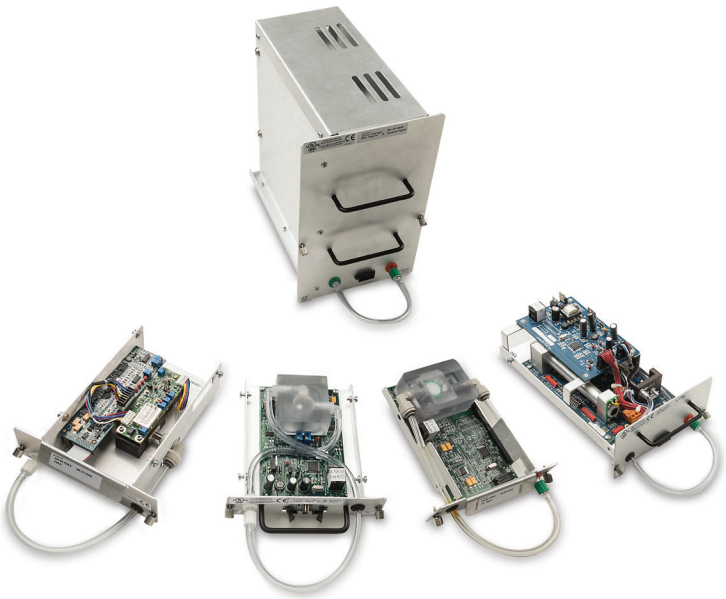
Sensor Suite Sensors

Total Volatile Organic Compounds



Sensor Suite Sensors

Sensor Suite Sensors enable the Aircuity system to cost effectively monitor a breadth of environmental parameters throughout a facility. Located within a Sensor Suite, the sensors evaluate an array of environmental conditions using a shared sensing architecture. In lieu of locating individual discrete sensors in each space, the Aircuity system gathers air samples from the spaces and multiplexes them across the Aircuity network back to the Sensor Suite for analysis.

Sensor Suite Sensors have unique performance specifications and product features to meet specific applications, such as demand controlled ventilation, Differential Energy™ economizer control; or for monitoring only purposes. The ability to sense a variety of conditions, combined with a specific level of sensor performance, optimizes an application's potential energy savings, control or monitoring capacity.

Features

- Sensor Suite Sensors are tailored to match specific monitoring and control needs.
- Calibration and maintenance of sensors is automatically and routinely scheduled through Aircuity's Calibration Laboratory and Assurance Services program.
- Flexible architecture for future sensor enhancements and technology updates.

55 Chapel Street
Newton, MA 02458

617.641.8800 tel
aircuity.com

AIRCUITY®
Creating Measurably Better Environments

Sensor Suite Sensors

Total Volatile Organic Compounds

Total Volatile Organic Compounds

Volatile Organic Compounds (VOCs) include a large number of compounds commonly found in indoor and outdoor environments. Measurement of total VOCs (TVOCs) is an integrated measurement of the concentrations of all VOCs in an air sample. These compounds have many sources, such as evaporation of isopropyl alcohol, gasoline, paint solvents, spray product propellants, combustion by-products, emissions from household furnishings, and some natural sources such as many food items. Individuals with chemical sensitivities could be affected by elevated TVOC readings within a traditional commercial building. In research laboratory settings, many compounds are hazardous to human health and must be closely monitored. In libraries, museums, archive vaults, etc., TVOC levels must also be kept in check to insure preservation of sensitive documents and artifacts.

MOS Sensor Sensing Technology (SEN-TVC-1)

The metal oxide semiconductor (MOS) sensor provides a broad range of sensing capabilities for many VOCs, solvents, and other gases. The sensing element is a heated tungsten trioxide semiconductor that exhibits a generally inverse response in its electrical resistance with exposure to VOCs and other reducing compounds. The measurement sensitivity will vary for different compounds, making the sensor suitable for use in applications where an environment must be monitored for a broad range of parameters.

As a general indicator of VOCs in a space, the device is used to detect any abnormally high levels of VOCs that would indicate the need for more detailed investigations for specific compounds. Additionally, it can be used to obtain different readings from different areas and, by comparing these results from these areas, determine potential sites or sources of VOCs, such as gasoline vapors, methanol, exhaust gases, or vaporized solvents. When used in conjunction with the PID (SEN-TVC-1&2), the MOS sensor provides complementary detection capabilities, as it will detect parameters (including but not limited to: methanol, methane, nitromethane and methylene chloride) that are either not sensed or only poorly sensed by the PID.

Combination TVOC Sensing Technologies (SEN-TVC-1&2)

This product combines the capabilities of the MOS (SEN-TVC-1) sensor with the Photoionization Detector (PID) sensing technology. The PID uses an ultraviolet (UV) light source to break down chemicals to positive and negative ions that can easily be measured with a detector. All elements and chemicals can be ionized, but they differ in the amount of energy they require. The energy required to displace an electron and *ionize* a compound is called its Ionization Potential (IP), measured in electron volts (eV). The light energy emitted by a UV lamp is also measured in eV.

The detector measures the charge of the ionized gas and converts the signal into current. The current is then amplified and displayed *as ppm*. After measurement, the ions reform into the original gas or vapor. PIDs are non-destructive; they do not *burn* or permanently alter the sample gas, which allows them to be used for sample gathering.

AIRCUITY®
Creating Measurably Better Environments

Sensor Suite Sensors

Total Volatile Organic Compounds

Combination TVOC Sensing Technologies (SEN-TVC-1&2) - *continued*

The largest group of compounds measured by a PID are the Organics – compounds containing carbon atoms – including the following:

- **Aromatics** – compounds containing a benzene ring including: benzene, toluene, ethyl benzene and xylene
- **Ketones & Aldehydes** – compounds with a C=O bond including: acetone, methyl ethyl ketone (MEK) and acetaldehyde
- **Amines & Amides** – carbon compounds containing nitrogen, like diethylamine
- **Chlorinated Hydrocarbons** – trichloroethylene (TCE), perchloroethylene (PERC)
- **Sulfur Compounds** – mercaptans, sulfides
- **Unsaturated Hydrocarbons** – such as butadiene and isobutylene
- **Alcohols** – like isopropanol (IPA) and ethanol

Enhanced Combination TVOC Sensing Technologies (SEN-TVC-1&3)
Designed for Vivariums and Harsh Environments

Specify the SEN-TVC-1&3 assembly for vivariums or harsh environments where there are likely to be higher concentrations of adsorptive compounds, such as ammonia. This product combines the capabilities of the MOS (SEN-TVC-1) sensor with an enhanced version of our Photoionization Detector (PID), which includes active on-board sensor conditioning to ensure excellent long term performance. This PID detects the same range of compounds as the SEN-TVC-1&2, but when it is installed in an Aircuity system an added *as ammonia* virtual point is enabled per sensed location, which provides a PID readout that is calibrated to both ammonia and isobutylene.

Combination TVOC Sensing Technologies (EFS-TVC-1&3)
Designed for Demand Based Control of Exhaust Fans

This sensor offering is designed to support the unique requirements of exhaust plenum monitoring for purposes of the Demand Based Control of exhaust fans. Although for the majority of the time the exhaust air will be clean for systems intended for this application, the breadth and concentration levels of the compounds that the sensors will be exposed to are potentially much higher than that of other applications. To accommodate this, the EFS-TVC-1&3 combines a Metal Oxide Semiconductor (MOS) sensor with an enhanced Photoionization Detector (PID) sensor with on-board sensor conditioning. The handling, test, and calibration of these sensors has been tailored to support the special needs of this application.

AIRCUITY®
Creating Measurably Better Environments

Ordering Guide

Sensed Parameter	Model Number	Element
Total TVOCs	SEN-TVC-1	Metal Oxide Semiconductor (MOS) – Non-critical applications
Total TVOCs	SEN-TVC-1&2	Combines the MOS and Photo Ionization Detector (PID) sensing technology Designed for critical applications, such as research labs
Total TVOCs	SEN-TVC-1&3	Combines the MOS and an enhanced version of the PID Designed for vivarium use and harsh environments
Total TVOCs	EFS-TVC-1&3	Combines the MOS and an enhanced version of the PID Designed for DBC of exhaust fans

Sensor Specifications

Model Number	SEN-TVC-1	SEN-TVC-1&2	SEN-TVC-1&3	EFS-TVC-1&3
Technology	MOS	MOS/PID	MOS/Enhanced PID	MOS/Enhanced PID
Typical Application	Utilizing the MOS sensing for monitoring only of non-critical ventilation applications.	Combines the MOS and PID sensing technology into a single assembly, while supporting the individual sensing capabilities of each. This configuration is recommended for monitoring only or for control of critical spaces such as research labs.	Combines the MOS and an enhanced version of the PID sensing technology into one single assembly that is designed to support vivariums and other environments where there are likely to be higher concentrations of adsorptive compounds, such as ammonia. The PID is calibrated to both ammonia and isobutylene.	Combines the MOS and an enhanced version of the PID sensing technology into one single assembly that is designed for use in the monitoring of exhaust plenum Demand Based Control (DBC) of exhaust fans.

Sensor: TVOCs		
Technology	MOS	PID
Element	Metal Oxide Semiconductor (MOS)	Photoionization Detector (PID) - VOCs & other gases with ionization potentials <10.6 eV
Range	**Calibrated Range:** 0–50 ppm (as Isobutylene) **Maximum Range:** 0–100 ppm (as Isobutylene)	**Calibrated Range:** 0–5 ppm (as Isobutylene) **Maximum Range:** 0–20 ppm (as Isobutylene)
Accuracy	± 0.5 ppm (as Isobutylene) or 25% of reading (whichever is greater)	± 0.2 ppm (as Isobutylene) or 2.5% of reading (whichever is greater)
Resolution	0.2 ppm	0.025 ppm
Drift Stability	± 15 ppm/6 months @ 50 ppm	± 2 ppm/6 months @ 5 ppm
Response	30 seconds	30 seconds

Regulatory Compliance

UL 916 Accessory Energy Management Equipment

Part 15 Class A

55 Chapel Street
Newton, MA 02458

617.641.8800 tel
aircuity.com

AIRCUITY®
Creating Measurably Better Environments