Thermo Scientific
TriPlus RSH Autosampler
Integrated Sampling System

You are productive

solving your chromatography challenges

Thermo
SCIENTIFIC

A step ahead
in automated sampling

The quality of gas chromatography results depends on many factors – the stability of the gas chromatograph, the ruggedness and sensitivity of the detector, and the skill of the chemist in executing the proper sample workflow. Within this process, sample preparation and introduction provide the foundation for repeatability and reliability that are essential for quality data.

The Thermo Scientific TriPlus RSH autosampler utilizes robotic sample handling to expand automated capabilities beyond liquid, headspace and solid-phase microextraction (SPME) injections to advanced sample handling cycles. Your results benefit from improved precision and reproducibility, while your laboratory gains unique advantages from the system's unattended operations and sample handling flexibility.

Exceptional Precision

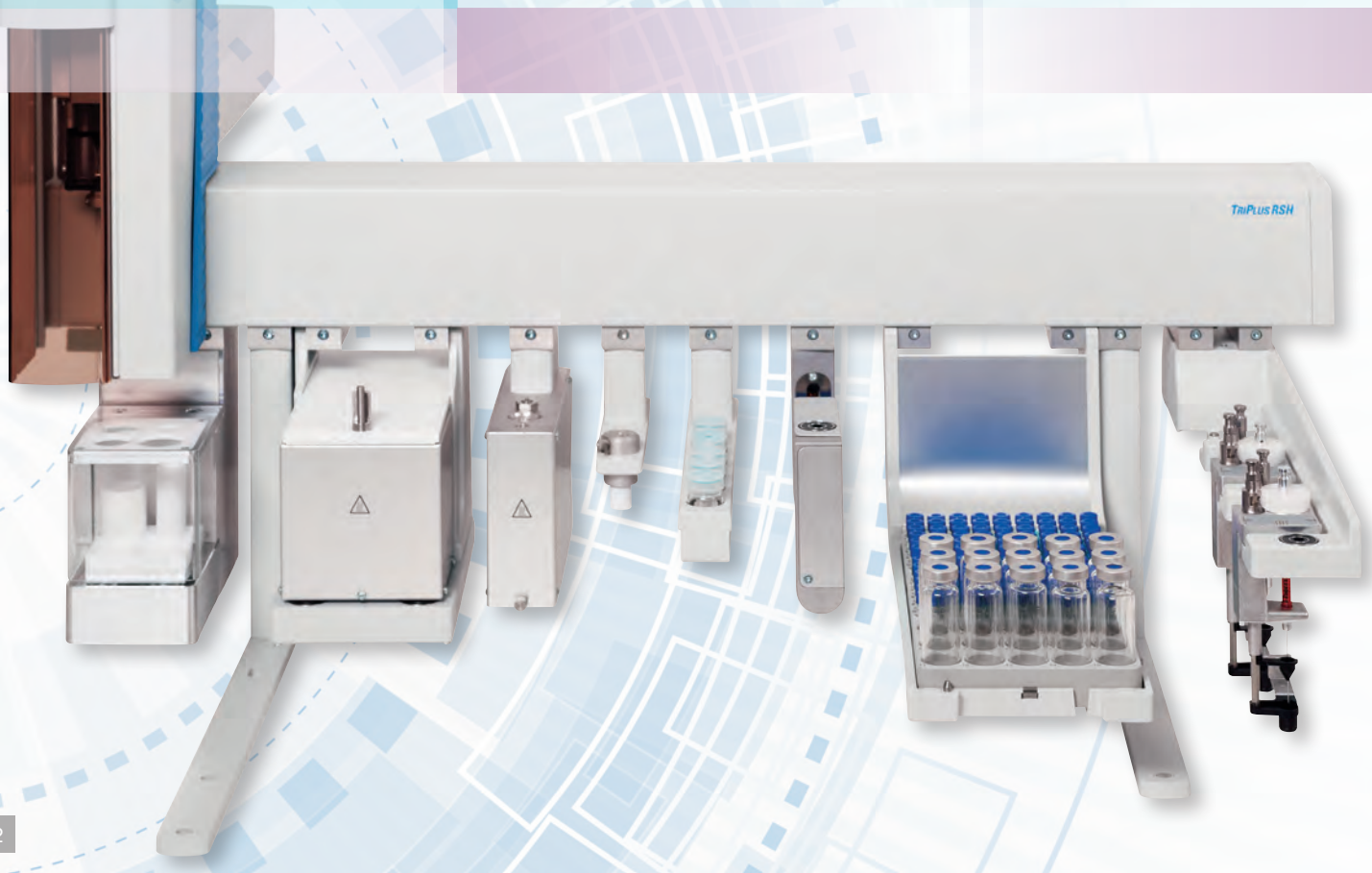
- Reproducible performance
- Automate basic sample and standards preparation
- Accuracy you can count on

Unmatched Flexibility

- Scalable capabilities to expand GC and GC-MS application range
- Accurate micro-sample injections
- Match techniques to sample types

Ultimate Productivity

- Large sample capacities
- Designed for full unattended 24/7 operation
- Rugged tireless operations



Expand productivity

and sample handling with unique and powerful capabilities

Experience Seamless Operation with the Innovative Automatic Syringe Exchanger

In the modern laboratory, basic sample handling tasks, including standard or stock sample dilutions, internal standard addition and derivatization, require manual pipetting of precise amounts of products before any dilution or chemical reaction occurs. To accurately automate all of these steps, the TriPlus RSH™ autosampler offers a new and innovative ATC (Automatic Tool Change) capability.

The ATC feature enables the user to set up a sequence using up to six different syringes, automatically loaded by the autosampler to accurately perform dilutions, calibrations, and sample injections. The ability to exchange syringes for different tasks enables high precision sample-handling in a single, unattended sequence prior to automated sample injection.

Developed for increased analytical flexibility and lab productivity, this unique capability automates complex sample preparation and injection workflows, thus eliminating human error. Combination of these features within one single unit, integrated on GC and GC-MS systems, saves precious lab space.

TriPlus RSH automatic tool change capability

5 microliters of a liquid sample in a 300 microliter vial

Accurate micro-sample injections

Expand Unattended Operations and Productivity with Unprecedented Sample Capacity

Unequivocal lab throughput is attainable by using the largest sample capacity available for an autosampler. A maximum of 972, 2 mL vials combined with multiple 100 mL wash/waste bottles, on the TriPlus RSH autosampler, enable week-end long unattended operations – a goal not attainable with most other sampling systems currently on the market.

Sequences can be developed in which one autosampler serves multiple GC systems, further expanding lab productivity. This feature enables the powerful combination of screening on a single GC or GC-MS system while simultaneously performing positive confirmation/quantitation on another GC-MS or GC-MS/MS system.

Further productivity is achieved by utilizing various injection modes that match techniques to sample types. Liquid, Headspace and SPME injections can all be used within a single sequence, running unattended with the use of the ATC capability, switching the syringe tool automatically as needed.

1 µL splitless injection	40 ppm C20 in toluene
Volume in vial (microliters)	Peak area
50	81244277
40	80268993
30	82088809
20	82095395
10	84436788
5	84312030
RSD%	**2.0**

The TriPlus RSH autosampler provides excellent repeatability with micro-samples, down to 5 µL in a vial, particularly interesting for trace analysis, radioactive samples, or samples requiring expensive internal standards.

Achieve the best results

for your sample type

The TriPlus RSH robotic sample handling system offers liquid, headspace, and solid phase microextraction – capabilities you expect as being a standard part of a multi-axis autosampler. In these modes, the TriPlus RSH autosampler delivers the precision you demand for achieving exceptional results.

Flexible Liquid Sampling and Injection

The TriPlus RSH autosampler offers optimized liquid injection modes to support a wide range of sample types, inlets, and techniques for syringe filling. Parameters like pull-up strokes, viscosity delay, washing cycles, and needle depths can all be programmed, thus achieving high precision sampling. Additionally, samples can be withdrawn into the syringe using one of the following methods:

- **Regular Mode** draws the sample plug into the syringe barrel for controlled injections.
- **Sandwich Technique** utilizes an additional solvent, standard, or second sample, and provides the optimum sampling conditions even for the most critical samples.

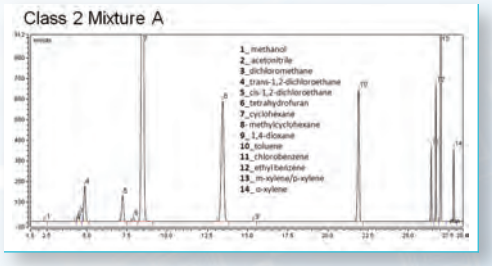
In addition to standard split/splitless injection modes, PTV and cold on-column methods are fully optimized to guarantee the highest quality results. Depending on the sample type, a new fast cold needle injection with cycle times lower than 100 ms is also available.

Simple and Reliable Headspace Injection

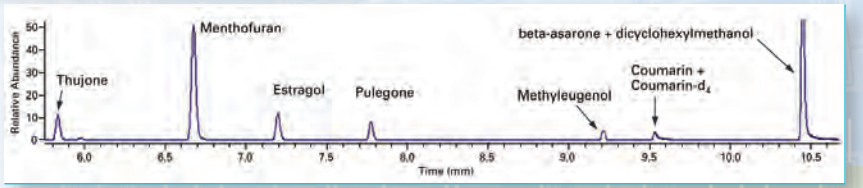
Static headspace is a straight forward method for volatile analysis. Eliminating the need for a transfer line and/or sample loop, the TriPlus RSH autosampler uses a high temperature resistant gas-tight syringe for direct headspace injection. Overlapping sample incubation capability offers higher productivity. Every sample is ready for injection based on the GC cycle time. The optional Multiple Headspace Extraction (MHE) mode enables accurate quantification of volatiles in a solid or samples with interfering matrices.

Solvent-free Sample Preparation with SPME

The TriPlus RSH autosampler automates SPME sample preparation. Optimum performance is achieved through precise control of all steps, from fiber preconditioning, to adsorption and desorption. Samples can be heated and shaken to reduce analysis times. Compounds of interest are extracted from liquid or headspace phases by simply setting the depth of needle penetration into the vials. A great productivity boost is delivered by the fiber conditioning station, which flushes and heats fibers after the injection.



USP ‹467› chromatogram – Residual solvents Class II – mix A by headspace



Mixture of seven flavoring standards and two internal standards analyzed by SPME/GC-MS/MS

	C12	C14	C16	C18	C20	C22	C24	C26	C28	C30	C32	C34	C36	C38	C40
inj 1	5790321	6454839	6514738	6381364	6422953	6341637	6250327	5902151	6115568	5938289	5840239	5608114	5666615	5489799	5336295
inj 2	5807141	6476970	6526454	6394970	6440861	6355375	6251328	5922265	6140268	5947775	5863126	5634042	5690967	5516798	5358942
inj 3	5827629	6497997	6554058	6420246	6459733	6379194	6286949	5954194	6145555	5984266	5901069	5682593	5730988	5550751	5378550
inj 4	5792134	6441515	6492578	6363032	6404787	6327450	6252542	5921469	6097604	5949291	5845351	5611117	5664331	5491697	5332499
inj 5	5800582	6468230	6522911	6392049	6433275	6360887	6263864	5952981	6092459	5979322	5865658	5637562	5688183	5520119	5357380
inj 6	5768772	6464892	6517503	6387861	6432945	6351598	6268676	5935155	6142234	5972692	5863080	5635080	5687770	5517832	5353762
inj 7	5823193	6476187	6531049	6398825	6441941	6367204	6265981	5949279	6145821	5989443	5898354	5662424	5717530	5538684	5370648
inj 8	5790579	6440709	6489338	6363591	6403511	6328596	6240425	5928660	6095460	5966984	5871535	5627761	5679370	5503010	5335919
inj 9	5802600	6458242	6512554	6377256	6423417	6349368	6249385	5941603	6090166	5964591	5871728	5643593	5696094	5517580	5350256
inj 10	5862631	6469692	6520845	6388855	6435882	6366909	6264664	5947004	6141475	5998001	5900393	5657099	5709141	5527381	5358868
mean	**5806558**	**6464927**	**6518203**	**6386805**	**6429931**	**6352822**	**6259414**	**5935476**	**6120661**	**5969065**	**5872053**	**5639939**	**5693099**	**5517365**	**5353312**
sd	**25973**	**17257**	**18505**	**16955**	**17091**	**16804**	**13295**	**16818**	**24616**	**19487**	**21765**	**22825**	**21274**	**19156**	**15098**
RSD%	**0.4**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.2**	**0.3**	**0.4**	**0.3**	**0.4**	**0.4**	**0.4**	**0.3**	**0.3**

Peak area repeatability of a splitless injection of a “Florida Mix” standard

Increased automation

and error-free sample handling

Move beyond automated sample injections to more advanced tasks, such as sample preparation, dilutions, standard curve generation, and derivatization routines by taking advantage of the newest technology in sample handling systems.

Sequential Dilution

A high concentration standard is automatically diluted to easily meet your requirements.

Sequential dilution

Calibration Dilution

Reliability and precision for your quantitative calibration. Prepare your calibration points with or without internal standards.

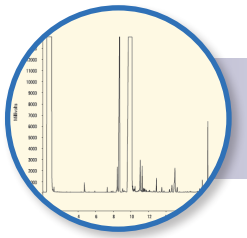
Calibration dilution with internal standard

Standard Addition

Add precise amounts of standards to any vial. Calibrating by standard addition is commonly used in headspace and SPME analyses. The accurate addition of standards is now a reliable, automated step in the measurement cycle.

Derivatization

Precise volumes, internal standard and reagent additions, with programmed incubation times – an all in one automated procedure that occurs just prior to injection.



Unknown biodiesel analysis with automated derivatization and internal standard addition

Mixing

Vials undergo automatic agitation after the addition of standard volumes. You can also speed-up headspace and SPME applications to reach the equilibrium faster.

Incubator for mixing and derivatization

Vortexing

Physical vortexing for thorough mixing can be used for liquids homogenization and extraction steps with solvents.

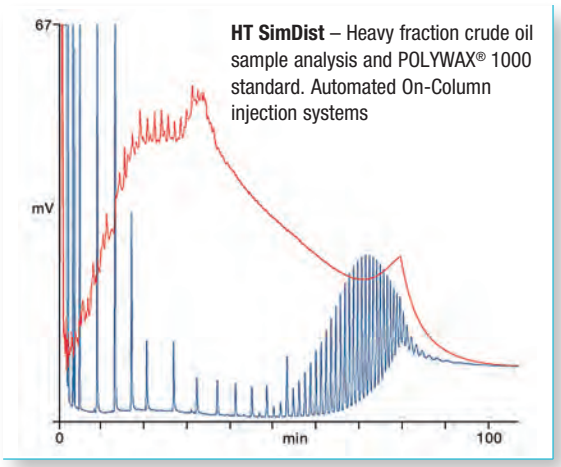
Vortexer utilizing different vial sizes

Powerful options

to expand applications, preserve sample integrity and enable sample traceability

Expand Applicability to Include Unstable Compounds or Viscous Samples

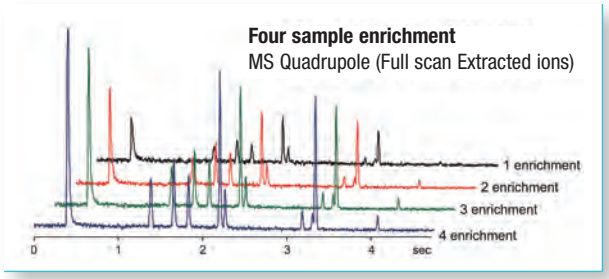
Temperature-controlled tray options protecting sensitive samples can be incorporated into the TriPlus RSH autosampler quickly at any time. An affordable solution for large 10/20 mL vials can control temperatures from 4 °C up to 70 °C with an external thermostatic bath. Alternatively, a temperature-controlled option can accommodate a wide range of vial types, providing stable temperature control for accurate sampling of very volatile solvents, unstable compounds, or extremely viscous samples.



HT SimDist – Heavy fraction crude oil sample analysis and POLYWAX® 1000 standard. Automated On-Column injection systems

Enhanced Sensitivity for Headspace Analysis

Sample enrichment is a valuable tool for the analysis of trace levels of volatile organics in difficult matrices with the use of headspace injections. Combining the TriPlus RSH autosampler capability of handling multiple sequential headspace injections with a cryogenic GC option, sensitivity is greatly enhanced as a larger sample volume can be efficiently analyzed. This capability is ideal for the simplification of demanding environmental analyses.



5 mL of 500 ppt water solution of Halogenated Volatiles Mix 551A

Utilize Barcode Reading for Enhanced Sample Traceability

The convenient dual-laser barcode reader is capable of reading vertical 1-D barcode labels on 2,10 and 20 mL vials. The dual-scanner capability allows the TriPlus RSH autosampler to read vial barcodes, regardless of their position in the vial, making it easier to build sequences and ensure complete sample traceability.

A fully validated laboratory solution

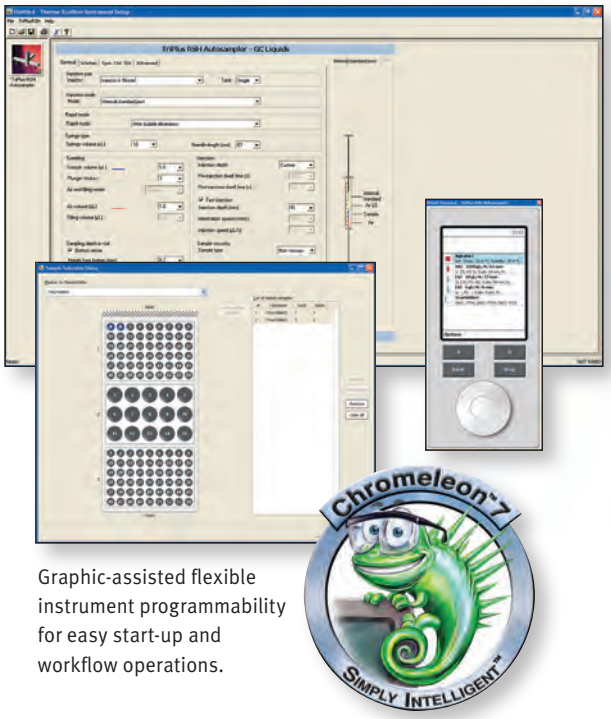
making you productive from day one

Validated Consumables for Trusted Results

A complete selection of Thermo Scientific consumables complements our innovative range of GC and GC-MS systems. They include micro vials, vials for liquid and headspace, magnetic and plastic caps, snap-on, screw- and crimp-top caps, a wide choice of liquid and gas-tight syringes, well plates, trays and much more.

All of these consumables are designed and tested to work problem-free with the TriPlus RSH autosampler.

All types of syringes, vials, and caps offered to accommodate the largest choice of application requirements



Graphic-assisted flexible instrument programmability for easy start-up and workflow operations.

Integrated Software Control for Quick Setup and Intuitive Sample Workflow

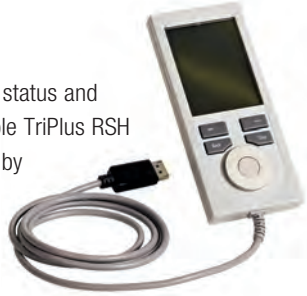
The TriPlus RSH instrument control – from installation and setup to the most complex sequence – is fully embedded on standard Thermo Scientific Chromatography Data Systems including Chromeleon 7.1. GC-MS operations run smoothly with integrated TriPlus RSH autosampler controls on Thermo Scientific Xcalibur and TraceFinder software.

Three basic setup screens (available on all Thermo Scientific software platforms), easily guide the setting of TriPlus RSH parameters for Liquid, Headspace and SPME methods. Despite the large number of configurations and options offered within the basic injection modes, instrument setup and methods are created quickly with just a few mouse clicks. Sample preparation cycles are available as add-ons through pre-compiled sequences with application descriptions.

Methods and sequences can be developed and run locally or remotely through the use of a convenient network card. A virtual terminal, fully integrated within the same software control, completely mimics the physical handheld controller and enables easier installation and initial setup.

Convenient Handheld Option for Local Control

The handheld controller is the ideal solution for displaying instrument status and facilitating setup and maintenance. Laboratories equipped with multiple TriPlus RSH autosamplers will also benefit from the operational flexibility provided by this controlling tool, using a single handheld device to set up all TriPlus RSH autosamplers in the lab.



Thermo Scientific solutions

for your gas chromatography needs

TRACE 1300 GC

The Thermo Scientific TRACE 1300 GC is the ideal budget-conscious investment for the basic routine laboratory when lower operator expertise requires ease of use with minimal instrument interaction.

TRACE 1310 GC

Ideal for larger routine QA/QC laboratories, the TRACE™ 1310 GC offers a complete icon-based touch screen interface, which is ideal for direct instrument control when method development is required. While retaining all of the capabilities and performance of the TRACE 1300 GC model, it also provides local status update of the oven, injectors and detectors, maintenance commands, run log, multiple language capabilities and video tutorials to drive simple instrument interaction.

ISQ Single Quadrupole GC-MS

The Thermo Scientific ISQ GC-MS system offers rugged and reliable performance and nonstop productivity. The ISQ™ GC-MS features a new source design ideal for continuous high-throughput operation. The vacuum interlock enables source removal without venting the system, for unstoppable productivity.

ITQ Series GC-Ion Trap MS

TheThermo Scientific ITQ Series GC-Ion Trap MS offers outstanding full-scan electron ionization sensitivity and upgradeability. From a small-footprint entry-level QA/QC instrument to a fully-featured, research-grade system with advanced MS^n functionality, the ITQ™ Series GC-MS system offers a broad range of standard features along with an impressive list of options.

TSQ 8000 Triple Quadrupole GC-MS/MS

The Thermo Scientific TSQ 8000 system is reliable, easy to use and enables faster, more precise analyses with unstoppable productivity. Designed for routine analysis, the TSQ™ 8000 system integrates proven triple quadrupole technology with a rich software suite for uncompromised MS/MS simplicity from startup to final report.

TSQ Quantum XLS Series Triple Quadrupole GC-MS/MS

The Thermo Scientific TSQ Quantum XLS Ultra is the new "Gold Standard" in GC-MS/MS. Thermo Scientific HyperQuad technology delivers highly increased mass resolving quadrupoles for ultra-selective SRM, with best-in-class sensitivity, and allows unsurpassed analytical performance for the most difficult matrix challenges.

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