



AL-439-00-921 EnoSense[®] CO2

EnOcean wireless sensor for CO2, temperature and humidity measurement

EnOcean 921.7 MHz / KOREA

Part no. 12852 (black) / 12877 (white)

Version 1.00, valid since FW/HW 2.3 / 1.7

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DEUTA Controls GmbH

Paffrather Straße 140
51465 Bergisch Gladbach
Phone: +49 2202 28557-61
Fax: +49 2202 28557-79
E-Mail: info@deuta-controls.de
Web: www.deuta-controls.net

Every conceivable measure has been taken to ensure the accuracy and completeness of this documentation. However, as errors can never be fully excluded, we always appreciate any information or suggestions for improving the documentation.

E-Mail: info@deuta-controls.de

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1 Validity of this documentation

This documentation is only applicable to the product

AL-439-00-921 EnoSense CO2

and is only applicable starting from products with FW/HW Version 2.3/1.7.

The device must only be installed and operated according to the instructions in these operating instructions.

2 Intended use

The **AL-439-00-921 EnoSense CO2** must not be used in any relation with equipment that supports, directly or indirectly, human health or life or with applications that can result in danger for people, animals or real value.

The **AL-439-00-921 EnoSense CO2** can be mounted using the wall-mount bracket (included in the delivery / part of the product). Depending on the wall material and surface, two screws or a double-sided adhesive tape can be used for mounting.

3 Disposal



Electrical and electronic equipment may not be disposed of with household waste. This also applies to products without this symbol.

Electrical and electronic equipment contain materials and substances that can be harmful to the environment and health. Electrical and electronic equipment must be disposed of properly after use.

Note only for EU: WEEE 2012/19/EU applies throughout Europe. Directives and laws may vary nationally.

4 Device description

4.1 Functionality

The **AL-439-00-921 EnoSense CO2** offers the possibility to measure the CO2 concentration, the temperature and the rel. humidity of the ambient air and to send the current values via radio (EnOcean).

The sensor electronics, which are built into a plastic housing, are attached with a double-sided adhesive pad or two screws to a wall.

Depending on your requirements, the sensor is available in a black or white housing. Power is supplied by two internal AAA batteries. Depending on the application, these typically will last 5 years or more.

The information is transmitted via the EnOcean wireless standard (selectable EEP: 1. MSC, 47-D1-09-01, 2. A5-09-04).

The following information is currently available:

- CO2 concentration in ppm (0..5000), 16 bit
- Temperature in °C (0..50), 8 bit
- Rel. humidity in % (0..100), 8 bit

- Cap. voltage (0..5.1) 8 bit [mV/20]
- Solar cell voltage (0..5.1) 8 bit [mV/20]
- Battery voltage (0..5.1) 8 bit [mV/20]

4.2 External product interface

The external product interface consists of the following items:

- Housing with venting openings on both sides and a solar cell in the front
- Internal service button and status LED to send teach in / learn telegram
- Notches on the back to open sensor housing (access to battery holder)

4.3 Observe intended use

The **AL-439-00-921 EnoSense CO2** must not be used in any relation with equipment that supports, directly or indirectly, human health or life or with applications that can result in danger for people, animals or real value.

4.4 Observe statutory provisions for operating frequency range.

The **AL-439-00-921 EnoSense CO2** must only be operated in compliance with the country-specific provisions regarding operation of radio equipment.

4.5 Non-conduction mounting surface

A non-conductive mounting surface is necessary.

Ensure the **AL-439-00-921 EnoSense CO2** is mounted on a non-conductive surface. If it is not, performance may be adversely affected.

5 Technical data

5.1 Communication / EnOcean wireless interface

Type	EnOcean
Number	1
Operating frequency	921.7 MHz
Transmission power	0 dBm
Modulation type	FSK
Number of channels	Ch 24 (921,7 MHz)
Transfer / data rate	125 kbit/s

Table 1: Technical data / communication

5.2 Sensor: CO2

Measuring range	0 .. 10.000 ppm
Accuracy	typ. +/- (50 ppm +3% of reading)

Table 2: Technical data / CO2 sensor

5.3 Sensor: Temperature

Measuring range	0 .. +50 °C
Accuracy	typ. +/- 0.2 °C max. +/- 0.4 °C
Resolution	1/10 °C
Response time	< 30 s
Long term drift	Typ. < 0.02 °C / year

Table 3: Technical data / temperature sensor

5.4 Sensor: Rel. humidity

Measuring range	0 .. 99 %
Accuracy	typ. +/- 2.0 % max. +/- 3.5 %
Resolution	0.5 %
Response time	< 8 s
Long term drift	Typ. < 0.02 °C / year

Table 4: Technical data / humidity sensor

5.5 User interfaces

Service button	Yes, internal
Service LED	Yes, green, internal

Table 5: Technical data / user interfaces

5.6 Housing / connection technology

Connection technology	-
Housing	Plastic, PC, white / black

Table 6: Technical data / housing

5.7 Power supply

Power supply voltage	2x AAA, 1.5 V internal batteries
Power consumption	Typ. 1 mW, 50 µA standby
Power rating	3.5 V DC, 0.05 A max. (operational)

Table 7: Technical data / power supply

5.8 Environmental conditions

Operating temp.	0°.. +50 °C
Storage temp.	-15 ..+60 °C
Rel. humidity	0..99 % rel. humidity, non condensing
Protection class	IP20

Table 8: Technical data / environmental conditions

5.9 Dimensions and weight

Weight	111 g (incl. batteries)
Dimensions	67 x 116 x 24 mm

Table 9: Technical data / dimensions and weight

5.10 Standards and guidelines

EMC	2014/53/EU RED directive 2011/65/EU + Annex 2015/863/EU RoHS-3 directive
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Table 10: Technical data / standards and guidelines

6 Functional description in detail

6.1 Measurement of CO2, temperature and re. humidity

The **AL-439-00-921 EnoSense CO2** will measure and send updated values all 5 minutes.

After 2 hours of darkness (no solar power generated), the devices will increase the measure and transmit interval to 60 minutes to save energy.

6.2 Send learn telegram

To connect the **EnoSense CO2** to any building automation system, a so called learn telegram can be send by the device.

Simply push the service button. The **EnoSense CO2** will immediately send a learn telegram.

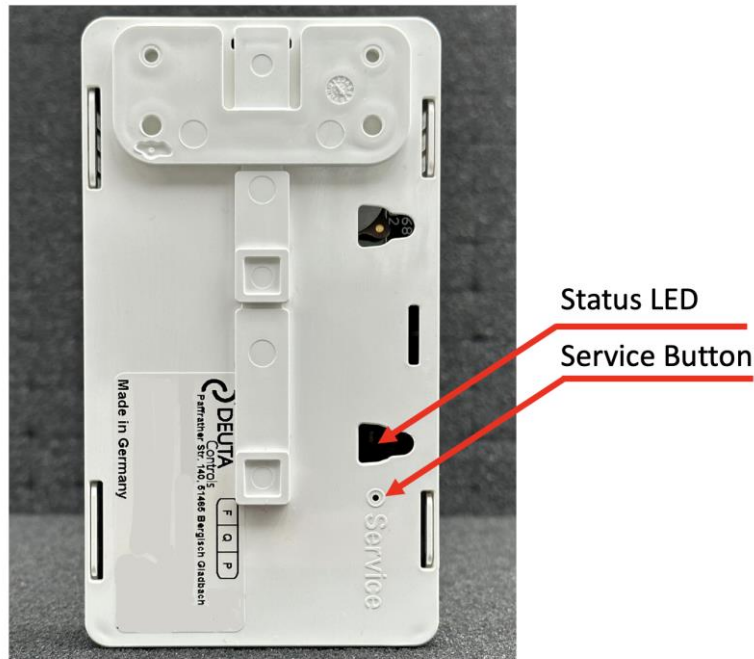


Figure 1: Position of Service Button and Status LED

6.3 Power status information

To support remote maintenance, the values of the supply voltage and the current solar voltage are measured and send via EnOcean in every message.

6.4 Table of supported EEP's (EnOcean Equipment Profiles)

6.4.1 Transmit / TX

The EnOcean wireless standard defines so called EnOcean Equipment Profiles (EEP). Each EnOcean based product sends data according to at least one standardized data format. The **EnoSense CO2** transmits data in one out of two possible EEP described as follows:

Option 1: MSC: D1-09-01 (Manufacturer Specific)

Cons. nr.	EEP	Description	Tx-ID
1	(47)-D1-09-01	CO2 + temperature + rel. humidity Cap. Voltage + solar voltage + batterie voltage	EURID

Table 11: Technical data / EnOcean MSC EEP for TX

Option 2: A5-09-04 (Standard EEP: Gas sensor)

Cons. nr.	EEP	Description	Tx-ID
1	47-D1-09-01	CO2 + temperature + rel. humidity	EURID

Table 12: Technical data / EnOcean standard EEP for TX

The following table describes in detail data send by the EnoSense CO2 according to the EEP (47)-D1-09-01:

Offset	Size	Bitrange	Data	Shortcut	Description	Valid range	Scale	Unit
16	16	DB3.7...DB3.0	Supply voltage	SVC	Battery voltage	0..250	0...5.0	V
16	23	DB2.7...DB1.0	Not used (= 0)					
24	8	DB0.7...DB0.0	Counter value	CNT	Counter value	0..255	1	-

Table 13: EnOcean transmit data

6.4.2 MSC data structure (47-D1-09-01)

Data field	CO2	Humidity	Temp.	CAP voltage	Solar voltage	Battery voltage
Offset	16	32	40	49	57	65
Size	16	8	9	8	8	8

Range min / max	0 / 5000	0 / 200	0 / 500	0 / 255	0 / 255	0 / 255
Scale min / max	0 / 5000	0 / 100	0 / 50	0 / 5.1	0 / 5.1	0 / 5.1
Unit	ppm	%	°C	V	V	V
Meaning	CO2 level	Rel. humidity	Temp.	Cap. voltage	Solar voltage	Battery voltage

Table 14: MSC data structure (47-D1-09-01)

6.4.3 Standard EEP data structure (A5-09-04)

Data field	Humidity	CO2	Temp.	Res.	LRNB	HSN	TSN
Offset	0	8	16	24	28	29	30
Size	8	8	8	4	1	1	1
Range min / max	0 / 200	0 / 255	0 / 255	-	0 / 1	0 / 1	0 / 1
Scale min / max	0 / 100	0 / 2550	0 / 51	-	0 / 1	0 / 1	0 / 1
Unit	%	ppm	°C	V	-	-	-
Meaning	Rel. humidity	CO2 level	Temp.	Res.	0 = teach in 1 = data	0 = humidity sensor not available	0 = temp. Sensor not available

Table 15: Standard EEP data structure (A5-09-04)

6.5 CO2, temperature and rel. humidity / data transmission rules

6.5.1 Transmit / TX

The integrated CO2 sensor works on the basis of an NDIR sensor. In addition

6.5.2 Receive/ RX

The **EnoSense CO2** only sends EnOcean telegrams. No data is received or interpreted.

6.6 Selection of the EEP using the Service button

The **EnoSense CO2** allows to select one out of two possible EEP to transmit data.

Mode 1: EEP = D1- 09-01

Mode 2: EEP = A5-09-04

The selection of the mode using the Service button works as follows:

1x short press within 3 seconds:

- **Mode = Mode 1**
- Service LED blinks 1x

2x short press within 3 seconds:

- **Mode = Mode 1**
- Service LED blinks 2x

6.7 Calibration of the CO 2 measurement

The appliance does not automatically calibrate the CO2 measurement.

If the measured value deviates significantly from the expected measured value, a new calibration may need to be carried out.

For this purpose, the **EnoSense® CO2** has an internal service button and a service LED (green). This button is used, among other things, to trigger a calibration.

The button can be pressed with a thin wire, such as a paper clip, without opening the device.

Device in sleep mode:

1x short press of the button:

The EnoSense® CO2 switches to operating mode.

Confirmation is given by 1x brief flashing of the LED (250 ms). In addition, a learning telegram is sent.

Device in operating mode:

1x short press of the button:

The EnoSense® CO2 sends a learning telegram. This is confirmed by 1x brief flashing of the LED (250 ms).

Hold button < 5 s:

Slow flashing of the LED (5x briefly), no function is executed.

Hold button > 5 s and < 10 s:

Fast flashing of the LED. If the button is now released, the EnoSense® CO2 starts the calibration. After 10-15 minutes, the calibration is completed.

Hold the button > 10 s:

The LED turns off. If the button is now released within the next 2 seconds, the EnoSense® CO2 switches to sleep mode. This is required for shipping the device by air freight.

7 Switching sleep mode on / off

Switch off sleep mode:

1x short press of the button:

The EnoSense® CO2 switches to operating mode.

Switch on sleep mode:

Hold button > 10 s:

The LED turns off. If the button is now released within the next 2 seconds, the EnoSense® CO2 switches to sleep mode. This is required for shipping the device by air freight.

8 Service / changing batteries



Caution: When opening the device, you have to take care of electrostatic discharge. Otherwise, electronics can be damaged.

In case of discharged batteries, they can be replaced with two new AAA batteries, 1.5 V.

You have to push the two housing notches on the rear side or left side with a small screw driver to open it. Then you can easily replace the two AAA batteries.

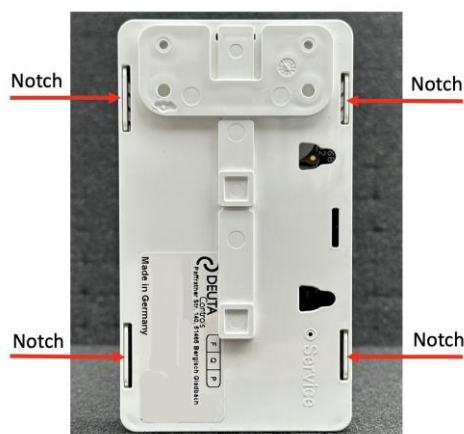


Figure 3: Notches to lock / unlock the housing



Figure 2: Internal batteries

9 Safety remarks



CAUTION: Risk of damage or explosion if a battery of incorrect type is used.



This product contains AA type batteries. If a battery is swallowed, it can cause severe internal burns in just 2 hours and can lead to death.



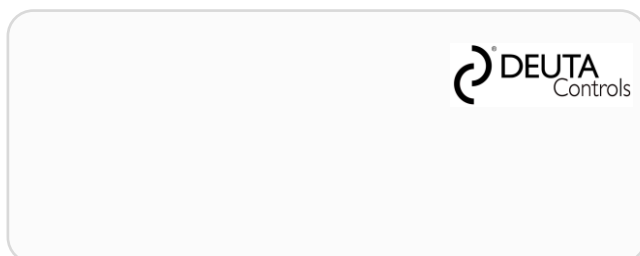
Keep new and used batteries away from children.

10 Device labels

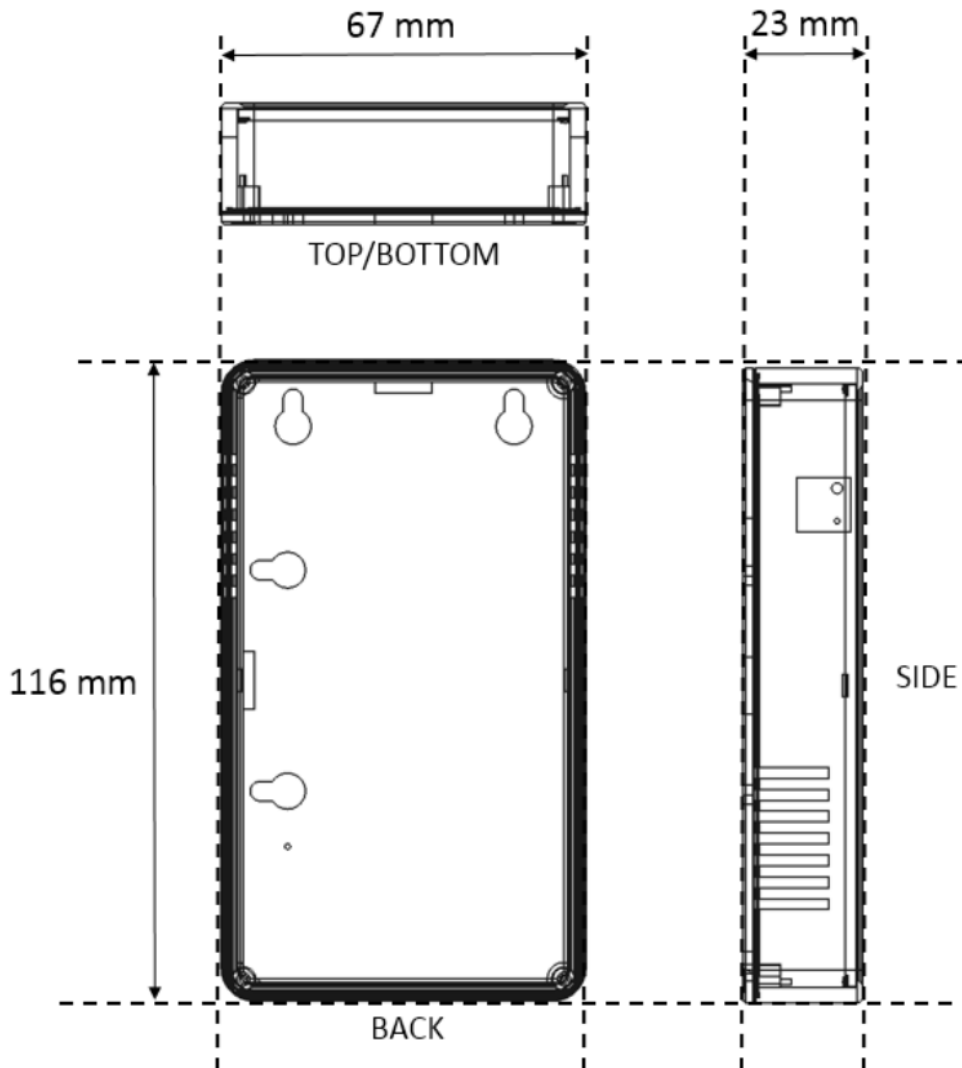
The following label is placed on the bottom side of the EnoSense CO2:

Will be added afterwards as a certification result.

Label:



11 Dimensions / drawings



12 Ordering information

Part name	Part nr.	Description
AL-439-00-921 EnOcean sensor „EnoSense CO2“ / white / KOREA	12877	Sensor EnOcean "EnoSense® CO2", for measuring CO2, temp. and rel. humidity; for wall mounting with/without holder; power supply: internal solar cell, backup batteries: 2x AAA; dimensions 67 x 116 x 23 mm, EnOcean 921 MHz, KC / KOREA , Housing: PC, black (RAL 9003 / signal white); incl. wall mount bracket; EEP: 47-D1-09-01 or A5-09-04, selectable
AL-439-00-921 EnOcean sensor „EnoSense CO2“ / black / KOREA	12852	Sensor EnOcean "EnoSense® CO2", for measuring CO2, temp. and rel. humidity; for wall mounting with/without holder; power supply: internal solar cell, backup batteries: 2x AAA; dimensions 67 x 116 x 23 mm, EnOcean 921 MHz, KC / KOREA , Housing: PC, black (RAL 9004 / signal black); incl. wall mount bracket; EEP: 47-D1-09-01 or A5-09-04, selectable

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13 Revision history

Version	Author	Reviewer	Date	Major changes
1.00	Lehzen	Pohl	26.03.2025	Initial release

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