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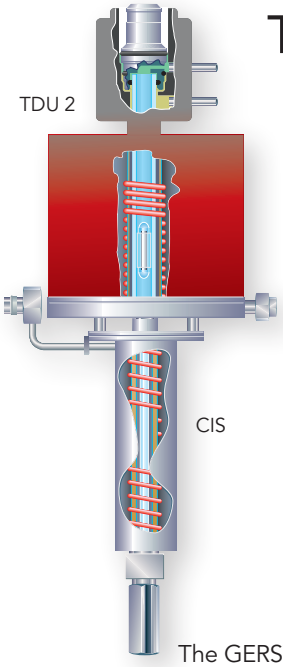
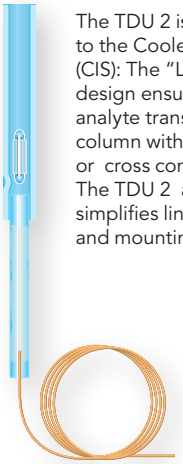
# Thermal Desorption Unit

## TDU 2

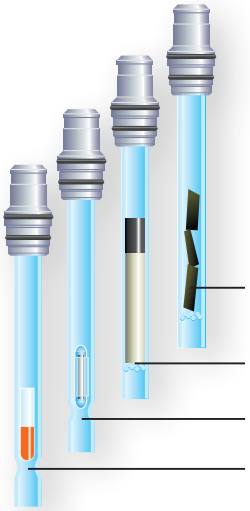
## A system for all techniques that involve Thermal Desorption and Thermal Extraction

# Thermal Desorption Unit TDU 2



The TDU 2 is coupled directly to the Cooled Injection System (CIS): The "Liner-in-Liner" design ensures best possible analyte transfer to the GC column without discrimination or cross contamination. The TDU 2 alignment support simplifies liner replacement and mounting.



### TDU 2 tubes

- with frit for thermal extraction of solid samples
- sorbent packed
- for Twister® desorption
- for thermal extraction in microvials

The GERSTEL Thermal Desorption Unit (TDU 2) is the most flexible automated solution available for thermal desorption and thermal extraction. The TDU 2 fits on top of any modern GC without the need for additional bench space and it is perfectly suited for the analysis of gaseous, liquid and solid samples.

Conventional thermal desorption systems usually consist of a desorption unit, a cooled trap, one or two long transfer lines, as well as some type of valve. In such systems, void volumes and active sites on metal and polymer materials can cause peak broadening, loss of analytes and memory effects. The TDU 2 incorporates the latest advances in thermal desorption technology. Intelligently designed and based on a "Linerin-Liner" concept it has no valves or transfer lines. The TDU 2 is connected directly to the GERSTEL Cooled Injection System (CIS), which serves both as a cryofocusing trap and as a temperature programmable GC inlet. Active sites are eliminated, reducing the risk of analyte loss, discrimination and memory effects to an absolute minimum. The TDU 2 can be operated in split or true splitless mode enabling it to cover the widest range of concentrations, to protect the column from water and contamination and to achieve the lowest possible detection limits. The TDU 2 lowflow split pneumatics provide improved flexibility and performance. For extreme sensitivity, the multidesorption mode can be selected in MAESTRO.

The TDU 2 is automated and upgraded to exceptional productivity by add ing the GERSTEL MultiPurpose Sampler (MPS). The MPS enables automated analysis of up to 480 samples such as GERSTEL Twisters®, sorbent packed tubes, solids, and liquids contained in microvial inserts for matrix elimination.


## Desorption of GERSTEL Twisters®

Stir Bar Sorptive Extraction (SBSE), based on the GERSTEL Twister®, is a solvent free technique for ultratrace determination of organic compounds in aqueous matrices. The PDMS or EG-Silicone phase on the Twister efficiently extracts organic compounds while the sample is stirred. SBSE is up to 1000 times more sensitive than SPME. TDU 2 performs thermal desorption of one or more Twisters placed in a desorption tube.

Up to 480 Twisters in individual tubes can be desorbed in one sequence using the MPS for automation. Analytes are transferred to the CIS for cryofocusing and subsequently introduced to the GC/MS column in split, splitless, or multidesorption mode covering a wide concentration range.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# TDU 2 Features

## Sample Introduction System for a Wide Range of Applications

- Analysis of solids, liquids and gases
- Temperature programmed desorption ensures optimal transfer conditions for all analytes
- Ideal trapping of unknowns, no need to select individual sorbent traps for specific compounds
- Split and true splitless analyte transfer covers a wide concentration range
- Multidesorption mode for extreme sensitivity
- Extremely low detection limits
- Complete and uniform tube heating during desorption, best possible SVOC recovery
- Flexible refocusing options; cryogen-free with sorbent bed or cryogenic to -180 °C
- Small footprint, mounts on top of GC

## Liner-in-Liner Design

- No transfer lineor valve, excellent analyte recovery
- No active sites, no memory effects, clean base line for your next sample
- Chromatography using advanced EPC of GC inlet
- Improved reliability and easy maintenance

## Sealed Sample Storage

- Sample integrity ensured through individual, leak-tight storage
- Reliable results achieved by eliminating analyte loss, contamination from laboratory air and cross contamination

## Preparative Fraction Collector (PFC)

- Collection of compounds after GC Separation
- Six sample traps, one trap for the residue
- Trap volume 1 µL or 100 µL
- Collection of individual compounds or series
- High-resolution through fast switching (0.01 min)
- Reproducible collection over 100s of GC runs

## Automated Pyrolysis (PYRO)


The PYRO module performs pyrolysis of solids and liquids at temperatures up to 1000 °C. PYRO is mounted onto the TDU in just a few minutes. PYRO performs Standard, Sequential, Smart Ramped, and Fractionated pyrolysis. Volatile compounds in the sample can be determined in TD-GC/MS run as needed, or simply purged from the sample resulting in a clean, easy-to-interpret pyrogram without interfering volatiles. Pyrolysis breakdown products are transferred directly to the GC/MS system without analyte discrimination for accurate result. Up to 120 samples per tray holder can be pyrolyzed automatically using the GERSTEL MPS under MAESTRO control or integrated with the GC/MS software.

## Thermal Extraction in Micro-Vials (ATEX)


Until now, anyone determining volatiles in "dirty matrix" liquids ran the risk of contaminating their GC/MS system. GERSTEL's Automated TDU Liner EXchange (ATEX) eliminates such problems. The MultiPurpose Sampler (MPS) transfers liquids automatically to a disposable microvial inside a TDU tube. When the tube is heated in the TDU 2, volatile analytes are extracted from the sample and transferred to the Cooled Injection System (CIS) where they are concentrated for transfer to the GC/MS. The nonvolatile matrix residue is left behind in the disposable microvial. The result: Contamination of the GC Inlet and the GC/MS system is eliminated, while productivity, throughput and quality of results are significantly improved.
Further possibilities with the ATEX Option:

- Solvent venting; targeted analyte concentration and determination of
- semivolatile compounds
- Thermal extraction of solid or viscous samples
- Addition of liquid standards to sorbent tubes inside the TDU 2
- Using the TDU 2/CIS combination as a Dual-PTV system for extended solvent venting

## Dynamic Headspace (DHS)


The industry standard GERSTEL MPS autosampler combined with the Dynamic Headspace (DHS) option and TDU 2 enable com plete automation of the DHS technique. In the DHS station, VOCs are extracted from liquid or solid samples placed in standard headspace vials. The headspace above the sample is purged and analytes are concentrated on a user selectable sorbent filled trap (TDU tube) at user defined sample and trap temperatures and purge flow. A dry purge step can be selected to remove humidity from the sorbent bed. Analytes are subsequently introduced into the GC/MS system by thermal desorption of the trap in the TDU 2, resulting in maximum recovery, and lowest possible detection limits. The DHS option offers improved performance for a wide variety of sample types, such as food, beverages, polymers, personal care products and pharmaceuticals. The DHS*Large* option enables direct analysis of larger samples in 1 liter containers. The DHS is uniquely qualified as a general thermal extraction tool for GC/MS analysis.

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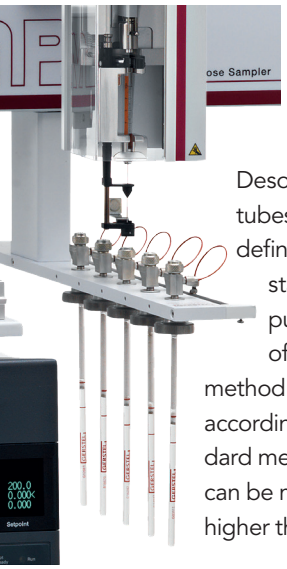
## Tube Spiking System TSS



The GERSTEL Tube Spiking System (TSS) enables automated generation of standard tubes for Thermal Desorption analysis. Sorbent tubes are spiked with a user defined volume of liquid standard and the solvent purged with a defined flow of carrier gas as required for method calibration and validation according to international standard methods. Multiple TSS units can be mounted on the MPS for higher throughput.

## HIT-HS sensitivity gain

The Hot Injection and Trapping (HIT) technique combines analytes from several Headspace injections for each GC/MS run. HIT is per formed using the GERSTEL MPS with Thermal Desorption Unit (TDU 2) and a Cooled Injection System (CIS), PTV-type inlet. The system is easily switched between standard and HIT operation. The number of injections is simply specified in the MAESTRO software compounds in water and beverages resulting in improved recovery and very low LODs.

## MultiPurpose Sampler (MPS)

The MultiPurpose Sampler (MPS) is an autosampler and sample preparation robot for GC/MS and LC/MS. Sample preparation steps are performed during analysis of the preceding sample for best possible system utilization and highest sample throughput. Sample preparation steps are performed in a controlled, highly accurate and reproducible manner for best possible results. Every step is selected by mouseclick from a pull-down menu in the MAESTRO software and added to the overall GC/MS or LC/MS method.
In addition to Thermal Desorption, the following techniques are available:

- Automated Liner EXchange (ALEX)
- SPME and SPME Fiber changer
- Solid Phase Extraction (SPE)
- Derivatization and addition of standards
- Extraction, dilution and filtration
- Weighing, sonication, centrifugation and evaporation (™VAP)
- Heating, conditioning and mixing
- Automated DNPH cartridge elution and LC determination

## GERSTEL MAESTRO Software

MAESTRO optimizes performance and throughput

- Stand-Alone operation, fully integrated in the Agilent Software, or integrated with the Thermo Scientific® Xcalibur™ sequence table
- Sample Prep by Mouse-Click using PrepBuilder functions
- Scheduler for easy planning of sequences and of laboratory work-flow
- PrepAhead / Multiple Sample Overlap: Automated overlapping of sample preparation and analysis for maximum throughput
- Priority samples can be added at any point in the analysis sequence
- LOG file and Service LOG file functions ensure traceability
- Automated E-mail notification if the sequence is stopped
- Real-time monitoring of all modules and parameters
- Interactive help function

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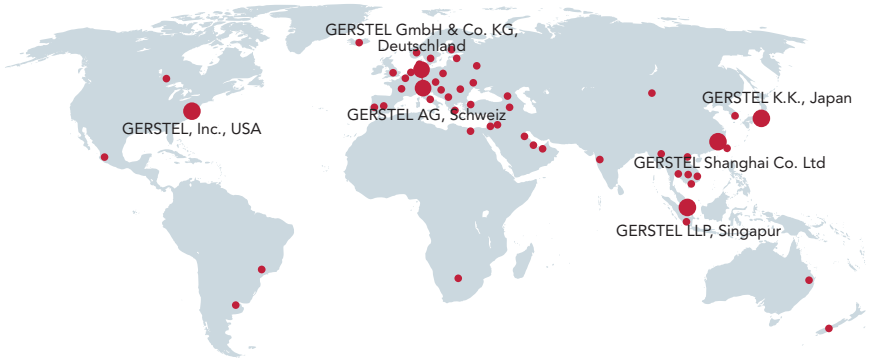




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