



Automated, cryogen-free, unattended on-line air monitoring system









UNITY-Air Server-xr

Introducing UNITY-Air Server-xr – a cryogen-free thermal desorption system for round-the-clock on-line monitoring of volatile and very volatile organic compounds ((V)VOCs) in air using GC and GC-MS.

UNITY–Air Server-xr is a robust, autosampler for unattended on-line monitoring of ambient air or industrial processes. Its leading performance has been demonstrated in multiple independent laboratory and field trials.

Key benefits:

- Throughput and reliability: Cryogen-free operation, fast cycle times and automated sequencing between at least three channels (sample, standard, blank) minimise user intervention and deliver optimum data coverage.
- Best-available sensitivity:
 - Quantitative retention of C₂ hydrocarbons from up to 1L of air to enhance ozone precursor monitoring.
 - Uniquely fast trap desorption delivers sharp peaks and optimum detection limits for critical trace air pollutants.

Versatility and robustness:

- Mass flow controlled sampling provides precise sample volumes and highly reliable data.
- Splitless and high-split options extend the sample concentration range.
- Completely inert flow path offers compatibility with the most challenging analytes.
- Method-compliant tube desorption offered as standard. Upgradable to 100-tube automation.
- Sophisticated water management Options for every application and budget:
 - Permeable membrane dryers provide cost-effective water removal for non-polar target lists.
 - Dry-Focus3[™] The ultimate cryogen-free drying option. Selectively eliminates water while preserving the recovery of polar VOCs, ultra-volatiles and reactive species.



High-productivity on-line monitoring

On-line TD-GC(-MS) is ideal for monitoring processes or for time-profiling concentrations of common pollutants such as ozone precursor hydrocarbons, odorous sulfur species and greenhouse gases. UNITY-Air Server-xr systems are expertly designed for reliable unattended operation and exceptional analytical performance.

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No.	Compound	t _R RSD (%)	Reponse RSD (%)	R ²
1	Hydrogen sulfide	0.03	1.1	0.9937
2	Carbonyl sulfide	0.01	1.6	0.9936
3	Methanethiol	0.01	2.3	0.9981
4	Ethanethiol	0.03	2.9	0.9929



Reactive odorous sulfur compounds are quantitatively analysed using UNITY-Air Server-xr. here demonstrated in combination with GC-flame photometric detection (FPD). A fully inert system and the use of relatively low flowpath temperatures ensure superior retention time and response reproducibilities, as well as excellent linearity - results that underpin the suitability of UNITY-Air Server-xr for continuous monitoring with minimal time spent on data review.



Efficient splitless desorption and cryogen-free trapping combine in UNITY-Air Server-xr, to provide a simple solution to monitoring ultra-volatile greenhouse gases with sub-ppt detection limits.

Exceptional trapping functionality

Combining high performance and practicality

The powerful focusing trap at the heart of UNITY–Air Server-xr has been refined over two decades and is used at thousands of locations globally.

The perfect balance of performance and productivity is achieved by:

- Quantitative retention of ultra-volatile compounds such as acetylene from up to 1 L of air.
- Electrical cooling of the focusing trap, which allows savings of up to \$15K per year and removes the risk of ice blockages typical of legacy systems using liquid nitrogen.
- Fast trap heating rates delivering sharp chromatographic peaks for optimum sensitivity and resolution.
- Overlap mode: Collection of the next sample can start while GC analysis of the previous sample continues, typically allowing data capture for up to 45 minutes per hour to maximise data coverage.



The excellent performance of the focusing trap at the heart of all Markes' TD instruments is demonstrated by the linearity obtained for high volumes of ultra-volatile C₂ hydrocarbons, sampled using the UNITY-Air Server-xr.



Leading technology for unattended on-line monitoring

As adopted in hundreds of mobile laboratories and field stations around the world

Engineered to operate in the lab or field, UNITY-Air Server-xr offers:

- A small footprint for easy installation in confined situations on ships, vans or even planes.
- Fully integrated Peltier-cooled trapping eliminates the need for large dewars and liquid cryogen supply logistics, enabling continuous, unattended monitoring in remote locations.
- Flexible sequencing allows samples to be scheduled at specific times or time intervals (e.g hourly) with automated switching between standard, blank and sample streams, all without user intervention.
- Onboard diagnostics maximise instrument up-time, with predictive maintenance warnings and built-in instrument self-checking routines optimised for remote troubleshooting.
- Short, reproducible cycle times (as low as 5 minutes) provide maximum sampling coverage and high time resolution. Combining the preconcentration power of UNITY-Air Server-xr with on-line mass spectrometers provides the ideal solution for fast-cycle emergency response monitoring or process control.
- Advanced water management options provide on-line drying of sample streams, delivering highly stable retention times and minimising data review requirements. Column and detector lifetimes are also extended increasing maintenance intervals for unattended systems.



The highly efficient desorption and cooling of UNITY-Air Server-xr, here interfaced directly to on-line MS detection, results in the short cycle times needed for highly time-resolved monitoring of contaminants in process gas streams.

Extend on-line monitoring with Dry-Focus3[™] water management

Unlike conventional membrane dryers, advanced Dry-Focus3 technology, requiring the addition of Kori-xr, allows selective water removal while ensuring full transfer of very volatile, non-polar and polar organic compounds to the focusing trap.

Use Dry-Focus3 to:

- Extend the analyte range to include monoterpenes and oxygenates alongside VVOC and VOCs.
- Characterise unknown atmospheres in combination with GC–MS.
- Reduce detection limits by sampling larger volumes.





Versatile tube analysis

US EPA TO-17

US EPA 325

At any time, you can upgrade UNITY-Air Server-xr to automate analysis of 100 tubes with the ULTRA-xr, and maximise return on investment with high productivity for a wide range of sample types.

- Tube automation is fully compliant with standard methods including US EPA methods such as TO-17 and 325, as well as ISO 16000-6, EN14662-1, ASTM D6196 and other key standards.
- On-line automation is fully compliant with standard methods including US EPA PAMS.
- Run complementary 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 onto sorbent tubes** for repeat analysis of unique samples.
- Adapt your system to seasonal applications or wide-ranging sample types.

Comprehensive portfolio of sampling accessories

As well as our wide range of instrumentation, Markes International offers sampling equipment and supplies to serve every customer need - shown below is just part of our extensive portfolio.



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:



Markes International

UK: Gwaun Elai Medi-Science Campus, Llantrisant, RCT, CF72 8XL T: +44 (0)1443 230935

USA: 2355 Gold Meadow Way, Gold River, Sacramento, California 95670 T: +1 866-483-5684 (toll-free)

 Germany:
 Bieberer Straße 1–7, 63065 Offenbach am Main
 T: +49 (0)69 6681089-10

P.R. China: No. 1 Building, No. 7 Guiqing Road, Xuhui District, Shanghai 200233 **T:** +86 21 5465 1216

E: enquiries@markes.com W: www.markes.com

