SRC-C1T1 - Indoor CO2+Temperature Transmitter



The SRC-C1T1 is an indoor CO2 monitoring and temperature measuring transmitter. Three LEDs in the colors green, orange and red indicate the CO2 concentration of the room air. This shows the user when to ventilate. The device has two analog outputs and one relay output. The CO2 background calibration of the SRC-C1T1 guarantees for accurate room air monitoring.

Features

- Indoor CO2 and temperature measurement
- Indication with three separate color LEDs
- Minimum and maximum CO2 and temperature value memory
- Two analog output signals for CO2 and temperature values
- 0…10 V or 2…10 V measuring analog output signal selectable with jumpers
- Relay output indicating CO2 concentration
- Levels of CO2 indication programmable
- Automatic CO2 background calibration
- Output signal ranges programmable
- May be used as simple P-controller
- Averaging signal adjustable
- Optional external display (OPU-S)
- Status LED

Applications

- Indoor CO2 and temperature measurement (home, office, school, restaurant, greenhouse, …)
- Recording of minimum and maximum CO2 and temperature 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 analog output signal range may be customized by jumpers and if required by a programming module. Standard signal ranges are 0…10 VDC and 2…10 VDC. Other ranges can be defined by using the external display and programming module (OPU-S).

For OPU-S usage see section “Parameter configuration” on page 5.

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. The Sensor can be calibrated by the client and does not need to be sent in for calibration. For manual calibration see section “Calibration” on page 8.

Temperature transmitter

The temperature is measured with a precision sensing element. The microprocessor samples the temperature once per second. It calculates an averaging signal over a preset number of samples and generates an analog output signal based on a lower and an upper signal range value. Standard range is -40…60°C (-40…140°F) and 10 seconds average. The measuring range and the averaging samples may be customized with the external display and programming module (OPU-S).

The analog output signal range may be selected by jumpers and if required by a programming module. Standard signal ranges are: 0…10 VDC and 2…10 VDC. Other ranges can be defined by using the external display and programming module (OPU-S).

For OPU-S usage see section “Parameter configuration” on page 5.

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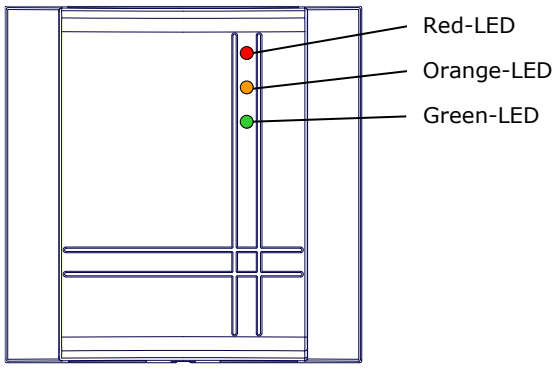
Minimum and maximum values

Using a display & programming module OPU-S, the user has the option to read out and reset the CO2 and temperature minimum and maximum 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 OPU-S usage see section "Displaying minimum and maximum values" on page 5.

Indication of air quality (CO2 concentration)

Three color LEDs are used to indicate air quality: Green for low CO2 concentration, orange for medium and red for high concentration. The levels for low-medium-high may be programmed.



Air quality LED	
No light	: No power or unit damaged
Green	: High air quality (low CO2 level)
Green + Orange	: Good air quality
Orange	: Moderate air quality (medium CO2 level)
Orange + Red	: Low air quality
Red	: Poor air quality (high CO2 level)
Red blinking	: 0 ppm calibration
Green blinking	: 400 ppm calibration

Default CO2 indication setting

Air quality LED	CO2 range in ppm
Green	0…699
Green + Orange	700…999
Orange	1000…1299
Orange + Red	1300…1599
Red	1600…2000

Safety

DANGER! Safety advice
This device is for use as a CO2 concentration indicator and a CO2 and temperature 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.

Ordering information

Product Name	Product Nr.	Description/Option
CO2+Temperature Sensor		
SRC-C1T1	40-300198	CO2+temperature transmitter / monitor
Accessories		
OPU-S	40-500030	External display and operation terminal. Note: For the correct display of values, V1.7 and later is required.

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Technical Specifications

Power supply	Operating voltage	24 VAC 50/60 Hz ± 10%, 24 VDC ± 10%
	Power consumption	Max. 2 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 - 2000 ppm vol.
	Repeatability	± 20 ppm ± 1 % of measured value
	Accuracy	± 40 ppm ± 3 % of measured value
	Pressure dependence	+ 1.6 % reading per kPa deviation from normal pressure, 100 kPa
Temperature - measurement	Accuracy: 0…50°C (32…122°F) 50…60°C (122…158°F) Note on accuracy: allow one hour for temperature compensation to stabilize after power up	 0.5 °C (1 °F) 1 °C (2 °F)
Signal outputs	Analog outputs Output signal Resolution Maximum load	 0…10 VDC or 2…10 VDC 10 bit, 9.7 mV Voltage signal: ≥1kΩ
	Relays output Insulation strength between relays and system electronics between neighboring contacts	48 VAC, 1 A max., 30 VDC, 1 A max. 500 VAC to EN 60 730-1 500 VAC to EN 60 730-1
Environment	Operation Climatic conditions Temperature Humidity	To IEC 721-3-3 class 3 K5 0…50° C (32…122° F) <95% RH non-condensing
	Transport & storage Climatic conditions Temperature Humidity Mechanical conditions	To IEC 721-3-2 and IEC 721-3-1 class 3 K3 and class 1 K3 -30…70° C (-22…158° F) <95% RH non-condensing class 2M2
Standards	Degree of protection	IP30 to EN 60 529
	Safety class	III (IEC 60536)
Housing materials	Cover Mounting plate	Fire proof ABS plastic Aluminium
General	Dimensions (H x W x D)	21 x 88 x 88 mm (0.8 x 3.5 x 3.5 in)
	Weight (including package)	135 g (4.8 oz)

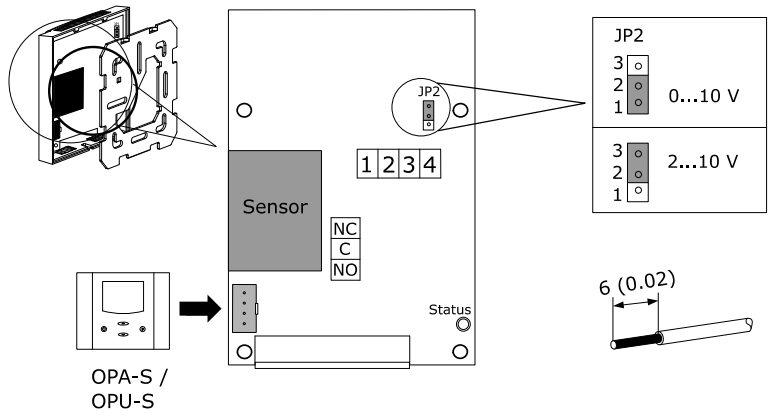
Product testing and certification

CE 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".

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Wiring and Connection



1	V+	AC 24 V 50-60 Hz, DC +24 V ± 10%
2	GND	AC 0 V, DC 0 V
3	AO1	CO2, DC 0(2)...10 V
4	AO2	Temperature, DC 0(2)...10 V
NC		CO2, 48 VAC, 30 VDC, 1 A max
C		Off = CO2 low level (green LED)
NO		On = CO2 high level (red LED)

For jumper settings see section "Output signal configuration" on page 5.

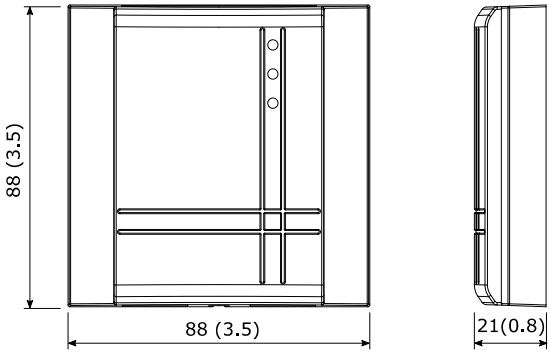
Mounting location

- On a flat, easily accessible inner wall
- The following installation locations should be avoided:
  - Protect from direct exposure to sunlight
  - Do not install near heat sources, e.g., radiators or other heat-generating devices
  - Areas with poor air circulation and niches, e.g., behind doors or shelves
  - Outside walls insufficiently insulated
  - In the direct influence area of ventilation openings and fans

Mounting instruction

See SRC-C1T1 installation sheet no. 70-000809 (www.vectorcontrols.com).

Dimension mm (inch)



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Operation

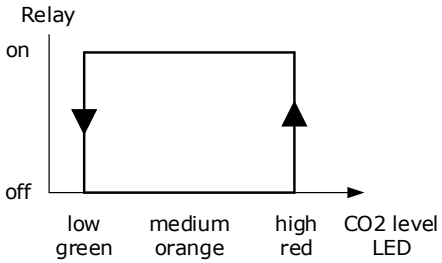
Displaying minimum and maximum values

To read out or reset the stored CO2 and temperature minimum and maximum values use the optional display & programming module OPU-S.

1. Remove SRC housing from the back plate (see SRC-C1T1 installation sheet no. 70-000809 www.vectorcontrols.com).
2. Connect the OPU-S operating device to the OPA-S connector on the SRC (see section "Wiring and Connection" on page 4). The measured CO2 and temperature 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.

Relay output

The relay output signals the CO2 level of the room air. The relay is off if the CO2 level is low and on if the CO2 level is high. The output can be used to control a ventilation system. The levels may be programmed (see section "Input configuration", page 6).
The diagram shows how the relay output corresponds to CO2 level and air quality LED.



Configuration

Output signal configuration, Jumper settings

The analog output signal type for the analog output AO1 and AO2 is factory set to VDC.

The signal range for the analog output AO1 and AO2 may be set with jumper **JP2**. **JP2** 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 **JP2** has no influence and the signal range defined with the output parameters applies.

Signal range	JP2
0…10 V	(1-2)
2…10 V	(2-3)

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

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 OPU-S. The OPU-S may also be used as remote indicator.

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

OPU-S operation

1. Remove SRC housing from the back plate (see SRC-C1T1 installation sheet no. 70-000809 www.vectorcontrols.com).
2. Connect the OPU-S operating device to the OPA-S connector on the SRC (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 TOA to apply the new settings correctly, the parameter setting must be completed with the left "ON/OFF" key!

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

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Input configuration

Parameter	Description	Range	Default
IP 00	TI1: Celsius or Fahrenheit, C = OFF, F = ON	ON, OFF	OFF
IP 01	TI1: Samples taken for averaging control signal [1]	1…255	10
IP 02	TI1: Calibration	-10…10	0
IP 03	TI1: Minimum temperature range (temperature when output is at its minimum)	-40…215 °C -40…419 °F	-40 °C -40 °F
IP 04	TI1: Maximum temperature range (temperature when output is at its maximum)	-40…215 °C -40…419 °F	60 °C 140 °F
IP 05	CI1: Light intensity of air quality LED on front	0…10	8
IP 06	CI1: Samples taken for averaging control signal [1]	1…255	10
IP 07	CI1: Calibration	-10…10%	0
IP 08	CI1: Minimum CO2 range ppm [2] (CO2 level when output is at its minimum)	0…5000 ppm	0 ppm
IP 09	CI1: Maximum CO2 range ppm [2] (CO2 level when output is at its maximum)	0…5000 ppm	2000 ppm
IP 10	CI1: CO2 level for medium CO2 indication [2]	0…5000 ppm	1000 ppm
IP 11	CI1: CO2 level for high CO2 indication [2]	0…5000 ppm	1600 ppm
IP 12	CI1: Enable ABC automatic CO2 background calibration	ON, OFF	ON
IP 13	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.

[2] Changing this parameter affects the control of the air quality LEDs or relay as follows:

Air quality LED	Use of Parameters	Default settings
Green	**IP 08** value … (**IP 10** value + 400) / 2	< 700
Green + Orange	(**IP 10** value + 400) / 2 … **IP 10** value	700…1000
Orange	**IP 10** value … (**IP 10** value + **IP 11** value) / 2	1000…1300
Orange + Red	(**IP 10** value + **IP 11** value) / 2… **IP 11** value	1300…1600
Red	**IP 11** value … **IP 09** value	> 1600

Output configuration

Parameter	Description	Range	Default
OP 00	AO1 (CO2): Configuration of CO2 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 [3] [4]	0…100 %	0 %
OP 02	AO1 (CO2): Maximum limitation of CO2 output signal [3] [4]	0…100 %	100 %
OP 03	AO2 (temperature): Configuration of temperature output signal: 0 = Temperature value 1 = Recorded minimum temperature value 2 = Recorded maximum temperature value	0…2	0
OP 04	AO2 (temperature): Minimum limitation of temperature output signal [3] [4]	0…100 %	0 %
OP 05	AO2 (temperature): Maximum limitation of temperature output signal [3] [4]	0…100 %	100 %

[3] 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.

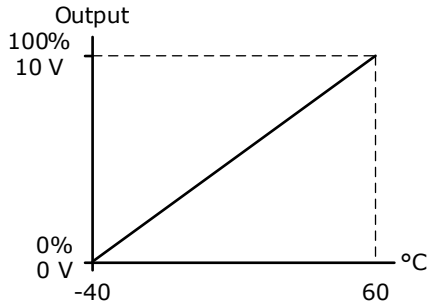
[4] If the default values are changed, the position of JP2 has no influence and the output signal range defined with the parameters applies.

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

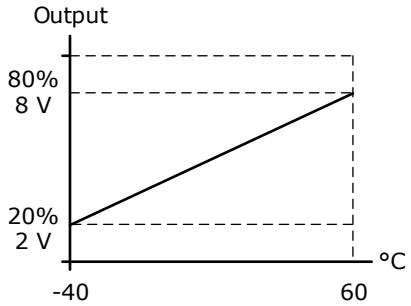
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Examples of temperature output signal on AO2:
Output signal range = 0…10 VDC (JP2 jumper setting)

Default setting
IP 03 = -40 °C, IP 04 = 60 °C (range)
OP 03 = 0 (temperature value)
OP 04 = 0 % (limitation)
OP 05 = 100 % (limitation)



Custom setting
IP 03 = -40 °C, IP 04 = 60 °C (range)
OP 03 = 0 (temperature value)
OP 04 = 20 % (limitation)
OP 05 = 80 % (limitation)



Error messages shown on OPU-S

Error	Description
Err 1:	Communication error: Verify cable connections, cable type and maximum distance.
Err 2:	Temperature sensor error (element damaged or missing)
Err 3:	CO2 sensor error: Make sure the sensor is not miss-calibrated. If possible, execute 400 ppm calibration. (see section "Calibration" on page 8). If error cannot be removed by calibrating the sensor, replace product.

Use the CO2-Transmitter as P-Controller

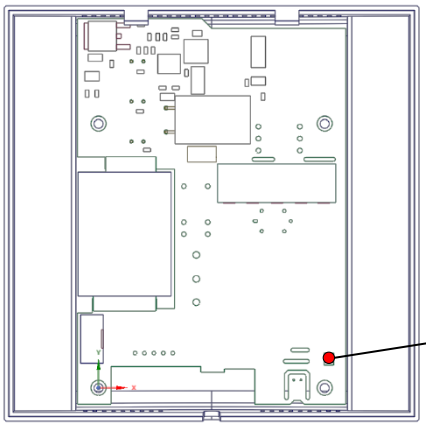
The CO2-transmitter may be converted into a proportional fresh air controller through a simple change of two parameter settings:

1. Set a minimum 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 the **IP 08** parameter.
2. Then define the value when the fan should run at full speed, for example 1000 ppm and set this value in **IP 09**.

Your transmitter has now been converted into a 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.

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

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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 OPU-S and expose the active sensor for at least 5 minutes to 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 OPU-S.
2. Once the CO2 value has stabilized, login with the OPU-S and set **IP 13** = 2, then exit configuration mode. The air quality led will blink green color 2 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 blink for 10s if successful. If calibration is not successful (no stability of concentration for 5 min, no communication with sensor) the red air quality led will blink instead and the status LED will stay constantly on red in error mode. Recalibrate or restart device to stop error mode.
4. You may additionally verify the calibration using the OPU-S. If successful **IP 13** will change to 0. If unsuccessful the value of **IP 13** 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 OPU-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 OPU-S.
2. Once the CO2 value has stabilized, login with the OPU-S and set **IP 13** = 1, then exit configuration mode. The air quality LED will blink in red color 2 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 blink for 10s if successful. If calibration is not successful (no stability of concentration for 5 min, no communication with sensor) the red air quality led will blink instead and the status LED will stay constantly on red in error mode. Recalibrate or restart device to stop error mode.
4. You may additionally verify the calibration using the OPU-S. If successful **IP 13** will change to 0. If unsuccessful the value of **IP 13** 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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