# CD2 SERIES

Duct Mount All-in-One $CO_2$, RH, Temp, VOC and PM Sensing



CD2

CD2 Series Air Quality Sensors are duct mount all-in-one sensors for monitoring air quality. The device combines $CO_2$, temperature, humidity, VOC and particulate matter (PM) sensing into a single unit to ensure a building's optimum air quality and energy efficiency.

Each device is an active sensor that converts a measurement into one of the following output options:

- Analog output: 4-20 mA, 0 to 5 Vdc or 0 to 10 Vdc
- Protocol output: BACnet MS/TP, Modbus RTU

Different models are available based on application requirements for lower-cost installations.

CD2 is available with an LCD display option on selected models. See Ordering Information for details.

## BACnet & Modbus

Embedded BACnet and Modbus communication protocols for easy systems integration

## Self-calibrating

Innovative self-calibration algorithm…easy to maintain

## Dual-beam NDIR $CO_2$ sensor

Dual-beam, non-dispersive infrared technology (NDIR) repeatable to ±20 ppm ±1% of measured value… high accuracy measurement

## Easy to install

Latch-on sensor cover and screwless terminal block wiring with spring actuator

## Field selectable

Field-selectable outputs for operation flexibility

## Field replaceable

Replace RH element and temp transmitter in the field… maintain accuracy and minimize downtime and cost

### APPLICATIONS

- HVAC systems
- Indoor air quality monitoring
- Life sciences applications
- Key component for the LEED green building program and WELL Building Standard*

*Leadership in Energy and Environmental Design (LEED) is a registered trademark of the US Green Building Council. The WELL Building Standard is a trademark of the International WELL Building Institute in the United States and other countries..

## SPECIFICATIONS

### OPERATING & STORAGE ENVIRONMENT

| | |
|---|---|
| Operating Temp. Range | 0 to 50 °C (32 to 122 °F) |
| Operating Humidity Range | 0 to 95% RH (non-condensing) |
| Storage Temp. Range | -25 to 70 °C (-13 to 158 °F) |
| Storage Humidity Range | 0 to 95% RH (non-condensing) |
| Power Supply | 3-wire volt mode: 20 to 30 Vdc, 24 Vac, 50 to 60 Hz |
| Output | Analog: selectable 4 to 20 mA, 0 to 5 Vdc, 0 to 10 Vdc Protocol: BACnet MS/TP, Modbus RTU |
| Power Consumption | See Maximum Power Consumption table, next page |
| Tube Length | 200 mm |
| Medium | Neutral gas, air |
| Housing Material | Polycarbonate; flammability rating UL 94 V0 |
| Mounting Location | For indoor use only. Not suitable for wet locations. |
| IP Rating | IP 65 |
| Protection Class | Class III |

### CO2 SENSOR

| | |
|---|---|
| Sensor Type | Non-dispersive infrared (NDIR), diffusion sampling |
| Output Range | Analog models: 0 to 2000/5000 ppm (selectable) Protocol models: 0 to 10,000 ppm |
| Accuracy | ±30 ppm ±3% of measured value |
| Repeatability | ±20 ppm ±1% of measured value |
| Response Time | <60 seconds for 90% step change |
| Calibration | Field calibration support |

### VOC SENSOR OPTION

| Sensor Type | Solid state | |
|---|---|---|
| Output Range | 0 to 100% AQI for VOC | |
| Accuracy | ±15% sensor-to-sensor variation | |
| | **LEVEL** | **VENTILATION RECOMMENDATION** |
| AQI Table | >61% | Greatly increased |
| | 20 to 61% | Significantly increased |
| | 10 to 20% | Slightly increased |
| | 5 to 10% | Average |
| | 0 to 5% | Target value |

### RH SENSOR OPTION

| | |
|---|---|
| Sensor Type | Solid state capacitive, replaceable |
| Accuracy* | ±2% from 10 to 80% RH @ 25 °C (77 °F) ±1%, ±2% replaceable models |
| Hysteresis | 1.5% typical |
| Linearity | Included in accuracy specification |
| Stability | ±1% @ 20°C (68 °F) annually for 2 years |
| Output Range | 0 to 100% RH |
| Temperature Coefficient | ±0.1% RH/°C above or below 25 °C (77 °F) typical |

### TEMPERATURE SENSOR OPTION

| | |
|---|---|
| Sensor Type | Solid state, integrated circuit |
| Temp. Sensing Element** | See Ordering Information on page 2 for available temp. sensing elements |
| Time Constant | Air velocity 1.5 m/s. approx. 72 s; Air velocity 3.0 m/s. approx. 52 s |
| Accuracy*** | ±0.2 °C (±0.4 °F) typical at 25 °C |
| Resolution | 0.1 °C (0.1 °F) |
| Range | 0 to 50 °C (32 to 131 °F) |

## SPECIFICATIONS (CONT.)

### PM SENSOR OPTION

| | |
|---|---|
| Sensor Type | Laser-scatter |
| Particulate Size | PM1.0, PM2.5, PM4.0, PM10 |
| Resolution | $\pm 1 \ \mu g/m^3$ |
| Mass Concentration Range | $\pm 1 \ \mu g/m^3$ |
| Accuracy | PM1 and PM2.5: 0 to 100 $\mu g/m^3$ +/-[5$\mu g/m^3$+5% m.v.], 100 to 1000 ug/m$^3$ +/-[10% m.v.] PM4 and PM10:**** 0 to 100 $\mu g/m^3$ +/-[25$\mu g/m^3$], 100 to 1,000 $\mu g/m^3$ +/-[25% m.v.] (sensor-to-sensor deviation) |

### DISPLAY MODELS

| | |
|---|---|
| LCD Type | Positive display with backlight |
| Measurement Values Displayed | $CO_2$: ppm, Temp: °C or °F, Humidity: % RH, VOC: % AQI, PM: $\mu g/m^3$ |
| Display Resolution | $CO_2$: 1 ppm, Temp: 0.1 °C or °F, Humidity: 0.1% RH VOC: 1% AQI, PM: 1 $\mu g/m^3$ |

### WIRING TERMINALS

| | |
|---|---|
| Terminal Blocks | Screwless terminal block with spring actuator, 16-24 AWG |

### WARRANTY

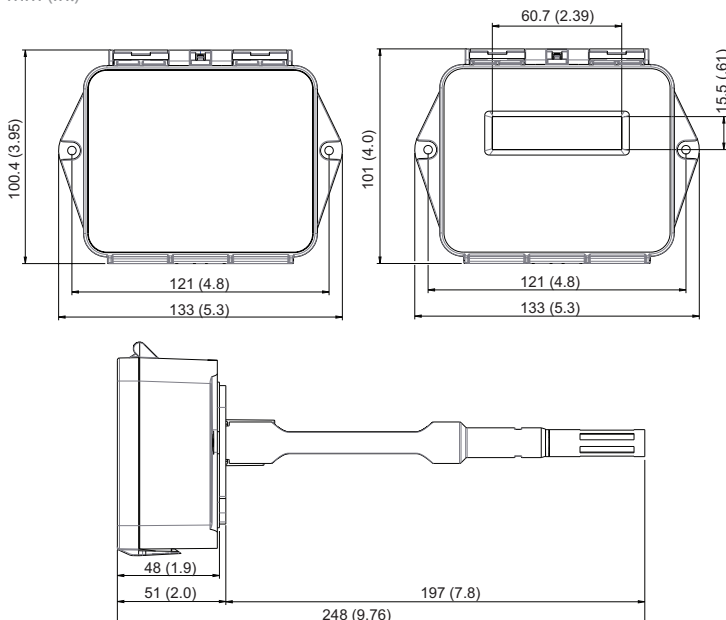| | |
|---|---|
| Limited Warranty | 5 years |

### COMPLIANCE INFORMATION

| | |
|---|---|
| Agency Approvals | UL 916 European Conformance CE: EN 60730-1, EN 61000-6-2, EN 61000-6-3, EN 61000 Series - Industrial Immunity, EN 61326-1 FCC Part 15 Class A, REACH, RoHS, RoHS 2 (China), RCM (Australia), ICES-003 (Canada), UKCA (UK) |

* Humidity sensor measurement uncertainty should include: accuracy, hysteresis, temperature coefficient and stability.
**See thermistor table Z202030 for accuracy.
***±0.5 °C over full operating range.
****PM4 and PM10 output values are calculated based on the distribution profile of all measured particles.

## DIMENSIONAL DRAWING
mm (in.)



## WIRING DIAGRAM

See installation guide for wiring information.

### MAXIMUM POWER CONSUMPTION

| SERIES | LCD | CO₂/VOC | PM | TEMP/RH | MAX. POWER |
|---|---|---|---|---|---|
| CD2 Analog | Yes | Yes | Yes | Yes | 9VA @ 24VAC |
| | Yes | Yes | No | Yes | 8VA @ 24VAC |
| | Yes | No | Yes | Yes | 7VA @ 24VAC |
| | No | Yes | No | Yes | 6VA @ 24VAC |
| | No | Yes | No | No | 4VA @ 24VAC |
| CD2 Protocol | Yes | Yes | Yes | Yes | 4VA @ 24VAC |
| | Yes | Yes | No | Yes | 3VA @ 24VAC |
| | No | Yes | Yes | Yes | 2VA @ 24VAC |
| | Yes | Yes | No | Yes | 1.5VA @ 24VAC |

### ORDERING INFORMATION

| MODEL | LCD | 2% RH SENSOR | TEMP. | NDIR CO2 | VOC | PM |
|---|---|---|---|---|---|---|
| **Analog Models** | | | | | | |
| CD2LAXAVP | X | | Temp Transmitter | X | X | X |
| CD2LAXAVX | X | | Temp Transmitter | X | X | |
| CD2LAXAXP | X | | Temp Transmitter | | | X |
| CD2XA2AVX | | X | Temp Transmitter | X | X | |
| CD2XA2BCX | | X | 100 PT RTD | X | | |
| CD2XA2CCX | | X | 1000 PT RTD | X | | |
| CD2XA2DCX | | X | 10K T2 | X | | |
| CD2XA2HCX | | X | 10K T3 | X | | |
| CD2XA2KCX | | X | 10K Curve G/11K | X | | |
| CD2XA2MCX | | X | 20K NTC | X | | |
| CD2XA2NCX | | X | 1.8K | X | | |
| CD2XAXAVX | | | Temp Transmitter | X | X | |
| CD2XAXBCX | | | 100 PT RTD | X | | |
| CD2XAXCCX | | | 1000 PT RTD | X | | |
| CD2XAXDCX | | | 10K T2 | X | | |
| CD2XAXHCX | | | 10K T3 | X | | |
| CD2XAXKCX | | | 10K Curve G/11K | X | | |
| CD2XAXMCX | | | 20K NTC | X | | |
| CD2XAXNCX | | | 1.8K | X | | |
| **Protocol Models** | | | | | | |
| CD2LP2AVP | X | X | Temp Transmitter | X | X | X |
| CD2LP2AVX | X | X | Temp Transmitter | X | X | |
| CD2LPXAVP | X | | Temp Transmitter | X | X | X |
| CD2LPXAVX | X | | Temp Transmitter | X | X | |
| CD2XP2AVP | | X | Temp Transmitter | X | X | X |
| CD2XP2AVX | | X | Temp Transmitter | X | X | |
| CD2XPXAVP | | | Temp Transmitter | X | X | X |
| CD2XPXAVX | | | Temp Transmitter | X | X | |

Note: Replaceable RH and temperature modules available to be ordered separately per table below.

### REPLACEABLE RH ELEMENTS & TEMPERATURE AND HUMIDITY CALIBRATION MODULES

| MODEL | DESCRIPTION | TEMP. CALIBRATION | RH CALIBRATION |
|---|---|---|---|
| HS1N | Replaceable RH sensor, 1% with NIST certificate | N/A | 2-point calibration |
| HS2N* | Replaceable RH sensor, 2% with NIST certificate | N/A | 2-point calibration |
| HS2X | Replaceable RH sensor, 2% | N/A | 2-point calibration |
| TS2** | Replaceable temperature module with 2-point calibration certificate | 2-point calibration | N/A |
| THS2** | Replaceable temperature and humidity module with 2-point calibration certificate | 2-point calibration | 2-point calibration |

*Not for use with HO2 Series outdoor humidity sensors.  **For use on temp transmitter models only.

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