MARKES
international

Sampling supplies & consumables

2025

Markes International

Since 1997, Markes International has been at the forefront of innovation for enhancing the measurement of trace-level volatile and semi-volatile organic compounds (VOCs and SVOCs) by gas chromatography. Our range of products has for many years set the benchmark for quality and reliability, with lowered detection limits and versatile automation options greatly extending the application range of GC.

Our comprehensive portfolio of products includes long-established thermal desorption systems such as UNITY-xr and TD100-xr, as well as our Centri sample preparation and concentration platform, which also offers SPME, headspace and high-capacity sorptive extraction. These systems are complemented by a wide range of high-quality sorbent tubes, sampling accessories and laboratory supplies, which together maximise performance for the widest possible range of VOC/SVOC analyses.

Markes International is a company of Schauenburg Analytics, to which our sister company SepSolve Analytical also belongs. SepSolve Analytical provides analytical equipment for separation scientists, with a focus on providing state-of-the-art sample introduction, gas chromatography, mass spectrometry and data analysis platforms. Both Markes and SepSolve are headquartered in the UK, and we also have laboratory and demonstration facilities in the USA, Canada, Germany and China.

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Markes International

We're pleased to present our comprehensive range of supplies and consumables for thermal desorption and sample extraction, providing everything you need to support your work.

Whether you're developing a new application or working with an existing method, we can provide the sorbent tubes, focusing traps, tools and accessories to get you up and running quickly and efficiently.

You'll find new additions to our range, like the POD Sampler (p. 29) and Radiello ranges (p. 30), as well as bestselling products like our HiSorb probes (p. 46). We've added new vacuum-assisted extraction technology (p. 56) to our sampling accessories, and you can now also buy GC columns (p. 70) from us!

And you'll also find a range of instrument spares (p. 61) to help maximise the performance of your instrument and minimise downtime.

Easy ordering

It's easy to order from Markes – just phone, email, or use our convenient online shop. We accept payment by credit card or on account, or you can place your order through your local distributor.

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

We're here to help

Need some help with your order or finding the right products? Our experienced customer service team is here to help. We understand the challenges of demanding applications, and are committed to guiding you toward the most suitable products.

As the world's leading manufacturer of thermal desorption equipment, our team of experts is ready to offer support and advice.

The Markes International team

How to contact us

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![MARKES international]

Sorbent tubes

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

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enquiries@markes.com

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www.markes.com

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Quality-assured sorbent tubes

Backed up by fast and friendly service, our 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 ±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.

Always happy to discuss your requirements

As the world's leading manufacturer of TD equipment, we understand the demands of difficult applications, and we're uniquely well-placed to provide any help you may need – just contact us with any questions.

Barcode scanner for sorbent tubes

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

Product description	Product code
Barcode Scanner *(not to be sold into USA or Canada)*.	C-BCR
Barcode Scanner *(for USA or Canada)*	C-BCR-US

Sorbent tube labelling

Standard features

All our tubes are permanently labelled with a **unique ID number, in clear barcode ❶ and numerical formats ❷**, 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 ❸** indicating the direction of the air/gas sampling flow to aid field monitoring.
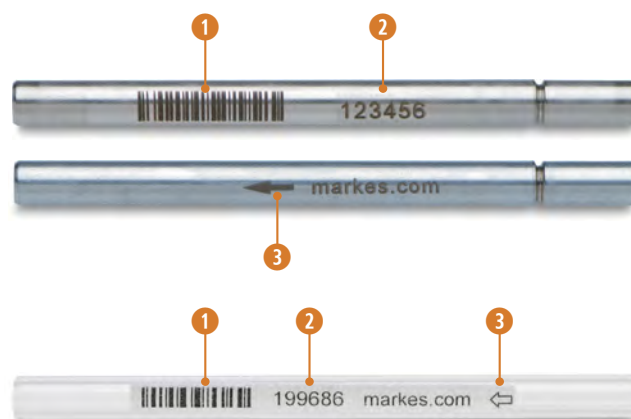
Special labelling options

You can specify up to 10 additional **alphanumeric characters ❹** to be etched on our stainless steel 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 ❺**, 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.

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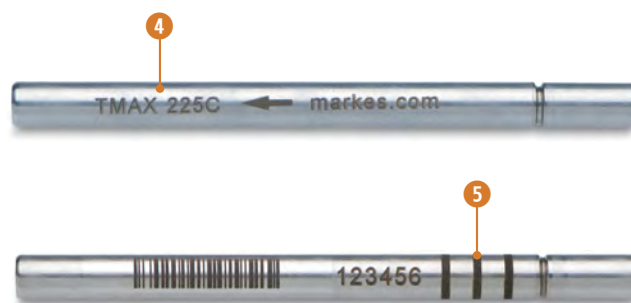
Compatible sampling techniques

The tubes listed on pages 8–11 have a wide variety of uses. For successful sampling and simplified workflows, ensure you have all the accessories you need.

Passive sampling

Passive sampling, also known as diffusive sampling, uses single-bed sorbent tubes, and is a convenient, quantitative and inexpensive option for fenceline monitoring and assessing personal exposure.

See pages 28 and 29 for accessories for passive sampling.

Active sampling

Active sampling onto sorbent tubes, also known as pumped sampling, is a versatile option for simultaneous monitoring of multiple target compounds, especially in unknown atmospheres. All our tubes are compatible with pumped sampling.

See pages 32 and 33 for our ACTI-VOC Plus and Easy-VOC pumps.

Dynamic headspace sampling

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

See page 48 for details of our Micro-Chamber/ Thermal Extractor.

Sorptive extraction

Manual sorptive extraction uses empty TD tubes as carrier tubes for desorption of high-capacity HiSorb probes. This approach is ideal for the aroma profiling of foods, beverages and fragranced goods.

See page 46 for details of our HiSorb probes and accessories.

Direct desorption

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

See page 21 for more information.

Need a customised sorbent tube? Contact us to discuss options for sorbent mixes, bed lengths or mesh sizes.

Stainless steel tubes

All our 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.

Our 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.

Our most popular stainless steel tubes

| Product description (all packs of 10)	Analyte range	Product code	
		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
'PFAS'	C_3–C_{40}	C3-AXXX-5424	C3-AAXX-5424
'PFAS Extended volume'	C_3–C_{40}	C3-AXXX-5426	C3-AAXX-5426
Empty	—	C0-AXXX-0000	—

Application-specific tubes
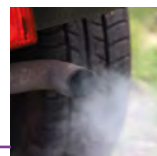
PAHs in air: Using large sample volumes and an optimised analytical protocol, this sorbent tube can be used to monitor polycyclic aromatic hydrocarbons at ppt levels.

Bio-monitoring: Packed with two hydrophobic sorbents to trap the widest possible range of vapour-phase organics, this tube is ideal for breath monitoring projects in the research or 'biomarker discovery' phase.

Material emissions/Indoor air: Complying with ISO 16000-6 for simultaneous monitoring of VVOCs, VOCs and SVOCs, this tube is well-suited for monitoring indoor air quality and for testing emissions from products and materials.
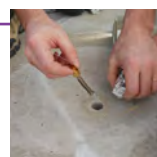
Soil gas/Vapour intrusion: This tube, packed with the best sorbents for monitoring underground contamination and vapour intrusion, is compatible with everything from C_4 hydrocarbons to middle-distillate fuels, as well as high-humidity air.

PFAS & PFAS Extended volume: These sorbent tubes are optimised for the analysis of per- and polyfluoroalkylated substances (PFAS) in ambient and indoor air, and from materials.

Sorptive extraction and direct desorption: Empty tubes are ideal for manual sorptive extraction using HiSorb probes (see page 46), as well as for direct desorption of small samples of materials (see page 21).

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Inert-coated stainless steel tubes

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.

Our 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.

## Our most popular inert-coated stainless steel tubes

Product description (all packs of 10)	Analyte range	Product code	
		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	—

Application-specific tubes

US EPA Method 325:
We offer both tube types referenced for monitoring fugitive emissions at refinery fencelines (specifically, BTEX and butadiene), and we're happy to advise on which option would work best for you.
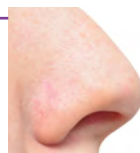
Monitoring odours:
These tubes are packed with a carefully optimised combination of weak and strong inert sorbents, making them perfect for profiling a wide range of compounds, including reactive sulfur species.

Custom tubes

Can't find the right tube for your application? Talk to us about custom-packed single-sorbent or multi-bed tubes specifically configured to suit your requirements. Further options include custom laser-etching, banding and RFID-tagging (TubeTAG).

To discuss your application with our team, contact enquiries@markes.com.

Glass tubes

Our 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.

Our most popular glass tubes

Product description (all packs of 10)	Analyte range	Product code	
		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
'PFAS'	C_3–C_{40}	C3-BXXX-5423	C3-BAXX-5423
Empty, restricted	—	C0-BXXX-0000	—
Empty, restricted *Suitable for direct desorption*	—	C0-NXXX-0000	—
Empty, unrestricted	—	C0-FXXX-0000	—

Application-specific tubes

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.

Diffusion-locking 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.

Our most popular SafeLok tubes

Product description (all packs of 10)	Analyte range	Product code	
		Unconditioned, without caps	Conditioned and capped
Stainless steel			
Tenax TA	C_6–C_{30}	C1-DXXX-5003	C1-DAXX-5003
'Universal'	$C_{2/3}$–C_{30}	C1-DXXX-5266	C1-DAXX-5266
Inert-coated stainless steel			
Tenax TA	C_6–C_{30}	C1-EXXX-5003	C1-EAXX-5003
'Universal'	$C_{2/3}$–C_{30}	C3-EXXX-5266	C3-EAXX-5266

Application-specific tubes

Monitoring unknown atmospheres: A combination of weak, medium and strong sorbents allows screening of VOCs and SVOCs in uncharacterised samples, with minimal water retention. SafeLok technology makes these tubes highly resistant to chemical losses or contamination.

DAAMS tubes

DAAMS tubes, with dimensions of 6 mm × 4½″ or ¼″ × 3½″, are packed by our skilled staff 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.
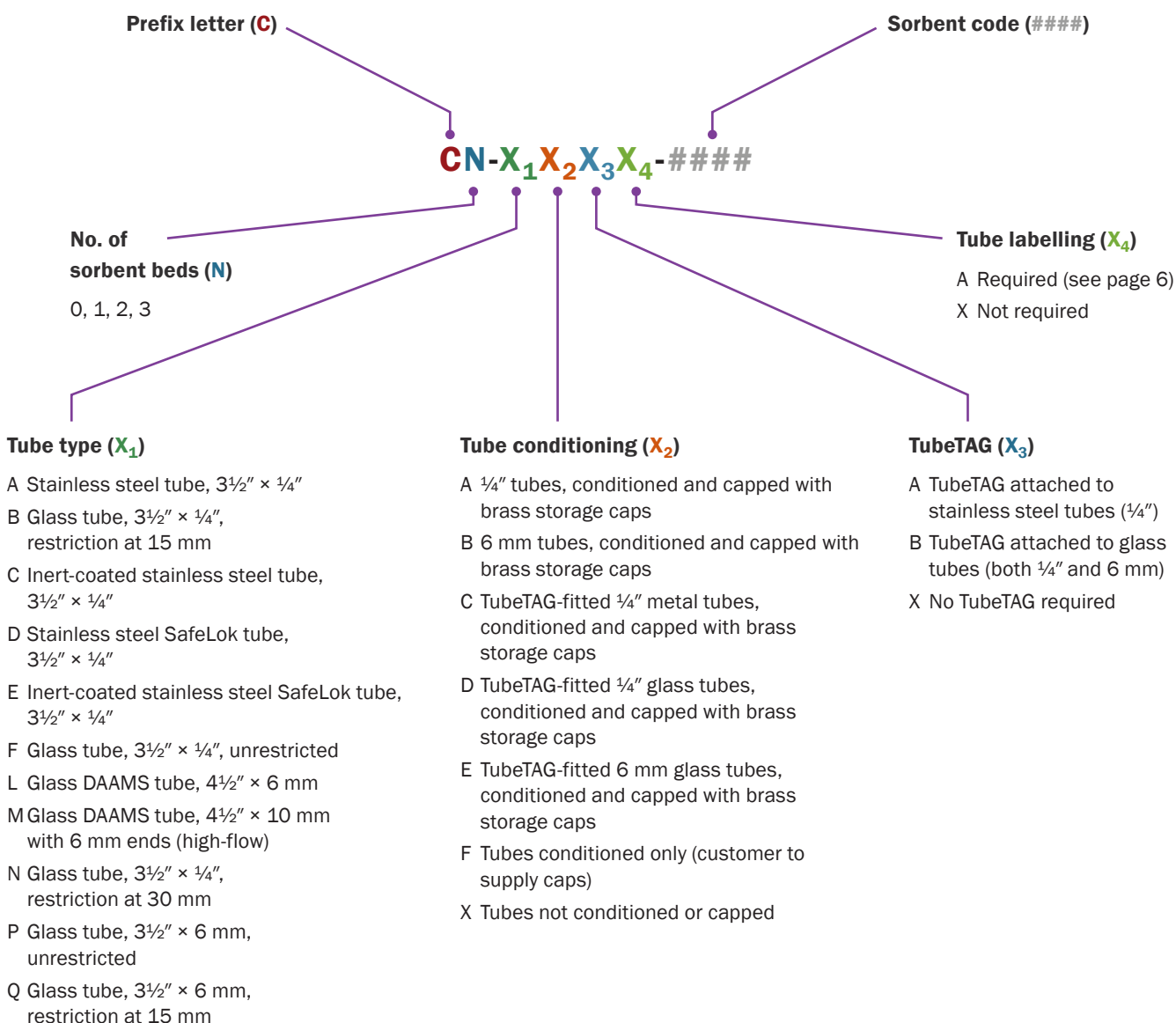
Our most popular DAAMS tubes

Product description (all packs of 10, unconditioned and without caps)	Product code	
	6 mm × 4½″	¼″ × 3½″
Glass		
Empty	C0-LXXX-0000	C0-BXXX-0000
Tenax TA *Suitable for most of the 'G' agents, HD, VX and 'Russian VX', amongst others*	C1-LXXX-7001	C1-BXXX-5039
HayeSep D *Suitable for the 'G' analogue of VX*	C1-LXXX-7003	C1-BXXX-5170
Inert-coated stainless steel		
Empty	C1-VXXX-0000	C0-CXXX-0000
Tenax TA *Suitable for most of the 'G' agents, HD, VX and 'Russian VX', amongst others*	C1-VXXX-7010	C1-AXXX-5003
HayeSep D *Suitable for the 'G' analogue of VX*	C1-VXXX-7012	C1-AXXX-5153

Tube configurator

Whatever combination of tube type and sorbent(s) you need, this tube configurator will help you construct the correct part number.

Alternatively, let our thermal desorption specialists help you configure a bespoke sorbent tube for your application – contact enquiries@markes.com.

Part numbers should be constructed using the following format, using the letters/numbers defined below:

Prefix letter (C)

Sorbent code (####)

$$CN\text{-}X_1X_2X_3X_4\text{-}####$$

No. of sorbent beds (N)

0, 1, 2, 3

Tube labelling (X_4)

A Required (see page 6)
X Not required

Tube type (X_1)

A Stainless steel tube, 3½″ × ¼″

B Glass tube, 3½″ × ¼″, restriction at 15 mm

C Inert-coated stainless steel tube, 3½″ × ¼″

D Stainless steel SafeLok tube, 3½″ × ¼″

E Inert-coated stainless steel SafeLok tube, 3½″ × ¼″

F Glass tube, 3½″ × ¼″, unrestricted

L Glass DAAMS tube, 4½″ × 6 mm

M Glass DAAMS tube, 4½″ × 10 mm with 6 mm ends (high-flow)

N Glass tube, 3½″ × ¼″, restriction at 30 mm

P Glass tube, 3½″ × 6 mm, unrestricted

Q Glass tube, 3½″ × 6 mm, restriction at 15 mm

Tube conditioning (X_2)

A ¼″ tubes, conditioned and capped with brass storage caps

B 6 mm tubes, conditioned and capped with brass storage caps

C TubeTAG-fitted ¼″ metal tubes, conditioned and capped with brass storage caps

D TubeTAG-fitted ¼″ glass tubes, conditioned and capped with brass storage caps

E TubeTAG-fitted 6 mm glass tubes, conditioned and capped with brass storage caps

F Tubes conditioned only (customer to supply caps)

X Tubes not conditioned or capped

TubeTAG (X_3)

A TubeTAG attached to stainless steel tubes (¼″)

B TubeTAG attached to glass tubes (both ¼″ and 6 mm)

X No TubeTAG required

TD Mini-tubes

Our 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.

TD Mini-tubes are provided in packs of five, and packed with either Tenax® TA or Tenax® GR. Alternatively, if you prefer to pack them yourself, they can be supplied empty. They can be fitted with long-term storage brass caps, or can be provided uncapped.
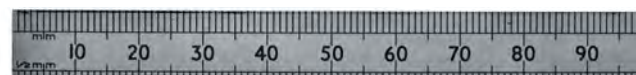
TD Mini-tube:
60 mm (2.36") × 6 mm (0.24") o.d. with 4 mm (0.16") i.d.

Industry-standard glass tube:
89 mm (3½") × 6.4 mm (¼") o.d. with 5 mm (0.20") i.d.

Product description	Product code
TD Mini-tubes, 60 mm × 6 mm, Tenax TA 35/60, without caps, pk 5	C1-TXX-5386
TD Mini-tubes, 60 mm × 6 mm, Tenax TA 35/60, with caps, pk 5	C1-TGX-5386
TD Mini-tubes, 60 mm × 6 mm, Tenax GR, without caps, pk 5	C1-TXX-5402
TD Mini-tubes, 60 mm × 6 mm, Tenax GR, with caps, pk 5	C1-TGX-5402
TD Mini-tubes, 60 mm x 6 mm, empty, pk 5	C0-TXX-0000

Contact us today to talk about any aspect of tube-based sampling

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MARKES
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Caps and tube accessories

Everyday tools for enhanced tube sampling

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Long-term storage caps

Our 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 (¼″ or 6 mm i.d. as required).

Product description	Product code
Standard ¼″ brass and aluminium long-term storage caps for industry-standard tubes (stainless steel or glass)	
Cap, storage, brass, ¼″ & PTFE ferrule, pk 10	C-CF010
Cap, storage, brass, ¼″ & PTFE ferrule, pk 20	C-CF020
Cap, storage, brass, ¼″ & PTFE ferrule, pk 100	C-CF100
Cap, storage, brass, ¼″ & PTFE ferrule, pk 200	C-CF200
Cap, storage, aluminium, ¼″ & PTFE ferrule, pk 20	C-CFA20
Cap, storage, aluminium, ¼″ & PTFE ferrule, pk 200	C-CFA200
Ferrule, ¼″, combined PTFE, pk 20	C-FP020
Ferrule, ¼″, 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

CapLok™ tool

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.

Product description	Product code
CapLok tool pk 1	C-CPLOK
CapLok tool, pk 10	C-10LOK

ℹ️ **For details of TAGLok (an equivalent tool for tag-adapted storage caps), see page 19.**

Watch our video describing how to use the CapLok tool

Diffusion-locking 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.
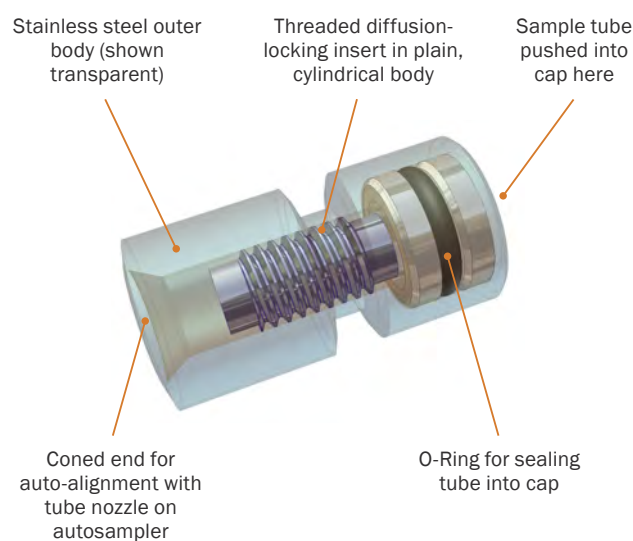
Unique to Markes, DiffLok caps simply push on to the ends of tubes and ensure reproducible results during analysis on the ULTRA-xr, TD100-xr and Centri 360 autosamplers.

DiffLok caps are available for ¼″ and 6 mm o.d. tubes, and are available in stainless and inert-coated steel.

Product description	Product code
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), ¼″, pk 10 pairs	C-DLP10
Cap, DiffLok (one stainless steel, one inert), ¼″, 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 ¼″ DiffLok caps)	U-COV10
O-Ring, low-emission, pk 100 (replacements for ¼″ 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

Watch our video describing how to remove and replace DiffLok cap O-rings

Inert-coated DiffLok caps ensure sample security when analysing tubes on a TD autosampler.

Stainless steel outer body (shown transparent)

Threaded diffusion-locking insert in plain, cylindrical body

Sample tube pushed into cap here

Coned end for auto-alignment with tube nozzle on autosampler

O-Ring for sealing tube into cap

DiffLok caps contain a threaded insert that provides a long path length to limit diffusive artefact ingress or sample loss.

DiffLok-capped sorbent tubes fit snugly into the tube trays of our TD autosamplers.

Tube tracking

TubeTAG™

Offering total peace-of-mind, our 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 our entire range of TD systems, and TubeTAGs are easily fitted to your existing tube stock.

Essential TubeTAG starter kit

This kit, for regular or inert-coated stainless steel tubes comes with a convenient carry-case.

The kit 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, ¼″ & PTFE ferrule (one standard, one tag-ready), pk 10 pairs, for ¼″ metal tubes	C-TCFP10
TAGLok tool for standard and TAG-ready ¼″ storage caps	C-TAGLOK

Product description	Product code
Essential TubeTAG starter kit	C-TAGKT

TAG*SCRIBE* ™ data entry

Our 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.

Product description	Product code
TAG*SCRIBE* read/write device for all TubeTAGs	C-SCRIBE

Watch our video describing how to fit TubeTAG to a sorbent tube

Watch our video describing how to use TubeTAG to track sorbent tubes during sampling

Packs of tags for fitting to sorbent tubes

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

Product description	Product code
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.

Product description	Product code
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 ¼″ storage caps	C-TAGLOK

TubeTAG-compatible storage caps

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

Product description	Product code
Tag-ready ¼″ brass long-term storage caps for industry-standard stainless steel tubes	
Cap, brass, ¼″ & PTFE ferrule, tag-ready, pk 10, for ¼″ metal tubes	C-TCF10
Cap, brass, ¼″ & PTFE ferrule, tag-ready, pk 100, for ¼″ metal tubes	C-TCF100
Tag-ready ¼″ or 6 mm brass long-term storage caps for glass tube	
Cap, brass, ¼″ & blind PTFE ferrule, tag-ready, pk 10, for ¼″ glass tubes	C-T4GCF10
Cap, brass, ¼″ & blind PTFE ferrule, tag-ready, pk 100, for ¼″ 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 ¼″ tagged tubes	
Cap, brass, ¼″ & PTFE ferrule (one standard, one tag-ready), pk 10 pairs, for ¼″ metal tubes	C-TCFP10
Cap, brass, ¼″ & PTFE ferrule (one standard, one tag-ready), pk 100 pairs, for ¼″ metal tubes	C-TCFP100

Watch our video describing how to use TubeTAG to track sorbent tubes during analysis

Gauzes and springs

Sorbent-retaining gauzes

Our 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.
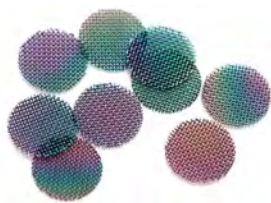
Product description	Product code
Sorbent-retaining gauze, pk 20	C-GZ020
Sorbent-retaining gauze, pk 200	C-GZ200
Sorbent-retaining gauze, pk 2000	C-GZ2000
Sorbent-retaining gauze, inert, pk 10	C-GZI10
Sorbent-retaining gauze, inert, pk 100	C-GZI100

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.

Product description	Product code
Gauze-retaining spring, pk 10	C-SP010
Gauze-retaining spring, pk 100	C-SP100

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.

Product description	Product code
TubeMate tool	C-TBMTE

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.
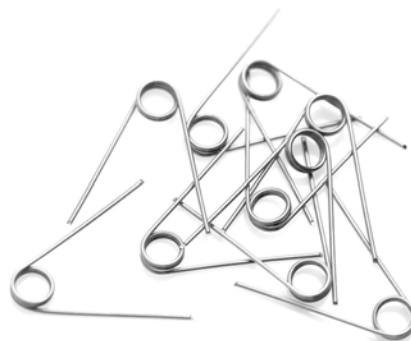
Product description	Product code
Spring, torsion, for 4 mm i.d. glass tubes, pk 10	C-GTSP10

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.

Product description	Product code
Union, ¼"–¼", stainless steel & ¼" PTFE ferrule, pk 10	C-UNS10
Union, ¼"–¼", stainless steel & ¼" PTFE ferrule, pk 100	C-UNS100

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.

Product description	Product code
Glass tube, empty, restricted, pk 10 *The restriction in this tube ensures that small samples are held centrally*	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 our cost-effective Direct desorption starter kit, see page 59.**

Quartz wool

Sample

Optional PTFE sleeve
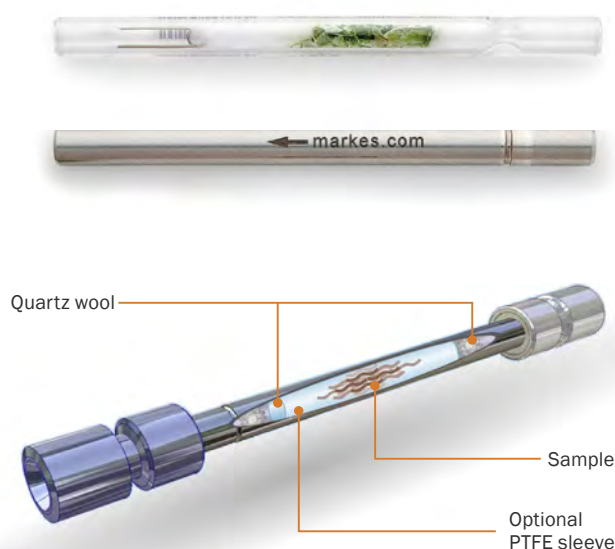
Watch our video describing how to pack a sorbent tube for direct desorption

🔊 **Need help with tube accessories? Talk to our team today**

---

1. Liners are suitable for stainless steel tubes only.

Tube conditioning and dry-purging

Our 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.

Product description	Product code
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 our RFID TubeTAGs (see page 18) 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.

Product description	Product code
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

Watch our video describing how to condition sorbent tubes with the TC-20

Watch our video describing how to change the filter on the TC-20

MARKES
international

Focusing traps

The heart of every TD instrument

Contact Markes International for expert advice

Email
enquiries@markes.com

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www.markes.com

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USA: +1 866-483-5684 (toll-free)
Germany: +49 (0)69 6681089-10
P.R. China: +86 21 5465 1216

Focusing traps

Focusing traps (also known as cold traps) are at the heart of all our thermal desorption instruments, and are vital for preconcentrating the analytes and so achieving maximum sensitivity.

Our focusing traps are constructed of quartz for optimum inertness, and packed with a sorbent bed up to 60 mm long, comprising a series of sorbents, arranged in order of increasing strength from the sampling end.

The following focusing traps are suitable for:

- UNITY series 2 and UNITY-xr
- TD-100 and TD100-xr
- 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-packed [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 Sulfide (H_2S)	U-T14H2S-2S
Air Toxics Analyser	U-T15ATA-2S
Greenhouse 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
Ethylene Oxide	U-T23ETO-2S
PFAS	U-T24PFAS-2S
Ozone Depleting Substances (ODS)	U-T25ODS-2S
Trace TO-15	U-TO15-KXR
EPA HJ 759	U-HJ759-KXR

The following focusing traps are suitable for:

- TT24-7 and TT24-7xr
  (Note that two traps are 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-11OP
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

The following focusing trap is suitable for:

- Kori-xr.

Description	Part number
Empty	U-T1KORI

---

1. Please call us to discuss your requirements for custom-packed cold traps before ordering.

THERMAL DESORPTION WITHOUT COMPROMISE
VALVE + FOCUSING TRAP = THE WINNING COMBINATION

The proprietary heated valve inside Markes' thermal desorption (TD) instruments was designed specifically for analytical TD and has proven its exceptional reliability and performance in thousands of TD installations.

Together, the valve and trap confer the following features and benefits:

2 COST SAVING

3 VERSATILITY

1 SAMPLE SECURITY

4 TIME SAVING

8 RELIABILITY

The 'valve + trap' combination delivers

5 WIDER SAMPLE RANGE $C_2 - C_{44}$

7 HIGH DATA QUALITY

6 PRECISION
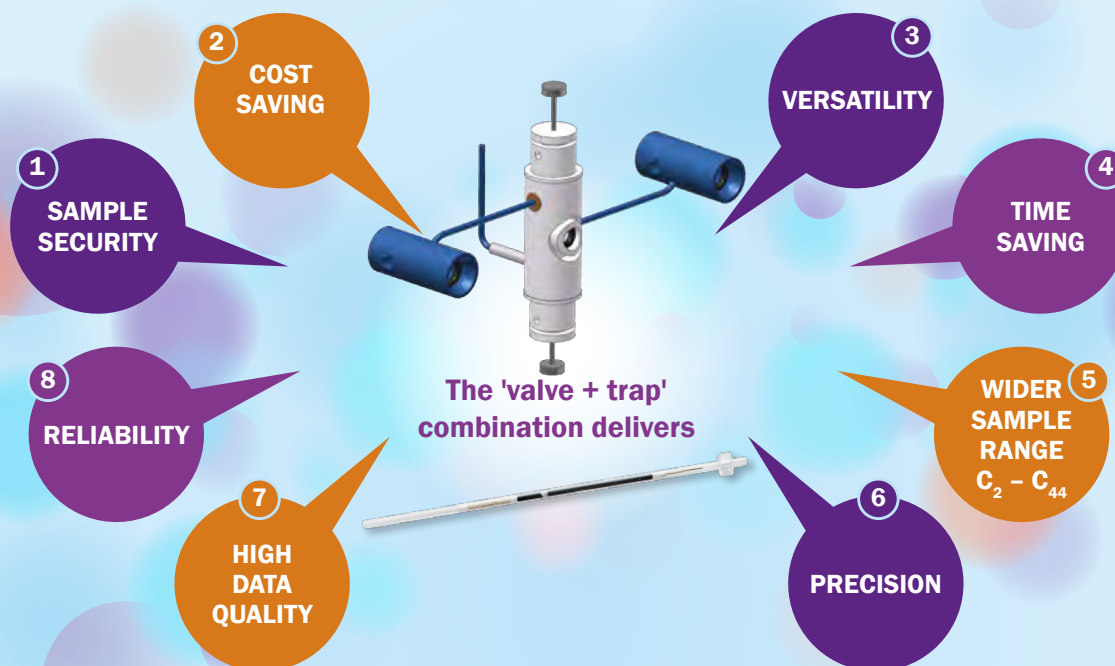
All Markes International's TD instruments, such as our flagship TD100-xr™ and scalable UNITY-xr™ and systems, use the power of trap-based focusing to concentrate samples into the small volumes needed to ensure highly sensitive GC–MS analysis.

ANALYTICAL CAPABILITY	MARKES' TD SYSTEMS	NON-MARKES TD SYSTEMS	
		ROTARY VALVE	FORWARD FLOW
1 Re-collection – Splitting the sample flow during both the inlet and outlet desorption stages and collecting the unanalysed portion onto a clean sorbent tube overcomes the 'one-shot' drawback of older TD systems and allows your valuable samples to be secured and quantitively re-analysed.	✔	✘	✘
2 Cryogen-free operation – The electrically-operated Peltier cooler is used to reduce the focusing trap temperature. These have far lower running costs than complicated and high-maintenance liquid cryogen systems.	✔	✔	✘
3 Automated switching between sample types – It's easy to sequence between tubes, canisters, and on-line samples on a single TD–GC instrument. Laboratories then have the option to perform comprehensive VOC and SVOC analyses.	✔	✘	✘
4 Overlap mode – This enables your sample to be prepared on the focusing trap whilst your previous sample is still being run on the gas chromatograph.	✔	✔	✘
5 Backflushing – Trap desorption in the reverse direction enables use of multiple sorbent beds, expanding the range of compounds that can be preconcentrated and analysed from a single sample.	✔	✔	✘
6 Internal standard addition – Automated addition of an internal standard to the focusing trap, or to a tube, during analysis enhances the quality of your data.	✔	✔	✘
7 Leak testing – Automatic leak tests carried out before analysis of each sample ensure confidence in your data quality.	✔	✔	✘
8 Dry-purge or pre-purge – These steps automatically remove water and air from the sample before analysis, avoiding the risk of interference in the gas chromatograph, and extending the lifetimes of your column and detector.	✔	✔	✘

MARKES
international

Custom traps

Can't find the right trap for your application?

We offer focusing traps ready-made for a number of applications, such as PFAS, chemical weapons, air toxics, and ozone precursors. However, if you don't see what you're looking for, we can create a custom trap optimised for your application.

To discuss your application with our team, contact enquiries@markes.com.

Tube & trap bundles

Our bundles for analysis of polyfluorinated alkylated substances (PFAS) contain two packs of PFAS tubes and an optimised PFAS focusing trap.

Description	Part number
PFAS tube & trap bundle, conditioned, with caps	C-PFASBUNDLE-COND
PFAS tube & trap bundle, unconditioned, without caps	C-PFASBUNDLE
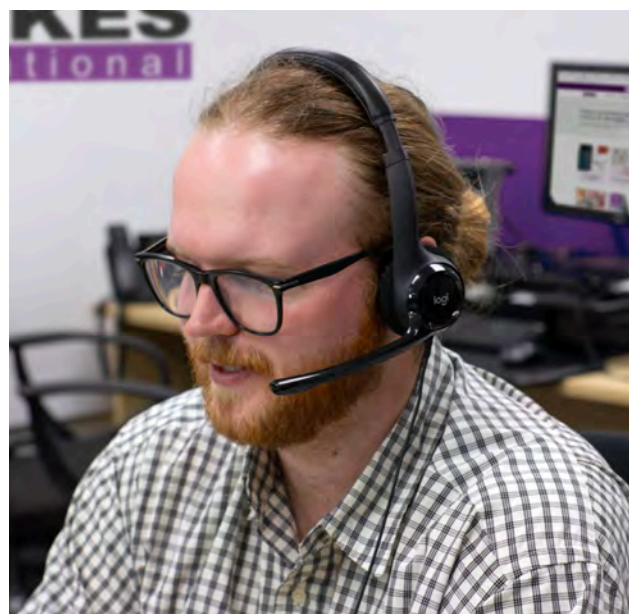
Traps, tubes and more – our skilled team is ready to help you

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Tube-based air sampling

Versatile accessories for passive and active
air sampling using sorbent tubes

Contact Markes International for expert advice

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Germany: +49 (0)69 6681089-10
P.R. China: +86 21 5465 1216

Diffusive sampling: Axial

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

Our 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, we can also etch each diffusion cap with a unique serial number.

Product description	Product code
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.

Product description	Product code
Penclip, pk 10	C-CL010
Penclip, pk 100	C-CL100

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. We provide 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.

The **325 Field Station™** 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 our TubeTAG system (see page 18).

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.

Product description	Product code
325 Field Station	C-325FS
325 Sun Shield	C-325SUN
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

Diffusive sampling: Radial

Compared with conventional (axial) samplers, radial samplers have a larger diffusive surface area of adsorption and a shorter diffusive pathway. This results in faster uptake rates, enabling shorter sampling times or increased sensitivity.

POD Sampler

The POD Sampler (POcket Diffusive Sampler) is a lightweight, compact radial diffusive air sampler for personal and environmental monitoring of air, which is compatible with analysis by thermal desoprtion.

NEW

Developed in partnership with pioneers in radial sampling at the European Commission's Joint Research Centre at Ispra, Italy (the European reference laboratory for air pollution), the POD Sampler's design results in exceptional performance.

The POD Sampler is:

- Robust and easy to use
- Suitable for a wide range of common volatile organic air pollutants (C_4–C_9)
- Ideal for short-term diffusive sampling of low atmospheric concentrations
- Less suspectible to environmental variables than other passive samplers (in terms of sampling rates)
- Reusable – it can be conditioned and cleaned for reuse multiple times
- Compatible with all commercial TD systems.

Product description	Product code
POD Starter Kit: Carbopack X *Includes 1 × POD sampler, 2 × cartridges and 1 × support plate with clip*	C-POD-KIT01
Cartridge, Carbopack X, pk 10	C-POD-1XX
POD Sampler, pk 10	C-POD-S010
POD Support Plate, with clip, pk 10	C-POD-SP10
POD Support Plate, with clip, pk 100	C-POD-S1P0
Spare Diffusive Body, for POD Sampler, pk 10	C-POD-B010
Spare Support Body, for POD Sampler, pk 10	C-POD-H010
Spare Cover, for POD Sampler, pk 10	C-POD-C010
Spare O-Ring, brown, for POD Sampler (diffusive body), pk 20	U-COV1517
Spare O-Ring, black, for POD Sampler (support body), pk 10	U-COV1516

Watch our video describing how to use the POD Sampler for passive air sampling

Radiello® sampler

Radiello® is a long-established radial diffusive (passive) sampling device for volatile organic compounds (VOCs), used for indoor, outdoor, workplace, and personal monitoring.

The diffusive body can be fitted to the supporting plate in either a vertical or horizontal position. Starter kits are available that include both the cartridge and appropriate diffusive body, along with a support plate and adapter, plus a blank cartridge as a shipment blank.

Product description	Product code
Starter kits	
Radiello Starter kit: BTEX & VOCs (TD)	C-RAD141S
Radiello Starter kit: BTEX & VOCs (TD)	C-RAD145S
Radiello Starter kit: BTEX & VOCs (CS$_2$)	C-RAD130S
Radiello Starter kit: H$_2$S	C-RAD170S
Ready-to-use samplers	
Radiello, ready-to-use, BTEX & VOCs (TD), pk 5	C-RAD1232
Radiello, ready-to-use, BTEX & VOCs (CS$_2$), pk 5	C-RAD1231
Radiello, ready-to-use, H$_2$S, pk 5	C-RAD1236
Radiello, ready-to-use, HCl, pk 5	C-RAD1238
Radiello, ready-to-use, NH$_3$, pk 5	C-RAD1237
Radiello, ready-to-use, NO$_2$, SO$_2$ & HF, pk 5	C-RAD1233
Radiello, ready-to-use, O$_3$, pk 5	C-RAD1235
Radiello, ready-to-use, aldehydes, pk 5	C-RAD1234
Cartridges & diffusive bodies	
Radiello cartridge, Carbopack X, pk 20	C-RAD141
Radiello cartridge, Carbograph™ 4, pk 20	C-RAD145
Radiello cartridge, Tenax TA, pk 20	C-RAD147
Radiello cartridge, 2,4-DNPH-coated florisil, pk 20	C-RAD165
Radiello cartridge, Activated charcoal, pk 20	C-RAD130
Radiello cartridge, Microporous PE coated with wet TEA, pk 20	C-RAD166
Radiello cartridge, Microporous PE impregnated with phosphoric acid, pk 20	C-RAD168
Radiello cartridge, Microporous PE impregnated with zinc acetate, pk 20	C-RAD170
Radiello cartridge, Microporous PE with silica gel coated with 4,4'-dipyridylethylene, pk 20	C-RAD172
Radiello cartridge, Molecular sieve/activated charcoal, pk 20	C-RAD132
Radiello cartridge, Silica gel, pk 20	C-RAD169
Radiello diffusive body: Yellow, pk 20	C-RAD1202
Radiello diffusive body: White, pk 20	C-RAD120
Radiello diffusive body: Blue, pk 20	C-RAD1201
Radiello diffusive body: Grey, pk 20	C-RAD1203

Product description	Product code
Calibration	
Calibration kit, BTEX (TD), for Radiello, pk 12	C-RAD407
Calibration kit, BTEX (CS$_2$), for Radiello, pk 12	C-RAD405
Calibration kit, workplace (CS$_2$), for Radiello, pk 12	C-RAD406
Calibration solution, aldehydes, 10 mL, for Radiello	C-RAD302
Calibration solution, glutaraldehyde, 10 mL, for Radiello	C-RAD301
Calibration solution, H$_2$S, 100 mL, for Radiello	C-RAD171
Other accessories	
Supporting plate, for Radiello, pk 20	C-RAD121
Clips for supporting plate, for Radiello, pk 20	C-RAD195
Adhesive label with barcode, for Radiello, pk 198	C-RAD190
Outdoor sampling shelter, for Radiello, pk 20	C-RAD196
Strips to suspend outdoor shelter, for Radiello, pk 10	C-RAD198
Vertical adapter, for Radiello, pk 20	C-RAD122
Storage tubes, 12 mL, plastic, with stopper, for Radiello, pk 100	C-RAD1992
Storage tubes, 2.8 mL, glass, with stopper, for Radiello, pk 100	C-RAD1991
Vertical snap-ring adapter, for Radiello, pk 20	C-RAD1221
Container for ready-to-use sampler, for Radiello, pk 20	C-RAD1242
Cap for ready-to-use sampler, for Radiello, pk 20	C-RAD1241
Radiello Thermometer kit, with vertical adapters	C-RAD126
Radiello Thermometer kit, with vertical snap-ring adapters	C-RAD1261
Thermometer reader, for Radiello	C-RAD127
Sterile sampler, for Radiello, pk 10	C-RAD125
Radiello Filtration kit, with syringes and 0.45 µm syringe filters, pk 20	C-RAD174

RADIELLO®

AIR QUALITY MONITORING WITH RADIAL SYMMETRY DIFFUSIVE SAMPLERS

VOCs
C-RAD130

O$_3$
C-RAD172

NH$_3$
C-RAD168

Phenols
C-RAD147

H$_2$S
C-RAD170

1,3 Butadiene
Isoprene
C-RAD141

NO$_2$
SO$_2$
C-RAD166

VOCs
C-RAD145

HCl
C-RAD169

Anesthetic
Gases
C-RAD132

HF
C-RAD166

Aldehydes
C-RAD165

LIQUID EXTRACTION

THERMAL DESORPTION

HEADSPACE

GC/FID

GC–MS

GC/FID or GC/MS

GC/ECD

HPLC

VISIBLE SPECTROMETRY

UV/VIS IC

ION CHROMATOGRAPHY

Radiello
Type

Extraction
Technique

Analytical
Technique

Istituti
Clinici
Scientifici
Maugeri

MARKES
international

Pumped sampling: Single-tube

Pumped sampling of air onto sorbent tubes is one of the most versatile methods for sampling VOCs and SVOCs. **ACTI-VOC™ PLUS** is a robust sampling pump that automatically compensates for different impedances, ensuring contact flow rates across a wide range of flows and TD tube types.

The ACTI-VOC PLUS is capable of sampling at rates ranging from 20 mL/min up to 500 mL/min and beyond, making it suitable for a wide range of applications. With its fast flow capabilities, ACTI-VOC PLUS is particularly well-suited for sampling semi-volatile organic compounds (SVOCs) such as phthalates and PAHs, which typically require flows above 300 mL/min.

Product description	Product code
ACTI-VOC PLUS fast-flow pump kit *Includes CapLok tool and carry case*	C-FFP-01
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

Pumped sampling: Multiple-tube

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.

ACTI-VOC PLUS has an intuitive interface and user-friendly buttons for navigation. This makes it easy to set-up and adjust flows. 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. Sampling flows and volumes are automatically logged by the pump for easy checking of a completed run.

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

For maximum confidence in results, all tubes should be sealed using our DiffLok caps (see page 17), 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.

Product description	Product code
MTS-32 multiple tube sampler	MTS-32
Low-flow pump kit for MTS-32	C-LFP-02
Spare charger, low-flow pump kit for MTS-32	SERLFP-5002
Spare back-pressure adaptor, low-flow pump kit for MTS-32	SERLFP-5003
Spare pump filter and air inlet, low-flow pump kit for MTS-32	SERZ-1076
Spare tubing (including $\frac{1}{8}$″ tube adaptor), for low-flow pump kit for MTS-32	SERZ-1097
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 *The user should supply a 12 V lead–acid battery*	MTS-5013
Power option C: Mains electricity	
Power supply accessory for MTS-32	MTS-5011

Grab-sampling

The 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.

Product description	Product code
Easy-VOC pump kit (includes CapLok tool and carry-case)	C-EZVOCPO
Easy-VOC accessory pack	C-EZVOCAK

Watch our video describing how to use the Easy-VOC

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air sampling

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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.

Air-monitoring canisters

Canisters complement sorbent tubes, by allowing quantitative sampling of the most volatile air pollutants such as C_2 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.

Canister kits and accessories

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

¼″ Sample inlet

Flow controller

Replaceable 2 µm frit, filter and washer

Critical orifice

Stainless steel vacuum gauge
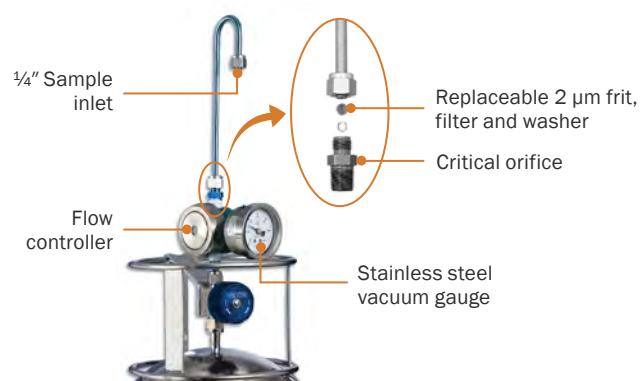
Product description	Product code
TWA air sampling kit, stainless steel *Gives 1 h sampling from a 1 L canister or 8 h sampling from a 6 L canister*	C-ASK1168SS
TWA air sampling kit, Siltek-treated *Gives 1 h sampling from a 1 L canister or 8 h sampling from a 6 L canister*	C-ASK1168SL
Replacement 2 µm 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

ℹ️ **For details of a gas standard suitable for US EPA Method TO-15, see page 44.**

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.

Product description	Product code
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.

Product description	Product code
SilcoCan with gauge and Siltek ¼″ valve, 1 L	C-SLCAN1
SilcoCan with gauge and Siltek ¼″ valve, 6 L	C-SLCAN6

Canister rack

Our 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).

Product description	Product code
Canister rack for CIA *Advantage*-xr (1 L to 6 L 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.

Product description	Product code
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
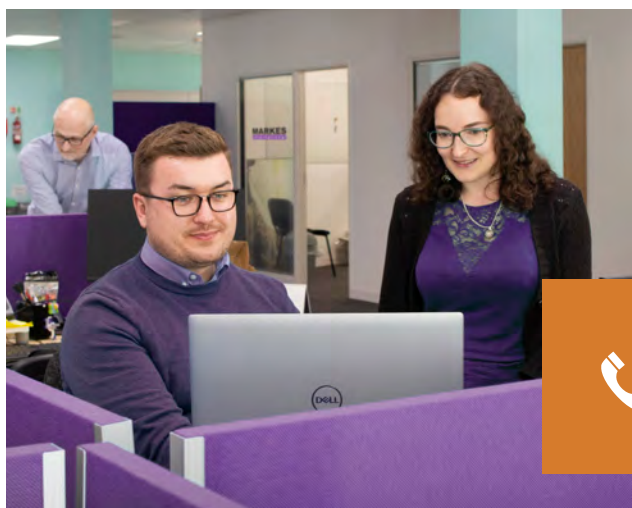
Contact us to discuss your canister application and how our technologies can provide improved performance

![MARKES international]

Calibration and standards

Standards and accessories for reliable, quantitative thermal desorption

Contact Markes International for expert advice

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Calibration Solution Loading Rig

The 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.

Product description	Product code
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 68.**

Watch our video describing how to introduce gas and liquid standards to sorbent tubes using the CSLR

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.

Product description	Product code
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.

Product description	Product code
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).

Product description	Product code
Check-standard (material emissions), 100 ng per tube (nominal), Tenax TA, pk 10	C-CHK10-ME

TOOLS FOR CALIBRATION & VALIDATION IN THERMAL DESORPTION

CALIBRATION

Calibration Solution Loading Rig

What is it?
A rig for reliable and convenient loading of liquid or gas standard onto sorbent tubes to generate calibration curves.

Allows you to
Calibrate the entire analytical system (TD-GC-MS) for qualitative and quantitative analysis.

When used
As part of routine quantitative analysis or when changing methods and/or analytical conditions.

Certified Reference Standard Tubes

What is it?
Sorbent tubes pre-loaded with accurate, certified quantities of analytes.

Allows you to
Confirm correct calibration of instrument.

When used
Usually at a defined frequency in line with good laboratory practice.

QUALITY ASSURANCE

Internal standards

What is it?
A fixed quantity of gas standard loaded onto the sample tube or trap during the analytical process.

Allows you to
Use internal quality control to identify anomalous results in an analytical sequence.

When used
As part of any analytical workflow for verification of instrument performance.

VALIDATION

Check standard tubes

What is it?
Sorbent tubes containing a selection of analytes at nominal concentrations.

Allows you to
Carry out quality assurance of methods/conditions and validate instrument performance.

When used
As a preliminary performance check following method changes or system maintenance.

Certified reference standard (CRS) tubes

Our 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 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.

Product description	Product code
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 *tert*-butyl ether
o-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.

Product description	Product code
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, we also offer 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 one of our specialists prior to ordering (a minimum order quantity may apply).

Product description	Product code
CRS (custom), pk 10	C-CUST-10

Internal standards

Suitable for all Markes International's TD instruments, our 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

Product description	Product code
Standard, gas cylinder, TO-14A IS/tuning mix, 1 ppm	C-GS14A-1PPM
Regulator, high-purity, for gas cylinder, 0–100 psig, ¼″ NPT connection	C-GSREG-100
Regulator, high-purity, for gas cylinder, 0–100 psig, ⅛″ tube compression connection	C-GSREG-101
Tubing, stainless steel, ⅛″, to connect IS to ISDP	SERZ-0022

ℹ **For details of our cost-effective TO-17 starter kit, see page 59.**

For advice on any aspect of calibration or standards, contact our technical specialists

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

Gas standards for external method calibration

We also offer 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 ppm[1]

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
Acrolein
Benzene
Benzyl chloride[2]
Bromodichloromethane
Bromoform
Bromomethane
Butadiene
Butan-2-one (methyl ethyl ketone)
Carbon disulfide[2]
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
Cyclohexane
Dibromochloromethane
1,2-Dibromoethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Dichlorodifluoromethane (Freon® 12)
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
Dichloromethane
1,2-Dichloropropane
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
1,2-Dichlorotetrafluoroethane (Freon® 114)
1,4-Dioxane

Ethanol[2]
Ethyl acetate
Ethylbenzene
4-Ethyltoluene
Heptane
Hexachlorobutadiene
Hexane
Hexan-2-one (methyl butyl ketone)
Methyl methacrylate
4-Methylpentan-2-one (methyl isobutyl ketone)
Methyl tert-butyl ether
Naphthalene
Propan-2-ol
Propene
Styrene
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Tetrahydrofuran
Toluene
1,2,4-Trichlorobenzene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Trichlorofluoromethane (Freon® 11)
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon® 113)
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
Vinyl acetate
Vinyl chloride
m-Xylene
o-Xylene
p-Xylene

Product description	Product code
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 ppbC[3] are given in parentheses).

Acetylene (40)
Benzene (30)
n-Butane (40)
But-1-ene (30)
cis-But-2-ene (35)
trans-But-2-ene (25)
Cyclohexane (40)
Cyclopentane (20)
n-Decane (30)
m-Diethylbenzene (40)
p-Diethylbenzene (25)
2,2-Dimethylbutane (40)
2,3-Dimethylbutane (50)
2,3-Dimethylpentane (50)
2,4-Dimethylpentane (40)
n-Dodecane (40)
Ethane (25)
Ethylbenzene (25)
Ethene (20)
m-Ethyltoluene (25)
o-Ethyltoluene (30)
p-Ethyltoluene (40)
n-Heptane (25)
n-Hexane (30)
Hex-1-ene (60)
Isobutane (25)
Isopentane (40)
Isoprene (40)

Isopropylbenzene (40)
Methylcyclohexane (30)
Methylcyclopentane (25)
2-Methylheptane (25)
3-Methylheptane (25)
2-Methylhexane (25)
3-Methylhexane (25)
2-Methylpentane (20)
3-Methylpentane (40)
n-Nonane (25)
n-Octane (30)
n-Pentane (25)
Pent-1-ene (25)
cis-Pent-2-ene (35)
trans-Pent-2-ene (25)
Propane (40)
n-Propylbenzene (30)
Propene (25)
Styrene (40)
Toluene (40)
1,2,3-Trimethylbenzene (25)
1,2,4-Trimethylbenzene (40)
1,3,5-Trimethylbenzene (25)
2,2,4-Trimethylpentane (30)
2,3,4-Trimethylpentane (25)
n-Undecane (30)
o-Xylene (25)
m/p-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.

Product description	Product code
Standard, gas cylinder, O₃/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 us 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 accessories
for use with all sample types

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Sorptive extraction

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 it 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 manufactured from inert-coated stainless steel, and are fitted with a section of polydimethylsiloxane (PDMS) that allows a wide range of analytes to be sorptively extracted.

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 the automated Centri platform, and 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.

Product description	Product code
HiSorb probe, PDMS, standard, pk 6	H1-DXAAC-06
HiSorb probe, PDMS, short, pk 6	H1-DXABC-06
HiSorb probe, PDMS/CWR, standard, pk 6	H2-DXAAC-06
HiSorb probe, PDMS/CWR, short, pk 6	H2-DXABC-06
HiSorb probe, PDMS/DVB, standard, pk 6	H3-DXAAC-06
HiSorb probe, PDMS/DVB, short, pk 6	H3-DXABC-06
HiSorb probe, DVB/DWR/PDMS, standard, pk 6	H4-DXAAC-06
HiSorb probe, DVB/DWR/PDMS, short, pk 6	H4-DXABC-06
HiSorb selection pack, standard	C-HSPKIT-SEL-D
HiSorb selection pack, short	C-HSPKIT-SEL-SD

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.[1]

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.

Product description	Product code
HiSorb Agitator, with 16 × 20 mL vial block	U-HSAG-20
Additional vial block, 16 × 20 mL	U-HSVB-20

Watch our video describing how to use HiSorb sorptive extraction

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.

Product description	Product code
Cap with HiSorb septum, for 10 mL/20 mL 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

ⓘ **For details of our HiSorb starter kit, see page 60.**

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

Micro-chamber sampling

The **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 four 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.

Each of the four chambers in the μ-CTE has a volume of 114 cm^3, and they can be heated up to a maximum temperature of 250°C. A number of accessories, listed on these two pages, further extend the application range.

Product description	Product code
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

Humidifier accessory

The Humidifer Accessory supplies the μ-CTE with air or gas at up to 50% relative humidity (at room temperature), allowing closer simulation of conditions used in reference tests, and enhancing the recovery of some less-volatile polar compounds.

Product description	Product code
Humidifier accessory for Micro-Chamber/ Thermal Extractor	M-HUMID-MCTE

Accessories for permeation testing

The permeation accessory fits inside the heated cavities of the μ-CTE, in place of the usual sampling pots, and allows a 6 cm^2 area section of test material ('membrane') to be exposed to the source of VOCs in the well below.

Each permeation accessory comprises three main parts: a membrane pan, a membrane retainer, and a septum seal and needle guide. It is also supplied with O-rings for the membrane pan and for the chamber lid.

Product description	Product code
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, ¼", for permeation accessory injection port, pk 6	M-PRSPT-250

Accessories for surface emissions testing

The SPF Sample Cutter enables consistent sections of spray polyurethane foam (SPF) to be prepared, ready for emissions sampling using the μ-CTE.

Spacers ensure that the section of SPF can be positioned securely against the underside of the μ-CTE lid, ensuring that only emissions from the surface of the sample are captured.

Product description	Product code
SPF sample cutter for M-CTE250 *Including ejection disk and cutting mat*	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

Calibration tool

The μ-CTE Chamber Calibration Tool enables the performance and reproducibility of the individual sampling chambers of the μ-CTE to be compared, both on one system and between systems.

The tool comprises four PTFE sample blocks, each containing three wells, into which aliquots of liquid standard are placed. The blocks are then loaded into the sample chambers of the μ-CTE, and analysed.

Product description	Product code
μ-CTE Chamber Calibration Tool	M-CHCT-250

Other accessories

Product description	Product code
O-Ring, size 007, and spacer, to connect 4 mm Luer cartridge, pk 6 (for DNPH cartridges)[1]	M-TCN04
Calibration tool for M-CTE250I, PTFE, pk 4	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 ¼″ 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

Watch our video describing how to use the SPF sample cutter for the μ-CTE

Watch our video describing how to use the calibration tools for the μ-CTE

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1. DNPH cartridges are not included.

2. We recommend that a pneumatics accessory (U-GAS03, page 68) is used with every μ-CTE.

Breath sampling

The **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 129 mL of expired breath for transfer to a sorbent tube for analysis by 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.

Product description	Product code
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

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″ × ¼″ sorbent tube and replaces the original Bio-VOC breath sampler developed by Markes.

Know what you're looking for? Buy online at www.markes.com/shop

▶ **Watch our video describing how to take a breath sample with the BioVOC-2**

Soil gas sampling

With a robust, high-quality stainless steel construction, the **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.

Product description	Product code
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

Watch our video describing how to use the VOC-Mole

VOC-Mole can be configured for diffusive sampling, using a cap fitted with a blanking plug.

VOC-Mole can be configured for pumped sampling, with the pump fitted to the top of the cap.

The brass impact former fits to the top of the VOC-Mole, to prevent damaging the top of the tube when driving it into the ground.

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SPME sampling

Our smart SPME fibers and SPME Arrows are equipped with a unique memory chip containing parameters, ranges, and usage history for the specific fiber.

Smart SPME fibers

Product description[1]	Product code
SPME fiber, Acrylate, 85 µm thickness, 10 mm length, grey, pk 1 [2]	S2-FIB-A-85/10-P1
SPME fiber, Carbon WR, 95 µm thickness, 10 mm length, dark blue, pk 1 [2]	S2-FIB-C-WR-95/10-P1
SPME fiber, PDMS, 100 µm thickness, 10 mm length, red, pk 1 [2]	S2-FIB-P-100/10-P1
SPME fiber, PDMS, 30 µm thickness, 10 mm length, gold, pk 1 [2]	S2-FIB-P-30/10-P1
SPME fiber, PDMS, 7 µm thickness, 10 mm length, green, pk 1 [2]	S2-FIB-P-7/10-P1
SPME fiber, DVB/PDMS, 65 µm thickness, 10 mm length, violet, pk 1 [2]	S2-FIB-DVB-65/10-P1
SPME fiber, DVB/Carbon WR/PDMS, 50/30 µm thickness, 10 mm length, dark grey, pk 1 [2]	S2-FIB-DVB/C-WR-80/10-P1
SPME fibers, collection of five, 10 mm length, thickness 7, 30 & 100 µm (PDMS), 85 µm (Acrylate), 95 µm (Carbon WR)	S2-FIB-SEL5-S1
SPME fibers, collection of five, 10 mm length, thickness 100 µm (PDMS), 65 µm (DVB), 95 µm (Carbon WR), 85 µm (Acrylate), 80 µm (DVB/Carbon WR)	S2-FIB-SEL5-S2

Smart SPME Arrows

Product description[1]	Product code
Smart SPME Arrows, collection of five, 1.10 mm, 20 mm length, thickness 100 µm (PDMS), 120 µm (Carbon WR/PDMS), 120 µm (DVB/PDMS), 100 µm (PDMS), 120 µm (DVB/Carbon WR/PDMS)	S2-ARR1115-SEL5-S2
Smart SPME Arrow, Acrylate, 1.10 mm, 100 µm thickness, 20 mm length, grey, pk 1 [2]	S2-ARR11-A-100/20-P1
Smart SPME Arrow, Carbon WR/PDMS, 1.10 mm, 120 µm thickness, 20 mm length, light blue, pk 1 [2]	S2-ARR11-C-WR-120/20-P1
Smart SPME Arrow, DVB/Carbon WR/PDMS, 1.10 mm, 120 µm thickness, 20 mm length, dark grey, pk 1 [2]	S2-ARR11-DVB/CWR120/20-P1
Smart SPME Arrow, DVB/PDMS, 1.10 mm, 120 µm thickness, 20 mm length, violet, pk 1 [2]	S2-ARR11-DVB-120/20-P1
Smart SPME Arrow, PDMS, 1.10 mm, 100 µm thickness, 20 mm length, red, pk 1 [2]	S2-ARR11-P-100/20-P1
Smart SPME Arrow, DVB/Carbon WR/PDMS, 1.50 mm wide sleeve, 120 µm thickness, 20 mm length, dark grey, pk 1 [2]	S2-ARR15-DVB/CWR120/20-P1
Smart SPME Arrow, DVB/PDMS 1.50 mm wide sleeve, 120 µm thickness, 20 mm length, violet, pk 1 [2]	S2-ARR15-DVB-120/20-P1
Smart SPME Arrow, PDMS, 1.50 mm wide sleeve, 100 µm thickness, 20 mm length, red, pk 1 [2]	S2-ARR15-P-100/20-P1
Smart SPME Arrow, PDMS, 1.50 mm wide sleeve, 250 µm thickness, 20 mm length, black, pk 1 [2]	S2-ARR15-P-250/20-P1
Smart SPME Arrow, Carbon WR/PDMS, 1.50 mm wide sleeve, 120 µm thickness, 20 mm length, light blue, pk 1 [2]	S2-SARR15-C-WR-120/20-P1

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1. Phases: Acrylate = Polyacrylate, Carbon WR = Carbon Wide Range, PDMS = Polydimethylsiloxane, DVB = Divinylbenzene.

2. Other pack sizes available.

Headspace vials, caps and tools

Product description	Product code
Headspace vial, 20 mL, crimp-top, clear, round-bottomed, pk 100	C-VCC20
Headspace vial, 10 mL, crimp-top, clear, round-bottomed, pk 100	C-VCC10
Cap with microcenter septum, for 10 mL/20 mL crimp-top vials, magnetic, bimetallic, pk 100	C-HSVCCS
Headspace vial, 20 mL, screw-top, clear, round-bottomed, pk 100	C-VSC20
Headspace vial, 10 mL, screw-top, clear, round-bottomed, pk 100	C-VSC10
Cap with microcenter septum, for 10 mL/20 mL screw-top vials, magnetic, pk 100	C-HSVSCS
Vial decapper, for 10 mL/20 mL crimp-top vials (20 mm)	U-HSVDC
Vial crimping tool, for 10 mL/20 mL crimp-top vials (20 mm)	U-HSVCR

SPME tools

Product description	Product code
Manual injector kit, SPME	C-MIK-SPME

Agitation equipment

For use with Markes Agitator (see page 47).

Product description	Product code
HiSorb Agitator, accommodates 16 vials (20 mL)	U-HSAG-20
Replacement vial block for Agitator	U-HSVB-20
Agitator spacer for vials, 20 mL to 10 mL, pk 4	C-HSINS10-4
Agitator spacer for vials, 20 mL to 10 mL, pk 6	C-HSINS10-6

Need help with SPME sampling? Give our friendly team a call

TF-SPME sampling

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

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.

1 Position the membrane in the vial, and hold it in place with a cotter pin.

2 Agitate (or magnetically stir) the vial at a controlled temperature.

3 Remove the membrane and blot-dry with a lint-free wipe.

4 Transfer the membrane to a 3½″ × ¼″ thermal desorption (TD) tube.

5 Analyse by TD–GC–MS.
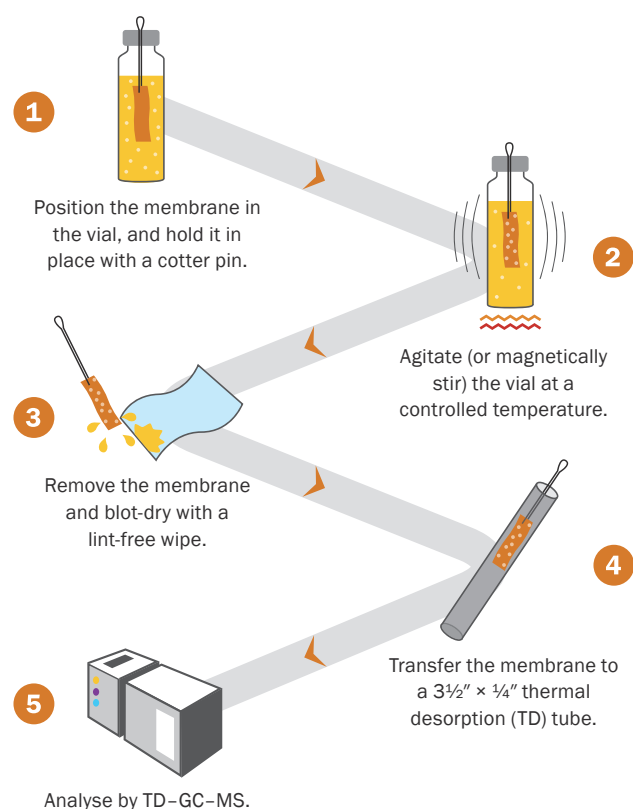
TF-SPME starter kit

Each 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).

Membranes are also sold separately as packs of five.

Product description	Product code
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

Smart headspace syringes

Our smart headspace syringes are equipped with a unique memory chip containing parameters, ranges, and usage history for the specific syringe.

Product description	Product code
Smart headspace syringe, 1 mL maximum capacity	S2-H1000-65-T-23-SP
Smart headspace syringe, 2.5 mL maximum capacity	S2-H2500-65-T-23-SP
Smart headspace syringe, 5 mL maximum capacity	S2-H5000-65-T-23-SP

Vials and caps

Product description	Product code
Headspace vial, 20 mL, crimp-top, clear, round-bottomed, pk 100	C-VCC20
Headspace vial, 10 mL, crimp-top, clear, round-bottomed, pk 100	C-VCC10
Cap with microcenter septum, for 10 mL/20 mL crimp-top vials, magnetic, bimetallic, pk 100	C-HSVCCS
Headspace vial, 20 mL, screw-top, clear, round-bottomed, pk 100	C-VSC20
Headspace vial, 10 mL, screw-top, clear, round-bottomed, pk 100	C-VSC10
Cap with microcenter septum, for 10 mL/20 mL screw-top vials, magnetic, metallic, pk 100	C-HSVSCS

Vial tools

Product description	Product code
Vial decapper, for 10 mL/20 mL crimp-top vials (20 mm)	U-HSVDC
Vial crimping tool, for 10 mL/20 mL crimp-top vials (20 mm)	U-HSVCR

New to TF-SPME? Give us a call and we'll explain everything you need to know

Vacuum-assisted headspace & SPME sampling

NEW

ExtraTECH

SPME sampling under vacuum accelerates the extraction kinetics of analytes that exhibit long equilibration times with regular headspace-SPME at atmospheric pressure. Importantly, the extraction of volatiles that reach equilibrium quickly is not affected, and the need for high temperatures that may cause analyte degradation is reduced.

These caps for headspace, SPME and SPME Arrow analyses offer a gas-tight seal to 20 mm crimp-top long-neck headspace vials, for extended periods of time. The metallic body of the cap is magnetic, to allow easy handling by the Centri autosampler (and avoiding the need for additional magnetic caps).

They are easy to use and implement in any routine laboratory, and are re-usable, reducing laboratory waste and minimising costs. They are also ideal for storing samples at atmospheric pressure without losing volatiles, for example, during long waits on an autosampler tray.

Vacuum-assisted sampling caps

These magnetic caps fit 20 mL, 20 mm crimp-top, long-neck headspace vials.

Product description	Product code
Vacuum-assisted sampling cap (headspace & SPME)	C-VAC-HSSPME-CLS
Vacuum-assisted sampling cap (SPME Arrow)	C-VAC-ARR-CLS

Septum plugs, cylindrical septa, O-rings, closure pins

Product description	Product code
Vacuum septum plug (headspace & SPME), pk 50	C-VAC-HSSPME-SEP50
Vacuum septum plug (headspace & SPME), pk 10	C-VAC-HSSPME-SEP10
Vacuum cylindrical septum (SPME Arrow), pk 100	C-VAC-ARR-SEP100
Vacuum cylindrical septum (SPME Arrow), pk 10	C-VAC-ARR-SEP10
Vacuum closure O-ring (body), pk 100	C-VAC-O-BODY
Vacuum closure O-ring (top), pk 100	C-VAC-O-TOP
Vacuum closure pin	C-VAC-PIN

Starter kits

Product description	Product code
Vacuum HS & SPME Basic Starter Kit *Containing: 10× caps (headspace & SPME), 10× O-ring (top), 40× O-ring (body), vacuum closure pin*	C-VAC-BSC-HSSPME-KIT
Vacuum HS & SPME Full Starter Kit *Containing: 10× caps (headspace & SPME), 10× septa, 10× O-ring (top), 40× O-ring (body), vacuum closure pin*	C-VAC-FULL-HSSPME-KIT
Vacuum SPME Arrow Basic Starter Kit *Containing: 10× caps (SPME Arrow), 10× O-ring (top), 40× O-ring (body), vacuum closure pin*	C-VAC-BSC-ARR-KIT
Vacuum SPME Arrow Full Starter Kit *Containing: 10× caps (SPME Arrow), 10× septa, 10× O-ring (top), 40× O-ring (body), vacuum closure pin*	C-VAC-FULL-ARR-KIT

Starter kits

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

Contact Markes International for expert advice

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Germany: +49 (0)69 6681089-10
P.R. China: +86 21 5465 1216

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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 our tube-based TD systems.

Product description	Product code
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 *Suitable for pumped sampling of VOCs from C_6 to C_{30}*	C1-AAXX-5003
CapLok tool for capping and uncapping ¼″ brass storage caps	C-CPLOK
Focusing (cold) traps, 'General-purpose carbon' *Compatible with the simultaneous analysis of analytes from $C_{4/5}$ to $C_{30/32}$*	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

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 *Suitable for pumped sampling of VOCs from C_6 to C_{30}*	C1-AAXX-5003
CapLok tool for capping and uncapping ¼″ brass storage caps	C-CPLOK
Focusing (cold) traps, 'General-purpose carbon' *Compatible with the simultaneous analysis of analytes from $C_{4/5}$ to $C_{30/32}$*	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 *For ULTRA 2/ULTRA-xr tube receiver*	U-COV07
O-Ring, size 010, pk 10 *For tube interface seal*	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 *For ULTRA 2/ULTRA-xr tube receiver*	U-COV07
O-Ring, size 010, pk 10 *For tube interface seal*	U-COV10

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

Email: enquiries@markes.com   **Web:** www.markes.com   **UK:** +44 (0)1443 230935

Application-specific starter kits

Environmental monitoring applications

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

Product description	Product code
TO-17 starter kit	C-TO17KIT
EPA 325 starter kit	C-KIT325T-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 *Suitable for pumped sampling of VOCs from C_5 to C_{30}*	C2-AAXX-5032
Sorbent tube, 'Air toxics', glass, conditioned and capped, pk 10 *Suitable for pumped sampling of VOCs from $C_{2/3}$ to C_{14}*	C2-BAXX-5259
Sorbent tube, 'Graphitised carbon universal', stainless steel, conditioned and capped, pk 10 *Suitable for pumped sampling of VOCs from C_2 to C_{20}*	C3-AAXX-5264
CapLok tool for capping and uncapping ¼″ brass storage caps	C-CPLOK
Focusing (cold) traps, 'Air toxics' *Compatible with the simultaneous analysis of analytes from $C_{2/3}$ to $C_{30/32}$*	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 *Suitable for passive sampling of VOCs from C_3 to C_8*	**2 ×** C1-CAXX-5020
Diffusion cap, aluminium, **2 ×** pk 10	**2 ×** C-DF010
Focusing (cold) traps, 'Method 325'	U-T18325-2S

Material emissions applications

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

Product description	Product code
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 *Suitable for sampling VOCs from C_6 to C_{30}*	C1-CAXX-5003
Sorbent tube, 'Material emissions', stainless steel, conditioned and capped, pk 10 *Suitable for sampling VOCs from C_3 to C_{40}*	C3-AAXX-5304
CapLok tool for capping and uncapping ¼″ brass storage caps	C-CPLOK
Focusing (cold) traps, 'Material emissions' *Compatible with the simultaneous analysis of analytes from C_3 to C_{32}*	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 *The restriction in this tube ensures that small samples are held centrally*	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' *Compatible with the simultaneous analysis of analytes from $C_{4/5}$ to $C_{30/32}$*	U-T2GPH-2S
CapLok tool for capping and uncapping ¼″ brass storage caps	C-CPLOK
Calibration Solution Loading Rig	C-CSLR
Sorbent tube, Tenax TA, stainless steel, conditioned and capped, **2 ×** pk 10 *Suitable for sampling VOCs from C_6 to C_{30}*	**2 ×** C1-AAXX-5003

Product-specific starter kits

We offer a range of product-specific kits as a cost-effective way of getting started with your application.

Product description	Product code
Centri booster pack	U-CENKIT
Starter kit for Micro-Chamber/Thermal Extractor	C-MCTEKIT-250

The **Centri booster pack** contains:

DiffLok cap, stainless steel, ¼″, pk 10	**6 ×**	C-DL010
O-Ring, size 007, pk 10	**1 ×**	U-COV07
O-Ring, size 010, pk 10	**1 ×**	U-COV10

The **starter kit for the Micro-Chamber/Thermal Extractor** contains:

Sorbent tube, Tenax TA, inert-coated stainless steel, conditioned and capped, pk 10 *Suitable for sampling VOCs from C_6 to C_{30}*	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

HiSorb starter kits

Product description	Product code
HiSorb selection pack, starter kit, CVD inert, short	C-HSPKIT-SEL-SD-SK
HiSorb selection pack, starter kit, CVD inert, standard	C-HSPKIT-SEL-D-SK
HiSorb starter kit (PDMS, short, CVD inert)	C-HSPKIT-01-D
HiSorb starter kit (PDMS/CWR, short, CVD inert)	C-HSPKIT-02-D
HiSorb starter kit (PDMS/DVB, short, CVD inert)	C-HSPKIT-03-D
HiSorb starter kit (DVB/CWR/PDMS, short, CVD inert)	C-HSPKIT-04-D
HiSorb selection pack, starter kit, CVD inert, short	C-HSPKIT-SEL-SD-SK
HiSorb selection pack, starter kit, CVD inert, standard	C-HSPKIT-SEL-D-SK

Get your application up and running quickly by giving our team a call

Instrument spares

User-installable spares and accessories for all Markes International's TD instruments

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TD100-xr™

User-installable spares for the TD100-xr automated thermal desorber.

Product description	Product code
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 *Connects fused silica transfer line*	U-FV001
ULTRA-xr/TD100-xr O-ring insertion tool	SERMTD-1382
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 *Connects fused silica to column*	C-QSC10

UNITY-xr™

Cryogen-free single-tube thermal desorbers

User-installable spares for the UNITY-xr.

Product description	Product code
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
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 *Connects fused silica transfer line*	U-FV001
Filter, disk, sintered PTFE, 5.1 mm section, pk 10	U-DISK1
Quick-seal column connector, pk 10 *Connects fused silica to column*	C-QSC10
UNITY-xr tube oven conversion kit, 3½″ to 4½″	U-35TO45KT
UNITY-xr tube oven conversion kit, 4½″ to 3½″	U-45TO35KT

ULTRA-xr™

User-installable spares for the ULTRA-xr autosampler (for UNITY thermal desorbers).

Product description	Product code
O-Ring, low-emission, size 007, pk 10 (ULTRA-xr tube receiver)	U-COV07
Label, ULTRA-xr tray, 4½″, strip of 10, blue	SERMTD-1394BU
ULTRA-xr/TD100-xr U-COV07 O-ring insertion tool	SERMTD-1382

For more information on any of our instruments, download the brochures from www.markes.com.

Watch our video describing how to replace the fused silica transfer line to the GC

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Air Server-xr™

User-installable spares for the Air Server-xr accessory for on-line air monitoring and canister analysis.

Product description	Product code
Split filter tube, glass, 3½″, packed with charcoal	SERAAA-1600
Tubing, PTFE, 1/8″, 1 m	SERZ-0062
Pump, 100 V, for unpressurised samples	U-ASPM3
Pump, 115 V, for unpressurised samples	U-ASPM1
Pump, 230 V, for unpressurised samples	U-ASPM2
Pump, 100 V, for unpressurised samples, multi-gas	U-ASPM3-H
Pump, 115 V, for unpressurised samples, multi-gas	U-ASPM1-H
Pump, 230 V, for unpressurised samples, multi-gas	U-ASPM2-H
Filter, disk, sintered PTFE, 3.2 mm section, pk 10	U-DISK4
Dryer kit for Air Server-xr	U-ASDRY

CIA *Advantage-xr*™

User-installable spares for the CIA *Advantage*-xr autosampler for analysing air in canisters or bags.

Product description	Product code
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
Pump, 100 V, for unpressurised samples, multi-gas	U-ASPM3-H
Pump, 115 V, for unpressurised samples, multi-gas	U-ASPM1-H
Pump, 230 V, for unpressurised samples, multi-gas	U-ASPM2-H
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

Kori-xr™

User-installable spares for the Kori-xr water management module.

Product description	Product code
O-Ring, low-emission, size 007, pk 10	U-COV07
O-Ring, low-emission, size 035, pk 10	U-COV35
O-Ring, low-emission, size 010, pk 10	U-COV10
Filter, disk, sintered PTFE, 5.1 mm section, pk 10	U-DISK1
Filter, disk, sintered PTFE, 6.5 mm section, pk 10	U-DISK3
Split filter tube, packed (Air Server)	SERAAA-1600

Buy instrument spares online at www.markes.com/shop

TT24-7™

User-installable spares for the TT24-7 twin-trap systems for continuous near-real-time monitoring

TT24-7 Series 2

Product description	Product code
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 S2 & XR air inlet, pk 2	SERNOA-1062
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 (2 m)	SERUTE-5099
Split filter tube, stainless steel, 3½″, packed with charcoal	SERUTD-5065
Ferrule, $1/16$″ × 0.4 mm graphite/Vespel®, pk 10 *Connects fused silica transfer line*	U-FV001
Quick-seal column connector, pk 10	C-QSC10
Nafion dryer for humid samples	U-ASDRY
Heated sample line, inert, 2 m	U-HSLTT
Pump, 100 V, for unpressurised samples	U-ASPM3
Pump, 115 V, for unpressurised samples	U-ASPM1
Pump, 230 V, for unpressurised samples	U-ASPM2
Pump, 100 V, for unpressurised samples, multi-gas	U-ASPM3-H
Pump, 115 V, for unpressurised samples, multi-gas	U-ASPM1-H
Pump, 230 V, for unpressurised samples, multi-gas	U-ASPM2-H
Dual regulator pneumatics accessory *For dry gas and carrier gas regulation*	U-GAS01

TT24-7xr

Product description	Product code
O-Ring, low-emission, size 007, pk 10	U-COV07
O-Ring, low-emission, size 035, pk 10	U-COV35
O-Ring, low-emission, size 010, pk 10	U-COV10
Filter, disk, sintered PTFE, 5.1 mm section, pk 10	U-DISK1
Filter, disk, sintered PTFE, 6.5 mm section, pk 10	U-DISK3
Filter, disk, sintered PTFE, 3.2 mm section, pk 10	U-DISK4
Filter, carbon, TT24-7 Series 2 & TT24-7xr air inlet, pk 2	SERNOA-1062
Split filter tube packed with charcoal	SERUTD-5065
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 (2 m)	SERUTE-5099
Ferrule, 1/16″ × 0.4 mm graphite/Vespel®, pk 10 *Connects fused silica transfer line*	U-FV001
Quick-seal column connector, pk 10	C-QSC10
Nafion dryer for humid samples (TT24-7 Series 2 and TT24-7xr)	U-ASDRY-TT
Heated sample line, inert, 2 m *Two recommended*	U-HSLTT
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	U-GAS01

TT24-7NRT

Product description	Product code
O-Ring, low-emission, size 007, pk 10	U-COV07
O-Ring, low-emission, size 035, pk 10	U-COV35
O-Ring, low-emission, size 010, pk 10	U-COV10
Filter, disk, sintered PTFE, 5.1 mm section, pk 10	U-DISK1
Filter, disk, sintered PTFE, 6.5 mm section, pk 10	U-DISK3
Filter, disk, sintered PTFE, 3.2 mm section, pk 10	U-DISK4
Filter, Carbon, TT24-7 Series 2 & TT24-7xr air inlet, pk 2	SERNOA-1062
Split filter tube packed with charcoal	SERUTD-5065
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 (2 m)	SERUTE-5099
Ferrule, 1/16″ × 0.4 mm graphite/Vespel®, pk 10 *Connects fused silica transfer line*	U-FV001
Quick-seal column connector, pk 10	C-QSC10
Nafion dryer for humid samples, TT24-7NRT	U-ASDRY-TTNRT-1
Heated sample line for TT24-7NRT	U-HSLTT-NRT
Pump, 100 V, for unpressurised samples	U-ASPM3
Pump, 115 V, for unpressurised samples	U-ASPM1
Pump, 230 V, for unpressurised samples	U-ASPM2
Pump, 100 V, for unpressurised samples, multi-gas	U-ASPM3-H
Pump, 115 V, for unpressurised samples, multi-gas	U-ASPM1-H
Pump, 230 V, for unpressurised samples, multi-gas	U-ASPM2-H
Dual regulator pneumatics accessory	U-GAS01

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

Centri®

The following parts are required for use with our Centri 90, 180 and 360 systems.

Product description	Product code
O-Ring, injector liner, brown, low-temperature, pk 10	U-COV108-L
O-Ring, injector liner, black, high-temperature, pk 1	U-COV108-H
O-Ring, injector HiSorb & HiSorb storage, pk 10 *For Centri 360 only*	U-COV201
Septa, injector inlet, 11 mm (headspace & SPME fiber), pk 50	U-SEP11
Injector liner, SPME, pk 1	U-LINER-SPME
Injector liner, headspace, pk 1	U-LINER-HS
Injector liner, HiSorb, pk 1	U-LINER-HISORB
O-Ring, low-emission, size 006, pk 10	U-COV06
O-Ring, low-emission, size 007, pk 10	U-COV07
O-Ring, size 010, pk 10	U-COV10
Split filter tube packed with charcoal	SERUTD-5065
Fused silica transfer line insert (0.25 mm i.d.) and PTFE sleeve (2 m)	SERUTE-5099
Filter, disk, sintered PTFE, 5.1 mm section, pk 10	U-DISK1

NuVo 200™

The following parts are required for use with our NuVo 200 system.

Product description	Product code
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 035, pk 10	U-COV35
Filter, disk, sintered PTFE, 5.1 mm section, pk 10	U-DISK1
Filter, disk, sintered PTFE, 6.5 mm section, pk 10	U-DISK3
Split filter tube, packed (Air Server)	SERAAA-1600
Fused silica transfer line insert (0.25 mm i.d.) and PTFE sleeve (2 m)	SERUTE-5099
NuVo 200 pump bundle, 100 V	U-NUVO-PUMP-3
NuVo 200 pump bundle, 115 V	U-NUVO-PUMP-1
NuVo 200 pump bundle, 230 V	U-NUVO-PUMP-2
Focusing trap bundle for NuVo 200 system	N-HLT1ODS
Focusing trap for HT module of NuVo 200 system	N-HT1ODS
Focusing trap for LT module of NuVo 200 system	N-LT1ODS

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.

Product description	Product code
Routine Maintenance Kit: Tube-based systems	RMK-0027
Routine Maintenance Kit: On-line and canister systems	RMK-0003-2S
Routine Maintenance Kit: TT24-7 systems (all series)	RMK-0005
Routine Maintenance Kit: Centri base unit	RMK-0028
Routine Maintenance Kit: Kori-xr	RMK-0026
Routine Maintenance Kit: Micro-Chamber/Thermal Extractor (high-temperature)	RMK-0006HT
Routine Maintenance Kit: 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.

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

Watch our video describing how to replace split O-rings on the TD100-xr and UNITY-xr

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-xr

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

Air Server-xr and CIA *Advantage*-xr

Replace filter disks	12 months

i **As well as routine maintenance procedures carried out by the user, our 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.**

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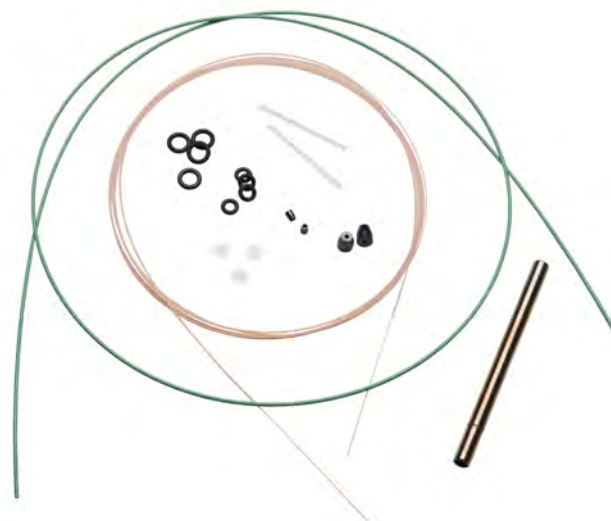
1. Note that these parts may require changing more frequently in automated systems.

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Pneumatic control accessories

Dual regulator pneumatics accessory

The high-quality dual regulator pneumatics accessory controls both carrier gas and dry gas flows, and is strongly recommended for all of our 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.

Product description	Product code
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.

Product description	Product code
Single regulator pneumatics accessory *For carrier gas regulation*	U-GAS03
Copper tubing	C-CUTUB-3M

Leak detector

This portable, highly sensitive 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 leak detector can be found at markes.com/shop/products/leak-detector.

Product description	Product code
Leak detector, with USB charger	C-HLD

Flowmeter

With resolution of 0.1 mL/min, and accuracy typically better than ±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.

Full specifications for the flowmeter can be found at markes.com/shop/products/flowmeter.

Product description	Product code
Digital flowmeter	C-FLMTR

Syringes

We offer two precision syringes for liquid injections.

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

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

Product description	Product code
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

This tool is 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.

Product description	Product code
Fused silica column-cutting tool	C-FSCCT

Gas purifier

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

We also recommend a purifier when using the BenchTOF™ mass spectrometer, in order to remove O_2, H_2O, hydrocarbons, CO_2 and CO from helium, giving an output gas that is 99.99999% pure.

The maximum flow capacity of the gas purifier is 8 L/min, and the stated life is 13 standard cylinders of 99.999% helium (corresponding to an impurity level no greater than 10 ppm).

Product description	Product code
Gas purifier, helium purifier, ⅛″ fittings	C-HEPUR

Fused silica column connectors

Single-use quick-seal **capillary column connectors** are supplied with every Markes 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.

Product description	Product code
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 ⅛″ 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.

Product description	Product code
Copper tubing, 3 m	C-CUTUB-3M
Union, brass, ⅛″, T-shaped	SERZ-0104
Union, brass, ⅛″–⅛″	SERZ-0026

Columns

NEW

We have selected these GC columns to give optimum performance for the most popular TD applications, including indoor air monitoring, environmental monitoring, material emissions and breath monitoring.

They are compatible with all leading GC instruments from vendors such as Agilent, Thermo and Shimadzu. GC columns are provided by our sister company SepSolve Analytical, who specialise in application-driven workflows using GC×GC. All columns are supplied with a quality assurance report and a column service record, with recommendations for storage, cleaning and conditioning.

Product description	Product code
1MS GC column, 30 m × 0.25 mm × 1 µm	SEP-1MS-30M
1MS GC column, 60 m × 0.25 mm × 1 µm	SEP-1MS-60M
5MS GC column, 30 m × 0.25 mm × 0.25 µm	SEP-5MS-30M
5MS GC column, 60 m × 0.32 mm × 0.50 µm	SEP-5MS-60M
624MS GC column, 30 m × 0.25 mm × 1.4 µm	SEP-624MS-30M
624MS GC column, 60 m × 0.32 mm × 0.5 µm	SEP-624MS-60M-1
624MS GC column, 60 m × 0.25 mm × 1.4 µm	SEP-624MS-60M-2
624MS GC column, 60 m × 0.32 mm × 1.8 µm	SEP-624MS-60M-3
WAX GC column, 60 m × 0.25 mm × 0.25 µm	SEP-WAXMS-60M
WAX GC column, 30 m × 0.25 mm × 0.25 µm	SEP-WAXMS-30M
200 GC column, 30 m × 0.25 mm x 1 µm	SEP-200-30M
5MS Plus GC column, 30 m x 0.25 mm × 0.25 µm	SEP-5MSPLUS-30M
5MS Plus GC column, 60 m × 0.25 mm × 0.25 µm	SEP-5MSPLUS-60M

Talk to our specialists today to resolve your GC column questions

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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.

Product description	Product code
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.

Product description	Product code
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.

Product description	Product code
Sorbent, SulfiCarb™ (40/70), 10 g	C-SLCRB
Sorbent, Carbosieve™ S-III (60/80), 10 g	C-CSIII

Zeolite molecular sieves

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

Product description	Product code
Sorbent, molecular sieve 5 Å, 20 g	C-MSV5A
Sorbent, molecular sieve 13X, 20 g	C-MS13X

Other sorbents

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

Product description	Product code
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

SORBENTS – A QUICK REFERENCE GUIDE

Sorbent		Volatility range		Suitable analytes	Max. temp (ºC) [1]	Desorb temp (ºC) [2]
		Hydrocarbon range	Boiling point (ºC)			
Porous polymer	Tenax TA	C_6~C_{30}	100 ~ 450	Aromatics, apolars, polar compounds bp >150ºC, and semi-volatiles.	350	300
	Tenax GR	C_6 ~C_{30}	100 ~ 450	Aromatics, apolars, polar compounds >150ºC, and semi-volatiles.	350	300
	HayeSep D	C_5 ~ C_{12}	50 ~ 200	Low molecular weight compounds, acetylene, halogens, and sulfur groups. GB/GE derivative of VX (CWA).	290	280
	PoraPak N	C_5 ~ C_{10}	50 ~ 200	Polar VOCs, acrylonitrile, acetonitrile, propionitrile, pyridine, volatile alcohols, ethanol, methyl ethyl ketone.	190	165
	PoraPak Q	C_5 ~ C_{12}	50 ~ 200	Oxygenated compounds.	250	190
Graphitised carbon black	Carbograph 2TD Carbopack C Carbotrap C	C_8 ~ C_{20}	130 ~ 340	Alkyl benzenes and large aliphatics. Heavy organics: PCBs, PNAs.	400	360
	Carbograph 1TD Carbopack B Carbotrap B	C_5 ~ C_{14}	50 ~ 250	A wide range from medium to high volatility: Ketones, alcohols, and aldehydes (but not formaldehyde). Non-polars within volatility range. Perfluorocarbon tracer gases. BTX.	400	360
	Carbograph 5TD Carbopack X	C_3 ~ C_8	50 ~ 150	Especially good for 1,3-butadiene and light hydrocarbons.	400	360
	Carbopack Y Carbotrap Y	C_{12} ~ C_{20}	50 ~ 340	Less volatile hydrocarbons. Pesticides e.g. alachlor atrazine, isoprene, and formothyon.	400	360
Carbonised molecular sieve	SulfiCarb	C_3 ~ C_8	-30 ~ 150	Thiols. VVOCs (vinyl chloride, CS_2, methanol, ethanol, and acetone). Used for sterically large VVOCs (SF_6).	400	360
	Carbosieve S-III	C_2 ~ C_5	-90 ~ 80	Permanent gases, and ethene to n-C_5, e.g. chloromethane. Also ethylene from small volumes.	400	360
	Carboxen 1000	C_2 ~ C_5	-60 ~ 80	Permanent gases, and ultra-volatile hydrocarbons, e.g. vinyl chloride.	400	360
	Carboxen 1003	C_2 ~ C_5	-60 ~ 80	Permanent gases, and ultra-volatile hydrocarbons, e.g. ethane.	400	360
Zeolite molecular sieve	Molecular Sieve 5Å	C_2 ~ C_4	-90 ~ 80	Permanent gases, and nitrous oxide	400	300 (165 for N_2O)
Other	Silica Gel	N/A	N/A	Low-boiling polar compounds, especially useful for separating chlorinated or sulfur compounds from matrices with hydrocarbon interferences.	200	180
	Quartz wool	N/A	N/A	SVOCs.	400	360

[1] Maximum temperature should not be exceeded, to prevent irreversible damage to sorbent. When using multi-beds of sorbents, maximum temperature is the lowest of all sorbents within the tube.

[2] Recommended desorption temperatures are a guide and may require optimisation depending on target analytes. Lower desorption temperatures are recommended where possible to prolong sorbent lifetime. Sorbent conditioning should be carried out at 10–20°C above the desorption temperature.

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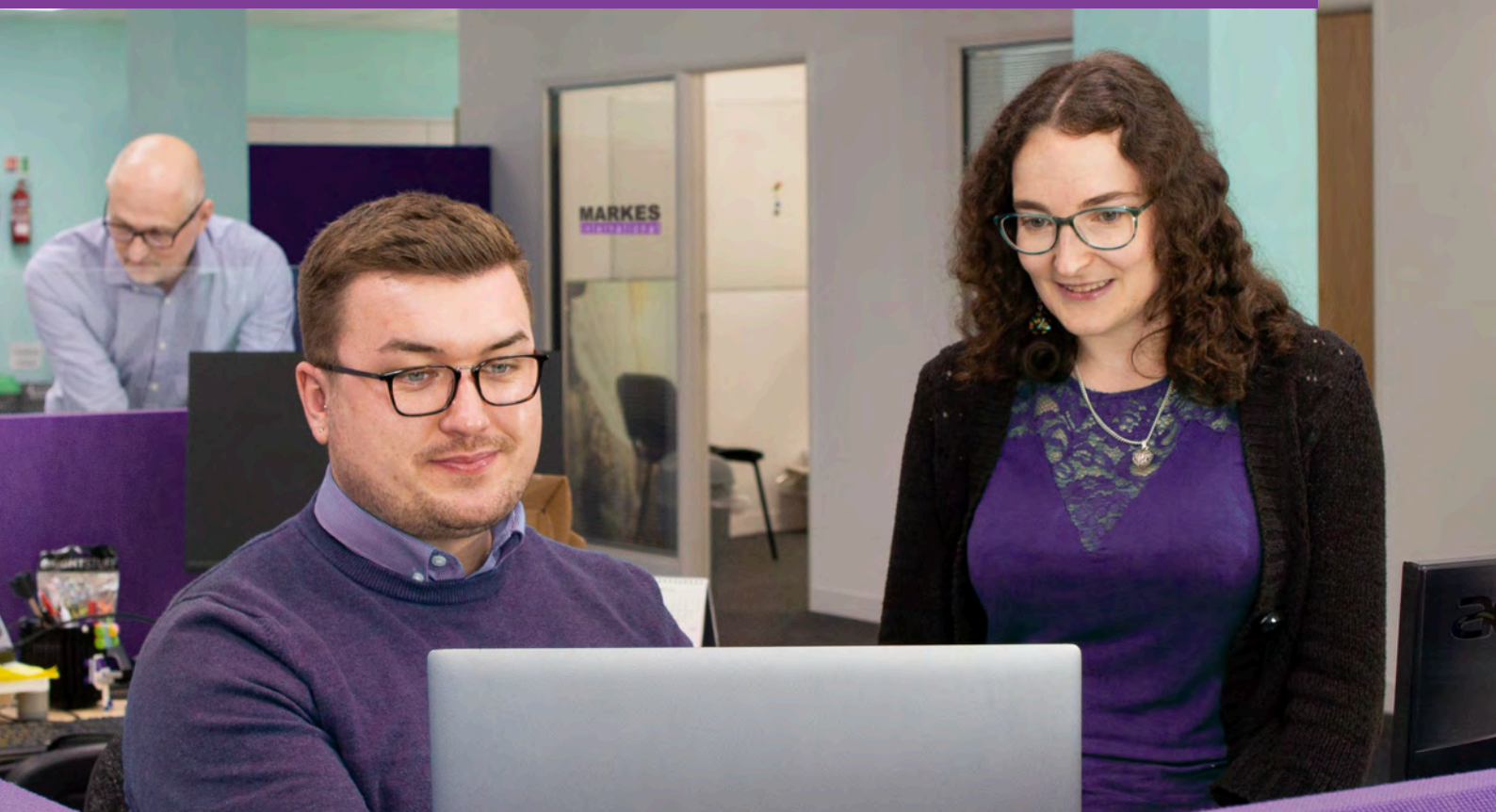
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List of part numbers

Where a component appears as part of a kit, a letter 'K' appears after the page number.

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