MARKES international

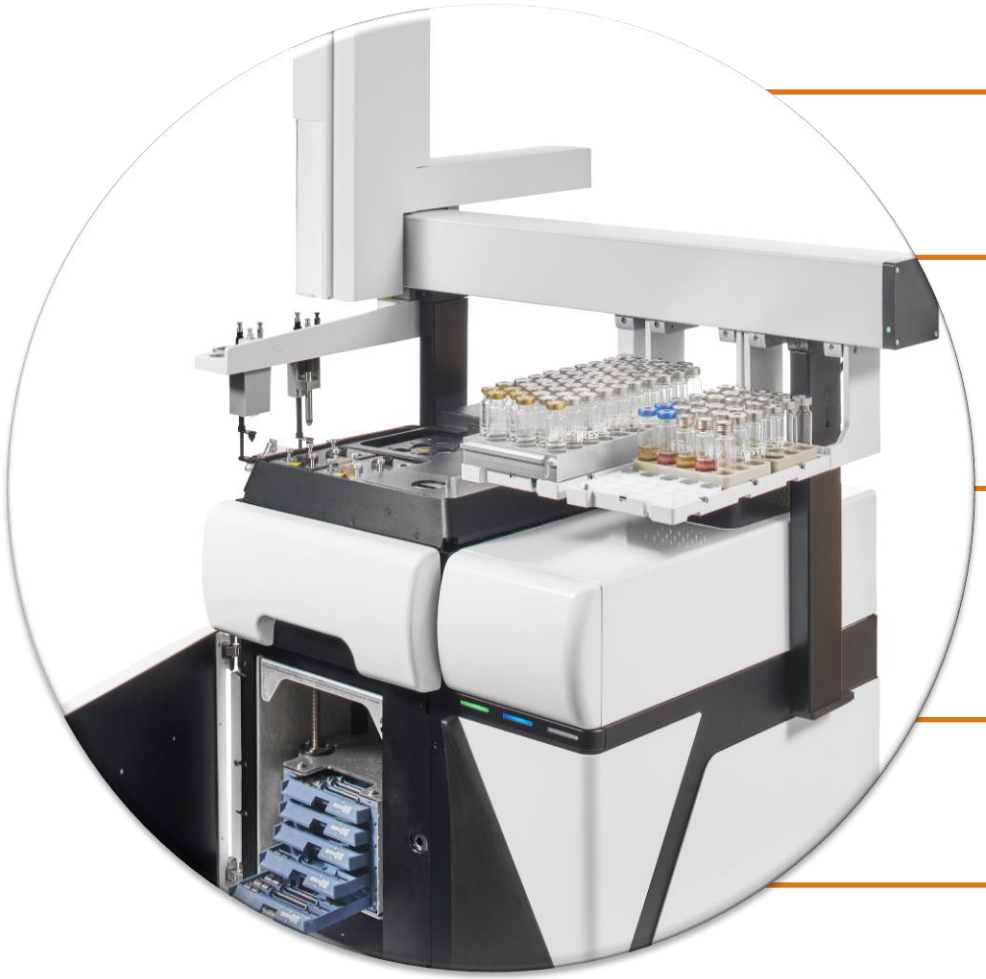
THE QUEEN'S AWARDS FOR ENTERPRISE: INNOVATION 2019

An introduction to the Centri portfolio

A breakthrough in automated sample extraction and enrichment

What is Centri®?

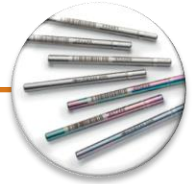
A breakthrough in automated sample extraction and enrichment for GC(–MS)



HiSorb

Headspace

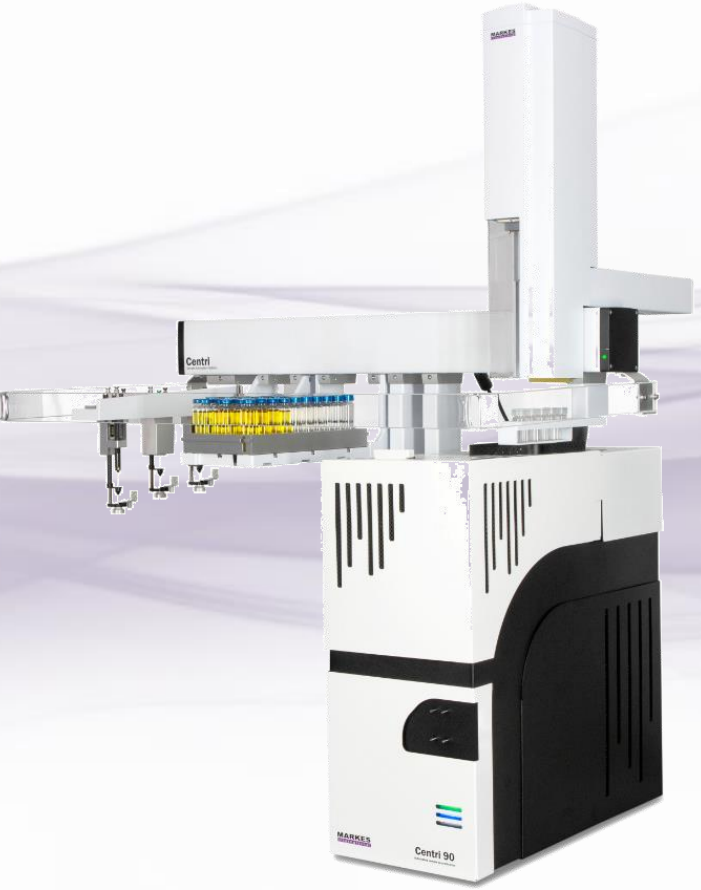
SPME & SPME Arrow



Tube-based thermal desorption (TD)

Liquid sample preparation & GC injection

The Centri family



Centri 90

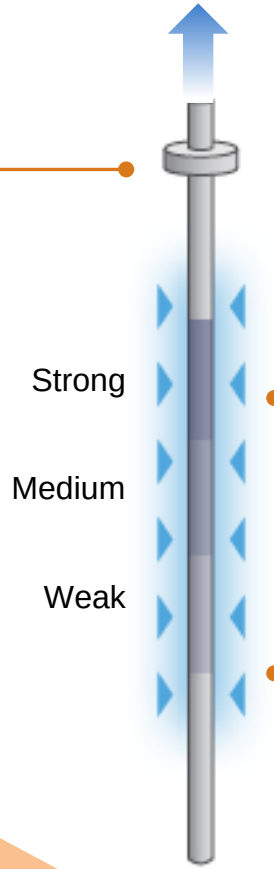
Centri 180

Centri 360

Analyte preconcentration

Step 1: Desorption of sampled analytes and focusing of volatiles

Trap purging allows removal of volatile interferences

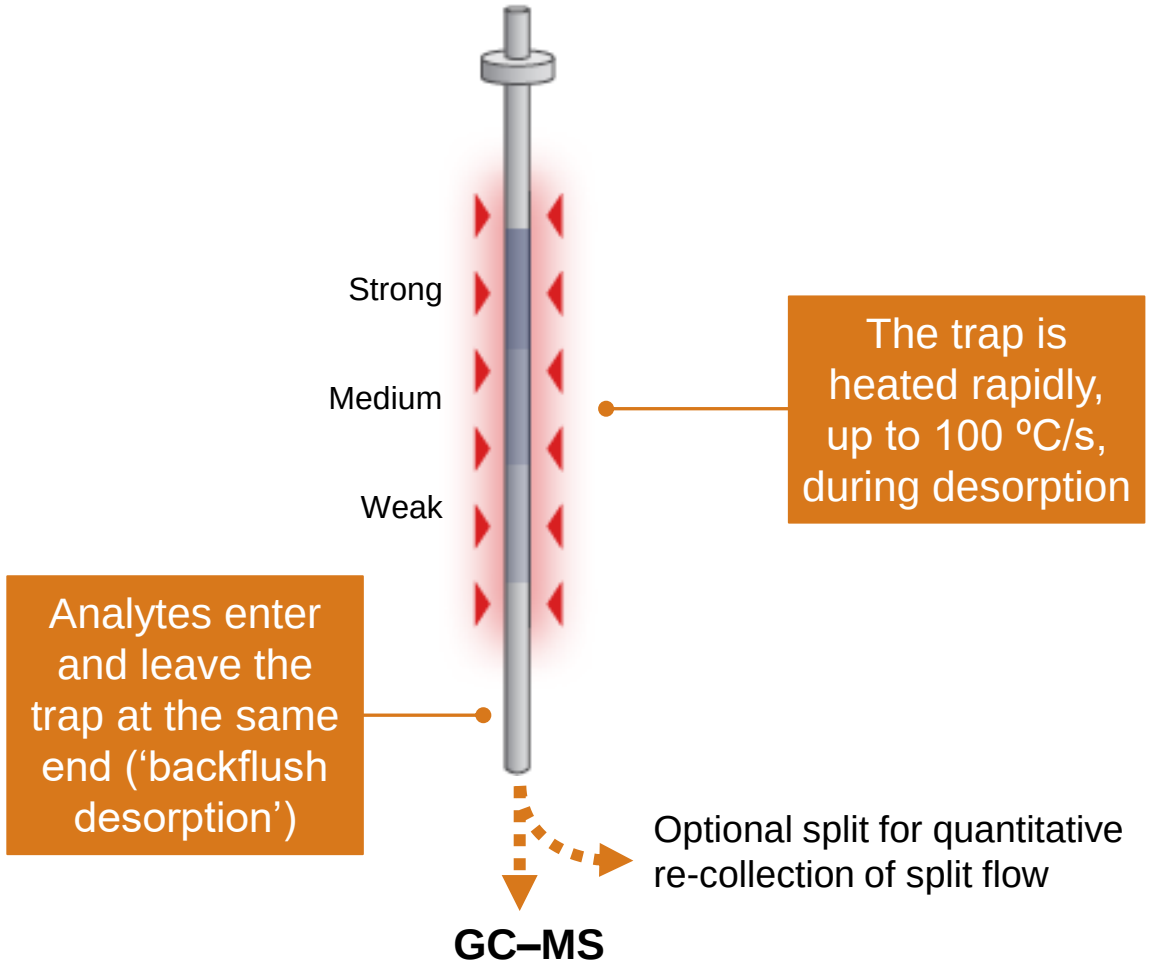


Trapping uses electrical cooling rather than cryogen

Multiple sorbents of increasing strength retain the widest volatility range of analytes in a single GC run

GC injection

Step 2: Rapid backflush desorption and transfer/injection to the GC



Types of sampling techniques

Compatible on Centri

Automated High Capacity Sorptive Extraction

Robust immersive or headspace sampling from liquids and solids using HiSorb probes.

Static Headspace

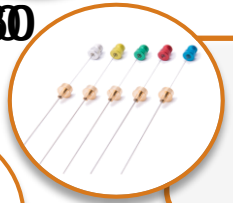
Versatile sampling from solids and liquids contained in regular headspace vials

Tube-based TD

Adaptable sampling onto sorbent packed TD tubes or direct desorption of samples from empty tubes

SPME

Fast and sensitive sample extraction, with a range of fiber/arrow types offering analyte selectivity



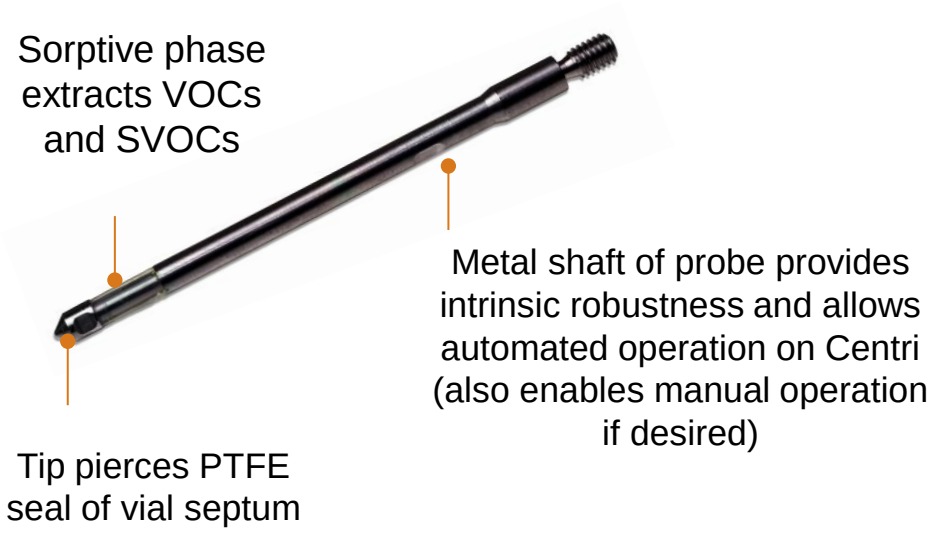
Liquid Injection

Direct liquid injection to GC compatibility – rail and configuration dependent.

Note: Does not use Centri Injector

HiSorb, high-capacity sorptive extraction

- Similar extraction principles as solid-phase microextraction (SPME)
- Analytes are extracted via an **absorptive or adsorptive process** depending on the phase type used.
- Intrinsically **robust** in design due to inert metal-core probes supporting the sorptive phase (30-65 µL phase vs. ~0.5 µL on SPME fiber)
- Can be used in **headspace** mode for both solid and liquid samples and robust **immersive** sampling of liquids

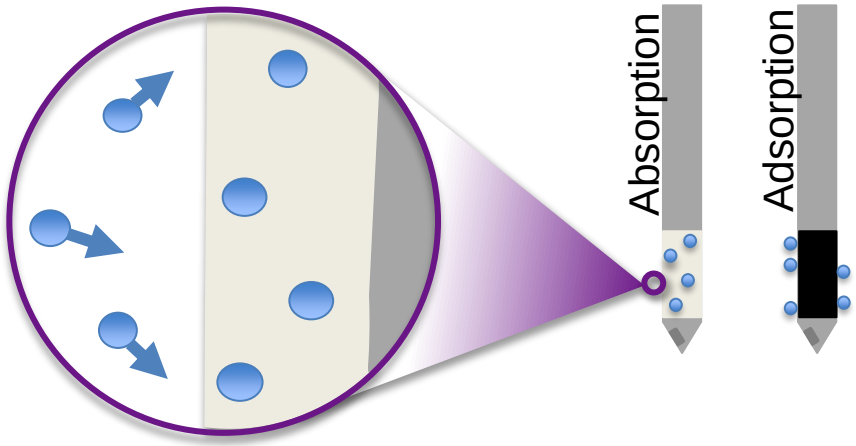


Multi-phase HiSorb

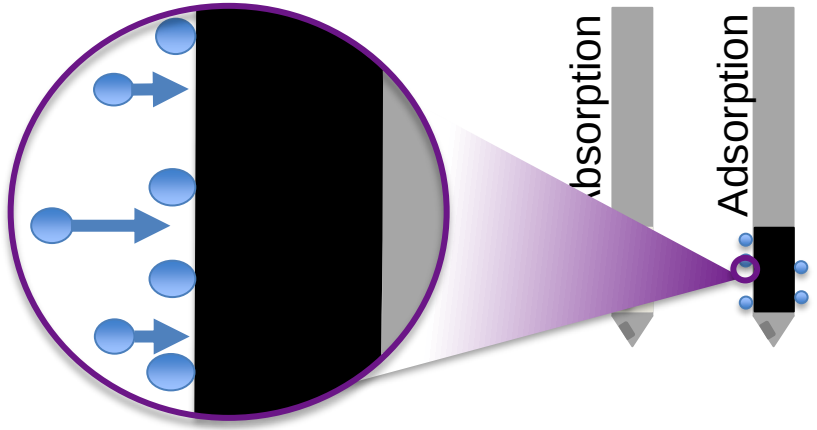
Phase combinations

- Polar compounds or compounds with log $K_{o/w}$ values < 3 are not extracted so well and typically require a different phase type such as:
  - PDMS/CWR (Carbon Wide Range)
  - PDMS/DVB (Divinylbenzene)

PDMS



CWR, DVB



For **non-targeted** analysis or to cover the **widest range** possible, a combination of **DVB/CWR/PDMS** is used

Thermal desorption injection on Centri

- Fully compliant with numerous standard TD methods.
- Cryogen-free, multi-sorbent, back-flushing trap operation facilitates wide analyte volatility range.
- Automated re-collection of HS, SPME, HiSorb or TD sample split flows onto sorbent-packed TD tubes.
- Re-collected samples can be stored for re-analysis without using new sample aliquots, thus preserving valuable or ‘unique’ samples.
- Complete automated sample traceability ensured at all times.

Sample tubes are placed in the 50-tube autosampler, and leak-tests are performed on every tube to confirm sample integrity.

Analytes are released from the tubes in a flow of heated gas, and the vapours collected on the focusing trap.

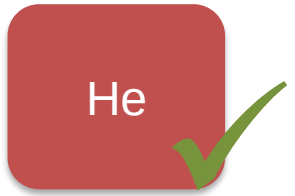
The trap is thermally desorbed and the sample injected into the GC–MS.

Speed up analysis and reducing cost per sample

Multi-gas enabled

- **Future-proof** thanks to independent certification of Centri 90 and Centri 180 for safe use with hydrogen, **safeguarding against helium shortages** and rising costs by switching now or in the future.

- **Remove dependency on gas bottles**, together with their associated costs, using gas generators to provide a consistent gas supply, eliminate any risk of downtime while **lowering cost-of-ownership**.



- **Speed-up sample analysis** to maximise your return on investment with **faster GC separations** enabling higher sample throughput and so increasing earning potential.

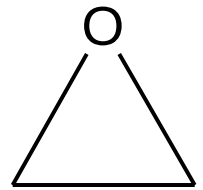
48 samples per system, per day with **helium** carrier

~50% (25) more samples per day with **hydrogen** = 73 samples in total

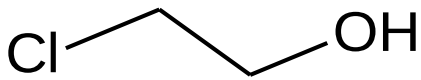
$100/sample, therefore, **additional earnings of $2500 per system, per day**

Food safety: Detecting fumigants in spices and matrices

- Used as a fumigant to eliminate insects in seasonings, seeds and spices
- In the EU, EtO use is banned due to its highly toxic carcinogenic, mutagenic and reprotoxic properties
- Produces 2-chloroethanol (2-CE) as a by-product[1], which is also a toxic chemical restricted by the EU
- The EU imposes strict maximum residue limits (MRLs) for EtO and 2-CE in imported products



Ethylene oxide



2-Chloroethanol

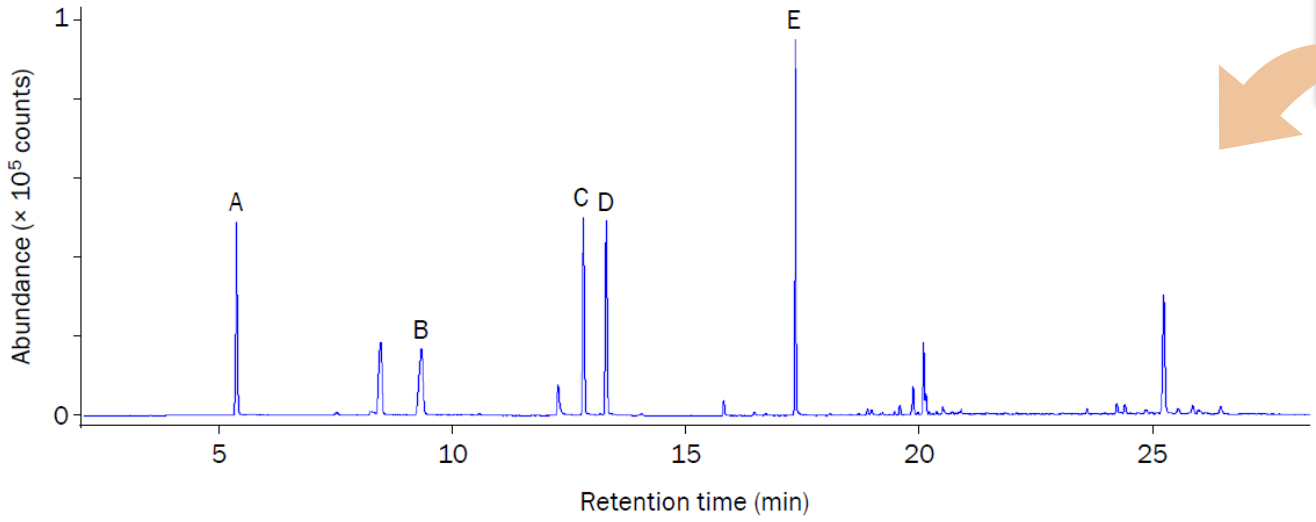
[1]EurlSrm_Observation_EO_V1.pdf (eurl-pesticides.eu)

Expanding the compound range for residual fumigants testing

- Other fumigant compounds are reported and may be used instead to circumvent tests for ethylene oxide use.
- 5 fumigants, spanning a volatility range from 3 °C to 131°C, were analysed using the same methodology as ETO & 2-CE.

Compound	Formula	B.p. (°C)	Quant ion (m/z)	Hazardous properties	EU MRL (mg/kg)
Bromomethane	CH_3Br	3.6	94	Highly toxic	0.01[a]
Bromoethane	C_2H_5Br	38	108	Toxic	0.01[a]
Carbon tetrachloride	CCl_4	77	117	Highly toxic	0.01[b]
1,2-Dichloroethane	$C_2H_4Cl_2$	83	62	Carcinogen	0.01[c]
1,2-Dibromoethane	$C_2H_4Br_2$	131	107	Highly toxic, carcinogen	0.01[c]

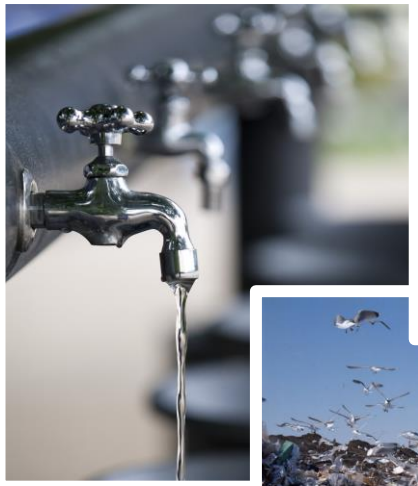
Table 1: Target analyte information with EU MRLs shown, and regulation number denoted with superscript. [a] Regulation (EC) No. 1005/2009. [b] Regulation (EU) 2021/155. [c] Regulation (EU) 2012/649.

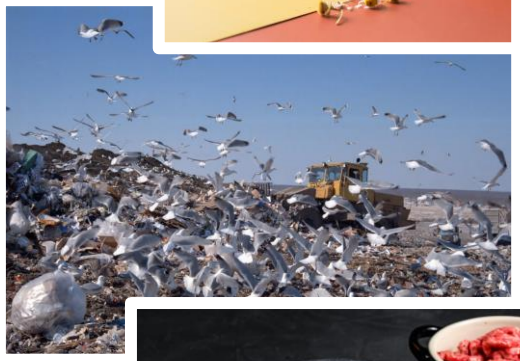


A Bromomethane
B Bromoethane
C Carbon tetrachloride
D 1,2-Dichloroethane
E 1,2-Dibromoethane

Figure 2: Extracted-ion chromatogram (merged EIC of m/z 94, 108, 31, 117, 62 and 107) for all target compounds, spiked at 0.05 mg/kg on sesame seeds.

One platform, many applications…






Thanks for listening!
Any questions?