

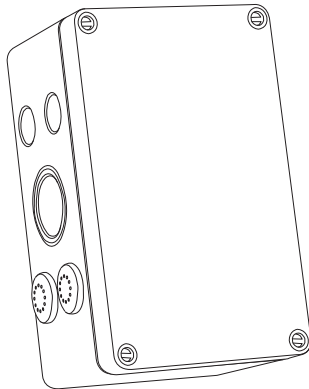


Introduction

The CO2 transmitter uses Infrared Technology to monitor CO2 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 CO2 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, as listed on page 6. 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 CO2 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.**

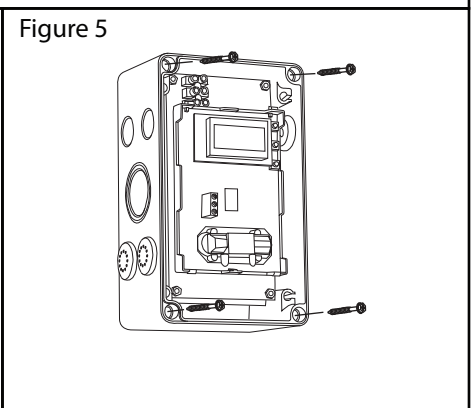
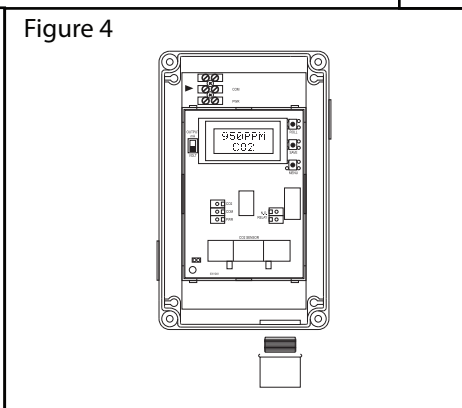
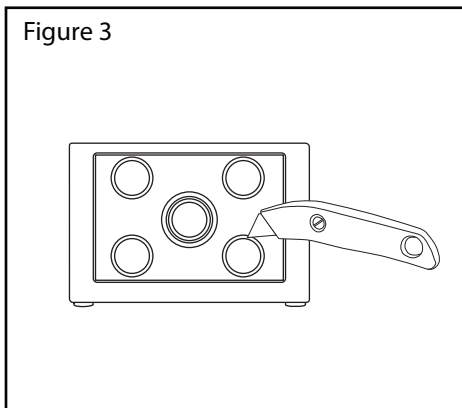
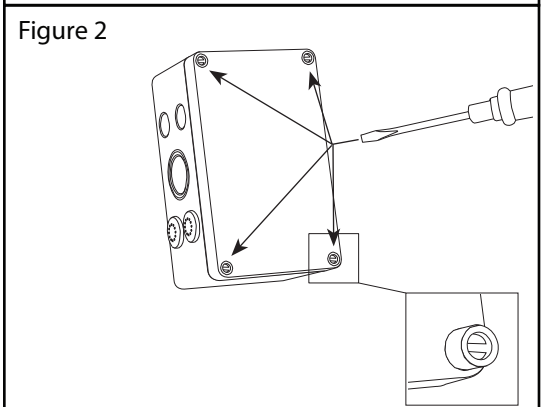
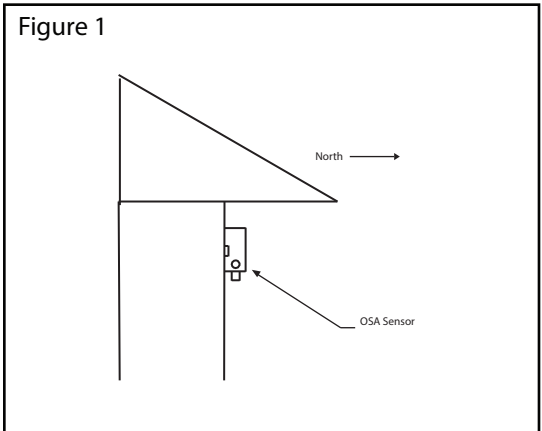
Remove the cover by using a standard or flat screwdriver to loosen the four screws as shown in Figure 2. As the screws are captive type, complete removal of the screw from the cover is not required.

On the bottom of the enclosure, remove one of the five available knockouts by using a utility knife which allows for control wire access as shown in Figure 3. It is recommended that weatherproof conduit or cable gland fittings be used. See Figure 4.

The outside mount CO2 sensor installs directly on an exterior wall using the four integrated mounting holes 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). Mount the base by screwing directly to the wall.

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.



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 diagram below.**

• Select 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 CO2 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

Use this terminal on CDD4A300 (Heated device).

Use this terminal on CDD4A400 (Unheated device).

Temperature Sensor Probe (Only present if Temperature Sensor option is ordered)

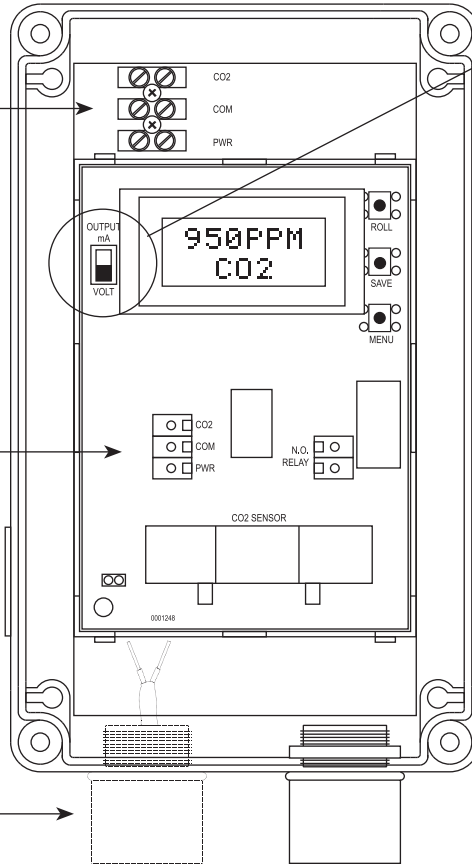


Figure 6

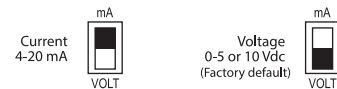
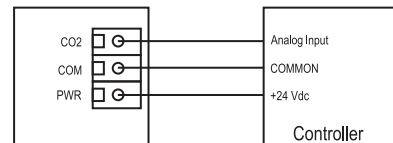


Figure 7

Typical wiring for 24 Vdc power from controller



Typical wiring for external 24 Vac power transformer

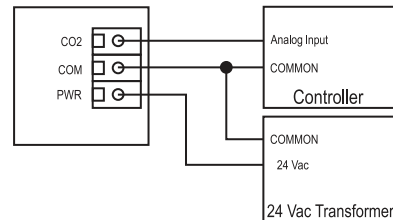


Figure 8

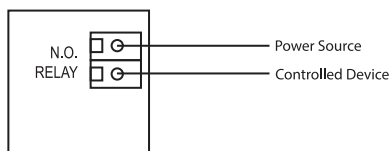
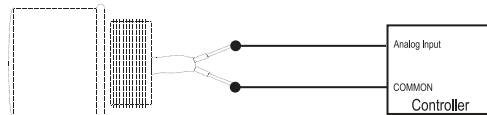


Figure 9



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 CO2 measurement range and then the sensor will begin reading the CO2 level, output the correct analog signal and display the value on the LCD.

Output

The CO2 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 or 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 CO2 terminal and is connected to the BAS analog input which reads the signal and calculates the CO2 ppm value using correct scaling for the range and signal type. The CO2 value is used to control output ventilation devices or initiate alarms. The CO2 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.

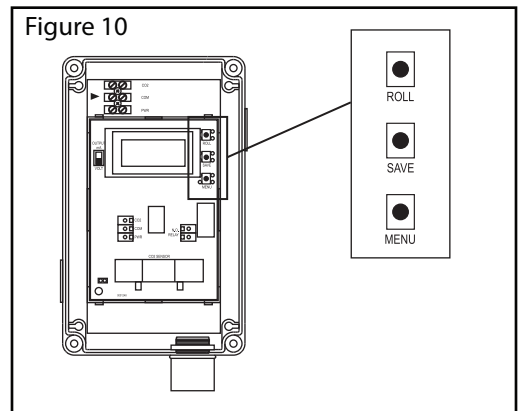
If a temperature sensor is installed, it will be wired to an analog input of the BAS that is set for the specific resistance type. This could be a 10 KΩ thermistor, a 1000 Ω RTD or other sensor values. The BAS reads the resistance signal and converts it to a temperature value.

NOTE: The outside enclosure slows the sensor response time to approximately 30 minutes for a 90% step change of CO2 concentrations.

Setup Menu

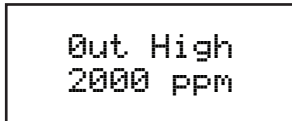
The menu has several items shown below. Some items change depending on the hardware configuration and the CO2 sensor. To enter the menu, press and release the <MENU> key while in normal operation. This will enter SETUP menu step 1, pressing the <MENU> key again advances to step 2. Each press of <MENU> 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.

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



If the 2000 ppm CO2 sensor is installed (CDD4A)

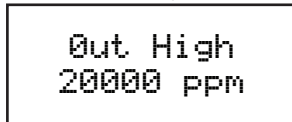
1. Output High



The factory default CO2 range is 0-2000 ppm. The span can be changed from 1000 to 7500 ppm in increments of 500. Use the <ROLL> key to change the value and <SAVE> to save.

If the 20,000 ppm CO2 sensor is installed (CDD4B)

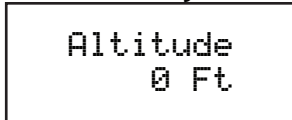
1. Output High



The factory default CO2 range is 0-20,000 ppm. The span can be changed from 2000 to 20,000 ppm in increments of 500. Use the <ROLL> key to change the value and <SAVE> to save.

Press <MENU> to advance.

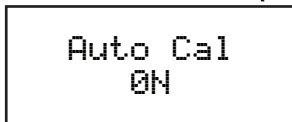
2. Altitude Adjustment



The default is 0 feet. Change by using the <ROLL> key from 0 to 5000 feet in 500 ft increments. Change for CO2 local altitude correction and press <SAVE> to save a change.

Press <MENU> to advance.

3. Auto Calibration (ACLP) This item omitted on the 20,000 ppm (CDD4B) device



Automatic Cal Mode default is ON to correct CO2 sensor drift to better than ± 10 ppm per year. Change ON with the <ROLL> key and save using <SAVE>. ON is recommended for applications where the CO2 level will be close to normal (400 ppm) at least once per day. If a building is occupied 24 hours and the CO2 level is fairly constant then this should be set to OFF. See ACLP Software section on page 4.

Press <MENU> to advance.

Items 4, 5 and 6 are only available if Relay Option is installed, otherwise skip directly to step 7.

4. Relay Setpoint

```
Relay SP
1000 PPM
```

The relay trip setpoint default is 1000 ppm. It can be changed from 500 to 5000 in 100 ppm increments for the 2000 ppm CO2 sensor or 500 to 15,000 ppm for the 20,000 ppm CO2 sensor. Save changes by using the <SAVE> key.

Press <MENU> to advance.

5. Relay Hysteresis

```
Relay Hy
50 PPM
```

The relay hysteresis default is 50 ppm. This can be changed from 25 to 200 in 25 ppm increments for the 2000 ppm CO2 sensor or 25 to 500 for the 20,000 ppm CO2 sensor. Use <SAVE> to save any change.

Press <MENU> to advance.

6. 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.

Press <MENU> to advance.

7. 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.

Press <MENU> to advance.

8. 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.

Press <MENU> to advance.

9. Calibration - This item omitted on the 0-2000 ppm CO2 sensor (CDD4A)

```
Calibrat
0 PPM
```

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

Press <MENU> to advance.

10. Calibration

```
Calibrat
1000 PPM
```

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

Press <MENU> to advance.

11. Calibration - This item omitted on the 0-2000 ppm CO2 sensor (CDD4A)

```
Calibrat
20000 PPM
```

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

Press <MENU> to advance.

13. Restore Defaults

Restore
Defaults

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

14. Menu Exit

Menu
Exit

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

Calibration

Calibration with gas requires a field calibration kit with pressure regulator, necessary tubing and appropriate bottles of CO₂ gas. Note that the procedure depends on the device model. The CDD4A requires only a single point.

CDD4A Model

1000 ppm calibration to meet specified accuracy due to the Automatic Calibration mode and other technology incorporated into the device.

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.

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.

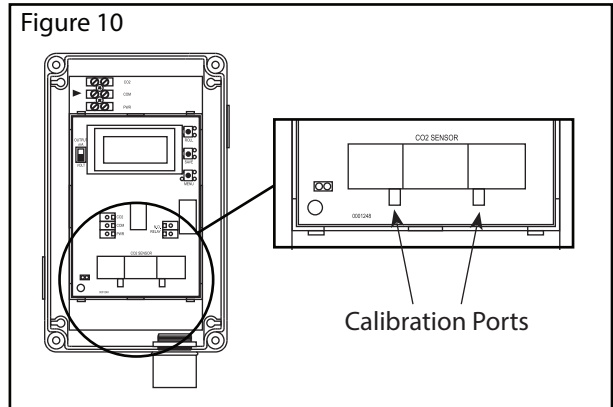
20,000 PPM Calibration

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.



ACLP Software

ACLP (Automatic Calibration Logic Program) software utilizes the computing power in the sensor's on-board microprocessor to remember the lowest CO2 concentration that takes place every 24 hours. The sensor assumes this low point is at outside levels. The sensor is also smart enough to discount periodic elevated readings that might occur if for example a space was used 24 hours per day over a few days. Once the sensor has collected 14 days worth of low concentration points, it performs a statistical analysis to see if there has been any small changes in the sensor reading over background levels that could be attributable to sensor drift. If the analysis concludes there is drift, a small correction factor is made to the sensor calibration to adjust for this change.

Specifications:

Range:.....	CDD4A: 0 - 2000 ppm CDD4B: 0 - 20,000 ppm standard, programmable span from 2000 to 20,000 ppm	Output Drive Capability:.....	Current: 550 ohms max Voltage: 10 Kohm min
Accuracy:.....	CDD4A: ±30 PPM + 3% of reading with Auto Cal on. CDD4B: ±75 PPM or 10% of reading (whichever is greater)	Output Resolution:.....	10 bit PWM
Sensor:.....	CDD4A: Non-Dispersive Infrared (NDIR), diffusion sampling CDD4B: Dual Channel Non-Dispersive Infrared (NDIR), diffusion sampling	Protection Circuitry:.....	Reverse voltage & over-voltage protected
Sensor Coverage Area:.....	100 m ² (1000 ft ²) typical	Operation Conditions:.....	Heated: -40° - 50°C (-40°-122°F) Unheated: 0° - 50°C (32°-122°F) 0-95% RH non-condensing
Temp. Dependence:.....	0.2% FS per °C	Wiring Connections:.....	Screw terminal block (14 to 22 AWG)
Stability:.....	CDD4A: < 2 % FS over life of sensor CDD4B: < 5 % FS over life of sensor	External Dimensions:.....	84mm W x 119mm H x 29mm D (3.3"x4.7"x 1.15")
Sensor Life Span:.....	15 years typical	Enclosure Ratings:.....	IP65 (NEMA 4X)
Press. Dependence:.....	0.13% of reading per mm Hg	Optional Temperature Signal:	Sensing Element:..... Various RTD's or thermistors as a 2-wire resistance output
Altitude Correction:.....	Programmable from 0-5000 ft via keypad	Optional Relay Output:	Contact Ratings:..... Form A contact (N.O.), 2 Amps @ 140 Vac, 2 Amps @ 30 Vdc
Response Time:.....	<2 minutes for 90% step change typical	Relay Trip Point:.....	CDD4A: Programmable 500-2000 ppm CDD4B: Programmable 500-15,000 ppm
Warm-up Time:.....	<2 minutes	Relay Hysteresis:.....	CDD4A: Programmable 25-200 ppm CDD4B: Programmable 25-500 ppm
Power Supply:.....	20-28 Vac/dc (non-isolated half-wave rectified)	Concealed LCD Display (Used for setting parameters):	Resolution:..... 1 ppm CO2
Output Signals:.....	4-20 mA active (sourcing), 0-5 Vdc or 0-10 Vdc (field selectable)	Size:.....	1.4" w x 0.6" h (35 mm x 15 mm) Alpha-numeric 2 line x 8 character
Consumption:.....	Heated: 1.0 A max @ 24 Vac 1.1 A max @ 24 Vdc Unheated: 100 mA max @ 24 Vdc 185 mA max @ 24 Vac		

Dimensions:

