MARKES international

# TD100-xr

## Enabling confident, high-throughput, automated thermal desorption analysis



THE QUEEN'S AWARDS FOR ENTERPRISE: INTERNATIONAL TRADE 2015

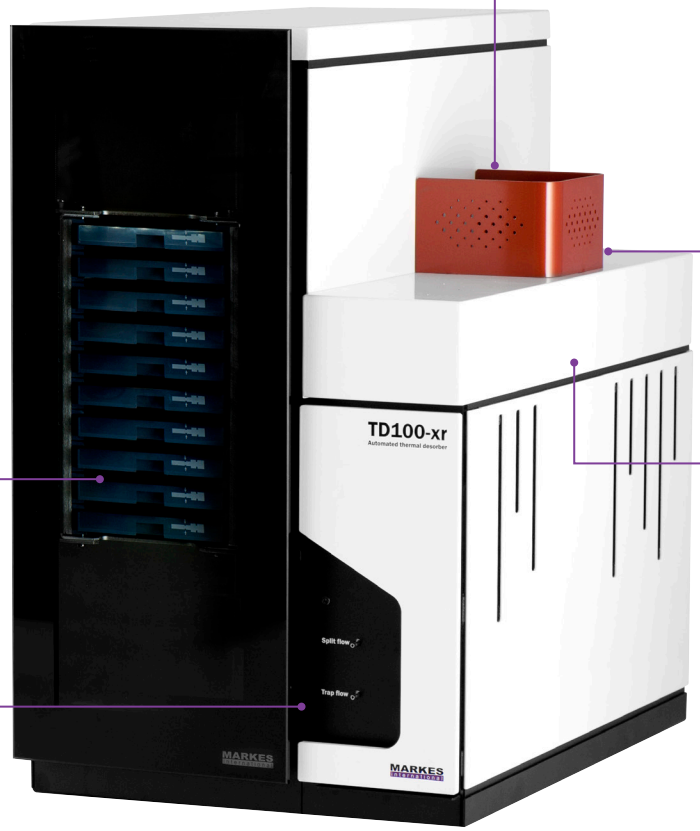
# TD100-xr™

**Introducing the TD100-xr automated thermal desorber for GC and GC–MS – an unrivalled platform for the analysis of trace-level volatile and semi-volatile organic compounds (VOCs and SVOCs) in air and materials.**

Markes International has for the last 20 years been the world leader in innovation for thermal desorption. We now present the TD100-xr, which like the other members of the 'xr' series incorporates new, powerful technical advances, making it perfect for a wide range of sample types and applications.

The TD100-xr gives you the following advantages compared to every other thermal desorber on the market:

- **E**xtended **r**e-collection
- **E**xtended analyte **r**ange
- **E**xtended **r**eliability.




**Unbeatable application versatility**

Inert sample paths and extended temperatures allow quantitative recovery of $C_2$ to $C_{44}$, including reactive and thermally labile species… from percent to sub-ppt concentrations.

**Platform-neutral**

The short, heated transfer line allows TD100-xr to be installed on all major makes of GC and GC–MS.

**Outstanding productivity**

Automated, cryogen-free, unattended operation for up to 100 sample tubes.

**Enhanced reliability**

High-precision parts result in increased robustness.

**Superior sample integrity and traceability**

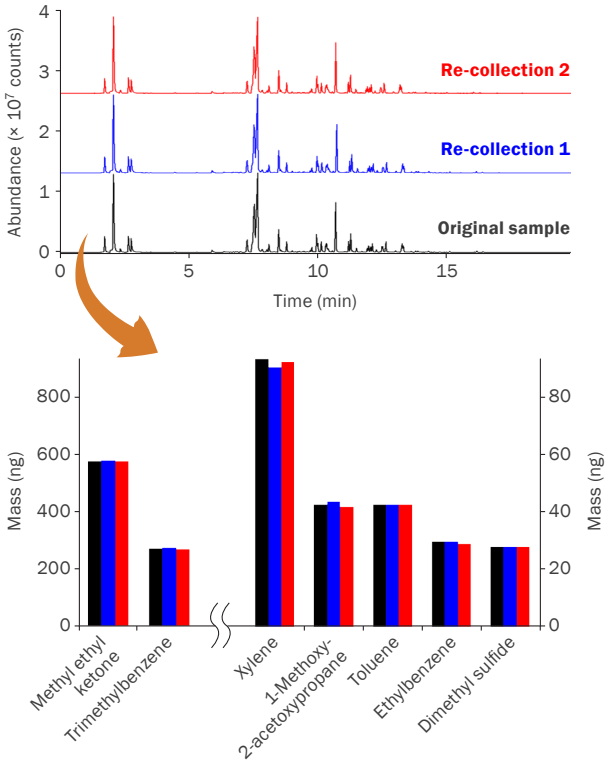
- Confidence in results through quantitative sample re-collection of split flows.
- Method compliance aided by leak-testing, water management and addition of internal standard.
- Enhanced traceability of samples using barcodes and RFID TubeTAGs.

# Quantitative sample re-collection of all split flows

## Powerful capabilities for repeat analysis and method validation

All models of the TD100-xr come with the unique ability to split samples during tube and/or trap desorption, and re-collect the split portions onto clean sorbent tubes. With options for manual or automated re-collection, this capability overcomes the historic 'one-shot' limitation of thermal desorption, aids method development, and allows complete analyte transfer to be validated, ensuring compliance with standard methods.

### Re-collection and repeat analysis of vapours in stack gas



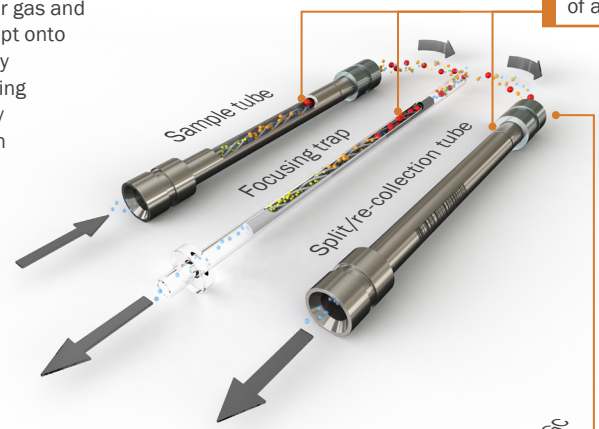

**Method-compliant, quantitative analysis of high-concentration stack gas** is confirmed by re-collecting the split sample onto a clean sorbent tube, followed by re-analysis.

### How two-stage thermal desorption works

Sample tubes and traps can contain multiple sorbents, for analysis of an extended range of analytes.

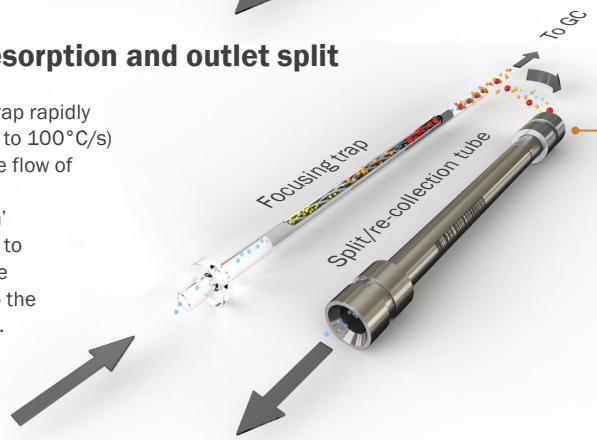
#### 1 Tube desorption and inlet split

Sample tube heated in a flow of carrier gas and analytes swept onto an electrically cooled focusing trap, typically held between ambient and –30°C.




#### 2 Trap desorption and outlet split

Focusing trap rapidly heated (up to 100°C/s) in a reverse flow of carrier gas ('backflush' operation), to transfer the analytes to the GC column.




During either stage, the flow of analytes can be split and re-collected onto a clean sorbent tube.

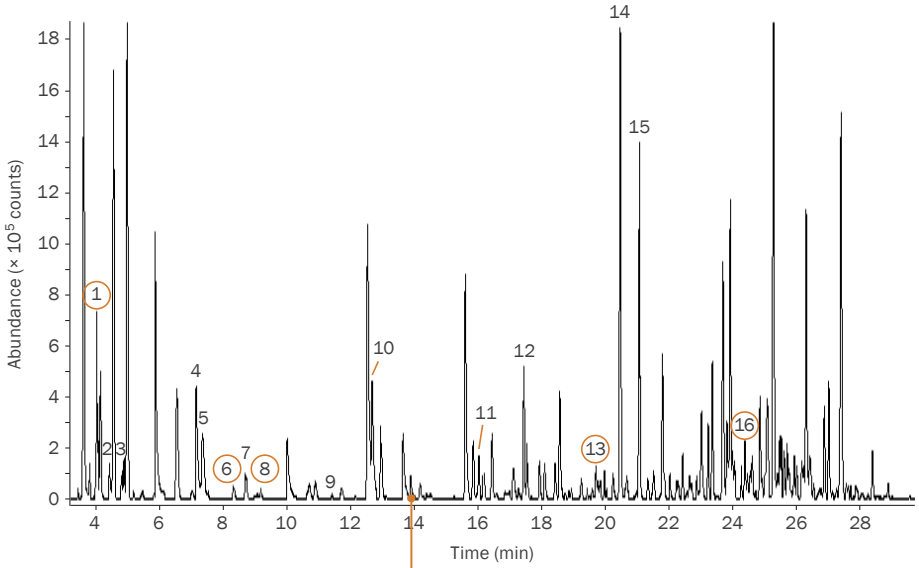
# Extended analyte scope

## From ultra-volatiles to semi-volatiles, over a wide concentration range

The uniformly inert flow path of the TD100-xr – in conjunction with tube and trap backflushing and use of optimised sorbent combinations – allows quantitative recovery and re-collection of $C_2$ to $C_{44}$ (including reactive and thermally labile species), from percent to sub-ppt concentrations.

### Landfill gas analysis

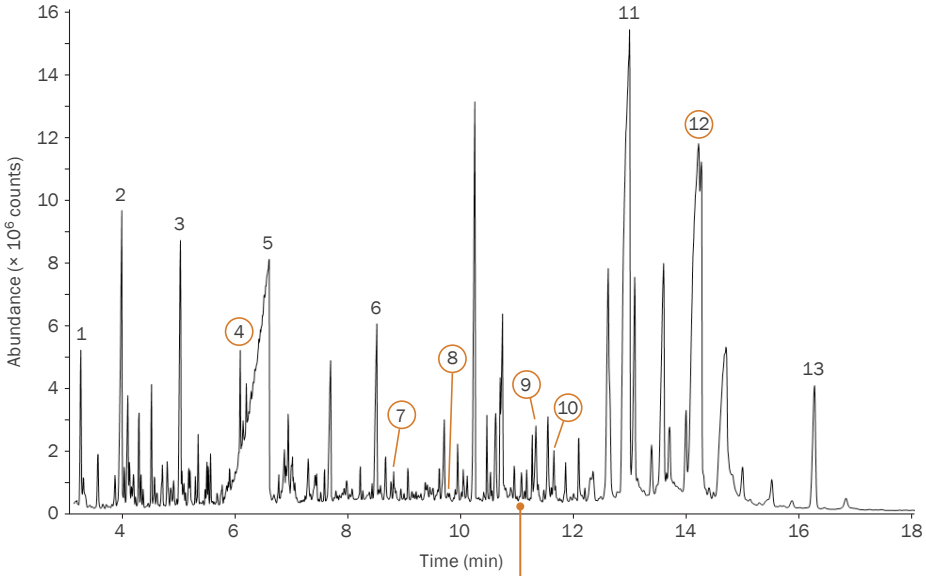
1 Acetaldehyde
2 Chloroethene
3 Chloroethane
4 Pent-1-ene
5 Furan
6 Dimethyl sulfide
7 Dichloromethane
8 Carbon disulfide
9 1,1-Dichloroethane
10 *cis*-1,2-Dichloroethane
11 Benzene
12 Trichloroethene
13 Dimethyl disulfide
14 Toluene
15 Ethyl butanoate
16 Styrene




**The simultaneous detection of acetaldehyde, styrene and sulfur species** (circled) in this sample of landfill gas illustrates the ability of Markes' TD systems to analyse a wide compound range in one run.

### Polycyclic aromatic hydrocarbons in ambient air

1 Xylene
2 Benzaldehyde
3 Acetophenone
4 Naphthalene
5 Benzoic acid
6 Phenylmaleic anhydride
7 Fluorene
8 Phenanthrene
9 Fluoranthene
10 Pyrene
11 2,5-Diphenyl-*p*-benzoquinone
12 Decahydrobenzo[e]pyrene
13 Squalene




**A range of sub-ppt SVOCs** – including analytically challenging PAHs (circled) – are detected in this Chinese urban air sample, as well as typical 'air toxic' VOCs.

# Unbeatable application versatility

## Fully method-compliant analysis across a variety of application areas

The enhanced features of the TD100-xr, coupled with a suite of innovative sampling accessories, allow a wide range of applications to be run on one instrument. Across many of these areas, our involvement with technical committees and legislative agencies means that we are uniquely well-placed to advise on method compliance.

### Environmental monitoring

The TD100-xr complies with:

- US EPA Method TO-17 (ambient air)
- US EPA Method 325 (fenceline)
- Chinese Method HJ 644 (ambient air)
- New European SVOC protocols
- Method CEN/TS 13649 (stack emissions)
- Chinese Method HJ 734 (source emissions)
- and more...

### Indoor and in-vehicle air

The TD100-xr complies with:

- ISO 16000 series (indoor air)
- ASTM D6196 (indoor air)
- ISO 12219 series (automotive test)
- VDA 278 (automotive test)
- Multiple OEM standards
- and more...

### Consumer environmental health

The TD100-xr complies with:

- European Method EN TS 16516 (construction products – mandatory)
- ASTM standards (spray polyurethane foam)
- New CEN standards (combustible air fresheners)
- and more...

### Defence and homeland security

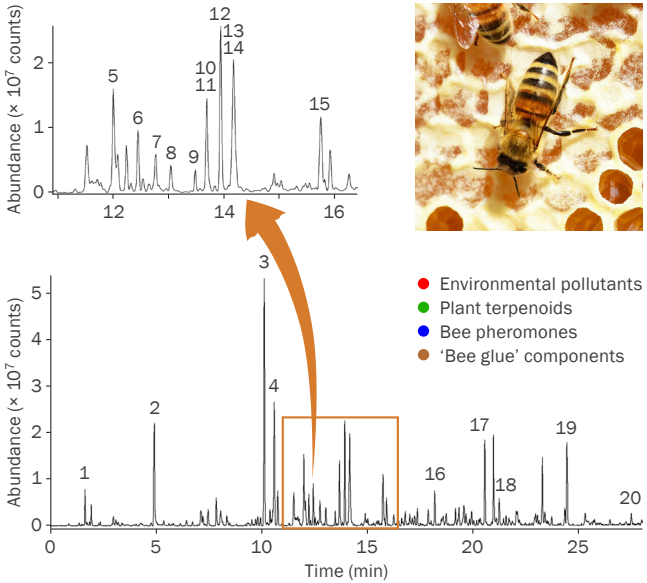
### Fragrance and odour profiling

### Food and drink

### Forensic


### Biological profiling

## Perfect for challenging applications

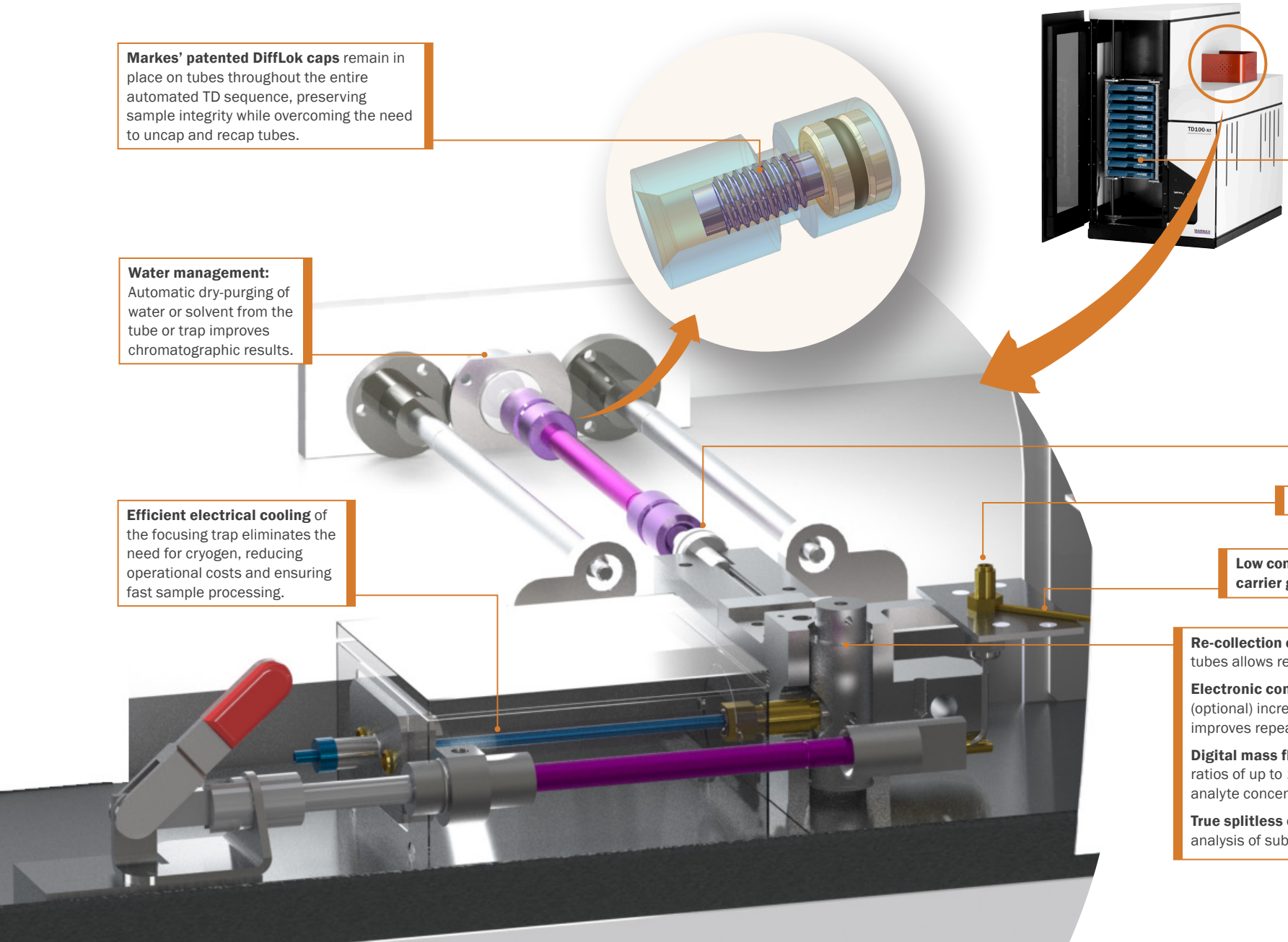



| | | | | | |
|---|---|---|---|---|---|
| 1 | Acetone | 8 | 2-Ethylhexan-1-ol | 15 | Decanal |
| 2 | Acetic acid | 9 | Phenyl formate | 16 | Triacetin |
| 3 | Styrene | 10 | Benzyl alcohol | 17 | Nerolidol |
| 4 | α-Pinene | 11 | Octan-1-ol | 18 | Guaiol |
| 5 | Benzaldehyde | 12 | Acetophenone | 19 | Benzyl 2-hydroxybenzoate |
| 6 | 3,3-Dimethylhexane | 13 | Methyl benzoate | 20 | Heneicosane |
| 7 | *cis*-Ocimene | 14 | Nonanal | | |

**Thermal desorption is not just for air monitoring...** as shown by this analysis of a complex blend of biogenic and anthropogenic volatiles in beehives.

# Outstanding productivity and reliability for TD–GC analysis

## Robust operation maximises sample throughput on the TD100-xr






**Markes' patented DiffLok caps** remain in place on tubes throughout the entire automated TD sequence, preserving sample integrity while overcoming the need to uncap and recap tubes.

**Water management:** Automatic dry-purging of water or solvent from the tube or trap improves chromatographic results.

**Efficient electrical cooling** of the focusing trap eliminates the need for cryogen, reducing operational costs and ensuring fast sample processing.

**High throughput:** 100 tubes for unattended operation over extended periods.

**Optional internal standard/dry-purge (ISDP) facility** is ideal for method validation.

**Tube pressure-ratio testing** monitors integrity of tube packing.

**GC column connection.**

**Low consumption of expensive high-purity carrier gas** minimises running costs.

**Re-collection of all split flows** onto clean sorbent tubes allows re-analysis and method validation.

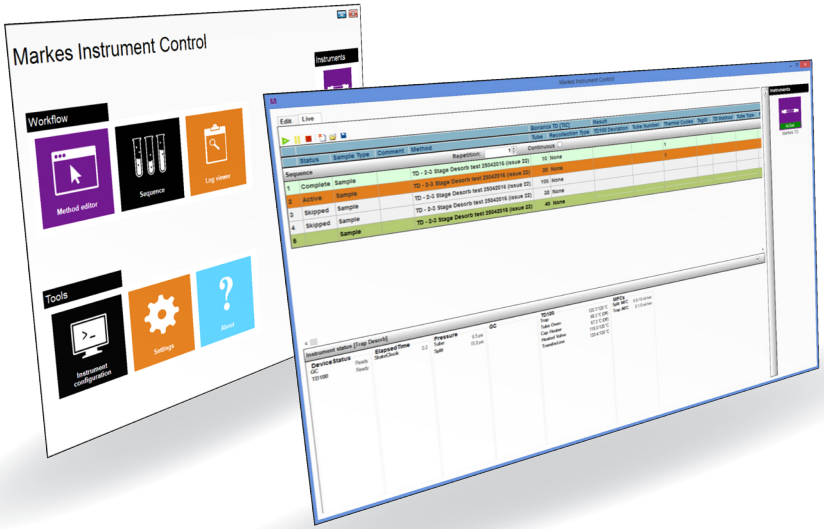
**Electronic control of split and desorb flows** (optional) increases confidence in your data and improves repeatability.

**Digital mass flow controllers** give double-split ratios of up to 125,000:1, accommodating analyte concentrations up to percent levels.

**True splitless operation** enables analysis of analysis of sub-ppt concentrations.

# Markes Instrument Control

## Easy-to-use software for the new ‘xr’ series




The new software used to control the TD100-xr and the other members of the ‘xr’ series offers the following features for enhanced laboratory productivity:

- **Editing of active sequences,** for greater flexibility and ease of use.
- **Rapid set-up of TD methods** using pre-programmed parameters for standard methods including VDA 278, US EPA TO-17 and PAH analysis.
- **Pre-loading of an internal standard** on a tube or trap, for enhanced quantitation.
- **System self-checking,** for improved diagnostics.

# Unmatched product range

## A comprehensive range of sorbent tubes and sampling accessories for every TD application

# Markes International – The TD experts

## World-leading instruments and unmatched expertise in VOC and SVOC monitoring

Markes International has for 20 years been at the forefront of innovation for enhancing the measurement of trace-level VOCs and SVOCs by thermal desorption–gas chromatography. Our suite of instruments for thermal desorption sets the benchmark for quality and reliability:

**UNITY-xr™**
Single-tube thermal desorber featuring sample re-collection of all split flows.

**UNITY–Air Server-xr™**
Versatile on-line VOC monitoring system.

**ULTRA-xr™**
High-throughput 100-tube autosampler for UNITY-xr.

**CIA *Advantage*™**
Cryogen-free automated canister autosampler and pre-concentrator.

**TC-20™ & TC-20 TAG™**
Cost-effective systems for off-line multi-tube conditioning and dry-purging.

**TT24-7™**
Twin-trap instrument for near-real-time on-line monitoring.

**Micro-Chamber/Thermal Extractor™**
Unique sampling device for emissions of VOCs and SVOCs from products and materials.

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