thermoscientific

PRODUCT SPECIFICATIONS

TriPlus 500 Gas Chromatography Headspace Autosampler

Superior reliability. Easy method transfer. High data quality.

Benefits

- The innovative and highly precise control of the pressure in both the vial and the sampling loop, prior transfer into the GC column, produces extremely reliable results and delivers excellent injection repeatability.
- Efficient heating of the entire sample path greatly reduces the risk of high boiling solvents contamination and extends the robustness of the system. Boost productivity with 24/7 operation and eliminate downtime.
- Effective purging over 5 levels of flow rates and short sample path take away the pain of eliminating the residual signal of heavier and polar compounds and assure minimal to no carryover.

The Thermo Scientific™ TriPlus™ 500 Gas Chromatography Headspace Autosampler offers the most advanced static headspace system to save time and money in daily workflows for volatile analysis. The innovative pneumatic design (patent granted) and direct GC connection provide high sample integrity and robust workflow for superior performance and highly reliable operations on all types of samples.

Laboratories who need to comply with stringent regulatory requirements will benefit from complete integration with the Thermo Scientific™ Chromeleon™ Chromatography Data System (CDS) software. Easy compliance and streamlined validation procedures can be achieved through dedicated tools for automatic reporting and system suitability testing.

Highly competitive testing laboratories seeking to increase productivity and reduce cost per sample, can rely on the highest sample throughput on the market embedded in the most compact design, capable to save about 30% of valuable bench space compared to similar configurations on the market.

The new scalable design of the TriPlus 500 HS autosampler also offers a safe investment with a fit-for-purpose vial capacity configuration, responding to different sample throughput needs.

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Specifications

System Description

The main unit is installed on the right side of the Thermo Scientific™ TRACE™ 1600 Series Gas Chromatograph and is directly connected to the capillary column through a short interface. The TriPlus 500 HS autosampler consists of three modules:

- A valve-and-loop headspace autosampler with a built-in 12-vial capacity carousel, a 12-seat incubation oven, the sampling pneumatic circuit, and integrated electronic pressure regulation
- A robotic vial loader with magnetic gripper for vial handling
- A tray holder with three removable and interchangeable 40-vial trays that offer intuitive vial position identification

Combining the valve-and-loop headspace autosampler, vial loader, and vial trays expands the system's vial capacity up to 240 vials. The vial loader and vial trays can be easily added to the system at any time without requiring any extra bench space.

The TriPlus 500 HS autosampler with the direct column connection design is compatible with the existing Thermo Scientific™ TRACE™ 1300 Series GC.

The TriPlus 500 HS autosampler is also available with an external flexible heated transfer line. Maintaining a highly inert sample path, this configuration is ideal for connecting the TriPlus 500 HS whenever the direct column connection is not achievable, such as in case of the TRACE 1600/1300 Series GC configured with the Auxiliary Oven or in case of legacy or third-party GC/GCMS systems.

Specification	Value
Analytical Performance	
Typical area repeatability	<0.8% RSD*
Sample Handling	
Vial capacity	• 12-vial capacity configuration, upgradable to 120-vial capacity with the vial loader and further extendable to 240-vial capacity with the vial tray. TriPlus 500 HS with transfer line is only available in 12- and 120-vial configurations. • Vial trays are exchangeable during sequence for endless operation • Optional cooled tray with 120-vial capacity is available (recirculating chiller required)
Vial compatibility	• 10 mL vials; dimensions, including septum and cap: – min. 46.5 mm to max. 49.5 mm height – min. 22.25 mm to max. 23.50 mm outer diameter • 20/22 mL vials; dimensions, including septum and cap: – min. 75.5 mm to max. 79.0 mm height – min. 22.25 mm to max. 23.50 mm outer diameter • Magnetic crimp or screw top caps • Flat or rounded bottom • No vial adapter required • Mixed vial size sequences
Oven capacity	12-seat electrically-driven carousel
Sample overlapping	• Up to 12 vials • Automatic timing to maintain the equilibration time constant and maximize throughput • Works with non-consecutive vial positions of the sample tray • Available for all configurations

Specifications *Continued*

Specification	Value
Operational Parameters	
Oven temperature	OFF or from ambient +5 to 300 °C, settable in 1 °C increments, and with 0.1 °C read out
Incubation time	0.00 to 999.99 min, settable in 0.01 min increments
Vial shaking	Proprietary built-in Quick Spin Shaking (QSS) for accelerated sample equilibration: Off, Slow, Medium, Fast
Sampling valve	6-port rotary valve, electrically actuated
Loop/sample path temperature	OFF or from ambient +5 to 225 °C or 150 to 300 °C (with optional HT valve), settable in 1 °C increments, and with 0.1 °C read out
Transfer line temperature (for transfer line configuration only)	OFF or from ambient +5 to 300 °C, settable in 1 °C increments and with 0.1 °C read out
Pressure equilibration time	0.00 to 5.00 min
Loop equilibration time	0.00 to 5.00 min
Injection time	0.00 to 999.99 min
GC run time	Set automatically
Vial pressurization modes	• Pressure: user-selectable vial pressure, with pressure rate automatically optimized • Time to pressure: user-selectable vial pressure with customized pressurization time • Rate to pressure: user-selectable vial pressure with customized pressure rate
Loop filling	• User-selectable loop pressure with active pressure control for optimal repeatability
Vial venting	• User-selectable option for residual vial pressure release
Purging	• Five levels for needle purging available in stand-by mode and after each injection with selectable time
Sample Path	
Material	Stainless steel coated with highly chemically inert material and SulfiNert™
Loop	• Standard: 1 mL • Optional: 25 µL, 50 µL, 100 µL, 500 µL, and 3 mL
GC interface	• Compatible with fused capillary column from 50 µm up to 530 µm internal diameter • Use fittings and ferrules common with the Thermo Scientific™ Instant Connect Split/Splitless (SSL) injector
Transfer line (for transfer line configuration only)	• The heated flexible transfer line accomodates a metal Hydroguard®-treated MXT stainless steel column 0.53 mm ID as a standard • Optional GuardGOLD™ fused silica capillary column or Sulfinert™ metal column available • Connected directly to a capillary column or through the GC split-splitless inlet with an adapter. Adapters for Thermo Scientific and third-party injectors available.
Pneumatics	
Carrier gas	• Compatible with helium, hydrogen, nitrogen and argon • On-board integrated Electronic Control (IEC) Gas Control for Carrier gas on the TriPlus 500 HS with transfer line configuration. Control modes: OFF, Constant Pressure, Constant Flow and Automatic Constant Flow (for TRACE 1600/1300 Series GC only)
Auxiliary gas	Compatible with nitrogen, helium and argon
Auxiliary gas control	Vial pressurization and loop filling controlled by on-board Integrated Electronic Control (IEC) Gas Control
Max inlet pressure	550 kPa for Auxiliary gas, 1050 kPa for Carrier gas
Max vial pressure	500 kPa
Pressure settings	bar, psi, kPa
Connectivity	
Communication and handshaking	LAN and remote contact closure (start-out/ready-in)

Specifications *Continued*

Specification	Value
Control	
Local	• Status LED lights on the front panel: Power, Ready/Not Ready, Run • Acoustic signal for loader movement
Control software	• Seamless integration into Thermo Scientific GC and GC-MS software: Chromeleon (CDS), Thermo Scientific™ TraceFinder™, and Thermo Scientific™ XCalibur™ software • Interfaced via LAN connector
GC user interface	• Fully controlled from the Thermo Scientific™ TRACE 1610/1310 Gas Chromatograph • Intuitive icons for graphical user interface (GUI) • Multi-lingual setting (English, French, German, Chinese, Japanese, Spanish, Portuguese, Dutch, Danish, Russian)
Web-server interface	• Web-based application for easy instrument installation and configuration • Suitable also for remote diagnostic and service
Options	
Barcode reader	Barcode reader for 1D and 2D barcodes with support for checksums and following fonts: UPC-A, UPC-E, EAN-8, EAN-13, Code-128, EAN-128/GS10128, Code 39 (3 of 9), 2 of 5 Interleaved, ISBT 128, QR Code
Heated/cooled tray holder plate	4 to 70 °C with external recirculating chiller Tray plate temperature setting included in the headspace method**
Power Requirements	
Main unit	100–240 Vac; 50/60 Hz; 600 W
Vial loader	24 Vdc through a portable external power supply, 100–240 Vac; 50/60 Hz; 90 W
Environmental Conditions	
Compatibility	• Indoor use only • Up to 3500 meters altitude over sea level • Operating temperature: 15 to 35 °C (59 to 95 °F) • Storage temperature: -30 to 70 °C (-22 to 158 °F) • Maximum RH% 80 (up to 31 °C/87.8 °F), non-condensing • Sound pressure level: <70 dBA (dBA = A weighted sound pressure level)
Safety and Regulatory Certifications	
Compliant with applicable directives	• Low voltage directive 2014/35/EU • EMC Directive 2014/30/EU • RoHS directive 2011/65/EU and (EU) 2015/863
Compliant with product standards	• EMC – EN 61326-1, IEC 61326-1 – FCC rules: CFR no. 47 Part 15 Subpart B Section 15.107 and 15.109 • Safety – EN 61010-1, IEC 61010-1 – EN 61010-2-010, IEC 61010-2-010 – EN 61010-2-081, IEC 61010-2-081 – UL 61010-1 – UL 61010-2-010 – UL 61010-2-081 – CAN/CSA C22.2 No. 61010-1 – CAN/CSA C22.2 No. 61010-2-010 – CAN/CSA C22.2 No. 61010-2-081 • Designed and manufactured under a quality system registered to ISO 9001 • Declaration of conformity available

* Analyzing ethanol solution in water on a TriPlus 500 HS autosampler and a TRACE 1600 Series GC with Thermo Scientific™ Instant Connect SSL Injector and Flame Ionization Detector (FID). Results could vary with different samples or matrices. See example of a repeatability series in the Appendix.

** Feature available for Thermo Scientific™ Accel 500 Series Recirculating Chiller with USB

Injection modes

- Standard mode: single extraction for each sample. Optimized vial overlapping of up to 12 vials to ensure the highest throughput while maintaining an equal incubation time for each vial.
- Multiple headspace extraction (MHE): up to 100 extractions from a single vial
- Multiple headspace injection (MHI): up to 100 extractions for a single vial; GC run is started after the last injection
- Method development optimization (MDO) available using Chromeleon CDS custom variables

Sample protection and traceability

- Automatic vial leak check before sampling
- Needle purging after injection
- Error Handling sequence actions with Ignore, Stop sequence, Abort sequence, and Skip vial commands available for missing/wrong vial, leak test failed, and missing GC ready signal
- System status logs and alarms for every vial
- Barcode reader optional

System checking

- Automatic static system leak check: automatic routine to check leaks before starting operating a sample sequence. Available from the CDS, from the GUI of the TRACE 1610/1310 GC, and through the Web Server.
- Web-based application with functions available to the operator for easy instrument maintenance and troubleshooting
- Real time alarm and log file tracking on CDS
- Auto diagnosis at power-on

Gas saving

Reduced gas consumption with adjustable needle purge level between vials and between sequences

System dimensions and weights

System Configuration	Dimensions* (height × width × depth)	Weight
TriPlus 500 HS autosampler 12-vial	45 × 31 × 60 cm (18 × 12 × 24 in)	24.5 kg (54 lbs)
TriPlus 500 HS autosampler 120-vial	95.5 × 31 × 64 cm (37.6 × 12 × 25 in)	34.0 kg (75 lbs)
TriPlus 500 HS autosampler 240-vial	95.5 × 31 × 64 cm (37.6 × 12 × 25 in)	38.0 kg (83.8 lbs)

*Not including the external transfer line

Example of TriPlus 500 HS autosampler 12-vial configuration directly connected to the Thermo Scientific™ ISQ™ 7610 GC-MS

Example of TriPlus 500 HS autosampler 120-vial configuration connected through the transfer line to the TRACE 1610 GC with Auxiliary Oven

Appendix

An example of repeatability series (n=6) with a solution of ethanol in water is reported showing a relative standard deviation (RSD%) for the absolute ethanol peak area counts of 0.69%, in compliance with the specifications.

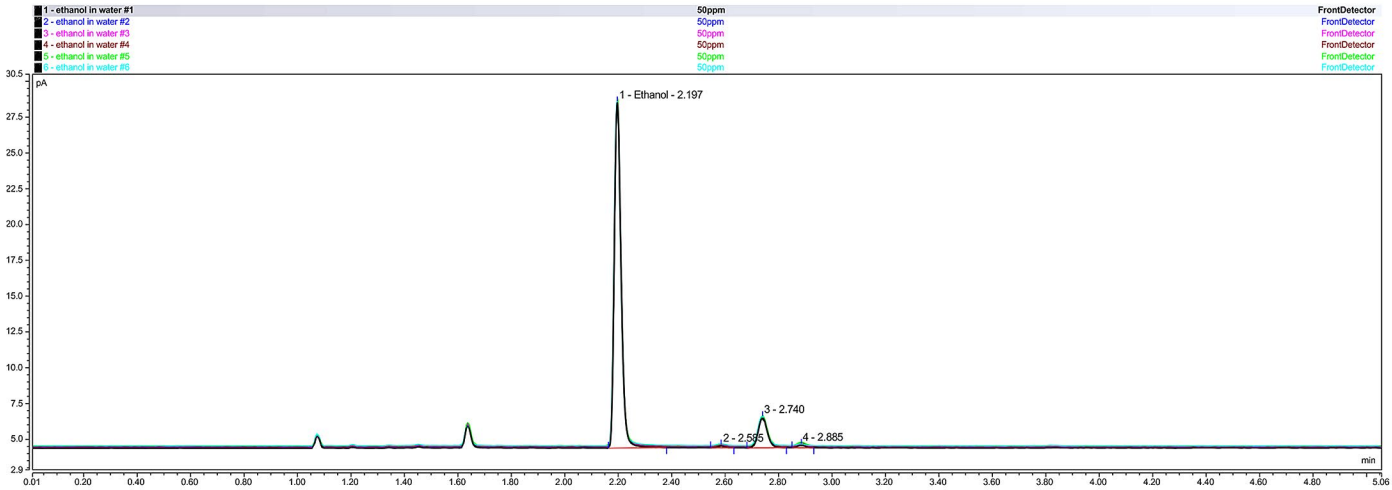
Sample preparation

Add 5 mL of ethanol/water test sample at 50 mg/L into a 10 mL headspace crimp top vial.

Method parameters

TRACE 1610 GC parameters	
Inlet module and mode	Thermo Scientific™ iConnect™ SSL, split
Split flow (mL/min)	50
Purge flow (mL/min)	5
Carrier gas (kPa)	Helium, 90
Oven temperature program	
Temperature (ºC)	40
Hold time (min)	10
FID	
Air flow (mL/min)	350
H_2 (mL/min)	35
N_2 (mL/min)	40
Column	Thermo Scientific™ TraceGOLD™ TG-624SilMS, 30 m, 0.32 mm, 1.8 um (P/N 26059-3390)

TriPlus 500 HS parameters	
Incubation temperature (ºC)	80
Incubation time (min)	15
Shaking	Medium
Pressurization mode	Pressure
Vial pressure (kPa)	100
Pressure equilibration time (min)	0.2
Loop filling mode (kPa)	50
Loop equilbration time (min)	1
Needle purge flow (mL/min)	2
Injection time (min)	0.5
Injection mode	Standard



	A	B	C	D	E	F	G	H
1	Inj.	Injection Name	Type	Ret.Time	Amount	Rel.Area	Area	Height
2	No.	Selected Peak:		min		%	pA*min	pA
3				FrontDetecto	FrontDetector	FrontDetecto	FrontDetector	FrontDetecto
4				Ethanol	Ethanol	Ethanol	Ethanol	Ethanol
5	*1*	*50ppm*	*Unknown*	*2.197*	*n.a.*	*88.43*	*0.7186*	*24.12*
6	2	50ppm	Unknown	2.197	n.a.	88.37	0.7136	24.04
7	3	50ppm	Unknown	2.197	n.a.	88.19	0.7090	23.92
8	4	50ppm	Unknown	2.197	n.a.	88.37	0.7106	23.88
9	5	50ppm	Unknown	2.197	n.a.	88.24	0.7223	24.33
10	6	50ppm	Unknown	2.195	n.a.	88.82	0.7156	24.22
11	Maximum			2.197	0.0000	88.82	0.7223	24.33
12	**Average**			**2.196**	**n.a.**	**88.40**	**0.7149**	**24.09**
13	Minimum			2.195	0.0000	88.19	0.7090	23.88
14	Standard Deviation			0.001	n.a.	0.22	0.0049	0.17
15	**Relative Standard Deviation**			**0.03%**	**n.a.**	**0.25%**	**0.69%**	**0.72%**
16								
17								
18								
19								
20								
21								

Summary | Peak Results | System Suitability Test | Calibration | Audit Trail

Figure A1. Results of repeatability series (n=6) for ethanol in water

For more information about the TriPlus 500 Headspace Autosampler, to request a demo, or to discuss your GC/GC-MS needs, please contact your Thermo Scientific representative today.