MARKES international

Multi-Gas -xr series

Hydrogen-certified thermal desorption for GC–MS

MULTI-GAS ENABLED

Multi-Gas enabled thermal desorption (TD): The latest innovation from Markes International

A major step forward in TD–GC–MS productivity

In a world first for TD instrumentation, the entire portfolio of Markes' Multi-Gas enabled TD instruments has been independently certified for safe operation with hydrogen carrier gas as well as helium and nitrogen.

Choosing one of our new hydrogen-certified TD instruments protects your laboratory against future helium shortages and reduces running costs. Operating with hydrogen also increases sample throughput by as much as 50% while maintaining analytical performance. TD–GC–MS methods can be easily converted, and existing columns and consumables can be used, thus allowing fast adoption in busy laboratories.

Multi-Gas enabled technology from the world's leading TD provider – Fast return on investment without any compromise in data quality.

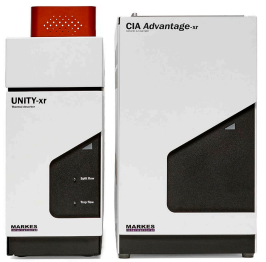
TD100-xr™

UNITY-xr™

UNITY–ULTRA-xr™

MULTI-GAS ENABLED

UNITY–Air Server-xr™ with Kori™ (as option)



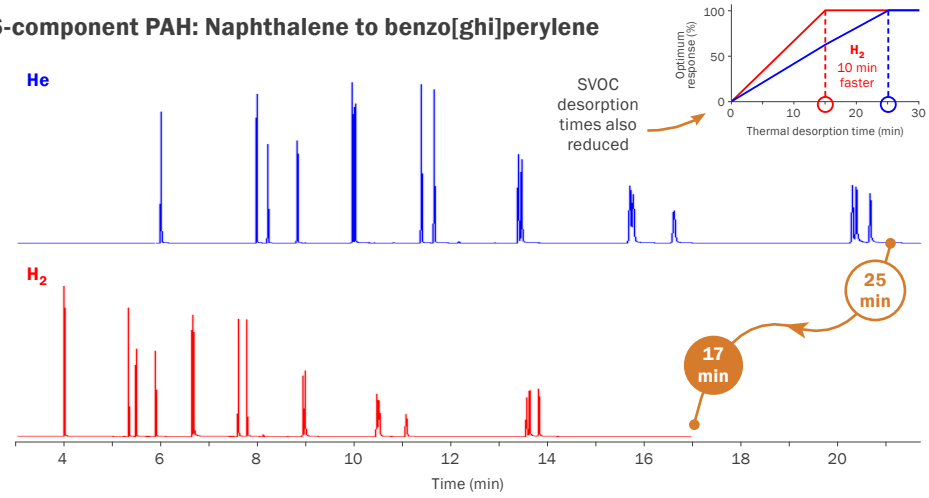
UNITY–CIA *Advantage*-xr™

UNITY–ULTRA-xr Pro™

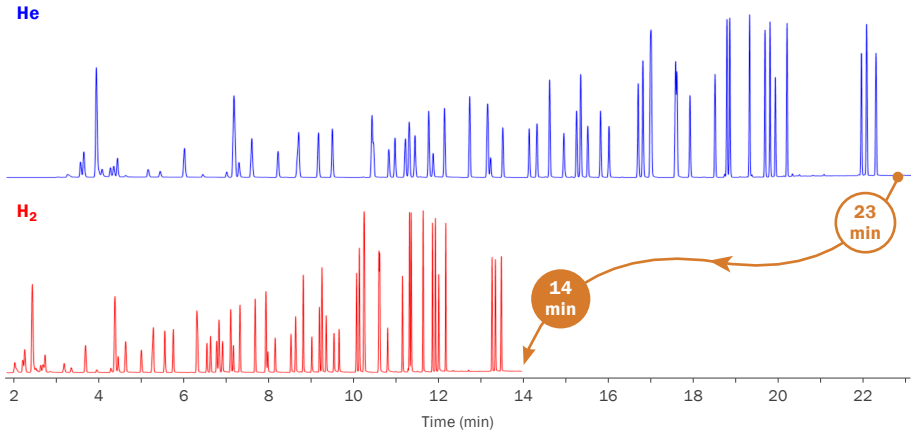
Exceptional productivity enhancement guarantees fast return on investment

Markes' thermal desorbers already lead the way in sample throughput with robust operation, high capacity and powerful overlap mode allowing subsequent samples to desorb while the previous GC run is still ongoing. ***Hydrogen carrier gas offers further significant improvement while maintaining exceptional method performance...***

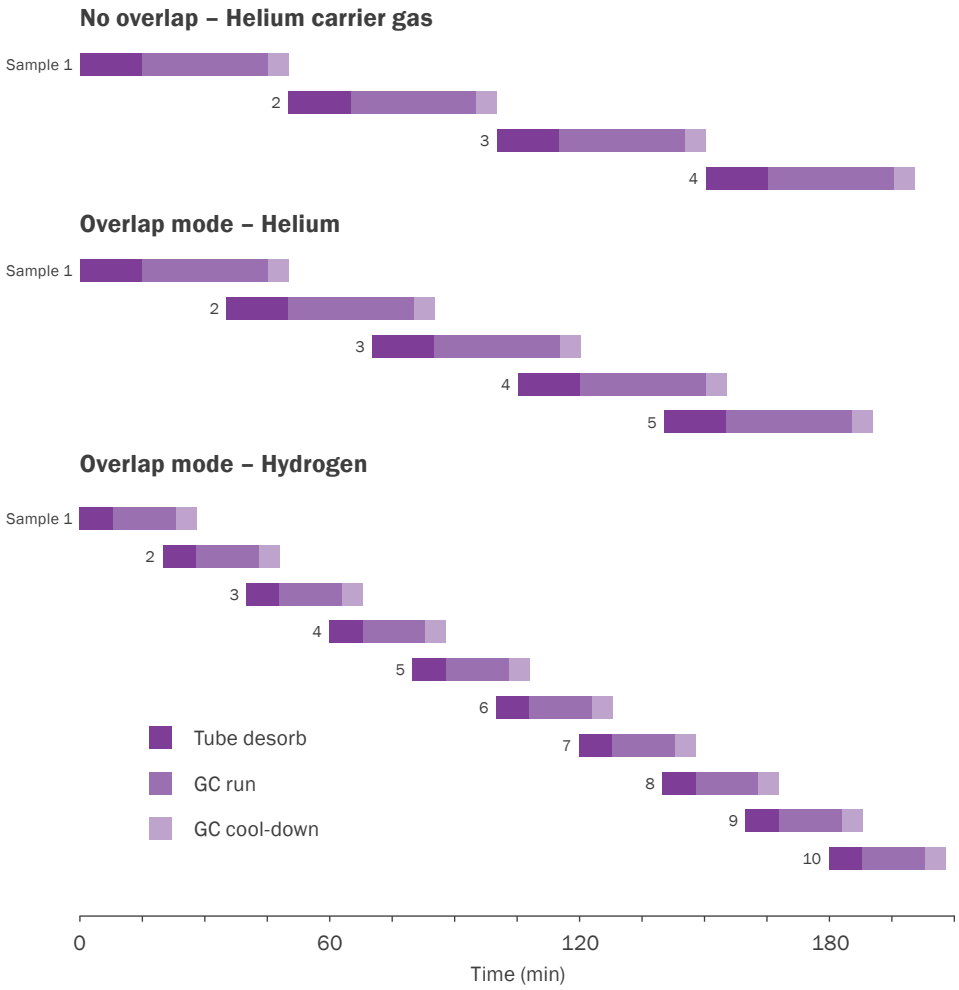
16-component PAH: Naphthalene to benzo[ghi]perylene



Standard of 65 'air toxic' VOCs (US EPA Method TO-17)



A very significant reduction in cycle times is achieved for this mix of without compromising analyte recovery or separation.

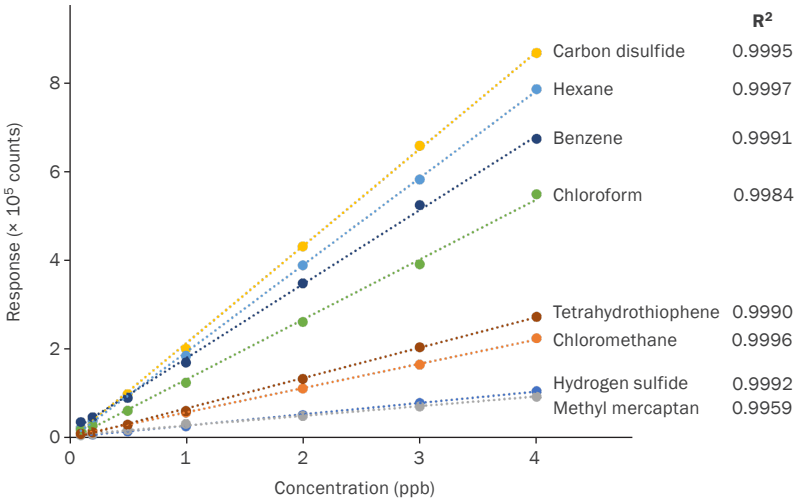


An additional analysis every hour, or ~20 extra billable samples per day, is typically delivered by changing from helium to hydrogen carrier gas. At $100 per sample this means $2,000 extra revenue per system per day, or >$10,000 per week.

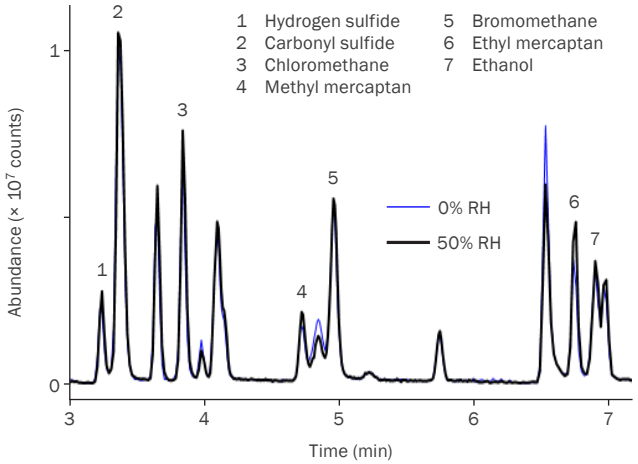
New application capabilities: Monitoring hydrogen quality

As a fuel for powering transport systems, hydrogen burns with no harmful emissions, and can also be carbon-neutral when generated using renewable energy sources. As a result, it is being widely investigated by researchers, and increasingly regulated by many standards institutions.

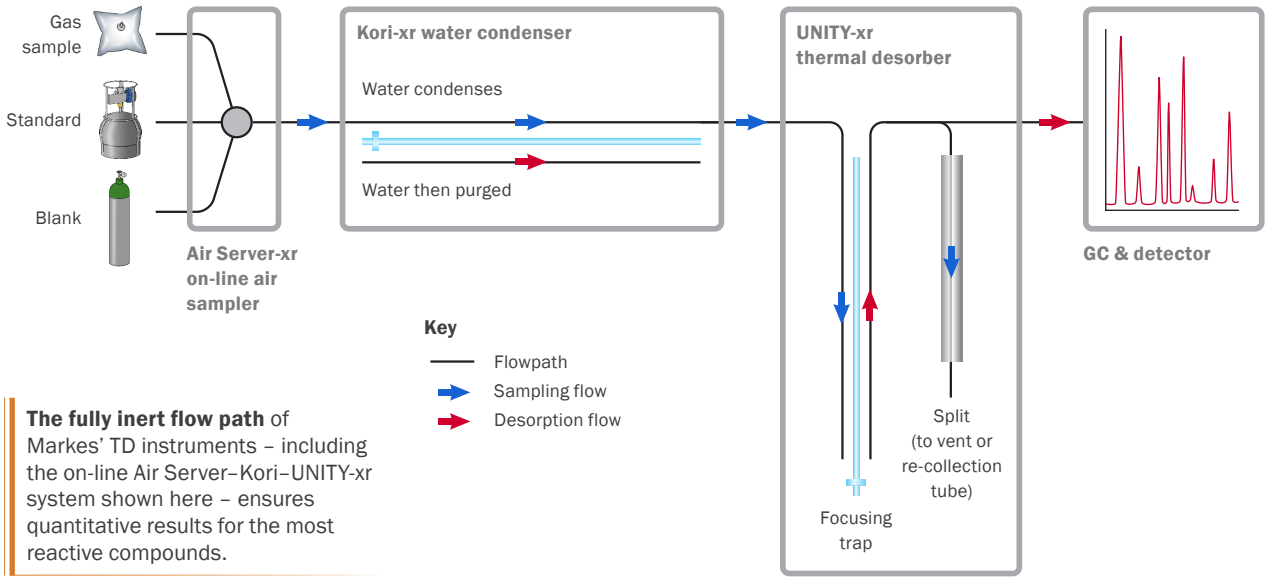
Markes' on-line systems are certified safe for the analysis of impurities in hydrogen and other highly flammable sample gases, even those containing high levels of humidity.



Excellent linearity is achieved for a selection of compounds of interest in humidified hydrogen, over a concentration range of 0.1–4 ppb.



Early-eluting compounds – including reactive sulfides and mercaptans – are reliably separated and quantified in humidifed hydrogen sample gas at various humidity levels, as demonstrated by these extracted-ion chromatograms.



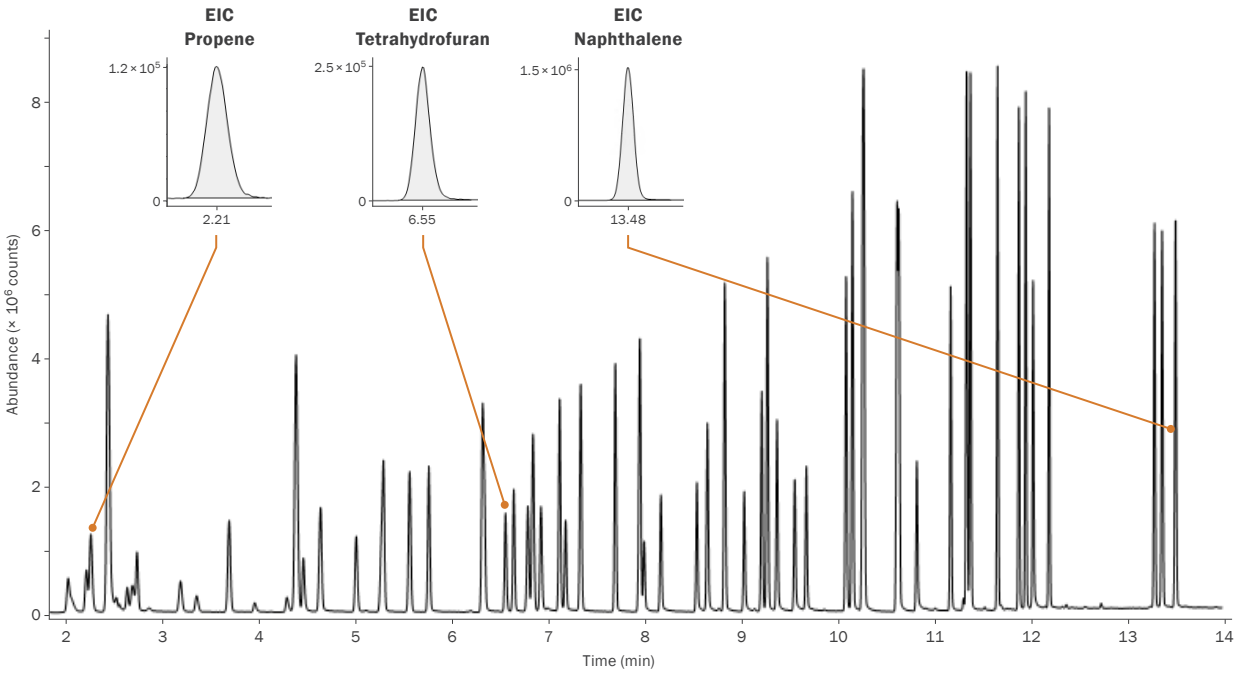
The fully inert flow path of Markes' TD instruments – including the on-line Air Server–Kori–UNITY-xr system shown here – ensures quantitative results for the most reactive compounds.

Method performance and method compliance maintained with H_2 carrier gas

Multi-Gas systems leverage all the innovations and advantages of Markes' world-leading range of thermal desorbers to address the widest range of TD applications and comply with international standard methods and guidelines such as ISO 16000-6 and ASTM D6196.

Exceed all performance criteria for US EPA method TO-17 with hydrogen carrier gas

Extended range of TO-17 VOCs	Linearity R^2	RRF RSD	Area RSD	RT RSD	MDL (ppb)
Measured average	0.9984	10%	3.8%	0.11%	0.137
Criteria	>0.99	<30%	<20%	<1%	<0.5

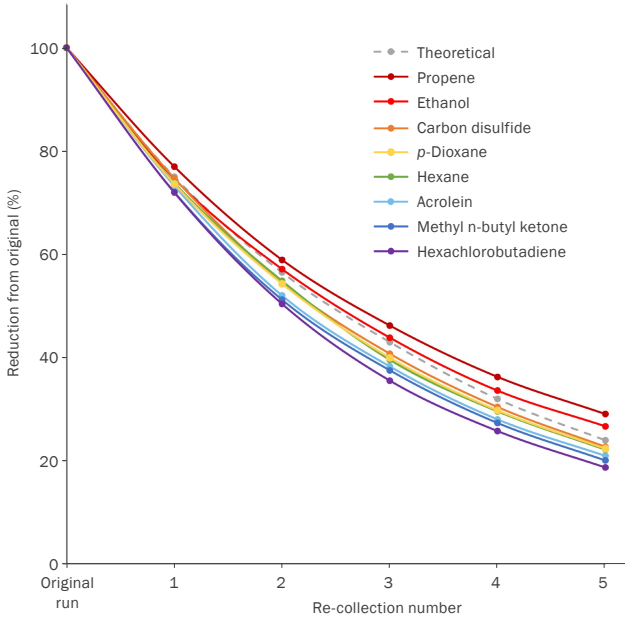


Routine analysis of air toxics by TD–GC–MS with hydrogen carrier gas reduces analytical cycle time to <15 minutes whilst maintaining method performance, method compliance and critical separations across the volatility range.

Confidence in data quality

The uniformly heated and inert flow path of every Markes thermal desorber minimises risk of reactivity.

Users of Markes' Multi-Gas TD instruments are uniquely well equipped to validate analyte recovery using quantitative sample re-collection and repeat analysis as recommended in standard methods. Selective losses of one or more analytes or generation of degradation products would quickly become apparent during a sequence of repeat runs.



Complete recovery of the most challenging VOCs in a 5 ppb TO-17 standard, analysed using hydrogen carrier gas, is demonstrated by this series of re-collections.

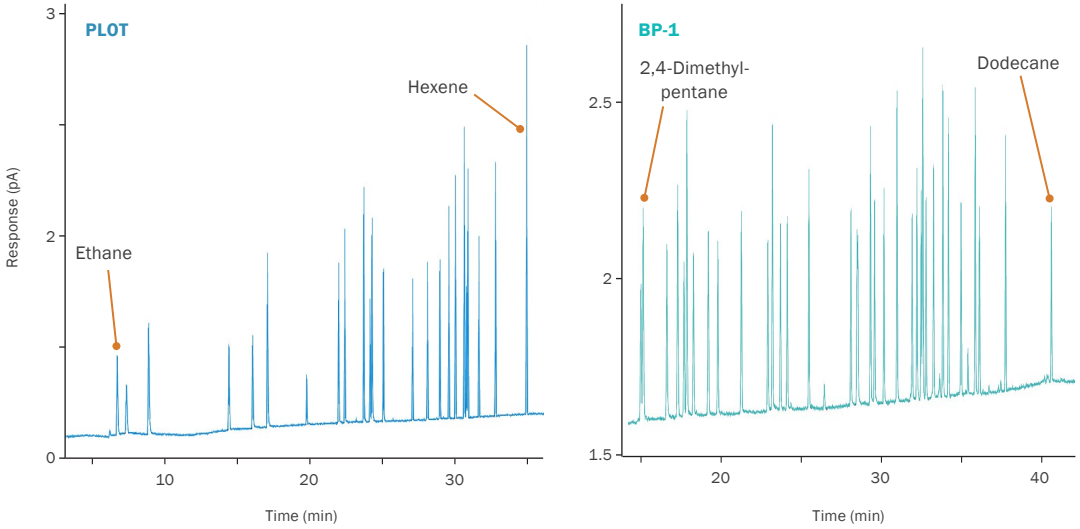
Hydrogen: Enhancing analytical versatility

PAMS analysis using hydrogen carrier gas

Since 1993, the US EPA network of Photochemical Assessment Monitoring Stations (PAMS) has required US states and local environmental agencies to measure ozone precursors and other ultra-volatiles in areas affected by significant ground-level ozone pollution.

The list of target compounds is often adapted to include volatile aliphatic and aromatic hydrocarbons, as well as a few polar species and two monoterpenes. All of these are easily analysed using Markes' Multi-Gas enabled on-line TD systems, which are particularly well-suited for sampling in remote locations. Using a hydrogen generator for both carrier and detector gas ensures continuous unattended operation and easier troubleshooting, as well as lower overall costs and reduced carbon footprint.

The data below shows how all these can be monitored using Markes' Multi-Gas enabled instruments, providing highly consistent data over an extended period of time.

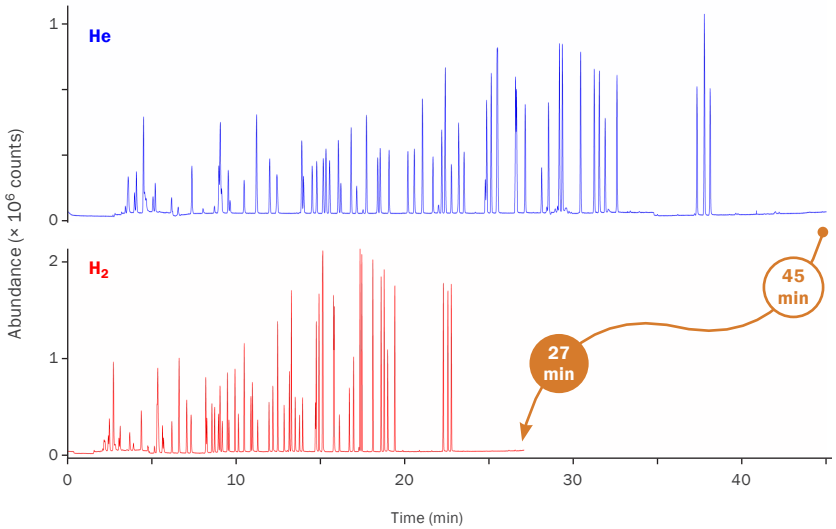


Compliance with PAMS method criteria (retention time stability, critical separation and effective water management) is achieved using Markes' Multi-Gas enabled UNITY–CIA *Advantage*–Kori-xr and dual-column GC–FID.

TO-15 analysis using hydrogen carrier gas

Potentially hazardous VOCs are routinely monitored in ambient air, with canister sampling being particularly popular in the US (Method TO-15 and TO-15A) and China (Method HJ 759).

For over 10 years, Markes' UNITY–CIA *Advantage*-xr has been used for canister applications because of its high productivity and excellent peak shape for the full suite of 65 TO-15 compounds. The Multi-Gas enabled system not only maintains this standard, but allows faster chromatography through the use of hydrogen carrier gas.



A reduction in GC run time from 45 minutes to 27 minutes is achieved for a standard TO-15 mix, using Markes' Multi-Gas enabled UNITY–CIA *Advantage*–Kori-xr with hydrogen carrier gas.

Cost-saving, eco-friendly and future-proof

With helium becoming increasingly difficult and expensive to source for labs around the world, hydrogen provides the ideal low-cost and environmentally friendly alternative. Hydrogen is around eight times less expensive than helium in like-for-like purity cylinders, and installing hydrogen generators allows costs to be reduced further – eliminating the costs associated with cylinders, freeing up trained staff, and reducing the carbon footprint of your lab.

Markes' Multi-Gas enabled TD systems can also be used with helium or nitrogen carrier gas if required, enabling new methods to be developed. If starting with helium, for example, the carrier gas can subsequently be replaced with hydrogen, resulting in faster methods once equivalence has been demonstrated. Installation is risk-free: existing capillary columns, sorbent tubes and focusing traps are all compatible with hydrogen and methods are simple and quick to translate. All necessary leak-tests and software settings are pre-built into the Multi-Gas thermal desorbers.

Canada:
CSA C22.2 No.61010-1

USA:
ANSI/UL 61010-1

IEC/EN 61010-1
IEC/EN 61010-2-010
IEC/EN 61010-2-081
IEC/EN 61326-1

CE Mark

MET Approved

Markes' Multi-Gas thermal desorbers have been certified safe for hydrogen operation by an independent UK Test House accredited to provide UKAS, A2LA and RvA certification and 'Notified Body' services to most management systems standards. They further provide third-party approvals, for example to NRTL, FCC, the IECEE CB scheme, and CE Marking.

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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