CIA Advantage

Specification sheet


The CIA Advantage™ is a multi-channel accessory that connects to Series 2 UNITY systems, and allows continuous monitoring of air or gas streams, and sampling from whole-air and gas samples collected using canisters and Tedlar bags.

Please read this document in conjunction with the Specification Sheet for Series 2 UNITY.

1. System features

- **Two models are available**, CIA Advantage-T and CIA Advantage-HL.

  - CIA Advantage-T is a dedicated system for analysis of trace-level components.
    - Sample volumes: 10 mL upwards.
    - Sample channels: 4.

  - CIA Advantage-HL is a versatile system for the analysis of both high- and low-concentration samples and for screening unknowns.
    - Sample volumes: 0.5 mL upwards (using sample gas loop).
    - Sample channels: 14.

- **Cryogen-free operation and low gas consumption** for robust operation and high uptime.

- **Electronic mass flow control** is used for sample and split flows. Set and actual sampling flows are displayed and continuously updated in the software.

- **Heated internal sample flow paths** eliminate risk of condensation and carryover.

- **Compatible with gas-phase samples** ranging in pressure from below atmospheric to 50 psig.

- **Tube desorption capability** in compliance with US EPA Method TO-17 as standard.

2. System controls

2.1 Pre-desorption checks and controls

- **Selection of carrier gas type**: Two carrier gas options (helium and nitrogen) are available as standard and are user-defined in the software.

- **Leak test**: Optional leak test of the entire UNITY –CIA Advantage internal flow path.

- **Sample purge**: This ensures that individual sample lines leading up to the CIA Advantage, as well as the entire flow path inside the system, are swept with the current sample before the beginning of sample collection. A mass flow controller controls the purge flow.
  - Sample purge time range 0–99.9 min, settable in 0.1 min increments.
  - Sample purge flow range 2–250 mL/min, settable in 1 mL/min increments.

- **Sample volume/time**: After the leak test (if selected) and sample purge, the flow of sample air/gas is directed to the electrically-cooled trap of UNITY until the desired volume is collected, or for a defined sample time
  - Sample volume range 0.5–999 mL, settable in 0.1 mL increments.
  - Sample time range 0–99.9 min, settable in 0.1 min 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: 2–250 mL/min.†
  - Settable in 1 mL/min increments.

• **Internal standard addition:** Internal standard can be added at the completion of the sampling process. Internal standard is added via a 1 mL inert sample loop.

• **Post-sampling purge:** The UNITY–CIA Advantage flow path is purged with clean gas (humidified or carrier) to eliminate any remaining sample, thereby preventing carryover into subsequent analyses.

• **Post-sampling purge time:**
  - Range: 0 to 99.9 min.
  - Settable in 0.1 min increments.

• **Post-sampling purge flow:**
  - Range: 2–250 mL/min.
  - Settable in 1 mL/min increments.

• **Trap purge:** The UNITY cold trap is purged with carrier gas after sample collection and before the trap is desorbed. The purge flow is directed through the cold trap (in the trapping direction) to sweep any remaining oxygen, water and/or other residual sample matrix gas from the trap before desorption.

• **Trap purge time:**
  - Range: 0 to 99.9 min.
  - Settable in 0.1 min increments.

• **Trap purge flow:**
  - Range: 2–250 mL/min.
  - Settable in 1 mL/min increments.

• **Trap desorption:** See Specification Sheet for Series 2 UNITY.

• **Flow path:** The entire sample flow path is heated to eliminate risk of contamination or carryover.
  - Range: 50–200 °C.
  - Settable in 1 °C increments.

• **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, in order that the GC analysis of the previous sample is complete and the GC system ready again, just before the cold trap is ready to desorb with the next sample.

2.2 **Automatic sequencing of inlets**

• A sequence of samples (gas/air streams, canisters, bags or other whole air/gas containers) comprising several ‘sets’ can be entered by the user into the sequence table on the PC user interface.

• Individual samples/sample channels can be included in more than one set in a sequence.

• A set normally comprises a series of samples to be analysed by the same method. Multiple analyses can be carried out on each individual sample. An entire sequence can be recycled any number of times.

• Three common sample gas matrix types are available to the user: Air, helium and nitrogen.

• Individual samples can be identified as calibrant, blank, sample or by a 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 sync’ with the desorber. Sequences can be stored and recalled for re-use if necessary.

† Sampling flow rates of 250 mL/min will not be attainable under all operational conditions. Factors affecting the maximum sampling flow rate will include the type of cold trap used and any sampling accessories connected to the sample inlet.
3. System specification

3.1 Dimensions and weight

- Height: 42 cm (16.5″).
- Width: 24 cm (9.4″).
- Depth: 54 cm (21.3″).
- Weight: 21 kg (46.2 lb).

3.2 Recommended ambient operating conditions

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

3.3 Power requirements

- 100 to 240 V, 50/60 Hz (CIA Advantage self-adjusts to local voltage input).
- Maximum power requirement of 900 W.

3.4 Pneumatic requirements

- Pressure-controlled 0–60 psig (0–415 kPa) supply of helium or nitrogen carrier gas under manual or electronic control. (This is in addition to the UNITY carrier gas supply).
- Pressurised supply of dry air/nitrogen at 50–60 psig (340–415 kPa). The gas is used for pneumatic actuation of valves. (This is in addition to the UNITY dry gas supply).

3.5 Data system – Minimum PC specification

CIA Advantage software will run on most 32- and 64-bit versions of Windows®. However, use of currently supported versions of Windows® is strongly recommended.

The recommended minimum PC specifications are:

- 2 GHz Pentium® 4 (or equivalent) processor.
- 512 MB RAM.
- 20 MB of free disc space (for software installation).
- XGA (1024 × 768 pixel) screen resolution, 256-colour.

The PC should have one free spare serial or USB port for communication, in addition to the one required for UNITY. (A USB–serial port adaptor is included).

3.6 Safety and regulatory certifications (for Series 2 UNITY–CIA Advantage)

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

The instrument conforms to the following standards:

- International Electrochemical Commision (IEC):
- CAN/CSA C22.2 No. 61010-1 and UL 61010-1.

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


4. System options

- **CIA Satellite**: The CIA Satellite provides capacity for an additional 13 channels.
  - CIA Advantage-T and CIA Satellite provides 17 channels.
  - CIA Advantage-HL and CIA Satellite provides 27 channels.
- **Canister racks**: Markes’ canister racks hold up to 15 canisters (14 samples and one internal standard). The bench-mounted model holds canisters up to 1 L, and the floor-mounted model holds canisters up to 6 L in size. See separate Specification Sheet.
- **Pump** (U-ASPM1 or U-ASPM2): If the sample/standard gas is pressurised (>5 psig), the controlled flow through the entire system is driven by this pressure. If the sample is at low (<5 psig) pressure, a pump (115/230 V) is required to draw the gas-phase sample through the system. The pump includes a power cord to connect to the mains supply, silicone rubber tubing and a copper tube adaptor.
- **In-line dryer** (U-ASDRY) (Optional item required for monitoring ultra-volatile, non-polar compounds in humid atmospheres): The dryer requires a pressure-regulated (~15 psig) supply of 150–200 mL/min dry air or nitrogen with a dew point below −50°C (as required for Series 2 UNITY).
• **Series 2 ULTRA™ 100-tube autosampler**: Both CIA Advantage and Series 2 ULTRA can be installed onto the same Series 2 UNITY, although only one autosampler can operate at any one time. A connection kit is required for this (U-UASK2-2S or U-UASK2-XZ).

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