GS-2AQD

Indoor Air Quality Sensor

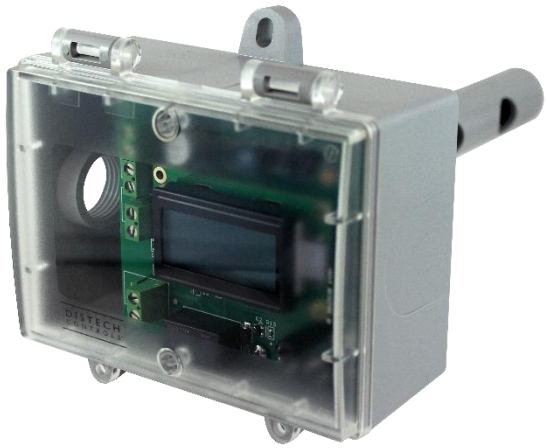

Figure 1: GS-2AQD Indoor Air Quality Sensor

Product Description

This document describes the hardware installation procedures for the GS-2AQD Indoor Air Quality Sensor.

The Indoor Air Quality Sensor uses an advanced MEMS metal oxide semiconductor sensor to detect poor air quality. The sensor reacts quickly to detect a broad range of VOCs such as smoke, cooking odors, bio-effluence, outdoor pollutants and from human activities. The sensor captures all VOC emissions that are completely invisible to CO_2 sensors.

General Installation Requirements

For proper installation and subsequent operation of each device, pay special attention to the following recommendations:

- Upon unpacking the product, inspect the contents of the carton for shipping damages. **Do not install damaged device.**
- Avoid areas where corroding, deteriorating or explosive vapors, fumes or gases may be present.
- Ensure that all equipment is installed according to local, regional, and national regulations.

Personal injury or loss of life may occur if you do not follow a procedure as specified.

Equipment damage or loss of data may occur if you do not follow a procedure as specified.

Take reasonable precautions to prevent electrostatic discharges to the controller when installing, servicing or operating the controller. Discharge accumulated static electricity by touching one's hand to a well-grounded object before working with the controller.

Mounting Instructions

The duct type sensor installs on the outside of a return air duct with the sampling tube inserted into the duct. Mount the sensor in an easily accessible location in a straight section of duct at least five feet from corners and other items that may cause disturbances in the air flow. Avoid areas with vibrations or rapid temperature changes.

The duct sensor principal of operation is based on the Venturi effect of the probe that extends into the HVAC duct. Air flowing through the duct is forced into the vent holes on one side of the probe, over the air quality sensor and then is drawn back out of the probe vent holes on the opposite side.

1. Drill or punch a 7/8" or 1" hole in the duct at the preferred location and insert the probe into the hole to mark the enclosure mounting holes. Remove the unit and drill the two mounting holes. Clean all drilled holes of debris before mounting the device. Mount the enclosure to the duct with two #10 sheet metal screws (not included) such that the duct air flow is parallel with the vent holes in the probe (i.e.: air flows directly into the probe holes). To prevent air leaks, ensure the gasket is compressed around the probe between the device enclosure and the air duct. As shown in Figure 2.

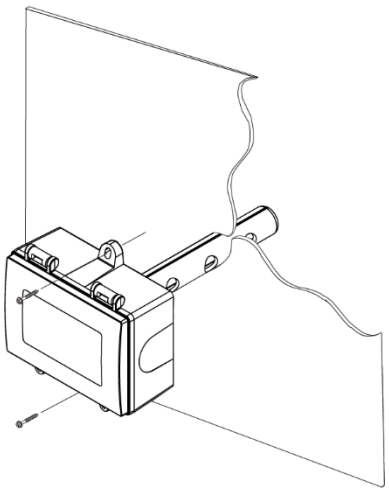

Figure 2: Mounting the sensor.

2. The enclosure has a hinged cover with a latch. Open the cover by pulling slightly on the latch on the bottom side of the enclosure and at the same time pulling on the cover, as illustrated in Figure 3.

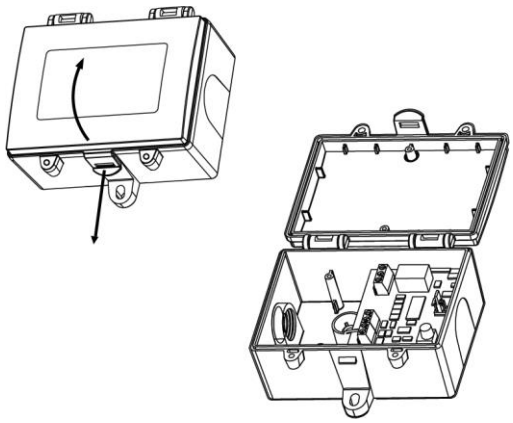

Figure 3: Open hinged cover.

3. A 21 mm (0.8125") hole is provided for connection of either a 1/2" conduit connector or a cable gland style connector. Insert the conduit or cable gland connector through the hole and securely fasten using a locknut as shown in Figure 4.

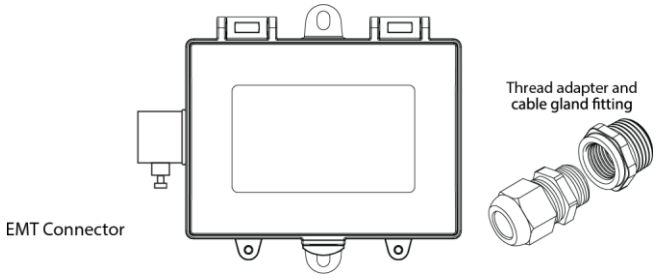

Figure 4: Insert conduit or cable gland.

4. Two security screws are provided which can be installed to help secure the cover once settings and wiring connections are complete. See Figure 5.

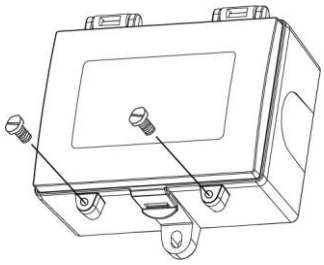

Figure 5: Tighten security screws.

Wiring

Deactivate the 24 Vac/dc power supply until all connections are made to the device to prevent electrical shock or equipment damage. Follow proper electrostatic discharge (ESD) handling procedures when installing the device or equipment damage may occur.

Use 18 - 22 AWG shielded wiring for all connections and do not locate the device wires in the same conduit with wiring used to supply inductive loads such as motors. Make all connections in accordance with national and local codes.

Connector layout is shown in Figure 6. Diagram shown includes all options. If option is not ordered, connector will not be present.

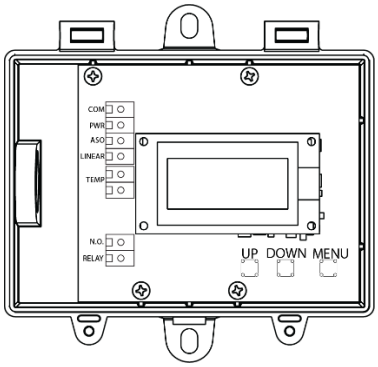

Figure 6: Connector layout.

Connect the positive DC voltage or the hot side of the AC voltage to the terminal marked POWER. The power supply common is connected to the terminal marked COMMON as shown in Figure 7. The device is reverse voltage protected and will not operate if connected backwards. This device has a half-wave type power supply so the power supply common is the same as the output signal common. Therefore, several devices may be connected to one power supply and the output signals all share the same signal common. Use caution when grounding the secondary of an AC transformer or when wiring multiple devices to ensure that the circuit ground point is the same on all devices and the controller.

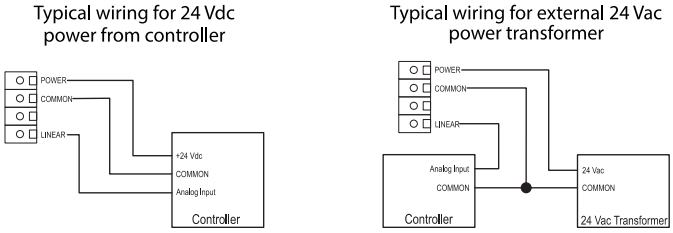

Figure 7: Typical AC or DC wiring

Ensure the controller Analog Input (AI) matches the IAQ voltage output signal type before power is applied. The voltage signals have a minimum load rating. Follow the ratings in the Specification section or inaccurate readings may result.

Linear Output
Connect the LINEAR output signal to a 0-5 or 0-10 VDC analog input port on the controller as shown in Figure 7. The device is factory configured for 0-5 VDC output signal but may be changed to 0-10 VDC via the menu. Changing output signal may be done during set up of the device. This linear output signal represents the 0-2000 ppm CO_2-equivalent value.

Analog Stepped Output
The ASO (Analog Stepped Output) output signal is a second voltage signal that represents the three air quality levels of GOOD, FAIR and POOR. Each level may be set independently via the menu to any value between 0 and 10 VDC. The factory default is GOOD = 2.5 V, FAIR = 5.0 V and POOR = 7.5 V. This signal can also be connected to a controller analog input, or it can be connected directly to a 0-5 or 0-10 VDC input of a damper actuator for direct ventilation control as shown in Figure 8. In this way, the Indoor Air Quality Sensor can be used as a stand-alone device. Since all steps are completely adjustable, the device can also drive a reverse acting actuator.

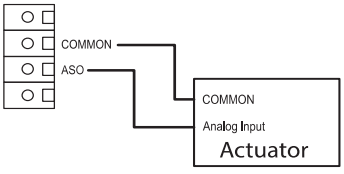

Figure 8: Direct connection to a damper actuator.

Relay Output
The relay output is available on the RELAY terminals. The relay output terminals are completely isolated from other connections and are NOT connected to the signal COMMON terminal as shown in Figure 9. This signal can be used to directly control an alarm, a ventilation fan or may be connected to a digital input of the Building Automation System for status monitoring. Respect the relay contact specification as listed in the datasheet.

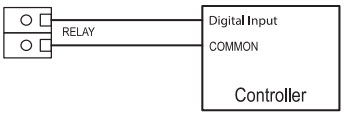

Figure 9: Relay output.

Resistive Temperature Sensor
An optional resistive temperature sensor may also be included in the device and is connected to the TEMP terminals as shown in Figure 10. Various thermistors or RTDs may be installed on the PCB to suit the application. These terminals would connect to a thermistor or RTD sensor input on the controller.

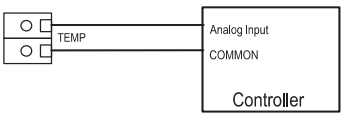

Figure 10: Resistive temperature sensor.

Start-up

Verify that the Air Quality Sensor is properly wired and all connections are tight. Apply power to the device and note that the LCD will display the software version number for a few seconds and then the device will enter Warm Up mode. The Warm Up mode will last for five minutes and the LCD will count down the time. This time is required to allow the device and sensor to reach normal operating temperature.

After the five minutes has expired the device will enter normal operation and the LCD will indicate the IAQ status and ppm value.

Operation

In normal operation, the Air Quality Sensor will detect a broad range of reducing gases such as CO and VOCs and translate the measurement into a parts per million (ppm) CO_2 equivalent value. This value is displayed on the LCD in either ppm or % as set in the menu. The air quality value is also displayed as GOOD, FAIR or POOR and these values can also be set via the menu.

The GOOD, FAIR and POOR air quality levels control the Analog Stepped Output (ASO) signal. The ASO output signal comprises of three independently set voltage levels that can be used to directly control a damper actuator for three positions. The levels are set via the menu and each level can be set anywhere from 0-10 VDC.

The air quality value is also sent to the LINEAR output as a 0-5 or 0-10 VDC signal to represent the 0-2000 ppm CO_2 equivalent. This signal can interface to any voltage analog input for logging or control purposes.

The linear output scaling and ASO operation are shown in Table 1 and Table 2. Note that the ASO GOOD/FAIR trip level = 1000 ppm and the FAIR/POOR trip level = 1500 ppm. The ASO output levels are GOOD = 2.5 V, FAIR = 5.0 V and POOR = 7.5 V.

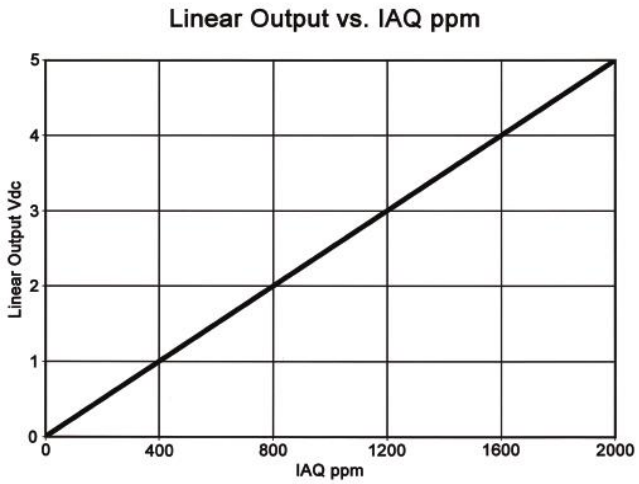

Table 1: Linear output scaling.

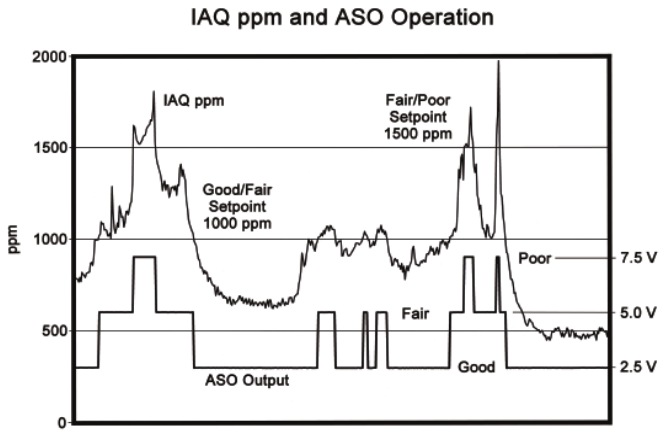

Table 2: ASO operation.

The normally open relay will close when the air quality exceeds a pre-set trip point. The trip point and hysteresis value can be programmed via the menu such that the relay closes when IAQ > Relay Setpoint and opens when IAQ < Relay Setpoint - Hysteresis. By default, the relay has a one minute minimum on and off time to prevent short cycling. This feature may be disabled via the menu. The menu may also be used to test the relay function. The relay can be used to control an alarm, fan directly or to signal a digital input.

Various optional resistive temperature sensors may also be included on the PCB and are available at the TEMP output. This is a two-wire resistive output signal and the temperature value is not displayed on the LCD.

Other features and configuration are described in the Setup section.

NOTE: The air quality sensor requires a continuous burn-in time of at least 3 weeks before the sensor algorithms provide accurate measurements. During this period the product-to-product readings may show large variations. The sensor may also indicate very high ppm readings during the initial burn-in phase.

The air quality sensor is meant to provide an accurate measurement of INDOOR air quality. Diesel exhaust is not a component of indoor air quality and the sensor should not be used in such an application.

Setup

The menu may be accessed any time after the initial warm-up period. The menu is controlled by using the three buttons on the PCB labeled UP, DOWN and MENU. All values entered are saved in non-volatile memory and will be restored correctly in case of a power failure.

The menu has several items as shown below. To enter the menu, press and release the <MENU> key while in normal operation. This will enter the menu step 1, pressing the <MENU> key a second time advances to step 2. Each press of the <MENU> key advances the menu item. The <UP> and <DOWN> keys are used to make changes to program variables by scrolling through the available options. When a value is changed, use the <MENU> key to save it to memory and advance to the next menu item. Actual menu displays with the factory default values are shown. If no keys are pressed for 2 minutes, the menu will automatically exit.

<MENU> Press and release the <MENU> key to enter the Setup menu.

1. IAQ Unit	
IAQ Unit ppm	The LCD displays the IAQ sensor reading from 450-2000 ppm. Use <UP> or <DOWN> to change from ppm (default) to % for 0-100 % display. Press <MENU> to advance.
2. IAQ G/F	
IAQ G/F 1000 ppm	This sets the trip point from Good to Fair IAQ for the LED and ASO. The factory default is 1000 ppm. Use <UP> or <DOWN> to change from 700 to 1200 ppm in 25 ppm steps. Press <MENU> to advance.
3. IAQ F/P	
IAQ F/P 1500 ppm	This sets the trip point from Fair to Poor IAQ. The factory default is 1500 ppm. Use <UP> or <DOWN> to change from 1300 to 1700 ppm in 25 ppm steps. Press <MENU> to advance.
4. Analog Output	
Analog Out 5V	The LINEAR analog output signal defaults to 0-5 Vdc. It can be changed with <UP> or <DOWN> to 0-10 Vdc. The selected scale is always equal to 0-2000 ppm. Press <MENU> to advance.

5. ASO Good Output	
ASO Good 2.5Vdc	This sets the ASO output voltage for the Good range. It can be set using <UP> or <DOWN> anywhere from 0-10 Vdc. Resolution is 0.1 Vdc. The value is shown on the LCD and the ASO output changes accordingly. Press <MENU> to advance.
6. ASO Fair Output	
ASO Fair 5 Vdc	This sets the ASO output voltage for the Fair range. It can be set using <UP> or <DOWN> anywhere from 0-10 Vdc. Resolution is 0.1 Vdc and ASO out updates as above. Press <MENU> to advance.
7. ASO Poor Output	
ASO Poor 7.5 Vdc	This sets the ASO output voltage for the Poor range. It can be set using <UP> or <DOWN> anywhere from 0-10 Vdc. Resolution is 0.1 Vdc and ASO out updates as above. Press <MENU> to advance.
8. IAQ Calibration	
IAQ Cal 0 ppm	Use <UP> or <DOWN> to add or subtract an offset to the IAQ signal. This can change from -200 to + 200 ppm in 10 ppm increments. Press <MENU> to advance.
9. Relay Test On/Off	
Relay Test OFF	Use <UP> or <DOWN> to toggle the relay contacts on or off for testing. Press <MENU> to advance.
10. Relay Setpoint	
Relay SP 1000 ppm	Use <UP> or <DOWN> to change the relay setpoint from 750-1500 ppm. Default is 1000 ppm. Resolution is 25 ppm. Press <MENU> to advance.
11. Relay Hysteresis	
Relay Hy 100 ppm	Can change the relay hysteresis to 20, 50, 100 or 200 ppm. Default is 100. Press <MENU> to advance.
12. Relay Delay	
Relay Dly YES	By default, the relay has a 1 minute minimum on time and a 1-minute minimum off time to prevent fast cycling. This feature can be disabled here. Press <MENU> to exit the User menu and return to normal operation.
13. Relay Op	
Relay Op NO	By default, the relay is normally open as its non-energized state. Use <UP> or <DOWN> to change to NC (normally closed). Press <MENU> to exit the User menu and return to normal operation. The LCD flashes "Menu Exits" for 3 seconds.

Specifications

Sensing Technology	MEMS metal oxide semiconductor VOC sensor
Measurement Range	450-2000 ppm CO2 equivalent or 0-100% (menu selectable)
Drift Compensation	Automatic baseline correction
Power Supply	20-28 Vac/dc (non-isolated half-wave rectified)
Consumption	35 mA max @ 24 Vdc
Input Voltage Effect	Negligible over specified operating range
Protection Circuitry	Reverse voltage protected, over voltage protected
Operating Conditions	0-50°C (32-122°F), 5-95 %RH non-condensing
Linear Output Signal	0-5 / 0-10 Vdc (menu selectable) = 0-2000 ppm CO2 equivalent
Analog Stepped Output Signal	Three steps representing Good, Fair, and Poor air quality
Output Drive Capability	10 KΩ minimum
Programming and Selection	Via internal push-buttons and LCD menu
Warm-up Time	5 minutes
LCD Resolution	1 ppm / 1%
LCD Size	35 mm W x 15 mm H (1.4" x 0.6") alpha-numeric 2 line x 8 characters
Wiring Connections	Screw terminal blocks, 14 to 22 AWG
Probe	152 mm L x 22.5 mm D (6" x 0.88")
Weight	290 gm (10.2 oz)
Relay Output	Form A contact (N.O.) 5 Amps @ 250 Vac, 5 Amps @ 30 Vdc for resistive load 2 Amps @ 250 Vac, 2 Amps @ 30 Vdc for inductive load (trip point and hysteresis set via menu)
Optional Temperature Sensor	Various thermistors and RTDs, 2-wire resistive output
Enclosure	Grey polycarbonate with gasket, UL94-V0 IP65 (NEMA 4X) The European enclosure includes thread adapter (1/2" NPT to M16) and cable gland fitting 116.5 W x 112.5 H x 53.7 D mm (4.585” x 4.43" x 2.115”)
Country of Origin	Canada

Dimensions