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UNITY–ULTRA-xr™

Specification sheet

The ULTRA-xr is a high-throughput autosampler, which adds to the UNITY-xr thermal desorption unit, for the rapid and unattended analysis of VOCs and SVOCs from up to 100 sample sorbent tubes in a single sequence.

UNITY–ULTRA-xr Thermal Desorbers are compatible with most GC and GC–MS applications and accommodate any workflows with the choice of manual or electronic control of gases: helium, nitrogen, and hydrogen (H_2 available with the Multi-Gas enabled range only).

1. System features

- **100-tube capacity** offers unattended, unsupervised operation over an entire weekend.
- **Compatible with 3½″ sorbent tubes:** Stainless steel, inert-coated stainless steel, and glass.
- **Quantitative re-collection** of both tube and trap desorption split flows to allow repeat analysis, with selectable automated outlet split re-collection.
- **Sample stacking:** Combine multiple tube samples onto the focusing trap before injection onto the GC column.
- **Internal standard** (optional): Allows gas-phase standard to be loaded onto the focusing trap or a sample tube *via* a 1 mL loop.
- **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) optimises productivity.
- **Sealing of tubes with DiffLok caps** prevents entry of contaminants and loss of volatiles before, during and after analysis.
- **Minimal linear robotic movements** required for operation increases reliability.
- **Tube cooling fan:** Rapidly cools sample tubes after desorption for increased sample throughput.
- **Versatility and throughput:** Software allows multiple sets of tubes, requiring different TD methods, to be linked together in a single automated sequence.
- **Integrates with:** All UNITY-xr configurations, with or without any other module(s).*

2. System controls

2.1 Control software

- **Markes Instrument Control (MIC)** allows:
  - Automated, unattended sequencing of tube, on-line and canister/bag samples.†
  - Addition, insertion or skipping of samples in active sequences.
  - Rapid set-up of TD methods using pre-programmed parameters for (a) standard methods including VDA 278, US EPA TO-17, US EPA 325 and PAH analysis; (b) conditioning methods for popular sorbent tubes and focusing traps.
  - Pre-loading of an internal standard on a tube or trap.

* Installation of an ULTRA-xr onto a UNITY 2 system: (a) requires a software update, (b) requires disconnection of existing Air Server 2 or CIA *Advantage* modules; (c) has limited functionality.

Installation of an ULTRA-xr Multi-Gas to the UNITY 2 is possible however configuration is not compatible with hydrogen.

† Not available if installing on a UNITY 2. Automated sequencing between tubes and on-line/canister samples also requires the Air Server-xr or CIA *Advantage*-xr to be configured.

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- Automated, intelligent system self-checking diagnostics, including leak isolation.
- Preventative maintenance feedback with usage counter – indicates when parts could be replaced to avoid instrument downtime.
- Integrated pressure ratio calculation for monitoring of tube packing integrity.
- Export of sequence history to .csv and .pdf file.
- Set-up in English, Chinese, French, and Japanese language.

2.2 Desorption modes

Please refer to the UNITY-xr specification sheet for details of desorption modes.

2.3 Primary (tube) desorption oven

- **Temperature:**
  - Range: 35°C to 425°C.
  - Adjustable in 1°C increments.
  - Temperature limits are user-settable within the stated range.

  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: 0–600.0 min.
  - Adjustable in 0.1 min increments.

2.4 Pre-desorption checks and controls

- The pre-desorption checks and controls are as for the UNITY-xr. However, the leak test is automated so that if a tube fails, it is not desorbed and replaced in its position in the tray.
- The position of the tube that failed the leak test is added to the sequence history/log, which is automatically maintained and saved.
- The number of consecutive leak test failures before sequence stop is user-settable.

2.5 Automatic sequencing of tubes

- A tube sequence of multiple methods can be entered into the sequence table *via* the PC user interface.
- An entire sequence can be repeated any number of times.
- Individual tubes can be identified as ‘calibrant’, ‘blank’, ‘sample’ or as a user-defined name.
- A sequence history/log file is produced as a sequence progresses, and is automatically maintained and saved.
- Sequence deviations, *e.g.* leak test failure or missing tube, are recorded in the log file. If any occur, the GC run is initiated to keep the analytical system synchronised with the desorber.
- An automated tube-conditioning mode is available on UNITY–ULTRA-xr configurations, allowing automated, sequential tube conditioning without risk of trap contamination.
- Automated re-collection of trap desorption (outlet) split flow for up to 100 tubes using a single ULTRA-xr autosampler when re-collected onto original tube. Not available with UNITY 2.
- ULTRA-xr systems also facilitate automated dry-purging of tubes. If configured with UNITY 2 this feature is only available when the ISDP accessory is installed.
- No manual change-over needed between ULTRA-xr and on-line/canister systems.

2.6 Sample splitting and quantitative re-collection for repeat analysis

- The UNITY-ULTRA-xr split can be operated in the following ways:
  - During primary (tube) desorption only (inlet split).
  - During secondary (trap) desorption only (outlet split).
  - During both desorption stages, i.e. double split operation (inlet and outlet split).
  - During neither desorption stage, i.e. splitless operation.
- The split can be turned on or off during system standby.
- Split and desorb flows are controlled by needle and solenoid valves downstream of the sample flow path.
  - Optional mass flow controllers provide electronic control of split and desorb/trap flows.

- 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 capability allows repeat analysis, method/data validation and archiving of critical samples.
- Note: Maximum split ratios and flows may not be achievable in all configurations

3. System specification

3.1 Dimensions and weight

ULTRA-xr:

- Height: 62 cm (24.4″).
- Width: 24 cm (9.4″).
- Depth: 55 cm (21.7″).
- Weight: 23 kg (51 lb) unloaded, 28 kg (62 lb) fully loaded.

UNITY–ULTRA-xr:

- Height: 62 cm (24.4″).
- Width: 40 cm (15.7″).
- Depth: 55 cm (21.7″).
- Weight: 39 kg (86 lb) unloaded, 44 kg (97 lb) fully loaded.

3.2 Tubes accommodated

- 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.

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, 400 W (ULTRA-xr self-adjusts to local voltage input).

3.5 Minimum PC specification

For TD control:

- CPU: 1 GHz 64-bit dual-core or better.
- RAM: 4 GB.
- Hard disk space: 2 GB.
- Graphics card: DirectX 9 or later.
- Display: 1024 × 768 display.
- Operating system: Windows® 10 or 11, 64-bit, English.
- Other requirements: Windows-compatible keyboard and mouse; one free USB (in addition to the port required for the UNITY-xr).

3.6 Safety and regulatory certifications

- The instrument is designed and manufactured under a quality system registered to ISO 9001.
- The instrument complies with the essential requirements of the following applicable European and North American Directives, and carries the CE/UKCA marks:
  - Low Voltage Directive 2014/35/EU.
  - EMC Directive 2014/30/EU.
  - ROHS Directive 2015/863/EU.
- The instrument conforms to the following product safety standards:
  - IEC 61010-1:2010/AMD1:2016.
  - IEC 61010-2-010/EN 61010-2-010:2014.
  - IEC 61010-2-081/EN 61010-2-081:2015.
  - Canada: CSA C22.2 No.61010-1:2012.
  - USA: ANSI/UL 61010-1:2012.
  - The instrument conforms to the following regulation on electromagnetic compatibility (EMC):
  - IEC 61326-1/EN 61326-1:2013.

4. System options

- Standard model configured for use with helium and nitrogen carrier gas
- Multi-Gas enabled model configured for use with helium, hydrogen and nitrogen carrier gas

Accessory and upgrade options include:

- **Internal standard accessory:** Contains a 1 mL loop for introducing a gas-phase internal standard onto the focusing trap or inlet end of a blank or sampled tube.
- **The addition of a second autosampler** (ULTRA-xr Pro) to the UNITY-xr fully automates the quantitative re-collection of inlet and outlet splits for up to 199 tube samples back onto the same tubes (or for up to 99 tube samples onto separate, conditioned, sample tubes).
- **The addition of a canister/on-line module** (CIA *Advantage*-xr or Air Server-xr) to the UNITY-xr enables the analysis of whole-air samples, gas/air streams, canisters or bags. Sequencing between these samples and tubes is fully automated.

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

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