ISKRAEMECO

CM-e-3 module

Ethernet communication module for MT880 meters

Technical description

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i. About the Technical description

- This technical description contains detailed information on the CM-e-3 Ethernet communication module for MT880 meters, its key features and functionalities.
- It is intended for a technical audience, who are responsible for the product and its integration into the system.

ii. Definitions, Acronyms and Abbreviations

CM	Communication Module
Consereth	Communication protocol (made by Iskraemeco) runs over TCP/IP protocol and enables transparent sending of any sort of messages through TCP/IP networks
COSEM	Companion Specification for Energy Metering
DHCP	Dynamic Host Configuration Protocol
DLMS UA	Device Language Message Specification User Association
DNS	Domain Name System
GND	Ground, common reference potential
GUI	Graphical User Interface
HTTP	Hypertext Transfer Protocol
Hz	Hertz
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet Protocol
IPv4	Internet Protocol version 4
kV	kilo Volt
LAN	Local Area Network
LED	Light Emitting Diode
MAC Address	Media Access Control Address
mWh	milliwatt hour
RS	Recommended Standard
RxD	Receive Data
TCP	Transmission Control Protocol
TxD	Transmit Data
W	Watt

iii. Reference documents

- MT880 User manual
- MT880 Installation and maintenance manual

iv. Versioning

Date	Version	Update
05.11.2014	V1.00	First version of document

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1. SAFETY INFORMATION

Safety information used in this Technical description is described with the following symbols and pictograms:

DANGER: for a possibly dangerous situation, which could result in severe physical injury or fatality – attention to a high risk hazards.

WARNING: attention to a medium risk hazards.

CAUTION: for a possibly dangerous situation, which could result in minor physical injury or material damage - attention to a low risk hazards.

Operating instruction: for general details and other useful information.

All safety information in this Technical description describes the type and source of danger; it is possible consequences and measures to avoid the danger.
All safety information written in this document applies to the MT880 meter with or without the module and to the module itself.

1.1. Responsibilities

The owner of the meter/module is responsible to assure that all authorized persons who work with the meter read and understand the parts of this technical description, the MT880 User manual and Installation and maintenance manual that explains the safe handling with the meter.

The personnel must be sufficiently qualified for the work that will be performed. The installation personnel must possess the required electrical knowledge and skills, and must be authorised by the utility to perform the installation procedure.

The personnel must strictly follow the safety regulations and operating instructions, written in the individual chapters in this document, the MT880 User Manual and the Installation and maintenance manual.

The owner of the meter/module responds specially for the protection of the persons, for prevention of material damage and for training of personnel.

1.2. Safety instructions

1.2.1. Handling and mounting

At the beginning of installation at the metering point, the module should be carefully taken out of the box where they were packed. This should prevent the module from falling as well as any other external or internal damage to the device and personal injuries. Should such an incident occur despite all precautions the module may not be installed at the metering point as such damage may result in different hazards. In such case, the module needs to be sent back to the manufacturer for examination and testing.

CAUTION: The module is intended only for indoor use!

DO NOT OPEN THE MODULE COVER!
Opening of the module might result in defects and damages. In such a case the warranty is not valid.

CAUTION: The edges of the seals, sealing wires as well as some edges under (removed) terminal cover are sharp!

DANGER: In case of any damage inside the meter/module (fire, explosion...) do not open the meter/module.

CAUTION: The meter/module may be used only for the purpose of measurement for which it was produced. Any misuse of the meter/module will lead to potential hazards.

WARNING: Safety measures should be observed at all times. Do not break the seals or open the meter/module at any time!

It must be consulted in all cases where symbol ⚠ is marked in order to find out the nature of the potential hazards and any actions which have to be taken to avoid them.

The module and the MT880 meter installation procedure is described in the MT880 Installation and maintenance manual. For safety reasons the following instructions should be followed.

See the complete MT880 User manual for detailed technical features of MT880 meter and the module and its intended use.

Only a properly connected meter/module can measure correctly! Every connection error could result in a financial loss for the power company!

1.2.2. Meter/module installation procedure

The installer must consult and comply with local regulations and read the installation instructions written in the MT880 Installation and maintenance manual before installation.

This Installation and maintenance manual provides the instructions for installing MT880 meters and modules. The document provides a short overview of the meter, details of device installation and set-up, installation considerations, and health and safety considerations.

The installer will be considered as a public face by both the power company and its customers. The installer shall adopt the highest standards of behaviour and be respectful to clients and members of the public.

Before the beginning of the installation procedure, check if the metering point is correctly prepared for meter installation. The metering point must always be left clean and in order.

The work location shall be defined and clearly marked. Adequate working space as well as means of access and lighting shall be provided at all parts of an electrical installation on, with, or near which any work activity is to be carried out.

Where necessary, safe access to the work location shall be clearly marked.

The metering point must not be exposed to running water or fire.

Meter/module installation may not be performed by unauthorised and untrained personnel. Such persons are not allowed to cut the seals and open the terminal or meter cover as contact with the live parts of the meter is dangerous for life.

CAUTION: The installer is expected to fully understand the risks and safety issues involved in electrical installations. The installer shall be aware at all times of the potential hazard of electrical shock and shall exercise due caution in completing the task!

Tools, equipment and devices shall comply with the requirements of relevant National or International Standards where these exist. Tools, equipment and devices shall be used in accordance with the instructions and/or guidance provided by the manufacturer or supplier.

Any tools, equipment and devices provided for the purpose of safe operation of, or work on, with, or near electrical installations shall be suitable for that use, be maintained and be properly used.

Personnel shall wear clothing suitable for the locations and conditions where they are working. This could include the use of close-fitting clothing or additional PPE (personal protective equipment).

CAUTION: The installer must be correctly equipped with personal protection equipment (PPE) and use the appropriate tools at all times during the installation.

Working procedures are divided into three different procedures: dead working, live working, and working in the vicinity of live parts. All these procedures are based on the use of protective measures against electric shock and/or the effects of short-circuits and arcing.

The installer must be informed if the national legislation permits the work on the installation under voltage – live work, and must follow the rules of legislation.

Depending on the kind of work, the personnel working in such conditions shall be instructed or skilled. Live working requires the use of specific procedures. Instructions shall be given how to maintain tools, equipment and devices in good working order and how to verify them before working.

This subclause deals with the essential requirements ("the five safety or golden rules") for ensuring that the electrical installation at the work location is dead and secure for the duration of the work.

This shall require clear identification of the work location. After the respective electrical installations have been identified, the following five essential requirements shall be undertaken in the specified order unless there are essential reasons for doing otherwise: disconnect completely (1.), secure against re-connection (2.), verify that the installation is dead (3.), carry out earthing and short-circuiting (4.) and provide protection against adjacent live parts (5.).

CAUTION: Only one wire or ferrule may be connected in one terminal. Otherwise, the terminal could be damaged or the contact could not be made properly.

CAUTION: Do not use those types of cable, which are not prescribed for the installation site and the power requirements!

DANGER: The insulation of the connecting cable must extend over the whole visible part of the cable. There must be no further bare part of the cable visible above the terminal edge. Touching live parts is dangerous for life. The stripped part of the connecting wire should be shortened if necessary.

1.2.3. Module maintenance

No maintenance is required during the module's life-time. The implemented metering technique, built-in components and manufacturing procedures ensure high long-term stability of meters and the modules. Therefore no recalibration is required during entire meters life-time.

In case the service of the module is needed, the requirements from the meter installation procedure must be observed and followed.

Cleaning of the module is allowed only with a soft dry cloth. Cleaning is allowed only in upper part of the module. Cleaning is forbidden in the back and side sites of the module. Cleaning can be performed only by the personnel responsible for meter/module maintenance.

CAUTION: Never clean soiled meters/modules under running water or with high pressure devices. Penetrating water can cause short circuits. A damp cleaning cloth is sufficient to remove normal dirt such as dust. If the meter/module is more heavily soiled, it should be dismounted and sent to the responsible service or repair centre.

Visible signs of fraud attempt (mechanical damages, presence of a liquid, etc.) must be regularly checked.

The quality of seals and the state of the terminals and connecting cables must be regularly checked.

If there exists a suspicion of incorrect operation of the meter/module, the local utility must be informed immediately.

After the end of the meter's/module's lifetime, the meter/module should be treated according to the Waste Electric and Electronic (WEEE) Directive!

2. CM-e-3 COMMUNICATION MODULE

2.1. General

The CM-e-3 module (see Figure 1) is intended to read out and reparameterization the MT880 meter from a system side with a LAN (Local Area Network) via the internet.
The RS485 interface can be used as additional MT880 communication port or for connection other meters (cascading connection).

It is constructed to be inserted or removed from the meter with ease and fixed without any screws, also when meter is powered.

Figure 1: CM-e-3 module

⚠ **CAUTION!**
The module is intended only for indoor use!

ℹ **NOTE!**
For proper module operation, the meter firmware version has to be at least **ISKAMMT880100414** or higher.

2.2. Identification

The version and hardware type of module are stored in the module memory. This information provides plug and play operation.

3. MODULE CONFIGURATION

3.1. Power supply

Power supply for the module is provided by the meter. The power consumption depends on communication activity (see Table 1).

	Power consumption (W)
Min. – communication is not active	1,05
Max. – active communication	1,46

Table 1: Module power consumption

3.2. Communication channels

There are two communication channels on the module:

- Ethernet interface
- RS485 interface

3.3. Module to meter connector

Figure 2: 24 pin connector on the back side of the module

Module to meter connector provides power, control and data signals.

3.4. Ethernet interface

The Ethernet interface is standardised to IEEE 802.3. The Ethernet interface permits connection to the LAN (Local Area Network) by means of the transmission control protocol TCP/IP (Transmission Control Protocol/Internet Protocol). The maximum transmission speed is 100 Mbit/s.

The Ethernet connection of the communication module is made via an RJ45 socket with the pin assignment as it is shown in Table 2 (see Figure 3).

Pin No.	Terminal	Signal
1	TxD+	Transmitted Data +
2	TxD-	Transmitted Data -
3	RxD+	Received Data +
6	RxD-	Received Data -

Table 2: RJ45 socket pin assignment
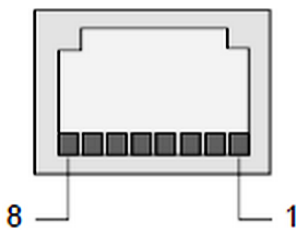
Figure 3: Pin numbering of RJ45 socket

Currently supported protocols are Static address (predefined IPv4 address is used) or DHCP client (IPv4 address is assigned by DHCP server).
DNS servers are not used by application and can be omitted.

To allow module to successfully communicate with meter, meter communication port (channel 2) has to be configured as (see Figure 4):
– physical communication speed: **115200 bit/s**
– communication mode: **DLMS UA**
– HDLC device address: **17**

IEC HDLC setup channel 2
Logical name: 0-2:22.0.0*255, Class ID: IEC HDLC setup class (23),

Communication speed
115200

Window size transmit
1

Window size receive
1

Max info field length transmit
154

Max info field length receive
154

Inter octet time out
50

Inactivity time out
120

IEC local port setup channel 2
Logical name: 0-2:20.0.0*255, Class ID: IEC local port setup (19), Version: 1

Communication mode
1 - Protocol according to IEC 62056-46 (DLMS UA)

Default baud rate
115200

Proposed baud rate
115200

Device address
17

Response time
0 - 20ms

Figure 4: Configuration of meter communication port (channel 2)

LEDs show current status of modem (see Figure 5 and Table 3).

Figure 5: LEDs status

LED's ID	LED's name	Definition	Description
D1	**Link/Activity**	Ethernet link activity	OFF – no activity on Ethernet ON – activity on Ethernet BLINK – transmitting/receiving Ethernet frames
D2	**Speed 10/100 Mb/s**	10/100 Mbit/s speed selection	OFF – no link or 10 Mbit/s detected ON – link is up and 100 Mbit/s detected BLINK – N/A
D3	**RxD**	RX serial data	OFF – no reception from the meter ON – Ethernet interface is receiving data from the meter BLINK – N/A
D4	**TxD**	TX serial data	OFF – No transmission to the meter ON – Ethernet interface is transmitting data to the meter BLINK – N/A

Table 3: LEDs description

3.5. RS485 interface

RS485 interface can be used for:

- meter access
- cascading functionality – up to 31 additional meters

RS485 is realized as half-duplex interface with 3 connection terminals (A, B, GND). Terminals are doubled for easy cascading connection. (See Figure 6 and Table 4.)

The meter hosting the communication module controls communication channel settings, communication speed is up to 115200 bit/s.

Same transfer rate needs to be set on all cascaded meters.

Figure 6: RS485 terminals

Terminal	Signal	Description
27	**A**	RS485 A line
29	**B**	RS485 B line
28	**GND**	Digital ground

Table 4: RS485 terminal description

Technical data for RS485 interface:

- Communication speed: 300-115000 bit/s
- up to 31 connected meters
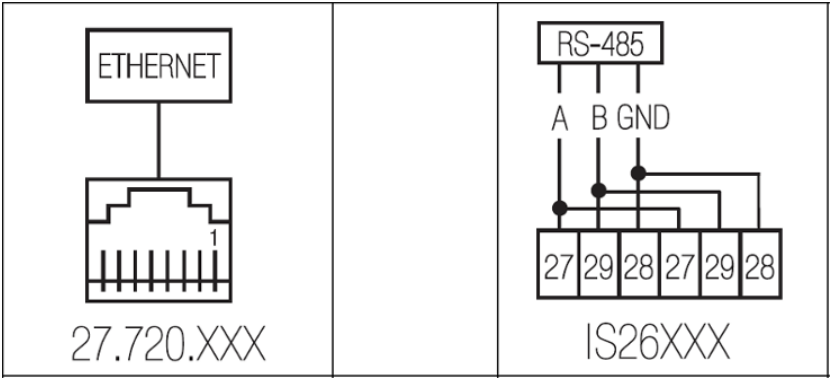- Maximum distance: 1200 m

4. MODULE CONNECTION

Figure 7: Connection diagram

Figure 8: CM-e-3 module terminals

5. SETTINGS

Parameters can be changed via:
- Meter objects
- Web GUI (Web Graphical User Interface)

5.1. Change settings via meter object

After installing module into the meter, module read the basic configuration from the meter and save them in the module memory.

NOTE!
In case that module is inserted into the meter by Iskraemeco, then default parameters are already written in the meter/module.
If modem is delivered as standalone product, then you need to take care about the meter parameterization.

New values are automatically stored in the meter in a predefined COSEM objects. Changed values are applied immediately.

5.1.1. Ethernet

Networking settings can be set also directly in COSEM objects and will be applied immediately after Consereth connection is terminated.

	Description	Default value	Storage (meter memory)
DL reference	DL reference	0.0.25.1.0.255	0-0:25.1.0.255, attribute 2
IPv4 netmask	device IPv4 subnet mask	255.255.255.0	0-0:25.1.0.255, attribute 6
IPv4 gateway	device IPv4 default gateway	0.0.0.0	0-0:25.1.0.255, attribute 7
Protocol	use DHCP for IPv4 assignment	False	0-0:25.1.0.255, attribute 8
DNS servers	primary DNS server address	0.0.0.0	0-0:25.1.0.255, attribute 9
DNS servers	secondary DNS server address	0.0.0.0	0-0:25.1.0.255, attribute 10
IPv4 address	device IPv4 address	192.168.1.1	0-0:25.3.0.255, attribute 4

Table 5: Ethernet configuration

IPv4 setup

Logical name: 0-0:25.1.0*255, Class ID: IPv4 setup (42), Version: 0

DL reference (references data link layer setup object)

0.0.25.1.0.255

IP address (IPv4 address of this physical device)

0 . 0 . 0 . 0

Multicast IP address

	IP address (IPv4 address of this physical device)	
*		

Parameters to support the selected IP options

	Type	Length	Data (i)	
*				

Subnet mask

255 . 255 . 255 . 0

Gateway IP address

0 . 0 . 0 . 0

Use DHCP flag (device uses dynamic host configuration protocol)

False

Primary DNS address (domain name server)

0 . 0 . 0 . 0

Secondary DNS address (domain name server)

0 . 0 . 0 . 0

Figure 9: Ethernet configuration

PPP setup

Logical name: 0-0:25.3.0*255, Class ID: PPP setup (44), Version: 0

IPCP options (IP control protocol)

	Use	Length	Data
IP compression protocol	☐	0 ↕	No IP Compression
Preferred local IP address	☑	6 ↕	192 . 168 . 1 . 1
Grant access only to pref peer on list	☐	0 ↕	
Use static IP pool	☐	0 ↕	
Preferred peer IP addresses	☐	0 ↕	

Figure 10: Preferred local IP

5.1.2. Consereth settings

	Description	Default value	Storage (meter memory)
TCP Port	TCP listen port number	4059	0-0:128.23.0.255, attribute 2
Timeout	TCP inactivity timeout	120	0-0:128.23.1.255, attribute 2

Table 6: Consereth settings

Consereth port
Logical name: 0-0:128.23.0*255, Class ID: Data (1), Version: 0
Value : LongUnsigned
4059

Figure 11: Consereth port setting

Consereth timeout [s]
Logical name: 0-0:128.23.1*255, Class ID: Data (1), Version: 0
Value : LongUnsigned
120

Figure 12: Consereth timeout setting

5.2. Change settings via Web GUI

Access to WEB server can be enabled/disabled by COSEM object 0-0:128.103.2.255, attribute 2.

	Description	Default value	Storage (meter memory)
Device Flags	WEB GUI access selection (bit 15) • 32768 – enabled • 0 – disabled	32768	0-0:128.103.2.255, attribute 2

Table 7: Web GUI selection

Device flags
Logical name: 0-0:128.103.2*255, Class ID: Data (1), Version: 0
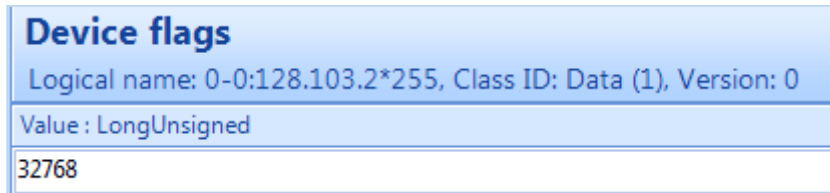
Value : LongUnsigned

32768

Figure 13: Web GUI selection – enabled

WEB server provides configuration interface and module firmware upgrade (only with administration rights). Access to the management WEB service is protected by username and password.

WEB GUI is accessible at IP address defined in COSEM object 0-0:25.3.0.255, attribute 4, parameter Preferred Local IP (example http://192.168.1.1) or address assigned by DHCP server, port 80.
Pages can be opened with any modern WEB browser like Firefox, Internet Explorer, Chrome and Safari.
Webuser (see Table 8) has access to configure application parameters: IP configuration and Consereth.

	Description	Default value	Storage location
HTTP user username	Name used to login into HTTP server – limited access	webuser	Module
HTTP user password	Password used to login into HTTP server	webuser	Module

Table 8: System configuration of Webuser

1. In a browser address bar enter a preferred local IP (example http://192.168.1.1) or an address assigned by DHCP, port 80.
2. *Webuser* has to login (see Table 8 and Figure 14).
   Username: **webuser**
   Password: **webuser**

NOTE!
Username and password cannot be changed. Both of them are case sensitive.

Authorization Required
Please enter your username and password.
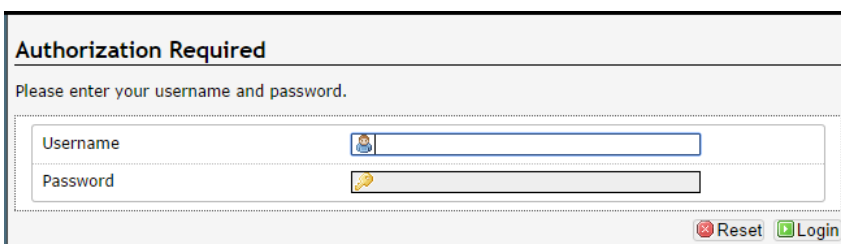
| Username | |
| Password | |

Reset Login

Figure 14: WEB GUI login page

3. After successful login, page with configuration tabs is shown (see Figure 15).
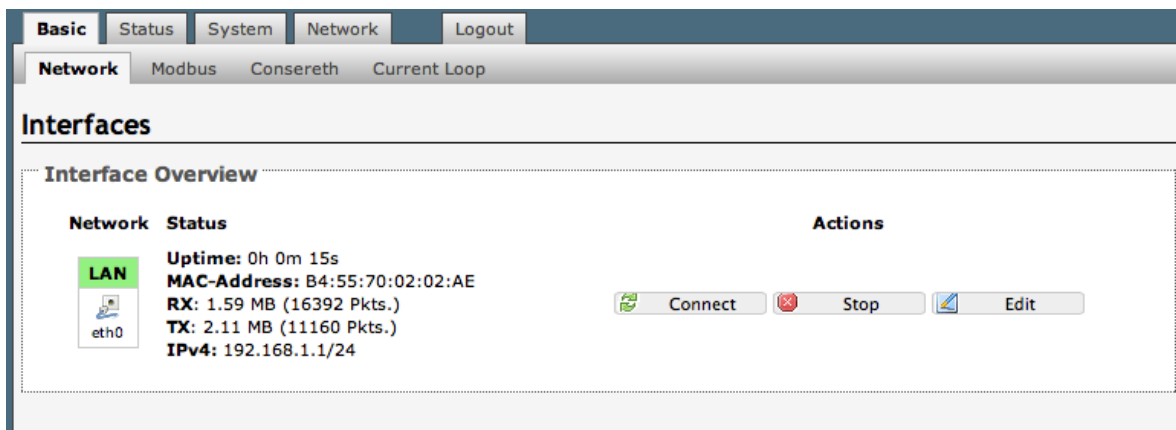Click on tabs to view or change (**Edit**) any configuration.

Figure 15: Page with configuration tabs

4. After any change of configuration **Save & Apply** button needs to be pressed to apply changes to the system.
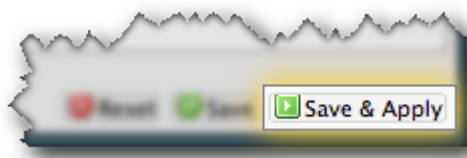

Figure 16: Save & Apply command

5.2.1. Ethernet

To change IP network settings under **Network** tab, press **Edit** button (see Figure 15 and Figure 17).
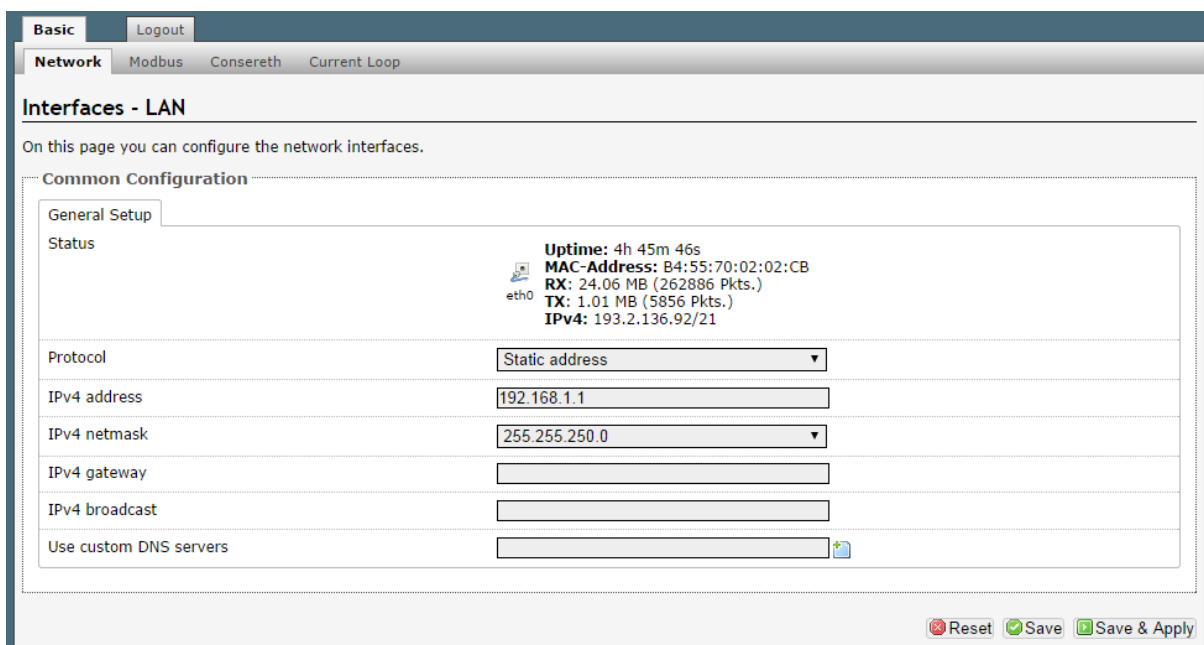

Figure 17: Network configuration

Currently supported protocols are Static address (predefined IPv4 address is used) or DHCP client (IPv4 address is assigned by DHCP server).

DNS servers are not used by application and can be omitted.

New values are automatically stored in the meter in a predefined COSEM objects. Changed values are applied immediately.

Networking settings can be set also directly in COSEM objects and will be applied immediately after Consereth connection is terminated.
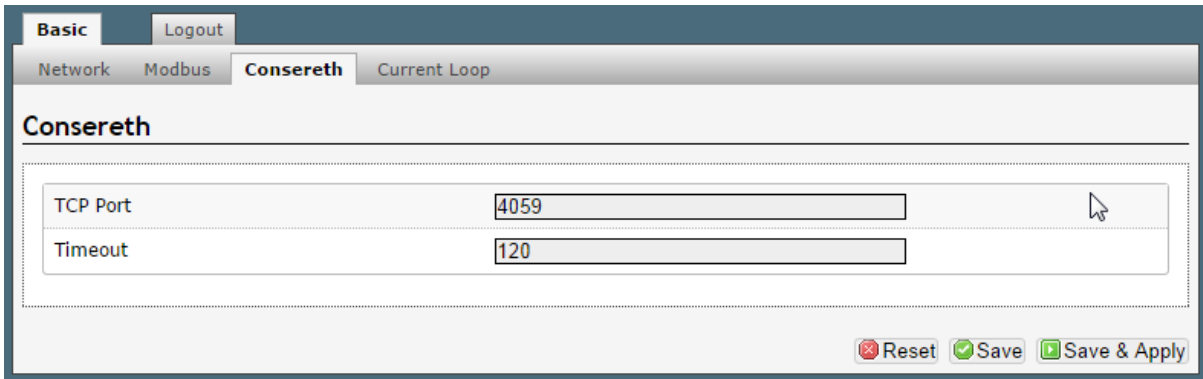
5.2.2. Consereth settings

Figure 18: Consereth settings

New values are automatically stored in the meter in a predefined COSEM objects. Changed values are applied immediately or after Consereth connection is terminated.

6. ERROR IN COMMUNICATION

Figure 19: LEDs position on the front plate

LEDs description when no error in communication with meter is detected is shown in Table 9.

LED's ID	LED's name	Definition	Description
D1	**Link/Activity**	Ethernet link activity	OFF – no activity on Ethernet ON – activity on Ethernet BLINK - transmitting/receiving Ethernet frames
D2	**Speed 10/100 Mb/s**	10/100 Mbit/s speed selection	OFF – no link or 10 Mbit/s detected ON – link is up and 100 Mbit/s detected BLINK – N/A
D3	**RxD**	RX serial data	OFF – no data activity between meter and module ON – Ethernet interface is receiving data from the meter BLINK – N/A
D4	**TxD**	TX serial data	OFF – no data activity between meter and module ON – Ethernet interface is transmitting data to the meter BLINK – N/A
D5	no name	–	–

Table 9: LEDs description

If an error in communication between module and meter is detected LEDs definition changes (see Table 10).

LEDs state and blinking frequency	Description
all blinking – 1 Hz	Cannot communicate with meter; please, check channel 2 settings.
all blinking – 5 Hz	Meter has stopped responding, backing of for specific time before restarting communication.
D3 – 5Hz, D4 – 2 Hz, D5 – 1 Hz	Module type is not supported by this software.
D3 – ON, D4 – OFF, D5 – OFF	Hardware failure; module will restart in 1 minute.

Table 10: LED signalization in a case of error in communication

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7. TECHNICAL DATA

Technical characteristics of the module comply with the:

- IEC/CISPR 22
- IEC61000-4-2
- IEC61000-4-3
- IEC61000-4-4
- IEC61000-4-5
- IEC62052-11

7.1. Ethernet interface

10/100 Mbit/s Ethernet port, IEEE 1588 available.

7.2. Power consumption

Consumption depends on communication activity.
Max. 1,46 W with all communications active.

7.3. RS485 interface

Technical data for RS485 interface:

- Communication speed: 300-115000 bit/s
- up to 31 connected meters
- 2-wire (half-duplex) transfer mode
- Maximum distance: 1200 m

7.4. Environment conditions

Temperature ranges:

- operation: -40 °C to + 85 °C
- storage: -40 °C to + 85 °C

Air humidity:
- 5% to 95% Non-Condensing

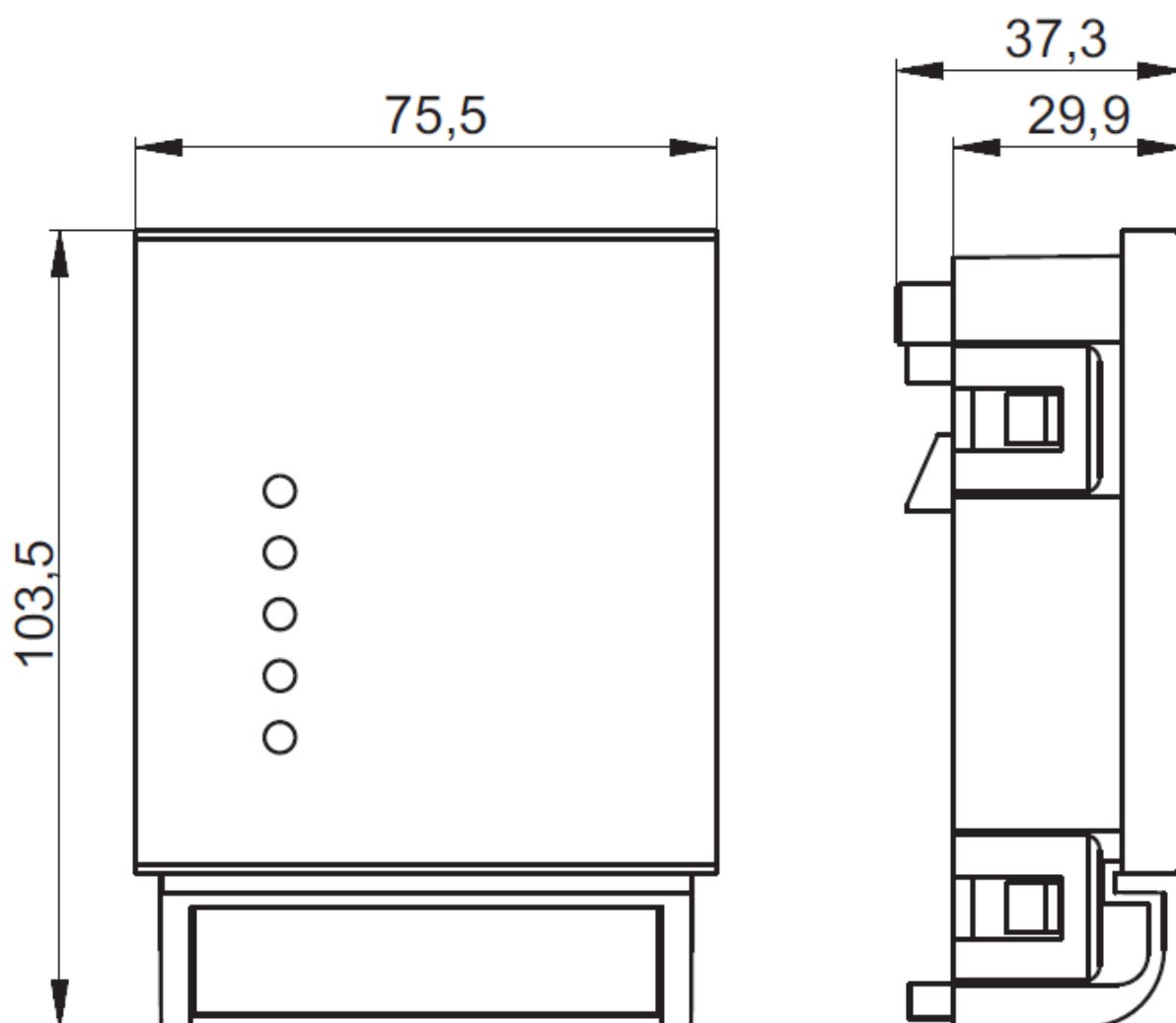# 8. DIMENSIONS

Width / Height / Length (mm) – see Figure 20

Figure 20: Dimensions of the CM-e-3 module

9. MODULE TYPE DESIGNATION

Figure 21: CM-e-3 module type designation

CM-e-3

CM	Communication Module
e	Ethernet
3	RS485 interface

Table 11: Description of CM-e-3 module type designation

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