



Thermo Scientific

AI 3000 / AS 3000 AI 3000 / AS 3000 II

3000 Series Automatic Sampling System

Operating Manual

P/N 31709392, Tenth Edition, March 2012

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(*) Note: The seventh edition of this manual considers the AI 3000/AS 3000 II automatic sampling system.

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Examples of operation are clear and useful.	1	2	3	4	5
The figures are helpful.	1	2	3	4	5
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Each EU Member State has own regulations regarding the application of these directives. Please refer to the regulations in force in your country.

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Preface

This manual contains descriptions of the features and components of the AI 3000/AS 3000 II sampling systems. Inside, you will find all of the information necessary for routine operation of your sampling system. This includes operating procedures, sample injection techniques, and diagrams and descriptions of the major components.

This manual is organized as follows:

- [Chapter 1, “Introduction,”](#) provides a basic overview of the features and options of the AI 3000/AS 3000 II System. It also describes the available instrument configurations.
- [Chapter 2, “Sampling Unit,”](#) provides a description of the components of the sampling unit of the AI 3000/AS 3000 II System.
- [Chapter 3, “Installation,”](#) contains the instructions for the installation of the AI 3000/AS 3000 II on the TRACE 1300/TRACE 1310, TRACE GC Ultra and FOCUS GC gas chromatographs, the syringe and the electrical connections with the different units of the gas chromatographic system.
- [Chapter 4, “AI 3000/AS 3000 II Control,”](#) provides the information to control the AI 3000/AS 3000 II from the computer or the GC. The chapter contains also the working procedures with different injectors.
- [Chapter 5, “Maintenance,”](#) provides guidelines for the maintenance of the AI 3000/AS 3000 II.
- [Abbreviations](#) contains definitions of terms used in this manual. This also includes abbreviations, acronyms, metric prefixes, and symbols.
- [Index](#) contains an alphabetical list of key terms and topics in this guide, including cross references and the corresponding page numbers.

About Your System



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

WARNING When, for technical reasons, it is necessary to work on instrument parts which may involve an hazard (moving parts, components under voltage, etc.) the authorized Technical Service must be contacted. This type of situations can be identified because access to these parts is possible only by using a tool. The removable protective covers bear a warning symbol suggesting to refer to the documentation accompanying the instrument. Should an operator perform a maintenance operation, he/she must have received proper training to carry out that specific action.

WARNING Before using dangerous substances (toxic, harmful, etc.), 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. The AI 3000/AS 3000 II sampling system requires the use of several chemical products, which are present in vials and syringes, having different hazard characteristics. Before using these substances or replacing the syringe, please read the hazard indications and information reported in the Safety Sheet supplied by the manufacturer referring to the relevant CAS (Chemical Abstract Service) number.

Environmental Conditions

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

Rating

AI 3000/AS 3000 II Automatic Sampling System

- 24 Vdc through a portable external power supply
 - input 90-264 Vac; 47/63 Hz — output 24 Vdc; 70 W

Contacting Us

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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 xv](#)) 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 xv](#)) 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:

	BIOHAZARD. This symbol indicates that a biohazard <i>will, could, or may</i> occur.
	BOOTS REQUIRED. This symbol indicates that you must wear boots when performing a task or else physical injury <i>could</i> or <i>may</i> occur.
	BURN HAZARD. This symbol indicates a hot surface <i>could, or may</i> incur burn injuries.
	CLOTHING REQUIRED. This symbol indicates that you should wear a work clothing when performing a task or else physical injury <i>could</i> or <i>may</i> occur.
	ELECTRICAL SHOCK HAZARD. This symbol indicates that an electrical shock hazard <i>could, or may</i> occur.
	EXPLOSION HAZARD. This symbol indicates an explosion hazard. This symbol indicates this risk <i>could</i> or <i>may</i> cause physical injury.
	FIRE HAZARD. This symbol indicates a risk of fire or flammability, or that fire/flammability damage <i>will, could, or may</i> occur.
	FLAMMABLE GAS HAZARD. This symbol 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>may</i> cause physical injury.
	GLOVES REQUIRED. This symbol indicates that you must wear gloves when performing a task or else physical injury <i>could</i> or <i>may</i> occur.
	HAND AND CHEMICAL HAZARD. This symbol indicates that chemical damage or physical injury <i>will, could, or may</i> occur.
	HARMFUL. This symbol indicates that the presence of harmful material <i>will, could, or may</i> occur.
	INSTRUMENT DAMAGE. This symbol indicates that damage to the instrument or module <i>may</i> occur. This damage may not be covered under the standard warranty.

	LIFTING HAZARD. This symbol indicates two or more people are required to lift the object to prevent a physical injury, which <i>could</i> or <i>may</i> occur.
	MATERIAL AND EYE HAZARD. This symbol indicates that eye damage <i>will</i> , <i>could</i> , or <i>may</i> occur. Eye protection must be worn.
	RADIOACTIVE HAZARD. This symbol indicates that the presence of radioactive material <i>could</i> , or <i>may</i> occur.
	READ MANUAL. This symbol alerts you to carefully read your instrument's operational instructions before usage to ensure your safety and the instrument's operational ability. Failing to carefully read the instructions <i>could</i> or <i>may</i> put you at risk for a physical injury.
	TOXIC SUBSTANCES HAZARD. This symbol indicates that exposure to a toxic substance <i>will</i> , <i>could</i> , or <i>may</i> cause personal injury or death.
	This is the general warning symbol that the ISO 3864-2 standard refers to as the general warning signal to prevent personal injury. It is a triangle with an exclamation mark that precedes the WARNING safety alert word. In the vocabulary of ANSI Z535 signage, this symbol indicates a possible personal injury hazard exists if the instrument is improperly used or if unsafe actions occur. We use this symbol and another appropriate safety symbol to alert 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 3000/AS 3000 II. 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

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

Symbol	Description
* 	On (Supply)
* 	Off (Supply)
	Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION (Equivalent to Class II of IEC 536)
* 	Instruction manual symbol affixed to product. Indicates that the user must refer to the manual for specific WARNING or CAUTION information to avoid personal injury or damage to the product.
	Caution, risk of electric shock
* 	Caution, hot surface
* 	Caution, biohazard
	In-position of a bistable push control
	Out-position of a bistable push control
* 	Jack socket
* 	Symbol in compliance to the Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE) placed on the european market after August, 13, 2005.

Introduction

This chapter provides a basic overview of the features and options of the AI 3000/AS 3000 II. It also describes the available instrument configurations.

Contents

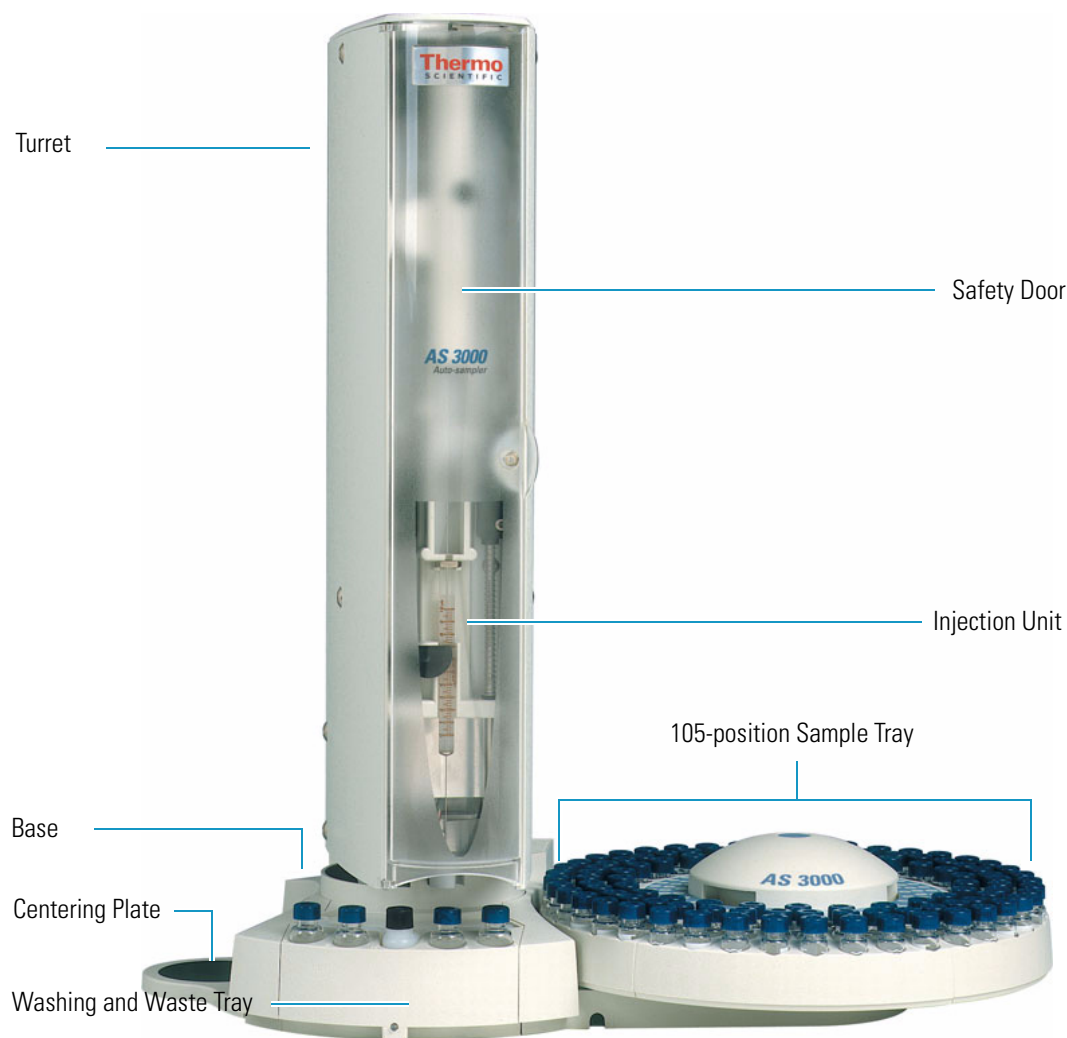
- [The AI 3000/AS 3000 II Sampling System](#)
- [Configurations of the 3000 Series Automatic Sampling System](#)
- [Technical Specifications](#)

The AI 3000/AS 3000 II Sampling System

The 3000 Series Automatic Sampling System, available as AI 3000 or AS 3000, consists of the following parts, as respectively shown in [Figure 1](#) and [Figure 2](#).

Figure 1. AI 3000 Auto-injector



Figure 2. AS 3000 Auto-sampler

Sampling Unit

The sampling unit consists of the following major components:

Base

This is the structure bearing the sampling unit components.

Turret

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

Injection Assembly

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

Washing and Waste Tray

It allows to accommodate up to four 4 mL vials of solvents to wash the syringe, and a 50 mL plastic container to collect the washing solvents after their use.

Centering Plate

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

Sample Tray

It contains the seats for the sample vials. Each position is numbered to make the sample identification easy. The following options are available:

- **AI 3000 Auto-injector** — sample tray consisting of an 8-position fixed support.
- **AS 3000 Auto-sampler** — sample holding assembly consisting of a 105-position turnable mobile tray mounted on a dedicated support plate.

Sampler Support

It constitutes the supporting base allowing to install the autoinjector/sampler on the gas chromatograph.

User Interface

The functions of the AI 3000/AS 3000 II can be controlled through:

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

For further information, please refer to:

- [“Configurations of the 3000 Series Automatic Sampling System” on page 5](#)
- [Chapter 2, “Sampling Unit.” on page 9](#)
- [Chapter 4, “AI 3000/AS 3000 II Control,” on page 55](#)

Configurations of the 3000 Series Automatic Sampling System

The AI 3000/AS 3000 II can be installed on the TRACE 1300/TRACE 1310, TRACE GC Ultra, or FOCUS GC gas chromatographs for sample introduction into the following injectors:

- TRACE 1300/TRACE 1310: S/SL, PTV, PTVBKF
- TRACE GC Ultra: S/SL, PTV, PKD, PPKD
- FOCUS GC: S/SL

The autoinjector/sampler is available in the following options:

- [AI 3000 Auto-injector Configuration](#)
- [AS 3000 Auto-sampler Configuration](#)
- [Gemini Configuration](#)

AI 3000 Auto-injector Configuration

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

Figure 3. AI 3000 Auto-injector Configuration

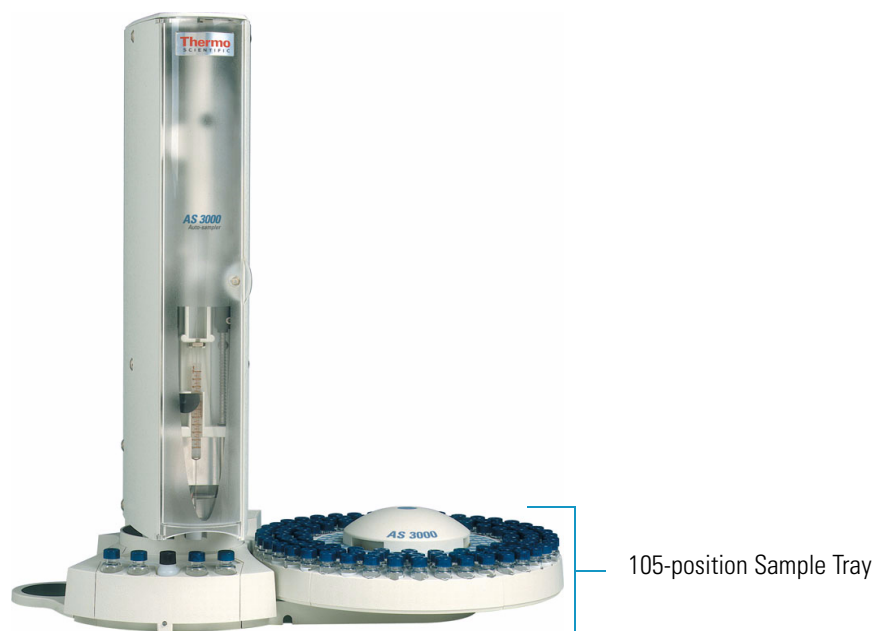


As a function of the configuration of installation, right or left, the support will be introduced into the relevant side housing on the base of the sampling unit. On the opposite side housing, the centering plate will be positioned.

AS 3000 Auto-sampler Configuration

In this configuration the 105-position sample tray is used, mounted on the hub provided on the dedicated support plate.

Figure 4. AS 3000 Auto-sampler Configuration



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

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

Gemini Configuration

Consists of the installation of two AI 3000/AS 3000 II on the same GC.

Note Gemini configuration is not possible with the FOCUS GC.

- With the TRACE 1300/TRACE 1310 — the samplers are installed on the right side, one on the front injector module and the other on the back injector module.
- With the TRACE GC Ultra — one sampler is installed on the left side of the GC, and the other is installed on the right side.

Each autosampler operates simultaneously on its own relevant injector. In this configuration, both autosampler are ready to inject the sample simultaneously, according to the programmed method that is the same for both.

Installation

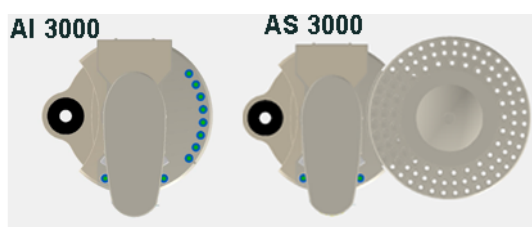
The AI 3000/AS 3000 II can be installed on the right or left side of the GC according to the following indications:

Right configuration

The right configuration, see [Figure 5](#), is the default configuration for all the GC units.

Note The right configuration is the only one possible on the TRACE 1300/TRACE 1310 and FOCUS GC.

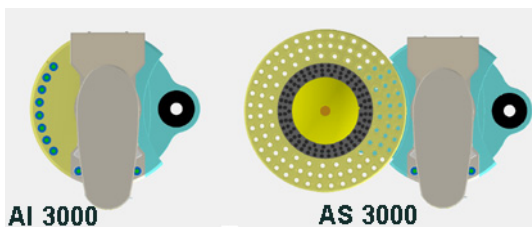
Figure 5. Right Configuration



Left Configuration

The left configuration, see [Figure 6](#), is only possible with the TRACE GC Ultra. The installation of the AI 3000/AS 3000 II requires a dedicated metal support on the base of the sampler support.

Figure 6. Left Configuration



WARNING If an existing AI 3000 auto-injector will be upgraded to AS 3000 auto-sampler, it is very important to switch off the AI 3000 before to install the 105 sample tray and plug-in its electrical cable. This recommendation will prevent a possible driver failure on AI 3000's pcb.

Gemini Configuration

Two AI 3000/AS 3000 II are installed on the same TRACE 1300/TRACE 1310 or TRACE GC Ultra by using their own dedicated supports. Refer to [“Sampling System Support”](#) on [page 23](#).

Technical Specifications

Technical specification of the AI 3000/AS 3000 II are listed in [Table 1](#).

Table 1. Technical Specifications

Sample tray capacity	<ul style="list-style-type: none"> 8 vials in the AI 3000 configuration 105 vials in the AS 3000 configuration
Vials capacity	0.3 and 2 mL (standard) with both 8- and 105-position trays
Flushing solvents	4 vials of 4 mL
Waste container capacity	50 mL
Types of syringes	<ul style="list-style-type: none"> 10 μL syringe (standard) 10 μL syringe for Merlin Microseal Valve (optional) 5 μL syringe (optional) 0.5 μL syringe for Nano-volumes injections (optional)
Volumes programming (μ L)	<ul style="list-style-type: none"> 0 to 5 μL (10 μL syringe) with increments of 0.1 μL 0 to 2.5 μL (5 μL syringe) with increments of 0.1 μL 0 to 0.5 μL (0.5 μL syringe) with increments of 0.01 μL
Programmability	Remote
External interface	Serial line RS 232
Power supply rating	24 Vdc through a portable external power supply Electrical characteristics of the supply <ul style="list-style-type: none"> input 90-264 Vac; 47/63 Hz output 24 Vdc; 70 W
Dimensions (height x width x length)	Sampling unit: <ul style="list-style-type: none"> AI Configuration: approx. 437 x 230 x 250 mm AS Configuration: approx. 437 x 400 x 250 mm
Mass	About 6 kg

Sampling Unit

This chapter provides a description of the components of the sampling unit of the AI 3000/AS 3000 II.

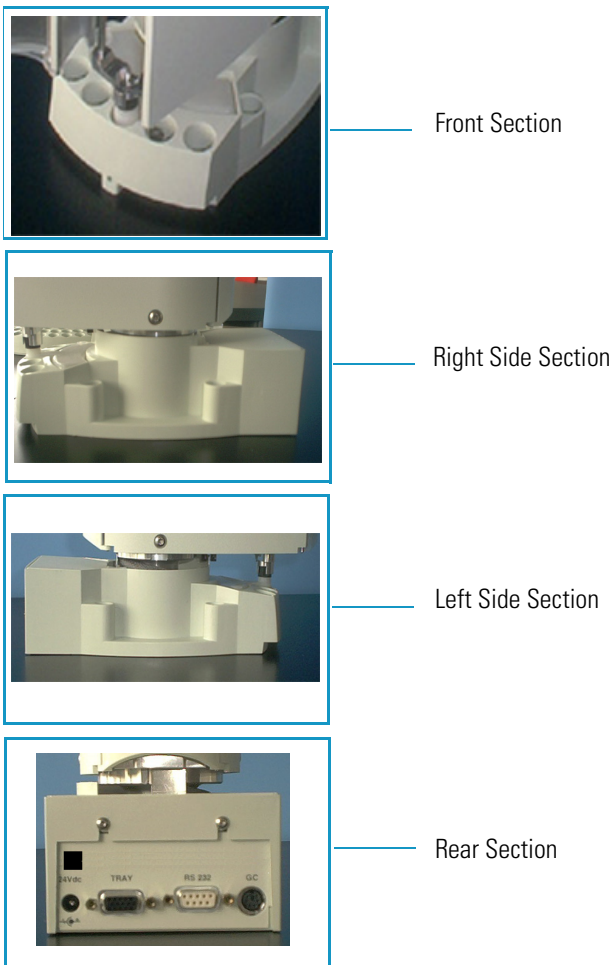
Contents

- [Base](#)
- [Turret](#)
- [Injection Assembly](#)
- [Washing and Waste Tray](#)
- [Rear of the Sampling Unit](#)
- [Sample Trays](#)
- [Centering Plate](#)
- [Status LED](#)

Base

It is the supporting structure of the instrument on which the sampling unit components and accessories are positioned (sample tray, centering plate). It consists of four sections. See [Figure 7](#).

Figure 7. The Sections of the Base



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

On the lower front part there is a LED indicating the instrument status. For details, refer to [“Status LED”](#) on [page 20](#).

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

The position of the above described accessories depends on the configuration of the auto-injector/auto-sampler installation.

See [“Configurations of the 3000 Series Automatic Sampling System”](#) on [page 5](#).

Rear Section — It includes the connections of the instrument to the mains, the gas chromatograph, the data system and the sample tray (only for AS 3000), and for the **Gemini** configuration.

Turret

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

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

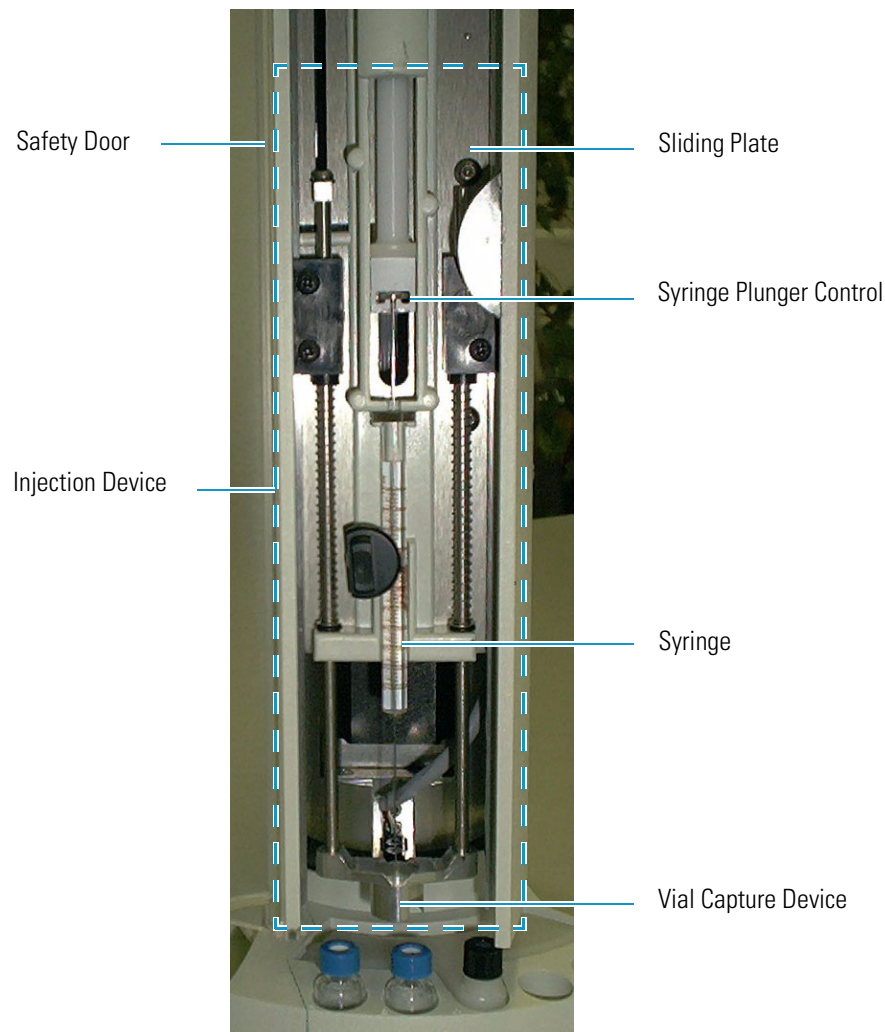
Figure 8. The Turret



Injection Assembly

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

Figure 9. Injection Assembly



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

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

Vial Capture Device

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

The function of this device are:

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

Figure 10. Vial Capture Device



Syringe

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

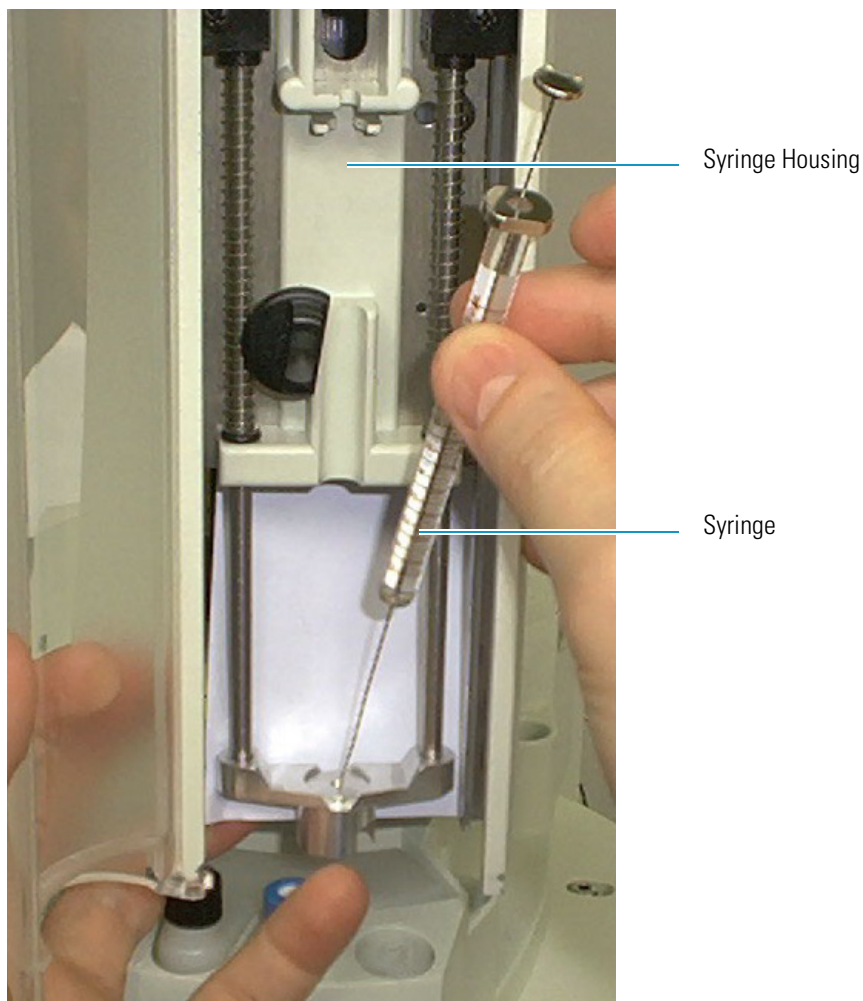
Note 5 and 0.5 μL syringes are optionally available.

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

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

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

Figure 11. Syringe Housing



Turret Movements

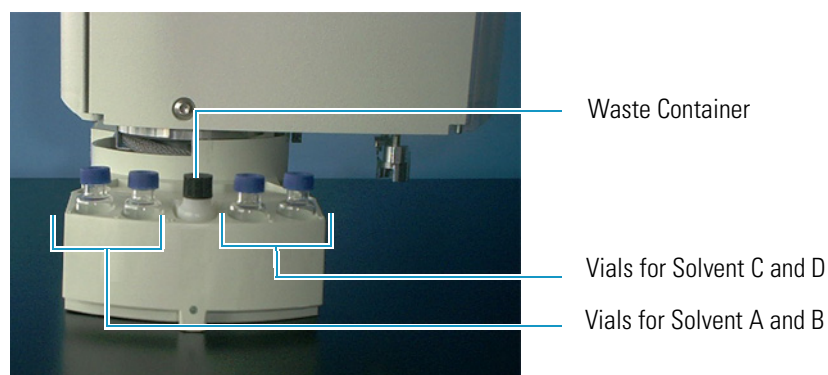
The sequence of the turret movements allows the autoinjector/sampler to perform the following functions:

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

Washing and Waste Tray

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

Figure 12. Washing and Waste Tray



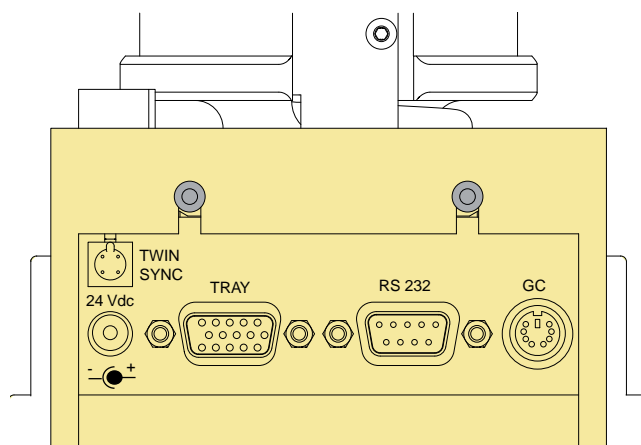
The vials contain the solvent (solvents) necessary for the syringe washing, which can take place both before and after the injection. The washing solvent is then collected in the waste container.

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

Rear of the Sampling Unit

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

Figure 13. Rear of the Sampling Unit



- Jack marked **24 Vdc** for the instrument power supply through the external portable feeder.

- 15-pin female connector (double density) marked **TRAY** for the communication between the sampling unit and the motor actuating the hub positioned on the supporting plate of the 105-position sample tray.
- 9-pin female connector marked **RS232** for the communication between the autoinjector/sampler and the GC (connector marked **AUTOSAMPLER**) through a proper cable.
- 6-pin female connector marked **GC** for connecting the autoinjector/sampler to the GC (connector marked **SAMPLER SIGNAL**) through the proper cable.
- 4-pin male connector marked **TWIN SYNC** for the synchronism between two AI 3000/AS 3000 II installed in Gemini configuration through the proper cable.

Sample Trays

The AI 3000/AS 3000 II can accept two types of sample trays which are accommodated in one of the two side housings on the base.

The type of sample tray accessory installed on the instrument (8 or 105 positions) is automatically acknowledged by the autoinjector/sampler when switched on, and it determines the instrument configuration.

- **AI 3000** uses the 8-position sample tray.
- **AS 3000** uses the 105-position sample tray.

8-Position Sample Tray

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

Figure 14. 8-position Sample Tray



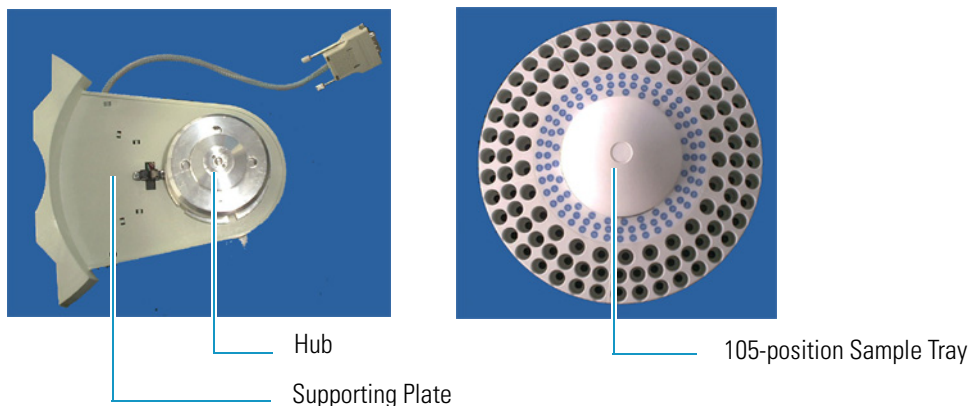
105-Position Sample Tray Assemble

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

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

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

Figure 15. Supporting Plate and 105-Position Sample Tray



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

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

Vials

Vials of 0.3 and 2 mL capacity can be used.

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



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

Centering Plate

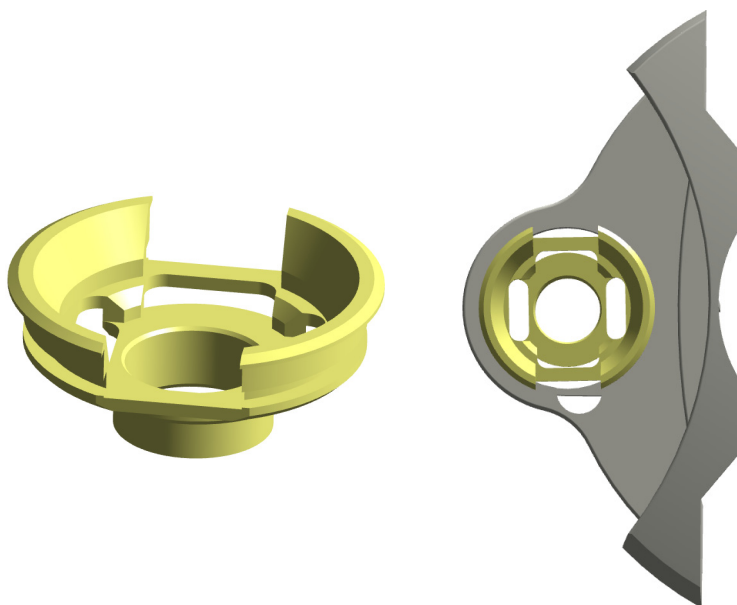
The centering plate consists of a plate provided with circular guides to center the sampling unit on the injector nut.

Centering Plate for TRACE 1300/TRACE 1310

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

- To center the sampling unit on the SSL injector nut, use the circular guide for SSL only. See B of [Figure 16](#).
- To center the sampling unit on the PTV injector nut, use the circular guide for PTV only. See A of [Figure 17](#).

Figure 16. Circular Guides for SSL



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

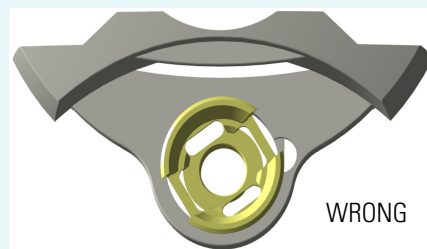
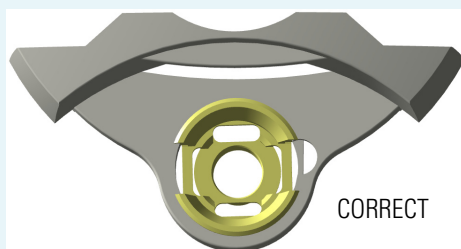
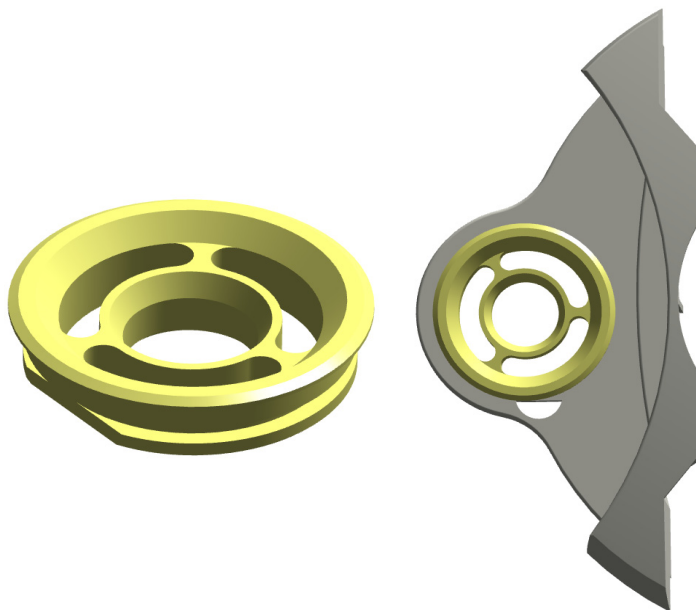


Figure 17. Circular Guides for PTV

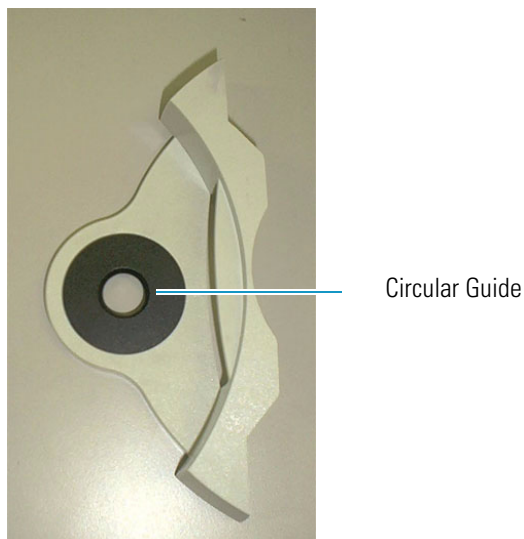


Centering Plate for TRACE GC Ultra and FOCUS GC

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

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

Figure 18. Centering Plate for TRACE GC Ultra and FOCUS GC



Status LED

The status LED, located on the front side of the sampling unit, see [Figure 19](#), provides the operator with indications on the instrument operating conditions showing a continuous or intermittent light. See [Table 2](#) for details.

Figure 19. The Status LED



Table 2. Status LED Conditions

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

Buzzer

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

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

Installation

This chapter contains the instructions for the installation of the AI 3000/AS 3000 II on the TRACE 1300/TRACE 1310, TRACE GC Ultra, and FOCUS GC gas chromatographs, the syringe, and the electrical connections with the different units of the gas chromatographic system.

Contents

- [Who Performs the Installation](#)
- [Electrical Requirements](#)
- [How to Lift and Carry the Sampling Unit](#)
- [Sampling System Support](#)
- [Installing the Sampling System Support on the TRACE 1300/TRACE 1310](#)
- [Installing the Sampling System Support on the TRACE GC Ultra](#)
- [Installing the Sampling System Support on the FOCUS GC](#)
- [Installation of the AI 3000/AS 3000 II on the GC](#)

Who Performs the Installation

The AI 3000/AS 3000 II is installed by authorized Thermo Fisher Scientific field service engineers (FSE), who will check its correct operation. For more details, please contact Thermo Fisher Scientific local representatives. Should the instrument not be installed by Thermo Fisher Scientific personnel, please strictly adhere to the following instructions.

Electrical Requirements

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



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

Do not connect the AI 3000/AS 3000 II to lines feeding devices of a heavy duty nature, such as motors, UV lamps, refrigerators and other devices that can generate disturbances. Pay attention not to leave any cable connecting the sampling unit and the chromatographic system or the power cord close to the GC hot air vents.

How to Lift and Carry the Sampling Unit

The AI 3000/AS 3000 II must be lifted and carried by hand. See [Figure 20](#).

Figure 20. How to lift and carry the Sampling Unit



Sampling System Support

The AI 3000/AS 3000 II is installed on the GC using the appropriate support provided.

According to your GC, please refer to:

- [Sampling System Support for TRACE 1300/TRACE 1310](#)
- [Sampling System Support for TRACE GC Ultra](#)
- [Sampling System Support for FOCUS GC](#)

Note The FOCUS GC MS Version, may accept the AI 3000/AS 3000 II also on the left side. Please refer to “[Assembling of the Sampling System Support on FOCUS GC MS Version](#)” on page 46.

To reduce the FOCUS GC working area, the AS 3000 may be installed as described in “[Space Saving Installation](#)” on page 47.

Sampling System Support for TRACE 1300/TRACE 1310

The AI 3000/AS 3000 II can be installed only on the **right** side of the GC on the **front** or **back** injector module or on both when in **Gemini** configuration by using the proper sampling system support.

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

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

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

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

To use the proper sampling system support on the TRACE 1300/TRACE 1310 please refer to:

- [Support for the Installation on the Front/Back Injector Module](#)
- [Support for the Installation in Gemini Configuration](#)
- [Support for the Installation When a TSQ Quantum Mass Spectrometer is Coupled with the GC](#)

Support for the Installation on the Front/Back Injector Module

The same sampling unit support is used. The L-shape bottom plate must be oriented accordingly before fixing it on the GC. See [Figure 21](#) and [Figure 22](#).

Figure 21. Support Oriented for the Installation on the Front Injector Module

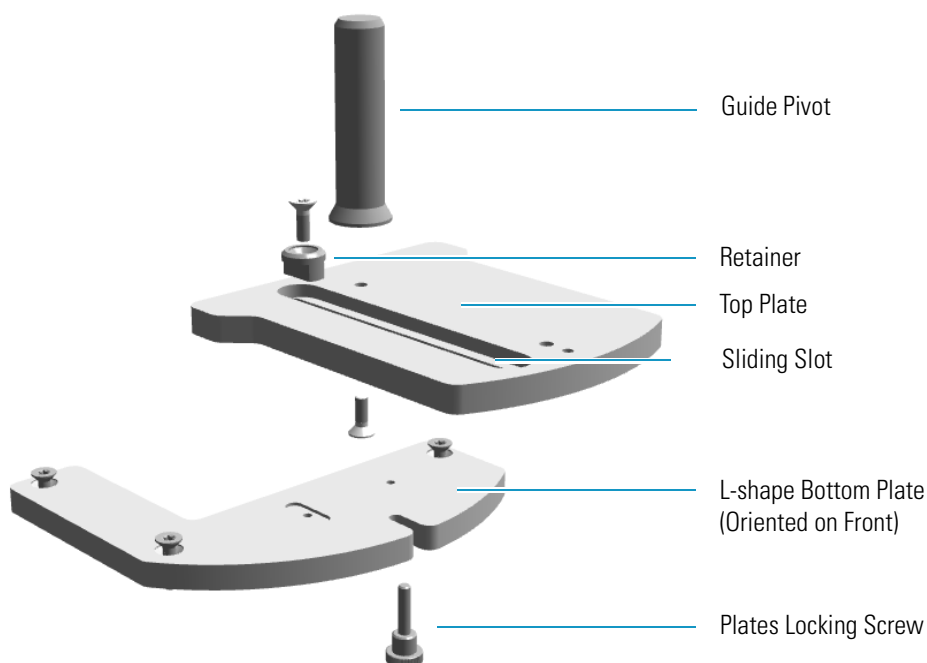
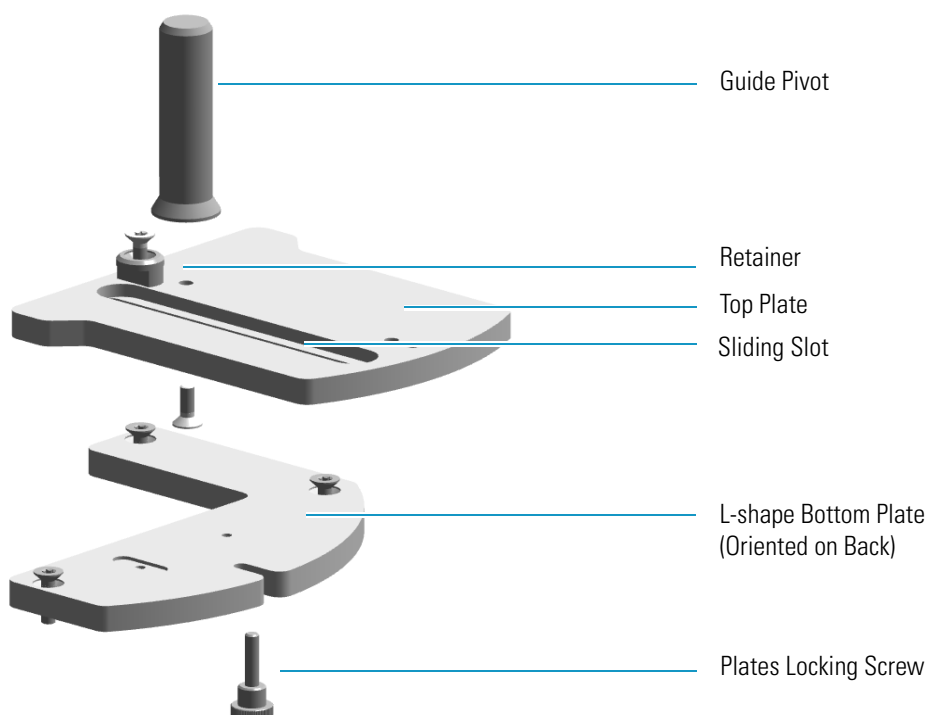


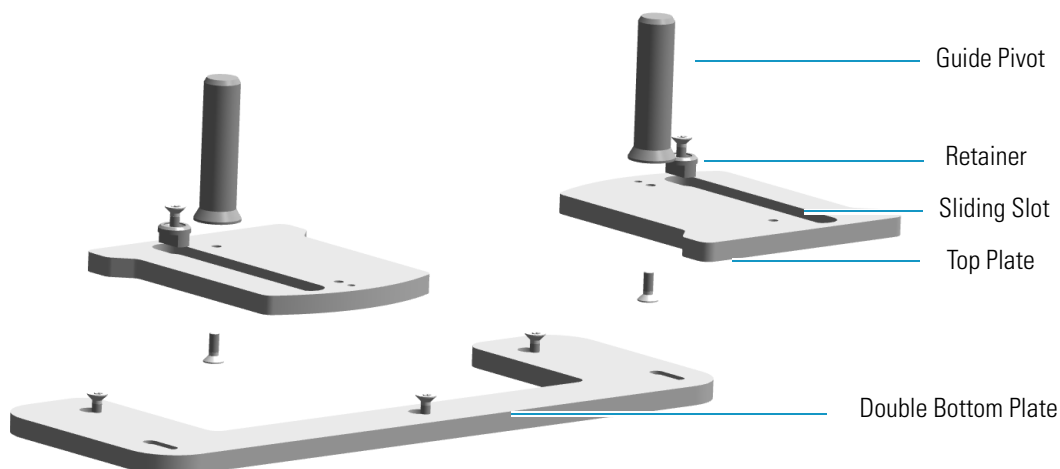
Figure 22. Support Oriented for the Installation on the Back Injector Module



Support for the Installation in Gemini Configuration

This configuration uses a dedicated double bottom plate and two top plates. See [Figure 23](#).

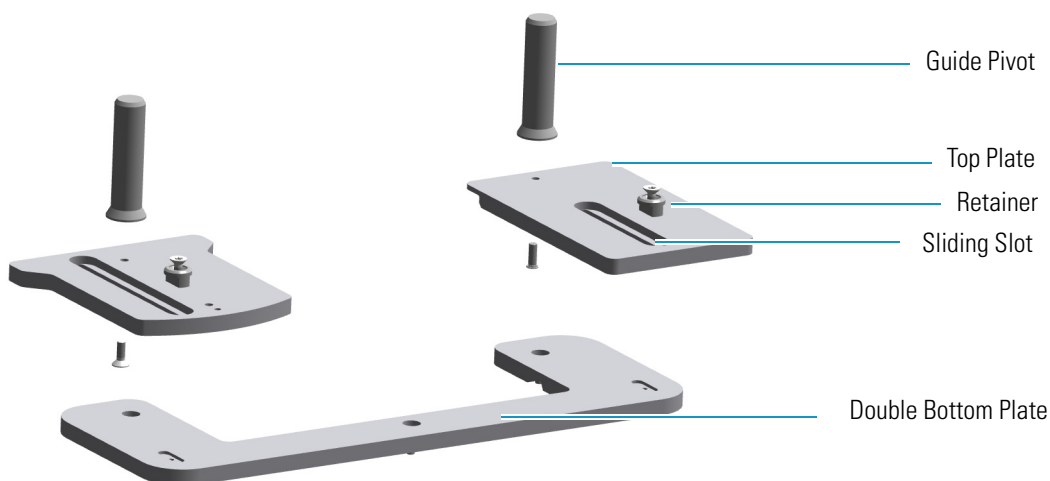
Figure 23. Support for the Installation in Gemini Configuration



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

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

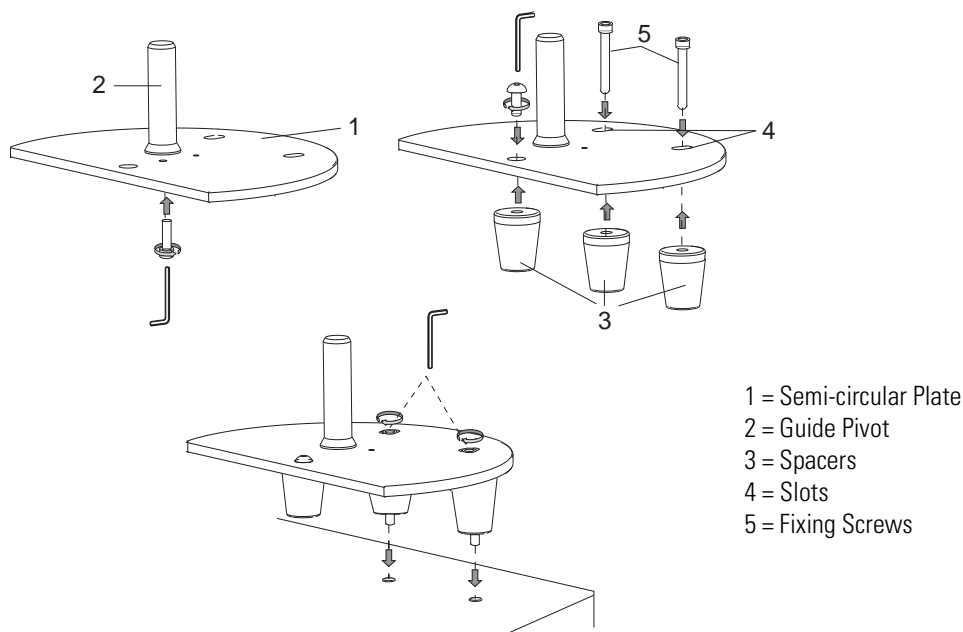
Figure 24. Support for the Installation When a TSQ Quantum is Coupled with the GC



Sampling System Support for TRACE GC Ultra

The support for the installation of the AI 3000/AS 3000 II on **right** or **left** side of the TRACE GC Ultra consists of a semi-circular plate resting on three spacers non adjustable in height, see [Figure 25](#). The top surface of the plate is provided with two slots for corresponding fixing screws. In the middle the guide pivot allows the accommodation and centering of the sampling unit.

Figure 25. Support for the Installation of the AI 3000/AS 3000 II on the TRACE GC Ultra



The AI 3000/AS 3000 II is installed on the **right** or **left** side of the TRACE GC Ultra.

Installation on the Right Side

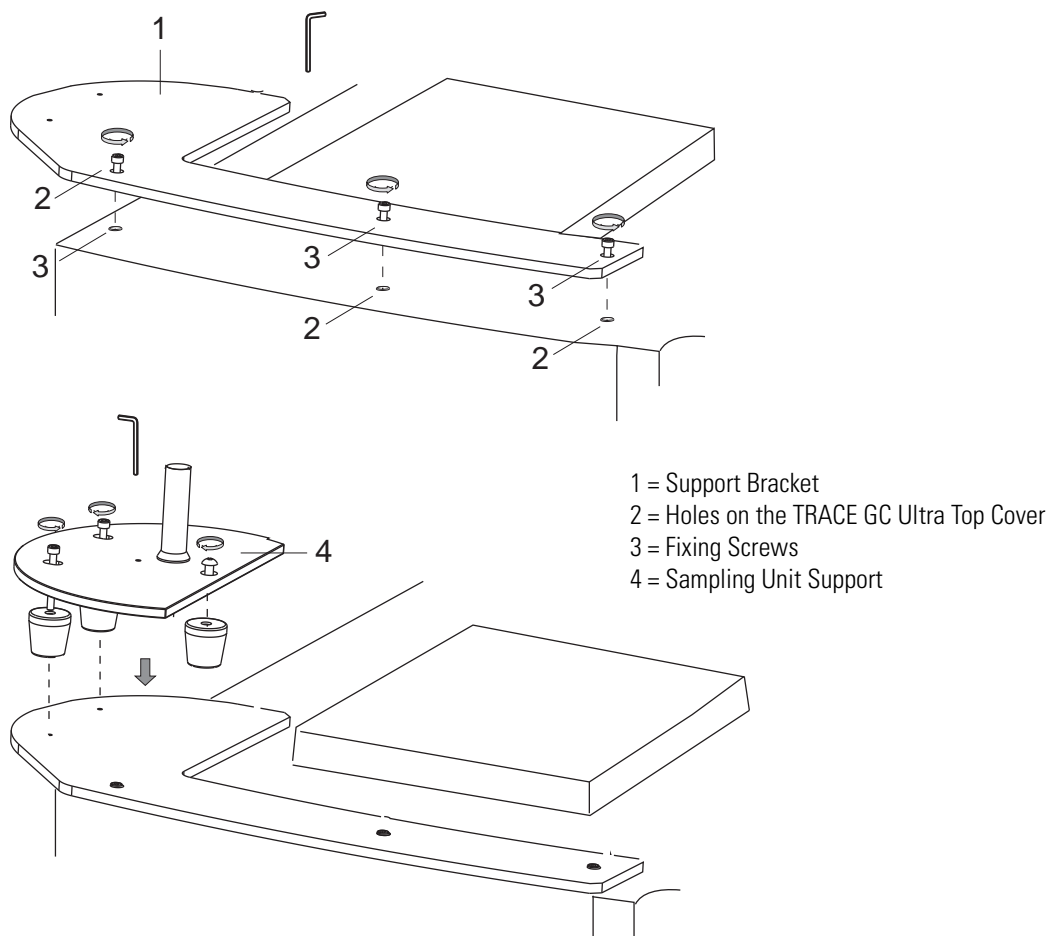
When installing the AI 3000/AS 3000 II on the TRACE GC Ultra **right side**, the support is directly mounted on the GC top panel previous installation of the spacer inside the GC. See [Figure 25](#).

Note For details about the installation of the spacer, please refer to “[Installing the Spacer Inside the GC](#)” on [page 43](#) for details.

Installation on the Left Side

When installing the AI 3000/AS 3000 II on the TRACE GC Ultra **left side**, before to mount the sampling system support, the support bracket must be placed and fixed on the GC top cover. See [Figure 26](#).

Figure 26. Bracket for the Installation of the AI 3000/AS 3000 II Support

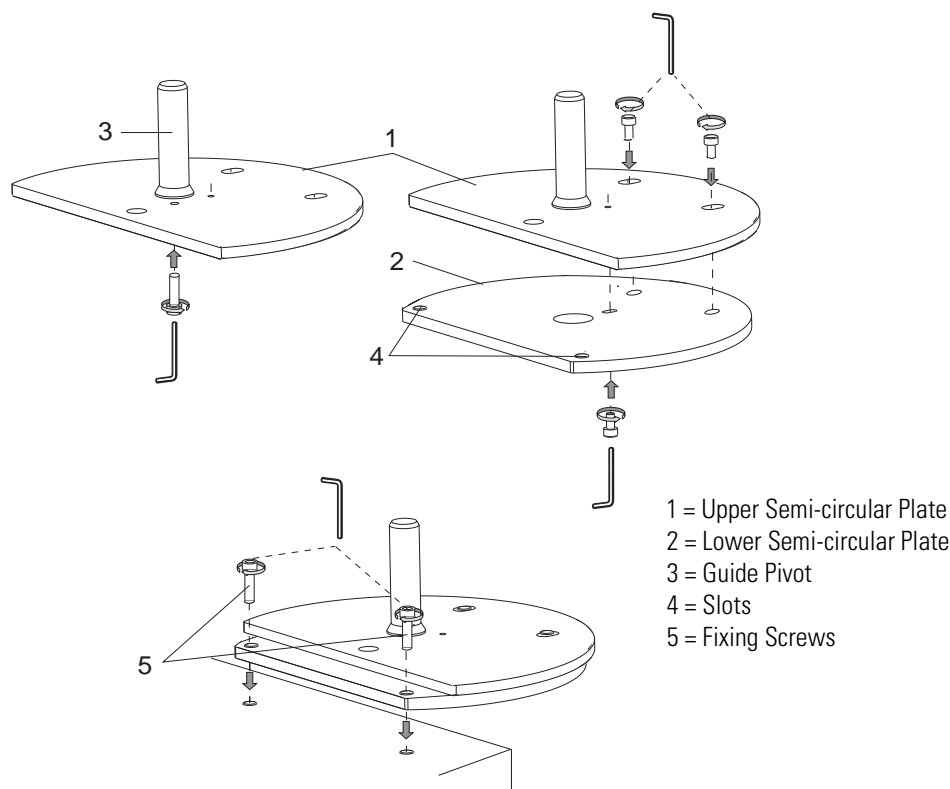


Sampling System Support for FOCUS GC

The support for the installation of the AI 3000/AS 3000 II on the right side of the FOCUS GC, consists of two semi-circular plates. See [Figure 27](#).

The top surface of the upper plate is provided with two slots for corresponding fixing screws. In the middle the guide pivot allows the accommodation and centering of the sampling unit.

Figure 27. Support for the Installation of the AI 3000/AS 3000 II on the FOCUS GC



Note The FOCUS GC MS Version, may accept the AI 3000/AS 3000 II also on the left side. Please refer to [“Assembling of the Sampling System Support on FOCUS GC MS Version”](#) on [page 46](#).

To reduce the FOCUS GC working area, the AS 3000 may be installed as described in [“Space Saving Installation”](#) on [page 47](#).

References for the Installation

For the installation of the AI 3000/AS 3000 II, please refer to:

- “Installing the Sampling System Support on the TRACE 1300/TRACE 1310” on page 30
- “Installing the Sampling System Support on the TRACE GC Ultra” on page 43
- “Installing the Sampling System Support on the FOCUS GC” on page 46
- “Installation of the AI 3000/AS 3000 II on the GC” on page 49

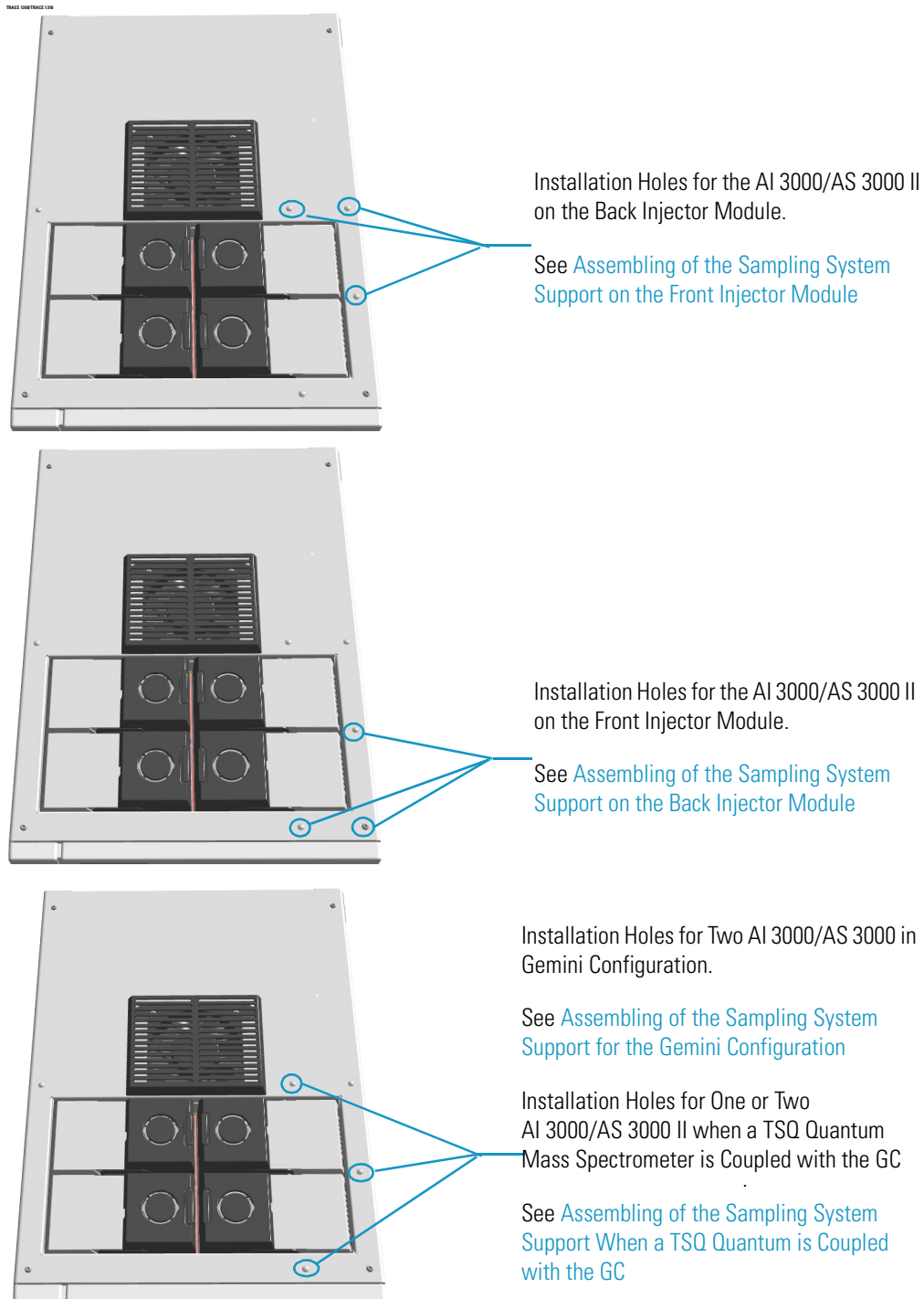
3 Installation

Installing the Sampling System Support on the TRACE 1300/TRACE 1310

Installing the Sampling System Support on the TRACE 1300/TRACE 1310

To install the sampling system support on the TRACE 1300/TRACE 1310, please refer to the instructions reported below. [Figure 28](#) shows the installation holes on the top of the GC.

Figure 28. Sampler Unit Support Installation Holes

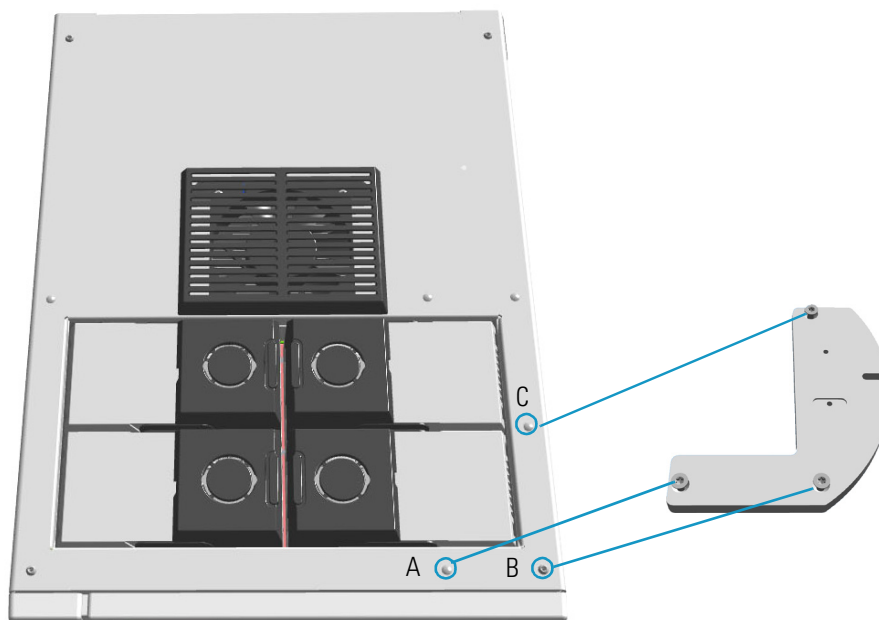


Assembling of the Sampling System Support on the Front Injector Module

The following is the description of how to mount the sampling system support on the **front** injector module of the TRACE 1300/TRACE 1310. See [Figure 29](#) and [Figure 30](#).

L-shape Bottom Plate

Figure 29. Assembling on the Front Injector Module (1)



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

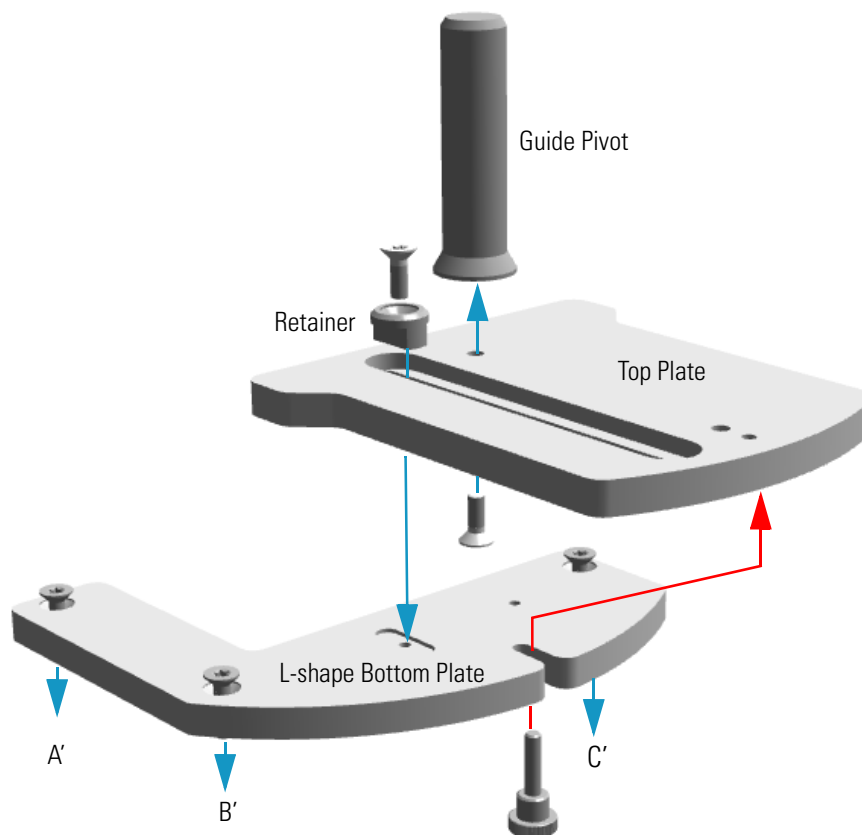
Note In comparison with the installation on the back injector module, the installation on the front injector module requires to upturn the L-shape bottom plate before fixing it on the GC.

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

3 Installation

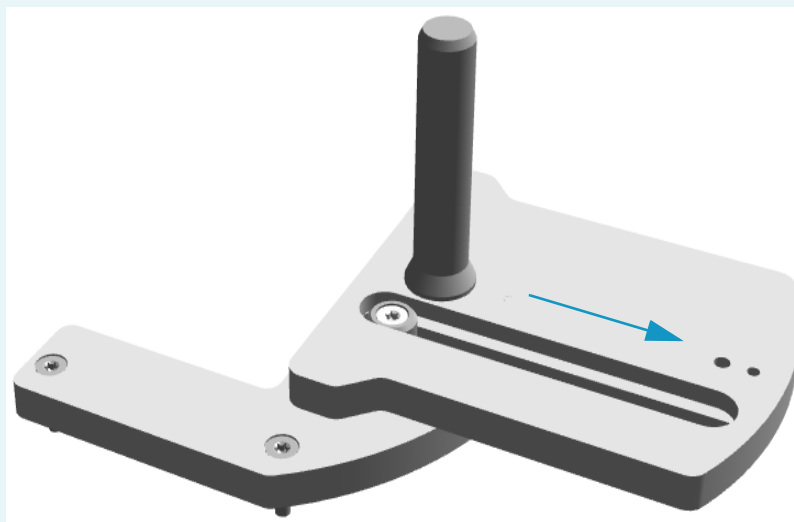
Installing the Sampling System Support on the TRACE 1300/TRACE 1310

Figure 30. Assembling on the Front Injector Module (2)



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

Note Removing the plates locking screw, the top plate is free to move outwards. See the figure below.

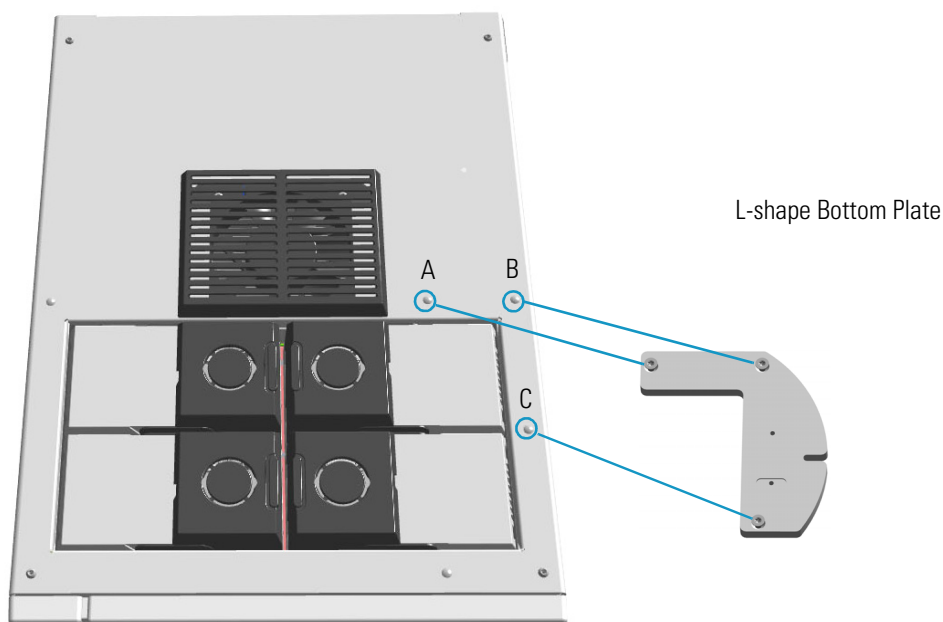


This allows the sampling unit, when installed, to be moved away from the injector module. See [“Moving Away the Sampling Unit from the Injector Module”](#) on page 80.

Assembling of the Sampling System Support on the Back Injector Module

The following is the description of how to mount the sampling system support on the **back** injector module of the TRACE 1300/TRACE 1310. See [Figure 31](#) and [Figure 32](#).

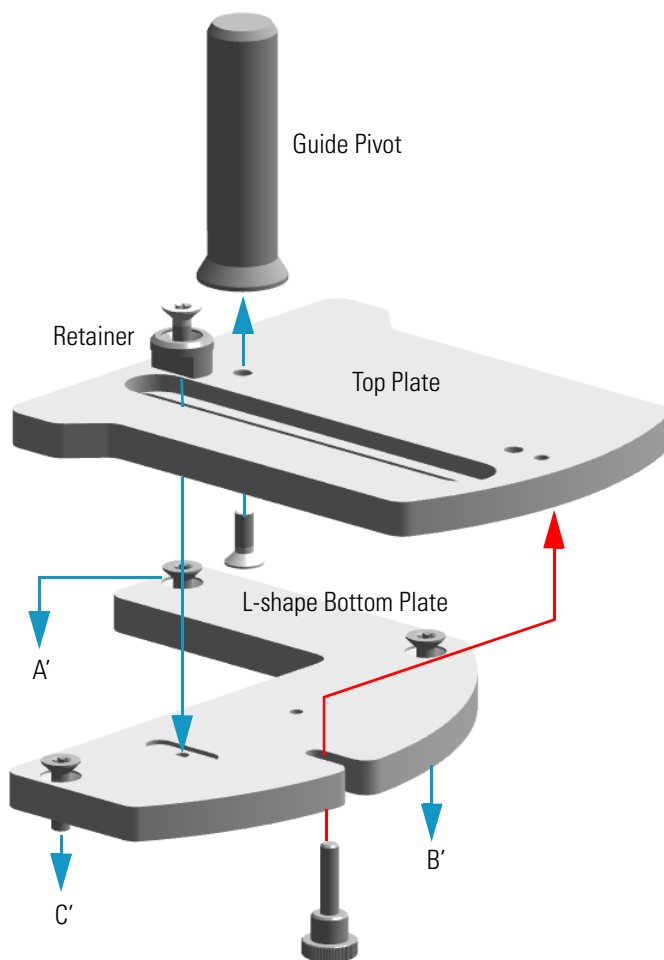
Figure 31. Assembling on the Back Injector Module (1)



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

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

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

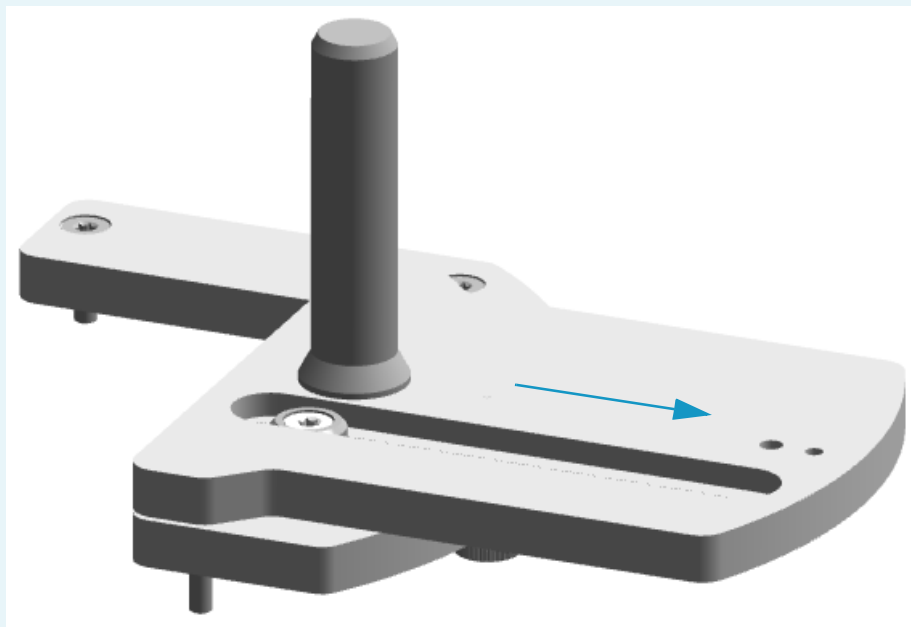
Figure 32. Assembling on the Back Injector Module (2)

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

3 Installation

Installing the Sampling System Support on the TRACE 1300/TRACE 1310

Note Removing the plates locking screw, the top plate is free to move outwards. See the figure below.



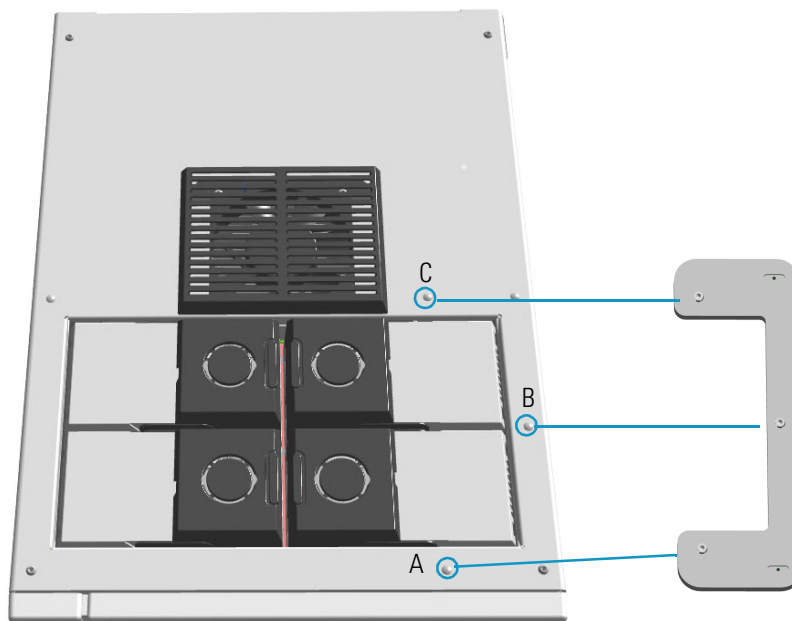
This allows the sampling unit, when installed, to be moved away from the injector module. See [“Moving Away the Sampling Unit from the Injector Module”](#) on page 80.

Assembling of the Sampling System Support for the Gemini Configuration

The following is the description of how to mount the sampling system support on the TRACE 1300/TRACE 1310 for the installation of two AI 3000/AS 3000 II sampling systems in **Gemini** configuration. See [Figure 33](#) and [Figure 34](#).

Figure 33. Assembling In Gemini Configuration (1)

Double Bottom Plate

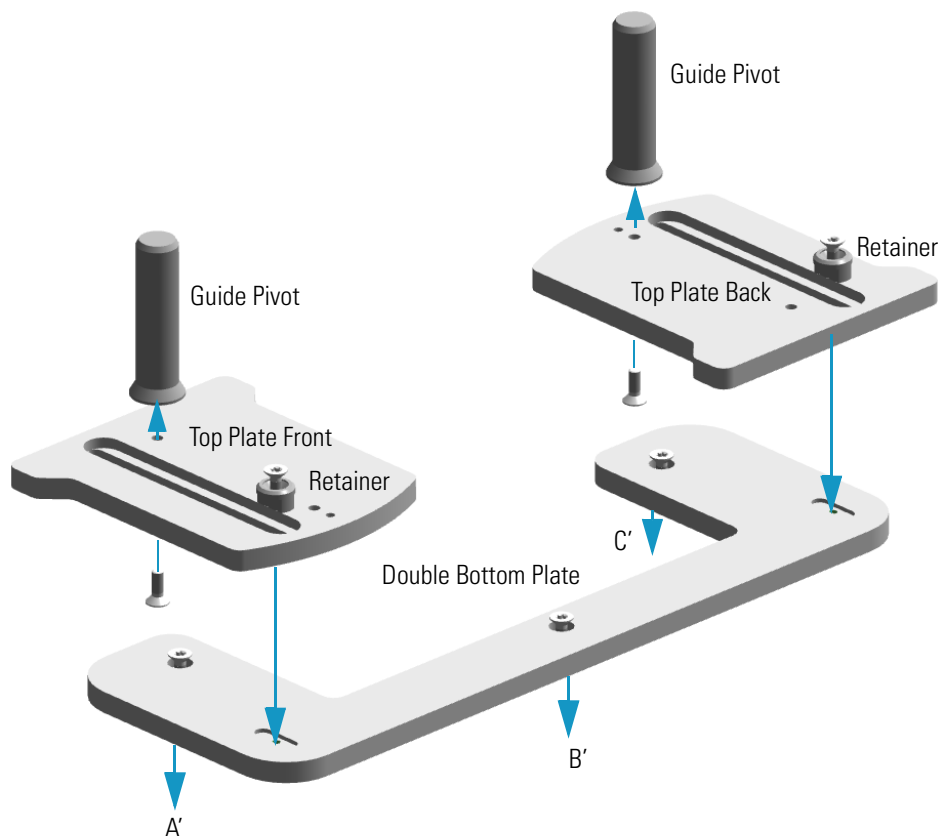


1. Remove from the GC top cover the five plastic caps covering the corresponding fixing holes. See A, B, and C.
2. Insert the provided fixing screws into the three holes present on the double bottom plate.

3 Installation

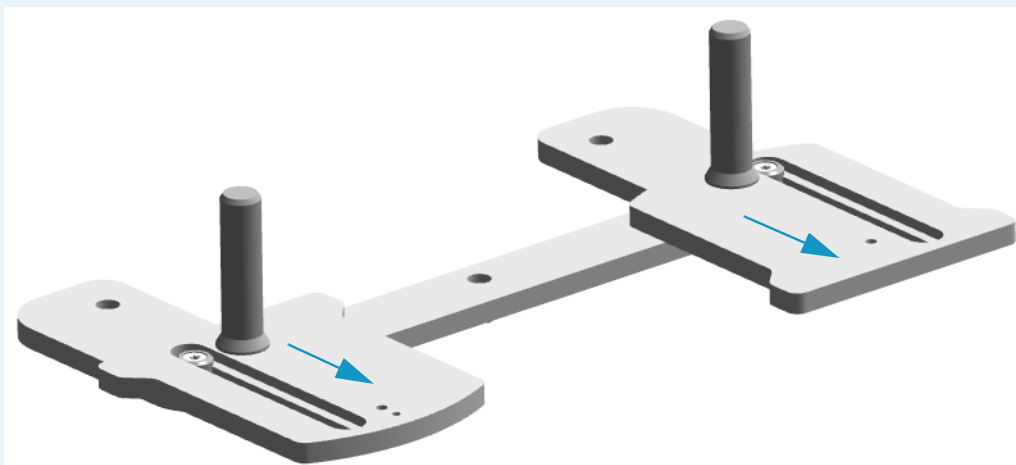
Installing the Sampling System Support on the TRACE 1300/TRACE 1310

Figure 34. Assembling In Gemini Configuration (2)



3. Guide the three fixing screws into the corresponding fixing holes located on the GC top. See A', B', and C'.
4. Tighten the three fixing screws.
5. If not already done, mount and fix the guide pivot on each top plate by using the proper 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 located on the double bottom plate.
9. Tighten each retainer fixing screw to block the corresponding upper plate to the double bottom plate.

Note Loosening the screw that secure each retainer, the corresponding top plate are free to move outwards. See the figure below.



This allows the sampling unit, when installed, to be moved away from the injector module. See [“Moving Away the Sampling Unit from the Injector Module”](#) on page 80.

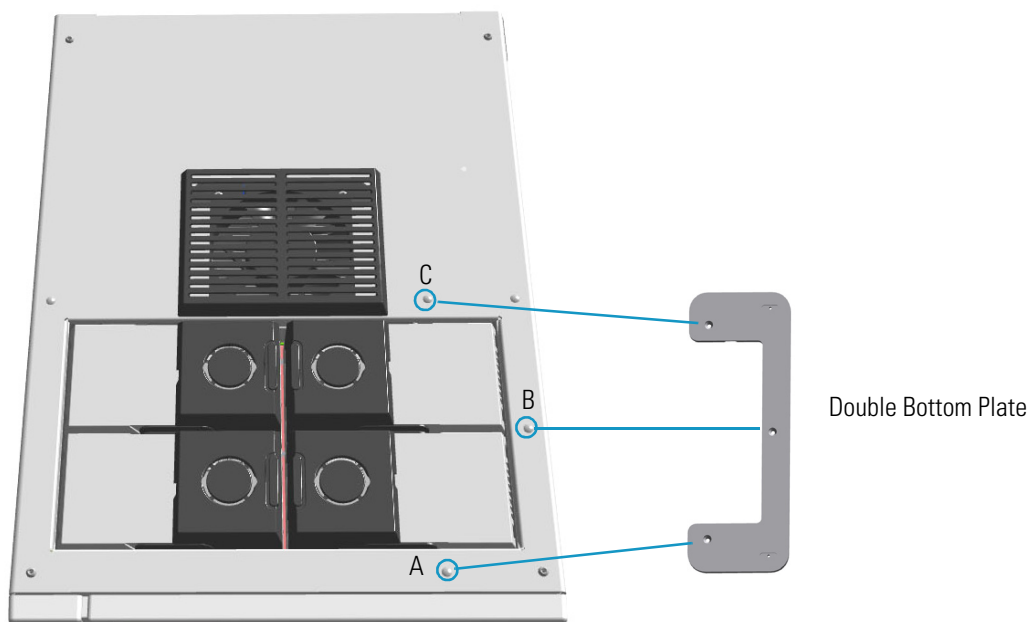
3 Installation

Installing the Sampling System Support on the TRACE 1300/TRACE 1310

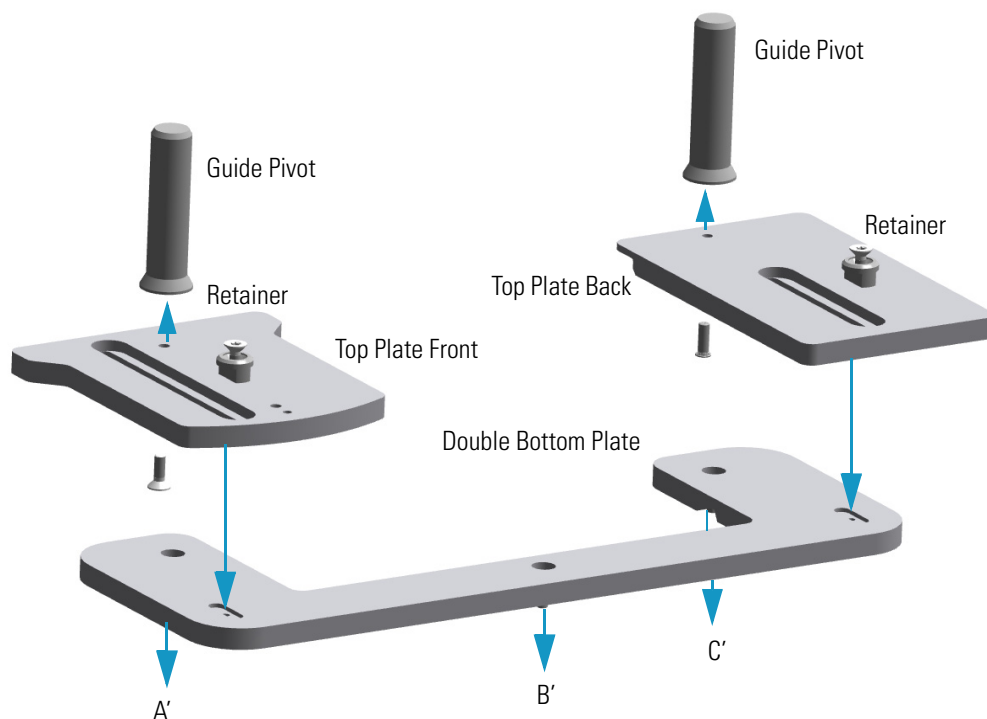
Assembling of the Sampling System Support When a TSQ Quantum is Coupled with the GC

The following is the description of how to mount the sampling system support on the TRACE 1300/TRACE 1310 for the installation of one or two AI 3000/AS 3000 II sampling systems when a TSQ Quantum mass spectrometer is coupled with the GC. See [Figure 33](#) and [Figure 35](#).

Figure 35. Assembling (1)



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

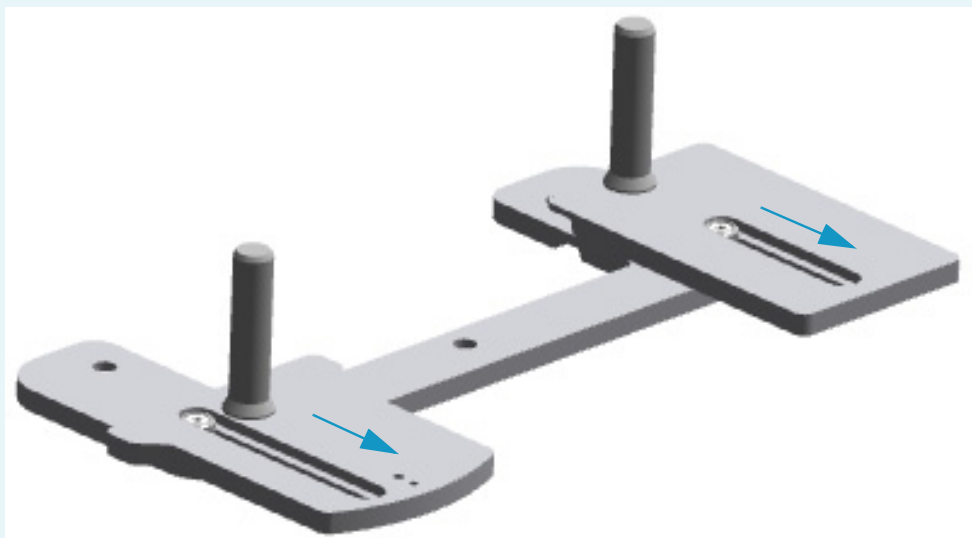
Figure 36. Assembling (2)

3. Guide the three fixing screws into the corresponding fixing holes located on the GC top. See A', B', and C'.
4. Tighten the three fixing screws.
5. If not already done, mount and fix the guide pivot on each top plate by using the proper 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 located on the double bottom plate.
9. Tighten each retainer fixing screw to block the corresponding upper plate to the double bottom plate.

3 Installation

Installing the Sampling System Support on the TRACE 1300/TRACE 1310

Note Loosening the screw that secure each retainer, the corresponding top plate are free to move outwards. See the figure below.



This allows the sampling unit, when installed, to be moved away from the injector module. See [“Moving Away the Sampling Unit from the Injector Module”](#) on page 82.

Installing the Sampling System Support on the TRACE GC Ultra

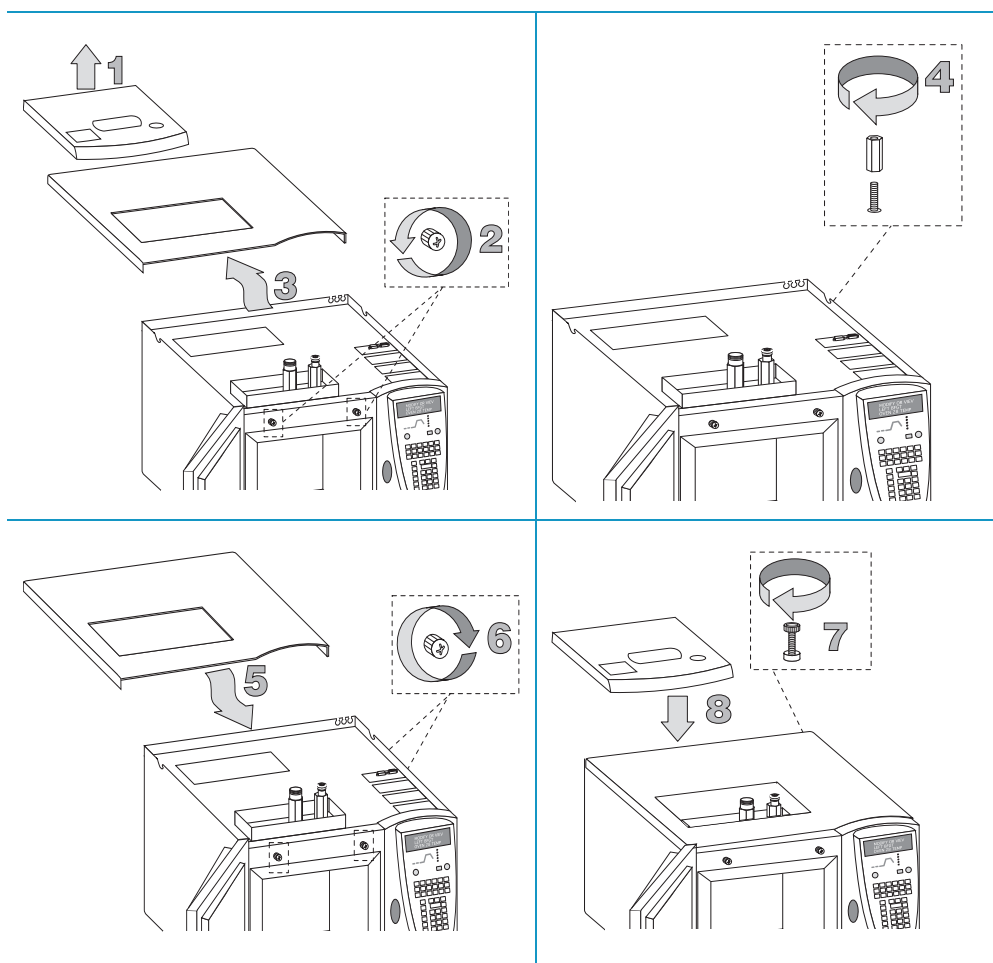
To install the support on the TRACE GC Ultra, please refer to the instructions reported below. Before installing the sampling system support, the spacer should be installed inside the GC, then assemble the sampling system support on the GC according to the required configuration.

- See [Installing the Spacer Inside the GC](#)
- See [Assembling of the Sampling System Support on the GC Right Side](#)
- See [Assembling of the Sampling System Support on the GC Left Side](#)

Installing the Spacer Inside the GC

To installing the spacer should be installed inside the GC proceed as described below. See [Figure 37](#).

Figure 37. Installation of the Spacer Inside the GC



3 Installation

Installing the Sampling System Support on the TRACE GC Ultra

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

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

Assembling of the Sampling System Support on the GC Right Side

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

1. Remove from the GC top cover the two plastic caps covering the corresponding fixing holes.
2. Insert into each slot present on the support the provided fixing screw.
3. Insert each screw into the relevant spacer paying attention to keep its largest surface turned towards the support base.
4. Holding the spacers in position with your hands, rest the support on the GC top cover, with their flat side towards the inside.
5. Guide the two fixing screws located on the external spacers into the corresponding fixing holes.
6. Loosely tighten the screws.

Assembling of the Sampling System Support on the GC Left Side

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

1. Remove from the GC top cover the four plastic caps covering the corresponding fixing holes.
2. Mount the support bracket on the TRACE GC Ultra and fix by using fixing screws provided.
3. Insert into each slot present on the support the provided fixing screw.

4. Insert each screw into the relevant spacer paying attention to keep its largest surface turned towards the support base.
5. Holding the spacers in position with your hands, rest the support on the bracket, with their flat side towards the inside.
6. Guide the two fixing screws located on the external spacers into the corresponding fixing holes located on the bracket.
7. Loosely tighten the screws.

Installing the Sampling System Support on the FOCUS GC

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

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

Assembling of the Sampling System Support on the GC right side

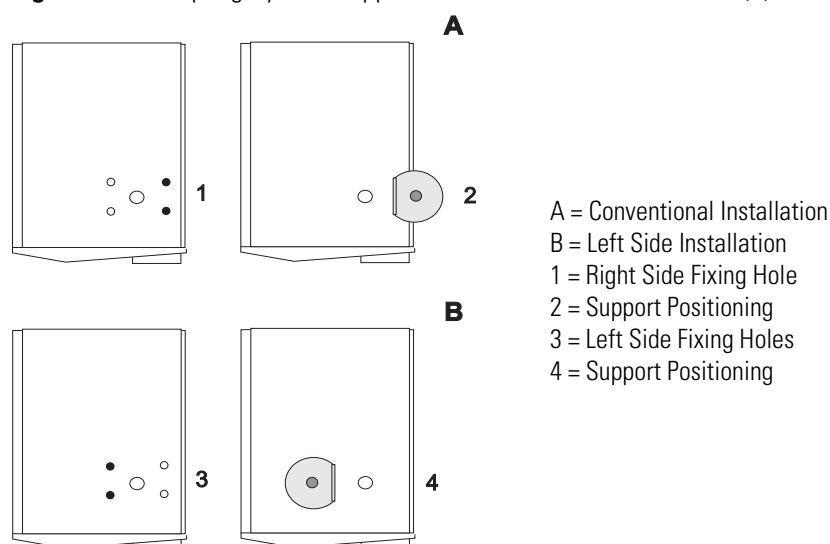
The following is the description of how to mount the sampling system support in the default configuration, i.e. on the **right** side of the FOCUS GC.

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

Assembling of the Sampling System Support on FOCUS GC MS Version

The installation on the GC **left** side, instead the conventional installation on the GC right side, may be carried out to reduce the working area of your FOCUS GC MS Version. Refer to the [Figure 38](#).

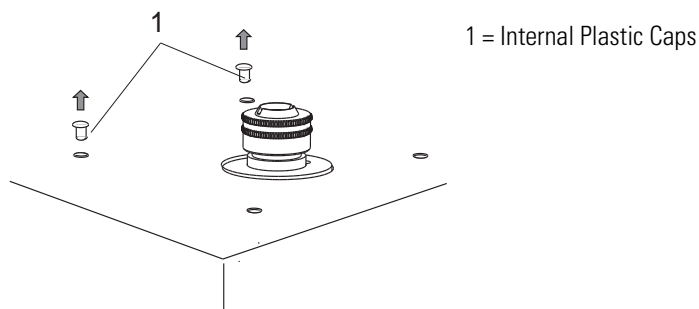
Figure 38. Sampling System Support on the FOCUS GC MS Version (1)



Proceed as follows:

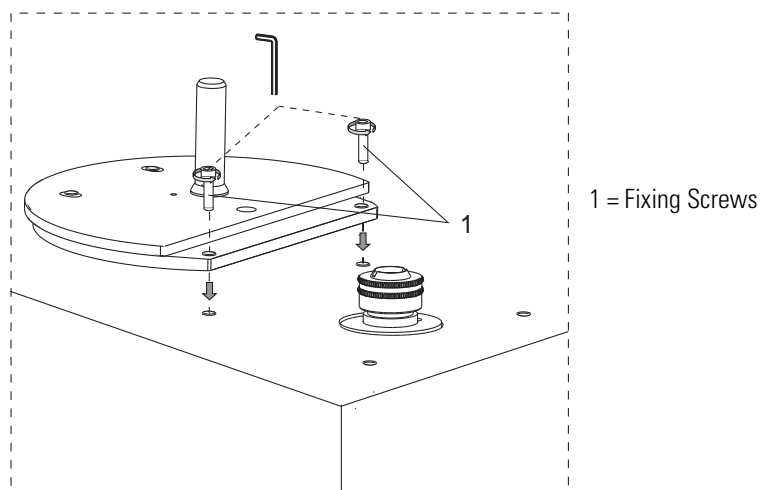
1. Remove from the GC upper cover the two internal plastic caps covering the corresponding fixing holes. See [Figure 39](#).

Figure 39. Sampling System Support on the FOCUS GC MS Version (2)



2. Insert the provided fixing screw into each slot present on the support.
3. Guide the two fixing screws into the corresponding fixing holes located on the GC upper panel. See [Figure 40](#).

Figure 40. Sampling System Support on the FOCUS GC MS Version (3)



4. Loosely tighten the screws.

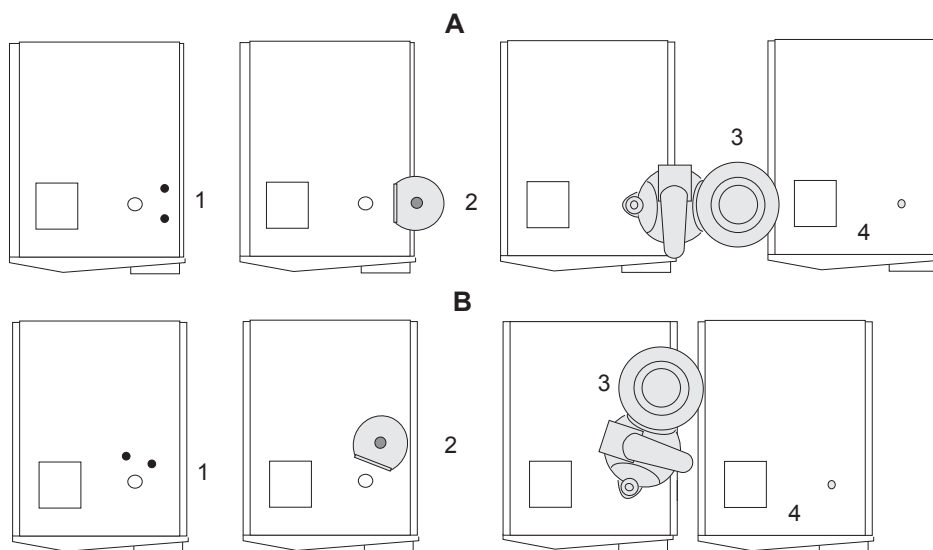
Space Saving Installation

This type of installation is suggested to reduce the working area of your FOCUS GC equipped with the AS 3000. This is applicable for example when two or more FOCUS GC units are to be placed on the same workbench. See [Figure 41](#).

3 Installation

Installing the Sampling System Support on the FOCUS GC

Figure 41. Two or More FOCUS Placed on the Same Workbench



A = Conventional Installation

B Space Saving Installation

1 = Fixing Screws

2 = Sampling System Support

3 = AS 3000

4 = Second FOCUS GC

Proceed as follows:

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

Installation of the AI 3000/AS 3000 II on the GC

To install the AI 3000/AS 3000 II on the TRACE 1300/TRACE 1310, TRACE GC Ultra, and FOCUS GC gas chromatographs, please refer to the instructions reported below:

The procedure includes the following steps:

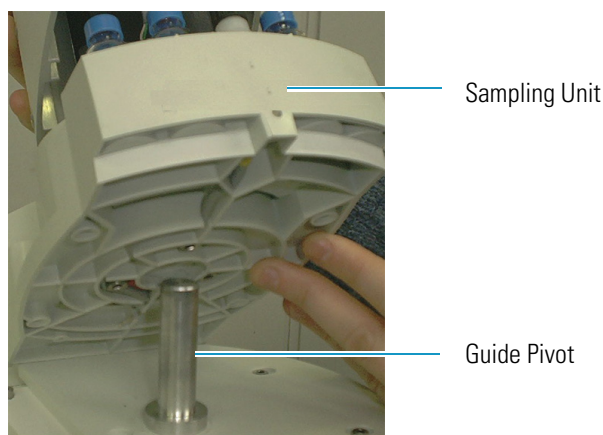
- [Installation of the Sampling Unit](#)
- [Installation of the Syringe](#)
- [Electrical Connections](#)
- [Instrument Start-up](#)

Installation of the Sampling Unit

Proceed as follows:

1. Lift the sampling unit, see [Figure 20](#) on [page 22](#), and insert it into the guide pivot located on the sampling system support. See [Figure 42](#).

Figure 42. Installation of the Sampling Unit



2. Insert the proper centering plate for TRACE GC Ultra or TRACE 1300/TRACE 1310, see [Figure 43](#), into its seat of the sampling unit base paying attention that the guide hole, present on the arm of the centering plate, correctly fits the injector nut.

Figure 43. Centering Plates

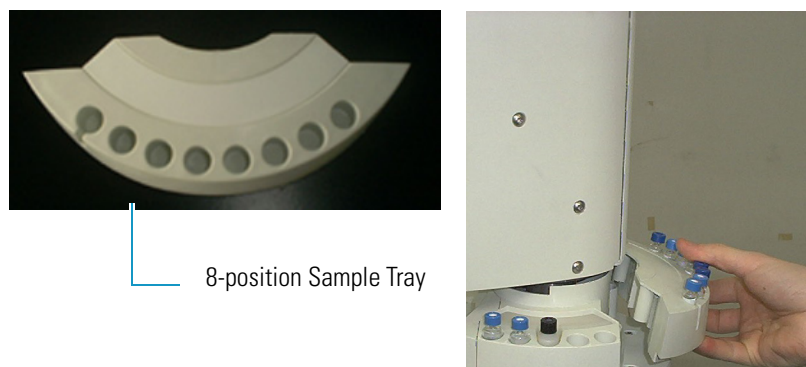


3 Installation

Installation of the AI 3000/AS 3000 II on the GC

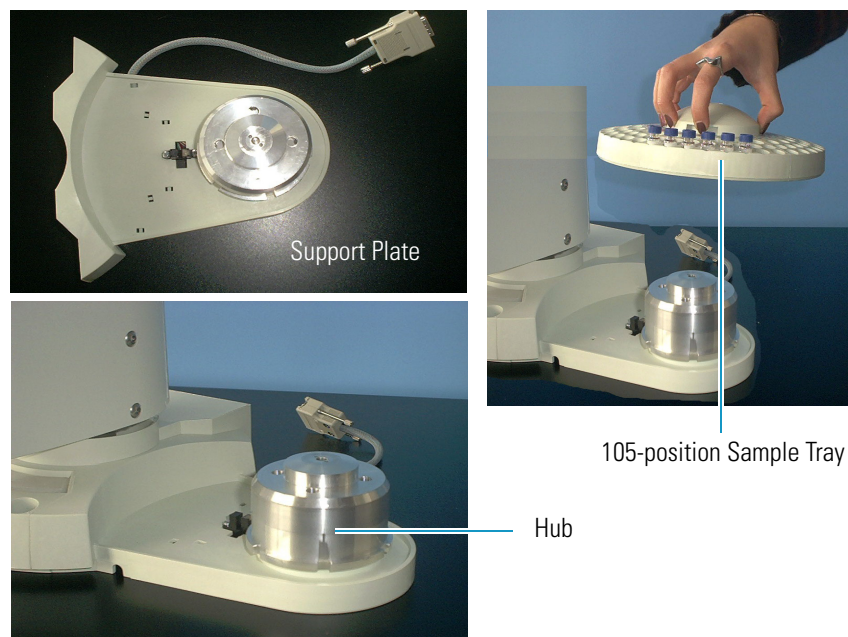
3. Check the correct alignment of the sampling system support, then fix it by tightening the proper fixing screws.
4. Insert the sample tray into the sampling unit base.
 - **AI 3000** — insert the 8-position sample tray into the appropriate housing of the sampling unit base. See [Figure 44](#).

Figure 44. 8-position Sample Tray



- **AS 3000** — insert the dedicated support plate into its appropriate housing of the sampling unit base. Place the 105-position sample tray on the hub located on the support. The system will automatically recognize the sample tray at the instrument power on. See

Figure 45. 105-position Sample Tray



Installation of the Syringe

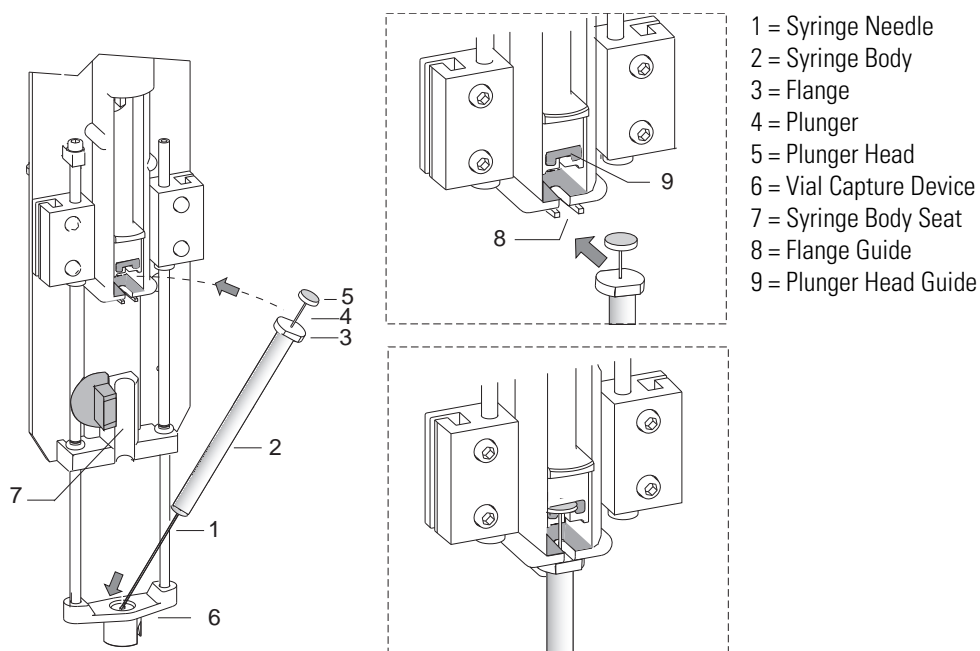
To install the syringe follow the instructions reported below.

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

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

1. Open the safety door of the turret.
2. Insert the syringe needle into the vial capture device. See [Figure 46](#).

Figure 46. Syringe Installation (1)

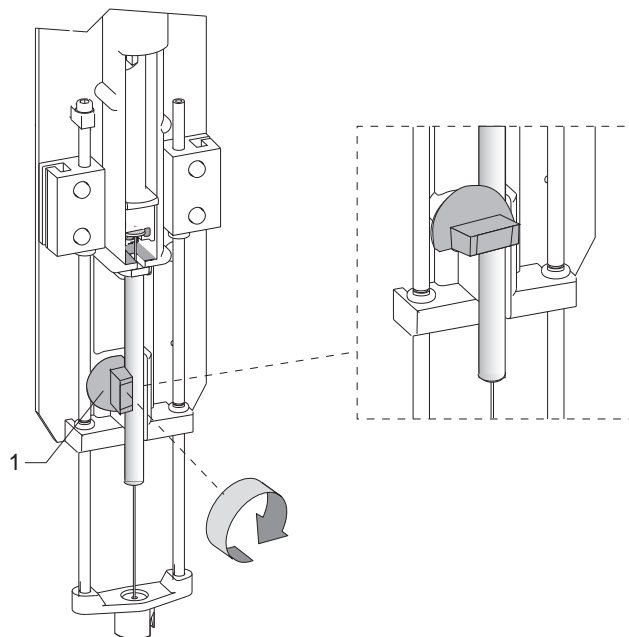


3. Accommodate the syringe body into its seat paying attention to insert simultaneously the flange and head of the syringe plunger into their relevant guides.
4. Lock the syringe by turning clockwise the lock knob by approximately 180°. See [Figure 47](#).
5. Close the safety door of the rotating turret.

3 Installation

Installation of the AI 3000/AS 3000 II on the GC

Figure 47. Syringe Installation (2)



Electrical Connections

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

Before performing electrical connections, ensure that the requirements reported in paragraph “[Electrical Requirements](#)” on [page 22](#) have been fulfilled.

This section provides the instruction to connect the AI 3000/AS 3000 II, in standard or Gemini configuration, to a TRACE 1300/TRACE 1310, TRACE GC Ultra, or FOCUS GC.

Refer to:

- [Standard Configuration](#)
- [Gemini Configuration](#)

Standard Configuration

Proceed as follows:

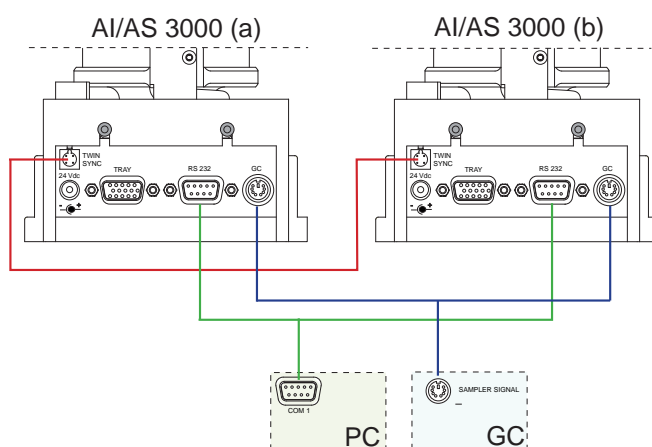
1. By using the cable provided, connect the 6-pin female connector marked **GC** located on the sampling unit back side and the connector, located on the rear panel of the GC, marked:
 - **AUTOSAMPLER HANDSHAKE** in the case of TRACE 1300/TRACE 1310.
 - **SAMPLER SIGNAL** in case of TRACE GC Ultra and FOCUS GC.

2. By using the cable provided, connect the 9-pin female connector marked **RS232** located on the sampling unit back side to 9-pin connector marked **AUTOSAMPLER** located on the GC rear panel.
3. **In case of AS 3000**, connect the 15-pin female connector of the cable coming from the support plate of the 105-position sample tray to the connector marked **TRAY** located on the sampling unit back side.

Gemini Configuration

Figure 48 shows how to connect two AI 3000/AS 3000 II in Gemini Configuration.

Figure 48. Connections in Gemini Configuration



Proceed as follows:

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

3 Installation

Installation of the AI 3000/AS 3000 II on the GC

- b. the first branch of the cable, labelled **Primary AI/AS** to the 9-pin female connector marked **RS232** on the rear of the sampling unit of the sampler “a”.
- c. the second branch of the cable, labelled **Secondary AI/AS** to the 6-pin female connector marked **RS232** on the rear of the sampling unit of the sampler “b”.

Instrument Start-up

Proceed as follows:

1. Plug in the Vdc power cable of the external portable power supply into the jack marked **24 Vdc** located on the sampling unit back side.
2. Connect the power cord of the external power supply to the mains outlet. The AI 3000/AS 3000 II will automatically run the self-testing routine during which the following automatic checks and settings are carried out:
 - alignment between AI 3000/AS 3000 II and the GC injector
 - acknowledgement of the installed sample tray
 - calculation of the syringe zero

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

AI 3000/AS 3000 II Control

This chapter provides the information to control the AI 3000/AS 3000 II from the computer or the GC. The chapter contains also the working procedures with different injectors.

Contents

- [Control from PC](#)
- [Control Through the TRACE GC Ultra](#)
- [Control Through the FOCUS GC](#)
- [Guidelines for Programming with Different Injectors](#)

Control from PC

The AI 3000/AS 3000 II is controlled through a Thermo Fisher Scientific data system for gas chromatography installed in the PC and interfaced with the instrument via serial line RS 232. This paragraph describes how to program the instrument operating parameters.



IMPORTANT Before creating an autosampler method you must configure the correct syringe capacity in the AI 3000/AS 3000 II Configuration page of the Data System in use (refer to your *Data System Operating Manual* – Configuration for details).

User Interface

The user interface, see Figure 49, is the same for AI 3000/AS 3000 II and Gemini configurations. In this page the sampler parameters can be set, whereas the sequence of samples to be analyzed and acquired is managed by the data system as a function of the type of sample tray installed.

Figure 49. AI 3000/AS 3000 II Autosampler Page

The screenshot shows the Autosampler Page with the following settings:

- Sampling**
 - Sample Volume (µl): 1,0
 - Plunger Strokes: 1
 - ☒ Viscous Sample
 - Sampling Depth: Bottom
- Injection**
 - Injection Depth: Standard
 - Pre-Inj. dwell Time (s): 0,0
 - Post-Inj. dwell Time (s): 0,0
- Washes**
 - Pre-Injection**
 - Solvent: A
 - Cycles: 1
 - Sample**
 - Rinses: 1
 - Post-Injection**
 - Solvent: A
 - Cycles: 1

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

When in **Gemini** configuration, the user interface controls both the samplers. The parameters set here will be send to both the samplers as they were a single ones. The hardware must be the same for both the samplers such as type of sampler, tray and samples numbering.



IMPORTANT In the Sampler Configuration page of the data system in use, select the function **Vial error handling >> Stop on vial missing**.

This page includes the following fields, menus and messages:

- [Sampling](#)
- [Injection](#)
- [Washes](#)
- [Info Line](#)
- [Status Line](#)
- [Menus](#)
- [Messages](#)

Sampling

Set up the sampling parameters in this field. See [Table 3.](#) for details.

Table 3. Sampling Parameters

Parameter	Description
Sample Volume	Enter a value for the injection volume. The range depends on the size of syringe selected in the Instrument Configuration. For a 5 µl syringe the range is 0.0-2.5 µl and for a 10 µl syringe, 0.0-5.0 µl.
Plunger Strokes	Select the number of strokes of the plunger used to eliminate air bubbles. The range is 1-15.
Viscous Sample	Select the check box to indicate that the sample is viscous. Clearing the check box implements a fast aspiration speed while a selected check box leads to a slow one.
Sampling Depth	Choose the position of the needle in the vial from which the aliquot is drawn. The options are Bottom or Center .

Injection

These parameters control the behavior of the syringe when the needle is inserted into the inlet. See [Table 4](#) for details.

Table 4. Injection Parameters (Sheet 1 of 2)

Parameter	Description
Injection Depth	Choose an injection depth. The options are Standard or Minimum . If the pre and post -injection dwell times are set to zero, the autosampler defaults to the Minimum setting.
Pre-injection Dwell Time	This is the time that the needle is held in the inlet prior to injection. Enter a value in the range 0-63 s.

Table 4. Injection Parameters (Sheet 2 of 2)

Parameter	Description
Post-injection Dwell Time	This is the time that the needle is held in the inlet after the injection. Enter a value in the range 0-63 s.

Washes

This field contains parameters controlling syringe washing with solvents and the sample.

Pre-Injection

These parameters are applied to pre-injection washing with a solvent chosen from the vials in the Washing and Waste tray. See [Table 5](#) for details.

Table 5. Washer Parameters

Parameter	Description
Pre-Injection	These parameters are applied to pre-injection washing with a solvent chosen from the vials in the Washing and Waste tray. See Table 6 for details.
Sample	This is the number of times that the syringe is rinsed with the sample prior to injection. Select a value in the range 1-15.

Table 6. Pre-injection parameters

Item	Description
Solvent	Choose a solvent from the drop-down list. The options are: A , B , C , D , A+B and C+D . These settings correspond to the vials in the Washing and Waste tray.
Cycles	Select the number of times the solvent is cycled through the syringe. The range is 1-15.

Sample

This is the number of times that the syringe is rinsed with the sample prior to injection. Select a value in the range 1-15.

Post-Injection

These parameters are applied to post-injection washing with a solvent chosen from the vials in the Washing and Waste tray. See [Table 7](#) for details.

Table 7. Post-injection parameters

Item	Description
Solvent	Choose a solvent from the drop-down list. The options are: A , B , C , D , A+B and C+D . These settings correspond to the vials in the Washing and Waste tray.
Cycles	Select the number of times the solvent is cycled through the syringe. The range is 1-15.

Info Line

It displays the range of the selected parameter.

Status Line

It displays the instrument status messages and error messages that may occur during operation. See “[Messages](#)” on [page 60](#).

Menus

The menus of the AI 3000/AS 3000 II are the follows: File, Edit, Command, and Help.

File Menu

This menu contains the following items:

New — This function creates a new method for the AI 3000/AS 3000 II starting from the data currently in memory or from default parameters previously stored with the function **Save As Default**.

Open — This function uploads a pre-existing analytical method for the AI 3000/AS 3000 II from disk to the computer memory.

Open Recent... — It allows to retrieve the last 5 saved analytical methods.

Note To activate a loaded or modified method, use the command **Send Method to Sampler**.

Save (Save as...) — This function allows to save an analytical method on the hard disk. With the command **Save as...** the method can be saved with a new name.

Load From Default — This function allows to upload a default analytical method.

Save As Default — This function allows to save the current analytical method as a default method for the AI 3000/AS 3000 II (... \tmp. \AI\AS1300 Default method.asm). The parameters of this method can be retrieved when selecting the function **New**.

Get Method from Sampler — It allows to transfer the AI 3000/AS 3000 II current method to the GC.

Send Method to Sampler — It transfers the method from the computer to the a AI 3000/AS 3000 II and makes the method active.

Print — This function allows to print the method.

Close — This function allows to close the method. If modifications have been done, the system will ask where to save them in the method.

Edit Menu

This menu gives access to the following functions:

View Audit Trail — It displays the log file of the method. Each change to the method parameters is recorded on the log file with the operator's name as well as the date and time of the modification. Using the function Copy it is possible to copy part or all the log file contents into Windows and then transfer information to other programs if required.

Note Audit trail method log is available only if a protection policy is active in the data system.

Command Menu

This menu gives access to the following functions:

Start Clean Cycle — It allows to start a washing cycle.

Inject Single Sample — It allows to start the injection of a single sample.

Force Autoinjector to Stand-by — It interrupts any current operation and forces the AI 3000/AS 3000 II to stand-by.

Help Menu

It allows to have access to the on-line guide.

Messages

This paragraph lists the status and error messages that the computer may display according to the status of the AI 3000/AS 3000 II.

Status Messages

The status messages are listed below:

- Opening Connection

- No connection (Check the serial line connections)
- The AI 3000/AS 3000 II is in stand-by
- AI 3000/AS 3000 II is checking positions
- AI 3000/AS 3000 II ready to inject sample in vial n but waiting GC Ready
- AI 3000/AS 3000 II is preparing the sample in vial n.
- AI 3000/AS 3000 II has injected the sample in vial n.
- The AI 3000/AS 3000 II front door is open (all operations are paused)

Error Messages

The error messages are listed below:

- AI 3000/AS 3000 II error, solvent not found
- AI 3000/AS 3000 II position error, cannot find the initial zero positions

Control Through the TRACE GC Ultra

This paragraph describes how to program and control the AI 3000/AS 3000 II through the TRACE GC Ultra keypad.

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

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

Note In an analytical method all the AI 3000/AS 3000 II functions can be programmed. To develop an analytical method and activate a sample sequence, please refer to the *TRACE GC Ultra Operating Manual*.

Configuring the AI 3000/AS 3000 II

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

The type of configuration is displayed by pressing **CONFIG** and selecting **AUTOSAMPLER**.

The following non editable message is displayed according to the AI 3000/AS 3000 II installed:

CONFIG AUTOSAMPLER	
Sample tray	105

for the AS 3000.

or

CONFIG AUTOSAMPLER	
Sample tray	8

for the AI 3000.

Note Should the AI 3000/AS 3000 II not be installed or correctly connected, the TRACE GC Ultra will display the message NO AUTOSAMPLER INSTALLED.

AI 3000/AS 3000 II Menu

To set the parameters of the AI 3000/AS 3000 II method, press **Autosampler** key to open the **relevant** menu described in [Table 8](#).

Table 8. Control Through the TRACE GC Ultra: Autosampler Menu

Menu	Range	Comment
AUTOSAMPLER		This line displays the menu title.
Sample volume	0–5 µL with increments of 0.1 µL	This parameter allows to set the sample quantity to be injected.
Sample rinses	0–15	This parameter allows to set the number of syringe pre-washings with the sample.
Plunger strokes	0–15	This parameter allows to set the number of plunger strokes to eliminate air bubbles forming during the sample withdrawal.
Pre wash solvent	A, B, C, D A+B C+D	This parameter allows to select the vial, or combination of two vials, containing the washing solvent. Press Mode/Type to select the solvent vial to be used.
Pre wash cycles	0–15	This parameter allows to set the number of syringe pre-washings with the selected solvent.
Post wash solvent	A, B, C, D A+B C+D	This parameter allows to select the vial, or combination of two vials, with the washing solvent. Press Mode/Type to select the vial with the solvent to be used.
Post wash cycles	0–15	This parameter specifies the number of syringe post-washings with the solvent selected.
Extended control	See “ Extended Control Menu ” on page 64	This parameter allows to set optional injection parameters. Press Mode/Type to enter the submenu.
When no vial abort	See “ When No Vial Abort Menu ” on page 65	This line shows the menu title.

Extended Control Menu

In this menu it is possible to set how long the syringe needle must remain inside the injector without injecting. This allows to avoid discriminations caused by evaporation of the sample contained in the syringe needle. In this way the sample is completely drawn into the syringe and the needle left inside the injector and heated for a few seconds before injecting. See [Table 9](#) for details.

Table 9. Control Through the TRACE GC Ultra: Extended Control Menu

Menu	Range	Comments
EXTENDED CONTROL		This line shows the menu title.
Viscous sample	Yes, No	This parameter defines the speed at which the sample is drawn from the vial as a function of the sample viscosity. Select No (default value) if the sample has low viscosity. Select Yes if the sample has high viscosity.
Sampl. depth	Bottom, Center selectable in the submenu	<p>This parameter determines the penetration depth of the syringe needle into the vial.</p> <p>Press Mode/Type or Enter to enter the submenu.</p> <ul style="list-style-type: none"> • Selecting Bottom (default value) the needle goes down to the vial bottom. • Selecting Center the needle goes down to half vial.
Inj. Depth	Standard, Minimum selectable in the submenu	<p>This parameter determines the penetration depth of the syringe needle into the injector.</p> <p>Press Mode/Type or Enter to enter the submenu.</p> <ul style="list-style-type: none"> • Selecting Standard (default value) the needle goes down to the maximum depth allowed. • Selecting Minimum the needle enters the injector and stops immediately beyond the septum (Cold Needle Technique).

When No Vial Abort Menu

See [Table 10](#) for details.

Table 10. Control Through the TRACE GC Ultra: When No Vial Abort Menu

Menu	Comments
ON MISSING AS VIAL	This line shows the menu title.
Skip to next	If this function is selected, the AI 3000/AS 3000 II skips a missing vial and goes to the next one. The sample sequence and the sample table are not affected.
Abort sequence	If this function is selected, the sequence is aborted after a missing vial.

Control Through the FOCUS GC

This paragraph describes how to program and control the AI 3000/AS 3000 II through the FOCUS GC keypad.

The AS 3000 can automatically analyze groups of samples under different analytical conditions when a *sequence* of samples is programmed.

The sequence includes a set of information for the group of samples and their position on the sample tray. The sequence also specifies the method to be used to process each group of samples. Refer to paragraph *Sequence of Samples with the AS 3000* on [page 68](#).

Configuring the AI 3000/AS 3000 II

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

To configure the AI 3000/AS 3000 II:

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

The following message will be displayed according to the AI 3000/AS 3000 II installed:

CONFIG AUTOSAMPLER	
Syringe Volume	10
Sample tray	105

for the AS 3000.

or

CONFIG AUTOSAMPLER	
Syringe Volume	10
Sample tray	8

for the AI 3000.

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

AI 3000/AS 3000 II Menu

To set the parameters of the AI 3000/AS 3000 II method, In Main Menu move the cursor until **Autosampler** is displayed, then press **Enter** to open the menu. See [Table 11](#) for details.

Table 11. Control Through the FOCUS GC: Autosampler Menu (Sheet 1 of 2)

Menu	Range	Comment
AUTOSAMPLER		This line displays the menu title.
Sample volume	0–5 µL, 0–2.5 µL with increments of 0.1 µL	This parameter allows to set the sample quantity to be injected.
Sample rinses	0–15	This parameter allows to set the number of syringe pre-washings with the sample.
Plunger strokes	0–15	This parameter allows to set the number of plunger strokes to eliminate air bubbles forming during the sample withdrawal.
Pre wash solvent	A, B, C, D, A+B, C+D	This parameter allows to select the vial, or combination of two vials, containing the washing solvent.
Pre wash cycles	0–15	This parameter allows to set the number of syringe pre-washings with the selected solvent.
Post wash solvent	A, B, C, D A+B C+D	This parameter allows to select the vial, or combination of two vials, with the washing solvent.
Post wash cycles	0–15	This parameter specifies the number of syringe post-washings with the solvent selected.
Viscous sample	Yes, No	<p>This parameter sets the sample drawing speed from the vial as a function of the sample viscosity.</p> <ul style="list-style-type: none"> • Select No (default value) if the sample has low viscosity. • Select Yes when the sample has high viscosity.

Table 11. Control Through the FOCUS GC: Autosampler Menu (Sheet 2 of 2)

Menu	Range	Comment
Sample depth	Bottom, Center, selectable in the submenu	This parameters sets the penetration depth of the syringe needle into the vial. If Bottom (default value) is selected, the needle goes down to the vial bottom. If Center is selected, the needle goes down to half vial.
Inj. depth	Standard, Minimum, selectable in the submenu	This parameter defines the penetration depth of the syringe needle into the injector. If Standard (default value) is selected, the needle goes down to the maximum allowed depth. If Minimum is selected, the needle enters the injector and stops immediately beyond the septum (<i>Cold Needle Technique</i>).
Pre dwell time	0–63 sec	This parameter specifies how long the syringe needle must remain in the injector before injection (<i>Hot Needle Technique</i>).
Post dwell time	0–63 sec	This parameter specifies how long the syringe needle must remain inside the injector after injection.

Sequence of Samples with the AS 3000

To set the parameters to run a sequence of samples with the AS 3000, in Main Menu move the cursor until **Sequence** is displayed, then press **Enter** to open the menu. See [Table 12](#) for details

Table 12. Control Through the FOCUS GC: Sequence Menu with AS 3000 (Sheet 1 of 2)

Menu	Range	Comments
SEQUENCE		This line shows the menu title.
First sample	1 to 105	Indicates the first sample of the sequence.
Last sample	1 to 105	Indicates the last sample of the sequence.
Injection/vial	1 to 99	Indicates how many times the same sample has to be run.

Table 12. Control Through the FOCUS GC: Sequence Menu with AS 3000 (Sheet 2 of 2)

Menu	Range	Comments
When no vial	See Table 13 .	
Start sequence		Indicates the sequence start.
Stop Sequence		Indicates the sequence end.

Table 13. Control Through the TRACE GC Ultra: When No Vial Abort Menu

Menu	Comments
ON MISSING AS VIAL	This line shows the menu title.
Skip to next	If this function is selected, the AI 3000/AS 3000 II skips a missing vial and goes to the next one. The sample sequence and the sample table are not affected.
Abort sequence	If this function is selected, the sequence is aborted after a missing vial.

Guidelines for Programming with Different Injectors

To get the best results from your AI 3000/AS 3000 II, follow these guidelines when programming the autosampler method according to the injector in use. Refer to:

- [SSL Inlet \(TRACE GC Ultra/FOCUS GC\)](#)
- [Nano-Volumes Injections in S/SL Inlets](#)
- [Packing a SSL Liner](#)
- [S/SL Inlet with a Merlin Microseal™](#)
- [PTV Inlet](#)
- [PTV Inlet with a Merlin Microseal™](#)
- [PKD and PPKD Inlets](#)

SSL Inlet (TRACE GC Ultra/FOCUS GC)

The AI 3000/AS 3000 II can inject in a hot SSL inlet using two distinct needle insertion modes: “**Standard**” and “**Minimum**”.

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

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

- **Cold needle technique** — (Minimum depth mode) prevents boil-out from the needle and lets the sample to enter the injector nearly entirely in liquid phase. This injection technique requires the use of packed liner to stop the liquid run (see “[S/SL Inlet with a Merlin Microseal™](#)” on [page 73](#)).
- **Hot needle technique** — (Standard depth mode) requires a minimum pre-dwell time to heat the needle (usually 3-5 seconds) to achieve a complete expulsion of the sample from the needle in form of a spray. This technique permits the use of empty liners.

[Table 14](#) reports a summary of injection parameters and conditions for the two SSL techniques. For your reference the type of liner and the column insertion inside the inlet are also reported.

Table 14. Summary of Injection Parameters and Conditions

Mode	Technique	Column Insertion	Liner Type	Packing of Liner	AI 3000/AS 3000 II Injection Parameters
Split	Hot Needle	40 mm	Tubular Liner (3 or 5 mm ID)	Not required	Standard Injection Depth 3-5 sec. Pre-Dwell Time 0 sec. Post-Dwell Time
	Cold Needle	40 mm		Packing material at half height	Minimum Injection Depth Dwell Time are automatically inhibited
Splitless	Hot Needle	64 mm	Tapered Liner (3 or 5 mm ID)	Not Required	Standard Injection Depth 3-5 sec. Pre-Dwell Time 0 sec. Post-Dwell Time
	Cold Needle	50 mm		Packing material at bottom	Minimum Injection Depth Dwell Time are automatically inhibited
S/SL Nano-Volumes ¹	Cold Needle	40 mm	Double Tapered Liner	No	Minimum Injection Depth Dwell Time are automatically inhibited

¹ Only with 0.5µL syringe. For details, refer to the *Nano-Volumes Kit for S/SL Inlet System User Guide*.

Nano-Volumes Injections in S/SL Inlets

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

The reduction of the injection volume to the sub microliter range using a standard autosampler, like the AI 3000/AS 3000 II unit, is achievable by exploiting the low capacity syringe (0.5 µL) and the tapered liner provided in the *Nano-Volumes Kit for S/SL Inlet System*. High accuracy and repeatability injecting nano-volumes are achievable by exploiting the “Cold Needle” injection mode.

For injection volumes higher than 0.2-0.3 µL use a 5 (or 10) µL syringe and a standard split or splitless liner (possibly packed with glass wool whenever you inject in “Cold Needle” mode). In summary, use the following guideline to choose the best syringe capacity for your injections with the AI 3000/AS 3000 II autosampler. See [Table 15](#) for details

Table 15. Syringe Guideline for AI 3000/AS 3000 II Autosampler

Injection Volume Range	Suggested Syringe ¹	AI 3000/AS 3000 II Injection Parameters
0.5 – 5.0 µL	10 µL	Standard – general purpose
0.2 – 1.0 µL	5 µL	---
0.01 – 0.3 µL	0.5 µL	Plunger-in-needle

¹ See your GC *Spare Part Catalog* for items part number.

Packing a SSL Liner

Proceed as follows:

1. On your TRACE GC Ultra or FOCUS GC keypad, enter the **oven** menu and switch off the oven temperature. This will avoid heating of the analytical column when carrier is off.
2. Enter the **injector** menu and switch off the inlet temperature.
3. Enter **carrier** Menu and switch off the carrier supply.
4. Remove the centering plate of the AI 3000/AS 3000 II (if installed).
5. Wait till the injector has reached room temperature and by means of the outfit tool unscrew the septum cap, then remove it together with the septum holder and its plate.
6. Unscrew the liner holder and remove it. Use tweezers to gently extract the liner from the injector.
7. Insert a little plug of packing material (i.e. deactivated glass wool) filling the liner cavity about 5 mm in length. Push the plug till it reaches the position. See [Figure 50](#).

Figure 50. Packing a SSL Liner



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

S/SL Inlet with a Merlin Microseal™

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

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

Mode	Technique	Column Insertion	Liner Type	Packing of Liner	AI 3000/AS 3000 II Injection Parameters
Split	Cold Needle	40 mm	Tubular Liner (3 or 5 mm ID)	Packing material at half height	Standard Injection Depth 0 sec. Pre-Dwell Time 0 sec. Post-Dwell Time
Splitless		50 mm		Packing material at bottom	Standard Injection Depth 0 sec. Pre-Dwell Time 0 sec. Post-Dwell Time

See “Packing a SSL Liner” on page 72 for instruction.

PTV Inlet

Since PTV is cold during sample introduction the syringe needle will not be heated whenever standard or minimum depth is selected or dwell times are set. However standard injection mode is advisable since the sample evaporation is faster in the deeper part of the liner. Optional 1-2 seconds of dwell times will guarantee stable flow condition after the needle introduction. See Table 16.

Table 16. PTV Inlet

Injector	Column Insertion	AI 3000/AS 3000 II Injection Parameters
Programmed Temperature Vaporizing Injector (PTV)	30 mm	Standard Injection Depth 1-2 sec. Pre-Dwell Time 1-2 sec. Post-Dwell Time

PTV Inlet with a Merlin Microseal™

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

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

PKD and PPKD Inlets

For injection into packed column the standard insertion depth with 3-5 seconds of Pre-dwell time is suggested. See

Table 17. PKD and PPKD Inlets

Injector	AI 3000/AS 3000 II Injection Parameters
Packed Injector (PKD)	Standard Injection Depth
Purged Packed Injector (PPKD)	3-5 sec. Pre-Dwell Time 0 sec. Post-Dwell Time

Maintenance

This chapter provides guidelines for the maintenance of the AI 3000/AS 3000 II.

Contents

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

Current Maintenance

The AI 3000/AS 3000 II does not generally require maintenance, except emptying of the waste container when full, cleaning of the sample tray and replacement of the syringe. For any other operation, contact Thermo Fisher Scientific Technical Service.

Emptying of the Waste Container

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

Cleaning of the Sample Tray Accessory

The sample tray must be periodically cleaned.

Use a water and soap solution or a household non abrasive product. Dry using a clean cloth.

Cleaning the Instrument Externally

Normal usage of the AI 3000/AS 3000 II can cause the exterior to get dirty.



WARNING It is your responsibility to avoid that dangerous liquids and/or materials seeping inside the AI 3000/AS 3000 II during operation and maintenance.

Solvent should not be used. Do not spray on electrical parts.

To clean the instrument externally:

1. Power off the AI 3000/AS 3000 II.
2. Externally clean the instrument with a soap and water solution, or with a household non-abrasive product.
 - Pay special attention when cleaning the back side of the instrument. Do not spray, but clean using a cloth imbued with the same substance.
 - Carefully avoid seeping of the products used inside the instrument, particularly when cleaning the grid of the rear panel.

- If you just suspect that a substance used for cleaning or a product submitted to analysis has penetrated inside the instrument, immediately shut down the instrument and call an authorized customer support engineer for proper actions. The service engineer must be fully informed on the nature of the concerned substance. In the event that a hazardous material is spilled on or in the instrument, clean the spill according to the procedures reported in the Material Data Sheet for that substance.
3. Dry with a clean cloth.
 4. Power on the AI 3000/AS 3000 II.

Replacing the Syringe

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

Note 5 and 0.5 µL syringes are optionally available.

5 and 0.5 µL syringes are optionally available.

This operation is possible with the instrument either on or off.

1. Open the safety door of the turret.

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

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

Note If the instrument is on, when the door is closed the instrument automatically runs the syringe zero routine.
If the instrument is off, the operation is performed when it is switched on during the self-test routine.

Cleaning the Syringe

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

1. If the sample is not viscous, program in the autosampler method one or more rinse with sample to maintain the lubrication of the plunger.
2. Program in the autosampler method one or more post-injection wash cycle with solvent.
3. If the sample is viscous, program in the autosampler method wash cycles of extra solvents (e.g. A+B, where A is used to clean and B to rinse). The first solvent should have a higher cleaning power than the second solvent. The latter should be chemically similar to the sample scheduled for injection.
4. Perform an automated maintenance cycle every 100 injections (see “[Automated Cleaning](#)” on [page 78](#)).
5. Perform a manual maintenance routine every 1000 injections (see “[Manual Cleaning](#)” on [page 78](#)).

Automated Cleaning

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

To perform an automated cleaning cycle proceed as follows:

1. Fill a 4 mL vial with fresh solvent with high cleaning power (acetone is recommended) and place it in the D position of the washing tray of the AI 3000/AS 3000 II.
2. From your PC, enter the Data System and then access the AI 3000/AS 3000 II method page. Select the following parameters:
 - Pre-injection Solvent: D
 - Pre-injection Cycles: 15
3. Enter the **File** menu and click on **Send Method to Sampler**.
4. Enter the **Command** menu and click on **Start Clean Cycle**.
5. If necessary, repeat the step 4 of this sequence.

Manual Cleaning



CAUTION This operating sequence is not applicable to the 0.5 µL syringe. For details, refer to the *Nano-Volumes Kit for S/SL Inlet System User Guide*.

To perform a manual cleaning cycle proceed as follows:

1. Remove the syringe as described in the operating sequence “Replacing the Syringe” on [page 77](#).
2. Completely take out the syringe plunger and clean it gently using a soft cloth or a paper tissue wetted with high cleaning power solvent (acetone is recommended).
3. Reintroduce the syringe plunger and gently move it repeatedly along its whole travel drawing an organic solvent (e.g. hexane).
4. Reinstall the syringe as described in the operating sequence “Replacing the Syringe” on [page 77](#).

Preparing a New Syringe

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

To prepare a new syringe proceed as follows:

1. Fill a 4 mL vial with fresh solvent (hexane is recommended) and place it in the D position of the washing tray of the AI 3000/AS 3000 II.
2. From your PC, enter the Data System and then access the AI 3000/AS 3000 II method page. Select the following parameters:
 - Pre-injection Solvent: D
 - Pre-injection Cycles: 15
3. Enter the **File** menu and click on **Send Method to Sampler**.
4. Enter the **Command** menu and click on **Start Clean Cycle**.

Moving Away the Sampling Unit from the Injector Module

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

Front/Back Configuration

1. Power off the AI 3000/AS 3000 II.
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. Remove the plates locking screw. The top plate is now free to move outwards allowing the sampling unit to be moved away from the injector module.
4. Carefully push the sampling unit outwards up to reach the end run of the top plate.
5. When the maintenance of the injector module has been performed, restore the position of the sampling unit on the injector module.
6. Block the two plates by using the plates locking screw.
7. Reinsert the centering plate into its seat of the sampling unit base paying attention that the guide hole, present on the arm of the centering plate, correctly fits the injector nut.

Gemini Configuration

1. Power off the AI 3000/AS 3000 II.
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. Undo that screw that secure the retainer. The top plate is now free to move outwards allowing the sampling unit to be moved away from the injector module.
5. Carefully push the sampling unit outwards up to reach the end run of the top plate.
6. When the maintenance of the injector module has been performed, restore the position of the sampling unit on the injector module.
7. Tighten the screw that secure the retainer.
8. Reinsert the centering plate into its seat of the sampling unit base paying attention that the guide hole, present on the arm of the centering plate, correctly fits the injector nut.
9. Reinsert the sample tray into its seat of the sampling unit base.

Abbreviations

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 V 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

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

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

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

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

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