

SDC-C1 Duct CO2-transmitter

Features

- CO2 measurement for air ducts
- Minimum and maximum value memory
- 0...10V, 0...20mA or 2...10V, 4...20mA measuring signals selectable with jumpers
- Optional alternative signal ranges programmable
- May be used as simple P-controller
- Selectable averaging signal
- Optional internal or external display (OPC-S or OPA-S)
- Status LED

Applications

- Demand based ventilation for homes and offices based on measurement of the CO2 concentration
- Preset standard measuring range 0...2000 ppm, max possible range 0...5000 ppm
- Recording of minimum and maximum limits for critical environments
- Direct control of extraction fan



CO2 transmitter

The CO2 concentration is measured through non-dispersive infrared (NDIR) waveguide technology with ABC automatic background calibration algorithm. The applied measuring technology guarantees excellent reliability and long-term stability. The microprocessor samples the CO2 once per second. It calculates an averaging signal over a preset number of samples and generates the output signal.

The output signal range and type may be customized by jumpers and if required by a programming module. Standard signal ranges are 0-10 VDC, 2-10 VDC, 4-20 mA and 0-20 mA. Other ranges can be defined by using the external display and programming module (OPA-S).



For OPA-S, OPC-S usage see section "Parameter configuration" on page 6.

Automatic baseline calibration (ABC)

The ABC background calibration constantly supervises the measured CO2 concentrations. The calibration function expects the CO2 values sink to 400 ppm when the room is not occupied. Over a period of several days the controller tries to reach this value step by step through recalibration of 30ppm per day max. In order to reach the given accuracy, it is required that the sensor is for at least 3 weeks in operation.



NOTE: The ABC calibration works only in those applications where the CO2 concentration sinks regularly to fresh air levels of 400 ppm. For special applications such as green houses, animal farms, etc. the ABC calibration should be de-activated and the sensor should be manually calibrated. The automatic calibration can deactivate through the external operation terminal. See chapter parameter configuration for details. The Sensor can be calibrated by the client and does not need to be sent in for calibration. For manual calibration see section "**Fehler! Verweisquelle konnte nicht gefunden werden.**" on page **Fehler! Textmarke nicht definiert..**

Minimum and maximum values

Using a display & programming module OPA-S or the optional built-in display and operation terminal OPC-S, the user has the option to read out and reset minimum and maximum CO2 values. The minimum and maximum values may as well be used as output signals. The minimum and maximum values are automatically saved to the device and are available after a power interruption.



For OPA-S, OPC-S usage see section "Displaying minimum and maximum values" on page 5.

Safety



DANGER! Safety advice

This device is for use as a CO2 concentration indicator and CO2 transmitter for comfort applications. It is not a safety device. Where a device failure could endanger human life and property, it is the responsibility of the client, installer and system designer to add additional safety devices to prevent such a device failure. Ignoring specifications and local regulations may cause equipment damage and endangers life and property. Tampering with the device and misapplication will void warranty.

Types and Ordering

Product Name	Product Nr.	Description/Option
CO2 Sensor		
SDC-C1-16-1	40-300152	CO2 transmitter for air ducts, 160 mm probe, incl. cable gland AMC-1
Accessories		
OPC-S	40-500029	Built-in display and operation terminal.
OPA-S	40-500006	External display and operation terminal. Note: For the correct display of values, V1.7 and later is required.
AMC-2	40-500074	Conduit connector: NPT thread

Technical Specifications

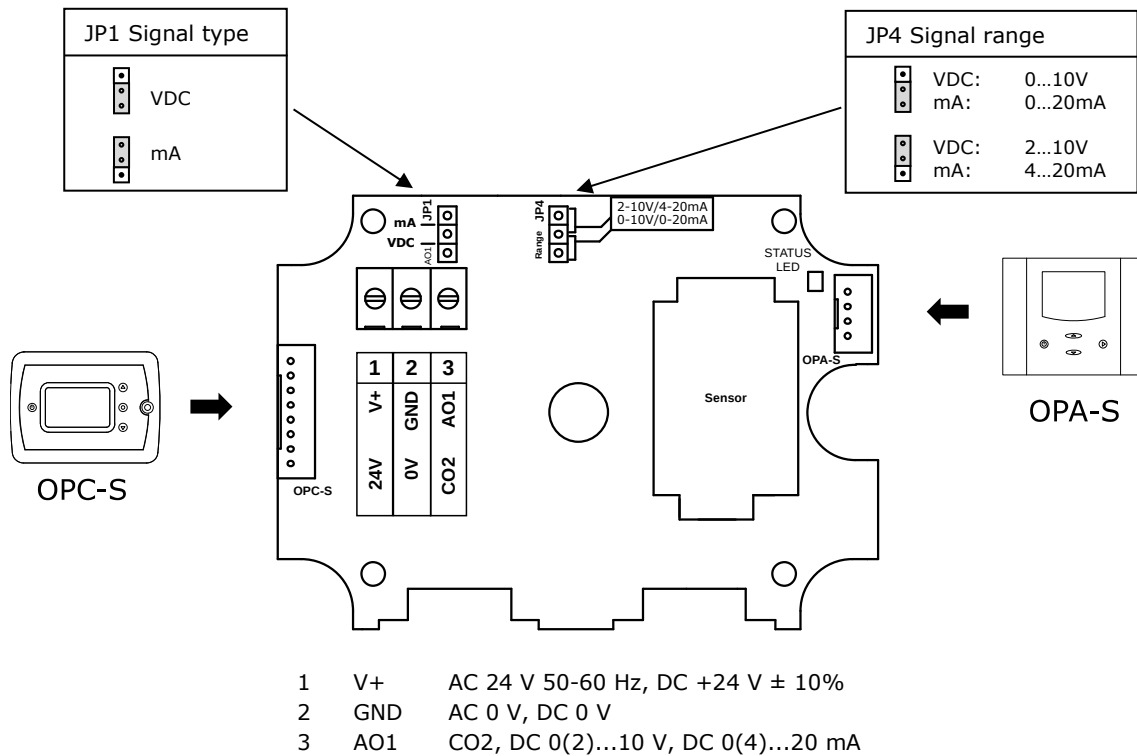
Power supply	Operating voltage	24 VAC 50/60 Hz $\pm$ 10%, 24 VDC $\pm$ 10%
	Power consumption	Max. 5 VA
	Safety extra-low voltage (SELV)	HD 384, class II
Connection	Terminal connectors	For wire 0.34...2.5 mm ² (AWG 24...12)
CO2 measurement	Sensing method	Non-dispersive infrared (NDIR) waveguide technology with ABC automatic background calibration algorithm
	Sampling method	Diffusion
	Response time (90%)	2 Minutes
	Measurement range	0 - 5000 ppm vol.
	Repeatability	$\pm$ 20 ppm $\pm$ 1 % of measured value
	Accuracy	$\pm$ 40 ppm $\pm$ 3 % of measured value
	Pressure dependence	+ 1.6 % reading per kPa deviation from normal pressure, 100 kPa
Signal outputs	Analog outputs	
	Output signal	0...10 VDC, 0...20 mA or 2...10 VDC, 4...20 mA
	Resolution	10 bit, 9.7 mV, 0.019.5 mA
	Maximum load	Voltage signal: $\geq$ 1k Ω , current signal: $\leq$ 250 Ω
Environment	Operation	To IEC 721-3-3
	Climatic conditions	class 3 K5
	Temperature	0...50 °C (32...122 °F)
	Humidity	<85% RH non-condensing
	Transport & storage	To IEC 721-3-2 and IEC 721-3-1
	Climatic conditions	class 3 K3 and class 1 K3
	Temperature	-30...70 °C (-22...158 °F)
Standards	Degree of protection	IP30 to EN 60 529
	Safety class	III (IEC 60536)
Housing materials	Cover, back part	PC+ABS (UL94 class V-0)
General	Dimensions (H x W x D)	
	Transmitter case	68 x 91 x 47 mm (2.7 x 3.7 x 1.9 in)
	Probe	Ø 14 x 160 mm, (Ø 0.55 x 6.2 in)
	Weight (including package)	290 g (10.2 oz.)

Product testing and certification


Declaration of
Conformity

Information on the conformity of our products can be found on our website
www.vectorcontrols.com on the corresponding product page under "Downloads".

Wiring and Connection



For jumper settings see section "Output signal configuration" on page 6.



Important

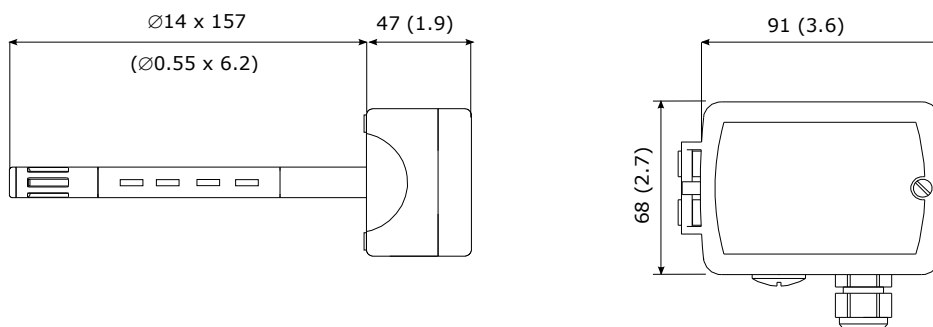
Make sure that the SDC-C1 case is closed airtight and that all cable glands are tightened properly to prevent false CO2 readings caused by ambient air entering the case!

Mounting instruction



See SDC-C1 installation sheet no. 70-000573 (www.vectorcontrols.com).

Dimension mm (inch)



Operation

Displaying minimum and maximum values

To read out or reset the stored CO2 minimum and maximum values use the optional display & programming module OPA-S or the built-in display & operation terminal OPC-S.

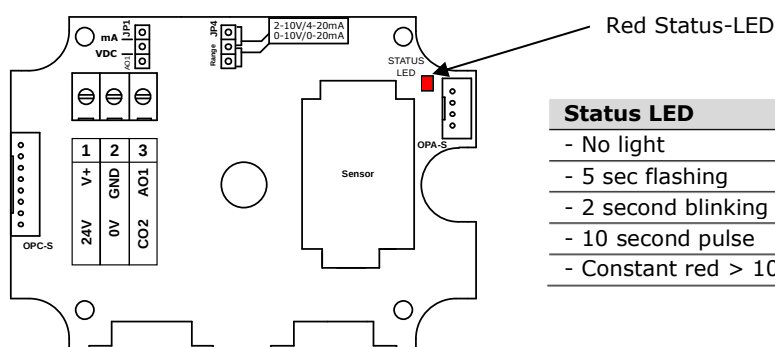
Use of OPA-S:

1. Open the SDC housing (see SDC-C1 installation sheet 70-000573 www.vectorcontrols.com).
2. Connect the OPA-S operating device to the OPA-S connector on the SDC (see section "Wiring and Connection" on page 4). The measured CO2 value is displayed.
3. Press the "UP" key to see the maximum values or the "DOWN" key to see the minimum values.
4. To reset the minimum value, press the "DOWN" key for at least 5 seconds and wait until the value changes.
5. To reset the maximum value, press the "UP" key for at least 5 seconds and wait until the value changes.

Use of OPC-S:

1. Press the "UP" key to see the maximum values or the "DOWN" key to see the minimum values.
2. To reset the minimum value, press the "DOWN" key for at least 5 seconds and wait until the value changes.
3. To reset the maximum value, press the "UP" key for at least 5 seconds and wait until the value changes.

Status-LED



Status LED

- No light	: No power or unit damaged
- 5 sec flashing	: Normal
- 2 second blinking	: Calibration
- 10 second pulse	: Calibration successful
- Constant red > 10 sec	: Calibration or sensor error

Error messages shown on OPA-S or OPC-S

Error	Description
Err 1:	Communication error: Verify cable connections, cable type and maximum distance.
Err 2:	CO2 sensor error: Make sure the sensor is not miss-calibrated. If possible, execute 400 ppm calibration. (see section " Fehler! Verweisquelle konnte nicht gefunden werden. " on page Fehler! Textmarke nicht definiert.). If error cannot be removed by calibrating the sensor, replace product.

Configuration

Output signal configuration, Jumper settings

The analog output signal type for the AO1 output may be configured with jumper **JP1** for Voltage or Current control signals. The factory setting is Voltage.



For Jumper location see section "Wiring and Connection" on page 4.

The signal range may be set with jumper **JP4** for the analog signal output AO1. **JP4** will only operate if the output range specified with output parameter **OP 01** and **OP 02** is left at the default value of 0...100%. With any other setting the position of **JP4** has no influence and the signal range defined with the output parameters **OP 01** and **OP 02** applies.



For Jumper location see section "Wiring and Connection" on page 4.

Signal type	JP1
Voltage (VDC)	
Current (mA)	

Signal range	JP4
0...10 V, 0...20 mA	
2...10 V, 4...20 mA	

Parameter configuration

The transmitter can be adapted to fit perfectly into any application by adjusting the software parameters. The parameters are set with the operation terminals OPA-S or the optional built-in OPC-S. The OPA-S may also be used as remote indicator.



NOTE: For the correct display of data, version 1.7 or greater of OPA-S is required.

OPA-S operation

1. Open SDC housing (see SDC-C1 installation sheet no. 70-00-0573 <http://www.vectorcontrols.com/>).
2. Connect the OPA-S operating device to the OPA-S connector on the SDC (see section "Wiring and Connection" on page 4). The measured CO2 value is displayed.
3. Press the "Up" and "Down" keys simultaneously for more than 3 seconds. "Code 0000" is displayed.
4. Use the "UP" and "DOWN" keys to set the password "0009" and confirm with the "RIGHT" key.
5. Select "IP SEL (Input Parameter) or "OP SEL" (Output Parameter) with "UP" and "DOWN" and confirm with the "RIGHT" key. The first parameter is displayed.
6. Use the "UP" and "DOWN" key to switch to the desired parameter. After pressing the "RIGHT" key adjust the parameter value with the "UP" and "DOWN" keys. Confirm the setting with the "RIGHT" key.
7. Complete parameter setting by pressing the left "ON/OFF" key twice. The measured CO2 value is displayed.



Important

In order for the SDC-C1 to apply the new settings correctly, the parameter setting must be completed with the left "ON/OFF" key!



Detailed information on the OPA-S can be found on the website www.vectorcontrols.com on the corresponding product page under "Downloads".

OPC-S operation

1. Press the "Up" and "Down" keys simultaneously for more than 3 seconds. "Code 0000" is displayed.
2. Use the "UP" and "DOWN" keys to set the password "0009" and confirm with the "RIGHT" key.
3. Select "IP SEL (Input Parameter) or "OP SEL" (Output Parameter) with "UP" and "DOWN" and confirm with the "RIGHT" key. The first parameter is displayed.
4. Use the "UP" and "DOWN" key to switch to the desired parameter. After pressing the "RIGHT" key adjust the parameter value with the "UP" and "DOWN" keys. Confirm the setting with the "RIGHT" key.
5. Complete parameter setting by pressing the left "ON/OFF" key twice. The measured CO2 value is displayed.



Important

In order for the SDC-C1 to apply the new settings correctly, the parameter setting must be completed with the left "ON/OFF" key!



Detailed information on the OPC-S can be found on the website www.vectorcontrols.com on the corresponding product page under "Downloads".

Input configuration

Parameter	Description	Range	Default
IP 00	Not used	-	-
IP 01	CI1: Samples taken for averaging control signal ¹⁾	1...255	10
IP 02	CI1: Calibration	-10...10%	0
IP 03	CI1: Minimum CO2 range ppm (CO2 level when output is at its minimum)	0...5000 ppm	0 ppm
IP 04	CI1: Maximum CO2 range ppm (CO2 level when output is at its maximum)	0...5000 ppm	2000 ppm
IP 05	CI1: Enable ABC automatic CO2 background calibration	ON, OFF	ON
IP 06	CI1: Calibrate CO2 sensor Note: For normal operation, calibration is not required. Only experts should calibrate the sensor. 0 = No calibration (default) 1 = Calibrate to gas (0 ppm) 2 = Calibrate to fresh air (400 ppm) 4 = Calibration error (status)	0...4	0

¹⁾ Sample interval: 1 sec.

Output configuration

Parameter	Description	Range	Default
OP 00	AO1 (CO2): Configuration of output signal: 0 = CO2 value 1 = Recorded minimum CO2 value 2 = Recorded maximum CO2 value	0...2	0
OP 01	AO1 (CO2): Minimum limitation of CO2 output signal ^{2) 3)}	0...100 %	0 %
OP 02	AO1 (CO2): Maximum limitation of CO2 output signal ^{2) 3)}	0...100 %	100 %

²⁾ The Output signal will be scaled according to selected input range, selected limitation of output signal and the output signal range selected by the jumper.

³⁾ If the default values are changed, the position of JP2 has no influence and the output signal range defined with the parameters applies.

IP = Input Parameter
OP = Output Parameter
CI = CO2 Input
AO = Analog Output

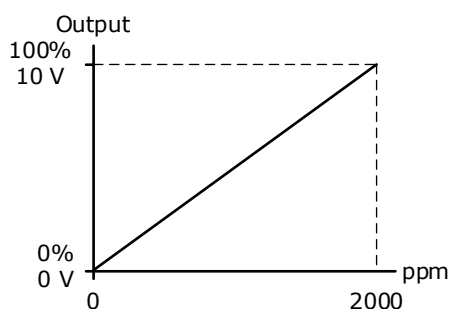
Examples of CO2 output signal on AO1:

Output signal type = Voltage (JP1 jumper setting)

Output signal range = 0...10 VDC (JP4 jumper setting)

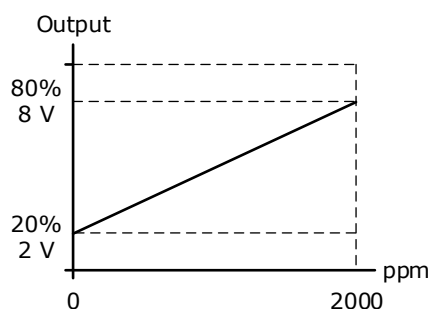
Default setting

IP 03 = 0 ppm, IP 04 = 2000 ppm (range)
OP 00 = 0 (CO2 value)
OP 01 = 0 % (limitation)
OP 02 = 100 % (limitation)



Custom setting

IP 03 = 0 ppm, IP 04 = 2000 ppm (range)
OP 00 = 0 (CO2 value)
OP 01 = 20 % (limitation)
OP 02 = 80 % (limitation)



Use the CO2-Transmitter as P-Controller

The CO2-transmitter may be converted into a proportional fresh air controller through a simple change of two parameter settings:

1. Set a minimum CO2 concentration when the fresh air fan should start to run at its minimum speed for example 500 ppm. Set this as the minimum value in **IP 03** parameter.
2. Then define the CO2 value when the fan should run at full speed, for example 1000 ppm and set this value in **IP 04**.

Your transmitter has now been converted into an air quality P-Controller!

By using the analog output, the fan will start to run if the CO2 concentration is higher than 500 ppm. It increases to its maximum when CO2 concentration reaches 1000 ppm.

Calibration

The CO2 sensor unit is maintenance free in normal environments thanks to the built-in self-correcting ABC algorithm (Automatic Baseline Correction). This algorithm constantly keeps track of the sensor's lowest reading over a 7 days interval and slowly corrects for any long-term drift detected as compared to the expected fresh air value of 400 ppm CO2. Rough handling and transportation might, however, result in a reduction of sensor reading accuracy. With time, the ABC function will tune the readings back to the correct numbers. The default "tuning speed" is however limited to about 30 ppm/week. For post calibration convenience, in the event that one cannot wait for the ABC algorithm to cure any calibration offset, manual calibration may be activated using following procedure. There are two calibration possibilities: 0 ppm and 400 ppm. Only one of the two manual calibration needs to be performed.

Calibration to 400 ppm (Fresh air)

1. Connect an OPA-S and expose the sensor for at least 5 minutes to the fresh outside air. It is important to expose the sensor to only fresh air. An open window close to the sensor with a higher level of CO2 could prevent a stable signal. Observe the CO2 value on the OPA-S.
2. Once the CO2 value has stabilized, login with the OPA-S and set **IP 06 = 2**, then exit configuration mode. The air quality LED will blink green color 4 times alternating with the status LED in 2 second intervals.
3. The sensor will now wait for a stable CO2 concentration. Once the calibration has been executed, the status LED will show constantly red for 20 seconds and the green air quality LED will light up for 20s if successful. If the calibration is not successful (no stable concentration for 5 min or no communication with sensor) the red air quality LED will blink instead and the status LED will stay constantly red in error mode. Recalibrate or restart the device to stop the error mode.
4. You may additionally verify the calibration using the OPA-S. If successful, **IP 06** will change to 0. If unsuccessful, the value of **IP 06** changes to 4.
5. If unsuccessful, wait at least 1 minute before repeating the procedure again. Make sure that the sensor environment is steady and calm!

Calibration to 0 ppm with CO2 free gas

1. Connect an OPA-S and place the sensor in a container filled with a gas mixture which is free from CO2 (i.e., Nitrogen or Soda Lime CO2 scrubbed air). Observe the CO2 value on the OPA-S.
2. Once the CO2 value has stabilized, login with the OPA-S and set **IP 06 = 1**, then exit configuration mode. The air quality LED will blink in red color 4 times alternating with the status LED in 2 second intervals.
3. The sensor will now wait for a stable concentration. Once the calibration has been executed, the status LED will show constant red and the green air quality LED will light up for 20s if successful. If the calibration is not successful (no stable concentration for 5 min or no communication with sensor) the red air quality LED will blink instead and the status LED will stay constantly red in error mode. Recalibrate or restart the device to stop error the mode.
4. You may additionally verify the calibration using the OPA-S. If successful **IP 06** will change to 0. If unsuccessful the value of **IP 06** changes to 4.
5. If unsuccessful, wait at least 1 minute before repeating the procedure again. Make sure that the sensor environment is steady and calm!

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