NS310 Indoor Air Quality Multi

Digital Air Quality Sensor

- Monitor for WELL Building Standard
- PM 1.0/2.5/10 Laser Particle Counter
- Total VOC Measurement
- Carbon Monoxide Measurement
- Ozone Measurement
- Plus CO2, Temperature, Humidity
- RS485 Digital Output
- 5-60V DC Supply
- 4 Wire Screw Terminal

Overview

The NS310 Indoor Air Quality Multi sensor is a simple low voltage digital air particulate matter and multi multi-gas detector. It can easily integrate into an existing building control system. Connect the sensor output signal to an RS485 transceiver of a controller, gateway, or data acquisition unit. The air quality values can be used to warn occupants and maintenance staff or adjust ventilation.

Operation

The sensor can detect air pollution from micron sized particles in air as well as various volatile organic compounds (VOCs), carbon monoxide (CO), and ozone (O3). The device is suitable for ceiling or wall mount applications. Place the sensor in a suitable location where occupant respiratory health is critical.

Particulate matter is detected using a laser particle counter. This uses an internal fan to continuously circulate a volume of air and observe the particle concentration. High concentration indicates a health hazard. The sensor classifies by 10um, 2.5um, and 1.0um particle width upper limits. The concentration values for each class are sent via RS485 message.

The gas sensors are sensitive to a range of volatile organic compounds, carbon monoxide, and ozone. Total volatile organic compounds as well as carbon monoxide and ozone concentration values are sent via RS485 message.

Particle Pollution Level

Fine particles are detected by the sensor. These particles cause air pollution hazards. Breathing unhealthy air can increase health risks. It is recommended to continuously monitor the particle pollution level. If the pollution exceeds healthy or safe levels notify occupants and advise maintenance or building controls to adjust ventilation and filtration. If possible, identify the source of the particle pollution and eliminate it.

Smaller particle sizes present a higher respiratory risk. The concentration range for each level of concern is reduced. More care should be taken to monitor and eliminate these smaller particles. Generally, air filtration can adequately reduce concentration to acceptable levels. Levels exceeding “Good” or “Moderate” should be addressed immediately. Inspect the air handling, filtration, and ventilation systems and repair any faulty components.

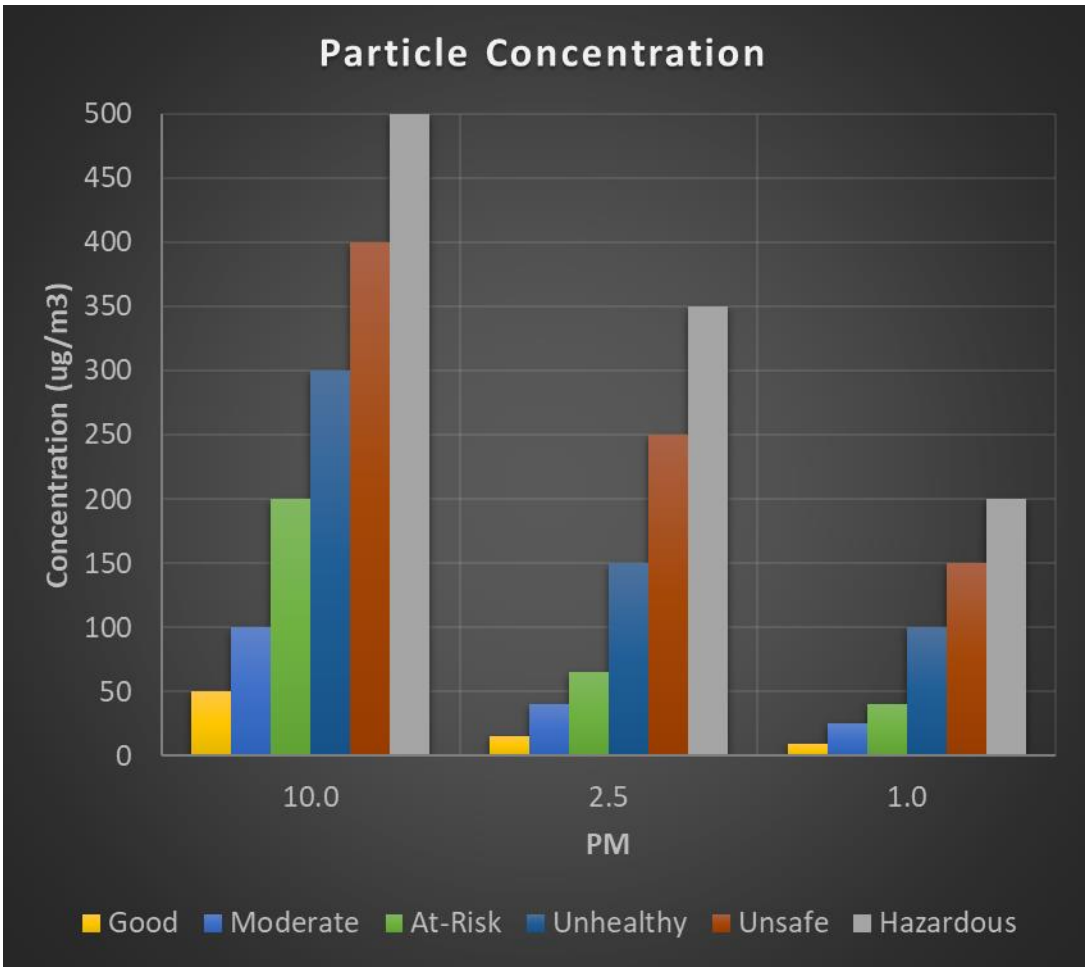


Figure 1 Particle Concentration Pollution Level by size

Total VOC Detection

Volatile organic compounds (VOCs) are up to five times more concentrated indoors than outdoor airspaces. These compounds are caused by human occupant's respiration, transpiration, and other metabolic processes. Additionally, common building materials such as furniture, flooring, wall coverings can out-gas VOCs. Most commonly these compounds include ethanol, toluene, acetone among other solvents. These compounds can cause eye irritation, headache, drowsiness, dizziness, and other irregularities. Continuous monitoring and ventilation are recommended.

Total volatile organic compound (TVOC) is the summation of various gas species. The metal-oxide detector has different sensitivities to various species. For example, it is significantly more sensitive to smaller molecules like CO and H2 than larger molecules like ethanol. Be advised that TVOC is an index of all pollutants and not a selective sensor for a particular gas species. If it is known that a particular gas species dominates an airspace, then selectivity might be significant. Use this sensor to detect the level of concern. But additional detection with more selective sensors might be necessary to find root cause.

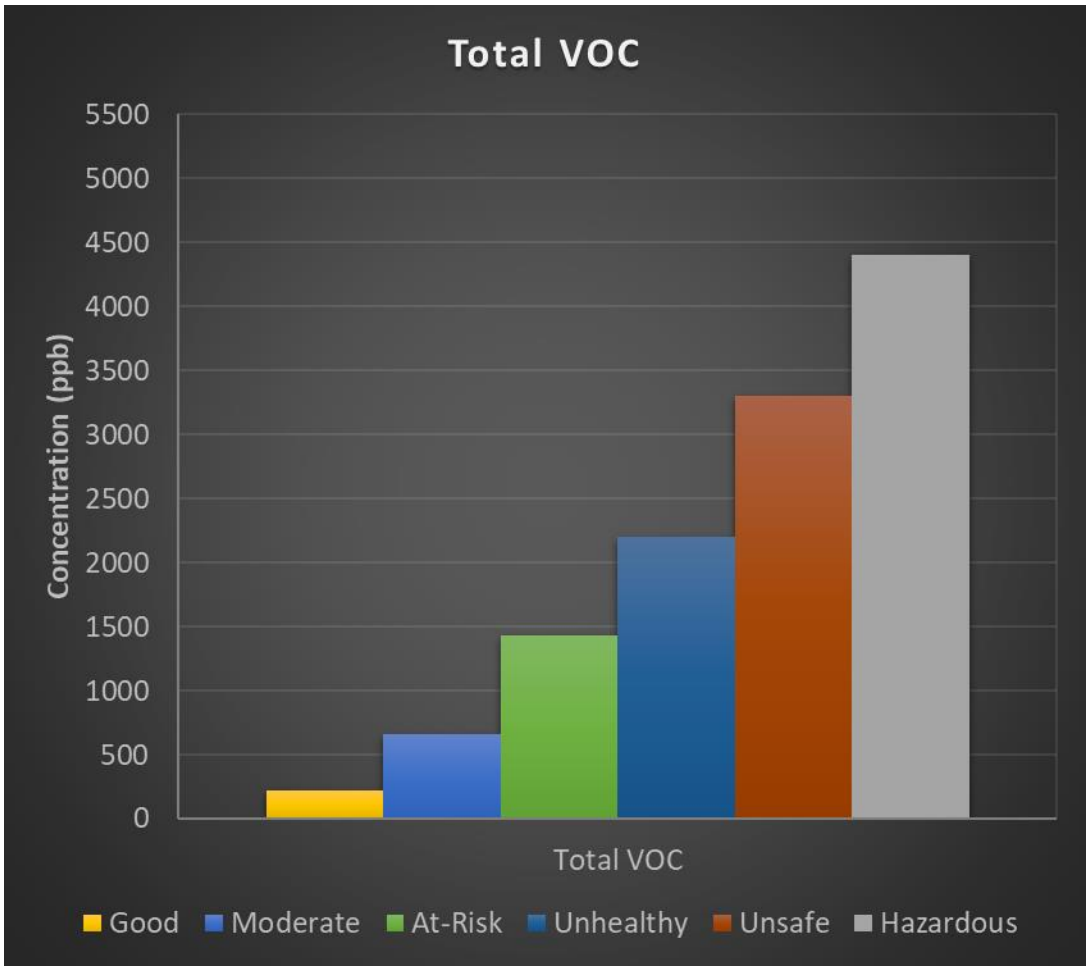


Figure 2 Total VOC Concentration Air Quality Levels

Carbon Monoxide Detection

Carbon monoxide is particularly hazardous in enclosed spaces. It is colorless and odorless. As such, it is not easily detected by human perception. Instead, continuously monitored sensors should be installed.

Without adequate ventilation high concentrations can cause acute respiratory harm, dizziness, confusion, unconsciousness and even death. Carbon monoxide is typically caused by partial combustion of process gases and fuels. Motor vehicles are a common source of these gases. Immediately correct high levels by adjusting ventilation. Vacate the premises if levels cannot be controlled.

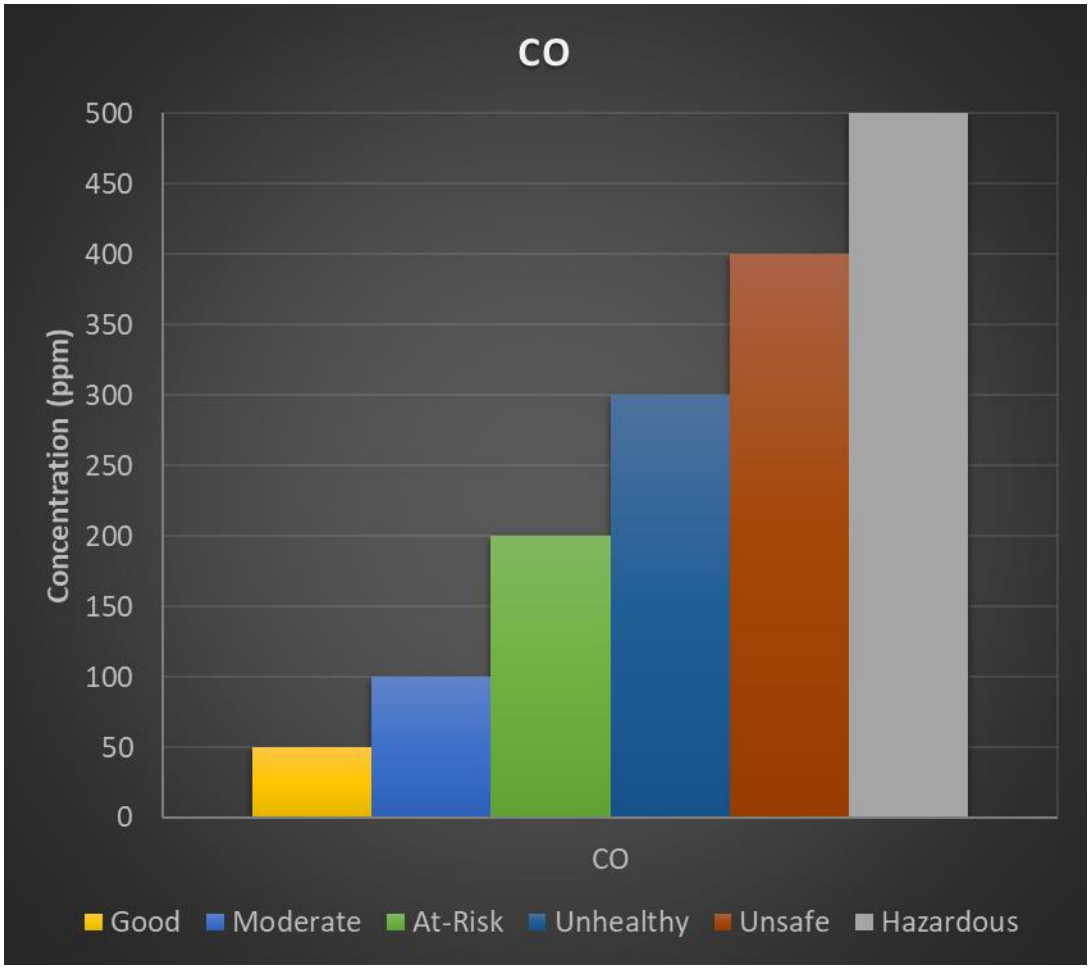


Figure 3 Carbon Monoxide Air Quality Levels

Ozone Detection

Ozone is another colorless and odorless gas that is particularly hazardous to humans. Continuous monitoring with sensors should be used in enclosed spaces. Even at low concentrations it can cause chest pain, coughing, breathing difficulties, and irritation to the throat or nasal cavities. High concentrations or extended exposures can lead to chronic conditions like asthma or disruption to immune response to respiratory infections.

Often, ozone is a secondary product of other air pollution such as nitrous oxide from combusted fuels interacting with ultraviolet light from sunlight. It can also be caused intentionally or unintentionally by ionization of clean air. Some air filtration devices use ionized air and in-turn ozone to reduce particulate matter. Carefully monitor the air quality to determine if ozone exceeds “Moderate” levels. Increase ventilation or vacate area if level is excessive.

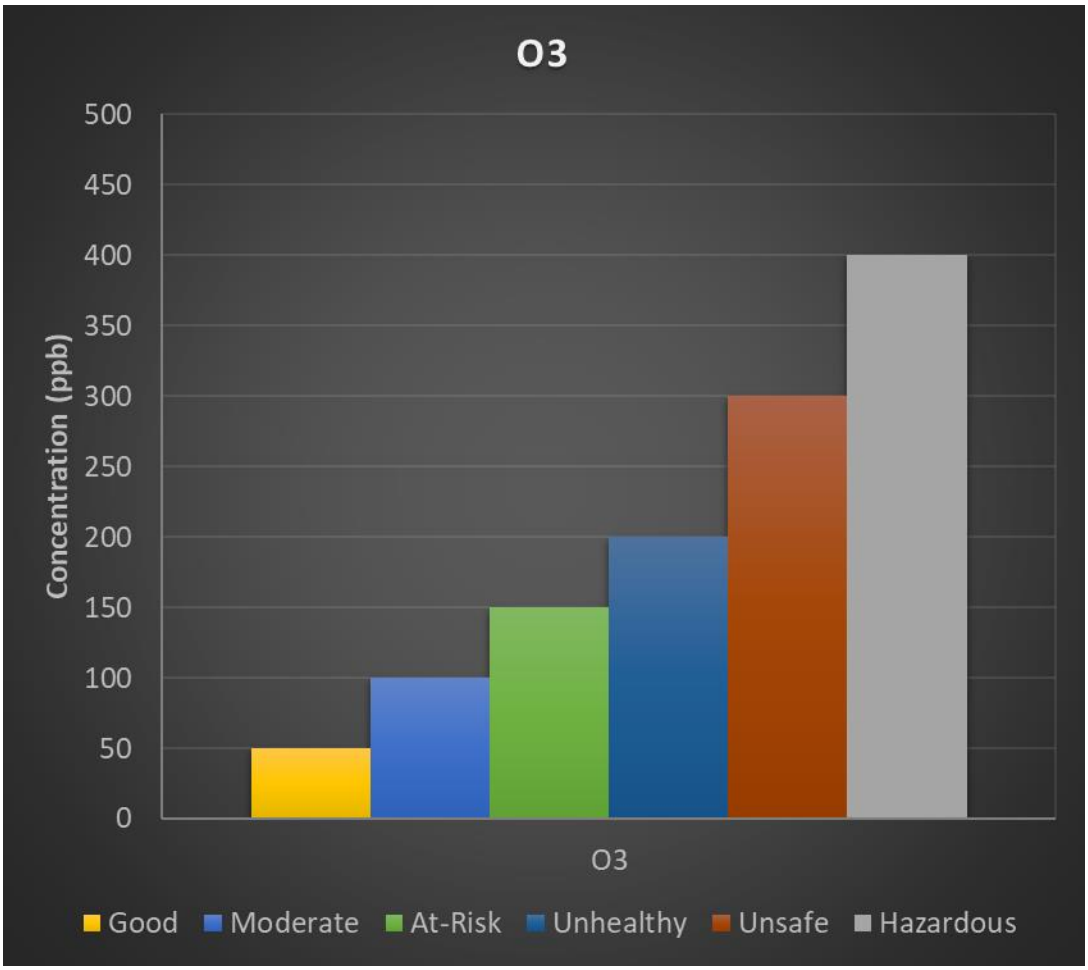
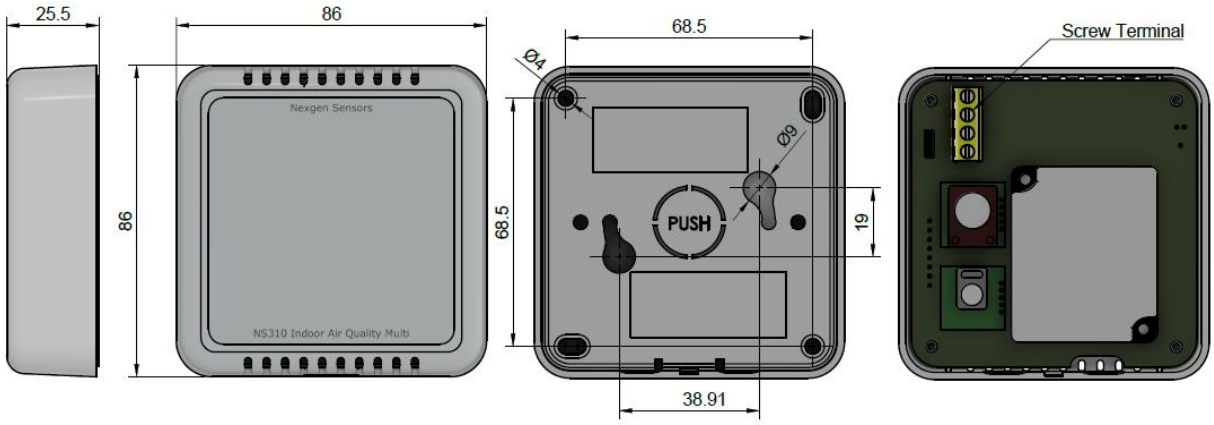


Figure 4 Ozone Concentration Air Quality Levels

Product Features and Installation

The product is a small plastic enclosure that can be wall or ceiling mounted. The back mounting plate is removable. Separate the front housing from the back mounting plate. Then use screws or adhesive to secure the plate to the ceiling or wall surface. Reattach the front housing to the back mounting plate. The two pieces snap together without extra screws.



5 Product Dimensions and Features

Sensitivity, Output Mode and Type

The sensitivity for each type is described in previous sections:

- ug/m3 for PM10, PM2.5 and PM1 particle concentrations
- ppm for CO
- ppb for O3
- ppb for Total VOC (TVOC)
- ppm for CO2
- C for temperature (T)
- % for relative humidty (RH)

The output mode is digital

- RS485 115200 Baud
- Jumper 120Ohm terminator if required
- 10 second message period
- ASCII message, sensor, serial number, key-value pairs comma separated, carriage return line feed:

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sensor NS310, hostname ns-xxxxxx, PM10 xxx ug/m3, PM2.5 xxx ugm/3, PM1 xxx ug/m3,
CO xxx ppm, O3 xxx ppb, TVOC xxxx ppb, CO2 xxx ppm, T xx.x C, RH xx.x %\r\n
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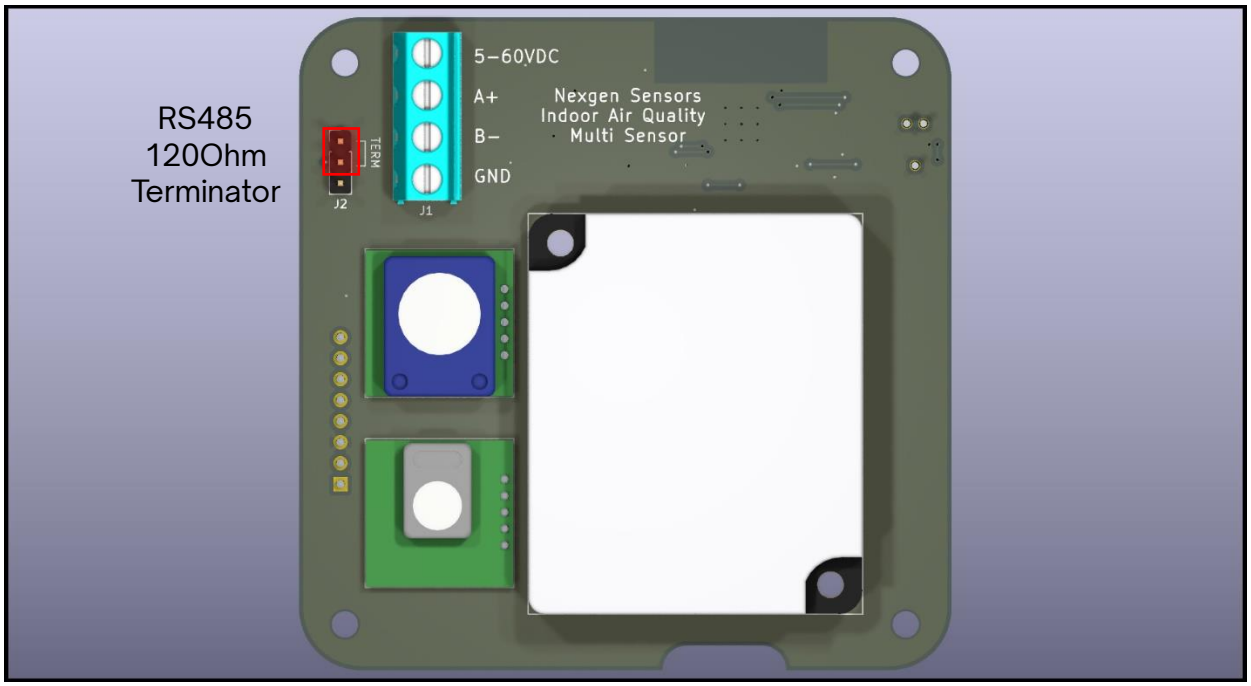


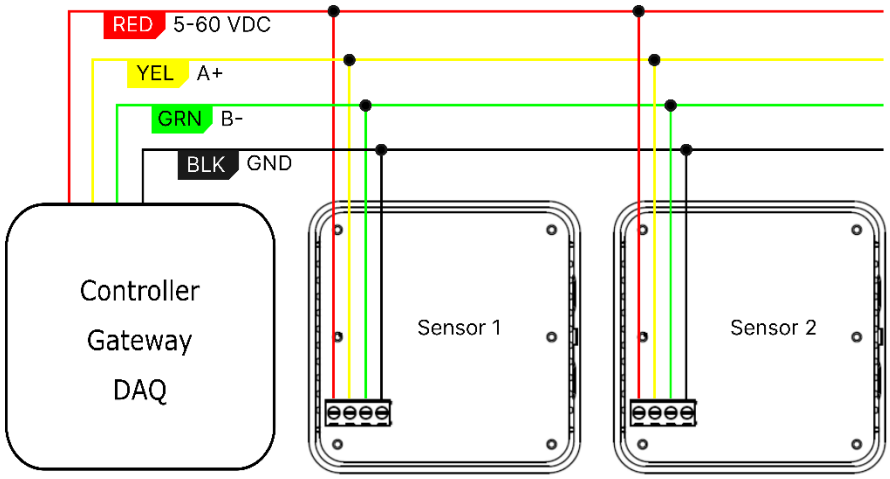
6 Sensitivity and Output Mode Adjustment and Measurement Type

Usage and Wiring

Connect the sensor to an existing controller, gateway, or data acquisition unit (DAQ). Provide a DC supply of 5-60V with at least 3W. Use appropriate wires or cabling. Conductors can be solid or stranded 14-26 AWG. Secure the conductors to the 4 pins of the screw terminals.

5-60VDC	Positive Supply, connect to 5-60V
A+	RS485 A data signal
B-	RS485 B data signal
GND	Negative Supply and signal return, connect to ground or common

Multiple sensors can be wired in parallel. Identify each sensor by serial number. Associate the serial number to the installation location of the sensor. This is useful for extending the sensing range or observing a larger area.



7 Sensor Wiring Diagram