INTRODUCTION

The CO_2 transmitter uses Infrared Technology to monitor CO_2 levels and outputs a linear 4-20 mA or 0-5/0-10 Vdc signal. Features include a back-lit LCD with user menu for easy installation and optional control relay with user selectable setpoint and temperature sensor outputs.

BEFORE INSTALLATION

Read these instructions carefully before installing and commissioning the CO_2 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, or 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 specifications. Use 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.

MOUNTING

Select a suitable mounting spot on an exterior wall where the CO_2 sensor is best protected from direct exposure to sunlight, wind, etc. preferably on a north facing wall. Do not mount the sensor near opening windows, supply/exhaust air louvres or other known air disturbances. Avoid areas where the sensor is exposed to vibrations or rapid temperature changes. It is recommended that the enclosure be mounted so conduit or cable-gland connections be made on the bottom of the enclosure. See Figure 1.

Remove the cover by using a standard or flat screwdriver to loosen the four screws as shown in Figure 2. As the screws are captive type, complete removal of the screw from the cover is not required.

On the bottom of the enclosure, remove the vent as shown in Figure 3. Install a conduit fitting or cable gland as shown in Figure 4. It is recommended that weatherproof conduit or cable gland fittings be used.

Mount the sensor directly on an exterior wall using the four integrated mounting holes that are provided on the enclosure. See figure 5. Select the best mounting technique based on the exterior wall material. The 4 mounting holes will facilitate a #10 size screw (not supplied).

After the base is securely fastened to the exterior wall, connect conduit to conduit connector or feed cable through the cable gland and tighten.

Make wire connections as per the "Wiring" illustrations on Page 2. Once wiring and set up are complete and re-install cover and secure by tightening the four screws using a flat screwdriver.
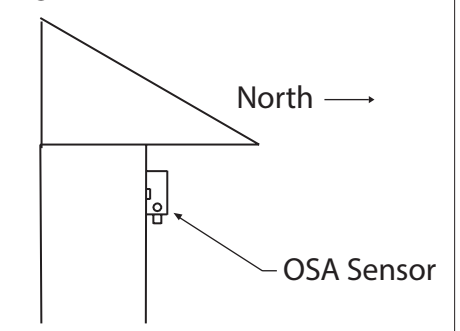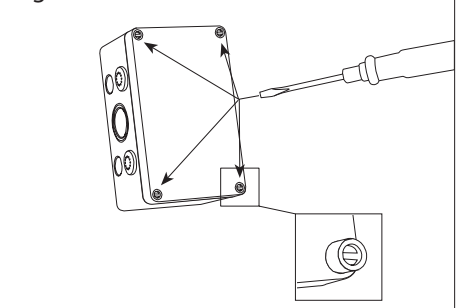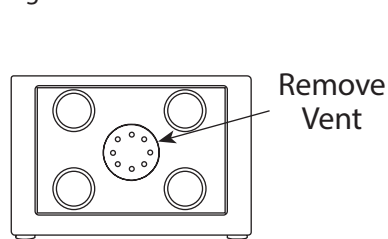
Figure 1

North →

OSA Sensor

Figure 2

Figure 3

Remove Vent
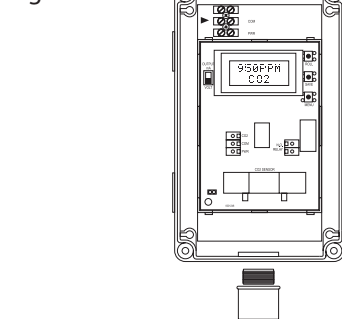
Figure 4

Figure 5
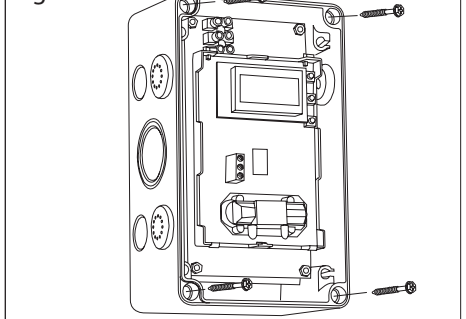
WIRING

- Deactivate the 24 Vac/dc power supply until all connections are made to the device to prevent electrical shock or equipment damage. Do not wire the device with power applied as accidental arcing may damage the product and void the warranty.
- **NOTE:** The 300 (Heated) & 400 (Unheated) series have different connection terminals as shown on the diagrams below.
- Select the desired signal output type by sliding the Output switch into desired position as shown in Figure 6. The factory default is "VOLT" and set to 0-5 Vdc. It may be changed to 0-10 Vdc during program set up. The "mA" setting provides a 4-20mA output.
- This is a 3-wire sourcing device. Connect the plus dc or the ac voltage hot side to the PWR terminal. The supply common is connected to the COM terminal. The device is reverse voltage protected and will not operate if connected backwards. It has a half-wave power supply so the supply common is the same as the signal common. Several devices may be connected to one power supply and the output signals all share the same common. Use caution when grounding the secondary of a transformer or when wiring multiple devices to ensure the ground point is the same on all devices and the controller. See Figure 7.
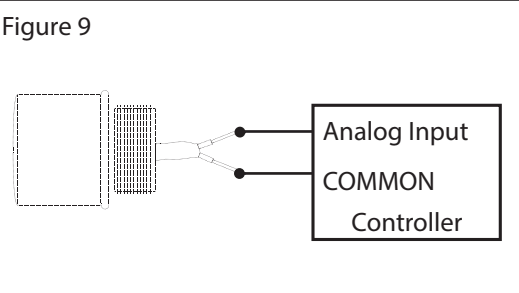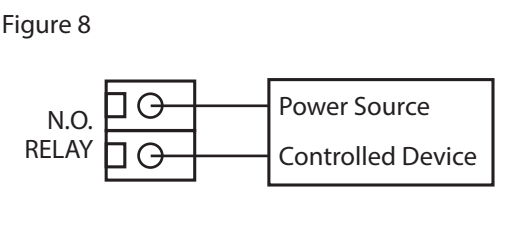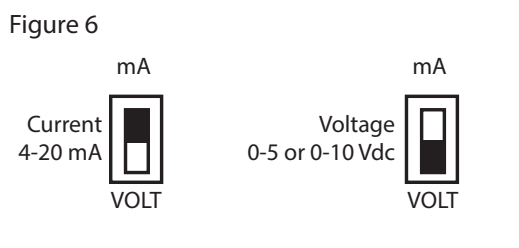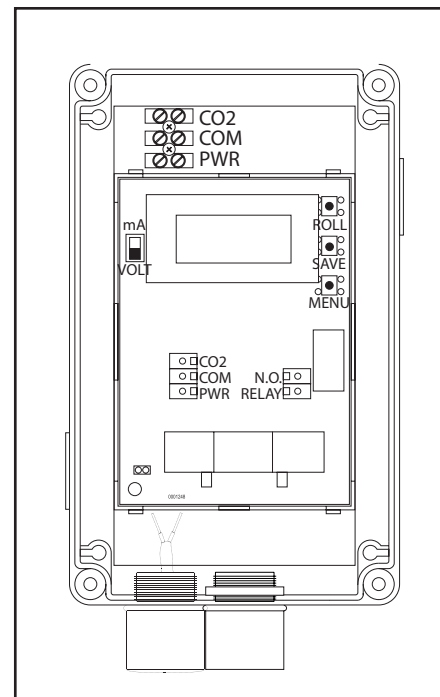- The analog output is available on the CO_2 terminal as shown in Figure 7. This signal is switch selectable for either voltage or 4-20 mA active output. In voltage mode the output is selectable for either 0-5 or 0-10 Vdc via the menu (the factory default is 0-5 Vdc). The current output operates in the active mode and does not require a loop power supply (the signal current is generated by the transmitter and must not be connected to a powered input or device damage will result). Check the controller Analog Input to determine the proper connection before applying power. Both current and voltage signals are referenced to the COM terminal. The analog output signal is typically connected directly to the Building Automation System (B.A.S.) and used as a control parameter or for logging purposes.
- The relay output is on the N.O. RELAY terminals as shown in Figure 8. The relay output is completely isolated and has a Normally Open (NO) signal. This signal can be used to directly control an alarm or ventilation fan. See page 6 for switch rating.
- The optional two-wire temperature sensor output is available with various RTDs and thermistors to suit all control applications and is available as a twisted pair connection. All connections should be made using either butt-splices or soldering. The use of wire nuts is not recommended. See Figure 9

Figure 6

Figure 7

Wiring for CO_2 output signal and 24 Vdc power from controller

Figure 8

Wiring for all output and external 24 Vac power transformer or external 24 Vac power supply

Figure 9
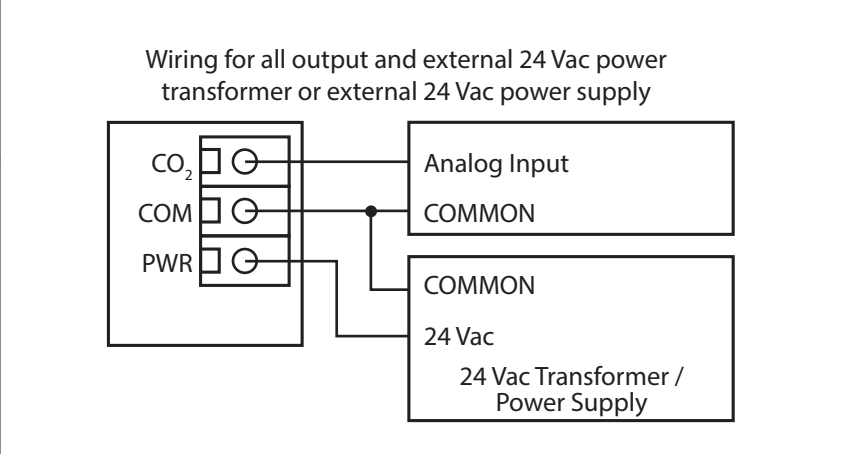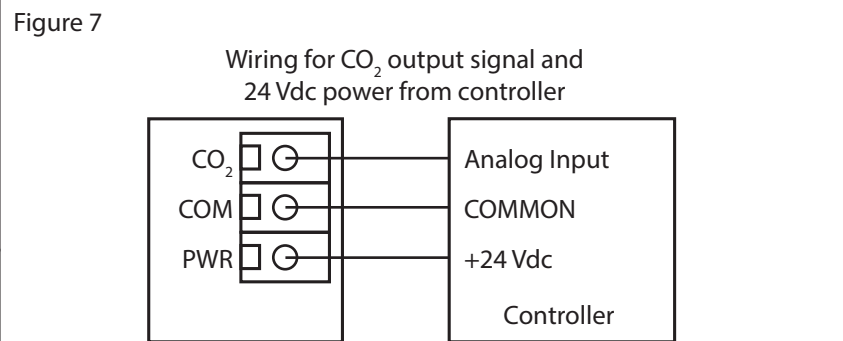
START-UP

Verify the device is properly wired and connections are tight. Ensure the V/I switch is set for the correct signal type. Apply power and the LCD will indicate the software version number, the output signal type, the relay setpoint (if installed), the CO_2 measurement range and then the sensor will begin reading the CO_2 level, output the correct analog signal and display the value on the LCD.

OUTPUT

The CO_2 output is scaled such that 4-20 mA, 0-5/0-10 Vdc equals 0 to Out_High. Depending on the model, the factory default is either 0-2000 ppm pr 0-20,000 ppm. Out_High can be changed in the Setup Menu and the output is scaled accordingly. The voltage output defaults to 0-5Vdc (0-10 Vdc can be selected in the menu).

OPERATION

The output signal is available on the CO_2 terminal and is connected to the BAS analog input which reads the signal and calculates the CO_2 ppm value using correct scaling for the range and signal type. The CO_2 value is used to control output ventilation devices or initiate alarms. The CO_2 value is also displayed locally on the LCD.

If the relay is installed it can control a small fan or alarm by setting the trip value and hysteresis to appropriate values.

If a temperature sensor is installed, it will be wired to an analog input of the BAS that is set for the specific resistance type. This could be a 10 KΩ thermistor, a 1000 Ω RTD or other sensor values. The BAS reads the resistance signal and converts it to a temperature value.

NOTE: The outside enclosure slows the sensor response time to approximately 30 minutes for a 90% step change of CO_2 concentrations.

SETUP MENU

The menu has several items shown below. Some items change depending on the hardware configuration and the CO_2 sensor. To enter the menu, press and release the <MENU> key while in normal operation. This will enter SETUP menu step 1, pressing the <MENU> key again advances to step 2. Each press of <MENU> advances the menu item. No values are saved or changed by using <MENU>. The <ROLL> key is used to make changes to program variables by scrolling through the available options. When a value is changed, use the <SAVE> key to save it to memory and advance to the next menu item. See Figure 10.

Figure 10

<MENU>   Press and release the <MENU> key to enter the Setup Menu
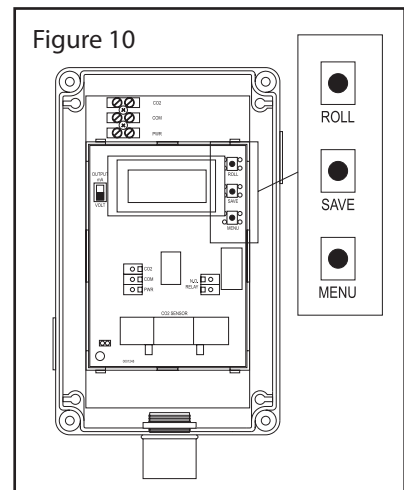
1. OUTPUT HIGH

| Out High |
| 2000 ppm |

The factory default CO_2 range is 0-2000 ppm. The span can be changed from 2000 to 20000 ppm in increments of 500. Use the <ROLL> key to change the value and <SAVE> to save.

<MENU>   Press to advance to next menu item

2. ALTITUDE ADJUSTMENT

| Altitude |
| 0 Ft |

The default is 0 feet. Change by using the <ROLL> key from 0 to 5000 feet in 500 ft increments. Change for CO_2 local altitude correction and press <SAVE> to save a change.

<MENU>   Press to advance to next menu item

3. SETPOINT

| Relay SP |
| 1000 PPM |

The relay trip setpoint default is 1000 ppm. It can be changed from 500 to 15,000 ppm. Save changes by using the <SAVE> key.

<MENU>   Press to advance to next menu item

4. HYSTERESIS

| Relay Hy |
| 50 PPM |

The relay hysteresis default is 50 ppm. This can be changed from 25 to 500 ppm. Use <SAVE> to save any change.

<MENU>   Press to advance to next menu item

5. RELAY TEST

| Relay |
| Test OFF |

Use the <ROLL> key to toggle the relay ON or OFF for testing purposes. Press either <SAVE> or <MENU> to turn the relay off and advance to the next item.

<MENU>   Press to advance to next menu item

6. OUTPUT TYPE

| Out Type |
| 0-5 Vdc |

For voltage, the factory default output type is 0-5 Vdc. Use the <ROLL> key to change the value to 0-10 Vdc if necessary. Press the <SAVE> key to save. If the switch is set to mA, then 4-20 mA is displayed.

<MENU>   Press to advance to next menu item

7. OUTPUT TEST

| Output |
| Test OFF |

Use the <ROLL> key to toggle the output OFF (normal operation), MIN (minimum output) or MAX (maximum output) for testing purposes. Press either <SAVE> or <MENU> to set it back to OFF and advance to the next item.

<MENU>   Press to advance to next menu item

8. CALIBRATION

| Calibrat |
| 0 PPM |

This item is used for 0 ppm gas calibration and is explained in the Calibration section.

<MENU>   Press to advance to next menu item

9. CALIBRATION

| Calibrat |
| 1000 PPM |

This item is used for 1000 ppm gas calibration and is explained in the Calibration section.

<MENU>   Press to advance to next menu item

10. CALIBRATION

| Calibrat |
| 20000 PPM |

This item is used for 20,000 ppm gas calibration and is explained in the Calibration section.

<MENU>   Press to advance to next menu item

11. RESTORE DEFAULTS

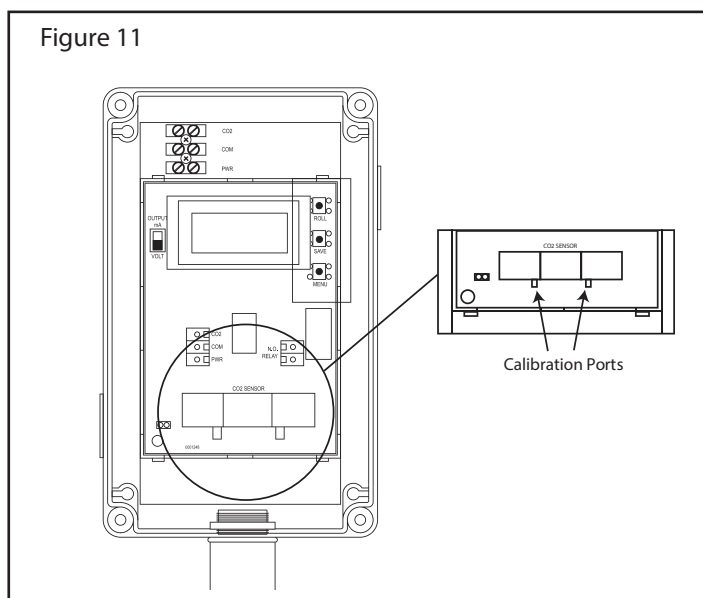| Restore Defaults	Press the <SAVE> key to restore calibration to original factory settings.

<MENU>   Press to advance to next menu item

12. MENU EXIT

Menu Exit	Press <SAVE> to exit the menu and return to normal operation or <MENU> to repeat the menu.

Figure 11

Calibration Ports

CALIBRATION

Calibration with gas requires a field calibration kit with pressure regulator, necessary tubing and appropriate bottles of CO2 gas.

CDD4B MODEL

The CDD4B dual-channel sensor with extended range requires a 3-point calibration with 0, 1000 and 20,000 ppm gas (in order).

0 PPM CALIBRATION

Turn the regulator knob off and attach it to the Nitrogen gas bottle and hand tighten. Remove the cover of the unit to be calibrated to expose the gas sensor chamber. The tubing from the gas bottle can be connected to either port on the chamber after the plastic cap is removed. Gently remove one cap and connect the tubing, note that strong shock or vibration can affect calibration.

Ensure the device has been operating normally for at least five minutes before applying gas. Turn the valve knob on the regulator to start the gas flow. The regulator will restrict the flow rate to the specified 100 ml/min. After a brief period the gas will flow into the chamber. Wait 1 to 2 minutes until the CO2 stabilizes.

Enter the Setup menu and use the <MENU> key to advance to Calibrat 0 PPM. Press and hold the <SAVE> key for 2 seconds and the display will change to Waiting Calibrat then to Waiting 5 minute to indicate that the process of setting the internal calibration is taking place.
This takes about 5 minutes while the LCD counts down. Do not disturb the unit or the gas flow. When complete the unit will display the ppm value and Cal Done. Press the <SAVE> key to return to normal operation and shut the gas off.

1000 PPM CALIBRATION

Connect the 1000 ppm CO2 gas bottle and apply the gas as before. The CO2 reading on the LCD will begin to approach 1000 ppm. Wait 1 to 2 minutes until the CO2 reading stabilizes.

Enter the Setup menu and use the <MENU> key to advance to Calibrat 1000 PPM. Press and hold the <SAVE> key for 2 seconds and the display will change to Waiting Calibrat then to Waiting 5 minute to indicate that the device is calibrating. Again, this process takes about 5 minutes. When calibration is complete the unit will display the ppm and Cal Done. Press the <SAVE> key to return to normal operation and shut the gas off.

20,000 PPM CALIBRATION

Connect the 20,000 ppm CO2 and apply the gas as before. The LCD will begin to approach 20,000 ppm. Wait 1 to 2 minutes until the CO2 reading stabilizes.

Enter the Setup menu and use the <MENU> key to advance to Calibrat 20,000 PPM. Press and hold the <SAVE> key for 2 seconds and the display will change to Waiting Calibrat then to Waiting 5 minute.

Again, wait 5 minutes and when calibration is complete the unit will display the ppm and Cal Done. Press the <SAVE> key to return to normal operation and shut the gas off.

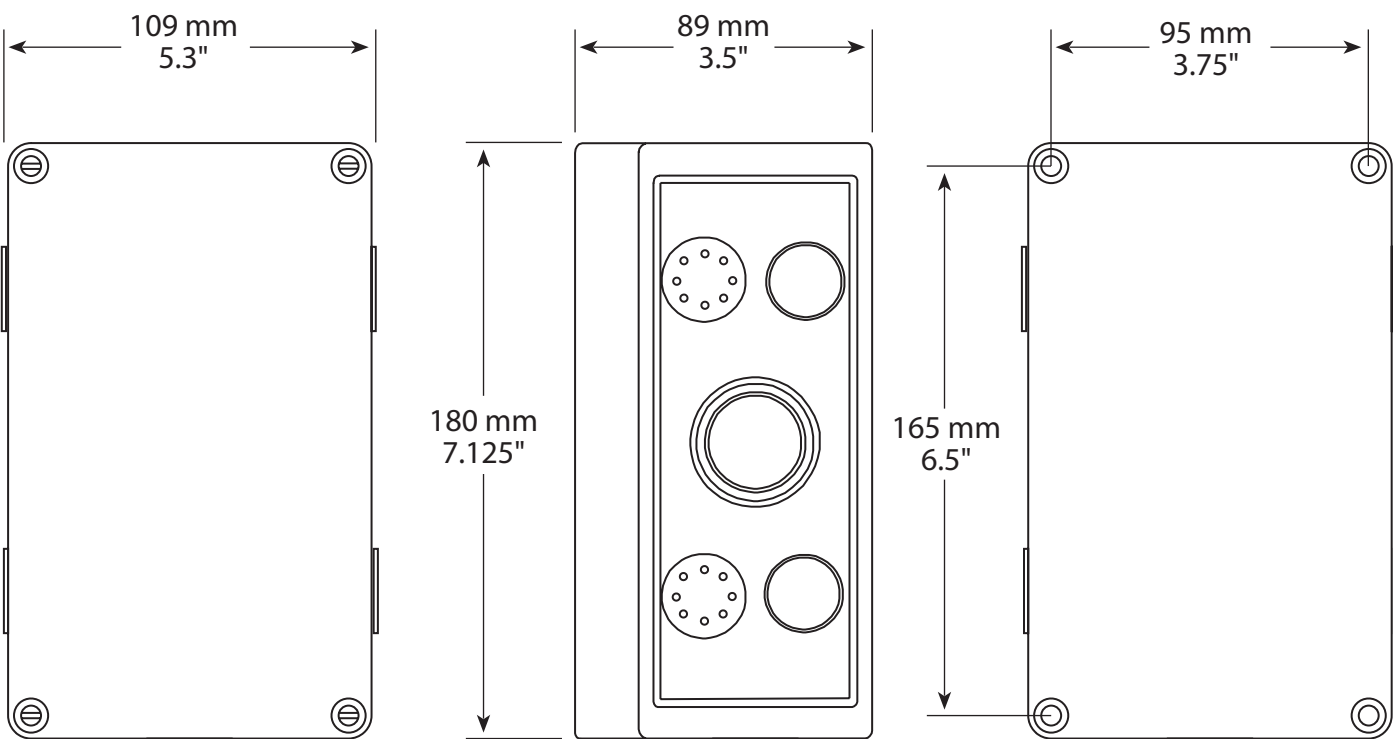Disconnect the tubing and replace the cap on the sensor chamber as calibration is complete.

DIMENSIONS

109 mm 5.3"	89 mm 3.5"	95 mm 3.75"
	180 mm 7.125"	165 mm 6.5"

SPECIFICATIONS

Gas Type Detected ....Carbon dioxide (CO_2)
Sensor Type ....Dual Channel Non-Dispersive Infrared(NDIR),
diffusion sampling
Sensor Accuracy..±75 PPM or 10% of reading (whichever is greater)
Measurement Range...0 - 2000 ppm standard, programmable span from
2000 to 20,000 ppm
Temperature Dependency....................................0.2% FS per °C
Pressure Dependency...0.13% of reading per mm Hg
Altitude Correction ....Programmable from 0-5000 ft via keypad
Stability ....< 5 % FS over life of sensor
Response Time ....<30 minutes for 90% step change typical
Warm-Up Time...<2 minutes
Sensor Coverage Area...100 m^2(1000 ft^2) typical
Sensor Life Span..15 years typical
Transmitter Accuracy ....±0.25% of span
(including linearity, hysteresis and repeatability)

OPTIONAL TEMPERATURE SENSOR (400 SERIES UNHEATED ENCLOSURE ONLY)
Sensing Element..Various RTD's or thermistors as a 2-wire resistance output

OPTIONAL RELAY OUTPUT
Contact Ratings...Form A contact (N.O.), 2 Amps @ 140 Vac, 2 Amps @ 30 Vdc
Relay Trip Point...Programmable 500-15,000 ppm
Relay Hysteresis..Programmable 25-500 ppm

CONCEALED LCD DISPLAY
Resolution ....1 ppm CO2
Size..1.4" w x 0.6" h (35 mm x 15 mm)
Alpha-numeric 2 line x 8 character

GENERAL
Power Supply ....20-28 Vac/dc (non-isolated half-wave rectified)
Protection Circuitry..Reverse voltage and transient protected
Input Voltage Effect...Negligible over specified operating range
Output Signal Type ....4-20 mA active (sourcing),
0-5 Vdc or 0-10 Vdc (field selectable)
Current Consumption...**Heated:** 1.0 A max @ 24 Vdc
     1.1 A max @ 24 Vac
Unheated: 100 mA max @ 24 Vdc
     185 mA max @ 24 Vac
Output Drive @ 24 Vdc ....**Current:** 550Ω max
Voltage: 10,000Ω min
Output Resolution ....10 bit PWM
Protection Circuitry..Reverse voltage protected & overvoltage protected
Ambient Operating Range....................................**Heated:** -40 to 50°C (-40 to 122°F)
Unheated: 0 to 50°C (32 to 122°F)
     0-95% RH non-condensing
Enclosure ....IP65 (NEMA 4X)
84mm W x 119mm H x 29mm D (3.3" x 4.7" x 1.15")
Wiring ....Screw terminal block (14 - 22 AWG)
Approvals ....CE
Country of Origin..Canada

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