



ENTECH 7100A

AUTOMATED PRECONCENTRATOR

The analysis of gas-phase Volatile Organic Compounds (VOCs) by GC or GC/MS requires a reliable, reproducible means of quantitatively delivering the VOCs from the point of sampling to the capillary GC column. Analysis of ppm level VOCs in stack gas, landfill gas, auto exhaust and headspace is accomplished by a fast injection of small, precisely measured volumes without exposure to active surfaces or dead-volume. Low-level ppb analysis of volatile compounds in ambient air, indoor air, industrial environments, or in headspace testing of flavors and fragrance requires larger sample volumes. The larger the sample size and the more complex the matrix, the more critical it becomes to have multiple preconcentration stages to eliminate the CO₂ and water vapor before sample introduction into the gas chromatograph.

The 7100A Preconcentrator

The 7100A Preconcentrator represents the most sophisticated preconcentrator available today for the analysis of vapor phase Volatile Organic Compounds. Its unique three stages of concentration offer a wide spectrum of choices for preparing the sample for capillary GC analysis. Turn-key methods are available for both cryogenic and cryogenless operation to accommodate laboratory and mobile operating environments. Advanced water and CO₂ management systems provide superior analysis of polar and non-polar organics, while the inert, heated flow path allows recovery of hydrocarbons in the range of C₂-C₁₈. Four inlets are built into the 7100A that are available for direct sample introduction or as inlets for multi-position autosamplers. Internal traps are easily accessed from the top for fast replacement.



Entech 7100A

System Hygiene

Cleaning of any preconcentration system is necessary on a routine basis, especially if the inlet is exposed to high concentration samples. Rather than flushing lines to remove contaminants entrained in fittings and valves, the model 7100A utilizes a vacuum/pressure pulsing technique called VP-Pulse™ that actually pulls contaminants out of un-flushed “dead volumes” so they are not left to slowly diffuse out and contribute to later sample analyses. With this procedure, acceptable blanks are obtained in a fraction of the time compared to constant pressure flushing and baking. The sample path in the 7100A has also been designed without solenoid valves so there are no cold regions with absorptive surfaces that can bleed contamination back into the flow stream. Silonite™ coated stainless steel tubing is used exclusively for all transfer tubing and traps exposed to the sample to minimize sample adsorption. These features

are helpful in obtaining the lowest useable detection limits in a wide variety of matrices. Ultra-sensitive mass spectrometers are meaningless if there are interferences from previous samples.

Quality Assurance

The 7100A comes equipped with tools for validating system performance, including the ability to perform automated leak checking and matrix spiking. The 7100A also records critical parameters during each sample preconcentration to verify proper system operation, such as trapping flow rates, flow volumes, trap pressure drop, trapping temperatures, water management parameters, desorption temperatures and flows, autosampler position, and sample transfer times. The preserved history of each preconcentration can be used for internal QA, while providing a powerful diagnostic tool that helps keep the 7100A operating at maximum potential.

Leak Checking

A major source of error in GC inlet systems is the presence of leaks that go undetected. The 7100A performs automated leak check using both pressure and vacuum techniques to insure that a leak-tight system exists before samples are analyzed. A report is generated giving the starting and ending pressure during the monitoring period. Leak checking can be done either by selecting individual sample ports, or by selecting a sequence table which defines a group of samples on the autosampler. Leak-checking of samples on robotic inlets such as the 7500 and 7405 is not needed as these are only accessed at the time of analysis and are closed and isolated until then.

Matrix Spiking

GC or GCMS calibration is performed using carefully prepared standards in a clean matrix (N_2 or zero air). It is usually assumed that no

interferences exist in actual samples that will change response factors or detection limits. However, this may not be the case. The true detection limit of benzene, for example, may be altered if it coelutes with a high concentration interferent that wasn't in the standard. The only way to determine whether interferences are changing response factors for target compounds in samples is to spike low levels of the analytical standard right into the sample matrix. By adding 1 ppb of target compounds to the sample being analyzed, for example, all responses should go up by about 1ppb. The 7100A makes this easy by allowing the co-preconcentration of analytical standard. This will add reassurances on the most critical of samples and can help uncover matrix interferences if they exist.

Sequential or Real Time Analysis

The 7100A can perform sample analysis sequentially as determined by the GC run time, or can be set up to run samples at a particular time of the day. For example, 24 runs can be started, one each hour, after which the system will loop back to the first sample position. For on-site analysis, air samples can be integrated into a single canister over 1-24 hours followed by an analysis and re-evacuation of the canister for continuous cycling.

SmartLab 2™ Control Interface

The 7100A is controlled by the Entech SmartLab 2™ control network operating under Microsoft Windows 2000 or XP using a high-speed USB interface. The 7100A application software includes screens for developing concentration METHODS and SEQUENCE TABLES for automated, multi-sample operation. SmartLab 2 electronics can be swapped with electronics in other Entech SmartLab 2 products, which simplifies the support strategy by reducing complexity and part count.

Features & Benefits

- Analytical**
- Superior H₂O and CO₂ management via advanced 3-stage trapping procedures.
 - No cold-spots or solenoid valves in sample flow path.
 - Optimized compound recovery through adjustable parameter settings.
 - Silonite™ coated stainless steel flow paths maximize heavy and polar VOC recovery while reducing carryover.
 - Pressure compensation allows 100 x calibration range from one standard mix.
 - Works with 7032A-L Loop Autosampler to provide a 0.1-1000cc dynamic range (10,000x).
 - Combines with 7500 and 7405 for heated sample analysis and Vacuum Extraction Headspace analysis.
- Operational**
- Supports matrix spiking and adds internal standard automatically.
 - Performs automated leak-checks and instrument bake-outs.
 - User-friendly Windows®-based software operating on GC data system.
 - Occupies only 9" of linear bench space.
- Economy**
- Fully automates VOC analysis.
 - Four sample inlets for unattended operation.
 - SmartLab technology reduces spare parts count.
 - Compatible with low cost MiniCan canisters.
- Serviceability**
- Built-in diagnostic software for troubleshooting.
 - Electronics are modular, socketed and easily accessible.
 - Remote communication option via modem.
 - Comprehensive instrument QA/QC report printed for each run.
- Flexibility**
- Compatible with most major GC models.
 - May be interfaced with P&T for maximum GC/MS utilization.
 - Accommodates canisters, tedlar bags, adsorbent traps and Large Volume Static Headspace (LVSH).
 - Up to three autosamplers can be added to maximize throughput.

Typical Configurations

<i>Application</i>	<i>Analyzer</i>	<i>Water/CO2 Elimination</i>	<i>Module 1</i>	<i>Module 2</i>	<i>Module 3</i>
Polar/Non-Polar AirToxics	GC/MS	MP&T	1/8" glass bead 04-11320	1/8" cryo sorbent 04-11330	on-column focusing
C ₁ -C ₆ Hydrocarbons	GC/FID	MP&T	1/8" GB/Sorb. 04-11340	1/8" cryo sorbent 04-11330	on-column focusing
Flavor and Fragrance Testing	GC/MS	Dry Purge	1/8" cryo sorbent 04-11330	1/8" cryo sorbent 04-11330	on-column focusing
Sample from GC Injector Loop or P&T	GC/MS	None	NA	NA	on-column focusing
PPB H ₂ S/Mercaptans	GC/MS	ECTD	Empty Trap 04-11310	1/8" cryo sorbent 04-11330	on-column focusing
BTEX Analysis	GC/MS	Dry Purge	None or pass-thru	1/8" sorbent 04-11330	pass thru

MP&T = Microscale Purge & Trap

ECTD = Extended Cold Trap Dehydration

7100A Specifications

Cryotrapping Modules:	Temperature range: -180 ⁰ C to 230 ⁰ C. Temperature rise: 360 ⁰ /min. Module 2 cryotrap (P/N 04-01725) can be used alone for single stage concentrations, or with Module 1 (P/N 04-01715) for advanced H ₂ O and CO ₂ management.
Cryofocusing Trap:	(P/N 04-01735) Internal megabore focusing trap. Trapping temperature to -190 ⁰ C. Initial temperature rise 10,000 ⁰ C/min decreasing rapidly to final value with no cold spots on entrance or exit of trap.
Mass Flow Controller:	(P/N 03-10200) 10 to 200 sccm.
Maximum Sample Volume:	2000 mls. 400 mls typical for low part-per-trillion full scan GCMS measurements.
Minimum Sample Volume:	10cc using pressure compensation algorithm.
Pressure Sensor:	(P/N 03-30120) 0-50 psia.
Sample Pressure:	Vacuum (Vacuum Extraction) to 35 psig.
Reproducibility:	3% for sample volumes over 100cc.
Heated Regions:	Maximum temperature of isothermal zones: sample transfer line (150 ⁰ C), rotary valve block (180 ⁰ C), Module 1 bulkhead (200 ⁰ C), Module 2 bulkhead (200 ⁰ C), GC transfer line (150 ⁰ C).
Outputs:	2 optoisolated contact closure outputs as start signals for GC1 and GC2 (AUX Device Ctrl).
Inputs:	Contact closures or open-collector inputs for GC1 READY, GC2/P&T READY.
Aux 1:	External canister sampler control for continuous monitoring.
Aux 2:	External MFC control for real-time monitoring.
Size:	9" W x 18" H x 21" D.
Weight:	60 lbs (3-stage cryo modules installed).
Utilities:	POWER (120VAC, 50/60Hz) 1500VA
Gases:	Ultra High Purity (UHP) Helium, 20 to 60 psig. <i>Pulse Gas:</i> UHP Nitrogen or Zero Air, 15 to 50 psig. <i>Vacuum System:</i> 1 psia at 200 sccm. <i>Coolant:</i> Liquid Nitrogen, 20 to 50 psig.

OPTIONS

P/N	DESCRIPTION
09-33203	Heated 4 Sample Inlet
7100-01	Single Tube Thermal Desorber
7100-04	Real Time Run Mode Sample Integrator
7032A	MiniCan Autosampler, 21Position
7032A- L	MiniCan Loop Autosampler
7016CA	6L Canister Autosampler, 16 Position
7500	Robotic Headspace Autosampler
7405	5 Vial / 1 Heated Position Inlet