

UNITY

Specification sheet

Covering: The Series 2 UNITY thermal desorber for 3½" and 4½" tubes.

UNITY™ is an analytical thermal desorption instrument for the simultaneous analysis of VOCs, SVOCs and thermally labile compounds collected onto single sorbent tubes.



1. System features

- **'Universal' TD platform** allowing analysis of compounds over a wide volatility range AND the ability to select low flow path temperatures for compatibility with labile compounds:
 - Highly effective retention of ultra-volatiles.
 - Quantitative recovery of n-C₄₀.
 - Quantitative recovery of labile compounds
 - mercaptans, CS gas, free-VX, amines, etc.
 - Simultaneous analysis of volatiles and semi-volatiles.
- **UNITY is available in two versions:** for 3½" (Standard) and 4½" (DAAMS) sorbent tubes, with or without TubeTAG™ RFID tags.
- **Electrically-cooled focusing trap** cools rapidly and is easy to maintain.
- **Stringent, method-compliant (no-flow/ambient-temperature) leak test** is carried out on every sample. Failed tubes are retained intact.
- **Trap heating rates** up to 100°C/s and backflush desorption combine to facilitate splitless operation at flows below 2 mL/min.
- **Single and double splitting options** and <0.1% carryover ensure compatibility with samples over a wide concentration range (ppt to percent).
- **Pre-purge of air to vent and selective elimination of water and solvents** minimise analytical interference.
- **PC control** in most Windows® operating environments provides an intuitive user interface.
- **Overlap mode** – desorption of a subsequent sample while a previous sample is still running
 - optimises productivity.
- **Small footprint** for operation in mobile labs or other confined environments.
- **Quantitative re-collection** of both tube and trap desorption split flow to allow repeat analysis (SecureTD-Q™).
- **Stand-alone injector** that can be connected to any make of GC(-MS) and does not interfere with other GC accessories.
- **Interface to the GC** typically via a direct coupling to the analytical column. The only part of a GC inlet which may be required is a back-pressure-regulated electronic pneumatic module. This can be used to provide electronic carrier gas control (ECC) through the entire TD-GC(-MS) analyser, and stabilise retention times independent of split flow and other analytical settings.
- **Extended standby mode** reduces instrument power consumption when not in use.
- **Flexible upgrade routes include:**
 - One or two integrated MFCs for control of split and/or desorb flows.
 - ULTRA™ for 100-tube automation, allowing unattended operation all weekend.

- Accessories for manual or automated headspace-trap analysis.
- Options for automated, multi-channel canister/bag analysis or round-the-clock on-line air monitoring.

2. System controls

2.1 Desorption modes

- **Tube conditioning** – Desorption of the sample tube for cleaning purposes with all the effluent directed to vent, *i.e.* away from the cold trap and other important components of the sample flow path
- **Two- (or three-) stage desorption** – Normal two-stage desorption of a sample, with the additional option of an elevated-temperature purge.
- Other modes including on-line monitoring, direct sampling and automation are available when the system is configured with an appropriate accessory.

2.2 Primary (tube) desorption oven

- **Temperature:**
 - Range: 35°C to 425°C.
 - Adjustable in 1°C increments.

N.B. The tube oven heats from ambient to the selected temperature at the start of tube desorption in order to minimise risk of flash-vaporisation and split discrimination when analysing samples with unknown water/solvent content.

- **Desorption time:**
 - Range: 0 to 999.9 min.
 - Adjustable in 0.1 min increments.

2.3 Focusing ('cold') trap

- **Quartz cold trap:** 2 mm i.d. where packed and 0.9 mm i.d. at the sample input/output end. Collar at non-sampling end makes trap easy to change.
- Central 60 mm packed with between one and four sorbents.
- **Backflush desorption** ensures quantitative retention and release of wide boiling range samples.

- **Trap low temperature:**
 - Range: –30°C to 50°C.
 - Adjustable in 1°C increments.
 - Uniform electrical cooling applied over full 60 mm length of sorbent bed.
- **Trap high temperature:**
 - Range: 35°C to 425°C.
 - Adjustable in 1°C increments.
 - Uniform heating applied over full 60 mm length of sorbent bed.
- **Trap desorption:**
 - Default setting is ballistic heating, which reaches rates of 100°C/s during the first critical stages of secondary (trap) desorption.
 - Alternatively, programmed trap heating rates from 1°C/s to 40°C/s can be selected.
- **Hold time at trap high temperature:**
 - Range: 0–999.9 min.
 - Adjustable in 0.1 min increments.
- **Trap can be independently heated** for conditioning purposes and for obtaining a system blank.

2.4 Sample flow path

- **Temperature range:**
 - Valve: 50°C to 210°C.
 - Transfer line: 50°C to 225°C.
 - Both adjustable in 1°C increments.
 - Uniform heating.
- **Constructed entirely of inert materials:** PTFE, quartz, inert-coated stainless steel and uncoated, deactivated fused silica.

2.5 Pneumatics

- Requires a pressure-controlled 0–60 psig (0–415 kPa) supply of helium, nitrogen or hydrogen carrier gas under manual or electronic control.
 - Requires a pressurised supply of dry air or nitrogen (dewpoint below –50°C) at 50–60 psig (340–415 kPa). The dry gas is used for both pneumatic actuation of the valve and for purging the cold trap box.
- N.B.* Helium cannot be used as the dry gas supply.

2.6 Pre-desorption checks and controls

- **Leak test:** each tube is pressurised and subjected to a stringent, ambient-temperature leak test without carrier gas flow. Failed tubes are not desorbed, but are preserved intact for operator attention.
- **Pre-purge:** Each tube is purged with carrier gas (in the desorption direction) at ambient temperature to remove oxygen before desorption. The air is purged to vent and none of it is allowed to reach the analyser e.g. GC-MS.
- **Pre-purge time:**
 - Range: 0–99.9 min.
 - Adjustable in 0.1 min increments.
- An additional carrier gas pre-purge can be carried out at elevated temperature to remove water or other interfering solvent if required.
- The cold trap can be selected to be in or out of line during either of the pre-purge stages.
- The split can be selected to be open or closed during either of the pre-purge stages.

2.7 Sample splitting and SecureTD-Q™ (quantitative re-collection for repeat analysis)

- The UNITY split can be operated in the following ways:
 - During primary (tube) desorption only.
 - During secondary (trap) desorption only.
 - During both desorption stages, *i.e.* double splitter operation.
 - During neither desorption stage, *i.e.* splitless operation.
- The split can be turned on or off during system standby and at any stage during pre-purge.
- Split and desorb/trap flows are controlled by needle and solenoid valves downstream of the sample flow path. Alternatively, the flows can be controlled with electronic mass flow control (MFC), using the U-DMFC-2S or Series 2 Air Server/CIA 8 accessories.
- The split vent line contains a charcoal filter in front of the control valves (and MFC) to prevent contamination of the valves/MFC and laboratory atmosphere. The charcoal filter has the same external dimensions as a standard sorbent tube. The flow path between the main heated valve and the charcoal filter is a mirror-image of the

short, inert heated flow path connecting the sample tube to the heated valve.

- When required, the charcoal filter can be replaced with a conditioned sorbent tube to quantitatively re-collect the split effluent from tube and trap desorption (inlet and outlet split). This SecureTD-Q capability allows repeat analysis, method/data validation and archiving of critical samples.

3. System specification

3.1 Dimensions and weight

- Height: 40 cm (15.7").
- Width: 16 cm (6.3").
- Depth: 51 cm (20").
- Weight: 16 kg (24 lb).

3.2 Tubes accommodated

By the 3½" (Standard) version:

- 3½" (89 mm) long × ¼" (6.4 mm) o.d. tubes.
- Constructed of stainless-steel, inert-coated stainless steel or glass.
- With or without sorbent packing.
- With or without TubeTAG™ RFID tags.

By the 4½" (DAAMS) version:

- 4½" (115 mm) long × 6 mm o.d. tubes or 4½" (115 mm) long × 10 mm o.d. ('high-flow') tubes with 6 mm o.d. ends.
- Constructed of stainless-steel, inert-coated stainless steel or glass.
- With or without sorbent packing.
- With or without TubeTAG™ RFID tags.

N.B. Kits are available to allow users to interchange between the 3½" and 4½" versions.

3.3 Ambient operating conditions

- Temperature: 15°C to 30°C.
- Relative humidity: 5–95% RH (non-condensing).

3.4 Power requirements

- 100–240 V, 50/60 Hz, 650 W

N.B. UNITY self-adjusts to local voltage input.

3.5 Gas consumption

- Dry air or nitrogen: ~100 mL/min.
- Carrier gas consumption is method-dependent (typically 5–200 mL/min).

3.6 Data system – Minimum PC specification

- UNITY software will run on most 32-bit versions of Windows® and 64-bit versions of Windows® 7. However, use of currently supported versions of Windows® is strongly recommended. In general, a PC with sufficient resources to run 32-bit Windows® should have enough performance to control UNITY.
- The minimum recommended PC specifications are:
 - 400 MHz processor.
 - 256 MB RAM.
 - 10 MB of free disc space (for the UNITY software installation).
- XGA (1024 × 768 pixel) screen resolution, 256-colour.
- The PC should have a free spare serial or USB port for communication with UNITY.

3.7 Safety and regulatory certifications

The instrument is designed and manufactured under a quality system registered to ISO 9001.

The instrument conforms to the following standards:

- International Electrochemical Commission (IEC):
 - 61010-1:2001.
 - 61010-2-010:2003.
 - 61010-2-081:2001.
- CAN/CSA C22.2 No. 61010-1 and UL 61010-1.

The instrument conforms to the following regulation on electromagnetic compatibility (EMC):

- IEC/EN 61326-1:2006.

3.8 GC remote cable connections

- UNITY includes a GC interface cable that connects to the 'ready' output and 'start' input of the GC(-MS) and data-handling systems.
- The cable supports automatic start of the entire analytical system when the UNITY cold trap desorbs, and allows UNITY to check the 'ready'

status of the analyser and associated data handling.

- The UNITY cold trap will not desorb unless and until it receives a 'ready' signal from the GC(-MS) system.

4. System options

Accessory and upgrade options include:

- ULTRA 100-tube autosampler.
- Manual or automated headspace-trap operation.
- Integrated electronic mass flow control of split and/or desorb flow. MFCs available with 2–500 mL/min flow range (helium). Allows split ratios from zero to 125,000:1 to be used with standard (60 m × 0.25 mm i.d.) capillary columns.
- Series 2 Air Server™ options (3- or 8-channel) for continuous on-line air/gas monitoring or method-compliant analysis of multiple canisters/bags.
- Kits to interchange between 3½" and 4½" versions of Series 2 UNITY.
- Extended GC transfer line to provide greater flexibility for the positioning of the thermal desorber relative to the GC(-MS).
 - Length: 1.4 m.
 - Temperature range: 50–225°C.

For more information about our products and services, please visit www.markes.com.

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