

**Dual Gas Detector-Transmitter E2660R-CO-NO2** belongs to the PluraSens® family of multifunctional measurement instruments.

The device is intended for simultaneous detection of carbon monoxide and nitrogen dioxide. It is a convenient solution for underground parkings.

The instrument utilizes electrochemical gas sensors with excellent repeatability, stability and long lifetime

Two analog outputs and RS485 digital interface with industry standard Modbus RTU protocol can be used to connect the device to safety or building automation systems.

Two relays RE1 and RE2 with closing contacts can be used to switch 24 V or 230 V powered alarm sirens, ventilation fans, shut-off valves or other actuators.

The version of your detector is marked on the package.

### Safety requirements

Always adhere to the safety provisions applicable in the country of use.

Do not perform any maintenance operation with the power on. Do not let water or foreign objects inside the device.

### Operating conditions

The device should be used in explosion-safe (non ATEX rated) indoor areas, at the atmospheric pressure (85...110 kPa), and relative humidity in the range 15...90%. (See also Specifications table.)

Avoid strong vibrations, mechanical shock, and the sources of strong electromagnetic interference.

### Installation guidelines

There are no precise rules to follow when installing the gas detectors. The geometry of the room, detected gases, environment condition should be taken into account. The device should be mounted on a wall at a place where it is available for maintenance and repair. Place the detector (or remote sensor probes) as close as possible a potential leakage source and not very close to ventilation openings or strong air currents. Avoid the areas without air circulation (corners, niches) as well. Recommended sensor position is vertical pointing downwards.

Carbon monoxide has practically the same density as air. Nitrogen dioxide is 1.6 times heavier than air, but in underground parkings it raises to the ceiling with hot exhaustion gases, so the sensor should be located at 1.2...1.5 m from the floor in order to detect potentially dangerous concentration more quickly.

### Mounting and connection

1. Fix the detector on the wall using four round holes or two key slots. The mounting dimensions of the device are shown below.

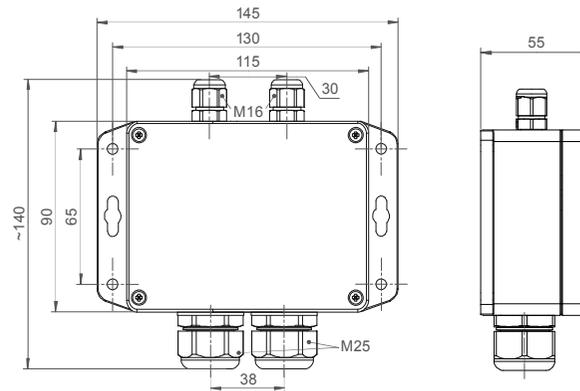
Unscrew four lid screws and detach the lid from the instrument.

2. Plug the power cable and connect the analog and relay outputs and/or digital interface terminals to the relevant devices according to the connection diagram.

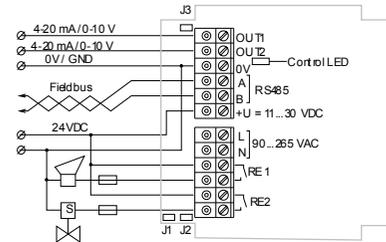
The screwless quick connect spring terminals on the E2660R series devices are suitable for a wide range of wires with cross-section 0,2...1,5 mm<sup>2</sup>. We recommend to strip the wire end by 8...9 mm and tin it, or to use the wire end sleeves.

To connect the wire, insert the wire end into terminal hole. To disconnect, push the spring loaded terminal lever, pull the wire out, and release the lever.

Use twisted pair cable, e.g. LIYY TP 2x2x0,5 mm<sup>2</sup> or CAT 5, to connect the device to RS485 network. Use one pair for A and B wires and the second pair for common 0 V and power +U wires to connect the transmitter to Fieldbus network. Respect polarity. Overall length of all connections via RS485 interface should not exceed 1200 m.



Connection diagram



J1: OUT1 type (open: 4-20 mA; closed: 0-10 V)  
 J2: OUT2 type (open: 4-20 mA; closed: 0-10 V)  
 J3: return to factory settings

**Note** The outputs are not galvanically isolated from 24 V power supply and share common 0V. Allowed load resistance limits are stated in Specifications table. To power the instrument from an external 24 VDC source, connect terminals 0V and +U to the source. If the integrated mains power supply module is used, connect terminals L and N to the mains.

**Note** Actuator short-circuits should be avoided, to protect the instrument relays use external fuses or safety switches.

The type of each analog output can be independently changed between 4-20 mA and 0-10 V with jumpers J1 (OUT1) and J2 (OUT2).

With closed jumper the output is 0-10 V, with open jumper the output is 4-20 mA. By default both outputs OUT1 and OUT2 are assigned to CO and NO<sub>2</sub> concentration respectively. The device has built-in temperature sensor which may be tied to any of the outputs.

The output assignments and scales can be changed by Modbus commands.

The relays RE1 and RE2 are assigned to CO and NO<sub>2</sub> concentration respectively.

3. Turn on the power. A LED placed on the PCB of the device allows to control the connection process. The LED response to different processes is presented in the table below.

Process	LED mode
Sensor absence or malfunction	Blinking 0.5 Hz (90% off, 10% on)
Relay1 turned on	Blinking 1 Hz (50% on, 50% off)
Relay2 turned on	Blinking 2 Hz (50% on, 50% off)
Modbus response	The signal is modulated with short on-off pulses, even single Modbus cycle is traceable
Normal measurement	Continuous light

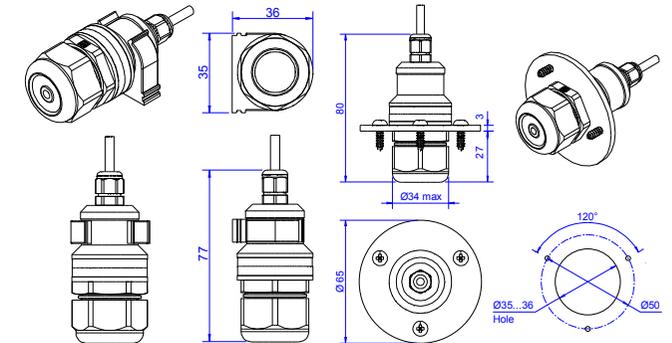
4. Make sure that the detector is properly fixed, the external devices connected, power on and control LED is constantly lit. Make certain that the cable glands are properly tightened to ensure the conformity to IP65 protection class. Place the lid back and fix it with the screws. The device is ready to use.

It is recommended to keep the device powered constantly, except for periods of maintenance and calibration, deplacement etc.

### Sensor probe handling

The device is available with remote probes (see drawing for dimensions).

The remote probe is connected to the main unit with shielded cable. Default cable length is 3 m.



The sensor probes are equipped with a hydrophobic microporous PTFE filter to protect the sensor from dust, dirt and water drops. The filter may be replaced if it gets strongly contaminated.

To replace the PTFE filter, unscrew the M25 nut and remove the old filter. Place a new filter into the nut and tighten it again.

**NB!** Never stab or press the filter near its center where the sensor is located since this may damage the sensor.

The recommended orientation of sensor probe is vertical with the sensor tip pointing downwards. This prevents possible accumulation of condensed water on the sensor protection filter. The horizontal orientation is also suitable. Avoid upward position of the sensor tip.

### Return to default settings

To reset the device's Slave ID, baudrate and sbit number to factory settings, proceed as follows:

1. De-energize the device
2. Connect the J3 jumper
3. Turn on the device
4. De-energize the device
5. Disconnect the J3 jumper
6. Turn on the device

### RS485 communication interface

See Annex 1

### Maintenance

Do not perform any maintenance operation with the power on. Clean the device with soft damp cloth. Do not use any abrasive cleaning agents. Do not immerse the device into water or any cleaning media.

### Delivery set

- Detector-transmitter E2660R-CO-NO2
- Mounting accessories:
  - 4 screws with plastic dowels
  - fixing clamp for remote probe version

**Properties of detected gases****Carbon monoxide**

Colourless, odourless, and tasteless gas. Highly toxic.

Synonyms: Carbonous oxide, Carbon(II) oxide, Flue gas, Monoxide

Chemical formula	CO	
Molar weight	28	
Relative gas density (to air)	0.97	
Conversion*	1 ppm = 1.15 mg/m <sup>3</sup>	
Boiling point	-191.5 °C	
Low explosive limit (LEL), % vol in air	12.5	
Upper explosive limit (UEL), % vol in air	74	
Odour	Odourless	
Hazards	Highly toxic. Mild poisoning causes lightheadedness, confusion, headache, dizziness, and flu-like effects. Larger exposures can lead to toxicity of the CNS and heart, and death. After acute poisoning, long-term problems may occur. CO also have negative effects on a baby if exposed during pregnancy. Chronic exposure to low levels can lead to depression, confusion, and memory loss.	
Exposure limits (NIOSH)	TWA	40 mg/m <sup>3</sup> /35 ppm
	IDLH	1380 mg/m <sup>3</sup> /1200 ppm

**Nitrogen dioxide**

Reddish-brown gas above 21 °C with a pungent, acrid odour. Yellowish-brown liquid below 21 °C, converts to the colourless dimer (N<sub>2</sub>O<sub>4</sub>) below -9 °C.

Chemical formula	NO <sub>2</sub>	
Molar weight	46	
Relative gas density (to air)	1.59	
Conversion*	1 ppm = 1.88 mg/m <sup>3</sup>	
Boiling point	21.2 °C	
Flammability	Powerful oxidizer, can cause many organic substances (wood, paper, oil etc) to ignite.	
Odour	Pungent, acrid odour	
Odour threshold	0.1 to 0.4 ppm	
Hazards	Irritates the skin, eyes and respiratory tract. Exposure to levels above 100 ppm can cause death due to asphyxiation from fluid in the lungs. There are often no symptoms at the time of exposure other than transient cough, fatigue or nausea, but over hours inflammation in the lungs causes edema.	
Exposure limits (NIOSH)	ST REL	1.88 mg/m <sup>3</sup> / 1 ppm
	IDLH	37.6 mg/m <sup>3</sup> /20 ppm

\* Calculated for 25°C and 1 atm.

**Specifications**

Signal update	every 1 second		
Power supply options	11...30 VDC, 24 VAC or 90...265 VAC		
Power consumption	< 2 VA		
Analog outputs	2 × 4-20 mA / 0-10 V, user settable		
Relay outputs	2 × SPST, max 5 A, 30 VDC / 250 VAC		
Load resistance	R <sub>L</sub> < (U <sub>s</sub> - 2 V) / 22 mA for 4-20 mA R <sub>L</sub> > 250 kOhm for 0-10 V mode:		
Digital interface	RS485, Modbus RTU protocol no galvanic isolation, common-mode voltage -7...+12 V		
Enclosure	grey ABS, wall mount, protection class IP65		
Dimensions	H90 × W145 × D55 mm		
CE marking	according to 2014/30/EU and EN61326-1 requirements		
	CO	NO <sub>2</sub>	
Sensor type	electrochemical	electrochemical	
Sensor lifetime	> 6 years	> 2 years	
Calibration interval	6 months	6 months	
Detection range	0...1000 ppm	0...20 ppm	0...100 ppm
Max. overload	2000 ppm	100 ppm	200 ppm
Response time T90	< 30s	< 40 s	< 60 s
Resolution/Gas unit	1 ppm	0.1 ppm	1 ppm
Outputs assignment	OUT1		OUT2
	2 gas 1 (CO)		2 gas 2 (NO <sub>2</sub> )
Outputs scale	0-1000	0-200	0-100
Output relays	2 × SPST relays (closing contact), 250 VAC / 30 VDC, 5 A max		
Default alarm setpoints	RE1: set 25 ppm release 20 ppm		RE2: set 3 ppm release 2.4 ppm
	15...90 %RH, atmospheric pressure ±10% non ATEXrated areas, non-aggressive atmosphere		
Operating conditions	-20...+50 °C		-30...50 °C   -20...50 °C
	Cross-sensitivity acetylene, etylene, H <sub>2</sub> , NO   chlorine Cl <sub>2</sub>		

**Calibration**

E2660R series devices have been calibrated by Manufacturer with standard gas mixtures before delivery. Provided that the device is used under moderate conditions, electrochemical gas sensors require field recalibration every 6 months..Please contact your dealer for more information.

**Warranty**

This product is warranted to be free from defects in material and workmanship for a period of one year from the date of original sale. During this warranty period Manufacturer will, at its option, either repair or replace product that proves to be defective. This warranty is void if the product has been operated in conditions outside ranges specified by Manufacturer or damaged by customer error or negligence or if there has been an unauthorized modification.

**Dual Gas Detector-Transmitter****E2660R-CO-NO2****User manual**

## E2660R-CO-NO2\_UM\_EN Annex 1

### E2660R series Modbus RTU Communication Reference

#### Modbus holding registers

Register addresses are shown 0-based, Addr in hexadecimal, Reg in decimal format.

Modbus holding register numbers MHR are shown in decimal 1-based format, and may be addressed either from 00001 or 40001 base.

Addr	Reg / MHR	RW	Description	Supported values (dec)	Default
0x0001	1 / 40002	R	Product information		2660
0x0002	2 / 40003	R			-
0x0003	3 / 40004	R			0
0x0004	4 / 40005	RW	Slave ID (net address) *	1...247 **	1
0x0005	5 / 40006	RW	Baudrate *	1200, 2400, 4800, 9600, 19200, 38400, 57600	9600
0x0006	6 / 40007	RW	Response delay, ms	1...255	10
0x0007	7 / 40008	RW	Stop bits *	1: no parity bit, 1 stop bit (default after factory reset) 2: no parity bit, 2 stop bits 3: odd parity, 1 stop bit 4: even parity, 1 stop bit <b>NOTE:</b> 3 and 4 are available starting from the Software version 0x204 (dec. 516)	1
0x0008	8 / 40009	R	Last error code	1...255	-
0x0011	17 / 40018	RW	Restarts counter	write '42330' to restart device (no response will follow)	-
0x00A2	162 / 40163	R	Zero adjustment for temperature data, °C × 100	-32000...+32000 (-320,00...+320,00 °C)	0
0x00A5	165 / 40166	R	Zero adjustment for 1st gas data, ADC	-32000...+32000 ADC units	0
0x00A6	166 / 40167	R	Slope adjustment for 1st gas data	1...65535	512
0x00A7	167 / 40168	R	Change rate limit for 1st gas data, gas unit / s	1...32000, 0 - no limit	0
0x00A8	168 / 40169	R	1st Integrating filter time constant, s	1...32000 (seconds), 0 - no filter	0
0x00C9	201 / 40202	RW	Parameter tied to analog output 1	0 - none 1 - temperature 2 - 1st gas concentration 3 - 2nd gas concentration 9 - forced Modbus control, value set in MHR / 40204	2
0x00CA	202 / 40203	RW	Parameter tied to analog output 2	0 - none 1 - temperature 2 - 1st gas concentration 3 - 2nd gas concentration 9 - forced Modbus control, value set in MHR / 40205	3
0x00CB	203 / 40204	RW	Forced value for analog output 1***	0...1000 (0,0%...100,0% of output scale)	0
0x00CC	204 / 40205	RW	Forced value for analog output 2***	0...1000 (0,0%...100,0% of output scale)	0

\* - The new value is applied after restart.

\*\* - Broadcast slave ID 0 can be used to assign a new ID to device with unknown ID. When addressing by ID 0 the device shall be the only Modbus instrument in the network. The device will not respond to Master command when addressed by ID 0.

\*\*\* - This value is dynamic and not kept in EEPROM after restart

#### RS485 communication interface

Databits: 8 Parity: none Stop bits: 1 or 2 Protocol: Modbus RTU	Supported Modbus functions: 03 - read multiple registers 06 - write single register
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#### Communication parameters

Parameter	Permitted values	Default
Supported baudrates	1200, 2400, 4800, 9600, 19200, 38400, 57600	9600
Data bits	8	8
Parity	none	none
Stop bits	1, 2	1
Protocol	Modbus RTU	
Modbus functions	03 - read multiple registers 06 - write single register	
Error codes	01 - illegal function 02 - illegal data address 03 - illegal data value 04 - slave device failure (details of last error 04 can be read from register 0x0008)	



## E2660Rseries Modbus holding registers (part 2)

Register addresses are shown 0-based, Addr in hexadecimal, Reg in decimal format.

Modbus holding register numbers MHR are shown in decimal 1-based format, and may be addressed either from 00001 or 40001 base.

Addr	Reg / MHR	RW	Description	Supported values (dec)	Default
0x00D3	211 / 40212	RW	Parameter tied to relay RE1	0 - off 1 - temperature 2 - 1 <sup>st</sup> gas concentration 3 - 2 <sup>nd</sup> gas concentration 4 - high 1 <sup>st</sup> or 2 <sup>nd</sup> gas concentration 5 - low 1 <sup>st</sup> or 2 <sup>nd</sup> gas concentration 9 - control by Modbus control, state set in MHR / 40214	2
0x00D4	212 / 40213	RW	Parameter tied to relay RE2	0 - off 1 - temperature 2 - 1 <sup>st</sup> gas concentration 3 - 2 <sup>nd</sup> gas concentration 4 - high 1 <sup>st</sup> or 2 <sup>nd</sup> gas concentration 5 - low 1 <sup>st</sup> or 2 <sup>nd</sup> gas concentration 9 - control by Modbus control, state set in MHR / 40215	3
0x00D5	213 / 40214	RW	Forced state for relay RE1***	0- off, 1 - on	0
0x00D6	214 / 40215	RW	Forced state for relay RE2***	0- off, 1 - on	0
0x00D7	215 / 40216	RW	Switching delay for relay RE1	0...1000 (s)	0
0x00D8	216 / 40217	RW	Switching delay for relay RE2	0...1000 (s)	0
0x00D9	217 / 40218	RW	Minimal on/off time for relay RE1	0...1000 (s)	0
0x00DA	218 / 40219	RW	Minimal on/off time for relay RE2	0...1000 (s)	0
0x00DB	219 / 40220	RW	Control logic for relay RE1	0- none 1- relay on at high values 2- relay on at low values 3- relay on at values within the range 4- relay on for the values outside the range	0
0x00DC	220 / 40221	RW	Control logic for relay RE2	0- none 1- relay on at high values 2- relay on at low values 3- relay on at values within the range 4- relay on for the values outside the range	0
0x00DD	221 / 40222	RW	LOW setpoint for relay RE1	0...65535 (gas units)	see Specifications
0x00DE	222 / 40223	RW	HIGH setpoint for relay RE1	0...65535 (gas units)	see Specifications
0x00DF	223 / 40224	RW	LOW setpoint for relay RE2	0...65535 (gas units)	see Specifications
0x00E0	224 / 40225	RW	HIGH setpoint for relay RE2	0...65535 (gas units)	see Specifications

\* - The new value is applied after restart.

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\*\*\* - This value is dynamic and not kept in EEPROM after restart

### E2660Rseries Modbus holding registers (part 3)

Register addresses are shown 0-based, Addr in hexadecimal, Reg in decimal format.

Modbus holding register numbers MHR are shown in decimal 1-based format, and may be addressed either from 00001 or 40001 base.

Addr	Reg / MHR	RW	Description	Supported values (dec)	Default
0x00FF	255 / 40256	RW	Sensor, analog outputs, LED and buzzer status	bit[0]=0/1 - sensor present/absent, read-only! bit[1]=0/1 - analog outputs deactivated/activated, bit[2]= 0/1 - in case the sensor1 is absent, turn signaling off/on analog output1, if output1 is tied to gas1 data; bit[3]=0/1 - in case the sensor1 is absent, turn on signaling with low current/high current on analog output1; if bit[2]=0 this bit will be ignored, bit[4]=0/1 - in case of sensor2 absent, turn signaling off/on analog output2, if output2 is tied to gas2 data; bit[5]=0/1 - in case of sensor absent, turn on signaling with low current/high current on analog output2; if bit[4]=0 this bit will be ignored, bit[6]=0/1 - current/voltage output detected on output1, read-only! bit[7]=0/1 - current/voltage output detected on output2, read-only! bit[8]=0/1 - LED deactivated/activated, bit[9]=0/1 - buzzer deactivated/activated	user defined
0x0100	256 / 40257	R	Raw temperature data, °C×100	signed integer, -4000...+8500 (-40,00...+85,00 °C)	
0x0101	257 / 40258	R	Raw 1st gas sensor data	ADC data 0...4095	
0x0102	258 / 40259	R	Measured temperature, °C×100	signed integer, -4000...+12500 (-40,00...+125,00 °C)	
0x0103	259 / 40260	R	1st gas concentration	signed integer, -32000...+32000 (gas units)	
0x0105	261 / 40262	RW	0% value for analog output 1	signed integer, -32000...+32000 (gas units)	0
0x0106	262 / 40263	RW	100% value for analog output 1	signed integer, -32000...+32000 (gas units)	1000
0x0107	263 / 40264	RW	0% value for analog output 2	signed integer, -32000...+32000 (gas units)	0
0x0108	264 / 40265	RW	100% value for analog output 2	signed integer, -32000...+32000 (gas units)	1000
0x016D	365 / 40366	R	Zero adjustment for 2nd gas data, ADC	-32000...+32000 ADC units	0
0x016E	366 / 40367	R	Slope adjustment for 2nd gas data	1...65535	512
0x016F	367 / 40368	R	Change rate limit for 2nd gas data, gas unit / s	1...32000, 0 - no limit	0
0x0170	368 / 40369	R	2nd Integrating filter time constant, s	1...32000 (seconds), 0 - no filter	0
0x01C9	457 / 40458	R	Raw 2nd gas sensor data	ADC data 0...4095	
0x01CB	459 / 40460	R	2nd gas concentration	signed integer, -32000...+32000 (gas units)	

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\*\*\* - This value is dynamic and not kept in EEPROM after restart