SASS® 4000 Plus

High-Volume Concentration +Wet Collection System

The SASS 4000 Plus combines a highly efficient, high-volume aerosol concentrator (SASS 4000) with a portable multi-stage, wetted-wall, cyclone sampler (SASS 2300) that extracts particulates and water-soluble chemical vapors from the concentrated air into to a liquid phase suitable for later analysis.

The system can be used for many applications including:

- Counter-terrorism
- Epidemiology
- Agriculture
- Food processing air quality
- Medical facility air quality

Figure 1: SASS 4000 Plus Concentrated Wet Air Sampling System showing air flow patterns.

Principles of Operation

The SASS 400 continuously samples over 3500 liters/minute of ambient air. Air flows radially inward into the concentrator through a coarse square-mesh screen. This inward radial flow provides 360 degree sampling of the surrounding aerosol environment. The primary fan and a curved air shroud are mounted above the sampler inlet section, channeling exhaust air into a vertical stream away from the inlet area.

Particulates in this air stream are transferred to a much smaller secondary air stream using patent-pending centrifugal and virtual impaction principles. Particles are routed into the secondary flow by forcing primary circuit air to circulate through specially shaped channels where centrifugal force and particle momentum isolate and concentrate the particles.

The secondary flow can reach aerosol concentrations that are 4X to 15X higher than present in the incoming air, yet the velocity of this secondary aerosol concentrate flow is much lower than peak velocities in the primary circuit. The two-stage sampler therefore amplifies and slows down the captured ambient aerosol particles prior to their collection. Due to advantageous pressure differentials within the device, one fan drives both the primary and secondary flows.

This secondary air flow is then routed, via a hose connection, into the SASS 2300 where the concentrated particulates and the vapors are extracted from sampled air and trapped in a small volume of liquid that can be removed at any time for analysis. Distilled water is typically the liquid of choice; no additives or surfactants are required for high efficiency. Trace aerosol concentrations can be amplified by extending the sampling time. A patented (US Patent No. 6,532,835) fluid monitoring system will maintain a fixed liquid volume in the device that is independent of collection time, air temperature or relative humidity.

It is the only wet-type air sampler shown to efficiently collect virus-sized particles, and has been successfully used to detect the airborne viral pathogens that cause exotic Newcastle disease and hoof-and-mouth disease, as well as some strains of avian influenza virus. Furthermore, it is the only portable sampler technology to receive U.S. Department of Homeland Security Certification under the U.S. Safety Act of 2002.

The air sampler is microcontroller-based and can function as a stand-alone unit or connected to other sampling, detection or communication systems via RS-232 or wireless link. Reprogramming of sampler operation may be performed at any time over the RS-232 link without having to disassemble the unit.

The SASS 4000 Plus has several favorable attributes:

- There are few moving parts; two fans, one pump and one valve.
- Collection times of 24 hours (at 50% RH) without user intervention
- Maintenance is minimal.
- Samples are immediately ready for analysis by PCR or immunoassay.
- The structure is comparatively clog resistant.
- Sampled air volume is maximized, improving collection statistics.

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SASS 4000 Plus Concentrated Wet Air Sampling System Specifications	
Concentrator (SASS 4000)	
Characteristic	**Description**
Primary airflow:	3,600+ liters/min is sampled uniformly from around the concentrator's circumference.
Secondary airflow:	390 LPM at +0.4 cm of water static head.
Secondary airflow connection:	Hose barb fitting on base surface for nominal 3.8 cm ID hose.
Concentration enhancement:	4 –15 times, typical, depending on primary/secondary airflow ratio.
Overall size:	38 cm high x 25.4 cm diameter max.
Weight:	6.32 kg (13.9 lbs.)
Operating temperature range:	-40°C to 60°C
Power consumption:	• 90 watts for 28 V ECM drive motor. If operated from DC, please specify DC source voltage of 12, 24 or 28 VDC. • 100 to 230 VAC lump-in cord AD/DC converter supplied. Please specify AC voltage range required.
Sound level:	72 db-A @ 1 meter radius on inlet equatorial plane.
Mounting:	Quick-detach tripod legs; 0.53m to 1.46m adjustable height.
Accessories:	• Hard shell carrying case. • Electret sample filter assembly (for stand-alone operation).
Wetted-Wall Air Sampler (SASS 2300)	
Operating principle	Multi-stage wetted-wall cyclone with enhanced particulate collection.
Air collection rate	390 LPM using 30,000 hr. life brushless fan.
Particulates collection range	1-10 µm. Contact Research International regarding vapor collection applications.
Concentration ratio	78,000/min., nominal.
Liquid inventory	4-5 cc range, adjustable by user. Proprietary control loop maintains a constant liquid volume in the sampler, independent of collection time, temperature, or humidity; useful for concentrating trace airborne analytes.
Make-up water	1 liter on-board reservoir; supplemental off-board reservoirs may be used in fixed installations: 0.8 cc/min typical evaporation rate at 20C/50% RH.
Physical size	18.4 cm x 21.3 cm x 34.3 cm (7.2" W x 8.4" D x 13.5" H).
Weight	3.7 kg without battery, 4.7 kg with battery (8.2/10.4 lbs). Add 1 kg (2.2 lbs) for 1 liter of water.
Air inlet	Industry-standard threaded adapter. It is recommended that third-party accessories have an airflow channel 2.54 cm diameter or larger.
Humidity range	Non-condensing conditions.
Operating temperature	Above freezing conditions to 66^{O} C.
Power source	12 VDC BA-5590/U primary battery; or BA-5390/U extended life primary battery; or UBI 2590 rechargeable battery; or 82-265 Volt (47-63 Hz) AC lump-in-cord power supply.
Power consumption	1.33 amps @ 12 V, 16 W.
Sample extraction	On-board 12 cc/min peristaltic pump, manual or remotely controlled. Vial filling module included. Air sampling may continue during extraction.
System controls	Microprocessor controlled. RS-232 or optional wireless link for remote operation or reprogramming. Additional TTL and motor drivers available.
Sound level	60 dB (A).
Package	Lightweight two-piece molded plastic shell with swivel-style carrying handle.
Decontamination	Auto-flush protocol using onboard water, or manual flush with detergent and/or disinfectant. Disposable high-performance pull-through fan module.
Accessories	Carrying case; inlet hose; 8cc sample bottles; sample bottles; rechargeable battery and charger.
Approvals	U.S. Dept. of Homeland Security certified under U.S. Safety Act of 2002

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