![elvaco]

CMa12w G.2
User's Manual
English
v 1.0

Content

1 Document notes

All information in this manual, including product data, diagrams, charts, etc. represents information on products at the time of publication, and is subject to change without prior notice due to product improvements or other reasons. It is therefore recommended that customers contact Elvaco AB for the latest product information before purchasing a CMa12w product.

The documentation and product are provided on an "as is" basis only and may contain deficiencies or inadequacies. Elvaco AB takes no responsibility for damages, liabilities or other losses by using this product.

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CMa12w is a trademark of Elvaco AB, Sweden.

1.2 Contacts

Elvaco AB

Kabelgatan 2T
434 37 Kungsbacka
SWEDEN

Phone: +46 300 30250

E-Mail: info@elvaco.com

Elvaco AB Technical Support

Phone: +46 300 434300
E-Mail: support@elvaco.se

Online: http://www.elvaco.com

2 Important usage and safety information

The following safety precautions must be observed during all phases of the operation, usage, service or repair of any CMa12w product. Users of the product are advised to convey the following safety information to users and operating personnel and to incorporate these guidelines into all manuals supplied with the product. Failure to comply with these precautions violates safety standards of design, manufacture and intended use of the product. Elvaco AB assumes no liability for customer's failure to comply with these precautions.

All instructions must be carefully read before CMa12w is installed and used. They contain important information about how the product is used properly.

The installation of CMa12w should not be started before the technical specifications are fully understood. The work must be performed in the order listed in this manual, and only by qualified personnel. The work must also be done in accordance with national electrical specifications and applicable local regulations.

In order to avoid the product being damaged by static electricity, an ESD wristband should be worn when handling the product.

The labelling of the product may not be changed, removed or made unrecognizable.

3 Using this manual

3.1 Purpose and audience

This manual covers information needed to mount, configure and use the CMa12w Wireless M-Bus indoor temperature sensor. It targets field engineers and developers.

3.2 Online resources

To download the latest version of this user's manual, please visit the Elvaco website, https://www.elvaco.se/en/. There, you will also find information about Elvaco's other products and services.

3.3 Symbols

The following symbols are used throughout the manual to emphasize important information and useful tips:

The Note symbol is used to mark information that is important to take into consideration for safety reasons or to assure correct operation of the sensor.

The Tip symbol is used to mark information intended to help you get the most out of your product. It can for example be used to highlight a possible customization option related to the current section.

4 Introduction

4.1 Application description

The CMa12w is a 1-way wireless M-Bus temperature sensor for indoor use. The sensor offers high accuracy and user-friendliness as well as a long battery-life (up to 15 years), which makes it the optimal choice for tenant owners. Readout and configuration are easily performed by using a mobile phone (via NFC).

5 Getting started

5.1 Purpose

This chapter provides instructions on how to get started with CMa12w. After reading and carefully following each step of this chapter, the sensor will be installed and operational.

5.2 Product specification

Figure 1: CMa12w front
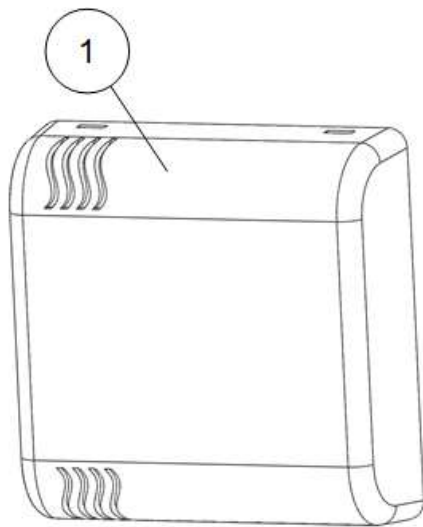
1. NFC antenna

2. LED light
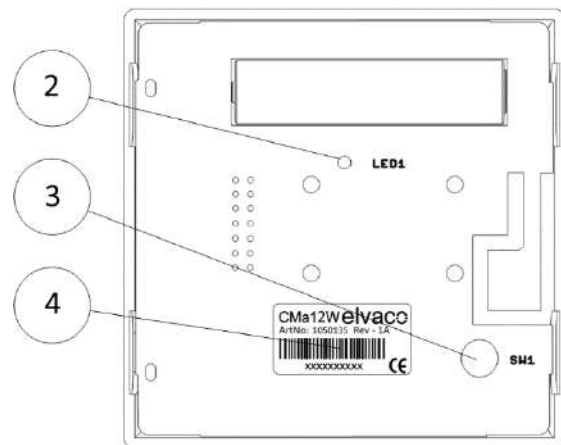3. Push button (SW1)
4. Serial number

Figure 2: CMa12w back

5.3 Mount the device

CMa12w is mounted on a wall by using the holes on the product back cover. Avoid using the holes highlighted in Figure 3.

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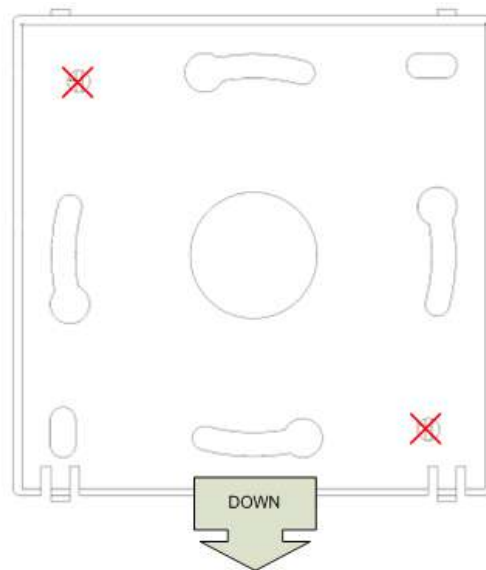
Figure 3: Mounting instructions

⚠	Avoid mounting the product near supplementary heat sources, such as kitchen stoves or in direct sunlight.

⚠	Make sure to mount the product at least 1.5 meters above the floor and at least 1 meter from nearest radiator.

⚠	Do not mount the product on an external wall or near a door. If mounted over a conduit pipe, make sure that the pipe is filled to prevent air flow.

5.4 **Demount the device**

To demount the sensor, carefully insert the end of a screwdriver in the upper part of one of the enclosure top holes, as illustrated by Figure 4.

Figure 4: Demounting of CMa12w

5.5 Connect the device

5.5.1 Wireless M-Bus

CMa12w is delivered in inactive mode, which means that the product is not performing any tasks in order to conserve battery life. The product needs to be activated in order to start transmitting data. CMa12w can be a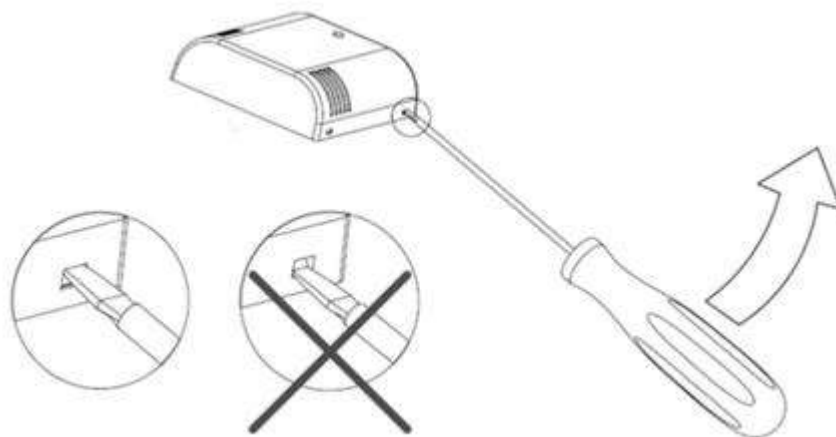ctivated in unencrypted mode (all data is transmitted unencrypted) or encrypted mode (all data is transmitted encrypted).

> ⚠️ Make sure to verify that the device has been activated by pushing SW1. If the product has been activated in encrypted mode, the LED light (2) will flash five times. If activated in unencrypted mode, it will flash once.

5.5.2 Unencrypted mode activation

To activate CMa12w in unencrypted mode:

1. Press and hold push button SW1 (5) for 6-10 seconds until the LED lights (4) starts to flash quickly.

2. Release push button SW1.

3. The product will transmit unencrypted wireless M-Bus telegrams (SND_NR) in C1 mode once every 180th second.

5.5.3 Encrypted mode

To activate CMa12w in encrypted mode:

1. Press and hold SW1 (5) for at least 13 seconds until the LED light (4) starts to flash slowly.

2. Release push button SW1.

3. The product will transmit encrypted wireless M-Bus telegrams (SND_NR) in C1 mode including sensor data and product/battery status once every 180th second.

The encryption is performed by a 128-bit AES algorithm.

> ⚠️ Note that the encryption key must be known to the receiving system in order to decrypt incoming data. The 128-bit AES key can be provided by Elvaco on demand.

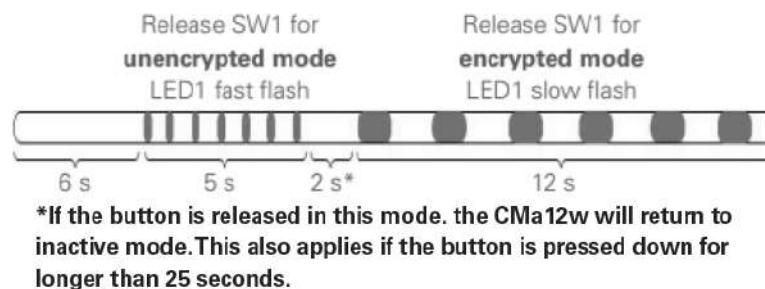> ⚠️ When the product has been activated, encryption mode cannot be changed.

Figure 5: Encrypted/unencrypted mode activation

5.6 NFC

CMa12w has a built-in NFC antenna which can be used to perform readouts from the device via a mobile phone. Place the mobile phone NFC reader next to the device NFC antenna (1). The readout will be performed automatically. The following information will be read:

- Model name
- Firmware version
- Hardware version
- Activation status
- Serial number
- Temperature, current/average over last 24 hours
- Encryption mode
- Transmit interval
- Wireless M-Bus mode
- SCD status
- SCD data
- Setup lock status

5.7 Setup lock

When enabling setup lock, the correct encryption key will be needed in order to configure device settings. The following configuration fields and features will be affected (locked) when setup lock is enabled:

- Encryption status
- Transmit interval
- Setup lock
- Factory reset
- Send telegram
- SDC status

⚠	If setup lock has been enabled, the device cannot be unlocked again.

ℹ	"SDC data" is the only configuration field which can be written to without having access to the encryption key if the device has been locked.

5.8 Factory default

Table 1 lists the CMa12w factory default settings.

Transmit interval	180 seconds
Encryption mode	Off
Setup lock	Off

Table 1: Factory default settings

6 Adminstration reference

6.1 Purpose

This section describes how CMa12w is administrated. The wireless M-Bus implementation is according to M-Bus standard EN13757-2, EN13757-3 and EN13757-4.

6.2 M-Bus product identification

The product can be identified using the following information:

- Manufacturer string = ELV
- Medium = 0x1B (Room sensor)
- Generation = 30-39 (CMa12w)

The Generation field between product releases will **only** change (increase by 1) if the M-Bus protocol information changes between versions. Use the software version field in the M-Bus telegram to identify current software version.

6.3 Wireless M-Bus mode

The product is using wireless M-Bus mode C1-b, which means that it sends spontaneous data in one direction, from sensor to collector device.

6.4 Addressing

The device address is globally unique and is set during manufacturing.

6.5 Operation mode

The product supports two different encryption modes, unencrypted and encrypted mode. In encrypted mode, an AES 128-bit algorithm is used to encrypt all data transmitted from the sensor. In unencrypted mode, no data will be encrypted.

6.6 Transmissions

The product will automatically begin to transmit data after the activation has been completed. By default, a SND_NR telegram will be transmitted every third minute. The table below lists all the data included in the telegram (SND_NR).

Slave to master

Byte index	Data	Description
	0x55	Preamble
	0x55	Preamble
	0x55	Preamble
	0x55	Preamble
	0x54	Sync word byte 0
	0x3D	Sync word byte 1
	0x54	Sync word byte 2
	0x3D	Sync word byte 3
0	0xnn	L Field

1	0x44	C Field: SND_NR
2..3	0x9615	Manufacturer "ELV"
4..7	0xnnnnnnnn	Identification number
8	0x1E	Version field
9	0x1B	Device type (Medium) = Room sensor
10	0x7A	0x7A = short application header
11	0xnn	Access number, increases after each transmission (0…255)
12	0xnn	Status. Bit 2 (0x04) represents "low battery flag", bit 3 (0x08) represents "sensor fault flag". Default is STATUS = 0x00
13..14	0xnnnn	CONFIG: Bit 7..4 = 0 or 2, number of encrypted 16 byte block, 0 if encryption = OFF Bit 11..8 = encryption mode, 5 with encryption, 0 without encryption
15	0x2F	Decryption verification byte 1
16	0x2F	Decryption verification byte 2
17	DIF	16-bit integer = 0x02 or 0x32 at sensor error
18	VIF	0x65 = external temperature in "centi Celsius"
19..20	0xnnnn	Instantaneous temperature x 100 At sensor error, temperature will be set to 0x0000
21	DIF	16-bit integer =0x42 or 0x72 at sensor error
22	VIF	0x65 = external temperature in "centi Celsius"
23..24	0xnnnn	1h average temperature x 100 At sensor error, temperature will be set to 0x0000
25	DIF	0x02 (16-bit integer)
26	VIF	0xFD
27	VIFE	0x1B
28..29	0xnnnn	Battery status
30	0x0D	Firmware version DIF
31	0xFD	Firmware version VIF
32	0xFD	Firmware version VIFE = "Other software version"
33	0x05	Length of firmware string (varying)
34..38	0xnnnnnnnnnn	Firmware version in format: Major.Minor.PatchLevel
39	0x0F	End of telegram, no more data

7 Troubleshooting

7.1 The master does not receive any telegram from the sensor

Please verify that:

- The product has been activated.
- The master is connected to a power source and is correctly configured.
- The master is within range of the radio signal.
- The master antenna is properly mounted for ideal performance.
- The master and the sensor use the same wireless M-Bus mode (C1).
- The sensor is not mounted inside a metallic cabinet.
- The sensor is not disturbed by other radio equipment.

7.2 Temperature value is inaccurate

Although the temperature sensor is normally very accurate, an incorrect positioning of the product can sometimes result in unintended temperature variations. When mounting the sensor, please verify that:

- The product is not mounted near any heat or cold sources.
- The product is not mounted in direct sunlight
- The product is not mounted in a spotlight beam.

8 Technical specifications

8.1 Characteristics

Type	Value	Unit	Comments
Mechanics			
Casing material	ABS UL94-V0	-	White
Protection class	IP30	-	
Dimensions	80 x 80 x 25	mm	
Weight	75	g	
Mounting	Wall-mount	-	
Electrical connections			
Supply voltage	Battery	-	Life span 15 years at 15°C to 25°C
Environmental specifications			
Operating temperature	-10 - 50	°C	
Operating humidity	0 - 95	%RH	No condensation
Operating altitude	0-2000	m	
Pollution degree	Degree 2	-	
Usage environment	Indoors	-	
Storage temperature	-40 - 85	°C	
Measurement range, temperature	-20 - 55	°C	
Temperature sensor, margin of error			
Temperature +5 to +55 °C	+/- 0.2	°C	
Temperature -20 to +5 °C	+/- 0.4	°C	
User interface			
Push button SW1	Product activation	-	
Sensor data readout	Wireless M-Bus or NFC	-	
LED light	Activation	-	
Momentary values	Temperature, status	-	
Historic values	Average values over last hour/day	-	
M-Bus slave interface			
Frequency	868.95	MHz	
Transmit power	10	mW	
Transmit interval	180	s	
Encryption	Yes	-	
Wireless M-Bus modes	C1/T1	-	

Table 2: Technical data

9 Type approvals

CMa12w is designed to comply with the directives and standards listed below.

Approval	Description
EMC	EN 61000-6-2, EN 61000-6-3

Table 3: Type approvals

10 Document History

10.1 Versions

Version	Date	Description	Author
1.0	2018-05	Initial version	Anton Larsson

Table 4: Document version