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A Guide to Whole Air Canister Sampling: Equipment Needed and Practical Techniques for Collecting Air Samples

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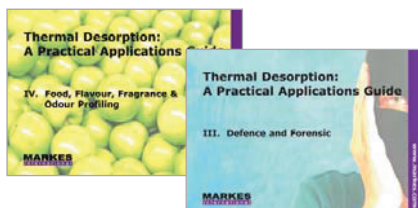
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Thermal Desorption Unit (TDU) Tubes vs. Canister Sampling Which VOC Sampling Technique is Right for You?

Thermal desorption unit (TDU) tubes provide a complementary option to canisters for sampling VOCs. Both techniques have advantages and disadvantages, and their features must be evaluated for suitability relative to the sampling environment and analytical capabilities. Table I outlines the similarities and differences between these techniques; use this handy comparison to determine which equipment is best for you.

Table I: Comparison of thermal desorption tube and canister sampling for VOCs.

Similarities Between Thermal Desorption Tubes and Canisters

- Reusable sampling device.
- Long product lifetime.
- Long-term sample stability.
- Blank certification required prior to sampling.
- Sample concentration required before GC-MS analysis.
- Dry purge helpful to remove moisture before GC injection.
- ppt sensitivity.
- Method acceptance.
- Collection of wide range of VOCs with single device.
- Useful for screening of unknowns.
- Leak tightness critical to maintaining sample integrity and preventing contamination of a clean device.

Differences Between Thermal Desorption Tubes and Canisters

	Thermal Desorption Tubes	Canisters
Methods	U.S. EPA TO-17 ASTM D6196 ISO 16017 ISO 16000-6 NIOSH 2549	U.S. EPA TO-14A, TO-15 ASTM D5466 OSHA PV2120 NIOSH Protocol Draft
	World-wide acceptance	Gold standard for U.S. ambient air market
Applications	Ambient air, indoor air, industrial hygiene Material emissions Food & flavor Chemical weapons	Ambient air, indoor air, vapor intrusion, emergency response
	C3 to C30	<C3 to ~C10
Handling	Lightweight for personal sampling and general ease of use	Larger and heavier; more costly to ship
Sampling	Active sampling with sampling pump or diffusive sampling without pump is possible with determined diffusion coefficients for each compound.	Passive sampling, no sampling pump required. Long-term sampling possible without battery to recharge.
	Integrated sampling only	Grab & integrated sampling
	Concentrated sample	Whole air
	Proper sorbent selection recommended in methodology.	N/A
	Must sample below sorbent breakthrough volumes to avoid sample loss and irreversible adsorption on sorbent	N/A
	Large sample volumes >100L	Sample volume is function of canister size, 15 L max
Analysis	Tube dimensions are instrument specific	Compatible with all manufacturer sample concentrators
	One injection, more injections possible for some instrumentation	Multiple sample injections
	Concentration range ppt to ppm	ppt to ppm
	Some sorbents prone to artifact formation.	Low blanks when properly cleaned.
Storage	Sample storage at 4 °C recommended for multibed tubes to prevent potential migration of compounds to more retentive sorbent, which may be difficult to recover.	Room temperature
Cleaning	Analytical process automatically cleans tube for reuse. Cleans as it analyzes. Conditioning/cleaning and analysis incorporated in one thermal desorption unit.	Canister cleaning requires separate equipment as additional step prior to background certification and sampling.
Cost	\$50-130 each	\$200-700 each

Thermal Desorption Unit (TDU) Tubes

- Variety of sorbents to collect a wide range of VOCs.
- Use corrosion-resistant glass tubes for excellent inertness; allow monitoring of sorbent bed condition.
- Choose stainless steel tubes for greater durability in the field. No sampling pump necessary for passive sampling with diffusion caps.
- Individually etched with unique serial number for convenient sample identification.
- Robust barcode—the most reliable “code 128” format—on tube for recording and tracking.
- Each tube has an arrow indicating flow direction to reduce errors during use.
- Available unconditioned or preconditioned and ready to sample. Tubes are reusable after thermal desorption for most applications.

High-quality thermal desorption tubes are suitable for ppt to ppm concentrations of volatile organic compounds (VOCs) in ambient, indoor, personal, and industrial hygiene environments. Fit Markes (ULTRA and UNITY™), PerkinElmer, and Shimadzu thermal desorbers. Packed tubes come with a report detailing the total mass of sorbent in the tube; conditioned tubes also include a blank chromatogram.

Thermal Desorption Tube Sorbent	Vapor Phase Organics Applications
Tenax TA	C6/7 to C26
Graphitized Carbon	C5/6 to C14
Tenax GR/Carbopack B	n-C5/6 to n-C20 (EPA Methods TO-14A/TO-15/TO-17)
Carbopack B/Carbosieve SIII	n-C2/3 to n-C12/14 (EPA Methods TO-14A/TO-15/TO-17)
Tenax TA/Graphitized Carbon/Carboxen 1000	C2/3 to C20
Carbopack C/Carbopack B/Carbosieve SIII	n-C2/3 to n-C16/20 (EPA Methods TO-14A/TO-15/TO-17)

Tenax is a trademark of Buchem BV. Carbopack, Carbosieve, and Carboxen are trademarks of Sigma-Aldrich.



method applications

Method	Application
U.S. EPA	TO-17
ASTM	D6196
NIOSH	2549
DIN EN ISO	16017

Specifications

Dimensions: 1/4" OD x 3 1/2" long
Low sampling rates: 0.01–0.20 L/min (<10 L total volume)
Long-term storage caps are supplied with conditioned tubes

Thermal Desorption Unit Tubes (Unconditioned and Conditioned & Capped)

Sorbent Description	qty.	Unconditioned		Conditioned & Capped	
		Stainless Steel cat.#	Glass cat.#	Stainless Steel cat.#	Glass cat.#
Tenax TA (35/60 mesh)	10-pk.	24056	24062	24080	24086
Graphitized Carbon (20/40 mesh)	10-pk.	24057	24063	24081	24087
Tenax GR (35/60 mesh)/ Carbopack B (60/80 mesh)	10-pk.	24058	24064	24082	24088
Carbopack B (60/80 mesh)/ Carbosieve SIII (60/80 mesh)	10-pk.	24059	24065	24083	24089
Tenax TA (35/60 mesh)/ Graphitized Carbon (40/60 mesh)/ Carboxen 1000 (60/80 mesh)	10-pk.	24060	24066	24084	24090
Carbopack C (60/80 mesh)/ Carbopack B (60/80 mesh)/ Carbosieve SIII (60/80 mesh)	10-pk.	24061	24067	24085	24091

Thermal Desorption Unit Tubes (Empty)

- Empty tubes for direct desorption of VOCs from liquids, solids, or pastes.
- Stainless steel: front sorbent-retaining gauze, rear gauze, and gauze retaining spring supplied; or glass: glass frit positioned 15 mm from sampling end.
- Can be packed with any sorbent to suit any application.

Description	qty.	Stainless Steel cat.#	Glass cat.#
TDU Tubes, Empty	10-pk.	24054	24055

Thermal Desorption Unit Tubes (Calibration)

Description	qty.	Stainless Steel cat.#	Glass cat.#
TDU Tubes, Calibration, Tenax TA 1 cm Bed (35/60 mesh)	10-pk.	24075	24076
Description	qty.	cat.	
Calibration Solution Loading Rig	ea.	24077	
Calibration Solution Loading Rig Replacement Septa, 9.5 mm	10-pk.	24078	
Certified Reference Standard, 100 ng BTX on Tenax TA	10-pk.	24079	



Thermal Desorption Unit Tubes



Thermal Desorption Unit Tubes (Accessories)

Description	Benefits/Uses	qty.	cat.
1/4" Brass Cap and PTFE Ferrules	Long-term storage of blank/sampled tubes.	20-pk.	24068
1/4" PTFE Ferrules	Long-term storage caps.	20-pk.	24069
CapLok Tool	Use for tightening long-term storage caps.	ea.	24070
Pen Clip		10-pk.	24071
TubeMate Tool	Assists with tube packing.	ea.	24072
1/4" Stainless Steel Union and PTFE Ferrules	Use for connecting tubes in series.	10-pk.	24073
Diffusion Caps	Required for diffusive sampling with stainless steel tubes.	10-pk.	24074



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