

Consumables and accessories for thermal desorption





UNITY-xr
Thermal desorber

World-leading products for thermal desorption

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

- **Centri**
Automated multi-mode extraction and enrichment platform for GC-MS.
- **TD100-xr**
High-throughput 100-tube automated thermal desorber.
- **UNITY-xr**
Single-tube thermal desorber featuring sample re-collection of all split flows.
- **Air Server-xr**
Versatile on-line VOC monitoring system.
- **ULTRA-xr**
High-throughput 100-tube autosampler for UNITY-xr.
- **CIA Advantage-xr**
Cryogen-free automated canister autosampler and pre-concentrator.
- **TT24-7**
Twin-trap instrument for near-real-time on-line monitoring.
- **Kori-xr**
An innovative approach to on-line monitoring of polar species in humid air.

Find out more at www.markes.com

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Ordering information

Ordering from Markes couldn't be simpler, whether by phone, fax, email or online. Payment is accepted by credit card (Mastercard or Visa) on account. If you need help with your order, simply contact one of our highly experienced chemists or customer service agents at any of Markes' main sales locations:

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You can also place orders with any of our global distributors – to find distributors in your country, please visit www.markes.com/Global-Distributors.aspx.

Quality-assured tubes, accessories and spares from the TD experts

When it comes to tubes, accessories and spares for thermal desorption, we offer our customers the very best:

- Application expertise that is second-to-none.
- Fast delivery and excellent customer service.
- The widest range of sorbent sampling tubes – whatever your TD application, we have the optimum solution.
- World-leading, patented technologies for thermal desorption.
- Stringent quality control of our manufacturing procedures.
- ISO 9001: 2015 and ISO14001: 2015 accreditation.
- Worldwide distributor and user base.
- Custom service – if you want something special, we can do it.

And most importantly... a 100% quality guarantee.

If you're not satisfied with the products we supply, we will provide replacements or give you your money back, whichever you prefer.



Contact Markes today for fast and friendly advice on any aspect of thermal desorption.

Sorbent tubes and Focusing (cold) traps

Unmatched product range, with expert advice
from the world's leading TD supplier

Product highlights

- Unrivalled range of tube types and sorbent options
- Quality assured – each tube individually checked
- Sophisticated tube labels as standard
- Fast delivery and competitive prices
- Quality-assured focusing (cold) traps



**Contact Markes
International for
expert advice**

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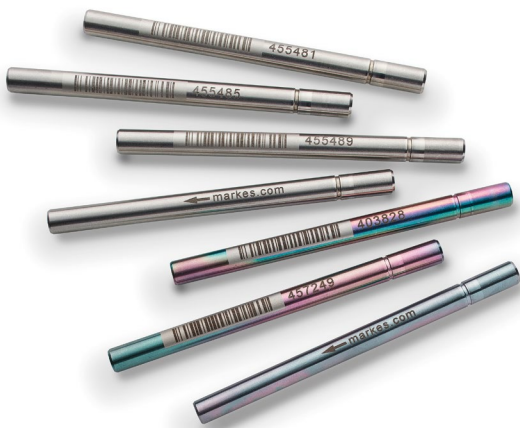
Quality-assured sorbent tubes

Backed up by fast and friendly service, Markes' tubes provide optimum sampling and analytical performance. Our range includes everything from cost-effective packages of industry-standard tubes to the last word in sorbent tube innovation.

- Choose from tubes manufactured from stainless steel, inert-coated stainless steel or glass.
- We stringently quality-check our tubes, and they're all packed to a tolerance of $\pm 2.5\%$ or better.
- Choose the 'conditioned and capped' option if you'd like your tubes to be conditioned prior to shipment.
- Need a customised tube for your application? Contact us to discuss alternative sorbent packing mixes, bed lengths or mesh sizes... as well as tube unpacking, repacking or re-conditioning.

Always happy to discuss your requirements

As the world's leading manufacturer of thermal desorption equipment, Markes International understands the demands of difficult applications, and is uniquely well-placed to provide any extra help you may need – just contact us with any questions.



i Clean tubes are essential for successful sampling. Make sure your tubes are contaminant-free by using Markes' TC-20 and TC-20 TAG tube conditioners – see page 16.



What can you use our tubes for?

The tubes listed on pages 8-11 have a wide variety of uses. To allow for successful sampling and simplified work-flows, ensure you have all the accessories you need.

Passive (diffusive) sampling uses single-bed sorbent tubes, and is a convenient, quantitative and inexpensive option for fence-line monitoring and assessing personal exposure.



See page 24 for accessories for passive sampling.

Pumped sampling onto sorbent tubes is a versatile option for simultaneous monitoring of multiple target compounds, especially in unknown atmospheres. All Markes' tubes are compatible with pumped sampling.



See page 26 for Markes' ACTI-VOC and Easy-VOC pumps.

Dynamic headspace sampling onto sorbent tubes is a powerful technique for releasing volatiles from consumer goods, construction materials, foods, biological specimens and many more samples.



See page 40 for details of Markes' Micro-Chamber/Thermal Extractor,

Manual **sorbent extraction** utilises empty TD tubes as carrier tubes for desorption of HiSorb probes in a tube based system. HiSorb probes have a large capacity sorbent phase which make them ideal for a wide variety of applications, especially for the aroma profiling of foods, beverages and fragranced goods. It has a wide variety of applications, especially for the aroma profiling of foods, beverages and fragranced goods.



See page 42 for details of Markes' HiSorb probes and accessories.

Direct desorption uses empty TD tubes to release volatiles from small samples.



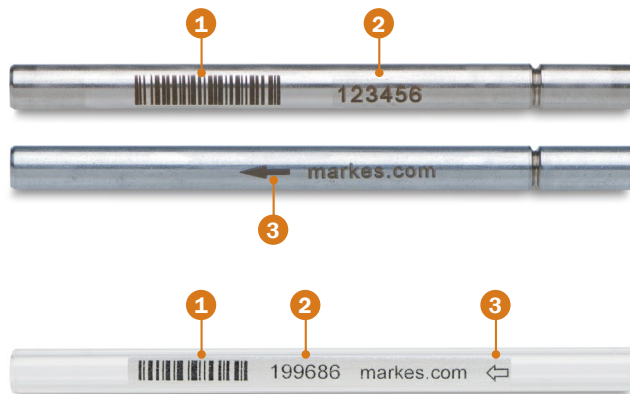
See page 22 for more information.

Sorbent tube labelling

Standard features

All Markes International's tubes are permanently labelled with a **unique ID number, in clear barcode 1 and numerical formats 2**, to help you keep track of samples and tube stock. The barcodes reduce errors and minimise time-consuming manual data entry. See below for Markes' recommended barcode scanner.

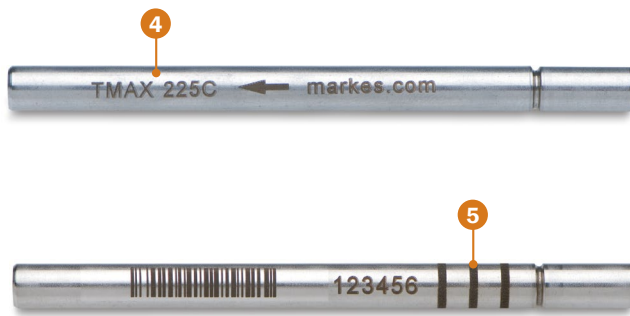
Each tube also features a **sampling arrow 3** indicating the direction of the air/gas sampling flow to aid field monitoring.



Special labelling options

You can specify up to 10 additional **alphanumeric characters 4** to be etched on Markes International's and inert-coated stainless steel tubes – for example, to identify the sorbent, maximum temperature or company name. Just include clear details of your requirements with your order.

Stainless steel and inert coated stainless steel tubes can also be etched with up to five **permanent black bands 5**, for rapid visual identification of sorbent type or project ID. Just send us your banding requirements with your order, or contact us with any questions.



Barcode scanner for sorbent tubes

Markes International supplies a barcode scanner for accurate and reliable reading of barcodes on Markes' metal and glass sorbent tubes.



i For ultimate control of information relating to tubes and samples, use Markes' TubeTAG system. See page 17 for details.



Description	Part number
Barcode Scanner (not to be sold into USA or CANADA).	C-BCR
Barcode Scanner (for USA or CANADA)	C-BCR-US



For more information on any of Markes International's sorbent tube labelling options, just contact a technical specialist for expert advice.

Stainless steel tubes



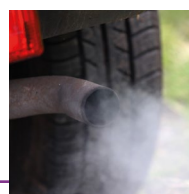
Markes International's industry-standard stainless steel tubes are made from the highest-specification materials, and are suitable for the majority of VOC air monitoring applications across a wide range of compound types and atmospheric concentrations. They comply with official standard methods such as US EPA Method TO-17 and EN ISO 16017.

All Markes' industry-standard thermal desorption tubes are 3½" (89 mm) long, with ¼" (6.4 mm) o.d. and 5 mm i.d. They are manufactured to precise tolerances under ISO 9001, and we guarantee their compatibility with any TD system that supports industry-standard tubes.

Markes International's most popular stainless steel tubes

Description (all packs of 10)	Analyte range	Part number	
		Unconditioned, without caps	Conditioned and capped
Tenax TA	C ₆ -C ₃₀	C1-AXXX-5003	C1-AAXX-5003
Carbograph 1TD	C ₅ -C ₁₄	C1-AXXX-5009	C1-AAXX-5009
'Graphitised carbon'	C ₅ -C ₂₀	C2-AXXX-5126	C2-AAXX-5126
'Universal'	C _{2/3} -C ₃₀	C3-AXXX-5266	C3-AAXX-5266
'Air toxics'	C _{2/3} -C ₁₄	C2-AXXX-5270	C2-AAXX-5270
'Graphitised carbon universal'	C ₂ -C ₂₀	C3-AXXX-5264	C3-AAXX-5264
'PAH'	C ₆ -C ₄₀	C2-AXXX-5138	C2-AAXX-5138
'SVOC'	C ₆ -C ₄₀	C2-AXXX-5342	C2-AAXX-5342
'Hydrophobic'	C ₆ -C ₃₀	C2-AXXX-5032	C2-AAXX-5032
'Bio-monitoring'	C ₃ -C ₃₀	C2-AXXX-5149	C2-AAXX-5149
'Material emissions/ Soil gas'	C ₃ -C ₄₀	C3-AXXX-5304	C3-AAXX-5304
Empty	—	C0-AXXX-0000	—

Tubes perfect for your application...



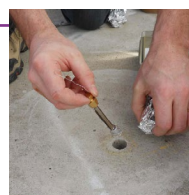
PAHs in air:

Using large sample volumes and an optimised analytical protocol, this sorbent tube can be used to monitor polycyclic aromatic hydrocarbons at ppt levels.



Material emissions/Indoor air:

These tubes comply with ISO 16000-6 for simultaneous monitoring of VVOCs, VOCs and SVOCs. They are particularly suitable for monitoring indoor air quality and for testing chemicals released by products and materials.



Soil gas/Vapour intrusion:

These tubes, packed with the best sorbents for monitoring underground contamination and vapour intrusion, are compatible with everything from C₄ hydrocarbons to middle-distillate fuels, as well as high-humidity air.



Sorptive extraction and direct desorption:

Empty tubes are ideal carrier tubes for manual sorptive extraction using HiSorb probes. HiSorb sorptive extraction probes (see page 42), as well as for direct desorption of small samples of relatively homogeneous materials (see page 22).

Inert-coated stainless steel tubes



Markes International's inert-coated stainless steel tubes are a robust alternative to glass tubes for sampling thermally labile and reactive compounds, due to the extremely thin inert coating on all surfaces.

Inert-coated stainless steel tubes are treated inside and out with industry-leading SilcoNert™ coating. This eliminates surface adsorption of active compounds and avoids the breakdown of thermally labile analytes during analysis.



Markes International's most popular inert-coated stainless steel tubes

Description (all packs of 10)	Analyte range	Part number	
		Unconditioned, without caps	Conditioned and capped
Tenax TA	C ₆ -C ₃₀	C1-CXXX-5003	C1-CAXX-5003
'EPA 325'	C ₃ -C ₈	C1-CXXX-5020	C1-CAXX-5020
'PAH'	C ₆ -C ₄₀	C2-CXXX-5138	C2-CAXX-5138
'Odour/Sulfur'	C ₃ -C ₃₀	C2-CXXX-5314	C2-CAXX-5314
'Bio-monitoring'	C ₃ -C ₃₀	C2-CXXX-5149	C2-CAXX-5149
'Material emissions/ Soil gas'	C ₃ -C ₄₀	C3-CXXX-5304	C3-CAXX-5304
Empty	—	C0-CXXX-0000	—

Tubes perfect for your application...



US EPA Method 325:

Markes offers both tubes referenced for monitoring fugitive emissions at refinery fencelines (specifically, BTEX and butadiene), and is happy to advise on which option would work best for you.



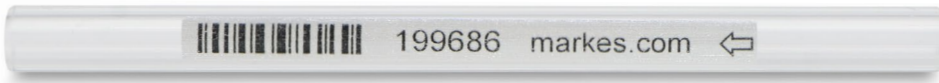
Monitoring odours:

These tubes are packed with a carefully optimised combination of weak and strong inert sorbents, making them perfect for profiling a wide range of compounds including reactive sulfur species.

 To order your tubes or ask a question about which tube is best for your application, simply telephone or send an email.

 Buy online at www.markes.com/shop

Glass tubes



Markes' glass tubes have a restriction rather than a fused glass frit, leading to better recovery of reactive and higher-boiling species.

Markes International's high-quality glass tubes are completely inert, making them ideal for sampling reactive species. The clarity of the glass makes it easy to check the status of the sorbent, while also making them perfect for direct desorption of small samples.



Markes International's most popular glass tubes

Description (all packs of 10)	Analyte range	Part number	
		Unconditioned, without caps	Conditioned and capped
Tenax TA	C ₆ -C ₃₀	C1-BXXX-5039	C1-BAXX-5039
'Air toxics'	C _{2/3} -C ₁₄	C2-BXXX-5259	C2-BAXX-5259
'Odour/Sulfur'	C ₃ -C ₃₀	C2-BXXX-5315	C2-BAXX-5315
'Hydrophobic'	C ₅ -C ₃₀	C2-BXXX-5068	C2-BAXX-5068
'Graphitised carbon'	C ₅ -C ₂₀	C2-BXXX-5197	C2-BAXX-5197
'SVOC'	C ₆ -C ₄₀	C2-BXXX-5343	C2-BAXX-5343
'Bio-monitoring'	C ₃ -C ₃₀	C2-BXXX-5201	C2-BAXX-5201
'Universal'	C _{2/3} -C ₃₀	C3-BXXX-5267	C3-BAXX-5267
'Material emissions/ Soil gas'	C ₃ -C ₄₀	C3-BXXX-5310	C3-BAXX-5310
Empty, restricted	—	C0-BXXX-0000	—
Empty, restricted <i>Suitable for direct desorption</i>	—	C0-NXXX-0000	—
Empty, unrestricted	—	C0-FXXX-0000	—

Tubes perfect for your application...



US EPA Method TO-17:

Packed with medium and strong sorbents, these tubes trap polar and non-polar 'air toxics' ranging from propene to hexachlorobutadiene, with minimal water retention.

Direct desorption:

As well as allowing easy inspection of the sample before and after analysis, these tubes feature a restriction that ensures small samples are positioned centrally in the tube.



Don't forget to order long-term storage caps for your tubes – see page 19.



SafeLok™ tubes

Markes International's SafeLok tubes provide unrivalled protection for trace and toxic samples, while complying fully with standard methods for pumped sampling.

With a diffusion-locking insert at each end, SafeLok tubes ensure sample integrity throughout storage, transport and analysis. They are available in both stainless steel and inert-coated stainless steel, and contain the same amount of sorbent as their non-SafeLok equivalents.

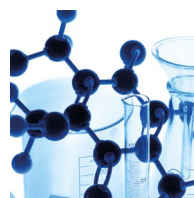


Markes' patented SafeLok tubes incorporate a diffusion-locking insert at each end, preventing sample loss or contamination.

Markes International's most popular SafeLok tubes

Description (all packs of 10)	Analyte range	Part number	
		Unconditioned, without caps	Conditioned and capped
<u>Stainless steel</u>			
Tenax TA	C ₆ -C ₃₀	C1-DXXX-5003	C1-DAXX-5003
'Universal'	C _{2/3} -C ₃₀	C1-DXXX-5266	C1-DAXX-5266
<u>Inert-coated stainless steel</u>			
Tenax TA	C ₆ -C ₃₀	C1-EXXX-5003	C1-EAXX-5003
'Universal'	C _{2/3} -C ₃₀	C3-EXXX-5266	C3-EAXX-5266

Tubes perfect for your application...



Monitoring unknown atmospheres:

An optimised combination of weak, medium and strong sorbents allows near-universal screening of VOCs and SVOCs in uncharacterised indoor and outdoor environments, with minimal water retention. SafeLok technology makes these tubes uniquely resistant to chemical losses or contamination.

DAAMS tubes

DAAMS tubes, with dimensions of ¼" x 3.5" or 6mm x 4.5", are packed by Markes International's experts to ensure optimum recovery of challenging and toxic analytes such as chemical agents, making them ideal for chemical defence and counter-terrorism applications. Tubes are available in glass and inert-coated stainless steel.



Markes International's most popular DAAMS tubes

Description (all packs of 10, unconditioned and without caps)	Part number	
	6mm x 4.5"	¼" x 3.5"
<u>Glass</u>		
Empty	C0-LXXX-0000	C0-BXXX-0000
Tenax TA <i>Suitable for most of the 'G' agents, HD, VX and 'Russian VX', amongst others</i>	C1-LXXX-7001	C1-BXXX-5039
HayeSep D <i>Suitable for the 'G' analogue of VX</i>	C1-LXXX-7003	C1-BXXX-5170
<u>Inert-coated stainless steel</u>		
Empty	C1-VXXX-0000	C0-CXXX-0000
Tenax TA <i>Suitable for most of the 'G' agents, HD, VX and 'Russian VX', amongst others</i>	C1-VXXX-7010	C1-AXXX-5003
HayeSep D <i>Suitable for the 'G' analogue of VX</i>	C1-VXXX-7012	C1-AXXX-5153

Focusing (cold) traps



Focusing (cold) traps for UNITY-xr (and series 2), TD-100 (all series), and Centri

Description	Part number
High Boilers	U-T1HBL-2S
General Purpose (Hydrophobic)	U-T2GPH-2S
Air Toxics (TO-14)	U-T3ATX-2S
Water Management	U-T4WMT-2S
Ozone Precursor/Freons	U-T5O3F-2S
Sulfur (Labile)	U-T6SUL-2S
Empty	U-T7EMP-2S
Custom Pack (2)	U-T8CUS-2S
Tenax	U-T9TNX-2S
Chemical Weapons	U-T10CW-2S
General Purpose (Graphitised Carbon)	U-T11GPC-2S
Material Emissions	U-T12ME-2S
Dynamic Headspace (DHS)	U-T13DHS-2S
Hydrogen Sulphide (H2S)	U-T14H2S-2S
Air Toxics Analyser	U-T15ATA-2S
Green House Gases Analyser	U-T16GHG-2S
Ozone Precursor	U-T17O3P-2S
Method 325	U-T18325-2S
PAH/SVOC	U-T19PAH-2S
Photochemical Assessment Monitoring (PAM)	U-T20PAM-2S
China Air 117	U-T22117-2S
Trace TO-15, for UNITY-xr (and series 2) with Kori-xr	U-TO15-KXR

Focusing (cold) traps for Kori-xr

Description	Part number
Empty	U-T1KORI

Focusing (cold) traps for TT24-7 and TT24-7xr (NB. 2 required per system)

Description	Part number
Chemical Weapons (VX)	T-1VX
Chemical Weapons (Mustard)	T-2HD
Chemical Weapons (GB/GE)	T-3GBGE
Air Toxics	T-4ATX
Empty	T-6EMP
Custom Packed ²	T-7CUS
Material Emissions	T-8MAT
General Purpose (Graphitised Carbon)	T-9GPC
Ozone Precursor	T-110P
Air Monitoring	T-12AM
Photochemical Assessment Monitoring (PAM)	T-13PAM
Trace TO-15, for TT24-7 and TT24-7xr with Kori-xr	T-TO15-KXR

1. UNITY 1 instruments require different cold traps from those listed above, and because this instrument was discontinued in 2008, we can now no longer guarantee that they will be available. If you need cold traps for a UNITY 1, please contact Markes International for advice.
2. Please call Markes to discuss your requirements for custom-packed cold traps before ordering.



Buy online at
www.markes.com/shop



Contact your regional distributor
or one of our offices (details
below).

TD Mini-tubes

Markes' 60 mm TD Mini-tubes are ideal for use with thermal desorption instruments such as Gerstel's TDU and TDU2.

Instrument compatibility

Markes' glass TD Mini-tubes have dimensions of 60 mm × 6 mm, which makes them compatible with thermal desorption instruments such as Gerstel's TDU and TDU2.

Product options

TD Mini-tubes from Markes are available:

- In packs of five.
- Packed with Tenax® TA or Tenax® GR, or empty (if you prefer to pack them yourself).
- Fitted with long-term storage brass caps, or uncapped.

We also offer a tube unpacking and repacking service for TD Mini-tubes. Contact us for more details.



Easy sample tracking

Each tube is permanently labelled with a unique ID number in barcode and numerical format, making it easy to keep track of samples and tube stock.

A sampling arrow is also printed on each tube, providing a visual indicator of the correct flow of sample gas.

Quality assurance

Like our industry-standard 3½" sorbent tubes, our TD Mini-tubes are manufactured under stringent quality control.

Our 20 years of experience in manufacturing and packing tubes for TD applications means that you can be confident of optimum performance for your TD Mini-tubes.

Compatible Markes products

As well as being designed for use with the Gerstel TDU and TDU2 thermal desorbers, TD Mini-tubes are compatible with the following instruments and accessories from Markes:

- Micro-Chamber/Thermal Extractor™
- TC-20™ multi-tube conditioner
- ACTI-VOC™ low-flow pump kit
- ACTI-VOC PLUS™ fast-flow pump kit
- Calibration Solution Loading Rig™
- Easy-VOC™ grab-sampler

If you already have industry-standard long-term brass storage caps, you can modify them for use with TD Mini-tubes by changing the ferrule (part no. C-FP200-XZ).

Ordering information

Description	Part number	
Tenax TA 35/60	C1-TXX-5386	TD Mini-tubes, 60 mm x 6 mm, Tenax TA 35/60, without caps, pk 5
	C1-TGX-5386	TD Mini-tubes, 60 mm x 6 mm, Tenax TA 35/60, with caps, pk 5
	C1-QXX-5386	TD Mini-tubes, 60 mm x 6 mm, Tenax TA 35/60, repacking service, pk 5
Tenax GR	C1-TXX-5402	TD Mini-tubes, 60 mm x 6 mm, Tenax GR, without caps, pk 5
	C1-TGX-5402	TD Mini-tubes, 60 mm x 6 mm, Tenax GR, with caps, pk 5
	C1-QXX-5402	TD Mini-tubes, 60 mm x 6 mm, Tenax GR, repacking service, pk 5
Empty	C0-TXX-0000	TD Mini-tubes, 60 mm x 6 mm, empty, pk 5



Buy online at
www.markes.com/shop



Contact your regional distributor
 or one of our offices (details
 below).



TD Mini-Tube: 60 mm (2.36") x 6 mm (0.24) o.d. with
 4 mm (0.16") i.d.

Glass industry-standard tube: 89 mm (3 1/2") x 6.4 mm
 (1/4") o.d. with 4 mm (0.20") i.d.

Tube accessories

Everyday tools for enhanced tube sampling

Product highlights

- Specialist accessories designed to enhance data confidence and make your job easier
- Time-saving TC-20™ and TC-20 TAG™ tube conditioners
- Innovative TubeTAG™ system for ultimate tube traceability
- The only storage caps independently validated to maintain sample integrity for over 2 years
- Patented analytical caps to ensure sample integrity and stability on Markes' TD autosamplers
- Tubes and liners for direct desorption

TC-20™ & TC-20 TAG™ conditioning/dry-purging

Markes International's TC-20 and TC-20 TAG save time and money by freeing up your TD-GC-MS system to run samples rather than condition tubes.

With temperatures up to 400°C and capacity for up to 20 industry-standard sorbent tubes, both instruments pass a uniform flow of inexpensive nitrogen (or helium carrier gas) through each attached tube at a constant rate – guaranteeing clean tubes whatever the sorbent packing.

TC-20

The TC-20 is a general-purpose tube conditioner (and dry-purge unit) for enhancing laboratory productivity across a range of projects.



Description	Part number
TC-20 multi-tube conditioner (115 V)	R-TC20-1
TC-20 multi-tube conditioner (230 V)	R-TC20-2
Filter for TC-20, carbon, 120 mm × 120 mm, pk 4 (replacement filters for cooling fan at rear of TC-20 or TC-20 TAG)	R-FLTR4

TC-20 TAG

The TC-20 TAG allows industry-standard single-bed tubes fitted with Markes' RFID TubeTAGs (see page 17) to be conditioned (or dry-purged), and is perfect for dedicated use as part of a TubeTAG-enabled monitoring campaign – for example, refinery fenceline monitoring in accordance with US EPA Method 325.



Description	Part number
TC-20 TAG multi-tube conditioner (115 V)	R-TC20-TAG-115
TC-20 TAG multi-tube conditioner (230 V)	R-TC20-TAG-230
TC-20 TAG spare manifold, pk 2	R-TCTAG-KIT
Filter for TC-20, carbon, 120 mm × 120 mm, pk 4 (replacement filters for cooling fan at rear of TC-20 or TC-20 TAG)	R-FLTR4



For more information on the TC-20 and TC-20 TAG, download the brochure.

TubeTAG™ – Sorbent tube information handling

Offering total peace-of-mind, Markes International's patented TubeTAG technology allows you to track tube history throughout the lifetime of a tube, and log sample information.

Using robust radio-frequency identification (RFID) tags that clip securely onto stainless steel or glass tubes, TubeTAG eliminates transcription errors, optimising control of the chain of custody throughout field monitoring and laboratory analysis. It is recommended by key standard methods such as US EPA Method 325.

TubeTAG is compatible with Markes' entire range of TD systems, and TubeTAGs are easily fitted to your existing tube stock.



i For details of Markes International's cost-effective Essential TubeTAG starter kit, see page 50.

TAG^{SCRIBE}™

Markes International's portable Windows®-based laptop- or tablet-controlled TAG^{SCRIBE} is a convenient alternative to using a tag-ready TD autosampler to enter information onto tags, whether in the field or laboratory.



The versatile TubeTAG software interface allows you to enter a wide range of tube and sample information, including the sorbent details, project name, monitoring location, and sampling parameters.

Description	Part number
TAG ^{SCRIBE} read/write device for all TubeTAGs	C-SCRIBE



Just let us know if you'd like to order sorbent tubes with TubeTAG RFID tags already attached.



Buy online at www.markes.com/shop



TubeTAG accessories

Packs of tags for fitting to sorbent tubes

For attaching to existing sorbent tubes, whether stainless steel or glass.



Description	Part number
TubeTAG for stainless steel tubes, pk 10	C-TAG10
TubeTAG for stainless steel tubes, pk 100	C-TAG100
TubeTAG for glass tubes, pk 10	C-TAGG10
TubeTAG for glass tubes, pk 100	C-TAGG100

Tools for TubeTAG

Special tools for fixing and removing tags, and for fitting TubeTAG-compatible storage caps.



Description	Part number
TubeTAG fixing/removal tool for stainless steel tubes	C-TAGTL
TubeTAG fixing/removal tool for glass tubes	C-TAGKY
TAGLok™ tool for standard and TAG-ready 1/4" storage caps	C-TAGLOK

TubeTAG-compatible storage caps

These long-term storage caps ensure that tagged tubes are securely sealed.



Description	Part number
<u>Tag-ready 1/4" brass long-term storage caps for industry-standard stainless steel tubes</u>	
Cap, brass, 1/4" & PTFE ferrule, tag-ready, pk 10, for 1/4" metal tubes	C-TCF10
Cap, brass, 1/4" & PTFE ferrule, tag-ready, pk 100, for 1/4" metal tubes	C-TCF100

[Tag-ready 1/4" or 6 mm brass long-term storage caps for glass tube](#)

Cap, brass, 1/4" & blind PTFE ferrule, tag-ready, pk 10, for 1/4" glass tubes	C-T4GCF10
Cap, brass, 1/4" & blind PTFE ferrule, tag-ready, pk 100, for 1/4" glass tubes	C-T4GCF100
Cap, brass, 6 mm & blind PTFE ferrule, tag-ready, pk 10, for 6 mm glass tubes	C-T6GCF10
Cap, brass, 6 mm & blind PTFE ferrule, tag-ready, pk 100, for 6 mm glass tubes	C-T6GCF100

[Pairs of long-term storage caps for 1/4" tagged tubes](#)

Cap, brass, 1/4" & PTFE ferrule (one standard, one tag-ready), pk 10 pairs, for 1/4" metal tubes	C-TCFP10
Cap, brass, 1/4" & PTFE ferrule (one standard, one tag-ready), pk 100 pairs, for 1/4" metal tubes	C-TCFP100



Talk to Markes International to discuss any aspect of implementing TubeTAG technology in your laboratory.

Caps

Long-term storage caps

Markes International's precision-engineered long-term storage caps meet stringent cleanliness specifications and tight manufacturing tolerances. They are recommended by international standard methods and are independently validated for long-term sample storage (up to 27 months).



They are available in brass or aluminium, and should be used with a combined PTFE ferrule (1/4" or 6 mm i.d. as required).

Description	Part number
Standard 1/4" brass and aluminium long-term storage caps for industry-standard tubes (stainless steel or glass)	
Cap, storage, brass, 1/4" & PTFE ferrule, pk 10	C-CF010
Cap, storage, brass, 1/4" & PTFE ferrule, pk 20	C-CF020
Cap, storage, brass, 1/4" & PTFE ferrule, pk 100	C-CF100
Cap, storage, brass, 1/4" & PTFE ferrule, pk 200	C-CF200
Cap, storage, aluminium, 1/4" & PTFE ferrule, pk 20	C-CFA20
Cap, storage, aluminium, 1/4" & PTFE ferrule, pk 200	C-CFA200
Ferrule, 1/4", combined PTFE, pk 20	C-FP020
Ferrule, 1/4", combined PTFE, pk 200	C-FP200

6 mm brass long-term storage caps for 6 mm stainless steel tubes or glass tubes with 6 mm o.d. ends	
Cap, storage, brass, 6 mm & PTFE ferrule, pk 10	C-CF010-XZ
Cap, storage, brass, 6 mm & PTFE ferrule, pk 20	C-CF020-XZ
Cap, storage, brass, 6 mm & PTFE ferrule, pk 100	C-CF100-XZ
Cap, storage, brass, 6 mm & PTFE ferrule, pk 200	C-CF200-XZ
Ferrule, 6 mm, combined PTFE, pk 20	C-FP020-XZ
Ferrule, 6 mm, combined PTFE, pk 200	C-FP200-XZ

i See page 18 for storage caps compatible with TubeTAG.

DiffLok™ caps

The patented diffusion-locking technology used in DiffLok caps preserves sample integrity by preventing both analyte loss and artefact ingress, while still allowing analytes to be released into the TD instrument when pressure is applied.



Unique to Markes, DiffLok caps simply push on to the ends of tubes and ensure reproducible results during analysis on the ULTRA-xr and TD100-xr autosamplers.

DiffLok caps are available for 1/4" and 6 mm o.d. tubes and are available in stainless and inert-coated steel.

Description	Part number
Cap, DiffLok, stainless steel, 1/4", pk 10	C-DL010
Cap, DiffLok, stainless steel, 1/4", pk 100	C-DL100
Cap, DiffLok, inert, 1/4", pk 10	C-DLS10
Cap, DiffLok, inert, 1/4", pk 100	C-DL1S0
Cap, DiffLok (one stainless steel, one inert), 1/4", pk 10 pairs	C-DLP10
Cap, DiffLok (one stainless steel, one inert), 1/4", pk 100 pairs	C-DL1P0
Cap, DiffLok (one stainless steel, one inert), 6 mm, pk 10 pairs	C-DLP10-XZ
Cap, DiffLok (one stainless steel, one inert), 6 mm, pk 100 pairs	C-DL1P0-XZ
O-Ring, low-emission, pk 10 (replacements for 1/4" DiffLok caps)	U-COV10
O-Ring, low-emission, pk 100 (replacements for 1/4" DiffLok caps)	U-COV100
O-Ring, low-emission, pk 10 (replacements for 6 mm DiffLok caps)	U-COV45
O-Ring, low-emission, pk 100 (replacements for 6 mm DiffLok caps)	U-COV450

Short-term storage caps

Aluminium push-on caps with O-ring seals are convenient for short-term storage of cleaned or sampled 1/4" tubes.

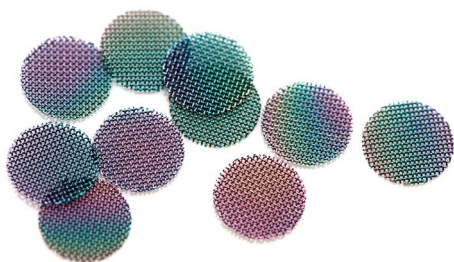


Description	Part number
Cap, push-on, aluminium, 1/4", pk 20	C-AC020
Cap, push-on, aluminium, 1/4", pk 200	C-AC200

Gauzes and springs

Sorbent-retaining gauzes

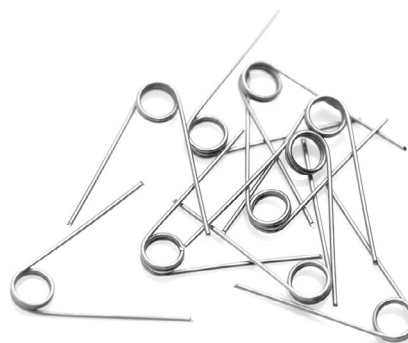
Markes International's sorbent-retaining gauzes are manufactured from high-quality stainless steel or inert-coated stainless steel for accurate sorbent positioning and robust separation of multiple sorbents above 80 mesh particle size.



Description	Part number
Sorbent-retaining gauze, pk 20	C-GZ020
Sorbent-retaining gauze, pk 200	C-GZ200
Sorbent-retaining gauze, pk 2000	C-GZ2000
Sorbent-retaining gauze, inert, pk 10	C-GZI10
Sorbent-retaining gauze, inert, pk 100	C-GZI100

Torsion springs for glass tubes

Used in glass tubes, torsion springs ensure that the rear plug of quartz wool remains positioned correctly behind the final bed of sorbent. They are also useful for securing material samples in the central heated zone of a tube during direct desorption.



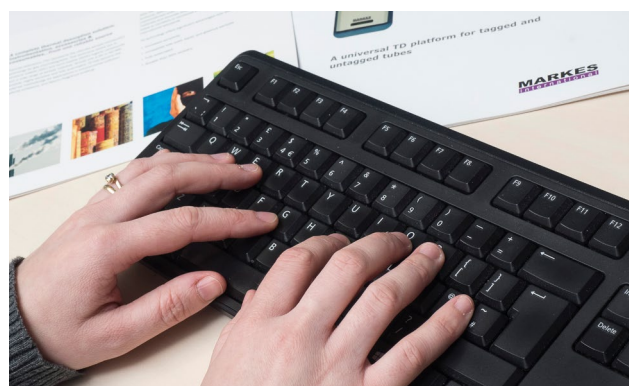
Description	Part number
Spring, torsion, for 4 mm i.d. glass tubes, pk 10	C-GTSP10

Gauze-retaining springs

Inserted and removed using the TubeMate tool, gauze-retaining springs ensure the rear sorbent-retaining gauze is correctly positioned behind the final bed of sorbent in metal tubes.



Description	Part number
Gauze-retaining spring, pk 10	C-SP010
Gauze-retaining spring, pk 100	C-SP100



Buy online at
www.markes.com/shop



To order any of these products,
simply telephone or send an email.

Tools

CapLok™

Designed by scientists at INERIS in France, the CapLok tool simplifies tube capping and uncapping procedures, and minimises the risk of sample loss through incorrect capping, or tube damage through over-tightening.



Description	Part number
CapLok tool pk 1	C-CPLOCK
CapLok tool, pk 10	C-10LOK

i For details of TAGLok (an equivalent tool for tag-adapted storage caps), see page 18.

TubeMate™

TubeMate makes it easy to insert (and remove) gauze-retaining springs in metal tubes, and can also be used to position the rear sorbent-retaining gauze on the sorbent surface.

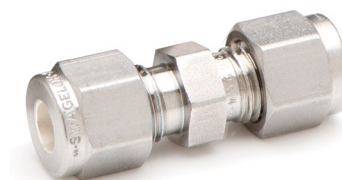


Description	Part number
TubeMate tool	C-TBMTE

Tube connection unions

Stainless steel unions fitted with one-piece PTFE ferrules make it easy to connect sorbent tubes in series, when necessary.

Tubes connected in this way are useful for monitoring breakthrough, or when collecting samples on sorbent combinations that cannot be packed into a single tube.



Description	Part number
Union, 1/4"-1/4", stainless steel & 1/4" PTFE ferrule, pk 10	C-UNS10
Union, 1/4"-1/4", stainless steel & 1/4" PTFE ferrule, pk 100	C-UNS100

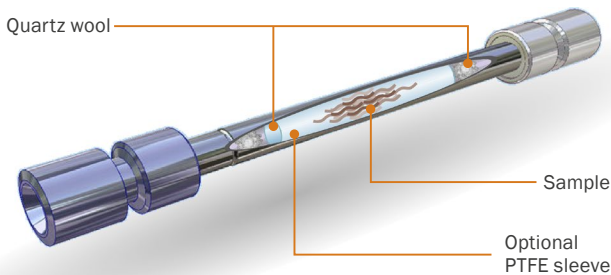


Just contact Markes International if you have any questions on tube accessories.

Direct desorption

Direct desorption is a highly effective, cost-saving technique that can be used to rapidly screen small quantities of homogeneous solid (or semi-solid) materials.

Samples are simply weighed into empty TD tubes (using a **tube liner**¹ if needed), and placed in the thermal desorber. They are then heated in a stream of inert gas to dynamically extract headspace volatiles directly onto the focusing trap.

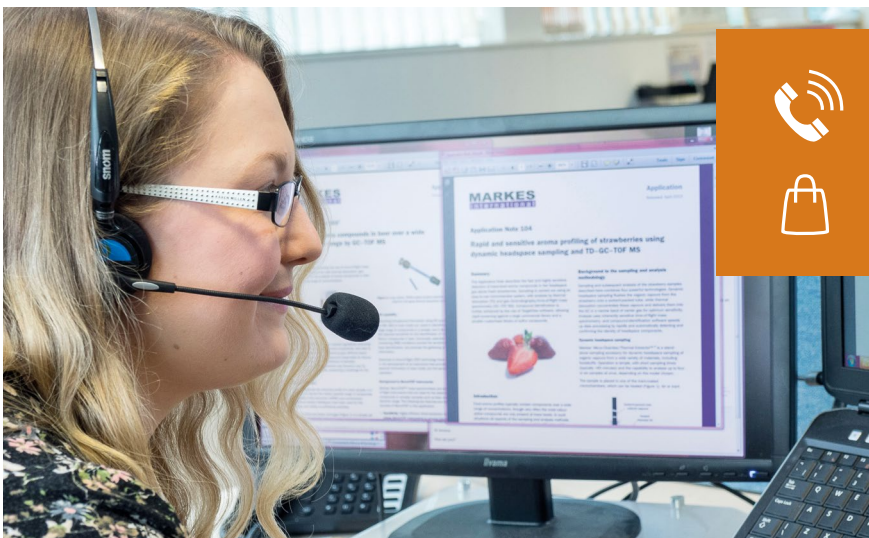


Direct desorption avoids labour-intensive manual sample preparation, and improves method stability by eliminating interferences such as non-volatiles, water and solvents prior to analysis.

1. Liners are suitable for stainless steel tubes only.

Description	Part number
Glass tube, empty, restricted, pk 10 <i>The restriction in this tube ensures that small samples are held centrally</i>	C0-NXXX-0000
Glass tube, empty, unrestricted, pk 10	C0-FXXX-0000
Stainless steel tube, empty, pk 10	C0-AXXX-0000
Inert-coated stainless steel tube, empty, pk 10	C0-CXXX-0000
Liner ¹ , PTFE, snug-fit, pk 10	C-PI010
Liner ¹ , PTFE, snug-fit, pk 100	C-PI100
Liner ¹ , PTFE, loose-fit, pk 10	C-PL010
Liner ¹ , PTFE, loose-fit, pk 100	C-PL100
Direct desorption starter kit	C-KITDD-2S

i For details of Markes International's cost-effective Direct desorption starter kit, see page 49.



To order your direct desorption tubes and accessories, simply telephone or send an email.



Buy online at www.markes.com/shop

Tube-based air sampling

Versatile accessories for pumped and passive air sampling using sorbent tubes

Product highlights

- Precisely manufactured diffusion caps for accurate passive sampling
- 325 Field Station™ for method-compliant refinery fenceline monitoring
- ACTI-VOC™ – low-flow sampling pump kit
- ACTI-VOC™ PLUS – fast flow sampling pump kit
- Easy-VOC™ – quick grab-sampling for stack gas and industrial air
- Portable sequential sampling with the MTS-32™

Passive sampling

Passive (diffusive) sampling using sorbent tubes is a convenient, quantitative and inexpensive air monitoring option for applications ranging from personal exposure studies to routine monitoring of industrial and urban air.

Diffusion caps

Markes International's robust diffusion caps are made of anodised aluminium and fit on to the end of standard 3½" metal tubes (see pages 8–9). Stainless steel caps are also available for more corrosive atmospheres. If enhanced traceability is required, Markes can also etch each diffusion cap with a unique serial number.



Description	Part number
Cap, diffusion, axial, aluminium, pk 10	C-DF010
Cap, diffusion, axial, aluminium, pk 100	C-DF100
Cap, diffusion, axial, aluminium, etched with serial number, pk 10	C-DF010E
Cap, diffusion, axial, aluminium, etched with serial number, pk 100	C-DF100E
Cap, diffusion, axial, stainless steel, pk 20	C-DFS20

Penclips

Penclips attach to the groove on 3½" metal tubes, so that they can be easily fastened to a lapel or pocket for personal monitoring.



Description	Part number
Penclip, pk 10	C-CL010
Penclip, pk 100	C-CL100

i For details of Markes International's cost-effective EPA 325 starter kit, see page 49.

US EPA Method 325

One of the most important applications of passive (diffusive) sampling is monitoring benzene and other hazardous VOCs in the air around oil refineries, in accordance with US EPA Method 325. Markes International provides a range of equipment and accessories that allow the fully method-compliant deployment of tube-based passive samplers, as well as sample analysis and tube cleaning.

325 Field Station™

This is a sturdy, non-emitting, weatherproof shelter for extended outdoor sorbent tube sampling, fully compliant with US EPA Method 325.



The 325 Field Station can accommodate up to five passive sampling tubes for sampling of benzene and other hazardous VOCs, and is fully compatible with Markes' TubeTAG system (see page 17).

It can be supplied with a **325 Sun Shield™** (shown above), which ensures that the tubes within the Field Station do not overheat in strong sunshine.

Description	Part number
325 Field Station	C-325FS
325 Sun Shield	C-325SUN

Sorbent tubes and related accessories

Markes' specially developed **EPA 325 sorbent tube** can trap a range of compounds (including butadiene, benzene, toluene, ethylbenzene and xylenes), and can be supplied conditioned, capped and ready to use. Diffusion caps, which replace the storage cap when sampling commences, are available separately (see also page 24).

To protect the tubes before and after deployment, Markes International recommends the **Tube storage container™**, which can accommodate 15 capped tubes, and fulfills the requirement of Method 325 to be air-tight and non-emitting.



When handling the large numbers of tubes required by Method 325, Markes International's patented **TubeTAG system** is recommended, to prevent manual transcription errors, optimise the audit trail and eliminate any risk of litigation (see also page 17). Tubes can be pre-fitted with the RFID tags, and a cost-effective starter kit is also available (see page 50).

Description	Part number
Sorbent tube, 'EPA 325', inert-coated stainless steel, pk 10	C1-CXXX-5020
Sorbent tube, 'EPA 325', inert-coated stainless steel, conditioned and capped, pk 10	C1-CAXX-5020
Sorbent tube, 'EPA 325', inert-coated stainless steel, fitted with TubeTAG, pk 10	C1-CXAX-5020
Sorbent tube, 'EPA 325', inert-coated stainless steel, conditioned and capped, fitted with TubeTAG, pk 10	C1-CCAX-5020
Cap, diffusion, axial, aluminium, pk 100	C-DF100
Tube storage container, air-tight and non-emitting, for up to 15 conditioned/capped tubes, pk 2	C-325CT
TubeTAG starter kit	C-TAGKT

ACTI-VOC™ low-flow pump kit

ACTI-VOC is a robust low-flow pump for sampling vapour-phase organic compounds (VOCs) onto sorbent tubes for subsequent analysis by thermal desorption (TD).

Being lightweight, easy-to-use and intrinsically safe, ACTI-VOC is ideal for personal monitoring and a wide range of other air and gas sampling applications.



ACTI-VOC is ideal for sampling onto TD tubes, and automatically compensates for different impedances, ensuring constant flow rates whatever the sorbent packing.

Description	Part number
ACTI-VOC low-flow pump kit (includes CapLok tool and carry-case)	C-LFP-01
Spare ACTI-VOC filter assembly	SERZ-1076
Spare ACTI-VOC bag sampling accessory	SERZ-1070
Spare ACTI-VOC charger	SERLFP-5002
Spare ACTI-VOC tube adaptor assembly	SERZ-1097
Spare ACTI-VOC back-pressure adaptor	SERLFP-5003

ACTI-VOC™ PLUS fast-flow pump kit

ACTI-VOC™ PLUS is a robust fast-flow pump kit for sampling volatile organic compounds (VOCs) onto sorbent tubes for analysis using thermal desorption (TD).

ACTI-VOC PLUS automatically compensates for different impedances, ensuring constant flow rates across a wide range of flows and TD tube types.

With its fast flow capabilities, ACTI-VOC PLUS is particularly well-suited for sampling semi-volatile organic compounds (SVOCs), where flows are in the region of 300-500mL/min.

ACTI-VOC PLUS has an intuitive menu and user friendly buttons for navigation. This makes set-up and flow adjustments an easy task. The ACTI-VOC PLUS is programmable to allow air to be pulled onto a tube from a chosen start time at a pre-set duration and flow rate; providing flexibility for unattended monitoring.

ACTI-VOC PLUS is not compatible with the MTS-32 multi-tube sequential sampler.

Easy-VOC™ grab-sampler

Markes International's manually-operated Easy-VOC allows simple and rapid 'grab-sampling' of precise volumes of air/gas directly onto sorbent tubes. With typical sampling volumes of 50–500 mL, key applications include industrial or workplace air monitoring.

Easy-VOC is also hassle-free, because it allows sampling of small air volumes without batteries or electrical power, and with minimal risk of analyte breakthrough.



Description	Part number
Easy-VOC pump kit (includes CapLok tool and carry-case)	C-EZVOCPO
Easy-VOC accessory pack	C-EZVOC AK



Description	Part number
Spare Filter Assembly	SERFFP-1002
Spare inlet filters, ACTI-VOC PLUS pk 10	SERFFP-1003
Spare battery, ACTI-VOC PLUS	SERFFP-1004
O-Ring extraction tool	SERZ-0351
O-Ring insertion tool	SERZ-0285
PTFE tubing and tube adapter	SERZ-1097
Back-pressure adaptor	SERLFP-5003
O-Ring, low-emission, size 10, pk 10	U-COV10
O-Ring, low-emission, 5.92 mm i.d., pk 10	U-COV45

MTS-32™ multiple-tube sampler

Markes International's MTS-32 is a compact, portable sampler perfect for unattended monitoring of ambient, indoor or workplace atmospheres over extended periods.

Air is continually drawn into the case and pumped sequentially through up to 32 sorbent tubes. To ensure that the same flow rate and volume of air is sampled onto each tube in the sequence, a constant-flow pump should be used.



For maximum confidence in results, all tubes should be sealed using Markes' DiffLok caps (see page 19), to prevent diffusive ingress or loss of volatiles.

A wide range of flow rates and sampling times, together with three power options, make the MTS-32 suitable for a wide range of air monitoring applications.

Description	Part number
MTS-32 multiple tube sampler	MTS-32
ACTI-VOC low-flow pump kit	C-LFP-01
Power option A: Internal 12 V battery	
12 V Battery assembly for MTS-32	MTS-5009
Mains charger for 12 V battery of MTS-32	MTS-5010
Power option B: External 12 V battery	
Cable assembly for connecting MTS-32 to external 12 V battery <i>The user should supply a 12 V lead-acid battery</i>	MTS-5013
Power option C: Mains electricity	
Power supply accessory for MTS-32	MTS-5011

i Markes International's specialists recommend the ACTI-VOC pump for use with the MTS-32.

↓ For more information on MTS-32, download the separate brochure.



Contact Markes International to purchase these products, and for advice about optimum sampling flows for different applications.



Buy online at www.markes.com/shop

Canister-based air sampling

Simple sampling for very volatile airborne organics

Product highlights

- Canisters for US EPA Methods TO-14 and TO-15
- Handy rack for convenient canister storage
- Canister cleaner for reliably accurate sampling

Please note that some of our canister products are only available in certain countries – please contact your local supplier or Markes' sales team for advice.



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Air-monitoring canisters

Canisters complement sorbent tubes, by allowing quantitative sampling of the most volatile air pollutants such as C₂ hydrocarbons and freons.

The TO-Can and SilcoCan are available in 1 L and 6 L sizes, and are pre-fitted with a ¼" three-port valve and a vacuum pressure gauge, reading from -30 to 122 inHg (-15 to 60 psi). All canisters are shipped clean and pressurised with contaminant-free nitrogen.



TO-Can® canisters

Optimised for US EPA Methods TO-14/TO-15 and ASTM D5466, these electropolished canisters contain high-quality metal-to-metal seals and a stainless steel diaphragm valve for the best possible performance.

Description	Part number
TO-Can with gauge and ¼" valve, 1 L	C-TOCAN1
TO-Can with gauge and ¼" valve, 6 L	C-TOCAN6

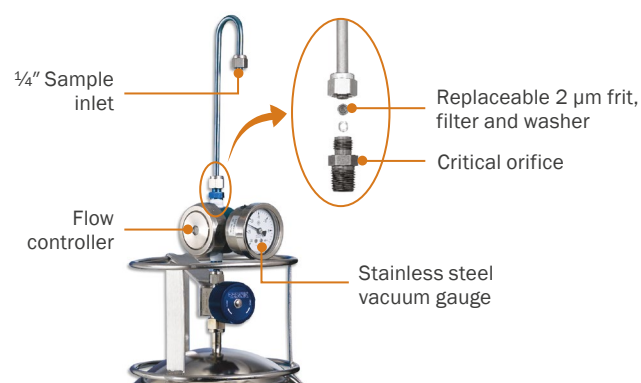
SilcoCan® canisters

Fitted with Siltek®-treated valves, these canisters offer unsurpassed inertness, even for brominated or sulfur-containing species.

Description	Part number
SilcoCan with gauge and Siltek ¼" valve, 1 L	C-SLCAN1
SilcoCan with gauge and Siltek ¼" valve, 6 L	C-SLCAN6

Canister kits and accessories

Easy to assemble in the field, Markes International's time-weighted-average (TWA) canister monitoring kits incorporate all necessary hardware for sampling over extended periods.



Description	Part number
TWA air sampling kit, stainless steel <i>Gives 1 h sampling from a 1 L canister or 8 h sampling from a 6 L canister</i>	C-ASK1168SS
TWA air sampling kit, Siltek-treated <i>Gives 1 h sampling from a 1 L canister or 8 h sampling from a 6 L canister</i>	C-ASK1168SL
Replacement 2 µm frit filter for critical orifice (includes washers), stainless steel, pk 3	C-ASK2USS
Replacement 2 µm frit filter for critical orifice (includes washers), Siltek-treated, pk 3	C-ASK2UST

i For details of a gas standard suitable for US EPA Method TO-15, see page 38.

Canister rack

Markes International's space-saving Canister Rack for CIA Advantage-xr supports canisters attached to CIA Advantage analysers.

Floor-mounted, it holds up to 15 canisters (14 samples and one internal standard).



Description	Part number
Canister Rack for CIA Advantage-xr (1L to 6L canisters)	U-RACK02
Rack connection kit	C-CRCK

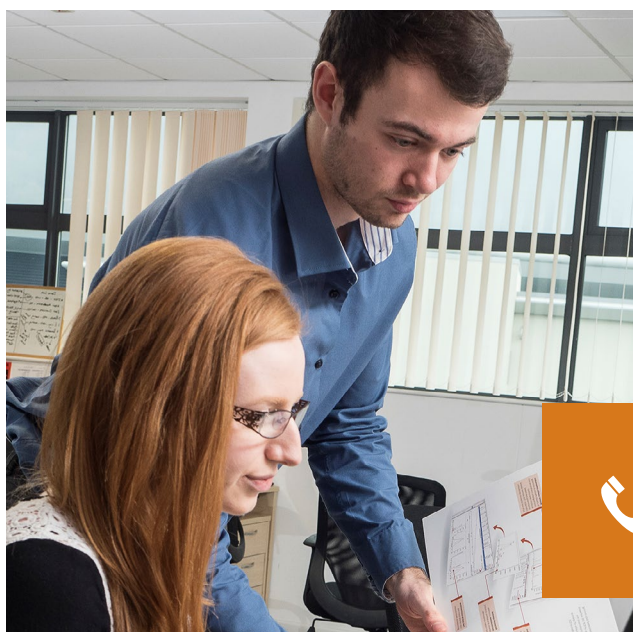
Canister cleaning system

Compliant with US EPA Method TO-14/TO-15, this TO-Clean canister cleaning system is easily adapted for canisters of different sizes – from twelve 6 L canisters to 48 miniature canisters – and at temperatures up to 110°C.

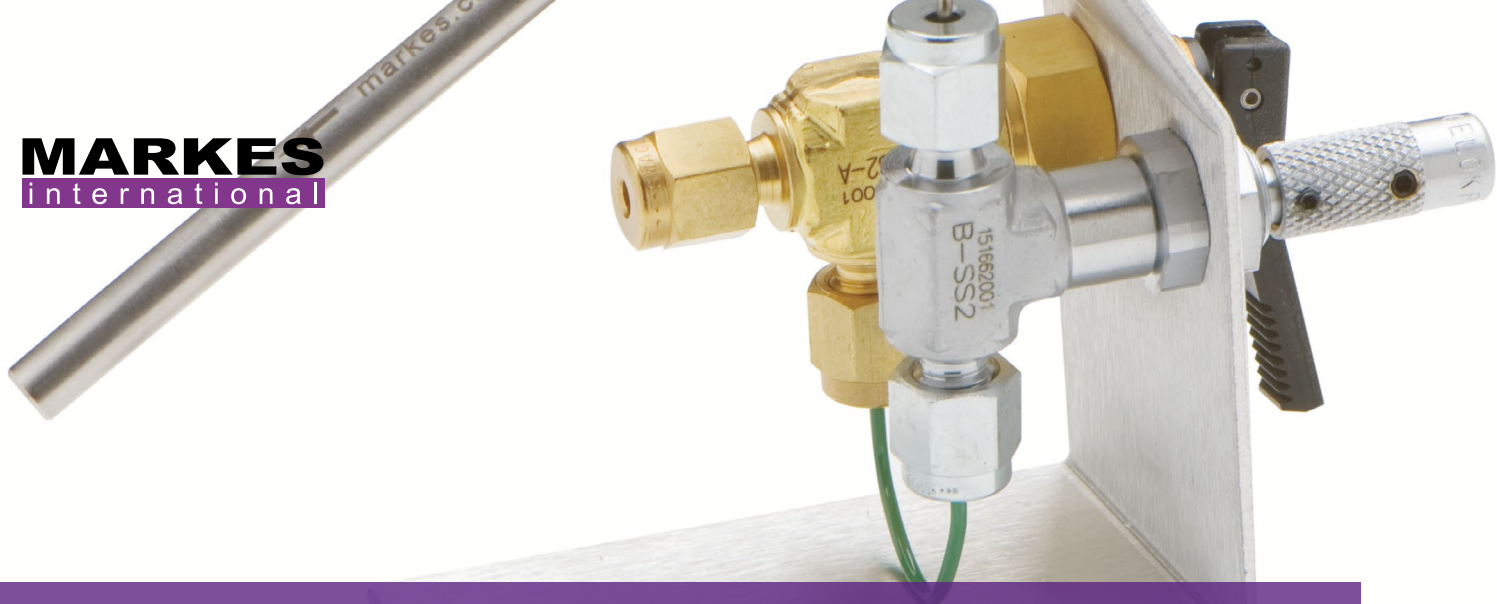
The system is fully automated, allowing you to start a cleaning cycle and walk away. Up to ten custom cleaning methods can be defined and loaded, while consistently high performance is ensured by the automated leak-check method.



Description	Part number
TO-Clean canister cleaning system with isothermal oven (120 V a.c.)	U-TOCLN120
TO-Clean canister cleaning system with isothermal oven (220–240 V a.c.)	U-TOCLN220
1 L bracket for TO-Clean, pk 12	C-TOCLN1L



Contact Markes International to discuss your canister application and how Markes' technologies can provide improved performance.



Calibration and standards

Standards and accessories for reliable, quantitative thermal desorption

Product highlights

- Calibration Solution Loading Rig – the easiest way to calibrate your TD system
- Specially packed tubes for loading liquid-phase external standards
- Handy check-standards for instrument set-up and troubleshooting
- Expert-prepared certified reference standard tubes for routine quality assurance
- High-quality standards for calibration of tube and canister systems



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P.R. China: +86 21 5465 1216

Calibration Solution Loading Rig

Markes International's Calibration Solution Loading Rig (CSLR™) has been specifically designed for loading sorbent tubes with gas- or liquid-phase standards. With an unheated injector port, it also complies with key TD standard methods such as ISO 16017, US EPA Method TO-17 and ASTM D6196.

Operation is simple – with the packed sorbent tube connected to the CSLR, the standard is injected through the septum, allowing the compounds to be swept onto the tube in a stream of carrier gas.



Description	Part number
Calibration Solution Loading Rig	C-CSLR
Septum, 9.5 mm (for CSLR), pk 10	C-SPTA

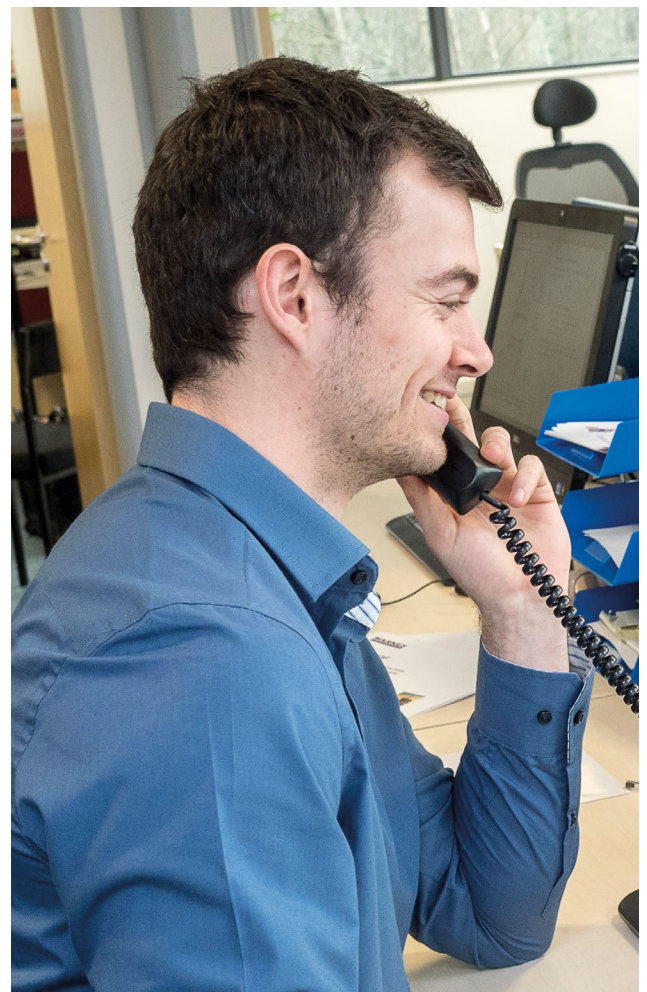
i A single regulator pneumatics accessory is needed for use with the CSLR – see page 60 for details.

Liquid-phase external calibration tubes

When it is difficult to introduce liquid standards in a stream of carrier gas, a convenient alternative is to inject them directly onto these glass sorbent tubes specially packed with a short bed of Tenax TA and quartz wool.



Description	Part number
Tube, glass, Tenax TA, 1 cm calibration, pk 10	C1-BXXX-5072
Tube, glass, Tenax TA, 1 cm calibration, conditioned and capped, pk 10	C1-BAXX-5072



Check-standard tubes

Check-standard tubes contain a range of routine and challenging analytes for troubleshooting and quality assurance. Markes International supplies two types of check-standard, both prepared on high-quality conditioned Tenax TA sorbent tubes.

Instrumentation check-standard tubes

These contain benzene, toluene, o-xylene, isobornyl methacrylate (IBMA) and dioctyl phthalate at a nominal concentration of 90 ng/μL for each component. A single check-standard tube is supplied with all Markes' systems.

Description	Part number
Check-standard (BTX, IBMA and dioctyl phthalate), 90 ng/μL (nominal), Tenax TA, pk 10	C-CHK10

Material emissions check-standard tubes

These enhance validation and quality control for laboratories using TD-GC methods to test chemical emissions from products and materials. The sorbent tubes are pre-loaded with n-hexane, 4-methylpentan-2-one (MIBK), toluene, n-butyl acetate, cyclohexanone, phenol, 1,2,3-trimethylbenzene, 4-phenylcyclohexene and n-hexadecane, at a nominal loading of 100 ± 10 ng per compound. The standard complies with ISO 17025 for loading tubes (also in accordance with ISO 9001).

Description	Part number
Check-standard (material emissions), 100 ng per tube (nominal), Tenax TA, pk 10	C-CHK10-ME



To order the CSLR, calibration tubes or check-standards, simply telephone or send an email.



Buy online at www.markes.com/shop

Do you participate in a proficiency testing scheme for TD?

As part of our service to customers, Markes likes to make thermal desorption users aware of complementary third-party services that could be of interest and benefit. Proficiency testing (PT) schemes are a case in point.

PT schemes for thermal desorption work by providing participating laboratories with spiked tubes for analysis. The tubes are analysed by these laboratories, as part of their routine operation, and the results reported to the scheme organisers. The laboratories involved are then provided with a report showing how closely their results agree with the accepted values. Reports are confidential, as results are given by laboratory identification number, known only to the organiser and the individual laboratories.

Regular participation in a proficiency-testing scheme:

- Provides a laboratory with an important independent insight into their performance.
- Benchmarks laboratory performance against other scheme participants.
- Allows laboratories to demonstrate commitment to measurement quality to regulatory agencies, accreditation bodies and laboratory customers.

The AIR PT scheme

One of the most popular schemes for thermal desorption is the AIR PT scheme. This tests the performance of laboratories measuring exposure to hazardous chemical substances in the ambient, indoor and workplace air environments using TD methods. The scheme was established in 1988 as the Workplace Analysis Scheme for Proficiency (WASP), and currently has more than 350 laboratory participants worldwide. The WASP scheme is operated by LGC Standards (which oversees management, registration, data analysis, publishing reports, membership and distribution), working in partnership with the UK Health & Safety Laboratory (who provide technical expertise, support, and produce the dynamically loaded TD tubes and filters).



AIR PT offers the following samples for the analysis of thermal desorption tubes:

Application	Testing environment	Analytes	Loading
Ambient air	ISO 16017-1 & 2, US EPA TO-17	BTEX	15–300 ng †
Indoor air and material emissions	ISO 16000-6	Up to 13 VOCs and SVOCs	25–1000 ng
Workplace air	ISO 16017-1 & 2	BTEX	0.5–200 µg †
	ISO 16000-3	Formaldehyde	1.5–60 µg ‡

† Analytes provided together on a TD sorbent tube packed with Tenax TA. Test samples dynamically loaded from a standard atmosphere based upon procedures set out in ISO 6145-4.

‡ Glass fibre filter spiked with DNPH derivative. Note this requires HPLC, and is not compatible with TD-GC(-MS) methods.



If you are interested in AIR PT, please contact LGC Standards on +44 (0)161 762 2500 or at ptcustomerservices@lgcgroup.com.

Certified reference standard (CRS) tubes

Markes International's CRS tubes are prepared by an expert national standards laboratory following approved methodology (ISO 6145 parts 4 or 8, accredited to ISO 17025), and are certified traceable to primary standards.

Routine use of these CRS tubes complies with guidance given in international standard methods, and provides continual quality assurance of system and procedure reliability.

All CRS tubes are supplied with a shipping blank and corresponding chromatogram, together with a certificate of standard traceability. BTX and TO-17 standard tubes are supplied with an example chromatogram and full user instructions.

BTX CRS tubes

Tenax TA tubes loaded with benzene, toluene and *o*-xylene at 100 ng per component are suitable for the majority of environmental applications, and have a certified shelf-life of 6 months.

Description	Part number
CRS (BTX), 100 ng, pk 10	C-BTX100-10

TO-17 CRS tubes

A TO-17 CRS tube is available loaded with nine components typical of those found during air toxics monitoring, namely:

Benzene	1,1,1-Trichloroethane
Toluene	Methyl <i>tert</i> -butyl ether
<i>o</i> -Xylene	Methyl ethyl ketone
1,2,4-Trimethylbenzene	Ethyl acetate
Dichloromethane	

These standard tubes are prepared on conditioned Tenax TA tubes at 100 ng per component, and have a certified shelf-life of 6 months.

Description	Part number
CRS (TO-17), 100 ng, pk 10	C-TO17100-10

Custom CRS tubes

If you require a special combination of stable chemicals pre-loaded onto conditioned sorbent tubes, Markes International also offers a custom CRS tube service. Up to eight compounds can be specified, with the sorbent typically being Tenax TA (although others are available). Please discuss your requirements with a Markes specialist prior to ordering (a minimum order quantity may apply).

Description	Part number
CRS (custom), pk 10	C-CUST-10

Internal standards

Suitable for all Markes International's TD instruments, Markes' 1 ppm internal gas standard is perfect for complying with US EPA Methods TO-14/TO-15/TO-17 and other TD-GC-MS applications.¹

The cylinder (110 L, 1800 psig) is of aluminium construction (8.3 cm × 29.5 cm), is PI-marked for compliance with EU transport regulations and US DOT specification 3AL2216, and contains the following components:

Bromochloromethane
 1-Bromo-4-fluorobenzene
 Chlorobenzene-*d*₅
 1,4-Difluorobenzene

Description	Part number
Standard, gas cylinder, TO-14A IS/tuning mix, 1 ppm	C-GS14A-1PPM
1/4" female NPT	C-GSREG-100
1/8" tube compression	C-GSREG-101
Tubing, stainless steel, 1/8", to connect IS to ISDP	SERZ-0022

i For details of Markes International's cost-effective TO-17 starter kit, see page 49.

1. Please note that this product may be unavailable in certain countries – please contact Markes International for more information.



For advice on any aspect of calibration or standards, contact Markes International's technical specialists.

Gas standards for external method calibration

Markes International also offers two high-quality gas standards suitable for a variety of canister- and tube-based environmental air monitoring methods.

The standards are contained in aluminium cylinders (8.3 cm × 29.5 cm) and are PI-marked for compliance with EU transport regulations and US DOT specification 3AL2216.

TO-15 'Air toxics'/TO-17 65-component mix – 1 ppm¹

Supplied in nitrogen at 1800 psig. Injecting 1 mL of this mix onto a sorbent tube or cold trap introduces 2–4 ng of the following components:

Acetone	Ethanol ²
Acrolein	Ethyl acetate
Benzene	Ethylbenzene
Benzyl chloride ²	4-Ethyltoluene
Bromodichloromethane	Heptane
Bromoform	Hexachlorobutadiene
Bromomethane	Hexane
Butadiene	Hexan-2-one (methyl butyl ketone)
Butan-2-one (methyl ethyl ketone)	Methyl methacrylate
Carbon disulfide ²	4-Methylpentan-2-one
Carbon tetrachloride	(methyl isobutyl ketone)
Chlorobenzene	Methyl <i>tert</i> -butyl ether
Chloroethane	Naphthalene
Chloroform	Propan-2-ol
Chloromethane	Propene
Cyclohexane	Styrene
Dibromochloromethane	1,1,2,2-Tetrachloroethane
1,2-Dibromoethane	Tetrachloroethene
1,2-Dichlorobenzene	Tetrahydrofuran
1,3-Dichlorobenzene	Toluene
1,4-Dichlorobenzene	1,2,4-Trichlorobenzene
Dichlorodifluoromethane (Freon® 12)	1,1,1-Trichloroethane
1,1-Dichloroethane	1,1,2-Trichloroethane
1,2-Dichloroethane	Trichloroethene
1,1-Dichloroethene	Trichlorofluoromethane (Freon® 11)
<i>cis</i> -1,2-Dichloroethene	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon® 113)
<i>trans</i> -1,2-Dichloroethene	1,2,4-Trimethylbenzene
Dichloromethane	1,3,5-Trimethylbenzene
1,2-Dichloropropane	Vinyl acetate
<i>cis</i> -1,3-Dichloropropene	Vinyl chloride
<i>trans</i> -1,3-Dichloropropene	<i>m</i> -Xylene
1,2-Dichlorotetrafluoroethane (Freon® 114)	<i>o</i> -Xylene
1,4-Dioxane	<i>p</i> -Xylene

Description	Part number
Standard, gas cylinder, TO-15, 65-component mix, 1 ppm	C-GS15-1PPM
Regulator, high-purity VOC, 0–100 psi outlet	C-GSREG-100

Ozone precursor/PAMS 57-component mix – EPA concentrations 20–60 ppbC^{1,3}

Supplied in nitrogen at 1800 psig. Injecting 1 mL of this mix onto a TD cold trap introduces approximately 0.1 ng of the components below (individual concentrations in ppbC³ are given in parentheses).

Acetylene (40)	Isopropylbenzene (40)
Benzene (30)	Methylcyclohexane (30)
<i>n</i> -Butane (40)	Methylcyclopentane (25)
But-1-ene (30)	2-Methylheptane (25)
<i>cis</i> -But-2-ene (35)	3-Methylheptane (25)
<i>trans</i> -But-2-ene (25)	2-Methylhexane (25)
Cyclohexane (40)	3-Methylhexane (25)
Cyclopentane (20)	2-Methylpentane (20)
<i>n</i> -Decane (30)	3-Methylpentane (40)
<i>m</i> -Diethylbenzene (40)	<i>n</i> -Nonane (25)
<i>p</i> -Diethylbenzene (25)	<i>n</i> -Octane (30)
2,2-Dimethylbutane (40)	<i>n</i> -Pentane (25)
2,3-Dimethylbutane (50)	Pent-1-ene (25)
2,3-Dimethylpentane (50)	<i>cis</i> -Pent-2-ene (35)
2,4-Dimethylpentane (40)	<i>trans</i> -Pent-2-ene (25)
<i>n</i> -Dodecane (40)	Propane (40)
Ethane (25)	<i>n</i> -Propylbenzene (30)
Ethylbenzene (25)	Propene (25)
Ethene (20)	Styrene (40)
<i>m</i> -Ethyltoluene (25)	Toluene (40)
<i>o</i> -Ethyltoluene (30)	1,2,3-Trimethylbenzene (25)
<i>p</i> -Ethyltoluene (40)	1,2,4-Trimethylbenzene (40)
<i>n</i> -Heptane (25)	1,3,5-Trimethylbenzene (25)
<i>n</i> -Hexane (30)	2,2,4-Trimethylpentane (30)
Hex-1-ene (60)	2,3,4-Trimethylpentane (25)
Isobutane (25)	<i>n</i> -Undecane (30)
Isopentane (40)	<i>o</i> -Xylene (25)
Isoprene (40)	<i>m/p</i> -Xylene (combined) (40)

Note that this standard contains some very volatile analytes, and is not suitable for loading onto standard sorbent tubes at ambient temperature.

Description	Part number
Standard, gas cylinder, O ₃ /PAMS, 57-component mix, EPA concentration, 20–60 ppb	C-GSPAMS-EPA
Regulator, high-purity VOC, 0–100 psi outlet	C-GSREG-100

1. Please note that this product may be unavailable in certain countries – please contact Markes International for more information.

2. Note that the stability of these compounds cannot be guaranteed.

3. ppbC = parts per billion expressed as carbon.

Sampling accessories

An extensive range of sampling accessories for every TD application

Product highlights

- Micro-Chamber/Thermal Extractor™ for quick emissions screening
- HiSorb™ probes and accessories for efficient immersive and headspace sorptive extraction
- Easy-to-use BioVOC-2™ breath sampler
- Cost-effective soil gas monitoring with the VOC-Mole™ soil probe



**Contact Markes
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Micro-Chamber/Thermal Extractor™

Markes International's Micro-Chamber/Thermal Extractor (μ -CTE™) is the ultimate system for sampling chemical emissions and odour profiles from a wide range of products and materials, quickly and reliably.

It accommodates up to six samples, and is used in conjunction with a TD-GC system to screen multiple samples quickly and cost-effectively. Applications range from routine quality assurance of manufactured goods to rapid aroma profiling of foods and fragranced products.

The μ -CTE is available in two models: the six-chamber model (max. 120°C, with 44 cm³ chambers) and the four-chamber model (max. 250°C, with 114 cm³ chambers).

Each is compatible with accessories that allow:

- Use of humidified air or gas.
- Permeation testing.
- Assessment of surface emissions.
- Formaldehyde sampling.
- Sampling from liquid or resinous samples.



Part numbers for the 6-chamber μ -CTE (max. 120°C)

Description	Part number
Micro-Chamber/Thermal Extractor, 6-chamber, inert	M-CTE120I
Micro-Chamber/Thermal Extractor, 6-chamber, inert, with 6 toggle valves	M-CTE120TI
Starter kit for Micro-Chamber/Thermal Extractor, 6-chamber	C-MCTEKIT-120
Sample pan, inert, pk 6	M-MCHSI
Removable lid, inert, pk 6	M-MCTOPI

Part numbers for the 4-chamber μ -CTE (max. 250°C)


Description	Part number
Micro-Chamber/Thermal Extractor, 4-chamber, inert	M-CTE250I
Micro-Chamber/Thermal Extractor, 4-chamber, inert, with 4 toggle valves	M-CTE250TI
Starter kit for Micro-Chamber/Thermal Extractor, 4-chamber	C-MCTEKIT-250
Sample pan, inert, pk 4	M-MCHSS250I
Removable lid, inert, pk 4	M-MCTOP250I



For advice on how the μ -CTE can aid compliance with construction products regulations, please contact Markes International's technical specialists.

Part numbers for the 6-chamber μ -CTE (max. 120°C)

Description	Part number
<u>Humidifier accessory</u>	
Humidifier accessory for Micro-Chamber/ Thermal Extractor	M-HUMID-MCTE
<u>Accessories for permeation testing</u>	
Permeation accessory, stainless steel, pk 1	M-PRMIN1
Permeation accessory, stainless steel, pk 6	M-PRMIN
Permeation accessory, inert, pk 1	M-PRMINSS1-120
Permeation accessory, inert, pk 6	M-PRMINSS-120
O-Ring, 30 mm o.d., permeation accessory seal, pk 6	M-PRO30-120
Septum, 1/4", for permeation accessory injection port, pk 6	M-PRSPT-120
<u>Accessories for surface emissions testing</u>	
Collar spacer, Al, 15 mm, pk 6	M-SPC15-120
Collar spacer, Al, 5 mm, pk 6	M-SPC05-120
Spacer disc, Al, 1.5 mm, pk 24	M-DSK15-120
Adjustable sprung spacer, pk 6	M-SPGSC-120
<u>Accessories for formaldehyde sampling¹</u>	
O-Ring, size 007, and spacer, to connect 4 mm Luer cartridge, pk 6 (for DNPH cartridges)	M-TCN04
<u>Other accessories</u>	
Sample disc, 1.0 mm thickness, PTFE, pk 6	M-DSKPF
Insert for liquid standard introduction, PTFE, pk 6	M-TSTIN
Routine maintenance kit for Micro-Chamber/ Thermal Extractor	RMK-0006
Pneumatics accessory (single regulator) ²	U-GAS03
O-Ring, size 010, to connect 1/4" o.d. tubes, pk 6 (for standard tubes)	M-TCN64
O-Ring, 5.92 mm i.d., to connect 6 mm o.d. tubes, pk 6	M-TCN06
O-Ring, size 006, for gas line connection to removable lid, pk 6	M-MC006
Tube interface cap for removable lid, pk 6	M-TICAP
O-Ring, micro-chamber pan seal, pk 6	M-MCHOR

 **For more information on the μ -CTE and associated accessories, download the separate brochure.**

 **For details of cost-effective μ -CTE starter kits, see page 51.**

Part numbers for the 4-chamber μ -CTE (max. 250°C)

Description	Part number
<u>Humidifier accessory</u>	
Humidifier accessory for Micro-Chamber/ Thermal Extractor	M-HUMID-MCTE
<u>Accessories for permeation testing</u>	
Permeation accessory, stainless steel, pk 1	M-PRMIN1-250
Permeation accessory, stainless steel, pk 6	M-PRMIN-250
Permeation accessory, inert, pk 1	M-PRMINSS1-250
Permeation accessory, inert, pk 4	M-PRMINSS-250
O-Ring, 30 mm o.d., permeation accessory seal, pk 4	M-PRO30-250
Septum, 1/4", for permeation accessory injection port, pk 6	M-PRSPT-250
<u>Accessories for surface emissions testing</u>	
SPF sample cutter for M-CTE250	M-SPFSC-250
Collar spacer, Al, 15 mm, pk 4	M-SPC15-250
Collar spacer, Al, 5 mm, pk 4	M-SPC05-250
Spacer disc, Al, 1.5 mm, pk 24	M-DSK15-250
Adjustable sprung spacer, pk 4	M-SPGSC-250
<u>Accessories for formaldehyde sampling¹</u>	
O-Ring, size 007, and spacer, to connect 4 mm Luer cartridge, pk 6 (for DNPH cartridges)	M-TCN04
<u>Other accessories</u>	
Calibration tool for M-CTE250I, PTFE, pk 4 ¹	M-CHCT-250
Sample disc, 1.0 mm thickness, PTFE, pk 6	M-DSKPF
Insert for liquid standard introduction, PTFE, pk 6	M-TSTIN
Routine maintenance kit for Micro-Chamber/ Thermal Extractor	RMK-0006HT
Pneumatics accessory (single regulator) ²	U-GAS03
O-Ring, size 010, to connect 1/4" o.d. tubes, pk 6 (for standard tubes)	M-TCN64
O-Ring, 5.92 mm i.d., to connect 6 mm o.d. tubes, pk 6	M-TCN06
O-Ring, size 006, for gas line connection to removable lid, pk 6	M-MC006
Tube interface cap for removable lid, pk 6	M-TICAP
O-Ring, micro-chamber pan seal, standard (for applications <200°C), pk 4	M-MCHOR250
O-Ring, micro-chamber pan seal, ultra-high purity standard (for applications >200°C), pk 4	M-MCHOR250HT

1. DNPH cartridges are not included.

2. Markes recommends that a pneumatics accessory (U-GAS03, page 60) is used with every μ -CTE.

HiSorb sorptive extraction probes

HiSorb is an innovative, labour-saving sampling system for the analysis of volatile and semi-volatile organic compounds (VOCs and SVOCs) in liquids and solids by TD-GC-MS.

HiSorb is far quicker and easier to use than solvent extraction (see manual workflow below), and completely avoids the cost of solvent consumption and disposal.

It also offers lower detection limits than for solid-phase micro-extraction (SPME), due to the larger capacity of the sorbent and the use of TD pre-concentration and automated GC-MS analysis.

These advantages make HiSorb probes and accessories ideal for aroma profiling, quality control and advanced research across a wide range of applications.

1



Probe insertion:

Two probe lengths allow immersive or headspace sampling in 20 or 10 mL vials.

2



Analyte extraction:

The HiSorb Agitator efficiently mixes and heats the sample to facilitate extraction.

3



Probe washing:

Probes are washed and dried to remove residual matrix.

4



Analysis:

The HiSorb probe is inserted into a standard TD tube for analysis by TD-GC-MS.

HiSorb probes

HiSorb probes are used to sorptively extract VOCs and SVOCs from a range of sample types. They can be used for immersive or headspace sampling from water-based solutions, emulsions and suspensions, as well as headspace sampling from solids.

The probes are available manufactured from stainless steel or inert-coated stainless steel, and are fitted with a section of polydimethylsiloxane (PDMS) that allows high-capacity sorptive extraction of a wide range of VOCs and SVOCs.



Standard-length (75 mm) probes are available for immersive sorptive extraction from liquids in 20 mL headspace vials. Short-length (55 mm) probes are suitable for immersive extraction from 10 mL vials, or headspace extraction from 20 mL vials.

HiSorb probes were designed for use on Centri-automated platform, they are also compatible with TD-GC-MS analysis using industry standard 3½" × ¼" tubes on all leading commercial systems. They are easy to use, robust and re-usable, minimising the cost per sample.

Description	Part number
HiSorb probe assembly, stainless steel, standard length, pk 6	H1-XXAAC
HiSorb probe assembly, stainless steel, short length, pk 6	H1-XXABC
HiSorb probe assembly, inert-coated stainless steel, standard length, pk 6	H1-AXAAC
HiSorb probe assembly, inert-coated stainless steel, short length, pk 6	H1-AXABC

HiSorb Agitator

The HiSorb Agitator is an efficient laboratory agitation unit for up to 16 headspace vials (2, 10 or 20 mL), with control of speed, incubation temperatures and agitation time.

The HiSorb Agitator can be used in conjunction with Markes' HiSorb probe technology for manual sorptive sample extraction,¹ and as a stand-alone unit for general laboratory mixing of liquids or solid suspensions – including incubation, agitation, derivatisation and extraction.

Sample blocks are detachable from the base unit, enabling sample preparation anywhere within the laboratory. The loaded sample block is then easily remounted on the agitator, without any tools.



Description	Part number
HiSorb Agitator, with 16 × 20 mL vial block	U-HSAG-20
Additional vial block, 16 × 20 mL	U-HSVB-20



Buy online at
www.markes.com/shop



Contact your regional distributor or one of our offices (details below).

HiSorb accessories

Headspace vials (20 mL and 10 mL) with crimp-top sealing come in cost-effective packs of 100.



The versatility of the HiSorb Agitator can be increased by using interchangeable **vial block inserts** to securely hold 2 mL and 10 mL vials in place within each well.



Empty TD tubes are used to hold HiSorb probes while they are thermally desorbed.



A **probe extraction device** firmly holds the end of the HiSorb probe during the transfer from vial to sorbent tube, eliminating any risk of contamination through manual handling.



Vial sealing plugs prevent the evaporative loss of hazardous or odorous samples after extraction, by sealing the hole through which the HiSorb probe is introduced.



Description	Part number
Cap with HiSorb septum, for 10mL/20mL crimp-top vials, magnetic, pk 100	C-HSPCCS
Headspace vial, 10 mL, crimp-top, clear, round-bottomed, pk 100	C-VCC10
Headspace vial, 20 mL, crimp-top, clear, round-bottomed, pk 100	C-VCC20
Vial block insert, 20 mL to 2 mL, pk 4	C-HSINS2-4
Vial block insert, 20 mL to 10 mL, pk 4	C-HSINS10-4
Stainless steel tube, empty, pk 10	C0-AXXX-0000
Inert-coated stainless steel tube, empty, pk 10	C0-CXXX-0000
HiSorb handle, for manual probe extraction	C-HSPH
HiSorb septum plug, pk 6	C-HSPVLP-6
HiSorb starter kit	C-HSPKIT

i For details of Markes International's cost-effective HiSorb starter kit, see page 50.

1. Note that HiSorb probes cannot be used with 2 mL vials.

BioVOC-2™ breath sampler

For non-invasive tube-based breath analysis

Markes' BioVOC-2 breath sampler is a lightweight and simple-to-use device designed for non-invasive biological exposure monitoring of VOCs. Using a design pioneered by the UK Health & Safety Executive, BioVOC-2 collects the last 129mL of expiratory breath for transfer to a sorbent tube for analysis via thermal desorption.

Constructed of safe, non-emitting, non-binding plastic, BioVOC-2 can be operated with minimal training and without medically qualified staff in attendance. It is suitable for large-scale screening of populations.

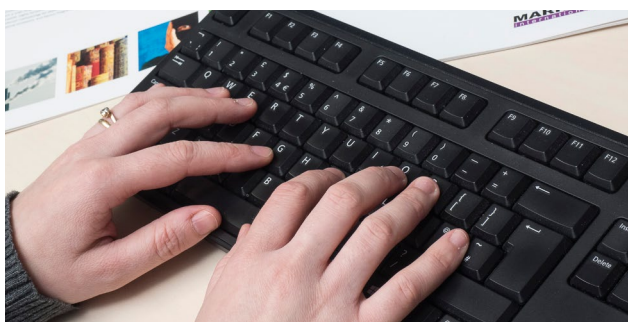
It can be applied to clinical research, occupational health monitoring and assessing exposure of the public to VOCs.

BioVOC-2 can be used multiple times for one participant within a single sampling session and consists of:

- The BioVOC-2 body to collect the breath sample
- A disposable cardboard mouthpiece to avoid mouth contact with the BioVOC-2 body
- A plunger with non-return valve for transferring the breath sample to a sorbent tube
- A bung to ensure the sample is retained before transfer to a sorbent tube

BioVOC-2 is compatible with any industry-standard 3½" x ¼" sorbent tube and replaces the original Bio-VOC breath sampler developed by Markes.

Description	Part number
BioVOC-2 breath sampler, pk 1	C-BIO02-01
BioVOC-2 breath sampler, pk 10	C-BIO02-10
BioVOC-2 breath sampler, pk 100	C-BIO02-100
Disposable cardboard mouthpieces, suitable for Bio-VOC and BioVOC-2, pk 100	C-B100M
Inert coated bio-monitoring tubes, pk 10	C2-CAXX-5149



Buy online at
www.markes.com/shop



To order any of these products,
simply telephone or send an email.

VOC-Mole™ soil probe

With a robust, high-quality stainless steel construction, Markes International's VOC-Mole is an economical way to sample VOCs in contaminated land, or along fuel pipelines.

Monitoring typically uses passive sampling tubes held inside the VOC-Mole, but pumped sampling is also possible. The VOC-Mole is available in three probe lengths, and there is also a modified version for use in marshy ground.



Description	Part number
VOC-Mole, Soil Probe, 230mm, pk 1	P-00001
VOC-Mole, Soil Probe, 230mm, pk 10	P-00010
VOC-Mole, Soil Probe, 380mm, pk 10	P-00020
VOC-Mole, Soil Probe, 830mm, pk 10	P-00030
VOC-Mole, Soil Probe, 830mm, modified for use in marshy ground, pk 10	P-00040
VOC-Mole Cap, pk 1	P-CP001
VOC-Mole Cap, pk 10	P-CP010
VOC-Mole O-ring, pk 20	P-CP020
VOC-Mole Replacement Blanking Plug, pk 10	P-CPP10
VOC-Mole Replacement Dowty Seal, pk 20	P-CPS20
VOC-Mole Replacement Union with PTFE Ferrule, pk 10	P-CPU10
VOC-Mole Impactor, Brass, to absorb impact when driving soil probes into the ground, pk 1	P-FORMR

TF-SPME starter kit

Thin-film solid-phase microextraction (TF-SPME) is a newly-available sampling approach for sorptive extraction of VOCs and SVOCs at ultra-trace levels.

Same applications, greater sensitivity

Developed by the inventor of SPME, Professor Janusz Pawliszyn, TF-SPME uses a strip of carbon mesh impregnated with a SPME sorptive phase.

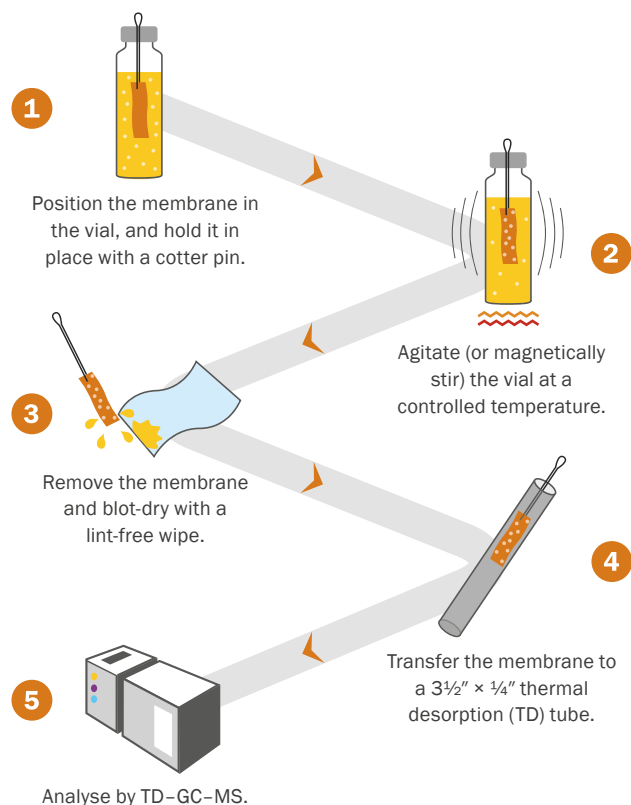
As with traditional SPME, TF-SPME membranes can be used to extract VOCs and SVOCs from solids and liquids, using immersive or headspace techniques.

However, the large surface area and 100× greater volume of sorptive phase offer more rapid extraction and greater sensitivity, making TF-SPME an ideal sampling tool for ultra-trace level analysis.



Each TF-SPME starter kit contains

- 4 cm TF-SPME membrane with storage vial (× 2)
- 20 mL clear screw-cap vial, cap and septum (× 2)
- Cotter pin (× 2)
- Glass-encapsulated magnetic stir bar (× 2)
- 3½" × ¼" thermal desorption tube (× 2)



Ordering information

Description	Part number
TF-SPME starter kit, PDMS	C-TF-P-KIT
TF-SPME starter kit, PDMS/CAR	C-TF-PCAR-KIT
TF-SPME starter kit, PDMS/DVB	C-TF-PDVB-KIT
TF-SPME starter kit, PDMS/HLB	C-TF-PHLB-KIT

All the above contain two sets of TF-SPME membranes and sampling equipment.

Membranes are also sold separately as packs of five.

Starter kits

Handy packages of tubes, traps, tools and accessories to get you up and running quickly

Product highlights

- General-purpose TD starter kits for all current UNITY-xr™ and TD100-xr™ models
- Specialist kits for environmental and material emissions applications
- Convenient kits for specific instruments and accessories



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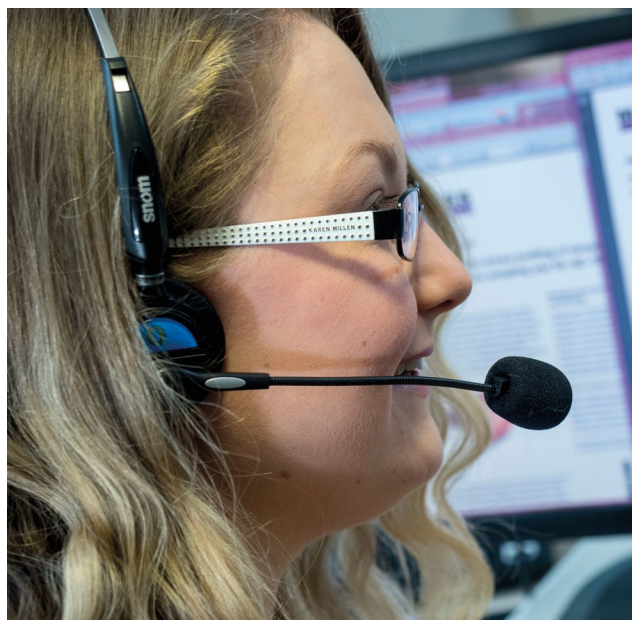
Markes' general TD starter kits

Two economical general-purpose starter kits (with 3½" tubes) and a booster pack are available for users of Markes' tube-based TD systems.

Description	Part number
Essential TD starter kit	C-TDKIT-01
Essential automated TD starter kit	C-TDKIT-02
Automated TD booster pack	U-ULKIT

The **Essential TD starter kit** is suitable for users of UNITY-xr systems, and contains:

Sorbent tube, Tenax TA, stainless steel, conditioned and capped, pk 10 <i>Suitable for pumped sampling of VOCs from C₆ to C₃₀</i>	C1-AAXX-5003
CapLok tool for capping and uncapping ¼" brass storage caps	C-CPLOK
Focusing (cold) traps, 'General-purpose carbon' <i>Compatible with the simultaneous analysis of analytes from C_{4/5} to C_{30/32}</i>	U-T11GPC-2S
Quick-seal column connector, pk 10	C-QSC10
Check-standard (BTX, IBMA and dioctyl phthalate), 90 ng/µL (nominal), Tenax TA, pk 10	C-CHK10



To order any of Markes' kits, simply telephone or send an email.



Buy online at www.markes.com/shop

The **Essential automated TD starter kit** is suitable for users of UNITY-ULTRA-xr or TD100-xr systems. It contains all the components of the Essential TD starter kit, plus the additional caps and O-rings needed to allow automated analysis of up to 100 tubes:¹



Sorbent tube, Tenax TA, stainless steel, conditioned and capped, pk 10 <i>Suitable for pumped sampling of VOCs from C₆ to C₃₀</i>	C1-AAXX-5003
CapLok tool for capping and uncapping ¼" brass storage caps	C-CPLOK
Focusing (cold) traps, 'General-purpose carbon' <i>Compatible with the simultaneous analysis of analytes from C_{4/5} to C_{30/32}</i>	U-T11GPC-2S
Quick-seal column connector, pk 10	C-QSC10
Check-standard (BTX, IBMA and dioctyl phthalate), 90 ng/µL (nominal), Tenax TA, pk 10	C-CHK10
Cap, DiffLok, stainless steel, ¼", 1.6 × pk 100	1.6 × C-DL100
O-Ring, size 007, pk 10 <i>For ULTRA 2/ULTRA-xr tube receiver</i>	U-COV07
O-Ring, size 010, pk 10 <i>For tube interface seal</i>	U-COV10

The **Automated TD booster pack** is suitable for users of UNITY-ULTRA-xr or TD100-xr systems not requiring all the components of the Essential automated TD starter kit. It contains just the additional caps and O-rings needed to allow automated analysis of up to 100 tubes:¹

Cap, DiffLok, stainless steel, ¼", 1.6 × pk 100	1.6 × C-DL100
O-Ring, size 007, pk 10 <i>For ULTRA 2/ULTRA-xr tube receiver</i>	U-COV07
O-Ring, size 010, pk 10 <i>For tube interface seal</i>	U-COV10

1. All automated TD systems from Markes International are supplied with 40 DiffLok caps, enabling analysis of up to 20 tubes.

Application-specific starter kits

Environmental monitoring applications

Two starter kits are available for tube-based environmental monitoring scenarios.

Description	Part number
TO-17 starter kit	C-TO17KIT
EPA 325 starter kit	C-KIT325-2S

The **TO-17 starter kit** is perfect for monitoring 'air toxics' using pumped tubes in compliance with US EPA Method TO-17. The kit contains:

Sorbent tube, 'Hydrophobic', stainless steel, conditioned and capped, pk 10 <i>Suitable for pumped sampling of VOCs from C₅ to C₃₀</i>	C2-AAXX-5032
Sorbent tube, 'Air toxics', glass, conditioned and capped, pk 10 <i>Suitable for pumped sampling of VOCs from C_{2/3} to C₁₄</i>	C2-BAXX-5259
Sorbent tube, 'Graphitised carbon universal', stainless steel, conditioned and capped, pk 10 <i>Suitable for pumped sampling of VOCs from C₂ to C₂₀</i>	C3-AAXX-5264
CapLok tool for capping and uncapping 1/4" brass storage caps	C-CPLOK
Focusing (cold) traps, 'Air toxics' <i>Compatible with the simultaneous analysis of analytes from C_{2/3} to C_{30/32}</i>	U-T15ATA-2S
Certified reference standard, 9-component TO-17 mix, 100 ng, pk 10 (plus certificate, chromatogram and shipping blank)	C-TO17100-10

The **EPA 325 starter kit** is perfect for TD users carrying out passive air sampling for benzene and other volatiles at refinery fencelines in compliance with US EPA Method 325. It contains:

Sorbent tube, 'EPA 325', inert-coated stainless steel, conditioned and capped, 2 × pk 10 <i>Suitable for passive sampling of VOCs from C₃ to C₈</i>	2 × C1-CAXX-5020
Diffusion cap, aluminium, 2 × pk 10	2 × C-DF010
Tube storage container, air-tight and non-emitting, for up to 15 conditioned/capped tubes, pk 2	C-325CT

Material emissions applications

Two starter kits cover the monitoring of emissions from construction/household materials and consumer goods.

Description	Part number
Material emissions starter kit	C-KITME01-2S
Direct desorption starter kit	C-KITDD-2S

The **Material emissions starter kit** is ideal for those carrying out routine in-house tests of product emissions in compliance with ISO 16000, ISO 12219 or equivalent ASTM standards. It contains:

Sorbent tube, Tenax TA, inert-coated stainless steel, conditioned and capped, pk 10 <i>Suitable for sampling VOCs from C₆ to C₃₀</i>	C1-CAXX-5003
Sorbent tube, 'Material emissions', stainless steel, conditioned and capped, pk 10 <i>Suitable for sampling VOCs from C₃ to C₄₀</i>	C3-AAXX-5304
CapLok tool for capping and uncapping 1/4" brass storage caps	C-CPLOK
Focusing (cold) traps, 'Material emissions' <i>Compatible with the simultaneous analysis of analytes from C₃ to C₃₂</i>	U-T12ME-2S
Quick-seal column connector, pk 10	C-QSC10

The **Direct desorption starter kit** is a cost-effective pack of consumables for measuring chemical content or emissions from small samples of materials, according to VDA 278 or equivalent methods. It contains:

Glass tube, empty, restricted, pk 10 <i>The restriction in this tube ensures that small samples are held centrally</i>	C0-NXXX-0000
Quartz wool, 10 g	C-QUTZW
Spring, torsion, for 4 mm i.d. glass tubes, pk 10	C-GTSP10
Focusing (cold) traps, 'General-purpose hydrophobic' <i>Compatible with the simultaneous analysis of analytes from C_{4/5} to C_{30/32}</i>	U-T2GPH-2S
CapLok tool for capping and uncapping 1/4" brass storage caps	C-CPLOK
Calibration Solution Loading Rig	C-CSLR
Sorbent tube, Tenax TA, stainless steel, conditioned and capped, 2 × pk 10 <i>Suitable for sampling VOCs from C₆ to C₃₀</i>	2 × C1-AAXX-5003

Product-specific starter kits

Markes International offers a range of product-specific kits as a cost-effective way of getting started with your application.

Description	Part number
Essential TubeTAG starter kit	C-TAGKT
HiSorb starter kit	C-HSPKIT
Starter kit for Micro-Chamber/Thermal Extractor, 6-chamber	C-MCTEKIT-120
Starter kit for Micro-Chamber/Thermal Extractor, 4-chamber	C-MCTEKIT-250

The **Essential TubeTAG starter kit** for regular or inert-coated stainless steel tubes comes with a convenient carry-case, and contains:



TAG ^{SCRIBE} read/write device for all TubeTAGs	C-SCRIBE
TubeTAG for stainless steel tubes, pk 10	C-TAG10
TubeTAG fixing/removal tool for stainless steel tubes	C-TAGTL
Cap, brass, 1/4" & PTFE ferrule (one standard, one tag-ready), pk 10 pairs, for 1/4" metal tubes	C-TCFP10
TAGLok tool for standard and TAG-ready 1/4" storage caps	C-TAGLOK

The **HiSorb starter kit**, for sorptive extraction of volatiles from liquids and solids, contains:



HiSorb probe assembly, stainless steel, standard length, pk 6	H1-XXAAC
Cap with HiSorb septum, for 10mL/20mL crimp-top vials, magnetic, pk 100	1 x C-HSPCCS
1 x Headspace vial, 20 mL, crimp-top, clear, round-bottomed, pk 100	1 x C-VCC20
HiSorb handle, for manual probe extraction	C-HSPH
HiSorb septum plug, pk 6	C-HSPVLP-6



To order any of Markes' kits, simply telephone or send an email.



Buy online at
www.markes.com/shop

The **starter kit for the 6-chamber Micro-Chamber/Thermal Extractor** (max. 120°C) contains:

Sorbent tube, Tenax TA, inert-coated stainless steel, conditioned and capped, pk 10 <i>Suitable for sampling VOCs from C₆ to C₃₀</i>	C1-CAXX-5003
CapLok tool	C-CPLOK
Insert for liquid standard introduction, PTFE, pk 6	M-TSTIN
Sample disc, 1.0 mm thickness, PTFE, pk 6	M-DSKPF
O-Ring, low-emission, size 010, 2 × pk 10	2 × U-COV10
O-Ring, micro-chamber pan seal, 2 × pk 6	2 × M-MCHOR
O-Ring insertion tool	SERZ-0285
Sample dish, aluminium, 20 mL, pk 100	M-MCAL20

The **starter kit for the 4-chamber Micro-Chamber/Thermal Extractor** (max. 250°C) contains:

Sorbent tube, Tenax TA, inert-coated stainless steel, conditioned and capped, pk 10 <i>Suitable for sampling VOCs from C₆ to C₃₀</i>	C1-CAXX-5003
CapLok tool	C-CPLOK
Insert for liquid standard introduction, PTFE, pk 6	M-TSTIN
Sample disc, 1.0 mm thickness, PTFE, pk 6	M-DSKPF
O-Ring, low-emission, size 010, 2 × pk 10	2 × U-COV10
O-Ring, micro-chamber pan seal, standard (for applications <200°C), 2 × pk 4	2 × M-MCHOR250
O-Ring, micro-chamber pan seal, ultra-high purity standard (for applications >200°C), pk 4	M-MCHOR250HT
O-Ring insertion tool	SERZ-0285
Sample dish, aluminium, 50 mL, pk 100	M-MCAL50

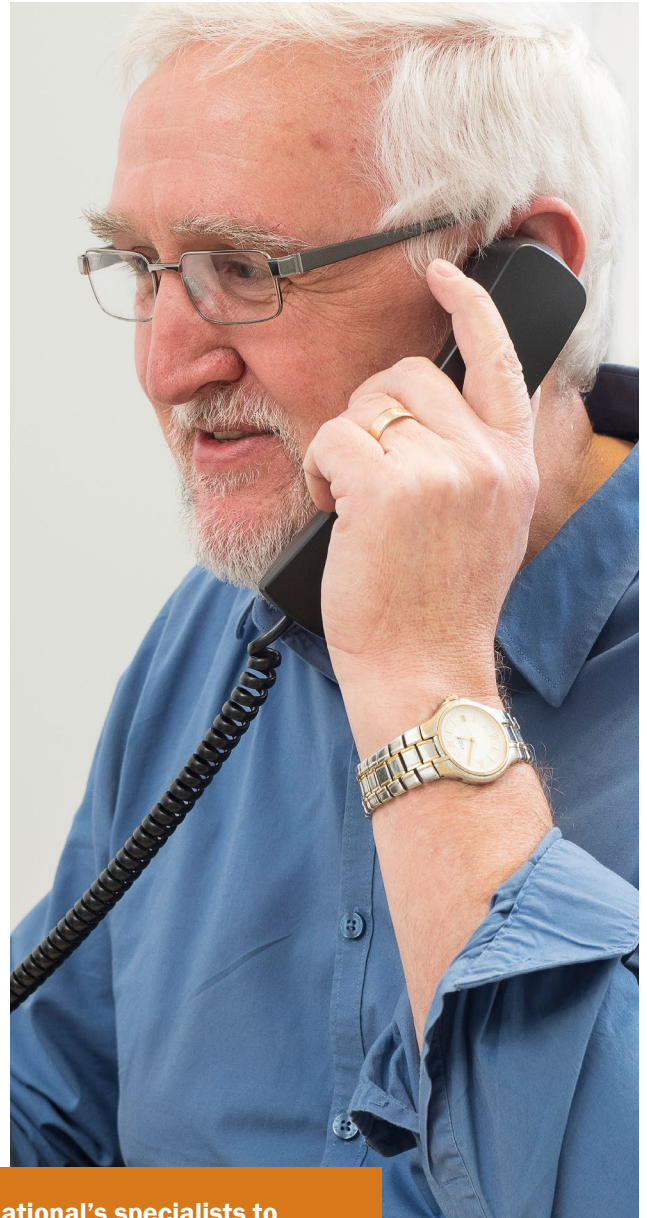


For examples of Markes' technology being used in real-world situations, download our Application Guides from www.markes.com.

Custom solutions

Over the years, Markes International has developed custom solutions for numerous TD users – from special-dimension DAAMS tubes to tailored TubeTAG data-input screens and multiple application-specific sampling accessories.

Whatever your requirements, Markes' specialists would be delighted to work with you to develop a custom solution precisely meeting your needs.



Talk to Markes International's specialists to discuss custom solutions for your application.

Instrument spares

Spares and accessories for all
Markes International's TD systems

Product highlights

- Single source for all Markes' instrument spares
- High-quality genuine Markes spares
- Routine maintenance kits to ensure ongoing high performance



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TD-100™ and TD100-xr™

Cryogen-free automated thermal desorbers

User-installable spares for all TD-100 and TD100-xr models.

Description	Part number
O-Ring, low-emission, size 006, pk 10	U-COV06
O-Ring, low-emission, size 007, pk 10	U-COV07
O-Ring, low-emission, size 010, pk 10	U-COV10
O-Ring, low-emission, size 010, pk 100	U-COV100
Ferrule, 1/16" × 0.4 mm graphite/Vespel®, pk 10 <i>Connects fused silica transfer line</i>	U-FV001
ULTRA 2/ULTRA-xr/TD-100/TD100-xr O-ring insertion tool	SERMTD-1382
Fused silica transfer line insert (0.25 mm i.d.) and PTFE sleeve (1.4 m)	SERUTD-5093
Fused silica transfer line insert (0.25 mm i.d.) and PTFE sleeve (2 m)	SERUTE-5099
Split filter tube, stainless steel, 3½", packed with charcoal	SERUTD-5065
Filter, disk, sintered PTFE, 5.1 mm section, pk 10	U-DISK1
Quick-seal column connector, pk 10 <i>Connects fused silica to column</i>	C-QSC10

UNITY™ 2 and UNITY-xr™

Cryogen-free single-tube thermal desorbers

User-installable spares for UNITY 2 and UNITY-xr models.

Description	Part number
O-Ring, low-emission, size 006, pk 10	U-COV06
O-Ring, low-emission, size 010, pk 10	U-COV10
O-Ring, low-emission, size 010, pk 100	U-COV100
O-Ring, low-emission, 5.92 mm i.d., pk 10	U-COV45
Split filter tube, stainless steel, 3½", packed with charcoal	SERUTD-5065
Split filter tube, glass, 3½", packed with charcoal (used for on-line systems)	SERAAA-1600
Split filter tube, glass, 4½", packed with charcoal	SERAAA-5167
Fused silica transfer line insert (0.25 mm i.d.) and PTFE sleeve (1.4 m)	SERUTD-5093
Fused silica transfer line insert (0.25 mm i.d.) and PTFE sleeve (2 m)	SERUTE-5099
Ferrule, 1/16" × 0.4 mm graphite/Vespel®, pk 10 <i>Connects fused silica transfer line</i>	U-FV001
Filter, disk, sintered PTFE, 5.1 mm section, pk 10	U-DISK1
Quick-seal column connector, pk 10 <i>Connects fused silica to column</i>	C-QSC10
UNITY 2 software CD (includes automation)	U-SW001-2S
UNITY 2 tube oven conversion kit, 3½" to 4½"	U-35TO45KT
UNITY 2 tube oven conversion kit, 4½" to 3½"	U-45TO35KT

ULTRA™ 2 and ULTRA-xr™

Autosamplers for UNITY thermal desorbers

User-installable spares for ULTRA 2 and ULTRA-xr models.

Description	Part number
Cap, DiffLok, stainless steel, ¼", pk 10	C-DL010
Cap, DiffLok, stainless steel, ¼", pk 100	C-DL100
Cap, DiffLok, inert, ¼", pk 10	C-DLS10
Cap, DiffLok, inert, ¼", pk 100	C-DL1S0
Cap, DiffLok, one stainless steel, one inert-coated, ¼", pk 10 pairs	C-DLP10
Cap, DiffLok, one stainless steel, one inert-coated, ¼", pk 100 pairs	C-DL1P0
Cap, DiffLok, stainless steel, 6 mm, pk 10	C-DL010-XZ
Cap, DiffLok, stainless steel, 6 mm, pk 100	C-DL100-XZ
Cap, DiffLok, inert, 6 mm, pk 10	C-DLS10-XZ
Cap, DiffLok, inert, 6 mm, pk 100	C-DL1S0-XZ
Cap, DiffLok, one stainless steel, one inert-coated, 6 mm, pk 10 pairs	C-DLP10-XZ
Cap, DiffLok, one stainless steel, one inert-coated, 6 mm, pk 100 pairs	C-DL1P0-XZ
O-Ring, low-emission, size 010, pk 10 (for ¼" DiffLok caps)	U-COV10
O-Ring, low-emission, size 010, pk 100 (for ¼" DiffLok caps)	U-COV100
O-Ring, low-emission, 5.92 mm i.d., pk 10 (for 6 mm DiffLok caps)	U-COV45
O-Ring, low-emission, size 007, pk 10 (ULTRA 2/ULTRA-xr tube receiver)	U-COV07
Label, ULTRA 2/ULTRA-xr tray, 4½", strip of 10, blue	SERMTD-1394BU
ULTRA 2/ULTRA-xr/TD-100/TD100-xr U-COV07 O-ring insertion tool	SERMTD-1382
TubeTAG read/write option for ULTRA 2/ULTRA-xr	U-TAGRW-2S



For more information on any of Markes International's products, download the brochures from www.markes.com.



Air Server™ 2 and Air Server-xr™

UNITY accessories for on-line air monitoring and canister analysis

User-installable spares for all Air Server and Air Server-xr models.

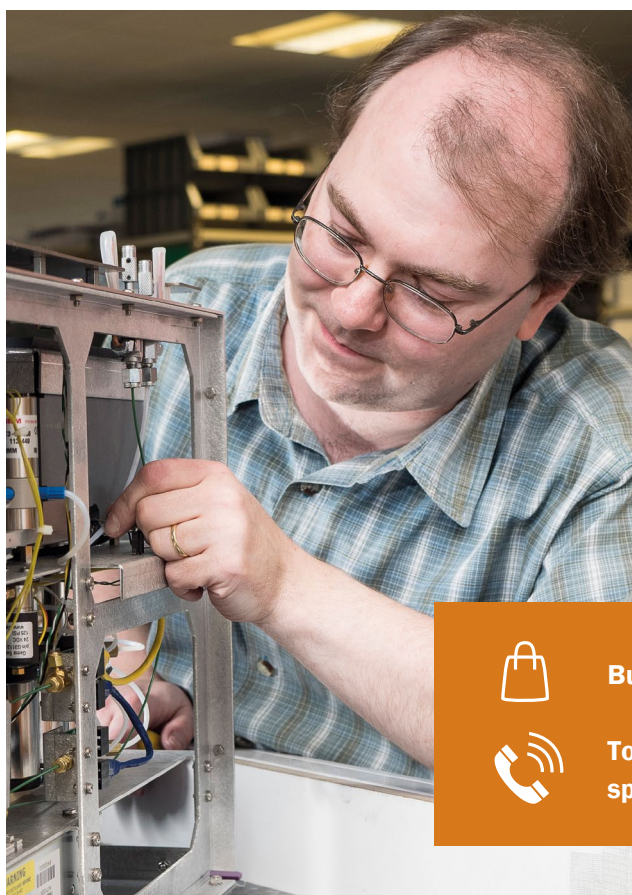
Description	Part number
Split filter tube, glass, 3½", packed with charcoal	SERAAA-1600
Tubing, PTFE, 1/8", 1 m	SERZ-0062
Sample transfer line (ASIS 8 only)	SERASU-5041
Pump, 100 V, for unpressurised samples	U-ASPM3
Pump, 115 V, for unpressurised samples	U-ASPM1
Pump, 230 V, for unpressurised samples	U-ASPM2
Filter, disk, sintered PTFE, 3.2 mm section, pk 10	U-DISK4
Dryer kit for Air Server 2/Air Server-xr	U-ASDRY
Connection kit, to connect Air Server 2/Air Server-xr and ULTRA 2/ULTRA-xr to the same UNITY 2/UNITY-xr, 3½"	U-UASK2-2S
Connection kit, to connect Air Server 2/Air Server-xr and ULTRA 2/ULTRA-xr to the same UNITY 2/UNITY-xr, 4½"	U-UASK2-XZ

CIA Advantage™

Cryogen-free autosampler for analysing air in canisters or bags

User-installable spares for all CIA Advantage models.

Description	Part number
Dryer kit for CIA Advantage	U-ASDRY
Humidifier, for humidification of purge gas	U-HUMID
Heated sample line (1.8 m length) for CIA Advantage-HL and CIA Advantage Satellite, pk 14	U-HTLNKT
Heated sample line (1.8 m length) for CIA Advantage-T, pk 14	U-HTLNKT-T
Filter, disk, sintered PTFE, 3.2 mm section, pk 10	U-DISK4
Pump, 100 V, for unpressurised samples	U-ASPM3
Pump, 115 V, for unpressurised samples	U-ASPM1
Pump, 230 V, for unpressurised samples	U-ASPM2
Split filter tube, glass, 3½", packed with charcoal	SERAAA-1600
Sample loop, 0.1 mL	SERZ-0993
Sample loop, 0.5 mL	SERZ-0994
Sample loop, 1 mL	SERZ-0516
Sample loop, 2 mL	SERZ-0995



Buy online at www.markes.com/shop



To order any of Markes International's instrument spares, simply telephone or send an email.

TT24-7™

Twin-trap thermal desorption system for continuous near-real-time monitoring

TT24-7 Series 1

In June 2013, TT24-7 Series 1 was discontinued. However, user-installable spares are still available from Markes International, as listed below.

Description	Part number
O-Ring, low-emission, size 006, pk 10	U-COV06
O-Ring, low-emission, size 007, pk 10	U-COV07
O-Ring, low-emission, size 010, pk 10	U-COV10
O-Ring, low-emission, 3.9 mm i.d., pk 10	U-COV39
Filter, disk, sintered PTFE, 5.1 mm section, pk 10	U-DISK1
Filter, disk, sintered PTFE, 6.5 mm section, pk 10	U-DISK3
Fused silica transfer line insert (0.25 mm i.d.) and PTFE sleeve	SERUTD-5093
Split filter tube, stainless steel, 3½", packed with charcoal	SERUTD-5065
Ferrule, 1/16" × 0.4 mm graphite/Vespel®, pk 10 <i>Connects fused silica transfer line</i>	U-FV001
Pump, 100 V, for unpressurised samples	U-ASPM3
Pump, 115 V, for unpressurised samples	U-ASPM1
Pump, 230 V, for unpressurised samples	U-ASPM2
Dual regulator pneumatics accessory <i>For dry gas and carrier gas regulation</i>	U-GAS01



Buy online at www.markes.com/shop



To order any of Markes International's instrument spares, simply telephone or send an email.

TT24-7 Series 2

Description	Part number
O-Ring, low-emission, size 007, pk 10	U-COV07
O-Ring, low-emission, size 010, pk 10	U-COV10
Filter, disk, sintered PTFE, 5.1 mm section, pk 10	U-DISK1
Filter, carbon, TT24-7 Series 2 air inlet	U-FLTRTT-C
Cup mesh for cold trap link, 6 mm	SERAAA-1603
Gauze filter, ¼", inert, sample inlet, TT24-7	SERTTD-1150
Fused silica transfer line insert (0.25 mm i.d.) and PTFE sleeve	SERUTD-5093
Split filter tube, stainless steel, 3½", packed with charcoal	SERUTD-5065
Split filter tube, glass, 4½", packed with charcoal	SERAAA-5167
Ferrule, 1/16" × 0.4 mm graphite/Vespel®, pk 10 <i>Connects fused silica transfer line</i>	U-FV001
Quick-seal column connector, pk 10	C-QSC10
Dryer kit for Air Server 2/Air Server-xr and CIA systems	U-ASDRY
Heated sample line, inert, 2 m	U-HSLTT
UNITY 2/UNITY-xr tube oven conversion kit, 3½" to 4½" <i>User-installable</i>	U-35TO45KT
Pump, 100 V, for unpressurised samples	U-ASPM3
Pump, 115 V, for unpressurised samples	U-ASPM1
Pump, 230 V, for unpressurised samples	U-ASPM2
Dual regulator pneumatics accessory <i>For dry gas and carrier gas regulation</i>	U-GAS01



For more information on any of Markes International's products, download the brochures from www.markes.com.

Routine maintenance kits

Routine maintenance kits contain sufficient spares (O-rings, PTFE filters, etc.) for approximately 12 months' use. Focusing traps will need to be purchased in addition to the kits required.

Description	Part number
Routine Maintenance Kit: tube based systems	RMK--0027
Routine Maintenance Kit: online and canister systems	RMK-0003-2S
Routine Maintenance Kit: TT24-7 series 1/2/ xr systems	RMK-0005
Routine Maintenance Kit: Kori-xr	RMK-0026
Routine Maintenance Kit: high temperature micro-chamber (250)	RMK-0006HT
Routine Maintenance Kit: low temperature micro-chamber (120)	RMK-0006
Routine Maintenance Kit: tube conditioner (TC-20)	RMK-0020

Suggested maintenance schedules

Suggested maintenance frequencies are given below. However, in some cases (depending on the application), items may need replacing more often.

TD-100 and TD100-xr

Condition/change charcoal filter (split tube)	3 months ¹
Replace focusing (cold) trap	12 months ¹
Replace fused silica transfer line	12 months
Change sample tube O-rings/ filters	12 months, or if damaged/ leaking
Focusing (cold) trap seals	12 months, or if damaged/ leaking
Replace O-rings in DiffLok caps	If damaged/leaking
Change nozzle seals	If damaged/leaking

1. Note that these parts may require changing more frequently in automated systems.

UNITY 2 and UNITY-xr

Condition/change charcoal filter (split tube)	3 months ¹
Replace/repack focusing (cold) trap	12 months ¹
Replace fused silica transfer line	12 months
Change sample tube O-rings/ filters	12 months, or if damaged/ leaking
Focusing (cold) trap seals	12 months, or if damaged/ leaking

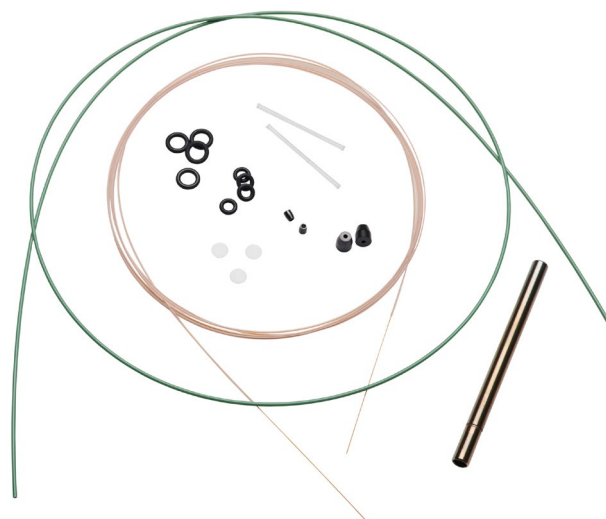
ULTRA 2 and ULTRA-xr

Replace O-rings in DiffLok caps	If damaged/leaking
Change nozzle seals	If damaged/leaking

Air Server 2, Air Server-xr and CIA Advantage

Replace filter disks	12 months
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i As well as routine maintenance procedures carried out by the user, Markes International's specialists strongly recommend that a routine maintenance service is carried out on your TD system, by a trained service engineer, at least once a year.





Laboratory accessories

A comprehensive range of accessories
for your laboratory

Product highlights

- Pneumatic control accessories specifically for Markes International's instruments
- Leak detectors, flowmeters and gas purifiers for quality assurance of gas flows
- Range of precision syringes for gas and liquid injections
- Consumables for capillary columns



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Pneumatic control accessories

Dual regulator pneumatics accessory

Markes International's high-quality dual regulator pneumatics accessory controls both carrier gas and dry gas flows, and is strongly recommended for all Markes' thermal desorbers.

It consists of a stainless steel regulator (0–60 psig) for control of the carrier gas, and a standard regulator (0–100 psig) for control of the dry gas. Both lines also have on/off toggle valves.



Description	Part number
Dual regulator pneumatics accessory For dry gas and carrier gas regulation	U-GAS01
Copper tubing	C-CUTUB-3M

Single regulator pneumatics accessory

The single regulator pneumatics accessory is recommended for:

- Controlling the purge gas supply on ULTRA-xr and TD100-xr autosamplers with internal standard functionality.
- Regulating the pressure of internal standard (IS) gas if no other appropriate regulation is supplied.
- Controlling the supply gas to the Micro-Chamber/Thermal Extractor, TC-20 and Calibration Standard Loading Rig.

It consists of a high-quality (stainless steel) regulator (0–60 psig) and an on/off toggle valve.



Description	Part number
Single regulator pneumatics accessory For carrier gas regulation	U-GAS03
Copper tubing	C-CUTUB-3M

Helium leak detector

This portable, highly sensitive helium leak detector for TD–GC systems provides the accurate, sensitive and rapid detection of carrier gas leaks that is essential for TD–GC troubleshooting.

Gas leaks are clearly indicated on the LED display, and it is powered by rechargeable batteries for ease of portability.

Full specifications for the helium leak detector can be found on our website.



Description	Part number
Helium leak detector, with USB charger	C-HLD

Flowmeter

With resolution of 0.1 mL/min, and accuracy typically better than $\pm 2.5\%$, this solid-state digital flowmeter offers outstanding performance for measuring TD gas.

It is compatible with eight gases: air, argon, argon–5% methane, carbon dioxide, helium, hydrogen, nitrogen and oxygen, in the range 0.1–500 mL/min.

Calibration is traceable to the UK National Physical Laboratory (NPL) standards, and an annual recalibration service (for helium, air and nitrogen) is offered on a return-to-factory basis.

Full specifications for the flowmeter can be found on our website.



Description	Part number
Digital flowmeter	C-FLMTR
Recalibration service for digital flowmeter (return to Markes)	C-FLCAL

Gas purifiers

The use of a carrier gas purifier is recommended with any analytical system to avoid contamination with hydrocarbons, oxygen or water.

Markes recommends a Helium purifier when utilising Bench-TOF, this removes O₂, H₂O, hydrocarbons, CO₂ and CO from helium, giving an output gas that is 99.99999% pure. The maximum flow capacity is 8 L/min, and the stated life is 13 standard cylinders (When the level in the incoming gas does not exceed 10 ppm) of 99.999% helium.

Description	Part number
Gas purifier, helium purifier, 1/8" fittings	C-HEPUR



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To order any of Markes International's laboratory accessories, simply telephone or send an email.

Syringes

Markes International offers two precision syringes for liquid injections.

The **1 µL plunger-in-needle liquid syringe** fitted with a repeating adaptor provides $\pm 2\%$ accuracy and reproducibility for injection volumes down to 0.1 µL.

The **5 µL plunger-in-barrel liquid syringe** provides $\pm 1\%$ accuracy and reproducibility for injection volumes between 1 and 5 µL.

Description	Part number
Syringe, 1 µL, plunger-in-needle with repeating adaptor, 50 mm needle length, 0.63 mm needle o.d.	C-SYL00-1UL
Syringe, 1 µL, replacement needle and plunger repair kit	C-SYLRP-1UL
Syringe, 5 µL, plunger-in-barrel fixed needle, 50 mm needle length, 0.47 mm needle o.d.	C-SYL00-5UL

Capillary column cutting tool

Used to cut the ends of fused silica tubing (e.g. transfer line insert or capillary columns) to ensure burr-free square ends, and reliable capillary–capillary connections.

Description	Part number
Fused silica column-cutting tool	C-FSCCT



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Fused silica column connectors

Single-use quick-seal **capillary column connectors** are supplied with every Markes International TD system, and are used to connect the fused silica transfer line insert to the GC capillary column inside the GC oven. They are suitable for most routine applications.



Reusable nut-and-ferrule **SilTite™ mini-unions** are recommended to make capillary–capillary connections for TD–GC systems incorporating an MS detector.



Description	Part number
Quick-seal column connector, pk 10	C-QSC10
SilTite mini-union, connects 0.25 mm fused silica transfer line to capillary column (up to 0.25 mm i.d.)	C-MU000
Ferrule, SilTite mini-union, 0.1–0.25 mm i.d. (columns up to 0.25 mm i.d.), pk 10	C-MUF25
Ferrule, SilTite mini-union, 0.32 mm i.d. (0.32 mm i.d. columns), pk 10	C-MUF32

Copper tubing and unions

This solvent-washed refrigeration-grade $\frac{1}{8}$ " copper tubing should be used to supply gases to TD–GC systems. It should not be brazed, and should only be connected using GC-compatible Swage-type unions.



Description	Part number
Copper tubing, 3 m	C-CUTUB-3M
Union, brass, $\frac{1}{8}$ ", T-shaped	SERZ-0104
Union, brass, $\frac{1}{8}$ "– $\frac{1}{8}$ "	SERZ-0026

Sorbents

Bulk sorbents from Markes – opening up a range of tube packing options

Product highlights

- Bulk sorbents for tube packing
- Popular Tenax® sorbents for routine applications
- Graphitised carbon blacks for trace-level applications
- Carbonised molecular sieves for highly volatile compounds
- Quartz and glass wools for very high-boiling and highly reactive compounds



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Porous polymers

Most porous polymer sorbents are inert, making them suitable for the analysis of labile and reactive compounds such as thiols and CS gas. In addition, their broadly hydrophobic nature allows them to be used for sampling in humid conditions.



Description	Part number
Sorbent, Tenax® TA (35/60), 10 g	C-TNXTA
Sorbent, Tenax TA (60/80), 10 g	C-TNXTA60
Sorbent, Tenax GR (35/60), 10 g	C-TNXGR
Sorbent, Tenax GR (60/80), 10 g	C-TNXGR60
Sorbent, PoraPak™ N (50/80), 20 g	C-2PPKN
Sorbent, PoraPak Q (50/80), 20 g	C-2PPKQ
Sorbent, HayeSep® D (60/80), 20 g	C-2HSPD

Graphitised carbon blacks

These are non-specific carbon sorbents, widely used for trace-level applications due to their minimal artefact levels. They vary from very weak to medium/strong, and are used for a wide range of VOCs and SVOCs.



Description	Part number
Sorbent, Carbograph™ 2TD (20/40), 10 g	C-CG220
Sorbent, Carbograph 2TD (40/60), 10 g	C-CG240
Sorbent, Carbograph 2TD (60/80), 10 g	C-CG260
Sorbent, Carbograph 1TD (20/40), 10 g	C-CG120
Sorbent, Carbograph 1TD (40/60), 10 g	C-CG140
Sorbent, Carbograph 1TD (60/80), 10 g	C-CG160
Sorbent, Carbograph 4TD (20/40), 10 g	C-CG420
Sorbent, Carbograph 5TD (20/40), 10 g	C-CG520
Sorbent, Carbograph 5TD (40/60), 10 g	C-CG540



Carbonised molecular sieves

Carbonised molecular sieves are the strongest sorbents and are used to trap the most volatile compounds.



Description	Part number
Sorbent, Carboxen™ 569 (60/80), 10 g	C-C569
Sorbent, SulfiCarb™ (40/70), 10 g	C-SLCRB
Sorbent, Carbosieve™ S-III (60/80), 10 g	C-CSIII
Sorbent, Carboxen 1003 (40/60), 10 g	C-C1003
Sorbent, Carboxen 1000 (60/80), 10 g	C-C1000

Zeolite molecular sieves

These are very selective hydrophilic sorbents used for specific TD applications.



Description	Part number
Sorbent, molecular sieve 5 Å, 20 g	C-MSV5A
Sorbent, molecular sieve 13X, 20 g	C-MS13X

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Confused about any aspect of sorbent selection or tube packing? Contact Markes International for expert advice.

Other sorbents

Other materials, such as quartz beads, quartz wool and glass wool, can be used in sorbent tubes and cold traps.



Description	Part number
Quartz bead, 1.5 mm, pk 100	C-QTZBD
Quartz wool, 10 g	C-QUTZW
Glass wool, silanised, 10 g	C-SILGW
Glass wool, unsilanised, 10 g	C-UNSGW
Sorbent, activated charcoal, 5 g	C-CHARC

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List of part numbers

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C0-FXXX-0000	10, 22	C2-CAXX-5138	9	C-CG240	64	C-HCPPG	61
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C2-AAXX-5342	8	C-BIO100	44	C-FP020-XZ	19	C-RFMST	61
C2-AXXX-5032	8	C-BTX100-10	37	C-FP200	19	C-SCRIBE	17, 50K
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C2-AXXX-5138	8	C-C1000	65	C-FSCCT	62	C-SLCAN1	30
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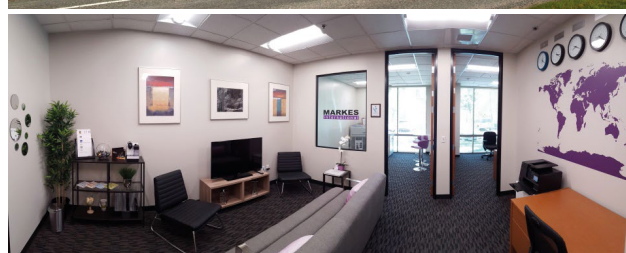
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