CMi4110
User's Manual
English

Contents

1 DOCUMENT NOTES 3

1.1 COPYRIGHT AND TRADEMARK 3
1.2 CONTACTS 3

2 IMPORTANT USAGE AND SAFETY INFORMATION 4

3 USING THIS MANUAL 5

3.1 PURPOSE AND AUDIENCE 5
3.2 ONLINE RESOURCES 5
3.3 SYMBOLS 5

4 INTRODUCTION 6

4.1 PURPOSE 6
4.2 APPLICATION DESCRIPTION 6
4.3 PRODUCT FEATURES 6
4.4 COMPATIBILITY 7

5 GETTING STARTED 8

5.1 PURPOSE 8
5.2 PRODUCT SPECIFICATION 8
5.3 MOUNT AND START-UP THE DEVICE 8
5.3.1 Mounting and connection 8
5.3.2 Connection of antenna 8
5.3.3 Start-up and LED indications 9
5.3.4 Switch off/reboot module 10

6 ADMINISTRATION REFERENCE 11

6.1 PURPOSE 11
6.2 SECURITY AND ACCESS CONTROL 11
6.3 CONFIGURATION OPTIONS 11
6.4 ADAPTIVE DATA RATE (ADR) 12
6.5 TRANSMIT INTERVAL 12
6.5.1 EcoMode 12
6.6 MESSAGE FORMATS 13
6.6.1 Message structure 13
6.6.2 Structure and payload 14
6.7 DOWNLINK 22

7 TECHNICAL SPECIFICATIONS 24

8 TYPE APPROVALS 26

9 DOCUMENT HISTORY 27

9.1 VERSIONS 27

10 REFERENCES 28

10.1 TERMS AND ABBREVIATIONS 28
10.2 NUMBER REPRESENTATION 28

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 recommended that customers contact Elvaco AB for the latest product information before purchasing a CMi Series 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.

1.1 Copyright and trademark

1.2 Contacts

Elvaco AB Headquarter
Kabelgatan 2T
434 37 Kungsbacka
SWEDEN
Phone: +46 300 30250
E-Mail: info@elvaco.com

Elvaco AB Technical Support
Phone: +46 300 434300
E-Mail: support@elvaco.se

Online: http://www.elvaco.com

2 Important usage and safety information

The following safety precautions must be observed during all phases of the operation, usage, service or repair of any CMi Series product. Users of the product are advised to convey the 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.

CMi4110 receives and transmits radio frequency energy while switched on. Remember that interference can occur if the product is used close to TV sets, radios, computers or inadequately shielded equipment. Follow any special regulations and always switch off the product wherever forbidden, or when you suspect that it may cause interference or danger.

3 Using this manual

3.1 Purpose and audience

This manual provides all information needed to mount, deploy and configure CMi4110 (Landis+Gyr description: WZU-LoRa) and targets system integrators.

3.2 Online resources

To download the latest version of this user's manual, or to find information in other languages, please visit http://www.elvaco.com/.

3.3 Symbols

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

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

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

Table 1 provides information on how the product should be used.

Symbol	Description
	Waste electrical products should not be disposed of with household waste. Please recycle where facilities exist. Contact your Local Authority for recycling advise.
	Electrostatic-sensitive device. Please observe the necessary ESD protective measures when installing the module.

Table 1: Usage information

4 Introduction

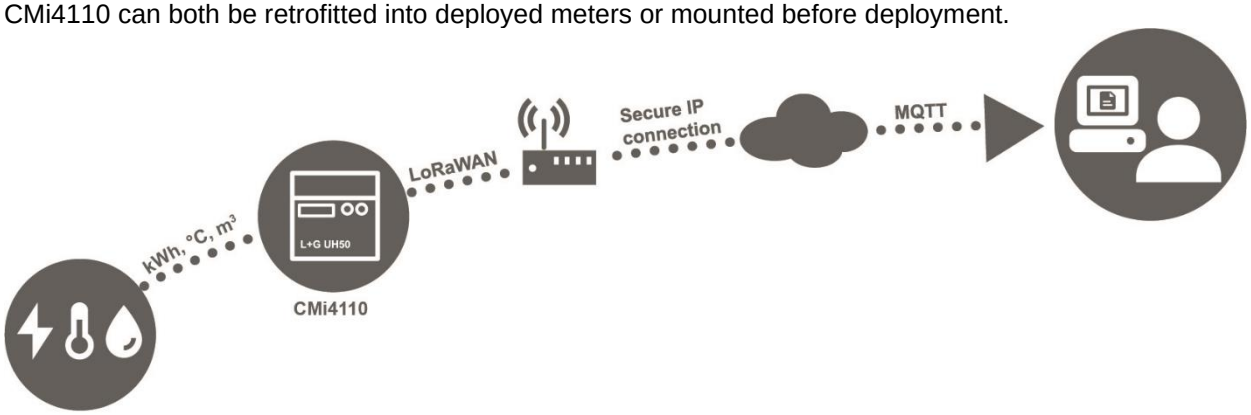
4.1 Purpose

This chapter provides a general description of CMi4110. In the next-coming sections you will learn more about possible applications for the product and how CMi4110 can be combined with other products to build versatile solutions.

4.2 Application description

CMi4110 is a cost-effective LoRaWAN meter connectivity module, which is mounted in a Landis+Gyr UH50 meter or a UC50 calculator. It uses a very energy-efficient scheme to deliver meter data to a receiving (application) server over a LoRaWAN network. Meter data is securely transmitted, using LoRaWAN end-to-end security scheme.

CMi4110 can both be retrofitted into deployed meters or mounted before deployment.



4.3 Product features

CMi4110 has the capability to offer a combination of battery operation with very long lifetime and a versatile application through its many configuration options. Key features of the module include:

- **Long battery lifetime**
  The module's EcoMode feature enables the module to achieve a battery-lifetime of at least 11+1 years.
- **No meter installation needed**
  As soon as the meter connectivity module has been mounted and started up, it will join the LoRaWAN network and start delivering meter data, i.e. no manual steps need to be taken in order to install the product in the meter.
- **Quick commissioning**
  The product uses Elvaco's One-Touch Commissioning (OTC) solution to securely and quickly configure products deployed. Using Elvaco's OTC App, simply enter your desired settings and place your phone on the right side of the L+G UH50 meter / UC50 calculator. New settings will be applied instantaneously via NFC.
- **A unique and flexible message scheme**
  - Meter data aligned with meter's internal clock and redundant daily energy values enables coordinated high-precision readouts without network congestion and assures reliable delivery of daily energy consumption.
  - Several message formats to choose between, including JSON, gives the right fit for the unique demands of each application.

4.4 Compatibility

CMi4110 is compatible with all L+G UH50 meters using software version 5.15 or higher as well as with all L+G UC50 calculators using software version 8.06 or higher.

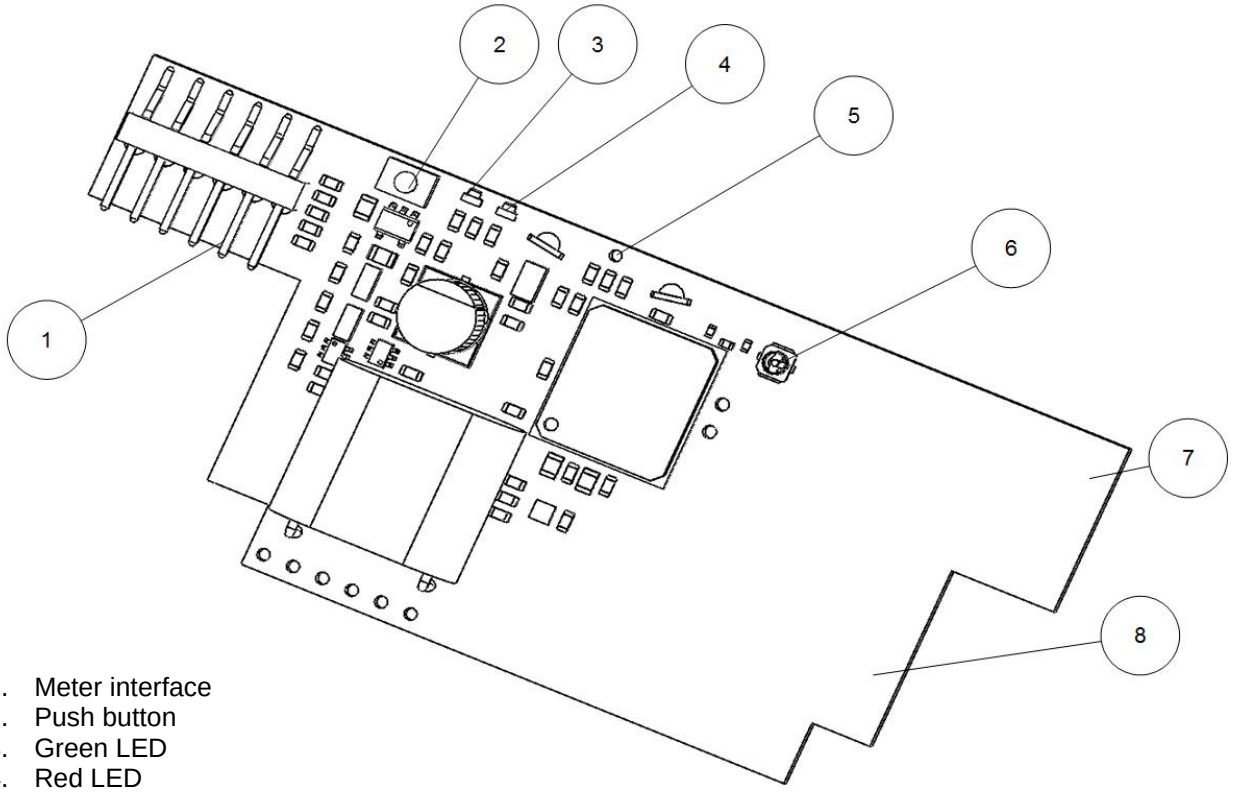
CMi4110 is supplied with power from the UH50/UC50 D cell battery. The module is also compatible with Elvaco's 230V CMip2110 PSUs and with the following PSUs from Landis+Gyr: WZU-AC230, WZU-AC110, WZU-ACDC24-00.

5 Getting started

5.1 Purpose

This chapter provides instructions on how to get started with the CMi4110. After reading and carefully following each step of this chapter, your meter connectivity module will be mounted, connected and started up.

5.2 Product specification



1. Meter interface
2. Push button
3. Green LED
4. Red LED
5. Tamper switch (optional)
6. External antenna connector (optional)
7. LoRa antenna
8. NFC antenna

5.3 Mount and start-up the device

5.3.1 Mounting and connection

CMi4110 is mounted in module slot 2 of a L+G UH50 heat meter or a L+G UC50 heat calculator.

5.3.2 Connection of antenna

If using CMi4110Ext, the SMA connector (6) is used to connect an external antenna. Please order your desired antenna (wall-mount or magnet-mount) from the Elvaco (or L+G) accessory assortment.

⚠	Make sure to mount the antenna at least 0.5 meters away from the meter in order not to disturb the meter and attached cables.

5.3.3 Start-up and LED indications

Module activation
Upon delivery, CMi4110 is set to passive mode, which means no messages will be transmitted from the module. There are two ways to activate the module:

1. Press down the push button (2) for at least 5 seconds until the green LED lights up, then release the button. A few seconds (1 to 11 seconds) later, CMi4110 will indicate start-up by flashing red and green LEDs for one second.

2. Via the Elvaco OTC app. Go to **Apply mode**, set the Module power to "active" and click **Apply settings.** Place the phone on the right side of the meter. The mobile phone should vibrate three times. This indicates that settings have successfully been applied.

Network join
After activation, CMi4110 will attempt to join the LoRaWAN network. The phase is indicated by short flashes every 5th second on the green LED. When CMi4110 succeeds in joining the LoRaWAN network, the green LED will lighten up for 8 seconds, as illustrated by Figure 1.

If the module fails to join the LoRaWAN network 6 times, it will wait for 60 minutes before another join attempt is initiated in order to conserve battery. A new join attempt cycle can be manually started anytime by pressing down the push button (2) for at least 5 seconds, until the green LED lights up, and then release the button.

When the module has joined the LoRaWAN network, meter data will initially be transmitted from the module every minute (regardless of transmit interval settings) in order to set the right data rate. After 10 minutes of calibration, the module will start to deliver meter data using its configured settings.

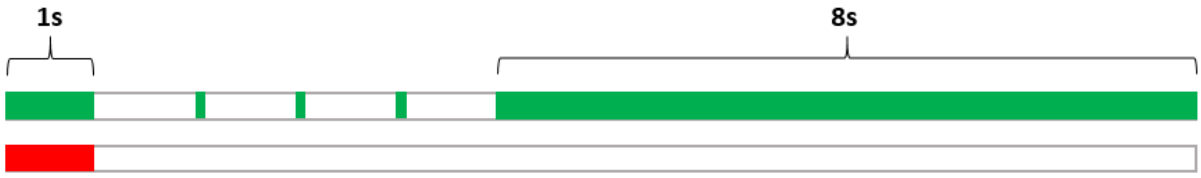


Figure 1: Network join LED indication

When activation-by-personalization (ABP) is used, the module does not perform a join operation before sending messages. Therefore, the 8-second indication of connection will **not** appear in ABP mode.

Soft start
In rare cases, if the battery is weak, the module will perform a soft start to be able to start-up despite the condition of the battery. The soft start takes 10 minutes to complete. The red LED will blink shortly every 10th second until the start-up has completed.

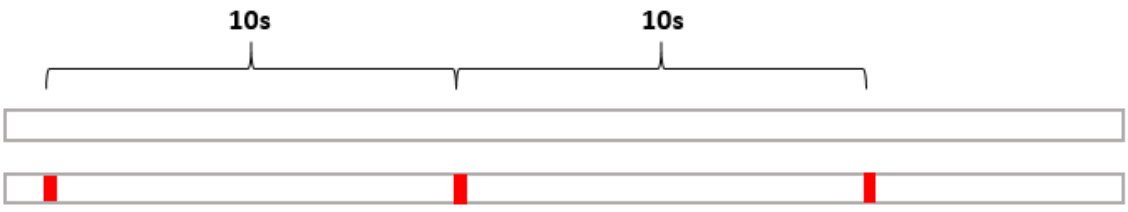


Figure 2: Soft start LED indication

5.3.4 Switch off/reboot module

To reboot the module, press and hold the push button (2) for 5-15 seconds. Release the button when the green LED is lit.

To switch off the module, press and hold the push button (2) for 15-20 seconds. Release the button when the red LED is lit.

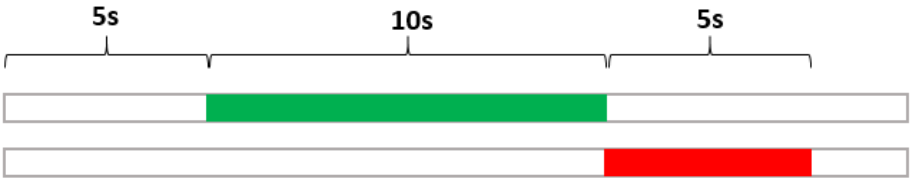


Figure 3: Reboot/switch off module

6 Administration reference

6.1 Purpose

This chapter contains detailed information about configuring options for CMi4110 and format of the different message types transmitted from the module.

6.2 Security and access control

CMi4110 has a configuration lock feature, which prevents unauthorized access to the module. When configuration lock has been enabled, a Product Access Key will be needed to access the device. For more information about security and access control for CMi4110, please refer to the One-touch commissioning (OTC) documentation, available on the Elvaco website.

6.3 Configuration options

CMi4110 is configured via the Elvaco OTC app. It uses NFC to transfer settings to the module. Downlink may also be used to for some applications, see section 6.7 Downlink for more information.

Please note that the Elvaco OTC app is only compatible with Android phones with Android 5.0 or later.

Table 2 provides a summary of all settings.

Field name (Abbr.)	**Description**	**Default value**	**Device access** Locked device & correct Product Access Key ***or*** Open device	**Device access** No Product Access Key	**Downlink**
Meter ID	Meter identification number of the meter. Not configurable.	N/A	Readable	Readable	N/A
Power mode	Used to activate/deactivate the module.	Passive	Readable / Writeable	Readable	N/A
Message format	The message format determines the structure and payload of the telegram sent from the module.	0 (Compact)	Readable / Writeable	Readable	N/A
EcoMode	When activated, 11+1 years of battery-life is guaranteed by adapting the transmit interval of the module to current signal conditions.	On	Readable / Writeable	Readable	Writeable
Maximum daily transmissions	Maximum number of transmissions allowed per day.	Inactive	Readable / Writeable	Readable	Writeable
Date & Time	Date and time set for the meter.	Current date/time	Readable / Writeable	Readable	Writeable
Set Time Relative	Adjusts the time of the meter relative to the current time.	N/A	Writeable	N/A	Writeable

Configuration Lock	Locks the module to prevent unauthorized access.	Open	Readable / Writeable	Readable	Writeable
LoRaWAN settings					
Device EUI	Unique module identification number. Not configurable.	Device-unique 64-bit number	Readable	Readable	N/A
Activation type	Sets the way the device joins the LoRaWAN network.	OTAA	Readable / Writeable	Readable	N/A
Network join	Used to display whether the module has joined the LoRaWAN network.	N/A	Readable	Readable	N/A
Join EUI	Application ID that determines where data ends up.	0x 00 00 00 00 00 00 00 00	Readable / Writeable	Readable	N/A
Application key	Encryption key for payload data (only applicable in OTAA mode).	Device-unique 128-bit number	Writeable	N/A	N/A
Application session key	Encryption key for payload data (only applicable in ABP mode).	Device-unique 128-bit number	Writeable	N/A	N/A
Device address	Unique address used by the device to identify itself on the LoRaWAN network (only applicable in ABP mode).	Device-unique 32-bit number	Writeable	N/A	N/A
Network session key	Encryption key for payload data (only applicable in ABP mode).	Device-unique 128-bit number	Writeable	N/A	N/A
Current data rate	The current data rate used for the module.	N/A	Readable	Readable	N/A

Table 2: Configuration options

6.4 Adaptive data rate (ADR)

ADR is part of the LoRaWAN standard where the network server determines the optimal rate of communication for the module based on current signal conditions. In best case, the module will use its highest data rate (DR5) in order to be as energy-efficient as possible. When signal conditions are poor, the network server will incrementally lower the data rate until it is able to receive the message. When the data rate is low, the energy consumption per telegram will increase.

6.5 Transmit interval

6.5.1 EcoMode

When EcoMode is active, a battery-lifetime of at least 11+1 years is guaranteed for the module. The module is able to achieve this by adapting its transmit interval to current signal conditions on the LoRaWAN network. In other words, when signal conditions are poor (and data rate is low), the module will send data less frequently in order to conserve battery-life. When signal conditions are decent, the module will be able to send data more frequently.

Table 3 summarizes the transmit interval for different data rates.

Data rate	Transmit interval
DR0	60 minutes
DR1 - DR2	30 minutes
DR3 - DR5	15 minutes

Table 3: Data rate and transmit interval

Set the transmit interval manually
If the transmit interval needs to be set to a fixed value, EcoMode can be disabled. Use the Elvaco OTC App to configure the transmit interval.

If EcoMode has been disabled, guarantees about battery-life no longer apply, even if EcoMode is activated later on.

Set an upper limit for number of daily telegrams
In some cases, it might be necessary to limit the number of daily telegrams that the module should be allowed to send. By using the MaxDTx parameter, such a limit can be easily set. For example, by setting MaxDTx to "24", no more than 24 telegrams will be transmitted each day (regardless of the data rate). Table 4 provides a set of examples.

MaxDTx value	Maximum transmit interval
1	Once per day
24	Once per hour
48	Once per 30 minutes
96	Once per 15 minutes

Table 4: MaxDTx setting

To achieve a battery life time of 16+1 (storage) years, the MaxDTx parameter needs to be set to 9 or lower.

6.6 Message formats

CMi4110 has five different message formats: *Standard*, *Compact*, *JSON*, *Scheduled-daily redundant* and *Scheduled-extended*. Each message type will be described in detail in this section. All data messages from the module will be transmitted on LoRa port 2.

6.6.1 Message structure

All message formats except for *JSON* are encoded according to M-Bus standard. Each telegram begins with one byte specifying the message format. Then follows a sequence of data information blocks (DIBs). The data and structure of the DIBs depends on the message type set. Each DIB contains a data information field (DIF), a value information field (VIF) and a data field (DATA), where the actual payload is stored. The structure is illustrated by Figure 4.

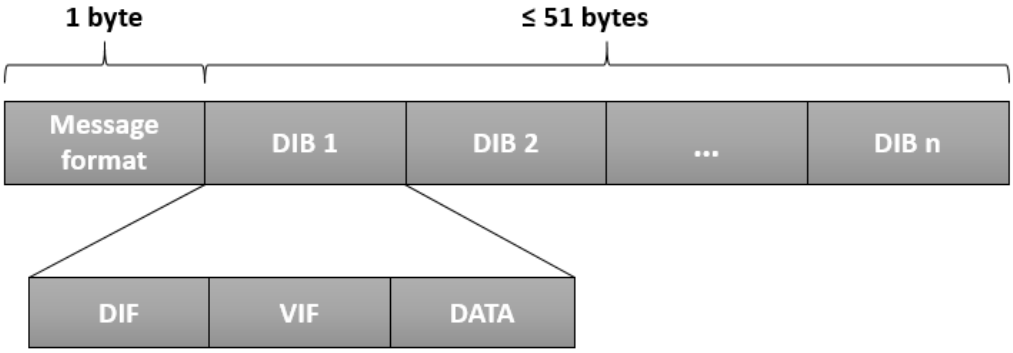


Figure 4: CMi4110 M-Bus message structure

For message type *JSON*, the data is presented as plain text.

Field	Size	Description
Message type	1 byte	0 = Standard 1 = Compact 2 = JSON 3 = Scheduled – daily redundant 4 = Scheduled - extended

Table 5: Message type field

6.6.2 Structure and payload

In this section, a detailed description of each message format is provided.

6.6.2.1 Standard

Figure 5 illustrates the structure of the message type for message format *Standard*. For a detailed description of the data included in each field, see Table 6.

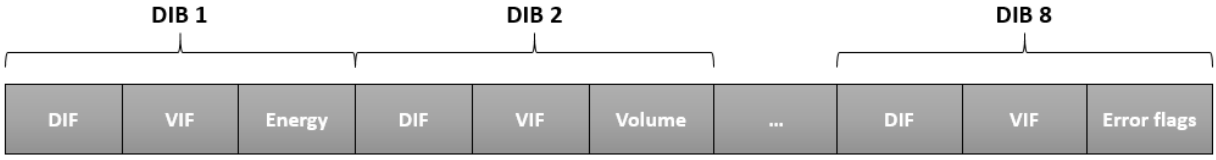


Figure 5: Structure, message format Standard

DIB	Field	Size	Data type	Description
1	Energy	6-7 bytes (including DIF/VIF)	BCD8 M-Bus Type A	Energy consumption (MWh, kWh, MJ, GJ) Mapped to OBIS 6.8 0C06xxxxxxx = kWh 0C07xxxxxxx = MWh, 2 decimals 0CFB00xxxxxxx = MWh, 1 decimal 0CFB01xxxxxxx = MWh, 0 decimals 0C0Exxxxxxx = GJ, 3 decimals 0C0Fxxxxxxx = GJ, 2 decimals 0CFB08xxxxxxx = GJ, 1 decimal 0CFB09xxxxxxx = GJ, 0 decimals If first byte is set to "3C" instead of "0C", this indicates value during error state
2	Volume	6 bytes (including DIF/VIF)	BCD8 M-Bus Type A	Volume (m^3) Mapped to OBIS 6.26 0C14xxxxxxx = m^3, 2 decimals 0C15xxxxxxx = m^3, 1 decimal 0C16xxxxxxx = m^3, 0 decimals If first byte is set to "3C" instead of "0C", this indicates value during error state
3	Power	5 bytes (including DIF/VIF)	BCD6 M-Bus Type A	Power (kW) Mapped to OBIS 6.4 0B2Bxxxxxx = kW, 3 decimals 0B2Cxxxxxx = kW, 2 decimals 0B2Dxxxxxx = kW, 1 decimal 0B2Exxxxxx = kW, 0 decimals If first byte is set to "3B" instead of "0B", this indicates value during error state
4	Flow	5 bytes (including DIF/VIF)	BCD6 M-Bus Type A	Flow (m^3/h) Mapped to OBIS 6.27 0B3Bxxxxxx = m^3/h, 3 decimals 0B3Cxxxxxx = m^3/h, 2 decimals 0B3Dxxxxxx = m^3/h, 1 decimal 0B3Exxxxxx = m^3/h, 0 decimals If first byte is set to "3B" instead of "0B", this indicates value during error state
5	Fw temp	4 bytes (including DIF/VIF)	BCD4	Forward temperature (°C) Mapped to OBIS 6.29 0A5Axxxx = °C, 1 decimal 0A5Bxxxx = °C, 0 decimals If first byte is set to "3A" instead of "0A", this indicates value during error state

6	Rt temp	4 bytes (including DIF/VIF)	BCD4	Return temperature (°C) Mapped to OBIS 6.28 0A5Exxxx = °C, 1 decimal 0A5Fxxxx = °C, 0 decimals If first byte is set to "3A" instead of "0A", this indicates value during error state
7	Meter ID	6 bytes (including DIF/VIF)	According to M-Bus EN13757-3 identification field	Meter ID 0C78xxxxxxxx If first byte is set to "3C" instead of "0C", this indicates value during error state
8	Error flags	5 bytes (including DIF/VIF)	Uint16 M-Bus Type C	Error and warning flags 02FD17xxxx If first byte is set to "32" instead of "02", this indicates value during error state

Table 6: DIB fields, message type standard

6.6.2.2 Compact

Figure 6 illustrates the structure for message format *Compact*. For a detailed description of the data included in each field, see Table 7.

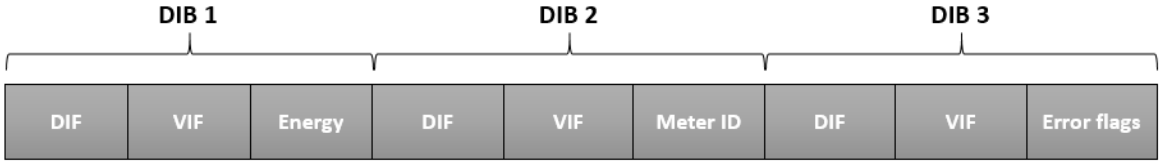


Figure 6: DIB structure, message type compact

DIB	Field	Size	Data type	Description
1	Energy	6 bytes (including DIF/VIF)	BCD8 M-Bus Type A	Energy consumption (MWh, kWh, MJ, GJ) Mapped to OBIS 6.8 0C06xxxxxxxx = MWh, 3 decimals =kWh 0C07xxxxxxxx = MWh, 2 decimals 0CFB00xxxxxxxx = MWh, 1 decimal 0CFB01xxxxxxxx = MWh, 0 decimals 0C06xxxxxxxx = kWh 0C0Exxxxxxxx = GJ, 3 decimals 0C0Fxxxxxxxx = GJ, 2 decimals 0CFB08xxxxxxxx = GJ, 1 decimal 0CFB09xxxxxxxx = GJ, 0 decimals If first byte is set to "3C" instead of "0C", this indicates value during error state
2	Meter ID	6 bytes (including DIF/VIF)	According to M-Bus EN13757-3 identification field	Meter ID 0C78xxxxxxxx

				If first byte is set to "3C" instead of "0C", this indicates value during error state
3	Error flags	5 bytes (including DIF/VIF)	Uint16 M-Bus Type C	Error and warning flags 02FD17xxxx =Error and warning flags If first byte is set to "32" instead of "02", this indicates value during error state

Table 7: DIB fields, message type compact

JSON

For message format *JSON*, the data is presented in a plain text format. Table 8 provides a description of all fields included in the telegram.

Field	Description
Energy	Energy consumption
Unit	Unit of energy consumption
Meter ID	Identification number of the meter in which the module is mounted.

Table 8: Fields, message type JSON

In Figure 7 an example of a message type *JSON* telegram is presented.

```
{"E":"12345.678","U":"MWh","ID":87654321}
```

Figure 7: JSON message example

6.6.2.4 Scheduled mode

When using message format *Scheduled*, two types of messages will be transmitted from the module: a clock message and a data message. The difference between the two is described in Table 9. There are two types of scheduled mode message types: *daily redundant* and *extended*.

Message	Time interval	Description
Clock message	Once per day	The clock message presents the current time of UH50/UC50. It can be used to verify that the clock is correct and has not drifted more than accepted. Byte 0 = 0xFA Byte 1 = DIF, 0x04 = valid, 0x34 =invalid Byte 2 = VIF, 0x6D Byte 3-6 = 32-bit date/time encoded as M-Bus format F
Data message	Determined by MaxDTx parameter.	The data message contains the fields listed in Table 11.

Table 9: Clock message and data message

The clock message will be transmitted once every day and the data message at least (regulated by MaxDTx parameter) once every day (on LoRa port 3). Figure 8 illustrates the principle. Note that although the meter readout will occur on top-of-the-hour, the data message will not necessarily be transmitted at that exact time. The LoRa transmission will occur after a random delay of 1-30 minutes. The meter readout for the clock message occurs at a random hour (00:00-23:00) at a random minute in the 35-45 interval. The clock message will be transmitted immediately after readout.

When using message type *Scheduled*, the MaxDTx cannot not be set higher than 24.

The transmit interval of the data message is adapted to current data rate and MaxDTx settings. Note that for message type *Scheduled*, the MaxDTx parameter can only assume the values listed in Table 10.

Parameter	Values
MaxDTx	1, 2, 3, 4, 6, 8, 12, 24

Table 10: MaxDTx values for message type scheduled

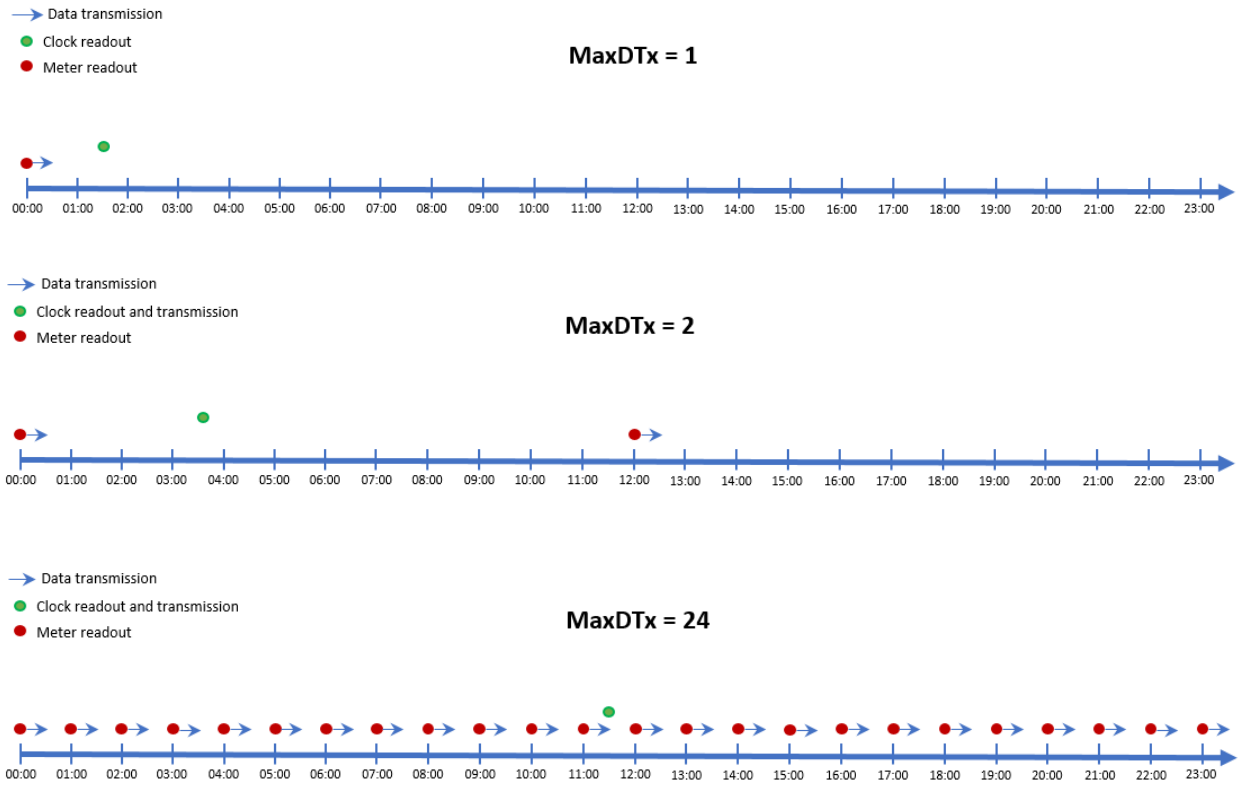


Figure 8: Data messages and MaxDTx settings

Scheduled- daily redundant

The data message of message format *Scheduled mode-daily redundant* contains an accumulated daily energy field, which is updated at 24:00 each day. Depending on MaxDTx settings and data rate, the field will be included in between 1-24 data messages per day. This will increase the probability of the value being received. For example, if MaxDTx is set to "12", the accumulated energy read at 24:00 will be transmitted 12 times during the 24 next coming hours.

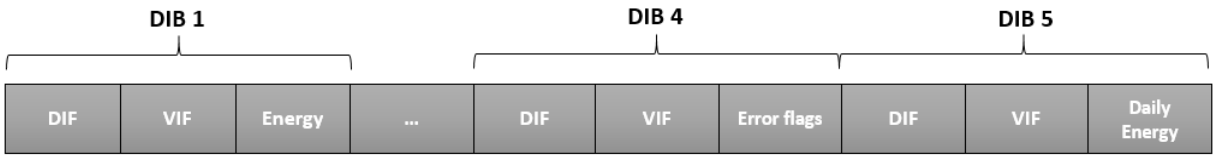


Figure 9: DIB structure, message type scheduled – daily redundant

DIB	Field	Size	Data type	Description

1	Energy	6 bytes (including DIF/VIF)	BCD8 M-Bus Type A	Energy consumption (MWh, kWh, MJ, GJ) Mapped to OBIS 6.8 0C06xxxxxxxx = MWh, 3 decimals = kWh 0C07xxxxxxxx = MWh, 2 decimals 0CFB00xxxxxxxx = MWh, 1 decimal 0CFB01xxxxxxxx = MWh, 0 decimals 0C0Exxxxxxxx = GJ, 3 decimals 0C0Fxxxxxxxx = GJ, 2 decimals 0CFB08xxxxxxxx = GJ, 1 decimal 0CFB09xxxxxxxx = GJ, 0 decimals If first byte is set to "3C" instead of "0C", this indicates value during error state
2	Meter ID	6 bytes (including DIF/VIF)	According to M-Bus EN13757-3 identification field	Meter ID 0C78xxxxxxxx If first byte is set to "3C" instead of "0C", this indicates value during error state
3	Meter date/time	6 bytes (including DIF/VIF)	M-Bus Type F	Meter date and time (YY-MM-DD HH:MM) Mapped to OBIS 9.36 046Dxxxxxxxx Bit 31-28 = Year-high* Bit 27-24 = Month Bit 23-21 = Year-low* Bit 20-16 = Day Bit 15 = Summer time flag** Bit 14-13 = Century Bit 12-8 = Hour Bit 7 = Error flag Bit 6 = Reserved for future use*** Bit 5-0 = Minute *The year is read by combining the year-high and year-low field. For example, year-high = 0010 and year-low = 010 => year = 0010010 **0 = standard time, 1= daylight-saving time ***0 = timestamp is valid, 1 = timestamp is **not** valid If first byte is set to "34" instead of "04", this indicates value during error state

4	Accumulated energy at 24:00	6 Bytes (including DIF/VIF)	BCD8 M-Bus Type A	Energy consumption (MWh, kWh, MJ, GJ) Mapped to OBIS 6.8 4C06xxxxxxxx = MWh, 3 decimals = kWh 4C07xxxxxxxx = MWh, 2 decimals 4CFB00xxxxxxxx = MWh, 1 decimal 4CFB01xxxxxxxx = MWh, 0 decimals 4C0Exxxxxxxx = GJ, 3 decimals 4C0Fxxxxxxxx = GJ, 2 decimals 4CFB08xxxxxxxx = GJ, 1 decimal 4CFB09xxxxxxxx = GJ, 0 decimals If first byte is set to "3C" instead of "4C", this indicates value during error state
4	Error flags	5 bytes (including DIF/VIF)	Uint16 M-Bus Type C	Error and warning flags 02FD17xxxx =Error and warning flags If first byte is set to "32" instead of "02", this indicates value during error state

Table 11: DIB fields, message type scheduled – daily redundant

Scheduled-extended

The data message of message format *Scheduled mode-extended* contains all the meter data included in the *Standard* telegram. In addition to these, a timestamp from the meter (meter date/time) is included in each telegram.

DIB	Field	Size	Data type	Description
1	Energy	6 bytes (including DIF/VIF)	BCD8 M-Bus Type A	Energy consumption (MWh, kWh, MJ, GJ) Mapped to OBIS 6.8 0C06xxxxxxxx = MWh, 3 decimals = kWh 0C07xxxxxxxx = MWh, 2 decimals 0CFB00xxxxxxxx = MWh, 1 decimal 0CFB01xxxxxxxx = MWh, 0 decimals 0C0Exxxxxxxx = GJ, 3 decimals 0C0Fxxxxxxxx = GJ, 2 decimals 0CFB08xxxxxxxx = GJ, 1 decimal 0CFB09xxxxxxxx = GJ, 0 decimals If first byte is set to "3C" instead of "0C", this indicates value during error state

2	Volume	6 bytes (including DIF/VIF)	BCD8 M-Bus Type A	Volume (m^3) Mapped to OBIS 6.26 0C14xxxxxxxx = m^3, 2 decimals 0C15xxxxxxxx = m^3, 1 decimal 0C16xxxxxxxx = m^3, 0 decimals If first byte is set to "3C" instead of "0C", this indicates value during error state
3	Power	5 bytes (including DIF/VIF)	BCD8 M-Bus Type A	Power (kW) Mapped to OBIS 6.4 0B2Bxxxxxx = kW, 3 decimals 0B2Cxxxxxx = kW, 2 decimals 0B2Dxxxxxx = kW, 1 decimal 0B2Exxxxxx = kW, 0 decimals If first byte is set to "3B" instead of "0B", this indicates value during error state
4	Flow	5 bytes (including DIF/VIF)	BCD6 M-Bus Type A	Flow (m^3/h) Mapped to OBIS 6.27 0B3Bxxxxxx = m^3/h, 3 decimals 0B3Cxxxxxx = m^3/h, 2 decimals 0B3Dxxxxxx = m^3/h, 1 decimal 0B3Exxxxxx = m^3/h, 0 decimals If first byte is set to "3B" instead of "0B", this indicates value during error state
5	Fw temp	4 bytes (including DIF/VIF)	BCD4	Forward temperature (°C) Mapped to OBIS 6.29 0A5Axxxx = °C, 1 decimal 0A5Bxxxx = °C, 0 decimals If first byte is set to "3A" instead of "0A", this indicates value during error state
6	Rt temp	4 bytes (including DIF/VIF)	BCD4	Return temperature (°C) Mapped to OBIS 6.28 0A5Exxxx = °C, 1 decimal 0A5Fxxxx = °C, 0 decimals If first byte is set to "3A" instead of "0A", this indicates value during error state
7	Meter ID	6 bytes (including DIF/VIF)	According to M-Bus EN13757-3 identification field	Meter ID 0C78xxxxxxxx = Meter ID If first byte is set to "3C" instead of "0C", this indicates value during error state

8	Meter date/time	6 bytes (including DIF/VIF	M-Bus Type F	Meter date and time (YY-MM-DD HH:MM) Mapped to OBIS 9.36 046Dxxxxxxxx Bit 31-28 = Year-high* Bit 27-24 = Month Bit 23-21 = Year-low* Bit 20-16 = Day Bit 15 = Summer time flag** Bit 14-13 = Century Bit 12-8 = Hour Bit 7 = Error flag Bit 6 = Reserved for future use*** Bit 5-0 = Minute *The year is read by combining the year-high and year-low field. For example, year-high = 0010 and year-low = 010 => year = 0010010 **0 = standard time, 1= daylight-saving time ***0 = timestamp is valid, 1 = timestamp is **not** valid If first byte is set to "34" instead of "04", this indicates value during error state
9	Error flags	5 bytes (including DIF/VIF)	Uint16 M-Bus Type C	Error and warning flags 02FD17xxxx If first byte is set to "32" instead of "02", this indicates value during error state

Meter communication error message
When CMi4110 is unable to communicate with UH50/UC50, an error message will be transmitted on the LoRaWAN network. Table 12 describes that error message for each message type.

Message type	Error message
Standard	0E00
Compact	0E00
JSON	{ }
Scheduled-daily redundant	0E00

Table 12: Meter communication error message

6.7 Downlink

CMi4110 supports configuration via downlink, i.e. sending commands to an end-device via the LoRaWAN network. **Note that this feature should only be used sparingly due to bandwidth consideration.** Communication via downlink can only be made in a short window after an uplink transmission from module to server. Therefore, time-critical communication should not be performed over downlink.

Some appropriate use of downlink commands is:

- Adjusting the meter clock when message type *scheduled* is used.
- Adjusting the MaxDTx parameter in order to optimize the performance of CMi4110 on the LoRaWAN network.

Downlink are sent on **port 2,** structured according to the following format: *"0x00" "TLV*" "*Number of bytes in configuration" "Configuration".* For a complete description of all available downlink commands, see Table 13**.**

Field name	TLV (Type Length Value)	Number of bytes in configuration	Configuration
Configuration lock	0x05	0x01	0x00 = Locked 0x01 = Open
Transmit interval (only applies when EcoMode is inactive)	0x06	0x02	0xNumber of minutes (lsByte -> msByte)
Message format	0x07	0x01	0x00 = Message format *Standard* 0x01 = Message format *Compact* 0x02 = Message format *JSON* 0x03 = Message format *Scheduled-daily redundant* 0x04 = Message format *Scheduled-extended*
Date & Time	0x11	0x02	0xHHMM
Set Date	0x12	0x03	0xYYMMDD
Set Time Relative	0x13	0x02	0xNumber of minutes* *Negative numbers supported.
EcoMode	0x0F	0x01	0x00 = Disable EcoMode 0x01 = Enable EcoMode
Maximum daily transmissions	0x21	0x01	0xNumber of transmissions

Table 13: Downlink commands

Example: To set the MaxDTx parameter to 24, the following command would be sent by downlink: 0x00 21 01 18

7 Technical specifications

Type	Value	Unit	Comments
Mechanics			
Protection class	IP54	-	
Dimensions (w x h x d)	80 x 38 x 23	mm	
Weight	35	g	
Mounting	In Landis+Gyr UH50/UC50 module slot 2	-	
External antenna connector	SMA female	-	
Electrical connections			
Supply voltage	Internal meter battery or PSU	-	PSU options: Elvaco CMip2110 230V, Landis+Gyr WZU-AC230-xx or WZU-ACDC24-00
Electrical characteristics			
Nominal voltage	3.0 - 5.0	VDC	
Power consumption (max)	40	mA	
Power consumption (sleep mode)	2.2	µA	
Environmental specifications			
Operating temperature	5 - 55	ºC	
Operating humidity	0 - 93	% RH	No condensation
Operating altitude	2000	m	
Pollution degree	Degree 1	-	
Usage environment	Indoors	-	
Storage temperature	-20 - 60	ºC	
Radio characteristics			
Frequency	868	MHz	
Output power	14	dBm	
Receiver sensitivity	-135	dBm	
LoRaWAN characteristics			
Device class	Class A	-	Bi-directional
LoRa version	1.0	-	
Activation	OTAA or ABP	-	
Data rate	DR0 - DR5	-	250 – 5470 bit/s
User interface			
Green LED	Status	-	
Red LED	Error	-	
Push button	Start-up / reboot / switch off module	-	

Configuration	NFC via Elvaco OTC app or downlink data	-	

8 Type approvals

CMi4110 is designed to comply with the directives and standards listed below.

Approval	Description
EMC	EN 301 489-1, EN 301 489-3

9 Document history

9.1 Versions

Version	Date	Description	Author
v1.0	2018-07	Initial version	Anton Larsson
v1.1	2018-10	Information about *Scheduled – extended* added	Anton Larsson
v1.2	2019-03	Corrected DIF/VIF for energy DIB	Anton Larsson
v1.3	2019-04	Added information about EcoMode	Anton Larsson
V1.4	2020-03	Added information about value during error state in message formats	David Svensson

10 References

10.1 Terms and abbreviations

Abbreviation	Description
DIB	Data Information Block
DIF	Data Information Field
VIF	Value Information Field
MCM	Meter Connectivity Module

10.2 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)