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C7364B Duct TVOC Sensor

INSTALLATION INSTRUCTIONS

The TVOC sensor emulates the human perception of air quality much more than a CO_2 sensor and even detects odorless, potentially hazardous substances such as carbon monoxide.

The CO_2-equivalent sensor output value was developed to allow the IAQ sensor to be used in select Demand Controlled Ventilation applications.

Before Installation

Read these instructions carefully before installing and commissioning the transmitter. Failure to follow these instructions may result in product damage. Do not use in an explosive or hazardous environment, with combustible or flammable gases, as a safety or emergency stop device or in any other application where failure of the product could result in personal injury. Take electrostatic discharge precautions during installation and do not exceed the device ratings.

NOTE 1: The air quality sensor requires a continuous calibration 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 calibration phase.

NOTE 2: 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.

Mounting

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.

For proper function probe must be mounted with holes in probe aligned with air stream (sensor mounting holes oriented at 90 degrees relative to air stream)

Drill 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
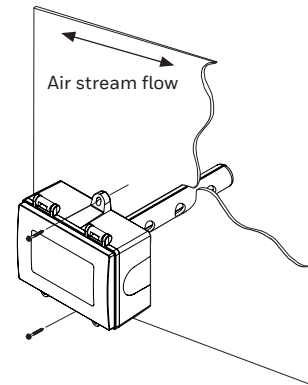

Fig. 1. Duct Mounting

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 1.
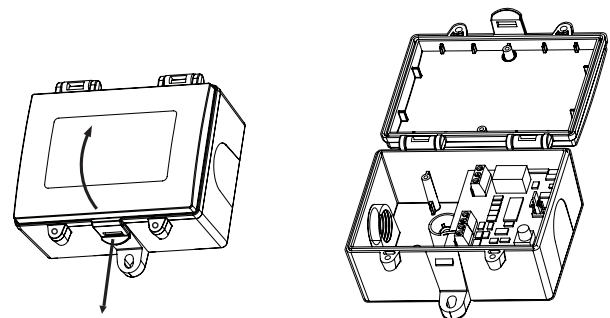

Fig. 2. Opening Cover

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 2.

A 1/2" NPT threaded connection hole is provided in the left side of the enclosure. Screw the EMT connector or cable gland connector in until tight. See Figure 3. It is recommended that weatherproof conduit or cable gland fittings be used.
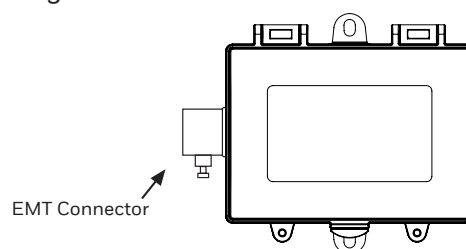

Fig. 3. EMT Connection

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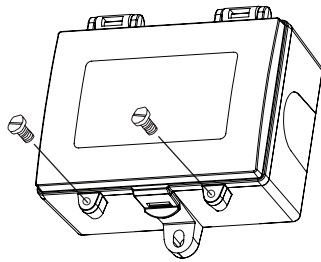

Fig. 4. Secure Cover

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 5. Diagram shown includes all options. If option is not ordered, connector will not be present.
- 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 6.
- The device is reverse voltage protected and will not operate if connected backwards.
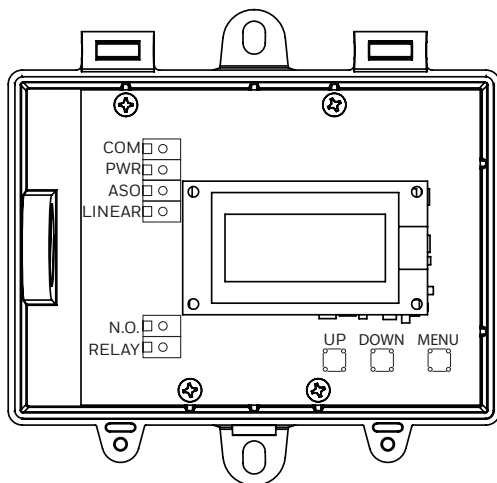

Fig. 5. PCB Layout

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.
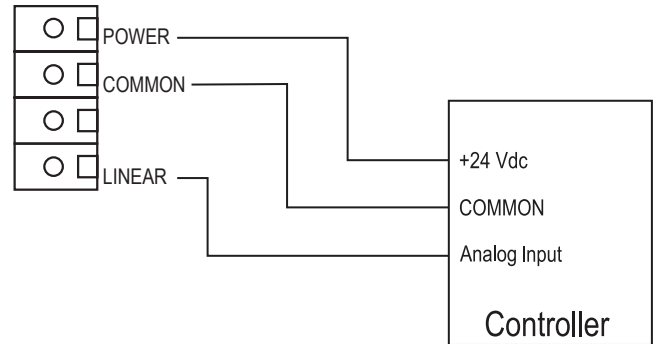
Wiring

Ensure the controller Analog Input (AI) matches the TVOC 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.
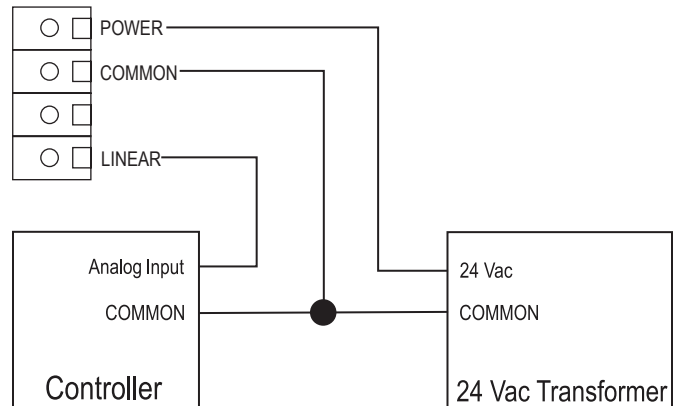

Fig. 6. Wiring

Connect the LINEAR output signal to a 0-5 or 0-10 Vdc analog input port on the controller as shown in Figure 6. 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 to 0-2000 ppm CO_2-equivalent value.

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 7. 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.
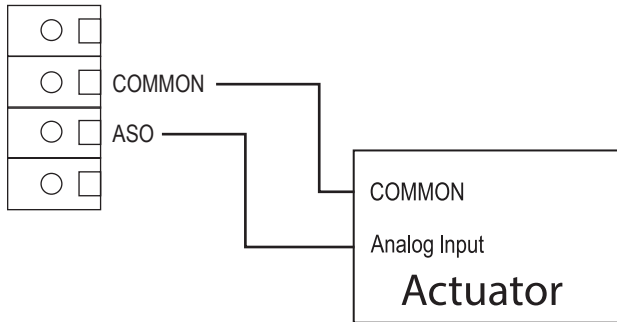

Fig. 7. ASO Wiring

The relay output 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 8. This signal can be used to directly control an alarm, a ventilation fan or may be connected to a digital input of a Building Automation System for status monitoring. Respect the relay contact specification as listed in this document.
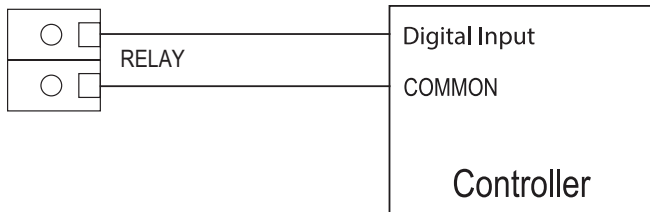

Fig. 8. Relay Wiring

Set-Up
Verify that the TVOC 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 TVOC status and ppm value.

Operation
In normal operation, the TVOC 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 either 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 GOOD, FAIR and POOR air quality levels will also be displayed on the tri-color front panel LED. The LED colors are displayed as GOOD = green, FAIR = blue and POOR = red. If required, the LED operation can be disabled via the menu.

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 is shown below. 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.

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.
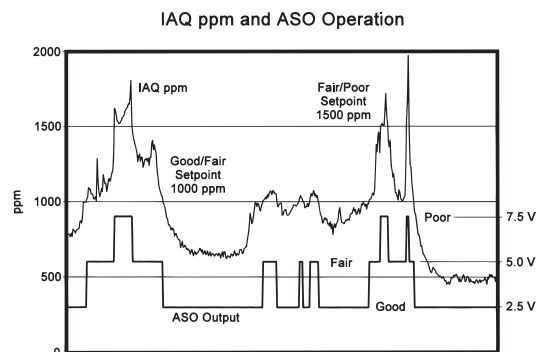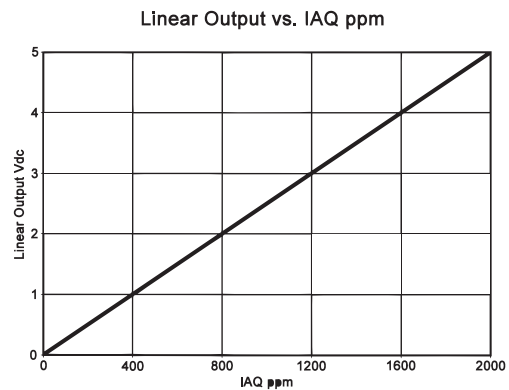
Other features and configuration are described in the Setup Menu section.

NOTE: The air quality sensor requires a continuous burn-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 TVOC sensor is meant to provide an accurate measurements 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.

Menu

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 User 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 value are shown.

NOTE: If no keys are pressed for 2 minutes, the menu will automatically exit.

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. 0-100% = 450-2000 ppm. This setting has no effect on the LINEAR output signal, it is always scaled 0-2000 ppm = 0-5/0-10 Vdc.

<MENU>   Press to advance to next menu item

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.

<MENU>   Press to advance to next menu item

3. IAQ F/P

| IAQ F/P 1500 ppm |

This sets the trip point from Fair to Poor IAQ for the LED and ASO. The factory default is 1500 ppm. Use <UP> or <DOWN> to change from 1300 to 1700 ppm in 25 ppm steps. Note that both IAQ trip points have a 25 ppm hysteresis built in.

<MENU>   Press to advance to next menu item

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.

<MENU>   Press to advance to next menu item

5. ASO Good Output

| ASO Good 2.5 Vdc |

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 ASO output changes accordingly.

<MENU>   Press to advance to next menu item

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.

<MENU>   Press to advance to next menu item

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.

<MENU>   Press to advance to next menu item

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.

<MENU>   Press to advance to next menu item

9. Relay Test

Relay Test OFF

Use <UP> or <DOWN> to toggle the relay on or off for testing.

<MENU>   Press to advance to next menu item

10. Relay Set Point

Relay SP 1000 PPM

Use <UP> or <DOWN> to change the relay setpoint from 750-1500 ppm. Default is 1000. Resolution is 25 ppm.

<MENU>   Press to advance to next menu item

11. Relay Hysteresis

Relay Hy 100 PPM

Can change the relay hysteresis to 20, 50, 100, or 200 ppm. Default is 100.

<MENU>   Press to advance to next menu item

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.

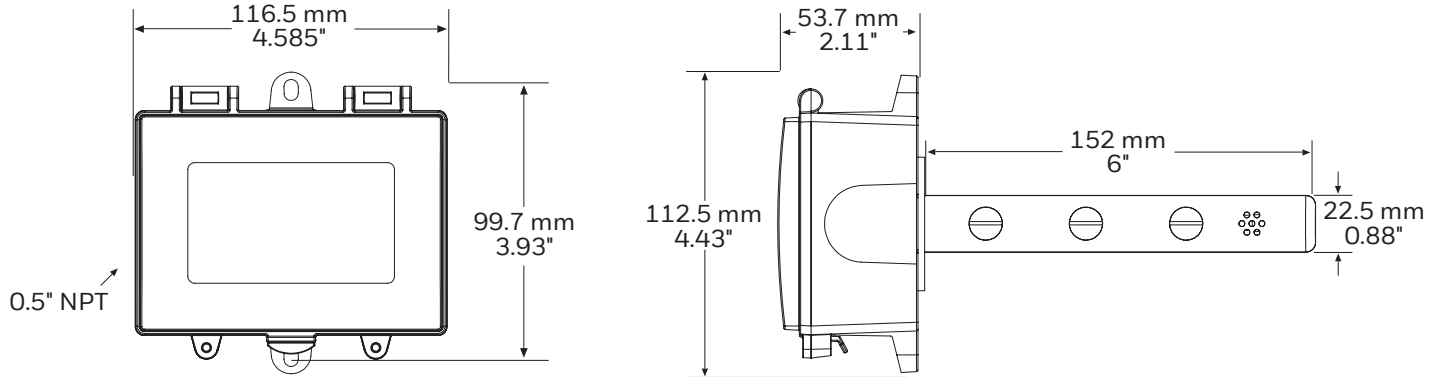<MENU>   Press to advance to next menu item

13. Relay Open/Closed

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).

<MENU>   Exits the User menu and returns the normal operation. The LCD flashes "Menu Exits" for 3 seconds.

Dimensions

116.5 mm
4.585"

99.7 mm
3.93"

0.5" NPT

53.7 mm
2.11"

112.5 mm
4.43"

152 mm
6"

22.5 mm
0.88"

WEEE Directive 2012/19/EC Waste Electrical and Electronic Equipment directive

At the end of the product life dispose of the packaging and product in a corresponding recycling centre. Do not dispose of the unit with the usual domestic refuse. Do not burn the product.

WARNING: This product can expose you to chemicals which are known to the State of California to cause cancer/birth defects or other reproductive harm. For more information go to www. P65Warnings.ca.gov.

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