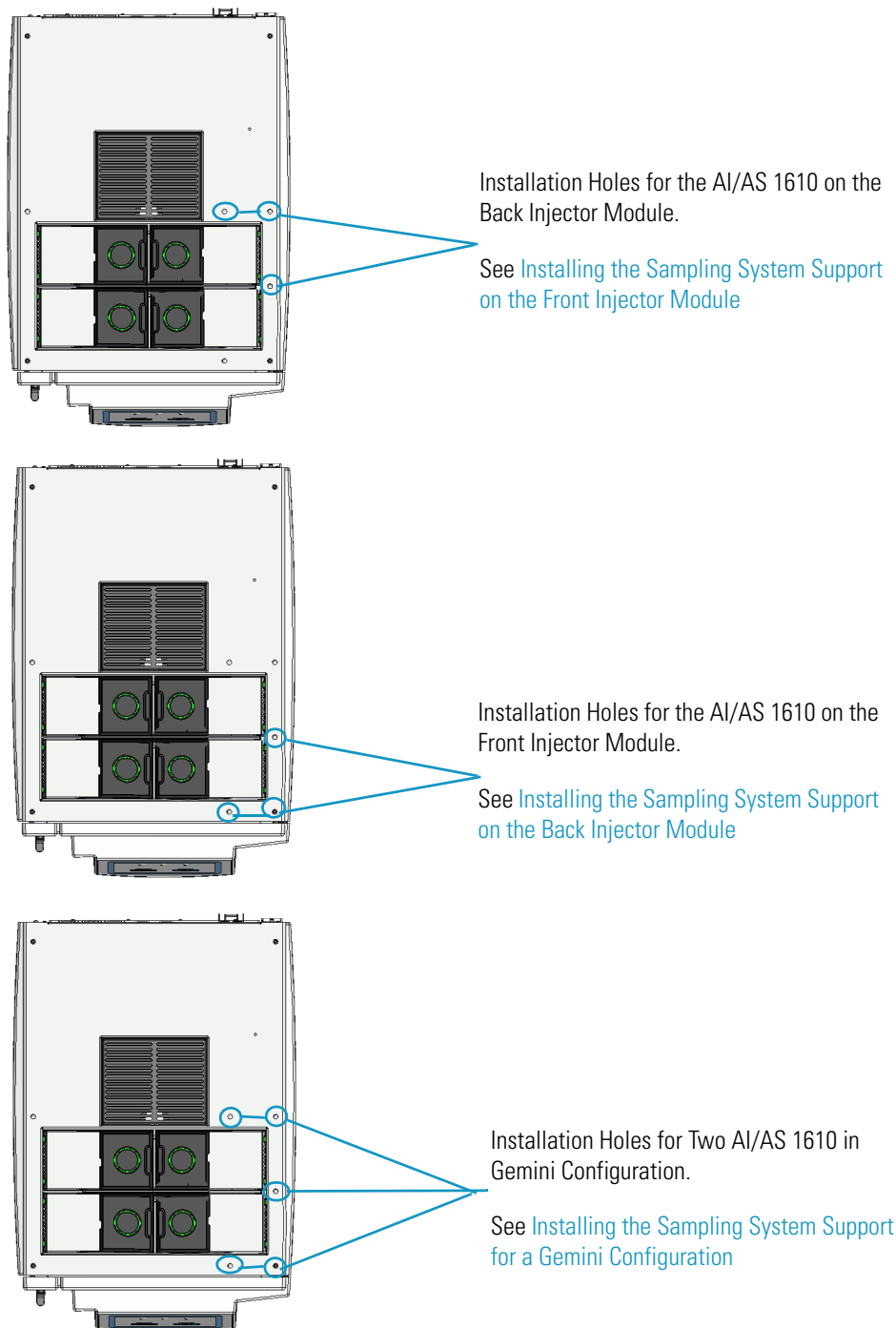
For the installation of the AI/AS 1610, see the following sections:

- [“Installing the Sampling System Support on the GC” on page 30](#)
- [“Installing the AI/AS 1610 on the GC” on page 37](#)

Installing the Sampling System Support on the GC

Complete the steps in the following sections to install the sampling system support on a TRACE 1300/1600 Series GC. [Figure 25](#) shows the location of installation holes on top of the GC.

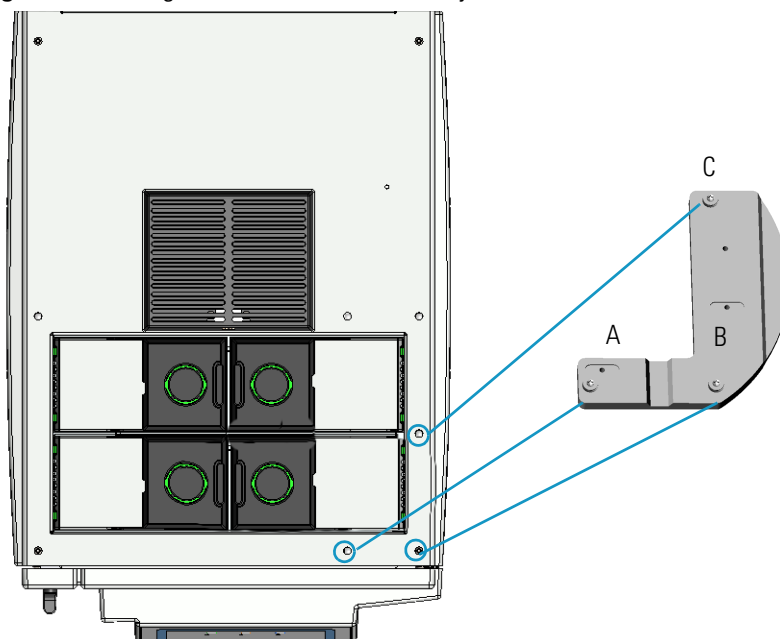
Figure 25. Sampler Unit Support Installation Holes



Installing the Sampling System Support on the Front Injector Module

The following steps describe how to mount the sampling system support on the **front** injector module of the TRACE 1300/1600 Series GC.

Figure 26. Fixing Hole Locations for Front Injector Module



❖ To install the support on the front injector module

1. Remove the three plastic caps covering the fixing holes on the GC top cover. See A, B, and C in [Figure 26](#).

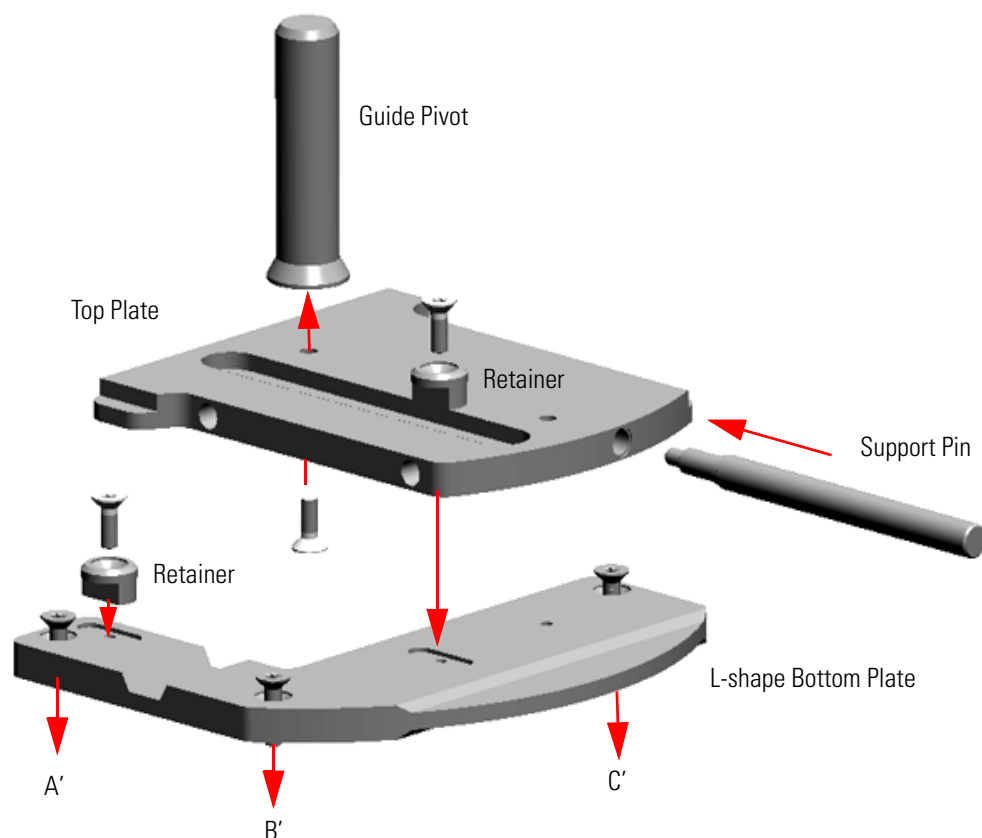
Note Installing the bottom plate on the front injector module requires you to upturn the L-shape bottom plate before attaching it to the GC.

2. Align the L-shape bottom plate with the three installation holes located on top of the GC.
3. Insert the provided fixing screws into the holes on the L-shape bottom plate.

3 Installation

Installing the Sampling System Support on the GC

Figure 27. Sampling System Support Assembly



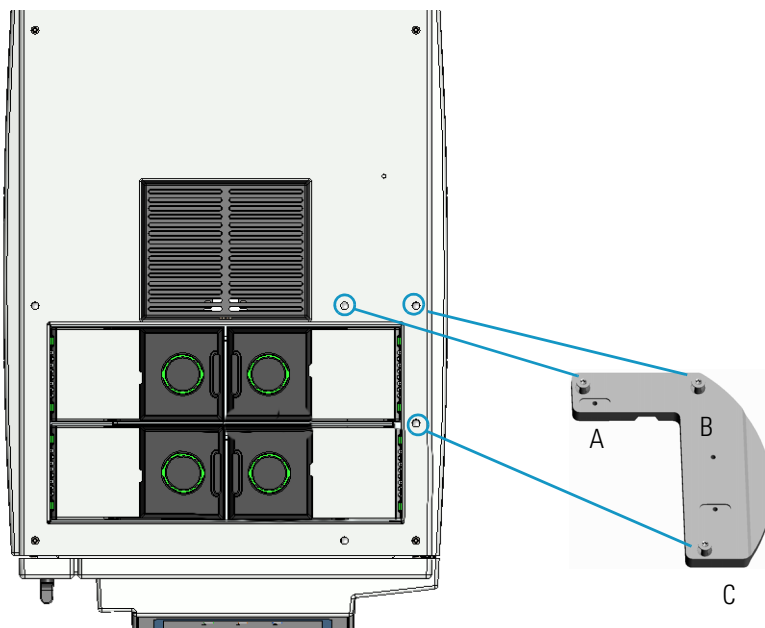
4. Tighten the three fixing screws.
5. Mount and fix the guide pivot on the top plate using the fixing screw. See [Figure 27](#).
6. Place the top plate over the L-shape bottom plate.
7. Guide the retainer and its fixing screw into the sliding slot present on the top plate.
8. Align the retainer fixing screw into the corresponding hole 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 are installing an AS 1610, screw the support pin into the hole on the side of the top plate.

Note The support pin is NOT required for the AI 1610.

Installing the Sampling System Support on the Back Injector Module

The following steps describe how to mount the sampling system support on the **back** injector module of the TRACE 1300/1600 Series GC. See [Figure 28](#) and [Figure 29](#).

Figure 28. Fixing Hole Locations for the Back Injector Module



❖ To install the support on the back injector module

1. Remove the three plastic caps covering the fixing holes on the GC top cover. See A, B, and C in See [Figure 28](#).

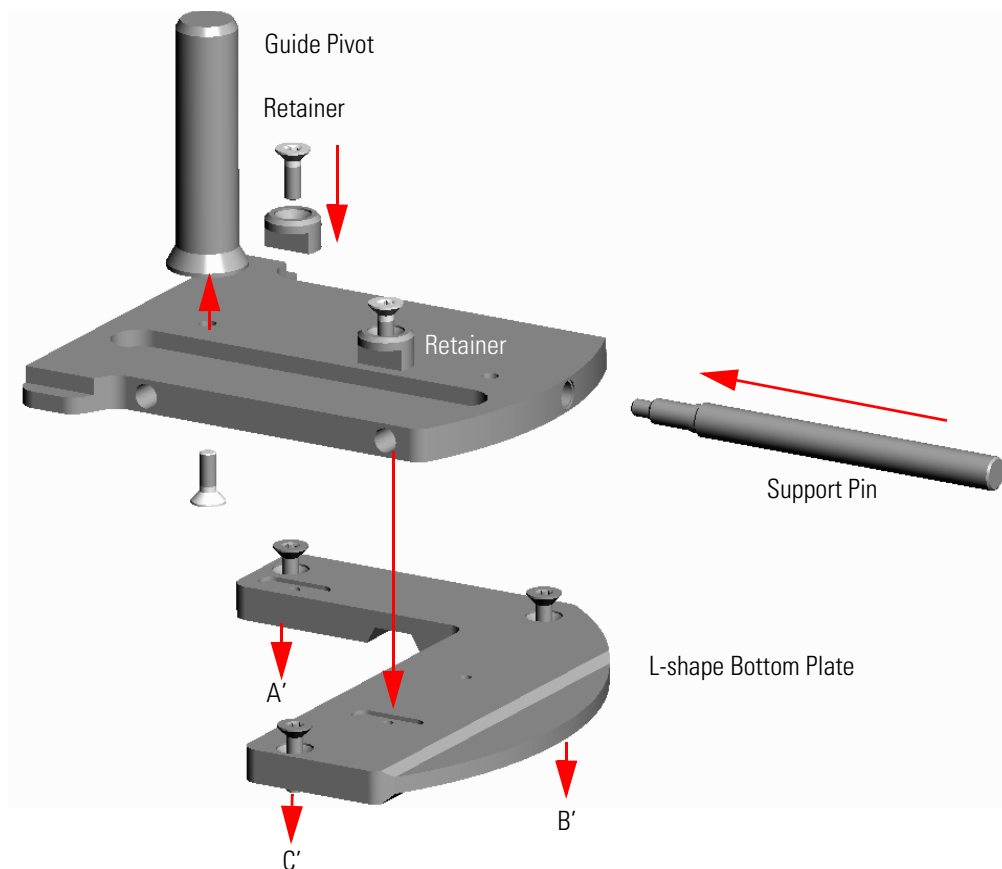
Note Installing the bottom plate on the front injector module requires you to upturn the L-shape bottom plate before attaching it to the GC.

2. Align the L-shape bottom plate with the three installation holes located on top of the GC.
3. Insert the provided fixing screws into the holes on the L-shape bottom plate.

3 Installation

Installing the Sampling System Support on the GC

Figure 29. Assembling on the Back Injector Module (2)



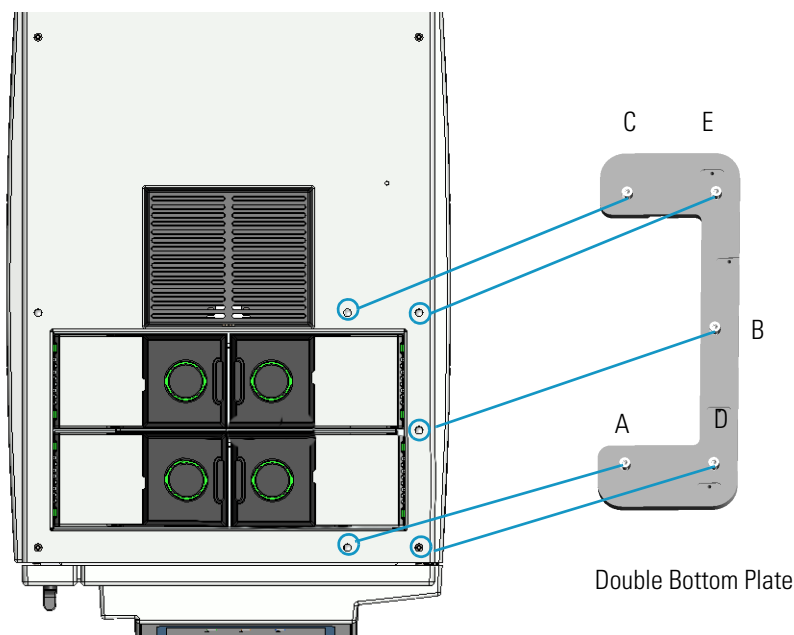
4. Tighten the three fixing screws.
5. Mount and fix the guide pivot on the top plate using the fixing screw. See [Figure 29](#).
6. Place the top plate over the L-shape bottom plate.
7. Guide the retainer and its fixing screw into the sliding slot present on the top plate.
8. Align the retainer fixing screw into the corresponding hole 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 are installing an AS 1610, screw the support pin into the hole on the side of the top plate.

Note The support pin is NOT required for the AI 1610.

Installing the Sampling System Support for a Gemini Configuration

The following is the description of how to mount the sampling system support on the TRACE 1300/1600 Series GC for the installation of two AI/AS 1610 sampling systems in **Gemini** configuration. See [Figure 30](#) and [Figure 31](#).

Figure 30. Assembling In Gemini Configuration (1)

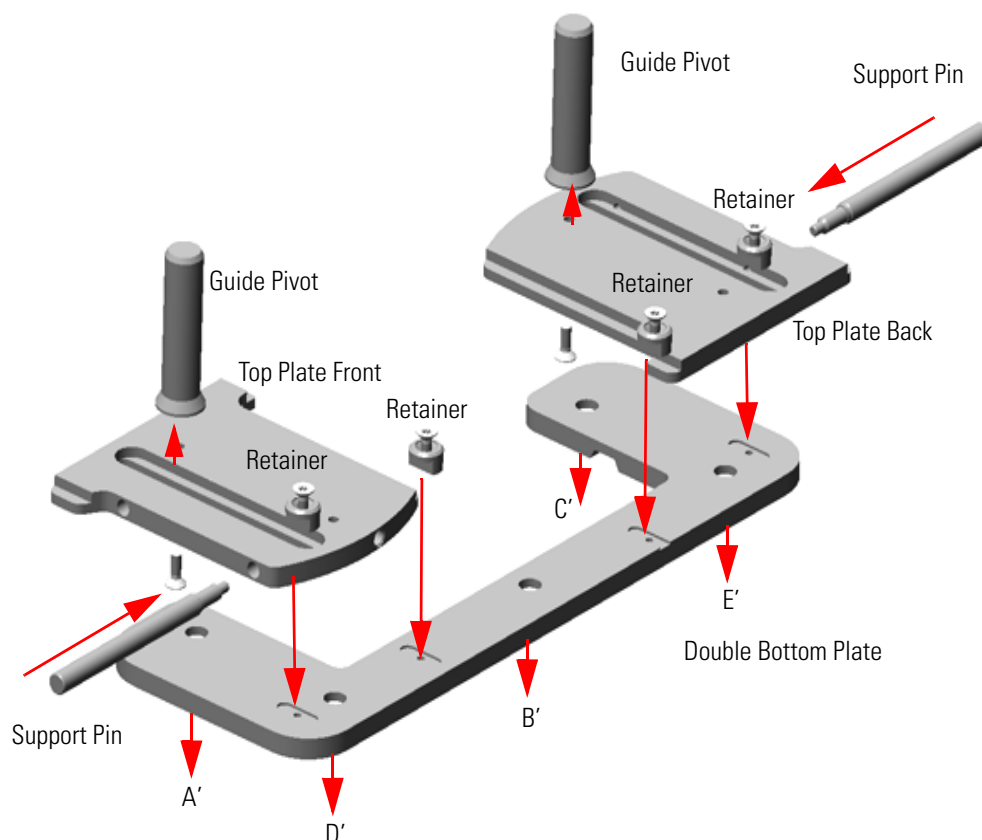


1. Remove the five plastic caps covering the fixing holes on the GC top cover. See A, B, C, D, and E in See [Figure 30](#).
2. Align the double bottom plate with the five installation holes located on top of the GC.
3. Insert the provided fixing screws into the five holes on the double bottom plate.
4. Tighten the five fixing screws.

3 Installation

Installing the Sampling System Support on the GC

Figure 31. Assembling In Gemini Configuration (2)



5. Mount and fix the guide pivot on both top plates using the fixing screw.
6. Place the two top plates over the double bottom plate.
7. Guide each retainer and its fixing screw into the sliding slot present on each top plate.
8. Align each retainer fixing screw into the corresponding fixing hole on the double bottom plate.
9. Tighten both retainer fixing screws to lock the upper plates to the double bottom plate.
10. Clamp the plates guiding the second retainer and its fixing screw into the hole provided on double bottom plate.
11. If you are installing an AS 1610, screw the support pin into the hole on the side of both top plates.

Note The support pin is NOT required for the AI 1610.

Installing the AI/AS 1610 on the GC

To install the AI/AS 1610 on the TRACE 1600 Series GC refer to the instructions in the following sections:

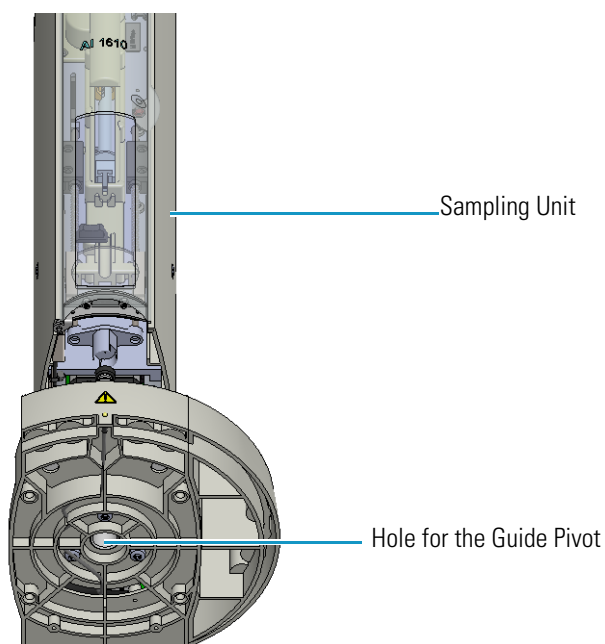
- “Installing the Sampling Unit” on page 37
- “Installing the Syringe” on page 40
- “Electrical Connections” on page 42
- “Instrument Start-up” on page 45

Installing the Sampling Unit

Complete the following steps to install your AI/AS 1610 sampling unit:

1. Lift the sampling unit, see [Figure 21](#) on [page 27](#), and insert it into the guide pivot located on the sampling system support. Place the guide pivot into the hole provided on the bottom of the base. See [Figure 32](#).

Figure 32. Installation of the Sampling Unit

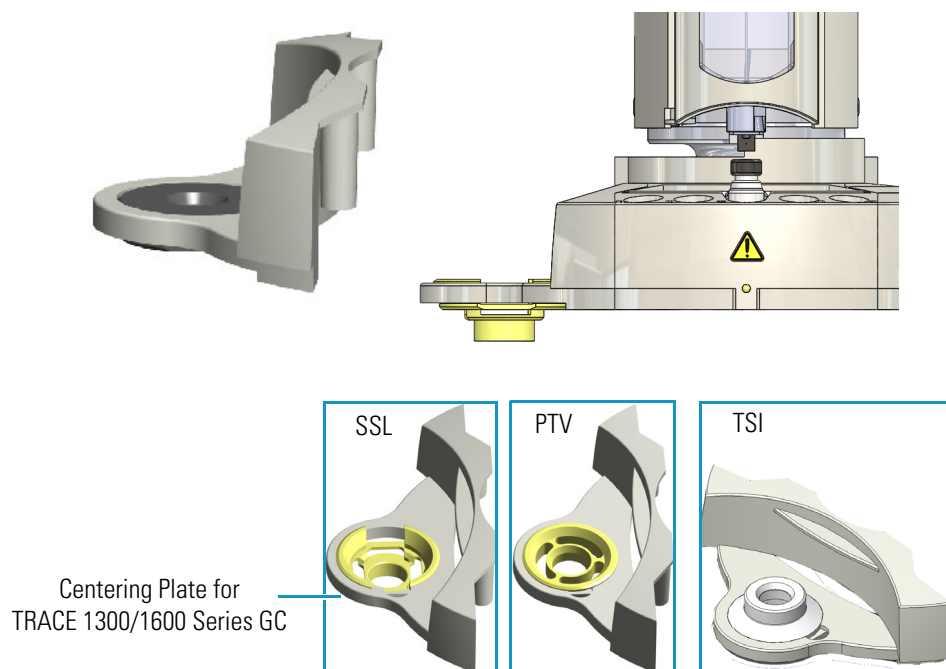


2. Place the centering plate into its seat on the sampling unit base and ensure the guide hole on the arm of the centering plate fits the injector nut. See [Figure 33](#).

3 Installation

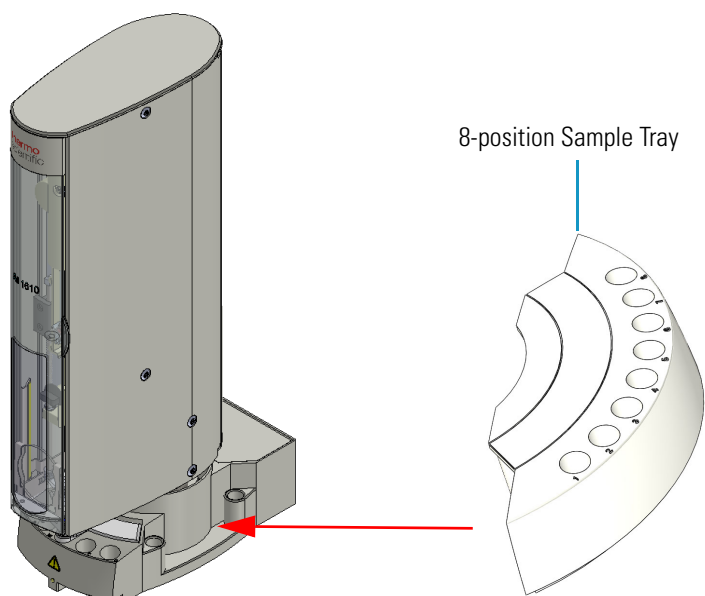
Installing the AI/AS 1610 on the GC

Figure 33. Centering Plates



3. Check the alignment of the sampling system support, then fix it by tightening the fixing screws.
4. Insert the sample tray into the sampling unit base.
 - **AI 1610** — Insert the 8-position sample tray into the housing of the sampling unit base. See [Figure 34](#).

Figure 34. 8-position Sample Tray



- **AS 1610** — For an AS 1610 with a **105** or **155-position** sample tray, insert the support plate into its housing of the sampling unit base. Place the sample tray on the hub located on the support. The system will recognize the sample tray at instrument power up. See [Figure 35](#) and [Figure 36](#).

Figure 35. Support Plate Installation

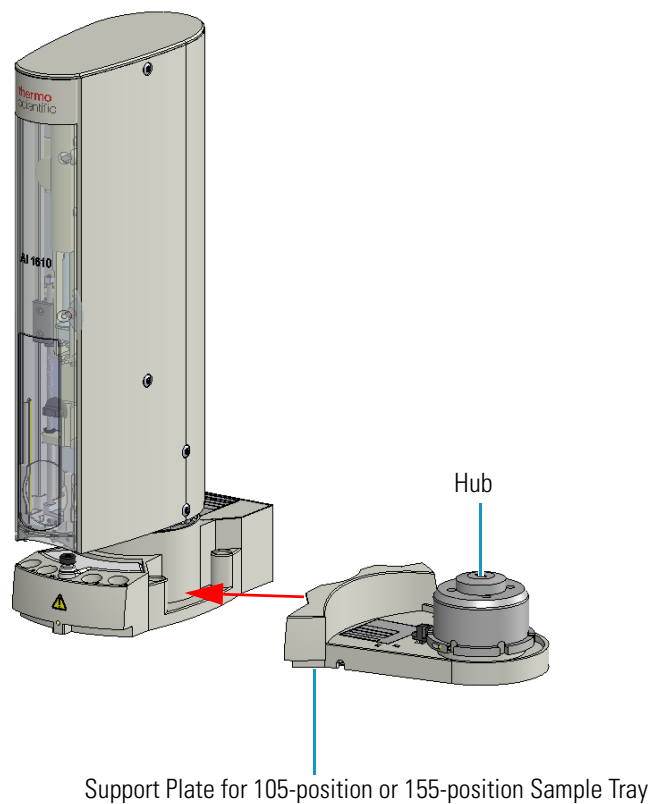
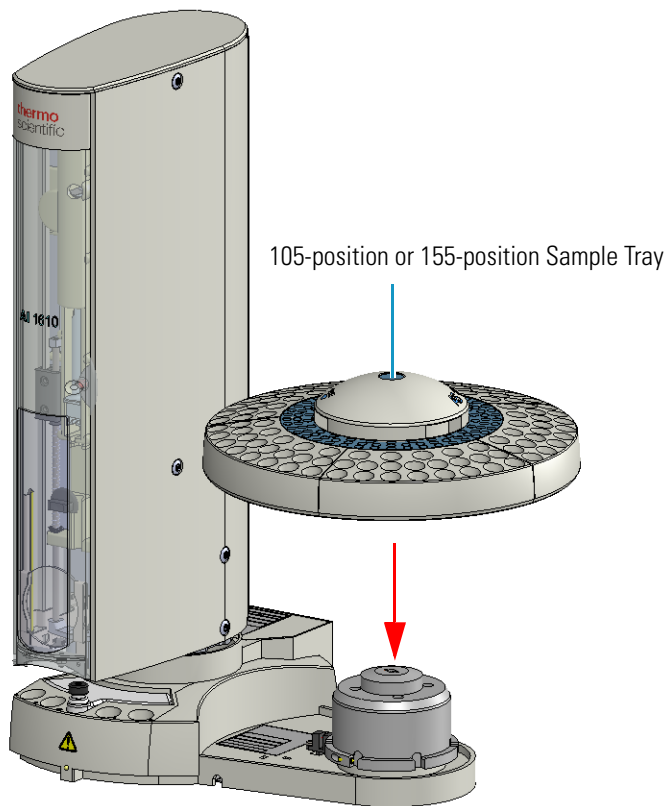


Figure 36. Sample Tray Installation



Installing the Syringe

The installation of the syringe must be performed with caution to avoid damage to the syringe needle and ensure optimal performance of the injection device.

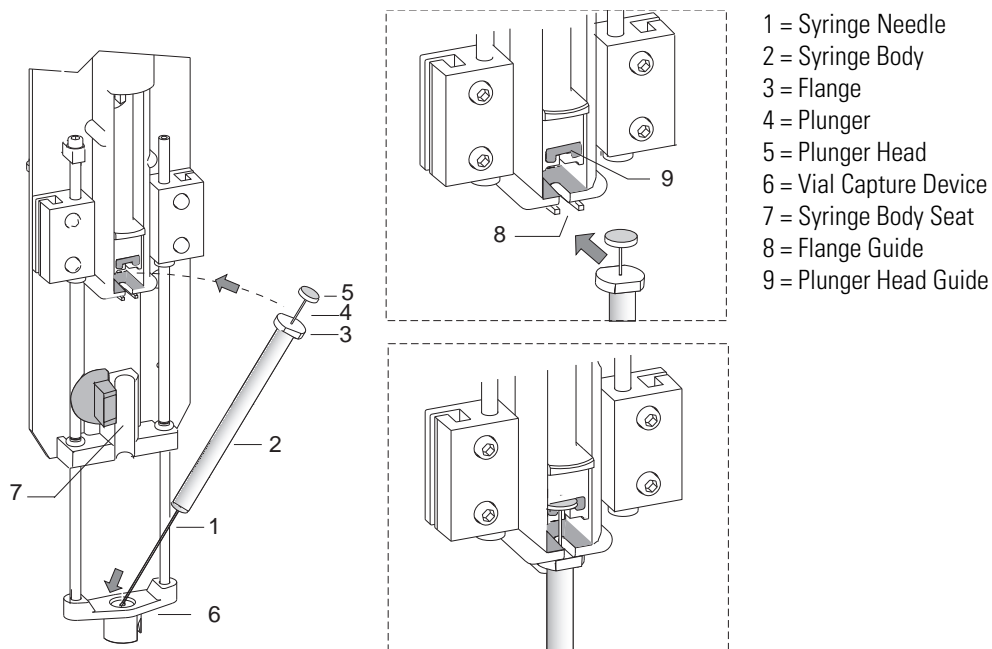
The standard syringe has 10 μL capacity with 50 mm needle length. Syringes with a capacity 0.5 μL , 5 μL , 50 μL , and 100 μL are also available.

Complete the following steps to install the syringe.

❖ **To install the syringe.**

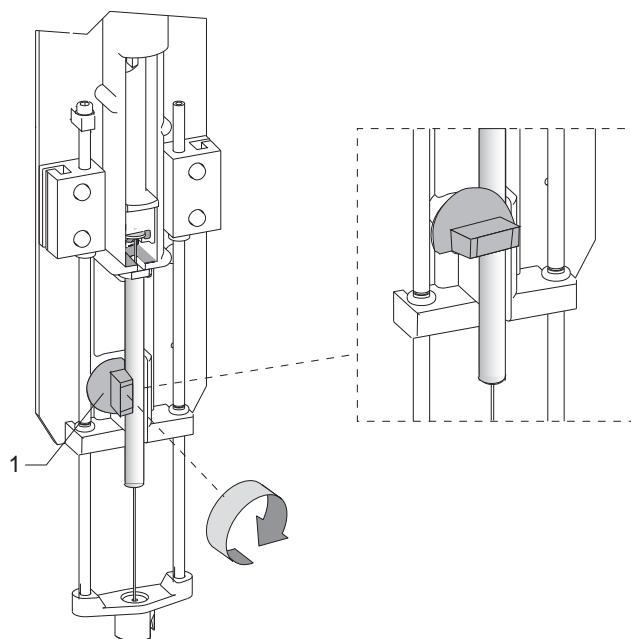
1. Open the safety door of the turret.
2. Insert the syringe needle into the vial capture device. See [Figure 37](#).

Figure 37. Syringe Installation (1)



3. Place the syringe body into its seat and insert the flange and head of the syringe plunger into their guides.
4. Lock the syringe by turning the lock knob clockwise approximately 180°. See [Figure 38](#).
5. Close the safety door.

Figure 38. Syringe Installation (2)



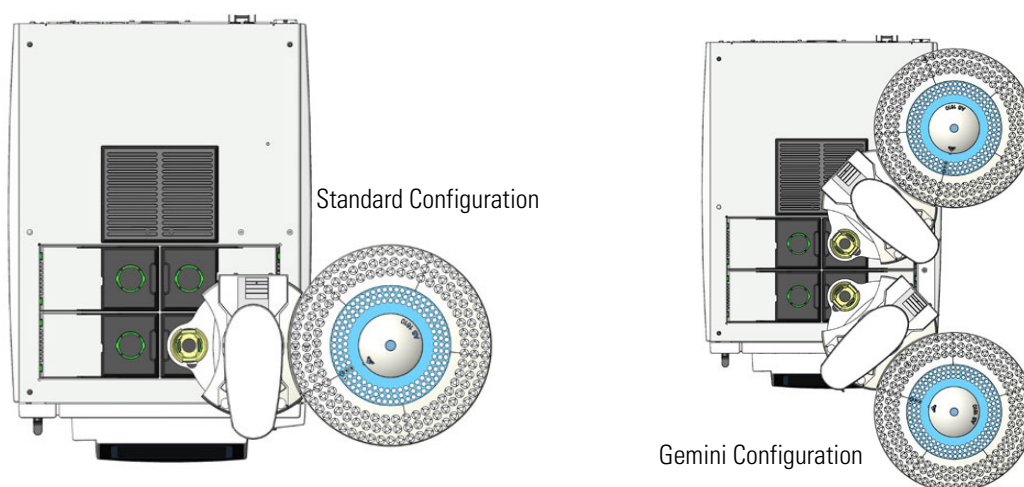
Electrical Connections

The instrument must be powered as listed in “[Technical Specifications](#)” on [page 8](#). Before making any electrical connections, refer to the “[Electrical Requirements](#)” on [page 26](#).

This section provides instructions to connect the AI/AS 1610, in a standard or Gemini configuration, to a TRACE 1600 Series GC.

Note When plugging in Mini Delta cables make sure to align and fully insert the connectors until the retaining clips are securely engaged.

Figure 39. AI/AS 1610 in Standard and Gemini Configurations



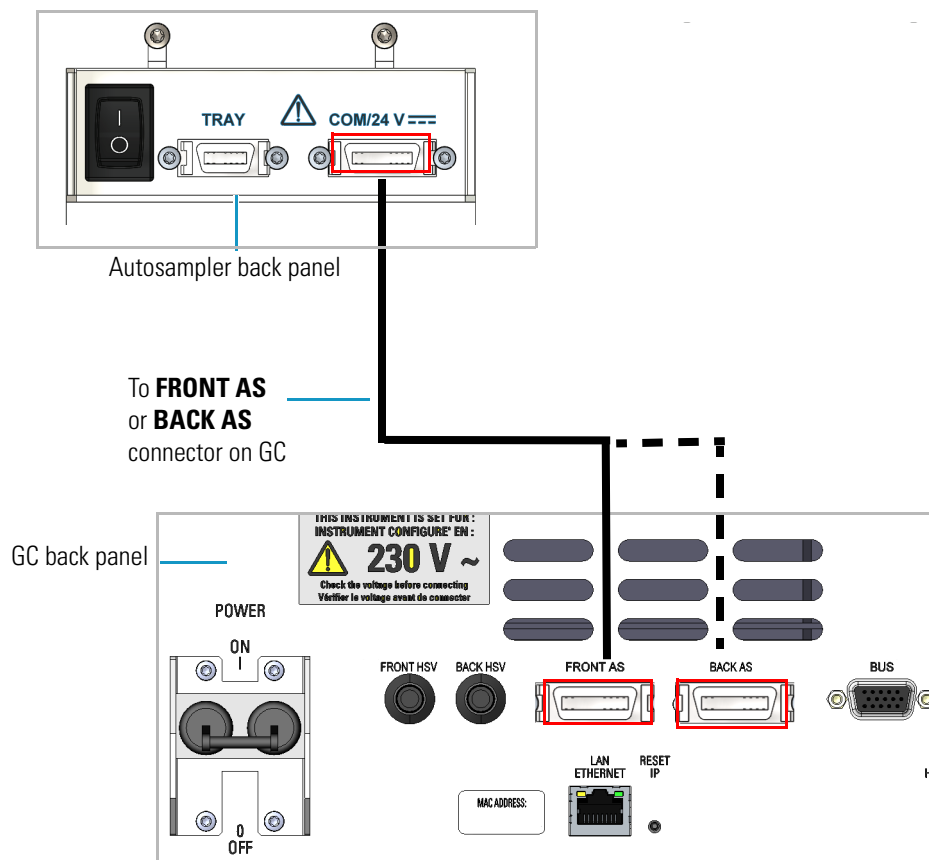
Note Instructions on connecting the AI/AS 1610 to a TRACE 1300 Series GC are provided with the required adapter kit.

Standard Configuration

❖ **To connect a front or back sampling unit to the GC in standard configuration**

1. Using the cable provided, connect the Mini Delta connector from the AI 1610 sampler to the Mini Delta connector on the back of the Trace 1600 Series GC.

Figure 40. Connections Between Front or Back Autosampler and GC



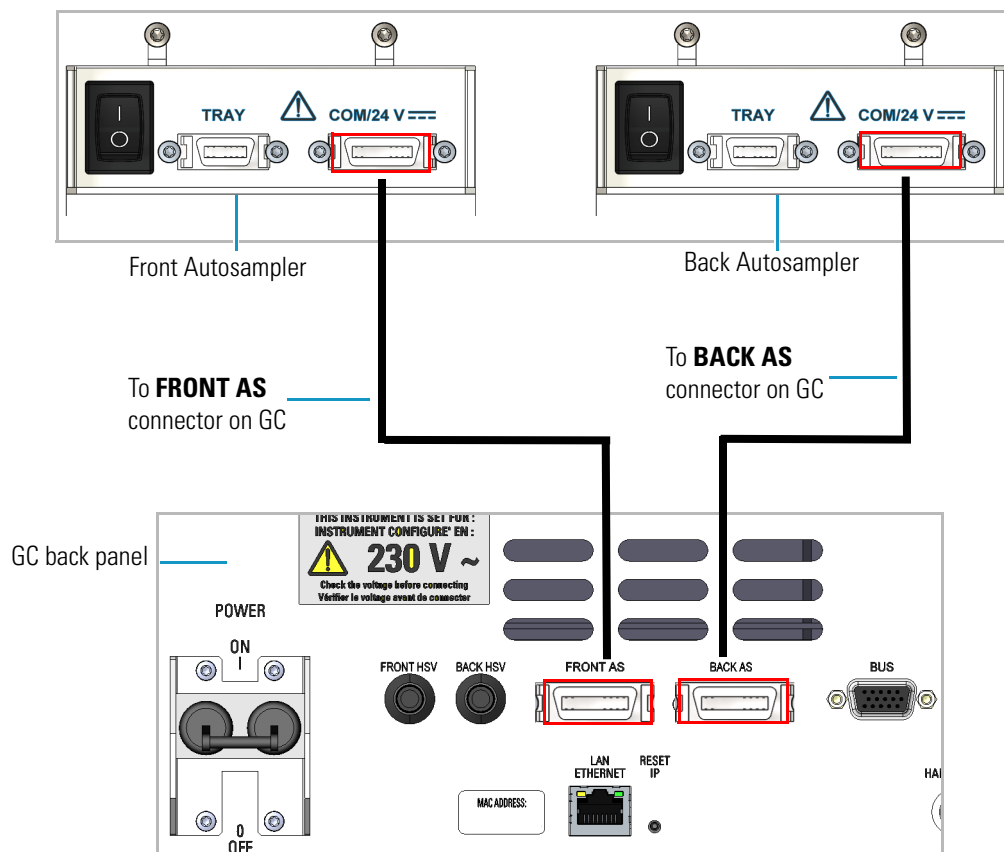
Gemini Configuration

This section provides instructions to connect two AI/AS 1610 sampling units to a Trace 1600 Series GC. See [Figure 41](#) for connector locations.

❖ To connect two sampling units to a GC in Gemini configuration

1. On the front autosampler use the provided cable to connect the COM 24 V connector to the FRONT AS connector on the rear panel of the GC.
2. On the back autosampler use the provided cable to connect the COM 24 V connector to the BACK AS connector on the rear panel of the GC.

Figure 41. Gemini Connections Between Front and Back Autosamplers and GC



In Gemini configuration, the AI/AS 1610 autosampler can work in three operating modes:

- **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** — One AI/AS 1610 autosampler is operating.
- **Confirmation Mode** — Typically, two columns with different stationary phases are installed in parallel, and 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.

Instrument Start-up

1. Connect the Mini Delta port on the AI/AS 1610 to the relevant Mini Delta port on the Trace 1600 Series GC.
2. Turn on the Trace 1600 Series GC and switch on the AI 1610 autosampler.
3. The AI/AS 1610 will automatically run a self-test routine and carry out the following automatic checks and settings:
 - alignment between AI/AS 1610 and the GC injector
 - recognize the installed sample tray
 - calculation of the syringe zero

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

AI/AS 1610 Control

This chapter contains the information for controlling the AI/AS 1610 through the Chromatography Data System. The chapter also contains procedures for working with different injectors.

Contents

- [General Configuration](#)
- [Gemini Configuration](#)
- [Method Parameters](#)
- [Guidelines for Programming with Different Injectors](#)

Control Through the Chromatography Data System

The AI/AS 1610 is controlled through a Thermo Scientific™ Chromatography Data System (CDS) installed on the PC and connected with the instrument via serial line RS 232. The following sections describe how to configure the instrument and set operating parameters.

General Configuration

The autosampler configuration can be set in the user interface, see [Figure 42](#). Click **Get Configuration** to import the current configuration settings. Click **OK** to save any modifications to the settings.

Figure 42. AI/AS 1610 Autosampler General Configuration

The screenshot shows the 'AI/AS 1610 Autosampler Configuration' dialog box with the 'General' tab selected. The 'Device name' field is set to 'Sampler'. Under the 'Communication' section, 'Simulation mode' is unchecked, 'Through GC' is selected with a dropdown menu showing 'FrontAsPort (TRACE 1600 Series GC)', 'Serial COM port' is set to 'COM1', and 'Mounted position' is set to 'Front'. Below this, 'Enable rapid mode' is unchecked, 'Installed sample tray' is set to '155 vials', and 'Missing vial policy' is set to 'Perform fake injection.'. At the bottom, there are four buttons: 'Get configuration', 'Help', 'Save and Close' (highlighted with a blue border), and 'Cancel'.

The General Tab includes the following fields:

Device name — Enter a name for your AI/AS 1610.

Communication

- **Simulation mode** — Check this box to run simulated procedures without communicating with the instrument.
- **Through GC** — When installed on a TRACE Series GC, communication is handled via the GC. Choose the port connecting to the GC: **Front AsPort (TRACE 1600 Series GC)** or **Back AsPort (TRACE 1600 Series GC)**.
- **Serial COM port** — When installed on a TRACE Series GC, communication is handled by a PC.

- **Mounted position** — Select where the autosampler is positioned on the GC. Choose **Front** or **Back**.

Enable rapid mode — Check this box to enable Rapid Mode. Rapid Mode speeds up analysis cycle time by performing pre-injection operations.

Installed sample tray — Displays the type of sample tray in use. **8**, **105**, or **155** vials. The tray configuration is automatically selected by clicking **Get Configuration**.

Missing vial policy — Choose what the AI/AS 1610 should do in the event of a missing vial. Select **Perform fake injection** or **Stop Sequence**.

Injector Configuration

Click **Get Configuration** to import the current configuration settings. Click **OK** to save any modifications to the settings.

Figure 43. AI/AS 1610 Autosampler Injector Configuration

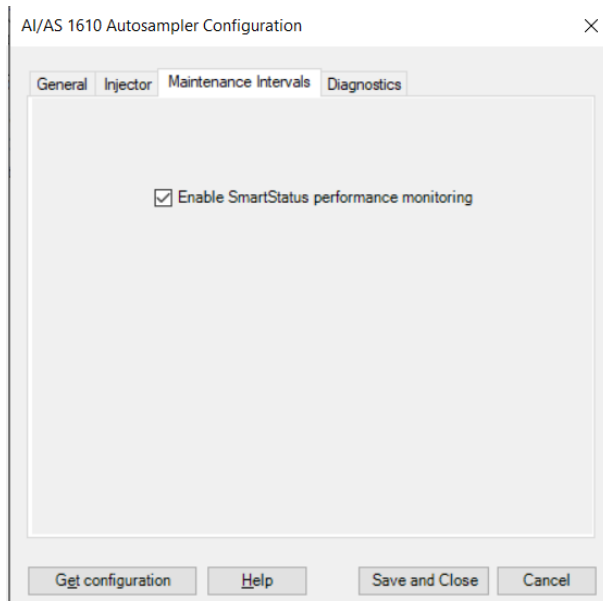
Syringe type (μL)— Choose the type of syringe: **0.5 μL**, **5 μL**, **10 μL**, **10 μL (Teflon tip plunger)**, **50 μL**, or **100 μL**.

GC inlet mode— Choose the GC inlet mode: **SSL**, **PTV**, **PTV_OC**, **TSI**, or **Custom**.

Maintenance Intervals

Click **Get Configuration** to import the current configuration settings. Click **OK** to save any modifications to the settings.

Figure 44. AI/AS 1610 Autosampler Maintenance Intervals Configuration



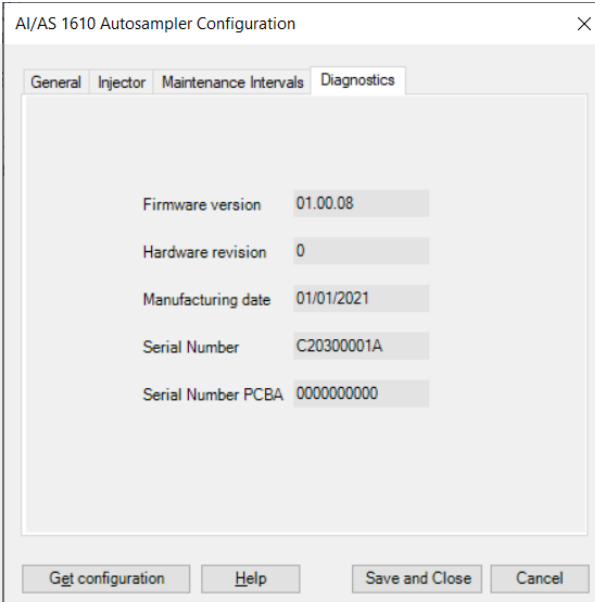
Enable SmartStatus performance monitoring — Check this box to monitor device status. SmartStatus software contains the following instrument health parameters for the AI/AS 1610 autosampler:

- **Syringe Injection Count**—This parameter is the number of injections made by the syringe installed on the AI/AS 1610 autosampler. Default: 500.
- **Syringe Plunger Stroke Count**—This parameter is the number of total plunger strokes made by the AI/AS 1610 for the installed syringe. It includes washes and other strokes as well as injections. The number is calculated at 20 times the number of injections. Default:10,000.

Diagnostic Configuration

Click **Get Configuration** to import the current configuration settings. Click **OK** to save any modifications to the settings.

Figure 45. AI/AS 1610 Autosampler Diagnostic Configuration



The image shows a software dialog box titled "AI/AS 1610 Autosampler Configuration". It has four tabs: "General", "Injector", "Maintenance Intervals", and "Diagnostics". The "Diagnostics" tab is selected. Inside the dialog, there are five input fields with labels and values: "Firmware version" (01.00.08), "Hardware revision" (0), "Manufacturing date" (01/01/2021), "Serial Number" (C20300001A), and "Serial Number PCBA" (0000000000). At the bottom of the dialog, there are four buttons: "Get configuration", "Help", "Save and Close", and "Cancel".

Field	Value
Firmware version	01.00.08
Hardware revision	0
Manufacturing date	01/01/2021
Serial Number	C20300001A
Serial Number PCBA	0000000000

Firmware version— Lists the current firmware version.

Hardware revision— Lists the hardware revision.

Manufacturing date— Shows the date of manufacture.

Serial Number— Lists the autosampler serial number.

Serial Number PCBA— Lists the PCBA serial number.

User Interface

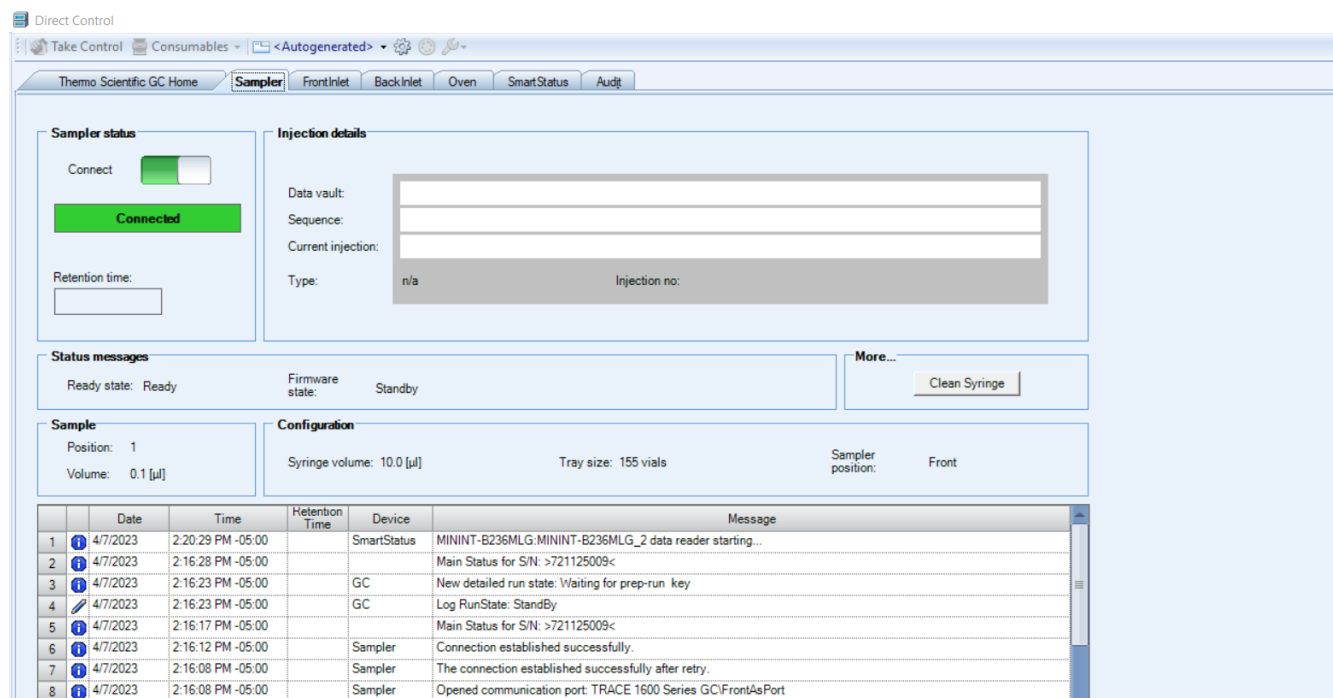
The autosampler parameters can be set in the user interface, see [Figure 46](#). The sequence of samples to be analyzed and acquired is managed by the data system depending on the type of sample tray installed.

In a Gemini high throughput configuration, each sampler is controlled by its own dedicated user interface and two AI/AS method pages will be displayed. The parameters set in each page will be sent to the selected sampler.

ePanel User Interface

The following figure shows the Chromeleon UI.

Figure 46. AI/AS 1610 Autosampler Chromeleon CDS ePanel



Chromeleon displays the following settings:

Sampler Status— Displays the status of sampler. **Connected** or **Not Connected**.

- **Retention Time**—Shows the expected retention time of a component for peak identification.

Injection details

- **Data vault**— File path location of audit trail information.
- **Sequence**— Lists the sequence to run.
- **Current injection**— Lists the current injection.
- **Type**— Displays the injection type and injection number.

Status message— Displays the sampler status. **Ready**, **Not Ready**, **Sequence Running**, or an error code.

Clean syringe—Press this button to perform an automated cleaning cycle.

Sample

- **Position**— Lists the position of the sample in the tray.
- **Volume (μL)**— Lists the volume of sample.

Configuration

- **Syringe volume** (µL)— Displays the syringe volume of the syringe in use.
- **Tray size**— Displays the type of sample tray in use. **8**, **105**, or **155** vials.
- **Sampler position** — Lists where the AI/AS 1610 is located on the GC.

Audit trail— A daily event log that is maintained independently for each instrument. It records all events related to instrument operation, such as system events, pre-run device settings, executed commands, and error messages.

Gemini Configuration

In a Gemini configuration two autosamplers are installed on the front and back GC inlets.

Confirmation Mode

In Confirmation mode a single instrument is configured: the parameters from one autosampler automatically copied and used on the other one. Typically the same sample is placed in two separate vials in the same tray position for both autosamplers. The autosampler parameters are the same for the front and back.

Both autosamplers are managed through a single sequence with two channels, one for each detector.

❖ To configure two autosamplers on a GC in CONFIRMATION mode

1. Open Chromeleon Services Manager and add one AI/AS 1610 Autosampler to the front of the instrument.
2. Select **TRACE 1600 GC** from the Modules column.
3. Select the **Instrument** tab in the TRACE 1600 Series Configuration window.
4. For Autosampler Configuration: select **Confirmation**.

High Throughput Mode

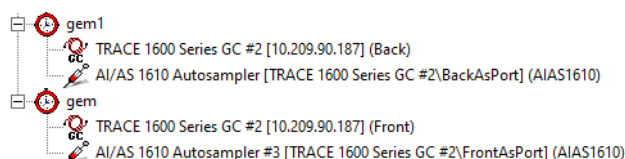
In High Throughput mode two autosamplers are installed on both front and back GC inlets. Both autosamplers need to be configured: the same IP address is assigned to both GCs. Autosampler parameters can be different between front and back.

Samples can be different between front and back. Each autosampler is managed through a separate sequence. Flexible Dual Control allows for separate Autosampler sequences.

❖ **To configure two autosamplers on a GC in HIGH THROUGHPUT mode**

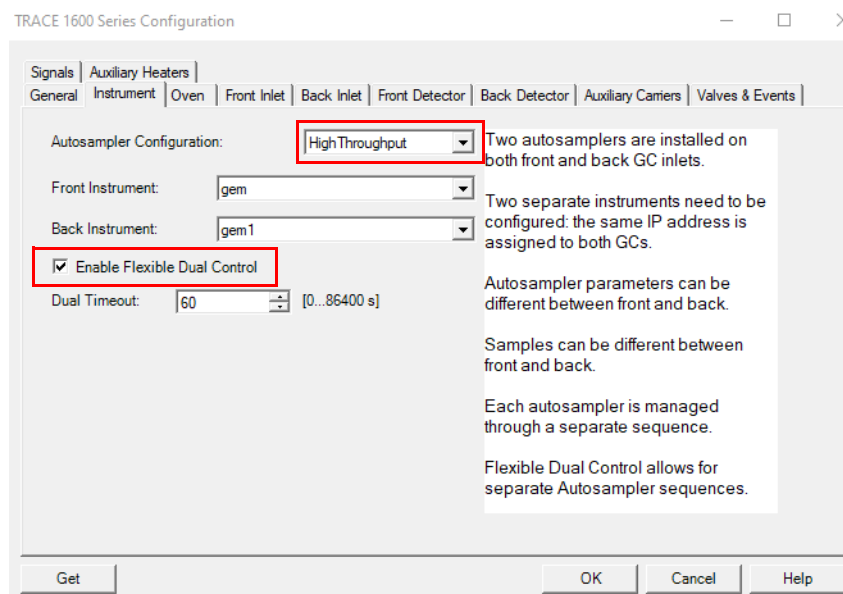
1. Open Chromeleon Services Manager and generate two instruments with the same IP address.
2. Add the autosampler modules to the Instruments and assign each autosampler to the appropriate GC. See [Figure 47](#).

Figure 47. Autosamplers Modules Assigned to the GC



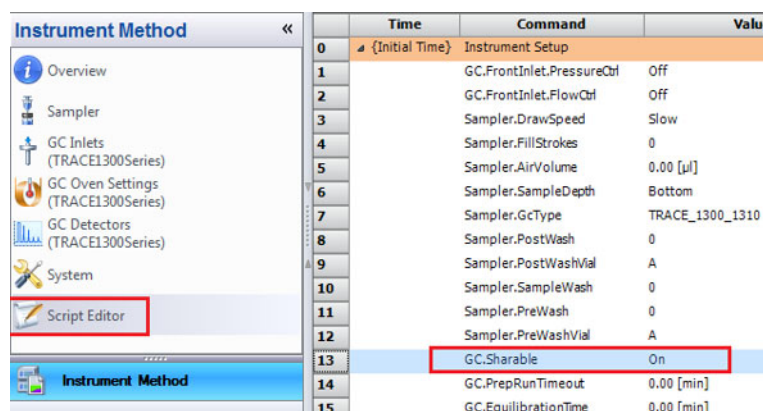
3. Select **TRACE 1600 GC** from the **Modules** column.
4. Select the **Instrument** tab in the TRACE 1600 Series Configuration window.
5. For Autosampler Configuration: select **High Throughput**

Figure 48. High Throughput Configuration



- a. Select the GC associated to the front autosampler.
 - b. Select the GC associated to the back autosampler.
6. Check the **Enable Flexible Dual Control** check box to allow separate sequences, setting a Dual Timeout. If the second sequence doesn't start within the timeout, one single sequence is performed.
 7. Create the methods for both systems.
 8. In the Script Editor for both methods, add a command line and set **GC.Sharable** to **On**. See [Figure 49](#).

Figure 49. Setting GC.Sharable to On in the Script Editor



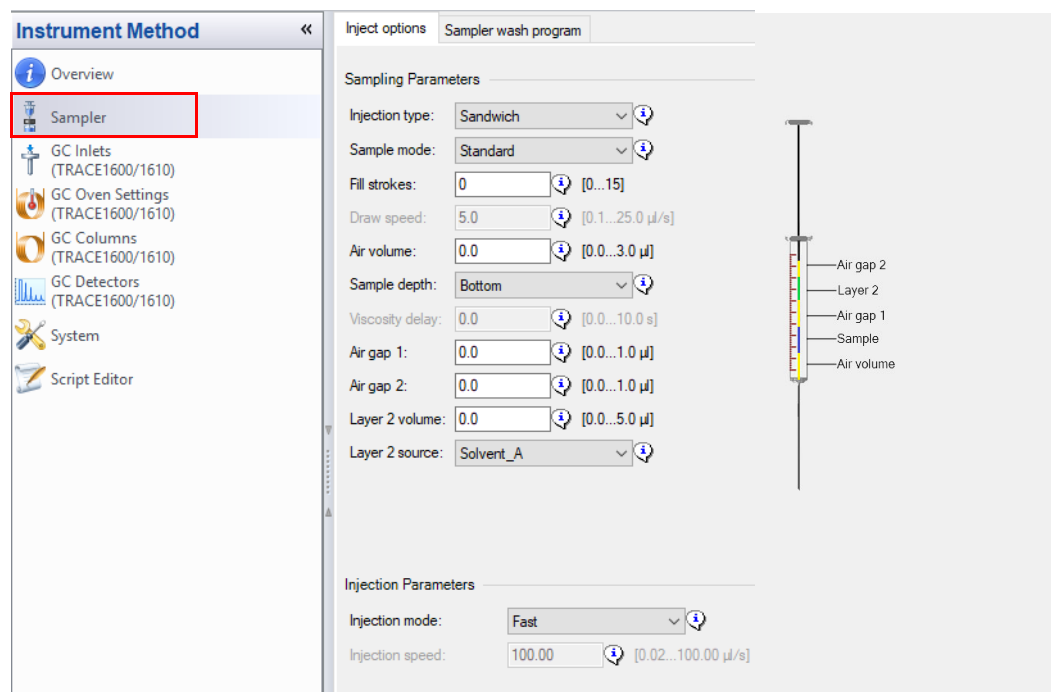
	Time	Command	Value
	0	(Initial Time)	Instrument Setup
	1	GC.FrontInlet.PressureCtrl	Off
	2	GC.FrontInlet.FlowCtrl	Off
	3	Sampler.DrawSpeed	Slow
	4	Sampler.FillStrokes	0
	5	Sampler.AirVolume	0.00 [μl]
	6	Sampler.SampleDepth	Bottom
	7	Sampler.GcType	TRACE_1300_1310
	8	Sampler.PostWash	0
	9	Sampler.PostWashVial	A
	10	Sampler.SampleWash	0
	11	Sampler.PreWash	0
	12	Sampler.PreWashVial	A
	13	GC.Sharable	On
	14	GC.PreRunTimeout	0.00 [min]
	15	GC.EquilibrationTime	0.00 [min]

Method Parameters

Edit an autosampler method using the following parameters:

Sampling Parameters

Figure 50. Injection Options



Instrument Method << | Inject options | Sampler wash program

Overview | **Sampler** | GC Inlets (TRACE1600/1610) | GC Oven Settings (TRACE1600/1610) | GC Columns (TRACE1600/1610) | GC Detectors (TRACE1600/1610) | System | Script Editor

Sampling Parameters

- Injection type: Sandwich
- Sample mode: Standard
- Fill strokes: 0 [0...15]
- Draw speed: 5.0 [0.1...25.0 μl/s]
- Air volume: 0.0 [0.0...3.0 μl]
- Sample depth: Bottom
- Viscosity delay: 0.0 [0.0...10.0 s]
- Air gap 1: 0.0 [0.0...1.0 μl]
- Air gap 2: 0.0 [0.0...1.0 μl]
- Layer 2 volume: 0.0 [0.0...5.0 μl]
- Layer 2 source: Solvent_A

Injection Parameters

- Injection mode: Fast
- Injection speed: 100.00 [0.02...100.00 μl/s]

Diagram: A vertical syringe diagram showing the injection sequence from top to bottom: Air gap 2, Layer 2, Air gap 1, Sample, and Air volume.

Injection type— The options are: **Standard** or **Sandwich**.

Sample mode — The options are: **Custom**, **Standard**, or **Viscous**.

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.

Draw speed — The draw speed is determined by the sample mode parameter. If **Custom** mode is selected, the draw speed is programmable. For Custom mode enter a draw speed between 0.1-25 µl/s.

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 depends on the syringe volume.

Sample depth — Select how deep the needle descends into the vial when drawing the sample for injection. The options are: **Bottom** (33 mm) or **Half** (17.5 mm).

Viscosity delay — This parameter is enabled for **Viscous** sample mode. Set the delay after sample aspiration. Enter a value between 0 to 10 seconds.

Air gap 1—This parameter is enabled for **Sandwich** injections. Specify the gap between the two layers. Enter a volume based on the syringe selected.

Air gap 2—This parameter is enabled for **Sandwich** injections. Specify the gap between the first layer and the plunger. Enter a volume based on the syringe selected.

Layer 2 volume—This parameter is enabled for **Sandwich** injections. Set the volume of the layer closest to the plunger. Enter a volume based on the syringe selected.

Layer 2 source—Choose from a range of **Solvent_A** to **Sample_155**.

Injection Parameters

Injection mode — The options are: **Custom**, **Fast**, or **Slow**.

Injection speed— The injection speed is determined by the injection mode parameter. If **Custom** mode is selected, the parameter is programmable.

Injector	Injection Depth	Penetration Speed
SSL	40 mm	400 mm/s
PTV	40 mm	400 mm/s
PTV-OC	43 mm	5.0 mm/s
TSI	40 mm	400 mm/s

Pre-inj. delay time (s)— Enter the time in seconds the syringe needle is held in the inlet before the injection of sample.

Set the wait time from 0 to 63 seconds. A delay of more than a few seconds, the needle preheats, which makes a Hot Needle Injection.

Post-inj. delay time (s)— Enter a time in seconds when the syringe is held in after the injection of the sample.

Set the wait time from 0 to 63 seconds. A delay of more than a few seconds will heat the needle with the possible effect of driving heavier analytes that have condensed in the needle out.

Note Pre-inj. and Post-inj. delay time parameters are enabled when PTV-OC, TSI or Custom are selected in the **Injector** configuration page

Pre Injection Washing Parameters

Figure 51. Sampler Wash Parameters

Inject options **Sampler wash program**

Pre Injection Washing Parameters

Pre-injection wash cycles: 0 [0...15]

Pre-injection solvent wash volume: 0.0 [0.0...8.0 µl]

Pre-injection wash vial 1: None

Pre-injection wash vial 2: None

Pre-injection wash vial 3: None

Pre-injection wash vial 4: None

Sample Washing Parameters

Sample wash cycles: 0 [0...15]

Sample wash volume: 0.0 [0.0...8.0 µl]

Post Injection Washing Parameters

Post injection wash cycles: 0 [0...15]

Post-injection solvent wash volume: 0.0 [0.0...8.0 µl]

Post-injection wash vial 1: None

Post-injection wash vial 2: None

Post-injection wash vial 3: None

Post-injection wash vial 4: None

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

Pre-injection solvent wash volume— Enter the solvent wash volume based on the syringe selected.

Pre-injection wash vial 1— Specifies which vials are used for the first washing of the syringe before the injection with the solvents. The options are: **Solvent_A**, **Solvent_B**, **Solvent_C**, **Solvent_D**, or **None**.

Pre-injection wash vial 2— Specifies which vials are used for the second washing of the syringe before the injection with the solvents. The options are: **Solvent_A**, **Solvent_B**, **Solvent_C**, **Solvent_D**, or **None**.

Pre-injection wash vial 3— Specifies which vials are used for the third washing the of the syringe before the injection with the solvents. The options are: **Solvent_A**, **Solvent_B**, **Solvent_C**, **Solvent_D**, or **None**.

Pre-injection wash vial 4— Specifies which vials are used for the fourth washing of the syringe before the injection with the solvents. The options are: **Solvent_A**, **Solvent_B**, **Solvent_C**, or **Solvent_D**.

Sample Washing Parameters

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

Sample wash volume—Enter a sample wash volume based on the syringe selected and the sample volume.

Post Injection Washing Parameters

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

Post-injection solvent wash volume— Enter the solvent wash volume based on the syringe selected.

Post-injection wash vial 1— Specifies which vials are used for the first washing of the syringe after the injection with the solvents. The options are: **Solvent_A**, **Solvent_B**, **Solvent_C**, **Solvent_D**, or **None**.

Post-injection wash vial 2— Specifies which vials are used for the second washing of the syringe after the injection with the solvents. The options are: **Solvent_A**, **Solvent_B**, **Solvent_C**, **Solvent_D**, or **None**.

Post-injection wash vial 3— Specifies which vials are used for the third washing of the syringe after the injection with the solvents. The options are: **Solvent_A**, **Solvent_B**, **Solvent_C**, **Solvent_D**, or **None**.

Post-injection wash vial 4— Specifies which vials are used for the fourth washing of the syringe after the injection with the solvents. The options are: **Solvent_A**, **Solvent_B**, **Solvent_C**, or **Solvent_D**.

Error Messages

This section lists the status and error messages that the computer may display according to the status of the AI/AS 1610.

- AI/AS 1610 error, solvent not found
- AI/AS 1610 position error, cannot find the initial zero positions

Guidelines for Programming with Different Injectors

To get the best results from your AI/AS 1610, follow these guidelines when programming the sampler method according to the injector in use:

- [SSL Inlet](#)
- [PTV Inlet](#)
- [TSI Inlet](#)
- [Custom Inlet](#)

SSL Inlet

The AI/AS 1610 uses a liquid band technique to inject into the SSL inlet. The needle penetrates almost its whole length without a pre- and post-dwell time to avoid any possible heating, while injecting deep into the liner.

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

[Table 3](#) lists injection parameters and conditions for SSL techniques. The type of liner and the column insertion inside the inlet are also listed.

Table 3. SSL Injection Parameters and Conditions (Sheet 1 of 2)

Mode	Technique	Column Insertion	Liner Type	AI/AS 1610 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 PN 453A2265	Injection depth = 40 mm

Table 3. SSL Injection Parameters and Conditions (Sheet 2 of 2)

Mode	Technique	Column Insertion	Liner Type	AI/AS 1610 Injection Parameters
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 PN 453A1925	Injection depth = 40 mm
SSL Nano-Volumes ¹	Cold Needle	10 mm in Split 5 mm in Splitless	SSL liner, Split/Splitless Focus/Precision Liner, 4 mm ID x 6.3 mm OD x 78.5 mm Length, Glass wool	Injection depth = 40 mm

¹ Only with 0.5 µL syringe.

Nano-Volume Injections in TRACE 1600 Series GC SSL Inlet

❖ To create a nano-volume method

1. Enter the AI/AS 1610 method page.
2. Set the autosampler parameters.
 - The desired volume must be set in microliters (1 µL = 1000 nL).
 - The Data System will let you choose a volume between 0.010 µL (10 nL) and 0.5 µL in steps of 0.010 µL.
 - Set **Sample Mode** to **Viscous**.
 - Always set the **Viscous** parameter to **Yes** when using the 0.5 µL syringe.
 - 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.
3. Save the method.

Note For Nano Volume injections, injecting the sample directly on the glass wool into the liner is highly recommended.

PTV Inlet

Since the PTV is cold during sample introduction, the syringe needle is not heated during the injection.

The injection depth in the PTV injector is optimized at a fixed value to obtain the fastest sample evaporation. When the PTV on-column mode is used, Pre- and a Post-injection Delay time parameters are available. See [Table 4](#).

Table 4. PTV Injection Parameters and Conditions

Injector	Column Insertion	AI/AS 1610 Injection Parameters
Programmed Temperature Vaporizing Injector (PTV)	30 mm	Injection depth = 40 mm Penetration speed = 400 mm/s
Programmed Temperature Vaporizing Injector On-Column Mode (PTV On-Column)	Until mechanical stop	Injection Depth = 43 mm Penetration Speed = 5 mm/s Pre and Post Inject Delay Time = variable, (suggested 1-2 s)

Note In order to guarantee long-life performance of the Merlin Microseal™ it is recommended to use syringes with a 23 gauge needle and cone shape tip. Please refer to the *AI/AS 1610 Spare Parts Guide* for part number information.

TSI Inlet

The degradation of thermolabile compounds, caused by the contact with hot surfaces, is minimized as in the thermospray technique the evaporation of the sample occurs from floating droplets. Sample is injected through **Hot Empty Needle** technique, that means needle is kept into the injector a few seconds, before pushing the syringe piston to eject the liquid sample. During this time needle becomes hot, and when the sample is ejected the evaporation starts as soon as sample pass through the hot needle.

Table 5. TSI Injection Parameters and Conditions

Mode	Technique	Column Insertion	Liner Type	AI/AS 1610 Injection Parameters
Split	Hot Needle	30 mm	Split liner (P/N 45350030-UI)	Injection depth = 40 mm
Splitless	Hot Needle	64 mm	Splitless liner (P/N 45350033-UI)	Injection depth = 40 mm

Custom Inlet

A custom inlet injector allows for maximum flexibility, regardless of the injector or injection technique.

Maintenance

This chapter describes basic maintenance procedures you can perform on the AI/AS 1610.

Contents

- General Maintenance
- Emptying of the Waste Container
- Cleaning of the Sample Tray Accessory
- Cleaning the Instrument Externally
- Replacing the Syringe
- Cleaning the Syringe
- Moving the Sampling Unit Away from the Injector Module

General Maintenance

The AI/AS 1610 does not generally require maintenance, except emptying of the waste container when full, cleaning of the sample tray and replacing the syringe. For any other operation, contact Thermo Fisher Scientific Technical Service.



WARNING Before you start, if you plan to use hazardous substances (toxic, harmful, etc.), read the hazard indications and information reported in the applicable Material Safety Data Sheet (MSDS). Use personal protection according to safety requirements.

AVERTISSEMENT Avant de commencer, si vous prévoyez d'utiliser des substances dangereuses (toxiques, nocives, etc.), lisez les indications sur les dangers et les informations figurant sur les Fiche de données de sécurité (FDS) applicables. Utilisez des équipements de protection individuelle conformément aux exigences de sécurité.

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 use of the AI/AS 1610 can cause the exterior to get dirty.



WARNING You are responsible for keeping dangerous liquids and materials from seeping inside the AI/AS 1610 during operation and maintenance. Solvents should not be used. Do not spray on electrical parts



AVERTISSEMENT Vous êtes responsable d'empêcher l'écoulement des liquides et produits dangereux à l'intérieur de l'AI / AS 1610 pendant l'utilisation et la maintenance. N'utilisez pas de solvants. Ne pulvérisez pas les pièces électriques.

❖ **To clean the instrument externally**

1. Power off the AI/AS 1610.
2. Clean the exterior of the instrument with a soap and water solution, or with a household non-abrasive product.
 - Pay special attention when cleaning the back of the instrument. Do not spray, but clean using a cloth moistened with the same substance.
 - Ensure the cleaning solution does not seep 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 for analysis has penetrated inside the instrument, immediately shut down the instrument and call an authorized customer support engineer.

Fully inform the service engineer about the nature of the substance. If a hazardous material is spilled on or in the instrument, clean the spill according to the procedures listed in the Material Data Sheet for that substance. Dry with a clean cloth.
3. Power on the AI/AS 1610.

Replacing the Syringe

Replacing the syringe is not a complicated process. However, it must be performed with caution to avoid damaging the syringe needle and ensure optimal performance of the injection device. The standard syringe has 10 µL capacity with 50 mm needle length.

❖ **To replace the syringe**

You can carry out this task when the instrument is either On or Off.

1. Open the safety door of the turret.
- Note** If the instrument is On, the power is immediately cut off.
2. Turn the syringe locking knob 180° counterclockwise.
 3. Gently take out the syringe plunger head and flange from their 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 the new syringe.
 6. Insert the syringe needle into the vial capture device.
 7. Put the syringe body into its seat, paying attention to simultaneously introduce the syringe plunger flange and head into their 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 powered 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.
5. Perform a manual maintenance routine every 1000 injections.

Moving the Sampling Unit Away from the Injector Module

To perform maintenance on an injector module, you must move the sampling system away from the GC.

Front/Back Configuration

1. Power off the AI/AS 1610.
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 injector module maintenance is complete, place the sampling unit on the injector module.

5. Reinsert the centering plate into its seat of the sampling unit base. Ensure that the guide hole on the arm of the centering plate correctly fits the injector nut.

Gemini Configuration

1. Power off the AI/AS 1610.
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 injector module maintenance is complete, place the sampling unit on the injector module.
6. Reinsert the centering plate into its seat of the sampling unit base. Ensure that the guide hole on the arm of the centering plate correctly fits the injector nut.
7. Reinsert the sample tray into its seat on 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

