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Markes International Series 2 Air Server 3

Specification Sheet February 2008

To be read in conjunction with USpec, the UNITY 2™ specification sheet

SYSTEM SUMMARY

UNITY 2 is a cryogen-free two-stage manual thermal desorber for tagged or untagged tubes. It uniquely provides a universal TD platform, compatible with every TD application. It incorporates a patented, inert heated valve ensuring recovery of the broadest range of analytes: C_2 to n-C_{40} hydrocarbons and reactive species such as mercaptans.

The **series 2 Air Server 3 (AS3)** mounts on the left hand side of UNITY 2 and extends the sample range to include cryogen-free concentration of vapor-phase organics from a sequence of 3 whole air/gas channels (-Typically sample, standard and zero gas). Sample options include: **canisters, bags or on-line air/gas streams**.

The selected sample, standard or calibrant gas channel is directed (*via* an optional in-line dryer) into the UNITY 2 cold trap at a controlled flow rate. This process is fully automated *via* software. The sample flow path through Air Server 3 is at ambient temperature (A thermostatted flow path is available on the free-standing 8-channel CIA 8 accessory – see associated spec. sheet.)

Sampling times and flows are entered into the 'on-line' TD method. During the 'sampling phase', the UNITY 2 cold trap is electrically-cooled allowing quantitative retention of ultra-volatiles such as acetylene from up to 1.5 L of air/gas. The typical upper limit of compounds sampled on-line or in canisters is n-$C_{10/12}$.

If the sample/standard gas is pressurized (>10 psi), the sampling flow is driven by this pressure. If the sample is at low (<10 psi), atmospheric or sub-atmospheric pressure, a pump (U-ASPM1 (115V) or U-ASPM2 (230V)) is required to 'pull' the gas-phase sample through the flow path and focusing trap.

At the end of sampling and after a purge of carrier gas to eliminate air, the UNITY 2 focusing trap heats ballistically to 'inject' the compounds of interest into the analytical system and trigger the measurement cycle. Collection of the next sample can begin, if required, as soon as the cold trap has re-equilibrated at its trapping temperature.

Key applications for series 2 UNITY-Air Server include:

- Continuous on-line measurement of C_2 to C_{10} hydrocarbons (**ozone precursors**) in ambient air. Typically requires series 2 UNITY-AS3 with a single or dual column GC and FID detection.
- On-line monitoring of **industrial or landfill odour** using series 2 UNITY-AS3 with GC-PFPD.
- Process monitoring of trace level volatiles in **food-grade CO_2** using series 2 UNITY-AS 3 with GCMS or process MS

Air Server 3 & 8 way modules feature:

- Electronic mass flow control of sample and split flow. Set and actual sampling flows are displayed and continuously updated in the software.
- Inert 3-way switching valves for stream selection. Zero dead volumes mean no carryover.
- 3 ports for automatic sequencing between sample, zero and standard gas
- Compatible with gas-phase samples ranging in pressure from just below atmospheric to 50 psi

Controls

- **Selection of carrier gas type**: Three carrier gas options, He, H_2, N_2, are available as standard and are user defined in the software
- All sampling and split flows are under **electronic mass flow control** and are settable between 2 and 100 ml/min. Higher

ranges (e.g. 5-200 ml/min or 10-500 ml/min) are available on request.

- **Leak test** (optional in on-line mode)
- **Pre-purge:** This ensures that individual sample lines leading up to the series 2 Air Server 3 plus the entire flow path inside the system (~0.6 ml without the optional dryer, ~2 ml with the dryer) are swept with the current sample before the beginning of sample collection. The mass flow controller controls the pre-purge flow to that set for sampling. The pre-purge flow is all directed to the split line.
  - Ambient purge time 0 to 99.9 minutes
  - Settable in 0.1 minute increments
- **Inlet selection:** 3 sample inlet options are available depending on the accessory chosen
- **Sample time:** After the leak test (if selected) and after the pre-purge, the flow of sample air/gas is directed to the electrically-cooled trap of UNITY 2 for this time period
  - Range 0 to 99.9 minutes
  - Settable in 0.1 minute increments
- **Sample flow:** This determines the flow of sample air/gas into the cold trap for the sampling time. It is controlled by the mass flow controller and is independent of the pressure of the sample
  - Range 2 to 100 ml/min. Higher ranges are available on request
- **Sample gas selection:** A choice of five common sample gas matrix types is available to the user: Air, helium, carbon dioxide, nitrogen and hydrogen
- **Trap purge time:** This relates to purging the UNITY 2 flow path and cold trap with carrier gas after sample collection and before the trap is desorbed. It is analogous to the ambient temperature purge of the tube before desorption. For the first 0.2 minutes (12 seconds) of purge time, the purge flow is all directed to the split line to prevent carryover. After the first 12 seconds, the purge flow is directed through the cold trap (in the trapping direction) to sweep any remaining O_2 or other residual sample matrix gas from the trap before desorption
  - Ambient purge time 0 to 99.9 minutes
  - Settable in 0.1 minute increments
- **Trap purge flow:** The same trap purge flow will be maintained whether the trap purge flow is passing to split or trap
  - Range 2 to 100 ml/min. Higher ranges are available on request
- **Cycle time:** The cycle time parameter defines the interval between the start of each sample collection time. Setting a cycle time means that the start of collection of another sample can overlap with analysis of the previous sample. System software uses the cycle time parameter to calculate when collection of a subsequent sample should begin such that the GC analysis of the previous sample will be complete and the GC system ready again, just before the cold trap is ready to desorb with the next sample.

Automatic sequencing of whole-air/gas analyses

- Programming a sequence: A series of analyses is programmed using the sequence table in an analogous way to a multi-tube sequence using ULTRA 2. The start of each new sample collection time can be programmed to begin:
  - as soon as the trap has re-cooled to its trapping temperature
  - at a fixed time interval or
  - at an absolute time *e.g.* 12.00, 13.00, 14.00

Automatic sequencing of inlets

A sequence of samples (gas/air streams, canisters, bags or other whole air / gas containers) comprising several 'sets' may be entered by the user into the sequence table on the user interface on the PC. Individual samples/sample channels may be included in more than one set in a sequence.

A set normally comprises a series of samples which are to be analyzed by the same method. Multiple (up to 100) analyses may be carried out on each individual sample. An entire sequence can be recycled any number of times as required.

Individual samples may be identified as calibration gas, blank, sample or by any user defined name.

A log file is produced as a sequence progresses and is automatically maintained and saved. Any sequence deviations are recorded in the log file. If any deviations occur in a sequence, the GC run is initiated to keep the analytical system 'in synch' with the desorber. Sequences may be stored and recalled for re-use if necessary.

SYSTEM SPECIFICATION

Dimensions and Weight

Series 2 Air Server 3 modules mount on the left hand side of UNITY 2. The dimensions and weight of the module are as follows:

- Height: 19.5 cm (7.7 in)
- Width: 6.5 cm (2.6 in)
- Depth: 50.5 cm (2 in)
- Weight: 3 Kg (7 lb)

Environmental Conditions

- Ambient operating temperature 0°C to 40°C
- Ambient operating humidity 5 to 95% RH non-condensing

Power Requirements

- Powered by UNITY 2 internal power supply. No extra power supply required.

Safety and Regulatory Approvals for series 2 UNITY-Air Server

- EN 60950-1
- EN 61010-1
- CE marked and compliant with the Low Voltage Directive (73/23/EEC) EN60950

EMC Performance

- IEC 61326:2002
- EN 61326:1997 + A1:1998 + A2:2001 + A3:2003

Designed and manufactured under a quality system registered to ISO 9001.

Data System – Minimum PC Specification

As per UNITY 2

Series 2 Air Server 3 software

If the series 2 Air Server 3 is to be attached to an existing (ULTRA-)UNITY 2 installation, it includes a new set of Markes International TD Control Software. This software should be used to replace the existing (ULTRA-)UNITY 2 control software.

Electrical connections

The series 2 Air Server 3 accessory is powered and controlled internally by UNITY 2

Series 2 Air Server 3 options

- **Pump** (U-ASPMP1/2): If the sample/standard gas is pressurized (>10 psi), the controlled flow through the entire system is driven by this pressure. If the sample is at low (<10 psi), atmospheric or just below atmospheric pressure, a pump (115/230V) is required to draw the gas-phase sample through the system
  - o The pump includes a power cord to connect to the mains supply, silicone rubber tubing and a copper tube adapter
- **In-line dryer** (U-ASDRY): (Optional item required for monitoring ultra-volatile, apolar compounds in humid atmospheres). The dryer requires a pressure regulated (~15 psi) supply of 150 - 200 ml/min pure dry air or nitrogen with a dew point below –35°C (as required for UNITY 2). Note also that appropriate fittings will be required to connect the regulated dry gas supply to the 1/8th-inch copper tubing provided
- **Series 2 ULTRA** 100-tube autosampler: Both series 2 Air Server 3 and ULTRA may be installed onto the same UNITY 2 although only one autosampler may operate at any one time. A connection kit will be required for this (U-UASK2-2S or U-UASK2-XZ)

For further information

For more information about our products and services please visit our web site at www.markes.com