



CO₂ Demand-Controlled Ventilation Duct-Sensor

Ordering number: 4190 4101, X13790423010 (VAC02DUCT010)

The carbon-dioxide (CO₂) duct-sensor is designed especially for demand-controlled ventilation applications for return air. The exceptional stability and reliable performance come from advanced silicon based Non-Dispersive InfraRed (NDIR) technology.

Specifications

Table 1 shows the specifications of the CO₂ sensor.

Table 1: Sensor specifications

Measuring range	0–2000 parts per million (ppm) CO ₂
Accuracy at 25°C	< ± [30 ppm CO ₂ + 2% of reading] (includes repeatability and calibration uncertainty)
Non-linearity	< 1.0% full scale (FS)
Temperature dependence of output	0.30% FS/°C
Long-term stability	< ± 5.0% FS/5-years
Recommended calibration interval	5 years
Response time	1 minute (0–63%)
Operating temperature	From 23 to 113°F (–5 to 45°C)
Storage temperature	From –4 to 158°F (–20 to 70°C)
Humidity range	0–85% relative humidity (RH)
Air flow range	0–33 ft./s (0–10 m/s)
Output signals (jumper selectable)	4–20 mA, 0–20 mA, 0–10 Vdc
Resolution of analog outputs	10 ppm CO ₂
Recommended external load	Current output: max. 500 Ω Voltage output: min. 1000 Ω
Power supply	Nominal 24 Vac
Power consumption	< 5 VA
Warm-up time	< 15 minutes
Housing material	ABS plastic
Housing classification	IP 65
Dimensions	3 ¹ / ₈ in. × 3 ¹ / ₈ in. × 7 ³ / ₄ in. (80 mm × 80 mm × 200 mm)

Power supply requirements

CAUTION

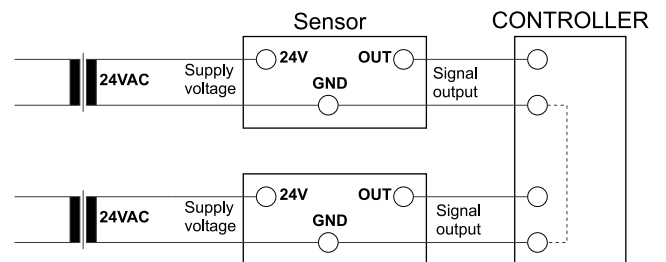
AVOID EQUIPMENT DAMAGE!

Make sure that you connect the power wires to the correct terminals. Connecting power to an output terminal may result in equipment damage.

The CO₂ sensor is designed to operate with a nominal 24 Vac supply. The power supply should maintain the voltage between 20 to 26 Vac.

Use a 24 Vac power supply according to the following guidelines. If more than one sensor is connected to one 24 Vac transformer, a common loop is formed and the risk of a short-circuit increases. To avoid this, use a separate floating supply for each sensor, as shown in Figure 1.

Figure 1: Separate ac power supplies



If several sensors must share one transformer, the phase (~) must always be connected to the 24V connector in each sensor to maintain polarity and to avoid short-circuit through the shared common line at the controller (Figure 2).

Figure 2: One ac supply for several sensors

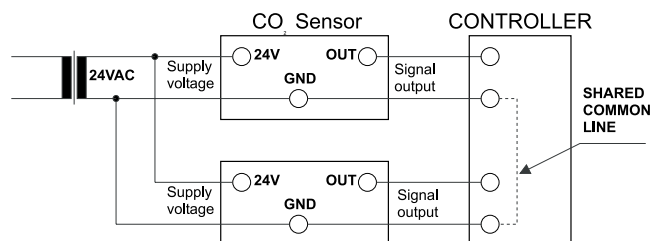
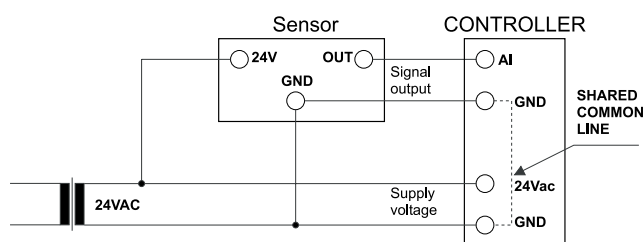


Figure 3 shows how to wire the sensor with 24 Vac power from a unit controller.

Figure 3: Power supply from controller



Mounting the sensor

1. Select a proper location on the duct to mount the CO₂ sensor.
2. Drill a $\frac{7}{8}$ -inch to 1-inch hole in the mounting surface for sensor insertion (Figure 4).
3. Attach the mounting plate to the duct wall with four screws.
4. Insert the sensor through the mounting plate, adjusting the depth for optimal air sensing.
5. If conduit is required, remove the wiring grommet and install the supplied $\frac{1}{2}$ -inch National Pipe Thread (NPT) conduit fitting.

Figure 4: CO₂ sensor mounting diameter

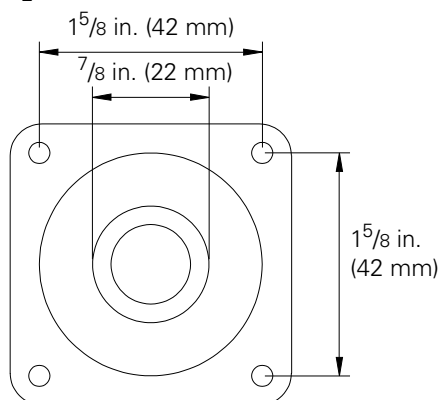
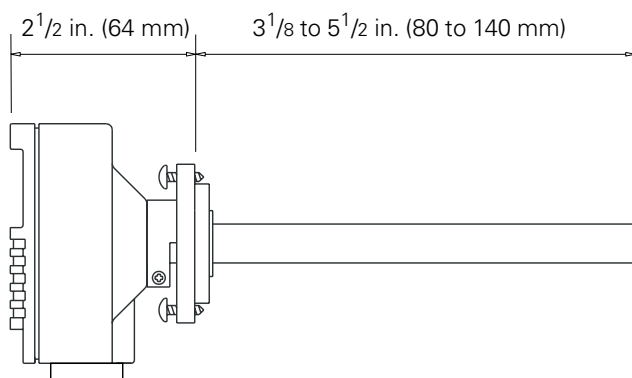


Figure 5: CO₂ sensor insertion depth



Wiring the sensor

1. Connect the common wire from the controller to the ground terminal (terminal 0) (Figure 6).
2. For voltage output, connect the signal wire to terminal V.
3. For current output, connect the signal wire to terminal mA. Select the type of output from the sensor by configuring the jumpers.
 - For 4–20 mA output, connect jumper 0/4mA (Figure 6).
 - For 0–20 mA output, remove jumper 0/4mA.
4. Connect the power according to the guidelines in *Power supply requirements* on page 1.

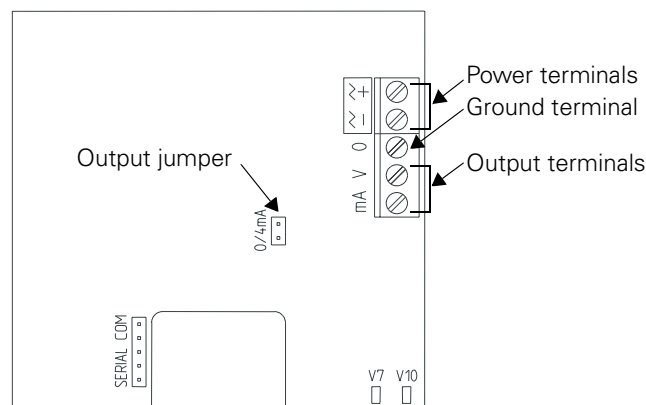
CAUTION

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Note: During normal operation, the green LED (V10) blinks. If the self-diagnostics procedure encounters an abnormality, the red LED (V7) lights up (Figure 6).

Figure 6: Terminal connections and LED locations



Service and maintenance

This CO₂ sensor has excellent stability and requires no maintenance. In most environments the recommended calibration interval is five years. A trained service technician can use a portable CO₂ meter to certify sensor calibration.

If the sensor reading differs too much from the reference value, the sensor can be re-calibrated in the field. A calibration kit, software, and calibration gases are required. If certified accuracy is required, the sensor must be calibrated in a laboratory. Consult Trane BAS for further details.