

TD-100

Specification sheet

The TD-100™ is a high-throughput, automated thermal desorption system for the rapid and unattended processing of up to 100 sample sorbent tubes in a single sequence.



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:
 - Quantitative recovery of n-C₄₀.
 - Quantitative recovery of labile compounds mercaptans, CS gas, free-VX, amines, etc.
 - Simultaneous analysis of volatiles and semi-volatiles.
- **Electrically-cooled focusing trap** cools rapidly and is easy to maintain.
- **A stringent, method-compliant leak test** (no-flow/ambient temperature) 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, thus maximising sensitivity.
- **Single and double splitting options** and <0.1% carryover ensure compatibility with samples over a wide concentration range (ppt to percent).
- **Prepurge of air to vent** and selective elimination of water and solvents minimise analytical interference.
- **Integrated TubeTAG read/write capability** for enhanced tracking of tube history.
- **Overlap mode** (desorption of a subsequent sample while a previous sample is still running).
- **Small footprint** for operation in mobile labs or other confined environments.

- **100-tube capacity** offers unattended unsupervised operation over an entire weekend.
- **Automated outlet-split re-collection** (50:50 functionality) available on most TD-100 configurations.
- **Sealing of tubes with DiffLok™ caps** prevents entry of contaminants and loss of volatiles both before and after analysis.
- **Minimal linear robotic movements** required for operation increases reliability.
- **Tube cooling fan:** Rapidly cools sample tubes prior to unloading from the autosampler for increased sample throughput.
- **Versatility and throughput:** Software allows multiple sets of tubes, requiring different TD methods, to be linked together in a single automatic tube sequence (see below).
- **Extended standby mode** reduces instrument power consumption when not in use.

2. System controls

2.1 Desorption modes

- **Tube conditioning mode:** 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 mode:** Normal two-stage desorption of a sample with the option of an elevated-temperature purge.

2.2 Primary (tube) desorption oven

- **Temperature**

- Range: 35°C to 425°C.
- Settable 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 vapourisation and split discrimination when analysing samples with unknown water/solvent content.

- **Desorption time**

- Range: 0–999.9 min.
- Settable 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.
 - Settable 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.
 - Settable in 1°C increments.
 - Uniform heating applied over full 60 mm length of sorbent bed.
- **Hold time at trap high temperature**
 - Range: 0–999.9 min.
 - Settable 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 settable 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).
N.B. Helium cannot be used as the dry gas supply.
- Carrier gas and dry air or nitrogen pressure control is regulated by the included pneumatic control accessory (U-GAS01).

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 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.
 - Settable 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 TD-100 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- or dry purge.
- Split and desorb flows are controlled by needle and solenoid valves downstream of the sample flow path. Alternatively, the flows can be controlled electronically using mass flow controller accessories (2–500 mL/min), which allow split ratios from zero to 125,000:1 to be used with standard (60 m × 0.25 mm) capillary columns.
- 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 charcoal filter is connected to the main heated valve via a short, inert, heated flow path.
- 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.

2.8 Automatic sequencing

- A tube sequence, comprising several ‘sets’, can be entered into the sequence table *via* the PC user interface. Tubes can be included in more than one sequence set.

- A set normally comprises a series of tubes for analysis by the same desorption method. Up to 100 desorptions can be carried out on each tube. An entire sequence can be ‘recycled’ any number of times.
- Individual tubes can be identified as ‘calibrant’, ‘blank’ or ‘sample’.
- The sequence can be viewed in the convenient ‘Sequence Viewer’ screen before initialising the run, and whilst a sequence is progressing. A ‘comma-separated values’ log file is produced and appended during sequence progression.
- Sequence deviations, *e.g.* leak test failure or missing tube, are recorded to the log file. If any occur, the GC run is initiated to keep the analytical system synchronised with the desorber.
- Tube conditioning mode is available on TD-100 configurations, allowing automated, sequential tube conditioning, without risk of trap contamination.

3. System specification

3.1 Dimensions and weight

- Height: 62 cm (24").
- Width: 40 cm (15.75").
- Depth: 53 cm (20.9").
- Weight: 32 kg (70.4 lb) unloaded.
- 37 kg (81.4 lb) fully loaded.

3.2 Ambient operating conditions

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

3.3 Gas consumption

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

3.4 Power requirements

- 100–240 V, 50/60 Hz, 650 W (TD-100 self-adjusts to local voltage input).

3.5 Data system – Minimum PC specification

TD-100 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 TD-100.

The recommended minimum PC specifications are:

- 400 MHz processor.
- 256 MB RAM.
- 10 MB of free disc space (for software installation).
- XGA (1024 × 768 pixel) screen resolution, 256-colour.

The PC should have either two free spare serial, or USB, ports for communication with TD-100.

Two USB-to-serial port adaptors are included.

3.6 GC remote cable connections

- TD-100 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 TD-100 cold trap desorbs, and allows UNITY to check the 'ready' status of the analyser and associated data handling.
- The TD-100 cold trap will not desorb unless and until it receives a 'ready' signal from the GC(-MS) system.

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.

4. System options

Accessory and upgrade options include:

- Electronic control of split and desorption flows.
- Automated re-collection for repeat analysis (also includes dry-purge functionality).
- Internal standard/dry-purge (ISDP) functionality.
- 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.

TD-100 is also available pre-configured with automated sample re-collection, and electronic mass flow control (MFC) of all split and desorption flows.

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