

WM-E3S[®] modem

Installation Guide and Modem Configuration



Document specifications

This documentation was made for the installation and configuration of the **WM-E3S[®]** modem.

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Chapter 1. Introduction

WM-E3S® is an integrated modem unit PCB. It is suitable for remote reading of electricity meters.

The modem family has several versions to fit for many meter types.

You can save money by using our modem, because furthermore there is no need of manual readout of the meter systems.

Wireless communication

The modem can be ordered with different cellular module types:

- LTE Cat.4 / 3G / 2G module
- LTE Cat.1 module with 2G “fallback”
- LTE Cat.M / Cat.NB module with 2G “fallback”

Over the LTE 4G communication, all versions of the device having a 2G mode or 2G “fallback” feature, therefore in case of outage/inaccessibility of the LTE 4G network, it is further communicating on the 2G network.

Depending on the client's needs, the modem can be set to which network it uses (e.g. only LTE 4G or 3G, etc.) or the best available network (Auto mode).

It can also be set that only GSM-CSDData connection - e.g. in the case of a CSDData supported module, by initiating CSDData calls.

The modem supports multi-operator SIM and the roaming feature.

The device provides a SIM-card independent- and mobile operator independent solution.

Design and installation

This modem was especially developed for **Honeywell**® / **Elster**® **AS3000, AS3500** electricity meters. Alternatively it can be used with **Honeywell**® / **Elster**® **AS220, AS230, AS300, AS1440** meters also.

The device can be installed under the sealed terminal cover of the electricity meter without replacing the seal certifying the first verification or the non-destructively sealed measuring housing. The modem can be connected to the meter by sliding into the meters' communication module slot and can be sealed.

Thus, the modem presents a compact solution, the dimensions of the meter will not change if a modem is fitted or not. This solution offers the possibility of future upgrade of the electricity meter with a communication module and is ideal for installations where there is restricted assembling space.

Operation properties, features

The modem is thus suitable for retrieving current and stored measurement data, reading recorded event log and load curve data, and reading and remotely managing meter parameter files.

The modem can be used with "push" mechanism, thus the modem can initiate the communication with the HES (smart metering center/server) periodically at a pre-programmed time interval or triggered by an alarm (power outage, cover removal, reverse run, etc.).

The device can be accessed remotely via the mobile network and is capable of sending data over the Internet using an APN.

The modem is basically prepared for transparent data transmission between the metering server or metering service provider, with CSDData call (only for 2G network setting!) And via mobile internet (TCP) connection ("PULL" mode) suitable for electricity meter registers. and remote reading of load curves, use of standard reading commands, remote reading and modification of the meter / parameters, updating of the meter application firmware.

Power source and power outage

The device can be powered from the meter's internal mains connection (by 230V AC voltage).

Supercapacitor

The modem is also available with a power outage protection by an optional supercapacitor component, which allows to continue the modem operation in case of minor power outage(s).

In case of a power outage, the supercapacitors will discharge by time, and the modem will shut down. When the power supply returns, the modem restarts and sends data over the cellular network, and the capacitor components will be charged).

Configuration and firmware refresh

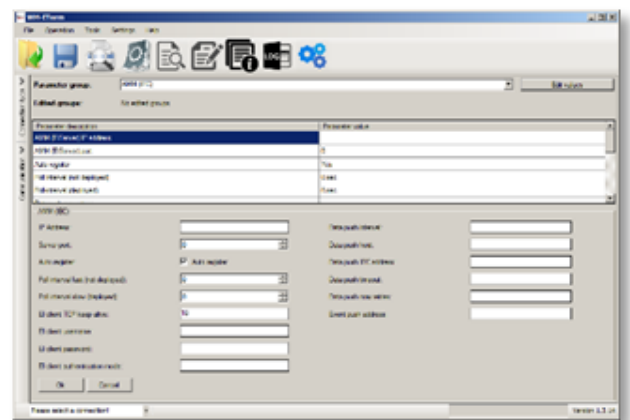
The modem can be configured locally via RS485 port or optical port, remotely with a CSData call (only if you use a setting that also uses a 2G network!) Or via a mobile internet (TCP) connection, and its firmware can be updated. The modem is configurable via TCP port remotely (or via local serial connection) and operating on the wireless network by configuring the APN, username and password (APN information is provided by your local mobile operator).

All settings can be configured with our administration tool (the WM-E Term[®] software), but also API available so our partner can easily adapt their current administration environment.

The configuration is possible by one device or for a group of devices.

The WM-E Term[®] tool is password protected and user management is also possible.

The configuration tool requires Windows[®] platform to run. It is available in English and some local languages as well (as French, German, Spanish, Czech, etc.).



Security

The product's firmware is encrypted and prevented against to upload firmware or data from other devices. The modem cannot be upgraded by any other 3rd party firmware – it's safe.

The control port of the modem is encrypted by AES (by option), or can be ordered with TLS protocol usage.

The external flash- and the internal flash content of the device are encrypted.

All security protocols can be activated/deactivated by authorized client.

Status and notification

The modem is continuously monitoring the mobile network and device communication health, and can send status information (signal strength, QoS).

By the configured features, the device is able to send SMS alarm notification, Last Gasp notification – depending on the used cellular network and mobile operators (if the SMS notification is not disallowed on the network, then it can be used).

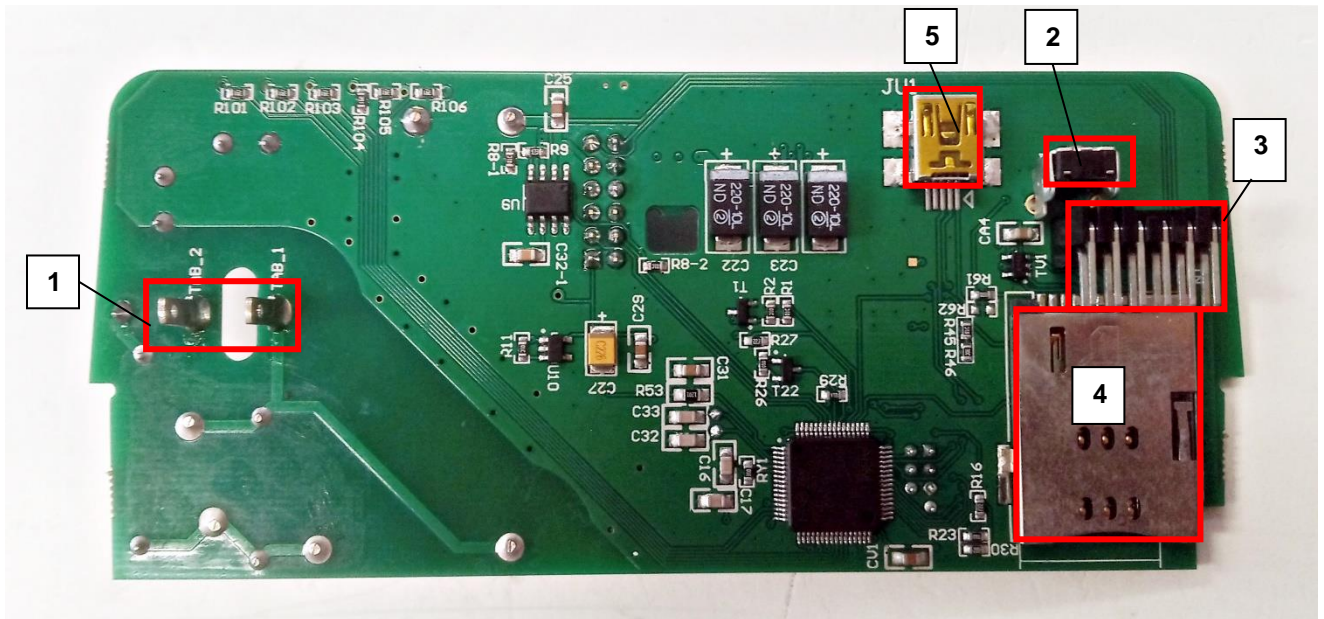
The LastGASP SMS notification feature is available by some models for case of reporting the occurred possible power outages.

Certification

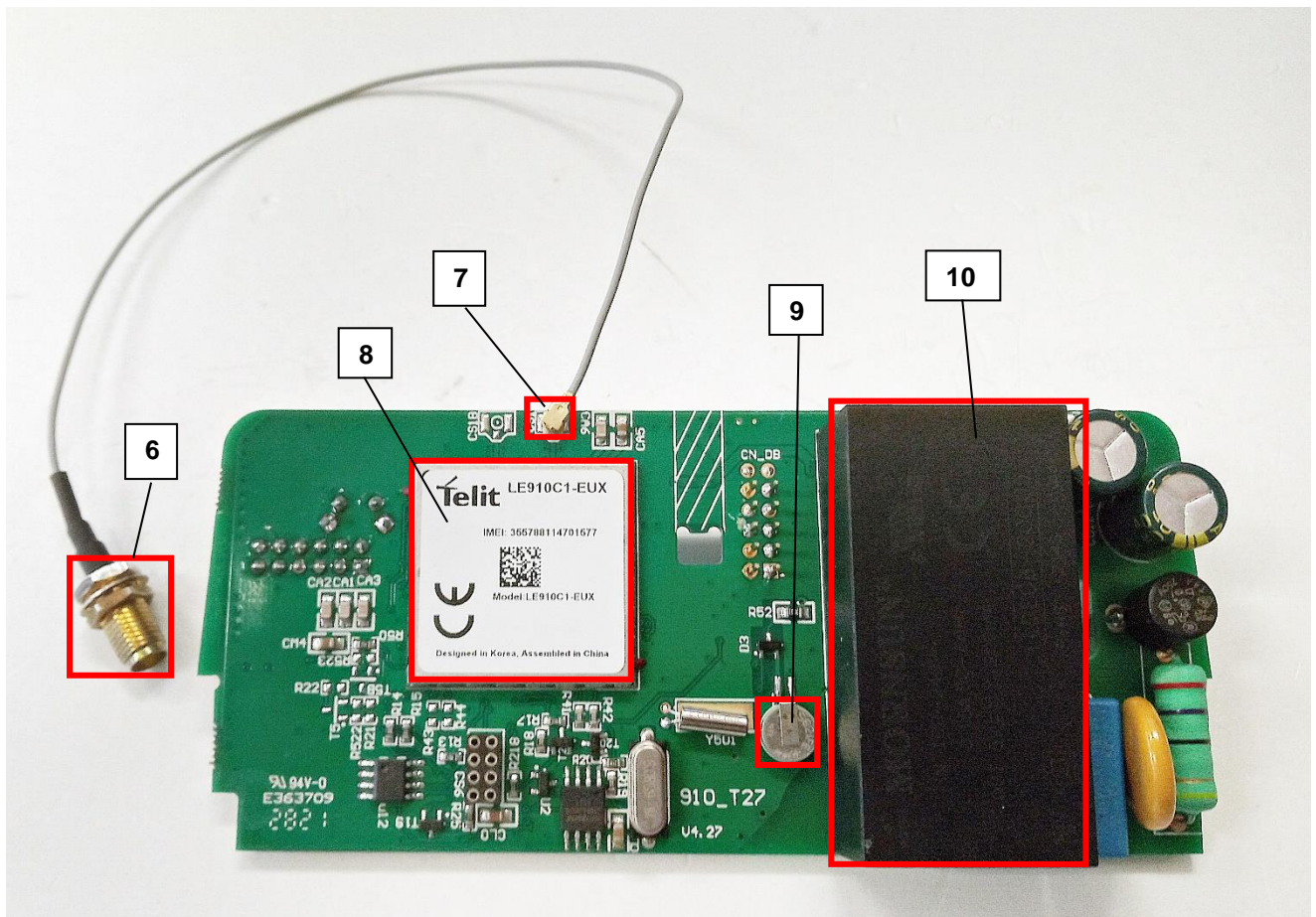
The modem is accomplishing with CE standard (Radio Equipment Directive (2014/53/EU)) and safety directives (EN 60950-1 / EN 62368-1) and RoHS declaration and has CE certification.

Chapter 2. Assembling instructions

2.1 Connectors, interfaces



- 1 – Mains connector
- 2 – Push button
- 3 – Internal data connector (to the meter)
- 4 – SIM card holder (push-insert, mini SIM, 2FF type)
- 5 – Connector (for factory purposes only)
- 6 – SMA antenna connector
- 7 – U.FL antenna connector
- 8 – Telit LTE module
- 9 – Rechargeable backup battery





10 – Power supply unit

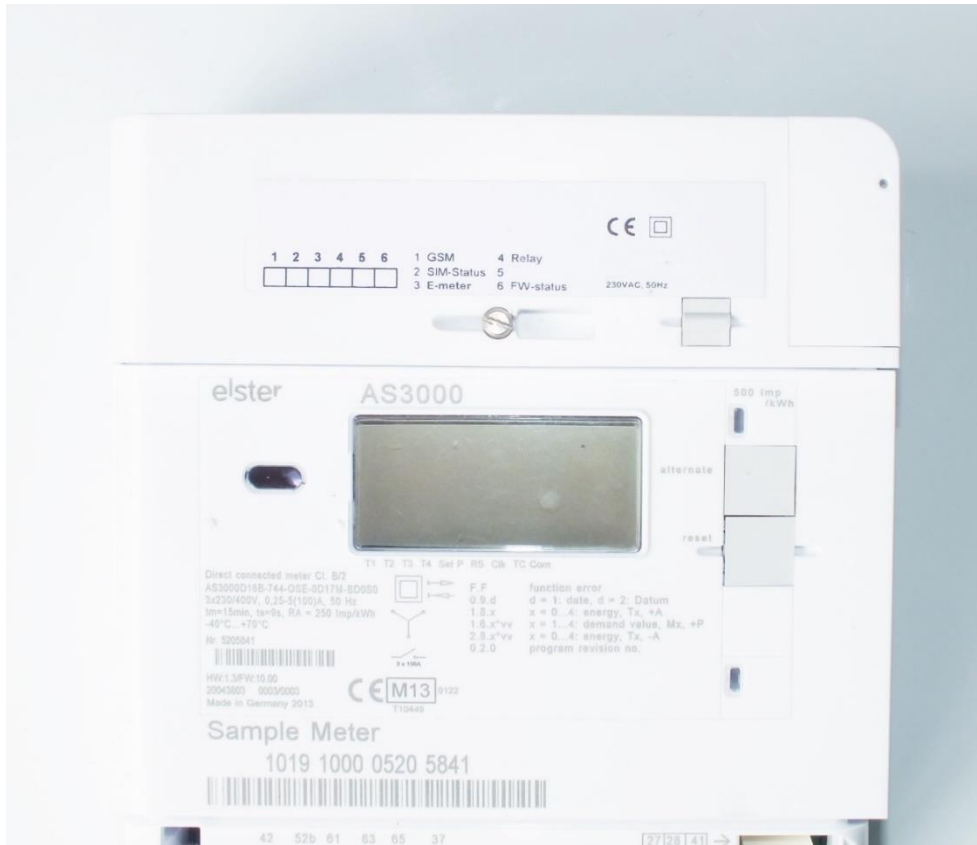
11 – 6pcs Status LEDs

2.2 Inserting the SIM card

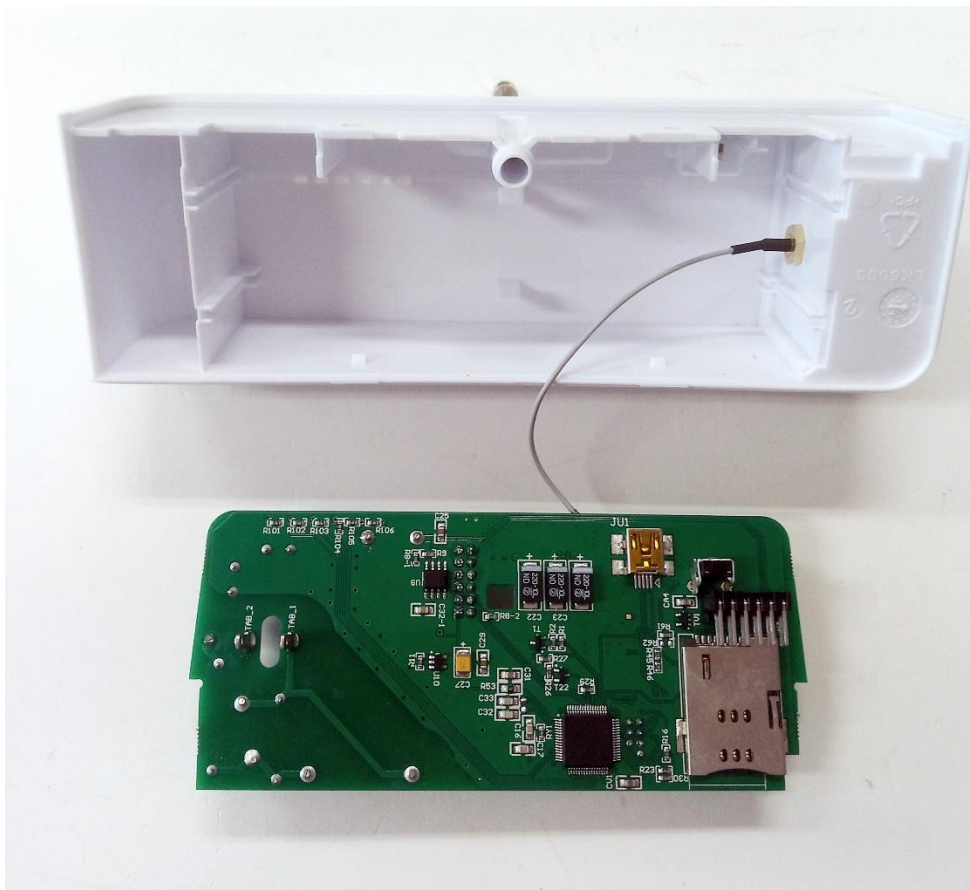
Insert an activated SIM card into the push-push SIM card slot (4). The SIM card is easily replaceable by pushing the inserted SIM card when it is necessary.

2.3 Connecting the modem unit PCB to the AS3000/AS3500 meter

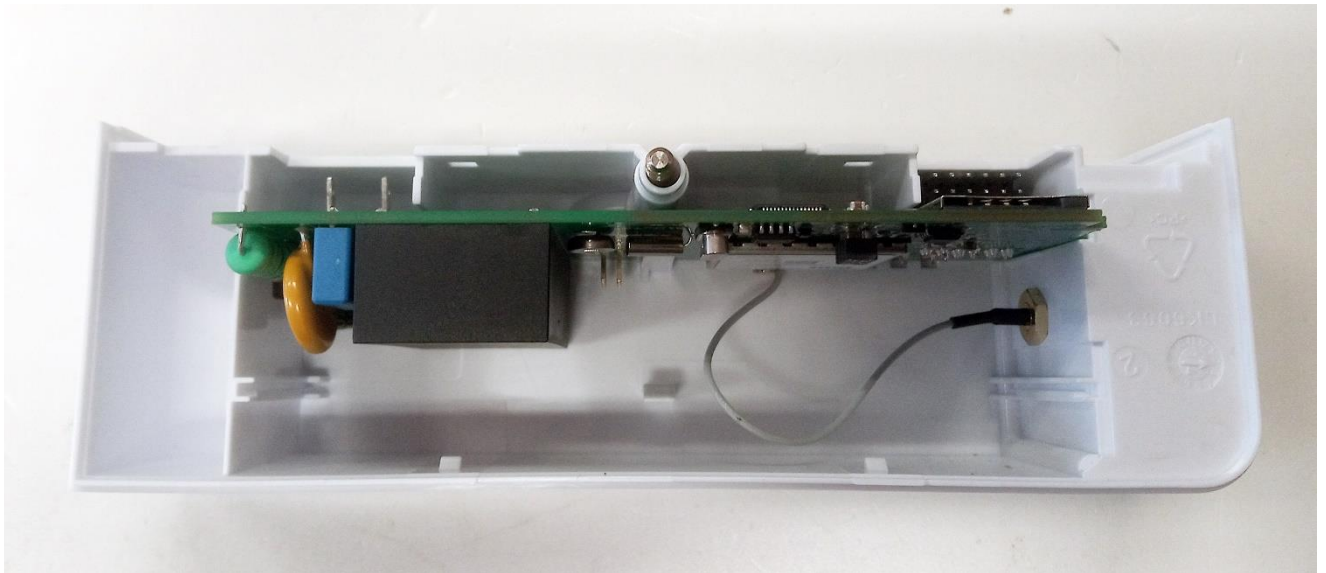
Take off the Honeywell®/ Elster® AS3000, AS3500 meter's communication module plastic case by releasing the screw from the top middle part of the housing.



Inside the communication unit's case mount the SMA-M antenna interface connector (6) on the housing. Then fasten it with the SMA connector's screw nut.

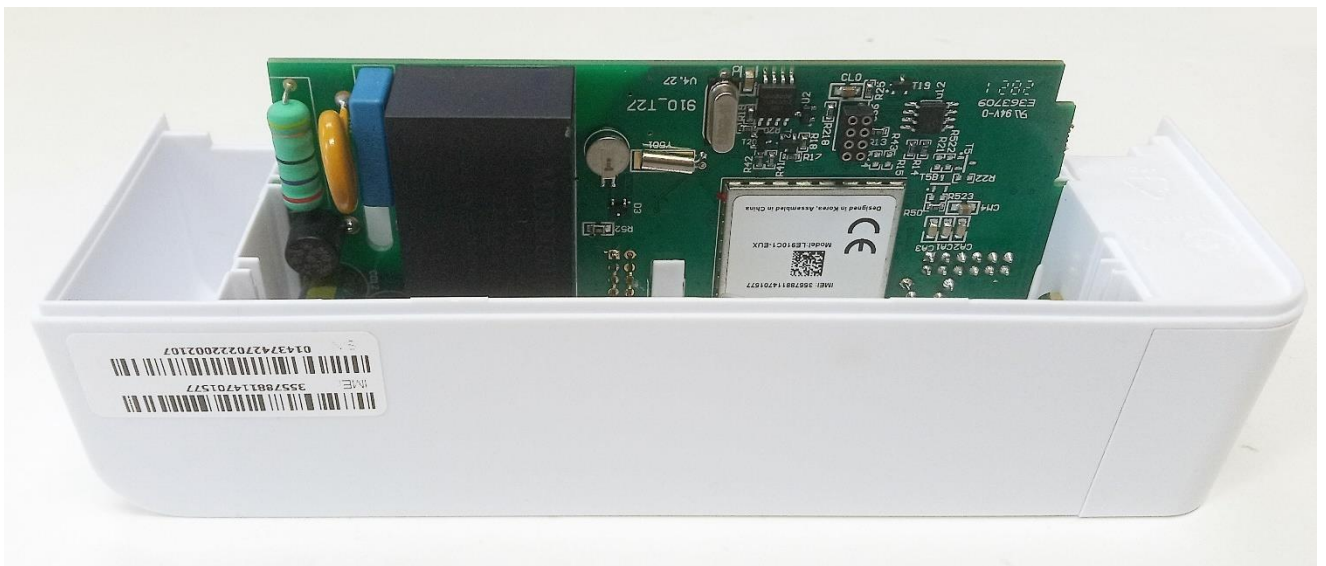


Now snap the modem unit PCB into the communication module's plastic housing by sliding it through the guiding rails of the case until you hear a click sound. Beware to place the modem unit PCB orientation into the slot. The 12-pins data connector (3) can help You to find the right position (upper right in the figure).



The internal interface connector (3) is close to the SMA antenna connector (6) (right top side on the picture).

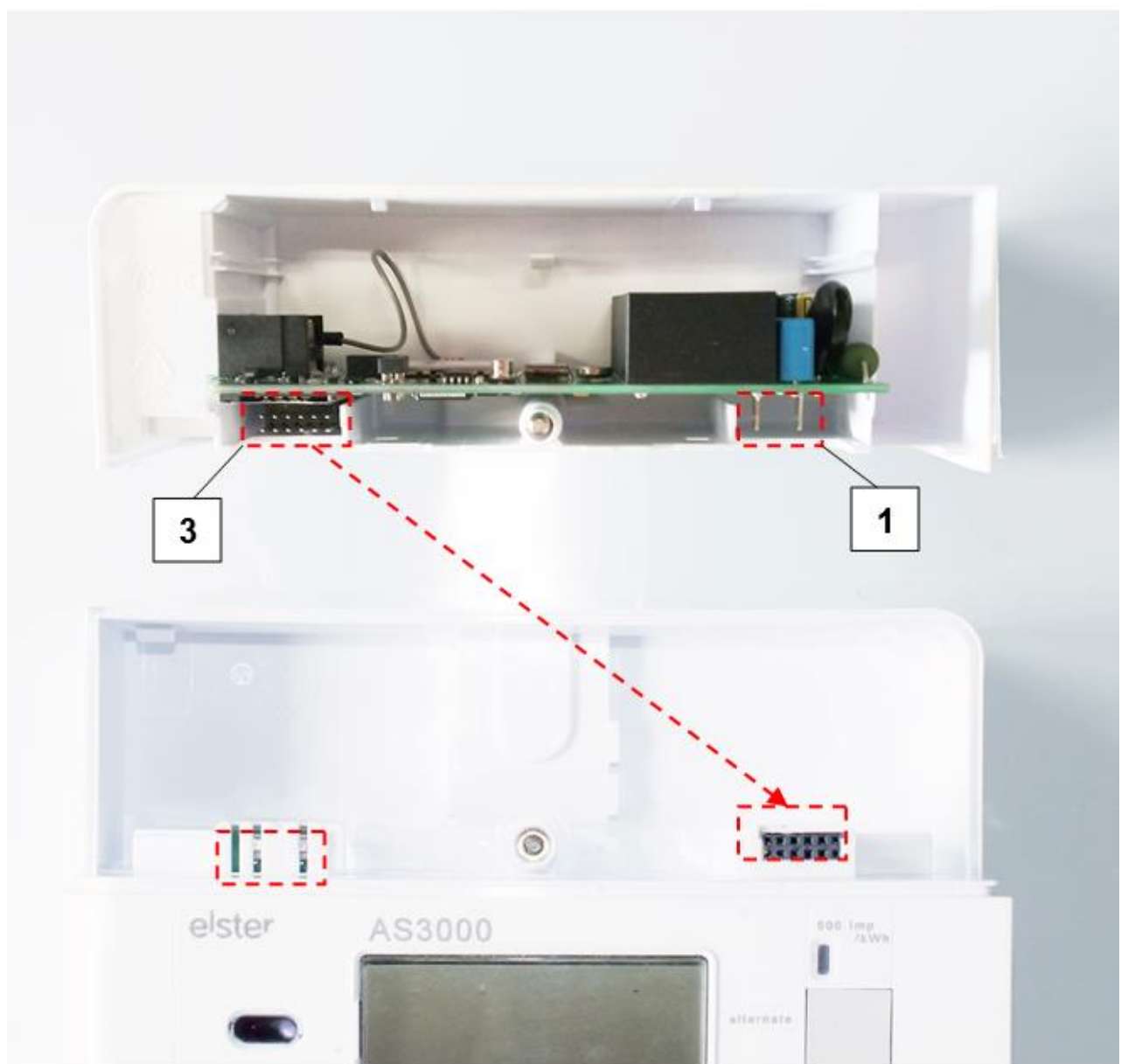
The PCB must be pushed until it is locked and fixed into the communication module's case. At the middle of the modem unit PCB there is whole that permits to the fixation hook of the communication module's housing to fix and holds back the modem unit PCB. When you want to remove the modem unit PCB, you must force the hook to release the PCB.



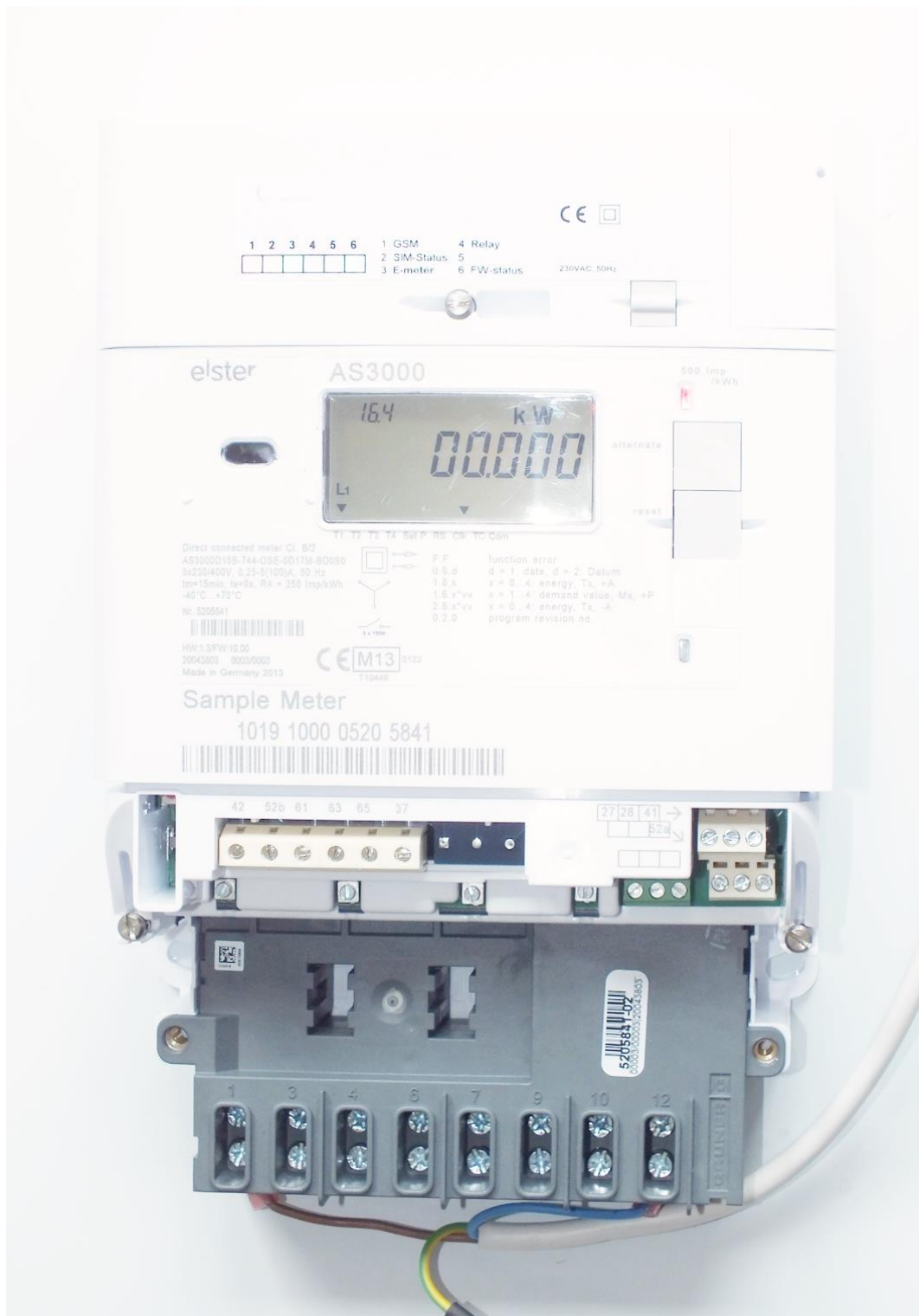
Now we can connect the communication module to the meter by sliding the communication unit into the meter housing.

The communication interface (3) and the mains connectors (1) must be connected to the connector pairs from the meter housing.

You will find, that the meter and communication module housing upper right edge is a rounded (radiused) as a sign of the perfect slide fit adaptation.



After assembling and turning on the meter the modem will be powered and its operation is confirmed by the LED signals (11).



2.4 Connecting the modem unit PCB to AS220, AS230, AS300 meter

Disassemble the Elster® AS220, AS230, AS300 meter's communication module plastic case. Release the top screw at the middle and take off the upper modem unit case.

The modem unit PCB can be placed into the transparent plastic housing of the communication unit.

Inside the communication module's transparent plastic case mount the SMA-M antenna connector on the housing (fix it with the SMA connector screw).

The communication unit now is ready to be attached to the meter by fixing it on the meter housing. The 12 pins communication interface (3) and the mains connector (1) now plugs into the meter.

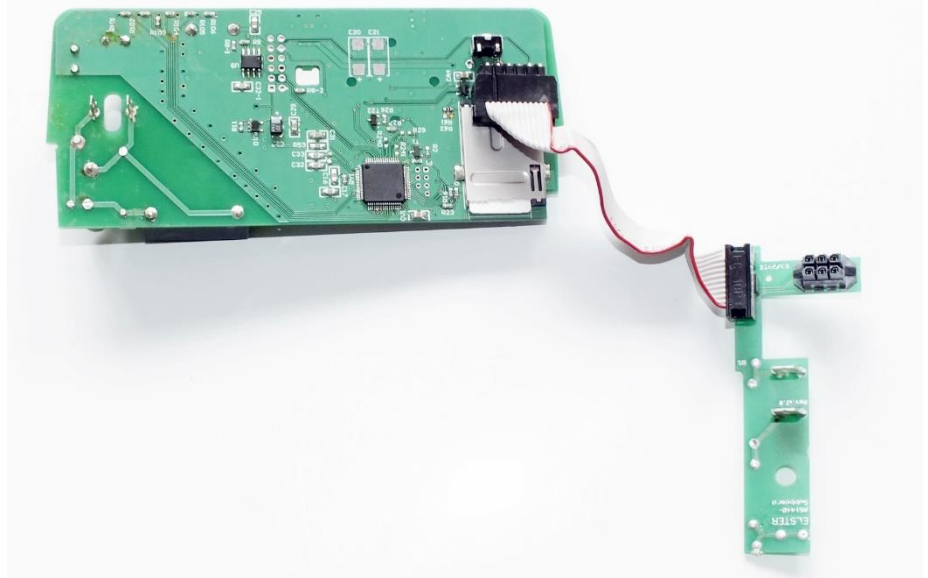
After assembly and turning the meter on the communication module is ready for operation. The LED signals will confirm the operation status of the communication module.



2.5 Connecting the modem unit PCB to the AS1440 meter

Connect the external PCB adapter with the 12 pins ribbon cable and slide the connector to the 12-pins communication interface (3) of the modem unit PCB as it can be seen in the picture.

The wire marked with red must be positioned towards the edge of the modem unit PCB.



The communication and power interface of the electricity meter to the module is provided by a 6-pin Elster® customized connector interface adapter.

Take off the Elster® AS1440 meter's terminal cover that hosts the communication module's plastic housing.

Release the back cover of the communication module in order to place the modem unit into the terminal cover.

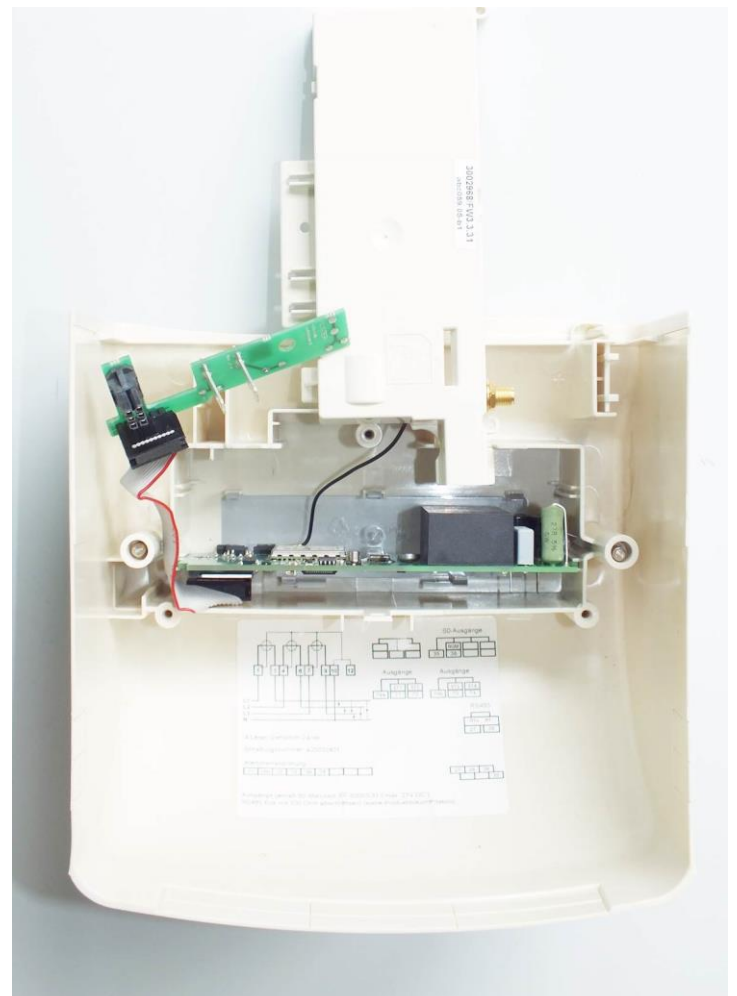
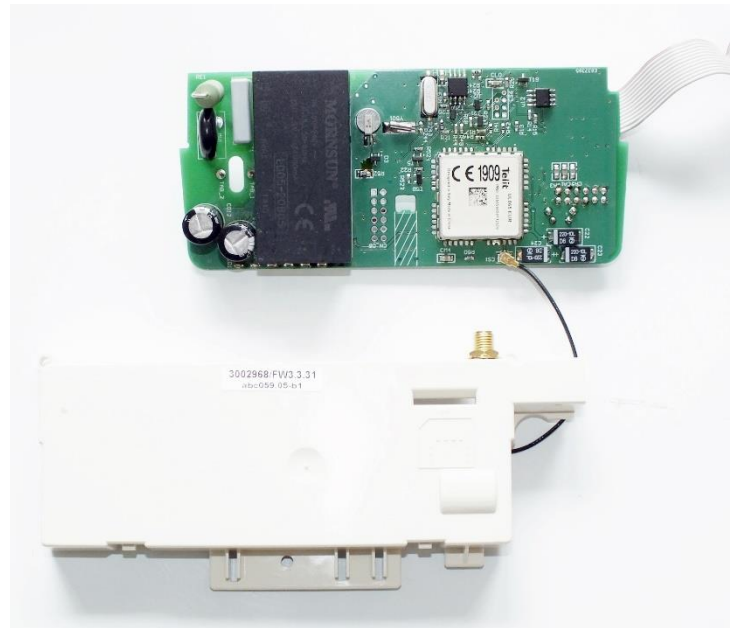


Mount the SMA-M antenna connector on the back cover of the communication module by fixing it with the antenna SMA screw (part of the U.FL cable).

Now insert the modem unit PCB inside the terminal cover's communication module housing by sliding it through the guiding rails that are closer to the fixing screws.

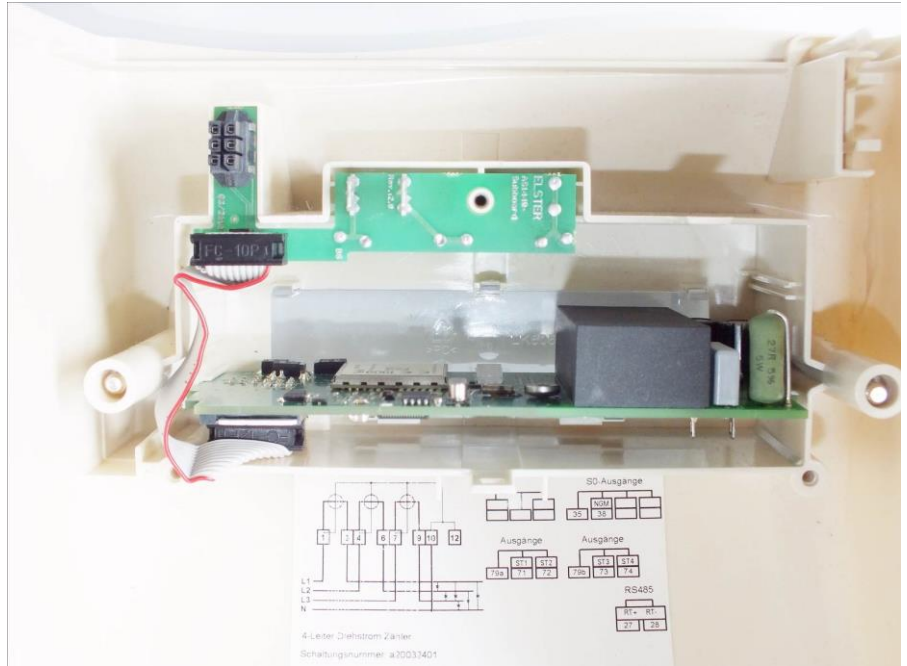
Take care to the position of the PCB and the power supply module (10) – which must be oriented to the right-side as it is shown on the picture. The 12-pins connector and its wire must be oriented to the left.

The modem unit PCB must be pushed until it will be locked and fixed into the case. In the terminal cover there are fixation points that hold the PCB in the plastic terminal cover.



Place the external power supply adapter PCB into the terminal cover case at the proper direction as it can be seen in the picture.

The 6 pins Microfit connector must be oriented to upside, the 12-pins wire must be placed to the left side – as it shown on the picture.



Please mind to arrange the ribbon cable to not obstruct the cover to be fixed on top of the communication unit housing.

Close the communication unit into the case by the back cover and fix it with the locking tabs and a screw.

Then place the terminal cover assembly onto the terminal block of the electricity meter. When inserting the terminal cover assembly, the 6-pins connector will assure power supply and data connection to the module from the meter.



After assembling and turning the meter on the communication module is ready for operation. The LED signals will confirm the operation status of the communication module.

2.7 Antenna connection

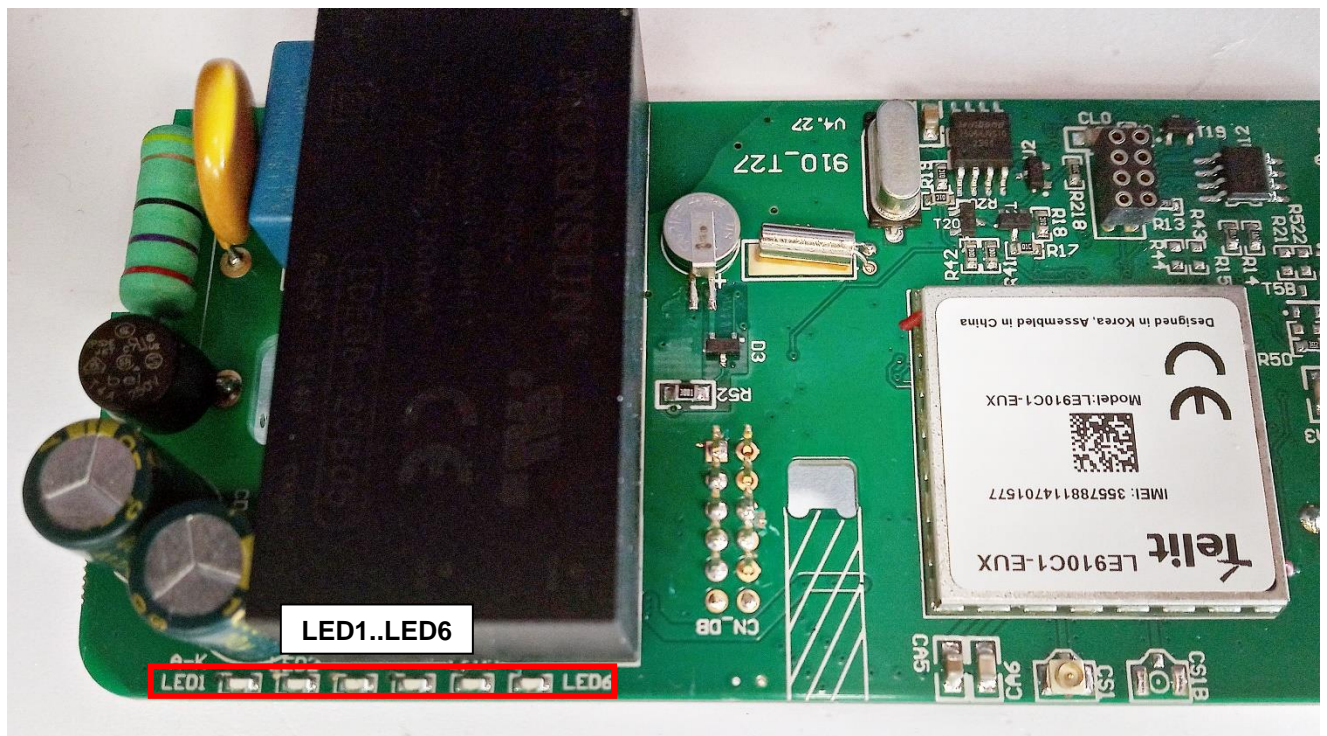
For proper operation of the communication module, it is necessary to getting sufficient cellular network signal strength.

Where the signal strength is strong it is possible to use internal antenna, for areas with poor reception mount an antenna to the SMA-M connection interface of the device (through U.FL antenna wire connectors).

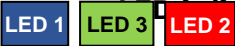


2.8 Status LED signals

The LED numbering can be seen at LED labels on the modem panel: from left to right in order: LED1 (blue, left), LED2 (red, right), LED3 (green, center) then LED4, LED5 and LED6.



Factory default LED signals:

LED identifier	Events
<p>LED 1 GSM / GPRS status</p>	<ul style="list-style-type: none"> • During network registration: led is <i>active</i> • During network searching: <i>blinking once per second</i> • When connected to the network and the IP connection is okay: <i>blinking twice per second</i> • When the mobile network access technology was changed: <i>quick flashing will be relied:</i> <ul style="list-style-type: none"> ○ 2G → 2 flashing per second ○ 3G → 3 flashing per second ○ 4G and LTE → 4 flashing per second • If there is no available cellular network detected: the led will be blank <ul style="list-style-type: none"> ○ During the CSD call and IP data forwarding, the  lighting continuously
<p>LED 2 SIM status / SIM failure or PIN failure</p>	<ul style="list-style-type: none"> • Continuously lighting, until the device is not on the cellular network and RSSI cannot be detected (SIM okay) • When the SIM PIN is okay: led is active • If there is no SIM detected or SIM PIN is wrong: <i>blinking once per second (slow flashing)</i> • The RSSI (signal strength) value is signed also by this led. Flashing by “N” times in every 10-15 seconds, depending on the RSSI refresh period. The RSSI value can be 1,2,3 or 4 on the current cellular network. The numbers of RSSI flashing is different on every available network technology, by the following: <ul style="list-style-type: none"> ○ <u>on 2G network:</u> <ul style="list-style-type: none"> ○ 1 flashing: RSSI >= -98 ○ 2 flashings: RSSI between -97 and -91 ○ 3 flashings: RSSI - between 90 and -65 ○ 4 flashings: RSSI > -64 ○ <u>on 3G network:</u> <ul style="list-style-type: none"> ○ 1 flashing: RSSI >= -103 ○ 2 flashings: RSSI between -102 and -92 ○ 3 flashings: RSSI - between 91 and -65 ○ 4 flashings: RSSI > -64 ○ <u>on 4G LTE network:</u> <ul style="list-style-type: none"> ○ 1 flashing: RSSI >= -122 ○ 2 flashings: RSSI between -121 and -107 ○ 3 flashings: RSSI between -106 and -85 ○ 4 flashings: RSSI > -84 ○ <u>on LTE Cat.M1 network:</u> <ul style="list-style-type: none"> ○ 1 flashing: RSSI >= -126 ○ 2 flashings: RSSI between -125 and -116 ○ 3 flashings: RSSI between -115 and -85 ○ 4 flashings: RSSI > -84 ○ <u>on LTE Cat. NB-IoT (Narrow Band) network:</u> <ul style="list-style-type: none"> ○ 1 flashing: RSSI >= -122 ○ 2 flashings: RSSI between -121 and -107 ○ 3 flashings: RSSI between -106 and -85 ○ 4 flashings: RSSI > -84
<p>LED 3</p>	

E-meter status	<ul style="list-style-type: none"> • During the transparent meter communication: <i>twice per second</i>. • At finish of the transparent communication: led is <i>blank</i>. • According the IEC meter status: the LED will be <i>active</i>. • In case of configuring the Multi Utility mode: led will be <i>active or blank</i>.
LED 4* E-meter relay output status	<ul style="list-style-type: none"> • Default status: "Ready" - LED flashes 1x per second • "Active" mode - the *relay switched, which turns on the LED when it is switched on. • "Normal" mode - the *relay released, which turns off the LEDs released.
LED 5** M-Bus status	<ul style="list-style-type: none"> • Not used
LED 6 Firmware status	<ul style="list-style-type: none"> • When the modem firmware starts, the LED turns on • When the connection between the meter ↔ modem is established, the LED flashes in every 2 seconds.

*LED 4 operation is available only in case of presence of the WM-E3S CIR version.

** LED 5 operation is available only in case of presence of the MBUS version.

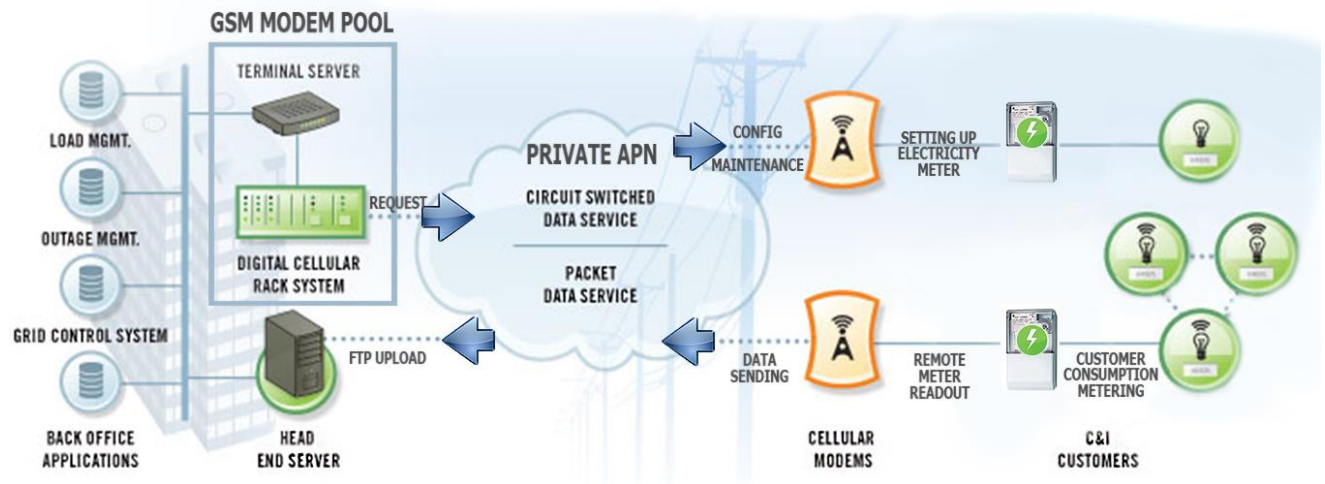
Further status LED signals (can be configured as well):

LED identifier	Events
Network status and access technology	<ul style="list-style-type: none"> • During network search: flashes once per second • When connected to the cellular network and the IP connection is OK: Blinks twice per second • If mobile network access has changed: flashes quickly: <ul style="list-style-type: none"> ○ 2G → 2 flashes / sec ○ 3G → 3 flashes / sec ○ 4G → 4 flashes / sec • If no network is available: the LED is not active
Meter status with IEC polling	<ul style="list-style-type: none"> • When the modem ↔ meter starts communicating, the LED flashes 1x per second. • If the meter responds to the modem during communication, it turns on the LED. • If the modem ↔ meter cannot communicate with each other for a while, the LED will turned off.
AMM (IEC) client state	<ul style="list-style-type: none"> • By default, or when the modem ↔ EI client communication is closed, the LED is off • • modem ↔ EI client** flashes briefly once per second when connecting (then pause for approx. 1 second) • If the EI client** flashes once per second when logging in • The communication connection between the EI client** ↔ modem is established - the led is active

** The EI client is a transparent TCP channel outgoing from the modem to the EI server

2.9 Push operation method

The complete readout and data sending mechanism to the center and the other direction for the configuration and maintenance tasks can be realized on the defined paths.



The modem does not operate continuously on the network.

Therefore, there is another option and meter data sending mode to initiate a remote readout automatically in the pre-defined intervals. Anyway, it is also possible to start the data sending in case of different events (e.g. removal of meter cover, incoming SMS message from the center).

In this situation the modem is connected to the mobile data network only during the time of the data transmission.

The device needs to be connected to GSM network and ready to connect to GPRS, but without active IP connection.

- Data Push - starting at predefined times

- The Data Push method triggers FTP file upload, plain text or encrypted.
- The unique filename and the file is generated automatically.
- The ftp function also requires an ftp server to receive data that is accessible from the currently used mobile network.
- The ftp must be set to passive mode.
- Unique file names are generated automatically.

-
- The file always consists of two parts, first a standard register read and then an event log (containing the events of the last 31 days).
 - The readings shown as standard IEC format, including some ASCII control characters like STX ETX, etc. also.

- **Alarm Push** - starting when new event can be read from meter

- Alarm Push method triggers TCP sending of a DLMS WPDU contains the IP address,
- listening port number for transparent service, and the meter ID.

- **Triggering with SMS**

- GPRS connection can be activated remotely with a defined SMS from any call number.
- The SMS text must be left empty.
- After the SMS received, the modem will connect to IP network, and will be accessible as a IP server for a time period defined in the config file.
- Example config file will be provided with a 30 minutes setting.

2.10 LED operation during the CSD call

The CSD call consists of two parts:

a.) We want to read / configure a meter in transparent mode

b.) We want to perform a modem configuration / firmware update

To read / configure a meter in transparent mode:

- The LED configured for GSM / GPRS status will be lit continuously during CSD call.
- The LED that is configured for e-meter status will flash according to the CSD call status:

- It will flash every half second from the beginning of the connection to the end of the connection / If the measuring interface is not configured for a baud rate of 9600, the LED will be lit continuously from the beginning to the end of the connection

-
- After closing the connection, the LED will turn off

If you want a modem configuration / firmware update:

- The LED configured for GSM / GPRS status will be lit continuously during the CSD call.
- In this case, the other LEDs do not change due to the CSD mode.

2.11 Configuring from CSD connection

If the modem restarts due to an incorrect configuration, it is possible to access it with a CSD call. Its operation can be fine-tuned in the WM-E Term software with a value that can be specified in the PDP connection delay field in the APN parameter group.

For more information, see Chapter 3.1 of the *WM-E Term User Manual*.

2.12 Automatic network reconnection

If the mobile network provider drops the modem from the cellular network due to the device's network inactivity, there are available parameters if these are set, then automatic and periodical connection rebuild can be caused. If the network provider sends a message to the modem that the data connection has been lost, the connection will be restored automatically. If you do not send a message, you can choose from these two workarounds to follow:

a.) **Active mode - Use periodical ping, set the ping:**

1. For setting this, set the **Watchdog** parameter group's ping parameters as **Ping IP-address, Number of ping retries, Ping wait-time (for reply)** and **Wait-time (for next)**.

-
2. If there is no ping response, it reconnects to the network after the time interval specified in the **Seconds, GPRS connection closed and restored after this time** parameter.

Attention! *In case of frequent ping using, the data traffic will be higher, but the chances are higher that the device will remain on the cellular network.*

b.) **Passive mode - If you don't use the ping - set the connection retry:**

1. For setting this, use the **Watchdog** parameter group's **Seconds, GPRS connection closed and restored after this time** parameter.
2. Here you can define that after the network drops out the modem, how long does the modem wait before trying to reconnect to the mobile network again. Ask your mobile provider about the offered settings.

Attention! *If there is less data traffic and there is no ping configured, the device may not stay on the network for a long time.*

If you set this parameter to a low value that can cause frequent network reconnections.

Therefore, under no circumstances should you set this value lower than what your mobile service provider recommends. (e.g. there are mobile network providers that limit the number of times a modem can log on to the network in a given time).

Chapter 3. Modem Configuration

3.1 Configuration

During the configuration and connection, the power supply of the modem power supply is provided by the connected meter through the internal connector.

The modem must be configured by the WM-E Term[®] software by configuring its parameters which must be performed before the normal operation and usage.

Important! *The WM-E3S[®] modem can be configured through meter's RS485 connection, meter's optical interface or via TCP connection settings.*

Use the WM-E Term program for the configuration – use the WM-E Term User manual. Over the parameter settings of meter, modem and communication, etc., you can also test the modem communication by the configuration program.

For the proper communication of the modem, you have to configure the APN settings of the SIM – as PIN code, APN, username and password. These all can be configured by using the WM-E Term[®] software.

For the successful operation of the communication module it is necessary to have appropriate signal strength.

In places where the signal strength is strong it is possible to use internal antenna, for areas with poor reception mount an external antenna (50 Ohm SMA connection) to the antenna connector (3) of the device, which you can place inside even inside the meter enclosure (under the plastic housing).

If you want to readout the meter parameter values during the PC-modem connection you made, then you should select a different configuration port to the meter as TCP/IP or Optical or RS485 (Serial).

3.2 Configuring the modem by WM-E Term®

The Microsoft .NET framework runtime environment is required on your computer.

Download WM-E Term® to your computer from the following location using a browser: https://m2mserver.com/m2m-downloads/WM-ETerm_v1_5.zip

Then unzip the .zip file to a directory and execute the **WM-ETerm.exe** file.

The configuration software supports user account management and password change. You can log in to the program with a password! Follow the **WM-E Term®** configuration software's **User's Guide!**

The LEDs on the device always inform you about the current status of the modem.

For the operation of the modem cellular network communication and SIM card settings (such as APN, password, and account) are required.

In addition, be sure to review and save the transparent mode data speed functions in the WM-E Term program for the RS485 settings. In addition, you must send the configured configuration to the modem using the program - according to the configuration software's User Manual document.

With the configuration software you can also update the modem's firmware. Then the modem will restart and work according to the new settings.

WM-E Term User Manual:

https://m2mserver.com/m2m-downloads/WM-E-TERM_User_Manual_V1_97.pdf

3.3 Sending an SMS from the meter


Depending on the meter configuration, by using the modem, the meter can send SMS message corresponding to standard AT commands to the phone number

which was configured at the meter side.

It is worth configuring this primarily for alarms and special events, according to the capabilities of the meter.

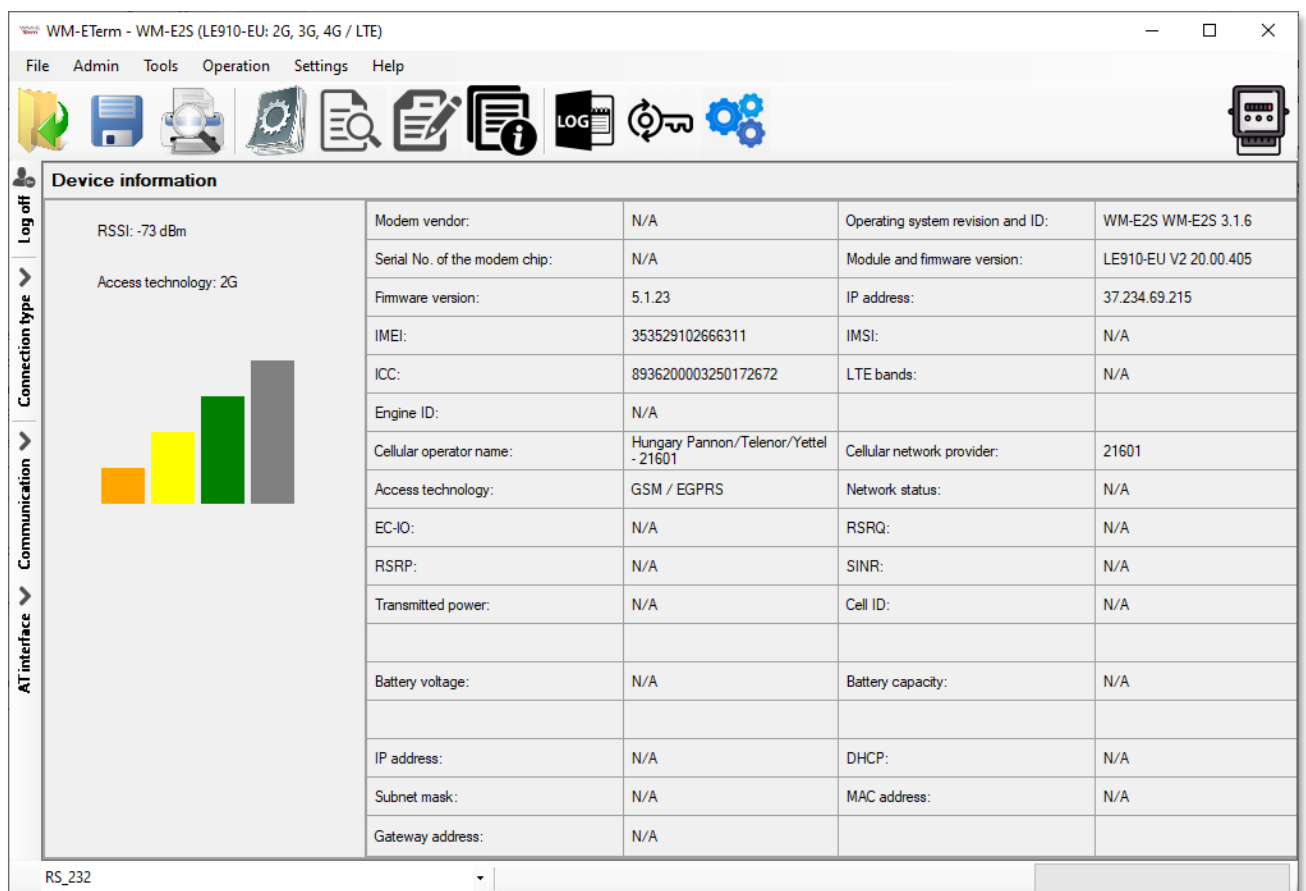
No other settings are required in WM-E Term®.

3.4 Signal strength

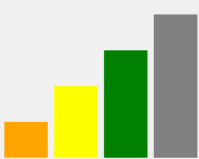
Check signal strength of the cellular network in the *WM-E Term*® software Device Information menu or by using the  icon. At the end of the process, the current status information will be updated.

Check RSSI value (at least it should be yellow – which means average signal strength – or better if it is green).

You can change the antenna position while you will not receive better dBm values (the status must be readout again for refresh).



The screenshot shows the WM-E Term software interface. The title bar reads "WM-E Term - WM-E2S (LE910-EU: 2G, 3G, 4G / LTE)". The menu bar includes File, Admin, Tools, Operation, Settings, and Help. The toolbar contains various icons for file operations, search, and settings. The main window is titled "Device information" and displays the following data:

<p>RSSI: -73 dBm</p> <p>Access technology: 2G</p> 	Modem vendor:	N/A	Operating system revision and ID:	WM-E2S WM-E2S 3.1.6
	Serial No. of the modem chip:	N/A	Module and firmware version:	LE910-EU V2 20.00.405
	Firmware version:	5.1.23	IP address:	37.234.69.215
	IMEI:	353529102666311	IMSI:	N/A
	ICC:	8936200003250172672	LTE bands:	N/A
	Engine ID:	N/A		
	Cellular operator name:	Hungary Pannon/Telenor/Yettel -21601	Cellular network provider:	21601
	Access technology:	GSM / EGPRS	Network status:	N/A
	EC-IO:	N/A	RSRQ:	N/A
	RSRP:	N/A	SINR:	N/A
	Transmitted power:	N/A	Cell ID:	N/A
	Battery voltage:	N/A	Battery capacity:	N/A
	IP address:	N/A	DHCP:	N/A
	Subnet mask:	N/A	MAC address:	N/A
Gateway address:	N/A			

The status bar at the bottom shows "RS_232" and a dropdown menu.

3.5 Power outage management – for supercapacitor expansion only!

If supercapacitors are presented on the PCB or on the additional expansion board, then the firmware of the modem will support the LastGASP feature. This means that in case of power outage the modem's supercapacitor allows to operating further the modem for a short time (a couple of minutes).


In case of detecting the loss of mains/input power source, the modem generates a "POWER LOST" event and the message will be immediately transmitted as an SMS text to the configured phone number.

In case of recovering the mains/power source the modem generates the "POWER RETURN" message and sending by SMS text.

The LastGASP message settings can be enabled by the WM-E Term® application – in the AMM (IEC) parameter group part.

3.6 Restart the modem

There cannot be found a direct option for modem restart in WM-E Term. But it is very easy to push the modem to be restarted.

1. Choose any parameter from the readout values.
2. Change a parameter value
3. Push to the **Save** button.
4. Send the settings by **Parameters Write**  icon to the modem.
5. At the end of the writing process, the modem will be restarted.
6. The restart of the device is signed by the **LED3**, which will be flashing quickly by **green** for 15 seconds. The starting requires 2-3 minutes while the modem will be available on its interfaces.

-
7. After all, the LED will be operating ordinary as it is listed in the LED operation behaviour description.

Chapter 4. Support

If you have a technical question regarding the usage You can find us on the following contact possibilities:

Email: support@m2mserver.com

Phone: +36 20 333-1111

4.1 Support

The product has an identification void which has important product related information for the support line.

Warning! Damaging or removing the void sticker means the loss of product guarantee.

Online product support available here: <https://www.m2mserver.com/en/support/>

4.2 Product Support

The documents and information related on the product are available here. <https://www.m2mserver.com/en/product/wm-e3s/>

Chapter 5. Legal notice

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Warning

Any fault or upcoming error during the software upload/refresh can lead to the device breakdown. When this situation happens call our specialists.