

Carbon dioxide

Synonyms: Carbonic acid gas, Carbonic anhydride, Carbon (IV) oxide; Dry ice (in solid state).

Chemical formula	CO ₂
Molar weight	44
Relative gas density (to air)	1.52
Conversion	1 ppm = 1.80 mg/m ³
Boiling point	Sublimes
Flammability	Nonflammable
Odour	Odourless
Hazards	Dusts of various metals (Mg, Zr, Ti, Al, Cr, Mn) are ignitable and explosive when suspended in carbon dioxide. In concentrations up to 1% (10 000 ppm), it will make some people feel drowsy and give the lungs a stuffy feeling. Concentrations of 7% to 10% (70 000 to 100 000 ppm) may cause suffocation, even in the presence of sufficient oxygen, manifesting as dizziness, headache, visual and hearing dysfunction, and unconsciousness within a few minutes to an hour.
Exposure limits (Directive 2006/15/EC)	TWA 9000 mg/m ³ /5000 ppm STEL Not specified

Conversion of ppm to mg/m³ is calculated for 25°C and 1 atm.

Indoor air quality in nonresidential buildings

CO ₂ level	Description
< 450 ppm	High quality (fresh air)
450-600 ppm	Medium quality
600-1000 ppm	Moderate quality
> 1000 ppm	Low quality

Installation guidelines

(See Installation and connections section for general information.)

Since CO₂ is heavier than air, it is recommended to locate the sensor not higher, than the potential leakage. For air quality control place the sensor in the breathing zone.

Calibration

E2608-CO₂ series detector have been calibrated by Manufacturer with standard gas mixtures before delivery. Provided that the sensor is used under moderate conditions, field recalibration is recommended every 5 years. Please contact your dealer for more information.

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 E2608 (wall mount or duct mount version)

-Mounting accessories:

- 4 cross-shaped mounting lug with screws and 4 screws with plastic dowels for wall mount version
- rubber flange for duct mount version
- fixing clamp for remote probe versions

E2608-CO₂-50K_UM_EN

Rev 19.12.2019

Specifications

Sensor type	optical (NDIR)
Sampling method	diffusion
Detection range	0...50 000 ppm
Resolution / digital unit	100 ppm
Accuracy	± (70 ppm + 5% of reading)
Response time T90	up to 3 minutes
Sensor lifetime	ca 10 years
Calibration interval	up to 5 years
Signal update	every 1 second
Digital interface	RS485, Modbus RTU protocol no galvanic isolation
Load resistance	R _L < (U _s - 2 V) / 22 mA for 4-20 mA R _L > 250 kOhm for 0-10 V mode
Power supply options	11...30 VDC, 24 VAC or 90...265 VAC (with mains power unit)
Power consumption	< 2 VA
Analog outputs	2 × 4-20 mA / 0-10 V, user settable
Outputs assignment	OUT1 2 gas; OUT2 2 gas
Output scale width	> 10 × resolution recommended: 20-100% of the detection range
Relay outputs	2 × SPST, max 5 A, 30 VDC / 250 VAC
Alarm setpoints	determined by user within 5-95% of the detection range
Cable connections	screwless spring loaded terminals
Enclosure	grey ABS, wall or duct mount, protection class IP65
Dimensions	H85 × W82 × D55 mm
Operating conditions	-25...+50 °C, 0...95% RH non-condensing, 0,9...1,1 atm* explosion safe indoor areas, non-aggressive atmosphere
CE marking	according to 2014/30/EU and EN61326-1 requirements
Other options	
Remote probe	Protection IP65, default cable length 3.0 m; max height 80 mm, max diameter 65 mm
Ambient pressure compensation	in the range 0,5...2 bar of absolute pressure

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 unauthorised modification.

**Carbon Dioxide Detector-Transmitter
E2608-CO₂-50K****User Manual**

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Evikon

E2608-series detectors-transmitters belong to the new PluraSens® family of multifunctional measurement instruments. The instruments utilise gas sensors of various types with excellent repeatability, stability and long lifetime. The devices are supplied either in duct-mount or wall-mount version. The wall mount version of the device is available with remote probe. The remote probe is connected to the main unit with shielded cable. Default connection cable length is 3 m.

E2608 series provides two independent analog outputs OUT1 and OUT2, user-selectable to 4-20 mA or 0-10 V, proportional either to gas concentration or temperature. RS485 Modbus RTU digital communication interface allows easy instrument configuration and integration into various 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, without aggressive gases in the atmosphere. See **Specification** table for more details.

Installation and connections

There are no precise rules or standards to follow when installing the gas detectors. The following points must be taken into account:

- application (air quality control or leakage detection),
- properties of the space under investigation (room geometry, direction and velocity of air flows etc),
- detected gas (relative density to air, whether the gas is flammable, or toxic, or oxygen displacing),
- safety: strong vibrations, mechanical shock, and the sources of strong electromagnetic interference should be avoided,
- the device should be accessible for maintenance and repair.

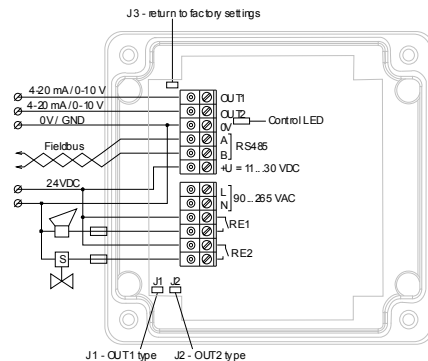
For early leakage detection install the sensor as close as possible to the potential leakage sources (flanges, valves, pressure reducers, pumps, etc), taking into consideration other points listed above. For general area monitoring without definite leakage sources, the detectors should be distributed evenly in the room. For personal safety control the detectors are installed in the breathing zone (at the height of the head of people or animals). Recommended sensor position is vertical, pointing downwards.

See **Installation guidelines** section for more information.

1. **Wall mount version:** Fix the detector on a wall by screws, using cross-shaped mounting lugs supplied with the instrument (see dimensional drawing above).

Duct mount version: Cut hole with a diameter of 36...45 mm in the air duct at the chosen mounting place. Place the rubber flange aligning the holes in the flange and the air-duct and fix the flange with four self-tapping screws. Pass the sensor probe through the flange and adjust it to the appropriate depth.

2. Unscrew four lid screws and detach the lid from the detector. Plug the power cable and connect the analog / relay outputs and / or digital interface terminals to the relevant devices according to the connection diagram below.



The screwless quick connect spring terminals on the E2608 series devices are suitable for a wide range of wires with cross-section 0,2...1,5 mm². 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 2×2×0,5 mm² 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.

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 selected with the appropriate jumper (J1 for OUT1 and J2 for OUT2). With jumper closed, the output type is 0-10 V. With jumper open, the output type is 4-20 mA.

By default both outputs OUT1 and OUT2 are assigned to gas concentration. 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

3. Turn on the power. The sensor heating up may take up to five minutes after switching on. 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 heating period	Blinking 0.5 Hz (50% on, 50% off)
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, displacement etc.

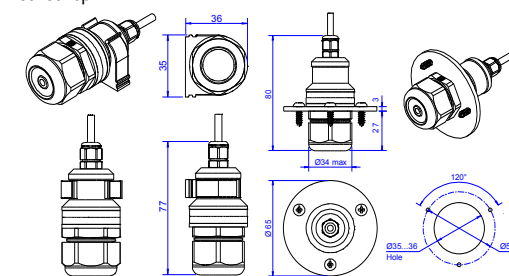
Sensor probe handling

The wall mount version of the transmitter is available with remote probe (see drawing below for dimensions). The remote probe is connected to the main unit with shielded cable. Default connection cable length is 3 m.

The sensor probes of all types 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 centre 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.



Configuring

Gas detectors E2608 share all functionalities of the PluraSens® multifunctional transmitter platform. The features and options include:

- digital output change rate limiting filter
- digital integrating (averaging) filter
- temperature measurement channel with internal sensor
- free assignment of each analog output to chosen parameter
- flexible setting of analog output scales for each output
- output shift and slope adjustment for calibration
- free assignment of each of two relays to chosen parameter
- several relay control logic modes (HI or LO with hysteresis, U or Π)
- switch delays and minimum on/off state durations for each relay
- Modbus controlled forced state option for analog outputs and relays.

E2608 can be configured through its RS485 interface by Modbus RTU commands. A standard configuration kit includes Model E1087 USB-EIA485 converter and a software pack. Please contact your Seller or the Manufacturer for more information.

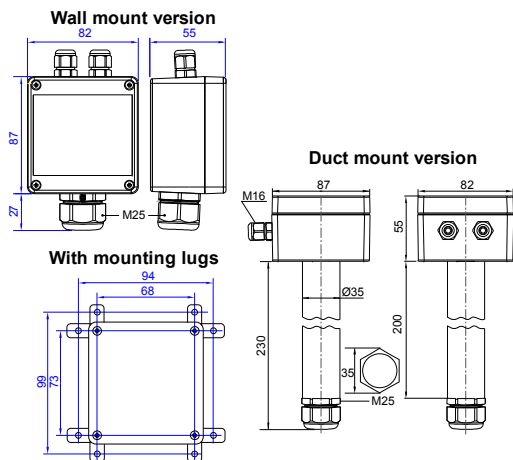
Return to default settings

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



E2608_UM_EN. Annex 1. E2608 series Modbus RTU Communication Reference

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)	

E2608 series 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	Hardware version		-
0x0002	2 / 40003	R	Software version		-
0x0003	3 / 40004	R	Product serial number	1...65535	-
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, parity bit *	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 NOTE: 3 and 4 are available starting from the Software version 0x218 (dec. 536)	1
0x0008	8 / 40009	R	Last error code	1...255	-
0x0011	17 / 40018	RW	Technological: age of data in seconds (read) / restart(write)	0...65535 s (read), 42330(write) writing 42330 restarts the device, response on Modbus will follow, 1.5 seconds should be waited for restart to be completed in every case	-

* — 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



E2608 series 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
0x00A2	162 / 40163	RW	Zero adjustment for temperature data, °C × 100	-32000...+32000 (-320,00...+320,00 °C)	0
0x00A5	165 / 40166	RW	Zero adjustment for gas data, ADC	-32000...+32000 ADC units	0
0x00A6	166 / 40167	RW	Slope adjustment for gas data	1...65535	512
0x00A7	167 / 40168	RW	Change rate limit for gas data, gas unit / s	1...32000, 0 - no limit	0
0x00A8	168 / 40169	RW	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 – 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 – gas concentration 9 – forced Modbus control, value set in MHR / 40205	2
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
0x00D3	211 / 40212	RW	Parameter tied to relay RE1	0 – none 1 – temperature 2 – gas concentration 9 – control by Modbus control, state set in MHR / 40214	2
0x00D4	212 / 40213	RW	Parameter tied to relay RE2	0 – none 1 – temperature 2 – gas concentration 9 – control by Modbus control, state set in MHR / 40215	2
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

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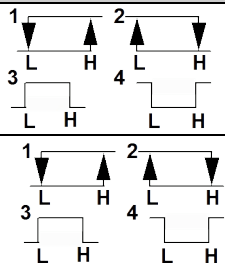
*** — This value is dynamic and not kept in EEPROM after restart

E2608 series 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
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 out of 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 out of 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
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 sensor is absent, turn signaling off/on analog output1, bit[3]=0/1 – in case the sensor 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 sensor absent, turn signaling off/on analog output2 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 bit[10]=0/1 – LED is on/off in normal condition bit[11]=0/1 - 1 Hz (50% on, 50% off) LED signal off/on if relay1 turned on bit[12]=0/1 - 2 Hz (50% on, 50% off) LED signal off/on if relay2 turned on	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 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	Gas concentration, gas units	0...65535, gas units	
0x0105	261 / 40262	RW	0% value for analog output 1	signed integer, -32000...+32000 (ppm / ‰)	0
0x0106	262 / 40263	RW	100% value for analog output 1	signed integer, -32000...+32000 (ppm / ‰)	1000
0x0107	263 / 40264	RW	0% value for analog output 2	signed integer, -32000...+32000 (ppm / ‰)	0
0x0108	264 / 40265	RW	100% value for analog output 2	signed integer, -32000...+32000 (ppm / ‰)	1000



NOTE 1 Relay setpoints should be set within 5-95% of the detection range.

NOTE 2 Sensor absence signalling (bits from [2] to [5]) is available only for sensors with digital interface (e.g.-CO2 10K, -O2-L).

NOTE 3 LED/buzzer signalization (if activated):

Detectable sensor absence or malfunction	0.5Hz (90% off, 10% on) light and/or sound signal
Relay1 turned on	1 Hz (50% on, 50% off) light and/or sound signal, depending on bit[8], bit[9] and bit[11]
Relay2 turned on	2 Hz (50% on, 50% off) light and/or sound signal, depending on bit[8], bit[9] and bit[12]
Modbus response	the light signal is modulated with short on-off pulses, even single Modbus cycle is visible
Normal operating	continuously on/off depending on bit[10]

NOTE 4 We recommend to set the difference between the upper and bottom limits of the output scale not narrower than 20% of detection range (for CO detectors the scales down to 5% of range are allowed). In any case, do not set the output scale below the tenfold resolution of the device.

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