NLII-CO2+TVOC-R-5-RS485 | Combined CO_2/TVOC sensor with RS485

Combined room sensor NLII-CO2+TVOC-R-5-RS485 is used to continuously monitor indoor air quality and for effective control of ventilation (HVAC) systems according to current air quality. The sensor monitors the concentration of carbon dioxide (CO_2) and the concentration of total Volatile Organic Compounds in air (TVOC=Total VOC). It can be effectively used in offices, schoolrooms, shopping malls, households, restaurants, fitness centres, commercial buildings, etc.

- monitors CO_2 a TVOC
- TVOC output in conformance with EPA and UBA standards
- three selectable TVOC ranges and an extra eCO_2 output compatible with CO_2 standard
- 2x output relay – 2x C/NO contacts, relays switch according to selected output range
- three-level LED indication
- no disturbance at night – automatic turn off of LED indication
- RS485 bus communication with Modbus RTU protocol
- maintenance free during operation
- wide range of supply voltage

Description

The measuring of CO_2 is based on the optical principle of infrared radiation attenuation dependence on the CO_2 concentration in the air (NDIR). Built-in auto-calibration function ensures very good long term stability.
Built-in advanced VOC sensor is sensitive to volatile organic compounds typically contained in the exhausted air - gaseous metabolic products of human bodies and other gaseous pollutants such as formaldehyde, disinfectant vapours, cooking vapours, fumes from paints, varnishes, adhesives, detergents, cigarette smoke etc. that the CO_2 sensor does not detect.
Besides the CO2 sensor output, there is the TVOC sensor output, which can be set to one of three TVOC measuring range or you can select the eCO_2 (estimated CO_2) measuring mode.

In this mode the sensor uses special algorithm to estimate CO_2 concentration based on the assumption that the TVOC produced by human metabolism is proportional to the exhaled CO_2. The analogue voltage output of the sensor is adjusted as equivalent to a standard CO_2 sensor in range of 400–2000 ppm of estimated CO_2. The relay then switches according to the selected measuring range.
The sensor contains 2 relays, it can be set to two switching modes: standard (each relay switches according to its assigned quantity), a cascade mode (both relays switch according to one selected quantity and each one can be set to different switching level). Cascade switching, for example, can be used to two-step switching of ventilation units output power. Relay trigger levels can be set independently by two rotary elements.
Ventilation and heat recovery units can be controlled as effectively as possible with the sensor output signal. Built-in LED indicators show in three steps actual indoor air quality. The ***eco*** level means good indoor air quality necessary to achieve a sense of well-being and at the same time optimal energy costs for heating, ventilation or air conditioning.

All outputs are available through RS485 bus. For information on the communication protocol, use the document NLII-Modbus-Communication.

Explanation of abbreviations and technical terms can be found on our website in the Glossary section.

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Technical data

Parameter	Value	Unit
Supply voltage range	12 – 35 12 – 24	V DC V AC
Average consumption	0,5	W
CO_2 measuring range	400 – 5000	ppm
CO_2 accuracy	± 35 ppm ±5 % of reading	
CO_2 relay hysteresis	100	ppm
CO_2 startup	max 1	min
CO_2 step response	(90 %) 80	s
TVOC measuring ranges	0 – 1000 0 – 3000 0 – 10000	µg/m^3
eCO_2 measuring range [1) 2)]	400 – 2000	ppm
TVOC relay hysteresis	5% from selected range	
Max. switching voltage	250/30	V AC / V DC
Max. switching current	5/5	A AC / A DC
Working humidity non condensing	0 – 95 %	RH
Working temperature	0 to +50	°C
Storage temperature	-20 to +60	°C
Expected lifetime	min. 10	years
Ingress protection	IP20	
Dimensions	90x80x31	mm
RS485 bus		
A-B voltage difference	max 5	V
A-B common input voltage	-7 to 12	V
A-B common output voltage	max 3	V

1) Output type and range can be set with jumpers. Factory setting range is TVOC 0 - 3000 µg/m^3.

2) Calculated estimated CO_2 concentration (estimated CO_2 - eCO_2).

CO_2 sensor autocalibration function

Autocalibration compensates for long-term aging of the key components of the sensor. This function is available only when sensor power supply is continuous and uninterrupted. Calibration during operation is not necessary.
For proper function the sensor needs to have contact with fresh air ideally once per 10 days.

Sensor start-up after power on

Startup of the CO_2 sensor: operational after 1 minute since power on.
The declared accuracy is reached after 4 days of continuous power supply.

Startup of the TVOC sensor: operational after 2 hours since power on.
More stabilised output is reached after 2 days of uninterrupted power supply, full stabilisation of sensor parameters is achieved after two weeks of uninterrupted power supply.

CAUTION

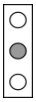
It is necessary to avoid severe mechanical shock of the sensor.

White LED lights:

Less than 600 ppm CO_2.
Less than 300 µg/m^3 TVOC.

- excellent air quality, low concentrations of VOC
- maintaining this level is not cost-effective

Green LED lights:



More than or equal to 600 ppm CO_2, less than or equal to 1200 ppm CO_2.
More than or equal to 300 µg/m^3 TVOC, less than or equal to 1000 µg/m^3 TVOC.

- optimal balance of air quality and energy consumption for ventilation and air condition

Yellow LED lights:

More than 1200 ppm eCO_2.
More than 1000 µg/m^3 TVOC.

- higher concentration of CO_2, lower air quality, that can cause fatigue, restlessness, headache and feeling uncomfortable, too hot etc.

Sensor failure indication

All three LED´s lights up at the same time permanently.

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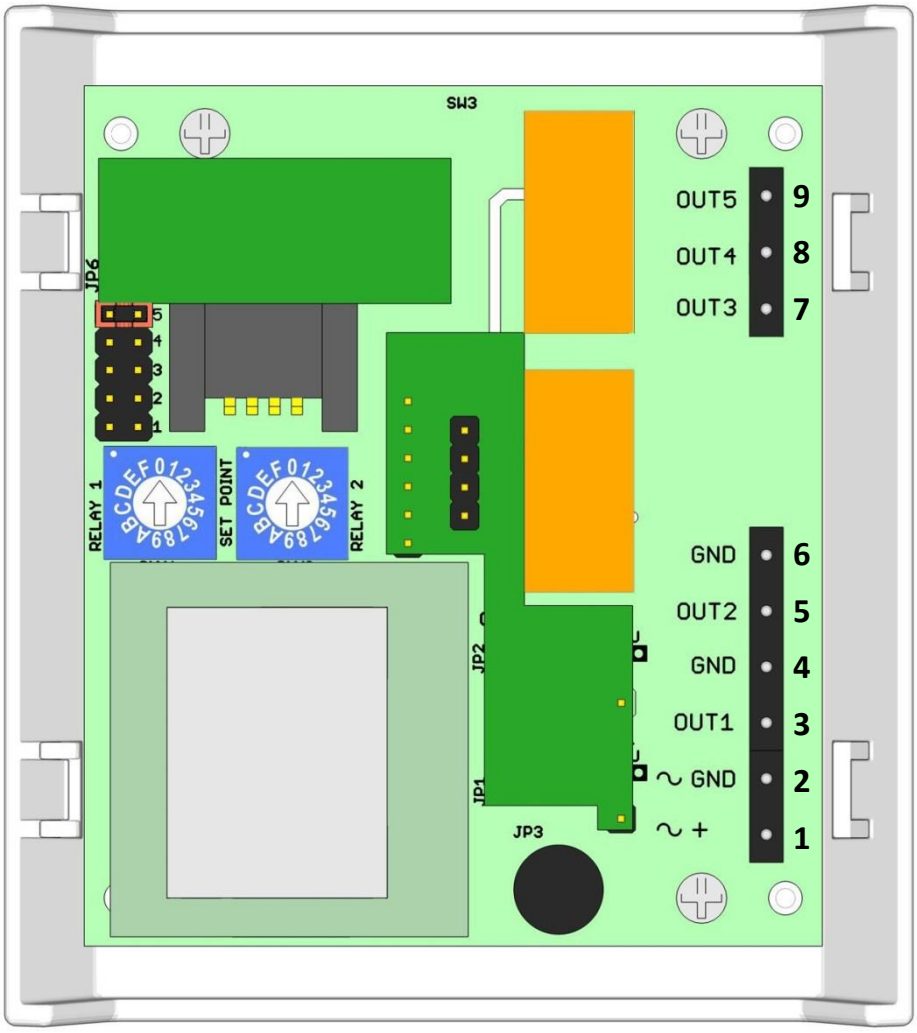
Electronic board controls and terminals



Terminals

1. ~ +	power AC or DC (+) plus pole
2. ~ GND	power AC or DC (-) minus pole, GND
3. OUT1	RS485 bus – signal line B
4. GND	GND
5. OUT2	RS485 bus – signal line A
6. GND	GND
7. OUT3	NO relay 2 output, normally open (TVOC)
8. OUT4	C output relay, common contact
9. OUT5	NO relay 1 output, normally open (CO_2)

SET POINT rotary switches for setting the relays switching levels

RELAY 1 – switching level for CO_2
RELAY 2 – switching level for TVOC

Jumpers

JP6 – LED indication, switching mode settings and measuring range of TVOC sensor setting

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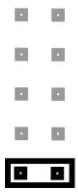
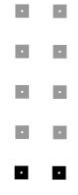
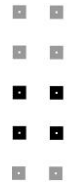
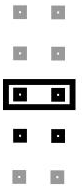
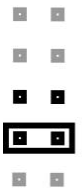
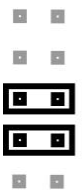
Jumpers on the electronics board

Mark	Description	Settings	Meaning
JP6 - 1	**LED indication** (factory setting - CO_2) - LED indication according to ambient light - when ambient light is dimmed (at night), LED indicators turn off automatically.		permanent LED indication enabled
			LED indication according to ambient light
JP6 - 2 **JP6 - 3**	**Switching mode setting - standard/cascade. Selecting the sensor for switching and LED indication - CO_2 or TVOC.** - if standard switching is selected, CO_2 and TVOC sensor control its own relay - if cascade switching is selected, the one chosen sensor controls both relays according to the levels set by the SET POINT rotary switches (for both switches the according switching levels table - CO_2 or TVOC, is applied)		switching and LED indication by CO_2 standard mode switching
			switching and LED indication by TVOC standard mode switching
			switching and LED indication by CO_2 cascade mode switching
			switching and LED indication by TVOC cascade mode switching

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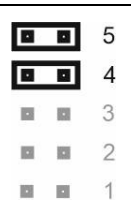
Mark	Description	Settings	Meaning
JP6 - 4 JP6 - 5	TVOC sensor measuring range selection		400 - 2000 ppm eCO_2
			0 - 1000 µg/m^3 TVOC
			0 - 3000 µg/m^3 TVOC
			0 - 10000 µg/m^3 TVOC

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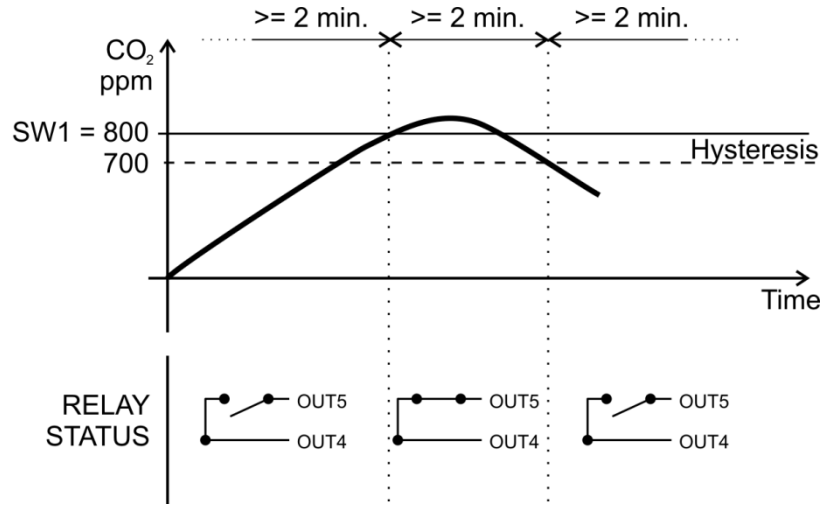
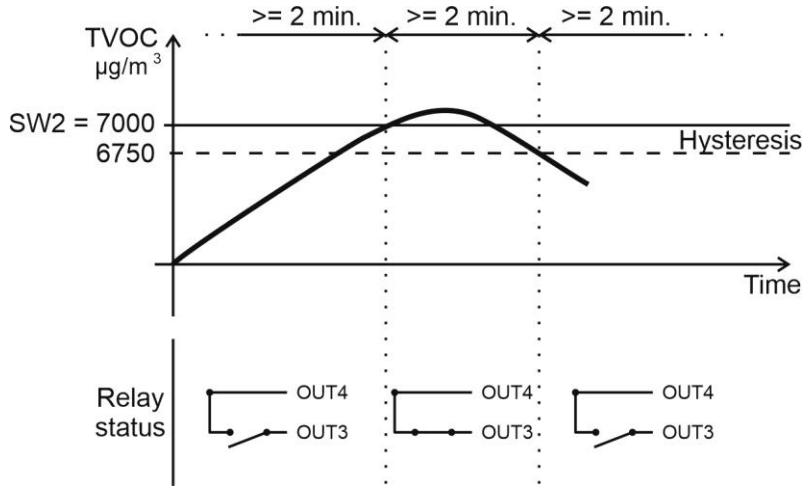
Setting the relay switching using rotary switch SET POINT

The relay switches on when the measured variable level rises above the level of the rotary switch SET POINT.
The relay switches off when the measured variable level falls below the level of the rotary switch SET POINT minus hysteresis value (see the Technical data table).
Minimal delay between changes in relays state is 2 minutes.

Standard switching with two relays by CO_2



Standard switching with two relays by TVOC



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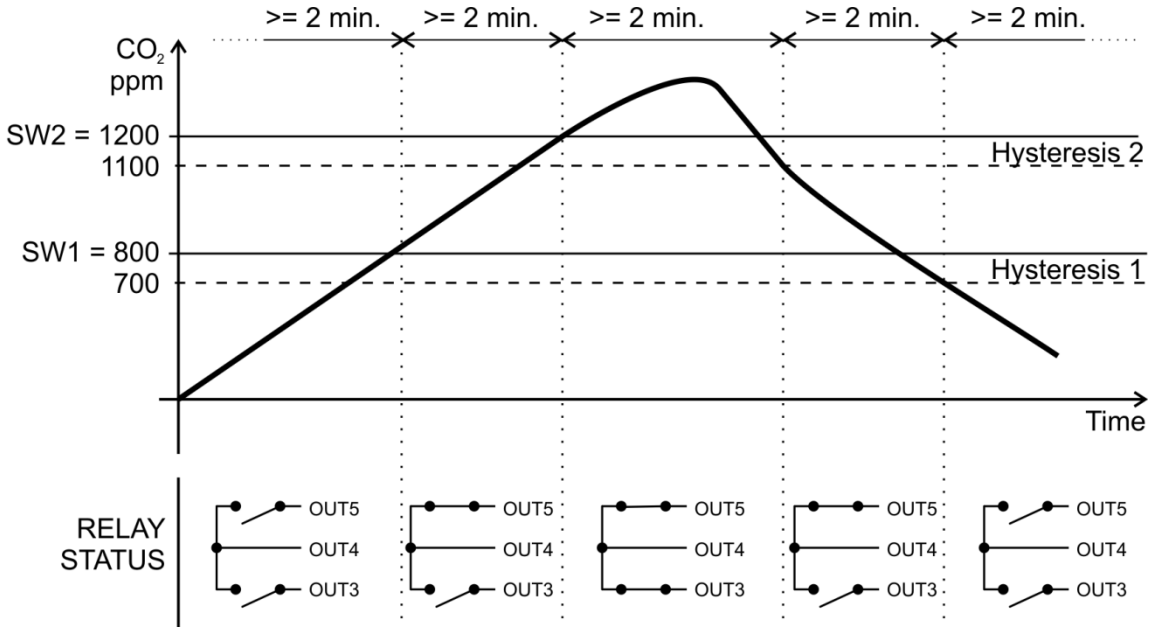
Cascade switching with two relays by CO_2



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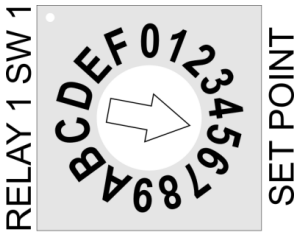
Setting the switching levels

Required concentration of CO_2

SET POINT	CO_2 [ppm]
0	500
1	800
2	1100
3	1400
4	1700
5	2000
6	2300
7	2600
8	2900
9	3200
A	3500
B	3800
C	4100
D	4400
E	4700
F	5000

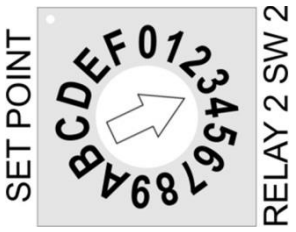
Example for setting the concentration of 2000 ppm:



Required concentration of TVOC

SET POINT	TVOC [%]
0	0
1	10
2	20
3	30
4	40
5	50
6	60
7	70
8	80
9	90
A	35
B	45
C	55
D	65
E	75
F	85

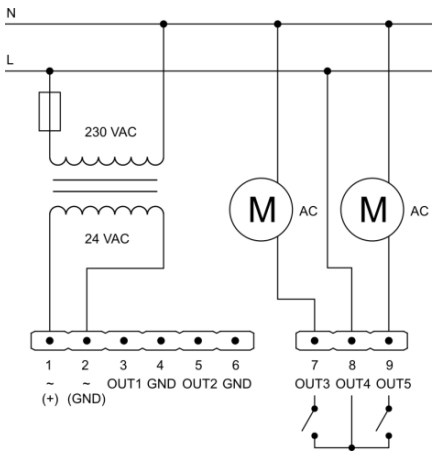
Example for setting the concentration of TVOC 30% (in the range TVOC 3000 µg/m^3 this corresponds to 900 µg/m^3):



Factory settings

LED indication:	by CO_2, indication turns off when ambient light dims
TVOC measuring range:	0-3000 µg/m^3
Relay switching mode:	standard
CO_2 switching level:	2000 ppm
TVOC switching level:	30 % (900 µg/m^3)

Sensor connection with two relays (2x C-NO)



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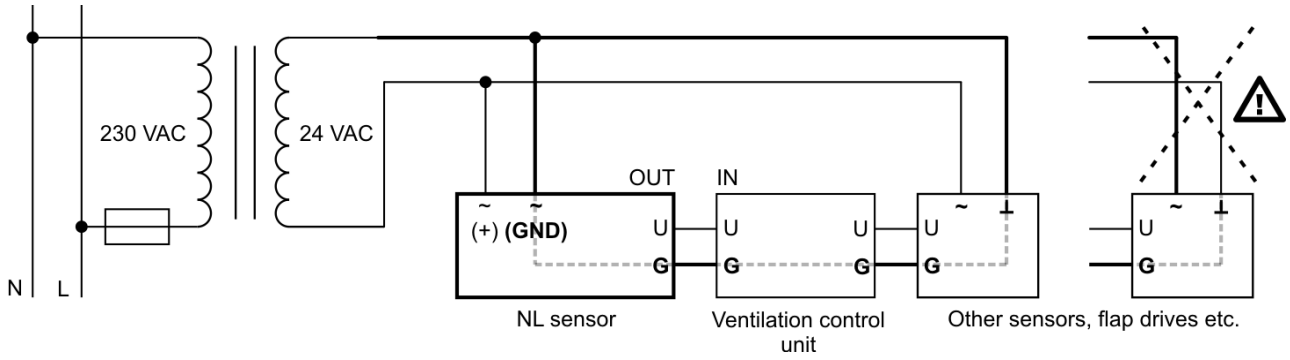
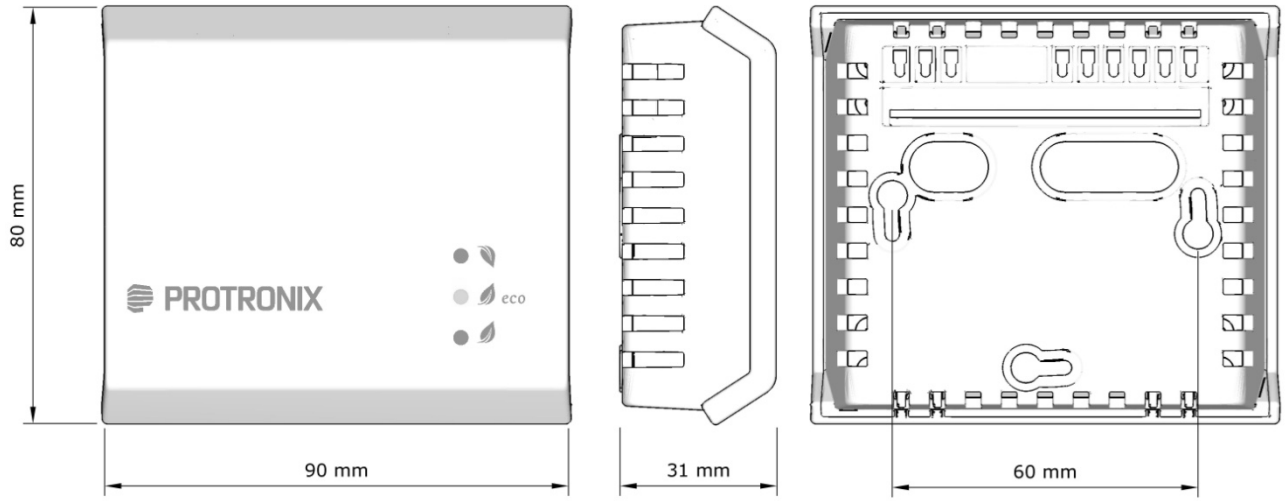
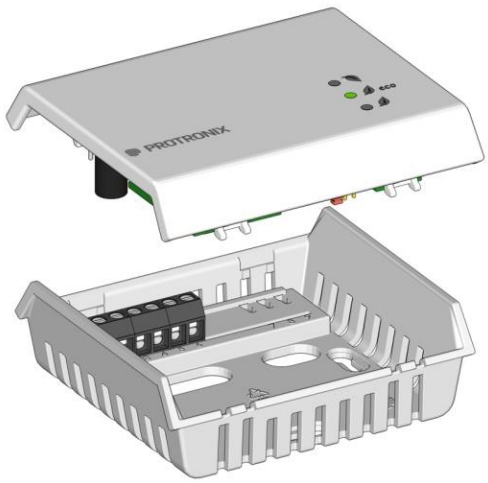
If you connect other devices to the same AC power source as the NL sensor, it is necessary to meet GND wiring of all analog inputs and outputs, as well as power wires.



Dimensions



Sensor assembly



Box color

Front: white - RAL9016
Base: gray - RAL7035

Way to use

The product is intended for indoor use only. You can read the recommendations for sensor placement on our web pages.

End of product life

Discard the product in according to the electronic waste law and the EU directives.

The producer reserves the right of technical changes in order to product improvements its properties and functions without previous notice.