antrumX™
Airflow that Makes Sense

# NITROGEN DIOXIDE SENSING

## DESCRIPTION

The Sensor Pack monitors multiple air quality parameters across 16 zones, independently reporting on each. Each sensor pack contains sensors for air velocity, temperature, humidity, and pressure. With a reference to clean air, it cancels sensor drift, ensuring more accurate and consistent data compared to standard wall-mounted solutions. All required sensors for a specific application are pre-installed in one sensor pack, making calibration effortless through a tool-free replacement process.

## WHY

Nitrogen dioxide is a significant air pollutant that can have harmful effects on human health and the environment. Monitoring for nitrogen dioxide ($NO_2$) is critical because it can identify sources of pollution, such as industrial facilities, transportation emissions (especially from diesel engines), and heating systems. The information can be used to develop strategies to reduce emissions and improve indoor air quality.

*Health and Safety:* Prolonged exposure to elevated levels of nitrogen dioxide can lead to respiratory problems, especially in vulnerable populations such as children, the elderly, and individuals with pre-existing respiratory conditions.

*Compliance with Regulations*: Many countries have established air quality standards and regulations to limit the levels of nitrogen dioxide and other pollutants in the atmosphere. Monitoring $NO_2$ levels helps ensure compliance with these standards and regulations.

*Environmental Impact:* Nitrogen dioxide can also contribute to acid rain and eutrophication, which can harm ecosystems, damage buildings and infrastructure, and affect water quality.

*Optimizing Ventilation:* Optimizing ventilation based on real-time $NO_2$ monitoring can contribute to energy efficiency in buildings/parking structures. By adjusting ventilation rates according to actual indoor air quality conditions, building managers can avoid excessive energy consumption associated with over-ventilation while still ensuring adequate air quality for occupants.

Implementing demand-controlled ventilation involves leveraging $NO_2$ levels as indicators to regulate the influx of fresh air into a space. By tracking $NO_2$ concentrations, ventilation systems can be dynamically adjusted or activated as necessary to maintain adequate fresh air circulation and mitigate $NO_2$ concentration to safe levels. This approach optimizes ventilation by responding to real-time needs rather than relying on fixed schedules, potentially reducing energy usage while ensuring optimal air quality.

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## HOW IT WORKS

The sensor uses solid polymer electrochemical technology which is based on the principle of electrochemical catalytic reaction caused by the target gas. This reaction leads to an electrical signal that is directly proportional to the gas concentration. The sensor is composed of three catalytic electrodes, a solid electrolyte, and gas diffusion holes. The gas reaches the working electrode of the sensor through the diffusion holes, an electrochemical redox reaction occurs on the porous micro-surface of the electrode, the solid electrolyte conducts electron transfer, and generates a current signal as an output. The current signal is used to characterize the gas concentration.

## SPECIFICATIONS

| Parameter | Value | Units |
|---|---|---|
| Technology | ElectroChemical | |
| Range | 0–2 | ppm |
| Humidity Range | 15–95 | % |
| Resolution | 0.005 | ppm |
| Accuracy | ± 5 | % (FS) |
| Response[1] | 50 | s |
| Recovery[1] | 120 | s |
| Overload | 10 | ppm |
| Calibration | 2 | Year(s) |

1. T90

## CROSS SENSITIVITY

| Gas[1] | Formula | Concentration (ppm) | Response (ppm) |
|---|---|---|---|
| Ammonia | $NH_3$ | 10 | 0 |
| Carbon Monoxide | CO | 100 | 0 |
| Chlorine | $Cl_2$ | 1 | 0.3 |
| Ethylene | $C_2H_4$ | 1 | 0.005 |
| Hydrogen | $H_2$ | 2000 | 0 |
| Hydrogen Sulfide | $H_2S$ | 1 | 0.06 |
| Nitric Oxide | NO | 5 | 0 |
| Ozone | $O_3$ | 0.25 | 0.1 |
| Sulfur Dioxide | $SO_2$ | 1 | 0.03 |

1. Table is not complete for all gases, and the sensor may be sensitive to other gases