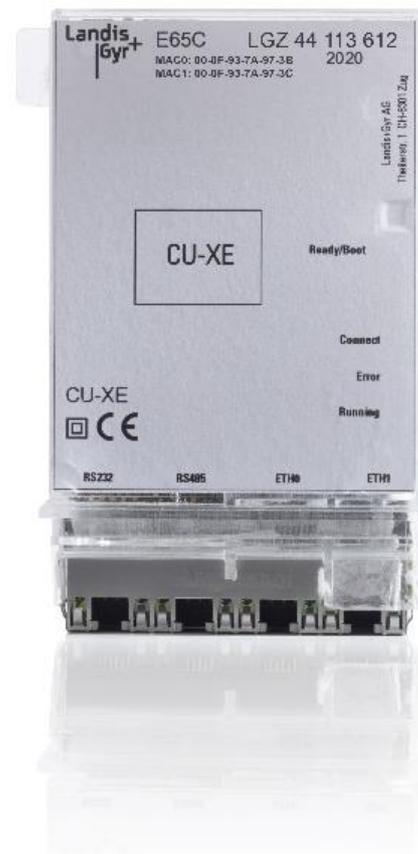


CU-XE Release 2

E65C

User manual



E65C CU-XE communication units provide Ethernet and serial communication between E650, S650 or E850 meters and the metering and SCADA systems.

Date: 20.03.2020

File name: D000062528 E65C CU-XE User Manual en e.docx

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D000062528 en e

Revision history

Version	Date	Comments
a -d	06.08.2019	Release 1: a) First edition (10.07.2018), b) Second edition (27.08.2018), c) Third edition (06.12.2018), d) Update (06.08.2019).
e	20.03.2020	Adaptations for Release 2: Note on supported web browsers added in section 2.4.1 <i>"Ethernet interfaces"</i> . SCADA IEC 60870-5-104 and Modbus added to examples of IP services in section 2.4.1 <i>"Ethernet interfaces"</i> . Section 2.4.2 <i>"RS485/RS422 interface"</i> updated. Section 5.1 <i>"Functional description"</i> updated (new Web UI). Section 5.3 <i>"LED operation"</i> updated. Section 5.4 <i>"Updating the CU-XE from Release 1 to Release 2"</i> new. Section 9 <i>"Terms and abbreviations"</i> updated. Several minor layout changes.

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All product information are subject to change without notice.

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About this document

Range of validity	This User Manual applies to E65C CU-XE Release 2 communication units hereinafter referred to as "CU-XE".
Purpose	<p>This User Manual supplements the operating instructions of the meter and is incomplete without the data contained therein. Together with these operating instructions, the User Manual contains all the information necessary for the operation of the CU-XE communication unit for its intended purpose. This includes:</p> <ul style="list-style-type: none">• Provision of knowledge concerning the characteristics, construction and function of the CU-XE communication unit• Information about possible dangers, their consequences and measures to prevent any danger• Details concerning the performance of all work throughout the service life of the CU-XE communication unit (installation, commissioning, operation, maintenance, decommissioning and disposal)
Target group	The contents of this User Manual are intended for technically qualified personnel of energy supply companies responsible for system planning, installation and commissioning, as well as the operation, maintenance, decommissioning and disposal of the communication units.
Reference documents	<p>The Technical Data and the Functional Description of the CU-XE communication unit can be found in the following documents:</p> <ul style="list-style-type: none">• D000062527 E65C CU-XE Release 2 Technical Data en• D000062529 E65C CU-XE Functional Description en
Terms and abbreviations	A list of terms and abbreviations used in this User Manual is available at the end of this document.

1 Safety

1.1 Safety information

The following symbols are used to draw your attention to the relevant danger level, i.e. the severity and probability of any danger, in the individual sections of this document.

**Warning**

Used to indicate a dangerous situation that could cause bodily injury or death.

**Caution**

Used to indicate a situation/ action that could result in material damage or loss of data.

**Note**

Used to indicate general guidelines and other useful information.

In addition to the danger level, safety information also describes the type and source of the danger, its possible consequences and measures for avoiding the danger.

1.2 Responsibilities

The owner of the communication units – usually the utility company – is responsible for assuring that all persons engaged in working with units:

- Have read and understood the relevant sections of the User Manual.
- Are appropriately qualified for the work to be performed in accordance with national regulations (see ISSA "Guideline for Assessing the Competence of Electrically Skilled Persons").
- Strictly observe the safety regulations (laid down in section 1.3 "*Safety regulations*") and the operating instructions as specified in the individual sections.

In particular, the owner of the communication units bears responsibility for the protection of persons, prevention of material damage and the training of personnel.

For this purpose, Landis+Gyr provide training on a variety of products and solutions. Contact your local Landis+Gyr representative, if interested.

1.3 Safety regulations

The following safety regulations must be observed at all times:

- Only appropriate tools shall be used for the job. This means, e.g. that the screwdriver must be of the correct size for the screws, and the handle of the screwdriver must be insulated.
- Devices that have been dropped must not be installed, even if no damage is apparent, but must be returned to an authorised service and repair centre (or the manufacturer) for testing. Internal damage may result in malfunctions or short-circuits.
- Communication units must not be cleaned under running water or with compressed air. Water ingress can cause short-circuits or damage components.
- Antenna installation must conform to instructions listed in this document.

In addition, the safety instructions given in the User Manuals for the meter is also applicable.

2 Device description

2.1 Scope of application

The CU-XE communication unit can be installed in and uninstalled from the following Landis+Gyr meters without opening the calibration seal:

- Landis+Gyr E650 ZxD300/400xT industrial and commercial meters
- Landis+Gyr E850 ZxQ high-precision meters
- Landis+Gyr S650 SxA300/400xT and SMA500 Smart Grid Terminals

2.2 Characteristics

The CU-XE communication unit contains two Ethernet interfaces, one RS232 serial interface and one RS422/RS485 serial interface. The device also contains a powerful application processor for networking, security and data processing functionalities.

2.3 Type designation

The type designation of the CU-XE communication unit is added to that of the meter (see meter User Manual), but is not shown on the main faceplate of the meter. The type designation is inscribed on the case of the communication unit and can be seen through the front door of the meter through an opening in the tariff faceplate.

The CU-XE communication unit is available in the following versions:

Type	Ethernet	RS485/RS422	RS232
CU-XE	●	●	●

2.4 Functions

The Functional Description of the CU-XE communication unit is provided separately. The main functions are briefly summarised below.

2.4.1 Ethernet interfaces

The CU offers two fully configurable Ethernet interfaces conforming to IEEE 802.3 standards applicable to both 100BASE-TX and 10BASE-TX.

The Ethernet interfaces can be used for the management of the device. They provide access to the device using a standard web browser (Web UI) for the purposes of changing the configuration and gathering diagnostic information. The interfaces use a secure web interface based on HTTPS (Hypertext Transfer Protocol over Transport Layer Security). For backwards compatibility, the web interface is also accessible over unencrypted HTTP (Hypertext Transfer Protocol).



Web browsers

The Web UI is compatible with Chromium based browsers (e.g. Google Chrome, new Microsoft Edge, ...), Mozilla Firefox and Microsoft Edge.

The Ethernet interfaces provide access to IP-based services and, in addition, are also clients for IP services depending on application requirements. Examples of IP services include:

- DLMS passthrough
- Web UI
- IEC 62056-21 (base meter: data readout)
- SCADA IEC 60870-5-104 (directly to SCADA system)
- Modbus
- Passthrough and bridging are protocol independent



Note

It is recommended to verify the suitability of any non-listed protocol that you intend to use. Landis+Gyr technical support may be contacted for support.

See the description of services. Each service is described in section 5 “Operation”.

2.4.1.1 Network bridging

Activating the bridge will aggregate both Ethernet interfaces and connect both network segments transparently. It does not justify the installation of a dedicated Ethernet switch with its own power supply.

2.4.2 RS485/RS422 interface

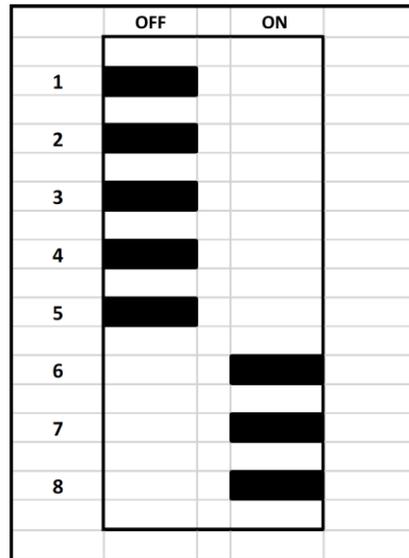
The RS485/RS422 interface is a serial, bi-directional, differential interface. The interface includes user configurable bias and termination resistors. A typical application is to create a multi-drop bus, where multiple devices can share the communication channel. For example, up to 31 E650 meters can be connected to the RS485 bus configured as the bus master, and they can be read remotely using the Ethernet interface.

To configure the RS485/RS422 operational mode as well as the bias and termination resistors, DIP switches on the back-side of the PCB can be used. The DIP switches are accessible only when the CU is removed from the meter.

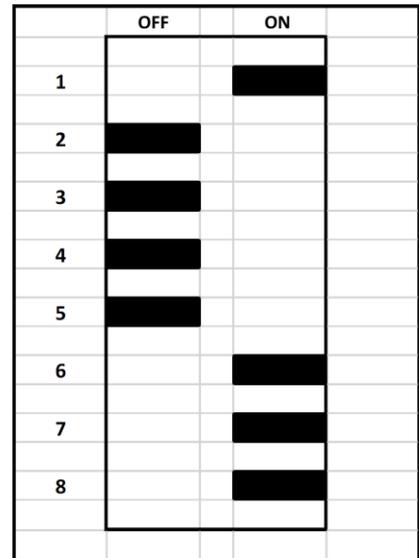
Legends for the scenarios below:

DIP switch	Function
Position 1	ON = rx termination enabled, 120 Ω
Position 2	ON = tx termination enabled, 120 Ω
Position 3	ON = bias enabled
Position 4	ON = bias enabled
Position 5	ON = Manufacturer access
Position 6	ON = used as RS485 (half-duplex); OFF = used as RS422 (full-duplex)
Position 7	ON = used as RS485 (half-duplex); OFF = used as RS422 (full-duplex)
Position 8	ON = used as RS485 (half-duplex); OFF = used as RS422 (full-duplex)

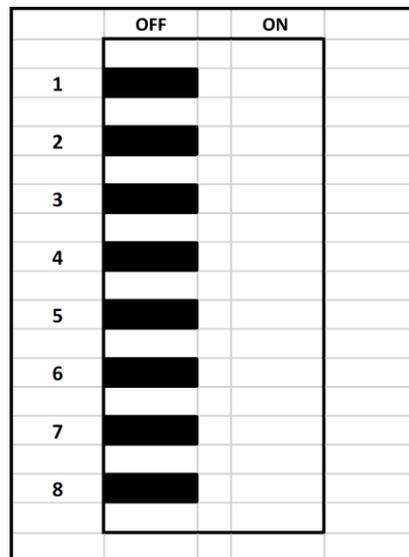
RS485 Half-duplex not terminated:



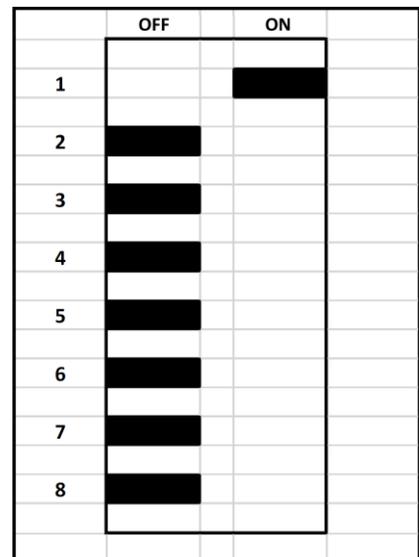
RS485 Half-duplex terminated:



RS422 Full-duplex not terminated:



RS422 Full-duplex terminated:



2.4.3 RS232 interface

The RS232 interface is a serial, bi-directional, full-duplex interface. The device implements the DTE interface that is used to connect to external modems provided a driver supports the particular modem type.

2.4.4 Base meter interface

The CU has a two-channel interface to connect to the meter that is hosting the CU. These two channels may be assigned to any of the available channels.

2.5 Root certificate authority

The CU is configured from production with certificates from the Landis+Gyr root certificate authority. The Landis+Gyr Root CA is available under the Landis+Gyr EMEA Root Certificate RSA-4096 at

<https://www.landisgyr.com/webfoo/wp-content/uploads/2013/12/rsa4096-root-ca-cert.pem>

Add this certificate to the root certificates of your system to be able to verify the server in a TLS connection to the CU.

3 Mechanical construction

3.1 Overview

The CU-XE communication unit is a complete unit, with its own plastic case.

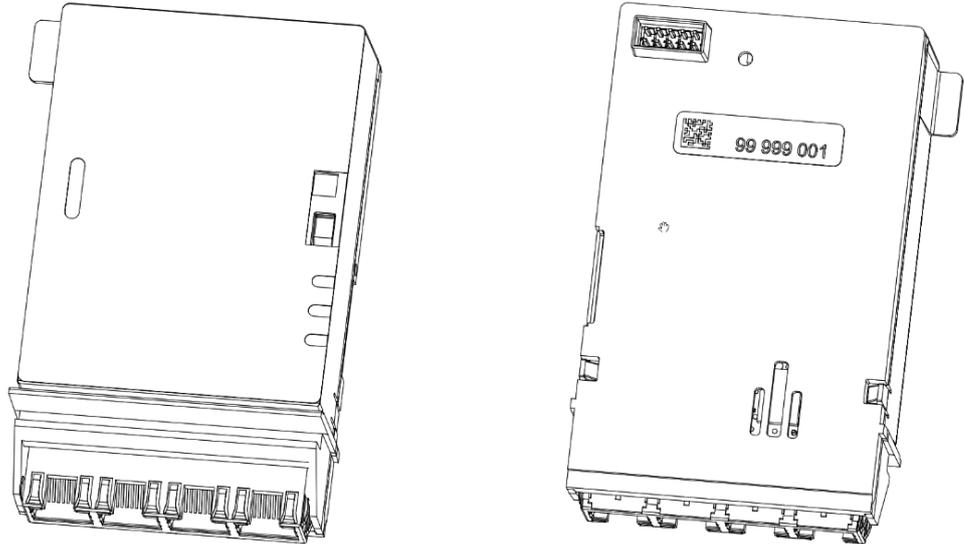


Fig. 1 Front and back side of the CU

The faceplate of the communication unit installed in the meter is visible when the meter front door is open.

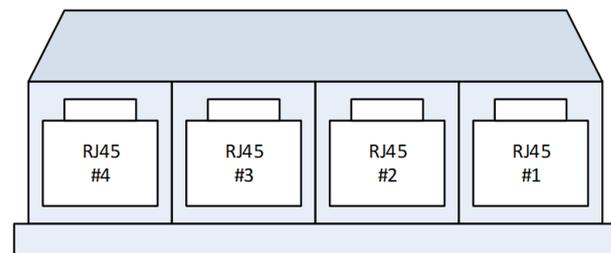
The external connections are situated underneath the unit, while a 10-pin connecting plug at the rear provides a connection to the meter electronics.

Four LEDs on the circuit board indicate when the CU is booting or ready, when it is connected, when there is an error and when the CU is running properly.

The communication unit has no seal of its own. It is secured by the utility seal of the meter.

3.2 Interface connections

The CU-XE communication unit has the following four interface connections:



- #1: Ethernet port 1
- #2: Ethernet port 0
- #3: RS485/RS422
- #4: RS232

Fig. 2 CU-XE interface connections

The RJ45 sockets of Ethernet ports 1 and 0 have the following pin assignment:

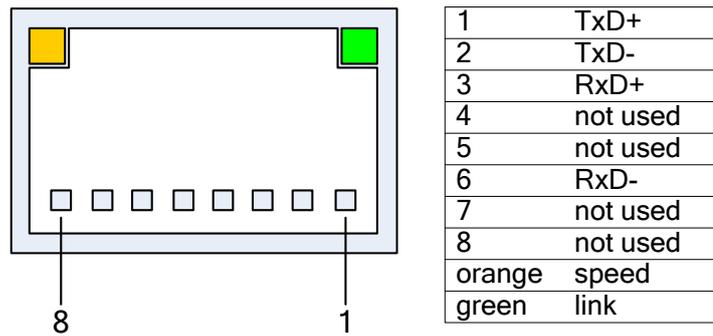


Fig. 3 Pin assignment of the Ethernet interfaces

The orange led shows the speed of the connection and if it is on then it is indicating the 100Mbit connection, otherwise it is referring to 10Mbit connection.

The green led is showing the link activity on the RJ45 socket. On status indicates the link is on and is blinking when data transmitted or received.

The RJ45 socket of the RS485/RS422 interface has the following pin assignment:

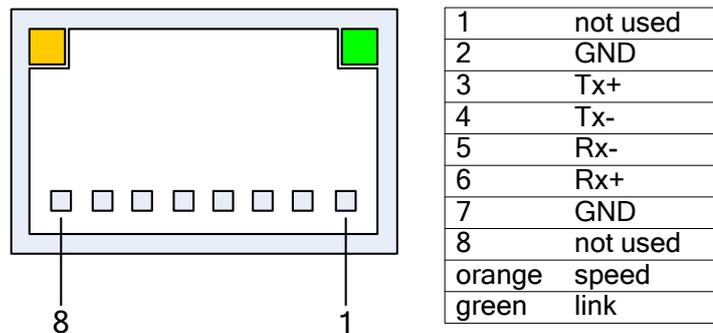


Fig. 4 Pin assignment of the RS485/RS232 interface

The RJ45 socket of the RS232 interface has the following pin assignment:

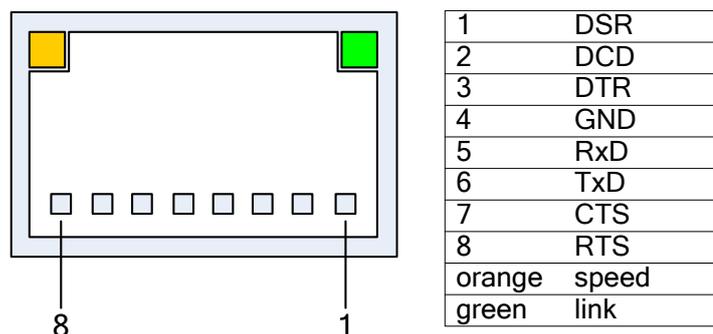


Fig. 5 Pin assignment of the RS232 interface

3.3 Faceplate

The faceplate of the CU-XE communication unit has the following appearance:

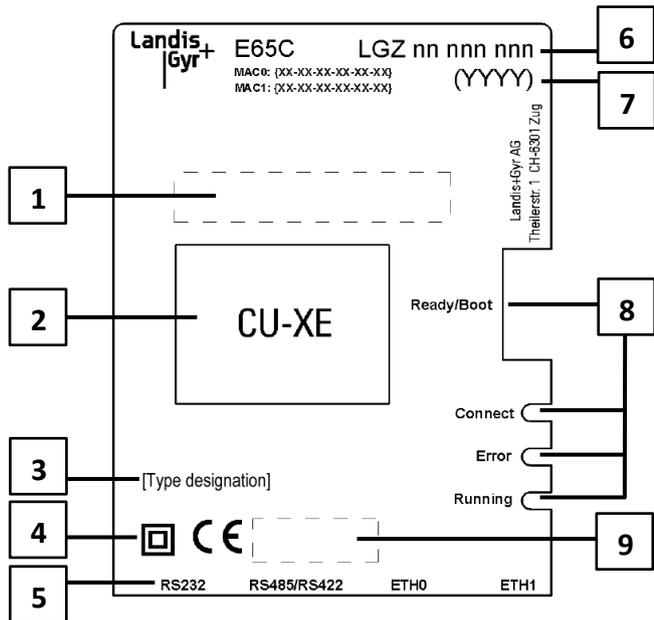


Fig. 6 Faceplate of the CU-XE communication unit

- 1 Warning plate (country-specific)
- 2 Type designation
- 3 Type designation (property information)
- 4 Insulation class and CE mark
- 5 Interface inscriptions
- 6 Serial number
- 7 Year of manufacture
- 8 LED inscriptions
- 9 Certification information

The faceplate may also contain other country-specific data.

3.4 LEDs

The four LEDs designated on the faceplate are located on the circuit boards and can be seen through the light guide on the right side of the faceplate. Their function is described in section 5 "Operation".

4 Installation/uninstallation

4.1 Installation in a meter

**No voltage to the meter during installation**

In order to avoid hazardous electric shocks, make sure that there is no voltage applied to the meter when installing the communication unit. Contact with live parts is dangerous to life. Disconnect the meter from the power supply as described in the meter User Manual.

**Excessive number of power failures reduces life of product**

The CU writes to its internal FLASH memory every time there is a power failure. This type of memory has a life expectancy of approximately 100,000 write cycles. This is not a guaranteed value. For a life of 15 years this amounts to approximately 15 power failures per day. Exceeding this limit may shorten the useful life of the product.

**E65C CU-XE communication units can be used in E650 (from Series 3 FW version B30 upwards), S650 and E850 electricity meters or in CU-ADPx adapters**

The CU is designed to be interoperable with meters existing at the time it was designed. Once the meter is obsolete and is replaced by a newer version of the product, interoperability testing stops. This means that older meters that have been in the field for a number of years should not be used with new CUs even though they can be inserted into the meter.

Install the communication unit in a meter as follows:

1. Make sure that no voltage is applied to the meter.
2. Remove the utility seals on the front door and terminal block cover.
3. Open the front door and remove the terminal block cover.

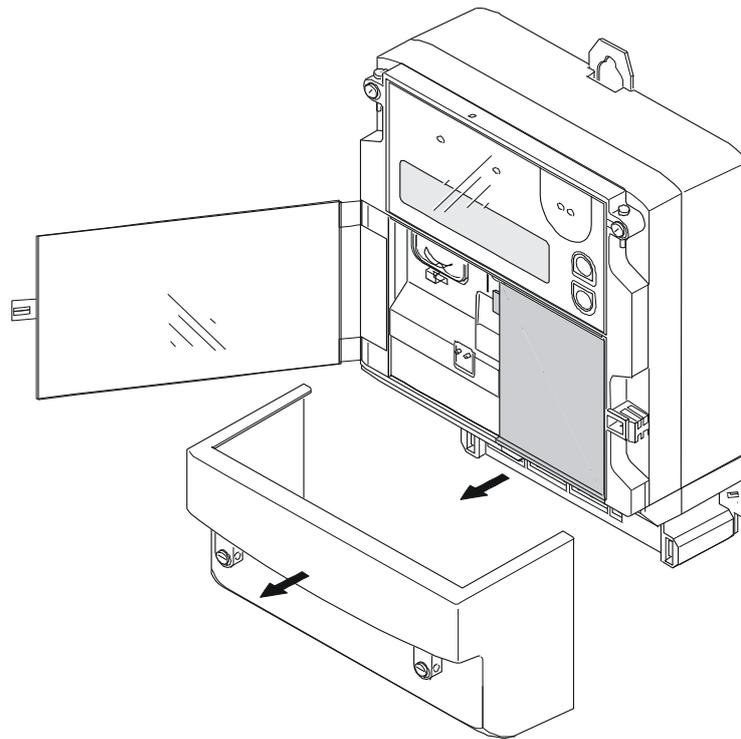


Fig. 7 Preparing the meter for the installation of the communication unit

4. Remove the built-in “dummy” communication unit.
5. Insert the communication unit carefully into the space provided in the meter. Ensure correct fitting of the connector.

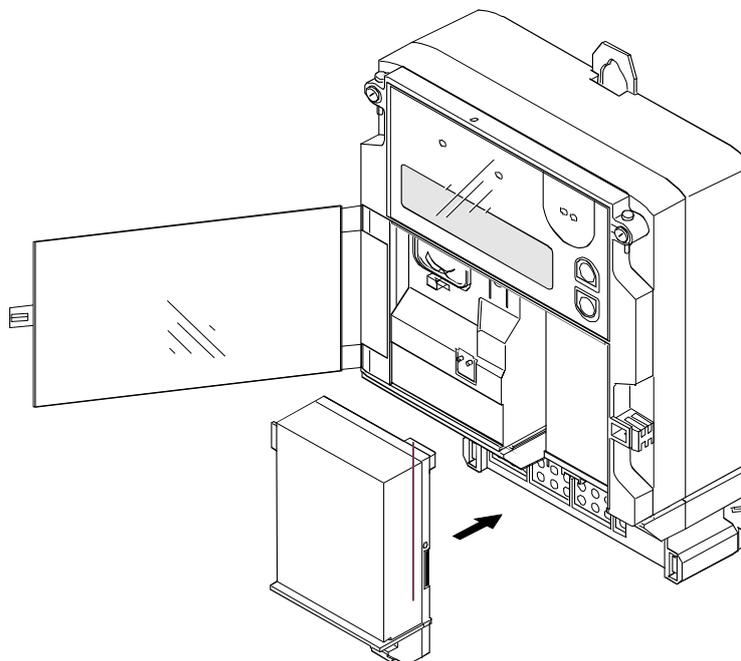


Fig. 8 Installing the communication unit in the meter

6. Close and seal the front door.
7. Connect to the Web UI, see section 5.1.1 “Accessing the Web UI” for more information.
8. Change the initial password that was specified prior to order confirmation. See section 5.1.11.6 “Change own password”.

4.2 Connecting the communication unit

4.2.1 Connecting the RS485/RS422 interface

Insert the connecting cable with the RJ45 connector to the socket labelled RS485/RS422 in the communication unit until the connector engages. Connect the other end of the cable to the nearest unit of the RS485 multiple connection.

If the RS485 interface is provided with two internally connected RJ12 sockets (e.g. CU-B2), the next extension of the RS485 bus can also be provided with an RJ12 plug. If, however, only one RJ12 socket is present (e.g. CU-XE) the extension for the RS485 bus must be formed with an external splitter.

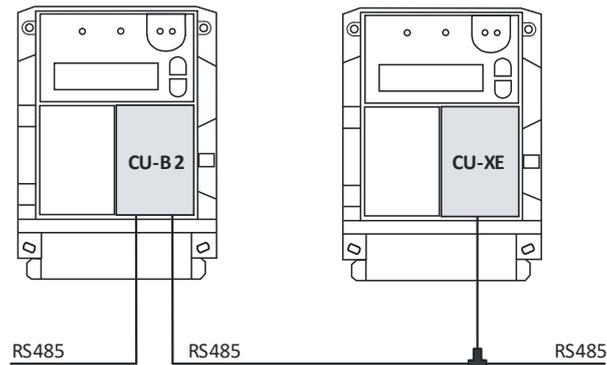


Fig. 9 Connecting multiple communication units



External wiring of RS485

In order to function correctly, all 3 wires (data a, data b and Common GND) must be connected. RS485 operation with only 2 wires (without common GND) is forbidden as the RS485 interface may not function correctly or may even get damaged.

4.2.2 Resealing the device

After all connections have been made to a CU-XE, you can replace the terminal block cover and seal it with a utility seal.

4.3 Commissioning and functional check

The CU-XE communication unit should be taken into operation as follows (see also section 5 "Operation" for a detailed description of the LED states):

1. After switching on the mains voltage, a red boot LED is blinking. When the CU-XE communication unit is ready for operation, the LED switches to green. When the Ethernet connection is made, the running LED is illuminated.
2. A remote readout of meter data via Ethernet should be performed as a functional check, if the CU has been appropriately configured.
3. If a multiple connection to further devices is present, check that they are working as expected.

4.4 Removal/exchange of communication unit

The communication unit is exchanged or removed from the meter in reverse order of the installation (see sections 4.1 "Installation in a meter" and 4.2 "Connecting the communication unit").

5 Operation

The CU-XE communication unit features four LEDs to display operational status information. These LEDs are visible through the transparent plastic housing on the right side of the faceplate.

5.1 Functional description

The Web UI described in this section belongs to **Release 2** of the CU-XE communication unit and looks entirely different to the Web UI of Release 1.

For upgrading a Release 1 CU to Release 2 refer to section 5.4 “Updating the CU-XE from Release 1 to Release 2”.

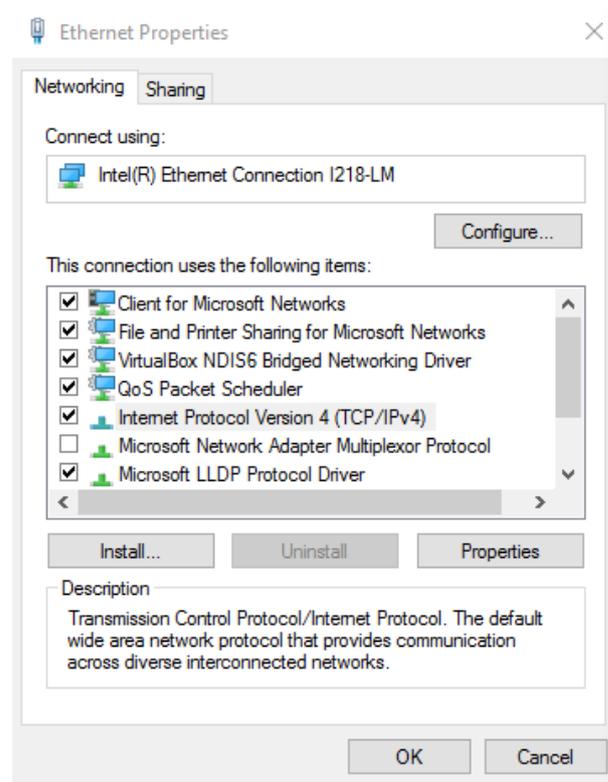


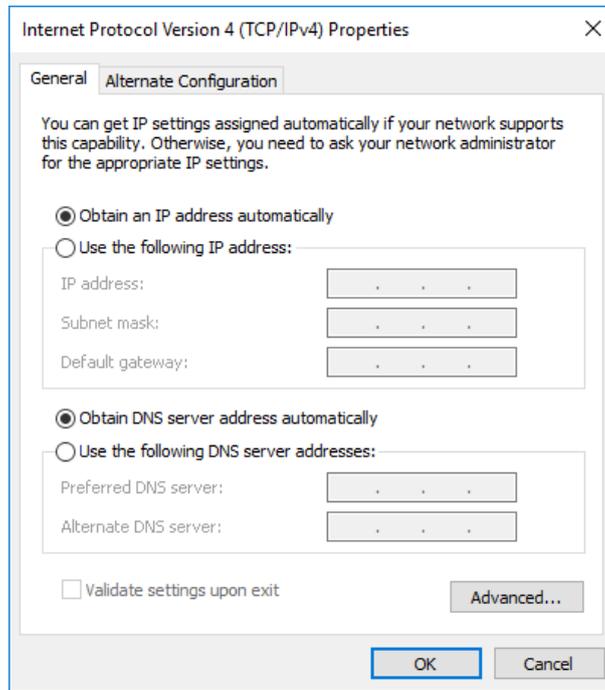
Note

After configuration change the power cannot be cut off for 10 seconds, otherwise the CU can be damaged.

5.1.1 Accessing the Web UI

Connection to the management port must be established first. The used PC shall be set in DHCP mode. See the example below.





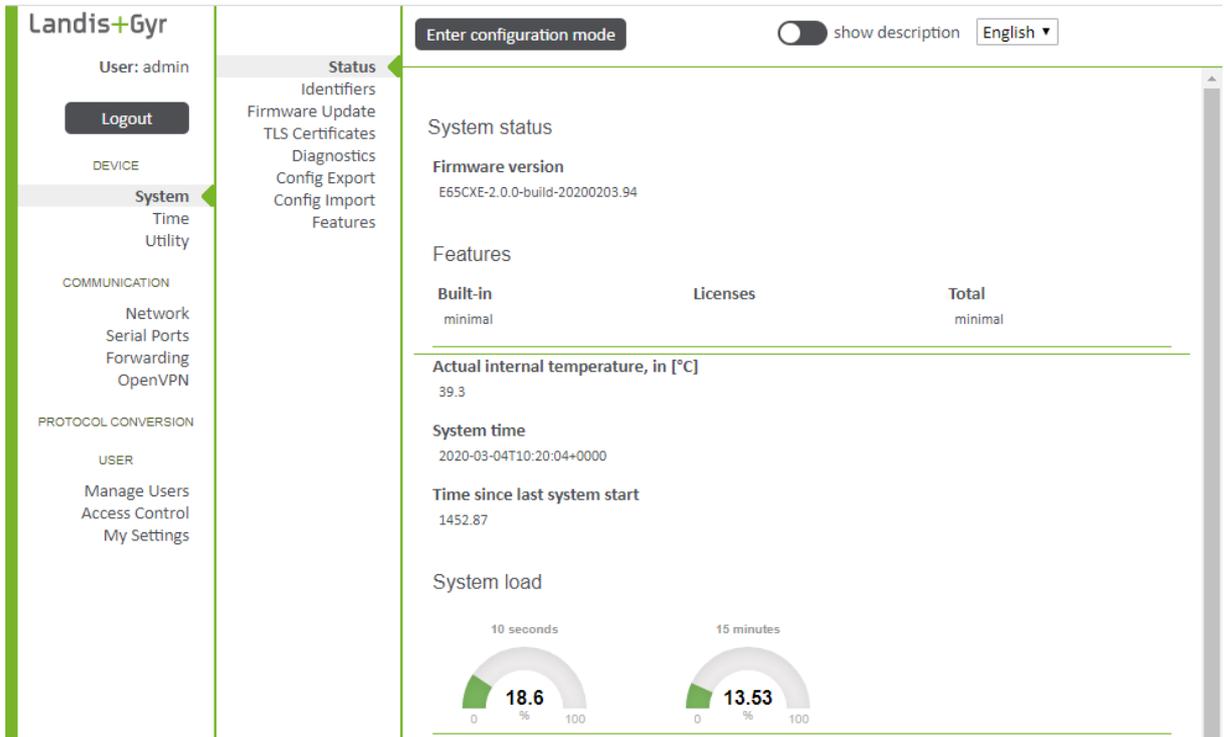
To access the Web UI of the CU either the device serial number (the “LGZ” number: <https://LGZ12345678.local>) or the IP address of the management port (<https://172.16.0.1>) must be used.



Note

HTTP is also available for backwards compatibility reasons.

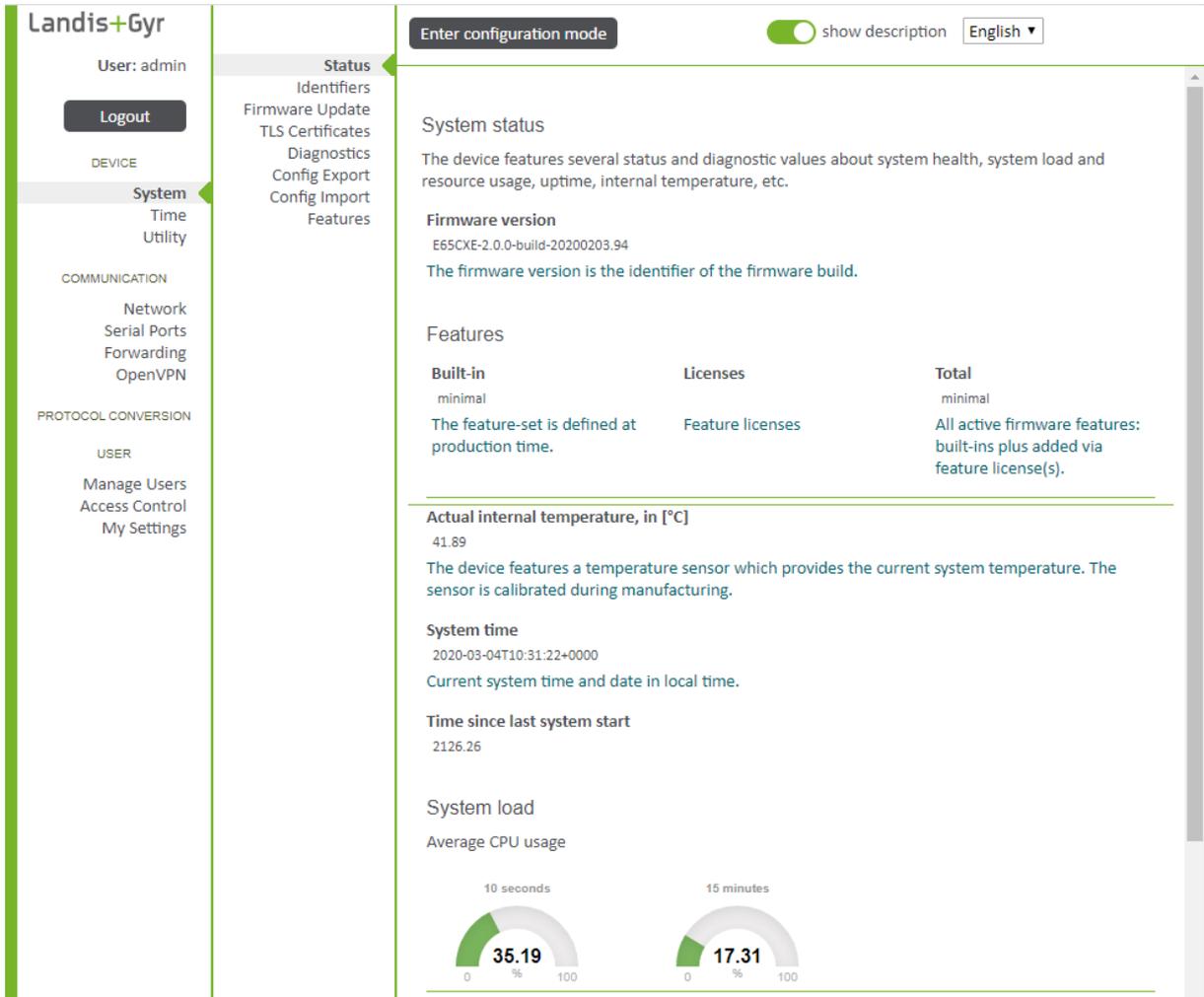
The Web UI is password protected. Therefore, a user name (admin) and a password are required. After a successful login, the system status screen is shown.



The screens of the Web UI are divided into a main menu (far left), a sub menu – if available – and a data representation area for the selected menu item (high-lighted grey).

5.1.2 Web UI online help

As an online help function the “show description” option in the top bar can be activated at any time to display explanations to all the information shown in the data representation area.



5.1.3 Configuration mode

To change settings, where applicable, the configuration mode can be entered by clicking on the “Enter configuration mode” button in the top bar.

After changing settings, save the changes by clicking on the “save” button (this temporarily stores the changes on the computer used, but not yet in the CU).

To exit the configuration mode, in the top bar click on the “Cancel configuration mode” button and then either on the “Apply configuration change” button (if the changes shall be stored in the CU) or on the “Discard configuration change” button (if the changes shall not be considered).



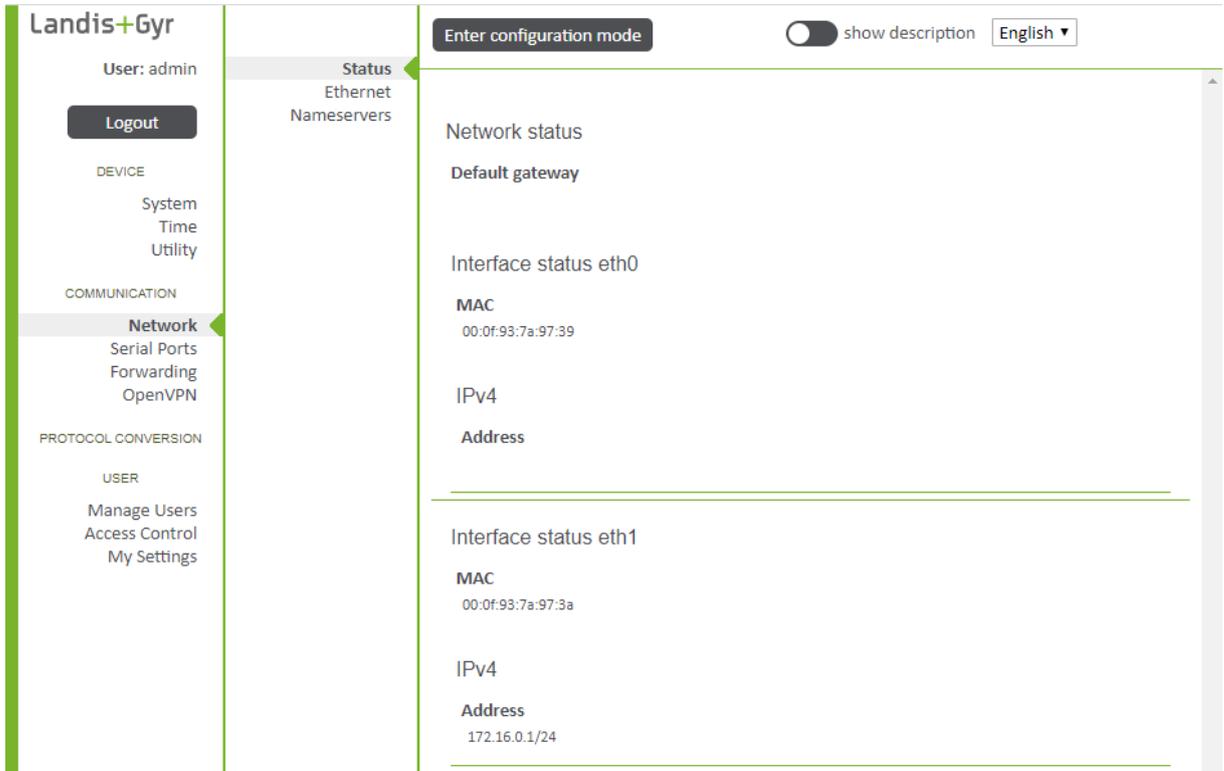
Note

Applying onfiguration changes might provoke components in the device to be stopped and restarted again. This can take up to several minutes.

5.1.4 Ethernet ports

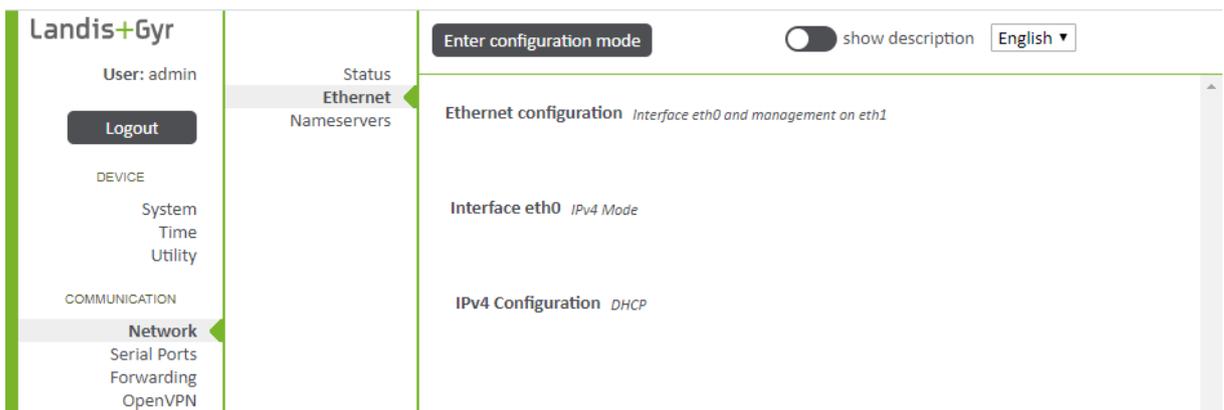
5.1.4.1 Network status

The Network status screen indicates the current address information (MAC and IPv4 address) for Ethernet port 0 (eth0) and 1 (eth1).

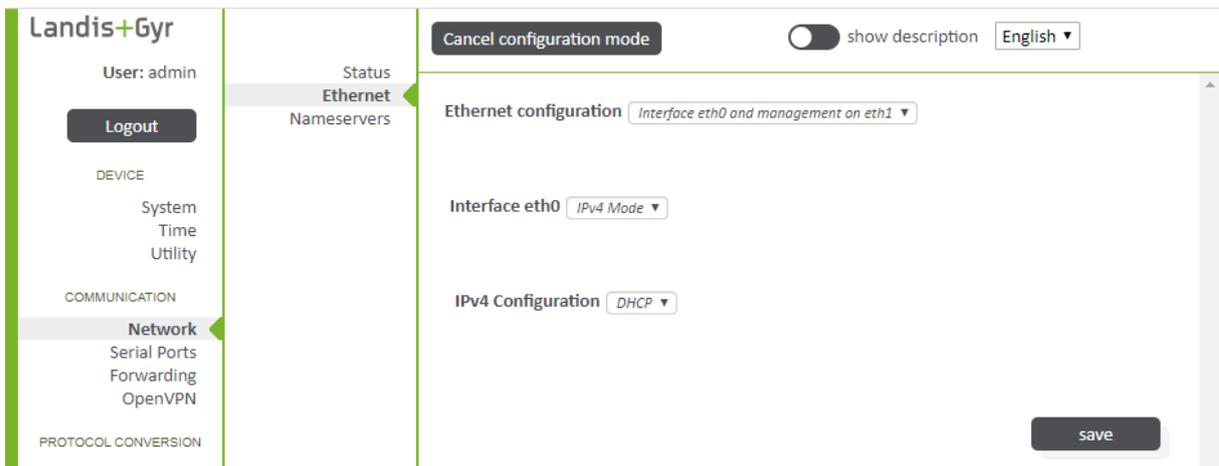


5.1.4.2 Ethernet configuration

The Network Ethernet screen indicates the Ethernet configuration, the interface mode and the IPv4 configuration.



Settings can be changed after entering the configuration mode:



The Ethernet configuration can for instance be set to the following options:

- Interface eth0 and management on eth1
- Bridge between eth0 and eth1
- Management on eth1
- Interface eth0 and eth1

If “Bridge between eth0 and eth1” is selected, the management port is not accessible over the standard IP or device ID see section 5.1.1 “*Accessing the Web UI*” as the management port has the same IP address as the main port.

Bridging over Ethernet interfaces allows you to connect several CUs transparently, without using an external switch. Therefore, it is a viable option for meter room applications. Bridging has been tested with up to 20 CUs.

The network is a linear topology and it is assumed that it is loop free since there is no Spanning Tree Protocol support implemented in the bridges.

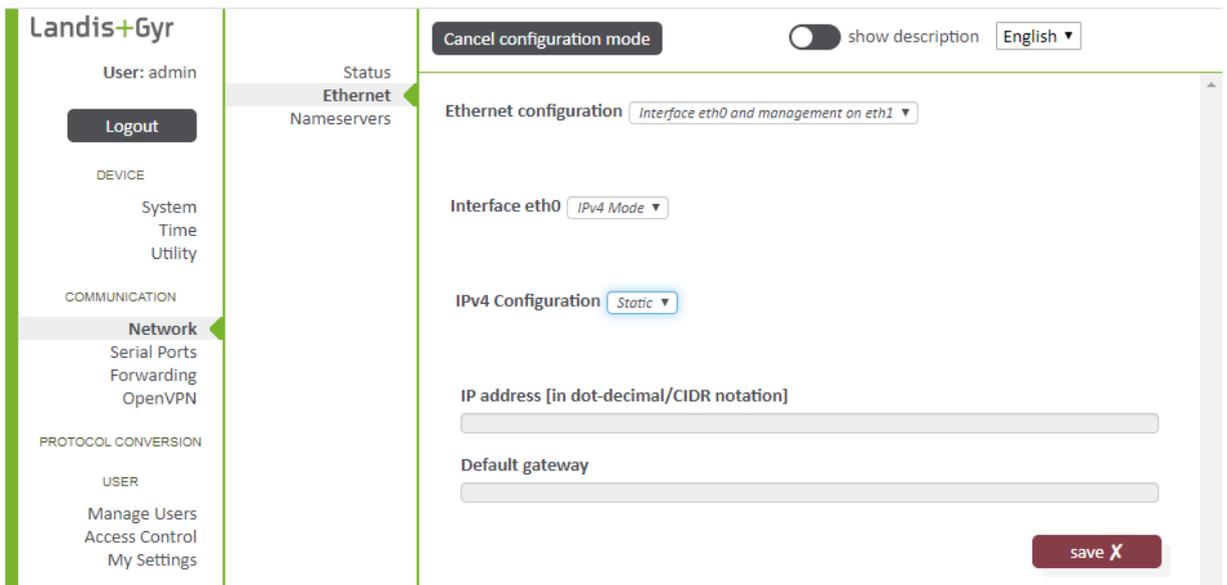
For more complex networks, a star topology, where only one CU is connected per link, is recommended.



Note

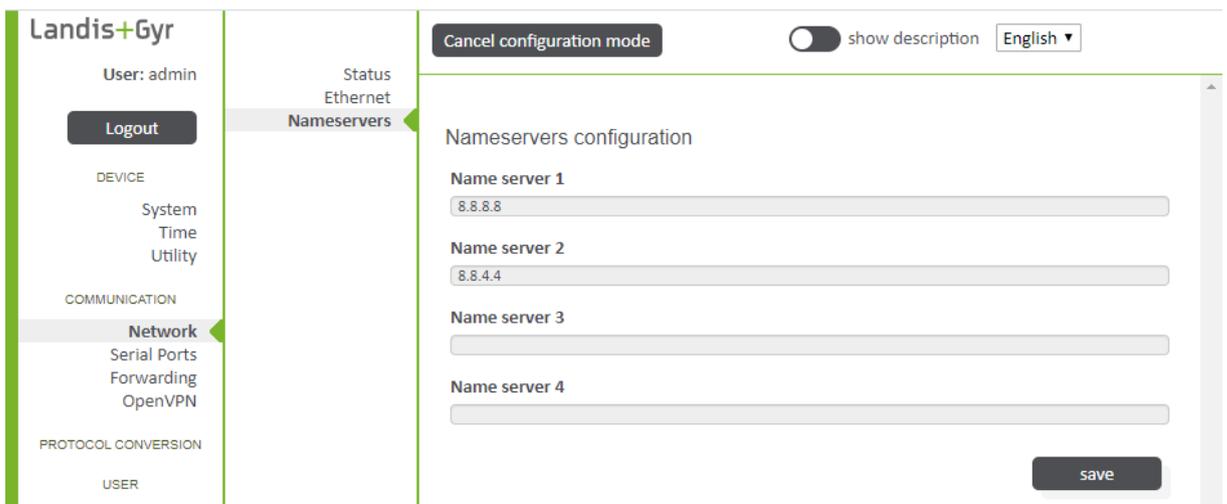
At the options “Interface eth0 and eth1” and “Bridge between eth0 and eth1” a “recovery access” can be activated. This recovery access provides an option to connect locally to the device over <https://172.16.0.1>.

The IP address can be configured manually in case the IPv4 configuration is not set for automatic IP addressing over DHCP. For Ethernet port 0 (eth0) the manually inserted IP address cannot refer to the same subnet as used for Ethernet port 1 (eth1).



5.1.4.3 Nameservers configuration

The Nameservers configuration allows you to configure the name(s) of the server(s). Up to 4 servers are supported.



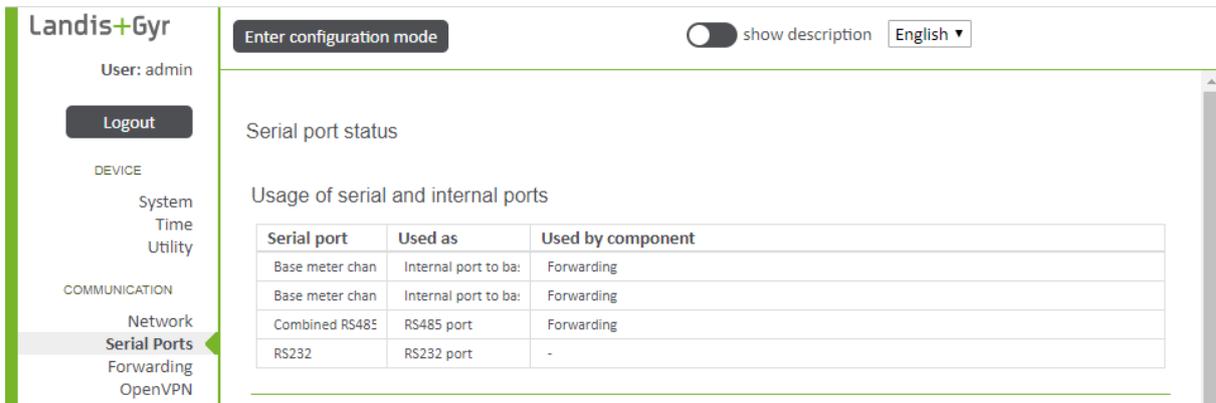
Note

If the IP address is obtained automatically via DHCP, the above configured servers will be used as secondary nameservers, otherwise as primary.

5.1.5 Serial ports

5.1.5.1 Serial port status

The Serial port status screen indicates the usage of serial and internal ports.



Landis+Gyr

User: admin

Enter configuration mode

show description English

Logout

DEVICE

System
Time
Utility

COMMUNICATION

Network
Serial Ports
Forwarding
OpenVPN

Serial port status

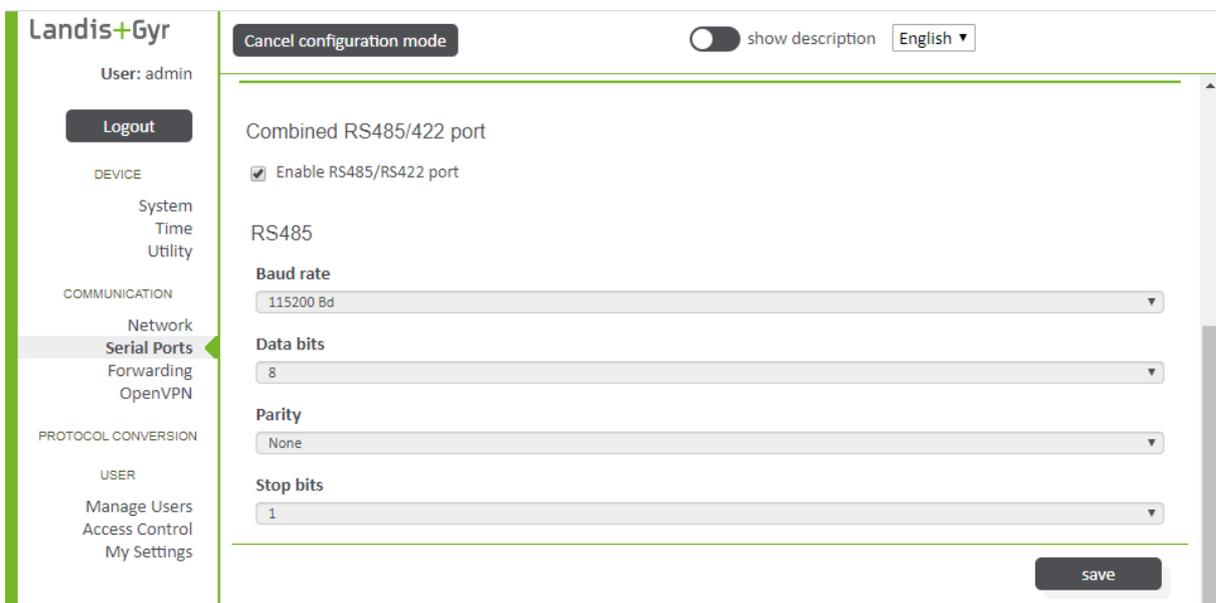
Usage of serial and internal ports

Serial port	Used as	Used by component
Base meter chan	Internal port to ba:	Forwarding
Base meter chan	Internal port to ba:	Forwarding
Combined RS485	RS485 port	Forwarding
RS232	RS232 port	-

Base meter channels 1 & 2 can be connected to the virtual bus (passthrough) in order to access the base meter. For further information, see section 5.1.6 “Forwarding (passthrough)”.

5.1.5.2 RS485/RS422

The RS485/RS422 interface can be used for virtual bus (passthrough). The port can be configured according to the peer. The CU supports a maximum transmission speed of 115.2 kbps.



Landis+Gyr

User: admin

Cancel configuration mode

show description English

Logout

DEVICE

System
Time
Utility

COMMUNICATION

Network
Serial Ports
Forwarding
OpenVPN

PROTOCOL CONVERSION

USER

Manage Users
Access Control
My Settings

Combined RS485/422 port

Enable RS485/RS422 port

RS485

Baud rate

115200 Bd

Data bits

8

Parity

None

Stop bits

1

save

To switch between RS485 and RS422, DIP switch settings have to be applied according to tables shown in section 2.4.2 “RS485/RS422 interface”

5.1.5.3 RS232

The RS232 interface can be used for virtual bus (passthrough). The port can be configured according to the peer. The CU supports a maximum transmission speed of 115.2 kbps.

The screenshot displays the Landis+Gyr web interface for RS232 port configuration. At the top left, the user is identified as 'admin' with a 'Logout' button. A 'Cancel configuration mode' button is located at the top center. On the top right, there is a 'show description' toggle switch and a language dropdown menu set to 'English'. The left sidebar contains a navigation menu with categories: 'DEVICE' (System, Time, Utility), 'COMMUNICATION' (Network, Serial Ports, Forwarding, OpenVPN), 'PROTOCOL CONVERSION', and 'USER' (Manage Users, Access Control, My Settings). The 'Serial Ports' option is highlighted. The main content area is titled 'RS232 port' and includes a checked checkbox for 'Enable RS232 port'. Below this, the 'Port settings' section contains several dropdown menus: 'Baud rate' (115200 Bd), 'Data bits' (8), 'Parity' (None), 'Stop bits' (1), and 'Flow control' (RTS/CTS). A 'save' button is positioned at the bottom right of the configuration area.

5.1.6 Forwarding (passthrough)

To be able to establish a “direct” connection between devices on different ports (serial and/or Ethernet), the CU provides a passthrough functionality. Application level data received on one interface is forwarded to one or more other interfaces (and vice versa). Using this approach, the device is capable of handling every data transmission (independent of any protocol language) on the configured ports. In this sense the passthrough component acts as a fully transparent media converter.

Serial port status

Usage of serial and internal ports

Serial port	Used as	Used by component
Base meter chan	Internal port to ba:	Forwarding
Base meter chan	Internal port to ba:	Forwarding
Combined RS485	RS485 port	Forwarding
RS232	RS232 port	-

Forwarding configuration

Channels:

Name	Endpoint 1	Endpoint 2	Endpoint 3	
ETH	TCP port TCP Port 4059	Serial port Serial port Base meter channel 1	Not connected	✕ ↓
Modem	Serial port Serial port Combined RS485/ RS422	Serial port Serial port Base meter channel 2	Not connected	✕ ↑

Channel ✕ Last Channel ✕ All

save

The CU contains several different ports that can be used for passthrough:

- TCP ports
- Serial ports (combined RS485/RS422 or RS232)
- Internal ports to the base meter (base meter channel 1 or 2)

Up to maximum 10 channels can be defined in the forwarding configuration.

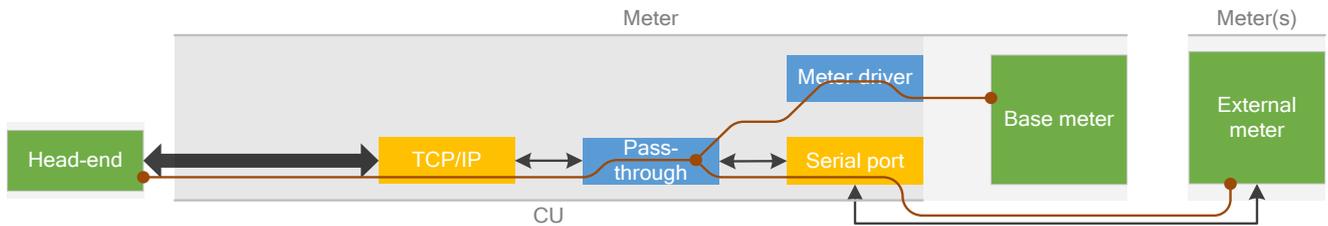
Using the buttons below the channels table you can add new channels or delete the last channel or all channels.

With the arrow buttons in the last column of the channels table you can move the table entries up and down for sorting purposes.

To delete a specific channel from the channels table click on the “x” button in the last column of the channels table.

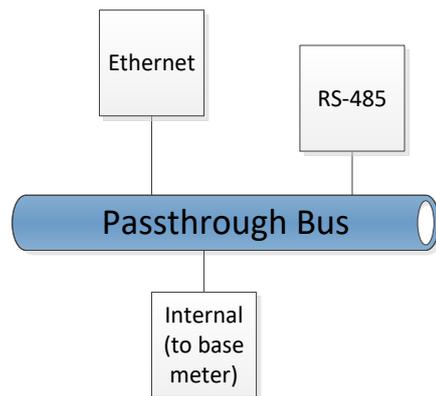
Ethernet bridging is meant to be used for forwarding using Ethernet ports.

The passthrough feature can be used in a number of different ways. See the example below.



Remark: Passthrough is not protocol-aware, i.e. every use case that does not require actions on the CU itself is supposed to be supported. Every protocol requiring actions (such as transmission speed switch at HDLC Mode E) is not supported.

Passthrough works like a bus with several attached ports. The number of ports attached to a bus is limited by the amount of available ports only. Traffic received from one of the connected ports is forwarded to every other port. This also implies that the slowest port defines the bus-speed, which might have an impact on the timing behaviour.



It is possible to have up to 4 busses configured to work in parallel.

If forwarding is being used to read out the base meter, the following protocols are supported:

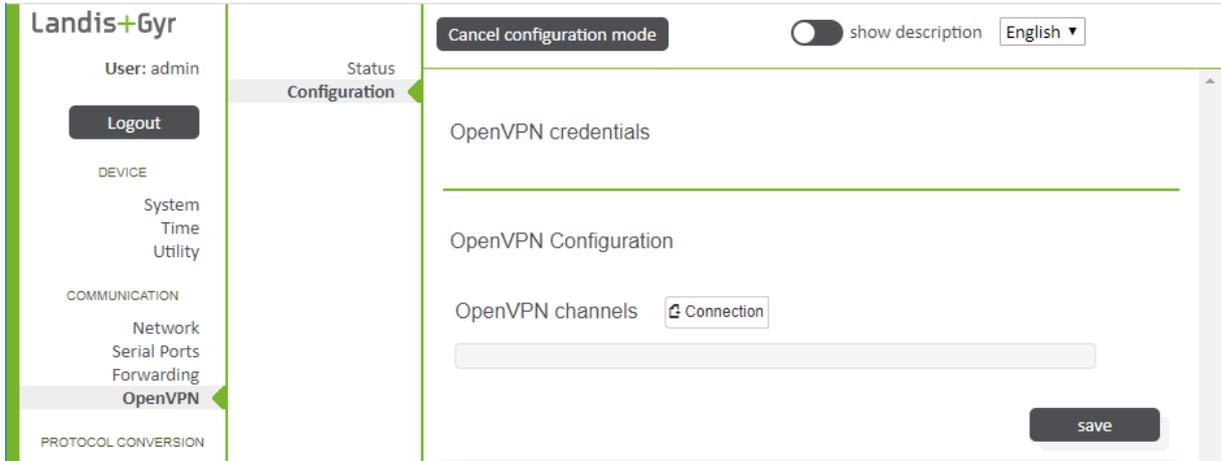
- DLMS
- IEC 62056-21 supported for data readout

5.1.7 OpenVPN

5.1.7.1 OpenVPN configuration

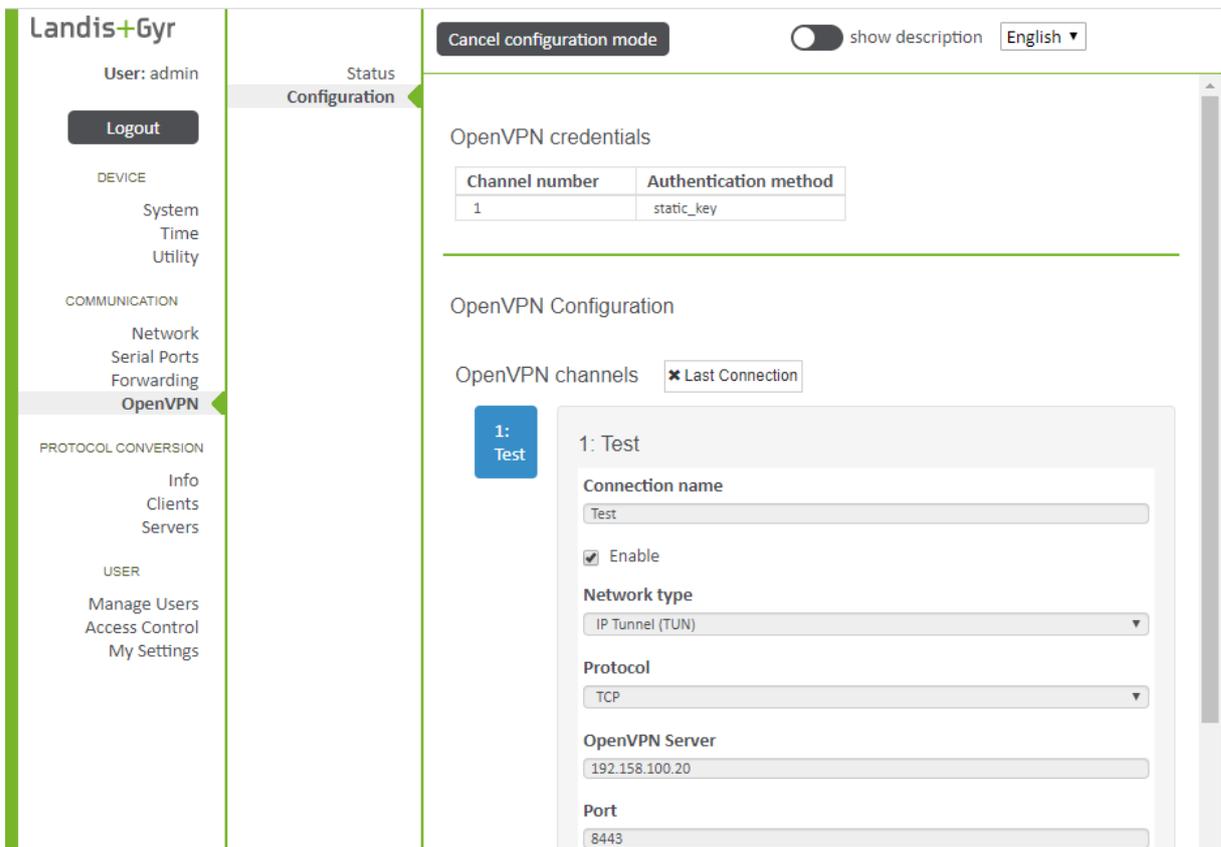
OpenVPN is an open-source software that implements virtual private network (VPN) techniques to create a secure encrypted point-to-point TSL connection.

Configuration settings can be changed after entering the configuration mode:



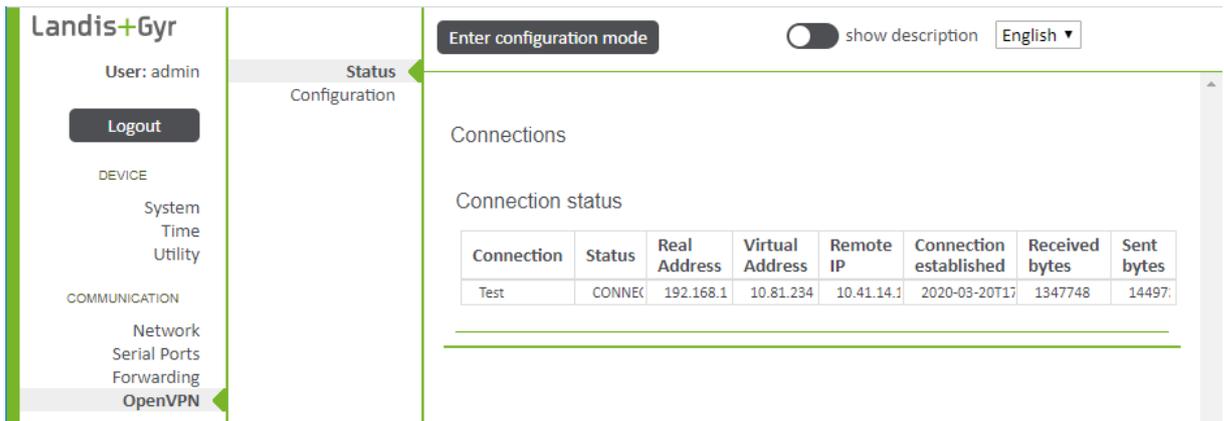
An OpenVPN channel can be defined in the OpenVPN Configuration area as follows:

- Click on the “Connection” button to display an OpenVPN channel definition.
- Activate the checkbox “Enable”
- Enter the required OpenVPN channel definition information.
- Click on the “save” button.
- Define further OpenVPN channels, if required.



5.1.7.2 OpenVPN status

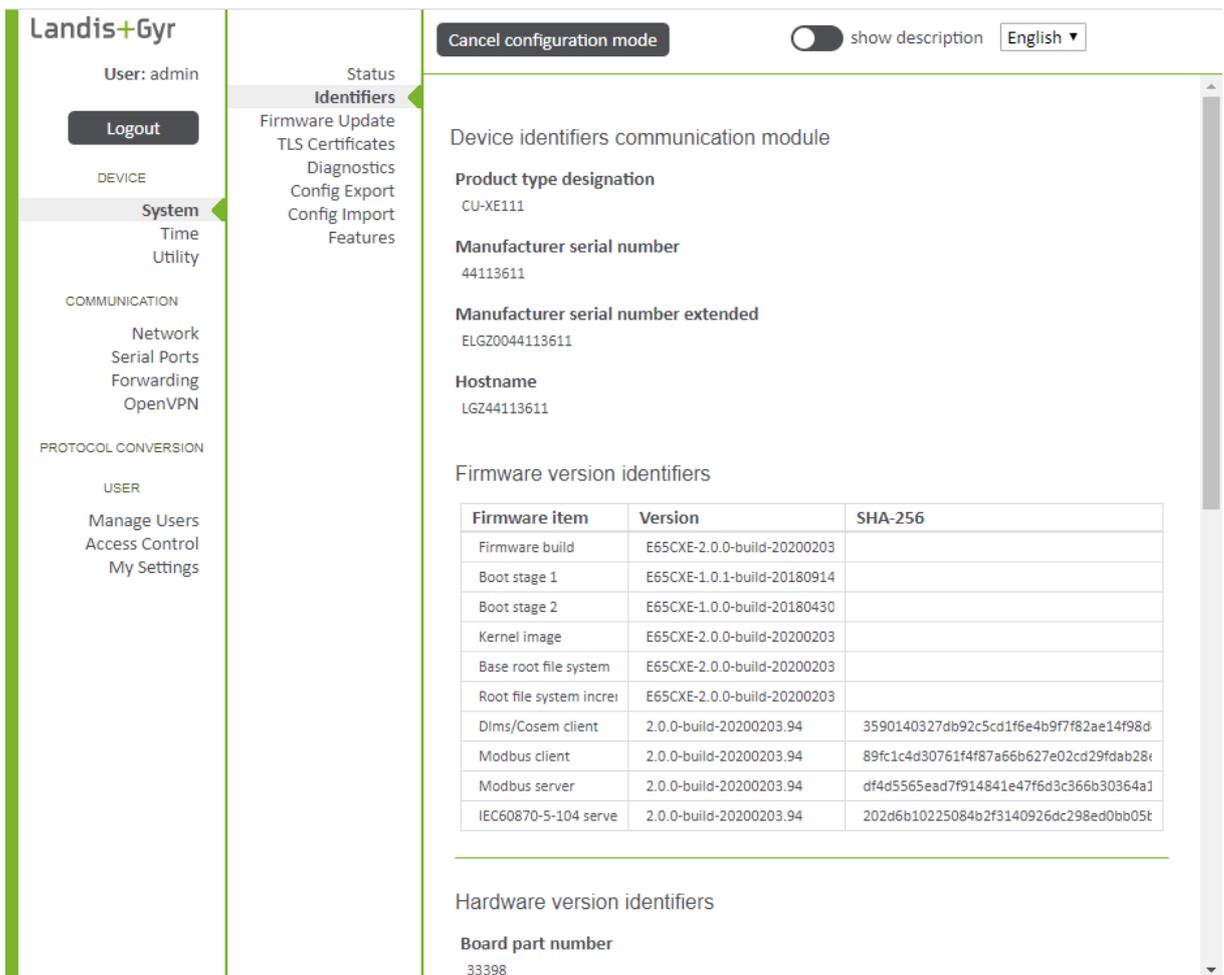
The OpenVPN status screen indicates the connection status of the defined OpenVPN channels.



5.1.8 Device management

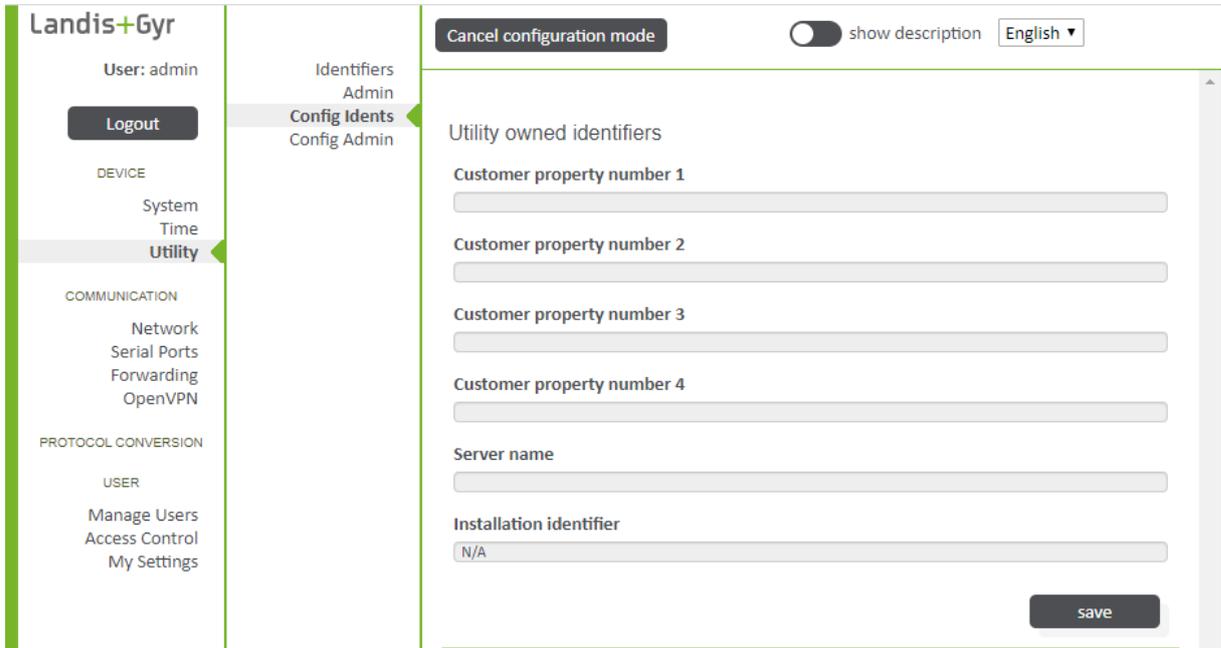
5.1.8.1 System identifiers

The system identifiers screen indicates the device identifiers of the CU, the firmware and hardware version identifiers and other information.



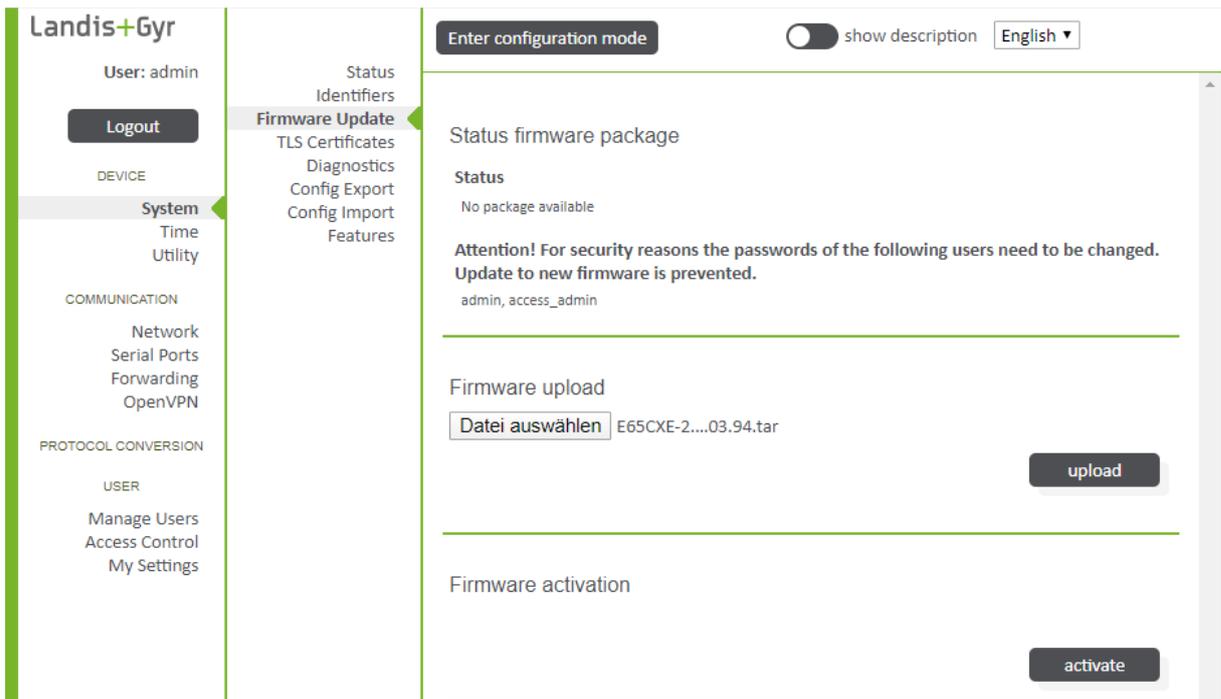
5.1.8.2 Utility identifiers

Additional system identification information can be added for the CU. For instance, the coordinates of the installation location, the customer property numbers of the CU and the server name (normally used for network management and in SCADA based applications).



5.1.8.3 Firmware update

If a newer firmware version is available, this is indicated in the Status firmware package area. To upgrade the firmware of the respective CU, in the Firmware upload area select the file with the firmware package and then click on the “upload” button.



The CU will only execute the update after the successful verification of the firmware. To activate the new firmware click on the “activate” button. After

activation on the system identifiers screen, the new firmware version will be indicated.



Note

During the firmware update no power down shall happen.

5.1.8.4 TLS certificates

The valid HTTP TLS key and certificate in use is indicated in the Certificate chain table.

Subject	Issuer	Valid From	Valid To	Subject Key ID	Subject Alternative Name
/O=Landis Gyr/CN	/C=GR/O=Landis +	Oct 2	Dec 3	87:DA:2B:E4:08:72	URI:http://LGZ4:
/C=GR/O=Landis +	/C=FI/O=Landis Gy	Jan 1	Dec 3	F6:89:10:E4:39:88	URI:http://www.
/C=FI/O=Landis Gy	/C=CH/O=Landis +	Jun 1	Dec 3	6F:6C:1D:E8:3B:5F	URI:http://www.

To apply a new certificate chain or private key, enter the configuration mode and then select the corresponding files and click on the “save” button.

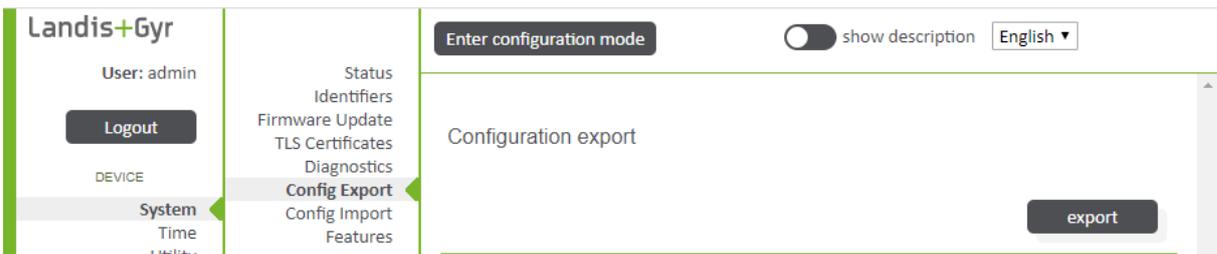
5.1.8.5 Diagnostics

In the diagnostics section, you can download relevant CU-related information for correspondence with L+G customer support or trigger a device reboot.

For a download select the desired information in the diagnostics type drop-down list, then click on the “download” button. For re-booting the CU, click on the “reboot” button.

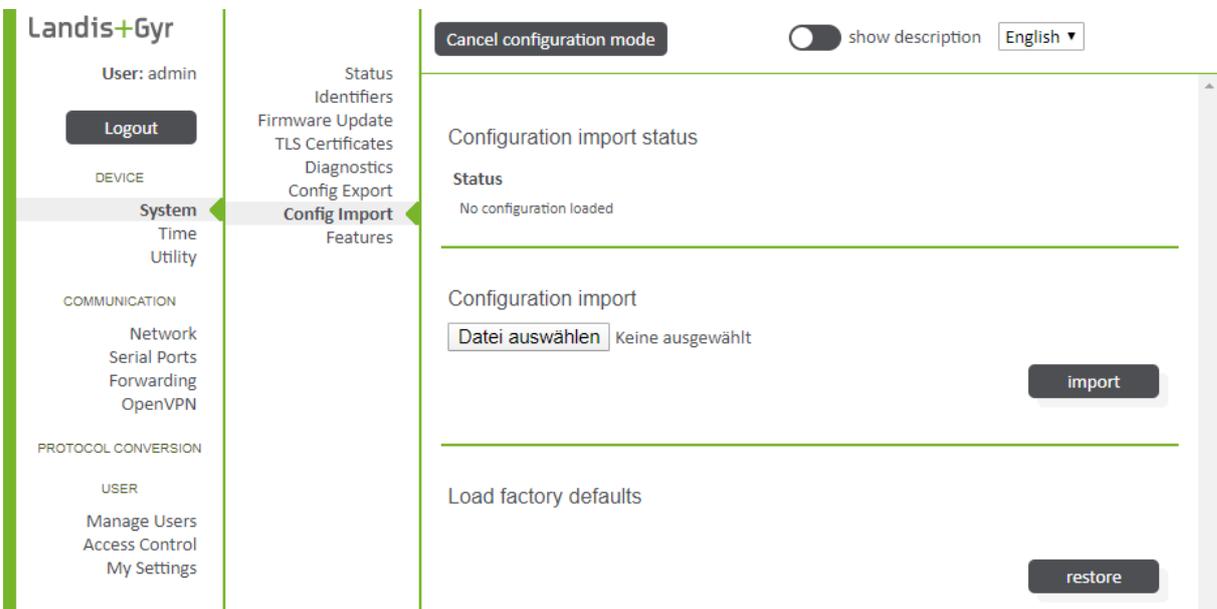
5.1.8.6 Configuration export

The actual configuration of the CU can be exported in JSON format.



5.1.8.7 Configuration import

A new configuration file for the CU in JSON format can be imported or the factory default configuration can be restored.



For a configuration import enter the configuration mode and select the import file, then click on the “import” button. To load the factory defaults, click on the “restore” button.



Note

Please check the restored configuration carefully in order not to lose the credentials/IP settings, etc. to access the device.

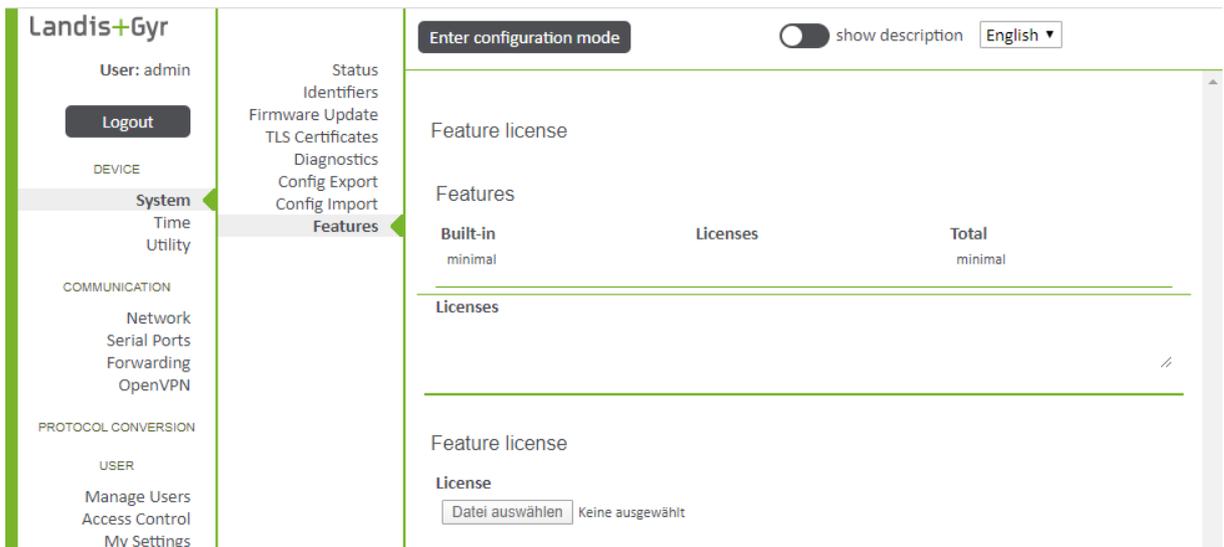


Note

Importing configuration can only be done to the same firmware version from which the configuration has been exported.

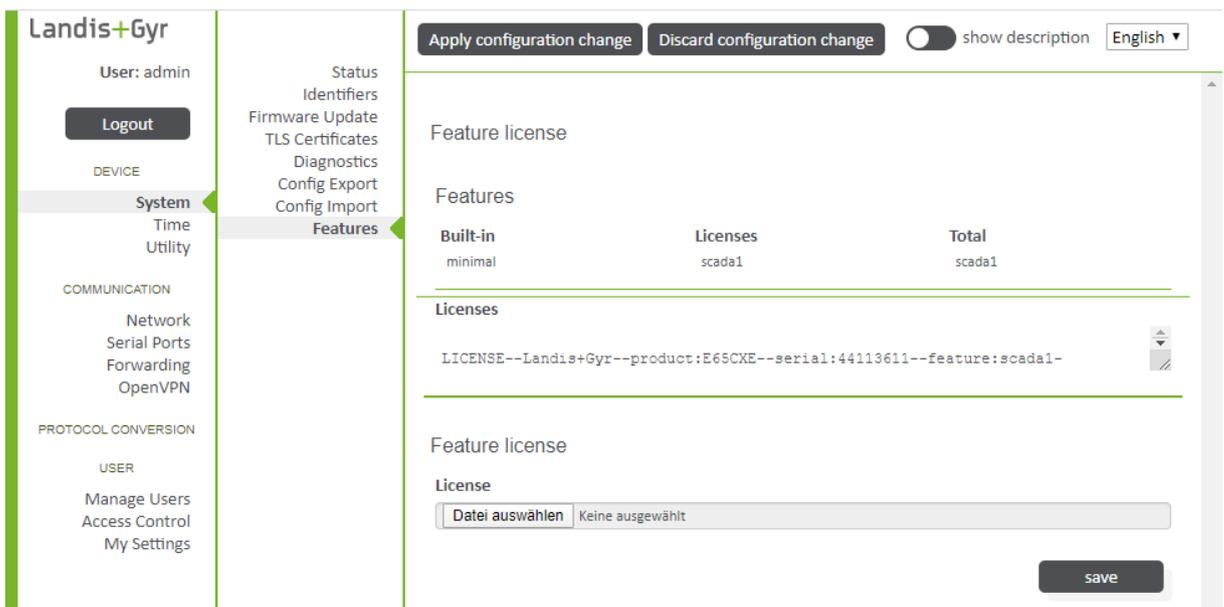
5.1.8.8 Feature licensing

A license file, e.g. for SCADA functionalities, can be installed in the CU.



For installing a feature license, enter the configuration mode and select the license file, then click on the “save” button.

Afterwards the installed feature license is indicated:



Click on the “Apply configuration change” button.



Note

The configuration change must be applied to the CU after installing a new license before doing any further configuration changes.

When the new installed license is applied to the CU, new menu items are displayed in the main menu under PROTOCOL CONVERSION (see also section 5.1.10 “Protocol conversion”).

5.1.9 Time synchronization

Time synchronization can be based on base meter time or NTP.

5.1.9.1 Time status

The Time status screen indicates the current system time and the last time synchronization.

Landis+Gyr

User: admin

Logout

DEVICES

System

Time

Utility

COMMUNICATION

Network

Serial Ports

Forwarding

OpenVPN

Enter configuration mode

show description

English

Status

Diagnostic

Configuration

Command

Time status

System time
2020-03-14T09:33:11+0000

Last time synchronization

Synch source type	Source	Last time synchronization
NTP	84.16.73.33	2020-03-14T09:32:41+0000

5.1.9.2 Time diagnostic

The Time diagnostic screen indicates the same information as the Time status screen plus NTP sources table (only in case time synchronization source NTP is selected) and time synchronization diagnostic data.

Landis+Gyr

User: admin

Logout

DEVICES

System

Time

Utility

COMMUNICATION

Network

Serial Ports

Forwarding

OpenVPN

PROTOCOL CONVERSION

Info

Clients

Servers

USER

Manage Users

Access Control

My Settings

Enter configuration mode

show description

English

Status

Diagnostic

Configuration

Command

Time diagnostic

System time
2020-03-14T09:33:48+0000

Last time synchronization

Synch source type	Source	Last time synchronization
NTP	84.16.73.33	2020-03-14T09:33:45+0000

NTP sources table

Source server	NTP server reference time
212.25.15.129	2020-03-14T09:22:03+0000
195.141.190.190	2020-03-14T09:33:26+0000
84.16.73.33	2020-03-14T09:33:25+0000
217.147.223.78	2020-03-14T09:32:26+0000

Time synchronization diagnostic data

Reference Server
84.16.73.33

Stratum
2

Ref time (UTC)
2020-03-14T09:33:45+0000

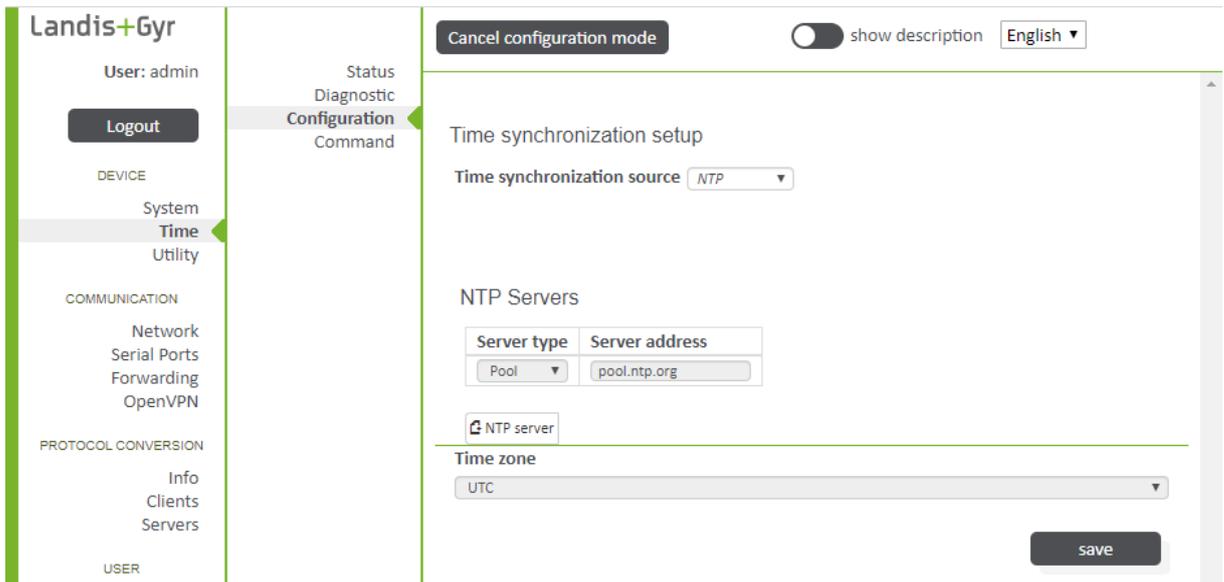
Last offset [s]
-0.001876208

RMS offset [s]
0.001876208

Update interval [s]
64.5

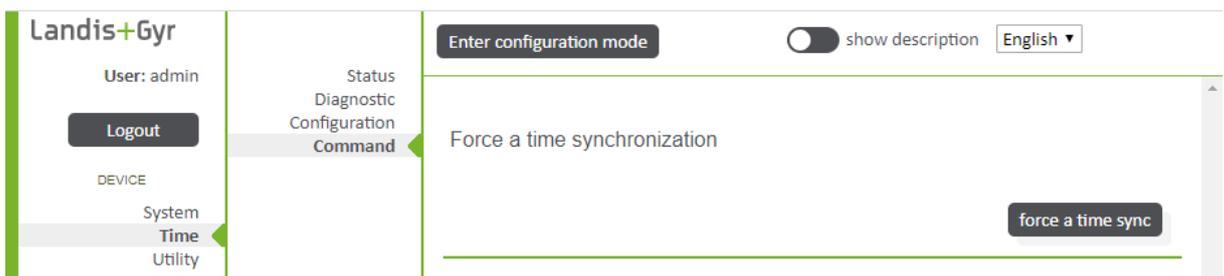
5.1.9.3 Time configuration

On the Time synchronization setup screen the time synchronization source (Base meter or NTP), the time zone and the NTP server type and address (only in case time synchronization source NTP is selected) can be defined.



5.1.9.4 Time command

With the time command the CU-XE can be forced to synchronize its time with the configured source by clicking on the “force a time sync” button.



5.1.10 Protocol conversion

For protocol conversion the DLMS/COSEM client mapping with Modbus and IEC 60870-5-104 SCADA must be configured.

The proper configuration can be verified using any Modbus Master and SCADA 104 test tool.

5.1.10.1 DLMS/COSEM client configuration

As a prerequisite for the DLMS/COSEM client configuration one of the base meter channels is freely available and not occupied for instance with forwarding rules. If a given forwarding rule is using the needed base meter channel, this forwarding rule must be removed (see section 5.1.6 “Forwarding (passthrough)”).

The usage of serial and internal ports is displayed in the serial port status area.

The checkbox “Enabled” in the DLMS/COSEM Client area has to be activated.

The screenshot displays the configuration interface for DLMS/COSEM. The left sidebar shows the user 'admin' and navigation menus for 'DEVICE', 'COMMUNICATION', 'PROTOCOL CONVERSION', and 'USER'. The main content area is titled 'DLMS/COSEM Modbus' and includes a 'Cancel configuration mode' button, a 'show description' toggle, and a language dropdown set to 'English'.

Serial port status

Usage of serial and internal ports

Serial port	Used as	Used by component
Base meter c	Internal port t1	Forwarding
Base meter c	Internal port t1	DLMS/COSEM Client
Combined R1	RS485 port	-
RS232	RS232 port	Forwarding

DLMS/COSEM-Client

Enabled

Time synchronization

Enabled **Interval** **Time offset** Use local time

Intervals

Slow polling group interval	Normal polling group interval	Fast polling group interval	Activation
<input type="text" value="86400"/>	<input type="text" value="10"/>	<input type="text" value="1"/>	<input type="text" value="60"/>

Then the meter mapping can be defined in the Meter Configuration area as follows:

- Click on the “Device” button to display a device definition.
- Enter the address information.
- Click on the “row” button to display the first mapping.
- Enter a name and a logical name (OBIS code) and select the type (e.g. Register).
- Click on the “save” button. If the mapping definition is correct, the checkbox “Valid” is activated.
- Define the next rows until the meter mapping is complete.



Note

Please note that there is no verification, whether the entered OBIS codes are configured accordingly in the base meter.

Landis+Gyr

User: admin

DLMS/COSEM
Modbus

Cancel configuration mode

show description English

Meter Configuration Device Last Device

1:

Label

Serial port: Base meter channel 2

Time Sync Mode: Off

Address

Client Address: 16

Logical Device Address: 1

Physical Address: 0

Password:

Mappings:

Valid	Name	Type	Logical name	Polling group	
<input checked="" type="checkbox"/>	EnergyTotal	Register (Class: 3/0, Attr: 2,3)	1-1:1.8.0.25	No	✕ ↓
<input checked="" type="checkbox"/>	EnergyTotal	Register (Class: 3/0, Attr: 2,3)	1-1:2.8.0.25	No	✕ ↑

row Last row All

save

5.1.10.2 Modbus client configuration

The checkbox “Enabled” in the Modbus Client area has to be activated.

The screenshot displays the Landis+Gyr web interface for Modbus Client configuration. The left sidebar contains navigation menus for 'DLMS/COSEM', 'Modbus', 'Serial port status', 'Usage of serial and internal ports', 'Modbus Client', and 'Global settings'. The 'Modbus Client' section is currently selected and shows the following configuration options:

- Serial port status**: A table showing the usage of serial and internal ports.
- Modbus Client**: A section with a checked 'Enable' checkbox.
- Global settings**: Includes an unchecked 'Optimize polling' checkbox and a 'Start' dropdown menu set to 'Start immediately'.
- Polling intervals**: Three input fields for 'Slow polling interval' (86400), 'Normal polling interval' (10), and 'Fast polling interval' (1).

Then the register list can be defined in the Device Configuration area as follows:

- Click on the “Device” button to display a device definition.
- Enter the hostname, TCP port and unit identifier.
- Click on the “row” button to display the first entry of the register list.
- Enter an ID and an index and select the bank (coils, contact, input or holding), the type and the polling group (normal, fast or slow).
- Click on the “save” button.
- Define the next rows until the register list is complete.

Landis+Gyr

User: admin

DLMS/COSEM
Modbus

Cancel configuration mode show description English

Device Configuration [Device](#) [Last Device](#)

1:

Label

Interface TCP

Hostname Host1

TCP Port 502 Unit identifier 1

Register list:

ID	Bank	Index	Type	Polling group
1	inpt	0	b1a	Norme
2	inpt	0	b1a	Norme

row Last row All

save

5.1.10.3 Modbus server configuration

The checkbox “Enabled” in the Modbus Server area has to be activated.

Landis+Gyr

User: admin

Modbus
IEC 60870-5-104

Cancel configuration mode show description English

Serial port status

Usage of serial and internal ports

Serial port	Used as	Used by component
Base meter c	Internal port t	Forwarding
Base meter c	Internal port t	DLMS/COSEM Client
Combined R	RS485 port	-
RS232	RS232 port	Forwarding

Modbus Server

Enable

Global settings

Server port TCP port

TCP Port 1502

Byte order ABCD

Once the Modbus server is activated, both the Modbus TCP port and the Modbus serial port (RTU mode) can be selected. In the example above the TCP port with port 1502 is selected.

Then the mapping to a client can be defined in the Mapping groups area as follows:

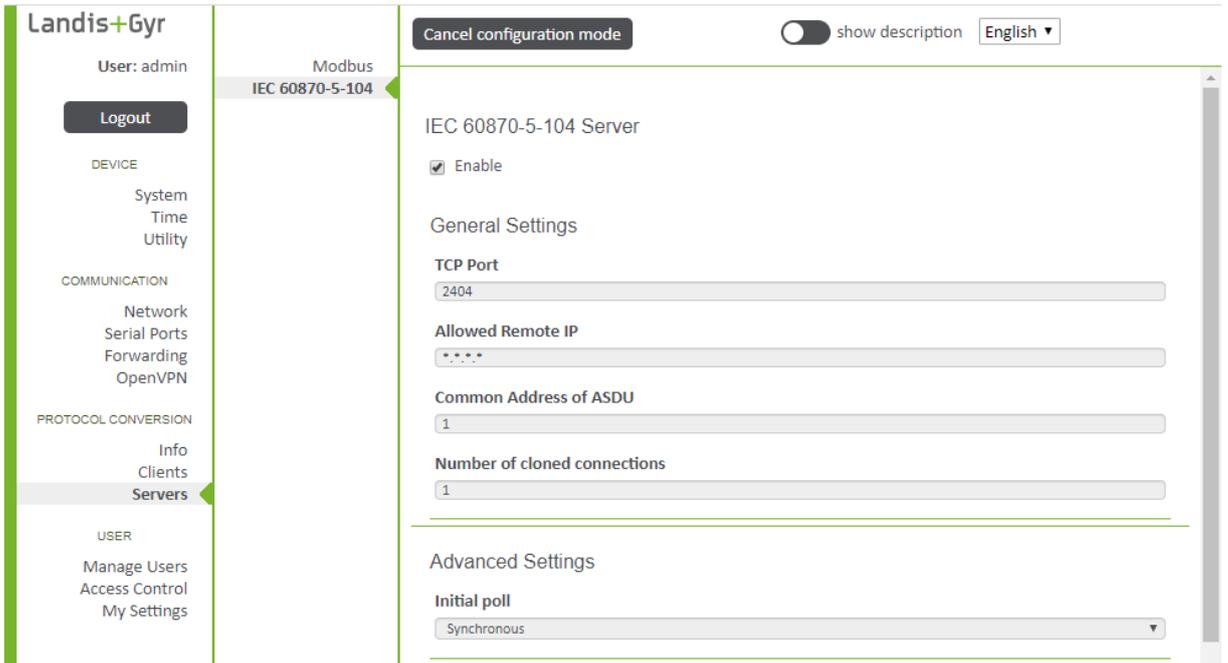
- Click on the “Group” button to display a group definition.
- Enter a label.
- Click on the “row” button to display the first mapping.
- Select a data point, the bank (coils, contact, input or holding) and the format (bool, i16, i32 or float) and enter the address and the scaling.
- Click on the “save” button.
- Define the next rows until the mapping is complete.

The screenshot shows the Landis+Gyr configuration interface. On the left is a navigation menu with categories: USER (admin, Logout), DEVICE (System, Time, Utility), COMMUNICATION (Network, Serial Ports, Forwarding, OpenVPN), and PROTOCOL CONVERSION (Info, Clients, Servers). The 'Servers' menu item is highlighted. The main content area shows the 'Modbus IEC 60870-5-104' configuration. At the top, there is a 'Cancel configuration mode' button, a 'show description' toggle, and a language dropdown set to 'English'. Below this is the 'Mapping groups' section, which includes a 'Group 1' definition. The 'Group 1' definition has a 'Label' field and a 'Mappings' table. The table has columns for 'Data point', 'Bank', 'Address', 'Format', and 'Scaling'. Two rows are visible in the table, both with 'dlms-cosem-client/dv/1/3/1-1.1.8.' and 'dlms-cosem-client/dv/1/3/1-1.2.8.' as data points, 'i' as bank, '1' and '3' as addresses, 'float' as format, and '1' as scaling. At the bottom of the mapping table are buttons for 'row', 'Last row', and 'All'. A 'save' button is located at the bottom right of the configuration area.

Please note that once the activated DLMS/COSEM client is selected for mapping with any server, only the previously activated OBIS objects can be used for mapping any data point.

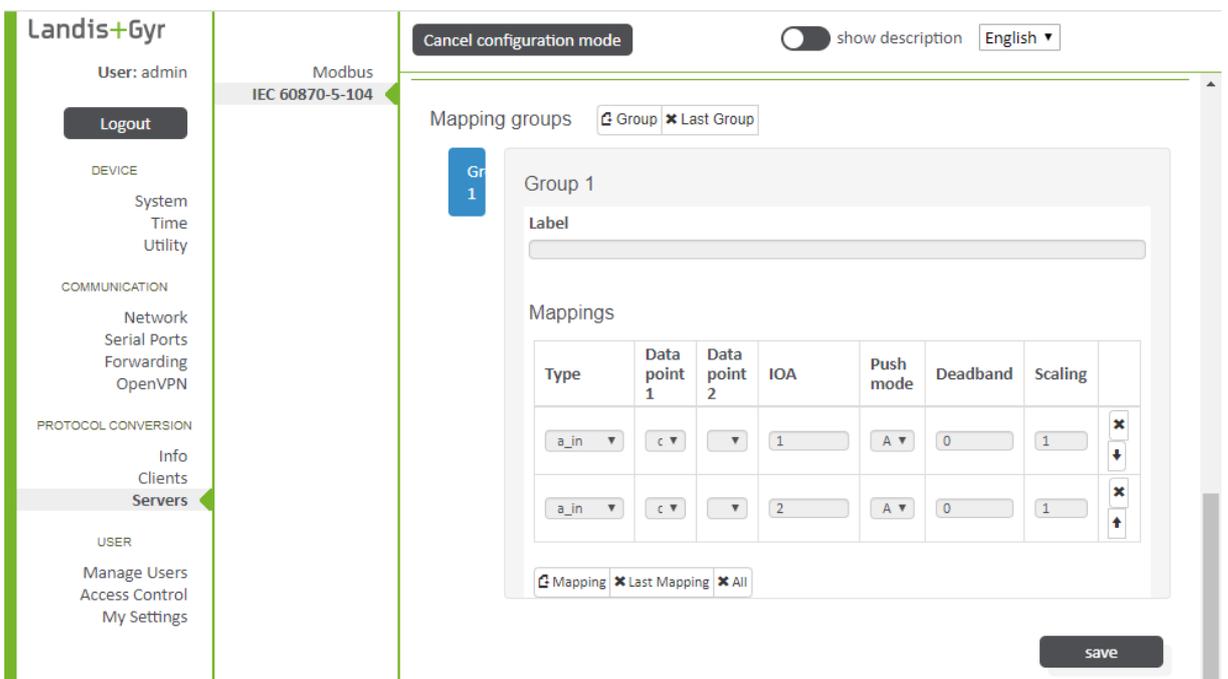
5.1.10.4 IEC 60870-5-140 SCADA server configuration

The checkbox “Enabled” in the 60870-5-140 Server area has to be activated.



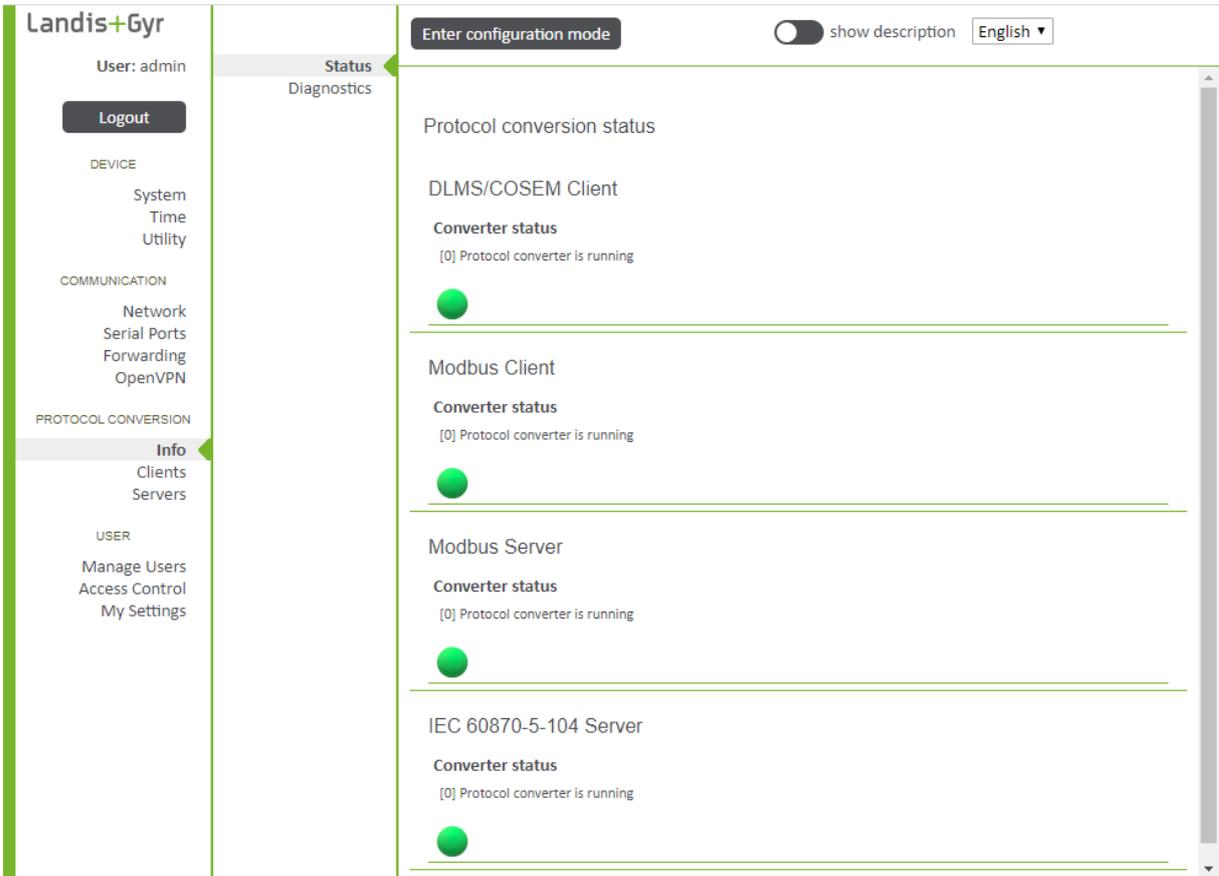
Then the mapping to a client can be defined in the Mapping groups area as follows:

- Click on the “Group” button to display a group definition.
- Enter a label.
- Click on the “Mapping” button to display the first mapping.
- Select a type, the data point1 and 2 and the push mode (always, on change or deadband) and enter the IOA, the deadband and the scaling.
- Click on the “save” button.
- Define the next row until the mapping is complete.

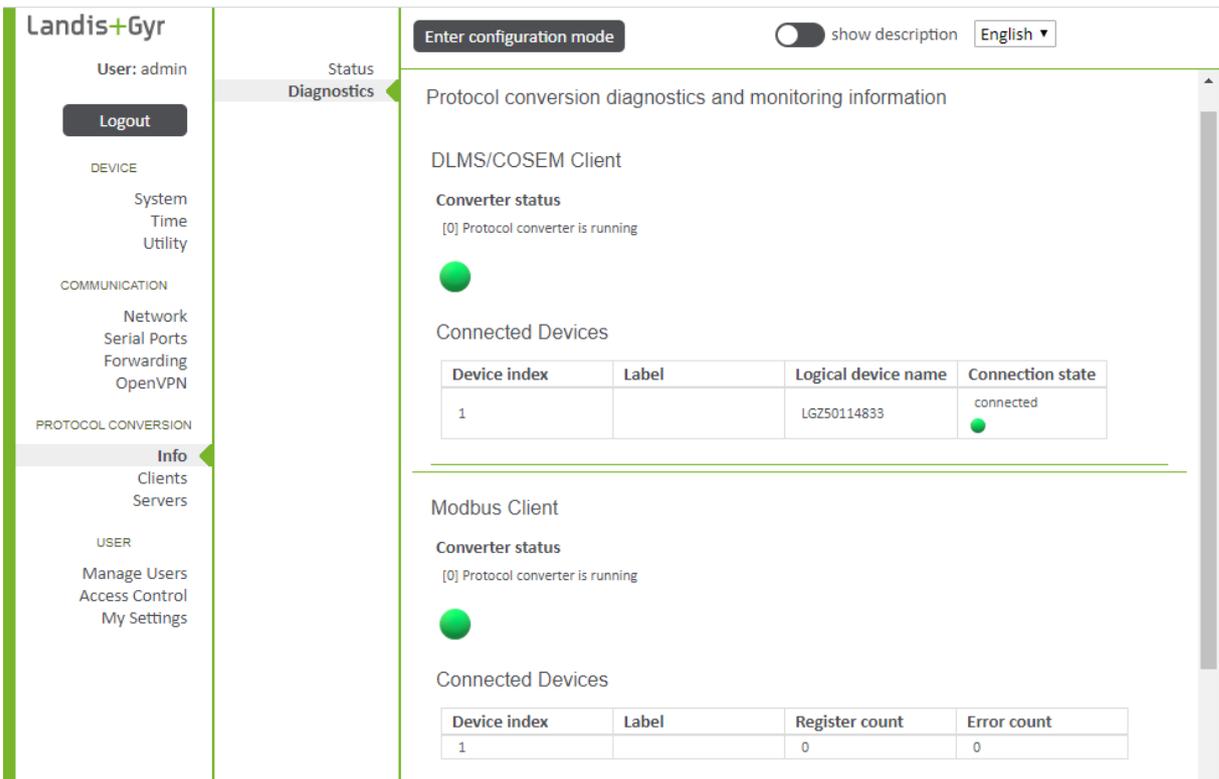


5.1.10.5 Checking the protocol conversion status of all clients and servers

The status of the activated clients and servers can be checked on the Protocol conversion status screen. Status green indicates the proper configuration from the CU perspective.



Additional information is displayed on the Protocol conversion diagnostics and monitoring information screen:



5.1.11 User management

The user management is highly configurable. Up to 32 users can be defined. These users can be part of up to 9 roles. Based on these roles the access control is configurable.

Per default following 6 roles are predefined:

Role ID	Role name	Role description
R1	consumer	Provides limited, read only access to identifiers, clock, status, instantaneous values and event logs.
R2	installer	Provides all access needed during the installation, e.g. setup of WAN communication, base meter communication Ethernet ports and serial interfaces.
R3	maintenance	Provides similar access as the role installer but might have slightly more e.g. with rights for local firmware update.
R4	operations	Provides read access to identifiers and status, event logs, instantaneous values, all needed in daily operations.
R5	device_admin	Provides all the rights to control the device from remote, get identifiers, status, etc., change configurations, e.g. add processing point to SCADA by uploading a license, firmware update, change/update of secrets of communication profile and channel security.
R6	security_admin	Provides all the rights to manage roles and users and their access rights to data.
R7 to R9	–	Also available for configuration.
RA	access_admin	This role is fix and has rights to access administration settings, to make sure that customers do not lock out themselves, assuming the password of role access_admin is not forgotten!
RM	manufacturer	This role is fix and has during manufacturing and in service & repair processes.

The users are configured as per the customer order. There is always a special user “access_admin” available.

The Users status screen shows a list of all currently defined users.

Users

Number of users

Maximum number of users	Remaining users
32	29

List of users

Username	active	Roles
access_admin	<input checked="" type="checkbox"/>	Roles R1 <input type="checkbox"/> R2 <input type="checkbox"/> R3 <input type="checkbox"/> R4 <input type="checkbox"/> R5 <input type="checkbox"/> R6 <input type="checkbox"/> <input checked="" type="checkbox"/> RA <input type="checkbox"/> RM
admin	<input checked="" type="checkbox"/>	Roles R1 <input checked="" type="checkbox"/> R2 <input checked="" type="checkbox"/> R3 <input checked="" type="checkbox"/> R4 <input checked="" type="checkbox"/> R5 <input checked="" type="checkbox"/> R6 <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> RA <input type="checkbox"/> RM
manufacturer	<input type="checkbox"/>	Roles R1 <input type="checkbox"/> R2 <input type="checkbox"/> R3 <input type="checkbox"/> R4 <input type="checkbox"/> R5 <input type="checkbox"/> R6 <input type="checkbox"/> <input type="checkbox"/> RA <input checked="" type="checkbox"/> RM

5.1.11.1 Add new users

On the Add user screen new user profiles, consisting of username and assignments of roles, can be defined.

Add a user profile

Username: Henry_Miller

Roles:

- R1
- R2
- R3
- R4
- R5
- R6
- RA

Active roles

Role ID	Role Name
R1	consumer
R2	installer
R3	maintenance
R4	operations
R5	device_admin
R6	security_admin
RA	access_admin
RM	manufacturer

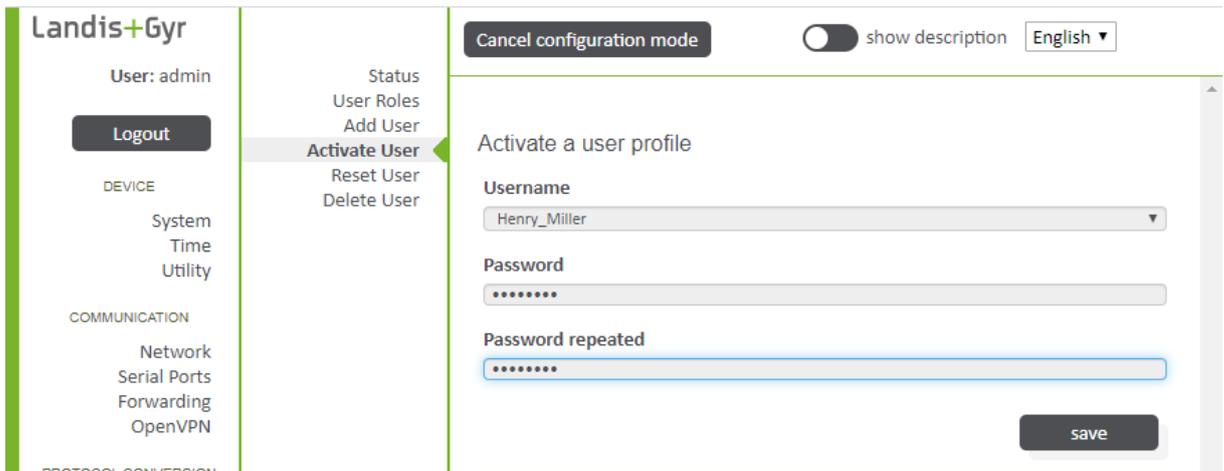
save

For adding new user profiles, enter the configuration mode and click on the “save” button after the user name has been entered and the role(s) assigned.

An added user profile is inactive until it is activated, i.e. a password is assigned.

5.1.11.2 Activate new users

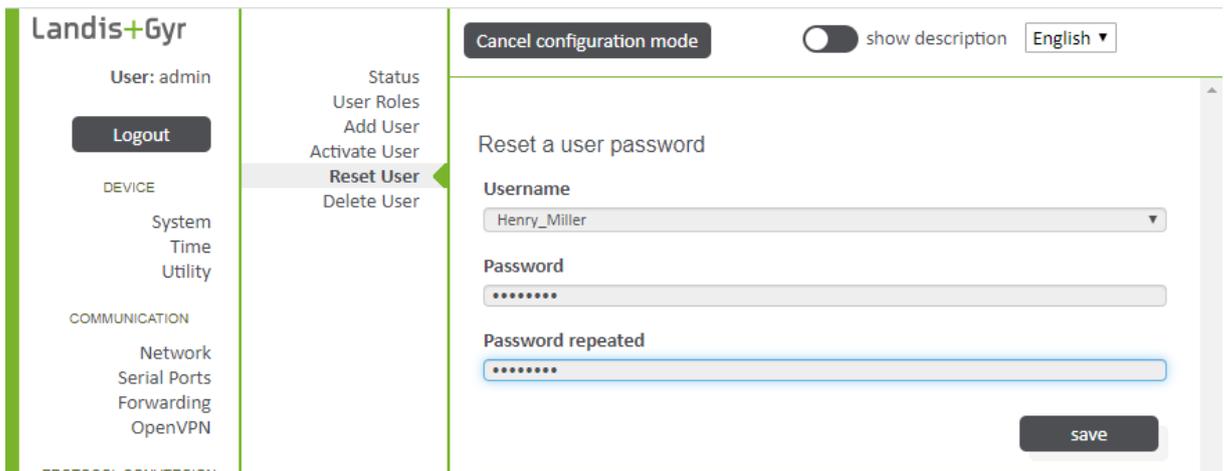
On the Activate user screen a password must be assigned to each new user profile in order to activate it.



For activating new user profiles, enter the configuration mode and select a username in the drop-down list, type in the password twice, then click on the “save” button.

5.1.11.3 Change user passwords

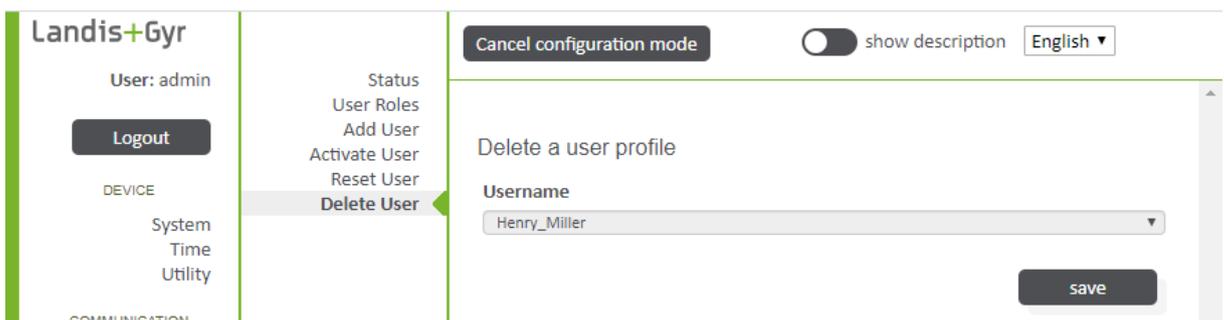
On the Reset user screen passwords of active users can be changed.



To change a user password, enter the configuration mode and select a username in the drop-down list, type in the new password, then click on the “save” button.

5.1.11.4 Delete users

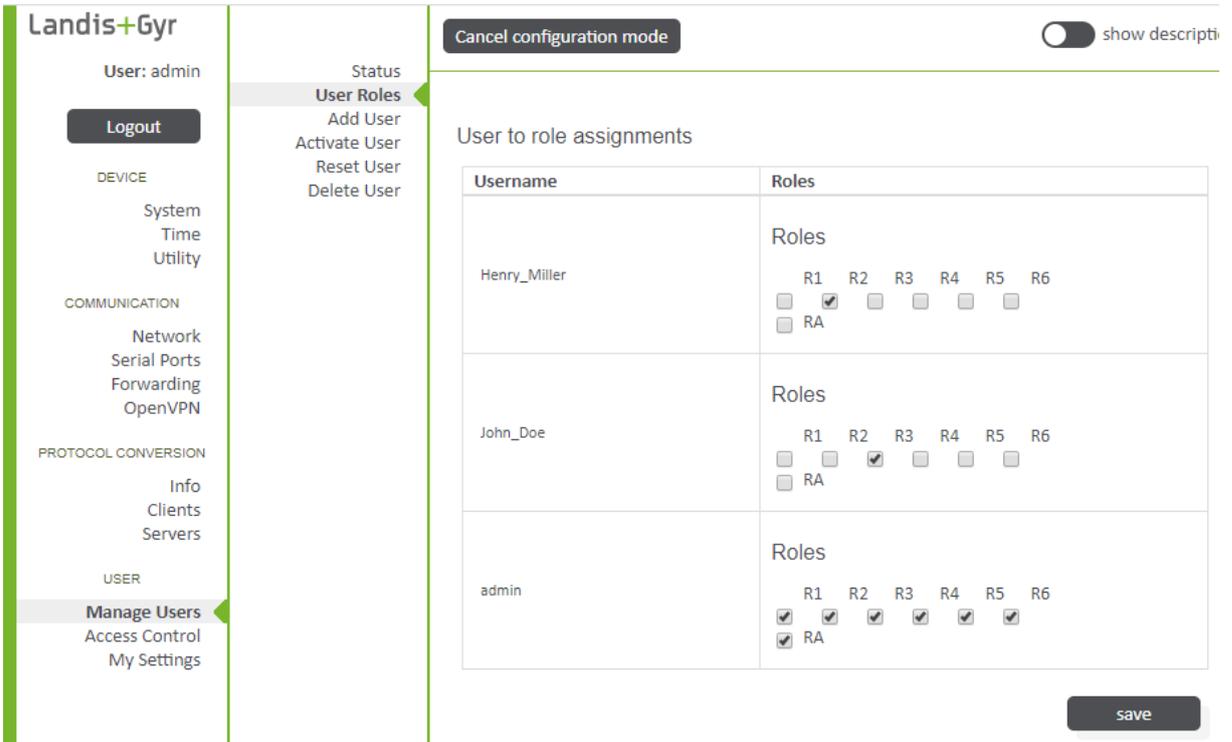
On the Delete user screen active users can be deleted.



To delete a user, enter the configuration mode and select a username in the drop-down list, then click on the “save” button.

5.1.11.5 Change role assignments

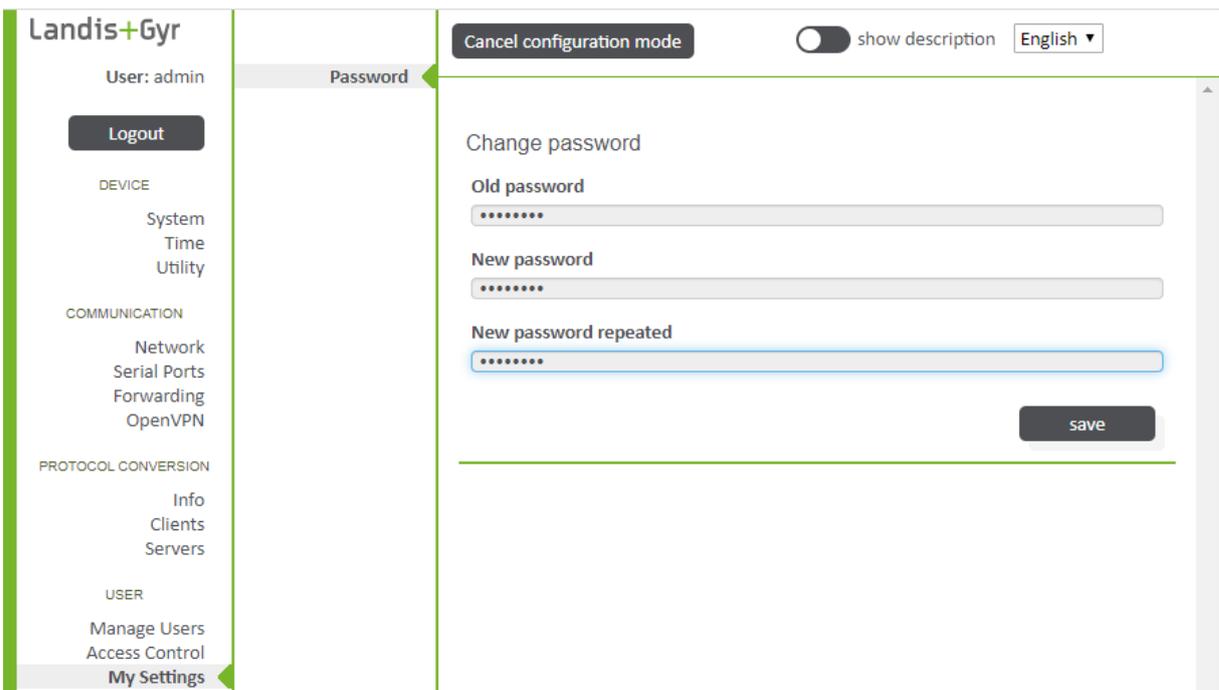
On the User roles screen role assignments can be changed, if you have access administration rights (Role ID “RA”).



To change the role assignments of a user, enter the configuration mode, search in the table for the user and activate or deactivate the role checkboxes as desired, then click on the “save” button.

5.1.11.6 Change own password

On the Change password screen you can change your own password.



To change your own password, enter the configuration mode and type in your old and the new password, then click on the “save” button.

5.2 LED status descriptions

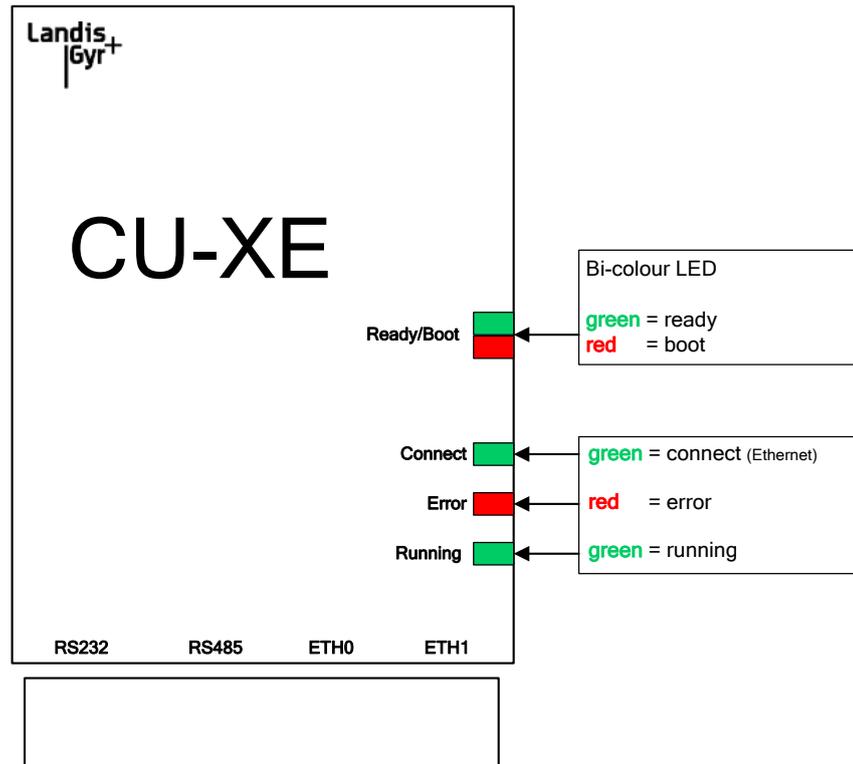


Fig. 10 LED statuses

5.3 LED operation

5.3.1 Power-up

During power-up, all LEDs are switched on. If the system is running, the LEDs display the following behaviour.

5.3.2 Connect LED

The Connect LED can be viewed by the user with meter cover closed. It is switched on when one or more application level TCP connections are established. This applies to all components that are used for transporting process data (SCADA protocols and the passthrough mechanism are examples) but excludes transient TCP connections like the main or management connections and VPN tunnels.

5.3.3 Boot LED

The Boot LED is the red part of the bi-colour Ready/Boot LED. It is switched on when the CU is booting and switched off during normal operation.

5.3.4 Ready LED

The Ready LED is the green part of the bi-colour Ready/Boot LED. It is switched off during start-up and blinks like a heartbeat once the application has fully started.

5.3.5 Ethernet LEDs

The orange and green Ethernet LEDs indicate speed and link state.

5.3.6 Other LEDs

All other LEDs are reserved for future enhancements.

5.4 Updating the CU-XE from Release 1 to Release 2

Only CU-XE communication units with firmware version 1.0.3 can be updated from Release 1 to Release 2.

The current firmware version is visible on the Status screen in the Web UI.

Vendor	Landis+Gyr
Product	CU-XE111
Device serial number	43571966
Year of manufacturing	2018
Customer property number	XE-0006_
Hostname	LGZ43571966
Installation location	Theilerstrasse 1
Firmware version	E65CXE-1.0.3-build-20181212.49
Boot stage 1 version	E65CXE-1.0.0-build-20180430.6
Boot stage 2 version	E65CXE-1.0.0-build-20180430.6
Kernel image version	E65CXE-1.0.3-build-20181212.49
Rootfs base version	E65CXE-1.0.3-build-20181212.49
Rootfs increment version	E65CXE-1.0.3-build-20181212.49
System time	2020-01-15 16:01:32
Uptime	5 d 22 h 40 m 34 s

If the CU-XE has an earlier version a stepwise firmware update (e.g. from 1.0.0 to 1.0.1, from 1.0.1 to 1.0.2 and finally from 1.0.2 to 1.0.3) is necessary.

The following firmware packages are available on demand from the Landis+Gyr technical support:

- **Release 2:**
 - E65CXE-2.0.0-build-20200227.105 or the latest release version
- **Release 1:**
 - E65CXE-1.0.1-build-20180914.24
 - E65CXE-1.0.2-build-20181018.36
 - E65CXE-1.0.3-build-20181212.49

To update the firmware of a CU-XE Release 1, two options are offered:

- Drag and drop the firmware package into the grey box or
- Click the grey box to open the File Select window.

After a successful firmware package upload, the version available for update is being displayed. To execute the firmware update, click the “Install and reboot” button. The CU will only execute the update after successful verification of the firmware. The CU restarts automatically to activate the new firmware.

Firmware

Version installed:

E65CXE-1.0.3-build-20181212.49



Version available for update:

E65CXE-2.0.0-build-20200227.105

Install and reboot

6 Service

6.1 Troubleshooting

When a fault has been detected in the system, check the following points regarding the interfaces:

1. Is the mains voltage present (meter LCD is working)?
2. Has the maximum permissible ambient temperature been exceeded?
3. Is there any visible damage to the installation?
4. Check the status of the LEDs according to section 5 “Operation”.

If none of these steps resolves the problem, the communication unit should be removed and sent to the designated service and repair centre.

6.2 Repairing the communication unit

Communication units can only be repaired by authorised service and repair centres (or by the manufacturer).



Meters must not be operated without a communication unit or “dummy”.

For safety reasons, the meter must not be operated without a communication unit or a “dummy” communication unit.

If repairing the communication unit is necessary, use the following procedure:

1. If installed, remove the communication unit and install a replacement communication unit. If no spare unit is available, a “dummy” unit must be used.
2. Describe the problem as accurately as possible and state the name and telephone number of the contact person in case of inquiries.
3. Pack the communication unit carefully to ensure it will not suffer any further damage during transport. Use the original packing materials, if available. Do not enclose any loose components.
4. Send the communication unit to the designated service and repair centre.

7 Maintenance

The CU-XE communication unit requires no maintenance.



Never use running water for cleaning

Communication units must not be cleaned under running water or with compressed air. Water ingress can cause short-circuits or damage components.

8 Decommissioning and disposal



Electronic waste treatment

This product must not be disposed of in regular waste. Use a professional electronic waste treatment process.

The components used to manufacture the device can, in the main, be broken down into constituent parts and sent to an appropriate recycling or disposal facility. When the product is removed from use, the whole product must be sent to a professional electronic waste treatment process. The waste treatment and disposal plants must be approved by local regulatory authorities.

The end processing of the product and recycling of its components must always be carried out in accordance with the rules and regulations of the country where the end processing and recycling are done.

On request, Landis+Gyr will provide more information about the environmental impact of the product.



Disposal and environmental protection regulations

The following are general guidelines and should NOT take priority over local disposal and environmental policies which should be adhered to without compromise.

Components	Disposal
Printed circuit boards	Delivered to recycling plants
Metal components	Sorted and delivered to metal recycling plants
Plastic components	Sorted and delivered to re-granulation if possible

9 Terms and abbreviations

The following terms and abbreviations are used in this document.

Term	Definition
10-BASE-TX	Ethernet standard for transmitting data at the nominal speed of 10 Mbit/s.
100-BASE-TX	Fast Ethernet standard for transmitting data at the nominal speed of 100 Mbit/s.
DHCP	Dynamic Host Configuration Protocol.
DLMS	Device Language Message Specification is a set of standards developed by the DLMS User Association.
IEC 62056-21	IEC 62056-21 is a standard for Electricity metering - Data exchange for meter reading, tariff and load control - Part 21: Direct local data exchange.
IEC 60870-5-104	IEC 60870-5-104 is a standard for telecontrol (SCADA) in electrical engineering and power system automation applications.
IPv4	Internet Protocol version 4. An older internet protocol.
SCADA	Supervisory Control and Data Acquisition Control system architecture comprising computers, networked data communications and graphical user interfaces for high-level process supervisory management.
TLS	Transport Layer Security is a cryptographic protocol for secure Internet communications.
UI	User Interface

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