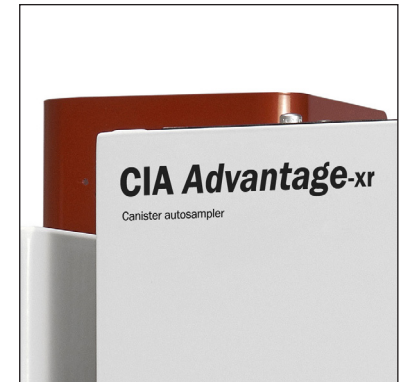


UNITY–CIA Advantage-xr

**Universal, cryogen-free, automated
canister and whole-air sample
preconcentrator**



UNITY–CIA *Advantage*-xrTM

Introducing UNITY–CIA *Advantage*-xr – Reliable and high-throughput automation for best-in-class GC and GC–MS analysis of canister air samples.

Operating entirely without liquid cryogen and in full compliance with standard canister and on-line air/gas sampling methods, Markes' UNITY–CIA *Advantage*-xr systems offer a world-leading combination of productivity, performance and versatility, ensuring a fast and future-proof return on investment.

Unique combination of advantages:

■ **Maximum instrument uptime:**

- UNITY–CIA *Advantage*-xr systems deliver an unbeatable application range, high uptime and low running costs, thanks to cryogen-free trapping and water removal using Dry-Focus3TM technology.
- A NEW uniformly-heated, low-volume flow path, treated with advanced inert coatings and combined with highly efficient purging, eliminates carryover, meaning fewer blanks and higher uptime.

■ **Versatility:**

- Low-volume loop sampling accommodates high-concentration samples, and precisely controlled MFC sampling of larger volumes allows trace detection.
- Efficient performance under a wide range of split conditions further extends the concentration range – from sub-ppt to percent levels.
- Compatible with pressurised and unpressurised samples.
- Compatible with any make of GC or GC–MS, single- or dual-column configurations and emerging methods such as fast GC.

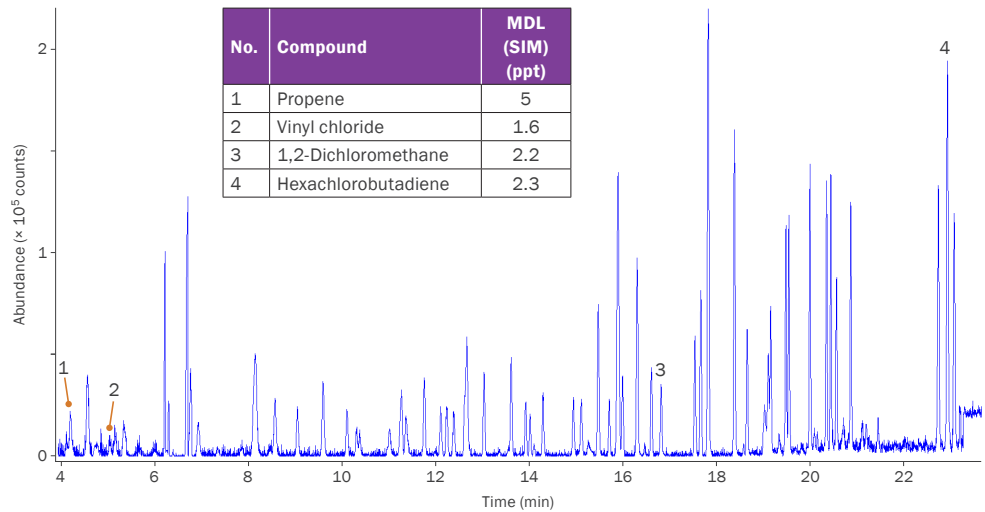
■ **Future-proof investment:**

- With capacity for 14 canisters in the standard compact unit UNITY–CIA *Advantage*-xr systems can easily be expanded to 27 canisters for longer unattended sequences.
- Accommodates US EPA Method TO-17-compliant tube desorption as standard; fully-upgradable to 100-tube automation.

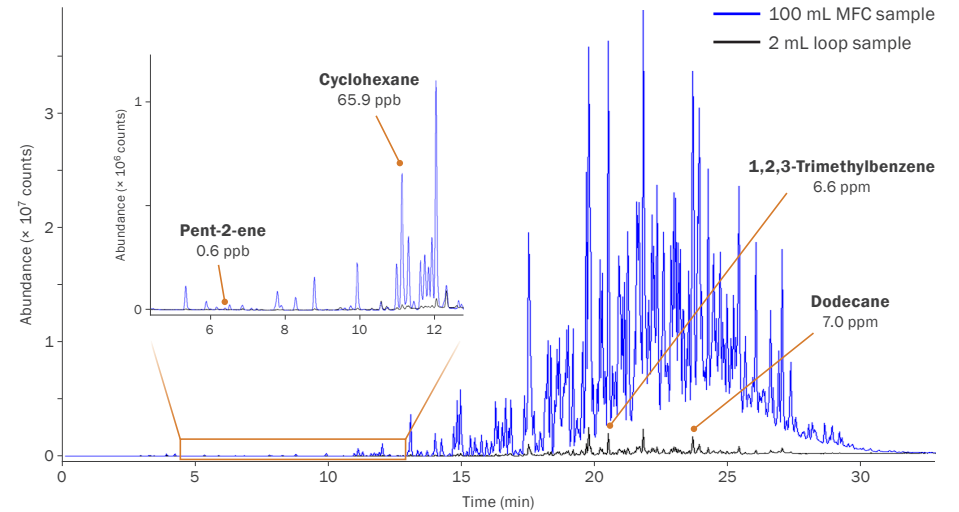


Putting UNITY-CIA Advantage-xr through its paces

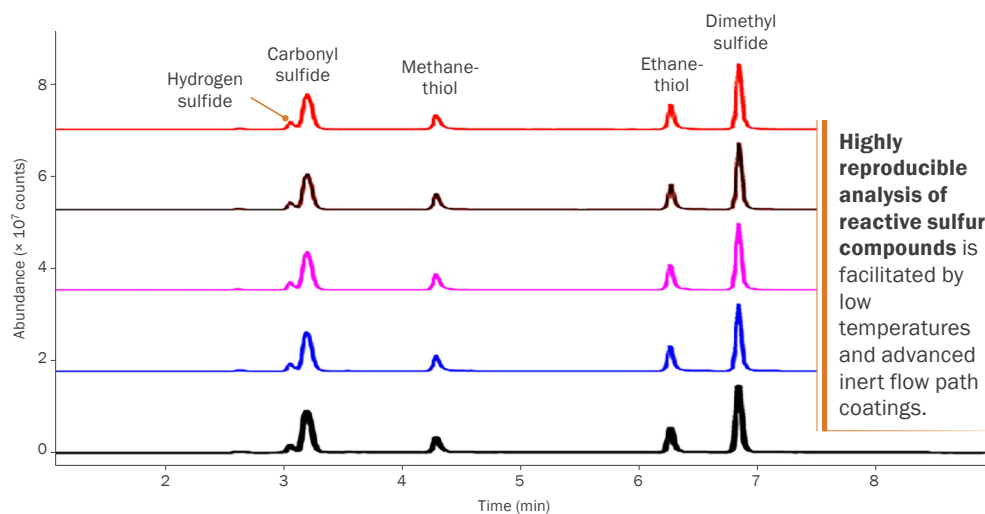
The universal, cryogen-free preconcentrator for every whole-air application – routine or challenging



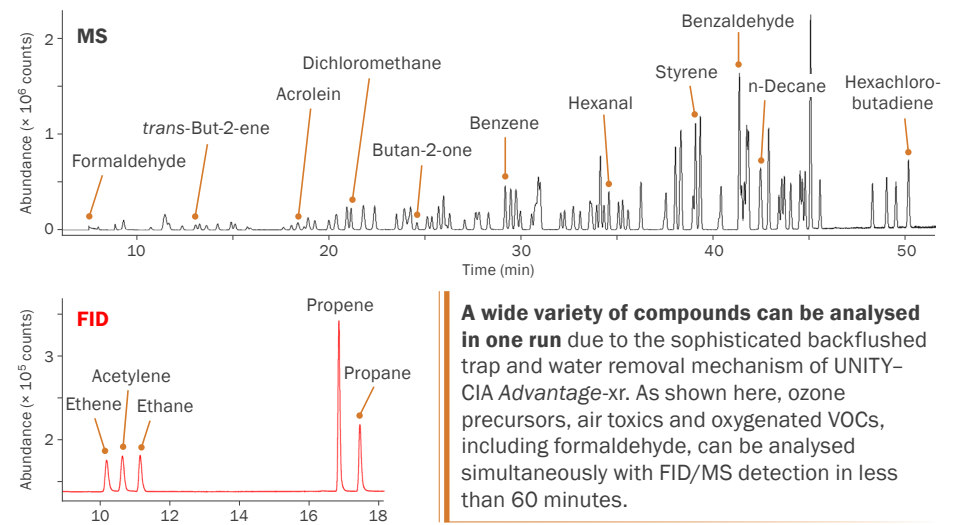
High-throughput, trace-level T0-15 analysis is routine on UNITY-CIA Advantage-xr, with its efficient trapping and water removal providing optimum chromatographic performance and high sensitivity.



Column loading for complex samples is reduced using low-volume loop sampling to quantify major compounds, and high-volume metered sampling for detailed analysis of trace species.



Highly reproducible analysis of reactive sulfur compounds is facilitated by low temperatures and advanced inert flow path coatings.



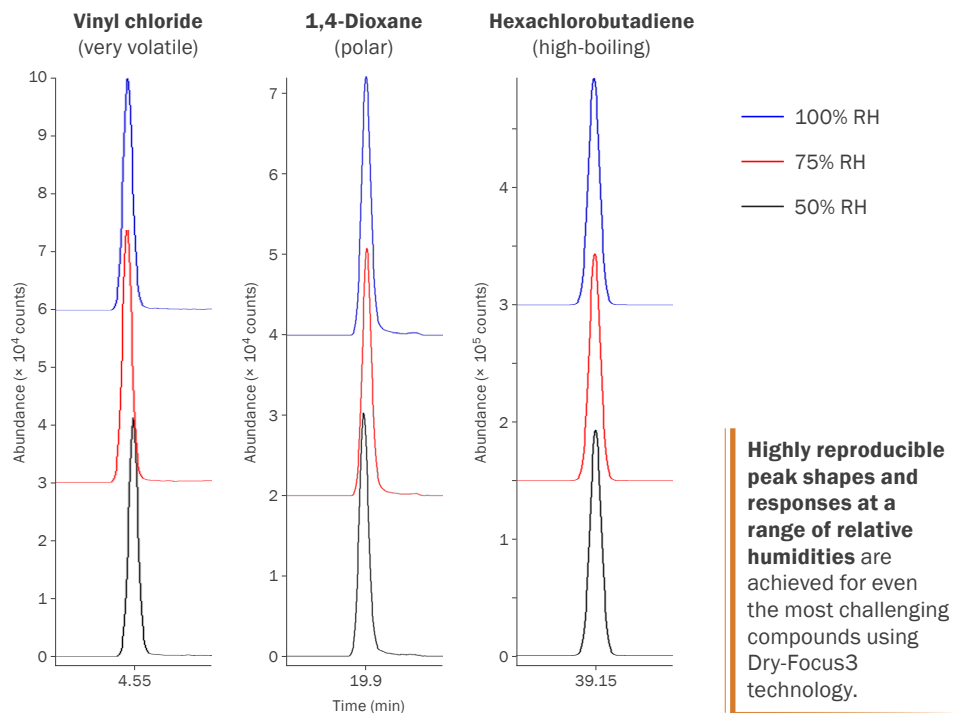
A wide variety of compounds can be analysed in one run due to the sophisticated backflushed trap and water removal mechanism of UNITY-CIA Advantage-xr. As shown here, ozone precursors, air toxics and oxygenated VOCs, including formaldehyde, can be analysed simultaneously with FID/MS detection in less than 60 minutes.

Dry-Focus3™: Cryogen-free trapping and water management

For high-quality analysis of polar and non-polar VOCs – at any humidity level

Refined over two decades, Markes' electrically-cooled focusing trap avoids the cost and inconvenience of liquid cryogen and delivers excellent analytical results – regardless of sample humidity – through a unique combination of selective drying, efficient focusing and fast trap desorption:

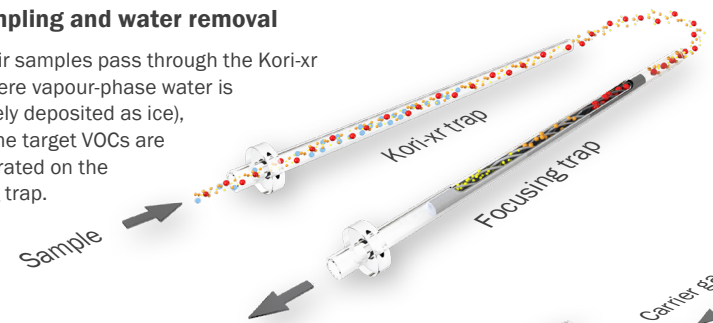
- Sharp capillary GC peaks maximise sensitivity, and are ideal for complex mixtures and fast GC methods.
- Highly stable retention times reduce the need for data review.
- Column and detector lifetime is extended, increasing maintenance intervals and reducing running costs.



How Dry-Focus3 works:

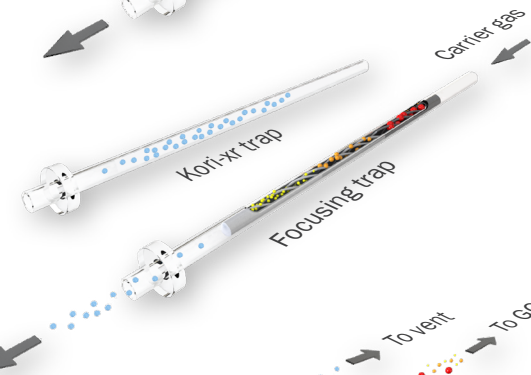
1 Air sampling and water removal

Whole-air samples pass through the Kori-xr trap (where vapour-phase water is selectively deposited as ice), before the target VOCs are concentrated on the focusing trap.



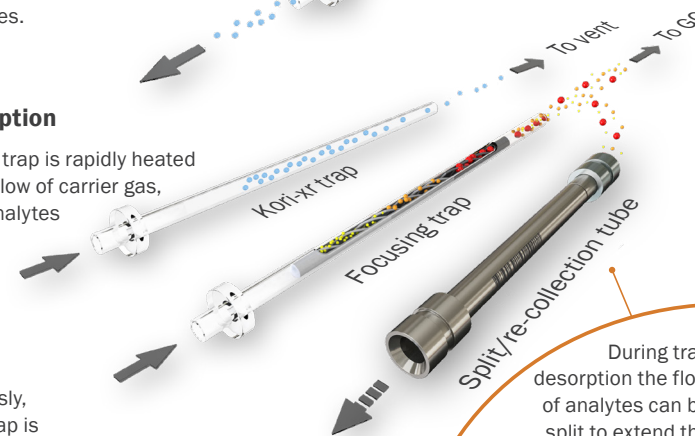
2 Purging of residual water

Optional temperature-programmed dry-purging of the focusing trap selectively eliminates any residual water while retaining 100% of target analytes.



3 Trap desorption

The focusing trap is rapidly heated in a reverse flow of carrier gas, to transfer analytes to the GC.



Simultaneously, the Kori-xr trap is heated in a flow of gas to expel the trapped ice and regenerate it for the next sample.

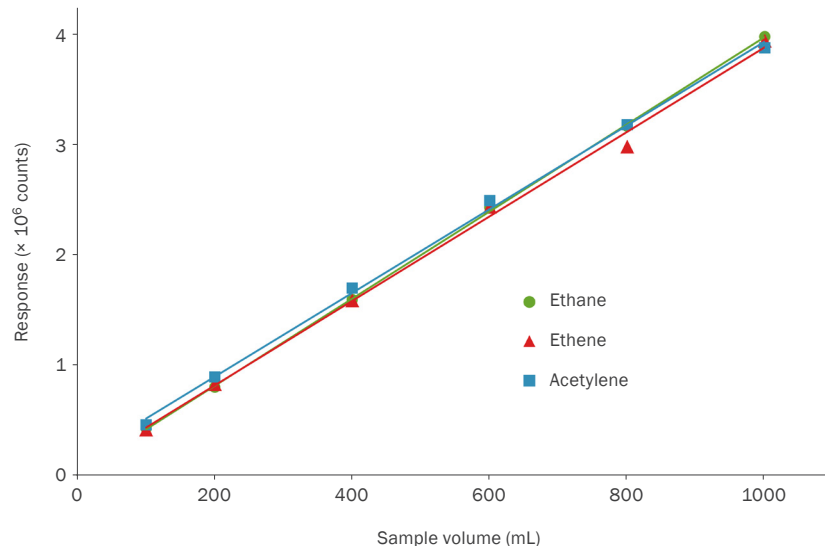
During trap desorption the flow of analytes can be split to extend the dynamic range. The split flow can be re-collected onto a sorbent tube for repeat analysis of critical samples.

Superior analytical performance for any whole-air application

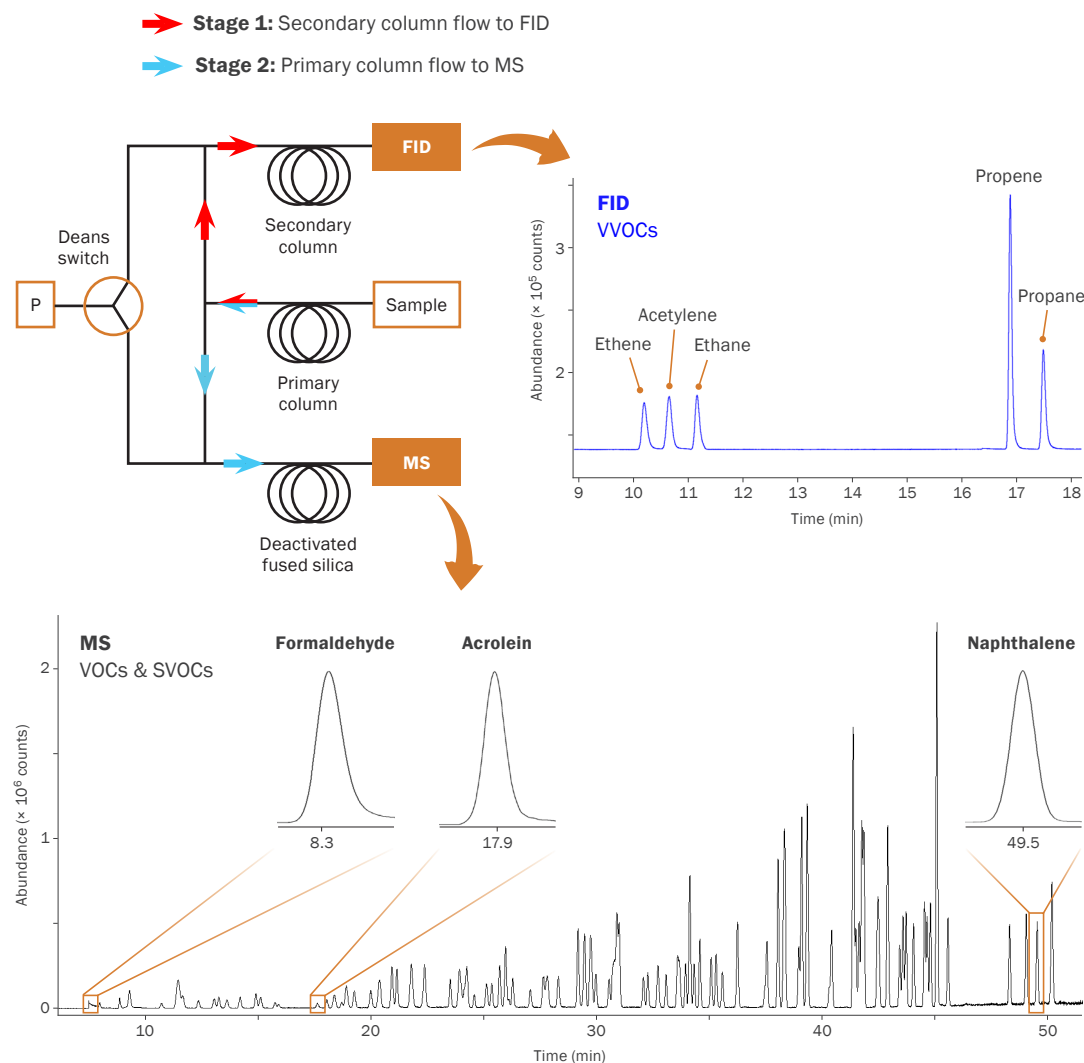
Enhance laboratory productivity with simultaneous analysis of wide-ranging target lists

The unique design of the focusing trap at the heart of UNITY-CIA *Advantage-xr* offers the perfect balance of capacity and analyte range:

- The combination of **uniquely efficient electrical cooling** and **highly retentive sorbents** provides quantitative retention of very volatile compounds, such as acetylene, from up to 1 L of sample.
- **Backflush desorption** facilitates the use of multi-bed focusing traps, enabling simultaneous analysis of an extensive range of target compounds, including high- and low-volatility species.
- The **narrow-bore design** and **fast trap heating rates** (up to 100°C/s) deliver analytes to the GC column in a narrow band of vapour for sharp peaks, optimising sensitivity and resolution.



The excellent trapping capability of the focusing trap is demonstrated by the quantitative retention of ultra-volatile C₂ hydrocarbons without liquid cryogenic cooling.



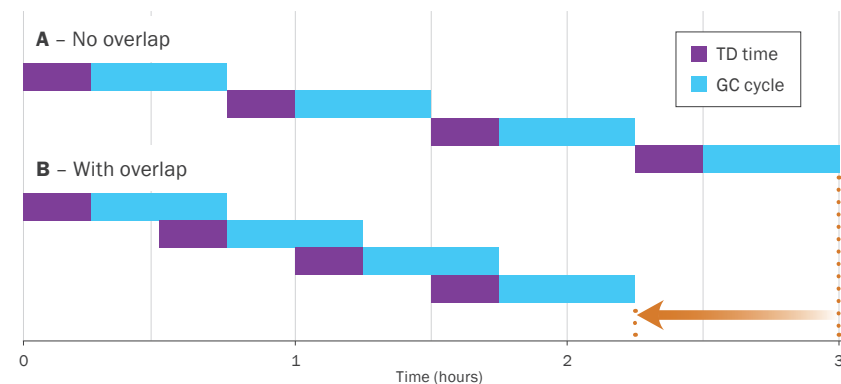
The exceptional chromatographic separation and peak shape shown for this extensive target list demonstrates the power of UNITY-CIA *Advantage-xr* to simultaneously analyse compounds covering a wide volatility and polarity range. See Markes application note 146 for more information.

Outstanding productivity and reliability

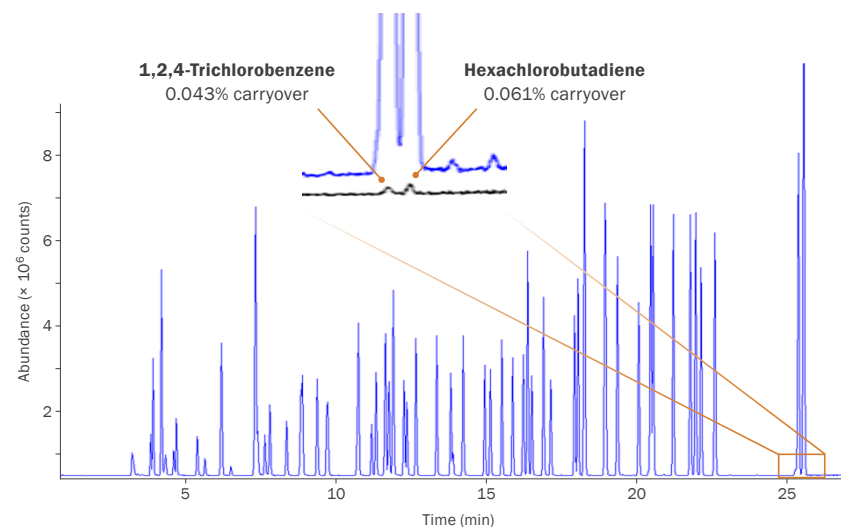
Time-saving innovations for high-throughput, method-compliant analysis with maximum up-time

From multi-canister capability to quick set-up of routine methods and onboard diagnostic routines, UNITY-CIA *Advantage-xr* is designed by TD users for TD users:

- **14 canister channels (as standard)**, and the option to upgrade to 27, combined with time-saving overlap mode significantly increase sample throughput for canister analysis.
- **Cryogen-free operation** means no time lost due to ice blockages or late deliveries.
- **Built-in methods for common applications** (including TO-15, HJ 759 and ozone precursors), saves time on method development.
- **Highly efficient purging** minimises carryover, reduces the need for blanks and extends the dynamic range.
- **Quantitative split ratios** from splitless to 500:1 maximise versatility.
- **Flexible internal standard addition:** The internal standard capability of UNITY-CIA *Advantage-xr* transfers a precise aliquot of a gaseous internal standard to the focusing trap prior to sampling.
 - Loop addition: Standard added *via* a 1 mL loop, saving expensive standard gas.
 - Large-volume addition: 5–500 mL of standard added directly to the trap.
- **Sample stacking** combines samples from multiple canisters (or tubes and canisters) onto the focusing trap before injection to the GC. Provides an easy, automated way to combine standards – for example, those containing compounds that are unstable when mixed in canisters.
- **Smart electronics:** Automated, intelligent troubleshooting and pre-maintenance warnings maximise instrument uptime.
- **Sample scheduling:** Start sequences or samples at a specified date and time, or after a selected time interval. Ideal for on-line sampling or for starting blanks and calibrations before you even get to the laboratory and receive samples.
- **The ‘Trace’ model** of the CIA *Advantage-xr*, with only four channels, is ideal for on-line analyses in remote locations.



Fast returns on investment are achieved by the use of overlap mode to maximise sample throughput.



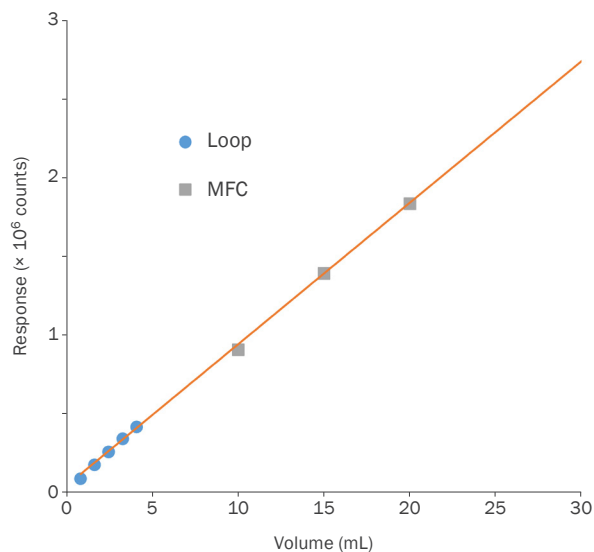
Minimal carryover is achieved for the least volatile TO-15 compounds, as shown by this analysis of a high-concentration standard (1 ppm).

Get the most from your investment

Optimised loading of samples and standards

UNITY-CIA *Advantage-xr* systems are designed to quantify samples ranging from ppt to percent levels with minimum sample preparation:

- **Low-volume loop sampling**, via a 0.5 mL sample loop, provides a convenient method for analysing high-concentration samples without the need for dilution.
- **MFC-controlled sampling** from 5 mL to several litres offers the flexibility to tune sample loading for trace-level analysis.
- **The combination of loop and MFC sampling** greatly simplifies calibration routines. Calibrations from single-digit ppt to hundreds of ppb can be created using just two canisters:
 - Preparing fewer canisters to cover a wide calibration range saves time.
 - Fewer calibration standard canisters means more revenue-generating samples per sequence.



Valuable time is saved by using a small number of canister standards to cover a wide range of calibration levels – loop samples are suitable for volumes up to 5 mL, while MFC samples can be taken from 5 mL to litre volumes.

Future-proof your lab with easy system upgrades

Upgrade your UNITY-CIA *Advantage-xr* with an ULTRA-xr™ autosampler for up to 100 sorbent tubes and maximise return on investment.

- **Tube automation** is fully compliant with standard methods including US EPA methods such as TO-17 and 325, as well as ISO 16000-6, HJ 644 and EN 14662-1.
- **Canister/on-line automation** is fully compliant with standard methods including US EPA Method TO-15, US EPA guidance for ozone precursor ('PAMS') monitoring, and Chinese Environment Agency Method HJ 759.
- **Run complementary tube and canister analyses on a single system** (and even in a single sequence) with no user intervention and without compromising analytical performance or sample-to-sample cycle time.
- **Re-collect tube, canister, bag or on-line samples** onto sorbent tubes for extended storage stability.
- **Adapt your system** to seasonal applications or wide-ranging sample types.



| | Status | Method | Tube | Channel | Recollection Tube |
|---|----------|---------------------------|------|---------|-------------------|
| 1 | Complete | Tube Sample (issue 4) | 1 | | |
| 2 | Complete | Tube Sample (issue 4) | 2 | | |
| 3 | Complete | Canister Sample (issue 3) | | 13 | 99 |
| 4 | Active | Canister Sample (issue 3) | | 14 | 100 |

Markes International – The TD experts

World-leading instruments, technical expertise and unmatched applications experience

Markes International has been at the forefront of thermal desorption design and innovation for over 20 years. Our 'xr' series of TD instruments sets the benchmark for product quality and delivers the best-available analytical performance across all TD-GC and TD-GC-MS application areas:

Environmental monitoring



Consumer environmental health



Food and drink



Automotive studies



Fragrance and odour profiling



Biological profiling



Defence and forensic



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