

Overview

AerNos[®] AerBand[™] Research for Ozone was specifically designed to enable scientists and research institutions to monitor personal air pollution exposure.

By enabling 24/7 personal air monitoring, AerBand Research is giving scientists new tools to more effectively study air pollution and its health effects and to develop more effective mitigation strategies. Harmful gases often come from vehicle and industrial pollution sources and have been identified as having potential negative health effects. Examples include nitrogen dioxide, ozone, carbon monoxide and sulfur dioxide. Gases available for detection will vary based on version and application.

The AerBand is a convertible unit that can be worn on the wrist or clipped to various objects such as bags, purses, clothing, etc. AerBand comes with a supporting mobile application that helps visualize and track exposure to different pollutants and includes the option to track the effect of these pollutants on health. The application also includes feedback about how to reduce exposure and mitigate the potential health effects of exposure. The AerBand mobile application is available for both iOS and Android devices., integrated algorithms, self-calibration technology, Lithium Ion battery, and communication ports.

This product data sheet is for AerBand Research configured for One Gas – Ozone (O₃) detection and reporting of concentration to the low parts per billion for standard use.

AerN²S[™] Technology

AerNos AerIoT is based on breakthrough AerNos AerN²S Technology. AerNos AerN²S Technology represents a significant evolution in the MEMS circuitry, hybrid-nanostructures, nanoelectronics, machine learning, algorithms and nanofabrication for high volume manufacturing of its gas sensor modules. These advances, which include specific techniques and processes to manipulate hybrid nanostructures at the atomic level, increase the selectivity and sensitivity of AerNos sensors at ambient temperatures.

AerNos AerBand Research nano gas sensors use doped and manipulated nanomaterials to target specific gases and its unique sensor array design allows for simultaneous detection of multiple gases to parts-per-billion (ppb) levels.

Key Features

- Small
- Portable
- Detects multiple gases simultaneously
- Sensitive to parts-per-billion (ppb) levels
- Low Power
- Rechargeable Lithium Ion Battery
- Self-Calibrating
- Real-Time & Quick Response
- Highly Accurate
- Splash Resistant
- Always Sensing – Updates every 10 seconds

Configurations



Recommended Research Applications

- Indoor/Outdoor
- Home
- Office
- Street level
- For Research Use (Includes Web Portal for researchers)

Performance Specifications

Gas			
Detection Capabilities	Ozone (O ₃)		
Low Detection Range	0 ppb		
High Detection Range	5 ppm		
Resolution	1 ppb		
Splash Resistant	Yes		
Detection Type	Absolute		
Power	Type Duration		
Battery	Lithium ion polymer battery 16 hours (high usage) 30 hours (typical usage) 48 hours (low usage)		
Humidity	Min	Typical	Max
Operating Humidity	5% RH	40% RH	99% RH
Storage Humidity	0% RH	60% RH	80% RH
Temperature	Min	Typical	Max
Operating Temperature	5 °C	20 °C	65 °C
Storage Temperature	0 °C	20 °C	50 °C
Performance			
Startup - From Off	30 Seconds		
Startup - From Sleep	< 10 seconds		
Reading Frequency	10 seconds		
Sensing Period for high accuracy ppb detection	Configurable: 30 seconds to 300 seconds cycle		
Accuracy	Low-Level Detection Capabilities		
Indoor/Outdoor	0-5ppb	6-25 ppb	26-70 ppb
Variance	± 125%	± 25%	± 18%
Accuracy	Detection Capabilities		
Indoor/Outdoor	71-200 ppb	201-500 ppb	> 501 ppb
Variance	± 10%	± 5%	± 3%

Technical Specification

Electronics	Microprocessor, Memory, MEMS Sensor Array, Humidity & Temperature Sensor
Communication	Bluetooth (BLE)
Weight (without strap)	21.7g
Weight (with strap or carabiner)	25g - 35g
Dimensions	150 x 454x 16 mm ³
Enclosure Material	Plastic
Clip Material	Variable: compatible with off-the shelf straps
Strap material	Variable; compatible with off-the shelf stop material.

AerNos Cloud Data Platform

Unlike traditional gas sensor that are “dumb” sensing elements that do not communicate to a command center. AerNos Nano Gas Sensors are “smart” sensors designed to communicate in real-time to the AerNos Cloud Data Platform. This feature enables product companies to manage all their end-user data in a consolidated or individual fashion and take real-time action to provide the best user experience. From real-time monitoring to alerts, to firmware upgrades, system administrators will easily be able to monitor and take action when necessary.

Features include:

- Real-Time Access to All Sensor Data – 24/7
- Turn On/Off or limit access to certain functions for End-Users
- Enable Additional Gas detection capabilities based on pre-defined conditions
- Download .csv data files with filtering options
- Normalized data option based
- Detect Sensor issues and correct via pushing new firmware
- Upgrade to new capabilities by pushing out new firmware upgrades
- Sensor End of Life Alerts
- Sensor Degradation Alerts based on un-common environmental conditions
- Reporting – Ability to set automated reporting based on pre-defined filters and settings
- Administrative function for Research Patients

Tested & Validated

The AerNos AeroIoT has been tested in the real world for both indoor and outdoor use. Sensors get exposed to potential cross-sensitive gases at multiple temperature and humidity in the environment during use. All product accuracy testing takes into account the thousands of gases present in the environment. Although it is impossible to test cross-sensitivity across all gases in the environment, our tests are meant to ensure our sensors perform based on the Performance Specifications under standard usage.

Ozone Decay – Hal-Life Test

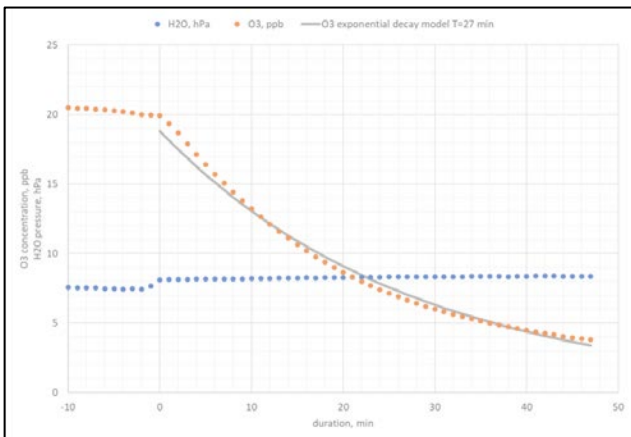


Figure 1: This graph shows that the sensor is not only able to detect O₃ with high precision but is able to provide accurate real-time readings as O₃ breaks down. This is important to demonstrate the speed and accuracy of the AerNos sensor sensing capabilities.

Designed versus Measure Tests – Accuracy Tests

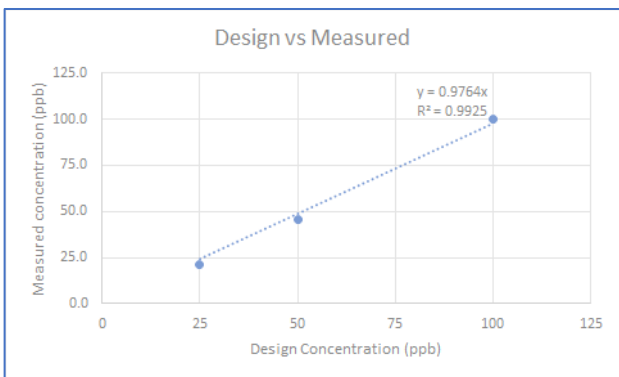


Figure 2: Percent error for Design versus Measured in laboratory environments show a 14.9% variance at 25 ppb; 8.5% variance at 50 ppb and 0.1% variance at 100 ppb exposure.

Cross Sensitive Test

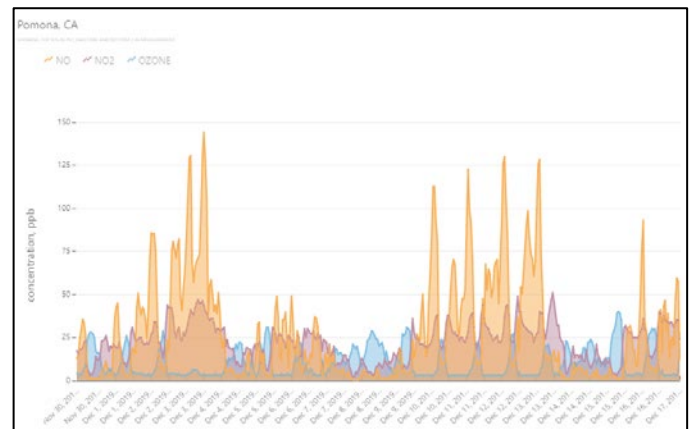


Figure 3: Cross-sensitive testing sensors with NO and NO₂. Above graph shows clear signal distinction.

Sensor Repeatability Test in Real World Environment

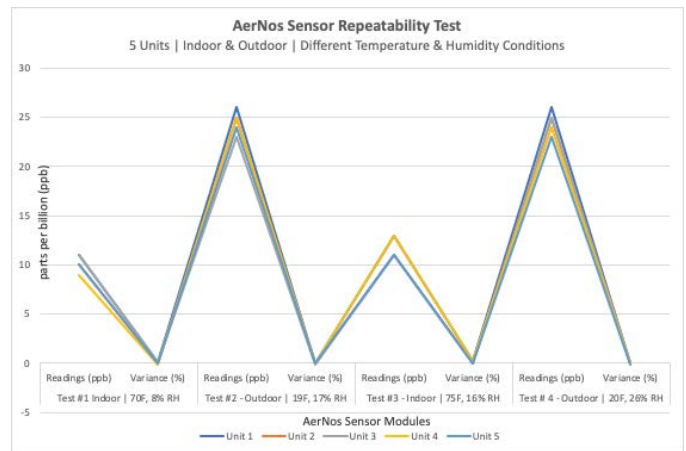


Figure 4: Repeatability test conducted in real world environment for indoor and outdoor environments. Tests were done with varying temperature and humidity settings. Variance for Test #1 was 10%; Variance for Test #2 was 8%; Variance for test #3 was 18% and variance for test #3 was 8%.

Software (IOS, Android Apps & Website)	
End-User Application	Android & IOS mobile applications
Browser for Organization Access	AerNos Cloud: APIs Website: Chrome, Safari, IE 11.X
Operating Systems	Android 5.0 or higher IOS 10 or higher*
Sensing Data When AerBand is connected to Smart Device	Real-Time Reading and auto transfer to AerNos Cloud
Sensing Data when AerBand is not connected to Smart Device	10 days sensing data storage

This information is provided below for reference only. For more detail information, please visit EPA.gov or AirNow.gov websites.

Ground-level ozone is one of our nation's most common air pollutants. Use the chart below to help reduce your exposure and protect your health. For your local air quality, visit www.airnow.gov.

Air Quality Index	Who Needs to be Concerned?	What Should I Do?
Good (0-50)		It's a great day to be active outside.
Moderate (51-100)	Some people who may be unusually sensitive to ozone.	Unusually sensitive people: Consider reducing prolonged or heavy outdoor exertion. Watch for symptoms such as coughing or shortness of breath. These are signs to take it easier. Everyone else: It's a good day to be active outside.
Unhealthy for Sensitive Groups (101-150)	Sensitive groups include people with lung disease such as asthma, older adults, children and teenagers, and people who are active outdoors.	Sensitive groups: Reduce prolonged or heavy outdoor exertion. Take more breaks, do less intense activities. Watch for symptoms such as coughing or shortness of breath. Schedule outdoor activities in the morning when ozone is lower. People with asthma should follow their asthma action plans and keep quick-relief medicine handy.
Unhealthy (151-200)	Everyone	Sensitive groups: Avoid prolonged or heavy outdoor exertion. Schedule outdoor activities in the morning when ozone is lower. Consider moving activities indoors. People with asthma, keep quick-relief medicine handy. Everyone else: Reduce prolonged or heavy outdoor exertion. Take more breaks, do less intense activities. Schedule outdoor activities in the morning when ozone is lower.
Very Unhealthy (201-300)	Everyone	Sensitive groups: Avoid all physical activity outdoors. Move activities indoors or reschedule to a time when air quality is better. People with asthma, keep quick-relief medicine handy. Everyone else: Avoid prolonged or heavy outdoor exertion. Schedule outdoor activities in the morning when ozone is lower. Consider moving activities indoors.
Hazardous (301-500)	Everyone	Everyone: Avoid all physical activity outdoors.

Note: If you don't have an air conditioner, staying inside with the windows closed may be dangerous in extremely hot weather. In these cases, seek alternative shelter.

Configured for Specific Use
 Based on Application, Environment & Use Case

AerNos AerBand Research is available to be configured for specific conditions and/or environments that are harsh or that cater to your specific end product. We take into consideration the use case and more specifically the environment that the sensor is going to deploy to minimize any noise that may result in inaccurate readings.

For example, the type of environment such as cross-sensitive gases may cause the target gas to be more or less sensitive thus increasing the accuracy variances. We can address this by further calibrating or configuring AerBand to this specific environment in order to get a higher level of accuracy.

To learn more about our AerBand Research configured for your specifications, please contact your AerNos Sales Representative.

Air Quality Index for Ozone
 Based on EPA.gov/AirNow.gov

AerNos utilizes the standards used by United States Environmental Protection Agency (EPA), Center for Disease Control (CDC) and World Health Organization (WHO) standards in determining the level of health concerns (concentrations) when exposed to Ozone.

* Information contained in this Datasheet is subject to change without notice. Sensor resolution depends on lower detection levels (LDL) or higher detection levels (HDL) as described and can further vary based on use case as well as environmental conditions. Depending on use case, lower detection range variances may vary more than specifications. Since AerBand flow of air is based on ambient air, sufficient air flow must come into contact with AerBand. In certain cases, higher level of accuracy is achieved when AerBand is exposed to the environment for periods longer than 15 minutes. We strongly suggest thoroughly validating our sensor performance in your products and use case environment to review and adjust readings on your end as necessary. AerBand requires Bluetooth connection to a smart device such as a Smartphone or tablet. Supported products are those that run Android or IOS. Product may not function as specified in certain environmental and/or usage conditions. Sensor life depends on configuration, usage and environment. Product dimensions are based on standard configurations. Warranty void when product is not used as specified.

Specifications herein are current as of document publication date.

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