



**ENTECH**  
INSTRUMENTS

*See What's Really There™*



# 2023 CATALOG

Solutions for Chemical Monitoring & Analysis

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## President's Letter



Entech Instruments is continuing its tradition of providing the most advanced and accurate sample preparations systems available for headspace and gas sample analysis by GC and GCMS. Our new Multi-Capillary Column Trapping Systems (MCCTS) are transforming the way that gas phase sample preconcentration is performed prior to GC injection, all without the use of liquid nitrogen or even electronic cooling systems. These "fan cooled", extremely robust and reliable multi-stage capillary column traps manage water and CO<sub>2</sub> hundreds of times better than any packed trap system. This means much faster release for better chromatography, supporting "faster" GC methods, while also demonstrating far better immunity to contamination when exposed to high concentration

samples. Our MCCTS traps have been implemented in a full cryogen free TO15 solution with much faster GC injections and shorter run times than other TO15 systems on the market. Other applications using this revolutionary capillary trapping technology will also soon be announced.

Entech's patent pending Sorbent Pen™ technology takes SPME to the next level by providing enhanced sensitivity, improved quantitation, and greater robustness than its fiber-based predecessor. Sorbent Pens utilize a unique flow through cartridge that forms a seal on a vial allowing a vacuum to be created within the vial. This new technique called VASE (Vacuum Assisted Sorbent Extraction) has been demonstrated to cover the entire range of analytes from the lightest volatile compounds (Freon 12/Vinyl Chloride and others) to very heavy 5-6 ring PAH compounds, while remaining in the headspace to avoid actual contact with the sample matrix. With 50-150x higher phase loading and the use of traditional adsorbents with thousands of times more surface area than SPME, the Sorbent Pen™ can fully extract difficult compounds from complex matrices providing superior sensitivity and reproducibility. Sorbent Pens are also available for performing Diffusive and Active air monitoring, making the Sorbent Pen technique extremely versatile. Our newly released SPR40 -Sample Preparation Rail promises to be a game changer for headspace sample preparation and general thermal desorption methods. Rather than desorbing a TD tube into a completely different instrument with separate traps, transfer lines, and rotary valves to have to clean and maintain, the SPR40 allows thermal desorption of Sorbent Pens directly into a GC or GCMS to allow dramatically improved recovery, consistency, and easy of maintenance. Watch for a new wave of applications coming out in 2019-2020 using the SPR40 Robotic inlet.

Our unmatched Silonite™ surface coatings continue to be perfected, resulting in the most consistent, durable, and inert coatings available for GC inlet systems and for mercury vapor handling without surface interactions. Silonite™ surface treatments play a vital role in achieving our ultimate goal; to provide our customers with complete solutions for "analytical grade" VOC and SVOC handling and inlet systems that can sample, store, and recover virtually all GCMS compatible compounds.

Finally, for US EPA Method TO-15 and China HJ-759, Entech is proud to be the only supplier that manufacturers and supports the complete solution for sampling and analysis of airborne contaminants using Silonite™ coated stainless steel canisters. Entech has assembled an extraordinary and talented team of Chemists and Service Engineers with a combined knowledge of over 200 years of laboratory and field experience – to provide our clients with premier customer service and on-site support. To our valued customers we would like to say thank you for your patronage through the years and we look forward to servicing your analytical needs for many years to come.

Sincerely,  
Daniel B. Cardin – President



# Entech Instruments | Solutions & Service



Entech Instruments is a leading developer and manufacturer of analytical instrumentation that supports professionals around the world in the Environmental, Industrial Hygiene, Food & Beverage, Product Testing, Forensics, and Clinical Analysis markets.

To provide solutions for such a diverse set of industry applications, Entech has assembled an extraordinary and talented team – a combined knowledge of over 200 years of laboratory and field experience – to provide our clients with premier customer service and on-site support. We invite you to share your application challenges and requirements so we can create a customized solution just for you.

~ The Entech Team

# Laboratory Instruments



**VASE** Vacuum Assisted Sorbent Extraction and Entech Headspace Sorbent Pen™ Solutions  
[See pages 8 – 10](#)



**7200CTS** Cryogen-Free Preconcentration Solution for Trace Air, Soil & Gas Analysis  
[See pages 26 – 31](#)



**7200A | 7650-M** MillionAir™ Analysis System  
State-of-The-Art, High Throughput Whole Air Analysis  
[See pages 38-39](#)

## Headspace Analysis Solutions

## High Performance Analysis of VOCs in Air and Soil Gas.

### This Section Covers

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# Instruments & Systems Selection Guide

## GC / GCMS Inlet Systems

Type	Range	Applications	Instruments	Pages
<b>Loop Injection</b> (0.1 PPM to %)	Volatiles / Semi-Volatiles	Packaging PPM Level Gases HDS™ Personal Monitors Soil Gas Permanent Gases Landfill Gas Sulfur Compounds	7650, 7650-L10 & 7650-L20	43 – 44 47 – 48
		Industrial Hygiene Environmental Monitoring Mold (MVOCs) Indoor Air Quality Sulfur Compounds	7200 LN2 + 7650-(01/M), 7200CTS + 7650-(01/M), 7016D	45 – 46 39 – 40 49
<b>VASE (Vacuum Assisted Sorbent Extraction) with Sorbent Pens™</b>	Volatiles / Semi-Volatiles	Pesticides in Foods Nitrosamines & Acrylimides in Foods Pharmaceuticals in Drinking water SVOCs in Drinking & Waste Water Taints & Odors in Foods / Alcoholic Beverages Materials Testing (plastics, textiles, auto parts, indoor synthetics) Environmental Sampling of PAHs and SVOCs in Air	5800 SPDU, 7850, 3800	21
	Volatiles / Semi-Volatiles			

*Sorbent Pens also support these applications.*

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## Gas Standards Preparation

Type	Range	Applications	Instruments	Pages
<b>Automatic Precision Dilution</b>	Volatiles	Environmental Monitoring	4700 Precision Diluter	55 – 56
<b>Manual Dilution</b>	Volatiles	Environmental Monitoring	Digital Dilution System™	57
<b>HDS™ Personal Monitors</b>	Volatiles	Workplace Monitoring	HDS™ Exposure Chamber HDS™ Prep. Station	59 60

## Canister / Bottle-Vac™ Cleaning

Type	Range	Applications	Instruments	Pages
<b>Cleaning Systems</b>	Volatiles / Semi-Volatiles	Environmental Monitoring Remote Headspace Sampling	3100D	61 – 62

## Advanced Sample Handling Systems

Introducing the next generation in Headspace and Environmental GCMS sample introduction systems. Entech's robotic autosamplers have an ultra-inert Silonite™ flow path that ensures complete recovery of compounds sampled while minimizing the potential for sample carryover. These autosamplers are optimized for collecting large volumes of headspace or other gas-phase samples using large vials or Silonite™ coated vacuum sampling canisters to achieve both trace level detection and quantitative recovery of all compounds present. Entech's exclusive On-Column Extraction provides chemists with information never before possible, using the SPME concept to absorb rather than adsorb samples during sample enrichment. Three different versions of this autosampler are shown below, one for trace level headspace analysis of liquid and solids samples, and the other two for advanced Environmental and Industrial Hygiene analysis of whole air collected samples. Obtain the system optimized for your application and take full advantage of all the benefits offered by our latest sample handling solutions.

### 7650-M "Million Air" Autosampler (Environmental and IH Analysis)



The 7650-M "Million Air" platform is our next generation autosampler for analyzing whole air samples. The 7650-M is the only trace level, whole air VOC autosampler that is capable of production level, multi-sample analysis using a single inlet to ensure consistent blank levels without the carryover challenges found in many rotary valve based autosamplers. This unique design also eliminates errors seen when analyzing samples over wide concentration ranges. The 7650-M combines with the 7200A Accelerated Preconcentrator to provide quantitative analysis of samples over a "1 million fold concentration range".

This range is simply not possible with rotary valve based systems that will absorb some of the previous sample connected to that inlet position, simply because of the length of time samples remain on each rotary valve inlet. The 7650-M can also perform loop injection of high concentration samples directly to the GC. This feature avoids any sample contact with the Tenax® trap when analyzing high concentration samples. Another new feature of the 7650-M is rapid sample screening (6–7 minutes per sample). Screening on the 7650-M allows the determination of the best analytical volume without any fear of system contamination. A 6L canister tray now allows up to six, 6L canisters to be screened directly by the robotic inlet without connection to any transfer lines in as little as 40 minutes. The 7650-M is configurable with trays that are optimized for sample vials, bottles, and canisters from 50cc to 6L. Up to 18 expansion ports can be also be added for the analysis of 6L Silonite-XL™ canisters and Tedlar® bags. For soil gas analysis, up to 38, 1L sample canisters can be analyzed unattended to maximize productivity.

### 7650-L20 GC Gas Autosampler (PPM Level and IH Analysis)



The 7650-L20 is the only system handling automated injection of Tedlar bags and other gas phase samples using a single inlet robotic autosampler. The 7650-L20 can automate the analysis of up to 16 Tedlar bags, or 24 to 80 Bottle-Vac samplers or MiniCans depending on the size of the canister or Bottles. Canisters and gas sampling Bottle-Vacs can be heated prior to analysis to extend the molecular weight range of recoverable compounds, allowing a reliable way of measuring heavy volatiles or semi-volatiles. The dual loop system simultaneously injects an Internal standard

along with the sample or calibration standard to support internal standard calibration methods. A 100% Silonite coated ceramic pathway ensures recovery of difficult compounds, creating the most comprehensive technique available for the quantitative measurement of organic compounds in gas phase samples. The 7650-L20 can automate the injection of gas samples to virtually all GCs by using the model specific communication cables available from Entech.

## Sample Handling Strategies for Improved Sensitivity and Statistical Accuracy

Entech offers the only “large vial” autosamplers available for headspace analysis. A large vial size is important to increase sample loading for improved statistical accuracy and to provide additional sample and headspace volume for improved detection limits when performing equilibrated static headspace analysis. This larger vial size can also accommodate large objects or products as a whole so they are presented to the analyzer the same as they would be to the consumer. For many compounds, olfactory detection is hundreds of times lower than what is possible by loop injection GCMS headspace analysis. Our autosamplers support 4 high sensitivity sample handling approaches listed below, including “remote headspace” sampling, which offers the most statistically accurate means of product quality measurement.

### Large Volume Static Headspace (LVSH – On-Column Extraction and Loop Systems)

Large Volume Static Headspace offers a quantitative approach for the analysis of trace level volatiles in liquids and solids. Achieving equilibrium and then quickly pulling a reproducible volume of headspace using convective transfer provides equal weighting of the light and heavy compounds in the headspace. Unlike SPME, the analyzer will receive the same distribution of headspace compounds as a consumer would receive when first smelling the headspace. This is very important when fine-tuning a product for improved consumer appeal. Static conditions virtually eliminate aerosols and foaming – which are all too common with Purge & Trap techniques. The large volume eliminates the need to boost headspace concentrations through sample heating, which may denature thermally labile compounds and produce headspace artifacts.

Large Volume Static Headspace



### Pulsed Vacuum Extraction Headspace (PVEH – On-Column Extraction Systems)

Pulsed Vacuum Extraction Headspace, or PVEH, allows for lower detection limits without the aerosols and foaming present in Purge & Trap. Volatiles in liquids and solids can be transferred more rapidly into the headspace by pulling a vacuum on the vial during sample preparation. After equilibration, the vial pressure is increased using UHP Helium or Nitrogen to provide a carrier gas to more efficiently transfer volatiles and SVOCs to a preconcentration system “pulsed” vacuum & pressure filling are repeated until the desired sensitivity is achieved.

Vacuum Extraction



Recharging the Headspace



### Headspace Sorbent Pens™

Introducing the next generation of Solid-Phase Microextraction (SPME) extraction and analysis. Rather than using a fiber inside of a needle, Sorbent Pens™ use a range of coatings and packings to extend the loading capacity and sampling rate over the Classical SPME sampler, while improving the robustness and speed of desorption. Sorbent Pens™ feature a built-in micro-seal that allows sampling of the headspace under vacuum, increasing the recovery of SVOCs by 10–20 fold over atmospheric pressure diffusive sampling with SPME. The larger loading capacity of the Sorbent Pen™ minimizes matrix interferences, allowing a more reproducible equilibrium to be achieved between the cartridge and the sample, improving quantitation. Vacuum extract samples for 1–48 hours, then perform either manual desorptions with the low-cost 5800 SPDU Sorbent Pen™ Desorber unit, or add on automation for higher productivity. Due to the benefits of longer sampling times and vacuum assisted extraction, Sorbent Pens™ are uniquely capable of analyzing BOTH volatiles and semi-volatiles without contacting the matrix. Sorbent Pens™ are the complete extraction techniques that solve hundreds of analytical challenges for the sampling and analysis of matrices that previously required solvent extraction.



### Remote Headspace Analysis

Direct collection of gas samples into vacuum-tight, inert containers enables the analysis of a tremendous number of systems as a whole. Quick, vacuum sampling into Silonite-XL™ canisters or Bottle-Vac™ samplers, provides significant advantages over sampling onto charcoal tubes or Tedlar® bags. These containers feature inert internal surfaces similar to that of a GC column, allowing collected headspace compounds to remain stable for weeks prior to analysis. For ease of sampling, storage, and extended compound ranges, these canisters offer an excellent alternative to Tedlar® bag, or thermal desorption tube sampling.



(Patent Pending)

# Sorbent Pens™ by **ENTECH** INSTRUMENTS

*A revolutionary new extraction technology that is quantitative by design.*

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## Air Monitoring Sorbent Pens for Environmental and Industrial Hygiene Applications

*See page 118*

## Vacuum Extraction for next generation headspace analysis

Perform exhaustive vacuum extraction of VOCs  
through many SVOCs.

### Applications Abound!



Ambient Air  
Monitoring



Water Testing



Drugs &  
Pharmaceuticals



Flavors &  
Fragrances

# Headspace Sorbent Pens™ The Ultimate Extraction Power

Introducing Entech's exciting new Sorbent Pen™ technology. The most versatile extraction and sample preconcentration technology available for GC and GCMS. Sorbent Pens™ combine the features of SPME and classical 1/4" adsorbent traps in a design with far more flexibility and enhanced performance. Sorbent Pens™ are extremely durable and are designed to perform both active and diffusive sampling. Following sampling, the Sorbent Pen™ is desorbed directly onto the head of a GC column, eliminating losses associated with standard thermal desorption systems that must transport the desorbed sample through rotary valves, secondary traps, and a lengthy transfer line prior to delivery onto the GC column.

The Sorbent Pen uses a new approach for headspace extraction, termed Vacuum Assisted Sorbent Extraction, or VASE. The Sorbent Pen is inserted into the top of the sample vial and brought under reduced pressure. VASE allows the recovery of a far wider range of compounds than what was previously attainable. With Sorbent Pens™, both VOCs and SVOCs can be measured in wastewater, breath condensate, alcoholic beverages, and virtually all other matrices. VASE offers a tremendous advantage over other extraction techniques that perform extractions at atmospheric pressure where diffusion rates are suppressed. Sorbent Pens™ perform sample enrichment offline from a GCMS, allowing all samples to extract simultaneously and for longer periods of time. This approach results in high throughput while yielding a more complete and reproducible extraction for more sensitive and quantitative measurements. The low cost 5800 Sorbent Pen™ Desorption Unit (5800 SPDU) makes this exciting new technique both affordable and practical for virtually any laboratory's budget. Then move up to 120 sample automation with the SPR (Sample Preparation Rail) Autosampler for the ultimate in laboratory productivity. Join the Sorbent Pen™ movement and take advantage of the next generation in GCMS sample preparation.

## Improvements over SPME and Dynamic Headspace Trapping

- Highly reproducible.
- Minimal carryover without the need for a secondary bakeout/cleanup step.
- Durable - hundreds of injections.
- Thousands of times more phase than SPME to eliminate matrix effects on sorbent affinities.
- Operates at or near equilibrium to improve sensitivity and quantitative accuracy.
- Performs exhaustive vacuum extraction of VOCs through SVOCs.
- Unlike SPME, Pens are shielded from exposure to aerosols formed during agitation.
- See taints, odors, additives, flavors & fragrances at levels below previously possible.
- Faster injection rates produces better chromatography and less thermal degradation.
- Rapid injections without cryogen or electronic cooling.
- Higher throughput via parallel off-line extractions.
- Sample at elevated or sub-ambient temperatures as needed.

## Applications include:

### Water Analysis

- VOCs & SVOCs
- Emerging Contaminants
- Odor Agents
- EPA 8270

### Flavors/Aromas

- Foods
- Beverages
- Alcoholic Beverages
- Taints/Off-Flavors

### Cannabis

- Pesticide Screening
- Terpene Profiling
- Residual Solvents
- Cannabinoid Potency

For a complete list of applications, visit [entechinst.com](http://entechinst.com)

### Food Safety

- Nitrosamines
- Acrylamide
- Pesticides/Herbicides
- Carcinogens
- Preservatives

### Clinical Markers/Drugs In

- Blood
- Urine
- Breath

### Misc.

- Odors in Consumer Products
- Residue Drugs/Pharma
- PCBs, PBDEs

## Headspace Sorbent Pens™

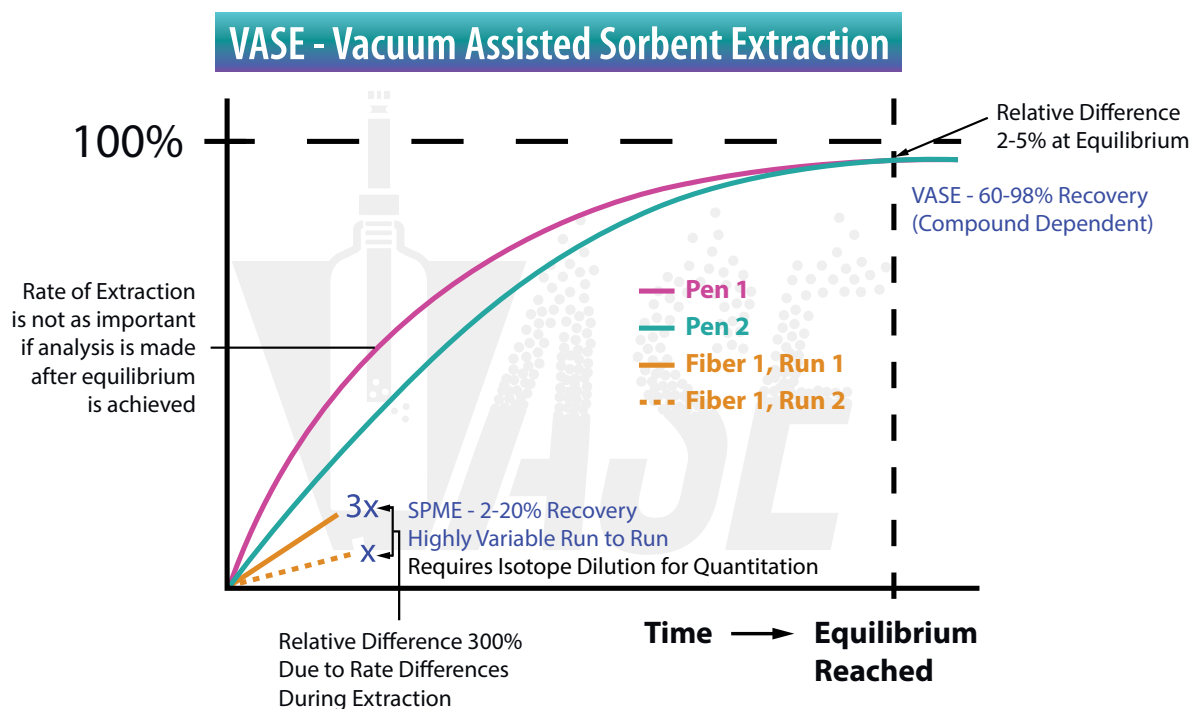
Description	Unit	Part #
<b>Headspace Sorbent Pens™</b>		
Tenax® TA (35 / 60)	EA	SP-HSP-T3560
Tenax® + Carboxen 1000	EA	SP-HSP-TCBXN
Tenax® + Carboxen 1000	EA	SP-HSP-TCBXN
Tenax® + Carboxen 1000	EA	SP-HSP-TCBXN
PDMS / Tenax® TA (35 / 60)	EA	SP-HSP-PDMST3560
Empty Headspace Pen	EA	SP-HSP-0
Sorbent Pen Isolation Sleeve	EA	19-5800-192

**Durable, Reuseable, and Cost Effective!**

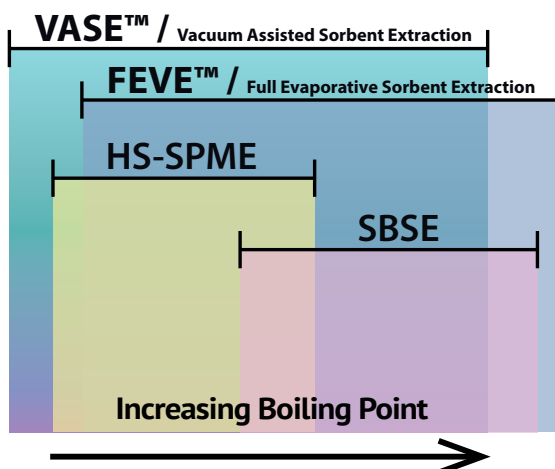


## VASE, utilizing Sorbent Pens™, Operates at or Near Equilibrium to Improve Sensitivity and Reproducibility.

- Operating at or near equilibrium increases sensitivity and reduces run to run variability.
- Small changes in VASE extraction conditions result in inconsequential differences in the ultimate recovery at equilibrium, resulting in excellent reproducibility.
- Typically no need to use isotope dilution for quantitative measurements.



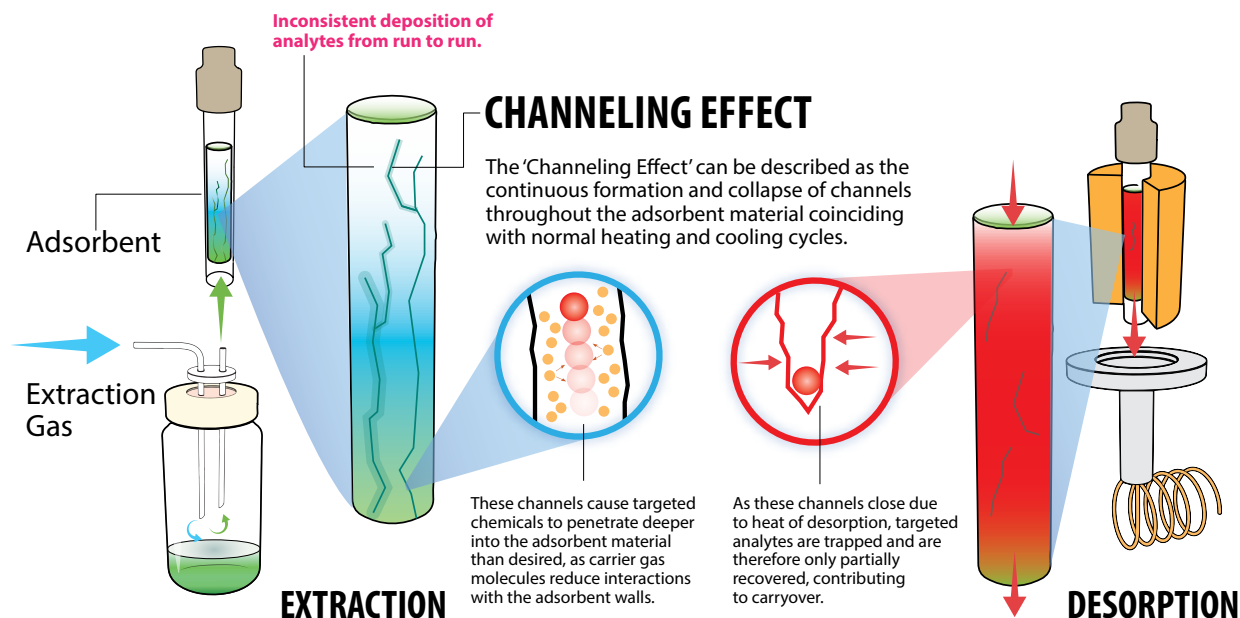
## VASE and FEVE (Sorbent Pens) vs HS-SPME and SBSE Recovery Relative to Analyte Volatility.



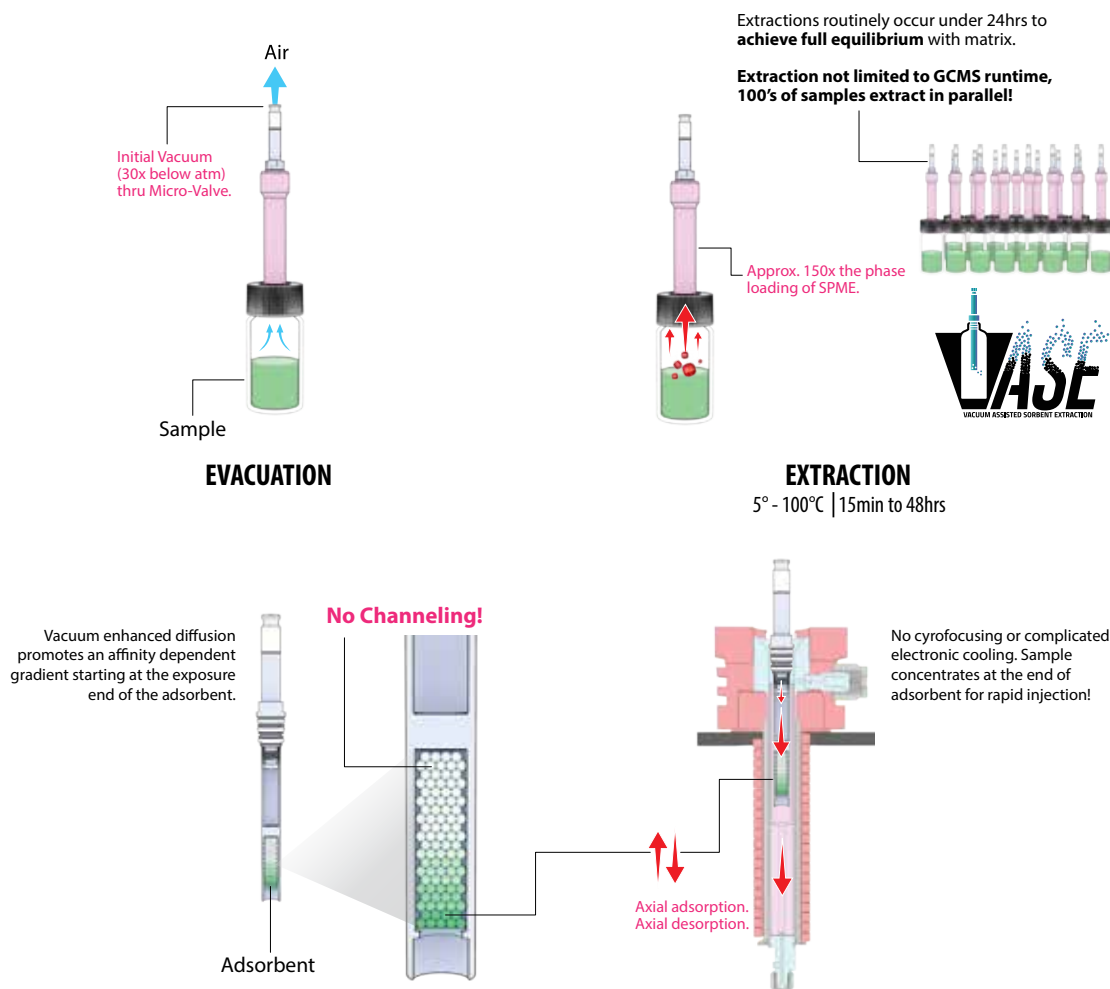
- Using VASE or FEVE, Sorbent Pens can recover compounds over a wider volatility range than either SPME or SBSE.
- Most applications done by either SPME or SBSE can be done more easily and usually with higher sensitivity and accuracy utilizing VASE or FEVE.



# Channeling: Limitations of technologies using flow-through adsorbent beds

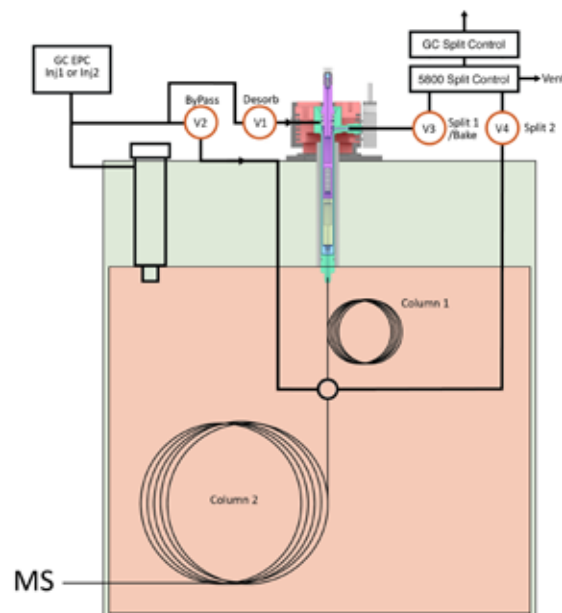


## VASE Provides Extraction Efficiencies & Promotes Reproducible Analyte Deposition Gradients.



## 5800 Sorbent Pen™ Desorption Unit (SPDU)

The 5800 SPDU is a thermal desorption system designed to reliably deliver samples collected on Sorbent Pens™ to a GC or GCMS. The unique design of the 5800 SPDU (multiple patents pending) includes a far shorter path length to the GC column than any other thermal tube desorption system (only 1-2cm), while supporting a dual GC column interface that allows additional sample preparation “inside the GC oven”, where losses due to cold spots and exposure to active surfaces are far less likely. Most other thermal desorption systems desorb samples far removed from the GC, requiring rotary valves, long transfer lines, and often additional trapping to finally deliver the sample to the GC column. Long sample path lengths generally equate to reduced recoveries, both due to the addition of reactive transfer line surfaces, and the eventual deposition of very low vapor pressure compounds that will likely affect the transport of target compounds to the GC. The 5800 eliminates these concerns by desorbing samples directly into the GC, allowing consistent analytical results with minimal maintenance. The 5800 supports 3 injection modes, including SPLIT, SPLITLESS, and SPLITLESS VOC, which optimize sensitivity and GC column loading while minimizing the on column injection bandwidth. All 4 types of Sorbent Pens are supported (HSP, FSP, DSP, & ASP), while maintaining a vertical position of the Sorbent Pens through the entire heating and cooling cycle to prevent the formation of gaps along the walls of the tube which often occurs with horizontally positioned desorbers, which in turn increases the potential for channeling during dynamic headspace sampling. The 5800 supports 2 split ports that are used for split injection, bakeout, backflushing, and focusing operations. The 5800 SPDU can be used without automation by introducing Sorbent Pens to the 5800 one at a time, or the SPR40 Sample Prep Rail can automate the analysis of up to 240 Sorbent Pens unattended.



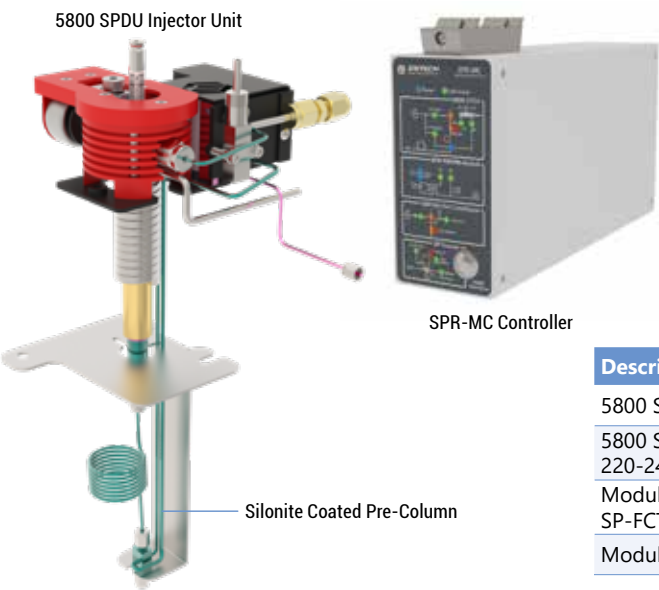
**5800 SPDU - Easily transfers volatile and semi-volatile compounds to a GCMS for extremely sensitive and accurate Sorbent Pen analysis.**



- Direct thermal desorption of Sorbent Pens into all 3 major GC brands
- Avoids transfer lines and rotary valves, maximizing recovery and long term system stability
- Performs injections using SPLIT (VOC thru SVOC), SPLITLESS, or SPLITLESS VOC Modes for maximum flexibility, dynamic range, and sensitivity
- Backflushes to remove heavy, unwanted compounds to reduce both run times and thermal stress on GC columns
- Desorbs the sample within 1-2cm of the GC column, through an inert, easily replaceable glass liner
- Supports “Delayed Split Injections” to allow carrier gas pressures to equilibrate to improve split injection consistencies
- Maintains sorbent devices (Pens) in the vertical position to avoid “wall-gaps” when sorbents are cooled in a horizontal tube
- Entech SPRINT control software orchestrates either manual or multi-sample automated analysis
- Takes thermal desorption technology to the next level of consistency and performance



5800 SPDU Ordering Information



Description	Unit	Part #
5800 Sorbent Pen Desorption Unit, 120VAC/60Hz	EA	5800-SPDU
5800 Sorbent Pen Desorption Unit High-Voltage, 220-240VAC/50Hz	EA	5800-SPDU-HV
Module Controller Supporting 5800, 3801A, SPR-FM, & SP-FCTS (VOC Focuser), 120VAC/60Hz	EA	SPR-MC
Module Controller, 220-240VAC/50Hz	EA	SPR-MC-HV

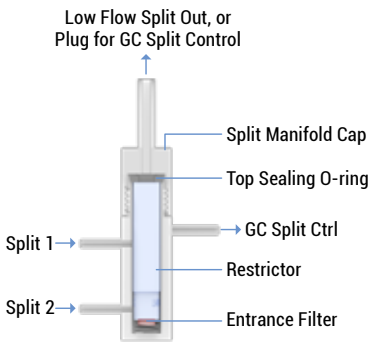
5800 SPDU Consumables and Replacement Parts

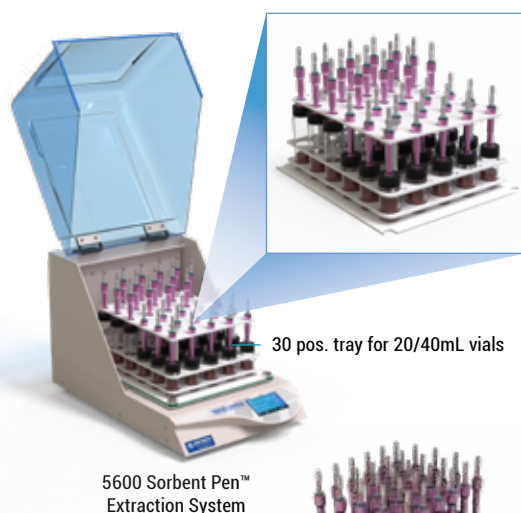
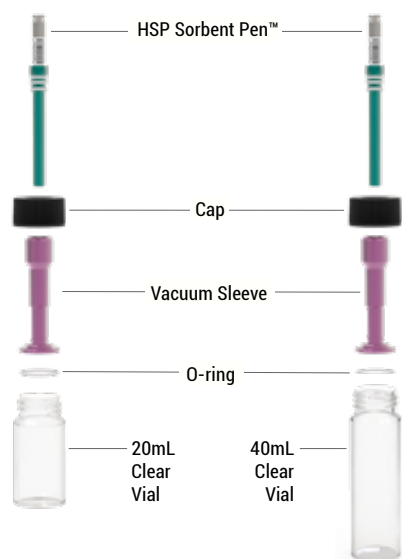
Description	Unit	Part #
<b>Consumables &amp; Replacement Parts</b>		
HSP/FSP/DSP Glass Liner, For 0.53mm ID Column 1	EA	5800-LNR-HD-1mm
HSP/FSP/DSP Glass Liner, For 1/16" OD Column 1	EA	5800-LNR-HD-2mm
ASP Glass Liner, For 1/16" OD or 0.53mm ID Column 1	EA	5800-LNR-ASP-2mm
5800 Column1 - 2 Interface Manifold	EA	5800-C12-M
5800 Insert. Silonite Coated	EA	5800-INSERT
Insert Locking Pin - Keeps 5800 Insert in place when removing Pens	EA	5800-INSERT-LOCPIN
Liner Spring - Keeps glass liner pressed against bottom of Pen during desorption	EA	5800-LNR-SPRING
5800 Spring Insertion Tool	EA	5800-Spring InsertTool
5800 Liner Extraction Tool	EA	5800-LNR-ExtTool
Column Insertion Tool for Metal 0.53mm ID Column 1	EA	5800-COL-InsertTool
<b>GC Model Mounting Kits* (Must select one)</b>		
Thermo 1300 / 1310 GC	EA	5800-GC-TH
Agilent 6890 / 7890(B)	EA	5800-GC-AG
Shimadzu 2010 GC	EA	5800-GC-SH

\* Required component



Description	Qty	Unit	Part #
<b>Split Manifold and Restrictor Elements Kit:</b>			
Split Manifold Enclosure	1	EA	5800-SPLT-M
Split Manifold Cap	1	EA	5800-SPLT-C
Split Manifold #3 Restrictor (Approx xxx cc/min at 10psi Helium)	1	EA	5800-SPLT-R3
Split Manifold #4 Restrictor (Approx xxx cc/min at 10psi Helium)	1	EA	5800-SPLT-R4
Split Manifold #5 Restrictor (Approx xxx cc/min at 10psi Helium)	1	EA	5800-SPLT-R5
Split Manifold #6 Restrictor (Approx 7-12 cc/min at 10psi Helium)	1	EA	5800-SPLT-R6
Split Manifold #7 Restrictor (Approx 4-7 cc/min at 10psi Helium)	1	EA	5800-SPLT-R7
Split Manifold Plug (0 split flow to allow GC to control Split Flow)	1	EA	5800-SPLT-PLUG
Split Manifold O-ring Kit	1	EA	5800-SPLT-OR-KIT





30 pos. tray for 20/40mL vials

5600 Sorbent Pen™  
Extraction System30-Position  
Cold Tray30 Position Sorbent Pen™  
Isolation TrayVial Evacuation  
Unit

Sorbent Pen™ Thermal Conditioner

## HSP Sorbent Pens, Vials, and Vacuum Sleeves

Description	Qty	Unit	Part #
<b>Sorbent Pens™</b>			
HS Sorbent Pen - Tenax TA	1	EA	SP-HSP-T3560
HS Sorbent Pen Tenax® + Carboxen 1000	1	EA	SP-HSP-TCBXN
HS Sorbent Pen Tenax® + Carboxen™ X	1	EA	SP-HSP-TCPX
HS Sorbent Pen - Blank	1	EA	SP-HSP-0
HS Sorbent Pen - PDMS Coated Glass Beads + Tenax TA	1	EA	SP-HSP-PDMST3560
HS Sorbent Pen O-Rings (upper) (10 pack)	4	Pack	SP-OR-SP1-2
HS Sorbent Pen O-Rings (lower) (10 pack)	2	Pack	SP-OR-SP3
<b>Glassware, Caps, &amp; Vacuum Sleeves</b>			
20mL Clear Vials (72 ct.)	1	Box	39-75020
40mL Clear Vials (72 ct.)	1	Box	39-75040
Plastic Vial Caps for 20 / 40mL (144 ct)	1	Pack	39-76044B
Vacuum Sleeve Lid Liner for 20 / 40mL, 24mm Screw Top Vials	1	EA	SP-VSLL024S
White Viton O-Rings for 20 / 40mL vials (10 ct) Low Bleed	1	Pack	SP-OR-L024
Sorbent Pen Ejection Tool	1	EA	SP-PEN-EJECT-TOOL

## 5600 SPES and Cold Tray Dehydration

The 5600 Sorbent Pen™ Extraction System agitates the samples at 30-300 RPM to speed up transfer of volatiles to the headspace, while optionally heating the sample from ambient +4°C to 70°C. Extractions are generally complete in 1-48 hours depending on the application. A 30 position cold tray that is pre-cooled in a lab freezer at about -18° C can be used to draw any moisture back out of the Pens prior to Pen removal, isolation, and then GCMS analysis.

Description	Qty	Unit	Part #
<b>Agitation, Extraction, Water Management</b>			
5600 Sorbent Pen Extraction System, 120VAC/60Hz	1	EA	5600-SPES
5600 Sorbent Pen Extraction System, 230VAC/50Hz	1	EA	5600-SPES-HV
30 Position Tray for 20 / 40mL Vials	1	EA	5600-040TRAY30
30 Position Cold Tray to Dehydrate Pens after 20 / 40mL Vial Extractions	1	EA	SP-HSCOLDTRAY30-2
15 Position Cold Tray to Dehydrate Pens after 125mL Bottle Extractions	1	EA	SP-HSCOLDTRAY15-2

## Sample Preparation & Extraction

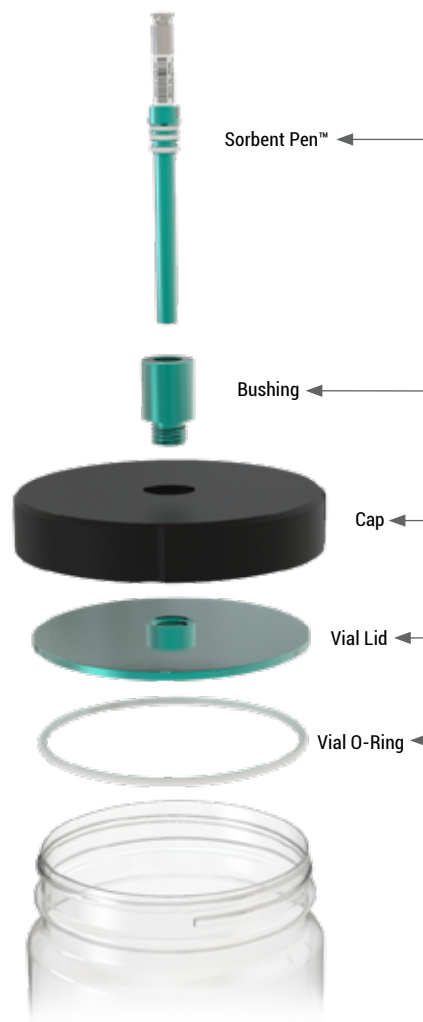
Description	Qty	Unit	Part #
<b>Essential Preparation</b>			
30 Position Sorbent Pen Isolation Tray	1	EA	SP-HSP-TRAY30
Vial Evacuation Unit	1	EA	SP-VIAL-EVAC
VXB Vial Evacuation Unit (VXB - Vacuum X-traction Bar)	1	EA	SP-VXB-PV-EVAC
30-0"Hg Vacuum Test Gauge (w/ Female Micro-QT)	1	EA	29-70010QT
Double-Ended Micro-QT Valve	1	EA	MQT-2S
2-Stage Oilless Diaphragm Pump, 120VAC/60Hz	1	EA	10-20036

## 3801A Sorbent Pen Thermal Conditioner

Description	Qty	Unit	Part #
<b>Sorbent Pen Conditioning</b>			
3801A Sorbent Pen Thermal Conditioner, 120VAC/60Hz	1	EA	3801A-SPTC
3801A Sorbent Pen Thermal Conditioner, 230VAC/50Hz	1	EA	3801A-SPTC-HV

## Glassware, Caps, Lids, & Misc Parts

Description	Unit	Qty. Incl.	Part #
<b>Headspace Vials</b> (vial caps and lids sold separately)			
20mL Clear Vials	Pack	72	39-75020
20mL Amber Vials	Pack	72	39-75020A
40mL Clear Vials	Pack	72	39-75040
40mL Amber Vials	Pack	72	39-75040A
60mL Clear Vials	Pack	72	39-75060
60mL Amber Vials	Pack	72	39-75060A
125mL LVSH Vials	Pack	12	39-75125BW
250mL LVSH Vials	Pack	24	39-75250BW
500mL LVSH Vials	Pack	12	39-75500W
1L LVSH Vials	Pack	12	39-75L1W
<b>Headspace Bottles</b>			
125mL Amber Bottles, deactivated*	Pack	24	39-75125AD
250mL Amber Bottles, deactivated*	Pack	12	39-75250AD
500mL Amber Bottles, deactivated	Pack	12	39-75500AD
<b>Sorbent Pen Bushing for 125 / 250 / 500 / 1L Vials</b>			
Bushing	EA	1	SP-L100S
<b>Vial Caps</b>			
Plastic Vial Caps for 20 / 40 / 60mL Vials	Pack	144	39-76044B
High Temp Vial Cap for 125mL Vials	EA	1	39-76812HS
High Temp Vial Cap for 250mL Vials	EA	1	39-76825HS
High Temp Vial Cap for 500mL Vials	EA	1	39-76850HS
High Temp Vial Cap for 1L Vials	EA	1	39-76894HS
<b>Vial Lids</b>			
Silonite Coated Sorbent Pen Receiver Lid for 20 / 40 / 60mL Vials + All Bottle-Vac Sizes	EA	1	SP-L024S
125mL Silonite™ Lid for Micro-QT Valve	EA	1	HS-760125
250mL Silonite™ Lid for Micro-QT Valve	EA	1	HS-760250
500mL Silonite™ Lid for Micro-QT Valve	EA	1	HS-760500
1L Silonite™ Lid for Micro-QT Valve	EA	1	HS-761000
<b>Individual O-Rings</b>			
White Viton O-Rings for 20 / 40 / 60mL vials (10 ct)	Pack	1	SP-OR-L024
Viton O-Rings for 125mL Vials	EA	1	39-20629
Viton O-Rings for 250mL Vials	EA	1	39-26M02-48
Viton O-Rings for 500mL Vials	EA	1	39-76508V
Viton O-Rings for 1L Vials	EA	1	39-26151
Viton O-Rings for Sorbent Pen Bushing	EA	1	39-26012



# SPR

## Sample Preparation Rail

### VASE & Sorbent Pen™ Automation

Take productivity to a whole new level by combining the award winning VASE & Sorbent Pen™ extraction solution with Entech's new Sample Preparation Rail (SPR). The SPR40 delivers unattended sample prep options and unattended desorption of up to 120 pre-extracted Sorbent Pens.



## Start Here.

### Sample Preparation Rail Bundle

Description	Qty	Unit	Part #
<b>Sample Preparation Rail Bundle</b> (100-250VAC, 50-60Hz)	1	EA	SPR40-H01
- Base Sample Rail System	1	EA	SPR40
- 5800 Controller Platform with Rail Clamp	1	EA	SPR-PF-CTRL1
- 30 Position Sorbent Pen Isolation Tray	2	EA	SP-HSP-TRAY30
- SPRINT Control Software	1	EA	45-SPRINT
<b>Rail Mounted Components</b>			
Dual Sorbent Pen Isolation Tray Platform w/Legs & Magnetic Sensing Rail Clamps	2	EA	SPR-PF-TR2

\* Included only with order of High Voltage version.

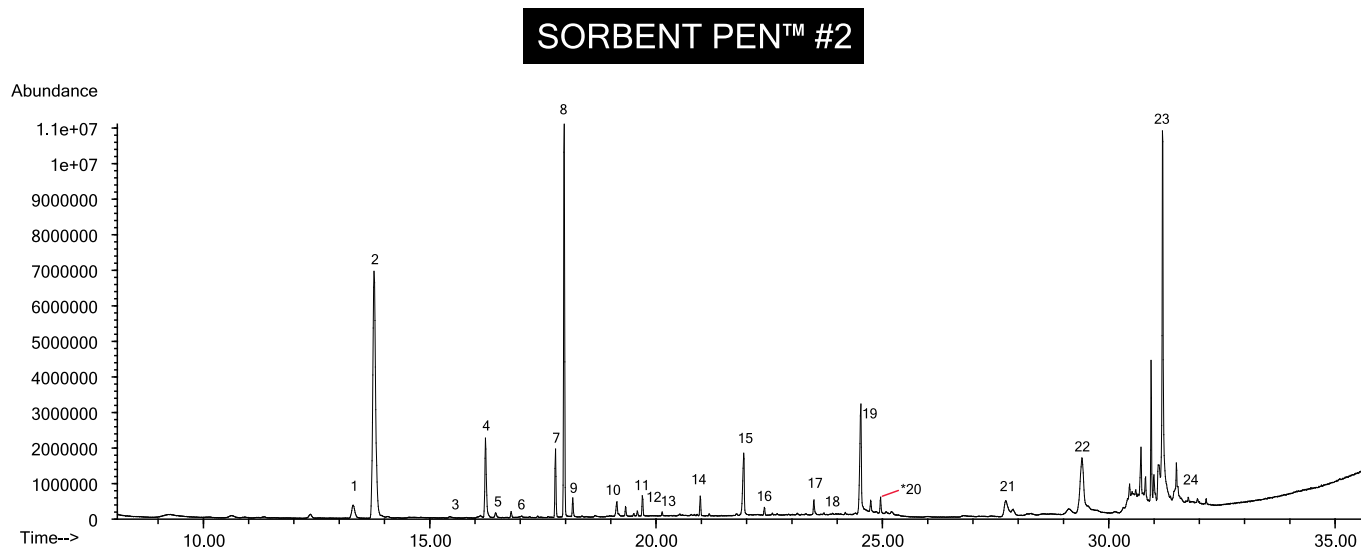
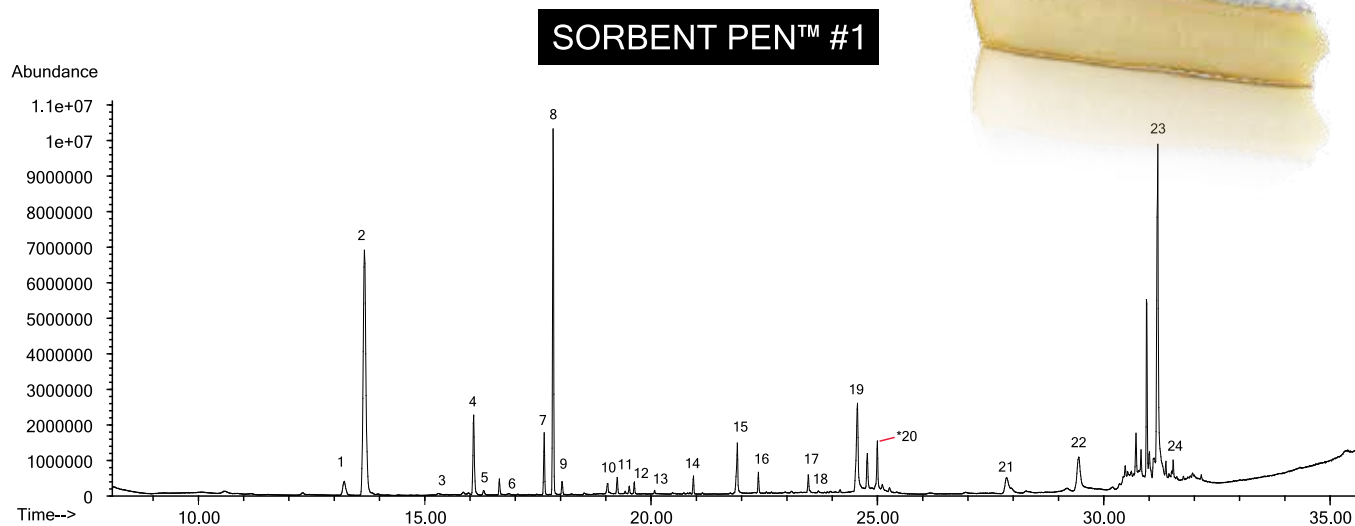
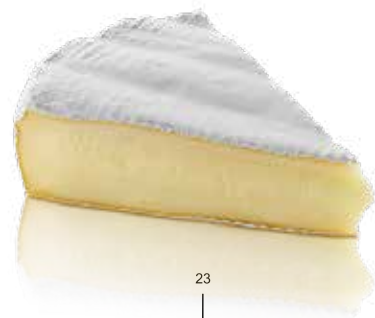
## Not Included in Bundle.

**You must also select a GC Rail Mounting Kit with the bundle.**

<b>SPR40 GC Mounting Kits</b>		
Rail Mounting Kit for Agilent® GC	EA	SPR-MNT-AG
Rail Mounting Kit for Thermo® GC	EA	SPR-MNT-TH
Rail Mounting Kit for Shimadzu® GC	EA	SPR-MNT-SH



## Brie Cheese Duplicate Analysis



\*Difference in Dodecanoic acid, ethyl ester caused by difficulty in maintaining exact amount of cheese sample oxidation from run to run, and expected variations in sample homogeneity.

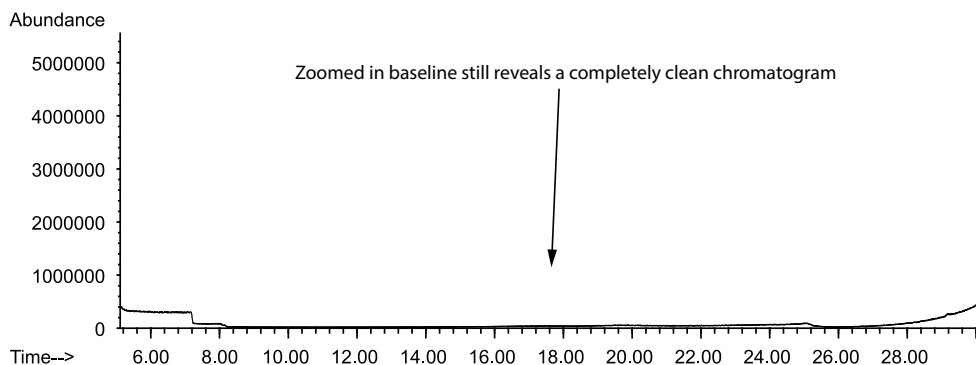
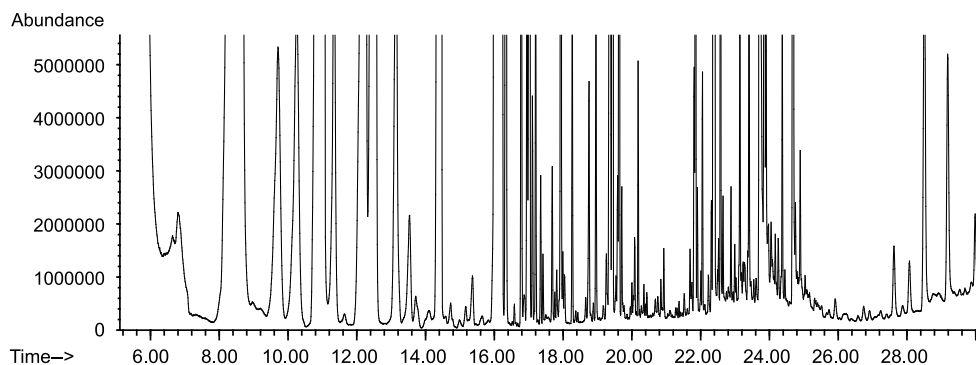
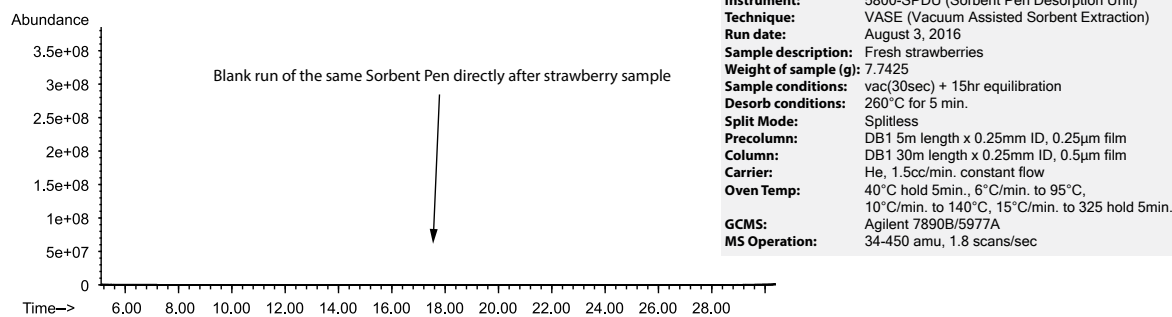
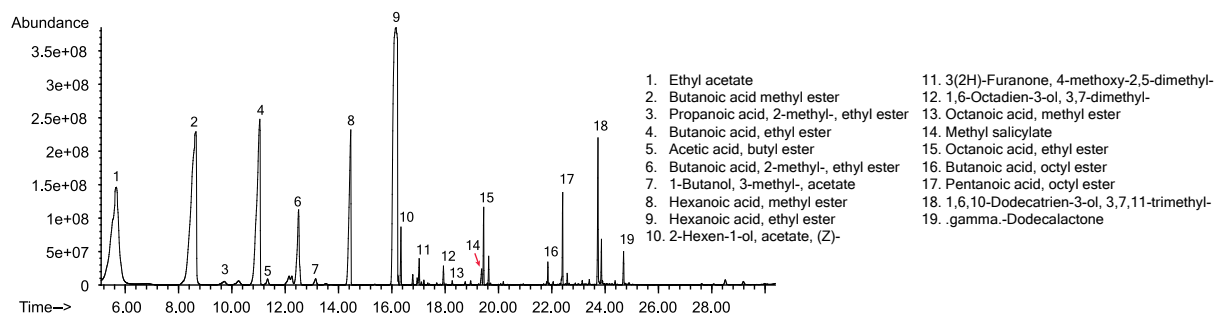
**Instrument:** 5800-SPDU (Sorbent Pen Desorption Unit)  
**Technique:** VASE (Vacuum Assisted Sorbent Extraction)  
**Run date:** August 15, 2016  
**Sample description:** Brie  
**Weight of sample (g):** 70g cheese in 140mL water, blended, 10.1025g taken  
**Sample conditions:** blended + vac(30sec) + 50°C + 3 hr equilibration  
**Desorb conditions:** 260°C for 5 min.  
**Split Mode:** Splitless  
**Precolumn:** DB1 5m length x 0.25mm ID, 0.25µm film  
**Column:** DB1 30m length x 0.25mm ID, 0.5µm film  
**Carrier:** He, 1.5cc/min. constant flow  
**Oven Temp:** 40°C hold 5min., 6°C/min. to 95°C, 10°C/min. to 140°C, 10°C/min. to 325 hold 5min.  
**GCMS:** Agilent 7890B/5977A  
**MS Operation:** 34-450 amu, 1.8 scans/sec

- |                                     |  |
|-------------------------------------|--|
| 1. 4-Heptanone                      | 14. 2-Undecanone                         |
| 2. 2-Heptanone                      | 15. n-Decanoic acid                      |
| 3. Benzaldehyde                     | 16. Decanoic acid, ethyl ester           |
| 4. 2-Octanone                       | 17. 2H-Pyran-2-one, tetrahydro-6-pentyl- |
| 5. Hexanoic acid, ethyl ester       | 18. 2-Tridecanone                        |
| 6. Benzeneacetaldehyde              | 19. Dodecanoic acid                      |
| 7. 8-Nonen-2-one                    | 20. Dodecanoic acid, ethyl ester         |
| 8. 2-Nonanone                       | 21. 2H-Pyran-2-one, 6-heptyltetrahydro-  |
| 9. Nonanal                          | 22. Tetradecanoic acid                   |
| 10. Octanoic acid                   | 23. n-Hexadecanoic acid                  |
| 11. Octanoic acid, ethyl ester      | 24. Hexadecanoic acid, ethyl ester       |
| 12. Decanal                         |  |
| 13. n-Octanoic acid isopropyl ester |  |

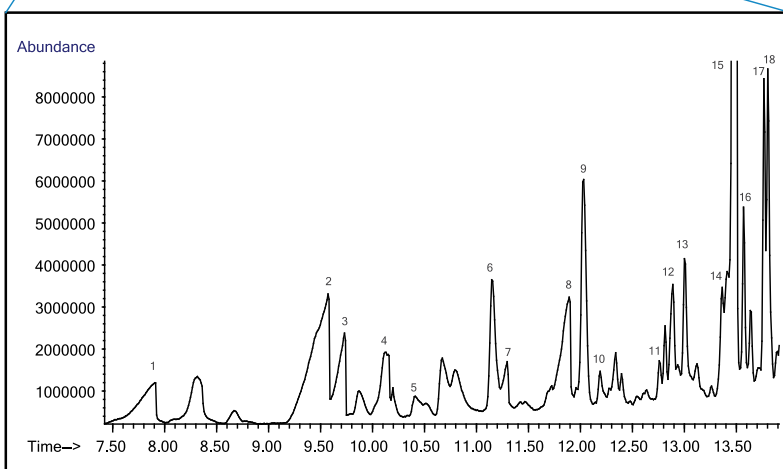
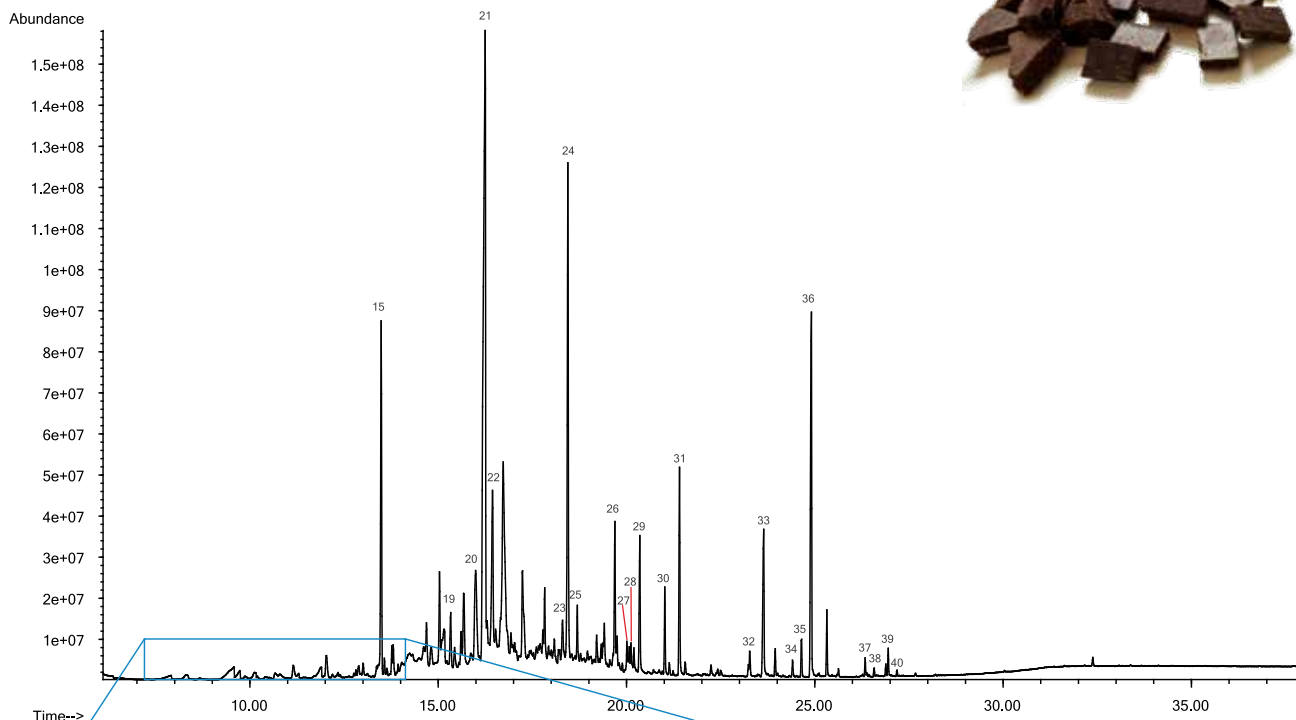
# Extremely Clean Blank After Strawberry Analysis



TIC: 16080301.D\data.ms



## Dark Chocolate Analysis



**Instrument:** 5800-SPDU (Sorbent Pen Desorption Unit)  
**Technique:** VASE (Vacuum Assisted Sorbent Extraction)  
**Run date:** November 17, 2016  
**Sample description:** Dark Chocolate  
**Amount of sample (g):** 1  
**Sample conditions:** 40 mL vial with 15hr equilibration at 25°C  
**Desorb conditions:** 260°C for 5 min.  
**Split Mode:** Splitless  
**Precolumn:** DB1 5m length x 0.25mm ID, 0.25µm film  
**Column:** DB1 30m length x 0.25mm ID, 0.5µm film  
**Carrier:** He, 1.5cc/min. constant flow  
**Oven Temp:** 40°C hold 5min., 10°C/min. to 325°C, 325 hold 5min. (solvent delay at 6 min.)  
**GCMS:** Agilent 7890B/5977A  
**MS Operation:** 34-450 amu, 1.8 scans/sec

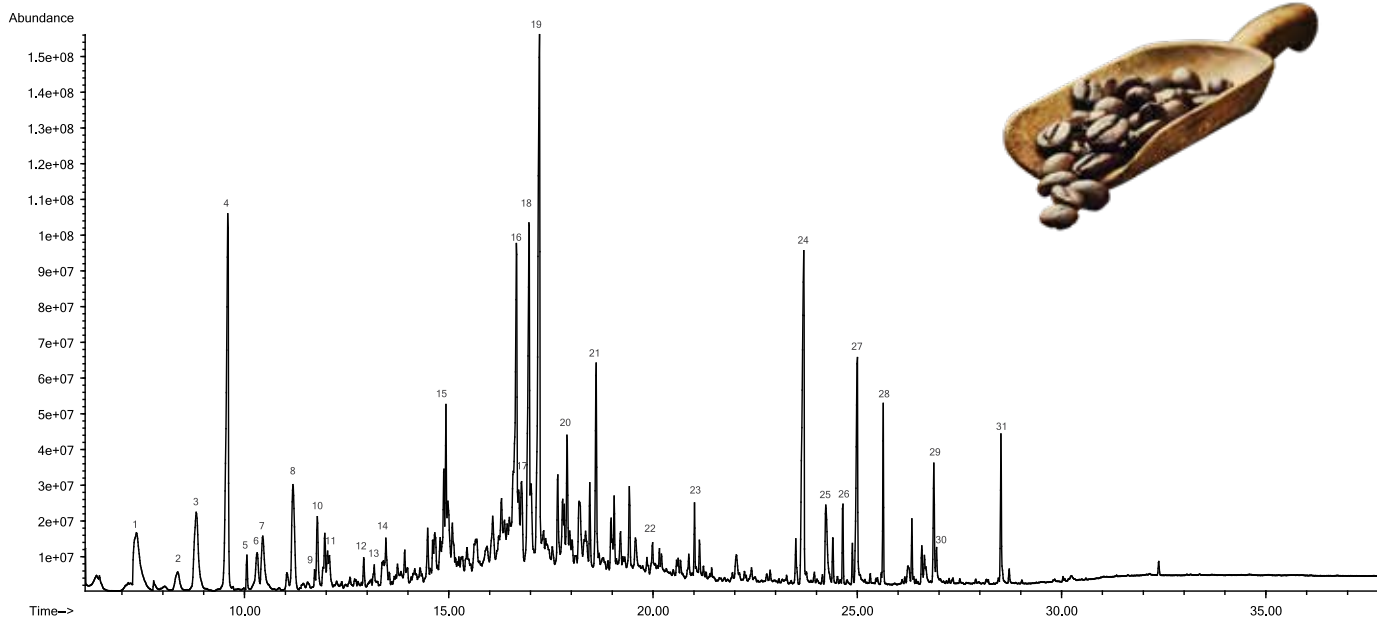
1. Propanoic acid, 2-methyl-
2. Butanoic acid, 3-methyl-
3. Butanoic acid, 2-methyl-
4. Heptanal
5. Pyrazine, 2,5-dimethyl-
6. Benzaldehyde
7. Pentanoic acid, 4-methyl-
8. Hexanoic acid
9. Pyrazine, trimethyl-
10. Propanoic acid, 2-hydroxy-, butyl ester

11. D-Limonene
12. Ethanone, 1-(1H-pyrrol-2-yl)-
13. Acetophenone
14. Pyrazine, 3-ethyl-2,5-dimethyl-
15. Pyrazine, tetramethyl-
16. 2-Nonanone
17. Nonanal
18. 1,6-Octadien-3-ol, 3,7-dimethyl-
19. Octanoic acid, ethyl ester
20. Benzeneacetic acid, ethyl ester

21. Acetic acid, 2-phenylethyl ester
22. Benzeneacetaldehyde, alpha-ethylidene-
23. Vanillin
24. Benzoic acid, pent-2-yl ester
25. Tetradecane
26. 5-Methyl-2-phenyl-2-hexenal
27. Pentadecane
28. Butylated Hydroxytoluene
29. 1H-2-Benzopyran-1-one, 3,4-dihydro-8-hydroxy-3-methyl-
30. Dodecanoic acid, ethyl ester

31. Benzophenone
32. Tetradecanoic acid, ethyl ester
33. Caffeine
34. 2-Heptadecanone
35. Hexadecanoic acid, methyl ester
36. Di-sec-butyl phthalate
37. 9-Octadecenoic acid, methyl ester
38. Linoleic acid ethyl ester
39. 9-Octadecenoic acid, (E)-
40. Octadecanoic acid, ethyl ester

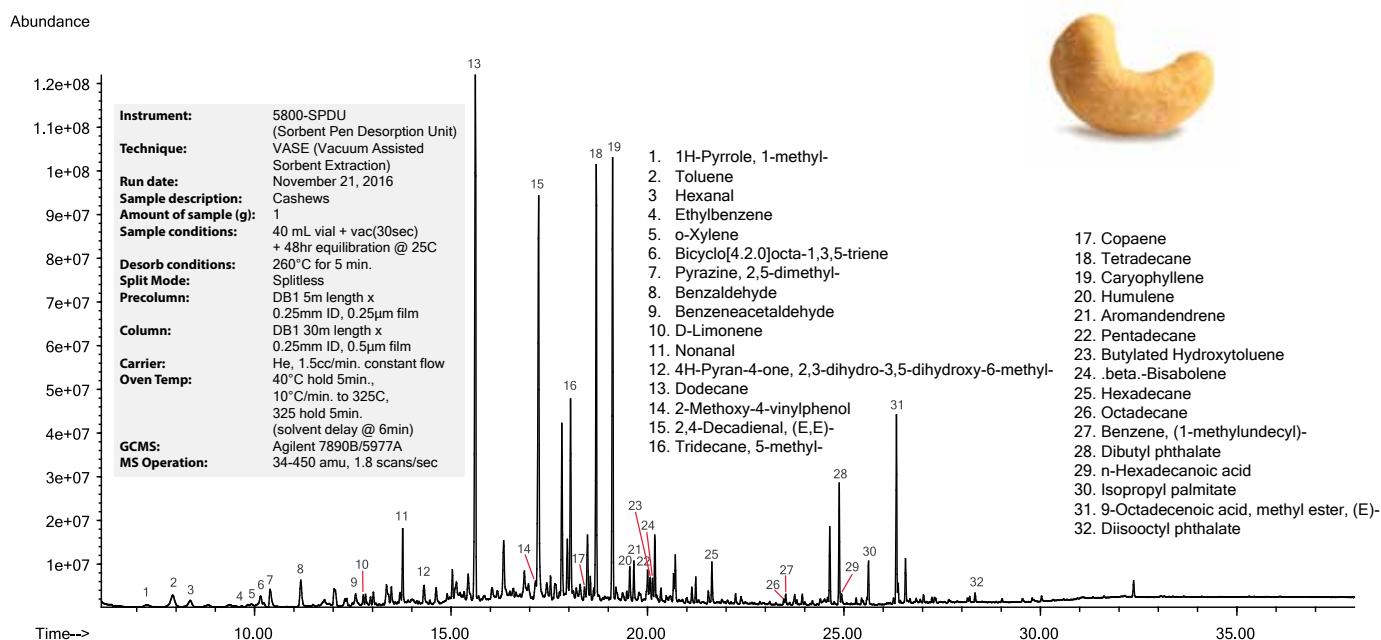
## Coffee Analysis



**Instrument:** 5800-SPDU (Sorbent Pen Desorption Unit)  
**Technique:** VASE (Vacuum Assisted Sorbent Extraction)  
**Run date:** November 28, 2016  
**Sample description:** Breakroom coffee  
**Amount of sample (g):** 2  
**Sample conditions:** 20 mL vial + vac(30sec) + 3hr equilibration @ 60C  
**Desorb conditions:** 260°C for 5 min.  
**Split Mode:** Splitless  
**Precolumn:** DB1 5m length x 0.25mm ID, 0.25µm film  
**Column:** DB1 30m length x 0.25mm ID, 0.5µm film  
**Carrier:** He, 1.5cc/min. constant flow  
**Oven Temp:** 40°C hold 5min., 10°C/min. to 325C, 325 hold 5min. (solvent delay @ 6min)  
**GCMS:** Agilent 7890B/5977A  
**MS Operation:** 34-450 amu, 1.8 scans/sec

1. Pyridine
2. 3(2H)-Furanone, dihydro-2-methyl-
3. 3-Furaldehyde
4. 2-Furanmethanol
5. Butyrolactone
6. Ethanone, 1-(2-furanyl)-
7. Pyrazine, 2,5-dimethyl-
8. 2-Furancarboxaldehyde, 5-methyl-
9. Phenol
10. 2-Furanmethanol, acetate
11. 1H-Pyrrole-2-carboxaldehyde
12. Ethanone, 1-(1H-pyrrol-2-yl)-
13. Ethanone, 1-(1-methyl-1H-pyrrol-2-yl)-
14. Phenol, 2-methoxy-
15. 1H-Pyrrole, 1-(2-furanylmethyl)-
16. Phenol, 4-ethyl-2-methoxy-
17. Indole
18. Furan, 2,2'-[oxybis(methylene)]bis-
19. 2-Methoxy-4-vinylphenol
20. Benzene, 4-ethenyl-1,2-dimethoxy-
21. 1H-Pyrrole, 1-(2-furanylmethyl)-
22. Phenol, 2,5-bis(1,1-dimethylethyl)-
23. Dodecanoic acid, ethyl ester
24. Caffeine
25. 1-Hexadecanol
26. Hexadecanoic acid, methyl ester
27. n-Hexadecanoic acid
28. Isopropyl palmitate
29. Octadecanoic acid
30. Hexadecanamide
31. 9-Octadecanamide, (Z)-

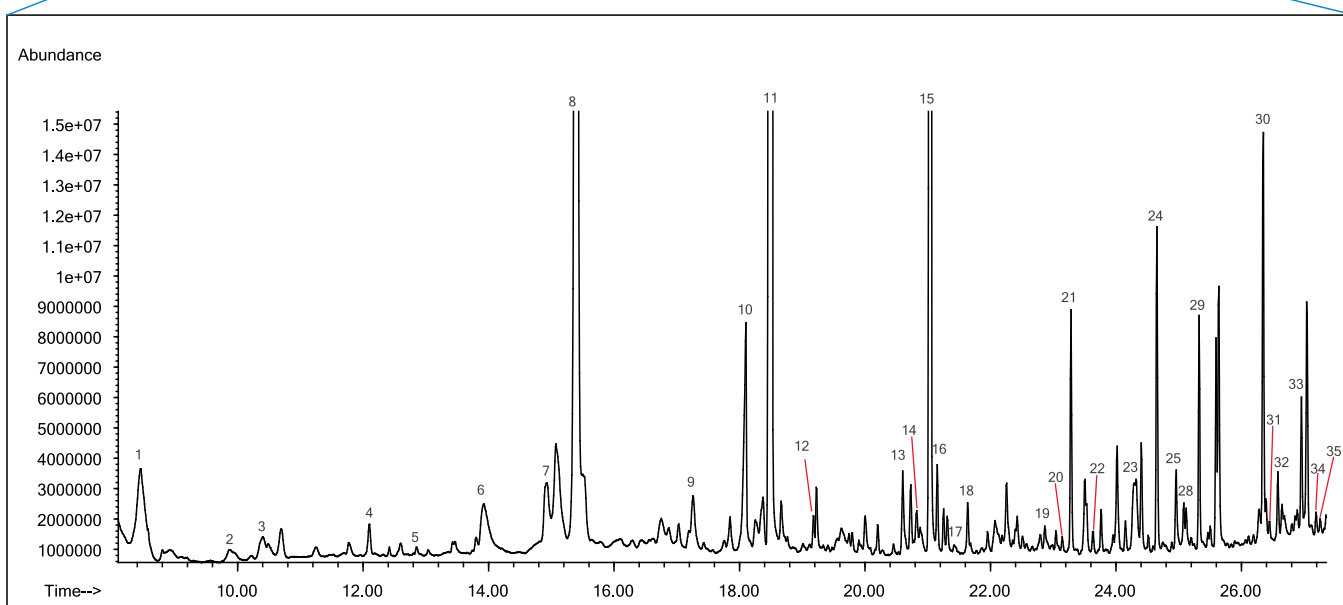
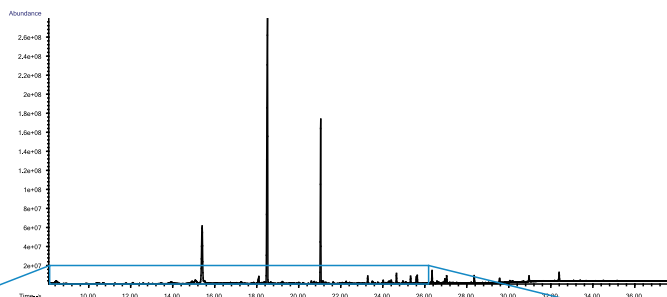
## Cashew Analysis



**Instrument:** 5800-SPDU (Sorbent Pen Desorption Unit)  
**Technique:** VASE (Vacuum Assisted Sorbent Extraction)  
**Run date:** November 21, 2016  
**Sample description:** Cashews  
**Amount of sample (g):** 1  
**Sample conditions:** 40 mL vial + vac(30sec) + 48hr equilibration @ 25C  
**Desorb conditions:** 260°C for 5 min.  
**Split Mode:** Splitless  
**Precolumn:** DB1 5m length x 0.25mm ID, 0.25µm film  
**Column:** DB1 30m length x 0.25mm ID, 0.5µm film  
**Carrier:** He, 1.5cc/min. constant flow  
**Oven Temp:** 40°C hold 5min., 10°C/min. to 325C, 325 hold 5min. (solvent delay @ 6min)  
**GCMS:** Agilent 7890B/5977A  
**MS Operation:** 34-450 amu, 1.8 scans/sec

1. 1H-Pyrrole, 1-methyl-
2. Toluene
3. Hexanal
4. Ethylbenzene
5. o-Xylene
6. Bicyclo[4.2.0]octa-1,3,5-triene
7. Pyrazine, 2,5-dimethyl-
8. Benzaldehyde
9. Benzeneacetaldehyde
10. D-Limonene
11. Nonanal
12. 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-
13. Dodecane
14. 2-Methoxy-4-vinylphenol
15. 2,4-Decadienal, (E,E)-
16. Tridecane, 5-methyl-
17. Copaene
18. Tetradecane
19. Caryophyllene
20. Humulene
21. Aromandendrene
22. Pentadecane
23. Butylated Hydroxytoluene
24. beta.-Bisabolene
25. Hexadecane
26. Octadecane
27. Benzene, (1-methylundecyl)-
28. Dibutyl phthalate
29. n-Hexadecanoic acid
30. Isopropyl palmitate
31. 9-Octadecenoic acid, methyl ester, (E)-
32. Diisooctyl phthalate

## Rum Analysis



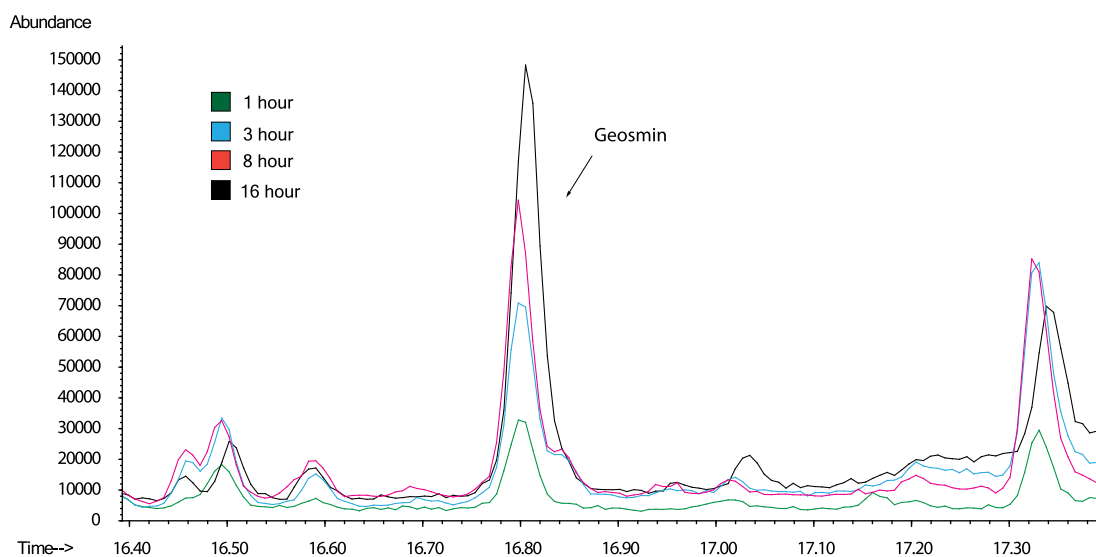
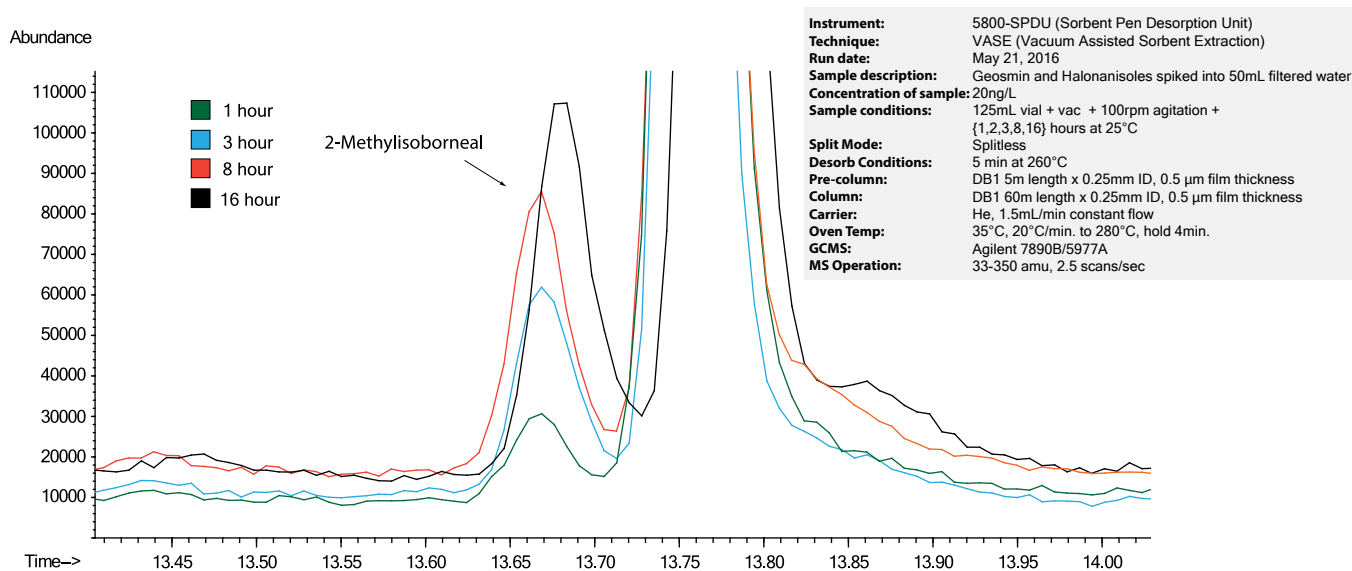
**Instrument:** 5800-SPDU (Sorbent Pen Desorption Unit)  
**Technique:** VASE (Vacuum Assisted Sorbent Extraction)  
**Run date:** November 16, 2016  
**Sample description:** 1:1 Rum (50µl Rum + 50µl Water)  
**Amount of sample (mL):** 50µl  
**Sample conditions:** 20mL vial with 15hr equilibration @ 25°C  
 260°C for 5 min.  
**Desorb conditions:** Splitless  
**Split Mode:** DB1 5m length x 0.25mm ID, 0.25µm film  
**Precolumn:** DB1 30m length x 0.25mm ID, 0.5µm film  
**Column:** He, 1.5cc/min. constant flow  
**Carrier:** 40°C hold 5min., 10°C/min. to 300°C,  
 hold 7min. (solvent delay @ 8min)  
**Oven Temp:**  
**GCMS:** Agilent 7890B/5977A  
**MS Operation:** 34-450 amu, 1.8 scans/sec

1. 3(2H)-Furanone, dihydro-2-methyl-
2. 1-Hexanol
3. Ethanone, 1-(2-furanyl)-
4. Hexanoic acid, ethyl ester
5. Pentanoic acid, 4-oxo-, ethyl ester
6. Phenylethyl Alcohol
7. Butanedioic acid, diethyl ester
8. Octanoic acid, ethyl ester
9. trans-3-Methyl-4-octanolide
10. n-Decanoic acid
11. Decanoic acid, ethyl ester
12. Octanoic acid, 3-methylbutyl ester
13. Dodecanoic acid
14. Benzoic acid, 4-hydroxy-3-methoxy-, ethyl ester
15. Dodecanoic acid, ethyl ester
16. Pentanoic acid, 2,2,4-trimethyl-3-carboxyisopropyl, isobutyl ester
17. Benzophenone
18. Pentadecanoic acid, 3-methylbutyl ester
19. Tetradecanoic acid
20. Ethyl 9-tetradecenoate
21. Pentadecanoic acid, ethyl ester
22. Isopropyl myristate
23. 1-Hexadecanol
24. Pentadecanoic acid, 14-methyl-, methyl ester
25. n-Hexadecanoic acid
26. Ethyl 9-hexadecenoate
27. Hexadecanoic acid, ethyl ester
28. 1-Tetradecyl acetate
29. Isopropyl palmitate
30. 9-Octadecenoic acid (Z)-, methyl ester
31. Heneicosane
32. Methyl stearate
33. Ethyl 9-hexadecenoate
34. Octadecanoic acid, ethyl ester
35. Benzoic acid, tridecyl ester



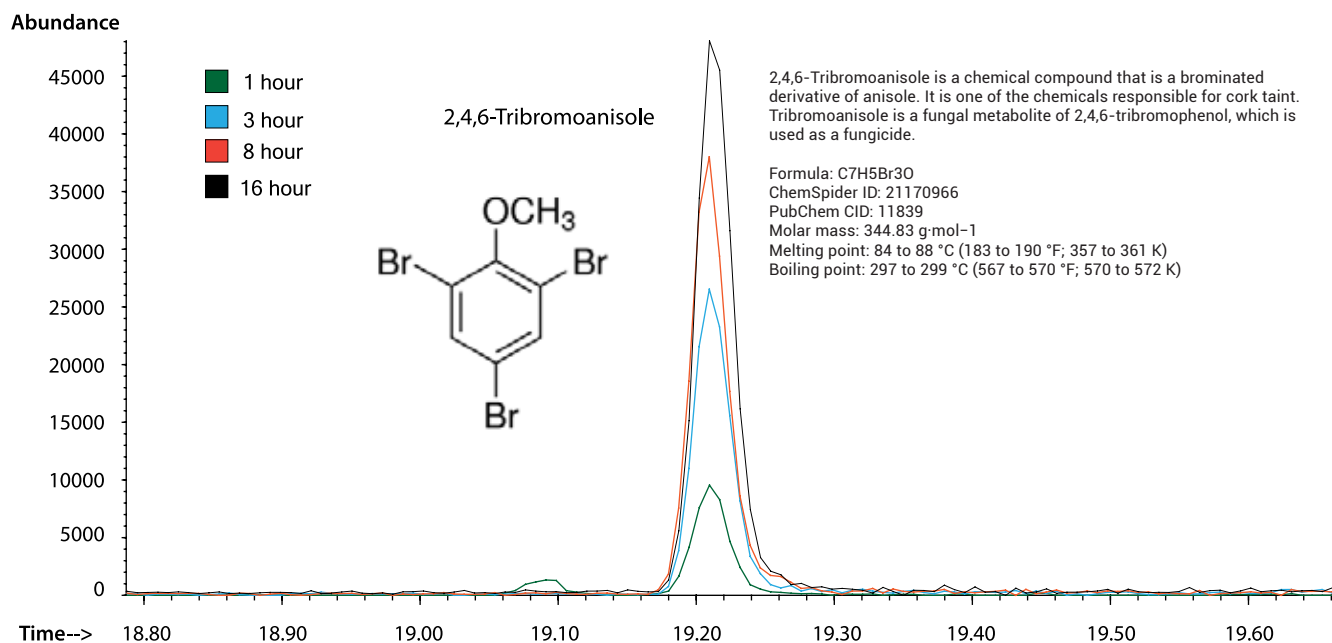
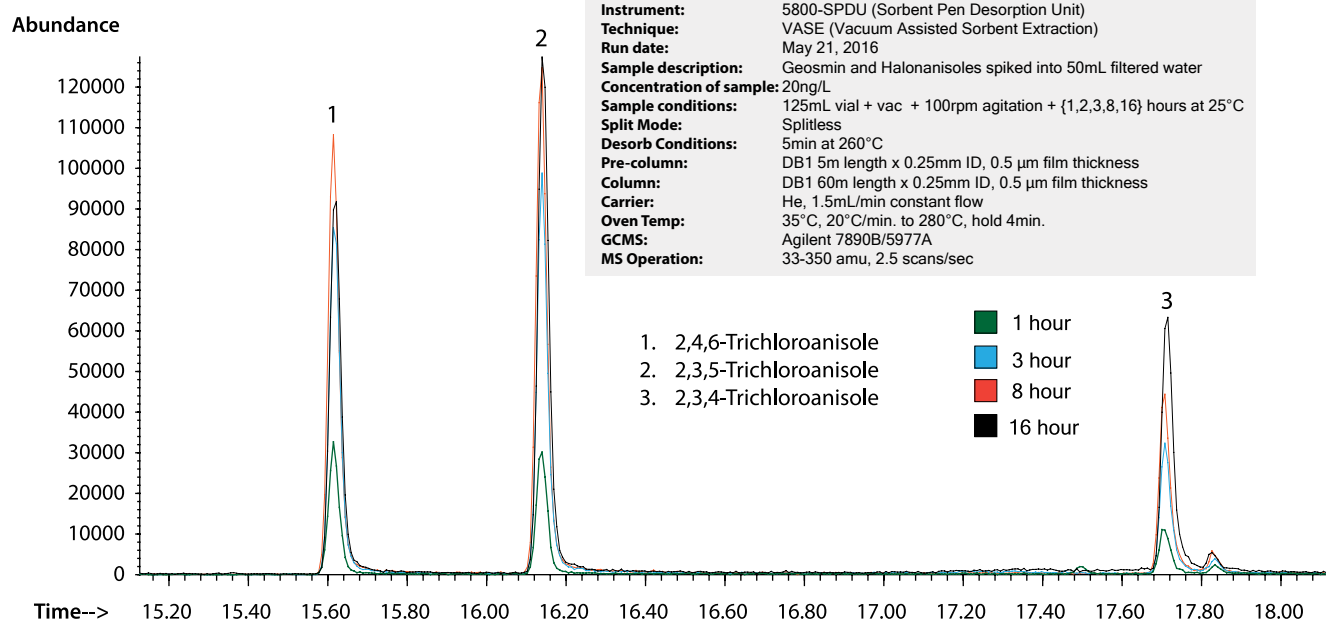
## Sorbent Pen™ Vacuum Extraction of Odors Kinetics Study Comparing Recoveries of a 20 PPT Standard in Water After 1, 3, 8, 16 Hour Extraction Times

- Extractions performed without salting to prevent adsorbent damage via aerosol transport
- Temp = 25°C. Sorbent Pens™ heated to 30°C to prevent water condensation
- An overnight extraction appears to bring the Pens to near equilibrium with the sample



**Figures 2,3 (above)** – Relative responses for target compounds extracted from 20ng/L standards in 50cc filtered water at 25°C, no salt added, 100 rpm agitation, 1/30th atm vacuum, for 1,3,8, and 16 hours. A final extraction time of 20 hours was selected for this method with an extraction efficiency between 60-80%.

## Sorbent Pen™ Kinetic Study



**Figures 4,5 (above)** – Relative responses for target compounds extracted from 20ng/L standards in 50cc filtered water at 25°C, no salt added, 100 rpm agitation, 1/30th atm vacuum, for 1,3,8, and 16 hours.



# Laboratory Instrumentation for Whole Air Analysis

25



**AMBIENT AIR  
MONITORING**



**INDUSTRIAL  
& FENCELINE**



**INDUSTRIAL  
HYGIENE**



**SOIL GAS &  
VAPOR INTRUSION**



**LN<sub>2</sub> FREE 7200CTS**

**"One of The Biggest Technological Leaps the Whole Air Analysis Market Has Ever Seen."**

**"A Game Changer For All Environmental Air Labs."**

**Just think how much your lab will save annually!**

## The Amazing Cryogen-Free 7200CTS

### The Only Capillary Column Based Canister Preconcentrator

Entech is proud to have developed the world's first multi-capillary column trapping system (MCCTS - Patented), for the precise concentration of vapor phased volatile chemicals in the boiling point range of -50° C to >230° C without the need for liquid nitrogen or complicated electronic cooling. With over 30 years of continued improvements and industry feedback, the 7200CTS is as established and reliable as it is new and improved. Many of the important advancements that have led to its unparalleled reproducibility, such as quantitative volumetric measurements utilizing

"Accu-Sample Technology," and digital valve isolation, are left unchanged from the 7200.

The core trapping system, however, has been completely re-engineered, giving way to a technology that will likely replace the utilization of packed traps for most, if not all methods requiring the preconcentration of vapor phase volatile organic compounds.



### 7200CTS Features

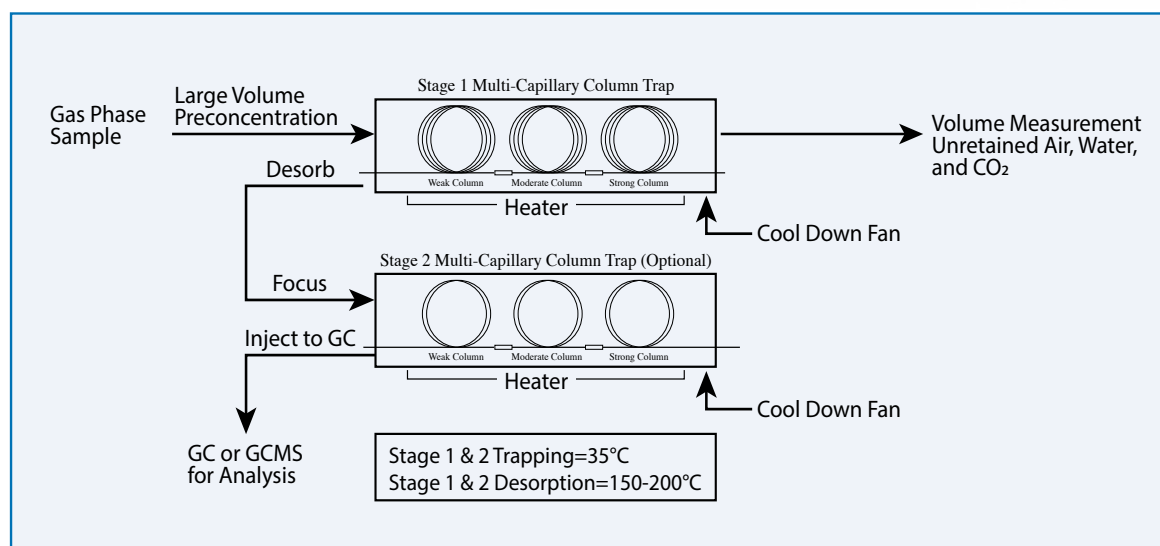
- Elimination of cryogen.**  
*Save thousands in annual LN<sub>2</sub> costs and enjoy greater convenience, reliability, and easier maintenance.*
- Elimination of Electronic Cooling Systems.**  
*Much faster cool down providing higher throughput, while enjoying faster injection speeds than electronically cooled packed trap system.*
- A new standard of system hygiene & uptime.**  
*The elimination of packed traps has led to a system with unrivalled uptime as there is virtually no trap carry-over, even after high concentration samples.*
- Improved precision and sensitivity.**  
*Full TO15 validation with single-digit %RSDs for most compounds in 0.04 - 10 PPBv standard curve.*
- Wide dynamic range (sub-PPB to PPM).**
- Near complete elimination of water!**  
*Water is almost unretained when using capillary traps without the need for cryogen or complex electronic cooling.*
- Not influenced by sample humidity levels.**  
*Complete removal of water eliminates any response variations when going from 0 to 100% Relative Humidity.*
- Less GCMS maintenance.**  
*Less water means less column bleed, longer GC column lifetimes, and fewer MS Source cleanings, all of which improves productivity while lowering costs.*
- Wider standard/sample pressure range.**  
*Reduced system volume allows accurate small volume measurements even at higher canister/standard pressures, eliminating the need for canister regulators known to cause VOC adsorption issues.*



## Multi-Capillary Column Trapping

### The Future of Vapor Phase Volatiles Analysis

The MCCTS in the 7200CTS concentrates all TO15 compounds at 35° C, which is conveniently achieved by using simple cooling fans. Two stages of traps are used: the first preconcentrates the sample, calibration standards, and internal standard; and the second further focuses the concentrate prior to GC/MS injection. The new solution uses multiple capillary columns in series with increasing strength to trap compounds boiling from -50° C to >230° C, using volumes of 10-500cc. The design shows considerably less susceptibility to contamination when exposed to high concentration soil gas samples, reducing the downtime laboratories experience when accidentally analyzing these samples prior to dilution. With the 7200CTS, full TO15 validation is easily achieved, including blank levels immediately following higher concentration samples containing BTEX, PCE, and TCE, which are compounds often found in soil gas at high concentrations.



## Understanding The Limitations of Packed Traps

Packed column traps have been used for many decades to preconcentrate samples for GC or GC/MS analysis, but they suffer from two major impediments: 1. a phenomenon known as "**channeling**", and 2. equally as problematic, the physical size of the adsorbent particles that the traps are packed with. These two concepts are further explained here.

The 'Channeling Effect' can be described as the continuous formation and collapse of channels throughout the length of an adsorbent bed, coinciding with the normal heating and cooling cycles of the trapping system. Since all materials including adsorbents have a Coefficient of Thermal Expansion, the contraction of the adsorbent upon cooling prior to the next trapping event is inevitable, causing the creation of channels or "gaps" within the adsorbent or along the walls of the tubing containing the adsorbent. Channeling poses a major challenge to quantitative

***Packed traps work well if you understand their limitations and take steps to prevent contamination, but now there's a better solution that not only eliminates contamination worries, but also makes much better financial sense.***

sample recovery, as the creation of low impedance flow paths throughout an adsorbent bed promotes both deeper penetration of target analytes into the bed, and a higher analyte saturation into the adsorbent particles contiguous with the channels. This leads to an uneven distribution of chemicals throughout the trap. As packed traps heat up, these channels collapse as the adsorbent expands, making it more difficult for many heavier or thermally labile compounds to be recovered. The result is not only reduced recovery, but

increased carryover, increased thermal degradation due to longer residence times on the hot, active adsorbent, and reduced adsorbent bed lifetime. Channeling can be especially prevalent along the walls of the adsorbent bed.

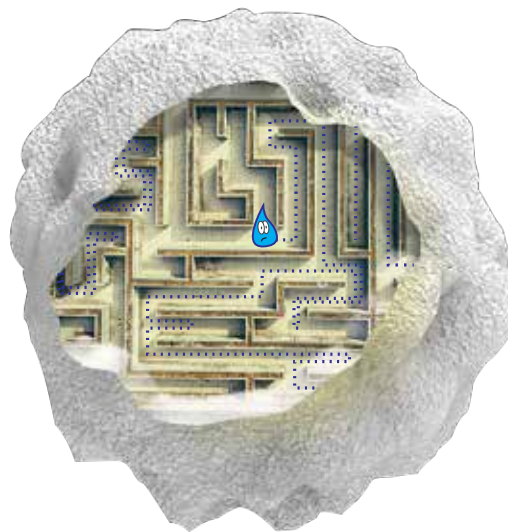
### Open Tubular Columns Solve Channeling

MCCTS uses multiple open tubular capillary columns with increasing strength to trap complex air samples containing compounds over a wide range of volatilities. The lightest compounds are trapped by the strongest phase placed at the back of the trap, while weaker columns are placed closer to the front of the trap to collect the heavier compounds. Only the walls of the capillary columns are coated, so there is no chance for channeling to occur. During heating and cooling, the difference in the size of the opening through the traps is negligible, preventing any possibility of excessive penetration during trapping, and therefore any inconsistencies in recovery during desorption. By utilizing 2 or 3 columns connected in series with increasing adsorbent strength and then backflushing the trapped compounds, the 7200CTS effectively recovers a much wider range of compounds than with packed traps, while minimizing memory effects (carryover).

### Larger Particles in Packed Traps Pose Another Problem - Sample & Water Retention

The particles in packed traps must be relatively large to avoid excessive pressure drop across the bed, but these larger particles retain adsorbed chemicals longer during

thermal desorption, causing poor run to run reproducibility and difficulty cleaning up the traps when exposed to higher concentrations or heavier molecular weight compounds. Even hydrophobic adsorbents, such as Tenax™, can accumulate water due to the complex inner surfaces of these larger particles and the statistical challenge for molecules to escape their inner 'maze'.



*Water vapor has a statistically greater challenge escaping from packed trap particles than capillary column particles, even with hydrophobic adsorbents!*

## A Deeper Look At The Limitations Of Packed Traps & Advantages of MCCTS

### 1. The Channeling Effect

The 'Channeling Effect' can be described as the continuous formation and collapse of channels throughout the adsorbent material coinciding with normal heating and cooling cycles.

As these channels close due to heat of desorption, targeted analytes are trapped and are therefore only partially recovered, contributing to carryover.

Packed trap particles must be relatively large to avoid excessive pressure drop. These larger particles retain adsorbed chemicals longer during desorption, causing poor reproducibility and making traps more difficult to clean.

**Packed Trap**

# VS

### 2. Particle Size

Capillary columns have a small inner diameter which allows diffusion to occur quickly across the ID of the column, ensuring complete interaction of the chemicals with the adsorbent on the walls. The open center reduces flow resistance.

In contrast to packed traps, capillary columns have very small particles or a thin film polymer coating the internal walls, allowing chemicals to exchange much faster between the particles and the gas phase for faster injection rates and more complete water/CO2 elimination.

**Capillary Trap**



## Superior Water Management

Water management improves dramatically with the Multi-Capillary Column trap design. Water is almost unretained by the traps, resulting from both the hydrophobic nature of the adsorbent, and the much smaller particle sizes than those used in packed traps. Even though they are hydrophobic, any particles with pores will have water molecules diffusing through them. The larger the particle, the longer it will take for the diffusion to release enough water to reduce the effect on the GCMS. The extremely small particles in the new capillary traps require almost no dry purging to remove the water because water can more quickly diffuse in and out of these particles.

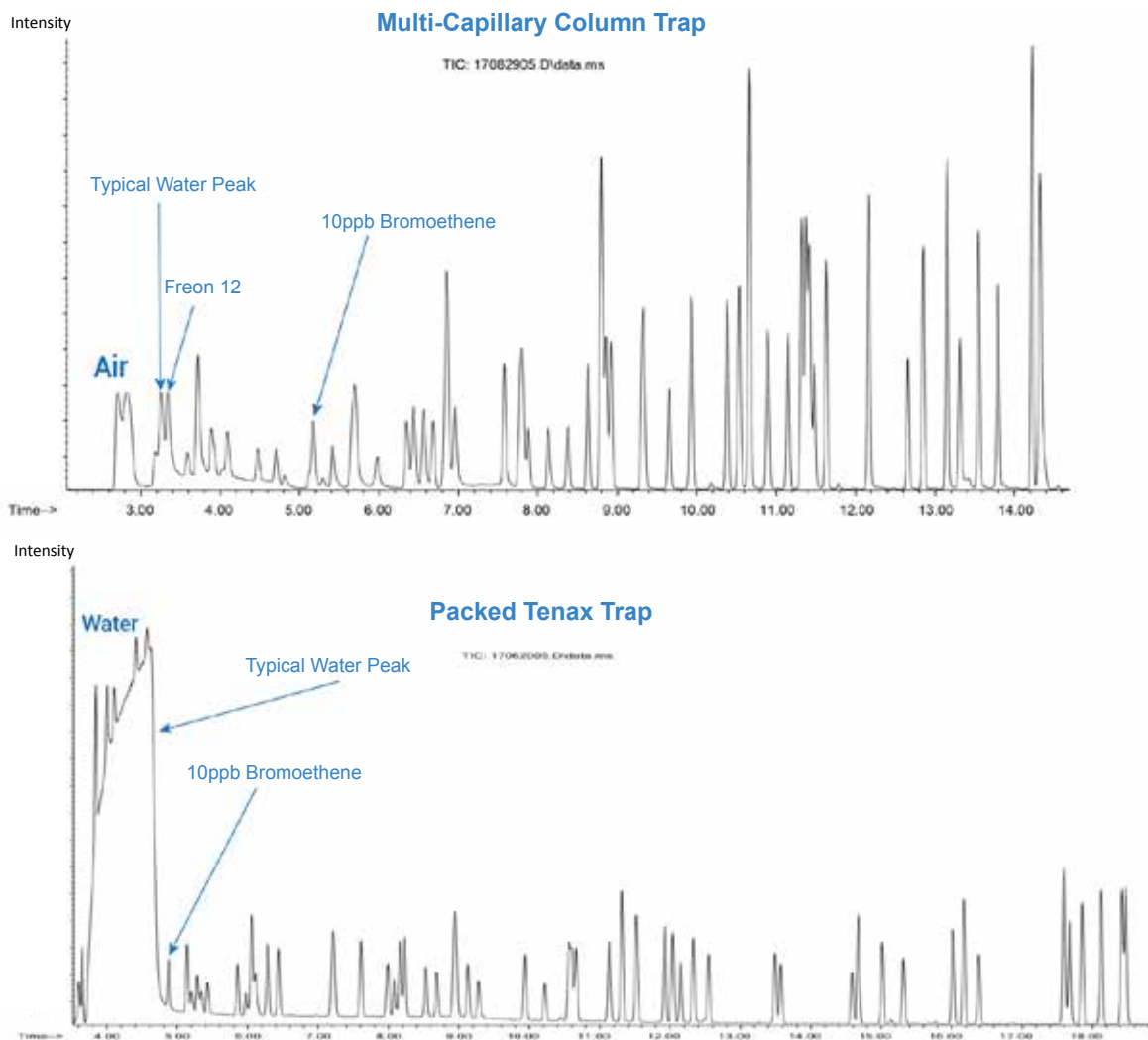
Typical water peaks when scanning  $m/z$  18 are up to 10,000 times smaller than when using packed traps or cold trap

dehydration, meaning that the GCMS will have almost no water to bake out, resulting in vastly improved sensitivity stability even when running many samples in any given day with shorter intervals between injections.

***"...the GCMS will have almost no water to pump out, resulting in vastly improved sensitivity stability..."***

Finally, systems which eliminate water via cold trapping at -10 to -40° C show losses of more highly polar compounds such as light fatty acids and mono-glycol esters. These compounds are recovered perfectly using the new Multi-Capillary Column Trapping System, offering a more complete solution for measuring a wider range of compounds.

## Superior Water Management



**Figure 1, 2** - Although the two chromatograms above are not on the same Y and X axis scale, as they were run using two different instruments, both chromatograms show a 10ppb TO15 standard at 50% RH. TO15 standard compound Bromoethene, shown at 10ppb for both runs, can be used to visually compare the relative amount of water found when scanning down to mass 18 for water using a packed trap vs a capillary column trap. At 25° C, 50% RH is equivalent to 15 million PPBv of water. A typical water peak using packed traps or cold trap water management is 0.5-1 minutes wide.

After trapping TO15 compounds on a primary, multi-stage trap, the sample is back-flushed during heating to a second trap with smaller column lengths to allow even faster injection into the GCMS to yield optimal peak shape of the lightest through the heaviest compounds. Both the first and second stages operate at 35° C during trapping, so only fan cooling is needed. This avoids complicated and maintenance intensive Peltier cooled traps.

## Peak Shape Comparison to Peltier Cooled Packed Traps

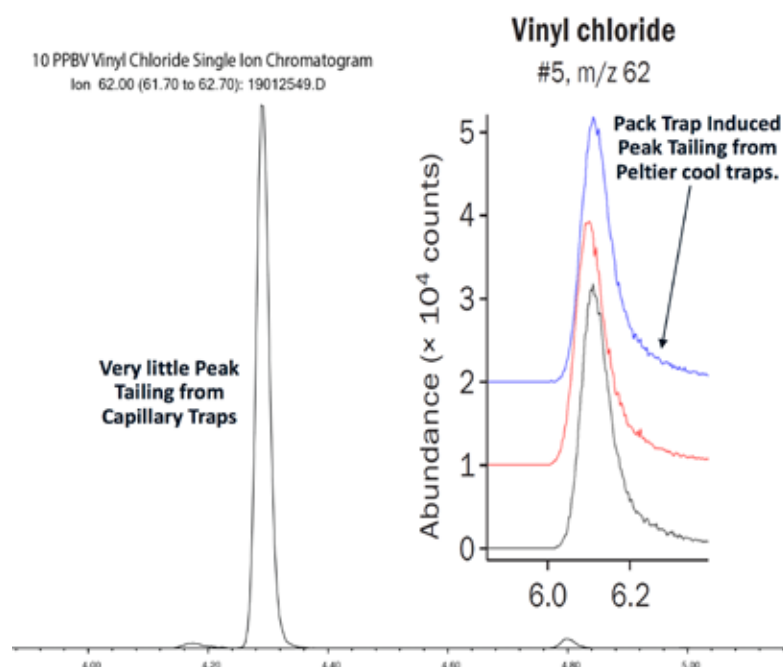


Figure 3 - Peak shape comparison

## Cryogen-Free Fast Injection

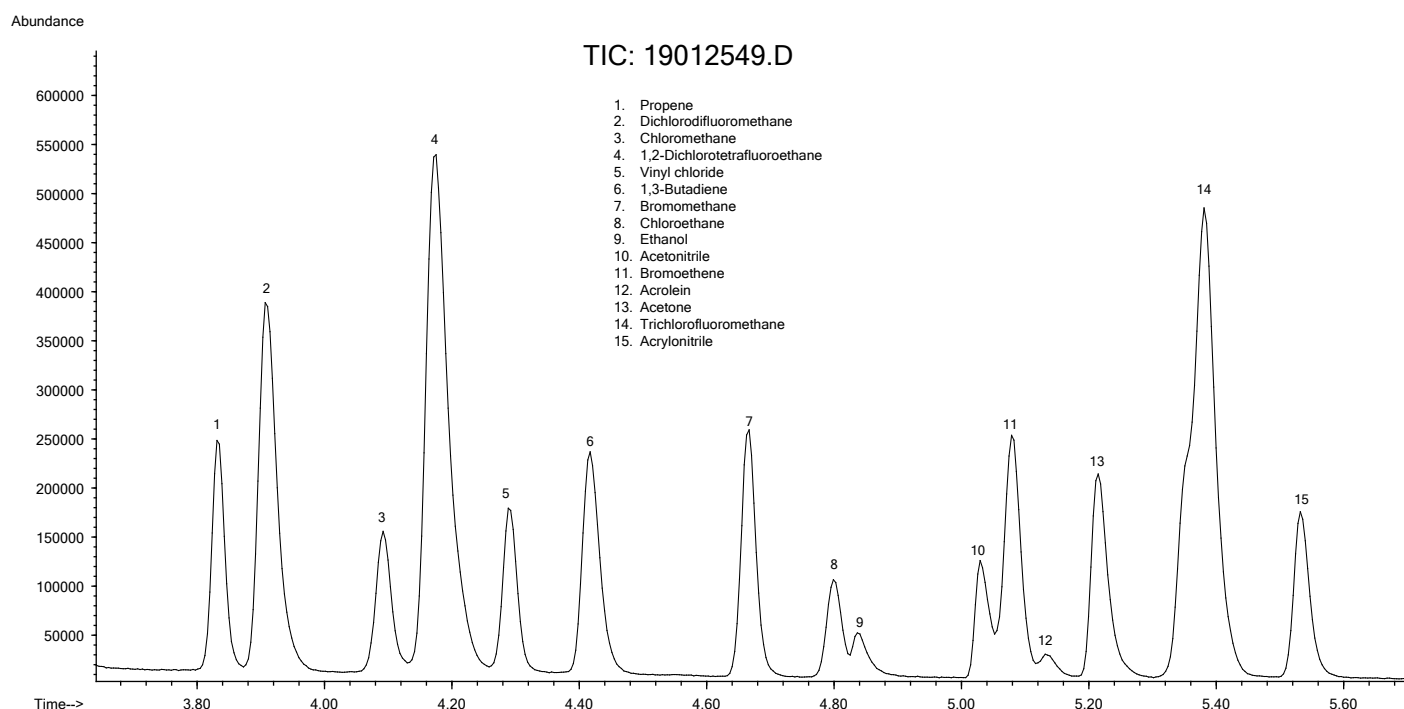
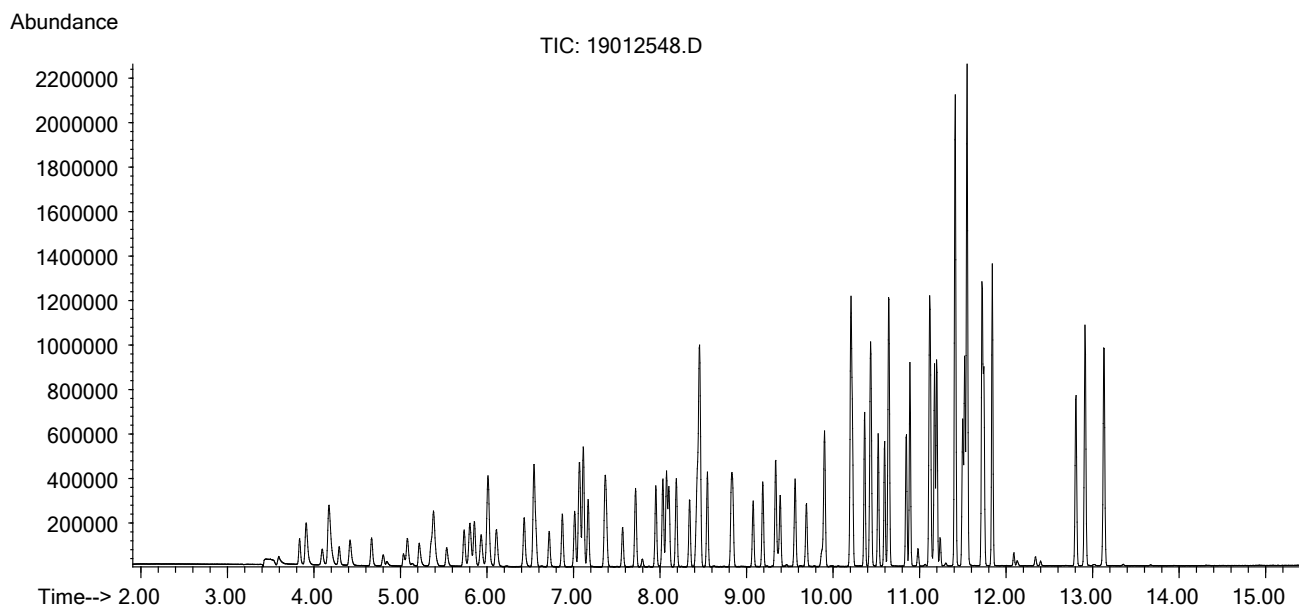


Figure 4 - TO15, 84 Compound Standard, 250cc, 10PPBV - The total ion chromatogram above demonstrates the cryogen-free fast injection of the light end with excellent separation and little or no peak tailing.

## 250cc at 10PPBv, 84 Component TO15 Std



**Figure 5** - Complete recovery through High Boilers.

### 7200CTS/7650-M, MillionAir™ Analysis System

Description	Unit	Part #
<b>System Includes:</b>		
7200CTS Cryogen-Free VOC Preconcentrator (Includes 1cc Loop Valve and diaphragm pump), 120VAC/60Hz	EA	7200CTS-01
7200CTS Cryogen-Free VOC Preconcentrator (Includes 1cc Loop Valve and diaphragm pump), 240VAC/50Hz	EA	7200CTS-01-HV
7200CTS-01 Bundle - All Rotary Valves & Fittings (Silonite Coating Option), 120VAC/60Hz	EA	7200CTS-01S
7200CTS-01 Bundle - All Rotary Valves & Fittings (Silonite Coating Option), 240VAC/50Hz	EA	7200CTS-01S-HV
7200CTS M1 Multi-Capillary Column Trap & Mandrel (For TO15 Analysis)	EA	7200CTS-M1-01
7200CTS M2 Multi-Capillary Column Focusing Trap & Mandrel (For TO15 Analysis)	EA	7200CTS-M2-01

### Inlet & Autosampler Systems

Description	Unit	Part #
<b>System Includes:</b>		
7016D 16 Position Autosampler, 120VAC/60Hz	EA	7016D
7016D 16 Position Autosampler, 240VAC/50Hz	EA	7016D-HV
7650 w/ Loop Injection, 120VAC/60Hz	EA	7650-M
7650 w/ Loop Injection, 240VAC/50Hz	EA	7650-M-HV
SkyCan Automated SPR75 Rail, 90-250VAC, 60/50Hz	EA	SK75-01

# MillionAir-CTS™ System



Advanced injection control

10<sup>6</sup> Concentration Range without Dilution

SHIMADZU

ThermoFisher  
SCIENTIFIC

Agilent Technologies



LN<sub>2</sub> FREE 7200CTS

## Next Generation Air & Gas Analysis

High Throughput Canister Analysis of Air & Soil Gas That Dramatically Improves Your Bottom Line

### Introduction

The 7200CTS / 7650-M combination, also known as the "MillionAir-CTS™ Analysis System," is the most advanced instrumentation ever developed for the analysis of volatile and light semi-volatile compounds in air and soil gas. Now, analyze any size canister in your inventory with the quality assurance of direct inlet robotics. The 7650-M includes the "SampleSafe" feature that performs rapid screening of samples without exposure to the 7200CTS trapping system, thereby maintaining far superior system hygiene relative to other preconcentration systems.

The MillionAir-CTS™ system gets its name by being able to handle samples with a million fold difference in concentration without pre-dilution. Air labs have always been faced with the dilemma of having to screen potentially high concentration air samples to determine if dilution will be needed, while at the same time preventing the contamination of their analyzer. Rotary valve autosamplers, used by all other manufacturers, expose potentially high concentration samples to inlet lines for hours or even days, creating a background in the system that may take days or even weeks of flushing to eliminate.

With the MillionAir-CTS™ system, contact with the sample is only a few seconds to a few minutes long. The 7650-M contains its own loop valve that can bypass the 7200CTS primary traps altogether, injecting the sample directly to the GCMS either for screening purposes or for quantitative analysis. Samples can be screened in as little as 4–6 minutes using an isothermal analysis to determine levels of TCE, PCE, and BTEX, which are the major contaminants

in soil gas that can raise havoc in other systems when high concentration samples are processed without dilution. With the Entech MillionAir-CTS™ system, both screening and analysis using sample volumes as low as 0.1 cc can extend the calibration curve well into the PPM range, drastically reducing the number of samples that have to be diluted before analysis. The MillionAir-CTS™ system is the ideal solution for today's competitive TO-15 laboratory.

### Introducing the Cryogen-Free 7200CTS

Entech is proud to release the world's first multi-capillary column trapping system (MCCTS - Patent Pending), for the precise concentration of vapor phased volatile chemicals in the boiling point range of -50°C to 230°C without the need for liquid nitrogen or complicated electronic cooling. Evolving from 28 years of continuous improvements and industry feedback on earlier preconcentrators, the 7200CTS is dramatically improving TO15 performance and sample throughput. Many of the important advancements that have led to its unparalleled reproducibility, such as quantitative volumetric measurements utilizing "Accu-Sample Technology," and digital valve isolation, are left unchanged from its market leading LN<sub>2</sub> based 7200 predecessor. The core trapping system, however, has been completely reengineered, giving way to a technology that will likely replace the utilization of packed traps for most, if not all methods requiring the preconcentration of vapor phase volatile organic compounds.

Description	Unit	Part #
<b>7200CTS   7650-M, MillionAir CTS System*</b>		
<b>System Includes:</b>		
7200CTS Preconcentrator (with 1cc Loop)	EA	7200CTS-01
7650 with Loop Injection	EA	7650-M

\*Order 7200CTS-01-HV and 7650-M-HV for 220/240VAC Operation.

## Features

### Direct Inlet Robotics

The 7650-M features a single inlet with a Silonite-D™ coated transfer line to eliminate stream select rotary valves and multiple inlet lines from the inlet flow path for the best possible sample isolation and analytical accuracy.

### New! MCCTS (Multi-Capillary Column Trapping) & Cryogen-Free Analysis

Experience precise concentration of vapor phased volatile chemicals in the boiling point range of -50°C to 230°C without the need for liquid nitrogen or complicated electronic cooling.

### SampleSafe Screening

The 7650-M features SampleSafe that includes the ability to perform rapid screening of samples without exposure to the 7200CTS trapping system, thereby maintaining far superior system hygiene relative to other preconcentration systems.

### A new standard of system hygiene & uptime.

The elimination of packed traps has led to a system with unrivalled uptime as there is far less trap carry-over, even after high concentration samples.

### Improved precision and sensitivity.

Full TO15 validation with low %RSDs for most compounds in 0.1 - 30PPBv standard curve.

### Near complete elimination of water!

Water is almost unretained when using capillary traps without the need for cyrogen or complex electronic cooling.

### Quantitative Accuracy

Sampling and analytical precision is not affected by changing matrices (air, humid air, nitrogen, helium, CO2, methane, argon, hydrogen).

**Now, analyze all sample types, including Tedlar® bags, canisters, and thermal desorption tubes!**



24 to 80 Minicans



24 to 80 Bottle-Vac Samplers



Sampling Media Options



Up to 20 Tedlar Bags



Up to 172 HDS Personal Monitors

7650-M with oven.

Position A  
Short Tray

Oven

Position B  
Long or Extra Long Trays

7650-M without oven.

Position A  
Long or Extra Long Trays

Position B  
Long or Extra Long Trays







## Meeting the Demands of the New Global Volatiles Market

With extreme air pollution events on the rise and more conclusive epidemiological data linking ambient VOC exposure to disease, global efforts to reduce pollution and its effects on health are driving aggressive testing and containment policies across developed and developing nations. Increasing government intervention will see demand for testing services across all categories of pollution monitoring rise dramatically, and over the next decade laboratories will be under pressure to increase their analytical throughput. The Entech 7200A Accelerated, Fast GCMS Canister Preconcentrator was specifically designed to meet the need for higher laboratory throughput, drawing on over 3 decades of preconcentrator optimization through Entech's delivery and support of thousands of canister preconcentration systems world-wide. All of this feedback and innovation has resulted in the fastest and most comprehensive volatiles preconcentrator on the planet, bar none.










## EFIT - Time is On Your Side with the 7200A

With EFIT (Extremely Fast Injection Technology), the sample is deposited on the column in less than 1 second, producing 1.4 - 2 second wide peaks that both reduce the required resolving power of the column while increasing centroid signal intensity. The entire suite of TO-15A compounds typically elutes within 8-9 minutes, with equal or greater separation than with prior technology simply because peak widths are under 2 seconds rather than being 5-7 seconds wide. The 7200A with EFIT creates a whole new standard of productivity for laboratories needing to optimize their sample throughput.

Doubling your throughput is like someone giving you a free GC-MS, as well as another free preconcentrator, since one system can generate the data of 2 systems. Would you spend another \$2-3 in LN2 to allow you to run another sample without the space or cost of another GCMS? Whether you are a contract lab or an agency needing to improve efficiency, faster throughput simply makes good sense.



## Features of the Fast GC-MS 7200A LN2 3-Stage Preconcentrator

 <p><b>Extremely Fast Injection Technology (EFIT)</b> Extremely Fast Injection Technology (EFIT) that reduces bandwidth to 1 second or less on column.</p>	 <p><b>Superior Water Management (3-5x better than 7200)</b> reduces impact on GCMS, and prevents MS signal loss even when doubling the number of injections per hour, per day.</p>
 <p><b>Much shorter run times and cycle times = Higher Productivity</b> Cycle times injection to injection as short as 20-25 minutes for a 250mL sample size.</p>	 <p><b>Less column bleed resulting in better baselines and fewer source cleanings</b></p>
 <p><b>Complete elution of TO15 compounds in under 10 minutes, with column bakeout done in just 2-3 additional minutes</b></p>	 <p><b>Advanced software that improves the user experience</b></p>
 <p><b>Up to 30% reduction in LN2 consumption as compared to prior Entech preconcentrators (7100A, 7200)</b></p>	 <p><b>Better Autosampler Options:</b> - 7016D Classic 6L Canister 16-Position <b>Autosampler</b> - 7650-M for soil gas analysis and screening - New SkyCan Rail Autosampler high productivity ambient or source level canister analysis</p>
 <p><b>Lower carryover by optimizing Silonite coated flowpath temperatures and M3 bakeout timing</b></p>	

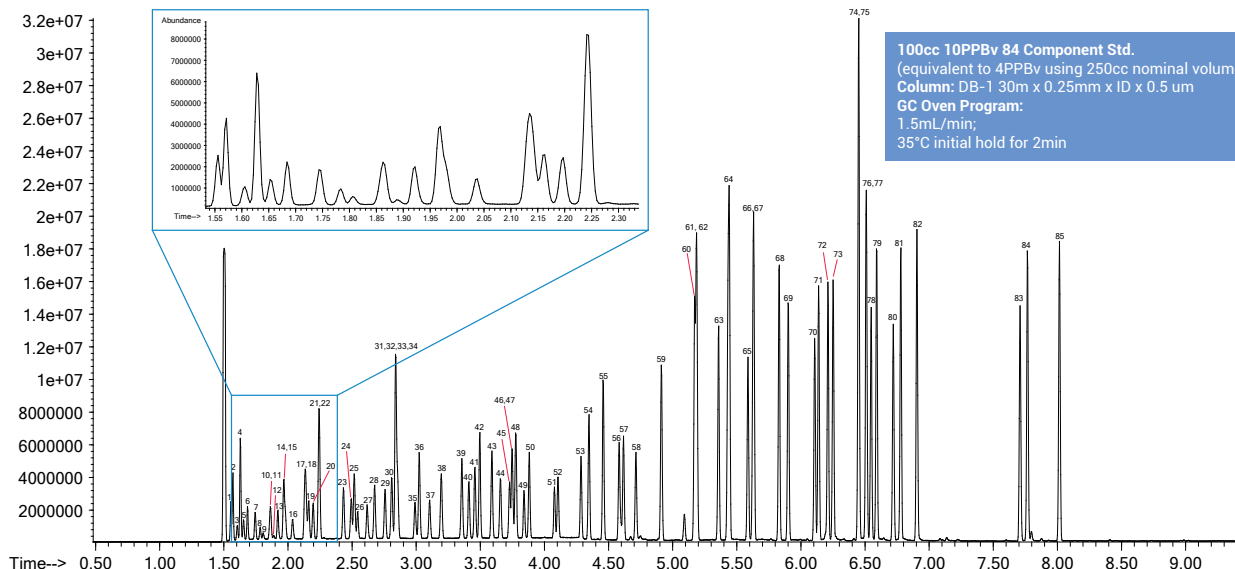
Features & Capabilities	7200A
Accelerated Analysis	✓
Microscale Purge & Trap	✓
Extended Cold Trap Dehydration	✓
Automated Standards Addition	✓
High CO <sub>2</sub> Samples	✓
Accu-Sample Technology	✓
Digital Valve Isolation	✓
Loop Injection Valve	Yes - Included (0.5-2cc) 1cc Typical
Pressure/Vacuum Leak Test Prior to Opening	✓
Built-In Sample Ports	4
Direct Volume Measurement (no MFCs)	✓



# 7200Accelerated and Agilent GC-MS, 7890B/5977A

Abundance

TIC: 1801002\_83.D\data.ms



- |  |                               |                                |                                  |                            |
|--|-------------------------------|--------------------------------|----------------------------------|----------------------------|
| 1. Propene                                       | 18. tert-Butanol              | 35. Tetrahydrofuran            | 52. 4-Methyl-2-pentanone         | 69. 4-Bromofluorobenzene   |
| 2. Dichloro difluorobenzene                      | 19. Methylene Chloride        | 36. Ethyl tert-butyl ether     | 53. trans-1,3-Dichloropropene    | 70. Cumene                 |
| 3. Chloromethane                                 | 20. Allyl Chloride            | 37. 1,2-Dichloroethane         | 54. 1,1,2-Trichloroethane        | 71. O-Chlorotoluene        |
| 4. 1,2 - Dichloro - 1,1,2,2 - tetrafluorobenzene | 21. Trichlorotrifluoroethane  | 38. 1,1,1-Trichloroethane      | 55. Toluene                      | 72. n-Propylbenzene        |
| 5. Vinyl chloride                                | 22. Carbon Disulfide          | 39. Benzene                    | 56. 2-Hexanone                   | 73. 4-Ethyltoluene         |
| 6. 1,3-Butadiene                                 | 23. trans-1,2-Dichloroethene  | 40. Carbon tetrachloride       | 57. Dibromochloromethane         | 74. 1,3,5-Trimethylbenzene |
| 7. Bromomethane                                  | 24. 1,1-Dichloroethane        | 41. Cyclohexane                | 58. 1,2-Dibromoethane            | 75. tert-Butylbenzene      |
| 8. Chloroethane                                  | 25. Methyl tert-butyl ether   | 42. 1,4-Difluorobenzene (ISTD) | 59. Tetrachloroethylene          | 76. 1,2,4-Trimethylbenzene |
| 9. Ethanol                                       | 26. Vinyl acetate             | 43. Tert-amyl methyl ether     | 60. 1,2-Chlorobenzene -d5 (ISTD) | 77. Benzyl Chloride        |
| 10. Acetonitrile                                 | 27. 2-Butanone                | 44. 1,2-Dichloropropene        | 61. 1,1,1,2-Tetrachloroethane    | 78. 1,3-Dichlorobenzene    |
| 11. Bromoethene                                  | 28. 2-Chloroprene             | 45. Bromodichloromethane       | 62. Chlorobenzene                | 79. 1,4-Dichlorobenzene    |
| 12. Acrolein                                     | 29. CIS- 1,2-Dichloroethene   | 46. 1,4-Dioxane                | 63. Ethylbenzene                 | 80. Sec-butylbenzene       |
| 13. Acetone                                      | 30. Bromochloromethane (ISTD) | 47. Trichloroethylene          | 64. m,p-Xylenes                  | 81. 1,2-Dichlorobenzene    |
| 14. Trichlorofluoromethane                       | 31. Hexane                    | 48. 2,2,4-Trimethylpentane     | 65. Bromoform                    | 82. O-Cymene               |
| 15. Isopropyl alcohol                            | 32. Diisopropyl ether         | 49. Methyl methacrylate        | 66. Styrene                      | 83. n-Butylbenzene         |
| 16. Acrylonitrile                                | 33. Chloro form               | 50. Heptane                    | 67. 1,1,2,2-Tetrachloroethane    | 84. 1,2,4-Trichlorobenzene |
| 17. 1,1-Dichloroethene                           | 34. Ethyl acetate             | 51. CIS-1,3-Dichloropropene    | 68. O-Xylene                     | 85. Naphthalene            |
|  |                               |                                |                                  | 86. Hexachlorobutadiene    |

Description	Unit	Part #
<b>7200A Accelerated Preconcentrators</b>		
<b>Instruments and Options:</b>		
7200A Accelerated VOC Preconcentrator (includes loop valve) 120VAC/60Hz	EA	7200A-01
7200A Accelerated VOC Preconcentrator (includes loop valve) 240VAC/50Hz	EA	7200A-01-HV
7200A Accelerated VOC Preconcentrator w/Silonite Coated Flow Path (includes loop valve) 120VAC/60Hz	EA	7200A-01S
7200A Accelerated VOC Preconcentrator w/Silonite Coated Flow Path (includes loop valve) 240VAC/50Hz	EA	7200A-01S-HV
7200 Empty Silonite-D™ Trap**	EA	7200-T1
7200 1/8" Glass Bead Trap**	EA	7200-T2
7200 Tenax® TA Trap**	EA	7200-T3
7200 Tenax® Plus 1/8" Glass Bead Trap**	EA	7200-T4
7200CTS Hydrocarbon Trap**	EA	04-25005
Silonite-D™ 3 Valve Flow Path	EA	90-72113
7200 Sample Trap Heater Assembly	EA	09-7200-00
7200 4 Canister Heated Inlet Line	EA	09-33303
48" 7200A GC transfer line heater	EA	09-33008A
54" 7200A GC transfer line heater	EA	09-33008A-045
72" 7200A GC transfer line heater	EA	09-33008A-06
6890 / 7890 Remote Start Cable	EA	12-31097
1-Stage Diaphragm Pump	EA	10-20010
1-Stg. Diaphragm Pmp. 240VAC/50Hz	EA	10-20014

Description	Unit	Part #
<b>7200 Replacement Parts:</b>		
Silonite-D™ 2 Valve Flow Path	EA	90-72112
7200 GC Transfer Line Heater	EA	09-33008
SL2A Unicard	EA	11-22024

\*\* Configure the 7200's traps for your application. Contact Entech for more info.



7200A | 7650-M, MillionAir™ System.

**MillionAir™**  
Advanced injection control  
10<sup>6</sup> Concentration Range without Dilution



7650-L20 GC Gas Autosampler

## Features

### High or Low Level Analysis

The 7650 Autosampler features stand-alone loop analysis, or pair with the 7200A Accelerated Preconcentrator for trace analysis.

### Analyze up to 20 1L MiniCans/Bottle-Vacs

The 7650 holds 1 – 1.4L canisters in two, 10-position trays with intersample isolation far beyond rotary valve autosamplers.

### TrueSeal™ Valve Compatibility

Now, add MiniCan™ autosampling for your canisters that use the popular TrueSeal™ and Nupro® valves by simply attaching a MicroValve™ to the top of the sampler valve prior to analysis.

### Silonite-D™ Coated Inlet Lines

The 7650 1/16" heated Inlet line inserts directly into a canister's MicroValve™ for a zero dead volume, secure sample connection. After minimal sample contact during transfer to a Preconcentrator or GCMS, the inlet line is immediately flushed with UHP helium or nitrogen. Carryover is often less than one millionth the concentration of the previous sample!

### Extended Autosampling Capacity

Analyze up to 18 additional 6L canisters or Tedlar® bags using expansion ports on the side of the 7650 Autosampler. Now, you can analyze any canister in your inventory using proven "direct inlet" reliability.

## 7650 Canister Autosampler

The 7650 brings the automated analysis of MiniCans™, Bottle-Vacs™, and even large volume sampling canisters to a whole new level! Drawing upon the benefits of its predecessors, the 7650 is the first canister autosampler to facilitate the analysis of up to twenty, 1–1.4L canisters while maintaining samples in a completely closed and isolated state until required for analysis. This level of isolation greatly reduces the potential for carryover, making the 7650 an ideal choice for today's soil gas laboratories. All samples, standards, and blanks flow through the same direct flow path, eliminating any problematic background level variations – a well-known challenge with rotary valve based autosamplers.

## A Canister Autosampler with the amazing precision you need for today's demanding air analysis challenges.

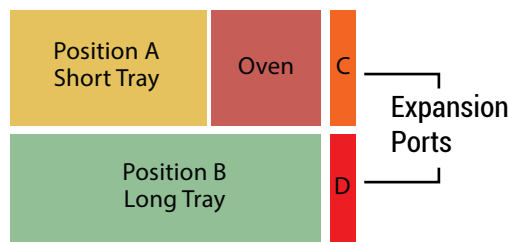
The 7650 features a reliable and precise pneumatic z-axis control along with minimal transfer line sample contact. The brief sample transfer process is immediately followed with a nitrogen flush to greatly reduce any sample contamination risk due to high sample concentrations. The 7650 heated transfer line directly inserts into a MiniCan™ or Bottle-Vac™ canister via an ultra-compact MicroValve™ fitting, for absolutely zero unswept dead-volume.

When paired with the 7200A Accelerated Preconcentrator, the 7650 becomes an ideal autosampler solution for today's modern laboratories that must routinely analyze both high and low concentration samples. Learn more about the 7200A | 7650-M for PPM to sub-PPB level analysis with the new MillionAir™.

The 7650 also includes an easily accessible, array of inlet expansion ports in banks of 9, for the analysis of up to 18 additional canisters or Tedlar® bags.

Description	Unit	Part #
<b>7650 Autosampler – Options</b>		
7650 Headspace Autosampler	EA	7650-01
SmartLab™ II – USB Cable (2m)	EA	12-51120
9-Position external sample inlet*	EA	HS-EXPAND9S
7650 – 220-240VAC/50Hz Option	EA	7650-01-HV

\* Optional Items – Contact Entech for more information and configurations.



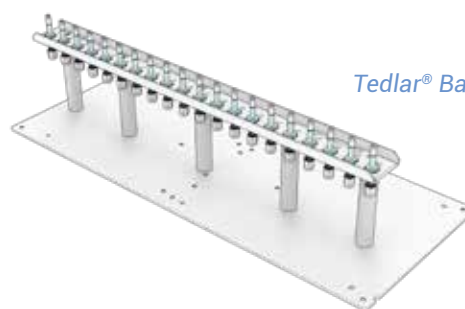
7650 Sample Handling

Description	Positions	Unit	Part #
<b>Long Sample Handling Trays – (7650)</b>			
20mL / 40mL Vial	86	EA	HS-LT115-086
Silonite™ HDS™ Personal Monitor	86	EA	HS-ELT119-086
100mL / 200mL Silonite-XL™ MiniCan™	53	EA	HS-LT158-053
125mL Bottle-Vac™	40	EA	HS-LT197-040
250mL Bottle-Vac™	24	EA	HS-LT248-024
450mL and 600mL MiniCan™	18	EA	HS-LT280-018
450mL and 600mL MiniCan™*	24	EA	HS-ELT278-024
500mL Bottle-Vac™	18	EA	HS-LT301-018
1L Bottle-Vac™	10	EA	HS-LT384-010
1L Silonite-XL™ MiniCan™	10	EA	HS-LT407-010
1L Silonite-XL™ MiniCan™*	12	EA	HS-ELT403-012
6L Canister Tray	6	EA	HS-FT906-06
6L Can Alignment Tool	N/A	EA	HS-FT906-Align
20-Position Tedlar® Bag Tray	20	EA	HS-LTTB-020

\* Extra Long Tray does not allow 9 Pos. Expansion Ports



The 7200A Accelerated Preconcentrator and 7650 Canister Autosampler



Tedlar® Bag Tray



Call Us Today to Learn More!

## The 7650 Autosampler – Optimal sample throughput and superior accuracy with the lowest carryover available anywhere!

Five fixed ports are available to facilitate the introduction of UHP Nitrogen, Internal Standard, Calibration Standard, and two additional fixed ports without using up sample tray positions.



The 7650's amazing single inlet system is designed to easily handle 1L MiniCans™ and 1L Bottle-Vacs™.

Smaller canisters / vials can be analyzed using optimized trays. Add up to 18 additional canisters or Tedlar® bags with the 7650's expansion ports, or analyze / screen 6L canisters directly using the new 6L canister tray.

# Air Toxics | Soil Gas | Vapor Intrusion by GC/MS

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## **7200A | 7650-M – MillionAir™ System** – High Throughput Air Analysis *The 7200 Preconcentrator and 7650-M Inlet combine for state-of-the-art whole air analysis.*

Introducing the 7200A | 7650-M, MillionAir™ Analysis System. The most advanced instrumentation ever developed for analysis of volatile and light semi-volatile compounds in air and soil gas. Now, analyze any size canister in your inventory with the quality assurance of direct inlet robotics. The 7650-M features the new MillionAir™ option that includes the ability to perform rapid screening of samples without exposure to the 7200A Trapping system, thereby maintaining far superior system hygiene relative to other preconcentration systems.

The 7650-M autosampler minimizes carryover when exposed to high concentration samples by combining brief sample contact time, zero dead-volume canister connections, and Accu-Sample™ technology found in the 7200A. Accu-Sample™ completely isolates samples within specific, low-volume flow-path segments, and prevents trap exposure during important sample select and preflush operations. The dual 0.1cc loop in the 7650-M and 1cc loop in the 7200A allows a vastly extended range when combined with the accurate 10–1000cc preconcentration range of the 7200A. The result is greater dynamic range and reduction in the number of sample dilutions required when analyzing soil gas and other high-concentration samples.

Description	Unit	Part #
<b>7200A   7650-M, MillionAir™ Analysis System</b>		
<b>System Includes:</b>		
7200A Accelerated VOC Preconcentrator (includes loop valve) 120VAC/60Hz	EA	7200A-01
7200A Accelerated VOC Preconcentrator (includes loop valve) 240VAC/50Hz	EA	7200A-01-HV
7650 w/ Loop Injection 120VAC/60Hz	EA	7650-M
7650 w/ Loop Injection 240VAC/50Hz	EA	7650-M-HV

[See p. 37 to select desired MiniCan™ Tray Sizes.](#)

## 7200A | 7650-M Air Analysis System

### Features

#### Direct Inlet Robotics

The 7650-M features a single inlet with a Silonite-D™ coated transfer line to eliminate rotary valves and multiple inlet lines from the inlet flow path for the best possible sample isolation and analytical accuracy.

#### Automated Analysis

Accu-Sample™ technology provides superior water management to quantitatively analyze 10 – 1000cc of sample volume.

Choose the 7200A Loop option to achieve accurate sample volumes from 0.1cc to 1cc.

#### New! MillionAir™ System

New, very low volume injection mode that allows analysis of a concentration range of up to one million fold.

#### Extended Range Air Analysis

Wide volume range (0.25–1000cc) for increased dynamic range without dilution. Directly handle PPM level samples without carryover.

Supports single canister calibrations.

#### Quantitative Accuracy

Sampling and analytical precision is not affected by changing matrices (air, humid air, nitrogen, helium, CO<sub>2</sub>, methane, argon, hydrogen).

#### Large Silonite-XL™ Canister and Tedlar® Bag Analysis

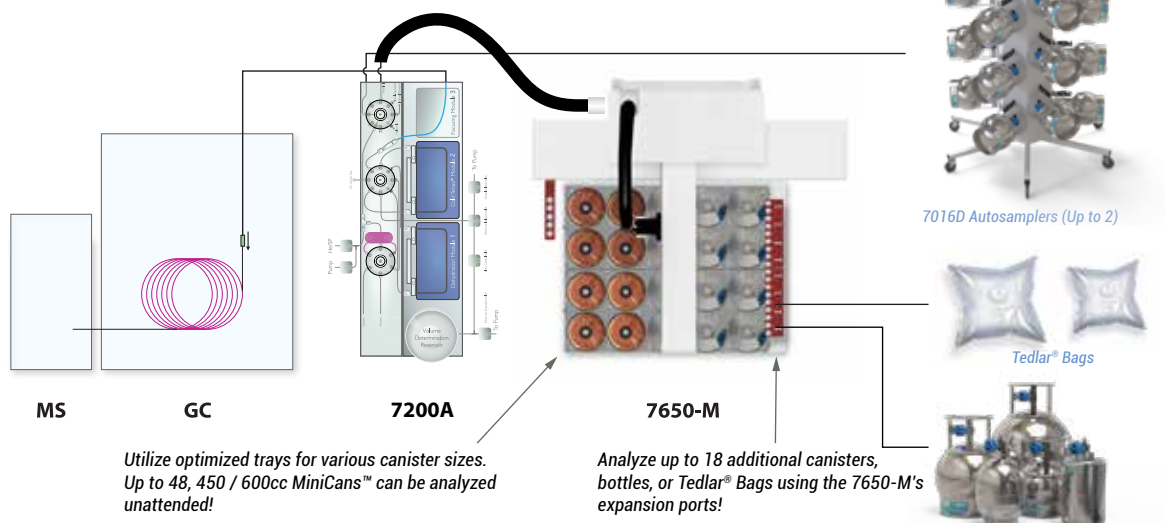
Add two, 9 port expansion ports to easily connect 18 large canisters and Tedlar® bags. The 7200A also features a built-in 4 sample inlet that can accommodate up to two 7016 or 7016D autosamplers in addition to the 7650-M for unsurpassed flexibility and sample throughput.

#### Screen High Concentration Samples

Prevents trap exposure to high concentration samples.

**Now, analyze all sample types, including Tedlar® bags, canisters, and thermal desorption tubes!**

## 7200A | 7650-M System Connections





# 7650-L20 GC Gas AutoSampler

Enjoy the benefits of the 7650-L20 in your laboratory:



- Automation of Tedlar bags, Silonite-XL MiniCans, HDS Personal Monitors, and Bottle-Vac vacuum samplers.
- Permanent Gases
- Volatiles & Semi-Volatiles Analysis (C1 - C20)
- Reduced Sulfur compounds to low PPBv Levels by GC/CLD
- Single sample inlet heated up to the point of sample contact
- Elimination of multiple sample lines that can become contaminated
- Oven option to heat sample containers to increase molecular weight range recovered (MiniCans or Bottle-Vacs)

## 7650-L20 System

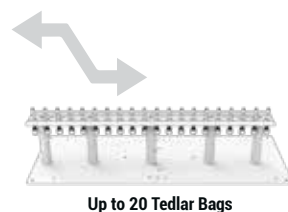
The Entech 7650-L20 is the only system handling automated injection of Tedlar bags and other gas phase samples using a single inlet robotic autosampler. The 7650-L20 can automate the analysis of up to 16 Tedlar bags, or 24 to 80 Bottle-Vac samplers or MiniCans depending on the size of the canister or Bottles. Canisters and gas sampling Bottle-Vacs can be heated prior to analysis to extend the molecular weight range of recoverable compounds, allowing a reliable way of measuring heavy volatiles or semi-volatiles. The dual loop system simultaneously injects an Internal standard along with the sample or calibration standard to support internal standard calibration methods. A 100% Silonite coated ceramic pathway ensures recovery of difficult compounds, creating the most comprehensive technique available for the quantitative measurement of organic compounds in gas phase samples. The 7650-L20 can automate the injection of gas samples to virtually all GCs by using the model specific communication cables available from Entech.

All other systems for the analysis of Tedlar bags use a rotary valve and individual lines that can suffer from contamination and carryover due to long exposure times, dead volume in connective fittings, and plastic rotors in the rotary valves. The 7650-L20 uses a single inlet that makes only momentary contact with the sample when drawing a sample through a calibrated loop for injection into a GC. This line is then immediately flushed to minimize exposure times. The unique inlet allows a  $\frac{1}{16}$ " ceramic coated stainless steel tube to be inserted right into the sample fitting, called a Micro QT valve, that is heated right up the point of sample contact. By inserting the  $\frac{1}{16}$ " continuous tubing right into the sample valve on the Tedlar bag, MiniCan, or Bottle-Vac, all dead volume and cold spots are eliminated. This ensures a clean, contamination free solution well into the semi-volatiles range. Entech has perfected this technology over the past 15 years, and no other system on the market has been designed with these capabilities.





Sampling Media Options



7650-L20 with oven.

7650-L20 without oven.

Position A Short Tray	Oven
Position B Long Tray	

Position A Long Tray
Position B Long Tray

Description	Unit	Part #
7650-L20 Autosampler	EA	7650-L20
SmartLab™ II – USB Cable (2m)	EA	12-51120
7650L-20 – 220-240VAC/50Hz	EA	7650-L20-HV

\* Optional Items – Contact Entech for more information and configurations.  
Please specify GC type when ordering to obtain correct READY/START cable.

Description	Unit	Part #
Sample Oven	EA	HS-OVEN-407-1
<b>Oven Reducing Bushings</b>		
125mL Bottle-Vac Bushing	EA	19-76525
250mL Bottle-Vac Bushing	EA	19-76535
500mL Bottle-Vac Bushing	EA	19-76545
1L Bottle-Vac Bushing	EA	19-76555
50mL HDS Personal Monitor	EA	19-76565
100mL / 200mL MiniCan	EA	19-76570
450mL / 600mL MiniCan	EA	19-76580
1L MiniCan Extender	EA	19-76585

Height: 38" (44" height with  
transfer line clearance)  
Width: 23.5"  
Depth: 27"

**Fuses**  
120V Systems  
15A Main  
8A Heater/Valve  
240V Systems  
8A main, 6A Heater/Valve

**Wattages**  
125W Main Transfer line heater  
75W Gripper  
85W Mandrel/Loop  
70W T200/GC Transfer line heater

Description	Positions	Unit	Part #
<b>Long Sample Handling Trays – (7650)</b>			
100mL / 200mL Silonite-XL™ MiniCan™	53	EA	HS-LT158-053
125mL Bottle-Vac™	40	EA	HS-LT197-040
250mL Bottle-Vac™	24	EA	HS-LT248-024
450mL and 600mL MiniCan™	18	EA	HS-LT280-018
500mL Bottle-Vac™	18	EA	HS-LT301-018
1L Bottle-Vac™	10	EA	HS-LT384-010
1L Silonite-XL™ MiniCan™	10	EA	HS-LT407-010
6L Canister	6	EA	HS-FT906-06
20-Position Tedlar® Bag Tray	16	EA	HS-LTTB-020

<b>Short Sample Handling Trays – (7650)</b>			
HDS Personal Monitor Tray	50	EA	HS-ST119-050
20 / 40 / 60 Vials	50	EA	HS-ST115-050
100mL / 200mL Silonite-XL™ MiniCan™	32	EA	HS-ST158-032
125mL Bottle-Vac™	24	EA	HS-ST197-024
250mL Bottle-Vac™	15	EA	HS-ST248-015
500mL Bottle-Vac™	11	EA	HS-ST301-011
1L Bottle-Vac™	6	EA	HS-ST384-006
1L Silonite-XL™ MiniCan™	6	EA	HS-ST407-006

<b>Extended Sample Handling Trays – (7650)</b>			
Silonite™ HDS™ Personal Monitor	86	EA	HS-ELT119-086
450 / 600cc Minican	24	EA	HS-ELT278-024
450 / 600cc Minican	24	EA	HS-ELT280-024
1L Bottle-Vac™	12	EA	HS-ELT384-012
1L Silonite-XL™ MiniCan™	12	EA	HS-ELT403-012



7016D Autosampler shown with 6L Canisters

## Features

### Automated Analysis

Up to sixteen 6L Silonite-XL™ canisters can be analyzed in accordance with EPA Methods TO-14A and TO-15.

### Back-Flushing of Each Line After Analysis

Using automated software control.

### Automated Leak-Checking

Verification of leak-tight connections prior to opening valves.

### Silonite™ Coated Inlet Lines

Ultra-inert flow paths for recovery of reactive compounds.

### Complete SmartLab™ II Automation

Sophisticated Windows® compatible software with precise automation control via USB connection.

### Easy Valve Alignment

Simple adjustment of digital feedback sensor.

## 7016D Canister Autosampler

The ultimate autosampler for large canister whole air analysis, now better than ever.

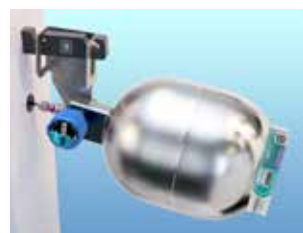
The new 7016D features 16 inlet positions that bring Entech's automated analysis capabilities to a wide variety of vacuum sampling canisters and Tedlar® bags. The 7016D easily connects to a 7200 Preconcentrator for the automated analysis of VOCs in canisters with EPA Toxic Organics Methods TO-14A and TO-15.

The 7016D is controlled through the advanced 7200A Windows® platform and incorporates an all-new, digitally controlled rotary valve actuator with "smart positioning" that improves port alignment. Valve alignment is easy and no longer requires rotation of the valve and tubing. All flow path tubing throughout the 7016D system is Silonite™ coated and heated to further reduce flow path carryover while maximizing sample recovery.

## The Most Flexible and Accurate Large Canister Solution for EPA Methods TO-14A and TO-15.



The 7016D easily adapts for the analysis of large canisters, MiniCans™, and Tedlar® Bags.

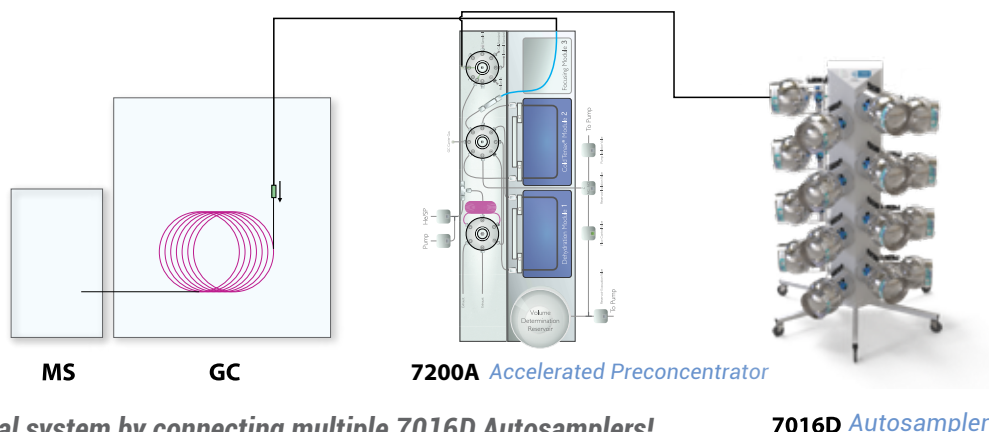


Type	Description	Unit	Qty. Incl.	Part #
Instrument	<b>7016D Canister Autosampler for 7200-01 or -02 Cryogenic Preconcentrators</b> (16 Position 6L Canister Autosampler w/ Digital Rotary Valve)	EA	1	7016D*
- Option	- Silonite Coated Flow Paths. Add "S" to part number for coated flow paths.	EA	1	7016DS*
Instrument	<b>7016D Canister Autosampler for 7200CTS &amp; 7200A Preconcentrator Models</b> (16 Position 6L Canister Autosampler w/ Digital Rotary Valve)	EA	1	7016D-2
- Option	- Silonite Coated Flow Paths. Add "S" to part number for coated flow paths.	EA	1	7016DS*
- Accessory	- 7016D 2.7L canister bracket (order one per canister)	EA	1	29-23270
- Accessory	- 7016D MiniCan / Bottle-Vac cradle	EA	1	19-14010

\* High Voltage Operation - Add "-HV" to the end of the part number for the 220V+ versions.

## 7016D Canister Autosampler Connections

Connect up to three 7016D Autosamplers directly to a 7200 Volatiles Preconcentrator and up to two 7016D Autosamplers when connecting to a 7200A | 7650 System. The 7016D is ideal for ambient air samples below 100 PPBv. When mixing ambient air and soil gas samples, the 7650 Autosampler is recommended. A typical 7200A | 7016D configuration is shown below.



**Expand your analytical system by connecting multiple 7016D Autosamplers!**

7016D Autosampler



## 7100A (Accessories & Spare Parts)

Description	Unit	Part #
<b>With Valco® Fittings:</b>		
Module 1 Empty Trap	EA	04-11310
Module 1 Glass Bead Trap	EA	04-11320
Module 2 Tenax® Trap	EA	04-11330
Module 1,2 Glass Bead/Tenax® Trap	EA	04-11340
7100A Flow Path Tube KitA	EA	90-71110
1/8" - 1/16" Bulkhead Union	EA	37-01200
1/8" - 1/16" Silonite™ Bulkhead Union	EA	37-01250
<b>With Swagelok®-Style Fittings:</b>		
Module 1 Empty Trap	EA	04-11310A
Module 1 Glass Bead Trap	EA	04-11320A
Module 2 Tenax® Trap	EA	04-11330A
Module 1,2 Glass Bead/Tenax® Trap	EA	04-11340A
7100A Flow Path Tube KitA	EA	90-71110A
1/8" - 1/16" Bulkhead Union	EA	30-02043
1/8" - 1/16" Silonite™ Bulkhead Union	EA	30-02043S
<b>Other Parts</b>		
9' x 1/32" Silonite™ GC Transfer Line	EA	06-08051
GC Transfer Line Heater	EA	09-33006
Trap Heater (M1/M2)	EA	09-13010
200 nccm MFC (Mass Flow Controller)	EA	03-10200C
Bulkhead Heater/TC Assembly	EA	09-13020
LN2 Cryovalve (M1-M3)	EA	01-71760
LN2 Sponge (M3)	EA	19-71355
Silonite™ Glass Liner for 7100-01	EA	36-71550
1-Stage Diaphragm Pump Repair Kit	EA	10-20016

Description	Unit	Part #
4 Sample Inlet (for 1/4" TrueSeal Valves)	EA	09-33203
4 Sample Inlet (for Micro-QT Valves)	EA	09-33410
Syringe Injection Option	EA	7100-01
Silonite™ Valves and Fittings	EA	90-71110



4-Line Heated Inlet PN 09-33203



Syringe Inj. Option PN 7100-01



Empty Trap PN 04-11310



M1 / M2 Trap Heater PN 09-13010

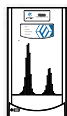
# Air Toxics Analysis by GC/MS



7200A Accelerated Preconcentrator



7016D Canister Tower Autosampler shown with 16 6L Canisters.



## 7200A | 7016D Air Toxics System – Large Canister 16-Position Inlet

*The 7200A Accelerated Preconcentrator combines with the 7016D Inlet for Ambient Air Toxics Analysis.*

The 7200A paired with the 7016D creates an excellent solution for 2.7, 3.2, 6L, and 15L canisters used for ambient level air toxics analysis in compliance with EPA Methods TO-14a and TO-15. The 7200A's 4-sample inlet can accommodate the simultaneous connection of up to three 7016D autosamplers to maximize unattended canister analysis. The new 7016D features the time-tested reliability of our popular 7016 Autosampler, along with new SmartLab™ II communication and digital rotary valve control – **for even more reliable valve positioning.**



The 7200A and 7016D both feature Entech's new SmartLab™ II control platform. SmartLab™ II sets a new standard for optimal and reliable instrument communication for Windows® environments. Run time data storage and management is simplified, including a standardized report that presents all the important information you need for straightforward, quality assessment. Now, with the 7200A | 7016D System, analyze your large canisters with confidence!

### TURNKEY APPLICATION COMBO

#### 7200A | 7016D Large Canister Air Toxics System

Type	Description	Unit	Qty. Incl.	Part #
Instrument	7200A Accelerated VOC Preconcentrator w/Silonite Coated Flow Path (includes loop valve) 120VAC/60Hz	EA	1	7200A-01S
Instrument	7200A Accelerated VOC Preconcentrator w/Silonite Coated Flow Path (includes loop valve) 240VAC/50Hz	EA	1	7200A-01S-HV
Instrument	7016D 16 Position Autosampler (canisters sold separately)* 120VAC/60Hz	EA	1	7016D
Instrument	7016D 16 Position Autosampler (canisters sold separately)* 240VAC/50Hz	EA	1	7016D-HV
- Accessory	7016D 2.7L canister bracket (order one per canister)	EA	1	29-23270
- Accessory	7016D MiniCan / Bottle-Vac cradle	EA	1	19-14010

## 7200A / 7016D Air Toxics Analysis System

### Features

#### Even Better Sample to Sample Isolation

The 7200A / 7016D Air Toxics System features Accu-Sample™ technology to reduce cross-contamination.

#### Automated Analysis

Accurate analysis of 0.5–1000cc of sample using precise volume determination, great water management, and Accu-Sample™ technology.

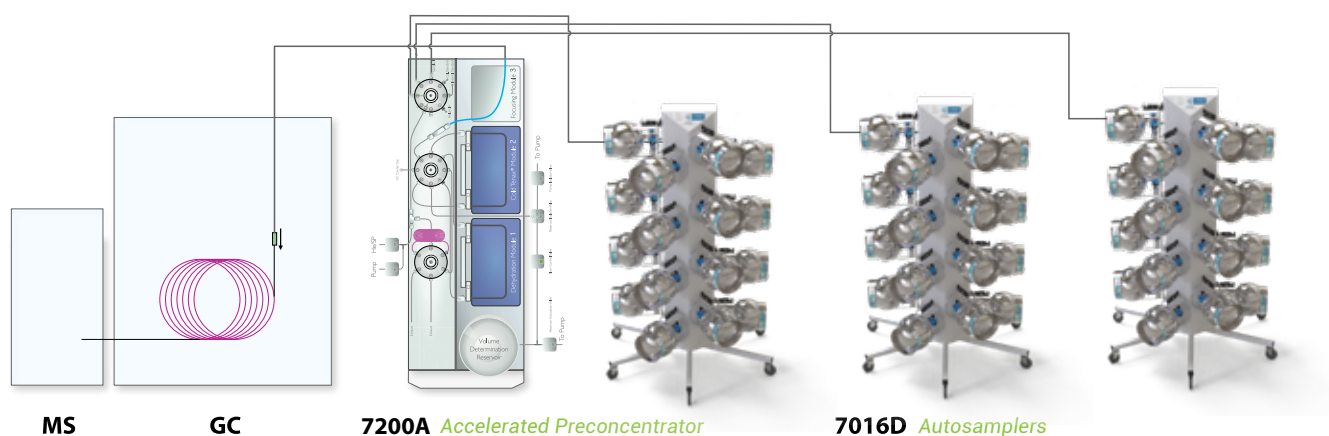
#### Quantitative Accuracy

This system ensures sampling and analytical precision is never compromised by changing matrices (air, humid air, nitrogen, helium, CO<sub>2</sub>, methane, argon, hydrogen).

#### Large Silonite-XL™ Canister Analysis

Reliably connect and analyze any extra-large canisters in your inventory. Simply connect additional 7016D autosamplers for higher throughput requirements.

## 7200A / 7016D System Connections



**The 7200A and 7016D Air Toxics System**  
ultimate precision for large canister analysis.





4700 Precision Diluter

## Features

### 6 Channels Installed and Ready!

The 4700 comes standard with six channels. This enables dedicated internal standards, calibration standards, and serial dilution channels.

### Performs Dilutions up to 10,000x!

The 4700 Precision Diluter can easily perform 1–100x dilutions (100 PPB to 1 PPB), or dilutions up to 10,000x by using a dedicated channel on the front of the system for second stage dilution.

### Dilutes High Concentrations

High concentration samples such as soil gas can be effortlessly diluted with the 4700.

### Conserves Cylinder Standards

The 4700 conserves cylinder standards relative to dynamic blending.

### Ideal for Challenge Standards

The 4700 can create 1 PPB challenge standards for 6L canister inertness validation tests. (One 110L Cylinder at 1 PPM can fill over 15,000 6L to 1 PPB at 1 atm)

### Gravimetric Dilution Validation

An optional digital scale can be used to validate dilution ratios gravimetrically, thus eliminating any need for expensive annual sensor calibrations.

## 4700 Precision Diluter

**The most precise, flexible, and efficient standard preparation system on the market.**

The 6 Channel 4700 Precision Diluter represents the next generation in accurate canister standards preparation. Utilizing a combination of precise gas flow control, exact pressure measurements, and an ultra-inert flow path, the 4700 is capable of performing multistage dilutions for achieving standards ranging from part-per-billion to low part-per-trillion. The 4700 works with canisters and Bottle-Vacs™ to create dilutions up to 100x, and then allows a second dilution of up to another 100x to yield a total 2 step dilution of up to 10,000x. The 4700 uses precise pressure control, rather than mass flow controllers to meter in the standard. This approach has several advantages. First, very little of the standard mix is used in making a standard. This allows the original cylinder to last longer, keeping cylinder pressures higher where contents are more stable. Secondly, the mixing region required in a dynamic diluter is eliminated, substantially reducing surface area and carryover.

With the 4700, small 110L cylinders at 1 PPM will allow over 15,000 6L canisters to be filled to atmospheric pressure with a 1 PPB mixture by first making a 20PPB working standard that can be further diluted into each canister to be tested. This results in just pennies worth of standard being consumed when performing inertness testing of canisters every 1–2 years. By contrast, typical dynamic diluters that must balance flows and pressures can typically only fill 50–100 6L canisters per high concentration cylinder, making field canister inertness testing prohibitively expensive. Low pressure standards or even samples can be further diluted using inlet #6 which is conveniently located on the front of the 4700. Easily perform up to a 100x dilution into a 6L canister, or up to a 40x dilution into a Bottle-Vac™ to obtain working concentrations that are more acceptable to GCMS inlet systems.

Description	Unit	Part #
<b>4700 Precision Diluter</b> (Includes 6 channels)	EA	4700
4700 Tablet Option	EA	4700-TSC
4-Position 110L Cylinder Holder	EA	40-44911

## Calibration Standards

Description	Unit	Part #
1 PPM TO-14a Standard (110L Cylinder, 1700psig)	EA	40-45010
1 PPM TO-15 Subset Standard (110L Cylinder, 1700psig)	EA	40-45110
1 PPM TO-15 Standard (110L Cylinder, 1700psig)	EA	40-45115
1 PPM 4 Component Internal Standard (110L Cylinder, 1700psig)	EA	40-45210
2–5 PPM Carbonyl Standard (800L Cylinder, 2000psig)	EA	40-45130
4-Position Cylinder Holder (for 102L Standard Cylinders)	EA	40-44911
High Purity Stainless Regulator w/ CGA180	EA	40-02001
Canister Regulator	EA	40-03000



## 4700 Precision Diluter – Operation

### Sample Pressurization

The 4700 uses pressure differentials rather than mass flow controllers to meter in the standard, which has several advantages. First, very little of the standard mix is used in making a dilution. This allows the original cylinder to last longer, keeping cylinder pressures higher where contents are more stable. This now makes it cost effective to create accurate standards into every field canister in a laboratory's inventory to check them for proper recovery once every 2 years.

Even small 110L cylinders at 1PPM will allow over 10,000 6L canisters to be filled to atmospheric pressure with a 1PPB mixture by first making a 20 PPB working standard that can be further diluted into each canister to be tested. This results in just pennies worth of standard being consumed during each inertness test.

By contrast, typical dynamic diluters that must balance flows and pressures can typically only fill 50–100 6L canisters per 102L cylinder, making field canister inertness testing prohibitively expensive. Secondly, now low pressure standards or even samples can be further diluted using inlet #6 which is conveniently located on the front of the 4700. Easily perform up to a 100x dilution into a 6L canister, or up to a 40x dilution into a Bottle-Vac™ to obtain the ideal working concentrations that are much more acceptable to GCMS inlet systems.

The 4700 can perform automated pressurizing of canister field samples to bring them to a positive pressure after receipt by the laboratory. A high accuracy sensor ( $\pm 0.3\%$ ) first measures the initial pressure, then fills the canister to a requested final pressure and calculates the dilution factor. A second operating mode allows dilution by a constant factor of 1.5, 2, or 3x. This conveniently eliminates the need to determine different dilution factors for each sample. Pressurizing samples with a surrogate-containing nitrogen cylinder can add further reliability to the results by validating the actual volume withdrawn from the sample canister during analysis.

### SmartLab™ II Control Interface

The 4700 is controlled using Entech's SmartLab™ II network. This software allows the defining and running of methods as well as the pressurizing of samples or standards prior to GCMS analysis. An easy to use graphical interface simplifies operation and accelerates user understanding of operation principles.

### Automatic Dilution Calculations

The automatic dilution calculation system, which is integrated throughout the Entech 4700's user interface, makes it very simple and intuitive to specify and describe target concentrations and final concentrations ranging from % and part-per-trillion.

Dilution values may be entered using any convenient unit of measure and all values are automatically converted to a common base within the Entech 4700 software.

## The 4700 Precision Diluter's feature rich software enables full control.

Intuitive user interface, Optional touch pad quick entry, Color coding, Status lights, Advanced reports, and much more!



## Cylinder Fittings

Description	Unit	Part #
1/8" x 4'L SC Tubing w/ SS Cap	EA	15-85231
SC MMQT-1/8" Comp Fitting- BLUE	EA	MQT-200L-BLUES
SC MMQT-1/8" Comp Fitting- GREEN	EA	MQT-200L-GREENS
SC MMQT-1/8" Comp Fitting- RED	EA	MQT-200L-REDS
SC MMQT-1/8" Comp Fitting- YELLOW	EA	MQT-200L-YELLS

# DDS™ – Digital Dilution System



## DDS™ – Four systems in one!

*The DDS™ is an absolute must for any TO-15 laboratory.*

### Sample Dilution

Transfer a known quantity from a high concentration sample via syringe to an evacuated Bottle-Vac™ or MiniCan™, followed by pressurization using the DDS™ to a consistent, final pressure to complete the dilution process as shown below.



### Sample Surrogate Spiking

Easily attach every sample that comes into the lab for a quick pressurization to 1.5x or 2x using UHP Nitrogen or preferably a Nitrogen cylinder filled with a surrogate of known concentration to enhance the quality assurance of each and every analysis.



### Standards Dilution

Easily make a 2PPB standard from a 40PPB standard canister to support the preparation of trace level calibration curves. Dilutions from 5–50x are easily and accurately achieved, allowing for wider dynamic calibration ranges without having to preconcentrate extremely small or large volumes.

### Field Testing of Canisters

Verify sample integrity with the precision and reliability of the DDS™ Gauge.

The ability to detect small leaks is >10x better than standard dial gauges. DDS™ readings are also not affected by changes in altitude.



Description	Unit	Part #
<b>Digital Dilution System (DDS™)</b>	EA	03-32010
<b>Includes:</b>		
DDS™ Digital Gauge Assembly	EA	03-32030
1/4" Silonite™ Cross Assembly	EA	03-32020
1/4" Silonite™ Female Micro-QT™	EA	FQT-400S
1/4" Silonite™ TrueSeal™ Valve	EA	29-TS-01

**DDS™ –  
One System. So Many Uses!**

## Create standard mixtures to your exact laboratory requirements.

Entech now provides multiple standard cylinders with no overlapping compounds. Start with the TO-14a Standard, then add on the particular TO-15 compounds required. Up to 4 different cylinders can be blended together to low PPB levels into a Silonite-XL™ canister using the 4700 Precision Diluter. Dedicating channels for Internal Standard and Calibration Standard mixes simplifies operation.

### TO-14a | Standard

Volume ~110L Balance: Nitrogen  
PN 40-45010

Methyl chloride  
Methyl bromide (Bromomethane)  
Freon 12 (Dichlorodifluoromethane)  
Chloromethane  
Freon-114  
Vinyl Chloride  
Bromomethane  
Chloroethane  
Freon-11 (Trichlorofluoromethane)  
1,1-Dichloroethene  
Methylene chloride  
Freon-113 (Trichlorotrifluoroethane)  
1,1-Dichloroethane  
cis-1,2-dichloroethene  
Chloroform  
1,2-Dichloroethane  
1,1,1-Trichloroethane  
Benzene  
Carbon Tetrachloride  
1,2-Dichloropropane  
Trichloroethylene  
cis-1,3-Dichloropropene  
trans-1,3-Dichloropropene

1,1,2-Trichloroethane  
Toluene  
1,2-Dibromoethane  
Tetrachloroethylene  
Chlorobenzene  
Ethylbenzene  
p-Xylene  
m-Xylene  
Styrene  
o-Xylene  
1,1,2,2-Tetrachloroethane  
1,3,5-Trimethylbenzene  
1,2,4-Trimethylbenzene  
1,3-Dichlorobenzene  
1,4-Dichlorobenzene  
1,2-Dichlorobenzene  
1,2,4-Trichlorobenzene  
Hexachloro-1,3-Butadiene  
Hexachlorobutadiene  
Dichlorotetrafluoroethane  
Dichloromethane

### TO-15 | Subset Standard

Volume ~110L Balance: Nitrogen  
PN 40-45110

Propylene  
1,3-Butadiene  
Vinyl Bromide  
Acetone  
Isopropyl Alcohol  
Carbon Disulfide\*  
Allyl Chloride  
trans-1,2-Dichloroethene  
Methyl-tert-Butyl Ether (MTBE)  
Vinyl Acetate  
Methyl Ethyl Ketone  
n-Hexane  
Ethyl Acetate  
Tetrahydrofuran  
Cyclohexane  
Bromodichloromethane  
1,4-Dioxane  
2,2,4-Trimethylpentane  
n-Heptane  
Methyl Isobutyl Ketone  
Methyl Butyl Ketone  
Dibromochloromethane  
Bromoform  
4-Ethyltoluene  
Benzyl Chloride\*

### TO-15 | Plus Standard

Volume ~110L Balance: Nitrogen  
PN 40-45115

Acrolein  
Acrylonitrile  
Acetonitrile  
1,1,1,2-Tetrachloroethane  
2-Chloroprene  
2-Chlorotoluene  
Methanol  
Ethanol  
tert-Butyl Alcohol  
Diisopropyl Ether  
Ethyl-tert-Butyl Ether  
tert-Amyl Methyl Ether  
Methyl Methacrylate  
Cumene (Isopropylbenzene)  
o-Cymene (2-Isopropyltoluene)  
n-Propylbenzene  
n-Butylbenzene  
tert-Butylbenzene  
sec-Butylbenzene  
Naphthalene

\* No Stability Guarantee  
Restricted to 500psia @ 1 PPM

### TO-15A | Plus Standard

Volume ~110L Balance: Nitrogen  
PN 40-45115A

Acrolein  
Acrylonitrile  
Acetonitrile  
1,1,1,2-Tetrachloroethane  
2-Chloroprene  
2-Chlorotoluene  
Methanol  
Ethanol  
tert-Butyl Alcohol  
Diisopropyl Ether  
Ethyl-tert-Butyl Ether  
tert-Amyl Methyl Ether  
Methyl Methacrylate  
Cumene (Isopropylbenzene)  
o-Cymene (2-Isopropyltoluene)  
n-Propylbenzene  
n-Butylbenzene  
tert-Butylbenzene  
sec-Butylbenzene  
Naphthalene  
Ethylene Oxide

\* No Stability Guarantee  
Restricted to 500psia @ 1 PPM

### Sulfur Standard

Volume ~110L Balance: Nitrogen  
PN 40-45600

2,5-Dimethylthiophene  
2-Methylthiophene  
3-Methylthiophene  
Butyl Mercaptan  
Carbon disulfide  
Dimethyl Disulfide  
Dimethyl Sulfide  
Ethyl Mercaptan  
Ethyl Sulfide  
Hydrogen Sulfide  
Isopropyl Mercaptan  
Methyl Mercaptan  
Pentyl Mercaptan  
Propyl Mercaptan  
Tert-butyl Mercaptan  
Thiophene  
Carbonyl Sulfide  
Isobutyl Mercaptan  
2-Ethylthiophene

### Internal Standard

Volume ~110L Balance: Nitrogen  
PN 40-45210

Bromochloromethane  
Chlorobenzene-d5  
1,4-Difluorobenzene  
1,4-Bromofluorobenzene

### Carbonyl Standard

Volume ~800L Balance: Nitrogen  
PN 40-45130

Formaldehyde  
Acetaldehyde  
Acetone  
Propionaldehyde  
2-Butanone

## Additional Calibration Standards

Entech offers an Internal Standard for TO-14a and TO-15 Method applications. A Carbonyl Standard is available that includes Formaldehyde (now easily recoverable from Entech canister solutions). A complete 77–84 component standard is listed which covers a wide range of required target compounds.



102L Cylinder



4-Position 110L Cylinder Holder  
locks onto 4700 base.

PN 40-44911



HDS™ PM Exposure Chamber PN: HDS-EC1

## Features

- Multiple Ports**  
 Multiple ports are ready for evacuation, filling with diluent, gas, or liquid standards, pressure / vacuum measurements, and more!
- Multiple HDS™ Personal Monitors**  
 Easily test up to 4 HDS™ Personal Monitors at a time.
- Silonite™ Coated Chamber**  
 The HDS™ Personal Monitor Exposure Chamber features a large 6L volume with the reliable inertness of Silonite™.
- Verify Specific Sampling Rates**  
 Prepare and test virtually any volatile chemical's sampling rates relative to the collection rate of air when using our HDS™ Personal Monitors.
- Easy HDS™ Sampling**  
 Liquid standards are spiked into chamber through the top and allowed to equilibrate prior to sampling. No disturbance in concentrations or chamber pressure when starting / stopping the sampling process.
- Reliable Measurements**  
 No flows to control or special gases required. When done, simply analyze by loop injection (PPM Level) or extract 10cc when monitoring PPB levels (7200).

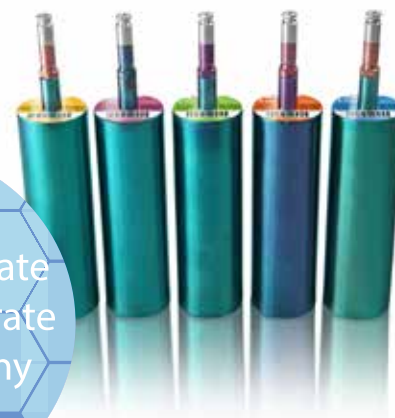
## HDS™ – Personal Monitor Exposure Chamber

The new HDS™ Personal Monitor Exposure Chamber allows laboratories to prepare and validate virtually any volatile chemical's sampling rates relative to the collection rate of air when using the Entech HDS™ Personal Monitors. Although sampling rates do not vary much on a compound by compound basis, our new exposure chamber will allow the verification of exact rates of virtually any volatile chemical to within a few percent, measured against the gravimetrically determined weight gain achieved during the sampling process. No other IH technique has such an accurate means by which to measure the amount of sample collected "during" the sampling event. HDS™ Personal Monitors collect chemicals at a relative rate that is about 75–95% as fast as the collection of air.

This exposure chamber can obtain specific sampling rate data on 4 HDS™ Personal Monitors at a time and the validation process is easy. Neat, or multi-component liquid standards can be injected into the exposure chamber and allowed to equilibrate to achieve the desired gas phase concentrations before HDS™ Personal Monitor sampling.



**Call Us Today to Learn More!**



Description	Unit	Part #
HDS™ PM Exposure Chamber	EA	HDS-EC1

Includes 30"Hg-0-30psig gauge and female MicroValve™ on top of the chamber with NPT fittings and a male MicroValve™ to attach either a flush gas or vacuum for easy cleaning.

Note: Base unit does not include TrueSeal™ Valve and fittings. Call for more information on how to best configure your Exposure Chamber.



HDS™ – PS1 Prep Station PN: HDS-PS1

## HDS™–PS1 Personal Monitor Prep. Station

Preparing HDS™ Personal Monitors for field sampling just became a lot easier with the HDS™ Personal Monitor Prep Station!

Simply attach an HDS™ Personal Monitor to the HDS-PS1 Prep Station and use a vacuum pump and cylinder containing Helium and BFT to evacuate, fill, evacuate, and fill the sampler. The personal monitor is now ready to be sent to the field. To clean samplers, simply evacuate, fill, and evacuate the samplers then place in an oven overnight at 70–100°C. Cool the samplers then follow the normal fill, evacuation, and fill process. Your samplers are now ready for the next field sampling event.

The HDS-PS1 comes with the prep station manifold as shown, and includes the compound gauge, 3-way valve, and female Micro-QT™ Valve. Diaphragm pump and cylinders containing the Helium/BFT mix are sold separately.

Description	Unit	Part #
HDS™ Personal Monitor Prep. Station (Includes compound gauge, 3-way valve, and female Micro-QT™)	EA	HDS-PS1
2-Stage Diaphragm Vac. Pump – 120 VAC Option	EA	10-20030
2-Stg. Diaph. Vac. Pmp. – 220-240VAC/50Hz	EA	10-20034
4-Position Expander (Prepare 4 samplers simultaneously)	EA	HDS-PM-4XM
1/4" Silonite™ Female Micro-QT™ (for 4-Pos. Expander.)	EA	FQT-400S

## Industrial Hygiene –HDS™ Cylinder Standards

Two separate cylinder mixes are required by the laboratory for the preparation and analysis of HDS™ Personal Monitors.

**HDS™ Preparation** – A cylinder containing 1 PPM Bromofluorotoluene (BFT) in Helium is used to “charge” the samplers prior to sending them into the field. Since the BFT remains at the same concentration through the sampling process and delivery back to the laboratory, the BFT serves as an excellent recovery standard to validate leak-tight and inert conditions.

**HDS™ Analysis** – A second cylinder containing Fluorobenzene (FB) in Nitrogen at 1 PPM is used as an internal standard. Each HDS™ Personal Monitor is pressurized to 7psig (7psi above atmospheric pressure) either manually or automatically on the Entech 7650-L20, 7410D, or 7200 | 7650-M MillionAir™ System, providing an internal standard to verify the correct delivery of the sample to the GCMS.

The Helium/BFT standard utilizes a single stage high purity regulator, while the N2/FB cylinder uses a 2-stage high purity regulator to maintain a more constant 7psig to improve analytical precision. Lower concentration BFT and FB at 10PPB are used when performing HDS™ sampling into larger canisters and Bottle-Vacs™ for high sensitivity measurements to low or sub-PPB levels.

## HDS™ Cylinder Standards

Description	Unit	Part #
1 PPM BFT in Helium (500L Cylinder, 1200psig)	EA	40-HDS-BFT-H
10 PPB BFT in Helium (500L Cylinder, 1200psig)	EA	40-HDS-BFT-E
1 PPM FB in Nitrogen (500L Cylinder, 1200psig)	EA	40-HDS-FB-H
10 PPB FB in Nitrogen (500L Cylinder, 1200psig)	EA	40-HDS-FB-E





3100D Canister Cleaner

## 3100D Canister Cleaning Systems

*Superior oil-free canister cleaning systems for high throughput laboratories.*

Canisters are cleaned for reuse by evacuating and refilling with nitrogen or zero air multiple times to completely eliminate VOCs introduced during the previous sampling. After cleaning, canisters are left under vacuum in preparation for resampling. System pressure and vacuum readings control the evacuation and fill times for consistent batch to batch cleaning. Silonite™ coated manifolds and separate fill and evacuation flow paths ensure the most rapid elimination of VOCs and SVOCs possible. These updated systems now include method control of oven temperatures and adaptive feedback and control of the molecular drag pump to improve pump performance and longevity.

The 3112D oven quick-connect manifold accommodates up to twelve 6L canisters or up to 36 1–1.4L Minicans for complete heating during the cleaning process. Connect two ovens and clean up to twenty-four 6L canisters or 72 Minicans simultaneously!

### 3100D | 3112D Canister Cleaning System



#### 3112D Oven Size

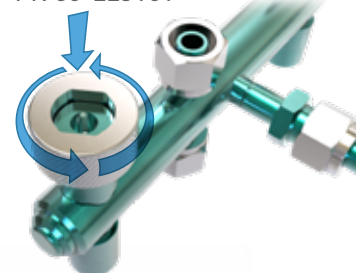
Height: 34 inches (86.36cm)  
Width: 33 inches (83.82cm)  
Depth: 35 inches (88.9cm)

*Shown Here - 3112DM  
Canister Cleaning System*

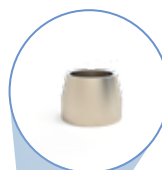
Low Profile  
Female Micro-QT  
Manifold Fitting  
PN FQT-624LPS



Female Micro-QT  
Removal Tool  
PN 30-22910T



NiFTY  
Nickel Ferrules  
PN 30-40400



New Micro-QT™ Quick Connect Manifolds

Description	Unit	Part #
<b>3112D Cleaning System Bundles*</b>		
(12) Position 6L Bundle	EA	3112D
(40) Position Minican or 12 Pos. 6L Bundle	EA	3112DM
(12) Position 6L Bundle w/MQT ports**	EA	3112DMP
<b>All bundles above include items below and a manifold</b>		
3100D & Control Software	EA	3100D
3100D Humidifier	EA	07-10531
6L x 12 Canister Oven ***	EA	09-OV6L12
3112D External Tubing	EA	15-31120
2-Stage Diaphragm Pump – 120VAC	EA	10-20030

\* Add "-HV" after part# for 220–240VAC Operation (e.g. 3112D-HV).  
\*\* Micro-QT™ ports are plugged. No Micro-QT™ Valves included.  
\*\*\* Order 09-OV6L12-HV for 220–240VAC Operation. Manifold required.

Description	Unit	Part #
<b>Individual Manifolds and Fittings</b>		
(12) Position Cleaning System Manifold for 6L Can Oven. Holds (12) 6L (or smaller) cans or (2) 15L Cans. †	EA	3100-12
40 / 12 P 3112 Oven Manifold Assembly w/ MQT Fittings Includes 40 MQT Fittings. †	EA	3100-12M
40 / 12P 3112 Manifold Assembly w/ Plugs Includes 40 Plugs. †	EA	3100-12MP
Female Micro-QT Manifold Fitting	EA	FQT-624LPS
<b>Optional Components</b>		
3100A/D Tablet/Bracket Option	EA	3100-TSC

† Does not include oven.

**Both the 3112D and 3108D  
Feature Precise Digital Control  
& Convective Heating!**

## 3100D | 3108D Canister Cleaning System

Utilize our new, 8-Position, ¼" and MicroValve™ Expansion Manifolds to clean up to 32 MiniCan™ or Bottle-Vac™ canisters per 3108D oven.



3108D Canister Cleaning System  
6L Canister with 8 position manifold

### 3108D Oven Size

Height: 37.5 inches (95.25cm)  
Width: 21.5 inches (54.61cm)  
Depth: 28 inches (71.12cm)

Description	Unit	Part #
<b>3108D Cleaning System Bundles*</b>		
(8) Position 6L Bundle †	EA	3108D
(32) Position Minican or 8 Pos. 6L Bundle †	EA	3108DM
(8) Position 6L Bundle w/MQT ports** †	EA	3108DMP
<b>All bundles above include items below and a manifold</b>		
3100D & Control Software	EA	3100D
3100D Humidifier	EA	07-10531
6L x 8 Canister Oven ***	EA	09-OV6L8
3108D External Tubing	EA	15-31080
2-Stage Diaphragm Pump – 120VAC	EA	10-20030
<b>Individual Manifolds and Fittings</b>		
(8) Pos. 6L Manifold	EA	3100-08
(32) Pos. Minican or (8) Pos. 6L Manifold	EA	3100-08M
(8) Pos. 6L Manifold w/MQT option**	EA	3100-08MP
Female Micro-QT Manifold Fitting	EA	FQT-624LPS
<b>Optional Components</b>		
3100A/D Tablet/Bracket Option	EA	3100-TSC

\* Order 3108(D,DM,DMP)-HV for 220–240VAC Operation.

\*\* Micro-QT ports are plugged. No Micro-QT Valves included.

\*\*\* Order 09-OV6L8-HV for 220–240VAC Operation. Manifold required.

† Does not include oven.



The 3100D Features all-new software.



3100D Humidifier  
PN 07-10531



External Manifold for  
Dual Oven Connection  
PN 3100-03

## Misc Parts

Description	Unit	Part #
3100D – External Manifold (2 Oven Parallel Operation)	EA	3100-03
3100D   3112D – Expansion Tubing (2nd Oven Fill / Evacuation Tubing Kit)	EA	15-31020P
3100D   3108D – Expansion Tubing (2nd Oven Fill / Evacuation Tubing Kit)	EA	15-31080P
3100D – 220-240VAC/50Hz Option	EA	3100-230
3100D – 100 VAC Option	EA	3100-100
2-Stage Diaphragm Pump – 240VAC (220-240VAC/50Hz option)	EA	10-20034
2-Stage Pump Kit (Diaphragm Pump Maintenance Kit)	EA	10-20017
3100A/D Tablet/Bracket Option****	EA	3100-TSC
Female Micro-QT Removal Tool	EA	30-22910T

# Silonite™ Coating

Our exclusive Silonite™ coating process creates the most inert sampling products available. No other competitive passivation process comes close to matching the superior performance, consistency, durability, and scientific reliability of Silonite™.



**Silonite™ Tubing & Loops**  
[See pages 56-57](#)



**Silonite™ Fittings**  
[See page 58](#)



**Silonite™ Cylinders**  
[See page 60](#)



**Silonite™ Injection Liners**  
[See pages 62-63](#)

## This Section Covers

- 55 Silonite™ Surface Coatings
- 56 Silonite™ Coated Tubing
- 57 Silonite™ Coated Loops & Cut Tubing
- 58 Silonite™ Coated Fittings
- 59 Custom Silonite™ Coating
- 60 High Pressure Silonite™ Cylinders
- 61 Silonite™ Coated Valves
- 62 – 63 Silonite™ Coated Injection Liners

# Silonite™ Surface Coating

## Silonite™ The Most Inert Surface Treatment Available

Silonite™ is a ceramic coating treatment developed by Entech to provide an extremely inert surface for chromatography applications. Silonite™ creates an ultra-smooth surface which reduces the potential for chemical adsorption. The high density Silonite™ coating nearly eliminates absorption effects prevalent in plastics (Teflon®, Tedlar® or Siloxane treated surfaces).

*Silonite™ Coating (Thickness: 40-100 nm)*



## The Silonite™ Color Secret

What makes Silonite™ coated parts so colorful? Placing a smooth, transparent coating over stainless steel surfaces results in a phenomenon known as "thin film interference" where light reflecting off the Silonite™ ceramic coating becomes out of phase with light reflecting off the stainless steel surface below. The cancellation of part of the light spectrum and enhancement of other wavelengths turns normal white light into one of several different shades exhibited by Silonite™ coated parts. The actual color formed is an indication of the thickness of the coating. As the thickness increases from 150–1000 angstroms, the apparent color of Silonite™ coating goes through a color progression:



*Silonite™ color consistency indicates a uniform coating thickness, providing maximum inertness, durability and corrosion protection.*

55

## The Silonite™ Advantage

Stainless steel and glass are the most commonly used materials in GC Inlet and sample handling systems. However, surface imperfections and inherent chemical dependent adsorption exists with even the highest quality 316L stainless steel, causing substantial losses of vapor phase chemicals. At elevated temperatures, surface metal oxides can be catalytic, especially exposed iron on the surface or in pores below the surface. The fact that 316SS is 67% iron makes catalytic losses a certainty unless the surface is treated with Silonite™. Glass, although more inert than stainless steel, also contains additives which have a negative effect on surface inertness. These include Iron, Sodium and Boron. Placing a thin layer of Silonite™ over these surfaces eliminates exposure of the sample to these reactive additives and impurities.

### Features and Applications

- More Inert than Metal or Glass
- Reduces Porosity of Metal Surfaces
- Ultra-Thin Coating  
*Thin enough to maintain substantial flexibility.*
- Complete Surface Bonding  
*Through chemical and mechanical processes.*
- Corrosion Resistance

### Chromatography Inlet Systems

- Injection Liners
- Tubing
- Vials

### Sample Handling

- Canisters
- Cylinders
- Valves

### Analyzer Components

Sulfur and Mercury Analysis  
Corrosion Protection of Parts







Silonite™ Coated Tubing

Silonite™ greatly improves the chemical inertness of stainless steel tubing. Combining the durability of stainless steel with the inertness of a non-reactive ceramic coating creates the perfect solution for real world chemical applications.

Unlike other coatings on the market, Silonite™ provides the most consistent, high-density barrier available. Silonite's consistency ensures chemicals never reach reactive metal oxides on interior tubing walls. The smooth coating layer provides an even, laminar flow, creating a lower pressure drop and discourages deposition of high molecular weight contaminants. This helps to maintain a clean flow path and preserves Silonite's inert, non-adsorptive properties within the tubing.

Silonite™ tubing can be further deactivated in a proprietary process which results in an incredibly thin, low-bleed coating. Our Silonite-D tubing provides the best inertness for chromatography applications. Polar and reactive compounds show even better GC injection profiles with reduced tailing during analysis.

## Silonite™ Deactivated Tubing

Description	Unit	Part #
1/32" x 0.02" Silonite™ Tubing (Deactivated)	FT.	15-87020D
1/16" x 0.02" Silonite™ Tubing (Deactivated)	FT.	15-87120D
1/16" x 0.04" Silonite™ Tubing (Deactivated)	FT.	15-87140D
1/8" x 0.085" Silonite™ Tubing (Deactivated)	FT.	15-87280D
1/4" x 0.21" Silonite™ Tubing (Deactivated)	FT.	15-87421D

## Silonite™ Coated Tubing

### Features

- Silonite™ Coating**  
*Inert and durable surface prevents interaction with reactive metal oxides on tubing walls.*
- Resists Cracking**  
*Silonite™ is flexible enough to handle mild bending.*
- Even Better Recovery**  
*Including reactive organic compounds containing oxygen, nitrogen, sulfur and phosphorous.*
- Ultra-Smooth Surface**  
*Reduces internal surface area and porosity.*
- Superior Quality Assurance**  
*Batch tested for inertness.*
- Handles a Wide Temperature Range**  
*-200°C to 450°C.*

### Applications

- GC Transfer Lines
- Sample Loops
- Chemical Analyzers
- GC Inlet Systems  
*(P&T, Headspace, Thermal Desorption)*
- Sulfur and Mercury Analysis

O.D.	Min. Bend Radius
1/32"	0.75"
1/16"	1.0"
1/8"	2.0"
1/4"	4.0"



## Silonite™ Deactivated Loops

### Applications

- Sulfur Compound Analysis
- Formaldehyde Analysis
- Mercury Sample Collection and Analysis
- Polar Compound Analysis  
*Faster cleanup for each analysis!*

Description	Unit	Part #
50µL Silonite™ Loop (Deactivated)	EA	07-60050
125µL Silonite™ Loop (Deactivated)	EA	07-60125
250µL Silonite™ Loop (Deactivated)	EA	07-60250
0.5cc Silonite™ Loop (Deactivated)	EA	07-60500
1.0cc Silonite™ Loop (Deactivated)	EA	07-61000
2.0cc Silonite™ Loop (Deactivated)	EA	07-62000
5.0cc Silonite™ Loop (Deactivated)	Pack	07-65000

*(Includes nuts and ferrules)*



*Silonite™ Coated Loop*

Silonite™ Coated Loops are pre-bent before coating. This creates the most inert internal surface possible. Loops are batch tested using dry, polar standards at room temperature to verify complete inertness.

We take the time and care required to ensure the acclaimed inertness and durability of Silonite™ during our intricate, software controlled surface treatment process.

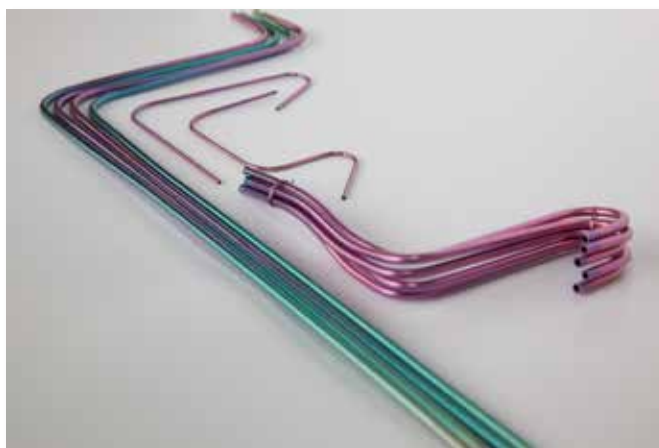
Silonite™ quality is visibly evident by its consistent color. Wide spectrum color shifts, or a "rainbow" appearance as often seen in competitive coatings are an indication of irregular surface thickness and inconsistent inertness / corrosion resistance.

## Silonite™ Coated Cut Tubing

### Features

- Superior Inertness  
*Tubing coated inside and out.*
- Pre-bent Cut Tubing  
*Tubing can be pre-bent to customer specifications.*

Description	Length (Max)	Unit	Part #
1/16" OD x 0.02" ID	8'	FT.	15-88120
1/16" OD x 0.04" ID	20'	FT.	15-88140
1/8" OD x 0.083" ID	20'	FT.	15-88280



*Silonite™ Coated Cut Tubing*

Small lengths of tubing can be coated on both the inside and outside for use in sampling systems and analyzers.

Union



Male Connector



Reducing Union



Reducer



Tee



Elbow



Cross



Valco® Tee



## Silonite™ Coated Fittings

Entech stocks a wide variety of Silonite™ coated fittings. We can also coat custom fittings upon request. Contact our Silonite™ Coating Department: [Silonite@entechinst.com](mailto:Silonite@entechinst.com)

Description	Unit	Part #
<b>Unions</b>		
1/16" Silonite™ Union	EA	37-01010
1/8" Silonite™ Union	EA	37-02010
1/4" Silonite™ Union	EA	37-04010
<b>Male Connectors</b>		
1/16" – 1/8" Silonite™ NPT Connector	EA	37-01002
1/8" – 1/8" Silonite™ NPT Connector	EA	37-02030
1/4" – 1/8" Silonite™ NPT Connector	EA	37-04030
<b>Reducing Unions</b>		
1/8" – 1/8" Silonite™ Reducing Union	EA	37-01020
1/16" – 1/4" Silonite™ Reducing Union	EA	37-01040
1/8" – 1/4" Silonite™ Reducing Union		37-02040
<b>Reducers</b>		
1/4" Fitting – 1/16" Tube, Silonite™ Reducer	EA	37-01140
1/4" Fitting – 1/8" Tube, Silonite™ Reducer	EA	37-02140
1/4" Fitting – 1/4" Tube, Silonite™ Reducer	EA	37-04140
<b>Tees</b>		
1/16" Silonite™ Tee	EA	37-01310
1/8" Silonite™ Tee	EA	37-02310
1/4" Silonite™ Tee	EA	37-04310
<b>Elbows</b>		
1/4" Silonite™ Elbow	EA	37-04020
<b>Crosses</b>		
1/4" Silonite™ Cross	EA	37-04410
1/8" Silonite™ Cross	EA	37-02026
<b>Valco® Fittings</b>		
1/16" Silonite™ ZDV Bulkhead Union	EA	37-01200
1/16" Silonite™ ZDV Union	EA	37-01210
1/16" – 1/8" Silonite™ ZDV Reducing Bulkhead Union	EA	37-0125
1/16" Silonite™ Tee	EA	37-01350

NOTE: Nuts are not coated since they do not come in contact with a sample path. Ferrules are also not coated since Silonite coating would make the surface harder, resulting in variances in sealing characteristics. (See pages 80-81 for Silonite™ Micro-QT™ Valves for Vials)

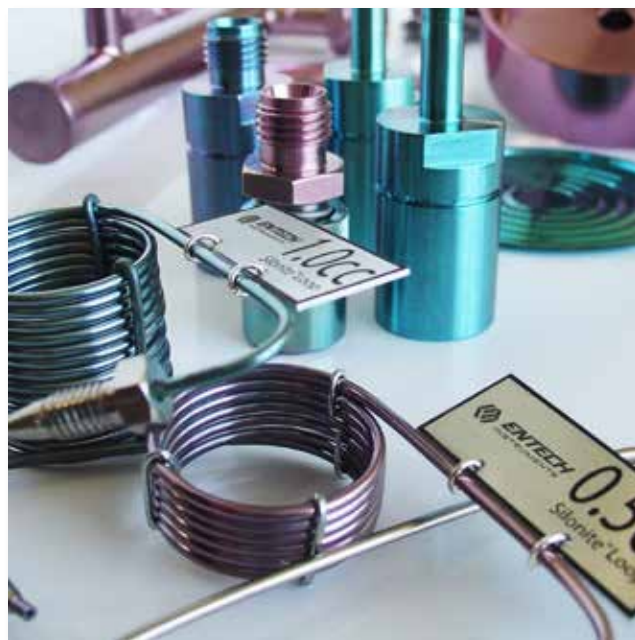
## Custom Silonite™ Coating

Any 300 series stainless steel or glass shape can be Silonite™ coated. Entech coats OEM parts for a variety of uses, and in various industries. Contact us today to see how Silonite™ can be the right solution for your applications.

### Features

- Corrosion Protection
- Chemical Inlets and Manifolds
- Sulfur Compound Analysis
- Analyzer Components
- Regulators

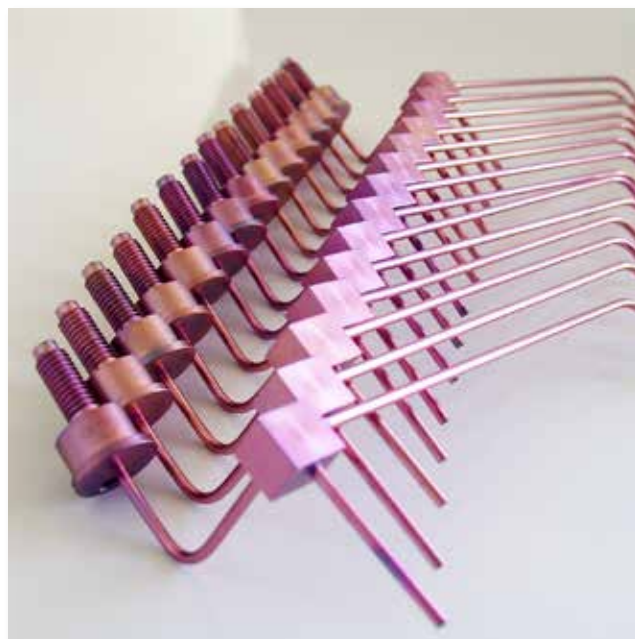
We are ready to assist you with your application! Contact Entech's Silonite™ Coating Department: [Silonite@entechinst.com](mailto:Silonite@entechinst.com)



*Silonite™ The most inert surface treatment available!*



*Silonite™ Coated Manifold*



*Silonite™ Coated Micro GC Sample Inlet Pathways*

## Silonite™ High Pressure Cylinders



### Refinery Sulfur Gas Sampling

High pressure refinery gas sampling cylinders are now available with our Silonite™ coating that allows sulfur compounds to remain stable for weeks prior to analysis. Corrosion resistance in the presence of HCl is also improved. Sampling cylinders and valves are rated to 1800psig, allowing for direct sampling of liquid propylene, LPG, and high pressure natural gas. Silonite™ coated cylinders also conform to new regulations requiring sulfur monitoring in refinery flare gas stacks.

Description	Unit	Part #
300cc, 1800psig Silonite™ Cylinder	EA	29-60300L
500cc, 1800psig Silonite™ Cylinder	EA	29-60500L
1000cc, 1800psig Silonite™ Cylinder	EA	29-61000L

Other sizes are available upon request. Contact our Silonite™ Coating Department: [Silonite@entechinst.com](mailto:Silonite@entechinst.com)



Male-Male Valve PN 29-66200L



Male-Female Valve PN 29-66100L



Male-Compression Valve PN 29-66300L

Entech stocks a wide variety of Silonite™ coated valves. We can also coat custom valves upon request. Contact our Silonite™ Coating Department: [Silonite@entechinst.com](mailto:Silonite@entechinst.com)

### Silonite™ High Pressure Valves

Description	Unit	Part #
1/4" Swagelok® MNPT to 1/4" FNPT	EA	29-66100L
1/4" Swagelok® MNPT to 1/4" MNPT	EA	29-66200L
1/4" Swagelok® MNPT to 1/4" COMP	EA	29-66300L



## Silonite™ Coated Valco® Valves

Includes valve, rotor, nuts, ferrules & 2" Stand-off



Description	Unit	Part #
1/16", 6-Port, 2-Position	EA	31-30820S
1/16", 8-Port, 2-Position	EA	31-30120S
1/16", 9-Port, 8-Position	EA	31-30220S
1/8", 17-Port, 16-Position	EA	31-30320S
1/16", 34-Port, 16-Position	EA	31-30420S

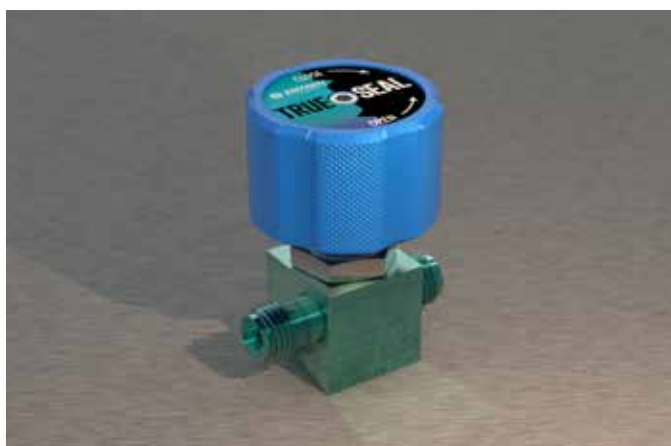
We are ready to assist you with your application!

Contact our Silonite™ Coating Department:

[Silonite@entechinst.com](mailto:Silonite@entechinst.com)



*Silonite™ Coated Valco® Valves*



*Silonite™ Coated TrueSeal™ Valve*  
(See pages 66-67)







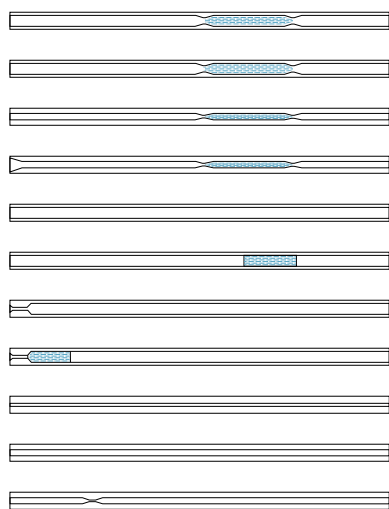
## Silonite™ Capillary Injection Liners

Silonite™ coated GC Injection Liners provide a "no-bleed" solution for the analysis of reactive compounds. Available to fit most common GC models.



## Silonite™ Injection Liners compatible with Agilent® Instruments

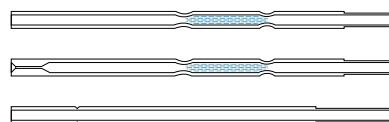
Agilent 5890 / 6890 / 7890



Description	Length & ID	Unit	Part #
Split/Splitless FocusLiner™	(78.5 x 6.3mm, 4mm ID)	EA	37-45010
Split/Splitless Tapered FocusLiner™	(78.5 x 6.3mm, 4mm ID)	EA	37-45020
Split/Splitless Fast FocusLiner™	(78.5 x 6.3mm, 2.3mm ID)	EA	37-45030
Split/Splitless Tapered Fast FocusLiner™	(78.5 x 6.3mm, 2.3mm ID)	EA	37-45040
Split Straight-through Liner	(78.5 x 6.3mm, 4mm ID)	EA	37-45050*
Split w/Quartz Wool	(78.5 x 6.3mm, 4mm ID)	EA	37-45060*
Split/Splitless w/Single Taper	(78.5 x 6.3mm, 4mm ID)	EA	37-45070*
Split/Splitless w/Single Taper-Qrtz Wool	(78.5 x 6.3mm, 4mm ID)	EA	37-45080*
Direct, Straight-through Liner	(78.5 x 6.3mm, 1.2mm ID)	EA	37-45090*
Splitless (Quartz) Straight-through Liner	(78.5 x 6.3mm, 2mm ID)	EA	37-45100
Splitless w/Recessed Gooseneck	(8.5 x 6.3mm, 2mm ID)	EA	37-45110*

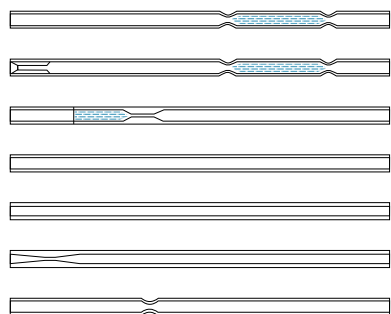
\* Also fits Varian® 1177 Injector

## Silonite™ Injection Liners compatible with Perkin-Elmer® Instruments Perkin-Elmer AutoSystem™



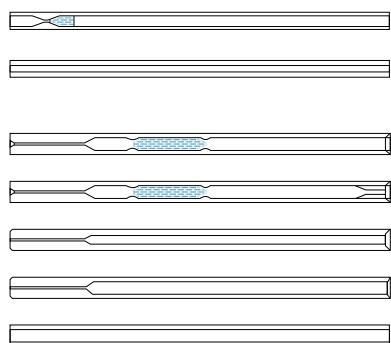
Description	Length & ID	Unit	Part #
Split/Splitless FocusLiner™	(92 x 6.2mm, 4mm ID)	EA	37-46210
Split/Splitless Tapered FocusLiner™	(92 x 6.2mm, 4mm ID)	EA	37-46030
Split, Straight-through Liner	(92 x 5.2mm, 4mm ID)	EA	37-46110

## Silonite™ Injection Liners compatible with Shimadzu® Instruments 17A (SPL-17 Injectors)



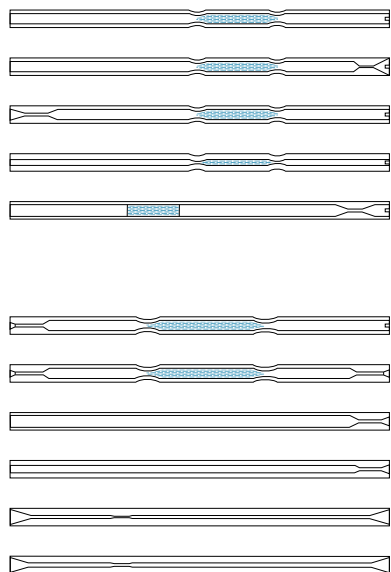
Description	Length & ID	Unit	Part #
Split/Splitless FocusLiner™	(95.5 x 5.0mm, 3.4mm ID)	EA	37-43150
Split/Splitless Tapered FocusLiner™	(95.5 x 5.0mm, 3.4mm ID)	EA	37-43010
Split/Splitless w/Recessed Gooseneck/Qtz Wool	(95.5 x 5.0mm, 3.4mm ID)	EA	37-43110
Split Straight-through Liner	(95.5 x 5.0mm, 3.4mm ID)	EA	37-43130
Splitless Straight-through Liner	(95.5 x 5.0mm, 2.6mm ID)	EA	37-43140
Direct	(95.5 x 5.0mm, 3.4mm ID)	EA	37-43160
Split/Splitless w/Middle Gooseneck	(95.5 x 5.0mm, 3.4mm ID)	EA	37-43210

## Silonite™ Injection Liners compatible with Thermo Finnigan® Instruments Mega Series 4000 / 5000 / 8000



Description	Length & ID	Unit	Part #
Split/Splitless w/Recessed Gooseneck/Qtz Wool	(79.5 x 5mm, 3mm ID)	EA	37-44010
Splitless Straight-through Liner	(79.5 x 5mm, 2mm ID)	EA	37-44020
<b>Model 8000 / TRACE™</b>			
Split/Splitless FocusLiner™	(105 x 8mm, 5mm ID)	EA	37-44030
Split/Splitless Tapered FocusLiner™	(105 x 8mm, 5mm ID)	EA	37-44040
Splitless w/Single Taper	(105 x 8mm, 3mm ID)	EA	37-44050
Split w/Single Taper	(105 x 8mm, 5mm ID)	EA	37-44060
Split, Straight-through Liner	(105 x 8mm, 5mm ID)	EA	37-44070

## Silonite™ Injection Liners compatible with Varian® Instruments Injector Models 1075 / 1077 - GC Model 3400 & 3600



Description	Length & ID	Unit	Part #
Split/Splitless FocusLiner™	(72 x 6.3mm, 4mm ID)	EA	37-42130
Split/Splitless Tapered FocusLiner™	(72 x 6.3mm, 4mm ID)	EA	37-42210
Split/Splitless FocusLiner™w/Top-end Restriction	(72 x 6.3mm, 4mm ID)	EA	37-42310
Split/Splitless Fast FocusLiner™	(72 x 6.3mm, 2.3mm ID)	EA	37-42110
Split w/Quartz Wool	(72 x 6.3mm, 4mm ID)	EA	37-42150
<b>Injector Models 1078 / 1079 - Temperature Programmable Injector</b>			
Split/Splitless FocusLiner™	(54 x 5mm, 3.4mm ID)	EA	37-42160
Split/Splitless Tapered FocusLiner™	(54 x 5mm, 3.4mm ID)	EA	37-42180
Split/Splitless w/Single Taper	(54 x 5mm, 3.4mm ID)	EA	37-42200
Splitless w/Single Taper	(54 x 5mm, 2mm ID)	EA	37-42220
SPI Liner (Restriction 0.25mm)	(54 x 4.6mm, 0.5mm ID)	EA	37-42240
SPI Liner (Restriction 0.25mm for 0.53mm ID on-column)	(54 x 4.6mm, 0.5mm ID)	EA	37-42260

(Injector Model 1177 & GC Models 3380 / 3800 / 3900 - See Agilent® Injection Liners)  
Available in Packages of 5 and in Bulk. Call Entech or Your Local Distributor for Ordering Information!

# Sampling

Entech has developed the most extensive line of canisters and systems for gaseous sample collection available. Learn more about solutions and exciting innovations in vapor intrusion, helium diffusion, and time integrated sampling technologies.



**Silonite-XL™ Canister Solutions**  
New, TrueSeal™ Valve. [See pages 68-71](#)



**Time Integrated Sampling**  
CS1200ES Canister Sampler. [See pages 74-75](#)



**Soil Gas Sampling**  
Chameleon Soil Gas Sampling. [See page 92](#)



**Helium Diffusion Sampling**  
HDS™ Personal Monitors. [See pages 110-113](#)

## This Section Covers

65	Canister Sampling Overview
66 – 67	TrueSeal™ Valve
68 – 69	Silonite-XL™ Canisters with TrueSeal™ Valve
70	Silonite-XL™ Canisters – Grab / Restricted Sampling
71	TM1200   TM1050
72-73	Vacu-Pen Samplers
74-76	CS1200E   Flow Professor
77	1900 Multi-Canister Sampling System
78 – 83	MicroValve™ Sampling, Fittings, and Accessories
84 – 85	MiniCan™   Bottle-Vac™ Canisters
86 – 87	MicroValve™ Canisters – Grab / Restricted Sampling
88 – 89	Bottle-Vac™ Helium Diffusion Sampling
90 – 91	HDS™ Indoor Air Samplers   MiniCan™   Bottle-Vac™ Carrying Cases
92 – 105	Soil Gas Sampling Solution
106 – 109	Industrial Hygiene – Indoor Air Quality   Mold Monitoring
110 – 113	HDS™ Personal Monitors
114 – 115	Arson Investigation   Law Enforcement
116 – 117	Refinery Sulfur Gas Sampling
118 – 129	Sorbent Pens™ for Quantitative Air Monitoring

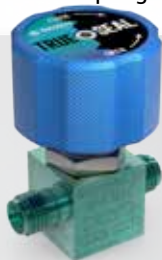
# Canister Sampling Overview

**E**ntech continues to be at the forefront of canister sampling technology. We are the only manufacturer that tests 100% of our canisters for chemical inertness by verifying the recovery of a mix of several challenging compounds. All Entech canisters feature the proprietary Silonite-XL™ coating which maximizes the recovery of the widest range of compounds possible. Silonite-XL™ is so effective because it creates an internal canister surface that is extremely inert – like the inside of a GC column. In fact, most GC-compatible compounds can be collected and recovered for analysis from Silonite-XL™ coated canisters.

Entech's continued research into making canisters even more inert has led to the development of Silonite™ Ultra, with the ability to maintain the stability of even light semi-volatiles such as Naphthalene and Methyl-naphthalene. The valves used to maintain canister vacuum and sample isolation play an important role in the successful recovery of target compounds. The TrueSeal™ and Micro-QT™ valves were designed by Entech to optimize recoveries of VOCs and SVOCs. These valves can be used for quick fill grab, restricted orifice, or time weighted sampling applications.

## EasyGrip Knob

If you're familiar with the TO valves, you'll surely notice the new and distinctive EasyGrip™ knob design. This ergonomic knob provides for a more comfortable experience when processing hundreds of canisters in the lab or having to conduct numerous sampling events in the field. It is designed to contour the hand and provide a more relaxed feel while promoting a more gentle closure. A simple  $\frac{1}{2}$  turn is all it takes to close. [Learn more on page 66.](#)



## Nickel Ferrules

Nickel Ferrules seal and are easily replaceable just like Graphite-Vespel™ Ferrules, and as with stainless steel ferrules, they are also non-contaminating and cannot be removed by hand. Just another of the many innovations you've come to expect from Entech. Order Entech Nickel Ferrules today!



Part #	Description
30-40400	$\frac{1}{4}$ " Nickel Ferrule
30-40900	$\frac{1}{4}$ " Nickel Ferrule Puller

65

## Micro-QT™ Valve Canisters

Micro-QT™ Valves improve the level of automation, ease of use, and performance of canisters and samplers. The Entech designed valve is completely contained in a  $\frac{1}{4}$ " tubular housing which uniquely allows for maximum flexibility in the lab and in the field. Inclusion volume is 80 times smaller than in Nupro® valves, resulting in far less contamination when making and breaking connections.

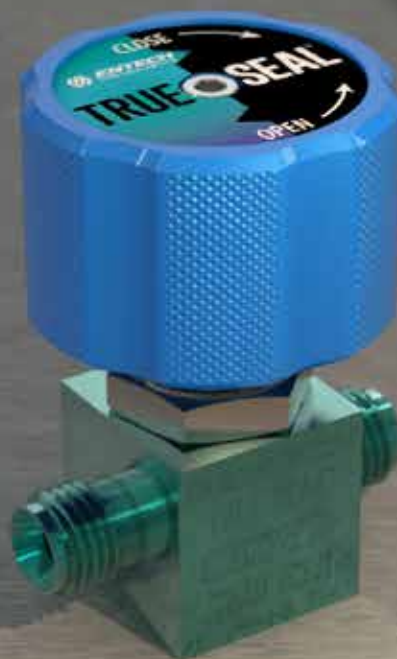
The compact MicroValve's internal volume also reduces the exposure to potentially contaminated surfaces, making the Micro-QT™ valve easy to clean, especially when analyzing semivolatile compounds. Learn more about MicroValves™ on [page 78.](#)



The Most Reliable & Inert Air Valve  
for Volatiles Sampling & Analysis!

# TRUESEAL™

FOR AIR & GAS SAMPLING



*TrueSeal™ (Silonite™ coated version shown)*

The TrueSeal™ Valve requires only 2 in/lbs of torque to seal!

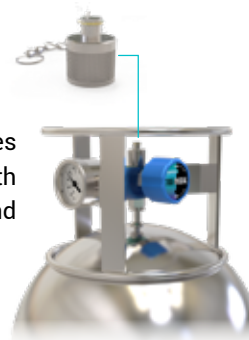


## The only double-sealing valve for added reliability.

With years of feedback from our laboratory customers and field sampling professionals, Entech has engineered a valve that not only seals with less force than any other valve on the market, but also provides a double seal for extra assurance of leak-free operation even in the most demanding conditions. To achieve these goals, the Entech TrueSeal™ valve utilizes some key design innovations and distinctions.

## Finger Tightened Cap

Also new on the outside, the TrueSeal™ valve comes standard with a finger tightened cap that makes a better seal than the alternative brass caps. There is also far less potential for thread damage with the elimination of wrenches. Thread damage is permanent and translates to replacement costs and time. Tool-free operation is just another way Entech protects your product investments.



## Silonite Coating Comes Standard

All TrueSeal™ valves will now come standard with the ultra-inert Entech Silonite™ coating. Silonite™ prevents the losses of sticky or reactive compounds and provides an inert path from the point of sample introduction to collection.



*TrueSeal™ Valve with Gauge*  
PN 29-TSG-01

Description	Unit	Part #
<b>TrueSeal™ Valve Part Numbers</b>		
TrueSeal™ Valve (Silonite™ Coated)	EA	29-TS-01
TrueSeal™ Valve with Stem (Silonite™ Coated)	EA	29-TSD-01
TrueSeal™ Valve with Gauge (Silonite™ Coated)	EA	29-TSG-01
Repair Kit for TrueSeal™ Valve (Includes nickel Valve Stop & O-Ring, 2 Diaphragms, & Sealing Washer)	EA	29-TS-KIT1
Toxic Organics Valve™ Repair Kit	EA	29-TOV1-KIT2



## TrueSeal™ Valve

### Features

- 3rd Generation valve offering superior performance.
- Not as susceptible to particulate induced leaks.
- Two separate seals ensure leak-tight operation.
- Repairable if very large amounts of debris were to enter the valve.
- Unique soft nickel seal is the same material used in ultra-torr and VCR fittings.
- Not subject to damage even after repeated hard tightenings.

# TRUESEAL

FOR AIR & GAS SAMPLING



## Silonite-XL™ Canisters with the **NEW** TrueSeal™ Valve



### 0.01–100 PPB Trace Level

Entech's Silonite-XL™ canisters feature a large volume capacity for detection of volatile chemicals down to the low part per trillion range. An inert and durable internal Silonite-XL™ coating provides a high-quality, long-term sample storage solution. Losses in the valve are avoided by using our new TrueSeal™ Valve which includes Entech's new "sure-seal" technology. An integrated valve guard is securely welded to the canister for superior light-weight valve protection without any stresses to the valve stem associated with heavy "strapped-type" valve guards. These canisters are certified to meet or exceed the technical specifications required for EPA methods TO-14a and TO-15. High quality performance is verified for EVERY canister with our demanding chemical inertness tests.

### Features

- Silonite-XL™ Surface Coating**  
*We believe that each and every canister should be as inert and corrosion resistant as possible. That is why all of our canisters feature Silonite-XL™.*
- Welded Valve Guard**  
*Unlike "strap" designs, our TrueSeal™ guard provides superior valve protection and far less added weight.*
- Extended Range Canister Sampling**  
*Our Silonite-XL™ Canisters are more inert than SUMMA® or electropolished canisters, allowing recovery of a greater range of chemicals – including reduced sulfur compounds.*

*The 3.2L and 2.7L are lighter alternatives for canister sampling featuring minimal weight and maximum portability. 6L and 15L Canisters are ideal for large volume sampling and lab standards.*

Description	Unit	Part #
1L Can Silonite-XL™ TrueSeal™ Valve	EA	29-MC10LSV
1L Can Silonite-XL™ TrueSeal™ & Compound® Gauge	EA	29-MC10LSVG
1.4L Can Silonite-XL™ TrueSeal™ Valve	EA	29-MC14LSV
1.4L Can Silonite-XL™ TrueSeal™ & Compound® Gauge	EA	29-MC14LSVG
2.5L Can Silonite-XL™ TrueSeal™ Valve	EA	29-10252
2.5L Can Silonite-XL™ TrueSeal™ & Compound® Gauge	EA	29-10252VG
2.7L Can Silonite-XL™ TrueSeal™ Valve	EA	29-10272A
2.7L Can Silonite-XL™ TrueSeal™ & Compound® Gauge	EA	29-10272VG
3.2L Can Silonite-XL™ TrueSeal™ Valve	EA	29-10322
3.2L Can Silonite-XL™ TrueSeal™ & Compound® Gauge	EA	29-10322VG
6L Can Silonite-XL™ TrueSeal™ Valve	EA	29-10622
6L Can Silonite-XL™ TrueSeal™ & Compound® Gauge	EA	29-10622VG
15L Can Silonite-XL™ TrueSeal™ Valve	EA	29-11522
15L Can Silonite-XL™ TrueSeal™ & Compound® Gauge	EA	29-11522VG

## Field Canister Testing

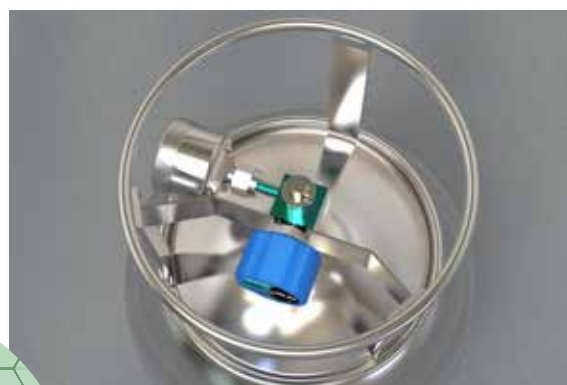
Entech Instruments offer high quality and reliable gauges with our exclusive 1/4" compression fitting. This gauge compression fitting connects easily to a dual-stem canister, or our new dual-port TrueSeal™ without any need for Teflon® tape for unsurpassed canister cleanliness.

You can also choose to verify sample integrity in the field with the precision and reliability of the DDS™ Gauge. The digital gauge shown below features absolute pressure readings that are never affected by altitude!



*It's easy to attach a compound gauge using the dual-stem canister design, or simply connect the new TrueSeal™ with gauge to any single stem canister!*

**6L Can w/ DDS™ Gauge**  
PN 03-32030



**6L Canister shown with TSG-01**  
PN 29-TSG-01

We Stock a  
Wide Variety of  
Canister Sizes

Call Today for Your Quantity Discount Price!

## Test Gauges for TrueSeal™ Canisters

We also offer high quality Compound® Gauge assemblies for easy field testing of standard TrueSeal™ equipped canisters that do not have an included valve or dual stem gauge.

Description	Unit	Part #
30"-0"Hg Vacuum Gauge (Assembly for 1/4" TrueSeal™)	EA	29-70030
30"Hg-0-40psig Compound Gauge (for 1/4" TrueSeal™)	EA	29-70040



**30"Hg-0-40psig Compound Gauge**  
PN 29-70040

## Filtered Grab Sampler for TrueSeal™ Canisters

Performing unfiltered sampling into your Silonite-XL™ canister can lead to particulate contamination. This will eventually reduce volatile compound recovery, while making it more difficult to achieve EPA required blank levels. Entech's Grab Samplers are a great solution to keep your canisters clean. The external filter allows rapid equilibration with the local environment to reduce net loss due to adsorption, and the "thimble" geometry provides the surface area required to quickly fill large canisters. All filters are Silonite™ coated to maximize recovery of volatile chemicals.



### Time to Fill Canisters (in Minutes)

Part No.	Description	2.7L Canister	6.0L Canister
39-RS-0	Grab Sampler	< 0.2	< 0.3

## Filtered Restricted Samplers for TrueSeal™ Canisters

Entech's Restricted Samplers are identical to the Grab Samplers listed above, but also include a sapphire orifice to slow down sampling rates. Fill rates remain constant until the canister is half full. Sampling can be stopped at this point for a true time weighted sample or allowed to continue if a time-weighted average is not required. Approximate times for filling to 50% and 95% of atmospheric pressure are listed in the table below.



*Restricted Sampler for TrueSeal™ Canisters*  
PN 39-RS-x



*Replacement Silonite™ Filter*  
PN 39-92150

Description	Unit	Part #
Grab Sampler for Silonite™ Canisters (No Restrictor)	EA	39-RS-0
Restricted Sampler for Silonite™ Canisters (600cc/min)	EA	39-RS-1
Restricted Sampler for Silonite™ Canisters (150cc/min)	EA	39-RS-2
Restricted Sampler for Silonite™ Canisters (63cc/min)	EA	39-RS-3
Restricted Sampler for Silonite™ Canisters (38cc/min)	EA	39-RS-4
Restricted Sampler for Silonite™ Canisters (19cc/min)	EA	39-RS-5
Restricted Sampler for Silonite™ Canisters (13cc/min)	EA	39-RS-6
Replacement Silonite™ Filter and O-Ring	EA	39-92150

### Time to Fill Canisters – Fill to 50% and 95% of Atmospheric Pressure (in Minutes)

Part No.	Code	Approx. Flow Rate	1L Canister		1.4L Canister		2.7L Canister		3.2L Canister		6.0L Canister	
			50%	95%	50%	95%	50%	95%	50%	95%	50%	95%
39-RS-0	0	No Restrictor	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.3
39-RS-1	1	600cc/Min	1	3	1.3	4	3	8	4	10	5	15
39-RS-2	2	150cc/Min	3	8	4	15	10	30	10	35	15	45
39-RS-3	3	63cc/Min	7	20	10	30	20	60	25	70	45	130
39-RS-4	4	38cc/Min	10	30	14	45	30	90	40	100	*	*
39-RS-5	5	19cc/Min	25	75	35	100	75	200	90	250	*	*
39-RS-6	6	13cc/Min	40	100	50	130	*	*	*	*	*	*
39-RS-x Restricted Sampler for Silonite™ canisters: (Replace x with desired flow code)												

\* Canister/Flow combinations not recommended by Entech Instruments.

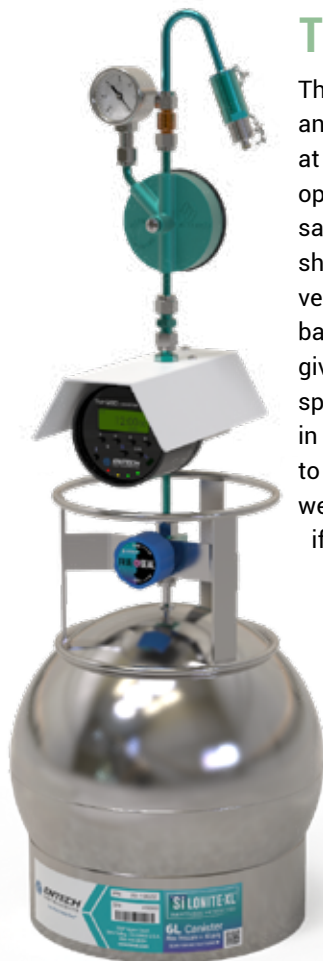


## TM1200 Canister Sampling Timer

The TM1200 is Entech's next generation canister sampling timer that automatically starts and stops the sampling process at specific times. Now you can easily start a 24 hour sample at midnight and stop it at midnight the following night without having to be present. Typically operated with our CS1200Ex canister sampler to time integrate the sampling event for a 24 hour sample, the TM1200 creates an optimized solution by exposing the collected sample to a very short, inert flow path for maximum compound recovery and minimal carryover. The TM1200 uses very little power, operating up to 6 continuous months before having to replace the single 9VDC battery. A battery status indicator shows you when there is less than one month of battery life left, giving you plenty of notice so you don't miss a sampling event. The internal latching valve was specially designed to minimize the exposure to the sealing elastomer for an unparalleled reduction in contamination potential. The TM1200 is sealed against water introduction and has a sun shield to keep the timer cooler while allowing easier programming in bright sunlight. Select any day of the week, and any time to start and stop the sampling. Several start/stop events can be programmed if more sophisticated sampling schedules are needed. When sample collection is needed once every 6 days, the TM1200 can be quickly reprogrammed to the new day.

- 7 day timer with up to 17 on/off events.
- Inert, high purity Isolatch valve uses "zero power" once activated.
- 4 to 6 month 9VDC battery life, or longer when placed in "sleep mode".
- Manual valve activation allows canister pressure check before / after sampling.
- Water tight cap and sun shield protects the TM1200 from the elements
- Designed for Entech CS1200E sampler for long term, time weighted sampling.
- Silonite coating is available for the ultimate in flow path inertness.

Description	Unit	Part #
TM1200 Canister Sampling Timer	EA	39-TM1200
TM1200S Silonite™ coated Canister Sampling Valve	EA	39-TM1200S



## TM1050 Remote Start/Stop System

The TM1050 enables start/stop canister fill operations with a direct wire connection from up to 500 feet away. The TM1050's wire connection allows remote sampling events to be accurately captured within confined spaces, or in hazardous environments. Examples include manhole/sewer sampling, collection of gases near a planned release, and collection of combustion/explosion products from a safe distance. The TM1050 is powered by a simple 9V battery using a "latching" valve that requires very little power. Each 9V battery can power in excess of 100 on/off operations for reliable sample collection over extended time periods.

Description	Unit	Part #
TM1050 Remote Start/Stop System*	EA	39-TM1050
TM1050S Silonite™ coated Remote Start/Stop System*	EA	39-TM1050S
100' Extended Remote Cable	EA	39-TM1050-C2
500' Extended Remote Cable	EA	39-TM1050-C3
6L Silonite-XL™ Canister (w/ TrueSeal™ Valve)	EA	29-10622
Silonite™ Filtered Grab Sampler (No Restrictor)	EA	39-RS-0

\* TM1050 system includes a Remote Control Unit, Start/Stop Valve Assembly, and a 20' remote cable. Order PN 39-TM1050S for Silonite™ coated Start/Stop Valve Assembly.



The TM1050S Remote Start/Stop System  
PN 39-TM1050S



## Large Volume Time Weighted Sampling for SVOC Analysis

Perform large volume, time integrated sampling into ASP Pens using the very accurate flow and volume control offered by Entech canister sampling technology. The CS1200Ex flow controller when placed on an evacuated canister can slow sampling down to between 0.1 to 10 cc/min to collect SVOCs over a 1 hour to 1 week period. When performing SPLITLESS SVOC mode injections using the Entech 5800 SPDU desorber, low to sub part per trillion concentrations are possible without the use of any solvents. This brings monitoring of SVOCs in ambient or indoor air into a whole new era. Lighter VOCs not capture by the ASP Pens are captured by the vacuum canisters, allowing a very wide range of compound recovery.

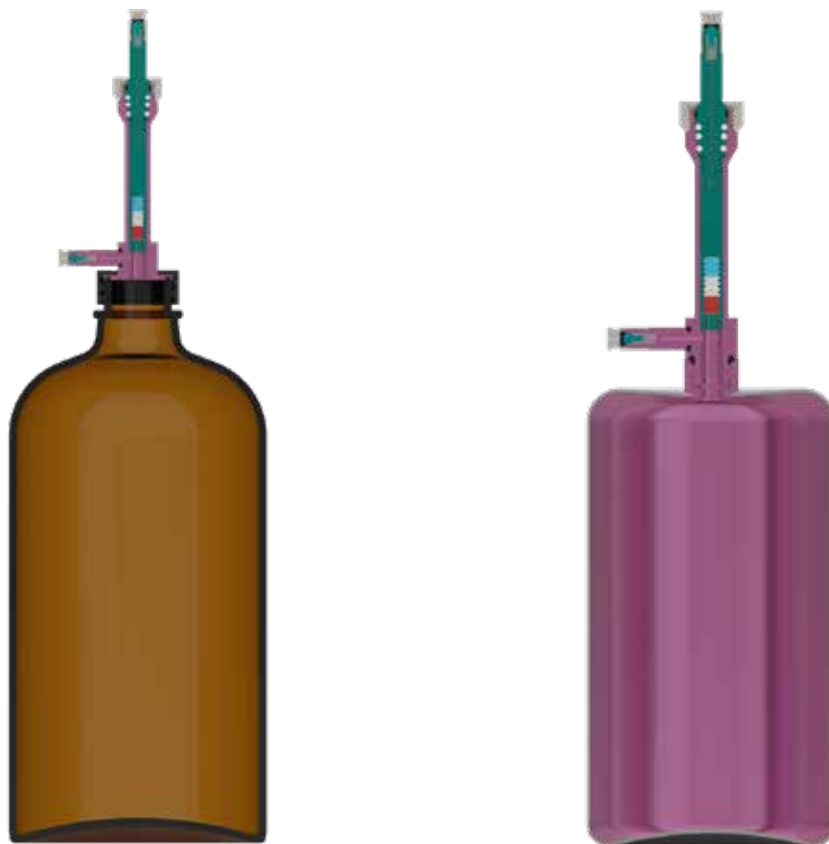


## Vacu-Pen Sampler for Fast Sampling of VOCs through SVOCs

The new Vacu-Pen Sampler (VPS) from Entech combines both canister and Sorbent Pen technology into one exciting, easy to use package. The vacuum of the container is used to pull the sample into the collection vessel where a Sorbent Pen has already been introduced, although the sample is collected without going through the Pen. A flow restrictor or regulator can be used to slow down the flow rate into the Vacu-Pen sampler, however maximum recovery of heavier SVOCs is obtained by performing a quick sampling directly into the vacuum container to minimize sample train exposure. By performing a fast, grab sampling of indoor air, outdoor air, or stack gas containing large or small amounts of water vapor, compounds from C1-C20 can be effectively transferred into the VPS for analysis. A huge advantage of this sampler is that even compounds boiling under -50° C that are not retained by virtually any sorbent can be recovered in the lab by flushing a loop to a GC, giving this collection approach an effective b.p range of -200° C to >350° C, which is well beyond any other "vacuum sampler or tube only" method. Sample collection and analysis is performed as follows:

1. The vacuum container is cleaned by standard canister vacuum cleanup using UHP N2, while the Pen is conditioned using the 5800 SPDU, the 3801A single Pen Conditioner, or multiple Pen conditioners (3806/3830).
2. The Sorbent Pen is assembled into the clean container to create the VPS solution, and a vacuum is drawn through the side-sampling port.
3. The VPS is sent to the field, and the container is quickly filled through the side micro valve port using a 16 gauge needle sampler or a short 1/16" tube. Sample temperatures during collection can be -50° C to +300° C.
4. The sampler is return to the lab for analysis, and a smaller vacuum bottle is placed on the top of the Sorbent Pen to draw the sample down to about ½ atm. The smaller bottle can be analyzed by loop injection for the C1-C2 Hydrocarbon content, as well as any light gases not maintained by the Sorbent Pen.
5. If there is excess water in the sample container, heat the entire Pen/Container assembly to 70° C for 2 hours. If Indoor or Outdoor Air was sampled, then just the container can be heated, leaving the Pen at a reduced temperature.
6. The bottom of the vacuum container is then placed into a cold tray to transfer just the water back to the container, effectively dehydrating the Pen before GCMS desorption.
7. The Pen is removed, isolated into a sleeve, and is analyzed using the Entech SPR40/5800 SPDU Thermal Desorption system.





The VPS Samplers are available in a glass bottle or Silonite coated stainless steel canister format. Bottles can be more easily opened up and rinsed out, while stainless canisters are more rugged and in some cases are required for refinery sampling. Neither container is expected to be pressurized to more than just a few psig above atmospheric pressure.

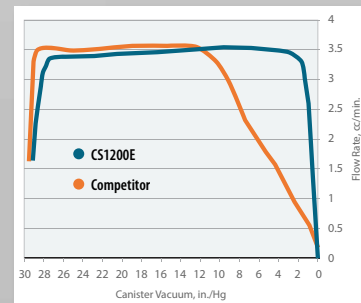
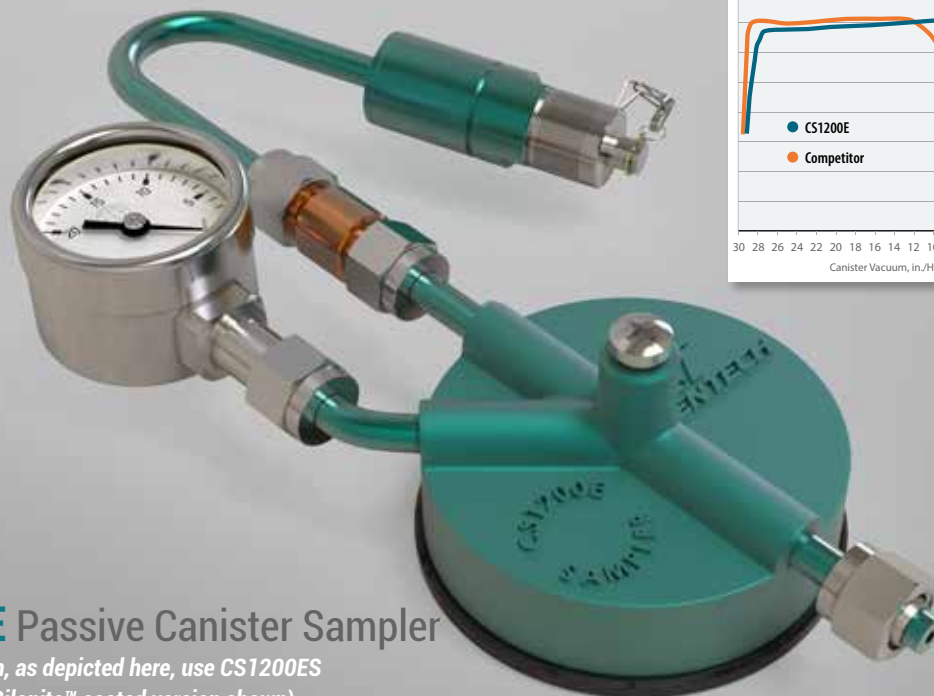
#### Vacu-Pen Sampler (VPS) Units and Components (HSPs Sold Separately)

Description	Qty	Unit	Part #
<b>Silonite Coated Stainless VPS Sampler</b>			
450mL Silonite™ Canister VPS Sampler	1	EA	VPS-MC450S
Silonite™ Coated Sleeve for VPS	1	EA	SP-VS-MQT
<b>Glass VPS Sampler</b>			
500mL Glass VPS Sampler	1	EA	VPS-BV500A
28mm Lid-Liner w/ 7/16" Thread	1	EA	VS-L028S
Silonite™ Coated Sleeve for VPS	1	EA	SP-VS-MQT
<b>VPS Vacuum Cleaning Accessory</b>			
MQT to 7/16 Male Thread Fitting	1	EA	MQT-MT700S

#### Headspace Sorbent Pens™ (HSPs)

Description	Qty	Unit	Part #
Blank/Empty	1	EA	SP-HSP-0
Tenax® TA (35/60)	1	EA	SP-HSP-T3560
Tenax® + Carboxen 1000	1	EA	SP-HSP-TCBXN
Tenax® + Carboxen™ X	1	EA	SP-HSP-TCPX
PDMS Glass Beads + Tenax® + Carboxen X	1	EA	SP-HSP-PDTCPX
PDMS Glass Beads + Tenax®	1	EA	SP-HSP-PDMST3560
End User Defined	1	EA	SP-HSP-CUSTOM





## CS1200E Passive Canister Sampler

For coated version, as depicted here, use CS1200ES3 (Silonite™ coated version shown)

Featuring an inert, compact, and reliable flow path with superior low flow stability.



PN: 39-92204S – Silonite™ Filter Inlet w/ Rain Guard

PN: 39-CS12-KIT2 – Low Flow Stability Upgrade Kit



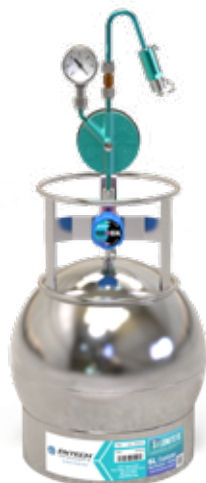
## CS1200E – Passive Canister Sampler

Low Level TO-15 monitoring requires consistent analyte recovery while collecting the maximum sample volume possible to support larger preconcentration volumes or repeat analyses from the same canister. The CS1200E will reliably fill canisters at a constant rate with better demonstrated recovery of TO-15 compounds than any other sampler.

### Silonite™ Filter Inlet Kit with Rain Guard

PN: 39-92204S – Silonite™ Coated Filter Inlet w/ Rain Guard

*An important component for Low Level TO-15.*



Untreated 300 series stainless steel is 67–70% iron, which is very reactive toward many TO-15A compounds. In addition, untreated stainless tubing has an internal oxide layer that readily adsorbs polar and heavier VOCs. The standard CS1200E inlet now comes internally polished, passivated, and Silonite™ coated to insure maximum recovery of all target compounds – virtually eliminating losses and carryover. The Silonite™ coated filter is placed on the inlet to completely eliminate dust and particulate intrusion during sampling. No need to worry about debris or anything including “insects” in the inlet tubing, a concern specifically mentioned in TO-15A when filters are not placed at the very inlet to the sample train. The inlet is capped off to avoid any contamination risk during shipping.

## CS1200E Passive Canister Sampler

Time integrated VOC concentrations can easily be determined by sampling into canisters at a constant flow rate. Precise and inert restrictors, combined with the inert pressure regulation offer by the CS1200E provides superior flow stability when compared to other regulated controllers. Different restrictors are available to fill a 6L canister over 0.25, 1, 3, 8, 24 hours, or 1, 2, or 4 weeks (1 month). Part numbers for CS1200E flow controllers are separated by flow range. Flow ranges can be easily changed by swapping out the flow restrictor (see *previous page*) and the performing an automated precise calibration using the Flow Professor (*shown on next page*).

### CS1200E (Options & Accessories)

Description	Unit	Part #
CS1200E Time Integrated Passive Sampler	EA	39-CS1200Ex
Silonite™ CS1200E Time Integrated Sampler	EA	39-CS1200ESx
Female MicroValve™ Adapter	EA	FQT-400
Silonite™ Female MicroValve™ Adapter	EA	FQT-400S
Low-Profile Male Micro-QT Valve™	EA	MQT-ST400
Silonite™ Low-Profile Male Micro-QT Valve™	EA	MQT-ST400S
Replacement Threaded Inlet Line	EA	39-92210
Replacement Silonite™ Coated Filter	EA	39-92150
Replacement 30-0"Hg Gauge	EA	39-27560
Sampling Enclosure	EA	39-50000
Long Inlet for Sampling Enclosure	EA	39-92212S
Silonite™ Filter Inlet Kit w/ Rain Guard	EA	39-92204S
Silonite™ Rain Guard w/ Shipping Cap	EA	39-92196
Low Flow Stability Upgrade Kit	EA	39-CS12-KIT2
Silonite™ Dual 6L Canister Sampling Adapter	EA	39-99006
Silonite™ Dual MiniCan™ Sampling Adapter	EA	39-99032
1.5 - 3m Canister Stand	EA	29-stand-1-3m
6L Can Secure Enclosure	EA	29-CANSTATION

**Important!** Calibrate your CS1200E using the latest flow table online. Visit [www.entechnst.com/CS1200E/](http://www.entechnst.com/CS1200E/)

Or, let the Entech Flow Professor™ handle all the calibrations automatically! Visit [www.entechnst.com/FlowProfessor](http://www.entechnst.com/FlowProfessor)

CS1200E   Restrictors				
Part #	Flow Range	Code	Replacement Restrictor Part #	
Silonite™ Coated	Uncoated		Silonite™ Coated	
39-CS1200E0	39-CS1200E0	150 – 450 cc/min.	0	39-23000S
39-CS1200E1	39-CS1200E1	50 – 150 cc/min.	1	39-23010S
39-CS1200E2	39-CS1200E2	25 – 75 cc/min.	2	39-23030S
39-CS1200E2+	39-CS1200E2+	12 – 36 cc/min	2+	39-23060S
39-CS1200E3	39-CS1200E3	6 – 18 cc/min.	3	39-23080S
39-CS1200E3+	39-CS1200E3+	4 – 12 cc/min.	3+	39-23160S
39-CS1200E4	39-CS1200E4	2 – 6 cc/min.	4	39-23240S
39-CS1200E4+	39-CS1200E4+	1 – 3 cc/min.	4+	39-23480S
39-CS1200E5	39-CS1200E5	0.5 – 1.5 cc/min.	5	39-24010S
39-CS1200E56	n/a	0.2 – 0.6 cc/min.	6	39-24020S
39-CS1200E57	n/a	0.1 – 0.3 cc/min.	7	39-24040S

## Tool-Free Field Sampling

Entech is proud to be the exclusive provider of "validated" tool-free solutions for the collection of time integrated canister samples. Simply add our new low profile male Micro-QT™ fitting onto the top of your TrueSeal™, Nupro®, or other canister valve, pair the Micro-QT™ fitting with a female MicroValve™ adapter attached to the CS1200E, and make sampling a "snap" for your customers. Ditch the tools and all the headaches of over-tightened fittings. The Micro-QT™ valve was chosen by NASA for the collection of air samples on the International Space Station, and with 10 years of field testing, don't risk your reputation on anything else.



Rain Guard / Shipping Cap  
PN 39-92196



MicroValve™ Adapter  
PN FQT-400S



Low-Profile Micro-QT Valve™  
PN MQT-ST400S



Silonite™ Sapphire Restrictor  
PN 39-24010S



Replacement Silonite™ Filter and O-Ring  
PN 39-92150



1.5-3m Canister Stand  
PN 29-stand-1-3m /  
PN 39-99032



6L Can Secure Enclosure  
PN 29-CANSTATION

Recommended Restrictor for Volumes and Fill Times									
Fill Duration	450mL	600mL	1L	1.4L	2.5L	2.7L	3.2L	6L	15L
15 min.	2+	2	1	1	1	0	0	0	—
1 hr.	3+	3+	3	2+	2	2	2	1	0
3 hrs.	4+	4	4	3+	3	3	3	2+	1
8 hrs.	5	5	4+	4+	4	4	3+	3	2+
12 hrs.	6	5	5	4+	4	4	4	3+	2+
1 day	6	6	5	5	4+	4+	4+	4	3+
2 days	7	7	6	6	5	5	5	4+	4
7 days	—	—	—	7	7	7	7	6	5
14 days	—	—	—	—	7	7	7	7	5
30 days	—	—	—	—	—	—	—	7	6

Assuming canisters are filled to 4" Hg below atmosphere



## Flow Professor™ Calibration System

*The best solution for accurate low level EPA TO-15 monitoring.*

The Flow Professor is the easiest and most accurate way to calibrate the CS1200E for TO-15 or TO-15A Time Integrated Sampling. Only the CS1200E can be calibrated using this unique system, handling canisters ranging from 0.45L to 15L. From within the easy to navigate Flow Professor™ software, simply set canister size, sampling duration, and the remaining canister vacuum desired at the conclusion of sampling (typically 2-4" Hg); then attach the Flow Professor™ to the front of the CS1200E and select Start Calibration from the software menu. The Flow Professor™ system proceeds to automatically adjust the flow setting of the CS1200E to obtain the ideal flow rate, every time. Attempting to achieve such precise calculations and flow controller adjustments manually would be difficult and time consuming at best. The Flow Professor™ makes it all easy!

The CS1200E features fantastic low-flow stability, and accurate sampling for a 6L canister can be set from 1 hour to a full 2 weeks. Can you imagine doing continuous monitoring at a field location and only collecting 2 samples a month? Now that process is easily automated with the Flow Professor™. Even the quality of the restrictor and diaphragm are verified to ensure consistent flow rates. Generate a calibration report for easy long-term reference and send the CS1200E out to the field in Entech's new shipping boxes that perfectly protect both canister and CS1200E flow controller in a single compact package.

The Flow Professor™ + CS1200E + Silonite-XL™ Sampling Canister = Your Secret to Success. A winning combination for today's modern air laboratory.

*Flow Professor™ Calibration System (PN 39-FP-03) shown with CS1200ES Sampler and 6L Silonite-XL™ Canister.*

Description	Unit	Part #
<b>Flow Professor™</b> (CS1200E Calibration System)	EA	39-FP-03
<b>100cc Ballast Assembly</b>	EA	39-FP-BALLAST
<b>600cc Ballast Assembly</b>	EA	39-FP-BALLAST-600



### MINIMUM COMPUTER REQUIREMENTS:

**Requires a 64-bit Processor and Operating System**

**OS:** Windows 7 or 10 Professional 64-bit computer with .Net Framework 4.7.1 or later

**Processor:** Dual-Core, Pentium I5 (WIN7 Gen6 is max) Processor or better

**Memory:** 8GB of RAM

**Monitor:** 1280x768 (16:10 aspect ratio)



*Calibrate up to four CS1200E's at the same time!*

### When To Use a Ballast

Flow Rate	Ballast Required	Restrictor Range
0 - 4.9 cc/min	None	4, 4+, 5, 6, 7
5 - 99 cc/min	100 cc	1, 2, 2+, 3, 3+, 4
100 - 600 cc/min	600 cc	0, 1



## 1900 Multi-Canister Sampling System

The 1900 Multi-Channel Canister Sampler is Entech's next generation solution for collecting air samples in Silonite-XL™ coated canisters for detailed analysis in the laboratory by GC/MS or GC/FID/MS. A dramatically improved flow path now creates far less potential for carryover relative to other commercially available samplers. Mass Flow Controllers and solenoid valves have been eliminated, as these contain elastomeric seals that have been shown to outgas VOC's, making it difficult to achieve VOC free blanks down to sub-PPBv levels. Instead, the 1900 uses a unique approach to start, control, and stop the sampling process that maintains both a clean and easily serviceable sample train, ensuring years of accurate collection of time integrated canister samples. A full WIN10 controller is integrated into the panel, allowing advanced remote operation, reducing the need for programming in the field.



1900 Dual Channel System shown here with 8-Position Expansion Port Option.

### Internal PC

WIN10 Touch Screen PC, with WIFI and 6 hour battery backup.

### Easy Flow Adjustment of CH1 and CH2

Low cost flow elements change the sampler from being optimized for slow, long term sampling (0.2 to 5cc/min) into canisters from 0.6L to 6.0L, to much faster sampling rates as needed (10–400cc/min). No more expensive mass flow controllers to have to change out.

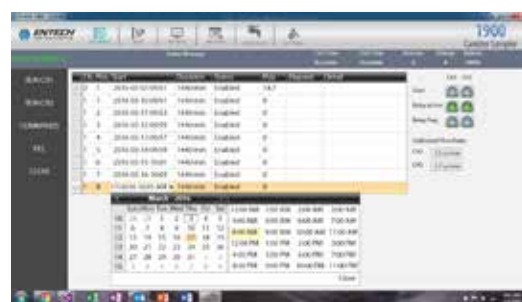
### Simple System Calibration

Flow rates are determined by the rate of change of canister pressure. System calibration is performed automatically by adjusting the time needed to fill a known calibration volume, with automatic re-evacuation until the calibration process is completed. This greatly simplifies long term reliability and significantly reduces maintenance costs.

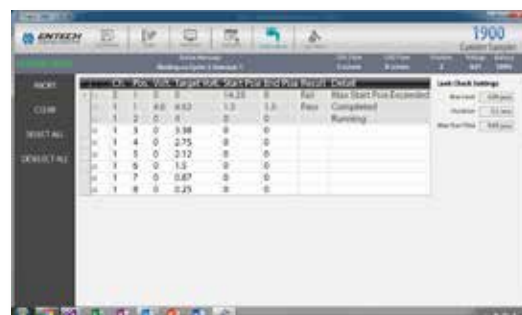
### Options for Occasional Sampling to Continuous Monitoring

CH1 can be configured in a few different ways to improve system flexibility.

- Single canister for event triggered sampling based on other sensors or remote sampling requests.
- 8-Channel expander for programmed sampling, or extended 8 event sampling.
- 24-Canister external sample pack based on 600cc canisters for continuous monitoring of C2–C12 compounds, Air Toxics Compounds, Carbonyls, or many odor producing compounds.



Schedule start times for CH1, Pos1-8, or remote start using an event driven contact closure.



Leak checks all positions to ensure proper sample collection. Can be programmed to skip a position if the canister does not meet the initial vacuum requirements.

Description	Unit	Part #
<b>1900 – Multi-Canister Sampling System</b> (Includes Touch Panel display, dual 0.2% accuracy 0-15 psia sensors, and dual isolatch valves)	EA	1900
Optional 8-Position Expander	EA	1900-8CH-EXPAND
DC Inverter (for battery, solar, or fuel cell power)	EA	1900-01

## Tool Free, Leak Free - Micro-QT™

The Micro-QT is a next generation gas valve offering uncompromising leak-tight performance in an ergonomic design. The Micro-QT is also versatile, providing numerous connection options to cover a wide range of applications. Once connecting the valve to tubing using compression fittings, mating male and female valve ends is literally just a quick "snap".

Originally designed for environmental air sampling and analysis, the Micro-QT has found a place in numerous other applications. Micro-QT's feature a distinctive bright and colorful Silonite coating that prevents gas phase compounds from interacting with the metal surface. The rugged, solid design stands up to thousands of connections, while maintaining leak tight operation. For scientists and professionals working with VOC and SVOCs, the Micro-QT's compact internal volume reduces exposure to potentially contaminated surfaces and allows for easy cleaning.

### MicroValve™ Features:

- **Fast Connection**
- **No Welds**
- **Very Light & Compact**
- **Inexpensive**
- **Lowest Inclusion Volume**
- **Ideal for Automation**
- **Easily Cleaned**
- **Clear Connection Indication**



The Micro-QT™ Valve is optimized for volatile and light semi-volatile compounds. MicroValves™ are compatible with existing Entech sampling devices by simply adding a female Micro-QT™ to 1/4" adapter (PN MQT-400).

### Popular Applications:

- **Laboratory Gas Lines**
- **Canister Field Sampling**
- **Headspace & Chambers**
- **Instrument Inlets**
- **Sampling Equipment**
- **Gas Manifold Connections**

### Instructions for Field Sampling:

#### Micro-QT™ – as primary canister valve



To attach your new Micro-QT™ Valve to your Entech Canister, simply tighten the valve onto the canister stem in place of the original valve.

#### Micro-QT™ – for use with packless valves



To attach your Micro-QT™ valve to an existing packless valve, just line up the nut, ferrule, and Micro-QT™ stem, place it on, and lightly wrench tighten.

#### Micro-QT™ – attach to sampling accessories



To Attach your new Female Micro-QT™ to your existing CS1200E™ or other sampling accessory is simple.

#### Micro-QT™ – connect sampling components



Now you are ready to sample with the world's most inert MicroValves™ with the added convenience of being completely tool-free.

## Micro-QT™ Valves (Male Fittings)

### Male to Compression



**MQT-100S**  
Silonite™ Male Micro-QT™ Valve  
to 1/16" Compression Fitting  
(Use MQT-100 for uncoated fitting)



**MQT-T400S**  
Silonite™ Male Micro-QT™ Valve  
to 1/4" Tube Fitting  
(Use MQT-T400 for uncoated fitting)



**MQT-200S**  
Silonite™ Male Micro-QT™ Valve  
to 1/8" Compression Fitting  
(Use MQT-200 for uncoated fitting)



**MQT-ST400S**  
Silonite™ Male Micro-QT™ Valve  
Short – to 1/4" Tube Fitting  
For 6L cans with existing valves  
(Use MQT-ST400 for uncoated fitting)



**MQT-400S**  
Silonite™ Male Micro-QT™ Valve  
to 1/4" Compression Fitting  
(Use MQT-400 for uncoated fitting)



**MQT-LUERS**  
Silonite™ Male Micro-QT™  
Valve to Luer-Lok® Fitting  
(Use MQT-LUER for uncoated fitting)



**MQT-600S**  
Silonite™ Male Micro-QT™ Valve  
to 3/8" Compression Fitting  
(Use MQT-600 for uncoated fitting)



**MQT-MP200S**  
Silonite™ Male Micro-QT™  
to 1/2" Male NPT Assembly  
(Use MQT-MP200 for uncoated fitting)



**MQT-400LS**  
Silonite™ Male Micro-QT™ Valve  
Long – to 1/4" Compression Fitting  
Recommended for 2.7, 3.2 & 6L Canisters  
(Use MQT-400L for uncoated fitting)

**MQT-400L-GS**  
Silonite™ Male Micro-QT™ Valve – Long  
to 1/4" Compression Fitting and Gauge  
(Use MQT-400L-G for uncoated fitting)



**MQT-400L-DS**  
Silonite™ Male Micro-QT™ Valve –  
Long to 1/4" Compression  
Fitting / Capped Tube  
(Use MQT-400L-DS for uncoated fitting)



**MQT-BH200S**  
Silonite™ Male MQT to  
1/8" Bulkhead  
(Use MQT-BH200 for uncoated fitting)



**MQT-REPAIR**  
Silonite™ Male Micro-QT™ Repair Kit

## Micro-QT™ Valves (Male Unions)



**MQT-2S**  
Male Double-Ended Valve Fitting  
(Use MQT-2 for uncoated fitting)



**MQT-3S**  
Male Tee Valve Fitting  
(Use MQT-3 for uncoated fitting)



**MQT-4S**  
Male Cross Valve Fitting  
(Use MQT-4 for uncoated fitting)

## Male Micro-QT™ Valves & Caps for Bottle-Vacs™



**MQT-BV24S**  
Silonite™ Male Micro-QT™  
to 24mm Bottle-Vac™ O-Ring Fitting  
(Use MQT-BV24 for uncoated fitting)



**MQT-BV28S**  
Silonite™ Male Micro-QT™  
to 28mm Bottle-Vac™ O-Ring Fitting  
(Use MQT-BV28 for uncoated fitting)



**MQT-BV28H2S**  
Silonite™ Male Micro-QT™  
28mm H<sub>2</sub>S Bottle-Vac™ O-Ring Fitting  
(Only available with Silonite™ coating)



**30-22070**  
Micro-QT™ Valve  
External Cap Assembly (3/16" Hex)



**30-22056**  
1L Bottle-Vac™  
Finger-Tight External Cap Assembly



**30-22060**  
Male Micro-QT™ Valve  
Finger-Tight External Cap Assembly



**39-76464**  
Valve Cap for 250mL, 500mL, & 1L bottles



**39-76044B**  
Valve Cap for 125mL bottles



**The Most Durable and Accurate  
Sample Collection Valves**  
for EPA Methods TO-14A and TO-15.



## Micro-QT™ Valves (Female Fittings)

### Female to Compression



**FQT-100S**  
Silonite™ Female Micro-QT™ Valve  
to 1/8" Compression Fitting  
(Use FQT-100 for uncoated fitting)



**FQT-200S**  
Silonite™ Female Micro-QT™ Valve  
to 1/8" Compression Fitting  
(Use FQT-200 for uncoated fitting)



**FQT-400S**  
Silonite™ Female Micro-QT™ Valve  
to 1/4" Compression Fitting  
(Use FQT-400 for uncoated fitting)



**FQT-600S**  
Silonite™ Female Micro-QT™ Valve  
to 3/8" Compression Fitting  
(Use FQT-600 for uncoated fitting)

### Other Female Connections



**FQT-T400S**  
Silonite™ Female Micro-QT™ Valve  
to 1/4" Tube Fitting  
(Use FQT-T400 for uncoated fitting)



**FQT-MP200S**  
Silonite™ Female Micro-QT™ Valve  
to 1/8" Male NPT Assembly  
(Use FQT-MP200 for uncoated fitting)



**FQT-FP200S**  
Silonite™ Female Micro-QT™ Valve  
to 1/8" Female NPT Connection Fitting  
(Use FQT-FP200 for uncoated fitting)



**FQT-LUERS**  
Silonite™ Female Micro-QT™ Valve  
to Luer-Lok® Fitting  
(Use FQT-LUER for uncoated fitting)

### Female to Bulkhead



**FQT-BH200S**  
Silonite™ Female Micro-QT™ Valve  
to 1/8" Compression – Bulkhead Fitting  
(Use FQT-BH200 for uncoated fitting)



**FQT-BH100S**  
Silonite™ Female Micro-QT™ Valve  
to 1/8" Compression – Bulkhead Fitting  
(Use FQT-BH100 for uncoated fitting)



## Micro-QT™ Test Gauges (Female Fittings)



**29-70010QT**  
30"-0"Hg Vacuum Gauge  
to Female Micro-QT™ Valve Fitting



























**29-70020QT**  
30"Hg-0-40psi Compound Gauge  
to Female Micro-QT™ Valve Fitting

## Micro-QT™ Valve Kit (Male & Female Fittings)



**MQT-Kit**  
Complete set of coated Male & Female  
MQT's (See included part list below)

 <b>MQT-100S</b> 1/16" Compression Fitting	 <b>MQT-200S</b> 1/8" Compression Fitting	 <b>MQT-400S</b> 1/4" Compression Fitting	 <b>MQT-600S</b> 3/8" Compression Fitting	 <b>MQT-400LS</b> 1/4" Compression Fitting	 <b>MQT-400L-DS</b> 1/4" Compression Fitting
 <b>MQT-BH200S</b> 1/8" Compression Fitting	 <b>MQT-T400S</b> 1/4" Tee Fitting	 <b>MQT-ST400S</b> 1/4" Tee Fitting	 <b>MQT-2S</b> Male Fitting	 <b>MQT-3S</b> Male Fitting	 <b>MQT-4S</b> Male Fitting
 <b>MQT-MP200S</b> 1/8" Male NPT Adapter	 <b>MQT-LUERS</b> Luer-Lock Fitting	 <b>FQT-100S</b> 1/16" Compression Fitting	 <b>FQT-200S</b> 1/8" Compression Fitting	 <b>FQT-400S</b> 1/4" Compression Fitting	 <b>FQT-600S</b> 3/8" Compression Fitting
 <b>FQT-BH 100S</b> 1/16" Compression Fitting	 <b>FQT-BH200S</b> 1/8" Compression Fitting	 <b>FQT-T400S</b> Tee Fitting	 <b>FQT-MP200S</b> 1/8" Male NPT Adapter	 <b>FQT-FP200S</b> 1/8" Female NPT Adapter	 <b>FQT-LUERS</b> Luer-Lock Fitting

## Grab & Critical Orifice Sampling MicroValves™

There are several ways to fill a MicroValve™ canister or Bottle-Vac™ depending on sampling requirements. Here's a brief overview:

### Grab Sampling

MiniCan™ or Bottle-Vac™ samplers are filled within 0.1–0.3 minutes using an unrestricted sampler with a Micro-QT™ valve.

### Restricted Critical Orifice Sampling

Sample collected using a filtered orifice restricted sampler. Fill rates are constant until the canister reaches ½ atmosphere.

### Time Integrated Sampling

Time integrated sampling is used for slow filling of canisters to determine average target compound concentrations. Fill times are 10–50 times longer than critical orifice restricted samplers. Use CS1200E and PN: MQT-400 adapter for Micro-QT™ Valve Samplers.



**39-RS-QTSx**  
Filtered Restricted Sampler  
for MicroValve™ Canisters  
(See Codes below.)  
(Use 39-RSQTx for uncoated sampler)



**30-22500S**  
Silonite™ MicroValve™  
Grab Sampler w/o Filter  
(Use 30-22500 for uncoated sampler)



**30-22530S**  
Silonite™ MicroValve™  
Drywall Sampler Assembly  
(Use 30-22530 for uncoated assembly)



**30-22550S**  
Silonite™ MicroValve™  
Dual Grab Sampler Union  
(Use 30-22550 for uncoated union)



**30-22545S**  
Silonite™ MicroValve™  
Drywall Needle  
(Use 30-22545 for uncoated needle)

**Entech MiniCans™ feature Silonite-XL™  
for the most accurate analysis  
of EPA Methods TO-14A and TO-15.**

### Time to Fill MiniCans™ – Fill to 50% and 95% of Atmospheric Pressure (in Minutes)

Part No.	Code	Approx. Flow Rate	450mL MiniCan™		600mL MiniCan™		1L MiniCan™		1.4L MiniCan™	
			50%	95%	50%	95%	50%	95%	50%	95%
30-22510	0	No Restrictor	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
39-RS-QT1	1	600cc/Min	*	*	*	*	1	3	1.3	4
39-RS-QT2	2	150cc/Min	1	3	2	6	3	10	5	15
39-RS-QT3	3	63cc/Min	3	10	5	15	8	25	10	30
39-RS-QT4	4	38cc/Min	5	15	8	25	12	40	15	45
39-RS-QT5	5	19cc/Min	10	30	15	50	25	75	35	100
39-RS-QT6	6	13cc/Min	15	45	25	70	40	120	60	170
39-RS-QTx Restricted Sampler for MiniCan™ with MicroValve™: (Replace x with desired flow code)										
39-RS-QTSx Restricted Sampler for MiniCan™ with Silonite™ MicroValve™: (Replace x with desired flow code)										
39-92150 Replacement Filter / O-Ring										

\* These canister / flow combinations are not recommended by Entech Instruments.



*MiniCan™ Samplers feature an advanced Silonite-XL™ coating for maximum inertness.*

## Advanced Air Sampling with Silonite-XL™ MiniCans™

MiniCans™ are the next generation of air sampling canisters from Entech. Designed for tool-free operation and advanced robotic analyzers, Silonite-XL™ treated MiniCans™ allow the recovery of a wider range of compounds than any other sampling canister – including semi-volatiles up through the full diesel range and C25 hydrocarbons. Like their larger 6L cousins, MiniCans™ excel at recovering compounds that are incompatible with tube sampling technology, including Siloxanes, H<sub>2</sub>S, mercaptans, formaldehyde, amines, ammonia, and many other thermally labile compounds. Despite the MiniCan's small size, advances in GCMS sensitivity allow for detection limits that easily surpass EPA Method TO-14A and TO-15 requirements. MiniCans™ feature an autosampler friendly compact design with superior analytical performance, low shipping weight, and low cost. The ideal canister solution.

### *New, reliable 24 Hour sampling with CS1200ES advanced low flow technology.*



Description	Unit	Part #
100mL Silonite-XL™ MiniCan™ Sampler	EA	29-MC100QT
100mL Silonite-XL™ MiniCan™ Sampler (w/ Silonite™ Valve)	EA	29-MC100SQT
100mL Silonite-XL™ MiniCan™ Sampler (w/ Silonite™ Valve / Gauge)	EA	29-MC100SQTG
200mL Silonite-XL™ MiniCan™ Sampler	EA	29-MC200QT
200mL Silonite-XL™ MiniCan™ Sampler (w/ Silonite™ Valve)	EA	29-MC200SQT
200mL Silonite-XL™ MiniCan™ Sampler (w/ Silonite™ Valve / Gauge)	EA	29-MC200SQTG
450mL Silonite-XL™ MiniCan™ Sampler	EA	29-MC450QT
450mL Silonite-XL™ MiniCan™ Sampler (w/ Silonite™ Valve)	EA	29-MC450SQT
450mL Silonite-XL™ MiniCan™ Sampler (w/ Silonite™ Valve / Gauge)	EA	29-MC450SQTG
600mL Silonite-XL™ MiniCan™ Sampler	EA	29-MC600QT
600mL Silonite-XL™ MiniCan™ Sampler (w/ Silonite™ Valve)	EA	29-MC600SQT
600mL Silonite-XL™ MiniCan™ Sampler (w/ Silonite™ Valve / Gauge)	EA	29-MC600SQTG
1L Silonite-XL™ MiniCan™ Sampler	EA	29-MC10LQT
1L Silonite-XL™ MiniCan™ Sampler (w/ Silonite™ Valve)	EA	29-MC10LSQT
1L Silonite-XL™ MiniCan™ Sampler (w/ Silonite™ Valve / Gauge)	EA	29-MC10LSQTG

Description	Unit	Part #
1.4L Silonite-XL™ MiniCan™ Sampler	EA	29-MC14LQT
1.4L Silonite-XL™ MiniCan™ Sampler (w/ Silonite™ Valve)	EA	29-MC14LSQT
1.4L Silonite-XL™ MiniCan™ Sampler (w/ Silonite™ Valve / Gauge)	EA	29-MC14LSQTG

### Applications

#### High Concentration

- Personal IH Monitoring
- Indoor Air Quality
- Fugitive Emissions
- Landfill Gas/Soil Gas
- Stack Gas
- Chemical Weapons
- Process Monitoring

#### Low Concentration

- Fence Line Monitoring
- Breath Analysis
- EPA TO-14a / TO-15
- Ozone Precursors
- Mold Detection (MVOCs)
- Markers in Foods
- Gas Impurities

## Bottle-Vac™ Samplers

Bottle-Vac™ samplers are the most economical gas-phase sample collection containers available. They use Micro-QT™ Valves which are small and non-contaminating by design. Our Bottle-Vac™ samplers are as gas-tight as stainless-steel canisters, making them a low-cost alternative for whole air sampling. A sample is only exposed to treated glass, 316 stainless or Silonite™ coated stainless-steel, and a small O-ring which forms the seal at the cap. All of these materials are inert, allowing for a wide range of analytes to be recovered. Time-weighted sampling techniques are possible using MiniCan™ sampling inlets, or by using Helium Diffusion Sampling.



Bottle-Vac™ Samplers

Description	Unit	Part #
40mL Bottle-Vac™ Sampler	EA	29-BV040A
60mL Bottle-Vac™ Sampler	EA	29-BV060A
125mL Bottle-Vac™ Sampler	EA	29-BV125A
125mL Bottle-Vac™ Sampler (w/ Silonite™ Valve)	EA	29-BV125AS
250mL Bottle-Vac™ Sampler	EA	29-BV250A
250mL Bottle-Vac™ Sampler (w/ Silonite™ Valve)	EA	29-BV250AS
500mL Bottle-Vac™ Sampler	EA	29-BV500A
500mL Bottle-Vac™ Sampler (w/ Silonite™ Valve)	EA	29-BV500AS
1L Bottle-Vac™ Sampler	EA	29-BVL1A
1L Bottle-Vac™ Sampler (w/ Silonite™ Valve)	EA	29-BVL1AS
30"-0"Hg Vacuum Gauge (w/ Micro-QT™)	EA	29-70010QT
30"Hg-0-30psig Compound Gauge (w/ Micro-QT™)	EA	29-70020QT

### REPLACEMENT PARTS

Description	Unit	Part #
Micro-QT™ Valve (40 /60 / 125mL)	EA	MQT-BV24
Micro-QT™ Valve, Silonite™ (40/ 60 / 125mL)	EA	MQT-BV24S
Micro-QT™ Valve (250 / 500/ 1L)	EA	MQT-BV28
Micro-QT™ Valve, Silonite™ (250 / 500 / 1L)	EA	MQT-BV28S
125mL Amber Bottles, deactivated*	EA	39-75125AD
250mL Amber Bottles, deactivated*	EA	39-75250AD
500mL Amber Bottles, deactivated*	EA	39-75500AD
1L Amber Bottles, deactivated*	EA	39-75L1AD
Netting for 250mL Bottle-Vac™	EA	29-59108
Netting for 500mL Bottle-Vac™	EA	29-59116
Netting for 1L Bottle-Vac™	EA	29-59132
Valve Caps, 125mL, (no valve)	EA	39-76044B
Valve Caps, 250, 500 or 1L, (no valve)	EA	39-76464

\* These items require valves, caps, and netting to be ordered separately.

### Bottle-Vac™ Sample Analysis

In the laboratory, analysis by loop injection requires either pressurizing to 3–7psig, or heating to 60–70°C to increase the pressure to purge a loop. Bottle-Vac™ samplers can also be analyzed using a 7200 or 7100A Preconcentrator to withdraw a larger volume for low PPB analysis. Automated analysis can be performed using the 7650, 7410D, or 7032A Autosamplers.

### Bottle-Vac™ Cleaning

Bottle-Vac™ samplers are reusable, making them less expensive per sampling event than other sampling devices, even Tedlar® bags. For PPB sampling, the bottles should be flushed with nitrogen or zero air in an oven after the fittings have been removed, then evacuated after the fittings are reattached. Fittings can be heated, flushed and stored under nitrogen in a separate container. For PPM sampling, the valves and bottles can simply be heated in an oven overnight with the fittings removed, then reassembled for immediate evacuation and delivery to the field. Bottle-Vacs™ can also be easily cleaned on Entech's canister cleaning systems.

### Applications – (All Tedlar® Bag uses, plus:)

- Indoor Air Quality
- Ceiling / STEL / TWA Monitoring
- Fugitive Emissions
- Landfill Gas / Soil Gas
- Fenceline Monitoring
- Breath Analysis
- Mold Detection (MVOCs)
- Impurities in Gases
- Stack Gas





Filtered Grab Sampler  
for MicroValve™ Canisters  
PN 30-22510S



Filtered Restricted Sampler  
for MicroValve™ Canisters  
PN 39-RS-QTSx ([See Codes on p.83](#))



Filterless Grab Sampler  
for MicroValve™ Canisters  
PN 30-22500



Replacement Filter  
PN 39-92150



Filterless Drywall Sampler  
for MicroValve™ Canisters  
PN 30-22530



Replacement Drywall Needles  
PN 30-22545

Finger-Tightened Cap  
PN 30-22060



30-0" Hg Vacuum Gauge  
29-70010QT

## Grab & Critical Orifice Sampling

There are several ways to fill a MicroValve™ canister or Bottle-Vac™ depending on the sampling requirements. Here's a brief overview:

### Grab Sampling

MiniCan™ or Bottle-Vac™ samplers are filled within 0.1–0.3 minutes, by either removing the valve (around the valve sampling), or using an unrestricted sampler.

### Restricted Critical Orifice Sampling

Sample is collected through the valve using a filtered orifice restricted sampler. Fill rates are constant until the canister reaches one-half atmosphere.

### Time Integrated Sampling

TWA sampling is used for slow filling of canisters to determine average target compound concentrations. Fill times are 10–50 times longer than with critical orifice restricted samplers. Use the CS1200E and the PN: MQT-400 adapter for Micro-QT™ Valve Samplers.

## Micro-QT™ Valve (Samplers & Accessories)\*

Description	Unit	Part #
Finger-Tightened Cap	EA	30-22060
Filterless MicroValve™ Grab Sampler	EA	30-22500
Filtered MicroValve™ Grab Sampler	EA	30-22510
Filterless Drywall Sampler (Mold MVOCs)	EA	30-22530
Replacement Drywall Needles	EA	30-22545
Filtered Restricted Sampler **	EA	39-RS-QTx
Silonite™ Filtered Restricted Sampler **	EA	39-RS-QTSx
Repl. Filter for Grab & Restricted Samplers	EA	39-92150
30-0" Hg Vacuum Gauge (w/Micro-QT)	EA	29-70010QT

\* All listed part numbers are compatible with both QT and QT2 Valves.  
\*\* Replace "x" with code for desired fill time. See table below.

## Time to Fill MiniCans™ - Fill to 50% and 95% of Atmospheric Pressure (in Minutes)

Part No.	Code	Approx. Flow Rate	450mL MiniCan™		600mL MiniCan™		1L MiniCan™		1.4L MiniCan™	
			50%	95%	50%	95%	50%	95%	50%	95%
30-22510	0	No Restrictor	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
39-RS-QT1	1	600cc/Min	*	*	*	*	1	3	1.3	4
39-RS-QT2	2	150cc/Min	1	3	2	6	3	10	5	15
39-RS-QT3	3	63cc/Min	3	10	5	15	8	25	10	30
39-RS-QT4	4	38cc/Min	5	15	8	25	12	40	15	45
39-RS-QT5	5	19cc/Min	10	30	15	50	25	75	35	100
39-RS-QT6	6	13cc/Min	15	45	25	70	40	120	60	170
39-RS-QTx Restricted Sampler for MiniCan™ with MicroValve™: (Replace x with desired flow code)										
39-RS-QTSx Restricted Sampler for MiniCan™ with Silonite™ MicroValve™: (Replace x with desired flow code)										
39-92150 Replacement Filter / O-Ring										

\* These canister / flow combinations are not recommended by Entech Instruments.



## Vacuum Sampling Approaches

### Grab Sampling

Sampling with MiniCan™ and Bottle-Vac™ canisters could not be easier. Simply verify sufficient canister vacuum with a check gauge and start sample collection.

A grab sample can be collected by using a filtered or non-filtered sampler fitting. Place a sampler fitting onto the MicroValve™ and press down to activate sample collection. Adding a critical orifice to these samplers can increase the sampling time to up to 1 hour.



*Filtered Grab Sampling*

### True Time Integrated Sampling

The CS1200E provides excellent stability at low fill rates for reliable TWA sampling and can be used with both Micro-QT™ or TrueSeal™ canister valves for tool free operation in the field.

Sampling stands are available for field use with 1L and 1.4 MiniCans™ as well as our 1L Bottle-Vac™ samplers.



*CS1200E Passive Canister Sampler  
and 1.4L MiniCan™ shown  
(Sampler and Canister sold separately)*

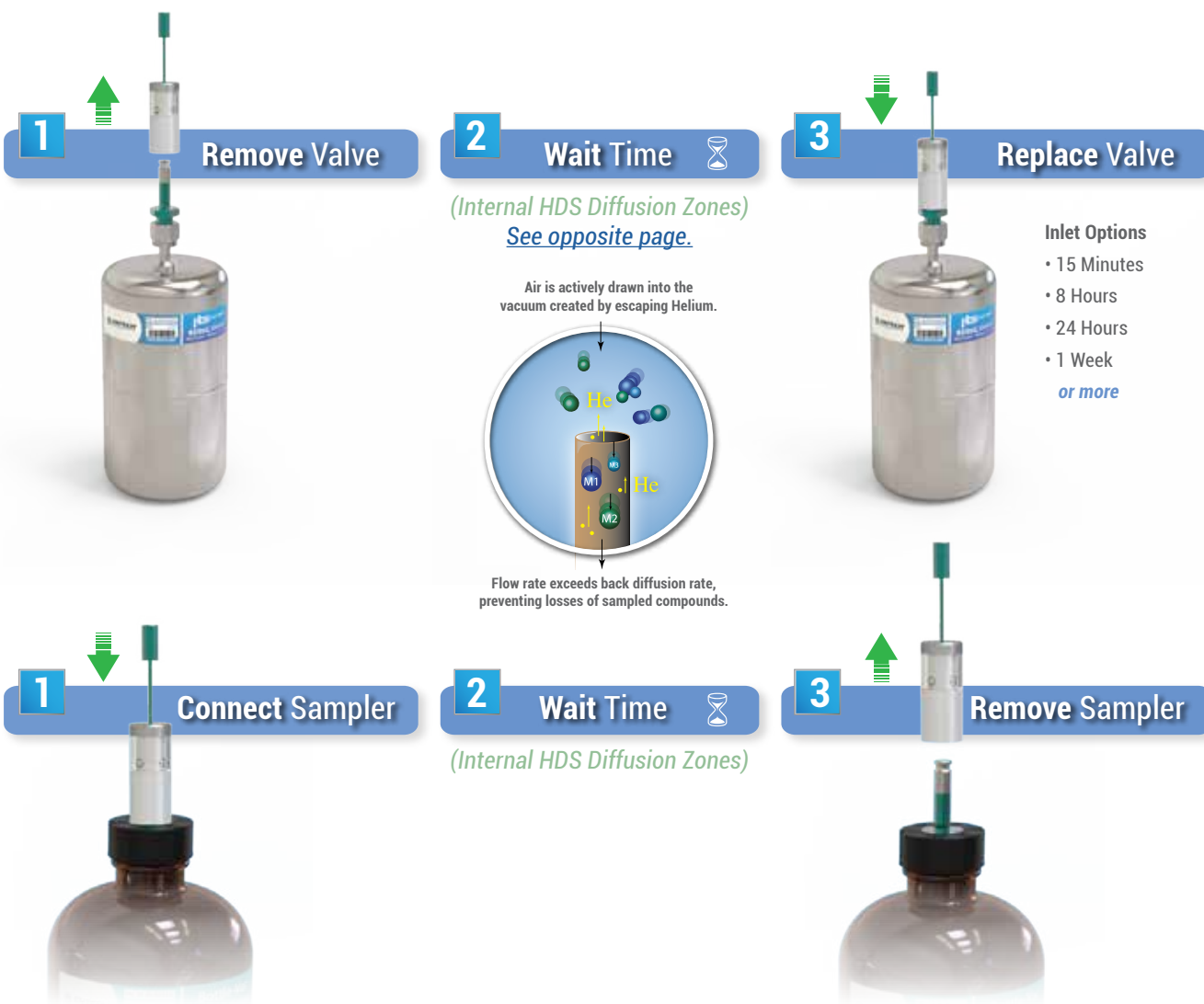
# HDS™

## HELIUM DIFFUSION SAMPLING

Introducing Entech's breakthrough technology for whole air sample collection – **Helium Diffusion Sampling (HDS™)**. We now offer HDS™ active sampling solutions for indoor air monitoring that simplify the collection of airborne chemicals for GC and GC/MS analysis. Rather than performing a traditional vacuum sampling event, Bottle-Vacs™ are initially filled with helium, or helium with a recovery surrogate, and active sampling occurs in response to the controlled exchange of helium with air through a diffusion region. An HDS™ diffusion zone's internal diameter is 20–50 times larger than typical critical orifice samplers, so particulate plugging is virtually impossible. HDS™ eliminates the need for sampler calibration, as relative diffusion rates of Helium and air are virtually constant. And

unlike passive sampling with tubes – **where compounds lighter than Benzene are not recovered quantitatively** – HDS monitoring recovers all compounds heavier than Helium. Some important carcinogenic compounds quantitatively recovered using HDS that are not recoverable using passive tube sampling devices include: Vinyl Chloride, 1,3-Butadiene, and Acrolein. HDS™ Samplers also increase their weight as more air exchanges with Helium, allowing sample collection amounts to be determined gravimetrically in the laboratory for extremely accurate and defensible measurements.

Two indoor air HDS™ sampling versions are available from Entech, 1) Bottle-Vac Samplers (detailed below). Special HDS™ MicroValves that are optimized for standard sampling event durations – **the diffusion zone exists inside of the fitting**. 2) Controlled helium / air exchange with an external HDS™ diffusion zone fitting that is designed to attach directly to Bottle-Vacs™ and MiniCans™ with standard Micro-QT™ valves. Like the HDS™ MicroValves, these external HDS™ fittings feature a specific length or ID of the diffusion zone to provide an ideal sample fill duration and canister volume. It's that easy. HDS™ collects an air sample much slower than vacuum driven controllers, allowing smaller canisters and Bottle-Vacs™ to be used for long term sampling, at a substantially reduced cost. With HDS™, collection of whole air samples has never been this easy, economical, and reliable!





500mL HDS Bottle-Vac™ Sampler  
PN 29-BV500AH8

Choose HDS™  
for Indoor Air  
Quality Monitoring

Call Today to Learn More!

## Features

- ◆ **No Calibration**  
*Diffusion zones are factory set and remain constant.*
- ◆ **No Sample Volume Guesswork**  
*Weighing the sampler after collection and again after evacuation determines collected sample volume.*
- ◆ **No Sample Losses**  
*Ultra-inert and compact sampling surfaces.*
- ◆ **No Sample Contamination**  
*Verified leak free with gauge prior to sampling.*
- ◆ **No Pumps & No Batteries**  
*Perfect for whole air sampling.*

### Bottle-Vac™ – Helium Diffusion Sampling

Description	Unit	Part #
500mL HDS Bottle-Vac™ Sampler (3 Hour)	EA	29-BV500AH3
500mL HDS Bottle-Vac™ Sampler (8 Hour)	EA	29-BV500AH8
500mL HDS Bottle-Vac™ Sampler (24 Hour)	EA	29-BV500AH24
1L HDS Bottle-Vac™ Sampler (8 Hour)	EA	29-BVL1AH8
1L HDS Bottle-Vac™ Sampler (24 Hour)	EA	29-BVL1AH24
1L HDS Bottle-Vac™ Sampler (1 Week)	EA	29-BVL1AH1W

## HDS™ Indoor Air Samplers

Using Helium Diffusion Sampling into Silonite-XL™ Canisters and Bottle-Vacs™ for indoor air monitoring has never been so easy and cost effective!

Introducing Entech's low-cost external HDS™ Samplers that allow any Silonite-XL™ Canister or Bottle-Vac™ to be used to perform time integrated sampling both simply and cost-effectively. HDS™ utilizes a simple diffusion zone to control the exchange rate of helium and air, with diameters that are 20–50 times larger than typical critical orifice samplers, making particulate plugging virtually impossible.

HDS™ eliminates the need for sampler calibration, as the relative diffusion rate of Helium to air is virtually a constant. Unlike passive sampling with tubes – where compounds lighter than Benzene are not properly recovered – HDS™ monitors retain all compounds heavier than Helium. This allows even Ethane, Ethylene, and Acetylene to be collected quantitatively.

HDS™ Samplers also increase their weight as more air exchanges with Helium, so collected amounts can be determined in the laboratory gravimetrically for extremely accurate and defensible measurements. Just select the color coded sampler below and the required container size shown in the table to achieve the sampling duration desired. All of these new samplers can also be used to perform quick grab sampling (2–30 seconds) into containers that are shipped to the field under vacuum rather than being filled with helium. For more dusty locations, samplers are available with a built in filter.



*Bottle-Vac™ shown with code 1 (Silver)  
HDS™ Indoor Air Sampler fitting. PN 39-HDS-F01*

# HDS™ Indoor Air Samplers – Simple, Reliable, and Cost-effective. *It's the right choice!*

*HDS™ Indoor Air Samplers with  
sampling range color codes.*



## HDS™ MicroValve™ Samplers – Fill Durations\*

\* Durations shown for listed canisters and Bottle-Vac™ samplers with Micro-QT™ Valves.

HDS™ Code	HDS™ Sampler Part # with Filter	40mL Bottle-Vac™	125mL Bottle-Vac™	250mL Bottle-Vac™	500mL Bottle-Vac™	1L Bottle-Vac™	450mL MiniCan™	1L MiniCan™	1.4L MiniCan™
1 – Silver	39-HDS-F01	–	8 Hours	–	1 Day	–	1 Day	–	–
2 – Red	39-HDS-F02	4 Hours	–	1 Day	–	–	–	–	1 Week
3 – Blue	39-HDS-F03	–	–	–	–	1 Week	–	1 Week	–
4 – Black	39-HDS-F04	1 Day	–	1 Week	2 Weeks	–	–	–	1 Month

## MiniCan™ & Bottle-Vac™ Carrying Cases

Several carrying cases are available for MiniCan™ and Bottle-Vac™ samplers. Options are based on the number and size of canisters needing to be shipped. Refer to the chart below for canister and valve compatibility. Custom kits can be made using PN 29-20810 which has pre-cut foam inserts to accommodate canisters, samplers, and test gauges.



29-position Carrying Case for 450mL and 600mL MiniCans™  
PN 29-20600 (Shown here)



16-position Carrying Case for 1–1.4L Bottle-Vacs™ and MiniCans™  
PN 29-20620

*These rugged carrying cases also feature a handy box insert to keep flow controllers, gauges, and other sampling supplies organized and ready for use in the field.*

**Contact us today to learn more!**



## Shipping Supplies

Reusable boxes with foam inserts are available for secure shipping or transportation of 250mL and 500mL Bottle-Vac™ samplers. Protective dust caps are available for MicroValves™ to help prevent the introduction of particulates during transportation. Leak-proof caps are available to ensure long term storage capability under vacuum, or when subjecting O-ring sealing valves to cold conditions (below -10°C).

6L Canister Shipping Box shown with integrated Samplers and Accessories Box.  
PN 29-22062 and PN 29-22064  
(Samplers and Canister sold separately)



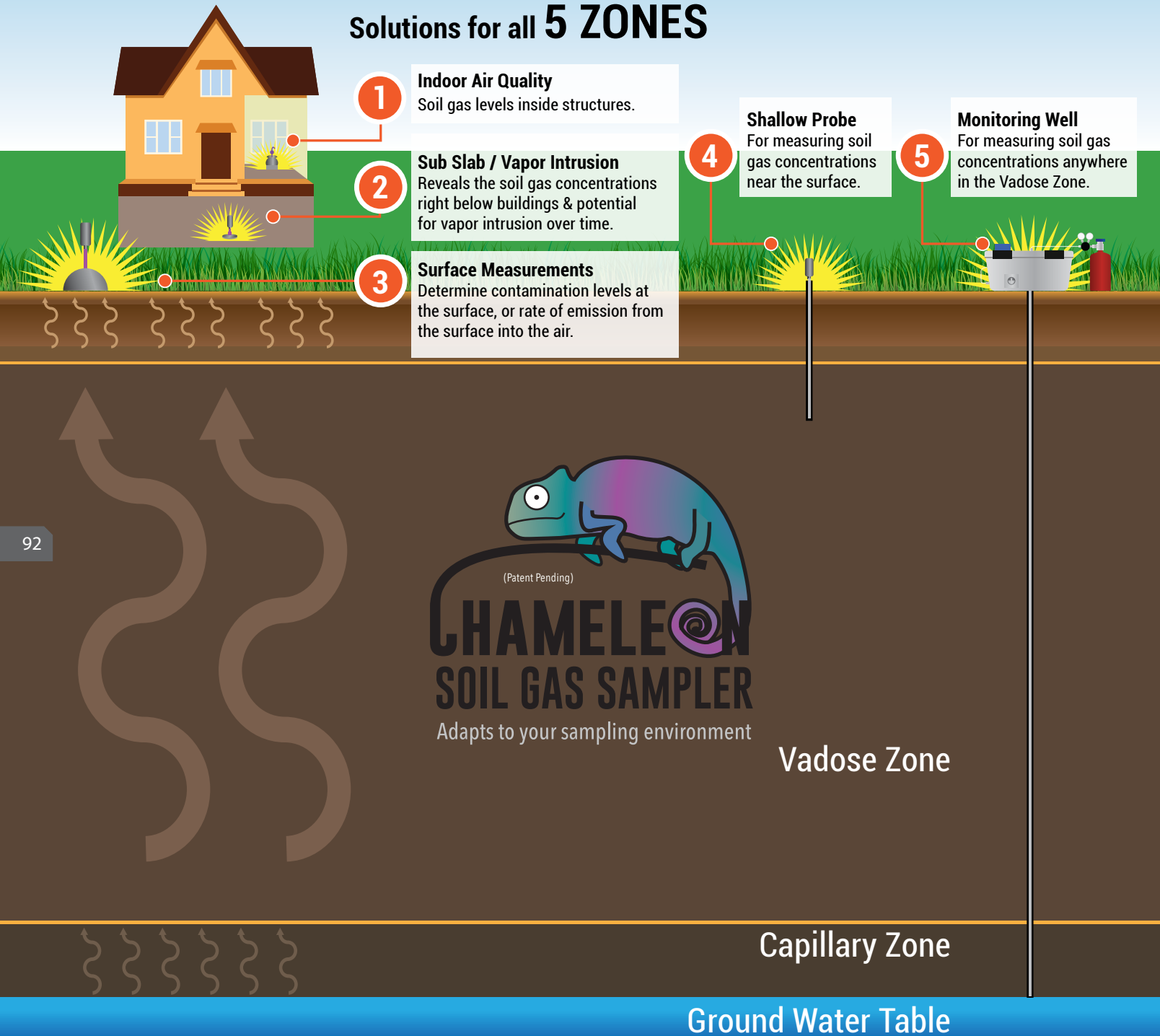
## Carrying Cases (Shipping Boxes / Caps)

Description	Unit	Part #
Carrying Case – 29-Position, 450mL or 600mL MiniCans™ (22"L x 17"W x 10"D)	EA	29-20600
Carrying Case – 16-Position, 1.4L MiniCans™ or 1L Bottle-Vacs™ (22"L x 17"W x 10"D)	EA	29-20620
Carrying Case – 29-Position, 500mL Bottle-Vacs™ w/Fittings (22"L x 17"W x 10"D)	EA	29-20610
Customizable Foam Case (22"L x 17"W x 10"D)	EA	29-20810
1-Position, 6L Silonite-XL™ Canister Tall Shipping Box	EA	29-22062
Samplers and Accessories Shipping Box (Designed to fit inside Tall Shipping Box)	EA	29-22064
MicroValve™ Cap (Short)	100pk	16-17845



# The All-In-One Soil Gas Sampling Solution

## Solutions for all 5 ZONES



## Advantages of Soil Gas Sampling with Canisters

Sampling soil gas into canisters provides significant advantages over the use of passive adsorbent samplers with regard to both maintaining the integrity of the sample in the field and ensuring that the best analytical technique is used in the laboratory.

Canisters eliminate the need for pumps, batteries, and media selection, and the same sampling approach can be utilized for any gas concentration while being universal for all compounds. Furthermore, humidity and temperature concerns inherent with tube sampling do not affect canister accuracy.

Entech has a long history of engineering turn-key solutions specific to the environments being sampled. Designed with feedback from numerous sampling professionals, the Chameleon provides an all-in-one solution that is changing the way soil gas studies are conducted world-wide.

### Sampling systems must be considered an extension of the laboratory.

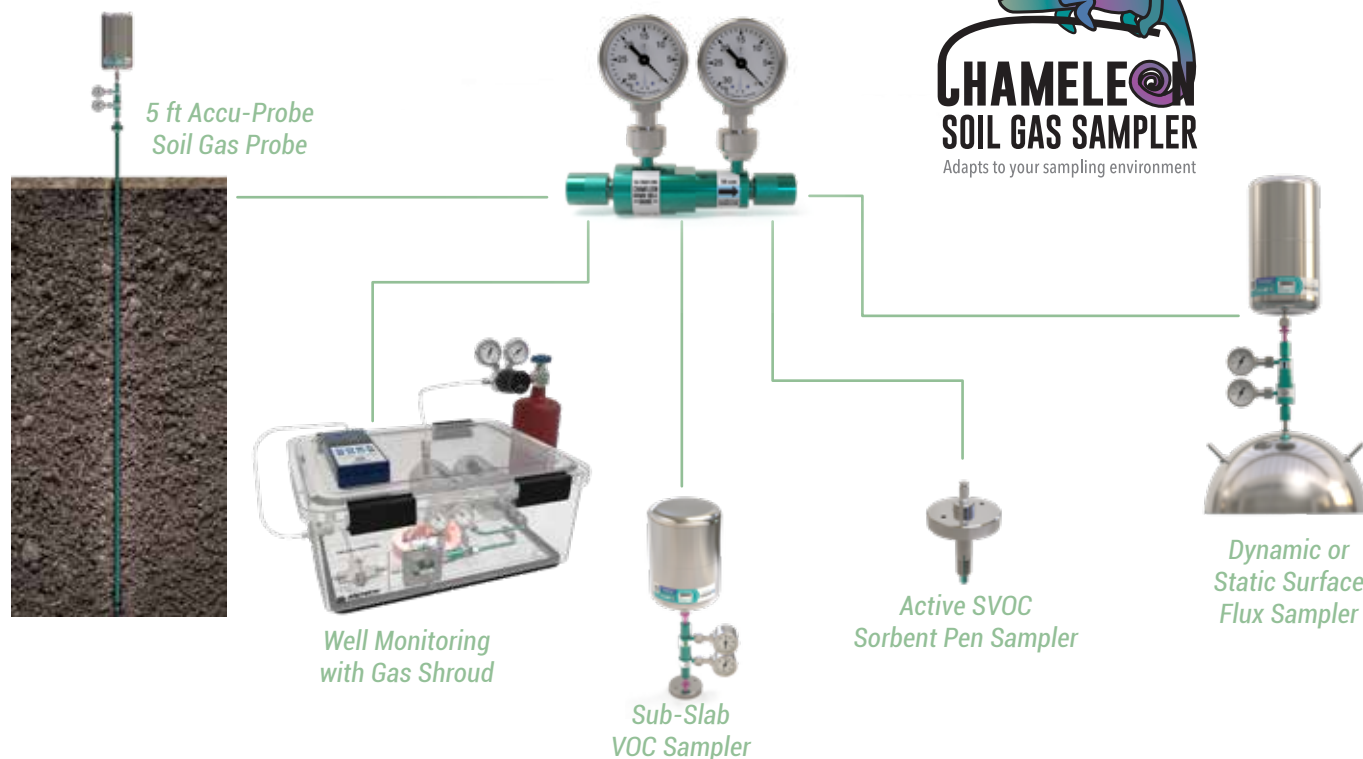
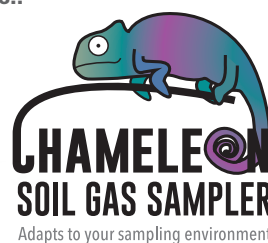
The Chameleon improves the accuracy of soil gas sampling by applying basic principles of gas chromatography. Chameleon maximizes recovery while minimizing carryover to yield the most accurate soil gas sample train available.

- Ensure all surfaces are inert (Entech Silonite™ coated stainless steel).
- Minimize surface area and shorten path lengths to canister.
- Minimize leak prone connections by engineering and machining custom solutions.
- Eliminate absorption (no plastic tubing where possible).
- Prove system is leak-tight before delivery to field.
- Isolate the flow path from the outside world during transportation.

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## The Chameleon Soil Gas Sampling Train

One Sample Train for All Soil Gas Sampling Techniques!!



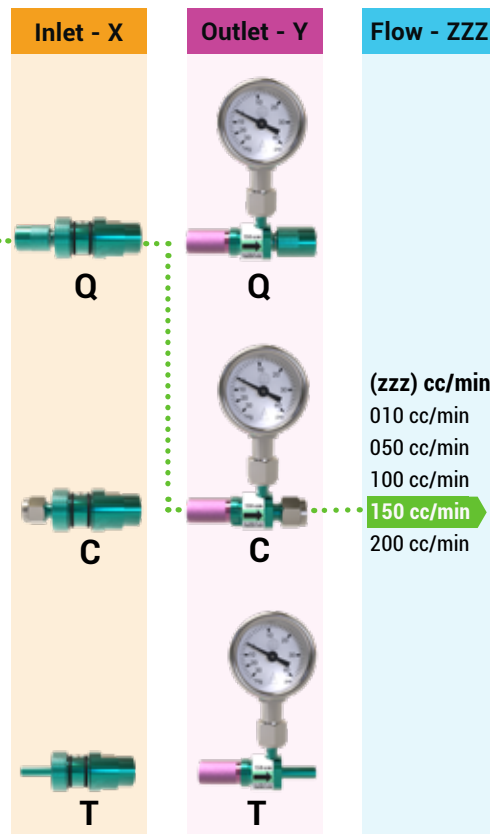
## Create Your Chameleon Part Number

Combine Any Inlet with Any Outlet!

Configure your part # **SG-CHAM - X Y - ZZZ**

Substitute Q,C,T for your inlet (X) and outlet (Y), and append desired flow rate (ZZZ)

EXAMPLE



- The Chameleon can be configured to minimize compression fittings based on the line or fitting to which it connects.
- The inlet and outlet can be configured separately to optimize the sample train.
- The down hole vacuum gauge monitor can be added to any configuration, and verifies that excessive vacuum is not forming in the soil (<7.3" Hg vacuum).
- All configurations can be maintained under vacuum during shipment to the field to perform the shut-in test (leak test) automatically.

Do you need the Optional down-hole gauge?

ADD THIS PART # TO YOUR ORDER

PN SG-CHAM-DHG

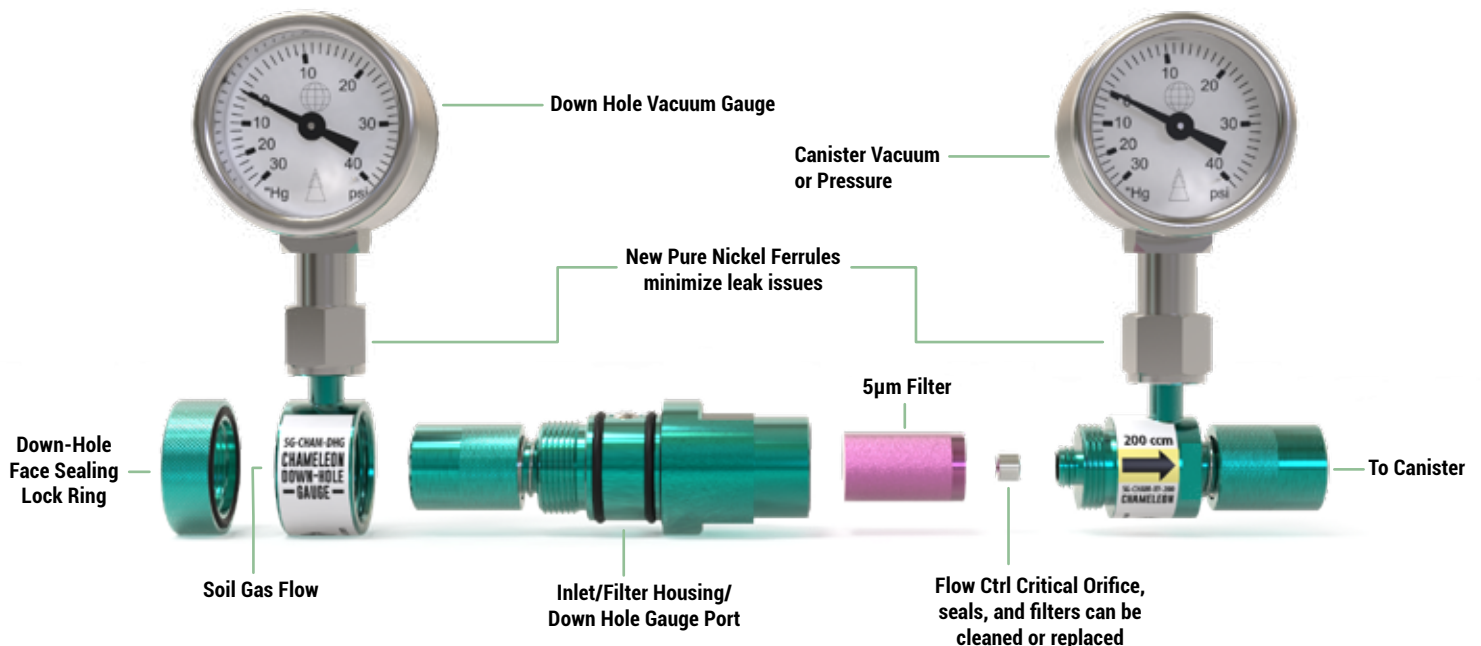


COMPLETE

**SG-CHAM-QC-150**

Example: SG-CHAM-QC-150 plus downhole gauge SG-CHAM-DHG

## Easy Maintenance and Replacement of All Components



## Sub-Slab & Vapor Intrusion Monitoring

**No Grout. No Mess. No Contamination. Better Results.**

Monitor gases directly under the slab of buildings to determine the potential for intrusion into the indoor environment. A vacuum tight seal is made through the building's foundation, with a unique "triple seal" using two O-rings and a water dam that ensures that only gases from beneath the slab will be drawn into the sample train and canister. After sampling, the slab face sealing fitting is removed allowing a temporary plug to be installed.

*Chameleon Soil Gas Sampler shown  
with Entech Slab-Tight™ Sampler.*



### Advantages:

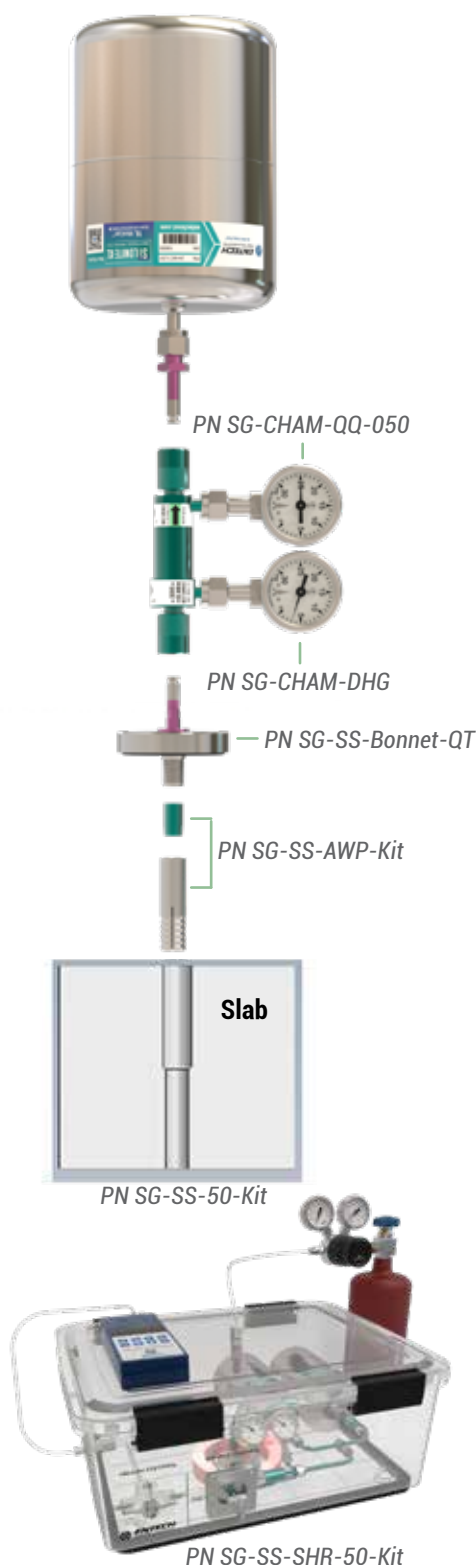
- Most reliable, non-contaminating slab vapor seal on the market.
- Shortest and most inert flow path ensures complete recovery and no sample carryover.
- Chameleon controls the flow rate to avoid disturbing the equilibrium of VOCs between gas, adsorbed soil, and dissolved water phases.
- Avoids the use of contaminating plastic tubing. All surfaces are Silonite™ ceramic lined stainless steel to prevent outgassing of contamination while ensuring maximum compound recovery.
- Compatible with Entech Soil Gas Shroud for "complete flow path" leak testing right up to the canister.



## Entech's Slab-Tight™ Sub-Slab Sampler

### Complete the Sampling with Chameleon and Silonite-XL™ MiniCan

- Entech's unique Slab-Tight™ sub-slab sampler eliminates interferences created by grout and other slab sealing materials.
- Grout may contain contaminants that can positively bias the results.
- Added Down-hole moisture from the grout may affect the solid/liquid/gas phase equilibria.
- The Entech Slab-Tight™ sub-slab sampler makes a mechanical connection and seal with no chance of contaminating the collected soil gas.
- Tracer Gas Shroud for butane or helium leak checking is available.



Description	Unit	Part #
<b>Sub-Slab Vapor Intrusion Canister Sampling Kit</b> (50cc/min) (600cc, 1L, or 1.4L Cans sold separately)	EA	<b>SG-SS-50-Kit</b>
Slab Anchor, Wedge, and Plug Kit	EA	SG-SS-AWP-Kit
Tool to expand anchor into the concrete	EA	SG-SS-Expander
Face-sealing Bonnet with QT Fitting	EA	SG-SS-Bonnet-QT
Bonnet Wrench - Tightens and releases Bonnet to concrete	EA	SG-SS-Bonnet-Wrench
50cc/min Chameleon with FQT on Inlet & Outlet. Includes down-hole gauge for measuring vacuum below ground soil	EA	SG-CHAM-QQ-050
50cc plastic preflush syringe	EA	07-20050
16 Gauge Sub-Slab Dispensing Needle	5pk	07-20018
<b>Sub-Slab Vapor Intrusion Canister Sampling Kit</b> (50cc/min) <b>w/ Tracer Gas Shroud</b> (600cc, 1L, or 1.4L Cans sold separately)	EA	<b>SG-SS-SHR-50-Kit</b>
50cc/min Chameleon Shroud Sample Train. Includes 3 way valve, magnetic latch, & down-hole gauge for measuring vacuum below ground soil	EA	SG-CHAM-TC-050-S
Slab Anchor, Wedge, and Plug Kit	EA	SG-SS-AWP-Kit
Tool to expand anchor into the concrete	EA	SG-SS-Expander
Face-sealing Bonnet with QT Fitting	EA	SG-SS-Bonnet-QT
Bonnet Wrench - Tightens and releases Bonnet to concrete	EA	SG-SS-Bonnet-Wrench
50cc plastic preflush syringe	EA	07-20050
Tracer Gas Shroud for Helium	EA	SG-He-Shroud
1/8" Silonite Line from Probe to 3-Way, w/ FMQT & 1/8" to 1/4" Tube Adapters	EA	SG-SHR-APVI
16 Gauge Sub-Slab Dispensing Needle	5pk	07-20018

Individual Parts	Unit	Part #
Slab Anchor & Plug Kit - Not reuseable. One needed per installation	EA	SG-SS-AWP-Kit
Shroud Foam Sealing Ring	EA	SG-SHR-RNG
Dual Canister Adapter w/ 2 Female Micro-QT™ Valves	EA	39-99014QT
600mL MiniCan with Micro-QT™ Valve	EA	29-MC600QT
1L Silonite-XL MiniCan	EA	29-MC10LQT
Helium Analyzer (0.1-100%)	EA	SG-He-Analyzer
Soil Gas Drill Bit Kit 1/2" and 3/8"	EA	SG-SS-DRILL-Kit
Tracer Gas Shroud for Helium	EA	SG-He-Shroud
16 Gauge Sub-Slab Dispensing Needle	5pk	07-20018
10cc/min Chameleon Shroud Sample Train. Includes 3 way valve, magnetic latch, & down-hole gauge for measuring vacuum below ground soil	EA	SG-CHAM-TC-010-S
50cc/min Chameleon Shroud Sample Train. Includes 3 way valve, magnetic latch, & down-hole gauge for measuring vacuum below ground soil	EA	SG-CHAM-TC-050-S
100cc/min Chameleon Shroud Sample Train. Includes 3 way valve, magnetic latch, & down-hole gauge for measuring vacuum below ground soil	EA	SG-CHAM-TC-100-S
150cc/min Chameleon Shroud Sample Train. Includes 3 way valve, magnetic latch, & down-hole gauge for measuring vacuum below ground soil	EA	SG-CHAM-TC-150-S
200cc/min Chameleon Shroud Sample Train. Includes 3 way valve, magnetic latch, & down-hole gauge for measuring vacuum below ground soil	EA	SG-CHAM-TC-200-S



## Surface Sampling

### Surface Flux Sampling

Analyze the soil gases right at the surface by using the Entech Soil Gas Flux Chamber. Simply place the 3L or 7.5L enclosure over the surface, allow the vapors to reach equilibrium, connect the Chameleon Soil Gas Sampler and Silonite-XL™ MiniCan, and collect the equilibrated vapors into the inert Silonite-XL™ MiniCan. This is a great means for looking for sites of maximum contamination and for general site assessment. Add a flow of purified nitrogen through the flux sampler to evaluate rates of outgassing as needed.

- Easy implementation
- No drilling
- Collect results quickly
- No materials left on-site
- Least invasive

*Entech 1.4L MiniCan with Chameleon Soil Gas Sampler and Enhancement Enclosure.*

## Surface Flux Measurement Test Kit

Description	Unit	Part #
<b>3L Flux Chamber Kit</b> (600cc, 1L, or 1.4L Cans sold separately)	EA	<b>SG-FLX30-50-Kit</b>
3L Flux Chamber	EA	SG-FLUX-30
50cc/min Chameleon, Female MQT Inlet and Outlet	EA	SG-CHAM-QQ-050
<b>7.5L Flux Chamber Kit</b> (600cc, 1L, or 1.4L Cans sold separately)	EA	<b>SG-FLX75-50-Kit</b>
7.5L Flux Chamber	EA	SG-FLUX-75
50cc/min Chameleon, Female MQT Inlet and Outlet	EA	SG-CHAM-QQ-050
<b>Individual Parts</b>	<b>Unit</b>	<b>Part #</b>
600mL MiniCan with Micro-QT™ Valve	EA	29-MC600QT
1L Silonite-XL MiniCan	EA	29-MC10LQT

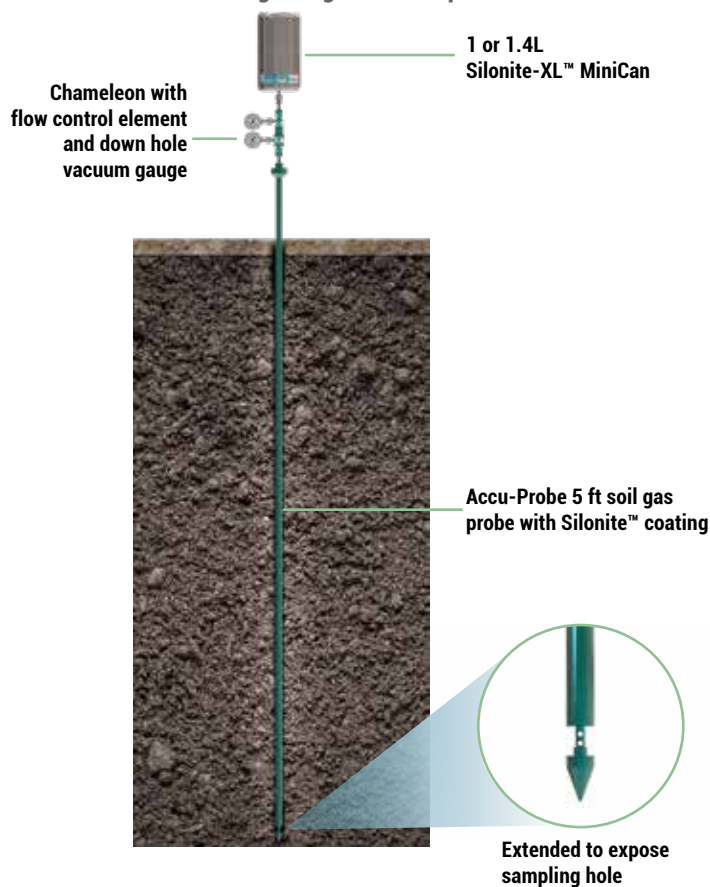


## Shallow Probe Sampling

Collect samples from a depth of 5 feet to determine levels of equilibrated soil gas. Gases at 5 ft are well equilibrated with the surrounding soil, therefore measurements taken at this depth tend to be more accurate than surface sampling. A unique approach developed by Entech utilizes a fixed drill bit and gas inlet holes which prevent the introduction of soil into the problem simply through controlling the hole geometry and using a plastic internal tube that is pulled out after probe insertion. The elimination of moving parts found on other probes substantially improves ruggedness and reliability in the field. A powerful cordless or corded drill makes the process of probe introduction easy, and running the drill in reverse removes the probe without the need for heavy jacks as in other designs. Further leak prevention is made using a special cap designed by Entech when sampling through dirt or grass, or using Bentonite when sampling through concrete or asphalt to completely along the outside of the probe to the surface.

### The Accu-Probe 5 ft Soil Gas Probe

Non-fouling Design with Unique Surface Seal

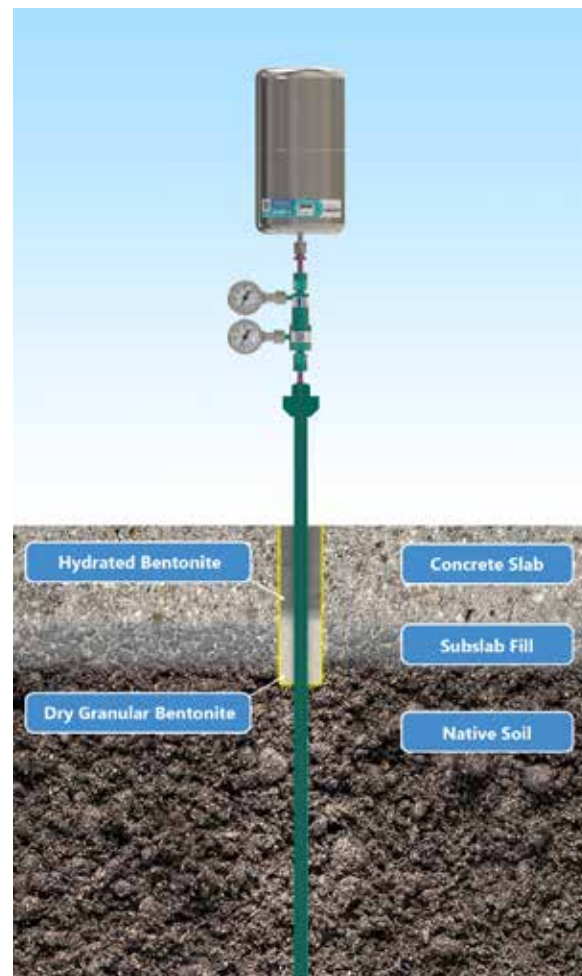


- Easily adapts to the Chameleon for controlled soil gas sampling.
- Surface sealing cap ensures that collected gas is all soil gas.
- Silonite™ coated stainless for complete recovery of soil gas VOCs with no flow path contamination.



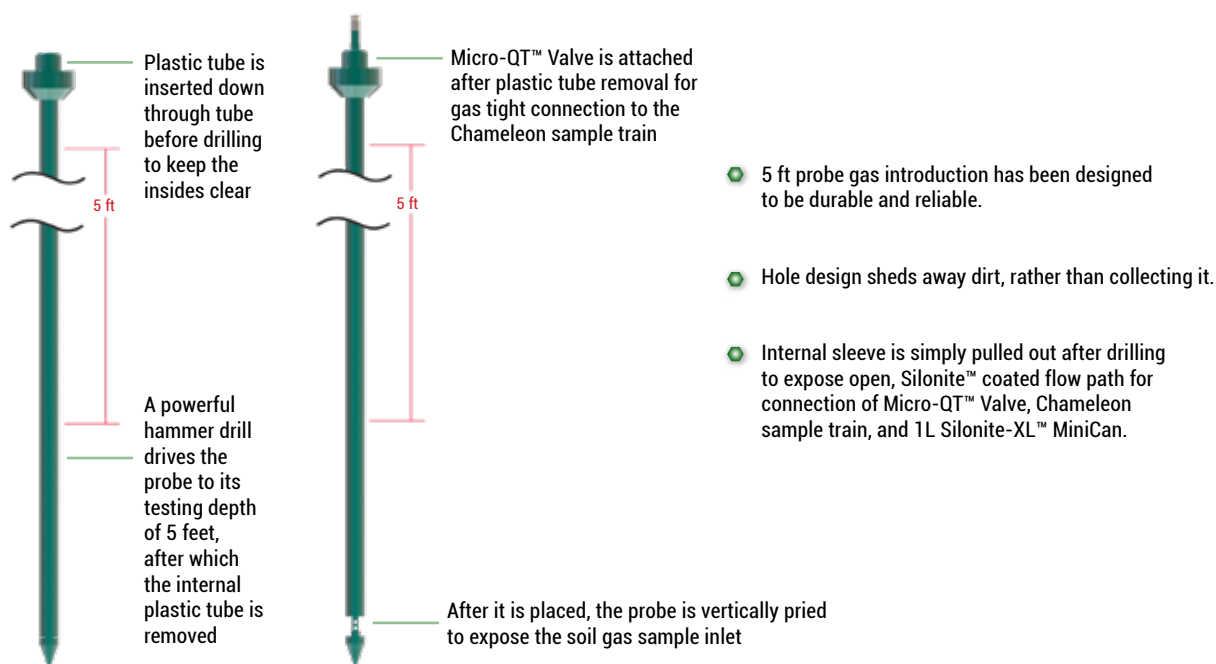
#### Advantages over other technology:

- No hammering or punching of probe through the soil.
- Simple installation and removal.
- Sample does not flow through plastic tubing!! Far more accurate recovery of VOCs.
- Sample train (Chameleon) is 100% Silonite™ coated.
- Canister connects directly to probe. Shortest path length of any probe sampler.
- All probes are Silonite™ coated as standard.



# The Accu-Probe 5 ft Soil Gas Probe

## 5 ft Sampling Probes with Superior Gas Sampling Inlet



## Accu-Probe 5 ft Soil Gas Probe Sampling Kit

Description	Unit	Part #
<b>Accu-Probe Soil Gas Probe Kit - 50cc/min</b> (600cc, 1L, or 1.4L Cans sold separately)	EA	<b>SG-AP-50-Kit</b>
<b>Accu-Probe 5 ft soil gas probe</b>	EA	SG-AP-60
50cc/min Chameleon with FQT on Inlet/Outlet. Includes down-hole gauge for measuring vacuum below ground soil	EA	SG-CHAM-QQ-050
50cc plastic preflush syringe	EA	07-20050
16 Gauge Sub-Slab Dispensing Needle	5pk	07-20018

## Accu-Probe 5 Ft Soil Gas Probe Sampling Kit w/ Tracer Gas Shroud

Description	Unit	Part #
<b>Accu-Probe Soil Gas Probe Kit - 50cc/min</b> (600cc, 1L, or 1.4L Cans sold separately)	EA	<b>SG-AP-SHR-50-Kit</b>
<b>Accu-Probe 5 ft soil gas probe</b>	EA	SG-AP-60
50cc/min Chameleon Shroud Sample Train. Includes 3 way valve, magnetic latch, & down-hole gauge for measuring vacuum below ground soil	EA	SG-CHAM-TC-050-S
50cc plastic preflush syringe	EA	07-20050
Tracer Gas Shroud for Butane or Helium	EA	SG-He-Shroud
1/8" Silonite Line from Probe to 3-Way, with FMQT and 1/8" to 1/4" Tube Adapters	EA	SG-SHR-APVI
16 Gauge Sub-Slab Dispensing Needle	5pk	07-20018

Individual Parts	Unit	Part #
Accu-Probe 5ft soil gas probe	EA	SG-AP-60
Probe Cap to block ambient air - for Soft Soil	EA	SG-AP-CAP
600mL MiniCan with Micro-QT™ Valve	EA	29-MC600QT
1L Silonite-XL MiniCan	EA	29-MC10LQT
Helium Analyzer (0.1-100%)	EA	SG-He-Analyzer
16 Gauge Sub-Slab Dispensing Needle	5pk	07-20018

## Deep Well Monitoring

### Get the Whole Picture by Canister Sampling

In order to test contaminants well into the vadose zone or near the water table, deeper holes or “permanent sampling wells” must be installed. The Entech Chameleon Soil Gas Samplers connect to the tubing that is installed into these wells for easy and controlled filling into inert Silonite-XL™ coated, canisters. Since these sampling sites are installed by different companies or agencies, the Chameleon was designed to change its inlet and outlet to adapt to whatever connections are needed, ultimately reducing the number of leak points and places for VOC contamination to build up.

#### Advantages:

- Simple, reliable, gas-tight connections ensures proper sampling.
- Chameleon is sent to the field under vacuum, to prove the entire sample train is leak-tight while also preventing contamination during shipping.
- Select the Chameleon that provides the required sampling rates (typically 150 or 200cc/min) based on agency requirements.
- Easily disassemble the entire Chameleon to clean parts if water is accidentally pulled into the sampler.
- Fewest number of fittings due to unique design of Chameleon.



*SG-MW-SHR-200-Kit Gas Shroud ensuring >95% soil gas collection*

*SG-MW-SHR-200-Kit Gas Shroud shown*



#### Soil Gas Monitoring Well Sampling Kit w/out Shroud

Description	Unit	Part #
<b>Monitoring Well Kit, 200cc/min</b> (600cc, 1L, or 1.4L Cans sold separately)	EA	<b>SG-MW-200-Kit</b>
200cc/min Chameleon, (no Down-hole Vacuum Gauge)	EA	SG-CHAM-QQ-200
50cc plastic preflush syringe	EA	07-20050
16 Gauge Sub-Slab Dispensing Needle	5pk	07-20018

#### Soil Gas Monitoring Well Sampling Kit w/ Tracer Gas Shroud

Description	Unit	Part #
<b>Monitoring Well Kit, 200cc/min</b> (600cc, 1L, or 1.4L Cans sold separately)	EA	<b>SG-MW-SHR-200-Kit</b>
200cc/min Chameleon Shroud Sample Train. Includes 3 way valve, magnetic latch, & down-hole gauge for measuring vacuum below ground soil	EA	SG-CHAM-TC-200-S
50cc plastic preflush syringe	EA	07-20050
Helium Tracer Gas Shroud	EA	SG-He-Shroud
16 Gauge Sub-Slab Dispensing Needle	5pk	07-20018

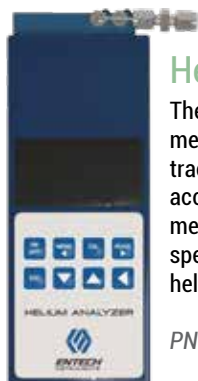
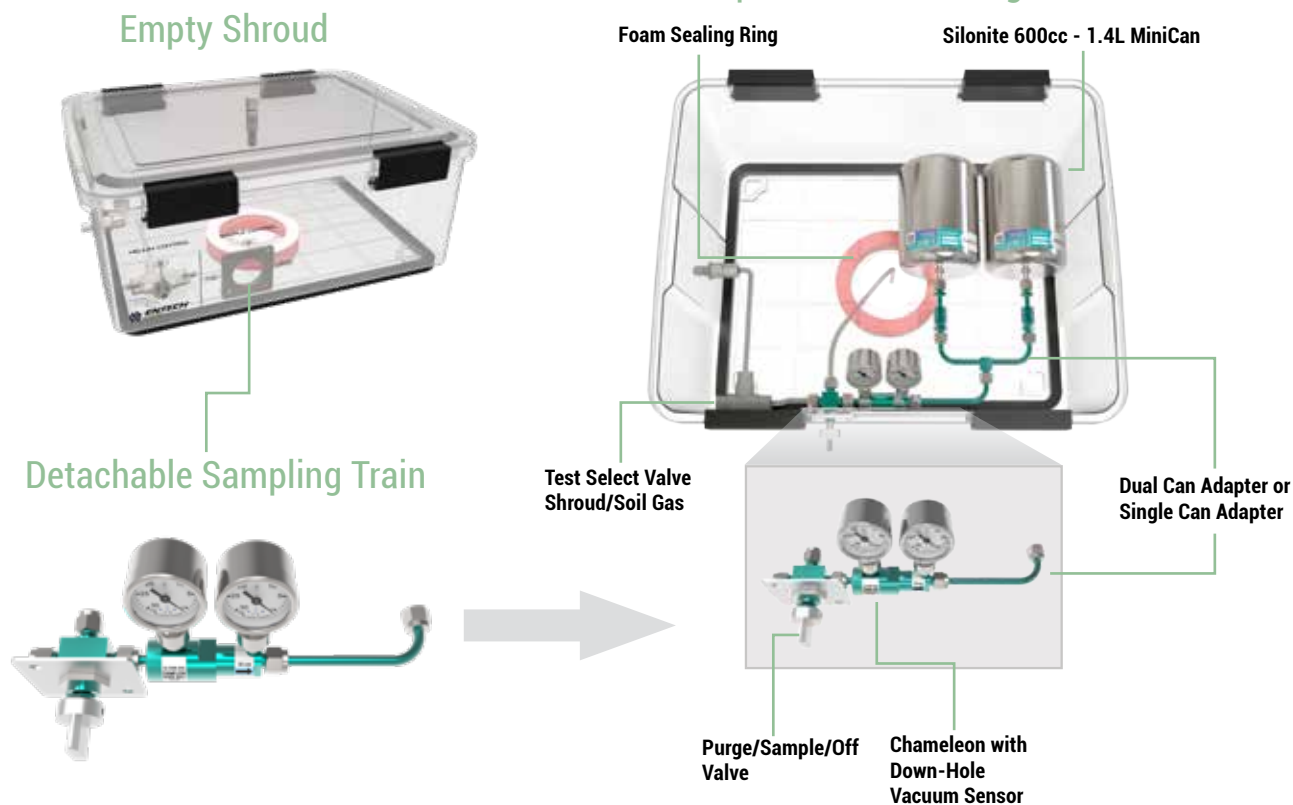
Individual Parts	Unit	Part #
600mL MiniCan with Micro-QT™ Valve	EA	29-MC600QT
1L Silonite-XL MiniCan	EA	29-MC10LQT
Optional Dual Can Adapter	EA	39-99014QT
Helium Analyzer (0.1-100%)	EA	SG-He-Analyzer
16 Gauge Sub-Slab Dispensing Needle	5pk	07-20018



## Helium Tracer Gas Shroud Solution

The Entech helium shroud solution was designed to be easy to use, easy to clean, and affordable. It delivers on all points by allowing for the entire soil gas train to be connected and disconnected from the shroud in just seconds through the utilization of a magnetic latching system. The inexpensive shroud can be reused over and over with clean evacuated sampling trains that are shipped directly from the lab and snap right in! The sample trains are sent under vacuum, therefore just a quick glance at the gauge is all it takes to satisfy the field shut-in test.

### Example Well Monitoring Shroud



### Helium Analyzer

The Entech He / O<sub>2</sub> analyzer is a precision instrument for measuring the concentration of oxygen and helium in the tracer gas shroud. The analyzer is characterized by high accuracy and reliability thanks to innovative measurement techniques. The technology works by measuring the speed of sound, thus there is never a need to change the helium sensor.

*PN SG-He-Analyzer*

### Helium Tank & Regulator

Entech provides 1800 psig He cylinders with a regulator, operated at 2-200 psi, to complete the all-in-one sampling solution.

*PN SG-He-Cylinder*



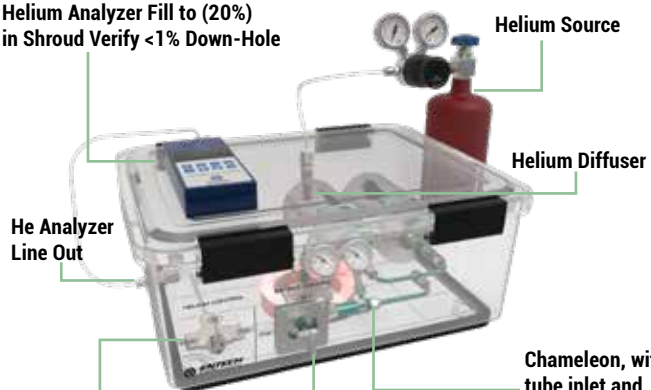


## TRACER GAS SHROUD FOR ACCU-PROBE



## TRACER GAS SHROUD FOR VAPOR INTRUSION

Helium Analyzer Fill to (20%)  
in Shroud Verify <1% Down-Hole



**Purge/Helium Monitor Select Valve**

1. Pre-Purge/Helium in Soil Gas Test
2. Off
3. Helium Level in Shroud Test

**Soil Gas Select Valve**

1. Pre-Purge/Helium Gas Test
2. Off
3. Sample

**Chameleon, with 1/4" tube inlet and Compression outlet**

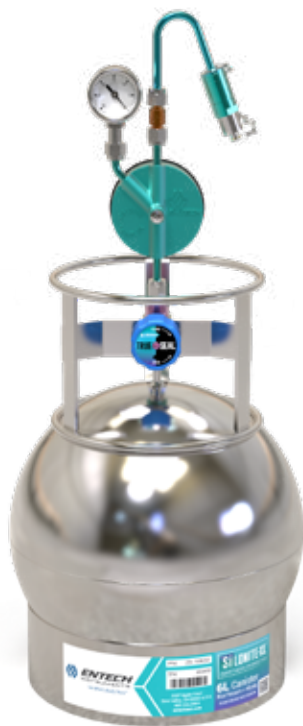
50cc/min for Slab-Tight Samplers,  
100 to 200cc/min for Permanent Wells



## TRACER GAS SHROUD FOR WELL MONITORING



## CS1200E Indoor Air Quality Monitoring Solution

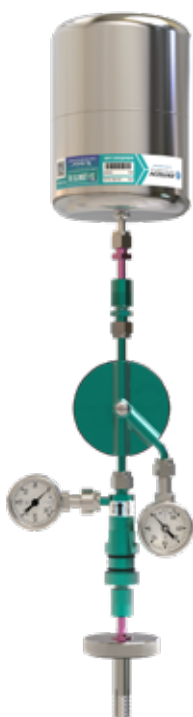


- Industry standard for time integrated sampling, from 1 hour to 1 month!!
- Proven recovery of low level T015 compounds to sub-PPBv levels (App Note 2014-05).
- Ultra low background, allowing measurements down to  $10^{-6}$  risk factors reliably, even for compounds requiring detection down to 2 part per trillion.
- Tool-free operation when using Micro-QT™ Valve Option.
- Easy start/stop automation if needed with TM1200 Timer.
- Now even better with improved Silonite™ coating!!

### Indoor Air Quality Test Kit

Description	Unit	Part #
<b>24 Hour Sample - 6L Canister</b>	EA	<b>IAQ-60S-24-KIT</b>
6L Can with coated TrueSeal™ Valve	EA	29-10622
Coated Flow Controller	EA	39-CS1200ES4
<b>24 Hour Sample - 3.2L Canister</b>	EA	<b>IAQ-32S-24-KIT</b>
3.2L Can with coated TrueSeal™ Valve	EA	29-10322
Coated Flow Controller	EA	39-CS1200ES4+

24 Hour Kits are available for 600cc & 1L canister sampling



### Optimized Soil Gas Sampling

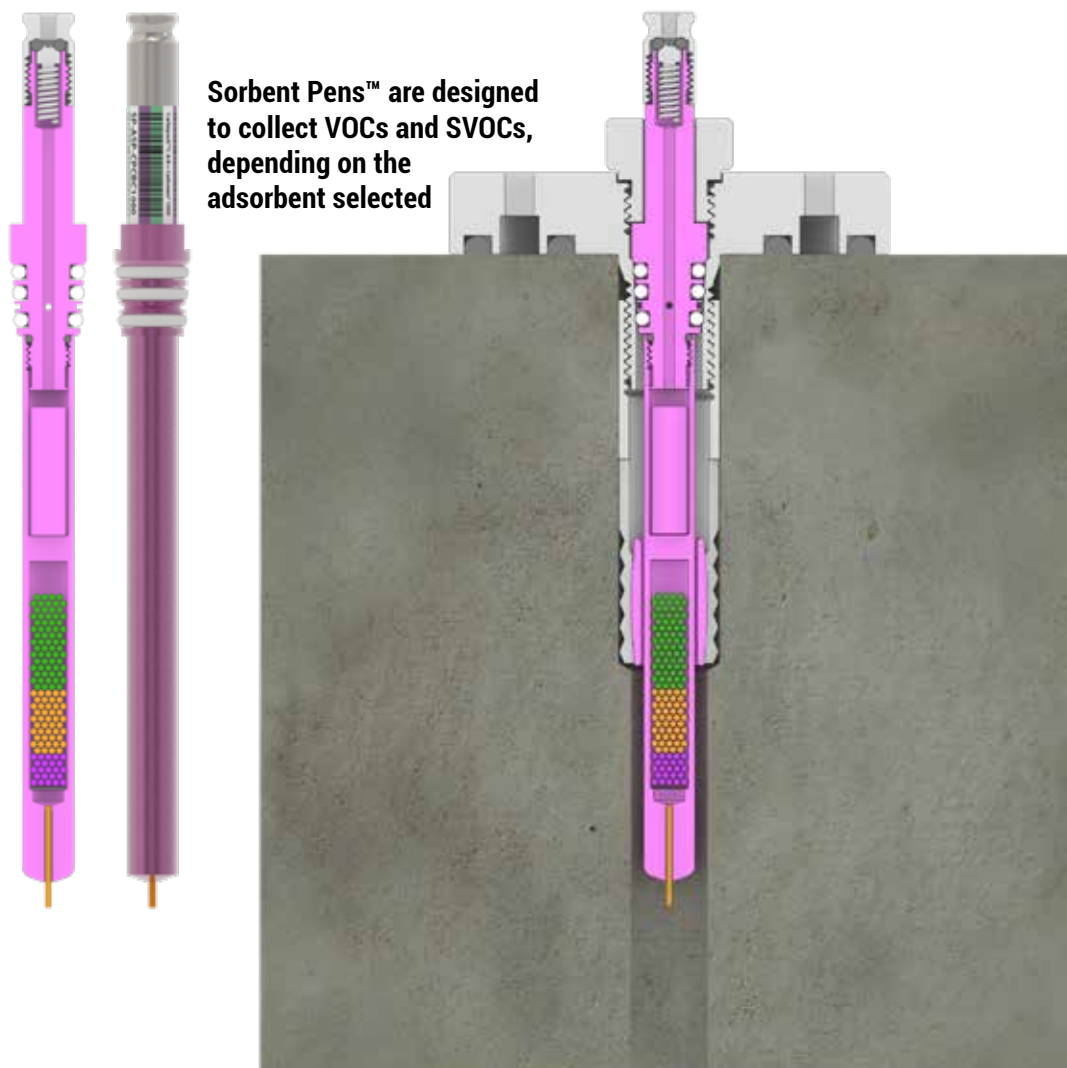
Slowing Down the Sampling Rate to 0.1 to 3 cc/min

- Combining the CS1200E and the Chameleon can drop the sampling rates down below the 10 cc/min limitation of the Chameleon alone.
- Allows a 3-24 hour sampling into a 600cc to 1L Silonite-XL canister if needed.
- The CS1200E can be added to any Chameleon application.

*\*Note: Leak checking is not needed for long sampling times where the sampling rates are far below the soil gas diffusion rates, making ambient air dilution of the soil gas highly improbable.*

## Soil Gas with Sorbent Pens™

### SVOC Recovery During Vapor Intrusion Sampling



- SVOCs will not transfer through lines or come out of canisters quantitatively.
- The correct adsorbent must be chosen to allow collection and then release by thermal desorption in the laboratory.
- The Sorbent Pen allows active sampling by connecting the outlet of the Chameleon to an evacuated canister with a restricted flow similar to our CS1200.
- Active sampling will provide non bias concentrations of PCB, Dioxins, Diesel and other SVOC's in the soil gas matrix.

## Sub-Slab Vapor Intrusion Semi-Volatiles Sampling Kit

For Recovering PCBs, Diesel, and other SVOCs



Description	Unit	Part #
<b>Sub-Slab Sampling, 10cc/min with Down-hole Gauge Kit</b> (600cc, 1L, or 1.4L Cans sold separately)	EA	<b>SG-SS-SP-10-Kit</b>
Anchor, Wedge, and Plug Kit	EA	SG-SS-AWP-Kit
Sorbent Pen Compatible Bonnet and Water Dam	EA	SG-SS-Bonnet-SP
Diffusive Air Monitoring Sorbent Pen w/ Tenax TA (35 / 60)	EA	SP-DSP-T3560
10 cc/min Chameleon with Female MQT Inlet/Outlet. Includes down-hole gauge for measuring vacuum below ground soil	EA	SG-CHAM-QQ-010
50cc plastic preflush syringe	EA	07-20050
16 Gauge Sub-Slab Dispensing Needle	5pk	07-20018

Individual Parts	Unit	Part #
Slab Anchor and Plug Kit - Not reusable. One needed per installation.	EA	SG-SS-AWP-Kit
600mL MiniCan with Micro-QT™ Valve	EA	29-MC600QT
1L Silonite-XL MiniCan	EA	29-MC10LQT
16 Gauge Sub-Slab Dispensing Needle	5pk	07-20018

## Industrial Hygiene Sampling

Canisters and Bottle-Vac™ samplers provide an exciting new way to collect whole air samples in the workplace to determine exposure levels. Whole air sampling does not attempt to “extract” chemicals at the time of sampling, and is therefore inherently more reproducible and defensible than badge, cartridge, and tube sampling. Whether performing Ceiling, STEL, or Time Weighted Average sampling, detection limits are always the same because the total amount of sample collected in each case is the same. Interaction of the target compounds with the matrix is substantially reduced by leaving the sample analytes in the gas phase, virtually eliminating any matrix effects on target compound measurements.

### Ceiling – Vacuum Grab Sampling

5-10 sec 

### STEL – Vacuum Sampling or Helium Diffusion Sampling™ (HDS)

15 min 

### Ceiling – CS1200P/ MiniCan™ Vacuum Sampling or Helium Diffusion Sampling™ (HDS)

1-8 hrs 

## Ceiling Measurements with Canisters

Ceiling measurements have historically been a challenge because there is no way to quickly and reproducibly collect a sample using tube and badge samplers. MiniCans™ and Bottle-Vac™ samplers make this easy. Simply opening and closing the evacuated container accomplishes the task in just a few seconds with extremely high precision. These whole air samplers can easily be checked prior to filling to show that they are still under vacuum; assuring a defensible sample collection process. Detection limits are equal whether performing STEL or TWA sampling procedures, because the sampling container is always filled with the same amount of sample. For example, even a small 50cc MiniCan™ or Personal Monitor using vacuum to collect the sample will achieve the same detection limits as the larger sampling MiniCans™ and Bottle-Vacs™ because just 0.25cc is typically used during each analysis to achieve a 0.05 PPM detection limit for most compounds by GC/FID or GCMS.

*HDS™ Personal Monitor shown using vacuum rather than helium diffusion sampling to collect an instantaneous ceiling measurement sample.*



## Filtered Grab Sampling (Options & Accessories)

Description	Unit	Part #
500mL Bottle-Vac™	EA	29-BV500A
450mL MiniCan™	EA	29-MC450QT
HDS Indoor Air Sampler with Filter	EA	39-HDS-F01
30-0"Hg Vacuum Gauge (w/Micro-QT)	EA	29-70010QT



## STEL Monitoring - Vacuum Sampling Bottles

Short Term Exposure Limit, or STEL monitoring can be performed using either evacuated Bottle-Vac™ samplers and MiniCans™ or using the new HDS™ Personal Monitors.

Vacuum sampling for 15 minutes into a Bottle-Vac™ or MiniCan™ is easily accomplished using a simple restrictor and transfer line leading to the evacuated sampler worn on a convenient waist-mounted pouch. The chart below shows the fill times based on the size of the sampler used. Note that filling with a critical orifice sampler maintains a constant flow rate only until the canister or Bottle-Vac™ is half full, then the flow rate will begin to decrease. Fortunately, the sampling can be stopped at 50% of atmospheric pressure while still providing several times the amount of sample needed by a laboratory to perform the analysis. Typically laboratories will measure the pressure, dilute the sample 2–3x to create a positive pressure in the container, and then adjust for the dilution when determining concentrations. Using this approach, the dilution amount is very reliably determined via pressure measurement, allowing a high degree of accuracy.



STEL monitoring shown with Silonite™ filtered inlet line sampling directly into a Bottle-Vac™ in pouch attached to belt.



### Restrictors and Canister Fill Times

Part No.*	Code	Approx. Flow Range	500mL Bottle-Vac™	450mL MiniCan™	Replacement Restrictor **
39-IH1200QT1	1	50-150cc/Min	2 - 12 Min	2 - 10 Min	39-23010
39-IH1200QT2	2	20-60cc/Min	8 - 30 Min	7 - 25 Min	39-23030
39-IH1200QT3	3	7-21cc/Min	25 - 90 Min	20 - 75 Min	39-23080
39-IH1200QT4	4	2-6cc/Min	1.2 - 4 Hrs	1 - 3 Hrs	39-23240
39-IH1200QT5	5	0.5-1.5cc/Min	4 - 12 Hrs	3 - 10 Hrs	39-24010
* 39-IH1200QTSx Restricted Sampler w/Silonite™ (Replace x with desired flow code)					
** 39-2XXXXS Replacement Restrictor w/Silonite™ (Add "S" to Restrictor PN)					

### Items needed for 15 Minute STEL Sampling.



PN 39-36020



PN 29-70010QT



PN 39-35015



PN 39-RS-FQTS6



PN 29-BV500AS

Description	Unit	Part #
500mL Bottle-Vac™ Sampler	EA	29-BV500A
450mL MiniCan™ Sampler	EA	29-MC450SQT
30-0"Hg Vacuum MicroValve™ Gauge	EA	29-70010QT
IH1200 Silonite™ Inlet Line	EA	39-36020
Silonite™ Female Restricted Sampler	EA	39-RS-FQTS6
Replacement Silonite™ Filter	EA	39-92150
MiniCan™ / Bottle-Vac™ Pouch (Attaches to Belt)	EA	39-35015



## IH1200 Personal Monitoring System

The IH1200 Personal Monitors utilize classical vacuum sampling into MiniCans™ and Bottle-Vacs™ to perform STEL or TWA monitoring for up to 12 hours. Like HDS Personal Monitors, sampling using the IH1200 eliminates the concentration and matrix effects associated with adsorbent-based sampling techniques. The IH1200 is universal, recovering all analytes in a single sampling event with no need to choose different media. Large flow rate adjustments are made by changing inlet restriction (see table below), while fine adjustments (2–3x) are made using a built in flow adjust feature. Enough sample is collected to allow multiple analyses in the laboratory, with detection limits down to low PPB if needed. The IH1200 meets the requirements of OSHA Method PV2120 for determination of workplace contaminants using MiniCan™ samplers. The sampling procedure is easy: Connect an evacuated MC450QT MiniCan™ or 500mL Bottle-Vac™ and sampling starts. Monitor the fill rate on the built-in gauge to document a constant fill rate during the sampling event; disconnect the canister to stop sampling.

**Flow Restrictor**  
(Restrictor elements shown in table below)



*The IH1200 System maintains accurate sampling flow rates without loss of volatile chemicals.*

### IH200 - Restrictors and Canister Fill Times



**IH1200**  
*Personal Monitoring System.*

Part No.*	Code	Approx. Flow Range	500mL Bottle-Vac™	450mL MiniCan™	Replacement Restrictor **
39-IH1200QT1	1	50-150cc/Min	2 - 12 Min	2 - 10 Min	39-23010
39-IH1200QT2	2	20-60cc/Min	8 - 30 Min	7 - 25 Min	39-23030
39-IH1200QT3	3	7-21cc/Min	25 - 90 Min	20 - 75 Min	39-23080
39-IH1200QT4	4	2-6cc/Min	1.2 - 4 Hrs	1 - 3 Hrs	39-23240
39-IH1200QT5	5	0.5-1.5cc/Min	4 - 12 Hrs	3 - 10 Hrs	39-24010
* 39-IH1200QTSx Restricted Sampler w/Silonite™ (Replace x with desired flow code)					
** 39-2XXXXS Replacement Restrictor w/Silonite™ (Add "S" to Restrictor PN)					

### IH200 Personal Monitoring System & Accessories

Description	Unit	Part #
<b>IH1200 Personal Monitoring System</b>	EA	39-IH1200QTx
<b>Includes:</b>		
Personal Monitoring Flow Controller	EA	39-CS1200Px
Female Micro-QT™ Valve	EA	FQT-400
Sampling Belt	EA	39-35000
Sampling Holster	EA	39-35010
Silonite™ Inlet Line (w/Teflon® Sleeve)	EA	39-36020
Silonite™ Inlet Filter	EA	39-36050
450mL MiniCan™ (w/ Micro-QT™ Valve)	EA	29-MC450QT
500mL Bottle-Vac™ Sampler	EA	29-BV500A
30-0"Hg Vacuum Gauge, Back Port (¼" SS Nut and ¼" G/V Ferrule)	EA	39-27565



**Silonite™ Sapphire Restrictor**  
PN 39-24010S



*Use the the FlowProfessor™ to accurately calibrate your IH1200 Samplers.  
(See page 76) PN 39-FP-03*

## Indoor Air Quality / Mold Monitoring (MVOC) Bottles

MiniCan™ and Bottle-Vac™ samplers can be used to sample for both indoor air contaminants and for Microbial VOCs. MVOCs are only found at elevated concentrations when there is live, growing mold present. Growing mold increases the likelihood of active, spore-bound microtoxins that have been shown to cause severe respiratory problems. The sample collection procedure for MVOCs is identical to that of general indoor air contaminants such as solvents and BTEX. In most cases, a grab sample is collected which takes only a few seconds to complete. Rapid sampling enables quick screening of a large number of indoor air environments.



MiniCan™ Samplers

Description	Unit	Part #
450mL MiniCan™ w/ Micro-QT™ Valve	EA	29-MC450QT
500mL Bottle-Vac™ Sampler	EA	29-BV500A
Filtered Grab Sampler for MiniCan™ / Bottle-Vac™	EA	39-HDS-F01
Bottle-Vac™ / MiniCan™ Carrying Case (16-Pos.)	EA	29-20500
Filterless Dry-Wall Sampler (Mold MVOCs)	EA	30-22530
Replacement Dry-Wall Needles	EA	30-22545



Dry-Wall Sampler  
PN 30-22530



Dry-Wall Needles  
PN 30-22545



An HDS™ Indoor Air Sampler can also be utilized as an excellent grab sampler using any standard MiniCan™ or Bottle-Vac™ under vacuum rather than Helium for easy sample collection. ([See page 88](#)) PN 39-HDS-F01



Indoor Air Quality & Mold Analysis – [p.132](#)  
Bottle-Vac™ Holding Study – [p.136](#)



Bottle-Vac™ Samplers

**Contact us to learn more about our mold sampling and analysis solutions.**

## HDS™ Personal Monitors

HDS™ Personal Monitors are a breakthrough technology based on helium diffusion that bring universal and defensible whole air canister monitoring into the realm of personal industrial hygiene monitoring. HDS™ Personal Monitors simplify the collection of chemicals in the workplace and deliver highly reliable results unaffected by factors that create errors in other diffusive samplers – **such as matrix concentrations, varying humidities, and fluctuating face velocities.** An HDS™ sample is easily collected based upon the reproducible diffusion of helium, slowly creating a vacuum that pulls air in actively as helium escapes. A surrogate recovery compound is added to prove recovery during laboratory analysis.

*HDS™ Personal Monitors. Available in 15 Minute, 1, 2, 4, and 8 Hour sampling versions.*



### HDS™ Personal Monitor Accuracy

Entech has engineered a new “twist” in whole air monitoring that eliminates many of the potential sources of error found in other sampling methods. Unlike other monitoring approaches such as tubes and badges, the new HDS™ Monitor enables compounds to remain in the gas phase where chemicals are much less likely to interact. The HDS™ sampler has the inertness of a GC column, allowing chemicals to remain stable for up to months after sampling. Since there is no adsorption/desorption process, the HDS™ monitor is universal for all GC compatible chemicals. The only choice to be made is selecting the required sampling duration.

### Proof of Sampler Integrity in the Field

Before going out to the field, each HDS™ Personal Monitor is vacuum cleaned and pressurized with helium at 5–10psig. A surrogate chemical called Bromofluorotoluene (BFT) is also added to validate leak-free operation and ensure the inertness of every sampler. Entech offers a pressure gauge to confirm a positive helium pressure immediately before field sampling to verify that unwanted sampling into the HDS™ Personal Monitor has not occurred. This pressure is measured and recorded at the time of sampling as proof of sampler integrity. Sampling starts when the control valve is removed and stops when the valve is re-attached. It's that simple.

### Reproducible Sample Collection

The sampling rate of the HDS™ Personal Monitor is unaffected by changing face velocities caused by air movement around the sampler. Uptake rate is also unaffected by analyte concentrations, matrix variations, and sample collection temperatures from 0°C to 40°C. With tubes and badges, a multi-chemical sampling event may adversely affect analyte uptake rate and stability to an unknown degree. The adsorption of these compounds concentrates them, allowing for much higher potential reaction rates as compared to the HDS™ Personal Monitor, where the compounds remain diluted in the gas phase. Changes in relative humidities can affect the hydrophobic properties of badge samplers, creating different uptake rates. Conversely, a humid or dry environment does little to change the diffusion rate of helium and the active collection of the humid or dry air sample.



## HDS™ Personal Monitor Sampling Procedure

After verification of positive pressure to confirm a leak-free sampler, the HDS™ Personal Monitor is positioned on the individual to be monitored. Removing the valve commences the sampling process. After the desired sample collection period, the valve is replaced and the sampling duration is recorded. The sampler is now ready to be sent to the laboratory for analysis.

### Laboratory Verification of Sample Collection

Although the HDS™ Personal Monitors are very consistent, there is no reason to have to assume proper sample collection as with other workplace sampling devices. Since air is 7.3 times heavier than helium, the amount of air collected can be determined in the laboratory by weight. Measuring the weight to the nearest 0.2mg and then subtracting the weight of the sampler after evacuation will provide the % air collected to an accuracy of  $\pm 1\%$ . No other workplace monitoring technique offers this level of certainty and defensibility.

### Reliable Sample Recovery

During laboratory analysis, proof that the sample was properly injected is obtained by verifiable recovery of an internal standard. Prior to analysis, the HDS™ Personal Monitor is pressurized with 7psig of nitrogen which contains an internal standard called Fluorobenzene (FB). Unlike adsorbent-based sampling devices, whole air samplers are uniquely capable of completely mixing the collected sample with a surrogate or internal standard prior to delivery into the analyzer. Only by creating a completely homogeneous mixture can sample recovery be proven by monitoring the response of the surrogate or internal standard.

### Accurate and Defensible Sample Analysis

Whether performing GC/FID or GCMS, accuracy depends upon the ability to reproducibly measure a sample aliquot and completely transfer the sample to the analyzer while eliminating unwanted matrix components (air, water, CO<sub>2</sub>). Concentrations down to 0.1 PPMv can be quantified by loop injection with no matrix management, typically yielding precision from 1–3%. Lower detection limits can be achieved by preconcentrating 10–20mL prior to GC/FID or GCMS injection, providing detection limits down to about .003 PPM. In either case, the response of an internal standard provides reliable confirmation of the actual volume analyzed. Monitoring accuracy and sampler inertness is also validated by recovery of the BFT surrogate.



*HDS™ Personal Monitors shown with the 7650-L20 Headspace Inlet*



*HDS™ Personal Monitor collection in the field. Helium Diffusion through a precise orifice results in defined active sampling of air and industrial chemicals.*



# HDS™ Personal Monitor Sampling

## How does Helium Diffusion Sampling work?

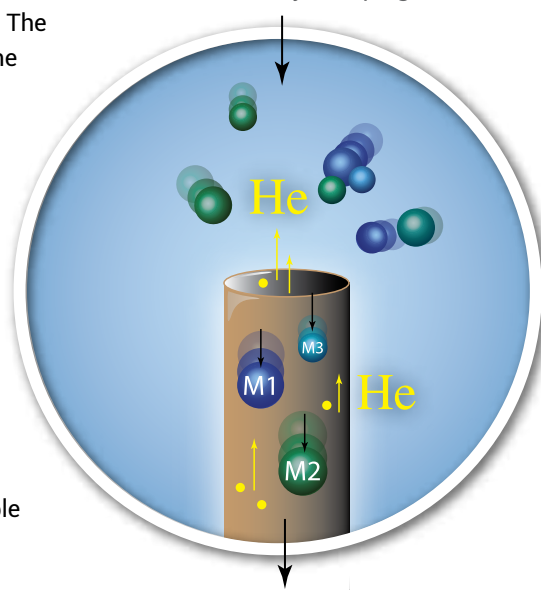
Helium diffuses much faster than air and other chemicals to be sampled. The vacuum created by escaping helium actively draws surrounding air into the sampler. This active sampling of air prevents any loss of compounds through reverse diffusion and normalizes characteristics of all compounds despite differences in diffusion rates.

The 15 minute, 1, 2, 4, and 8 Hour HDS™ Monitors use different diffusion zones to achieve their respective sampling rates. This design means all monitors feature the SAME detection limits whether performing TWA or STEL measurements. An evacuated version of the HDS™ Monitor can also be used to collect an immediate sample for ceiling measurements.

Every HDS™ Monitor contains a surrogate recovery compound called Bromofluorotoluene (BFT). The recovery of this compound ensures sample integrity.

Replacing the valve on the HDS™ Monitor after a sampling event effectively isolates the sample until analysis.

Air is actively drawn into the vacuum created by escaping Helium.



Flow rate exceeds back diffusion rate, preventing losses of sampled compounds.

## Features

### Universal Sampling

No need to select media based on target analyte. Like canisters, the HDS™ Personal Monitor is **universal**.

### Reliable Sampling Rates

Sampling rates are not affected by humidity, temperature, or sample matrix variables. Best of all, the HDS™ Monitor is not affected by changes in face velocities and works effectively in absolutely "still" air.

### Amazing Detection Limits

Analysis of 4–8 Hour HDS™ Monitors utilizing 10cc gives detection limits 5–7 times lower than badges. The 1 Hour and 15 Minute HDS™ Monitors provide detection limits as much as 100 times lower than badges. All 5 HDS™ Personal Monitors provide the SAME detection limits – **they all collect the same amount of sample!**

### Superior Quality Assurance

Contamination free sampling is assured by field pressure measurement and BFT recoveries. No solvent workup is needed, making the HDS™ Personal Monitors ideal for analysis by GCMS.



## HDS Personal Monitor User's Guide

- 1 Confirm under positive pressure (3–10psig helium) using gauge. Test Gauge PN: 29-70020QT (Available separately)
- 2 Place HDS™ in holder near breathing zone and remove valve for 50–100% of the suggested sampling periods. HDS™ Holder PN: 39-35026 (Available separately)
- 3 Replace valve and record time duration of sampling event.
- 4 Send to laboratory for analysis.
- 5 Request type of analysis:
  - Standard 0.1 PPM and higher
  - Trace 0.01 PPM to 1 PPM
  - Ultra Trace (SIM) 0.001 PPM



## Why is the HDS™ Monitor so sensitive?

The HDS™ Personal Monitor features the ability to sample at a much lower rate than conventional badges and tubes. The collection of far less sample on a weight basis is one of the reasons why the HDS™ Personal Monitor allows for greater stability of chemicals, especially in a multi-chemical matrix, as bimolecular reaction rates are concentration dependent. During the analysis, a much larger “percentage” of the sample is utilized, making up for the decreased sampling rate. A comparison of badges and HDS™ Personal Monitors is shown below. This chart details the amount actually injected into the GCMS when analyzing 10cc from an Entech HDS™ Personal Monitor.

Sampling Media	Sampling Rate (cc/min)	Sampling Time (min)	Total Sample Collected	Extraction Solvent	Injection Volume	Injection Split	Equiv. Sample Injected (cc) *	Badge Normalized Sensitivity
Badge (8 Hour)	30	480	14400cc	2000µl	1µl	20:1	0.36	1.00
HDS™ Personal Monitor (8 Hour Version)	.033	480	16cc	N/A	10cc	1	2.6	7.2
Badge (15 Minute)	30	15	450cc	2000µl	1µl	20:1	0.01	1.00
HDS™ Personal Monitor (15 Minute Version)	1	15	13cc	N/A	10cc	1	2.2	220

\* Effective volume of original sample injected during analysis.

## HDS™ Sensitivity Advantage!



HDS™ Personal Monitors are available with this handy reusable shipping box.



HDS™ Personal Monitors with Silonite™ MicroValves™.



Monitor Holder  
PN 39-35026



30" Hg-0-40psig Compound Gauge  
PN 29-70020QT

Description	Unit	Part #
15 Minute HDS™ Personal Monitors*	EA	HDS-PM15M
1 Hour HDS™ Personal Monitors*	EA	HDS-PM1HR
2 Hour HDS™ Personal Monitors*	EA	HDS-PM2HR
4 Hour HDS™ Personal Monitors*	EA	HDS-PM4HR
8 Hour HDS™ Personal Monitors*	EA	HDS-PM8HR
HDS™ Personal Monitor Holder	EA	39-35026
30" Hg-0-40psig Compound Gauge	EA	29-70020QT

\* All Monitors (Helium + Bromofluorotoluene 1 PPM)  
Add "PK" to end of part number to order a 4 pack of that Personal Monitor.

## Arson Investigation



Description	Unit	Part #
450mL MiniCan™ with Micro-QT™ Valve	EA	29-MC450QT
500mL Bottle-Vac™ Sampler	EA	29-BV500A
3L Solvent Enhancement Enclosure	EA	39-63030QT
1 Min. MiniCan™ / Bottle-Vac™ Sampler	EA	39-RS-QT2
500mL LVH Vial (Box of 12)	12	39-75500W
500ml Wide Mouth Vial Cap	25pk	39-75500W-CP
Vacuum Sampler Check Gauge	EA	29-70010QT
Lid Punch for MicroValve™ (for collection canister)	EA	39-PUNCH312
Female Micro-QT™ Valve for paint can	EA	Call



Fill restrictors simplify the sampling process. An internal limiting orifice and filter control the fill rate while eliminating particulates.

## Emergency Response Sampling (ERS)

Monitoring for chemicals in response to accidental releases requires the sampling device to be mobile and easy to use. It should also be small, light and inexpensive. The MiniCan™ fits this description better than any other sampling device available. Featuring a Silonite-XL™ coated interior, the MiniCan™ becomes an essential, portable and cost effective extension of the GC analytical process.



MiniCan™ and Bottle-Vac™ samplers are ideal for investigating the presence of accelerants at a burn site. Vapor phase samples can be easily collected directly using restricted samplers, or Solvent Enhancement Enclosures (SEE). The self-contained vacuum pulls the sample into the container without a power source requirement.

Using MiniCans™ and Bottle-Vacs™ can also speed up laboratory sample preparation, as well as improve upon the sensitivity of accelerant detection. Currently, debris analysis is performed by placing a carbon strip into a paint can containing the debris and then waiting up to 24 hours before removal of the carbon strip to perform a solvent extraction.

Entech offers an improved “paint can” sample work-up solution which offers the benefits of canister sampling technology. Debris to be tested is collected into a paint can as usual, followed by delivery to the lab. The paint can cover is then replaced with a new can cover with an integrated female Micro-QT™ valve that creates a leak-tight seal at the time when the normal carbon strip is introduced. After 1–2 hours, some of the can's headspace is extracted into an evacuated MiniCan™ or Bottle-Vac™. Analysis of just 100cc of this headspace effectively increases the sensitivity of this technique by 50–100 times while eliminating the need for extraction solvents, making it more GCMS friendly. Analysis can be done quickly, with a same day sample turn around if required, and Arson Investigators may continue to use sampling methodologies they are comfortable with.

*MiniCans™ and Bottle-Vacs™ allow accelerant extraction from debris the same day, rather than waiting 24 hours required for classical charcoal strip passive transfer and solvent extraction, with 10 to 100 times greater sensitivity!*



MiniCans™ and Bottle-Vacs™ collect the entire sample, rather than trying to perform difficult separations right at the point of release (tube sampling). These vacuum samplers allow recovery of a wider range of flammable compounds than any other sampler, including chemical warfare agents and toxic industrial compounds from C2 to C25, and polar compounds as light as methanol. Even compounds like formaldehyde that were once thought to require derivitization can be sampled and analyzed directly by GCMS.

## Law Enforcement

The ability to collect and analyze gas phase samples for trace chemicals has many uses in forensic science. Some of the applications include:

- **Illegal Drug Laboratories**
  - Indoor Air Quality testing during cleanup
  - Locate chemical signature from "cooking" process
  - Identify presence of chemical signature in breath (for health risk determination and forensics)
  - Chemical signature on clothing via direct thermal desorption in Large Volume Headspace (LVSH) vials.
- **Detection of Drugs of Abuse**  
(or their metabolic breakdown products in breath)
- **Arson Investigation**
- **Detection of hidden chemicals**  
(Vehicles, containers, or warehouses from trace vapor signature.)

Description	Unit	Part #
500mL Bottle-Vac™ Sampler	EA	29-BV500A
Quick Fill Sampler	EA	30-22510
Restricted Sampler, Silonite™ Coated (1 minute in MC450QT and Bottle-Vac™)	EA	39-RS-QT1
Vacuum Sampler Check Gauge	EA	29-70010QT



Collecting a hazardous material sample.



Vapors can be sampled directly once a positive canine response is obtained.



MiniCan™ Sampler for Chemical Detection and Arson Investigations.



## Breath Analysis

Analysis of volatile chemicals in breath can be used to determine the extent of exposure, which finds applications in both industrial hygiene and forensic science. Measuring and comparing relative abundances of chemicals produced in the human body can also help to screen for many metabolic disorders and diseases.

The economical and disposable Breath Sampler (39-82000) allows non-equilibrated bronchial air to be first eliminated before collecting the deeper, alveolar air which is more representative of levels of chemicals in the blood. Conversely, collecting air using shallow, rapid breathing allows chemicals in the mouth to be sampled when studying oral hygiene or flavor changes during food consumption (aftertaste).

Description	Unit	Part #
Disposable Breath Sampler	EA	39-82000
Vacuum Sampler Check Gauge	EA	29-70010QT
500mL Bottle-Vac™ Sampler	EA	29-BV500A
1L Bottle-Vac™ Sampler	EA	29-BVL1A
500mL Amber Bottles, deactivated*	EA	39-75500AD
1L Amber Bottles, deactivated*	EA	39-75L1AD



Breath Sampler shown with 1L Bottle-Vac™.





Entrust your Sulfur Gas Sampling & Analysis to Entech's H<sub>2</sub>S Bottle-Vac™ Samplers!

## H<sub>2</sub>S Bottle-Vac™ Samplers

H<sub>2</sub>S and Methyl Mercaptan recovery has continued to be a analytical challenge when sampled into canisters at PPB to sub-PPB levels. The presence of more than 10–15% relative humidity within a sampling canister has been shown to dramatically reduce reliable storage time of H<sub>2</sub>S and to a lesser extent Methyl Mercaptan, relative to dry samples.

Fortunately, Entech offers an economical solution. Now, laboratories can choose to collect H<sub>2</sub>S and Methyl Mercaptan samples into new H<sub>2</sub>S Bottle-Vac™ canisters. These canisters are designed to accommodate a specific amount of Silica gel within the sampler in order to dehydrate the sample upon collection. This small amount of Silica gel effectively removes more than 90% of the water vapor without effecting quantitative recoveries of H<sub>2</sub>S and Methyl Mercaptan. Easily collect H<sub>2</sub>S, COS, and MeSH into 500mL and 1L H<sub>2</sub>S Bottle-Vac™ canisters and reliably retain >80% recovery even after a 1–2 week storage time prior to analysis. For the collection of heavier sulfur compounds which are less affected by humidity levels, simply utilize standard Bottle-Vac™ or Silonite-XL™ canisters.



## H<sub>2</sub>S Bottle-Vac™ Samplers

Description	Unit	Part #
500mL H2S Bottle-Vac™ Sampler	EA	29-BV500-H2S
1L H2S Bottle-Vac™ Sampler	EA	29-BVL1-H2S



## Low Pressure Reduced Sulfur (0.1–100 PPB)

Sulfur gases can be collected and analyzed using Silonite™ coated samplers and canisters. Sulfur compounds have been shown to be stable in Silonite-XL™ canisters for 1–2 weeks, allowing sufficient time to perform laboratory analysis, even if samples must be shipped over long distances after sampling. Odor threshold levels can be met using GCMS or GC/CLD (Chemiluminescence Detector) when preconcentrating 10–200cc of sample.

Maximum stability of H<sub>2</sub>S and Methyl Mercaptan requires relative humidities to be below 20%. When the relative humidity is above 20%, excess water can be absorbed using Bottle-Vac™ samplers that contain a small amount of anhydrous Silica gel. Just enough Silica gel is used to absorb most of the water without affecting H<sub>2</sub>S or Methyl Mercaptan concentrations, allowing these compounds to be stable for weeks. When monitoring a wider range of sulfur compounds, Entech recommends the use of two different samplers; the 29-BV500-H2S or 29-BVL1-H2S for H<sub>2</sub>S and Methyl Mercaptan, and a standard Bottle-Vac™ or Silonite-XL™ coated MiniCan™ or larger Silonite-XL™ canister for all other compounds. Silonite™ coated cylinders are also available for high-pressure refinery gas sampling environments and long-term storage requirements.

High-Pressure Refinery Gas  
Sampling Cylinders  
(See p.60 in the Silonite™ Section)



Bottle-Vac™ Samplers

## Sulfur Gas – TrueSeal™ Valve Canisters

Description	Unit	Part #
450mL MiniCan™ with Silonite™ TrueSeal™	EA	29-MC450SV
1L MiniCan™ with Silonite™ TrueSeal™	EA	29-MC10LSV
1.4L MiniCan™ with Silonite™ TrueSeal™	EA	29-MC14LSV
6L Canister with Silonite™ TrueSeal™	EA	29-10622
Restricted Grab Sampler for Silonite™ Canisters	EA	39-RS-x

(x=0 to 6. See restrictor codes on [pg. 82](#))



450mL, 1L, and 1400mL MiniCans™  
shown with MicroValves™ and TrueSeal™

## Sulfur Gas – Micro-QT™ Valve Canisters

Description	Unit	Part #
450mL MiniCan™ with Silonite™ Micro-QT™	EA	29-MC450SQT
600mL MiniCan™ with Silonite™ Micro-QT™	EA	29-MC600SQT
1L MiniCan™ with Silonite™ TrueSeal™	EA	29-MC10LSV
1.4L MiniCan™ with Silonite™ Micro-QT™	EA	29-MC14LQT
1L Bottle-Vac™ Sulfur Gas Sampler	EA	29-BVL1-H2S
Silonite™ Micro-QT™ Grab Sampler	EA	30-22510S
Silonite™ Micro-QT™ Restricted Sampler (x=0 to 6. See restrictor codes on <a href="#">pg. 82</a> )	EA	39-RS-QTx
Micro-QT™ Valve Vacuum Check Gauge	EA	29-70010QT
Female Silonite™ Micro-QT™ CS1200ESx Adpt.	EA	FQT-400S



Restricted Sampler for Micro-QT™ Canisters  
39-RS-QTSx (See Codes on [p.83](#))



Restricted Sampler for TrueSeal™ Canisters  
PN 39-RS-x

## Sorbent Pens™ for Quantitative Air Monitoring

Sorbent Pens are Entech's high-tech version of classical thermal desorption tubes. Two different Sorbent Pen versions are used to either collect air samples via diffusion without the aid of a pump (Diffusive Sorbent Pens, or DSPs), or by utilizing a pump or vacuum sampling device to draw a known volume of air through the sorbent (Active Sampling Pens, or ASPs). Unlike the standard thermal desorption tubes that use the same geometry to do either diffusive or active sampling, Sorbent Pens have been optimized to improve performance for both sample collection approaches. In addition, Sorbent Pens have an integrated valve on one end and a tool-free sealing sleeve to seal the other end, which not only simplified their operation, but takes the guess work out of which side to sample into, and which side to desorb out of. With Sorbent Pens, there is no way to get this backwards!!

### DSP - Diffusive Sorbent Pens™



**1 hour to 2 weeks**

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

#### When To Use?

- Use when sampling for 1 hour to 2 weeks
- When the boiling point range is not too large  
example C4-C8  
For compounds that are NOT bound to particles (under C16)
- When method calls for diffusive sampling

#### Benefits?

- Very easy use
- No pumps or vacuum source
- Uptake rate known for dozens of compounds
- Ideal for BTEX monitoring
- Both Environmental and Industrial Hygiene applications

### ASP - Active Sorbent Pens™



**5 minutes to 8 hours**



#### When To Use?

- Use for faster sample collection: *5 min to 8 hours*
- For wider boiling point ranges:  
(-40° C to >500° C)
- When method requires an active sampling

#### Benefits?

- Multiple adsorbent traps are available which substantially increases the range of recoverable compounds
- Accurate volume collection measurements made using Entech's Accu-Bottle vacuum sampler



# Diffusive Sorbent Pens™ for Passive BTEX Monitoring



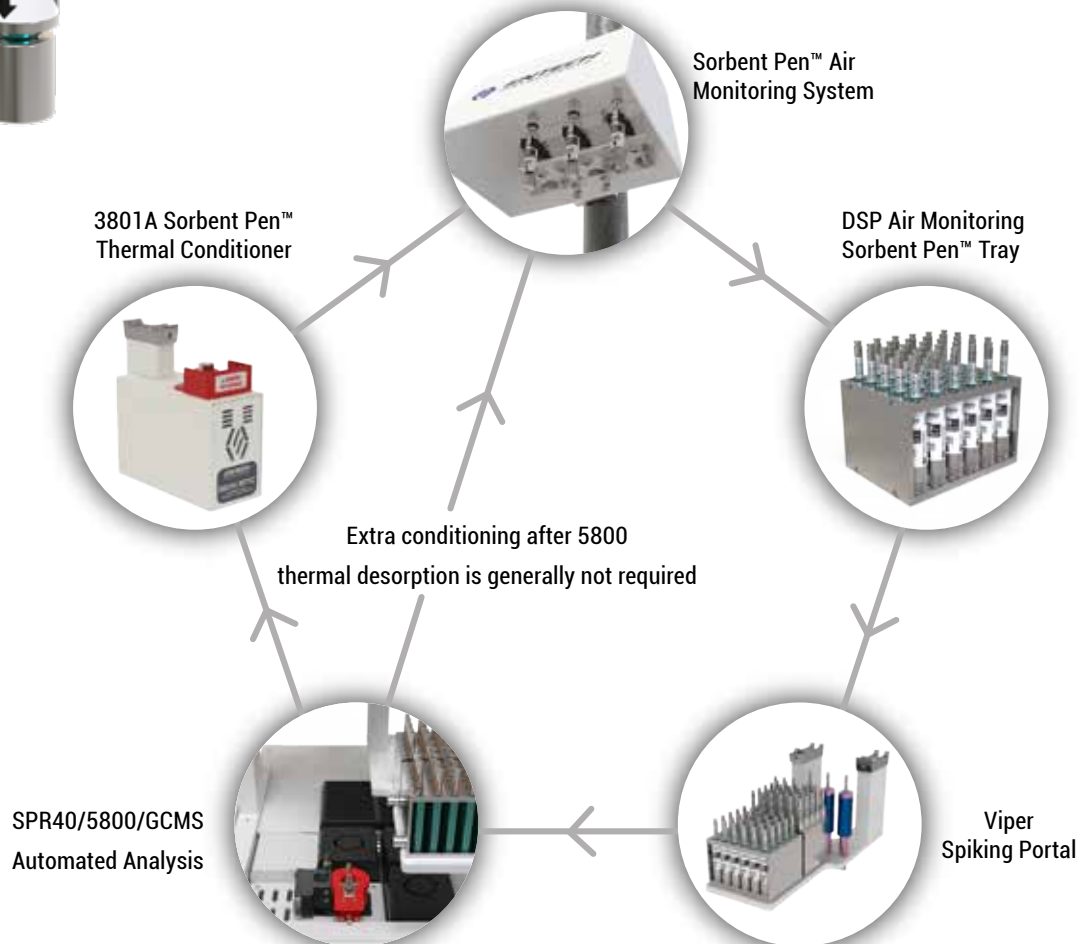
## Passive BTEX Sampling for Fenceline or Community Monitoring



- 8 hr - 2 week passive sampling provides highly reproducible results for BTEX and similar boiling range VOCs when using DSP Sorbent Pens with Carboxack X sorbent
- More reproducible than radial samplers because sample is backflushed during thermal desorption rather than pushed through the entire adsorbent bed
- Carbon Tetrachloride is quantitatively recovered, so Global background of 70 ppt can be used to validate proper sampling for collections lasting 8 hours or more



## An Affordable End-to-End Solution



# DSP Sorbent Pen Air Monitoring Components



Isolated Sorbent Pen for storage and transportation from lab to field and back. No crushing of tops and bottoms of tubes, common with nuts and ferrules on 3.5" TD tubes, so sampling rates remain the same.

During sampling, bottom isolation caps are placed on top of the Sorbent Pens for safe keeping.

Diffusers to prevent wind from affecting sampling rates.



Field Blank (not sampling)



DSP/ASP Plug  
PN: SP-DSPA-PLUG



DSP/ASP Retaining Cap  
PN: SP-DSPA-CAP



DSP Isolation Sleeve  
PN: SP-DSP-SLEEVE

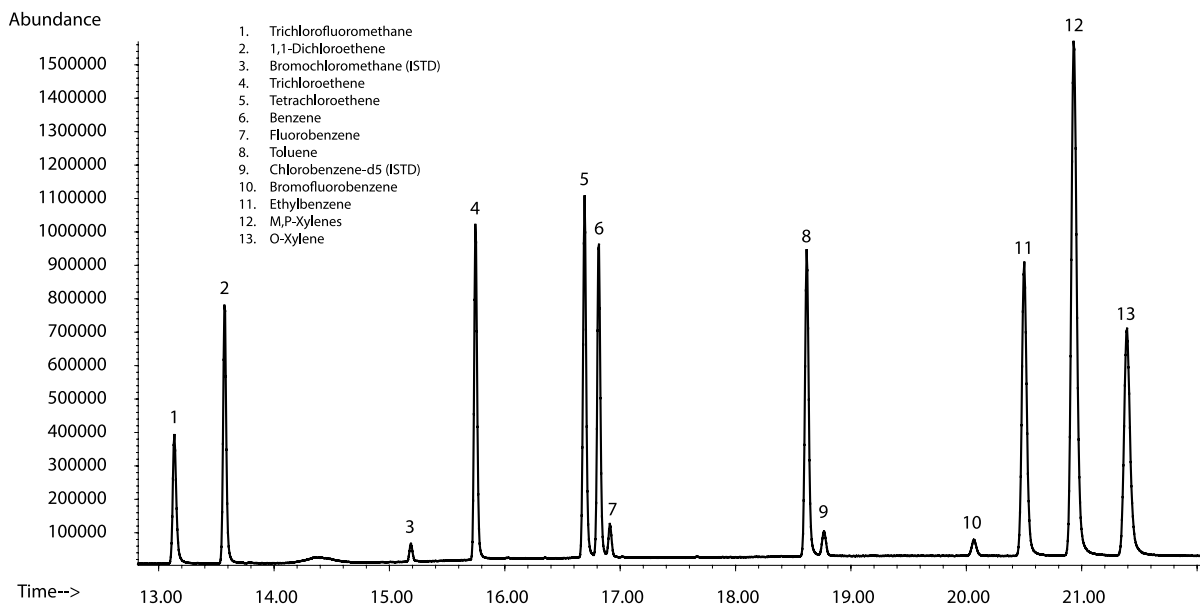
Diffuser Cap  
PN: 19-5800-138

## Sampling Rates of Several Compounds into SP-DSP-CPX

Compound	Carbopack™ X
1, 1-Dichloroethene	0.57 ±0.14
3-Chloropropene	0.51 ±0.3
1, 1-Dichloroethane	0.57 ±0.1
1, 2-Dichloroethane	0.57 ±0.08
1,1,1-Trichloroethane	0.51 ±0.1
Benzene	0.67 ±0.06
Carbon tetrachloride	0.51 ±0.06
1, 2-Dichloropropane	0.52 ±0.1
Trichloroethene	0.5 ±0.05
1, 1, 2-Trichloroethane	0.49 ±0.13
Toluene	0.52 ±0.14
Tetrachloroethene	0.48 ±0.05
Chlorobenzene	0.51 ±0.06
Ethylbenzene	0.46 ±0.07
m, p-Xylene	0.46 ±0.09
Styrene	0.5 ±0.14
o-Xylene	0.46 ±0.12
p-Dichlorobenzene	0.45 ±0.05

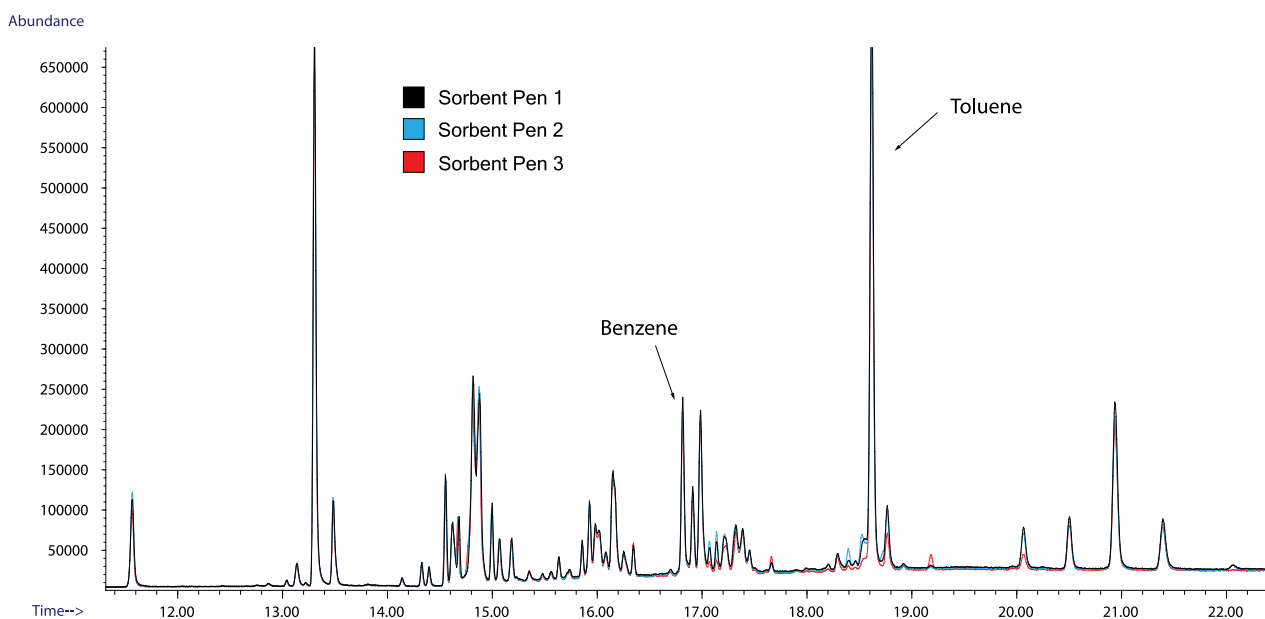


## Gaussian Peak Shape without LN2 Focusing. Back-flushing Eliminates Ghost Peaks and Reduces Run Times



**Figure 1** - BTEX Standard Corresponding to 6 PPBv for Benzene as sampled for 1 week.

## Triplicate Sampling of Diffusive Sorbent Pen Virtually perfect overlap of BTEX Compounds

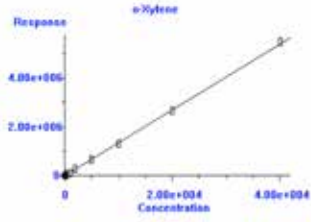
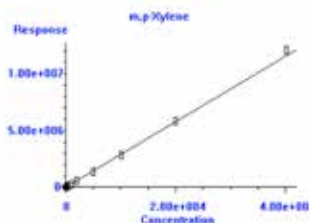
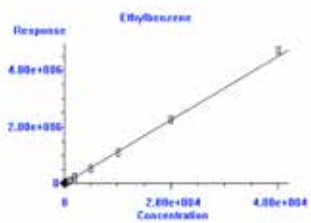
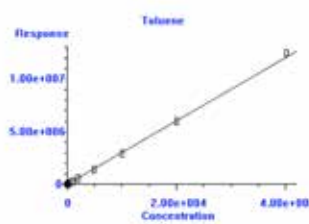
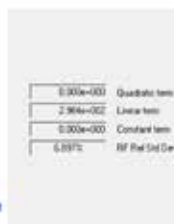
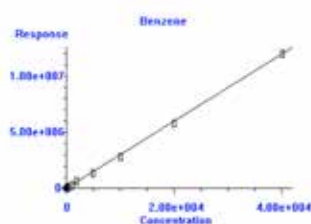


**Figure 2** - Triplicate tubes placed in parking lot near parked vehicles to increase BTEX Concentrations. Sampling was performed over a 1 week period. Overlap of BTEX is virtually perfect.

# Viper Sorbent Pen Spiking Portal

## For Sorbent Pen Air Monitoring Solutions

- Fully automated way to create accurate spiking of standards onto Sorbent Pens
- Separate Calibration Standard and Internal Standard spiking ports to prevent any possibility of cross contamination
- Can spike 1 to 200cc of calibration or internal standard using calibrated vacuum reservoir
- Compatible with all Sorbent Pens, but primarily intended for DSP and ASP Air Monitoring Pens
- Not compatible with 3.5" TD Tubes



Description	Unit	Part #
<b>Diffusive Air Monitoring Bundle - 5800 and SPR40 GC Mounting Kit Ordered Separately (BTEX and Other Compounds, Meets EPA Method 325 Requirements) (120VAC)</b>	EA	SPR40-DSP-B01
Sorbent Pen Thermal Desorption Unit (120VAC/60Hz) - Order GC install kit separately	EA	5800-SPDU
SPR-MC; Controls all 4 of the following: 5800, 3801A, SPR-FM/PM, SP-FCTS (120VAC)	EA	SPR-MC
Sample Prep Rail DSP/ASP Bundle includes SPR-FM Module (100-250VAC/ 50-60Hz)	EA	SPR40-DA01
Platypus Multi-Capillary Column VOC focuser for 5800 SPDU (120VAC)	EA	SP-FCTS-01
6L Canisters, 30-0-40 Gauge for Standards to Spike Pens	Qty 3	29-10622VG
Sorbent Pen Thermal Conditioner (120VAC/60Hz)	EA	3801A-SPTC
Diffusive Sorbent Pen - CarboPack X	Qty 3	SP-DSP-CPX
Blank Diffusive Sorbent Pen	EA	SP-DSP-0
Diffuser Caps (Prevents Convective Sampling in windy conditions)	10pk	SP-DSP-DFCAP
3-Position Diffusive Pen Monitoring Station	EA	SP-DSP-AMS3

Description	Unit	Part #
<b>Diffusive Air Monitoring Bundle - 5800 and SPR40 GC Mounting Kit Ordered Separately (BTEX and Other Compounds, Meets EPA Method 325 Requirements) (220-240VAC)</b>	EA	SPR40-DSP-B01-HV
Sorbent Pen Thermal Desorption Unit (230VAC/50Hz) - Order GC install kit separately	EA	5800-SPDU-HV
SPR-MC; Controls all 4 of the following: 5800, 3801A, SPR-FM/PM, SP-FCTS (240VAC/50Hz)	EA	SPR-MC-HV
Sample Prep Rail DSP/ASP Bundle includes SPR-FM Module (100-250VAC/ 50-60Hz)	EA	SPR40-DA01
Platypus Multi-Capillary Column VOC focuser for 5800 SPDU (240VAC)	EA	SP-FCTS-01-HV
6L Canisters, 30-0-40 Gauge for Standards to Spike Pens	Qty 3	29-10622VG
Sorbent Pen Thermal Conditioner (230VAC/50Hz)	EA	3801A-SPTC-HV
Diffusive Sorbent Pen - CarboPack X	Qty 3	SP-DSP-CPX
Blank Diffusive Sorbent Pen	EA	SP-DSP-0
Diffuser Caps (Prevents Convective Sampling in windy conditions)	10pk	SP-DSP-DFCAP
3-Position Diffusive Pen Monitoring Station	EA	SP-DSP-AMS3

# Diffusive Sorbent Pens™ for Personal Monitoring



## DSP Badge Samplers

More Reliable and Sensitive than Solvent Extraction Badges



- Diffusive sampler that collects a wide range of compounds
- Several adsorbents available depending on compounds to be collected
- The DSP Badge has several advantages
  - Higher sensitivity due to much greater percentage of sample reaching the detector during analysis (thermal desorption rather than solvent extraction)
  - 20-60 times lower sampling rates, so far less likely to "starve" during sampling (common problem with other badges)
- Easier Analysis. Just spike and desorb

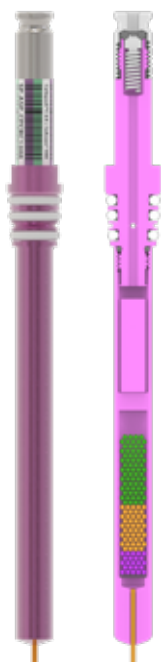


## DSP Badge Samplers

Dual Sampler also Available

- Allows DSP Badges with different adsorbents to be used together to increase range of chemicals to be monitored
- Perfect when duplicates are needed
- Uses diffusers on the Pen inlets to prevent convective transfer, so diffusion is the only transport mechanism onto the adsorbent
- Just like badges, chemicals will have different diffusion rates, but the Diffusive Sorbent Pens have adopted the same inlet geometry used by 3.5" diffusion TD Tubes, so sampling rates for a large number of compounds are already known





## ASPs - Active Sampling with Sorbent Pens™

Active sampling dramatically speeds up the sampling process, because rather than sampling at about 0.5cc/min via diffusion, the sampling rates can be increased to several cc's per minute. This is accomplished by providing both a vacuum source to draw the air through the sampler, and a way to measure the total volume of air sampled. Although adding a vacuum device that also measures the collected volume adds complication and cost to the sampling event, there are many advantages to performing active sampling:

1. Samples are collected over a shorter period of time. This is advantageous when the period of investigation for toxicology reasons must be below 8 hours.
2. A much wider range of compounds can be recovered, by using a multi-bed trap.

Multi-bed traps are packed with weak adsorbents at the trap's entrance, and then use stronger adsorbents further into the trap. This creates an adsorbent strength gradient that allows heavier VOCs to be recovered without using extremely high desorption temperatures, while still recovering the lighter compounds that would have otherwise broken through a weak, single bed adsorbent. A typical number of adsorbents in a multi-bed trap is 3, above which there are diminishing returns relative to the difficulty in packing these traps reproducibly.

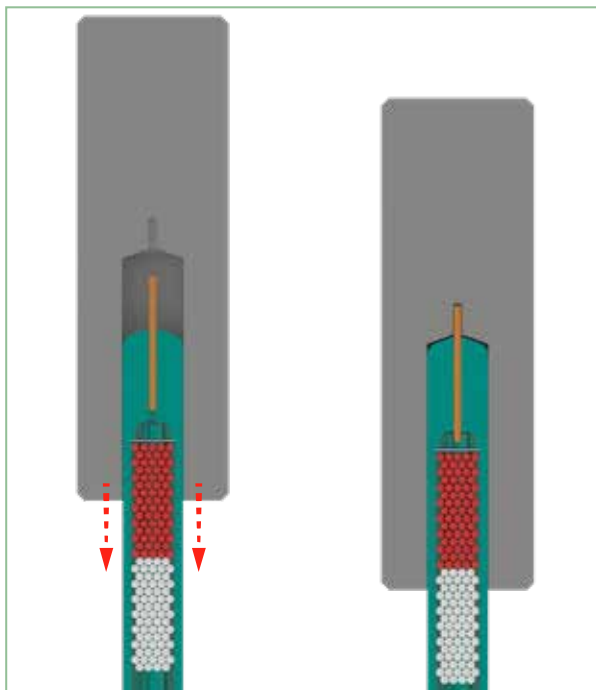
One of the more important disadvantages in active air sampling onto adsorbents can be eliminated by simply collecting air at a slower rate. When sampling at rates that are more than about 20-30 times the diffusion rate, a phenomenon called "channeling" can create inconsistencies in sample penetration into the tubes, and therefore consistency from tube to tube, and even carryover from one sampling event to the next. Like almost all materials, adsorbents expand when they are heated and then contract upon cooling. When adsorbents contract, they leave gaps that are low impedance flow paths that allow chemicals in air to penetrate much further into the tube than if these gaps are not present. Since these gaps are inconsistent from tube to tube, or even one heating cycle to the next, the extent of penetration will also be inconsistent. When the sampling rates are slowed down, the extent of penetration into the tube will decrease, and recoveries between tubes and sampling events will become more consistent, despite a different pattern of channels within each adsorbent tube.

The Active Sorbent Pen has been designed to not only minimize the creation of channels, but they have a very small entrance hole that allows sampling rates to be substantially reduced without the potential for reverse adsorption off the front of the tube. Optimal sampling rates from 0.2 to 20 cc/min are used to trap a very wide range of compounds, from C3 to over C25. Like all Sorbent Pens™, the ASPs are desorbed within about 2cm of the GC column to ensure quantitative delivery to the analyzer. The simple replacement of the 5800 SPDU liner provides a completely new flow path to the GC column, eliminating the potential for degradation of analytical performance over time.

## Sorbent Pen Selection Guide

Name / Geometry	Adsorbent	Part #	Label Color	Label	Effective Range	Packing Diagram
Active Sorbent Pens (1/4" OD)	Tenax® TA 35/60	SP-ASP-T3560	White		100°C to > 450°C	
Active Sorbent Pen (1/4" OD)	Glass Beads / Tenax® TA 35/60	SP-ASP-PDMST3560	Red / White		100°C to > 450°C	
Active Sorbent Pens (1/4" OD)	Tenax® / Carboxen® X	SP-ASP-TCPX	White / Blue		80°C to >450°C	
Active Sorbent Pens (1/4" OD)	Carboxen® C & B / Carboxen® 1000	SP-ASP-CPCBC1000	Purple / Green		-60°C to >400°C	
Active Sorbent Pens (1/4" OD)	Blank / Empty	SP-ASP-0	Yellow		NA	
Active Sorbent Pens (1/4" OD)	Tenax® + Carboxen® 1000	SP-ASP-TCBXN	White/Green		-60°C to >450°C	

## Active Sorbent Pen 7um Column Insert



After 5-10 samplings, or after sampling in dusty environments, the coated inlet metal capillary column can be replaced simply by pulling it out with a pair of pliers, and then using the calibrated insertion tool to create the perfect press fit every time. Just pre-load the capillary inlet into the ASP Pen, place the insertion tool over the top, and then press down to snap the column into place. The patent pending pre-column ensures that particles containing the heavier SVOCs are maintained in a high flow velocity part of the Pen to greatly improve recovery during thermal desorption into a GCMS.

Description	Unit	Part #
Active Sorbent Pen 7um Column Insert	EA	SP-ASP-CAP07
Column Insert Tool	EA	SP-ASP-CAP-TOOL

## Collecting ASP Samples using the "Accu-Bottle Sampler"

Another source of errors when actively sampling air onto adsorbent tubes comes from incorrectly measuring the volume that passes through the tube. Generally, time and flow rate is used to collect a known volume, but flow rates using sampling pumps are not always constant, and pumps that measure and record flow rates are very expensive and can still suffer from flow measurement errors. Entech has developed a simple means of controlling flow and directly measuring trapping volumes that is far more accurate, reliable, and best of all cost effective. Using the Accu-Bottle sampler, a bottle of known volume is evacuated either in the lab or in the field, and then sampling is either performed until the bottle reaches atmospheric pressure, or until a desired pressure increase has occurred. The Accu-Bottle sampler uses precision flow elements to sample at either 10 or 30cc/min, based on volumes and sampling times desired. Again, to avoid channeling and reduced recoveries, the best data will be obtained when sampling at 10cc/min, although 30cc/min is acceptable in some cases. A simple pump can be used to recharge the Accu-Bottle sampler in the field, or samplers can be evacuated in the lab, and will remain under vacuum for weeks awaiting use in the field. With the Accu-Bottle samplers, tube to tube consistency is dramatically improved, allowing active sampling to be a reliable means for quantitative air measurements over a very wide molecular weight range.

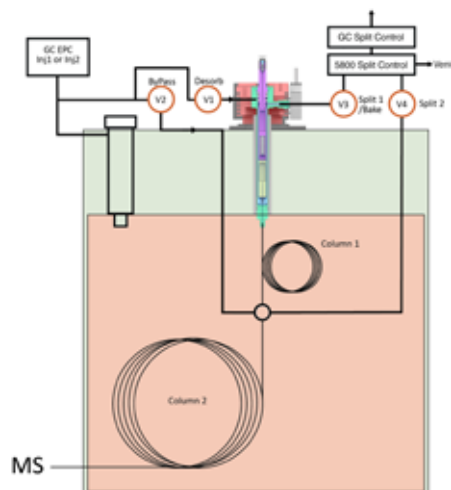
Description	Unit	Part #
10cc/min 250mL Accu-Bottle™ Sampler	EA	SP-ABS250-010
10cc/min 500mL Accu-Bottle™ Sampler	EA	SP-ABS500-010
10cc/min 1L Accu-Bottle™ Sampler	EA	SP-ABS1000-010
30cc/min 250mL Accu-Bottle™ Sampler	EA	SP-ABS250-030
30cc/min 500mL Accu-Bottle™ Sampler	EA	SP-ABS500-030
30cc/min 1L Accu-Bottle™ Sampler	EA	SP-ABS1000-030





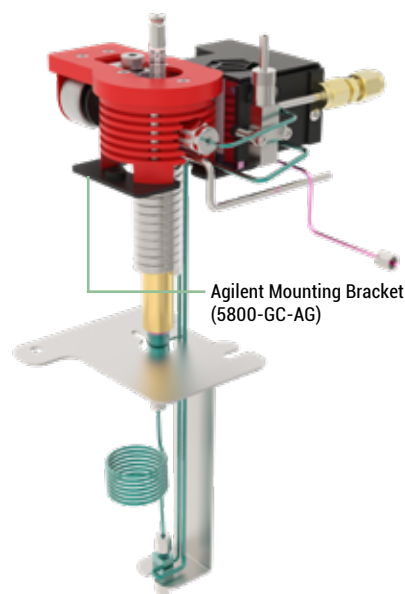
## 5800 Sorbent Pen™ Desorption Unit

Sorbent Pens™ are analyzed using the 5800 SPDU. After sample enrichment, simply insert the Sorbent Pen™ into the 5800 SPDU, and press START on the 5800 SPDU Controller. The complete desorption process is performed automatically to transfer both volatile and semi-volatile compounds onto the GC-column for extremely sensitive and accurate headspace analysis. Control the extraction and desorption conditions to either limit or optimize the molecular weight range transferred onto the column. A unique desorber design utilizes a Silonite™ coated flow path, allowing simple liner replacement to maintain maximum inertness for optimum long-term performance. Methods are created and stored on the same PC operating the GCMS. Develop methods using this entry level solution and then add the SPR40 Autosampler when you are ready to fully automate the analysis of up to 240 Sorbent Pens™.



for optimum long-term performance. Methods are created and stored on the same PC operating the GCMS. Develop methods using this entry level solution and then add the SPR40 Autosampler when you are ready to fully automate the analysis of up to 240 Sorbent Pens™.

**5800 SPDU - Easily transfers volatile and semi-volatile compounds to a GCMS for extremely sensitive and accurate Sorbent Pen analysis.**



## 5800 SPDU Ordering Information

Description	Unit	Part #
Sorbent Pen™ Desorption Unit, 120VAC/60Hz	EA	5800-SPDU
Sorbent Pen™ Desorption Unit High Voltage, 220-240VAC/50Hz	EA	5800-SPDU-HV
Module Controller Supporting 5800, 3801A, SPR-FM, & SP-FCTS (VOC Focuser), 120VAC/60Hz	EA	SPR-MC
Module Controller, 220-240VAC/50Hz	EA	SPR-MC-HV
<b>Consumables &amp; Replacement Parts</b>		
HSP/FSP/DSP Glass Liner, For 0.53mm ID Column 1	EA	5800-LNR-HD-1mm
HSP/FSP/DSP Glass Liner, For 1/16" OD Column 1	EA	5800-LNR-HD-2mm
ASP Silonite Liner, For 1/16" OD or 0.53mm ID Column 1	EA	5800-LNR-ASP-2mm
5800 Column 1-2 Interface Manifold	EA	5800-C12-M
5800 Insert. Silonite Coated	EA	5800-INSERT
Insert Locking Pin - Keeps 5800 Insert in place when removing Pens	EA	5800-INSERT-LOCPIN
Liner Spring - Keeps glass liner pressed against bottom of Pen during desorption	EA	SP-LNR-SPRING
5800 Spring Insertion Tool	EA	SP-Spring InsertTool
5800 Liner Extraction Tool	EA	SP-LNR-ExtTool
<b>GC Model Mounting Kits* (Must select one)</b>		
Thermo® 1300 / 1310 GC	EA	5800-GC-TH
Agilent® 6890 / 7890(B)	EA	5800-GC-AG
Shimadzu® 2010 GC	EA	5800-GC-SH

\* Required component



Thermo Mounting Bracket



Agilent Mounting Bracket



Shimadzu Mounting Bracket

# SPR

Sample Preparation Rail

## Diffusive Sorbent Pen™ Automation

Take productivity to a whole new level by combining the award winning Sorbent Pen™ solution with Entech's new Sample Preparation Rail (SPR). Enjoy automated spiking and analysis of up to 90 samples.



**START HERE.****Sample Preparation Rail Bundle**

Description	Qty	Unit	Part #
<b>Sample Preparation Rail Bundle for Air Monitoring Sorbent Pens DSP/ASP (120-240VAC)</b>	1	EA	SPR40-DA01
- Sample Preparation Rail System	1	EA	SPR40
- 5800 Controller Platform with Rail Clamp	1	EA	SPR-PF-CTRL1
- Dual isolation tray platform w/legs & magnetic sensor rail clamps	1	EA	SPR-PF-TR2
- 30 Position Tray for Diffusive Sorbent Pens™	2	EA	SP-DSP-TRAY30
- SPR Flow Module	1	EA	SPR-FM
- Sorbent Pen Spiking Portal	3	EA	SP-PENSPIKE
- Sorbent Pen Focusing System	1	EA	SPR-CTS-SP

**NOT INCLUDED IN BUNDLE.**

**You must also select a GC Rail Mounting Kit with the bundle.**



<b>SPR40 GC Mounting Kits</b>		
Rail Mounting Kit for Agilent® GC	EA	SPR-MNT-AG
Rail Mounting Kit for Thermo® GC	EA	SPR-MNT-TH
Rail Mounting Kit for Shimadzu® GC	EA	SPR-MNT-SH

# Analytical Applications

Our Application laboratory continually strives to develop new and improved methods for solving real world problems. At Entech we are focused on providing complete solutions for your analytical needs.



**Bottle-Vac™ Samplers**  
Volatiles Analysis. [See page 136](#)



**Breath Analysis**  
Volatiles Analysis in Breath.  
[See pages 137-138](#)



**Chemical Warfare Agents  
& Toxic Industrial Compounds.**  
[See page 141](#)



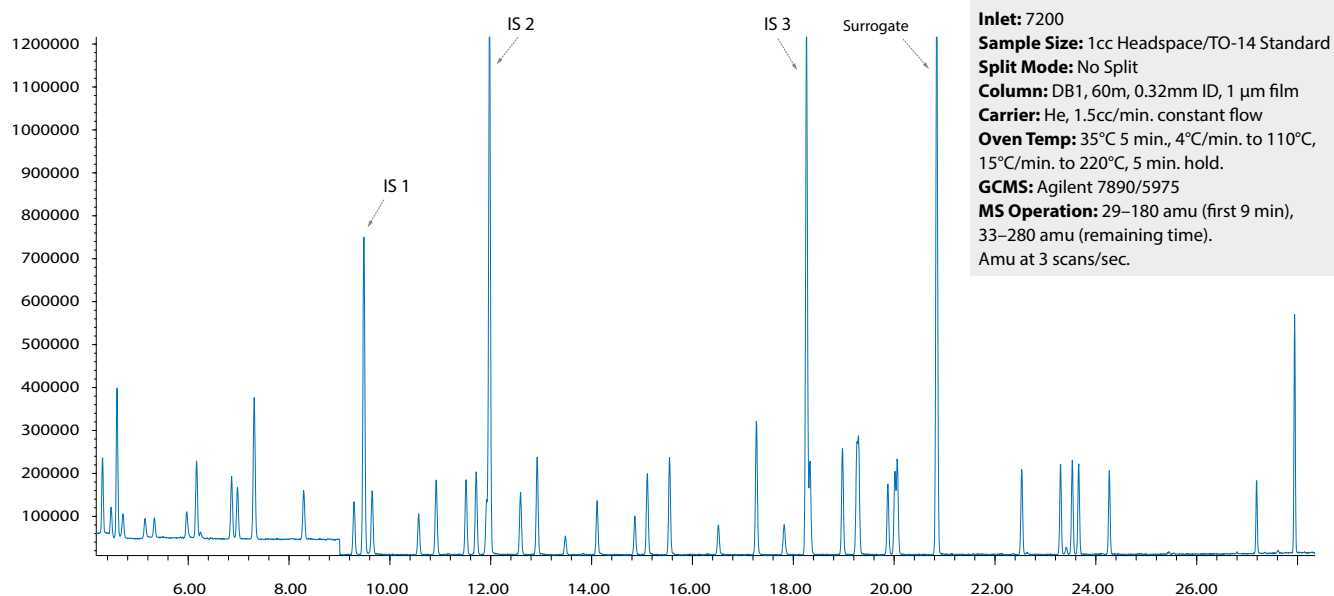
**HDS Personal Monitor Analysis**  
HDS Analysis. [See page 143](#)

## This Section Covers

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|-----------|---|
| 131       | Ambient Air / EPA Methods                                       |
| 132       | Indoor Air Quality & Mold Analysis                              |
| 133       | Ethylene Oxide & Glutaraldehyde                                 |
| 134 – 135 | Sorbent Pen Vacuum Extraction   Kinetic Study                   |
| 136       | Bottle-Vac™ Volatiles Analysis                                  |
| 137 – 138 | Breath Analysis   |
| 139       | Trace Contaminants in CO <sub>2</sub>                           |
| 140       | Refinery Gas Analysis   |
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| 142       | EPA TO-14 Standard – HDS™ Analysis by Loop Injection            |
| 143       | HDS™ Personal Monitoring   Food Packaging Analysis              |
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| 145       | Food & Ingredients – Tomatoes Analysis                          |
| 146 - 148 | Strawberries – Raspberries – Peanuts Analysis                   |
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| 156 – 157 | Rum – Blank After Strawberry Analysis                           |
| 158 – 159 | Eggnog – Ripe Mango – Mushroom – Apple Analysis                 |
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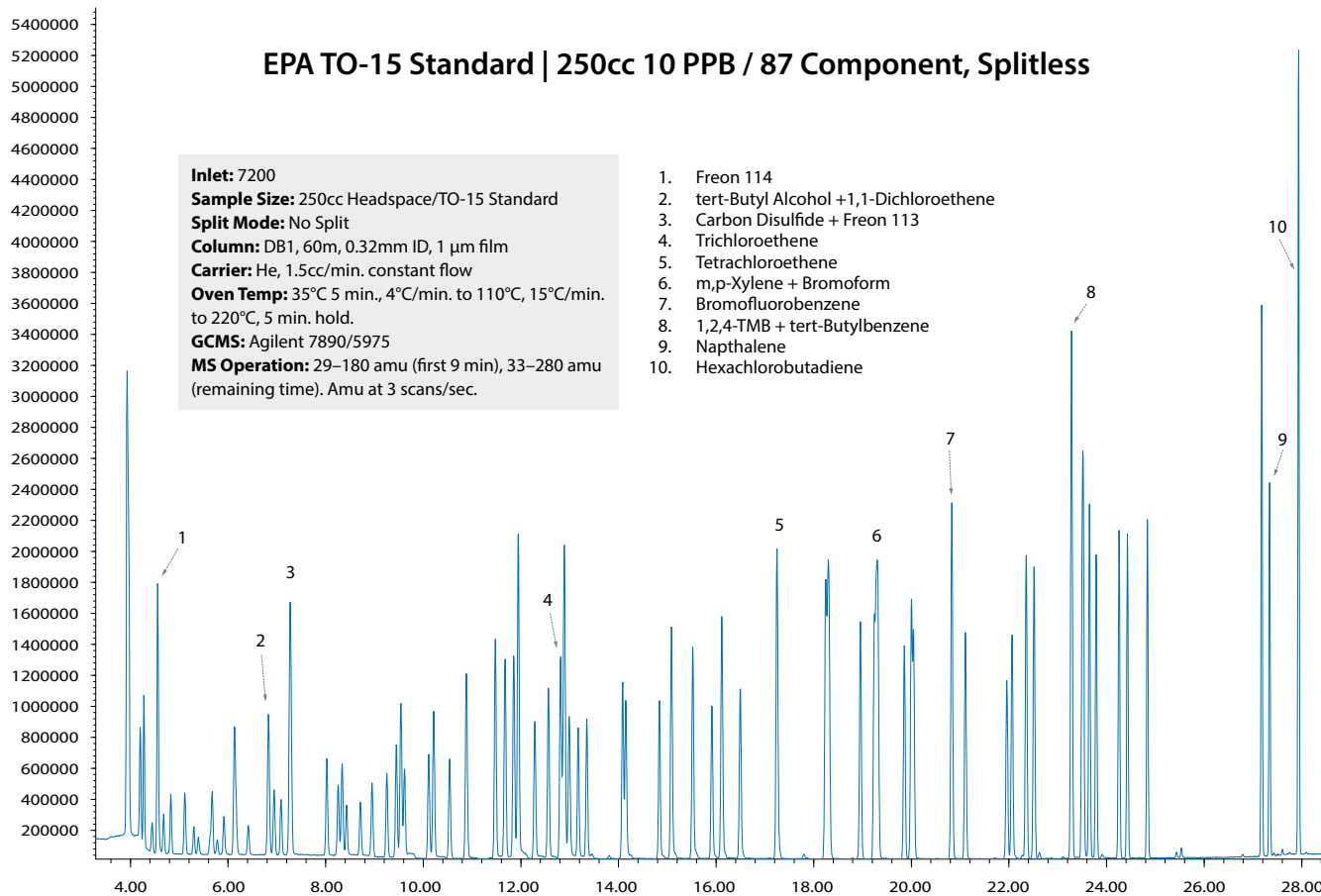
# Ambient Air / EPA Methods

## EPA TO-14 Standard | 1mL Loop 10 PPB / 39 Component, Splitless



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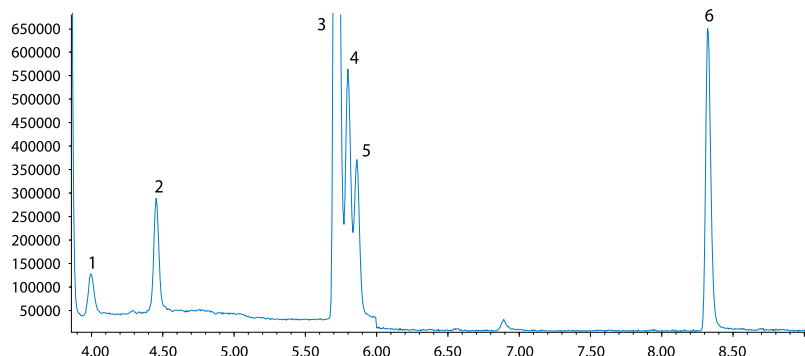
## EPA TO-15 Standard | 250cc 10 PPB / 87 Component, Splitless





## Indoor Air Quality

## Formaldehyde &amp; Carbonyls Analysis



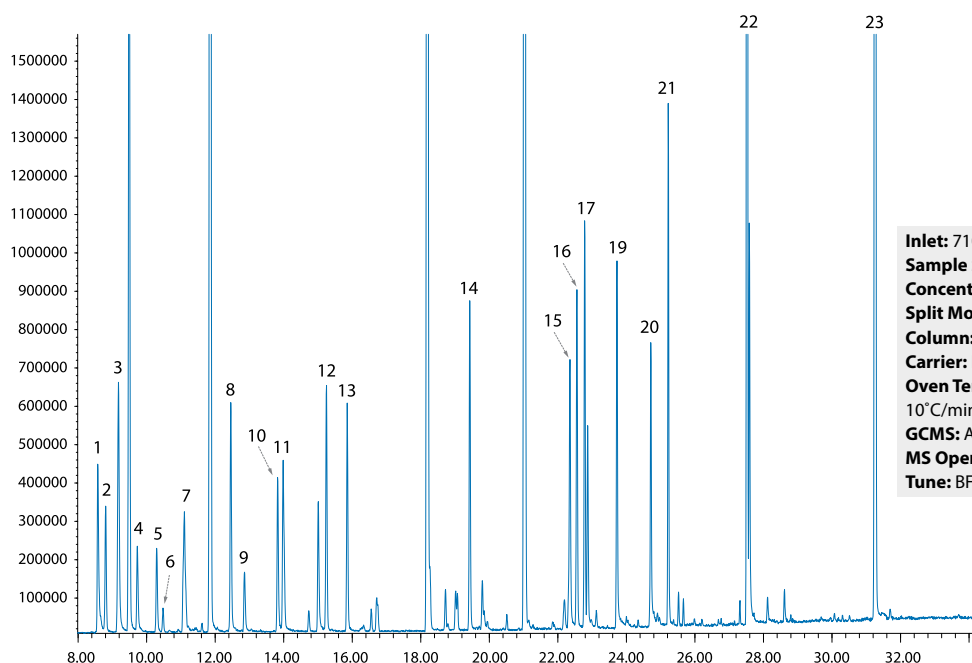
**Inlet:** 7100A / 7200 Preconcentrator  
**Sample Size:** 100cc  
**Matrix Management:** Coldtrap Dehydration, M1 – Open, M2 – Tenax®  
**Column:** HP1, 60m, 0.32mm ID, 1 µm film  
**Carrier:** He, 1.5cc/min. constant flow  
**Oven Temp:** 35°C 5 min., 6°C/min. to 150°C, 15°C/min. to 220°C, 4 min. hold.  
**GCMS:** Agilent 5973  
**MS Operation:** 33–270 amu, 3.1Hz, EI, EM=0 Rel.  
**Tune:** BFB

**Compounds:** Carbonyl Standard

1. Formaldehyde	50 PPB	60 ng/l
2. Acetaldehyde	20 PPB	60 ng/l
3. Acetone-d6	100 PPB	261 ng/l
4. Acetone	20 PPB	47 ng/l
5. Propionaldehyde	20 PPB	47 ng/l
6. Methyleneethylketone (MEK - 2-Butanone)	20 PPB	59 ng/l

## Mold Analysis

## MVOC Standard | 100cc, 2 PPBV



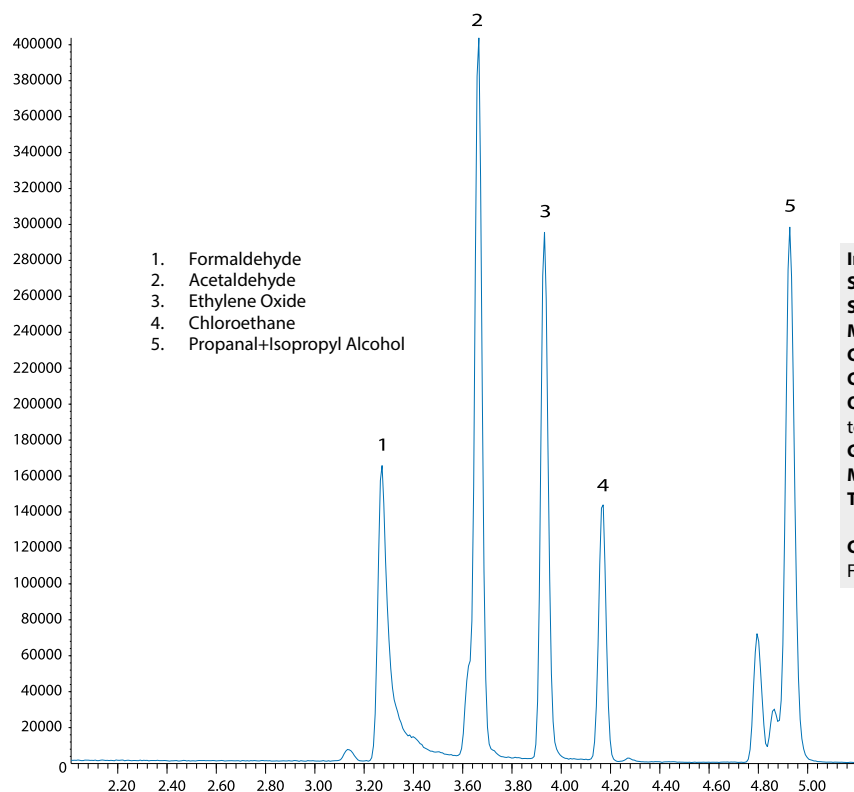
**Inlet:** 7100A / 7200 Preconcentrator  
**Sample Size:** 100cc  
**Concentration:** 2 ppbv  
**Split Mode:** No Split  
**Column:** DB1, 60m, 0.32mm ID, 1 µm film  
**Carrier:** Helium  
**Oven Temp:** 35°C 5 min., 6°C/min. to 120°C, 10°C/min. to 220°C, 2 min. hold.  
**GCMS:** Agilent 6890/5973  
**MS Operation:** 33–270 amu  
**Tune:** BFB

## Calibration Results for MVOCs

Analyte	%RSD	Analyte	%RSD	Analyte	%RSD
1. 2-Methylfuran	6.78	9. 1,4-Dioxane	11.91	17. 2-Pentylfuran	12.77
2. 2-Butanone	7.65	10. 3-Methyl-1-butanol	10.33	18. 3-Octanol	13.18
3. 3-Methylfuran	6.86	11. 2-Methyl-1-butanol	7.09	19. 2-Ethyl-1-hexanol	30.70
4. 2-Methyl-1-propanol	5.76	12. 1-Pentanol	3.52	20. 1-Octanol	16.47
5. 2-Methyl-2-butanol	10.63	13. 2-Hexanone	5.35	21. 2-Isopropyl-3-methoxypyrazine	11.50
6. tert-Pentyl Alcohol	12.06	14. 2-Heptanone	10.99	22. 2-Methylisoborneol	14.99
7. 3-Methyl-2-butanol	9.29	15. 1-Octen-3-ol	20.55	23. Geosmin	16.68
8. 2-Pentanol	7.42	16. 3-Octanone	11.76		

## Indoor Air Quality

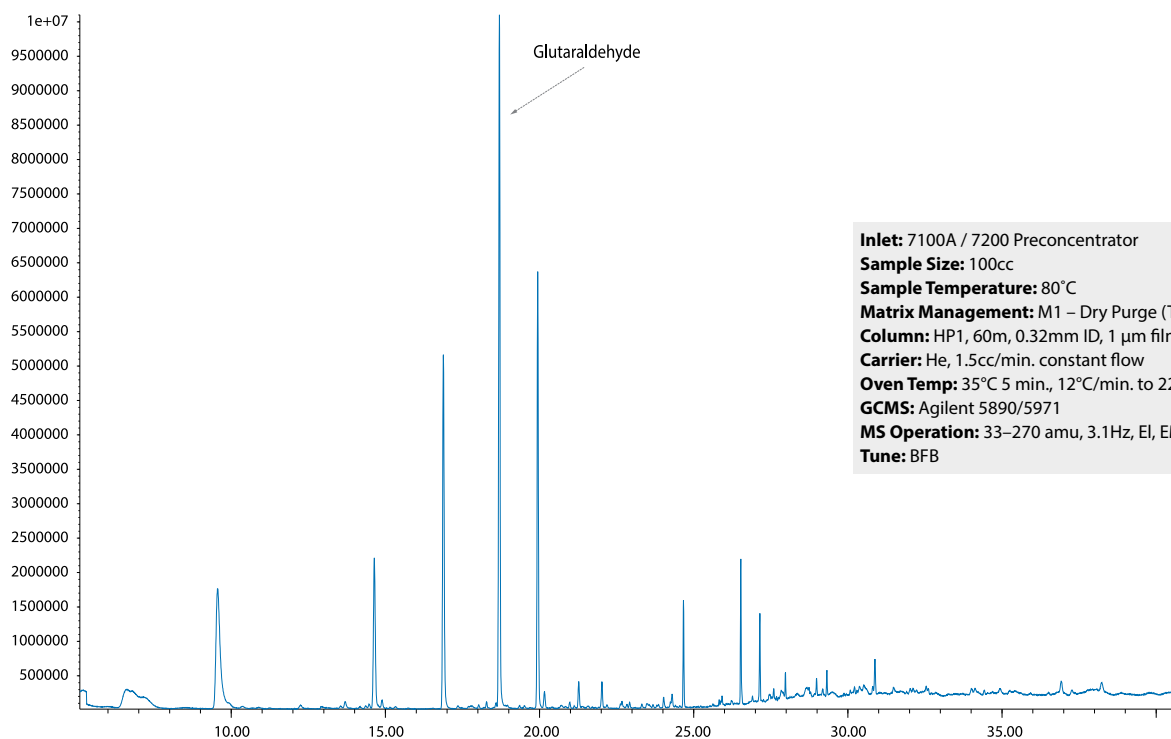
## Ethylene Oxide Analysis



**Inlet:** 7100A / 7200 Preconcentrator  
**Sample Size:** 100cc  
**Sample Temperature:** Ambient  
**Matrix Management:** ECTD  
**Column:** HP1, 60m, 0.32mm ID, 1 µm film  
**Carrier:** He, 1.5cc/min. constant flow  
**Oven Temp:** 35°C 5 min., 6°C/min. to 150°C, 15°C/min. to 220°C, 4 min. hold.  
**GCMS:** Agilent 5973  
**MS Operation:** 29–180 amu, 3.1Hz, EI, EM=0 Rel.  
**Tune:** BFB

**Concentrations:**  
Formaldehyde: 25 ppb, other Carbonyls: 10 ppb

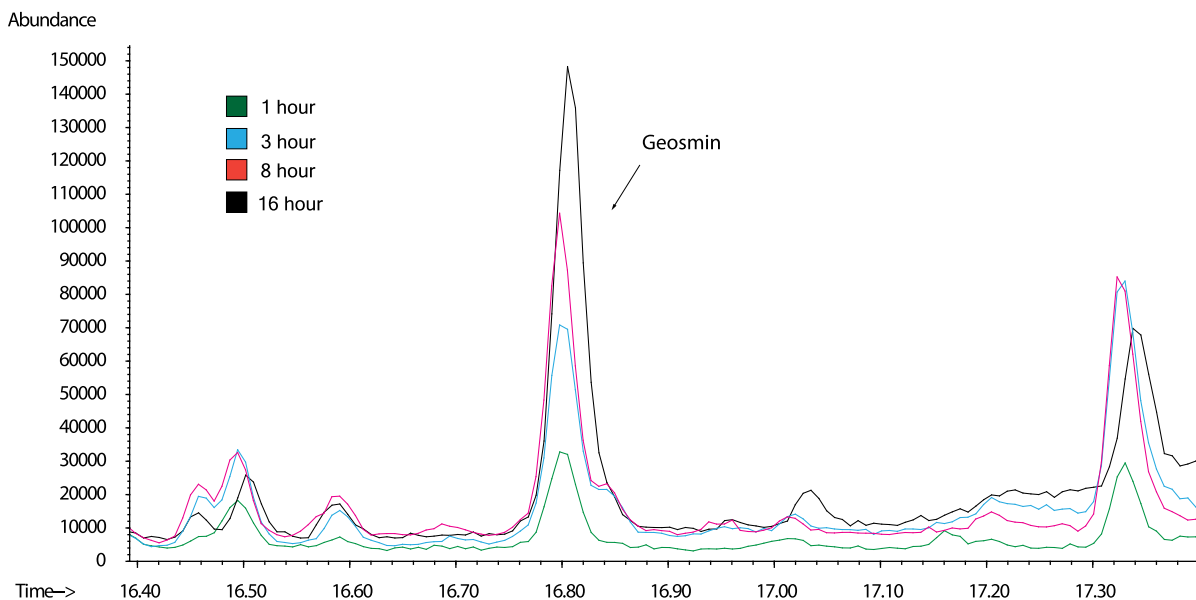
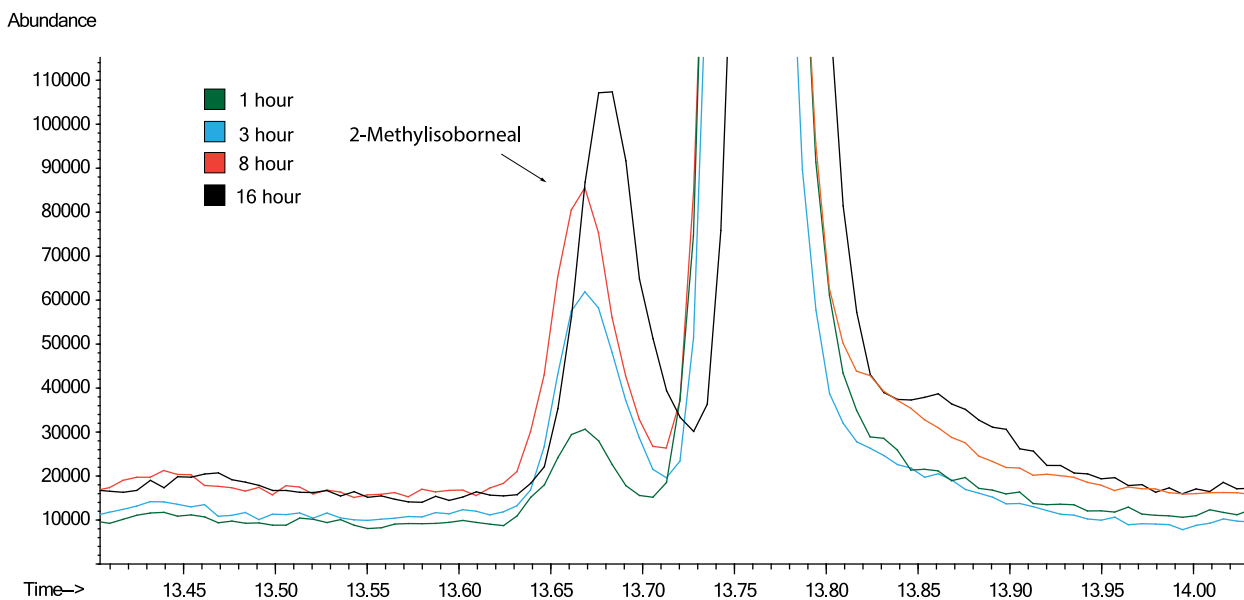
## Glutaraldehyde Analysis | 100cc, 100 PPB



**Inlet:** 7100A / 7200 Preconcentrator  
**Sample Size:** 100cc  
**Sample Temperature:** 80°C  
**Matrix Management:** M1 – Dry Purge (Tenax® TA)  
**Column:** HP1, 60m, 0.32mm ID, 1 µm film  
**Carrier:** He, 1.5cc/min. constant flow  
**Oven Temp:** 35°C 5 min., 12°C/min. to 220°C, 4 min. hold.  
**GCMS:** Agilent 5890/5971  
**MS Operation:** 33–270 amu, 3.1Hz, EI, EM=200 Rel.  
**Tune:** BFB

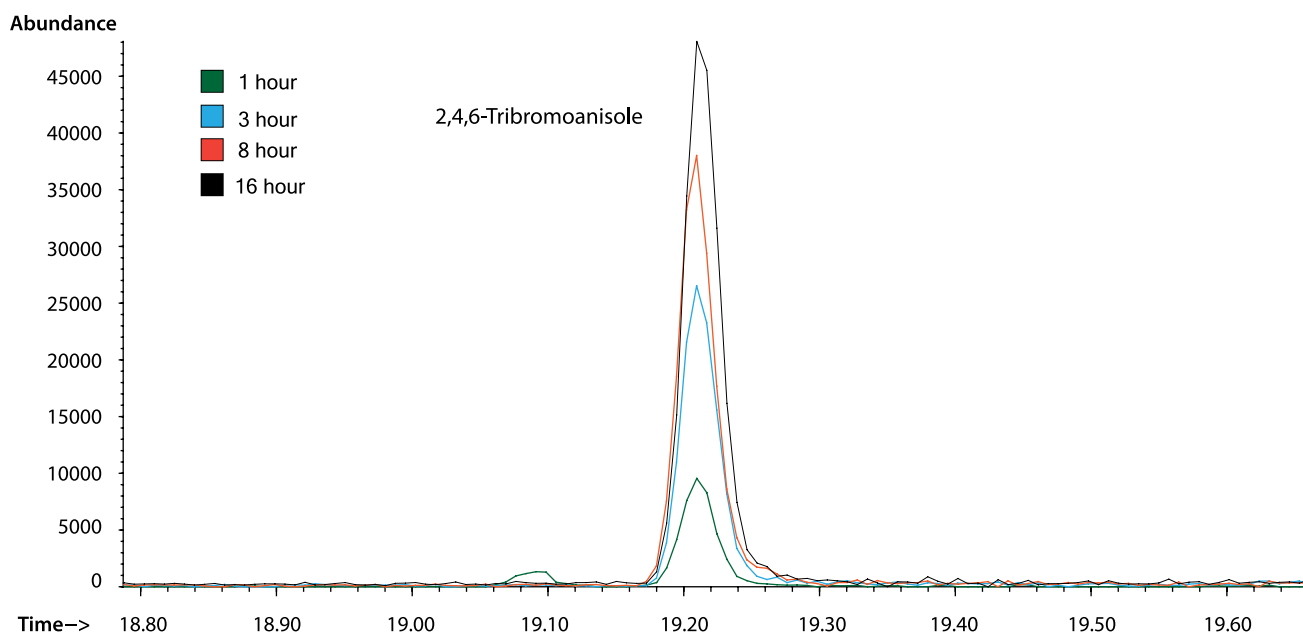
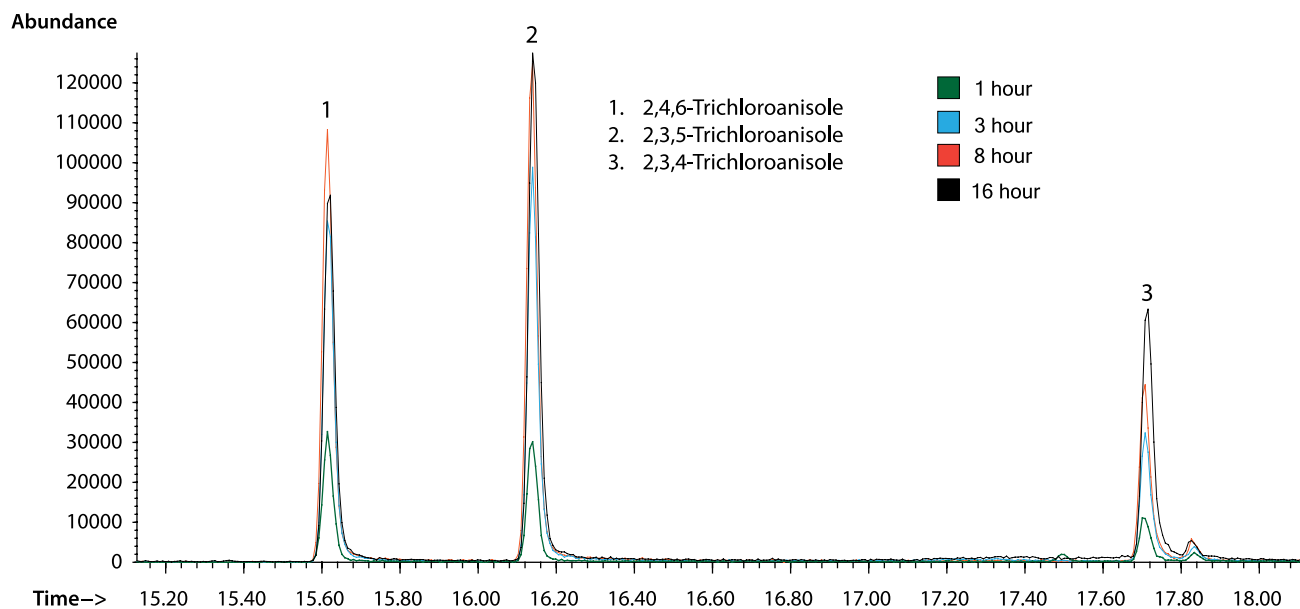
# Sorbent Pen™ Vacuum Extraction of Odors Kinetics Study Comparing Recoveries of a 20 Ppt Standard in Water After 1, 3, 8, 16 Hour Extraction Times

- Extractions performed without salting to prevent adsorbent damage via aerosol transport
- Temp = 25°C. Sorbent Pens™ heated to 30°C to prevent water condensation
- An overnight extraction appears to bring the Pens to near equilibrium with the sample



**Figures 1,2 (above)** – Relative responses for target compounds extracted from 20ng/L standards in 50cc filtered water at 25°C, no salt added, 100 rpm agitation, 1/30th atm vacuum, for 1,3,8, and 16 hours. A final extraction time of 20 hours was selected for this method with an extraction efficiency between 60-80%.

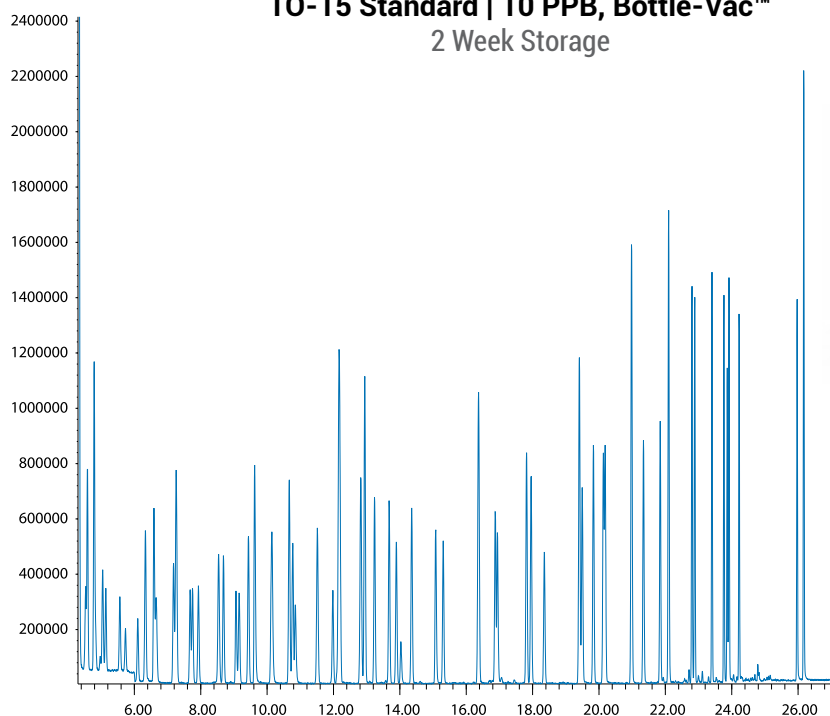
# Sorbent Pen™ Kinetic Study



**Figures 3,4 (above)** – Relative responses for target compounds extracted from 20ng/L standards in 50cc filtered water at 25°C, no salt added, 100 rpm agitation, 1/30th atm vacuum, for 1,3,8, and 16 hours. A final extraction time of 20 hours was selected for this method with an extraction efficiency between 60-80%.

# Silonite-XL™ MiniCan™ & Bottle-Vac™ Holding Study (TO-15 Standard, 14 Days – 4 Months)

## TO-15 Standard | 10 PPB, Bottle-Vac™ 2 Week Storage



Bottle-Vac™ Samplers

**Inlet:** 7100A / 7200 Preconcentrator  
**Sample Size:** 100cc  
**Sample Temperature:** Ambient  
**Matrix Management:** ECTD  
**Column:** HP1, 60m, 0.32mm ID, 1 µm film  
**Carrier:** He, 1.5cc/min. constant flow  
**Oven Temp:** 35°C 5 min., 6°C/min. to 120°C, 10°C/min. to 210°C, 4 min. hold.  
**GCMS:** Agilent 6890/5973N  
**MS Operation:** 29–150 amu (first 6 min), 33–270 amu (remaining time). 3.1Hz, EI, EM=200V Rel.  
**Tune:** BFB

Analyte	MiniCan™ % Recovery			Bottle-Vac™ % Recovery	
	2 week	3 week	4 month	2 week	30 day
Propene	99	97	89	100	91
Dichlorodifluoromethane	94	95	92	102	95
Chloromethane	93	93	90	95	85
Dichlorotetrafluoromethane	87	91	91	95	96
Acetaldehyde	99	96	96	96	104
Vinyl Chloride	95	93	90	96	95
1,3-Butadiene	96	94	86	95	100
Bromomethane	96	95	94	97	101
Chloroethane	95	95	90	96	93
Bromoethene	94	95	91	97	93
Trichlorofluoromethane	95	95	92	97	94
Acetone	91	91	83	103	102
Propanal	93	92	82	100	87
Isopropyl Alcohol	90	96	92	99	116
1,1-Dichloroethene	96	95	90	95	98
1,1,2-Trichloro-1,2,2-Trifluoroethane	95	95	91	98	98
Methylene Chloride	96	96	92	99	99
Allyl Chloride	95	94	86	98	92
Carbon Disulfide	98	97	92	97	99
trans-1,2-Dichloroethene	95	94	88	96	97
Methyl-tert-Butyl Ether	89	90	84	93	92
1,1-Dichloroethane	96	95	91	95	96
Vinyl Acetate	88	87	76	94	92
2-Butanone	89	87	77	109	104
Hexane	97	96	89	99	99
cis-1,2-Dichloroethene	94	93	88	97	89
Ethyl Acetate	88	87	76	93	94
Chloroform	95	95	92	95	95
Tetrahydrofuran	91	91	81	94	128
1,1,1-Trichloroethane	95	95	92	94	94
1,2-Dichloroethane	94	93	89	96	94

Benzene	96	94	90		100	102
Carbon Tetrachloride	95	94	92		95	93
Cyclohexane	98	97	92		97	98
2,2,4-Trimethylpentane	97	98	97		96	96
Heptane	97	98	97		97	96
1,2-Dichloropropane	96	97	97		98	94
Trichloroethene	95	95	95		97	94
Bromodichloromethane	97	97	95		95	96
1,4-Dioxane	110	105	74		97	94
cis-1,3-Dichloropropene	91	92	81		97	91
4-Methyl-2-Pentanone	101	103	56		96	94
trans-1,3-Dichloropropane	82	81	62		97	97
Toluene	96	96	98		100	100
1,1,2-Trichloroethane	96	96	97		96	97
2-Hexanone	97	98	45		112	100
Dibromochloromethane	96	97	93		97	93
1,2-Dibromoethane	92	91	83		99	96
Tetrachloroethene	96	96	78		99	94
Chlorobenzene	96	95	93		102	95
Ethylbenzene	97	96	96		100	93
Bromoform	96	100	90		99	97
Styrene	93	92	81		100	99
o-Xylene	98	98	99		101	96
1,1,2,2-Tetrachloroethane	100	100	100		99	103
4-Ethyltoluene	97	100	93		102	92
1,3,5-Trimethylbenzene	99	97	100		106	98
1,2,4-Trimethylbenzene	99	97	100		99	95
1,3-Dichlorobenzene	99	96	91		97	93
Benzyl Chloride	93	96	65		99	83
1,4-Dichlorobenzene	96	91	80		98	95
1,2-Dichlorobenzene	104	100	103		96	94
1,2,4-Trichlorobenzene	102	92	110		82	75
Hexachlorobutadiene	112	102	120		89	84





## Analyzing Volatiles in Human Breath

Chemicals in the blood will equilibrate with inhaled air in a similar fashion to that of  $O_2$  and  $CO_2$ . Concentrations in breath can be correlated to blood concentrations, making breath analysis an ideal means for simple screening applications. The non-invasive sampling process makes breath collection inherently safe and easy allowing field collection of samples by non-clinical personnel. The following uses for breath analysis have been demonstrated:

- **Analysis of Exogenous Chemicals**  
*To determine extent of exposure in occupational monitoring.*
- **Endogenous Products of Metabolism**  
*Analysis utilized to screen for various diseases.*
- **Analysis of Volatile Drugs of Abuse**  
*or their metabolic breakdown products.*

## Monitoring Metabolic Breakdown Products for Clinical Diagnosis

Analysis of volatile chemicals in breath can be a powerful tool for clinical diagnosis. The relative concentration of "chemical markers" in breath can be used to diagnose several diseases in their earliest and most treatable stages. Many tests are also currently performed using isotopically labeled ( $^{13}C$ ) fats or carbohydrates to determine whether the expected concentration of the isotopes show up in metabolites, including  $CO_2$ . Some of the markers and their corresponding disease or conditions are as follows:

- **High Acetone**  
*Indicates poorly regulated glucose levels caused by uncontrolled diabetes.*
- **High Pentane**  
*Increased oxygen free-radicals in damaged cells. Elevated in patients with acute myocardial infarction, arthritis or multiple sclerosis. Also elevated in schizophrenic patients.*
- **Acetone, MEK, n-Propanol, Tolualdehyde and Oxepanone**  
*Elevated in patients with lung cancer.*
- **High Ethane**  
*May indicate deficiency in vitamin E or trace metals such as Selenium and Copper.*
- **$^{13}CO_2$**   
*Produced after ingesting  $^{13}C$  labeled urea when peptic ulcer causing *Helicobacter pylori* bacteria are present.*  
  
*Low production after  $^{13}C$  labeled Triglyceride ingestion indicates pancreatic disorders.*  
  
*Low production after labeled galactose injection indicates liver damage (cirrhosis, hepatitis).*

## Exposure Monitoring – Breath Analysis

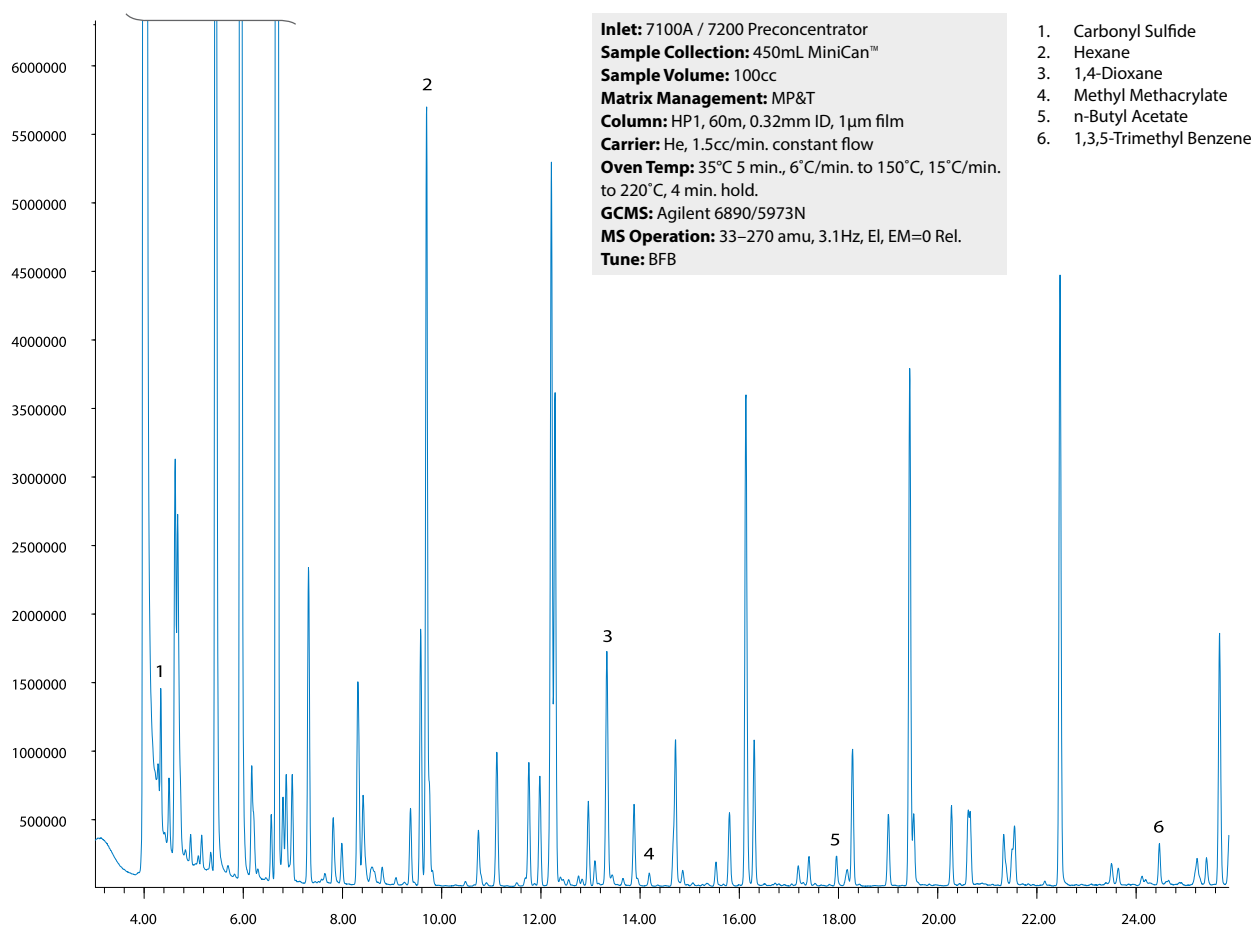
Breath samples were collected before and after exposure to 0.05 to 0.20 PPM level compounds during an eight hour work day. Compounds were clearly visible in the breath after the eight hour shift. Other compounds present are derived from both exogenous and endogenous sources. Exposure levels were 10 to 100 times below current OSHA PELs for each compound.

Higher concentration exposures may produce levels that can be monitored for several days after exposure. This technique does not require any prior planning, making it ideal for unexpected exposure episodes (Emergency Response). It also does not assume exposure through inhalation, treating respirative and dermal exposures equally. Monitoring of more unique compounds may have forensic applications, such as detection of the volatiles found in illegal drug manufacturing labs.

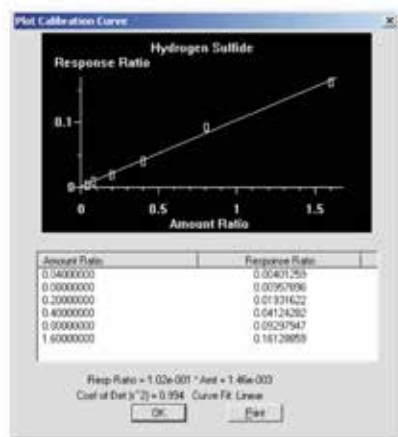
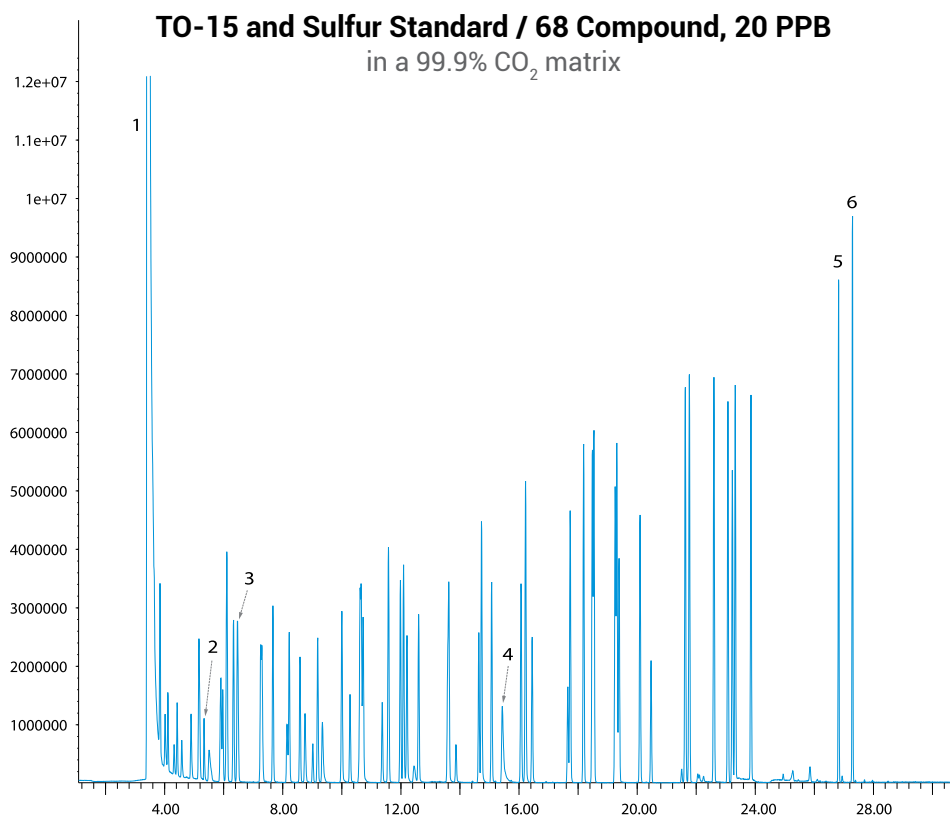


*Human Breath Sampling into Bottle-Vacs™*

### Human Breath Analysis (After 8 Hour Exposure Study)



# Reduced Sulfurs and VOCs in a CO<sub>2</sub> Matrix



The use of GCMS for purity is both quantitative and qualitative. The calibration curve for H<sub>2</sub>S is shown here.

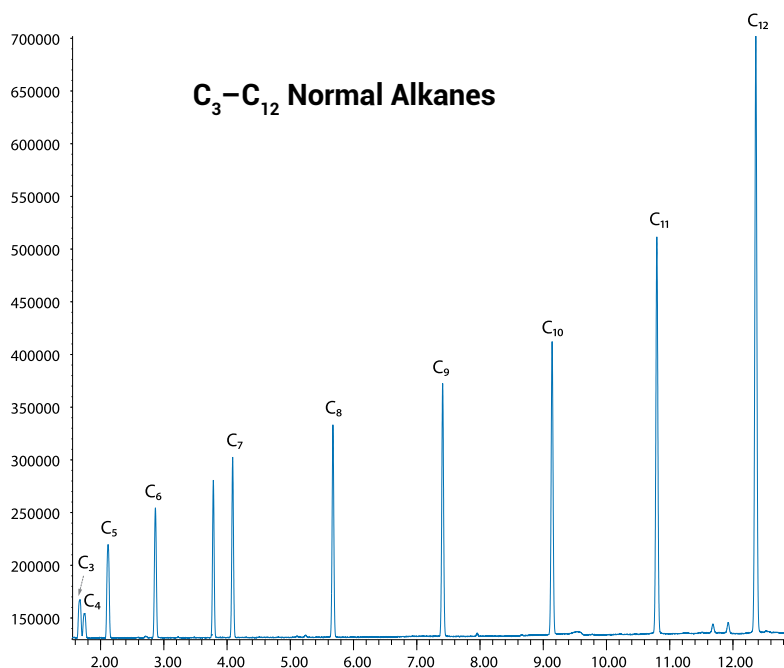
**Inlet:** 7100A / 7200 Preconcentrator  
**Sample Size:** 100cc  
**Matrix Management:** ECTD  
**Column:** HP1, 60m, 0.32mm ID, 1µm film  
**Carrier:** He, 1.5cc/min. constant flow  
**Oven Temp:** 35°C 5 min., 6°C/min. to 150°C, 15°C/min. to 220°C, 4 min. hold.  
**GCMS:** Agilent 6890/5973N  
**MS Operation:** 34–270 amu, 3.1Hz, EI, EM=0 Rel.  
**Tune:** BFB

**Compounds:**  
 TO-14, TO-15, and Carbonyl Standards, H<sub>2</sub>S, and Mercaptans

1. CO<sub>2</sub>
2. Acetone
3. Carbon Disulfide
4. 2-Hexanone
5. 1,2,4-Trichlorobenzene
6. Hexachlorobutadiene

Please contact Entech and request App Note 202 for complete details on this application.

# C<sub>3</sub>-C<sub>12</sub> Hydrocarbon Analysis

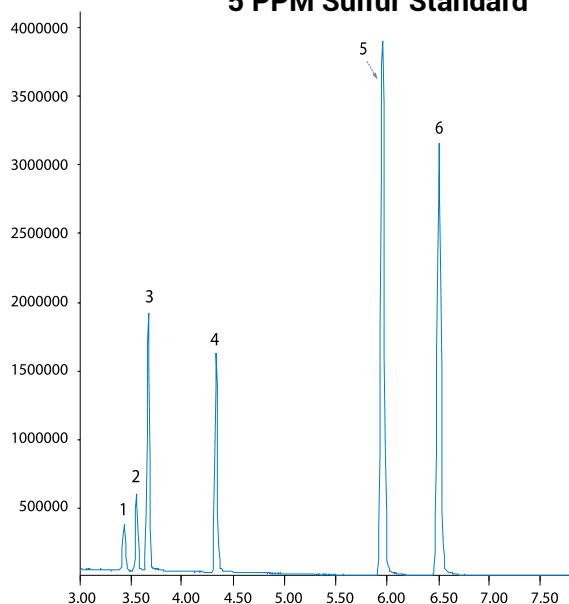


**Inlet:** 7650-L10  
**Sample Size:** 0.5cc  
**Concentration:** 1 ppmv  
**Split Mode:** No Split  
**Column:** HP1, 60m, 0.32mm ID, 1µm film  
**Carrier:** He, 10cc/min. constant flow  
**Oven Temp:** 40°C 1 min., 20°C/min. to 200°C, 0 min. hold.  
**GCMS:** Agilent 6890  
**Detector:** FID

*Note: Standard introduced into evacuated Silonite™ canister without "flow-thru" equilibration. Virtually no loss of C<sub>10</sub>-C<sub>12</sub> to canister walls was observed.*

## Sulfur in Refinery Gas

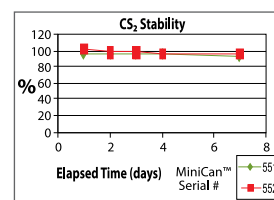
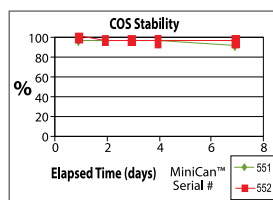
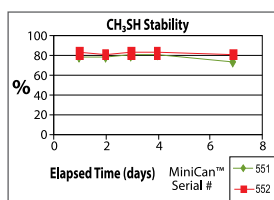
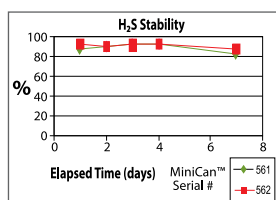
### 5 PPM Sulfur Standard



**Inlet:** 7032A-L  
**Sample Size:** 1.0cc  
**7032A-L Split Ratio:** 10:1  
**Column:** HP1, 60m, 0.32mm ID, 1µm film  
**Carrier:** He, 1.5cc/min. constant flow  
**Oven Temp:** 35°C 9 min., Isothermal  
**GCMS:** Agilent 5973  
**MS Operation:** 33-270 amu, 3.1Hz, EI, EM=0 Rel.  
**Tune:** BFB

1. CO<sub>2</sub>
2. Hydrogen Sulfide
3. Carbonyl Sulfide
4. Methyl Mercaptan
5. Dimethyl Sulfide
6. Carbon Disulfide

### 5 PPM, 7 Day Stability Study



# Chemical Warfare Agents

## Chemical Warfare Agents | Surrogates Analysis



**Inlet:** SV Trap

**Sample Size:** 100cc

**Concentration:** 2.5 ppb

**Matrix Management:** On-Column

**Column:** HP1, 60m, 0.32mm ID, 1µm film

**Carrier:** He, 1.5cc/min. constant flow

**Oven Temp:** 35°C 5 min., 6°C/min. to 140°C, 15°C/min. to 220°C, 3 min. hold.

**GCMS:** Agilent 6890/5973

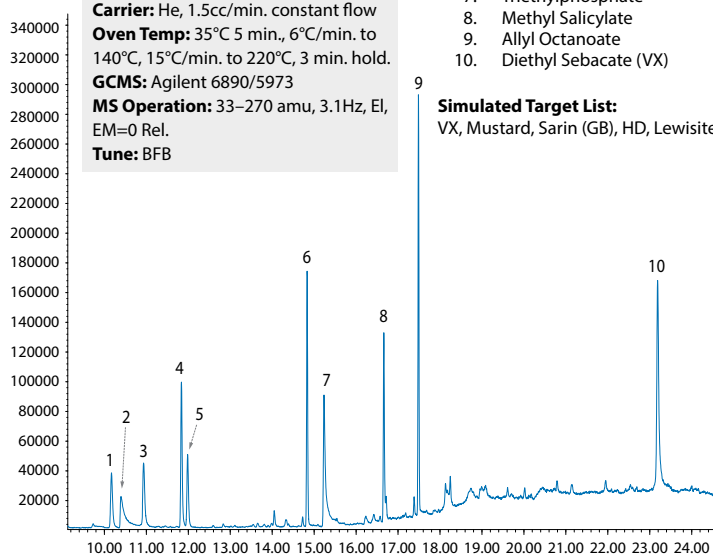
**MS Operation:** 33–270 amu, 3.1Hz, EI, EM=0 Rel.

**Tune:** BFB

1. Chlorobenzene-d5 (IS)
2. Dimethyl Methylphosphonate
3. 1,4-Thioxane
4. Methyl Caproate (Sarin/GB)
5. Bromofluorobenzene (Surrogate)
6. Allyl Caproate
7. Triethylphosphate
8. Methyl Salicylate
9. Allyl Octanoate
10. Diethyl Sebacate (VX)

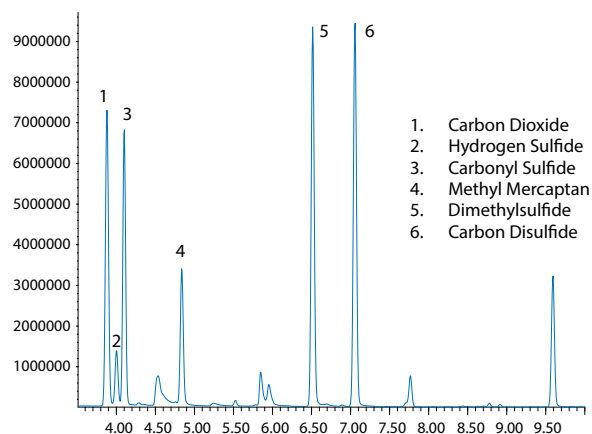
### Simulated Target List:

VX, Mustard, Sarin (GB), HD, Lewisite, GA, GE

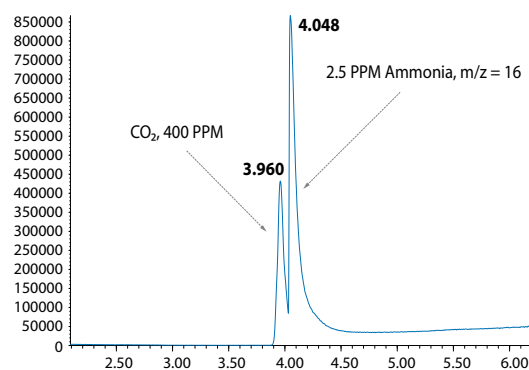


## Toxic Industrial Compounds

**Reduced Sulfur Std | 5 PPB, 100cc,**  
Extended Cold Trap Dehydration



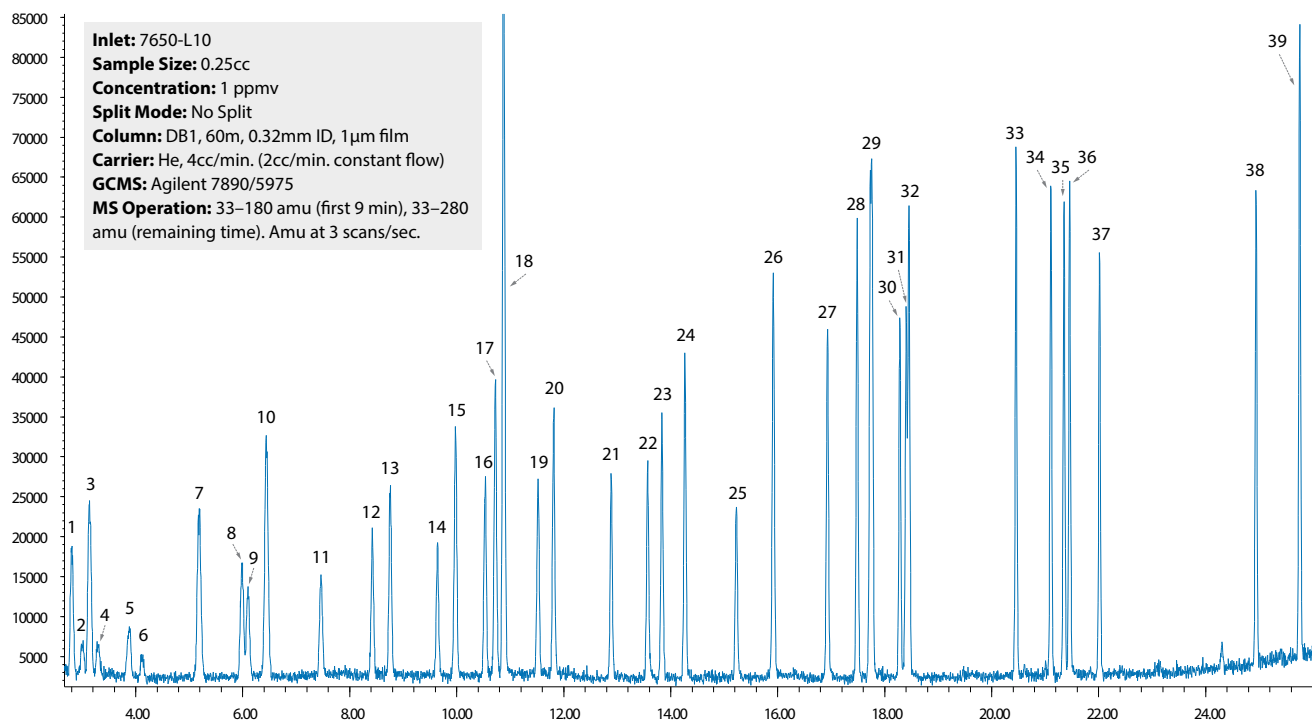
**2.5 PPM Ammonia in air | 10cc,**  
Direct LN2 Focus Method





## EPA TO-14 Standard – HDS™ Analysis by Loop Injection

39 Component, TO-14 Standard | 1 PPM, 0.25cc Loop Injection

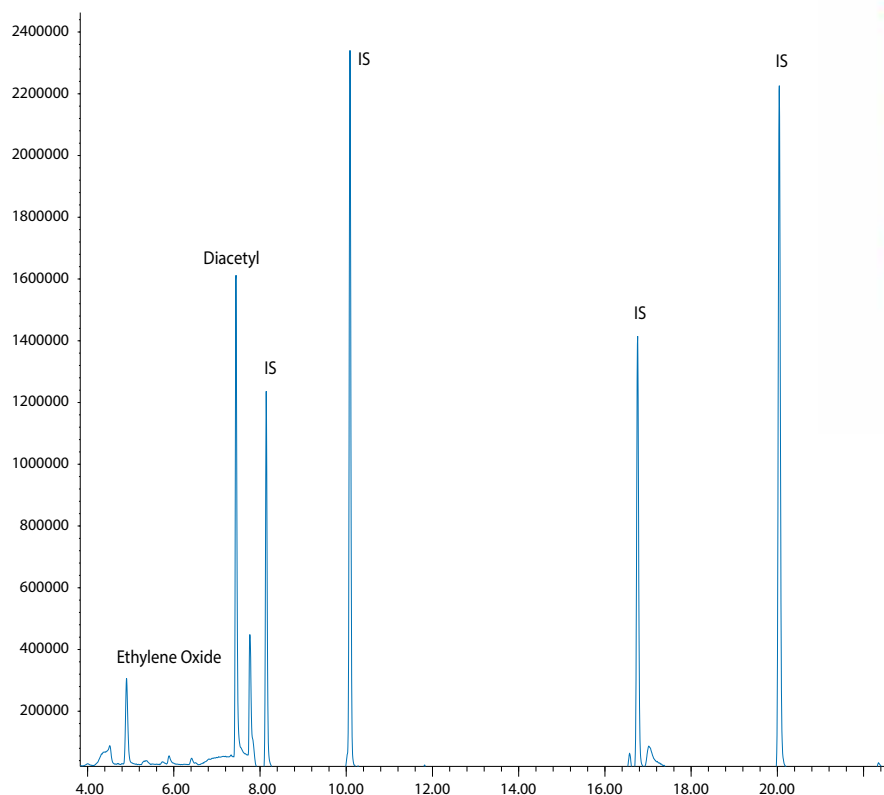


- |                              |                            |                               |                               |
|------------------------------|----------------------------|-------------------------------|-------------------------------|
| 1. Dichlorodifluoromethane   | 11. 1,1-Dichloroethane     | 21. cis-1,3-Dichloropropene   | 31. 1,1,2,2-Tetrachloroethane |
| 2. Chloromethane             | 12. cis-1,2-Dichloroethene | 22. trans-1,3-Dichloropropene | 32. o-Xylene                  |
| 3. Dichlorotetrafluoroethane | 13. Chloroform             | 23. 1,1,2-Trichloroethane     | 33. 1,3,5-Trimethylbenzene    |
| 4. Vinyl chloride            | 14. 1,1,1-Trichloroethane  | 24. Toluene                   | 34. 1,2,4-Trimethylbenzene    |
| 5. Bromomethane              | 15. 1,2-Dichloroethane     | 25. 1,2-Dibromoethane         | 35. 1,3-Dichlorobenzene       |
| 6. Chloroethane              | 16. Benzene                | 26. Tetrachloroethylene       | 36. 1,4-Dichlorobenzene       |
| 7. Trichlorofluoromethane    | 17. Carbon tetrachloride   | 27. Chlorobenzene             | 37. 1,2-Dichlorobenzene       |
| 8. 1,1,1,2-Tetrafluoroethane |                            |                               |                               |
| 9. T                         |                            |                               |                               |
| 10. A                        |                            |                               |                               |



## HDS™ Personal Monitoring

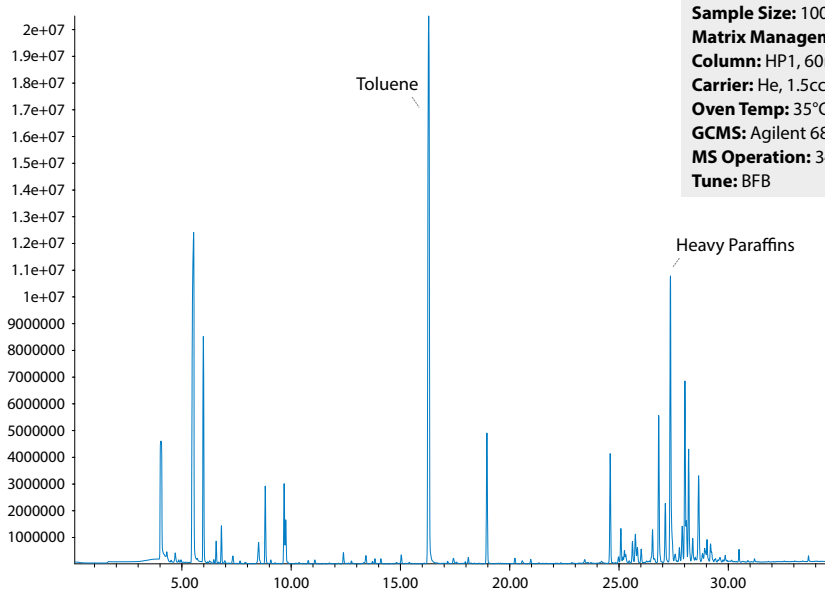
### Ethylene Oxide / Diacetyl HDS™ Analysis



**Sample Size:** 10cc  
**Concentration:** 1 ppmv  
**Concentration Procedure:** 3-Stage Trap  
**Column:** DB1, 60m, 0.32mm ID, 1µm film  
**Oven Start Temp:** 35°C  
**GCMS:** Agilent 5975C  
**MS Operation:** Full Scan  
**Tune:** BFB

## Volatiles in Food Packaging

### Cheese Wrapping Analysis



**Inlet:** 7100A / 7200 Preconcentrator  
**Sample Size:** 100cc  
**Matrix Management:** MP&T  
**Column:** HP1, 60m, 0.32mm ID, 1µm film  
**Carrier:** He, 1.5cc/min. constant flow  
**Oven Temp:** 35°C 5 min., 6°C/min. to 150°C, 15°C/min. to 220°C, 4 min. hold.  
**GCMS:** Agilent 6890/5973N  
**MS Operation:** 34–270 amu, 3.1 Hz, EI, EM=0 Rel.  
**Tune:** BFB

# Volatile Compounds from Can Coatings

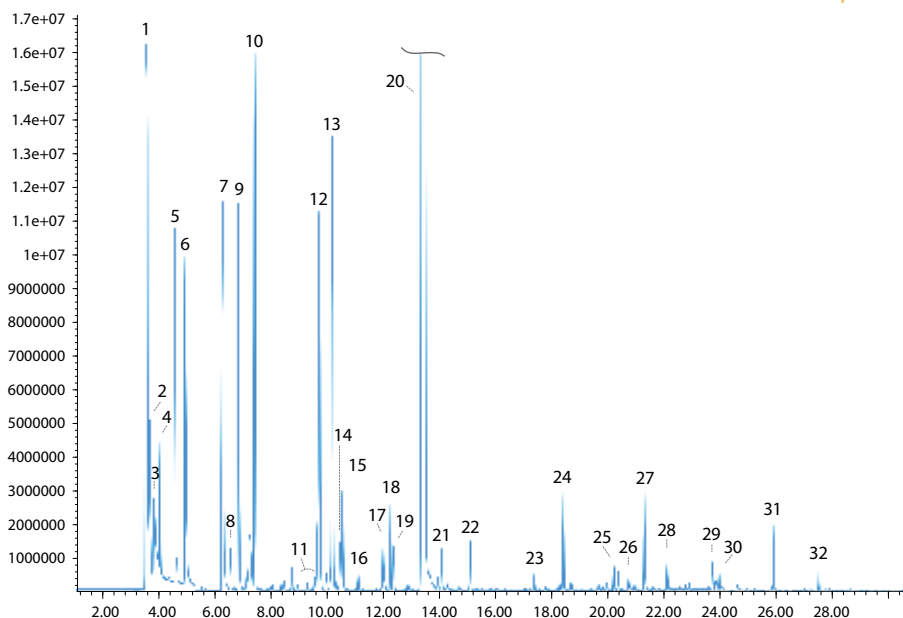


Can Gas Sampler attaches to any size can for sampling interior volume.  
PN 30-20160QT



## Can Coatings Analysis

Up to 21 containers, 3" in Dia. or less can be sequentially analyzed on the 7032A Autosampler.

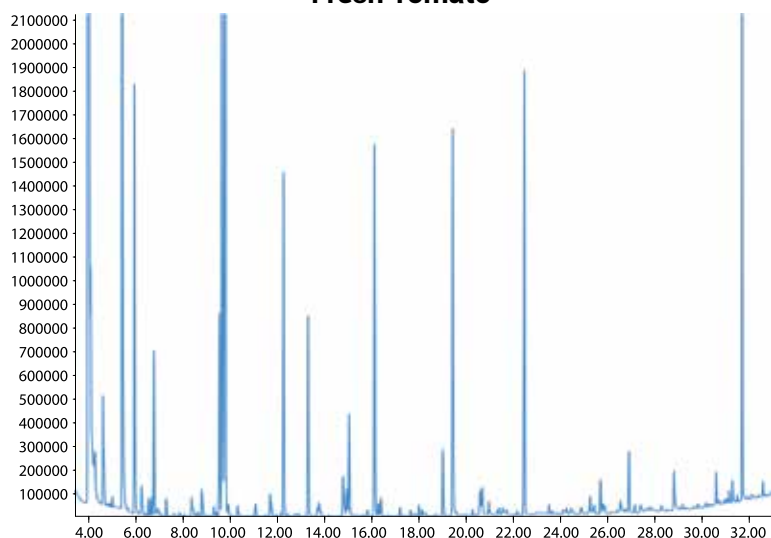


**Inlet:** 7100A / 7200 Preconcentrator  
**Sample Size:** 150cc  
**Matrix Management:** MP&T, M1-GB, M2-Tenax®  
**Column:** HP1, 60m, 0.32mm ID, 1µm film  
**Carrier:** He, 1.5cc/min. constant flow  
**Oven Temp:** 35°C 5 min., 6°C/min. to 150°C, 15°C/min. to 220°C, 4 min. hold.  
**GCMS:** Agilent 6890/5973N  
**MS Operation:** 34-270 amu, 3.1Hz, EI, EM=0 Rel.  
**Tune:** BFB

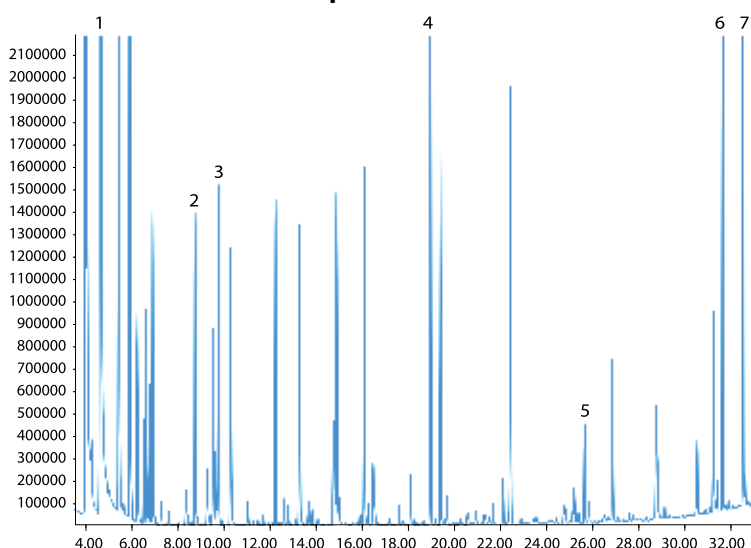
- |                     |                      |
|---------------------|----------------------|
| 1. CO <sub>2</sub>  | 17. Isobutyl Alcohol |
| 2. Propane/ Propene | 18. IS 2             |
| 3. Formaldehyde     | 19. 2-Ethylacrolein  |
| 4. Isobutene        | 20. 1-Butanol        |
| 5. Acetaldehyde     | 21. Butyl Formate    |
| 6. Methanol         | 22. Toluene          |
| 7. Ethanol          | 23. Hexanal          |
| 8. Propanal         | 24. IS 3             |
| 9. Acetone          | 25. 3-Heptanone      |
| 10. Surrogate       | 26. Heptanal         |
| 11. Cyclohexane     | 27. Surrogate 1      |
| 12. Butanal         | 28. 2-Ethylhexanal   |
| 13. 2-Butanone      | 29. Octanal          |
| 14. IS 1            | 30. Column Artifact  |
| 15. Heptane         | 31. Nonanal          |
| 16. Benzene         | 32. Decanal          |

# Analysis of Chemical Markers in Foods and Ingredients

## Fresh Tomato



## Spoiled Tomato



**Inlet:** 7100A / 7200 Preconcentrator  
**Sample Size:** 100cc  
**Matrix Management:** MP&T, M1-GB, M2-Tenax®  
**Column:** HP1, 60m, 0.32mm ID, 1µm film  
**Carrier:** He, 1.5cc/min. constant flow  
**Oven Temp:** 35°C 5 min., 6°C/min. to 150°C, 15°C/min. to 220°C, 4 min. hold.  
**GCMS:** Agilent 6890/5973N  
**MS Operation:** 34-270 amu, 3.1Hz, EI, EM=0 Rel.  
**Tune:** BFB

1. Ethanol
2. Ethyl Acetate
3. 2-Methyl Furan
4. Limonene
5. Nonanal
6. Decanal
7. Dimethyl-HexahydroNaphthalene

## Fresh Spoiled Tomatoes

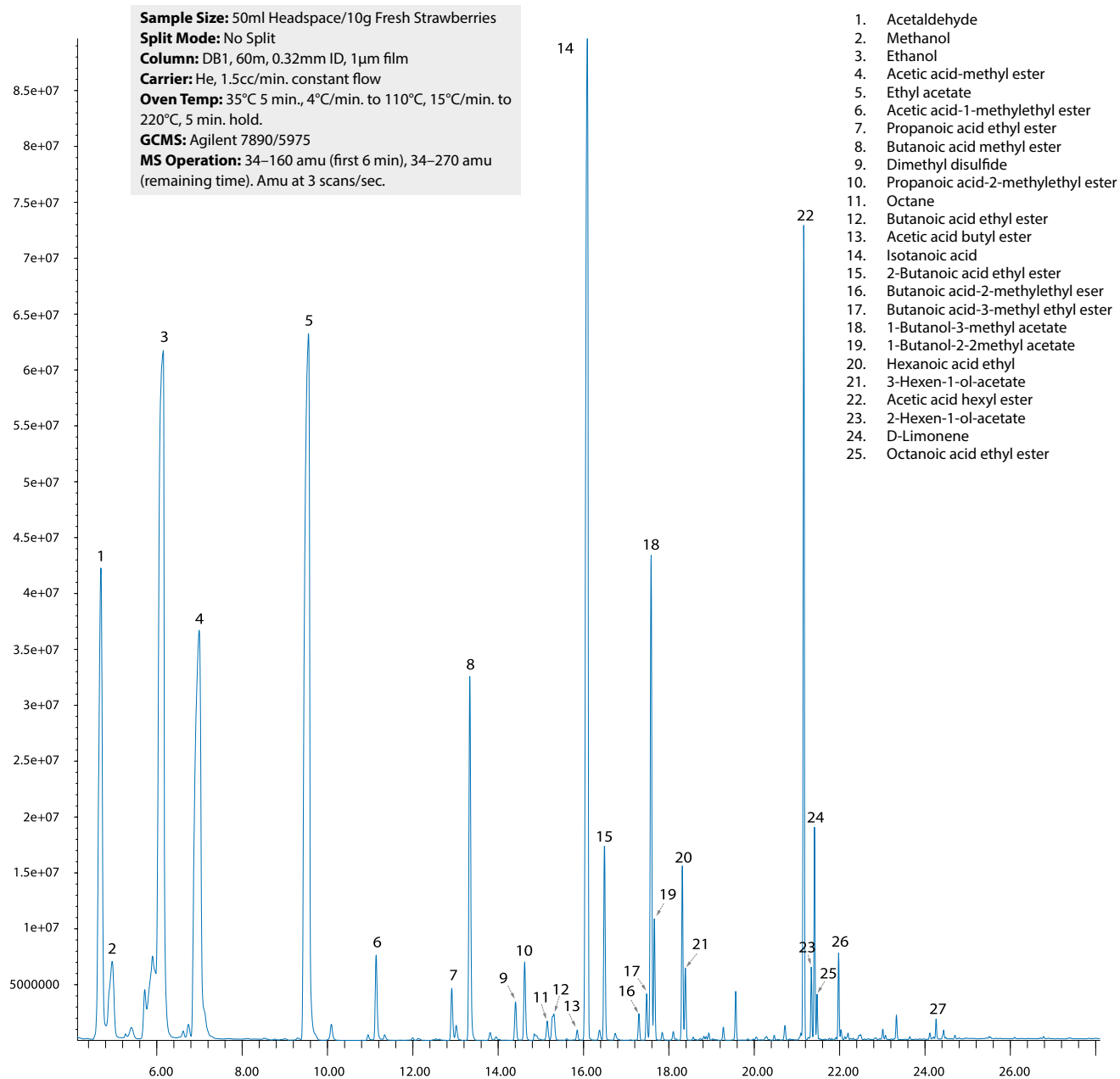
Area Counts (x10<sup>6</sup>)

	Fresh	Spoiled	S/F Ratio
Ethyl Acetate	74	12	0.2
Nonanal	5.5	25	4.5
Decanal	2	23	11.5
Ethanol	84	85	1.0
Limonene	8	21	2.6
Demethyl-Hexa-HydroNaphthalene	0.2	248	1240.0
2-Methyl Furan	157	43	0.3
DHHN/2-MF	0.001	5.8	4527.4

# Strawberries Analysis



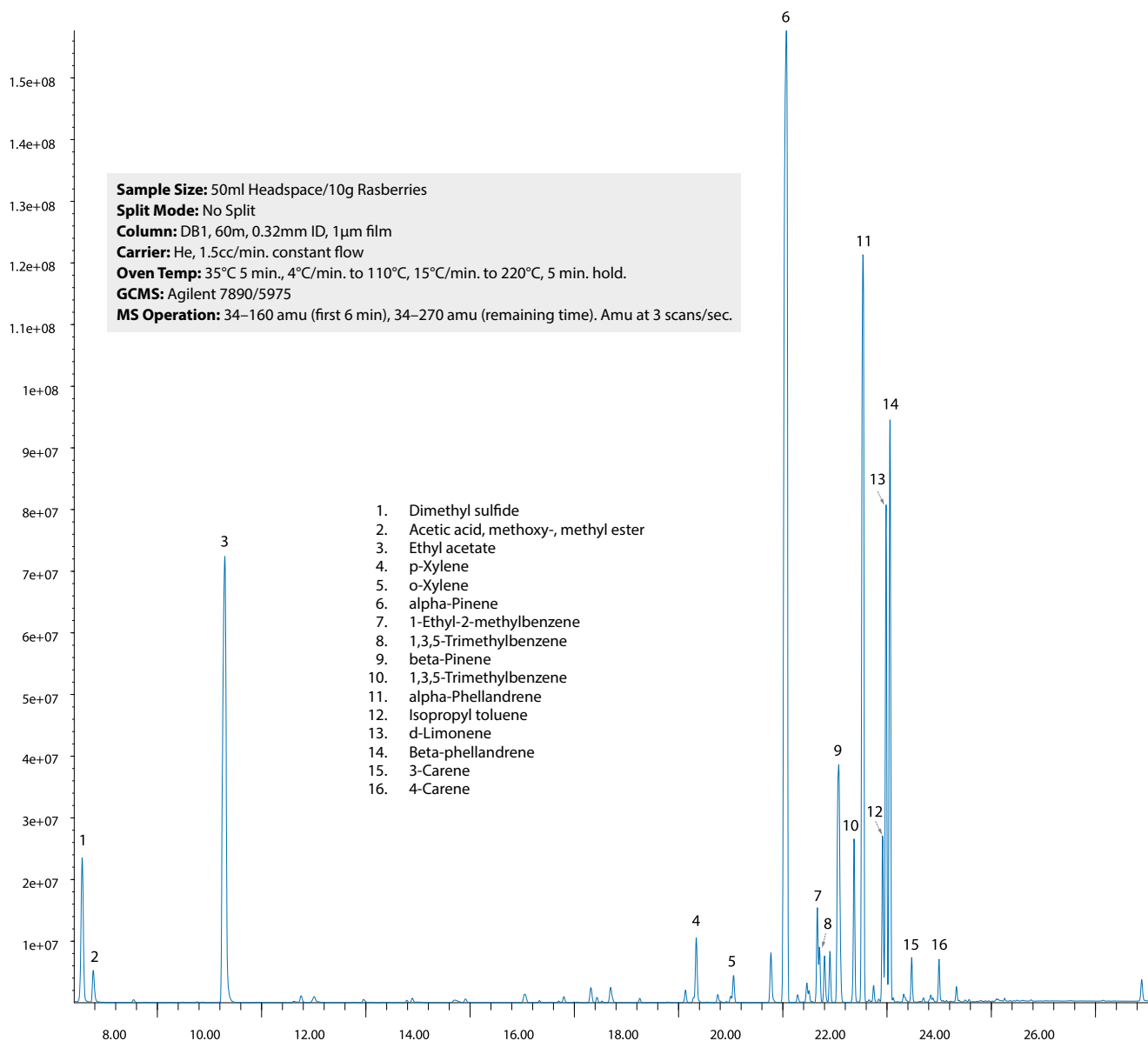
## Strawberries Analysis (On-Column Extraction)







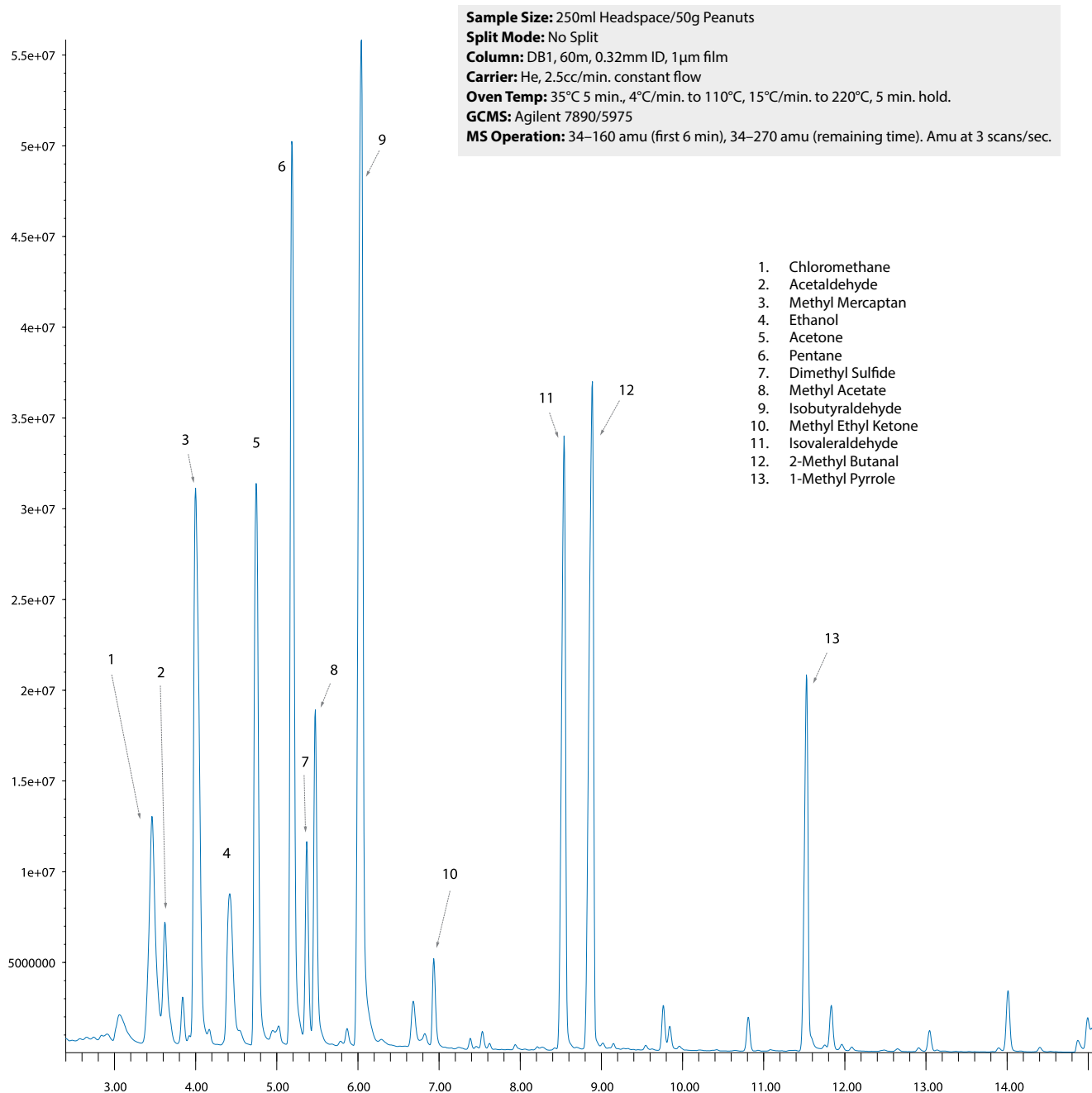
## Raspberries Analysis (On-Column Extraction)



# Peanuts Analysis



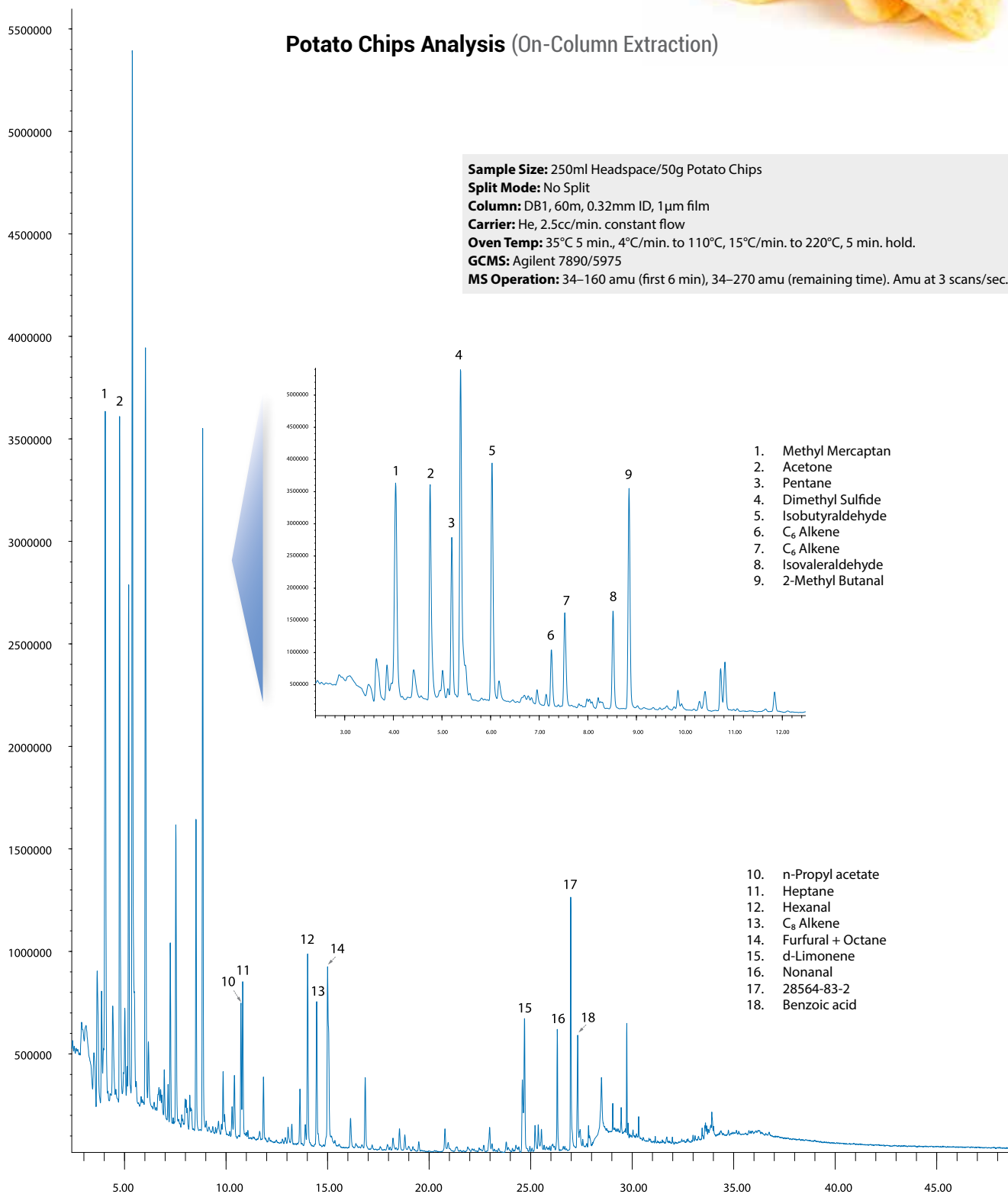
## Peanuts Analysis (On-Column Extraction)



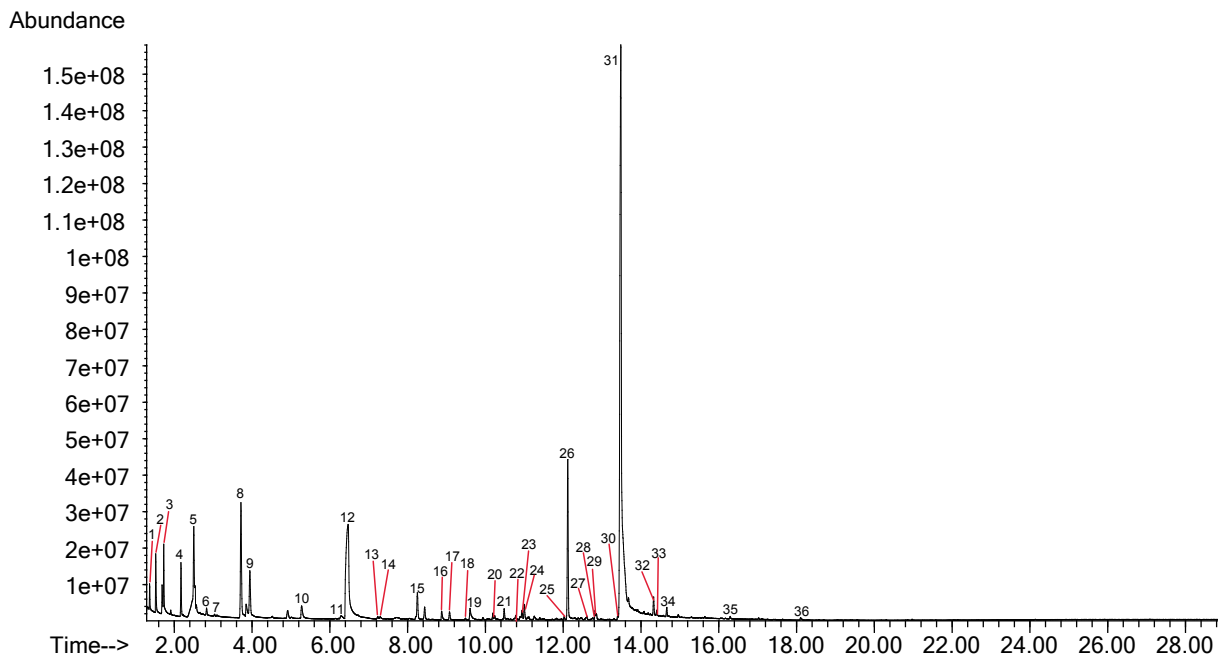


## Potato Chips Analysis (On-Column Extraction)

**Sample Size:** 250ml Headspace/50g Potato Chips  
**Split Mode:** No Split  
**Column:** DB1, 60m, 0.32mm ID, 1µm film  
**Carrier:** He, 2.5cc/min. constant flow  
**Oven Temp:** 35°C 5 min., 4°C/min. to 110°C, 15°C/min. to 220°C, 5 min. hold.  
**GCMS:** Agilent 7890/5975  
**MS Operation:** 34–160 amu (first 6 min), 34–270 amu (remaining time). Amu at 3 scans/sec.



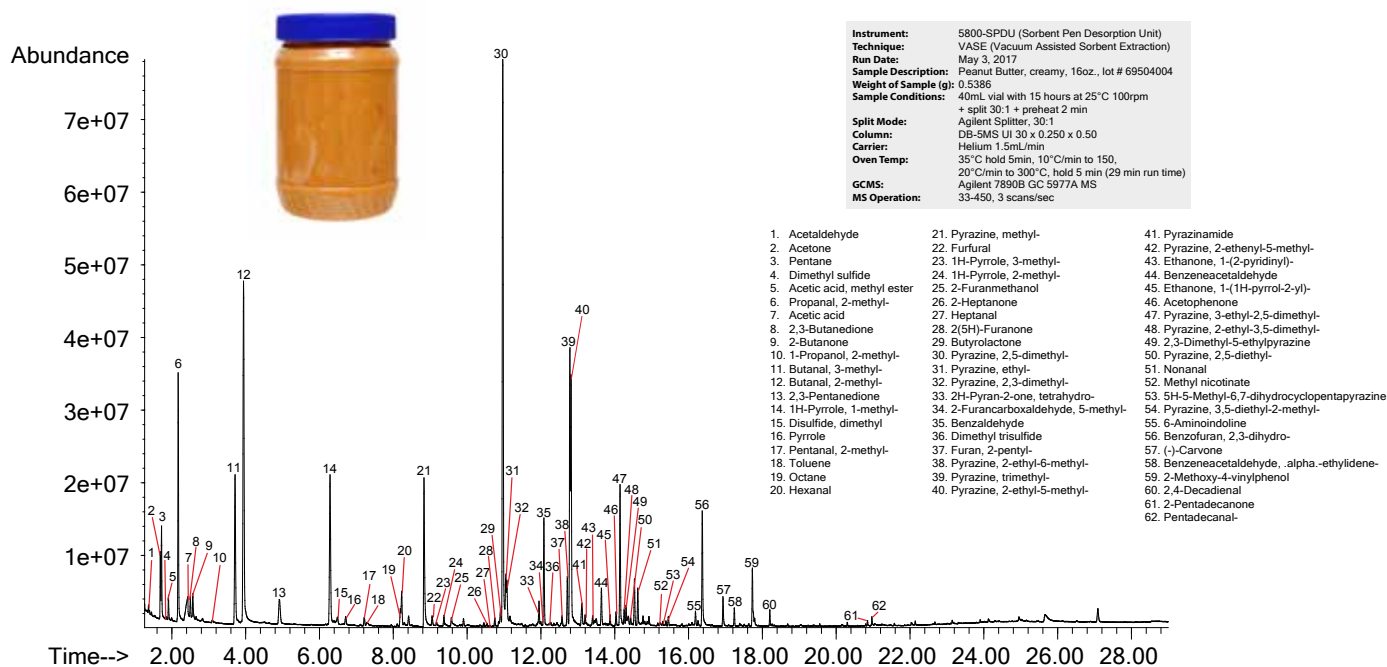
## Fresh Cookie Analysis



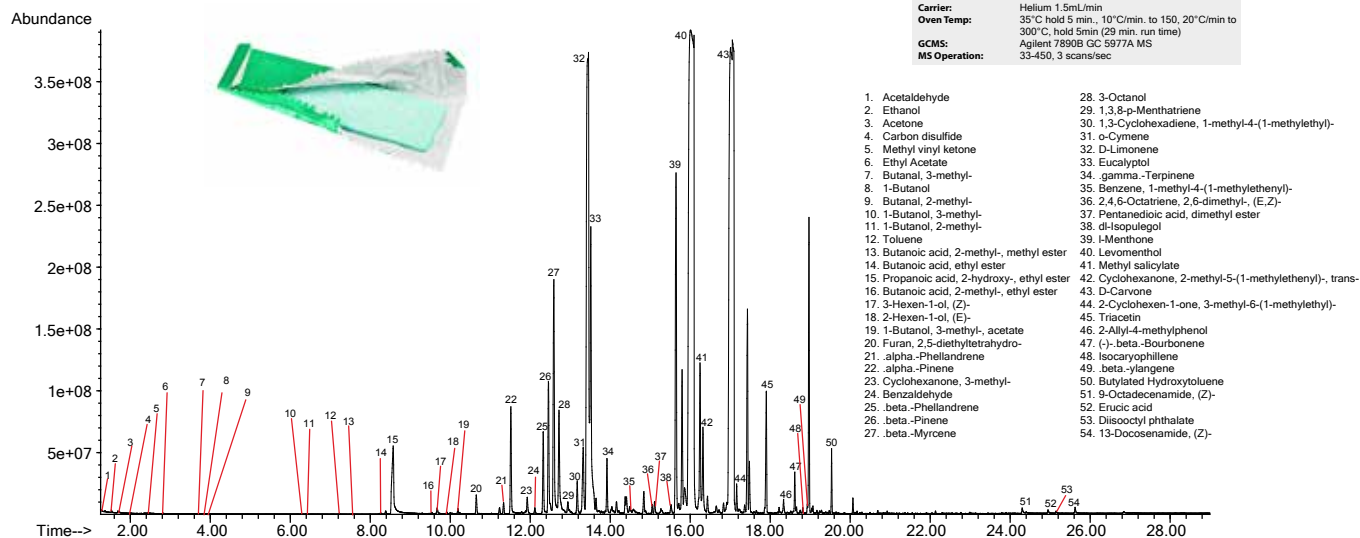
**Instrument:** 5800-SPDU (Sorbent Pen Desorption Unit)  
**Technique:** VASE (Vacuum Assisted Sorbent Extraction)  
**Run date:** April 28, 2017  
**Sample description:** Fresh Baked Chocolate Chip Cookie  
**Weight of sample (g):** 1.4723  
**Sample conditions:** 5hrs@25C 100rpm + preheat 2min + split 30:1  
**Split Mode:** Split 2, 30:1  
**Column:** Db-5MS UI 30 x 0.250 x 0.50  
**Carrier:** Helium 1.5mL/min  
**Oven Temp:** 35C hold 5min, 10C/min to 150, 20C/min to 300C, hold 5min (29min run time)  
**GCMS:** Agilent 7890B GC 5977A MS  
**MS Operation:** 33-450, 3 scans/sec

- |                          |                                      |
|--------------------------|--------------------------------------|
| 1. Acetaldehyde          | 19. 2-Furanmethanol                  |
| 2. Ethanol               | 20. 1-Butanol, 3-methyl-, acetate    |
| 3. Acetone               | 21. 2-Heptanone                      |
| 4. Propanal, 2-methyl-   | 22. Heptanal                         |
| 5. Acetic acid           | 23. Butyrolactone                    |
| 6. Ethyl Acetate         | 24. Pyrazine, 2,5-dimethyl-          |
| 7. Trichloromethane      | 25. 2-Furancarboxaldehyde, 5-methyl- |
| 8. Butanal, 3-methyl-    | 26. Benzaldehyde                     |
| 9. Butanal, 2-methyl-    | 27. Furan, 2-pentyl-                 |
| 10. Acetoin              | 28. Pyrazine, trimethyl-             |
| 11. 1-Butanol, 3-methyl- | 29. Octanal                          |
| 12. Propylene Glycol     | 30. D-Limonene                       |
| 13. Toluene              | 31. Benzyl alcohol                   |
| 14. 1-Pentanol           | 32. Pyrazine, tetramethyl-           |
| 15. Hexanal              | 33. 2-Nonanone                       |
| 16. Pyrazine, methyl-    | 34. Nonanal                          |
| 17. Furfural             | 35. Acetic acid, phenylmethyl ester  |
| 18. 2-Pentanol, acetate  | 36. Piperonal                        |

# Peanut Butter Analysis

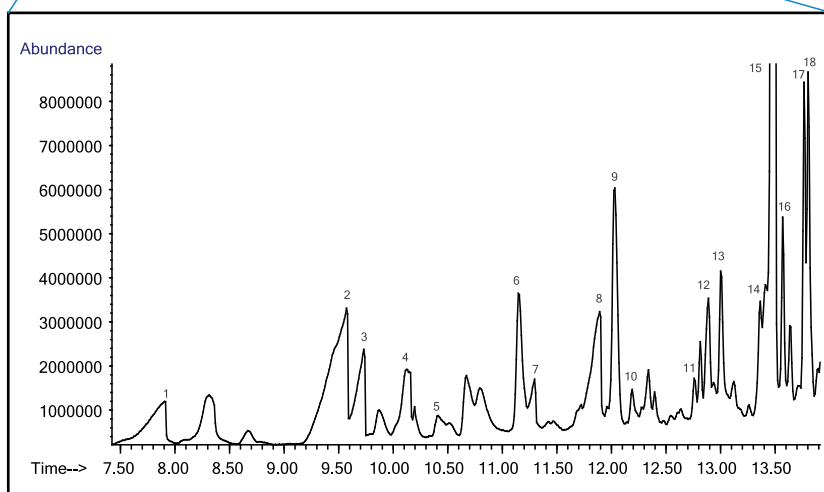
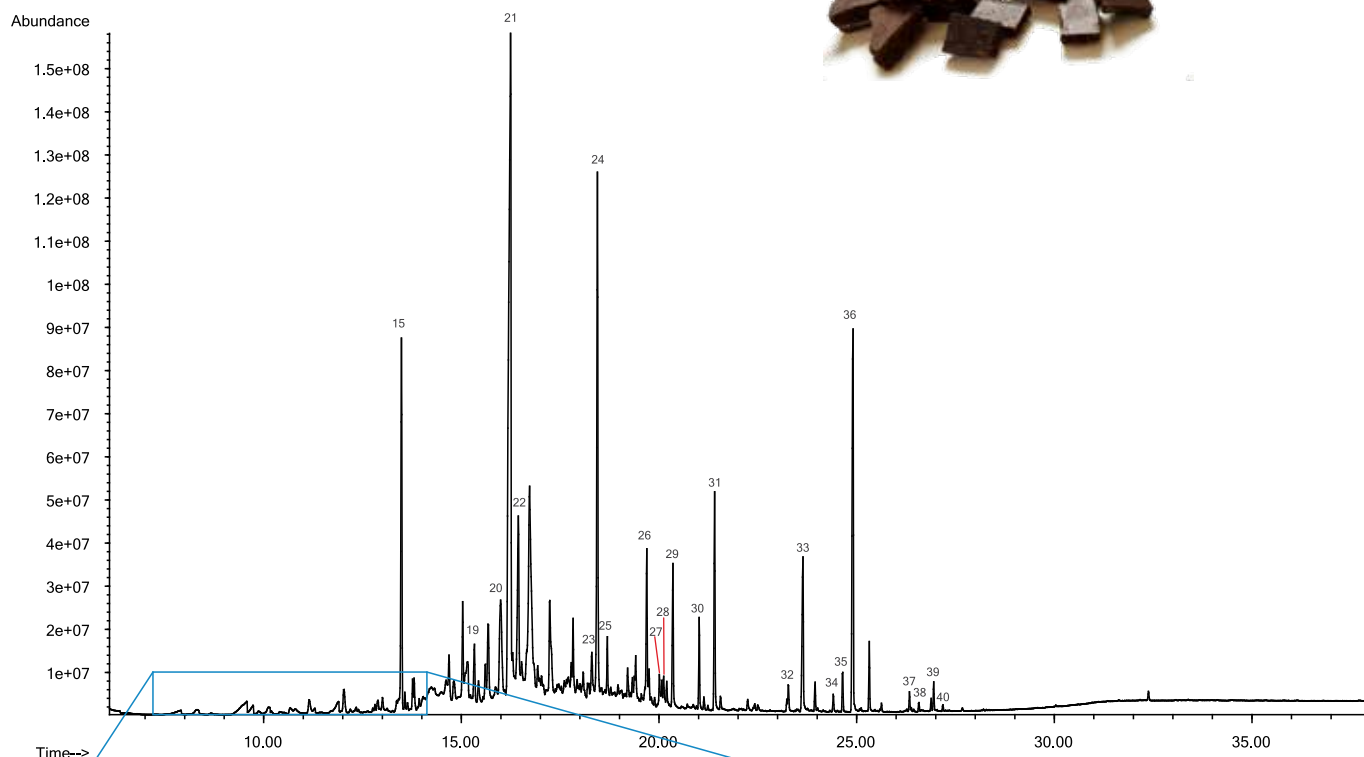


# Gum Analysis





## Dark Chocolate Analysis

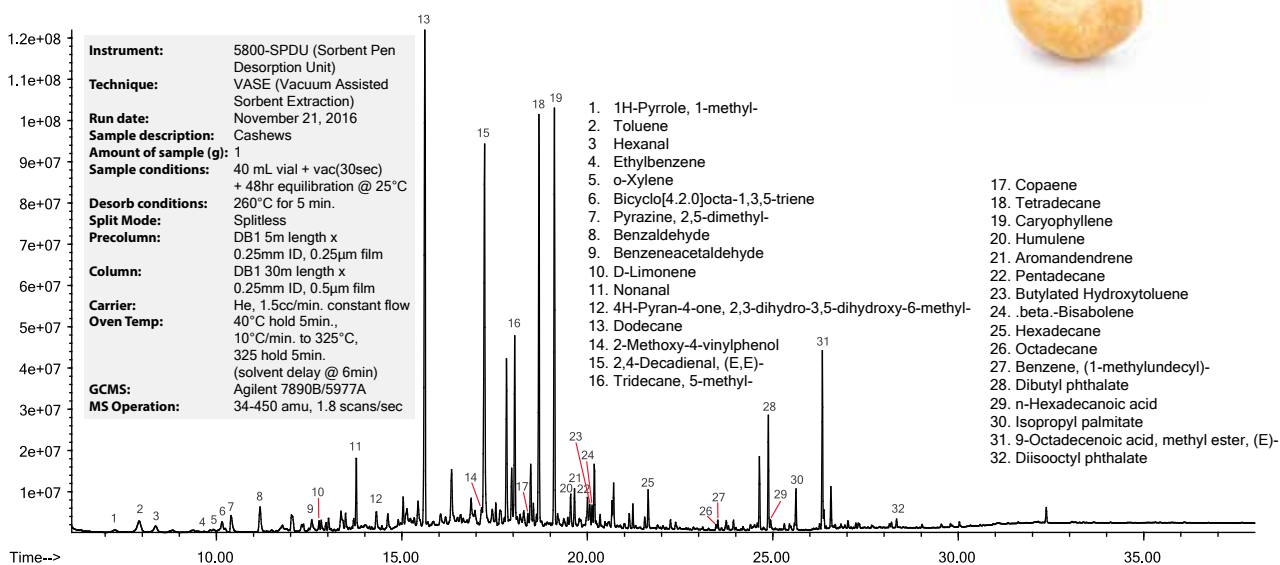


**Instrument:** 5800-SPDU (Sorbent Pen Desorption Unit)  
**Technique:** VASE (Vacuum Assisted Sorbent Extraction)  
**Run date:** November 17, 2016  
**Sample description:** Dark Chocolate  
**Amount of sample (g):** 1  
**Sample conditions:** 40 mL vial with 15hr equilibration at 25°C  
**Desorb conditions:** 260°C for 5 min.  
**Split Mode:** Splitless  
**Precolumn:** DB1 5m length x 0.25mm ID, 0.25µm film  
**Column:** DB1 30m length x 0.25mm ID, 0.5µm film  
**Carrier:** He, 1.5cc/min. constant flow  
**Oven Temp:** 40°C hold 5min., 10°C/min. to 325°C, 325 hold 5min. (solvent delay at 6 min.)  
**GCMS:** Agilent 7890B/5977A  
**MS Operation:** 34-450 amu, 1.8 scans/sec

- |   |                                      |  |                                       |
|---|--------------------------------------|--|---------------------------------------|
| 1. Propanoic acid, 2-methyl-                | 11. D-Limonene                       | 21. Acetic acid, 2-phenylethyl ester                       | 31. Benzophenone                      |
| 2. Butanoic acid, 3-methyl-                 | 12. Ethanone, 1-(1H-pyrrol-2-yl)-    | 22. Benzeneacetaldehyde, .alpha.-ethylidene-               | 32. Tetradecanoic acid, ethyl ester   |
| 3. Butanoic acid, 2-methyl-                 | 13. Acetophenone                     | 23. Vanillin   | 33. Caffeine                          |
| 4. Heptanal                                 | 14. Pyrazine, 3-ethyl-2,5-dimethyl-  | 24. Benzoic acid, pent-2-yl ester                          | 34. 2-Heptadecanone                   |
| 5. Pyrazine, 2,5-dimethyl-                  | 15. Pyrazine, tetramethyl-           | 25. Tetradecane  | 35. Hexadecanoic acid, methyl ester   |
| 6. Benzaldehyde                             | 16. 2-Nonanone                       | 26. 5-Methyl-2-phenyl-2-hexenal                            | 36. Di-sec-butyl phthalate            |
| 7. Pentanoic acid, 4-methyl-                | 17. Nonanal                          | 27. Pentadecane  | 37. 9-Octadecenoic acid, methyl ester |
| 8. Hexanoic acid                            | 18. 1,6-Octadien-3-ol, 3,7-dimethyl- | 28. Butylated Hydroxytoluene                               | 38. Linoleic acid ethyl ester         |
| 9. Pyrazine, trimethyl-                     | 19. Octanoic acid, ethyl ester       | 29. 1H-2-Benzopyran-1-one, 3,4-dihydro-8-hydroxy-3-methyl- | 39. 9-Octadecenoic acid, (E)-         |
| 10. Propanoic acid, 2-hydroxy-, butyl ester | 20. Benzeneacetic acid, ethyl ester  | 30. Dodecanoic acid, ethyl ester                           | 40. Octadecanoic acid, ethyl ester    |

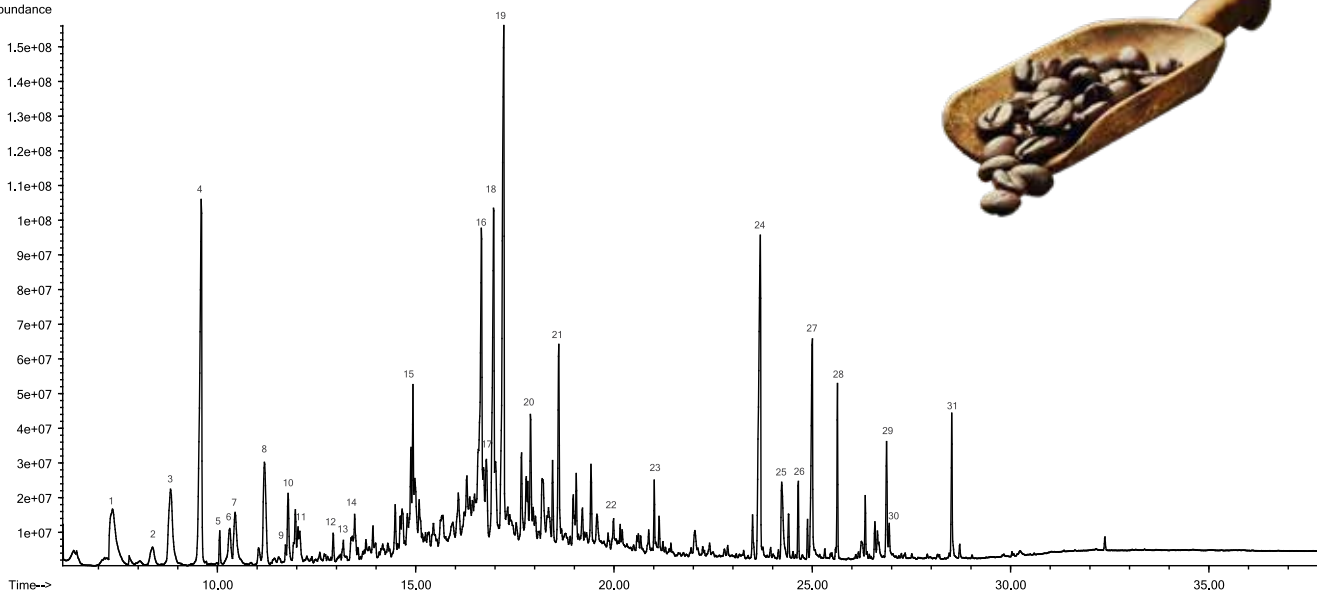
# Cashew Analysis

Abundance



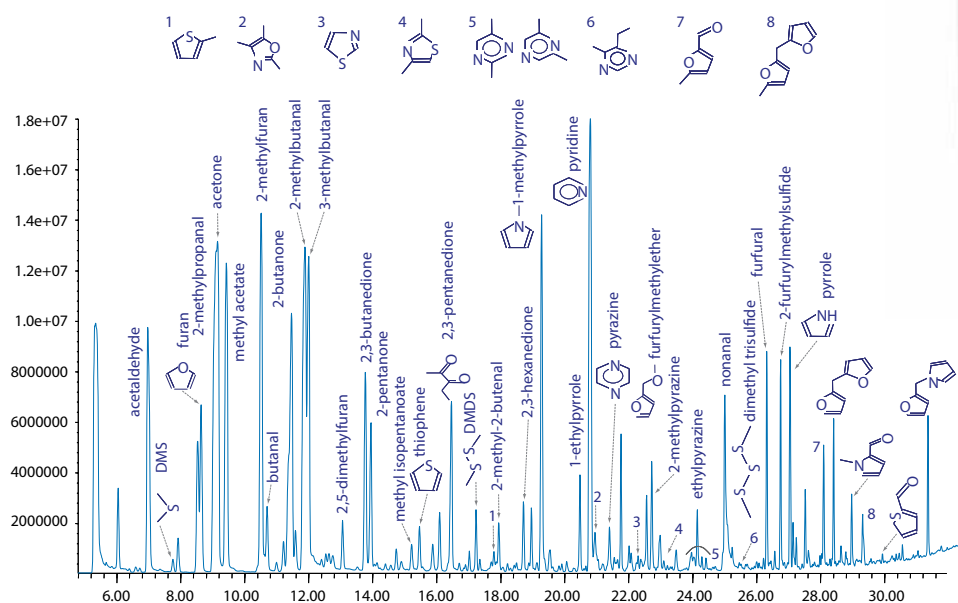
# Coffee Analysis

Abundance



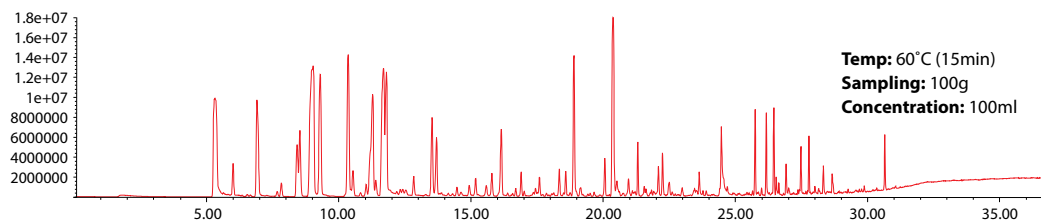
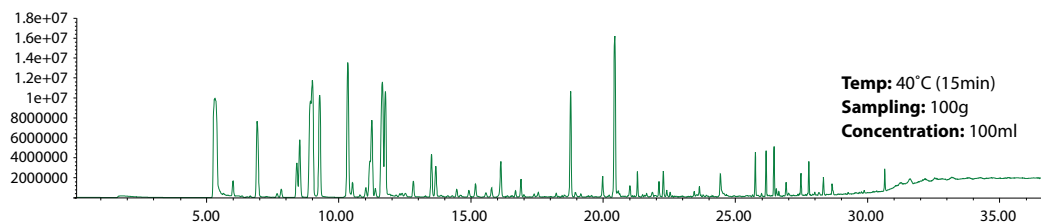
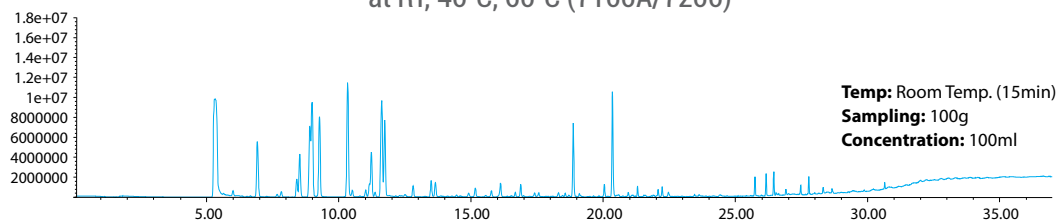
## Coffee Aroma Analysis

## Flavor Analysis in Coffee (LVSH)



**Sampling:** 7100A/7200 LVSH (500ml jar) **Sample Size:** 100ml **Preconcentration:** MPT **Temp:** 60°C **MS Scan Range:** m/z 29–300 **GC Column:** HP-wax (60m length, 0.25mm I.d., 0.5m thickness) **GC Oven:** 40 (5 min) - 5/min - 100 - 10/min - 250 (hold)

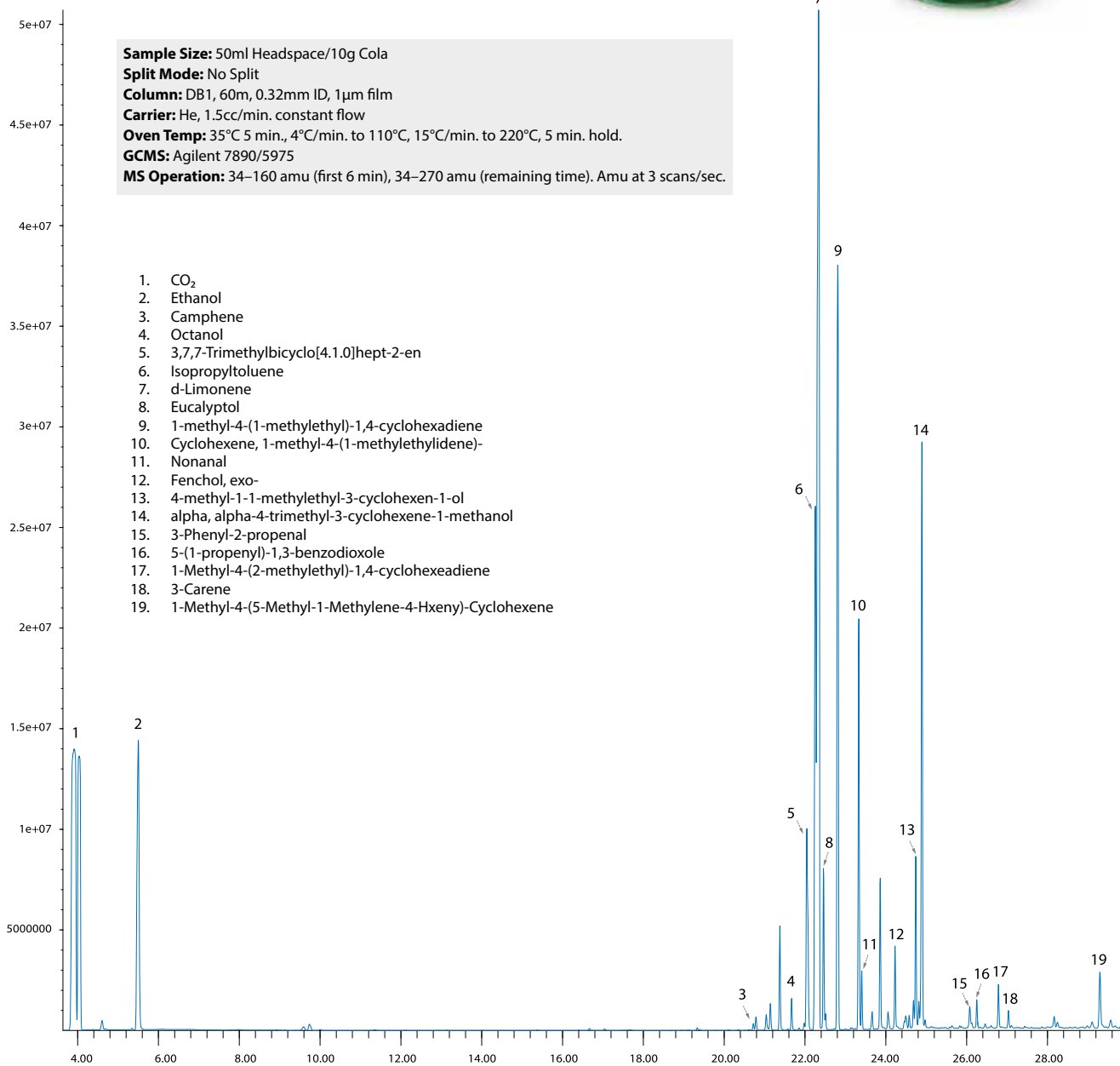
### Flavor Analysis in Coffee (LVSH) at RT, 40°C, 60°C (7100A/7200)



7100A / 7200 analysis of brewed coffee at three different temperatures by LVSH using a 15 minute preheat. Recovery of heavier volatiles increased with an increase in the sample temperature.

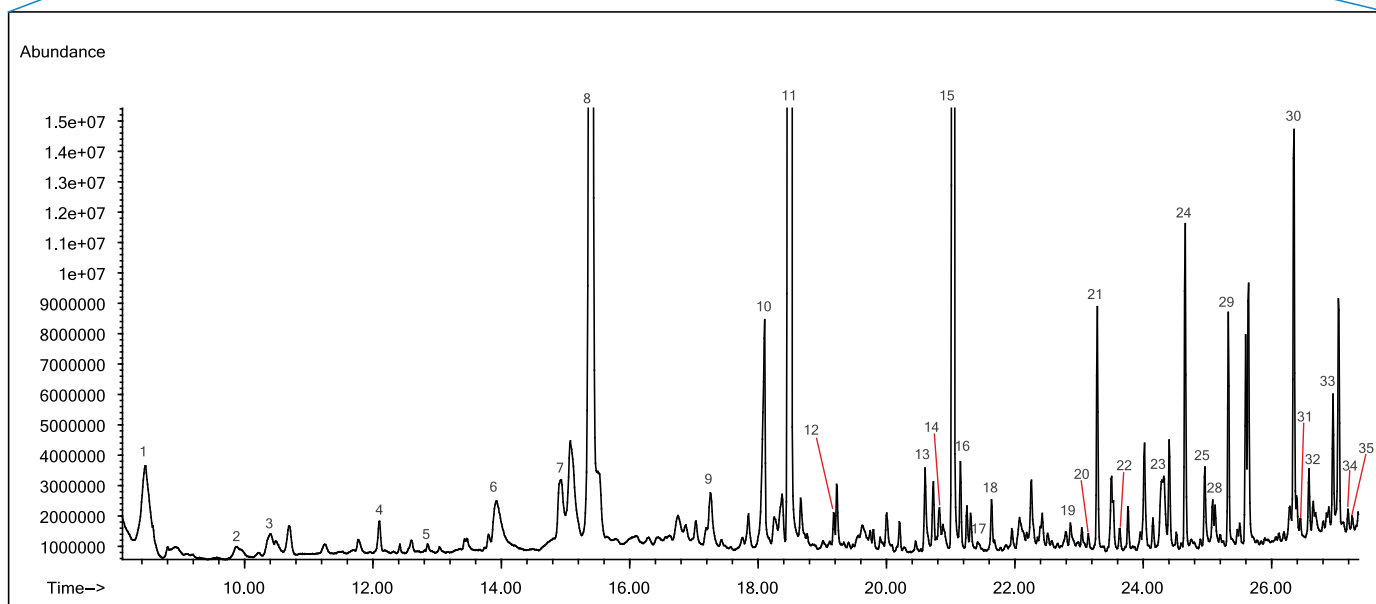
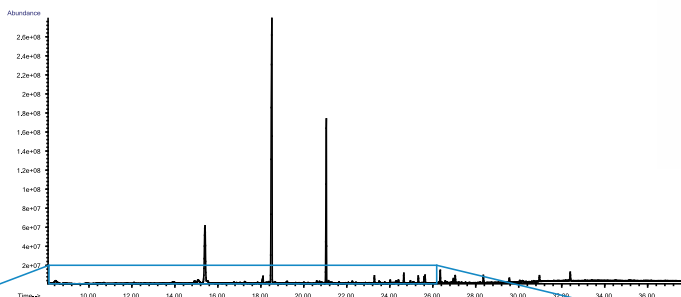


## Cola Beverage Analysis (On-Column Extraction)



# Rum Analysis

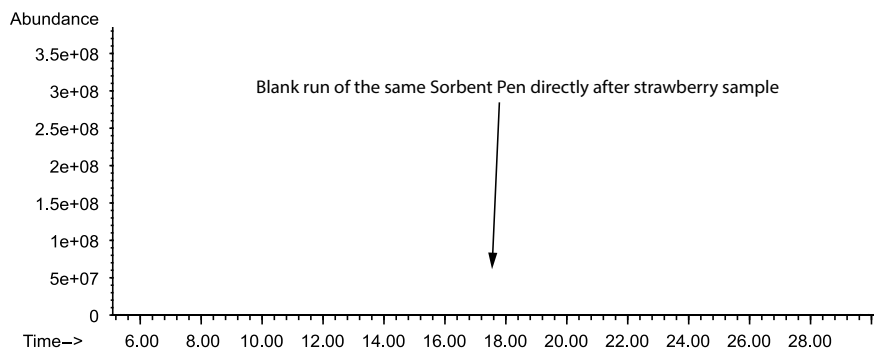
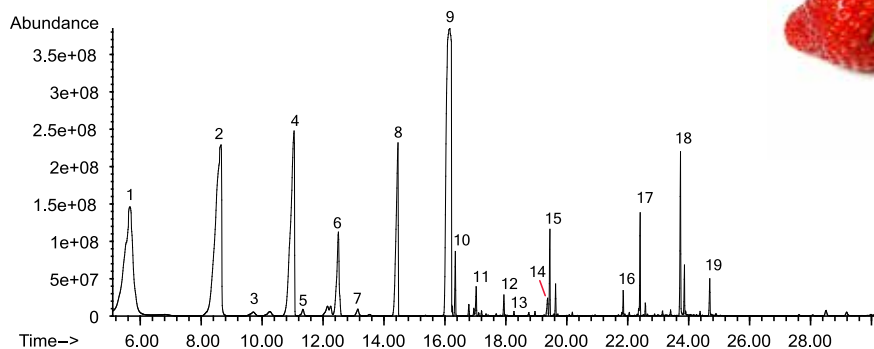
**Instrument:** 5800-SPDU (Sorbent Pen Desorption Unit)  
**Technique:** VASE (Vacuum Assisted Sorbent Extraction)  
**Run date:** November 16, 2016  
**Sample description:** 1:1 Rum (50µl Rum + 50µl Water)  
**Amount of sample (mL):** 50µl  
**Sample conditions:** 20mL vial + vac(30sec) + 15hr equilibration @ 25°C  
**Split Mode:** Splitless  
**Column:** DB1 30m length x 0.25mm ID, 0.5µm film  
**Carrier:** He, 1.5cc/min. constant flow  
**Oven Temp:** 40°C hold 5min., 10°C/min. to 300°C, hold 7min. (solvent delay @ 8min)  
**GCMS:** Agilent 7890B/5977A  
**MS Operation:** 34-450 amu, 1.8 scans/sec



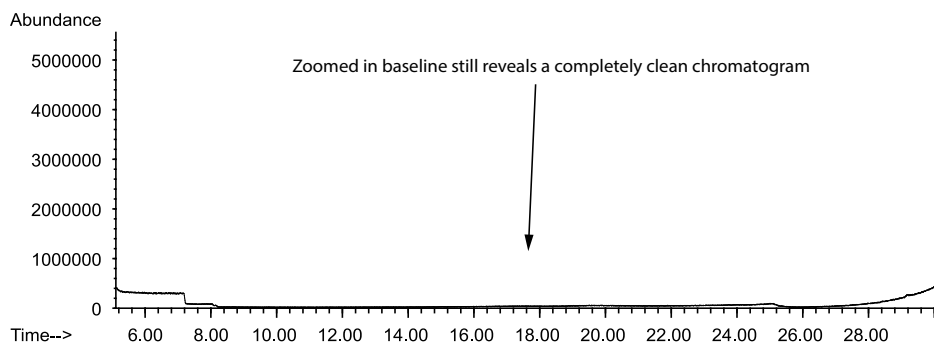
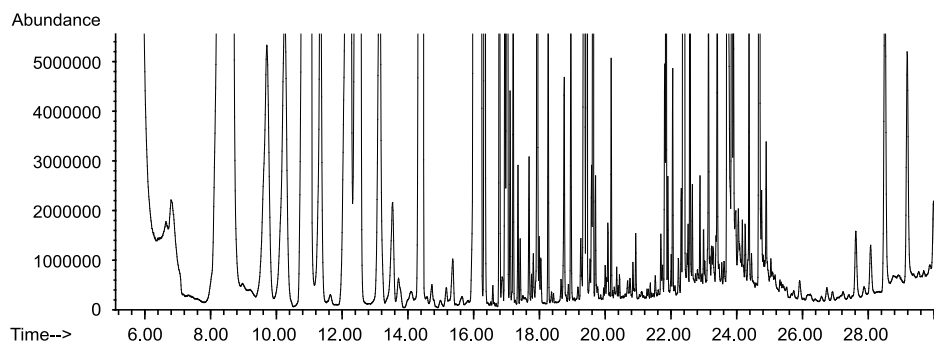
- |  |  |
|--|--|
| 1. 3(2H)-Furanone, dihydro-2-methyl-                                   | 19. Tetradecanoic acid                           |
| 2. 1-Hexanol   | 20. Ethyl 9-tetradecenoate                       |
| 3. Ethanone, 1-(2-furanyl)-  | 21. Pentadecanoic acid, ethyl ester              |
| 4. Hexanoic acid, ethyl ester  | 22. Isopropyl myristate                          |
| 5. Pentanoic acid, 4-oxo-, ethyl ester                                 | 23. 1-Hexadecanol                                |
| 6. Phenylethyl Alcohol   | 24. Pentadecanoic acid, 14-methyl-, methyl ester |
| 7. Butanedioic acid, diethyl ester                                     | 25. n-Hexadecanoic acid                          |
| 8. Octanoic acid, ethyl ester  | 26. Ethyl 9-hexadecenoate                        |
| 9. trans-3-Methyl-4-octanolide   | 27. Hexadecanoic acid, ethyl ester               |
| 10. n-Decanoic acid  | 28. 1-Tetradecyl acetate                         |
| 11. Decanoic acid, ethyl ester   | 29. Isopropyl palmitate                          |
| 12. Octanoic acid, 3-methylbutyl ester                                 | 30. 9-Octadecenoic acid (Z)-, methyl ester       |
| 13. Dodecanoic acid  | 31. Heneicosane                                  |
| 14. Benzoic acid, 4-hydroxy-3-methoxy-, ethyl ester                    | 32. Methyl stearate                              |
| 15. Dodecanoic acid, ethyl ester                                       | 33. Ethyl 9-hexadecenoate                        |
| 16. Pentanoic acid, 2,2,4-trimethyl-3-carboxyisopropyl, isobutyl ester | 34. Octadecanoic acid, ethyl ester               |
| 17. Benzophenone   | 35. Benzoic acid, tridecyl ester                 |
| 18. Pentadecanoic acid, 3-methylbutyl ester                            |  |



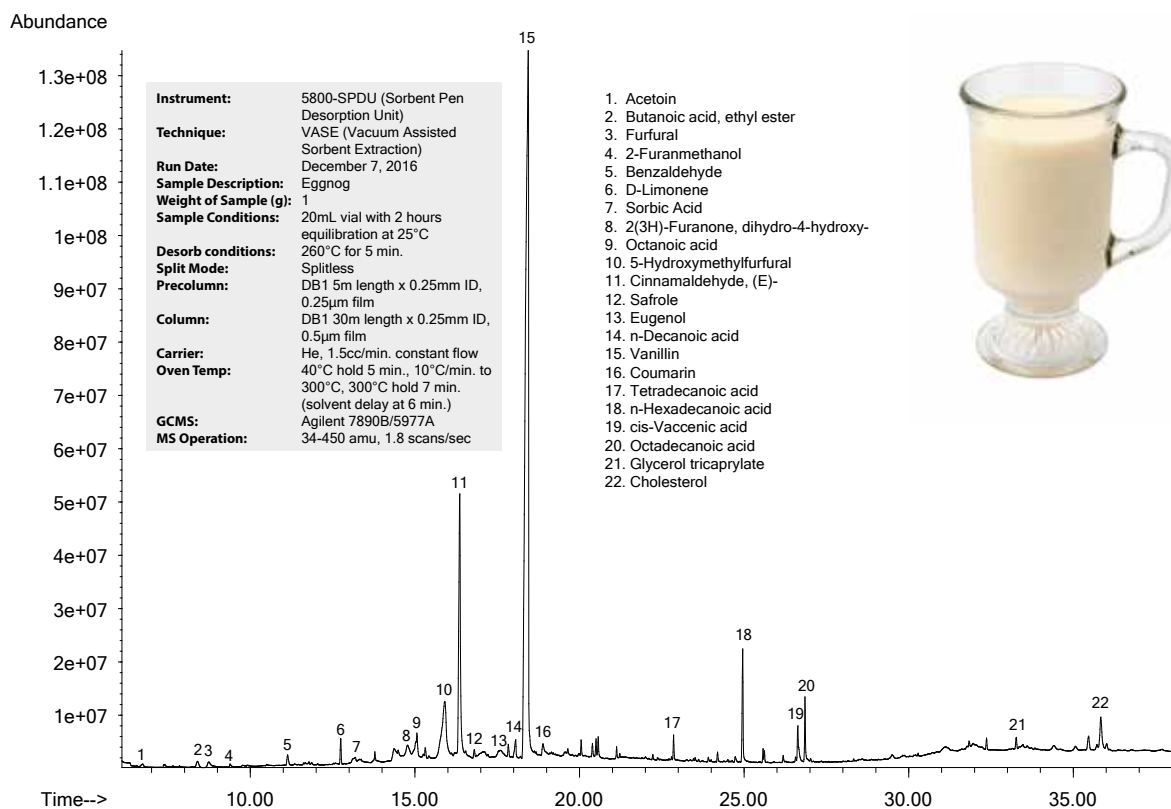
# Blank After Strawberry Analysis



- |   |  |
|---|--|
| 1. Ethyl acetate                          | 11. 3(2H)-Furanone, 4-methoxy-2,5-dimethyl-    |
| 2. Butanoic acid methyl ester             | 12. 1,6-Octadien-3-ol, 3,7-dimethyl-           |
| 3. Propanoic acid, 2-methyl-, ethyl ester | 13. Octanoic acid, methyl ester                |
| 4. Butanoic acid, ethyl ester             | 14. Methyl salicylate                          |
| 5. Acetic acid, butyl ester               | 15. Octanoic acid, ethyl ester                 |
| 6. Butanoic acid, 2-methyl-, ethyl ester  | 16. Butanoic acid, octyl ester                 |
| 7. 1-Butanol, 3-methyl-, acetate          | 17. Pentanoic acid, octyl ester                |
| 8. Hexanoic acid, methyl ester            | 18. 1,6,10-Dodecatrien-3-ol, 3,7,11-trimethyl- |
| 9. Hexanoic acid, ethyl ester             | 19. .gamma.-Dodecalactone                      |
| 10. 2-Hexen-1-ol, acetate, (Z)-           |  |



## Eggnog Analysis



158

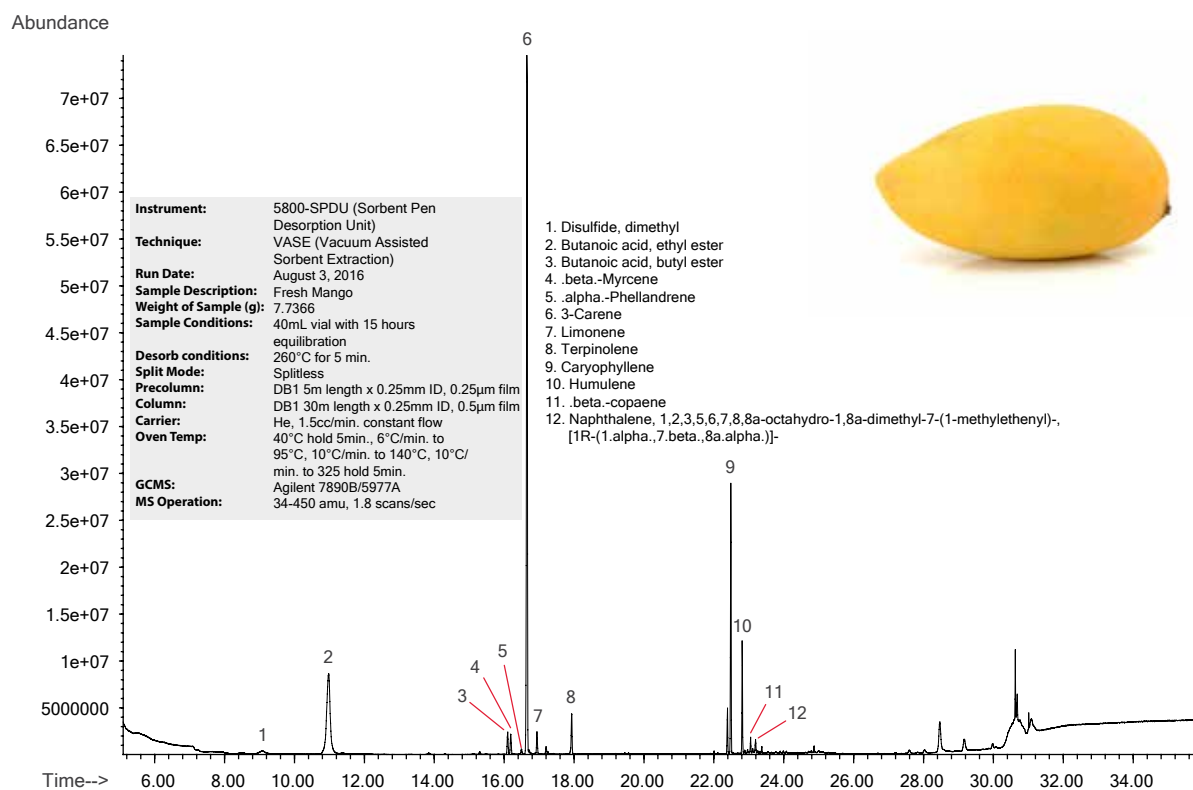
Instruments

Silonite™

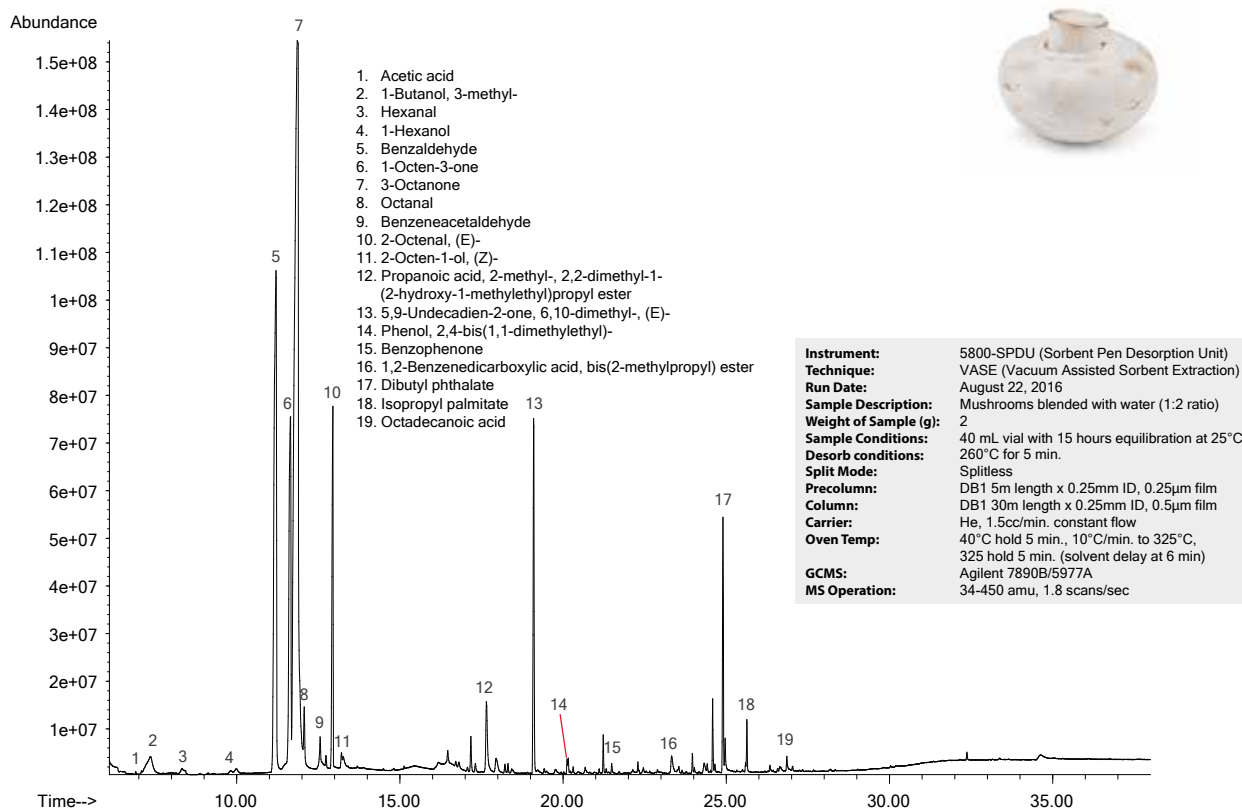
Sampling

Applications

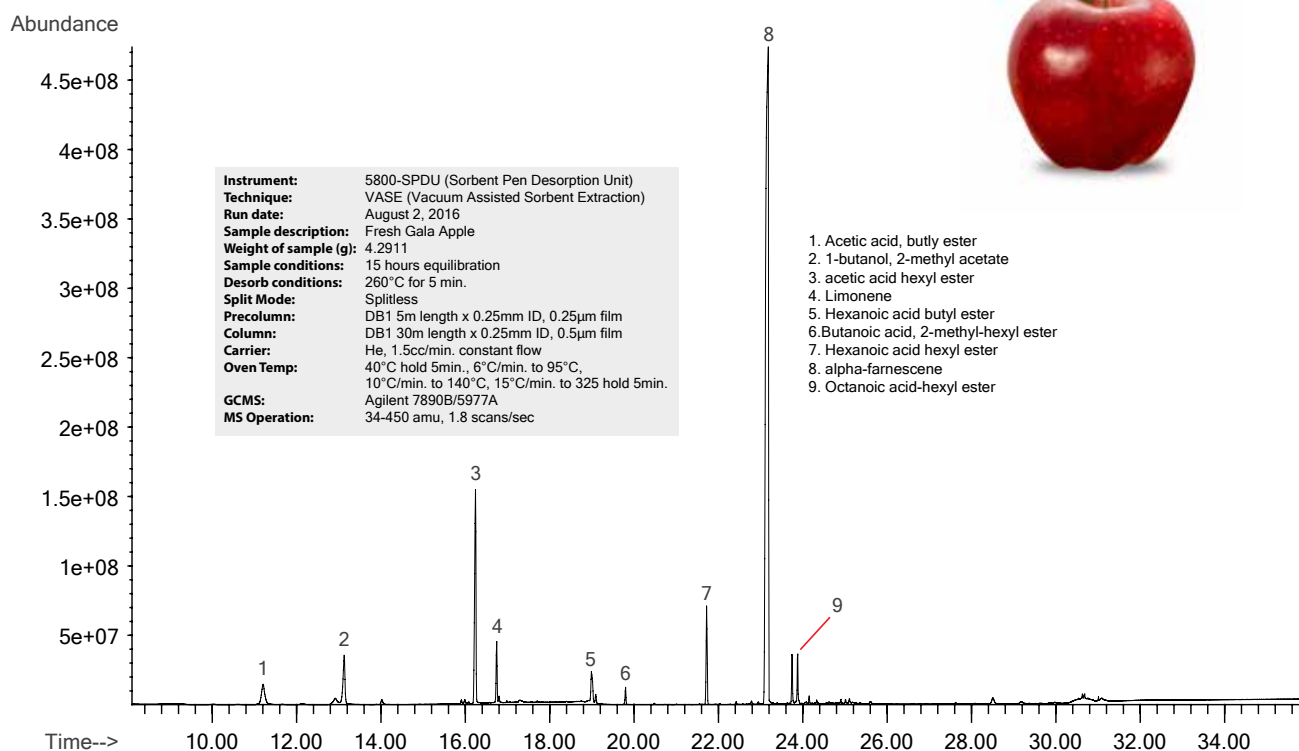
## Ripe Mango Analysis



## Mushroom Analysis



## Apple Analysis



# Alcoholic Beverage Analysis

An preconcentration technique with the On-Column Multi-Trapping System (OCMTS) offers a much more quantitative approach than Solid Phase Microextraction (SPME). A volume of 10–1000cc of headspace is actively pulled through a column containing a typical SPME coating of PDMS (Polydimethylsiloxane) providing hundreds of theoretical plates for compound extraction, rather than the single plate offered by classical “diffusive” SPME. This permits quantitative extraction of headspace compounds while removing the effects of high concentrations of alcohol in the headspace.



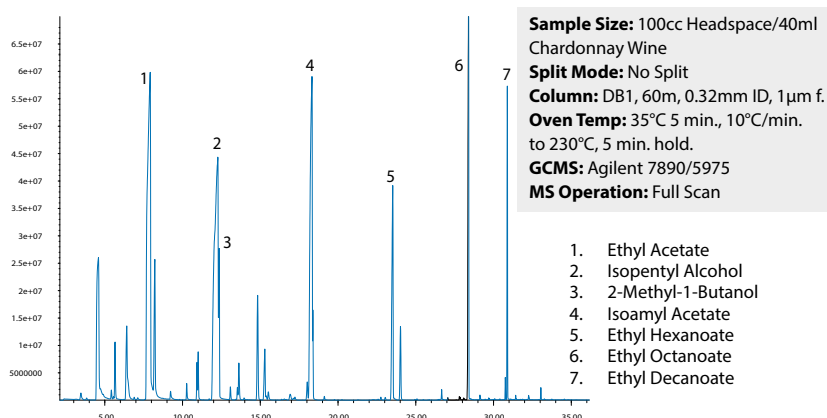
The initial on-column extraction stage, uses a thinner absorptive film than diffusive SPME to minimize carryover and allow much faster injection rates. Compounds too light to be quantitatively retained on the on-column extraction stage are captured on a cold Tenax® trap. A unique flow path design is used to eliminate exposure to plastic rotors while reducing the size of the flow path to minimize losses. Dry purging of the Tenax® trap removes most of the ethanol prior to thermal desorption back through the on-column extraction stage, with refocusing on the head of the column before final delivery to the GCMS. This process greatly improves the chromatographic performance for compounds eluting near ethanol while preventing over-pressurization of the MS and premature aging of the filament or electron multiplier.

The ability to precisely control the volume of headspace analyzed while taking full advantage of both on-column extraction and volatiles recovery with a mild Tenax® adsorbent allows the measurement of very light volatiles to much heavier, thermally labile semi-volatiles. This technique ensures quantitative recovery of all headspace compounds with true characterization of the headspace for all aroma and off-flavor compounds.

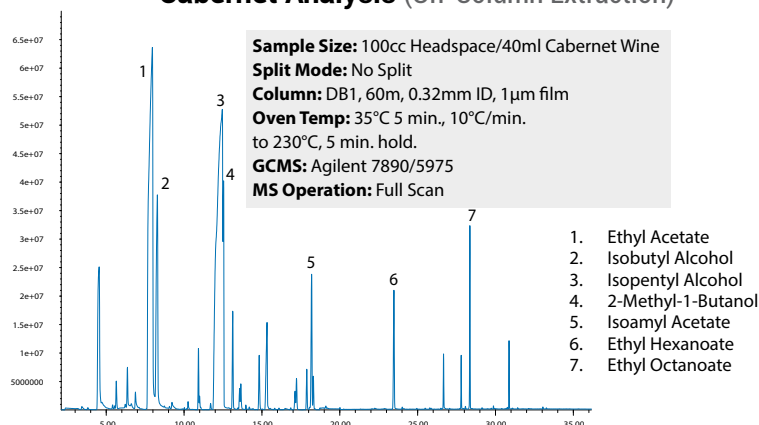
## Features

- Headspace Analysis**  
*Pulls headspace of 10–1000cc.*
- Quantitative Accuracy**  
*Light volatiles and heavier compounds are captured using a mild Tenax® trap.*
- Ultra-clean Flow Path**  
*Flow path eliminates exposure to plastic rotors.*
- On-Column Extraction**  
*Heavier compounds are never exposed to adsorbent traps.*

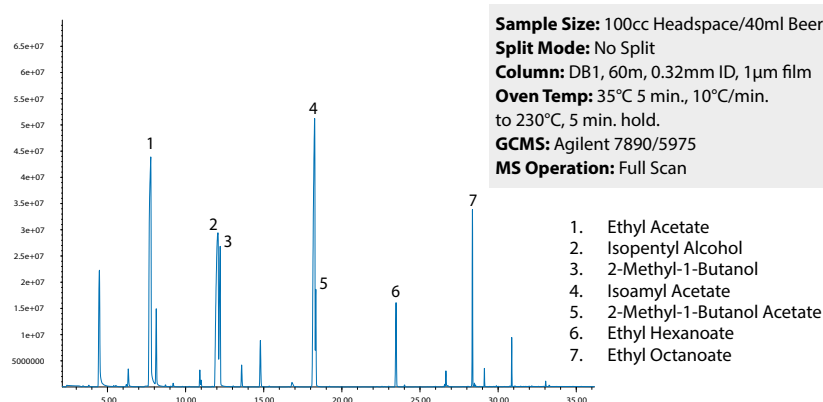
## Chardonnay Analysis (On-Column Extraction)



## Cabernet Analysis (On-Column Extraction)

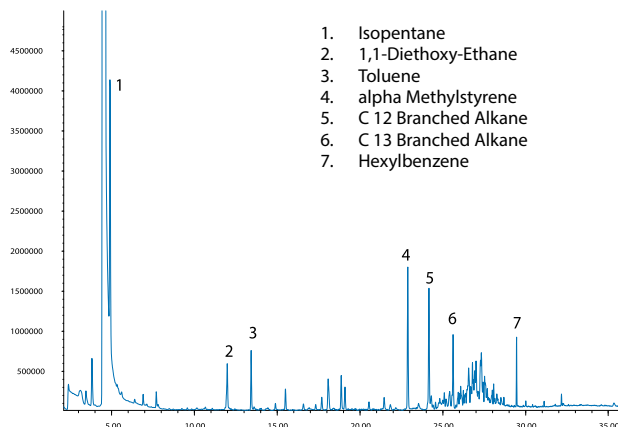
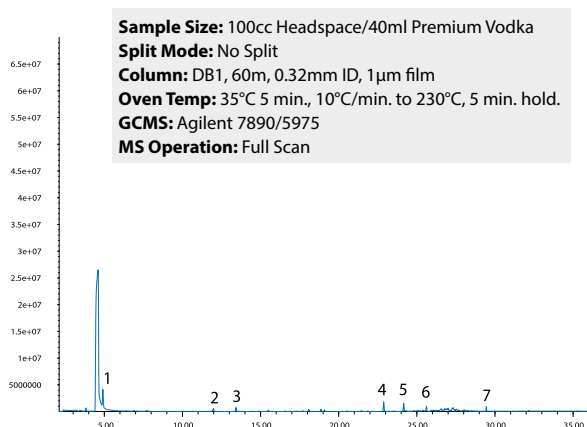


## Light Beer Analysis (On-Column Extraction)

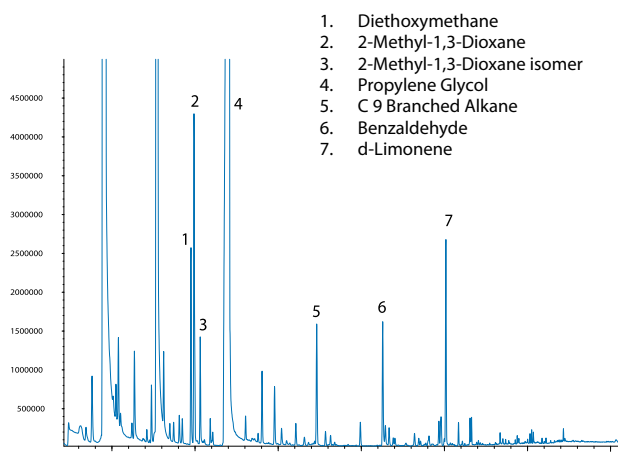
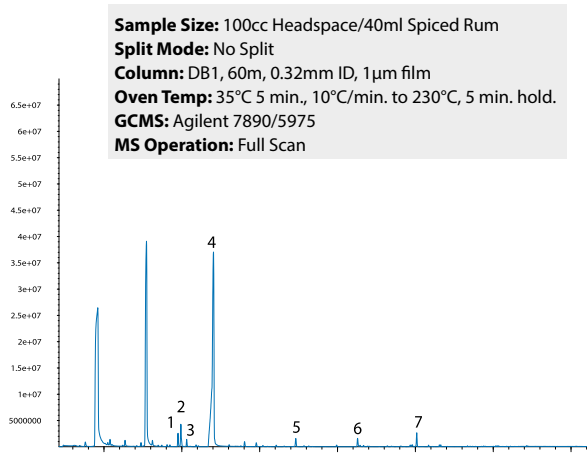


# Alcoholic Beverage Analysis

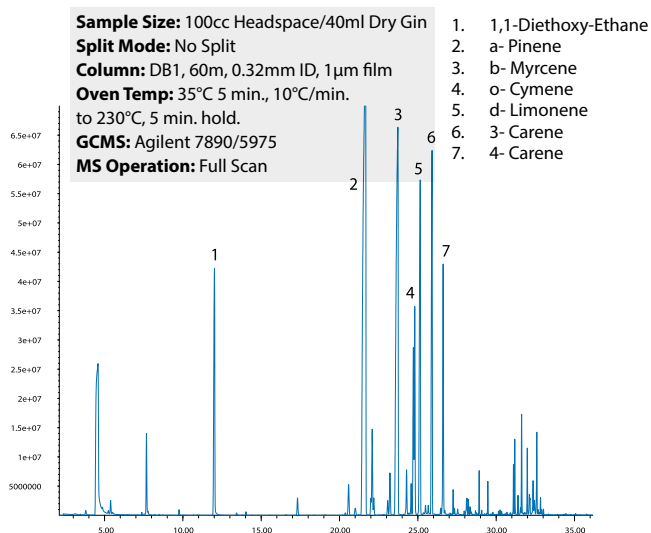
## Vodka Analysis (On-Column Extraction)



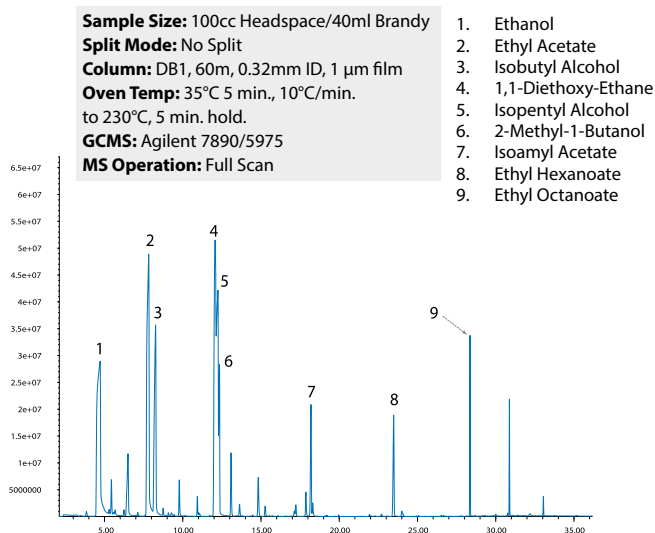
## Spiced Rum Analysis (On-Column Extraction)



## Dry Gin Analysis (On-Column Extraction)



## Brandy Analysis (On-Column Extraction)





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