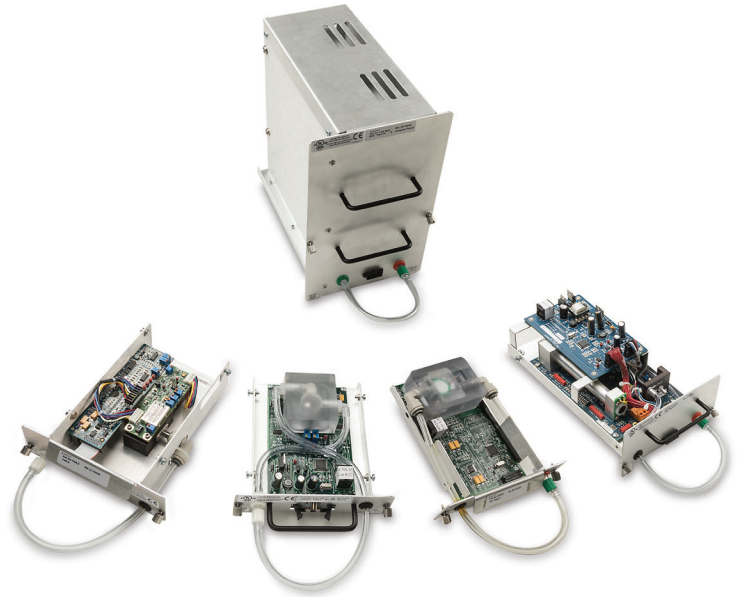


# Sensor Suite Sensors

Airborne Particulates



## 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.

# Sensor Suite Sensors

## Airborne Particulates



### **Airborne Particulates (Small Particles PM2.5)**

Particles in indoor air form a complex mixture that originate from a variety of sources, including the outdoors, office equipment, building materials, furnishings, and occupants. Particles are an important category of indoor air pollutants because in high enough concentrations, they can act as irritants to the eyes, skin, and respiratory tract.

Particle size affects how far particles can penetrate into the respiratory tract and determines the sites of possible health effects. Inhalable particles are those that can deposit anywhere in the respiratory tract from the nose and upper airways to the lower airways and lung tissue where gas exchange occurs. The diameter of inhaled particles that can reach the nose, mouth, trachea, and airways in the lungs but, not in the gas exchange areas is generally between 10 microns ( $\mu\text{m}$ ) and  $100\ \mu\text{m}$  in aerodynamic diameter (1 micron equals approximately 1/25,000 of an inch). Particles less than  $5\ \mu\text{m}$  can reach the trachea and all of the airways.

In addition to indoor air quality monitoring and control, particle monitoring in healthcare settings is used for control of infectious diseases; verifying HEPA filter integrity and efficiencies in clean space applications; and in research labs and vivariums to dynamically vary air change rates.



### **Optical Particle Counter**

A known flow rate of air passes through the sample port and measuring chamber of the optical particle counter. Laser light is scattered by individual airborne particles and is detected by the receiving optics and converted into electric pulses. The particle size is determined by analyzing the peak height of the electric pulses. Through calibration with polystyrene latex particles of known size, the relationship between electric signal pulse height and latex particle size is established. This relationship is used to determine the size of the unknown particles.

The optical particle counter determines the number of particles in a specific size category from a calibration curve established using various latex sphere sizes.



### **Particulates Sensing Technology (SEN-PAR-1)**

The SEN-PAR-1 provides a single channel of operation throughout the small particle (PM2.5 respirable particulates) range. This includes particulates between  $0.3\ \mu\text{m}$  and  $2.5\ \mu\text{m}$ . The SEN-PAR-1 is beneficial for monitoring particles in critical environments, such as healthcare and other facilities where high concentrations of pollutants can act as irritants to eyes, skin and respiratory tracks.



### **Particulates Sensing Technology (SEN-PAR-2)**

The SEN-PAR-2 provides two channels of operation throughout the small particle (PM2.5 respirable particulates) range. This includes a channel between  $0.3\ \mu\text{m}$  and  $0.5\ \mu\text{m}$ , and a second channel which measures between  $0.5\ \mu\text{m}$  and  $2.5\ \mu\text{m}$ . From critical environments to general office space, it can be advantageous to have more than one channel of particle count information as it helps to better identify potential issues of building cleanliness and source locations. It would not be uncommon for 90% of the SEN-PAR-1 ( $0.3\text{--}2.5\ \mu\text{m}$ ) total count be made up of particles in the size range of  $0.3\text{--}0.5\ \mu\text{m}$ . By segmenting the PM2.5 range,  $0.5\text{--}2.5\ \mu\text{m}$  events are illuminated that may otherwise go undetected. In general office space, lower MERV rating filtration is often used, which is not intended to efficiently capture particulate matter that is  $0.3\ \mu\text{m}$  in size. Most filters however, will perform with at least 80% filtration efficiency with particles that are  $0.5\ \mu\text{m}$  in size or greater.

In clean space applications the SEN-PAR-2 is a good tool for verifying HEPA filter integrity and efficiencies. For this reason the SEN-PAR-2 can be a better choice when one wants to assess filtration performance in such applications. The US FED STD 209E equivalent to ISO-7 is Class 10,000, which also is classified starting at  $0.5\ \mu\text{m}$ . The  $0.5\ \mu\text{m}\text{--}2.5\ \mu\text{m}$  channel of the SEN-PAR-2 sensor is used in these applications.

The  $0.5\text{--}2.5\ \mu\text{m}$  channel is especially important to vivarium applications, as the count within this size range may be trended as an indicator for possible allergens and biocontaminants. The dual channel sensor is also well suited for healthcare facilities.

## Ordering Guide

Sensed Parameter	Model Number	Element
Particulates: Single Channel	SEN-PAR-1	Optical Particle Counter
Particulates: Dual Channel	SEN-PAR-2	Optical Particle Counter

## Sensor Specifications

Model Number	SEN-PAR-1	SEN-PAR-2
Typical Application	Particulate Monitoring/Control: May be used in any application.	Particulate Monitoring/Control: Designed for use in Vivariums, Healthcare Facilities, Clean Rooms and other applications.
<b>Sensor: Airborne Particulates - Small Particles PM2.5</b>		
Element	Optical Particle Counter	Optical Particle Counter
Range	PM2.5: 0.3–2.5µm	PM2.5: 0.3–0.5µm, 0.5–2.5µm, 0.3–2.5µm
Accuracy	± 25% of reading	± 25% of reading
Concentration Range	100–10,000,000 particles pcf	100–10,000,000 particles pcf
Response	30 seconds	30 seconds

## Regulatory Compliance



