elvaco

CMeX50 Users Manual English

1050062-CMeX50 Wireless M-Bus Receiver (868MHz)
1050128-CMeX50 Wireless M-Bus Receiver (434MHz)

The CMeX50 is a Wireless M-Bus Receiver handling up to 800 wireless M-Bus slaves. The CMex50 complies with the OMS standard and operates in the wireless M-Bus mode T1, C1 and S1

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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 CMeX50 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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2 Using this manual

2.1 Purpose and Audience

This manual covers information needed to mount, configure and use the CMeX50 Wireless M-Bus Receiver. It is intended for field engineers and developers.

2.2 Models

CMeX50

2.3 Additional and updated information

Latest documentation version is available on Elvaco web site at http://www.elvaco.com.

3 Introduction

3.1 Product configuration

Use the table below to find out the capabilities of your product.

Product name	Comments
CMeX50	Wireless M-Bus Receiver handling 800 Wireless M-Bus slaves

Table 1 Product configuration

3.2 Capabilities

The CMeX50 is a wireless M-Bus Receiver handling up to 800 wireless M-Bus slaves and up to 32 wired M-Bus slaves. The product can operate in all commonly used wireless M-Bus modes; T1, C1, and S1.

The CMeX50 will virtualize the connected wireless M-Bus slaves and the slaves will be readable using standard M-Bus commands. The CMeX50 can be read using RS232, USB and standard M-Bus 2-wire. This makes the product usable in any standard M-Bus system, without having any knowledge about wireless M-Bus.

The CMeX50 can be used together with Elvaco CMe/CMeX Series products, which enables GSM/GPRS communication, TCP/IP communication, M-Bus Master extension modules and much more.

3.3 Applications

The CMeX50 should be used in the following scenarios:

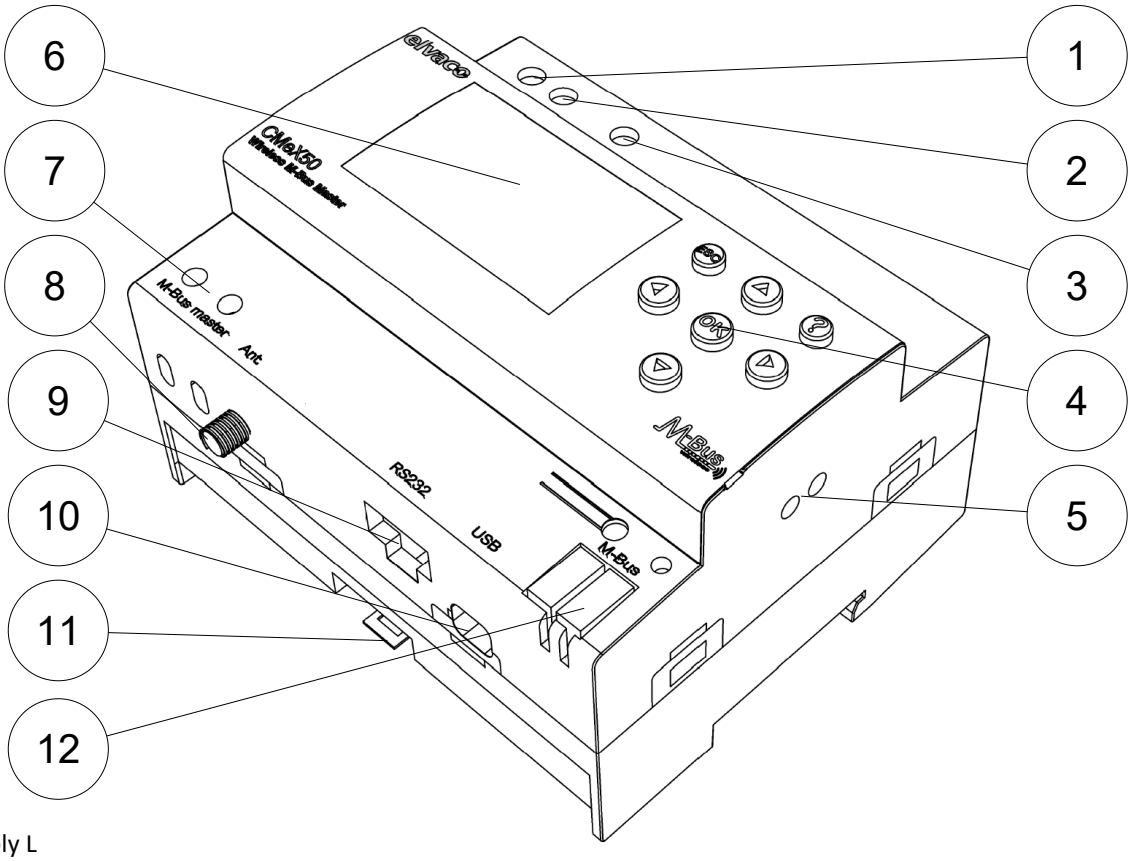
- Radio networks in villa-areas
- Radio networks in tenant owners associations
- Reading any type of wired M-Bus slave
- Reading any type of wireless M-Bus slave supporting T1, C1, or S1

4 Getting Started

This chapter covers the steps required for getting the CMeX50 installed and operational.

The CMeX50 is very flexible and can be configured on site using the display or by using standard M-Bus commands. This section covers important parts to take into consideration during the physical installation phase.

4.1 Overview



1. Power supply L
2. Power supply N
3. Protective earthing
4. Keypad
5. IR interface right
6. LCD display
7. M-Bus master
8. Antenna connector
9. RS232 connector
10. USB connector
11. DIN-rail lock
12. M-Bus slave
13. IR interface left

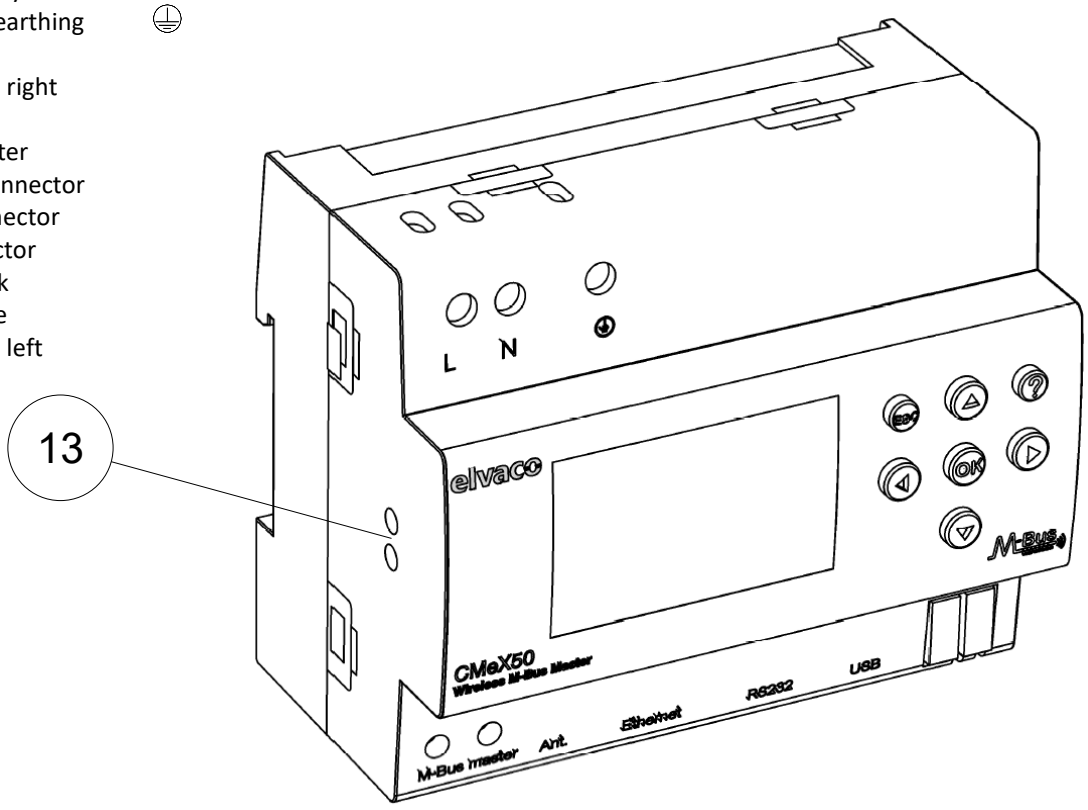


Figure 1 CMeX50 overview

4.2 Mounting

The product should be mounted on a DIN-rail. The DIN-lock (11) on the bottom is used to mount and demount the unit from the DIN-rail. To fully comply with safety regulations, a DIN-rail enclosure must cover the terminals.

4.2.1 M-Bus master port

M-Bus is a multi-drop 2-wire bus, with no polarity. Use a cable of area 0.25-1.5 mm^2, e.g. a standard telephone cable (EKKX 2x2x0.5). Connect the wiring to the screw connector (7). Do not exceed the maximum cable length of 1000 meters.

⚠ **IMPORTANT**

Please take the following in consideration:

- The product handles 32 slaves. Overloading the bus will show an error message on the display and turn off the M-Bus bus.
- All connected M-Bus slave devices must have unique primary or secondary M-Bus addresses depending on addressing mode used.

4.2.2 M-Bus slave ports

The product is equipped with four different M-Bus slave ports (IR interface left (13), RS232 (9), USB (10) and M-Bus slave interface (12)) to enable wide integration. These ports can be used to:

1. Read the connected wireless M-Bus slaves as normal M-Bus slaves
2. Read the connected wired M-Bus slaves (transparent)

Slaves can be read using primary and/or secondary addressing. The CMeX50 itself is available as an M-Bus slave with the secondary address equal to the serial number.

4.2.2.1 IR interface

The IR interface is used as a standard transparent M-Bus interface over IR. This port can be used together with M-Bus Metering Gateway products from Elvaco, i.e. CMe2100 and CMe3000. In this way it is possible to extend the product with TCP/IP and GPRS communication.

4.2.2.2 RS232 interface

The RS232 interface is used as a standard transparent M-Bus interface over RS232. Use an RS232 cable (RJ45 to D-SUB9) and connect to any standard RS232 D-SUB9 connector. Go to www.elvaco.com to order the cable.

4.2.2.3 USB interface

The USB interface is used as a standard transparent M-Bus interface over USB. Use the included USB cable and connect to any standard USB master port. When using Microsoft Windows® operating systems, a virtual comport will automatically be generated when connecting the product to the computer. Additional USB drivers can be downloaded from the Elvaco web site: www.elvaco.com.

4.2.2.4 M-Bus 2-wire interface

The M-Bus 2-wire interface acts like any other M-Bus slave device on the 2-wire bus. The nominal current is 1T (1.5mA). This interface can be directly used with any standard M-Bus master device.

4.2.3 IR Interface with ABB electricity meters or CMeX Series modules

If the IR interface is to be used beside an ABB electricity meter or other CMeX module, the IR shield (5) should be removed. The CMeX50 should be mounted on the left side of the ABB electricity meter. There shall be no space between the CMeX50 and the ABB electricity meter or other CMeX module. (Do not remove the shield if not used beside an ABB electricity meter or CMeX module.)

4.2.4 Antenna

The antenna should be connected to the SMA connector (8). Depending on signal strength and environment, a different antenna with extension cable can be used.

⚠ **IMPORTANT**

Please take following in consideration:

- CMeX50 should be connected to the antenna when the wiring of the antenna cable is done. Otherwise, the SMA connection can be damaged
- Do not mount the antenna close to any metallic objects
- Do not mount the antenna close to the M-Bus 2-wire bus
- Do not mount the antenna inside a metallic cabinet

4.2.5 Wireless M-Bus Receiver

The product can handle any type of wireless M-Bus slave following the wireless M-Bus standard or the OMS specification. The product can operate in single or combined modes; T1, C1, T1&C1, and S1.

The CMeX50 handles AES encryption of meters with individual key or a global key. If no key for an encrypted meter is installed, the product will on the M-Bus slave ports respond with a container mode M-Bus telegram with encrypted wireless M-Bus telegram, see 6.1.4.7. CMeX50 supports encryption modes 5 and 7 in compliznace with the OMS standard.

See section 4.3 for more information on how to install the wireless M-Bus slaves using the LCD display.

4.2.6 Power supply

The installation should be performed by a qualified electrician or an installer with the required knowledge. The power supply should be connected via a clearly marked, easily accessible and nearby switch so the unit can be switched off during service work. The main supply should be connected to screw terminal (1) and screw terminal (2). Main supply voltage should be in the range of 100-240 VAC, 50/60 Hz. Connect protective earthing to screw terminal (3).

4.3 Step by step installation of wireless M-Bus meters using the display

This section describes a step by step guide how to install wireless M-Bus slaves in the product. The installed wireless M-Bus slaves will be readable on any of the wired M-Bus slave ports on completion. This section does not cover wireless M-Bus slaves which run in encrypted mode. Please see section 5 for a complete description how to operate the CMeX50 display menu.
Up/down keys are used to scroll through the options.

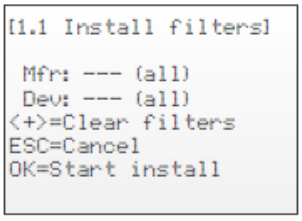
Step by step guide:

1. After power up, following screen is shown:

2. Press **OK** key to be able to enter the 4 digit password before the product can be accessed using the key pad.
3. Enter the default password **0000** and press **OK** key**:**

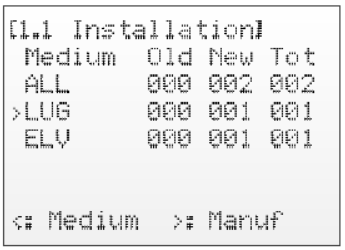
4. Select menu choice *1. Installation* by pressing **OK** key on selected item:

5. Select Manufacturer (Mfr) or Meter (Dev). If left blank (---), all meters will be installed. Proceed by pressing **OK**:



6. *1. Start, keep* - Keep already installed meters and stay in installation mode for 60 min, (or chosen time).
   2. Start, clear all. – Clear all installed meters.
   3. Start, cont. – Keep already installed meters and stay in installation mode (until it is manually turned off).
   Change installation choice with up/down keys, choose installation by pressing **OK**:

7. Now the product will listen for all wireless M-Bus slaves in range which operates in wireless M-Bus mode C1 and T1. The following information is shown on the display:



8. The installation will by default proceed for 60 minutes, but can be stopped at any time by pressing the **ESC** key.
9. The installed wireless M-Bus slaves can be read on any M-Bus slave port using primary or secondary addressing on 2400 baud.

5 LCD display

The product is equipped with a display and a keypad to navigate in the menu. After power up, the product will stay in sleep mode until any key is pressed. The product will ask for a login password, which is default set to **0000.**

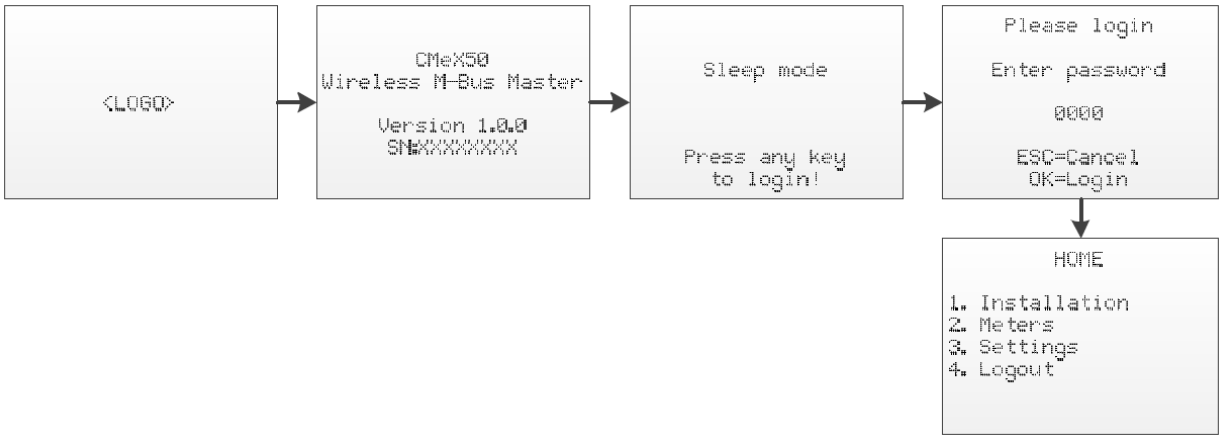


Figure 2 Power on sequence

5.1 Menu navigation

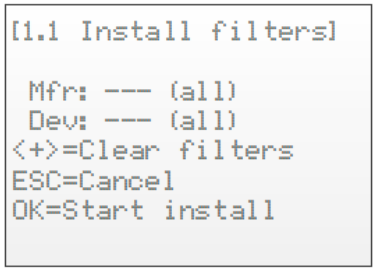
The **Up**/**Down** keys are used to select menu. The **OK** key is used to select the current menu choice. **ESC** key will cancel current choice or return to previous menu. **?** key will show help information for current menu page. **Right/Left** keys are used to move cursor in an editor or to access the bottom menu (when available).

Home menu page is the top level of the menu system. Pressing **ESC** key in this menu will force the product to enter sleep mode.

5.2 Installation menu page

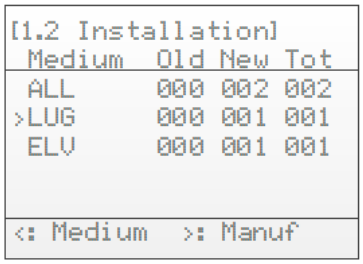
1. Select menu choice *1. Installation* by pressing **OK** key on selected item:

2. Select Manufacturer (Mfr) or Meter (Dev). If left blank (---), all meters will be installed. Proceed by pressing **OK**:



3. *1. Start, keep* - Keep already installed meters and stay in installation mode for 60 min, (or chosen time).
   2. Start, clear all. – Clear all installed meters.
   3. Start, cont. – Keep already installed meters and stay in installation mode (until it is manually turned off).
   Change installation choice with up/down keys, choose installation by pressing **OK**:

4. Now the product will listen for all wireless M-Bus slaves in range which operates in wireless M-Bus mode C1 and T1. The following information is shown on the display:



5. The installation will by default proceed for 60 minutes, but can be stopped at any time by pressing the **ESC** key.

6. The installed wireless M-Bus slaves can be read on any M-Bus slave port using primary or secondary addressing on 2400 baud.

5.2.1 Installation progress page

Installation progress page will show current installation procedure status. Meters are grouped by manufacturer or medium. Pressing **Left/Right** keys will switch between group by manufacturer and group by medium. Pressing **OK** key on any selected group (medium or manufacturer), will show all meters matching selected criteria.

See Figure 3 for an overview of the informational parts of the installation procedure menu page.

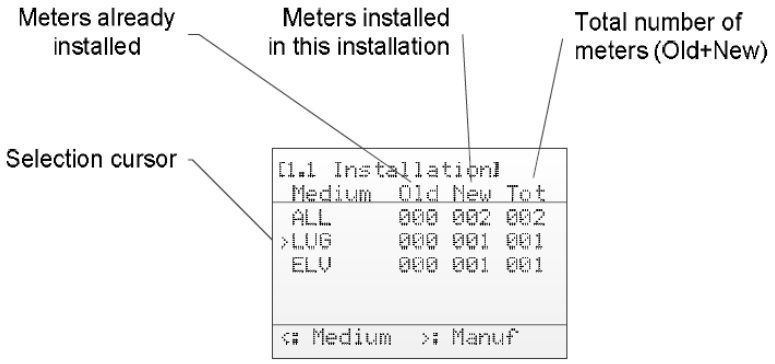


Figure 3 Installation page: Group by manufacturer

Figure 4 below shows a schematic overview of the navigation when the installation procedure is running.

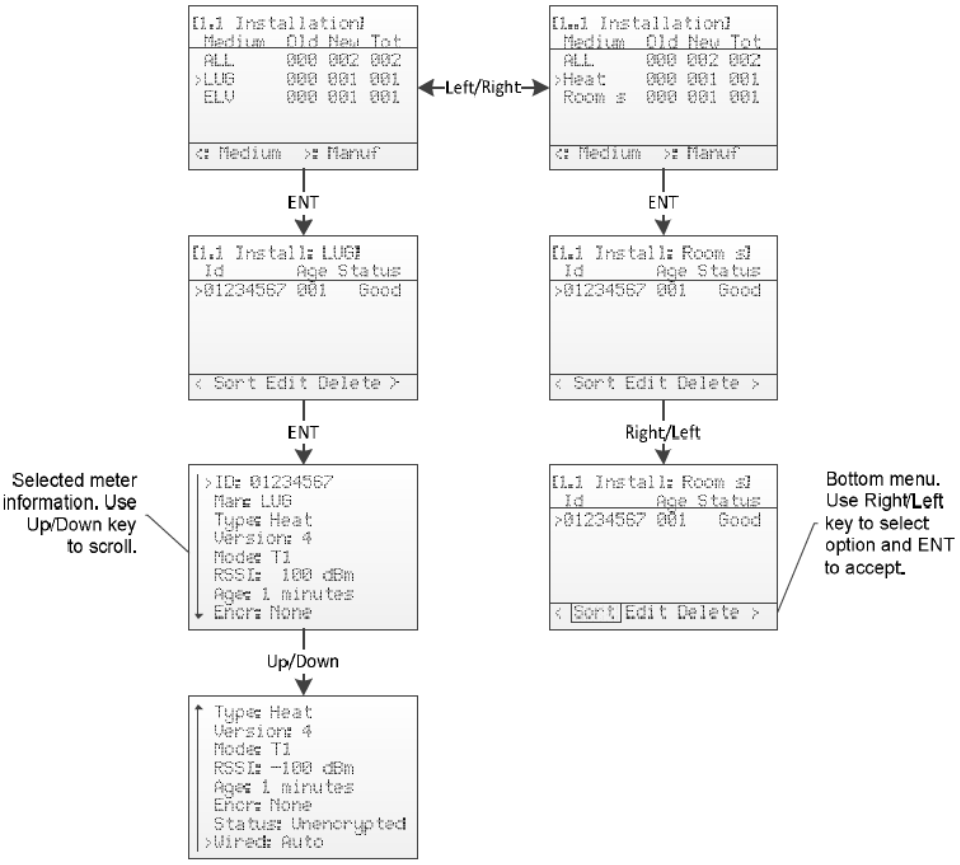


Figure 4 Installation page navigation overview

5.3 Meters menu page

In the meters menu (on the Home screen, choose 2. Meters), installed meters can be viewed and removed. The menu layout is similar to the installation procedure page.

See Figure 5 for an overview of the informational parts of the meters menu page.

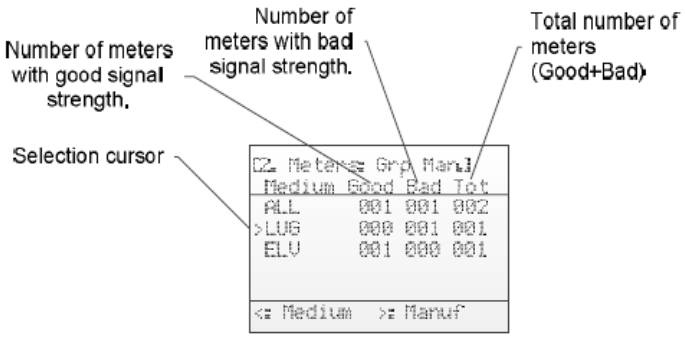


Figure 5 Meters menu page overview

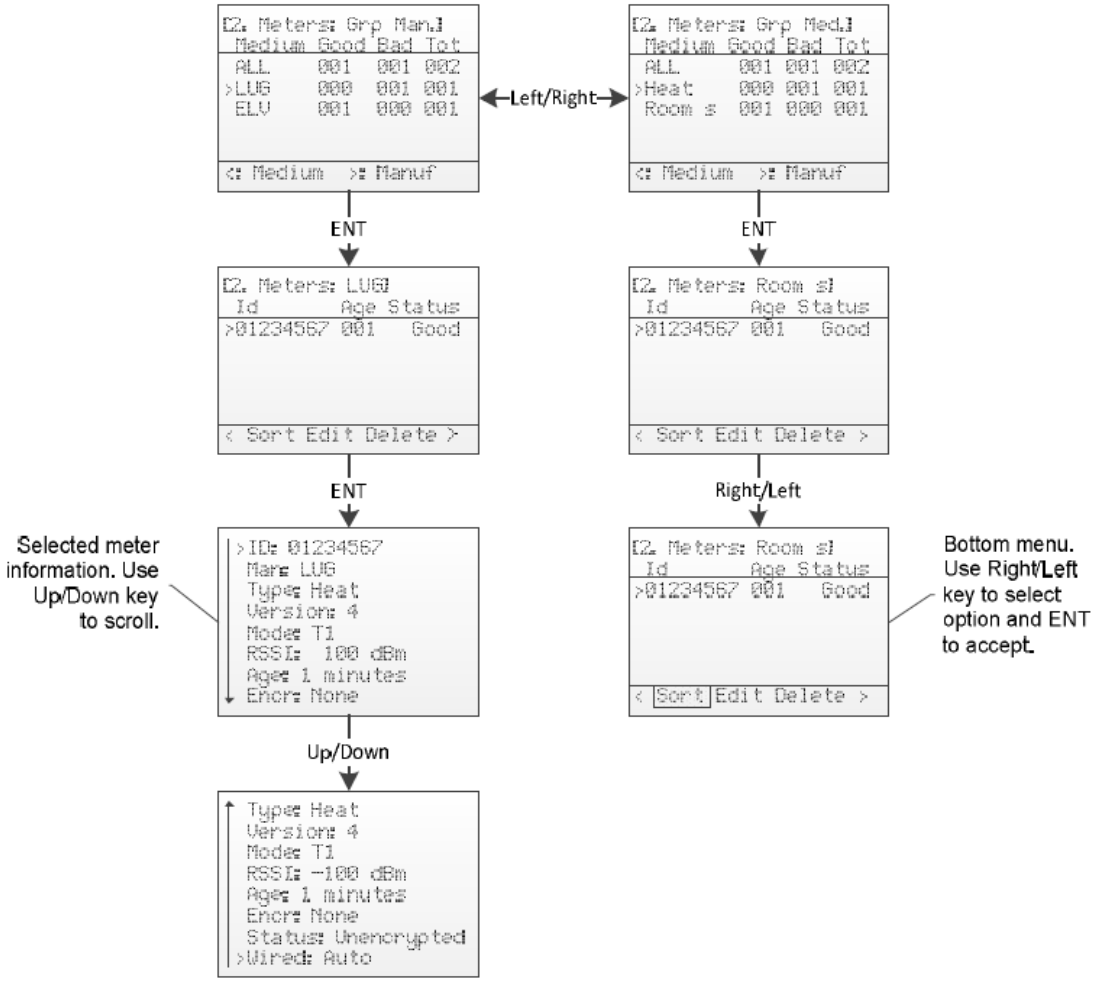


Figure 6 Meters menu navigation overview

5.3.1 Sort meters

Access the bottom menu using **Right/Left** keys. The selected option will be highlighted. When *Sort* is selected, press **OK** key to shift between:

1. Sort by Id
2. Sort by Age
3. Sort by Status

See Figure 7 for a schematic overview of the sort procedure.

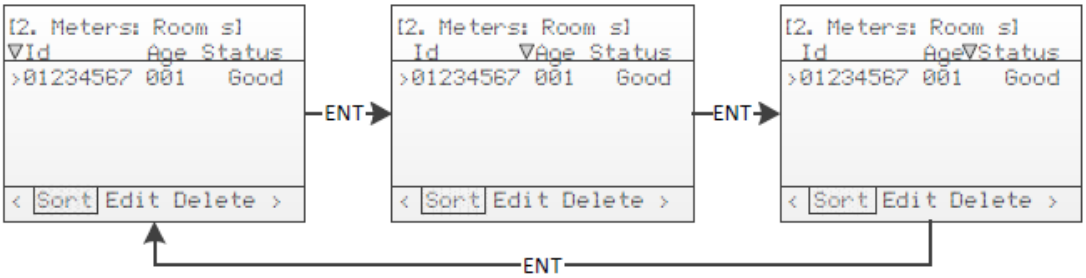


Figure 7 Sort meters

5.3.2 Edit meter

Move the cursor to the meter which should be edited by pressing **Up/Down** keys.

Access the bottom menu using **Right/Left** keys. The selected option will be highlighted. When *Edit* is selected, press **OK** key to enter the meter edit menu page.

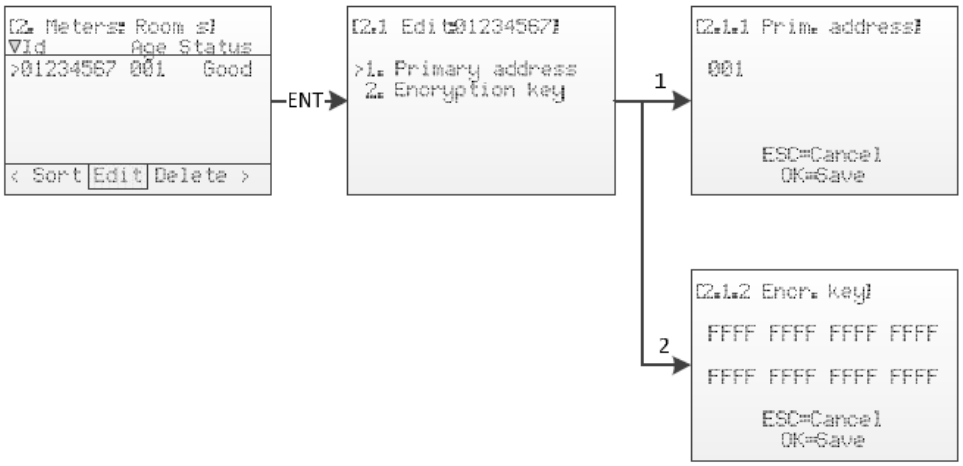


Figure 8 Edit meter

5.3.2.1 Edit meter primary address

Select menu choice *1. Primary address* using **Up/Down** keys and press **OK** key.

The primary address is used on the wired M-Bus interfaces to access the M-Bus meter using primary addressing. A valid primary address is between 0 and 250.

Change the primary address of the meter using **Up/Down** keys and move the cursor using **Right/Left** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

5.3.2.2 Edit meter encryption key

Select menu choice *2. Encryption key* using **Up/Down** keys and press **OK** key.

When an encrypted telegram is received, the CMeX50 will check if there is any installed key for this meter. If not, the CMeX50 will try the default key. If the encryption fails, the telegram will be placed in a "container" and be sent encrypted. It can be decrypted later in the process. This kind of container telegram is normally not readable by a standard M-Bus readout software.

If the key fits (either the unique meter key or the default key) the telegram will be decrypted and sent unencrypted.

The encryption key can be obtained from the manufacturer of the wireless M-Bus meter.

Change the encryption key of the meter using **Up/Down** keys and move the cursor using **Right/Left** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

5.3.2.3 Meter information page

The meter information page is accessed by pressing the **OK** key on a selected meter. The meter information page gives a good overview of the meter and also if the meter could be readout using a standard M-Bus software on the wired M-Bus interfaces.

See Table 2 for a complete description of the information shown on the information page.

Name	Description	Possible values
ID	Identification of the meter	00000000-99999999
Man	Manufacturer	M-Bus Three letter manufacturer code according to the Flag Association, see http://www.dlms.com/flag
Type	Device type	M-Bus Device type according to the M-Bus standard document prEN_13757-3_2011.
Version	Version	M-Bus version field, 0-255
Mode	Wireless mode	T1,C1,S1
RSSI	Signal strength in dBm	-55 dBm to -107 dBm
Age	Time since last received telegram in minutes	0-9999 minutes
Encr.	Encryption mode	None AES_COUNTER = AES counter mode DES_CBC_0 = DES CBC vector 0 DES_CBC_N0 = DES CBC vector not 0 AES_CBC_0 = AES CBC vector 0 AES_CBC_N0 = AES CBC vector not 0 Reserved = All others
Status	Status of the last received telegram.	Unknown = No telegram received Unencrypted = Telegram is unencrypted Unknown CI = The CI-field received is unknown for the product Encrypted = Telegram is encrypted Decrypt error = Encryption method and key is set for the meter, but the telegram could not be decrypted Decrypted = Encryption method and key is set for the meter and the telegram decrypted successfully

Wired	Wired status of the telegram. This field gives information if the information from the meter is available for readout on the M-Bus wired interface.	Auto = Telegram is readable on the wired interface using any standard M-Bus readout software. Container = Meter data is encrypted and encryption mode and/or key is not set or wrong key set. The meter data can be read on the wired M-Bus interface, but is encapsulated in an M-Bus data container message according to EN_13757-3_2011.

Table 2 Meter information page fields

5.4 Settings menu page

The settings menu page is used to change configuration of the product.

See Figure 9 below for a schematic view of the settings menu page navigation.

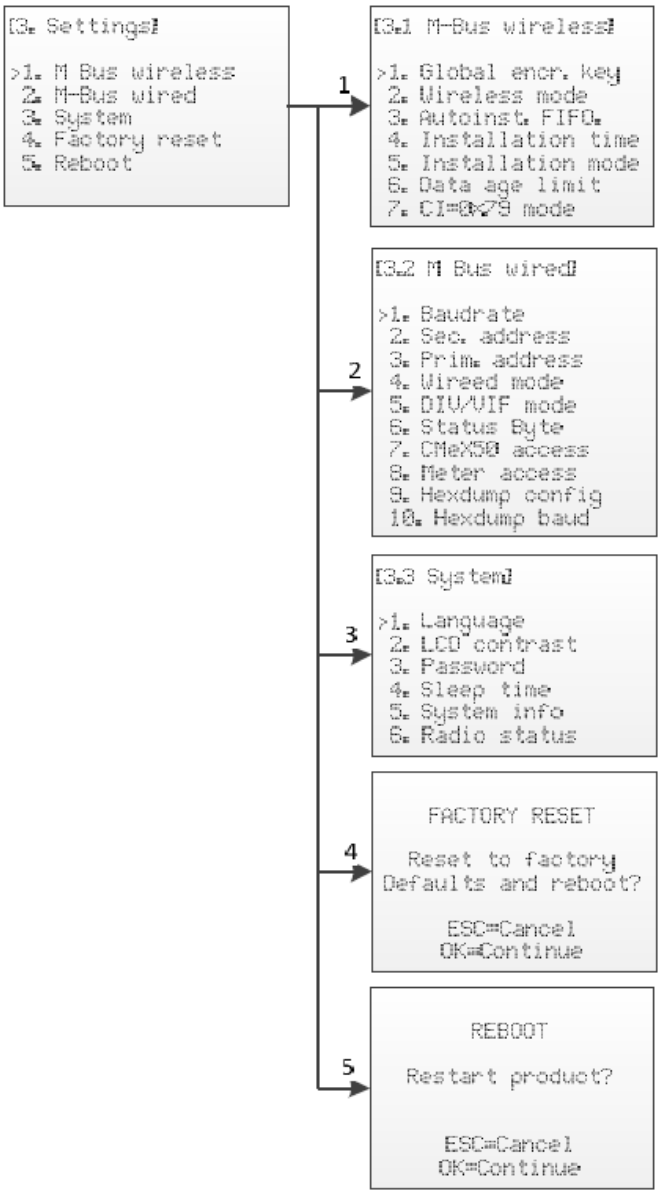


Figure 9 Settings menu page navigation overview

5.5 M-Bus wireless settings

The M-Bus wireless menu page is used to change the configuration and behavior of the Wireless M-Bus Receiver of the product.

See Figure 10 for a schematic overview of the M-Bus wireless settings menu page.

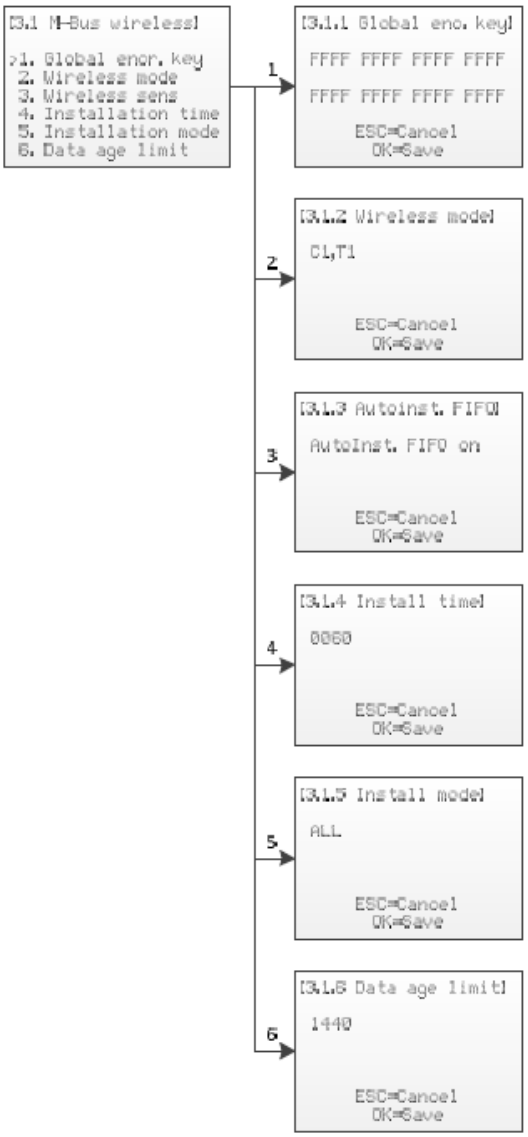


Figure 10 M-Bus Wireless settings menu

5.5.1 Edit global encryption key

Select menu choice *1. Global enc. key* using **Up/Down** keys and press **OK** key.

The global encryption key is used by meters configured to use the global key for encryption/decryption. This is useful when multiple meters have the same encryption key.

The encryption key is used to decrypt the telegrams received from the wireless M-Bus slave, which enables standard wired M-Bus readout. If a meter is sending encrypted telegrams and there is no/wrong encryption key entered, the readout on the wired M-Bus interface will return a container telegram with encrypted data. This kind of container telegram is normally not readable by a standard M-Bus readout software.

The encryption key can be obtained by the manufacturer of the wireless M-Bus slave.

Change the encryption key by using **Up/Down** keys and move the cursor using **Right/Left** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

5.5.2 Edit wireless mode

Select menu choice *2. Wireless mode* using **Up/Down** keys and press **OK** key.

The wireless mode is used to configure the product to be able to communicate with different types of M-Bus wireless slaves.

The Cx WIDE modes use mode T receiver configuration and may allow reception of “problematic” mode Cx meters with excessive frequency or data rate error. Use WIDE modes only if absolutely necessary.

Change the wireless mode of the product by using **Up/Down** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

Table 3 describes possible M-Bus wireless modes/combined modes:

Name	Description
S	Product is configured to communicate with S1 slaves.
T	Product is configured to communicate with T1 slaves.
T+Ca	Product is configured to communicate with T1 and C1a slaves.
T+Cb	Product is configured to communicate with T1 and C1b slaves.
T+Ca+Cb	Product is configured to communicate with T1, C1a and C1b slaves.
Ca	Product is configured to communicate with C1a slaves.
Cb	Product is configured to communicate with C1b slaves.
Ca+Cb	Product is configured to communicate with C1a and C1b slaves.
Ca WIDE	Product is configured to communicate with C1a slaves, wide mode.
Cb WIDE	Product is configured to communicate with C1b slaves, wide mode.
Ca+Cb WIDE	Product is configured to communicate with C1a and C1b slaves, wide mode.

Table 3 Wireless M-Bus modes

5.5.3 Change storage method for meters

Select menu choice *3. Autoinst. FIFO.* using **Up/Down** keys and press **OK** key.

The storage method determines how to save new meters. Up to 800 meters can be stored in the CMeX50. See Table 4 for description how to use the different modes.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

Table 4 describes possible M-Bus wireless modes/combined modes:

Name	Description
On	This mode is used to save according to the FIFO model (First In First Out). When 800 meters are stored and a new meter is found, the oldest meter will be removed from the list and the new will be saved instead.
Off	In this mode, the first found 800 meters are saved. After that, no more meters can be found and saved.

Table 4 Storage method for meters

5.5.4 Edit installation time

Select menu choice *4. Install time* using **Up/Down** keys and press **OK** key.

The installation time is the time the product will stay in installation mode when starting an installation.

Change the installation time of the product by using **Up/Down** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

5.5.5 Edit installation mode

Select menu choice *5. Install mode* using **Up/Down** keys and press **OK** key.

The installation mode is used to configure which wireless M-Bus telegrams are accepted for installing new wireless M-Bus slaves in installation mode. See Table 5 for available modes.

Change the installation mode of the product by using **Up/Down** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

Name	Description
SND_IR	Only telegrams of type SND_IR will be able to add new meters during installation. See 6.1.4.
ALL	All valid telegrams will be able to add new meters during installation

Table 5 Installation modes

5.5.6 Edit data age limit

Select menu choice *6. Data age limit* using **Up/Down** keys and press **OK** key.

The data age limit is the maximum time in minutes a wireless M-Bus telegram is valid for readout on the wired M-Bus interface. If a telegram is older than the data age limit, the corresponding virtualized wired M-Bus slave will stop responding to any requests.

Change the installation time of the product by using **Up/Down** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

5.5.7 Handling of telegram with CI = 0x79 och 0x69 (Compact data / format frame)

Select menu choice 7. *CI=0x79* using **Up/Down** keys and press **OK** key.

Change the installation time for the product using **Up/Down** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

Name	Description
Ignore	Ignore telegram
Put in container	Save the whole received telegram in original condition. The telegram will be placed in a ”data container” when retrieved via wired M-Bus.

Table 6 Choice of container, not container mode

5.6 M-Bus wired settings

The M-Bus wired menu page is used to change the configuration and behavior of the wired M-Bus slave interface of the product. The wired M-Bus interface is used to readout the virtualized wireless M-Bus slaves by a standard M-Bus Master.

See Figure 11 for a schematic overview of the M-Bus wireless settings menu page.

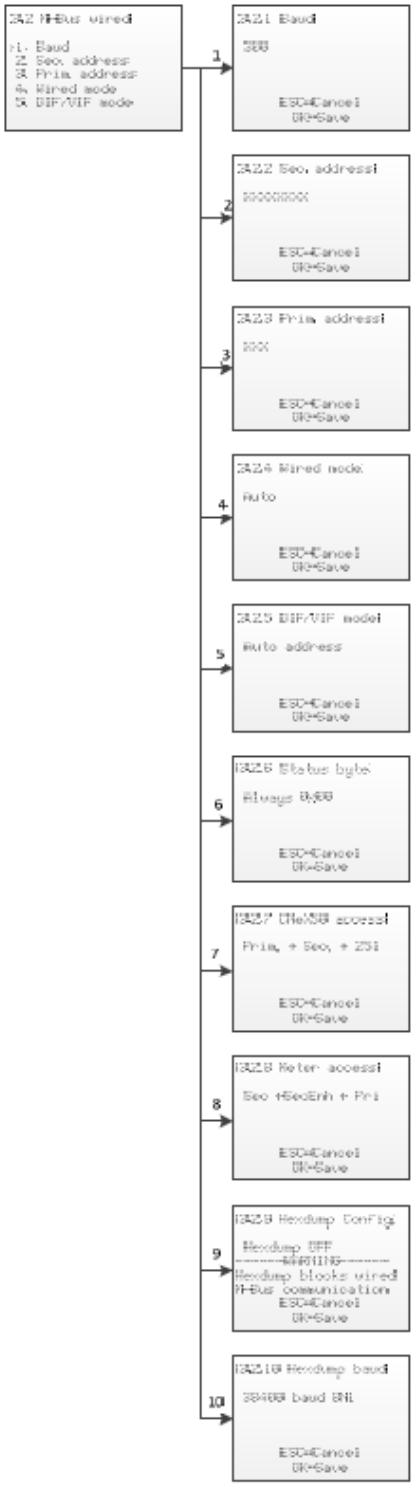


Figure 11 Wired M-Bus settings menu

5.6.1 Edit wired M-Bus baud rate

Select menu choice *1. Baud* using **Up/Down** keys and press **OK** key.

The wired M-Bus baud rate is the speed to use when communicating with the M-Bus wired interface. Accepted baud rates are 300, 600, 1200, 2400, 4800 and 9600. This setting is global for all virtualized M-Bus slaves and the CMeX50 M-Bus slave implementation.

Change the baud rate key by using **Up/Down** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

5.6.2 Edit secondary address of the CMeX50

Select menu choice *2. Sec. address* using **Up/Down** keys and press **OK** key.

The secondary address of the CMeX50 is used when using secondary addressing to access the M-Bus wired slave interface of the product.

Change the secondary address of the product by using **Up/Down** keys and move the cursor using **Right/Left** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

5.6.3 Edit primary address of the CMeX50

Select menu choice *3. Prim. address* using **Up/Down** keys and press **OK** key.

The primary address of the CMeX50 is used when using primary addressing to access the M-Bus wired slave interface of the product. The CMeX50 can also always be accessed using the primary address 251.

Change the primary address of the product by using **Up/Down** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

5.6.4 Edit wired mode

Select menu choice *4. Wired mode* using **Up/Down** keys and press **OK** key.

The wired mode is used to configure the product to encapsulate all wireless M-Bus telegrams in containers or trying to send the data to the requesting M-Bus master as a standard M-Bus telegram with readable M-Bus data. See section 6.1.4 for more information about wired mode and telegram handling.

Change the wired mode of the product by using **Up/Down** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

5.6.5 Edit DIF/VIF mode

Select menu choice *5. DIF/VIF mode* using **Up/Down** keys and press **OK** key.

The DIF/VIF mode is used to configure the product to add optional information to wireless M-Bus telegrams on the wired M-Bus interface. See section 6.1.4 for more information about the DIF/VIF mode and telegram handling.

Change the DIF/VIF mode of the product by using **Up/Down** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

5.6.6 Change Status byte

Select menu choice *6. Status byte* using **Up/Down** keys and press **OK** key.

Here you select what should be in the byte STATUS in the header of the wired M-Bus telegram when collecting data from a virtualised meter.

Name	Description
Always 0x00	Always 0x00
Wireless status	STATUS byte from long (CI=0x72) or short (CI=0x7A) application header in received radio telegram or 0x00 if such header is missing.

Change the product's DIF/VIF mode by using **Up/Down** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

5.6.7 Change CMeX50 access

Select menu choice 7. *CMeX50 access* using **Up/Down** keys and press **OK** key.

In this menu you choose which addressing modes that can be used on wired M-Bus for access to CMeX50.

Name	Description
Prim + Sec + 251	Primary address that may have been selected in menu **3.2.3**, secondary address that have been selected in menu **3.2.2** (normally CMeX50 serial number) and the fixed primary address 251.
Address 251 only	Only the fixed primary address 251.

Change the product's DIF/VIF mode by using **Up/Down** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

5.6.8 Change Meter access

Select menu choice 8. *Meter access* using **Up/Down** keys and press **OK** key.

Meter access chooses which addressing modes that can be used on wired M-Bus for access to the virtualized meters.

Change access mode for the product by using **Up/Down** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

Name	Description
Sec + SecEnh + Pri	Secondary addressing, enhanced secondary addressing (with CMeX50 "fabrication number") and primary addressing.
SecEnh only	Only enhanced secondary addressing (with CMeX50 "fabrication number").

5.6.9 Change Hexdump configuration

Select menu choice 9. *Hexdump config* using **Up/Down** keys and press **OK** key.

WARNING, if the hexdump is used (if this value is set to other than OFF), the wired M-Bus will not work.

The hexdump is used for reading directly from received wireless messages to a PC (connected via USB or RS232 to CMeX50).

Name	Description

OFF	Normal operation, wired M-Bus-, RS-232- and USB ports used for M-Bus.
Info only	Short information about received radio telegram is sent out on the serial port in real time. Meters can be installed and the telegrams are stored as usual in the CMeX50's memory, but the telegrams can not be collected via wired M-Bus since the serial port is busy.
Info + Tgm	Same as above, but the complete content of the telegram is also sent out on the serial port.
Info only sniffer	Short information about received radio telegram is sent out on the serial port in real time. This is a ”hexdump mode”, meters can not be installedand the telegrams are not stored in the CMeX50.
Info + Tgm sniffer	Same as above, but the complete content of the telegram is also sent out on the serial port.

Change between the different configuration modes by using the **Up/Down** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

Format on hexdump in mode ”Info only”:

```
iiiiiiii;*mmm;vv;dd;ss;rrrr;ww;<cr><lf>
```

where:

```
   iiiiiiii = Meter ID, eight digits

  *mmm = The meter’s manufacturer code in a four-character wide field.
         The first character is a space if bit 15 in
         ”manufacturer field” is zero (normal). If this bit
         is one, the first character is an asterisk (*).
         The three following characters are the meter’s manufacturer code
         In the shape of three ASCII characters.

  vv   = The meter’s ”Version byte” in hexadecimal form, two characters.

  dd   = The meter’s ”Device type byte” in hexadecimal form,
         two characters.

  ss   = The meter’s ”Status byte” in hexadecimal form, two characters.

  rrr  = Received signal strength (RSSI) in the unit dBm.
         Right aligned in a four-character wide field.

  ww   = Wireless M-Bus mode, two characters:
           ” S” = Mode S
           ” T” = Mode T
           ”Ca” = Mode C, frame type A
           ”Cb” = Mode C, frame type B
  <cr> = Carriage return, 0x13
  <lf> = Line feed, 0x10
```

```
Example:
00028954; ELV;20;1B;00; -83; T;
```

In hexdump mode ”Info + Tgm” is the same string as above, without <cr><lf> sent, followed by the telegrams content in hexadecimal form with two characters per byte. At the end is a semicolon followed by <cr><lf>.

```
Example:
00028954; ELV;20;1B;00; -83; T;57449615548902002 01B7AE400000002...0F;<cr><lf>
                               | | |   |       | | | | | |   |
                              L-field = 0x57   | | | | | |   |
                                C-field = 0x44| | | | | |   |
                                  MFR-field = 0x1596 = ”ELV”|
                                      ID-field = 0x00028954 |
                                              VER = 0x20    |
                                                DEV = 0x1B  |
                                                  CI = 0x7A |
                                                    ACC = 0xE4
                                                      STATUS = 0x00
                                                        CONFIG = 0x0000
                                                            DIF = 0x02
```

5.6.10 Change Hexdump baud

Select menu choice 10. *Hexdump baud* using **Up/Down** keys and press **OK** key.

In this menu you choose which speed you should send data on the hexdump.

Change between the different baud rates by using the **Up/Down** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

5.7 System settings

The System menu page is used to change configuration which is global for the product.

See Figure 12 for a schematic overview of the M-Bus wireless settings menu page.

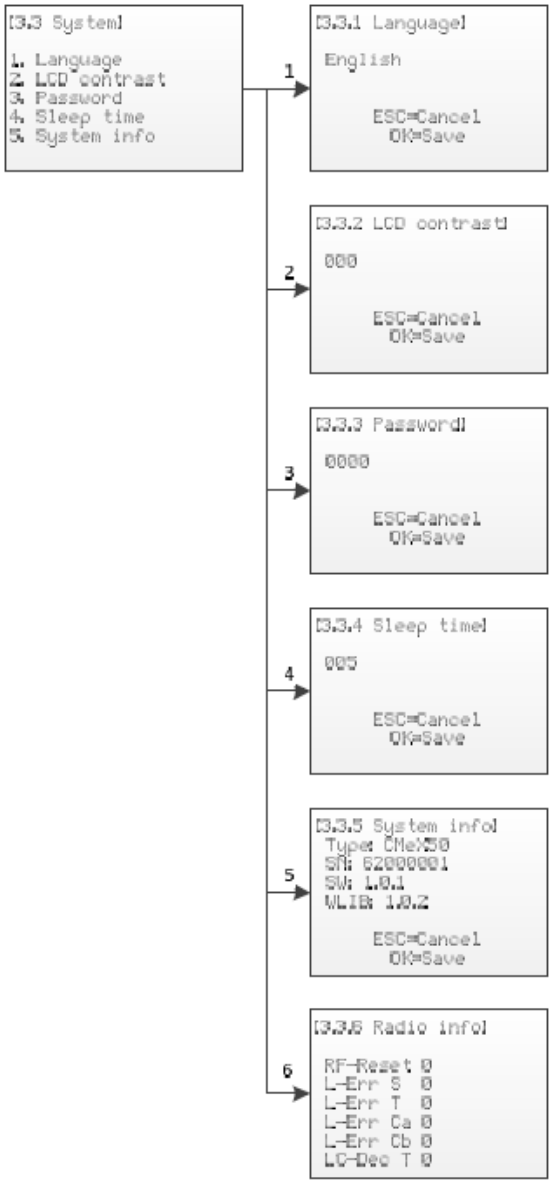


Figure 12 System settings menu

5.7.1 Edit language

Select menu choice *1. Language* using **Up/Down** keys and press **OK** key.

The language setting affects the language output on the product LCD display. Current languages are English, Swedish and German.

Change the language by using **Up/Down** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

5.7.2 Edit LCD contrast

Select menu choice *2. LCD contrast* using **Up/Down** keys and press **OK** key.

This setting changes the contrast of the LCD display.

Change the LCD contrast of the product by using **Up/Down** keys and move the cursor using **Right/Left** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

5.7.3 Edit password

Select menu choice *3. Password* using **Up/Down** keys and press **OK** key.

The password is used when a user is accessing the product using the LCD display.

Change the password of the product by using **Up/Down** keys and move the cursor using **Right/Left** keys. Retype the password when asked.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

5.7.4 Edit Sleep time

Select menu choice *4. Sleep time* using **Up/Down** keys and press **OK** key.

The sleep time is the time in minutes before the LCD display enters sleep mode and a new login is requested.

Change the sleep time of the product by using **Up/Down** keys and move the cursor using **Right/Left** keys.

Accept the changes by pressing **OK** or cancel by pressing the **ESC** key.

5.7.5 Show system information

Select menu choice *5. System info* using **Up/Down** keys and press **OK** key.

The system information page is used to show information about the product to the user.

Press the **ESC** key to exit the system information page.

5.7.6 Show radio status

Select menu choice 6*. Radio status* using **Up/Down** keys.

The radio status page is used to show status for the radio.

Name	Description
RF-Reset	Number of times the radio has been restarted because no telegram has been received in 30 minutes.
L-Err S	Number of times the L-field has been less than 9 in mode S.
L-Err T	Number of times the L-field has been less than 9 in mode T.
L-Err Ca	Number of times the L-field has been less than 9 in mode Ca.
L-Err Cb	Number of times the L-field has been 128, 129 or less than 11 in mode Cb.
LC-Dec T	Number of times the L- and C-field has had invalid 4/6-coding in mode T.
F-Dec T	Number of times invalid 4/6-coding has been found in RX FIFO-interrupt.
E-Dec T	Number of times invalid 4/6-coding has been found in RX End-of-Packet-interrupt.
H-Err Cx	Number of times other than 0x3D or 0xCD came after 0x54 in mode Cx.

C-Err S	Number of telegrams with at least one invalid CRC received in mode S
C-Err T	Number of telegrams with at least one invalid CRC received in mode T
C-Err Ca	Number of telegrams with at least one invalid CRC received in mode Ca
C-Err Cb	Number of telegrams with at least one invalid CRC received in mode Cb
Clear ALL errors	Press OK here to reset all above counters.

Press the **ESC** key to exit the system information page.

5.8 Reset to factory default

Navigate to menu choice *3.4. Factory default* and press the **OK** key. When accepting the question on the confirm page, the product will restore all configuration to default, remove all meters and reboot.

Reset to factory defaults can also be made using standard M-Bus command Application reset, see chapter 6.3.11.

5.9 Reboot the product

Navigate to menu choice *3.5. Reboot* and press the **OK** key.

6 Administration of the product

This chapter covers the wireless M-Bus implementation and wired M-Bus implementation of the product. The M-Bus implementation is according to the new M-Bus standard EN13757-2, EN13757-3, EN13757-4 (2011) and the OMS specification.

The product itself operates as a normal M-Bus slave, which can be addressed using primary and secondary addressing. The wired slave implementation is used to configure the product and read status information about connected slaves.

6.1 Wireless M-Bus Receiver

The product handles all widely used wireless M-Bus slaves which conforms to the wireless M-Bus standard and/or OMS specifications. Both wireless M-Bus slaves sending installation requests and slaves only sending spontaneous data can be handled.

6.1.1 Installation mode

Installation mode can be started using the display or by issuing M-Bus command on the wired M-Bus slave implementation on the product, see section 6.3.18.

When installation mode is activated, wireless M-Bus slaves sending SND_IR telegrams or SND_NR telegrams are automatically added to the slave list. The product can also be configured to only handle slaves which transmit SND_IR telegrams (installation requests), see section 5.5.5 and 6.3.19.

6.1.2 Normal operation

Installed wireless M-Bus slaves will be directly readable on the wired M-Bus slave port on the product. Depending on key handling and telegram contents, the information will be available as standard M-Bus data (decrypted and readable) or the data will be put in an M-Bus container, which contains the complete wireless M-Bus telegram received from the meter.

Container settings can be changed in the display or by issuing M-Bus command on the wired M-Bus slave interface, see section 5.6.4 and 6.3.21.

6.1.3 FAC mode

Currently the product cannot be used to open an FAC window for bidirectional communication. This is a feature which will be implemented in future releases.

6.1.4 Telegram handling

All telegrams from wireless M-Bus slaves are handled, but are handled differently depending on contents. If a telegram is encrypted or the C and CI-fields are unknown to the product, the telegram is always stored and available as container telegrams on the wired M-Bus interface.

Telegram types listed in Table 7 and Table 8 Handled CI-fields for “extended link layer” received from wireless M-Bus slaves are stored and can be read on the wired M-Bus slave interface with any standard M-Bus software. Only the latest telegram received from a wireless M-Bus slave is stored.

The product also adds an optional information block on the wired M-Bus interface before the actual wireless M-Bus telegram information. The information block added depends on the DIF/VIF mode set, see 5.6.5 and 6.3.22.

6.1.4.1 Handled C-fields

C-Field	Symbolic name	Description
0x44	SND-NR	Send unsolicited/periodical application data from meter without request from master unit (Send /No Reply)
0x46	SND-IR	Manually initiated sending of telegram with request for installation in master unit (Send Installation Request)
0x08, 0x18, 0x28 or 0x38	RSP-UD	Sending of application data after a request from the master (response of user data)

Table 7 Handled C-Fields

6.1.4.2 Handle CI-fields

6.1.4.2.1 Handled CI-fields for ”Extended Link Layer”

CI- Field	Designation	Description
0x8C	Type I with CC- and ACC-field	Encryption not possible.
0x8D	Type II with CC-, ACC-, SN- and PLCRC-field	Encryption type 1 for extended link layer is supported (AES128/CTR).
0x8E	Type III with CC-, ACC-, M2-, and A2-field	Encryption not possible. The fields M2 and A2 are intended for destination address and are presently ignored by the product.
0x8F	Typ IV with CC-, ACC-, M2-, A2-, SN- and PLCRC-field	Encryption type 1 for extended link layer is supported (AES128/CTR). The fields M2 and A2 are intended for destination address and are presently ignored by the product.

Table 8 Handled CI-fields for “extended link layer”

6.1.4.2.2 Handled CI-fields for application data

CI-Fält	Designation	Description
0x72	Normal data telegram with long application header	Telegram with 12-byte header. Secondary address for the corresponding virtualized meter on wired M-Bus is taken from the ID-field in this header.
0x73	”Compact frame” data telegram with ”long application” header	Same as above.
0x6B	”Compact frame” format telegram with ”long application” header	Same as above.
0x6F	”Application error”-telegram with ”long application” header	Same as above.
0x75	”Alarm”-telegram with ”long application” header	Same as above.
0x7A	Normal data telegram with ”short application” header	Telegram with 4-byte header. Secondary address for the corresponding virtualized meter on wired M-Bus is taken from the ID-field ”Link layer header”.

0x7B	”Compact frame” datatelegram with ”short application” header	Same as above.
0x6A	”Compact frame” format telegram with ” short application” header	Same as above.
0x6E	”Application error”-telegram with ”short application” header	Same as above.
0x74	”Alarm”-telegram with ”short application” header	Same as above.
0x79	”Compact frame” data telegram without header	Ignored or sent in data container on wired M-Bus depending on the setting ”CI=0x79 mode”, see **5.5.7**.
0x69	”Compact frame” format telegram without header	Same as above.
0x78	Normal data telegram without header	Secondary address for the corresponding virtualized meter on wired M-Bus is taken from the ID-field ”Link layer header”.
0xA1	Maddalena water meter with annual periodic reading	This is a special format for Maddalena water meters. The product supports decryption of these telegrams with Maddalena’s own algorithm that uses a 64-bit key. It is the last 8 bytes of installed decryption key (meter specific or global) that are used, the first 8 bytes of the key are ignored and are for example set to 0x00. The secondary address for corresponding virtualized meter on wired M-Bus is taken from the ID-field in ”Link layer header” whose format is *not* following the standard EN13757-4.
0xA2	Maddalena water meter with monthly periodic reading	Same as above.
0xA3	Maddalena water meter with weekly periodic reading	Same as above.

Table 9 Handled CI-fields for “extended link layer”

6.1.4.3 Wireless M-Bus telegram with no header

Figure 13 describes how data is mapped from the received wireless M-Bus telegram to the wired M-Bus telegram. The wired secondary address is taken from the M-Field and A-Field from the wireless M-Bus telegram. The wired A-Field is automatically assigned upon installation.

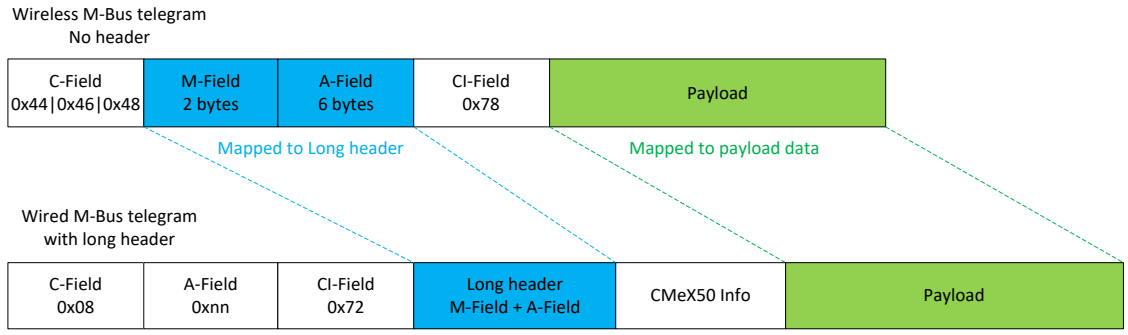


Figure 13 Wireless M-Bus telegram with no header data mapping

6.1.4.4 Wireless M-Bus telegram with short header

Figure 14 describes how data is mapped from the received wireless M-Bus telegram to the wired M-Bus telegram. The wired secondary address is taken from the M-Field and A-Field from the wireless M-Bus telegram. The wired A-Field is automatically assigned upon installation. The short header information received in the wireless M-Bus telegram is not used on the wired M-Bus interface.

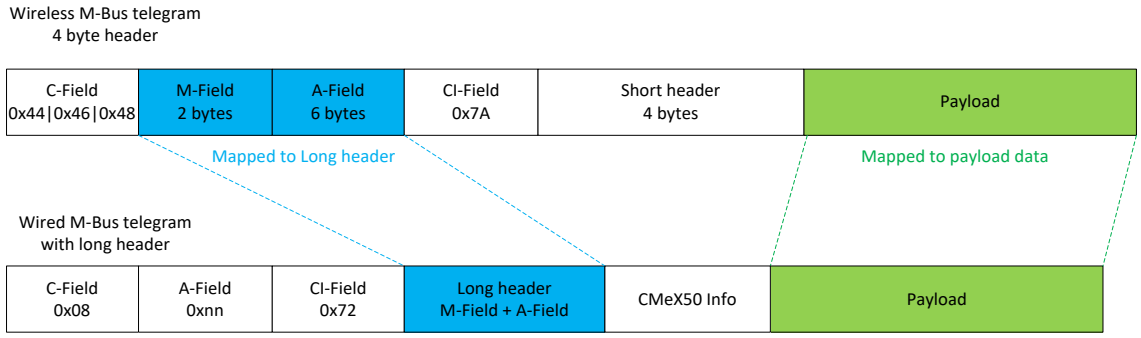


Figure 14 Wireless M-Bus telegram with short header data mapping

6.1.4.5 Wireless M-Bus telegram with long header

Figure 15 describes how data is mapped from the received wireless M-Bus telegram to the wired M-Bus telegram. The wired secondary address is taken from the long header from the wireless M-Bus telegram. The wired A-Field is automatically assigned upon installation.

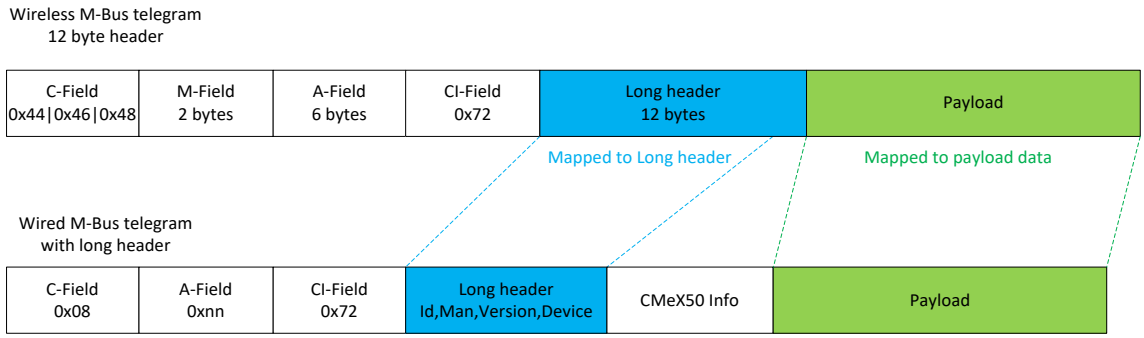


Figure 15 Wireless M-Bus telegram with long header data mapping

6.1.4.6 Wireless M-Bus telegram with extended link layer 0x8C and 0x8D

The actual CI-field contained in the payload data is handled according to previous description of no, short and long header.

6.1.4.7 Wireless M-Bus telegrams contained in wired M-Bus container

The wireless M-Bus telegram will be placed in an M-Bus container if one or more of the following criteria's are met:

1. C- and CI-Field are unknown to the product
2. The wireless M-Bus telegram is encrypted and no key is set
3. The wireless M-Bus telegram is encrypted, private or global key is set, but encryption mode is set to "None"
4. The wireless M-Bus telegram is encrypted, wrong key or wrong encryption mode is set
5. The global setting for wired mode is set to "Container"

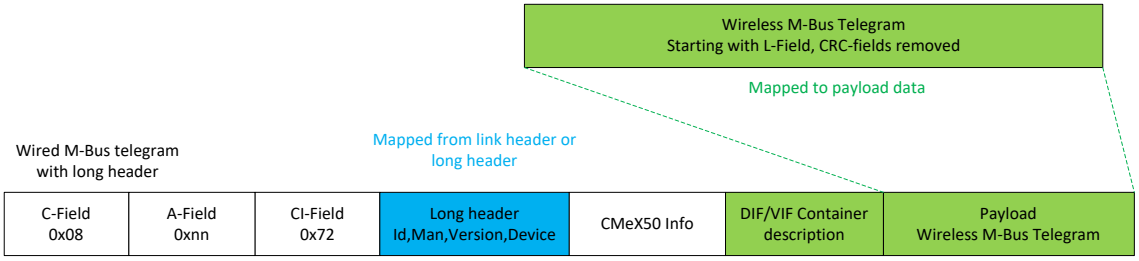


Figure 16 Wireless M-Bus telegram container data mapping

The DIF/VIF Container description is identified by following DIF/VIF data:

0x0D 0xFD 0x3B 0xnn

where 0xnn is the length of the complete wireless M-Bus telegram (length of the container).

6.2 Wired M-Bus slave port

The wired M-Bus slave interface of the product is used to read data received from wireless M-Bus slaves and also to read/write configuration of the CMeX50 product.

There are four ports available on the CMeX50: IR-interface, RS232, USB and M-Bus slave port. All ports have the same application layer functionality.

6.2.1 M-Bus product identification

The product can be identified by the following information:

- Manufacturer string = ELV
- Medium = 0x31 (OMS MUC)
- Generation = 01-09

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 the current software version.

6.2.2 M-Bus addressing

The product can be addressed using primary or secondary addressing. The secondary address of the product is by default set to the serial number of the product. The secondary address and primary address can be changed on demand using the display or by issuing standard M-Bus commands.

The connected wireless M-Bus slaves are addressed by primary and secondary address. The primary address of the connected slave can be changed, but not the secondary address which is taken from the wireless M-Bus telegram information received from the meter.

Connected wireless M-Bus slaves can also be read using enhanced secondary addressing, which is used when multiple CMeX50 exist on the same 2-wire M-Bus and the same wireless M-Bus slave resides on more than one CMeX50. This avoids possible multiple secondary addresses used on the same 2-wire M-Bus.

6.2.3 M-Bus baud rate

The product can handle 300, 600, 1200, 2400, 4800 and 9600 baud. No auto-baud detection is available. The baud rate can be changed using M-Bus standard commands. Default baud rate is set to **2400** baud.

6.2.4 M-Bus break

M-Bus master break signals are handled according to the M-Bus standard. Any on-going communication from M-Bus slave to master will be aborted on break detection from the M-Bus master.

6.2.5 Collision handling

The CMeX50 will generate a break and garbage data and send to the requesting M-Bus master on a collision between virtualized slaves and/or the CMeX50. In this way the installed M-Bus slaves will behave like any other normal wired M-Bus installation.

6.2.6 FCB-bit toggling (multi-telegram)

Multi-telegram mode, or FCB-bit toggling, is implemented in the product. By toggling the FCB bit with FCV bit set, the CMeX50 will reply with the following information:

Telegram 1: Configuration and status of the CMeX50

Telegram 2..n: Information and status of connected wireless M-Bus slaves

6.2.7 CMeX50 optional information field

The optional information field is included before the actual payload data received from the wireless M-Bus slave. This data is used to give more information about the received telegram. The optional information included depends on the DIF/VIF mode configured.

DIF/VIF mode	Description
Auto address	If the wireless M-Bus telegram is sent in a container on the wired M-Bus interface, the current CMeX50 secondary address will be included. If the wireless M-Bus telegram is not sent in a container, the current CMeX50 secondary address will not be included.
Address	The current CMeX50 secondary address will be included.
Address, Time	The current CMeX50 secondary address and the age of the received wireless M-Bus telegram will be included.
Address, Time, RSSI	The current CMeX50 secondary address, age and RSSI of the received wireless M-Bus telegram will be included.

Table 10 DIF/VIF modes

CMeX50 Info	Description
Address	DIF = 0x0C (8 digit BCD) VIF = 0x78 (Fabrication number) Data = 0xnnnnnnnn Where nnnnnnnn is the current secondary address in packed BCD of the CMeX50 product.
Time	DIF = 0x02 (16 bit integer) VIF = 0x75 (Actuality duration) Data = 0xnnnn Where nnnn is a 16 bit unsigned age in minutes of the received telegram.
RSSI	DIF = 0x01 (8 bit integer) VIF = 0xFD (RSSI) VIFE = 0x71 (RSSI) Data = 0xnn Where nn is the 8 bit signed RSSI calculated according to the following pattern: Resulting range: -128 ... -6dbm 0xnn in the range 1..62: 2 x 0xnn-130 = Actual RSSI 0xnn = 0 (No RSSI) 0xnn = 1 (-128dBm) 0xnn = 63 (> -6dBm)

Table 11 CMeX50 info data description and coding

6.2.8 Enhanced secondary addressing

The enhanced addressing is useful when multiple CMeX50 are connected to the same wired M-Bus master and one or more wireless M-Bus slaves are installed in multiple CMeX50. When using enhanced addressing, it is possible to address a specific wireless M-Bus slave on a specific CMeX50. Without this possibility, using normal secondary addressing, would result in collisions between the CMeX50 containing the same wireless M-Bus slave.

The enhanced secondary addressing works as a normal secondary address select with included information about the CMeX50 secondary address.

Figure 17 shows a standard secondary address select telegram.

Start 0x68	L-Field 0x0B	L-Field 0x0B	Start 0x68	C-Field 0x53	A-Field 0xFD	CI-Field 0x52	ID 4 bytes	Man 2 bytes	Gen 1 byte	Dev 1 byte	CS 1 byte	Stop 0x16

Figure 17 Secondary select telegram

Figure 18 shows an enhanced secondary address select telegram. The FAB field is the 4 byte BCD coded secondary address of the CMeX50 to select the slave from. The secondary address of the CMeX50 is default set to the fabrication number of the CMeX50.

Start 0x68	L-Field 0x11	L-Field 0x11	Start 0x68	C-Field 0x53	A-Field 0xFD	CI-Field 0x52	ID 4 bytes	Man 2 bytes	Gen 1 byte	Dev 1 byte	DIF 0x0C	VIF 0x78	FAB 4 bytes	CS 1 byte	Stop 0x16

Figure 18 Enhanced secondary select telegram

6.2.8.1 Enhanced secondary address search procedure

The search procedure of an enhanced secondary search could look like:

1. Perform a standard secondary search with Dev (Device type or medium) set to the CMeX50 device type (0x31). Fill Man (Manufacturer) and Gen (Generation) fields with wildcards.
2. After all CMeX50 devices found, perform an enhanced secondary address search on every CMeX50 found. Fill The FAB (Fabrication number) with the CMeX50 secondary address found in step 1.

Performing these steps will avoid possible collisions on the same wireless M-Bus slave which is installed on multiple CMeX50 products.

By using the age and RSSI information received, a filter of which slave to use on which CMeX50 can be obtained to optimize readout time.

6.3 M-Bus commands

6.3.1 Initialize slave (SND_NKE)

6.3.1.1 Master to slave

Byte index	Data	Description
0	0x10	Start character
1	0x40	C-Field = SND_NKE
2	0xnn	A-Field = Address of slave
3	0xnn	Checksum
4	0x16	Stop character

6.3.1.2 Slave to master

Byte index	Data	Description
0	0xe5	Acknowledge

6.3.2 Request user data (REQ_UD2)

Request user data from product or virtualized M-Bus slave and wait for slave response.

6.3.2.1 Master to slave

Byte index	Data	Description
0	0x10	Start character
1	0x4b | 0x5b | 0x6b | 0x7b	C-Field = REQ_UD2
2	0xnn	A-Field = Address of slave
3	0xnn	Checksum
4	0x16	Stop character

6.3.2.2 Slave to master (CMeX50 product addressed) – Telegram 1

The first telegram of the CMeX50 contains information and configuration of the product.

Values that are longer than one byte are always sent with least significant byte (LSByte) first. This also applies to text strings that are sent ”backwards”. The only exception is the encryption keys that are sent in the same order they are written and shown on the LCD-display.

Values formatted as ”packed BCD” are also sent with LSByte first, but MSNibble (bit 7..4) contains the most significant of the two numbers in each byte.

Unless otherwise indicated, all numerical values are without signs, i.e. positive (unsigned).

Byte index	Data	Description
0	0x68	Start 1
1	0xnn	L-field 1

2	0xnn	L-field 2 = L-field 1
3	0x68	Start 2
4	0x08	C-field = RSP-UD
5	0xnn	A-field = CMeX50 primary address
6	0x72	CI-field = 12-byte header follows
7-10	0xnn 0xnn 0xnn 0xnn	ID-field = CMeX50 secondary address, packed BCD
11-12	0x96 0x15	MFR-field = 0x1596 = ”ELV”
13	0xnn	VER-field, 0x01..0x09
14	0x31	DEV-field = 0x31 = ”OMS MUC”
15	0xnn	ACC-field, continuous counter 0.00..0xFF, 0x00..
16	0x00	STATUS-field, always 0x00 in this telegram
17-18	0x00 0x00	SIGNATURE-field, always 0x0000 in this telegram
19-24	0x0C 0x78 0xnn 0xnn 0xnn 0xnn	CMeX50 serial number, 8 digits packed BCD
25-33	0x0D 0xFD 0x0F 0x05 0xnn 0xnn 0xnn 0xnn 0xnn	CMeX50 program version, 5 digits ASCII-text. Example: 0x35 0x2E 0x36 0x2E 0x31 in transmit order ”1.6.5” which means MajorVersion=1, MinorVersion=6, PatchLevel=5
34-56	0x0D 0x7C 0x03 0x79 0x65 0x6B 0x10 0xnn 0xnn 0xnn 0xnn 0xnn 0xnn 0xnn 0xnn 0xnn 0xnn 0xnn 0xnn 0xnn 0xnn 0xnn 0xnn	Global AES128 key for decryption of telegram (0x79 0x65 0x6B = 'key' backwards)
57-63	0x01 0x7C 0x03 0x6F 0x6D 0x77 0xnn	0xnn = wireless M-Bus mode: 0x00 = S1 0x02 = T1 0x04 = T1 + C1a + C1b 0x06 = C1a 0x07 = C1b 0x08 = C1a + C1b 0x09 = T1 + C1a 0x0A = T1 +C1b 0x0B = C1a WIDE 0x0C = C1b WIDE 0x0D = C1a + C1b WIDE (0x6F 0x6D 0x77 = 'wmo' backwards, wireless mode)
64-70	0x01 0x7C 0x03 0x65 0x73 0x77 0x00	This data field is no longer used, but is still transmitted due to compatibility reasons (0x65 0x73 0x77 = 'wse' backwards, wireless sensitivity)
71-78	0x02 0x7C 0x03 0x74 0x69 0x77 0xnn 0xnn	Installation time, 0xnnnn minutes. Allowed area 0..9999 minutes.

		(0x74 0x69 0x77 = 'wit' backwards, wireless installation time)
79-86	0x02 0x7C 0x03 0x73 0x69 0x77 0xnn 0xnn	Continued installation time, 0xnnnn minutes. (0x73 0x69 0x77 = 'wis' backwards, wireless installation *something...*)
87-93	0x01 0x7C 0x03 0x6D 0x69 0x77 0xnn	0xnn = Wireless installation mode: 0x00 = Only SND-IR-telegram can install meters. 0x01 = All allowed telegram types can install meters. (0x6D 0x69 0x77 = 'wim', wireless installation mode)
94-101	0x02 0x7C 0x03 0x65 0x67 0x61 0xnn 0xnn	0xnnnn = Time limit for wireless telegram in minutes. Allowed interval is 0 .. 9999 minutes. A virtual M-Bus slave will stop answering on wired M-Bus if the latest stored telegram from the corresponding wireless slave is older than this value. (0x65 0x67 0x61 = 'age' backwards)
102-111	0x04 0x7C 0x03 0x66 0x69 0x77 0xnn 0xnn 0xgg 0xgg	0xnnnn = Installation filter for manufacturer code: 0xFFFF = The filter is off. Meters from all manufacturers can be installed. Other values than 0xFFFF = only meters with the specific manufacturer code can be installed. 0xgggg = Installation filter for DEV (meter type): 0xFFFF = The filter is off. All meter types can be installed. 0x0000..0x00FF = Only the selected meter type can be installed (DEV = 0x00..0xFF). (0x66 0x69 0x77 = 'wif' backwards, wireless installation filter)
112-118	0x01 0x7C 0x03 0x69 0x63 0x77 0xnn	0xnn = Setup for continuous installation mode: 0x00 = Only time limit installation 0x01 = Continuous mode is activated (0x69 0x63 0x77 = 'wci' backwards, wireless continuous installation)
119-125	0x01 0x7C 0x03 0x6F 0x6D 0x74 0xnn	0xnn = Packing method or telegram: 0x00 = Automatic, wireless telegrams are repacked to simulate virtual wired M-Bus slaves if possible. At decryption error, wireless telegrams without header, unknown CI-code, etc, the telegram will automatically be placed untouched in a data container. 0x01 = All wireless telegrams are placed in a data container. (0x6F 0x6D 0x74 = 'tmo' backwards, wire-mode (!))
126-132	0x01 0x7C 0x03 0x66 0x64 0x74 0xnn	0xnn = DIF/VIF-Mode: 0x00 = Auto

		0x01 = Serial number 0x02 = Serial number, age 0x03 = Serial number, age, RSSI (signal strength) (0x66 0x64 0x74 = 'tdf' backwards, !)
133-139	0x01 0x7C 0x03 0x64 0x63 0x6C 0xnn	0xnn = LCD-contrast, offset from standard settings, 8-bits value with sign. Allowed area is -10 (brightest) to +10 (darkest). (0x64 0x63 0x6C = 'lcd' backwards)
140-146	0x01 0x7C 0x03 0x6E 0x61 0x6C 0xnn	0xnn = Code for language on the LCD menu.: 0x00 = English 0x01 = Swedish 0x02 = German (0x6E 0x61 0x6C = 'lan' backwards)
147-153	0x01 0x7C 0x03 0x65 0x6C 0x73 0xnn	0xnn = Time from latest tangent activity until CMeX50 goes to sleep mode. Allowed values are 0x00..0xFF (0..255) minutes. (0x65 0x6C 0x73 = 'sle' backwards, sleep)
154-158	0x0A 0xFD 0x16 0xnn 0xnn	0xnnnn = Password for login to LCD-menu, four digits, packed BCD.
159-165	0x04 0xFD 0x0B 0xnn 0xnn 0xnn 0xnn	0xnnnnnnnn = Tag for user configuration, 32-bits binary. This value can be written to the CMeX50 to indicate a specific configuration ID. The value is reset when changes are made in the LCD menu.
166-173	0x02 0x7C 0x03 0x61 0x66 0x77 0xnn 0xnn	0xnnnn = Fine-tuning of the radio frequency, in steps of 38,147Hz. 16-bits value with sign. Example: 0x0000 = No adjustment 0x0069 = +105 that gives +105*38,147Hz = +4kHz 0xFF07 = -249 that gives -249*38,147Hz = -9,5kHz (0x61 0x66 0x77 = 'wfa' backwards, wireless frequency adjustment)
174-180	0x01 0x7C 0x03 0x66 0x69 0x61 0xnn	0xnn = FIFO-mode for automatic installation: 0x00 = FIFO-mode off. Installation of new meters stops when the meter list is full (800 meters). 0x01 = FIFO-mode is on. If CMeX50 is in continuous installation mode and a telegram from a new meter is received when the meter list is full, the meter with the oldest telegram will be deleted, and the new meter will be installed. (0x66 0x69 0x61 = 'aif' backwards, autoinstall fifo)
181-190	0x04 0x7C 0x03 0x63 0x72 0x72 0xnn 0xnn 0xnn 0xnn	0xnnnnnnnn = Number of times the radio has been rebooted, due to no accurate telegram has been received the last 30 minutes. 32-bits binary value (0x63 0x72 0x72 = 'rrc' backwards, radio restart

		counter)
191-197	0x01 0x7C 0x03 0x61 0x74 0x73 0xnn	0xnn = Setup for STATUS-byte in telegram from virtualized meters: 0x00 = STATUS is always 0x00 0x01 = STATUS copied from corresponding meters STATUS-byte, if that exists. (assumed that the wireless telegram has a short or long application header) otherwise it will be set to 0x00 (0x61 0x74 0x73 = 'sta' backwards, status)
198-204	0x01 0x7C 0x03 0x6D 0x61 0x63 0xnn	0xnn = Addressing settings for CMex50: 0x00 = Chosen primary address, secondary address and fixed primary address 251. 0x01 = Only the fixed primary address 251. (0x6D 0x61 0x63 = 'cam' backwards, collector access mode)
205-211	0x01 0x7C 0x03 0x6D 0x61 0x6D 0xnn	0xnn = Addressing settings for virtualized meters: 0x00 = Primary address, secondary address and enhanced secondary address (with CMeX50 ”fabrication number”). 0x01 = Only enhanced secondary address (with CMeX50 ”fabrication number”). (0x6D 0x61 0x6D = 'mam' backwards(!), meter access mode)
212-218	0x01 0x7C 0x03 0x66 0x63 0x69 0xnn	0xnn = Action to take when receiving a telegram with CI = 0x79 or 0x69: 0x00 = Ignore telegram. 0x01 = Place telegram in a container. (0x66 0x63 0x69 = 'icf' backwards, ignore c… flag)
219	0xnn	0xnn = End sign for first telegram from CMeX50: 0x0F = Telegram is finished (no meters are installed) 0x1F = Telegram continues with meter information. Toggle FCB-bit to fetch the next telegram part.

6.3.2.3 Slave to master (CMeX50 product addressed) – Telegram 2..n

2nd and possible more telegrams, depending on number of connected wireless M-Bus slaves, contain information about the installed wireless M-Bus slaves.

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-Field 1
2	0xnn	L-Field 2
3	0x68	Start character 2
4	0x08	RSP_UD
5	0xnn	A-Field = Primary address of CMeX50
6	0x72	Variable data respond, mode 1 = LSByte first

7-10	0xnnnnnnnn	Secondary address of CMeX50
11-12	0x9615	Manufacturer id “ELV”
13	0xnn	Generation field In the range from 01 to 09.
14	0x31	Device type / medium = OMS MUC
15	0xnn	Access number
16	0xnn	Status byte 0x00 = Ok (no error)
17-18	0x0000	Signature, 16 bit binary
19-58	[SLAVE INFO 1]	Wireless M-Bus slave 1 See 0 for more information of [SLAVE INFO 1]
59-98	[SLAVE INFO 2]	Wireless M-Bus slave 2 See 0 for more information of [SLAVE INFO 2]
99-	[SLAVE INFO n]	Wireless M-Bus slave n See 0 for more information of [SLAVE INFO n]
-	0x0F or 0x1F	End of telegram More data available: 0x1F No more data available: 0x0F
-	0xnn	Checksum
-	0x16	Stop character

6.3.2.3.1 Wireless slave info description

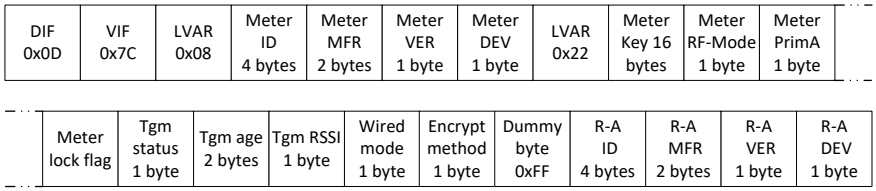


Figure 19 M-Bus Slave information

Name	Description
Meter ID	Wireless M-Bus meter identification
Meter MFR	Wireless M-Bus meter manufacturer code
Meter VER	Wireless M-Bus meter version (generation)
Meter Dev	Wireless M-Bus meter device type (medium)
Meter Key	AES128 encryption key used for this meter (if not CMeX50 global key is used)
Meter RF mode	Wireless M-Bus meter RF mode (S1, T1, C1)
Meter PrimA	Virtual primary address of this meter on CMeX50 wired M-Bus interface
Meter lock flag	Meter lock flag (valid for continuous installation FIFO mode only) 0x00 = Meter is not locked (meter may be replaced by another when meter list is full) 0x01 = Meter is locked (meter will not be erased even if the meter list is full)
Tgm status	Status of last received telegram from this meter: 0x00 = No telegram received yet 0x01 = Last telegram was unencrypted 0x02 = Last telegram had an unknown CI field 0x03 = Last telegram was unmodified and put in container 0x04 = Decryption of last telegram failed 0x05 = Last telegram was successfully decrypted
Tgm age	Age of last received telegram from this meter in minutes
Tgm RSSI	RSSI of last received telegram from this meter
Wired mode	Wired M-Bus mode setting for this meter: 0x00 = Auto (put in container only if necessary, for example if CI is unknown etc.) 0x01 = Always put telegram in container
Dummy	Always 0xFF
R-A ID	Radio adapter ID (ignore if meter address = radio address)
R-A MFR	Radio adapter manufacturer code (ignore if meter address = radio address)
R-A VER	Radio adapter version (generation) (ignore if meter address = radio address)
R-A DEV	Radio adapter device type (medium) (ignore if meter address = radio address)

Table 12 M-Bus slave information field description

6.3.2.4 Slave to master (virtualized M-Bus slave addressed) – Telegram 1 and 2

6.3.2.4.1 Virtualized M-Bus slave data with no encapsulation in a container

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-Field 1
2	0xnn	L-Field 2
3	0x68	Start character 2
4	0x08	RSP_UD
5	0xnn	A-Field = Primary address of virtualized M-Bus slave
6	0x72	Variable data respond, mode 1 = LSByte first
7-10	0xnnnnnnnn	Secondary address of virtualized M-Bus slave
11-12	0xnnnn	Manufacturer id of virtualized M-Bus slave
13	0xnn	Generation field of virtualized M-Bus slave
14	0xnn	Device type / medium of virtualized M-Bus slave
15	0xnn	Access number of virtualized M-Bus slave
16	0xnn	Status byte of virtualized M-Bus slave 0x00 = Ok (no error)
17-18	0x0000	Signature, 16 bit binary
Optional CMeX50 information depending DIF/VIF mode, see section 6.1.4 and 6.2.7		
19..N		Wireless M-Bus slave payload data
N+1	0x0F or 0x1F	End of telegram More data available: 0x1F No more data available: 0x0F
N+2	0xnn	Checksum
N+3	0x16	Stop character

6.3.2.4.2 Virtualized M-Bus slave data with encapsulation in a container

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-Field 1
2	0xnn	L-Field 2
3	0x68	Start character 2
4	0x08	RSP_UD
5	0xnn	A-Field = Primary address of virtualized M-Bus slave
6	0x72	Variable data respond, mode 1 = LSByte first
7-10	0xnnnnnnnn	Secondary address of virtualized M-Bus slave
11-12	0xnnnn	Manufacturer id of virtualized M-Bus slave
13	0xnn	Generation field of virtualized M-Bus slave
14	0xnn	Device type / medium of virtualized M-Bus slave
15	0xnn	Access number of virtualized M-Bus slave
16	0xnn	Status byte of virtualized M-Bus slave

		0x00 = Ok (no error)
17-18	0x0000	Signature, 16 bit binary
Optional CMeX50 information depending DIF/VIF mode, see section 6.1.4 and 6.2.7		
19	0x0d	DIF Variable data length
20	0xfd	VIF Extension table FD
21	0x3b	VIFE Wireless M-Bus container
22	0xnn	Length of container
23..N		Wireless M-Bus slave complete telegram. Starting with L-Field. CRC fields are left out.
N+1	0x0F or 0x1F	End of telegram. More data available: 0x1F No more data available: 0x0F
N+2	0xnn	Checksum
N+3	0x16	Stop character

6.3.3 Choose type of STATUS byte in telegram from virtualized slave on wired M-Bus

6.3.3.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-field 1
2	0xnn	L-field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-field = SND-UD
5	0xnn	A-field = primary address, e.g. 0xFB = 251
6	0x51	CI-field = Master to slave data transmission
7-13 (14)	0x01 0x7C 0x03 0x61 0x74 0x73 0xnn OR 0x01 0xFC 0x03 0x61 0x74 0x73 0x00 0xnn	0xnn = setting for STATUS byte in telegram from virtualized meters: 0x00 = STATUS is always 0x00 0x01 = STATUS is copied from the corresponding wireless meter's STATUS byte if available (assuming that the wireless telegram has long or short application header) otherwise it is set to 0x00 (0x61 0x74 0x73 = 'sta' backwards)
14 (15)	0xnn	Checksum
15 (16)	0x16	Stop character

6.3.3.2 Slave to master

Byte index	Data	Description
0	0xE5	Acknowledge

6.3.4 Choose addressing method for the product (CMeX50) on wired M-Bus

6.3.4.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-field 1
2	0xnn	L-field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-field = SND-UD
5	0xnn	A-field = primary address, e.g. 0xFB = 251
6	0x51	CI-field = Master to slave data sending
7-13 (14)	0x01 0x7C 0x03 0x6D 0x61 0x63 0xnn OR 0x01 0xFC 0x03 0x6D 0x61 0x63 0x00 0xnn	0xnn = Addressing mode for CMeX50: 0x00 = Chosen primary address, secondary address and fixed primary address 251. 0x01 = Only the fixed primary address 251. (0x6D 0x61 0x63 = 'cam' backwards)
14 (15)	0xnn	Checksum
15 (16)	0x16	Stop character

6.3.4.2 Slave to master

Byte index	Data	Description
0	0xE5	Acknowledge

6.3.5 Choose addressing method for virtualized meter on wired M-Bus

6.3.5.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-field 1
2	0xnn	L-field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-field = SND-UD

5	0xnn	A-field = primary address, e.g. 0xFB = 251
6	0x51	CI-field = Master to slave data sending
7-13 (14)	0x01 0x7C 0x03 0x6D 0x61 0x6D 0xnn OR 0x01 0xFC 0x03 0x6D 0x61 0x6D 0x00 0xnn	0xnn = Addressing mode for virtualized meters: 0x00 = Primary address, secondary address and enhanced secondary address (with CMeX50 fabrication number). 0x01 = Only enhanced secondary address (with CMeX50 fabrication number). (0x6D 0x61 0x6D = 'mam')
14 (15)	0xnn	Checksum
15 (16)	0x16	Stop character

6.3.5.2 Slave to master

Byte index	Data	Description
0	0xE5	Acknowledge

6.3.6 Choose installation method for continuous meter installation

6.3.6.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-field 1
2	0xnn	L-field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-field = SND-UD
5	0xnn	A-field = primary address, e.g. 0xFB = 251
6	0x51	CI-field = Master to slave data sending
7-13 (14)	0x01 0x7C 0x03 0x66 0x69 0x61 0xnn OR 0x01 0xFC 0x03 0x66 0x69 0x61 0x00 0xnn	0xnn = FIFO-mode for automatic installation: 0x00 = FIFO-mode off. Installation of new meters stops when the meter list gets full (800 meters). 0x01 = FIFO-mode is on. If CMeX50 is in continuous installation mode and a telegram from a new meter is received when the meter list is full, the meter with the oldest stored telegram will be erased from the meter list and the new meter will be installed in its place. (0x66 0x69 0x61 = 'aif' backwards)
14 (15)	0xnn	Checksum

15 (16)	0x16	Stop character

6.3.6.2 Slave to master

Byte index	Data	Description
0	0xE5	Acknowledge

6.3.7 Set filter for meter installation

6.3.7.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-field 1
2	0xnn	L-field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-field = SND-UD
5	0xnn	A-field = primary address, e.g. 0xFB = 251
6	0x51	CI-field = Master to slave data sending
7-16 (17)	0x04 0x7C 0x03 0x66 0x69 0x77 0xnn 0xnn 0xgg 0xgg OR 0x04 0x7C 0x03 0x66 0x69 0x77 0x00 0xnn 0xnn 0xgg 0xgg	0xnnnn = Installation filter for manufacturer code: 0xFFFF = The filter is closed. Meters from all manufacturers can be installed. Other value than 0xFFFF = Only meters with the specified manufacturer code can be installed. 0xgggg = Installation filter for DEV (meter type): 0xFFFF = The filter is closed. All meter types can be installed. 0x0000..0x00FF = Only specified meter type can be installed (DEV = 0x00..0xFF). (0x66 0x69 0x77 = 'wif' backwards, wireless installation filter)
17(18)	0xnn	Checksum
18 (19)	0x16	Stop character

6.3.7.2 Slave to master

Byte index	Data	Description
0	0xE5	Acknowledge

6.3.8 Start continuous meter installation

6.3.8.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-field 1
2	0xnn	L-field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-field = SND-UD
5	0xnn	A-field = primary address, e.g. 0xFB = 251
6	0x51	CI-field = master to slave data sending
7-13 (14)	0x01 0x7C 0x03 0x69 0x63 0x77 0x01 OR 0x01 0xFC 0x03 0x69 0x63 0x77 0x00 0x01	Continuous installation is started. The installation can be stopped with the command ”Start/stop installation mode”, see 6.3.18. (0x69 0x63 0x77 = 'wci' backwards)
14 (15)	0xnn	Checksum
15 (16)	0x16	Stop character

6.3.8.2 Slave to master

Byte index	Data	Description
0	0xE5	Acknowledge

6.3.9 Choose how telegram with CI=0x79 / 0x69 shall be handled

6.3.9.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-field 1
2	0xnn	L-field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-field = SND-UD
5	0xnn	A-field = primary address, e.g. 0xFB = 251
6	0x51	CI-field = master to slave data sending

7-13 (14)	0x01 0x7C 0x03 0x66 0x63 0x69 0xnn OR 0x01 0xFC 0x03 0x66 0x63 0x69 0x00 0x01	0xnn = action upon receiving telegrams with CI = 0x79 or 0x69: 0x00 = Ignore the telegram. 0x01 = Place the telegram in a data container. (0x66 0x63 0x69 = 'icf' backwards)
14 (15)	0xnn	Checksum
15 (16)	0x16	Stop character

6.3.9.2 Slave to master

Byte index	Data	Description
0	0xE5	Acknowledge

6.3.10 Set baud rate

Set baud rate of slave.

This command only changes the local baud rate if the CMeX50 product is addressed.

6.3.10.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0x03	L-Field 1
2	0x03	L-Field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD
5	0xnn	A-Field = Address of slave
6	0xnn	CI-Field = Baud rate selection code: 0xb8 = 300 baud 0xb9 = 600 baud 0xbA = 1200 baud 0xbb = 2400 baud 0xbc = 4800 baud (note 1) 0xbd = 9600 baud (note 1) 0xbe = no change (note 2) 0xbf = no change (note 2) Baud rates > 2400 baud do work but have not been tested to comply with the timing specifications in the M-Bus standard. Baud rate codes 0xbe and 0xbf are ACKed with 0xe5 although they do not change the baud rate (this is in accordance with the M-Bus specification).

7	0xnn	Checksum
8	0x16	Stop character

6.3.10.2 Slave to master

Byte index	Data	Description
0	0xe5	Acknowledge

6.3.11 Application reset

Sending application reset address to the CMeX50 product will reset the product to factory default settings.

Application reset sent to any virtualized M-Bus slave will only be acknowledged with no action taken.

6.3.11.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0x04	L-Field 1
2	0x04	L-Field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD
5	0xnn	A-Field = Address of slave
6	0x50	CI-Field = Application reset
7	0xb0	Application reset sub-code
8	0xnn	Checksum
9	0x16	Stop character

6.3.11.2 Slave to master

Byte index	Data	Description
0	0xe5	Acknowledge

6.3.12 Set primary address

Change M-Bus primary address of the CMeX50 product or any virtualized M-Bus slave.

6.3.12.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0x06	L-Field 1
2	0x06	L-Field 2

3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD
5	0xnn	A-Field = Address of slave
6	0x51	CI-Field
7	0x01	Primary address DIF
8	0x7A	Primary address VIF
9	0xnn	New primary address (0x00-0xfa)
10	0xnn	Checksum
11	0x16	Stop character

6.3.12.2 Slave to master

Byte index	Data	Description
0	0xe5	Acknowledge

6.3.13 Set secondary address

This command only changes the secondary address of the CMeX50 if the CMeX50 product is addressed.

Setting secondary address on any virtualized M-Bus slave will only be acknowledged with no action taken.

6.3.13.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0x09	L-Field 1
2	0x09	L-Field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD
5	0xnn	A-Field = Address of slave
6	0x51	CI-Field
7	0x0c	Secondary address DIF
8	0x79	Secondary address VIF
9-12	0xnnnnnnnn	New secondary address, 8-bit packed BCD
13	0xnn	Checksum
14	0x16	Stop character

6.3.13.2 Slave to master

Byte index	Data	Description
0	0xe5	Acknowledge

6.3.14 Select slave

Select slave for further secondary addressing. After successful selection, the slave can be addressed using primary address 253.

6.3.14.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-Field 1 Variable depending on selection mask. The selection mask can have any size in the range 0..8 bytes except 5 (manufacturer id requires a full 16-bit mask).
2	0xnn	L-Field 2 Variable depending on selection mask
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD
5	0xnn	A-Field = Address of slave
6	0x52	CI-Field = Slave selection The slave will be deselected if there is any mismatch.
7-10	0xnnnnnnnn	*Optional* M-Bus secondary address mask, packed BCD The M-Bus ID mask can use the nibble 0xf as a wildcard in any of the eight BCD digit positions.
11-12	0xnnnn	*Optional* M-Bus manufacturer id mask, 16-bit binary The M-Bus manufacturer id mask can use 0xff as wildcard for one or both bytes.
13	0xnn	*Optional* M-Bus generation mask, 8-bit binary The M-Bus generation mask can use 0xff as wildcard.
14	0xnn	*Optional* M-Bus medium mask, 8-bit binary The M-Bus meter medium mask will match if 0x00 ("unknown") or 0xff (wildcard).
15	0x0c	*Optional* DIF 8 digit packet BCD

16	0x78	*Optional* VIF Fabrication number
17-20	0xnnnnnnnn	*Optional* CMeX50 M-Bus secondary address mask, packed BCD
21	0xnn	Checksum
22	0x16	Stop character

6.3.14.2 Slave to master

Byte index	Data	Description
0	0xe5	Acknowledge

6.3.15 Set global AES128 key

The global AES128 key is useful when more than one wireless M-Bus slave has identical AES128 key. Set the wireless M-Bus slave *Decryption mode* to *Global* when the global AES128 key should be used.

6.3.15.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-Field 1
2	0xnn	L-Field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD
5	0xnn	A-Field = Address of slave
6	0x51	CI-Field = Master to slave data send
7-35(36)	0x0D7C0379656B10[KEY] OR 0x0DFC0379656B1000[KEY]	Write global AES128 key [KEY] = 16 bytes global AES128 key
35(36)	0xnn	Checksum
36(37)	0x16	Stop character

6.3.15.2 Slave to master

Byte index	Data	Description
0	0xe5	Acknowledge

6.3.16 Set wireless M-Bus mode

The wireless M-Bus mode is used to set which wireless M-Bus slaves the product will handle; C1, T1, S1 a combination.

6.3.16.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-Field 1
2	0xnn	L-Field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD
5	0xnn	A-Field = Address of slave
6	0x51	CI-Field = Master to slave data send
7-13(14)	0x017C036f6d77nn OR 0x01FC036f6d7700nn	Write wireless M-Bus mode nn = 8 bit unsigned wireless M-Bus mode. Valid values: 0x00 or 0x01 = S1 (both values are equivalent) 0x02 or 0x03 = T1 (both values are equivalent) 0x04 or 0x05 = T1 + C1a + C1b 0x06 = C1a 0x07 = C1b 0x08 = C1a + C1b 0x09 = T1 + C1a 0x0A = T1 + C1b 0x0B = C1a WIDE 0x0C = C1b WIDE 0x0D = C1a + C1b WIDE
14(15)	0xnn	Checksum
15(16)	0x16	Stop character

6.3.16.2 Slave to master

Byte index	Data	Description
0	0xe5	Acknowledge

6.3.17 Set wireless installation time

The installation time is the time the product will be in installation mode after an installation is started.

6.3.17.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-Field 1
2	0xnn	L-Field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD

5	0xnn	A-Field = Address of slave
6	0x51	CI-Field = Master to slave data send
7-14(15)	0x027C03746977nnnn OR 0x02FC0374697700nnnn	Write wireless installation time nnnn = 16-bit unsigned installation time in minutes Valid interval: 0..9999
15(16)	0xnn	Checksum
16(17)	0x16	Stop character

6.3.17.2 Slave to master

Byte index	Data	Description
0	0xe5	Acknowledge

6.3.18 Start/stop installation mode

This command is used to start or stop an installation window.

6.3.18.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-Field 1
2	0xnn	L-Field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD
5	0xnn	A-Field = Address of slave
6	0x51	CI-Field = Master to slave data send
7-14(15)	0x027C03746977nnnn OR 0x02FC0374697700nnnn	Start/stop installation window nnnn = 16 bit unsigned installation time in minutes. Valid range: 0..9999 Setting nnnn to zero will stop current installation.
15(16)	0xnn	Checksum
16(17)	0x16	Stop character

6.3.18.2 Slave to master

Byte index	Data	Description
0	0xe5	Acknowledge

6.3.19 Set wireless installation mode

The wireless installation mode is used to filter which wireless M-Bus telegrams are accepted to install a new wireless M-Bus slave in the product.

6.3.19.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-Field 1
2	0xnn	L-Field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD
5	0xnn	A-Field = Address of slave
6	0x51	CI-Field = Master to slave data send
7-13(14)	0x017C036D6977nn OR 0x01FC036D697700nn	Write wireless installation mode nn = 8 bit unsigned installation mode Valid values: 0 = Only SND-IR telegrams are valid for installation of wireless M-Bus slaves 1 = SND-NR, SND-IR are valid for installation of wireless M-Bus slaves
14(15)	0xnn	Checksum
15(16)	0x16	Stop character

6.3.19.2 Slave to master

Byte index	Data	Description
0	0xe5	Acknowledge

6.3.20 Set wireless age limit

The wireless age limit is used to mark wireless M-Bus slave telegrams as old, resulting in that the virtualized wired M-Bus slave will stop responding when telegrams are outside the wireless age limit. This is useful to indicate that the connection with the wireless M-Bus slave is not working properly.

6.3.20.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-Field 1
2	0xnn	L-Field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD
5	0xnn	A-Field = Address of slave

6	0x51	CI-Field = Master to slave data send
7-14(15)	0x027C03656761nnnn OR 0x02FC0365676100nnnn	Write wireless age limit nnnn = 16 bit unsigned wireless age limit in minutes Valid rage: 0..9999 minutes
15(16)	0xnn	Checksum
16(17)	0x16	Stop character

6.3.20.2 Slave to master

Byte index	Data	Description
0	0xe5	Acknowledge

6.3.21 Set wired M-Bus mode

Set how wired M-Bus interface will transport information to requesting M-Bus master; *Auto* or in *Container* mode. The *Auto* mode will try to transport the data to requesting M-Bus master as unmanaged data received from the wireless M-Bus slave. The *Container* mode will encapsulate the complete wireless M-Bus telegram in a container. The *Container* mode can be useful if key handling (decryption of telegrams), should be handled centralized and not within the CMeX50.

See section 6.1.4 for more information about *Auto* and *Container*.

6.3.21.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-Field 1
2	0xnn	L-Field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD
5	0xnn	A-Field = Address of slave
6	0x51	CI-Field = Master to slave data send
7-13(14)	0x017C036f6d74nn OR 0x01FC036f6d74nn	Write wired M-Bus mode nn = 8 bit unsigned wired M-Bus mode Valid values: 0 = Auto 1 = Container
14(15)	0xnn	Checksum
15(16)	0x16	Stop character

6.3.21.2 Slave to master

Byte index	Data	Description

0	0xe5	Acknowledge

6.3.22 Set wired M-Bus DIF/VIF mode

Wired DIF/VIF mode is used to configure optional data added by the CMeX50 on the wired M-Bus interface. The information from the CMeX50 can be address information, age of telegram and RSSI (signal strength) information.

See section 6.2.7 on optional data added by CMeX50.

6.3.22.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-Field 1
2	0xnn	L-Field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD
5	0xnn	A-Field = Address of slave
6	0x51	CI-Field = Master to slave data send
7-13(14)	0x017C03666474nn OR 0x01FC0366647400nn	Write wired M-Bus DIF/VIF mode nn = 8 bit unsigned wired M-Bus DIF/VIF mode Valid values: 0 = Auto 1 = Fabrication number 2 = Fabrication number, age 3 = Fabrication number, age, RSSI
14(15)	0xnn	Checksum
15(16)	0x16	Stop character

6.3.22.2 Slave to master

Byte index	Data	Description
0	0xe5	Acknowledge

6.3.23 Set LCD contrast

Set the display LCD contrast on the product.

6.3.23.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-Field 1
2	0xnn	L-Field 2

3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD
5	0xnn	A-Field = Address of slave
6	0x51	CI-Field = Master to slave data send
7-13(14)	0x017C0364636Cnn OR 0x01FC0364636C00nn	Write LCD contrast nn = 8 bit signed LCD contrast offset. Valid range: -10 (brightest) .. +10 (darkest)
14(15)	0xnn	Checksum
15(16)	0x16	Stop character

6.3.23.2 Slave to master

Byte index	Data	Description
0	0xe5	Acknowledge

6.3.24 Set language

Set the LCD display language.

6.3.24.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-Field 1
2	0xnn	L-Field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD
5	0xnn	A-Field = Address of slave
6	0x51	CI-Field = Master to slave data send
7-13(14)	0x017C036E616Cnn OR 0x01FC036E616Cnn	Write language nn = 8 bit unsigned language Valid values: 0 = English 1 = Swedish 2 = German
14(15)	0xnn	Checksum
15(16)	0x16	Stop character

6.3.24.2 Slave to master

Byte index	Data	Description

0	0xe5	Acknowledge

6.3.25 Set sleep mode time

Set the time before the product enters sleep mode when no user interaction has been taken place in the LCD menu. The user needs to enter the 4 digit password in the LCD menu to be able to continue configuration of the product.

6.3.25.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-Field 1
2	0xnn	L-Field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD
5	0xnn	A-Field = Address of slave
6	0x51	CI-Field = Master to slave data send
7-14(15)	0x017C03656C73nn OR 0x01FC036E616Cnn	Write sleep mode time nn = 8 bit unsigned sleep mode in minutes. Valid range: 0..255
15(16)	0xnn	Checksum
16(17)	0x16	Stop character

6.3.25.2 Slave to master

Byte index	Data	Description
0	0xe5	Acknowledge

6.3.26 Set LCD menu password

Set the LCD menu password which needs to be entered to access the LCD menu. The default password is **0000**.

6.3.26.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-Field 1
2	0xnn	L-Field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD
5	0xnn	A-Field = Address of slave
6	0x51	CI-Field = Master to slave data send

7-14(15)	0x0AFD16nnnn OR 0x0AFD1600nnnn	Write LCD menu password nnnn = 4 digit packed BCD password
15(16)	0xnn	Checksum
16(17)	0x16	Stop character

6.3.26.2 Slave to master

Byte index	Data	Description
0	0xe5	Acknowledge

6.3.27 Delete meter

Delete one or all installed meters from the product.

6.3.27.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-Field 1
2	0xnn	L-Field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD
5	0xnn	A-Field = Address of slave
6	0x51	CI-Field = Master to slave data send
7-15(16)	0x0DFC08[ADDR]09	Delete one or all meters from the product. [ADDR] = 8 byte wireless M-Bus address Valid values: 0xFFFFFFFFFFFFFFFF = Delete all OR The corresponding 8-byte wireless M-Bus address of the meter to delete: ID 4 bytes | Man 2 bytes | Gen 1 byte | Dev 1 byte
16(17)	0xnn	Checksum
17(18)	0x16	Stop character

6.3.27.2 Slave to master

Byte index	Data	Description

0	0xe5	Acknowledge

6.3.28 Add/update meter

Add or update an existing meter in the product meter list.

Layout of ADD_METER_INFO

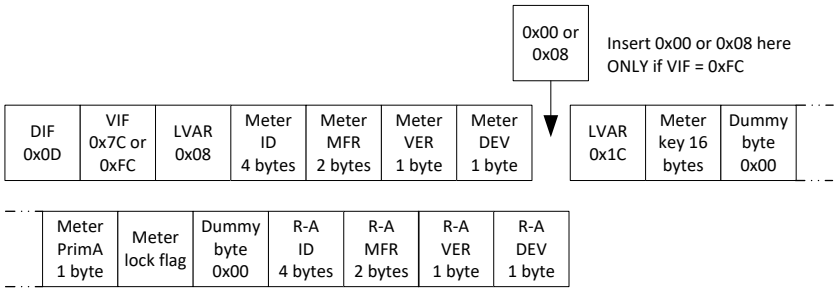


Figure 20: Meter and R-A fields

The Meter and R-A fields are described in figure 21 but the following additions apply when adding/updating a meter:

- Set meter PrimA = 0xFF to avoid updating it.
- Set all 16 bytes of meter key to 0xFF to avoid updating it.
- Meter lock flag:
  - 0x00 = Meter is not locked in meter list.
  - 0x01 = Meter is locked (erase protected in continuous installation FIFO mode)
  - 0xFF = Avoid updating meter lock flag (keep current settings)
- Set all R-A fields (8bytes) to 0xFF if no separate radio adapter is used.

6.3.28.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-Field 1
2	0xnn	L-Field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD
5	0xnn	A-Field = Address of slave
6	0x51	CI-Field = Master to slave data send
7-46(47)	[ADD_METER_INFO]	Add or update meter
47(48)	0xnn	Checksum
48(49)	0x16	Stop character

6.3.28.2 Slave to master

Byte index	Data	Description

0	0xe5	Acknowledge

6.3.29 Set meter lock flag

SND-UD with the following M-Bus record:

0x0DDIF ”variable length”
0xFCVIF ”plain text VIF” + extension bit for object action code
0x08length of plain text VIF (actual VIF is meter address)
0xnnmeter address ID lsByte
0xnnmeter address ID
0xnnmeter address ID
0xnnmeter address ID msByte
0xnnmeter address MANUFACTURER lsByte
0xnnmeter address MANUFACTURER msByte
0xnnmeter address VERSION
0xnnmeter address DEVICE TYPE
0x03/0x06object action code, 0x03 = set flag, 0x06 = clear flag

Individual flags are written by supplying the corresponding meter address.

The flags of all installed meters can be written (set or cleared) with a single command by setting all eight meter address bytes to 0xFF.

Important note!
This command is useful only for changing lock flags of meters that are already installed in the meter list since a meter's lock flag will always be cleared as default at the moment of installation.

6.3.30 Set configuration tag

The configuration tag can be used to indicate if changes have been made in the LCD menu after any configuration has been made using the wired M-Bus interface.

6.3.30.1 Master to slave

Byte index	Data	Description
0	0x68	Start character 1
1	0xnn	L-Field 1
2	0xnn	L-Field 2
3	0x68	Start character 2
4	0x43 | 0x53 | 0x63 | 0x73	C-Field = SND_UD
5	0xnn	A-Field = Address of slave
6	0x51	CI-Field = Master to slave data send
7-13(14)	0x04FD0Bnnnnnnnn OR 0x04FD0B00nnnnnnnn	Write configuration tag nnnnnnnn = 32 bit unsigned tag Valid range: 0x00 .. 0xFFFFFFFF

14(15)	0xnn	Checksum
15(16)	0x16	Stop character

6.3.30.2 Slave to master

Byte index	Data	Description
0	0xe5	Acknowledge

7 Troubleshooting

7.1 When running installation, no meters are found

Please verify:

- CMeX50 antenna installation and position, see section 4.2.4.
- Wireless M-Bus slave mode must be same as configured CMeX50 wireless M-Bus mode, see section 5.5.2 and 6.3.16.

7.2 CMeX50 does not respond to M-Bus master commands

Please verify M-Bus status:

- Voltage over M-Bus slave should be between 21 VDC and 42 VDC (if M-Bus slave input is used).
- All M-Bus slaves connected to the M-Bus master must have unique primary addresses or secondary addresses depending on addressing mode used.
- Verify M-Bus slave baud rate used by M-Bus master. M-Bus master baud rate must be identical to the CMeX50 baud rate.
- Encrypted wireless M-Bus slaves without uploaded keys will send meter data in container mode. Add keys to meters via the LCD display or M-Bus commands

If the problem persists, please contact Elvaco AB.

8 Technical specifications

8.1 Characteristics

Type	Value	Unit	Comments
Mechanics			
Casing material	Polyamide	-	White
Protection class	IP20	-	
Dimensions (w x h x d)	105 x 90 x 65	mm	6 DIN modules
Weight	220	g	
Mounting	Mounted on DIN-rail (DIN 50022) 35	Mm	
Electrical connections			
Power supply	0.5-2.5	mm^2	Screw terminal
M-Bus master port	0.5-2.5	mm^2	Screw terminal
M-Bus slave port	0.6-0.8	Ø mm	Pin terminal solid wire
Antenna	SMA-f	-	
RS232	RJ45 8/8	-	
USB port	Mini USB type B	-	
Electrical characteristics			
Nominal voltage	100-240	VAC	+/- 10%
Frequency	50/60	Hz	
Power consumption	<6	W	
Installation category	CAT 2	-	
Environmental specifications			
Operating temperature	-25 to +55	°C	Reduced response time on LCD at low temperature
Operating humidity max	5 to 90	%	Non-condensing
Operating altitude	0-2000	m	-
Pollution degree	Degree 2	-	
Usage environment	Indoors	-	Can be extended with IP6x enclosure for outdoor use
Storage temperature	-40 to +85	°C	
User interface			
LCD display	Graphic monochrome	-	
Display resolution	128 x 64	pixels	
Keyboard	7 illuminated buttons	-	
M-Bus			

Interfaces	IR, Integrated M-Bus Master, Wireless M-Bus Receiver, M-Bus slave	-	
Maximum number of M-Bus devices (software limit)	M-Bus Master: 32 meters, Wireless M-Bus Receivers: 800 meters	-	
Decryption	Yes	-	
Integrated M-Bus Master			
M-Bus standard	EN 13757	-	
M-Bus baud rate	300 and 2400	bit/s	
Nominal voltage	28	VDC	
Maximum unit loads	32/48	T/mA	Can be extended with the CMeX10-13S Series
M-Bus search modes	Primary, secondary	-	
Maximum cable length	1000	M	100 nF/km, maximum 90 Ω
Wireless M-Bus Receiver			
M-Bus standard	EN 13757-4	-	
Wireless M-Bus modes	S1, T1, C1	-	
Maximum number of M-Bus devices	800	-	
Radio frequency band	868 or 434	MHz	
Encryption	AES-128	-	
RF sensitivity	-105	dBm	
OMS compliant	Yes	-	
M-Bus slave interface			
M-Bus standard	EN 13757	-	
M-Bus baud rate	300 and 2400	bit/s	
Nominal voltage	21-42	VDC	
Power consumption	1.5/1	mA/T	
M-Bus search modes	Primary, secondary, enhanced secondary	-	
M-Bus default address	251	-	

Table 13 Technical specifications

8.2 Factory defaults

Section	Name	Value	Unit	Comments

M-Bus Wireless	Global encryption key	Random from factory		
M-Bus Wireless	Wireless mode	C1,T1		Combined mode
M-Bus Wireless	Wireless sensitivity	Wide		
M-Bus Wireless	Installation time	60	Minutes	
M-Bus Wireless	Installation mode	ALL		Handling both SND_IR and SND_NR
M-Bus Wireless	Data age limit	1440	Minutes	
M-Bus wired	Baud rate	2400	Bit/s	
M-Bus wired	Secondary address	Product serial number		
M-Bus Wired	Primary address	251		
M-Bus Wired	Wired mode	Auto		
M-Bus Wired	DIF/VIF mode	Auto address		
System	Language	English		
System	LCD contrast	0		
System	Password	0000		
System	Sleep time	5	Minutes	

Table 14 Factory defaults

9 Type approvals

CMeX50 is designed to comply with the directives and standards listed below.

Approval	Description
EMC	EN 61000-6-2, EN 61000-6-3
Safety	EN 61010-1, CAT 2

Table 15 Type approvals

10 Safety and environment

10.1 Safety precautions

The following safety precautions must be observed during all phases of the operation, usage, service or repair of any CMeX50 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 CMeX50 is installed and used. They contain important information about how the product is used properly.

The installation of CMeX50 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.

To prevent hazardous power levels, the M-Bus 2-wire cable should be disconnected from the M-Bus master or other installations.

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

11 Document History

Version	Date	Description	Author
1.0	2012-10-02	First release	David Vonasek
1.1	2012-10-30	Updated sections: 6.3.19.1 6.3.21.1 6.3.22 6.3.23	David Vonasek
1.2	2014-02-14	Updated sections: 6.3.2.3.1 6.3.22 6.3.22.1	Ericha Bloom
1.3	2015-06-08	Adapted for new software	Nicklas Alnström/ Ericha Bloom
1.4	2015-11-27	Removed T2, C2 and S2	Nicklas Alnström/ Ericha Bloom
1.5	2016-11-10	- Added instructions on introduced feature ”Lock meter”. - New wireless M-Bus modes. Updated sections: 6.3.2.3.1 6.3.28 6.3.29 5.5.2 6.3.16	Anton Larsson
1.6	2026-08-19	RS232 cable is not included when purchasing a CMeX50, see ch 4.2.2.2.	Niclas Andersson

11.1 Document software and hardware appliance

Type	Version	Date	Comments
Hardware	R1B	2012-10	
Software	1.7.0	2016-11	

12 References

12.1 References

[1] EN-13757-1, EN-13757-2, EN-13757-3, EN-13757-4, EN-13757-5, EN-13757-6
Communication System for meters and remote reading of meters, Part1-Part6

[2] Open Metering Specification (OMS)
Volume 2 - Primary communication Issue 3.0.1 / 2011-01-29

12.2 Terms and Abbreviations

Abbreviation	Description
Product	In this document, CMeX50
DIF	Data Information Field (M-Bus data clock information)
VIF	Value Information Field (M-Bus value block information)

12.2.1 Number representation

Decimal numbers are represented as normal number, i.e. 10 (ten)

Hexadecimal numbers are represented with prefix 0x, i.e. 0x0A (ten)

Binary numbers are represented with prefix 0b, i.e. 0b00001010 (ten)

13 Appendix A

Below is an overview of the menu system in the CMeX50.

1 - **Installation**
Mfr: Dev:
- Start, keep meters
- Start, clear meters
- start, cont
    - List found meters, (Installation window)

2 - **Meters**
- *List medium/manufactures*
Medium: Manuf:
- List meters
    - Choosed meter
        - Info about meter
    - Sort
        (Sort the list by, Id, Age, Status)
    - Edit
        - Primary address
        - Encryption key
    - Delete

3 - Settings
3-1 - M-Bus wireless
1 - Global Encr. key
2 - Wireless Mode
    - T1/T2/C1/C2 (But T2/C2 mode isn't implemented yet)
        - C1, T1
        - T1,T2 (But T2 mode isn't implemented yet)
        - T1
    - S1/S2 (But S2 mode isn't implemented yet)
        - S1
3 - Autoinst. FIFO
        - AutoInst. FIFO on
        - AutoInst. FIFO off
4 - Installation time
5 - Install mode
    - All
    - Only SND_IR
6 - Data age limit
7 - CI=0x79 mode
        - Ignore telegram
    - Put in container
3-2 - M-Bus wired
1 - Baudrate
        - 300
        - 600
        - 1200
        - 2400
        - 4800
        - 9600
2 - Sec. address

3 - Prim. address
4 - Wired mode
- Auto
- Container
5 - DIF/VID mode
- Address,Time,Rssi
- Address,Time
- Address
- Auto address
6 - Status byte
- Always 0x00
- Wireless status
7 - CMeX50 access
-Prim. + Sec. + 251
-Address 251 only
8 - Meter access
- Sec + SecEnh + Pri
- SecEnh only
9 - Hexdump config.
- Hexdump OFF
- Info Only
- Info + Tgm
- Info only SNIFFER
- Info + Tgm SNIFFER
10 - Hexdump baud
38400 baud 8N1
19200 baud 8N1
9600 baud 8N1
4800 baud 8N1
2400 baud 8N1
1200 baud 8N1
600 baud 8N1
300 baud 8N1

3-3 - System
1 - Language
2 - LCD Contrast
3 - Password
4 - Sleep time
5 - System info
6 - Radio Status

3-4 - Factory reset
3-5 - Reboot

4 - **Logout**