CD-Pxx-00-0 Series Duct Mount CO_2 Transmitter

Johnson Controls offers a full line of Carbon Dioxide (CO_2) transmitters for measuring and transmitting CO_2 levels, ranging from 0 to 2,000 parts per million (ppm), within Heating, Ventilating, and Air Conditioning (HVAC) applications. Specific HVAC CO_2 applications include: Demand Control Ventilation (DCV), fresh air and Indoor Air Quality (IAQ), and rooftop air handling Economizer controls systems.

These compact, duct-mounted devices output 0 to 10V, 0 to 20 mA, or 4 to 20 mA signals and feature a relay output as an optional feature. They are designed to work:

- *in standalone mode*
- *connected to Metasys® system or the AD-DME series controllers*
- *as part of any integrated Building Automation System (BAS)*

The new CO_2 transmitters are easy to install, offer a full three year warranty, and require no maintenance or field calibration.

Figure 1: Duct Mount Transmitter with Conduit Adaptor and Mounting Flange

Features and Benefits

❑ **Energy Savings from DCV Strategies**	Offers potential for 10 to 70% energy savings
❑ **CARBOCAP® Single-beam, Dual-wavelength Design**	Provides superior performance compared to other technologies
❑ **CARBOCAP Silicon, Micro-machined Construction**	Provides reliable CO_2 measurement in duct environments
❑ **Calibration Reliability**	Offers five years of reliable calibration
❑ **Adjustable Duct Probe Depth**	Permits optimal placement of sensing tip in a duct
❑ **Extended (Optional) Features**	Offers relay output for fan control

Product Overview

This transmitter uses a completely new CO_2 sensing technology. The silicon-based CARBOCAP sensor provides stability and reliability.

The CARBOCAP sensor operates in accordance with the single-beam, dual-wavelength method. This patented sensor has unique reference measurement capabilities, offering excellent stability over both time and temperature. The monolithic Fabry-Perot Interferometer (FPI) chip utilizes the optical, mechanical, and electronic properties of silicon at the same time.

The transmitter is factory set to measure CO_2 levels up to 2,000 (ppm). It requires a Class 2, 24 VDC/VAC power source and generates an output signal proportional to the CO_2 level detected. The duct-mounted CO_2 transmitter series offers:

- standard CO_2 transmitter
- transmitter with relay output

IMPORTANT:	The CD-Pxx-00-0 transmitters are intended to provide input to equipment under normal operating conditions. Where failure or malfunction of the device could lead to an abnormal operating condition that could cause personal injury or damage to the equipment or other property, other devices (limit or safety controls), or systems (alarm or supervisory) intended to warn of, or protect against, failure or malfunction of the device must be incorporated into and maintained as part of the control system.

Calibration

Johnson Controls CO_2 transmitters are calibrated using certified gases for the following:

- output signal (0 to 10V) proportional to CO_2 concentration (0 to 2,000 ppm)
- altitude range of 0 to 1,969 ft (0 to 600m) above sea level without compensation
- relay output trigger point set for 1,000 ppm (in models featuring the optional relay output)

CARBOCAP Technology

Johnson Controls is licensed to integrate the new, silicon-based CARBOCAP CO_2 sensor into HVAC or Building Automation Systems. This sensor has several advantages: high accuracy, excellent stability, negligible temperature dependence, and ease of installation.

The structure of the diffusion-aspirated, single-beam dual-wavelength sensor is remarkably simple. It consists of an Infrared (IR) source, a sample cell, a tunable-interference filter, and an IR detector. The tunable-interference filter enables measurements at two wavelengths. As a result, references are measured accurately, without the typically broad tolerances inherent in dual-beam sensors.

Dust, water vapor, and most chemicals do not affect the measurement accuracy of the sensor. No special software compensation patches are required.

Packaging Innovation

Johnson Controls offers the industry's first duct-mount package that is Underwriters Laboratories, Inc.® (UL) Listed and requires no separate hardware. This product includes a strain relief/conduit adapter for connecting to standard 1/2 in. fittings. The CARBOCAP sensor is not affected by typical airflow rates encountered in ducts or rooftop air handlers.

The compact design of the device requires only a small hole in the ventilation duct, which eliminates the problems associated with leaking gaskets. The enclosure reduces material and labor costs by offering an integrated product; no "pressurized" boxes, pitot pickups, or tubing and fittings are required.

Energy Efficiency

Using the CO_2 transmitter duct probe results in considerable savings in installation, operation, and maintenance costs with no recalibration expenses.

Johnson Controls CO_2 transmitters, when used with BAS/Economizer controllers (featuring DCV strategies), can generate energy savings ranging up to:

- 20 to 40% in office buildings
- 20 to 60% in restaurants/light retail facilities
- 10 to 70% in educational/business settings

Dimensions

See Figure 2 and Figure 3 for CO_2 transmitter and mounting flange dimensions.

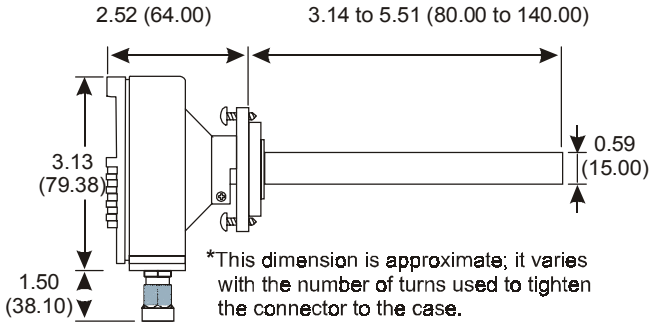

Figure 2: Transmitter Dimensions, in. (mm)

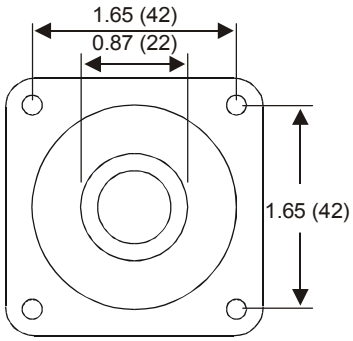

Figure 3: Mounting Flange Dimensions, in. (mm)

Optional Feature

Relay Module

For applications where On/Off ventilation or fan control is required to provide fresh air, order the CD-PR0-00-0 transmitter. This model includes a relay output module that plugs into the main Printed Circuit Board (PCB) offering a 30V, 0.5A Class 2 output with configurable On and Off trip points. Default On is 1,000 ppm, and default Off is 950 ppm.

Note: To redefine the relay On and Off trip points to suit the application, use the ACC-CD-S Relay Setpoint Software.

Repair and Replacement

The device is not field repairable.

Altitude Compensation

These devices are intended for an altitude range of 0 to 1,969 ft (0 to 600m) without compensation. To compensate for higher altitudes, refer to the installation instructions for this device.

Ordering Information

Contact the nearest Johnson Controls representative to order a CO_2 transmitter, and specify the desired product code number from Table 1. Refer to Table 2 for replacement parts and Table 3 for accessories available for the duct-mount CO_2 transmitter.

Table 1: CO_2 Transmitters

Product Code Number	Description
CD-P00-00-0	Duct Mount CO_2 Transmitter
CD-PR0-00-0	Duct Mount CO_2 Transmitter with Relay

Table 2: Replacement Parts for Duct Mount CO_2 Transmitters

Product Code Number	Description
ACC-CD-R	Relay Output Module for use in CD-P00-00-0 or CD-PR0-00-0
ACC-CD-CFK1	Conduit Adaptor Kit

Table 3: Accessories for Duct Mount CO_2 Transmitters

Product Code Number	Description
ACC-CD-S	Relay Setpoint Software Kit; includes software and interface cable to reset the On and Off relay setpoints for CD-PR0-00-0
Y65T31-0	Multiple Primary Transformer, 40 VA, 120/208/230V Primary, 24V Class 2 Secondary with Screw Terminals: Foot Mounting or 4 x 4 in. (101.6 x 101.6 mm) Plate

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Specifications

Product	CD-Pxx-00-0 Series Duct Mount CO_2 Transmitter
Measuring Range	0 to 2,000 ppm CO_2
Accuracy at 77°F (25°C)	<± (30 ppm CO_2 + 2.0% of reading) (includes manufacturing deviation and drift). All accuracy specifications reflect testing the transmitters using high-grade, certified gases. Transmitters are intended for an altitude range of 0 to 1,969 ft (0 to 600m) above sea level without compensation. To compensate for higher altitudes, see the Johnson Controls installation instructions for this device.
Non-Linearity	<0.5% of Full Scale
Temperature Dependence of Output	<0.056% of Full Scale/F° (<0.1% of Full Scale/C°)
Long-Term Stability	<±5.0% of Full Scale/5 Years
Response Time (0 to 63%)	1 Minute
Operating Temperature Range	23 to 113°F (-5 to 45°C)
Storage Temperature Range	-4 to 158°F (-20 to 70°C)
Humidity Range	0 to 85% RH (non-condensing)
Transmitter Output Signals	
CO_2	Jumper Selectable: 0 to 20 mA or 4 to 20 mA or 0 to 10 VDC (Default) Maximum Output Current: 25 mA; Maximum Output Voltage: 12.5V
Relay Output (Optional)	Maximum 30V, 0.5A, Class 2
Recommended External Load	Current Output: Maximum 500 ohms Load Resistance Voltage Output: Minimum 1,000 ohms Load Resistance
Power Supply Range	20 to 30 VAC (18 to 30 VDC), Class 2
Power Consumption	<2.5W Average, 4.1 VA
Warmup Time	<5 Minutes
Air Flow Range	0 to 7,500 ft/minute (0 to 2,286 m/minute)
Duct Probe Material	Duct probe meets plenum rating requirements of UL 1995, Heating and Cooling Equipment.
Housing Material	ABS Plastic
Dimensions (H x W x D)	3-1/8 x 3-3/16 x 8 in. (80 x 81 x 204 mm)
Shipping Weight	0.3 lb (140g)
Agency Listings	UL Listed, CCN XAPX (US) and XAPX7 (Canada); EMC Directive (CE Mark), 89/336/EEC; FCC and DOC Compliant

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products

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CD-Wxx-00-0 Series Wall Mount CO_2 Transmitter

Johnson Controls offers a full line of Carbon Dioxide (CO_2) transmitters for measuring and transmitting CO_2 levels, ranging from 0 to 2,000 parts per million (ppm), within Heating, Ventilating, and Air Conditioning (HVAC) CO_2 applications. Specific HVAC CO_2 applications include: Demand Control Ventilation (DCV), fresh air and Indoor Air Quality (IAQ), and rooftop air handling Economizer controls systems.

These compact, wall-mounted devices output 0 to 10V (default), 0 to 20 mA, or 4 to 20 mA signals and feature analog temperature outputs, relay outputs, and/or a digital display as (optional) features. They are designed to work:

- *in standalone mode*
- *connected to Metasys® system or the AD-DME series controllers*
- *as part of any integrated Building Automation System (BAS)*

These new CO_2 transmitters are easy to install, offer a full three year warranty, and require no maintenance or field calibration.

Figure 1: Wall Mount CO_2 Transmitter with Display

Features and Benefits	
❑ **Energy Savings from DCV Strategies**	Offers potential for 10 to 70% energy savings
❑ **CARBOCAP® Single-beam, Dual-wavelength Design**	Provides superior performance compared to other technologies
❑ **CARBOCAP Silicon, Micro-machined Construction**	Provides reliable CO_2 measurement in room environments
❑ **Calibration Reliability**	Offers five years of reliable calibration
❑ **Stable Infrared Reference**	Compensates for light-source drift

Product Overview

This transmitter uses a completely new CO_2 sensing technology. The silicon-based CARBOCAP sensor provides stability and reliability.

The CARBOCAP sensor operates in accordance with the single-beam, dual-wavelength method. This patented sensor has unique reference measurement capabilities, offering excellent stability over both time and temperature. The monolithic Fabry-Perot Interferometer (FPI) chip utilizes the optical, mechanical, and electronic properties of silicon at the same time.

The transmitter is factory set to measure CO_2 levels up to 2,000 ppm. It requires a Class 2, 24 VDC/VAC power source and generates an output signal proportional to the CO_2 level detected. One simple wire to a screw terminal and a jumper on the Printed Circuit Board (PCB) combine to select the analog output signal from the following options:

- 0 to 20 mA
- 4 to 20 mA
- 0 to 10V (default)

IMPORTANT:	The CD-Wxx-00-0 transmitters are intended to provide input to equipment under normal operating conditions. Where failure or malfunction of the device could lead to an abnormal operating condition that could cause personal injury or damage to the equipment or other property, other devices, (limit or safety controls) or systems (alarm or supervisory) intended to warn of, or protect against, failure or malfunction of the device must be incorporated into and maintained as part of the control system.

Calibration

Johnson Controls CO_2 transmitters are calibrated using certified gases for the following:

- output signal (0 to 10V) proportional to CO_2 concentration (0 to 2,000 ppm)
- altitude range of 0 to 1,969 ft (0 to 600m) above sea level without compensation
- relay output trigger point set at 1,000 ppm (in models featuring the optional relay output)

CARBOCAP Technology

Johnson Controls is licensed to integrate the new silicon-based CARBOCAP sensor into HVAC or Building Automation Systems. Integrating this sensor delivers several advantages: high accuracy, excellent stability, negligible temperature dependence, and ease of installation.

The structure of the diffusion-aspirated, single-beam, dual-wavelength sensor is remarkably simple. It consists of an Infrared (IR) source, a sample cell, a tunable-interference filter, and an IR detector. The tunable-interference filter enables measurements at two wavelengths. As a result, references are measured accurately, without the typically broad tolerances inherent in dual-beam sensors.

Dust, water vapor, and most chemicals do not affect the measurement accuracy of the sensor. No special software compensation patches are required, and the device requires no maintenance.

Versatile Transmitter

Designed for use with a standard U.S. wallbox or mounting directly to a wallboard surface, the CO_2 transmitter generates considerable savings in installation, operation, and maintenance with no recalibration costs. Johnson Controls includes a Drywall Spring-clip Mounting Kit with each unit.

Johnson Controls CO_2 transmitters, when used with BAS/Economizer controllers (featuring DCV strategies), can generate energy savings ranging up to:

- 20 to 40% in office buildings
- 20 to 60% in restaurants/light retail facilities
- 10 to 70% in educational/business settings

Dimensions

See Figure 2 and Figure 3 for wall mount CO_2 transmitter dimensions.

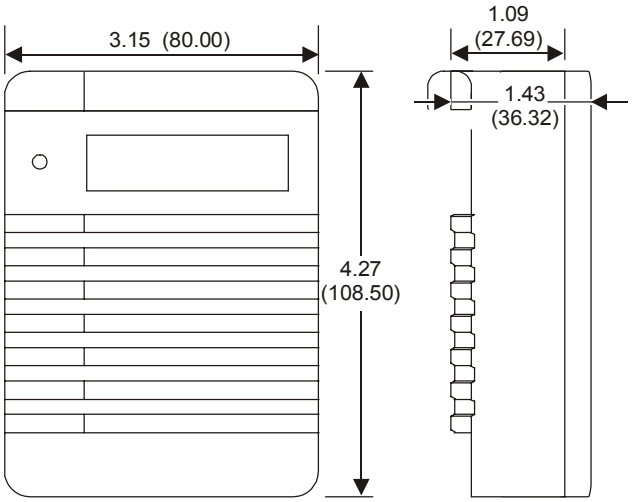

Figure 2: Cover Dimensions, in. (mm)

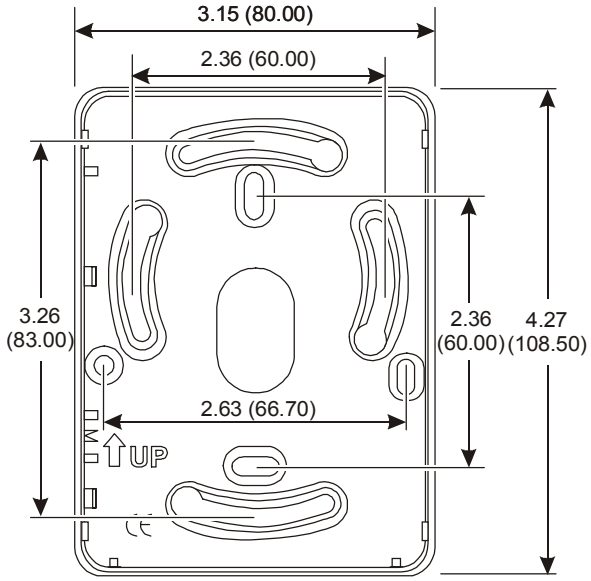

Figure 3: Wall Mount Base Dimensions, in. (mm)

Optional Features

Analog Temperature Module

For applications requiring measurements and outputs for both CO_2 and temperature, order the CD-WA0-00-0 transmitter. This model includes an analog temperature module that plugs into the main PCB and has an active temperature output, linear from 0 to 10 VDC for 32 to 122°F (0 to 50°C).

Relay Module

Order the CD-WR0-00-0 transmitter for applications where On/Off ventilation or fan control is required to provide fresh air. This model includes a relay output module that plugs into the main PCB offering a 30V, 0.5A Class 2 output with configurable On and Off trip points. Default On is 1,000 ppm, and default Off is 950 ppm.

Note: To redefine the relay On and Off trip points to suit the application, use the ACC-CD-S Relay Setpoint Software.

Relay and Display Module

For applications where the display of the measured CO_2 level and a relay output and relay On notification are required, order the CD-WRD-00-0. This module contains a relay and a digital display. The unit plugs into the transmitter PCB. The display includes a 4-digit display and a Light-Emitting Diode, which indicates when the relay is On.

Note: To redefine the relay On and Off trip points to suit the application, use the ACC-CD-S Relay Setpoint Software.

Repair and Replacement

The CD-Wxx-00-0 Series is not field repairable.

To order a replacement, refer to the *Ordering Information* section.

Altitude Compensation

These devices are intended for an altitude range of 0 to 1,969 ft (0 to 600m) without compensation. To compensate for higher altitudes, see the Johnson Controls installation instructions for this device.

Ordering Information

Contact the nearest Johnson Controls representative to order a CO_2 transmitter, and specify the desired product code number from Table 1. Refer to Table 2 for replacement parts and Table 3 for accessories for the wall mount CO_2 transmitter.

Table 1: CO2 Wall Mount Transmitters

Product Code Number	Description
CD-WA0-00-0	Transmitter with Analog Temperature Output
CD-WR0-00-0	Transmitter with Relay
CD-WRD-00-0	Transmitter with Relay and Display

Table 2: Replacement Parts for Wall Mount CO_2 Transmitters

Product Code Number	Description
ACC-CD-A	Analog Temperature Module for CD-WA0-00-0 Only
ACC-DWCLIP-0	Drywall Spring-clip Mounting Kit
ACC-CD-DR	Replacement Relay and Display Module for CD-WRD-00-0 Only
ACC-CD-R	Relay Output Module for CD-WR0-00-0

Table 3: Accessory for Wall Mount CO_2 Transmitters

Product Code Number	Description
ACC-CD-S	Relay Setpoint Software Kit; includes software and interface cable to reset the On and Off relay setpoints for CD-WR0-00-0 or CD-WRD-00-0
Y65T31-0	Multiple Primary Transformer, 40 VA, 120/208/230V Primary, 24V Class 2 Secondary with Screw Terminals: Foot Mounting or 4 x4 in. (101.6 x 101.6 mm) Plate

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Specifications

Product	CD-Wxx-00-0 Series Wall Mount CO_2 Transmitter
Measuring Range	0 to 2,000 ppm CO_2
Accuracy at 68°F (20°C)	<±[30 ppm CO_2 + 2.0% of reading] (includes manufacturing deviation and drift). All accuracy specifications reflect testing the transmitters using high-grade, certified gases. Transmitters are intended for an altitude range of 0 to 1,969 ft (0 to 600m) above sea level without compensation. To compensate for higher altitudes, see the Johnson Controls installation instructions for this device.
Non-Linearity	<1.0% of Full Scale (FS)
Temperature Dependence of Output	<0.056% of Full Scale/F° (<0.1% of Full Scale/C°)
Long-Term Stability	<±5.0% of Full Scale/5 Years
Response Time (0 to 63%)	1 Minute
Operating Temperature Range	23 to 113°F (-5 to 45°C)
Storage Temperature	-4 to 158°F (-20 to 70°C)
Humidity Range	0 to 85% RH (non-condensing)
Transmitter Output Signals	
CO_2	Jumper Selectable: 0 to 20 mA or 4 to 20 mA or 0 to 10 VDC (Default) Maximum Output Current: 25 mA; Maximum Output Voltage: 12.5V
Analog Temperature Module (Optional)	Linear 0 to 10 VDC for 32 to 122°F (0 to 50°C)
Relay Output (Optional)	Maximum 30V, 0.5A, Class 2
Resolution of CO_2 Output	10 ppm (CD-WRD-00-0 only)
Recommended External Load	Current Output: Maximum 500 ohms Load Resistance Voltage Output: Minimum 1,000 ohms Load Resistance
Power Supply Range	20 to 30 VAC (18 to 30 VDC), Class 2
Power Consumption	<2.5W Average, 4.1 VA
Warmup Time	<5 Minutes for CO_2 Measurement <30 Minutes for Temperature Measurement
Housing Material	ABS Plastic
Dimensions (H x W x D)	3-5/32 x 4-9/32 1-3/8 in. (80 x 108.5 x 35 mm)
Shipping Weight	3.5 oz (100g)
Agency Listings	UL Listed, CCN XAPX (US) and XAPX7 (Canada); EMC Directive (CE Mark), 89/336/EEC; FCC and DOC Compliant

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

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