

VBAD 3600

Vehicle-Based Automatic Biological Detection

DETECT: Biological Aerosols, Chemicals, Vapors

The VBAD 3600 is an integrated vehicle-based system for monitoring biological aerosols and optionally, chemical gases and vapors. The system is compatible with a wide range of vehicle interior spaces and is highly automated in operation. All key features are constantly monitored by software residing on a laptop computer within the vehicle. In a typical scenario, a multistep protocol involving detection, alarm, sample collection and biological identification are automatically performed and the results reported on the attached computer with no human intervention. From the computer, the information can be easily transferred to a headquarters location using any customer-defined communication link.

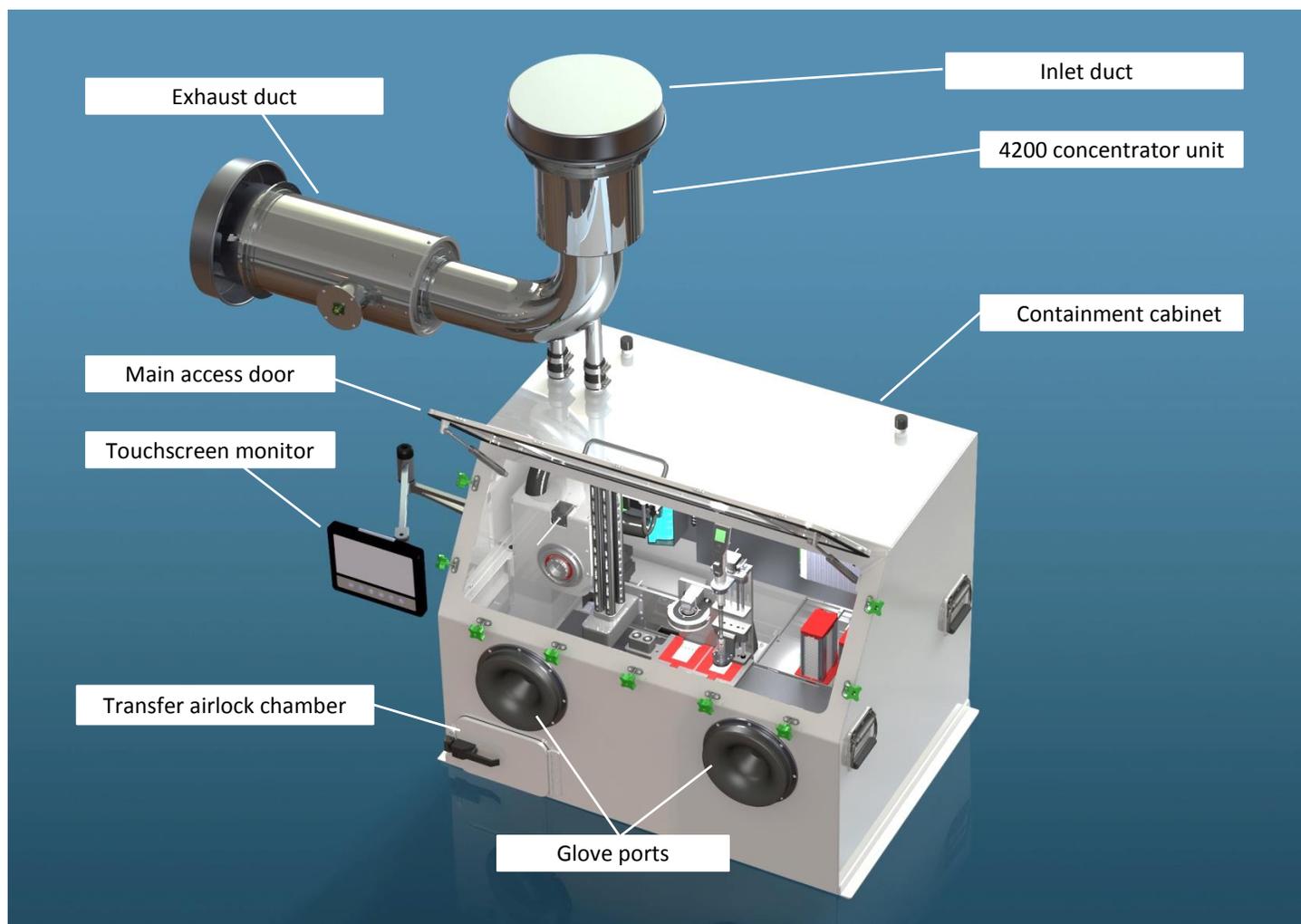


Figure 1: VBAD 3600 system rendering. Shown with optional gas-tight box installation.

Operation is as follows. Exterior air is sampled at the very high rate of 4000 liters/minute to maximize sensitivity. An IMS chemical detector and an optional 6-channel electrochemical detector connected to the inlet side of this sampling circuit monitor for chemical warfare agents and toxic industrial chemicals (TICs), respectively. An optional sensor integrated with the electrochemical sensors scans for flammable gases. Sampled air then passes into a patented aerosol concentrator. This device extracts particulates down to 0.5 microns in size and puts them into a 300 liter/minute secondary aerosol concentrate flow that is delivered to an ultraviolet-based bioaerosol fluorescence trigger and a liquid sample preparation device (See Figure 2).

The equipment for concentrating and collecting liquid aerosol samples is currently being used in NATO bio-monitoring vehicles in Europe, and the bioaerosol trigger is based on the TacBio trigger developed by the U.S. Army and marketed worldwide by Research International. The liquid sample preparation device is the same wetted wall cyclone used in the United States APDS bioaerosol monitoring system. If ambient air is below freezing, the operator can alternatively set the system to perform a dry collection protocol where the aerosol sample is collected onto a high-efficiency electret filter media.

Under normal circumstances if an unusual biological aerosol event is detected by the trigger, a wet biosample is sent to an automated multichannel bioanalyzer and optionally, one or more confirmatory samples are prepared in parallel for independent analysis. The analyzer is a robotic lateral flow immunoassay system that uses “tickets” similar to those used for determining pregnancy. These bioassay tickets are very popular and available for a great many pathogens. The system can process single-pathogen tickets or ticket arrays that provide simultaneous detection of up to 10 pathogens. Up to 24 such tickets can be loaded and stored for use in the system over a 24 hour period. Detection of pathogens is done using machine vision procedures. This automated approach is less prone to human error and it has been shown in some cases to improve ticket detection limits by a factor of 5X to 10X. Most pathogen types can be identified, including toxins, viruses, bacteria, spores, or micro-organisms. Identification is not restricted to pathogens having DNA, as is the case with PCR-based systems.

All VBAD 3600 components can optionally be housed in a gas-tight box. Access and transfer ports are provided to service equipment and to introduce and remove samples.

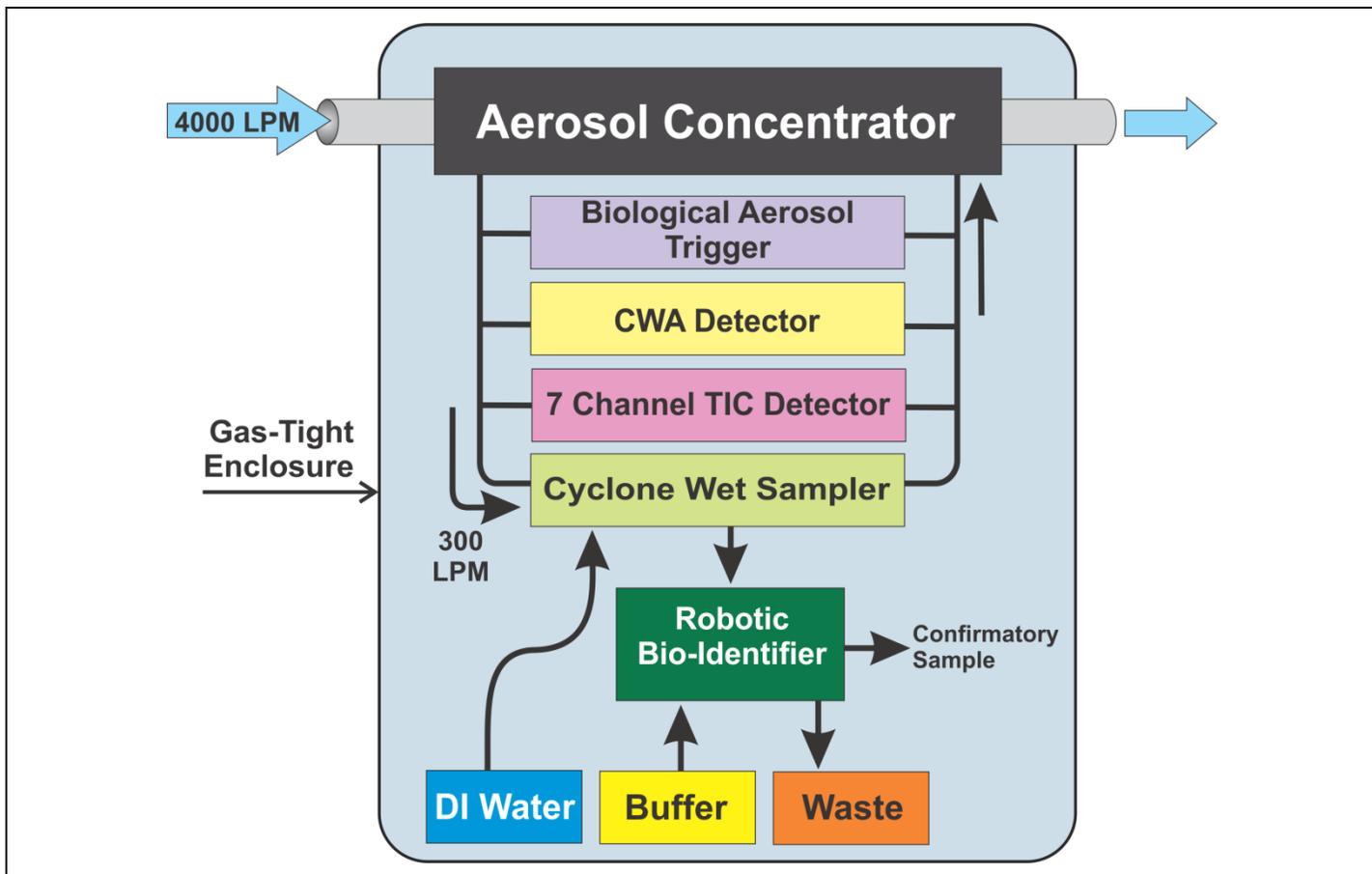


Figure 2: Diagram showing VBAD 3600 system connectivity.

Typical Specifications for the VBAD 3600 Multi-Threat Vehicle System

Feature	Value
Exterior air sampling rate	4000 liters/min. Weather-proof inlet and outlet penetrations.
Aerosol preconcentrator	Yes; SASS 4200 technology-based.
Biological and chemical sample transfer loop	Secondary air flows from 40-360 liters/min acceptable. Selectable wet or dry sampling protocol based on temperature or other conditions.
Aerosol biodetector- trigger for sampling process	UV bio-fluorescence detector. Average time-to-alarm is 30 seconds.
Air sampling rate for biological aerosol detector	1.2 liters/min.
Bioaerosol detection limit	Dependent on concentrator secondary flow: 25 ACPLA typical, controlled lab conditions.
Biological sample preparation after trigger signal	Liquid sample: wetted wall cyclone; dry sample: 44mm dia. electret filter.
Confirmatory assay sample preparation after trigger signal	4.5 ml sample automatically provided in self-sealing sterile vial. Vials will survive 2m drop onto common hard surfaces. Sample transfer door provided at front of optional gas-tight box.
Bioassay method	Automatic robotic lateral flow immunoassay. Minimum and maximum times-to-detect are 5 and 15 minutes, respectively.
Number of simultaneously identifiable biological agents	Three ticket storage magazines provide the ability to use up to three different single-pathogen or multi-pathogen ticket arrays per testing protocol.
Bioassay procedures performed before system needs to be serviced	Up to 24 tickets may be loaded in each magazine. Assay robot selects tickets from those stored, as specified by user.
Bioassay consumables life	6 months to 1 year, typical. Single-use product.
Chemical warfare agent detector (optional)	IMS technology. Specific product to be negotiated with customer.
Air sampling rate for chemical detector	1.0 liter/min.
Number of toxic gases and chemical agents	Typically 10 to 12, maximum of 18 depending on vendor product chosen.
Toxic Industrial Chemicals (optional)	6 electrochemical gas detectors. Gases selected by user.
Flammable gases (optional)	One solid state catalytic flammable gas detector.
Consumables	1) Bulk distilled water and PBS buffer in refillable containers. 2) Liquid disinfectant in refillable container, which holds enough for 24 assays. 3) Dryer cartridges for optional IMS detector.
Containment vessel (optional)	Gas-tight box and piping operable at negative pressure. Large viewing window. Internal solid state lighting.
Containment vessel humidity control	Relative humidity sensor and computer-controlled dehumidifier.
Equipment access	Glove ports; Removable front window, removable rear faceplate.
Process control details	Industrial PC-based control/protocol software. Touch screen control. Fully automated and integrated sampling, sample preparation, bioassay and cleaning protocols. Immediate operator alert upon any detected fault.
Output upon positive result	Immediate light and sound alarms, signal provided for remote alarm.
Ethernet connectivity	Yes, optional.
Operating temperature range	Freezing to 50C.
Environmental standards, shock and vibration	Appropriate sections of MIL-STD-810, per customer specification.
Power	250W @ 115-240 VAC, 50-60 Hz, single phase.
Physical footprint (cm); weight	94H x 82W x 33D; 120 kg, approx.
Exterior noise level	Less than 70 dB-a.
Expandable to nuclear detection	Yes.
<i>Research International, Inc. reserves the right to change product and system specifications without prior notice.</i>	

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