Datasheet and User manual
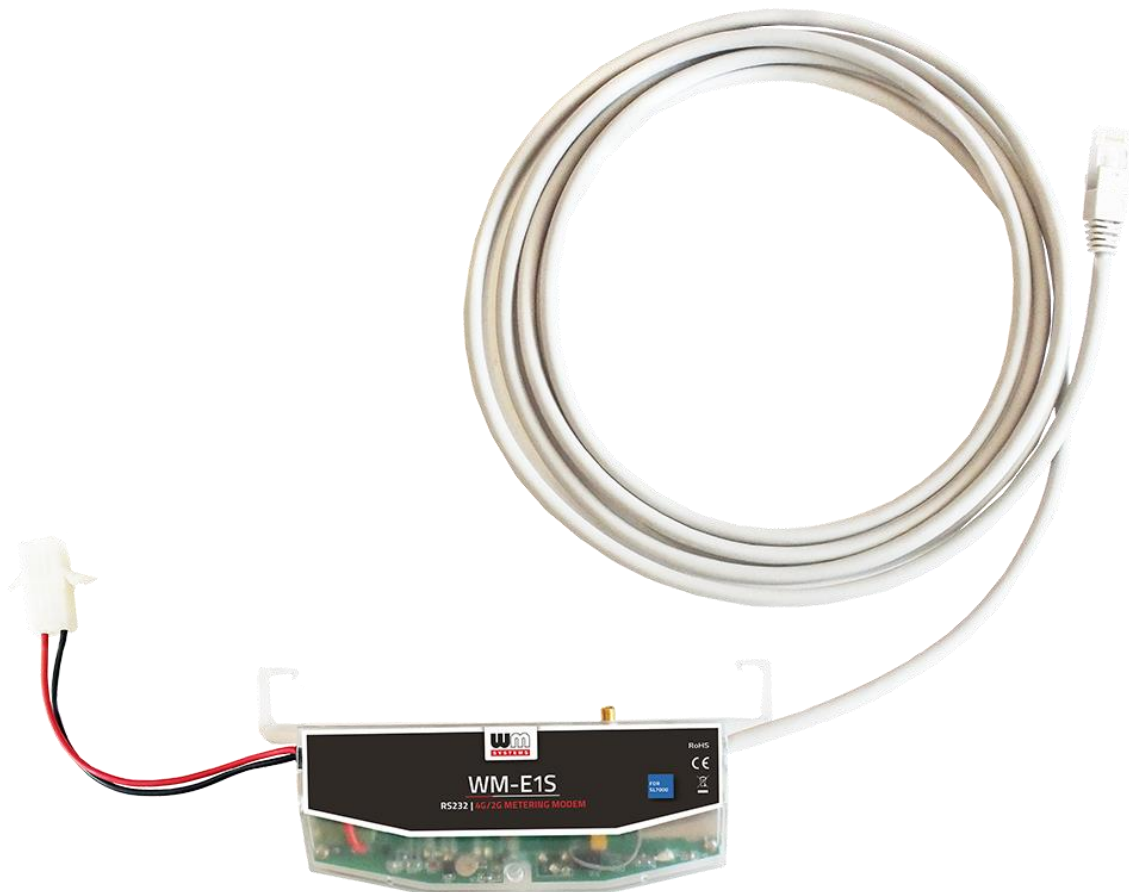# for WM-E1S® modem
for Itron® SL7000 electricity meters

Document specifications

This documentation was made for presenting the installation and configuration steps of the WM-E1S® smart metering modem for Itron® SL7000 electricity meters.

Document Version:	**REV 2.70**
Hardware Type/Version:	**WM-E1S® modem** **for Itron® SL7000 electricity meters**
Hardware Version:	**V 5.10**
Firmware Version:	**V 5.1.58 TLS**
WM-E Term® config. **software version:**	**V 1.3.80**
Pages:	**20**
Status:	**Final**
Created:	**06-02-2020**
Last Modified:	**04-12-2023**

Chapter 1. Introduction

The **WM-E1S**® modem is suitable for remote reading of **Itron**® **SL7000** electricity meters on the 4G LTE-based cellular network.

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

Wireless communication

The modem can be ordered with this cellular module type: LTE Cat.4 / 3G / 2G module

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).

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

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

The modem has been designed to provide "Pull" operating mode, which means that the modem has a transparent communication data sending from the meter to the HES (smart metering center/server).

Design and installation

This modem was especially developed for the 3-phase **Itron**® **SL7000** electricity meters, which can be connected to the meter by its design and its its RJ45 connection RS232 interface. It is installable to the meter as an external modem – due its 35mm DIN-rail adapter (provided to the modem) - which allows to fix the device.

Operation properties, features

The modem is suitable for reading the meter's actual and stored consumption values, access the recorded event log, read the load profile data, and read or modify the parameter set of the meter - remotely. It can be accessed remotely through the cellular network (by the embedded SimCom® A7602 module) and it is able to send data on the Internet by using an APN.

Power source and power outage

The device can be powered from the meter's mains connection (by general 100V-240V AC voltage).

The modem can be connected through the following modes:

a.) the meter is connected to the 57.7/100V AC power network: the modem must be connected to **line** voltage (100V, L1..L2 or L2..L3 or L1..L3)

b.) the meter is connected to the 230/400V AC power network: the modem must be connected to the **phase** voltage (230V, L1..N or L2..N or L3..N)

Supercapacitor

The modem is equipped with internal supercapacitor part, which prevent the intermittent power cuts also help decrease power peaks. This enables to keep the module in operation during small power outages.

Because of the supercapacitors, the modem is able to function normally after a few minutes of charging, and even for frequent data transmission of a few minutes.

In the event of a power outage, the supercapacitors will discharge over time, and the modem will shut down. When the power supply returns, the supercapacitors must first be recharged, and only then can the modem send data over the mobile network again.

Configuration

The modem is configurable locally via its RS232 port (RJ45 connector). For that a USB Dongle converter is also required to be used to connect the modem on its RJ45 connector via USB connection to a computer.

The modem is configurable via TCP/UDP 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 be executed, and it is available in several languages – as well the French.

Firmware refresh

The WM-E Term® also provides safe firmware change for one or group of devices – locally (via RJ45 connection) or remotely (via cellular connection).

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 – its safe.

The data communication between the modem and the meter is transparent and uses TLS protocol compatible (Transport Layer Security) firmware.

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 (depending on the used cellular network and mobile operators - if the SMS notification is not disallowed on the network, then it can be used) and optional Last Gasp notification (power outage alert sending).

Certification

According to the CE certification, the modem complies with the Radio Equipment Directive - ReD - 2014/53/EU. The product is RoHS and CE certified.

Chapter 2. Connections

2.1 Connectors, interfaces
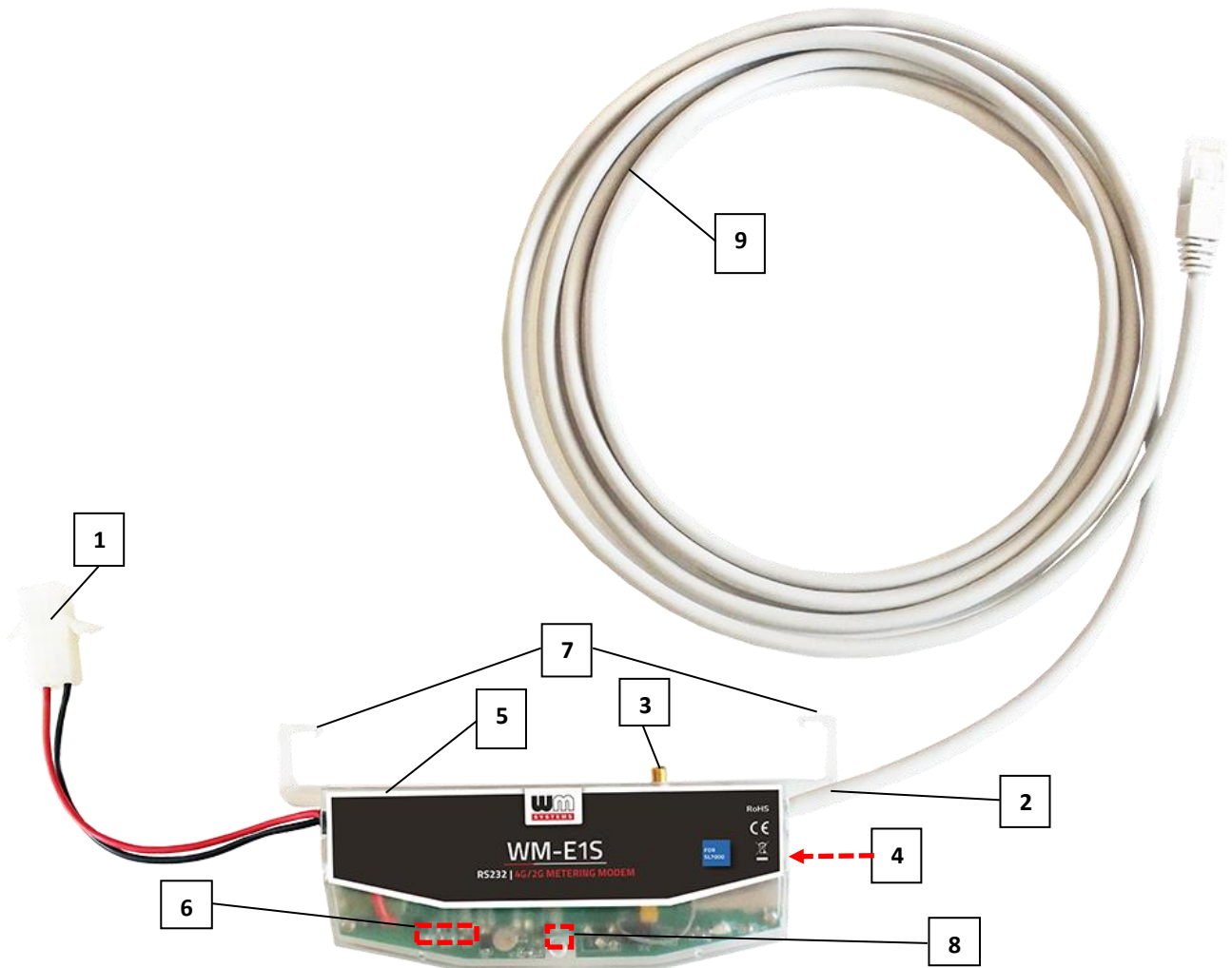
1 – **Mains pigtail connector* (100-240V AC - to the meter's AC connector)**
2 – **RS232 connector (for RJ45 – data connection between the modem← → meter)**
3 – **External antenna connector (SMA-M, 50Ω)**
4 – **SIM card slot (mini SIM, insert-push, type 2FF – at right side of modem)**

5 – **Modem enclosure (transparent, plastic)**
6 – **3pcs Status LEDs**
7 – **Hooks to fix the modem case into meter enclosure (optional)**
8 – **Fixation screw of top modem enclosure**
9 – **Meter data cable (for the RJ45 – data connection between the modem← → meter)**
10 – **DIN rail adapter (backside)**

*Note that the modem power plug can be connected through the following modes:

   *a.) the meter is connected to the 57.7/100V AC power network: the modem's AC power plug must be connected to **phase** voltage (100V, L1..L2 or L2..L3 or L1..L3)*

   *b.) the meter is connected to the 230/400V AC power network: the modem's AC power plug must be connected to the **line** voltage (230V, L1..N or L2..N or L3..N)*

2.2 Installation steps

Step #1: Ensure that the device is not powered on or remove the AC connector (1) from the meter.

Step #2: Insert a replaceable and active SIM card (which uses APN) into the SIM-holder (4). The SIM chip looks down, the cutted edge of the SIM is oriented to inside of the modem. Then push the SIM until it is fastened (you will hear a click sound) to the SIM slot.
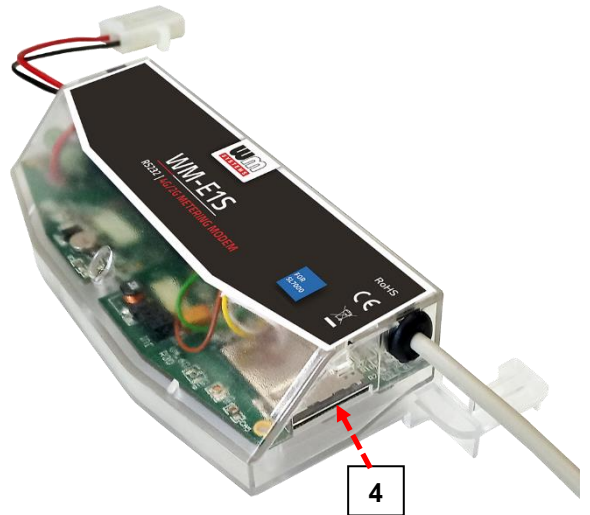
Step #3: Make the RS232 data connection between the modem and the Itrón® SL7000 meter by the RJ45 interface (2) using the provided and integrated data cable of the modem.
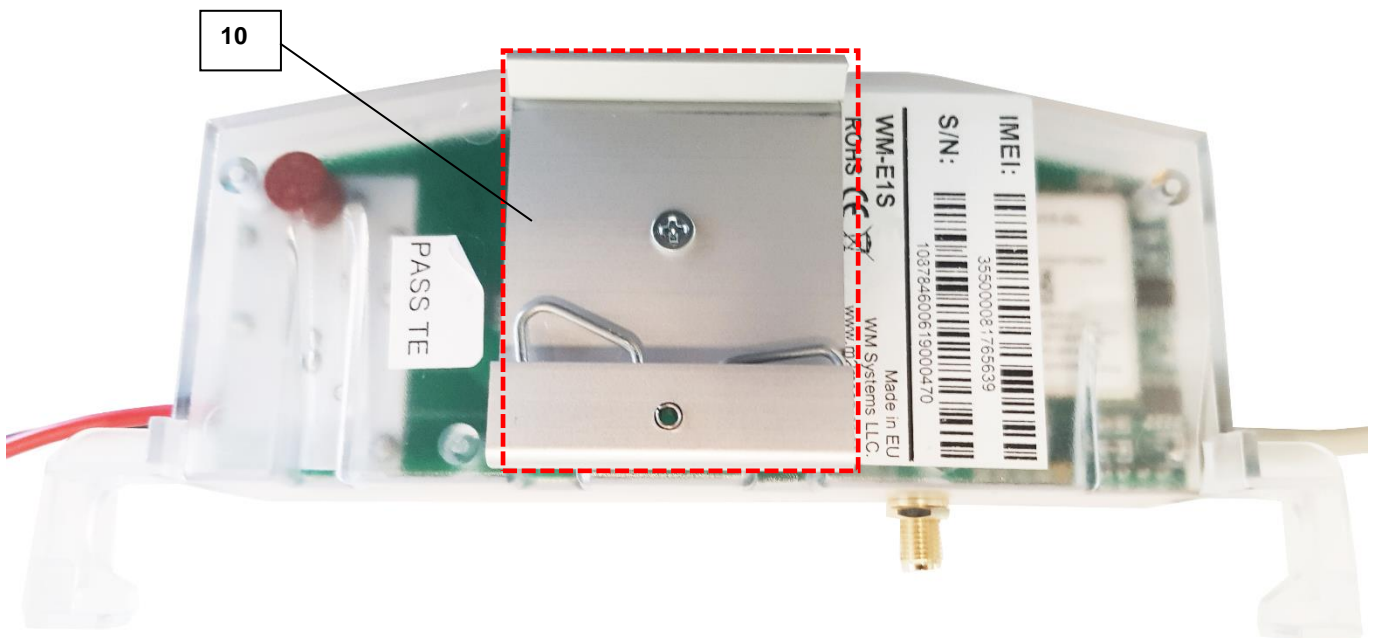
Step #4: Install the modem enclosure (5) by using the 35mm DIN-rail adapter (10) to fixate on rail (which can be seen on the figure). Therefore the modem position can be fixed.

Step #5: Mount a 4G antenna (SMA, 50 Ohm) to the SMA antenna connector (3) of the modem.
Important! *For the successful communication of the modem you need to use a 4G antenna!*

Step #6: Remove the Itrón® SL7000 meter's communication module plastic enclosure by releasing the screw from the top of the plastic middle part of the cover interface – according to the meter's installation manual.

Step #7: Connect the modem's RJ45 data cable (9) to the modem's RJ45 port (2) to the Itron® SL7000 meter's RS232 port.

Step #8: Connect the modem's AC Power plug (1) to the meter's Power input line (in case of using 100V AC) or connect to **2-phase** (in case of using 57.7V voltage as power source).

Step #9: Then the modem will be power supplied by the meter and the modem will start its operation and the LED signals are signing the current activity.
Now you can use or configure the modem.

2.3 Description of the RJ45 connector

Connect the provided RJ45-type RS232 cable (9) to the modem's RJ45 communication interface (2).
The Itrón® SL7000 meter's RJ45 connection pinout can be seen in the following table.
Please note, that the modem side of the connector pinout is the opposite / counterpart to the meter's side.

Pin # (RJ45)	Legend
1	**VMDM Approx +10V DC at 100mA (0.9W max.)**
2	**No connection**
3	**No connection**
4	**RX (Data request)**
5	**TX (Data transmit line)**
6	**0V – Ground**
7	**DTR**
8	**No connection**

2.4 Status LED signals

Factory default LED signals:

LED identifier	Events
LED 1 **GSM / GPRS status**	• **During** network **registration**: led is ***active*** • **During** network **searching**: ***blinking once per second*** • When **connected to the network** and the **IP connection** is okay: ***blinking twice per second*** • When the mobile **network** access technology was **changed**: ***quick flashing will be relied:***

	2G → **2 flashing per second** 3G → **3 flashing per second** 4G LTE → **4 flashing per second** - If **there is no available cellular network** detected: the led will be **blank** **During the CSD call and IP data forwarding, the LED is ligthing continuously**
LED 3 **E-meter status**	- 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**: *blinking once per second* (slow flashing) **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:** **on 2G network:** **1 flashing: RSSI >= -98** **2 flashings: RSSI between -97 and -91** **3 flashings: RSSI - between 90 and -65** **4 flashings: RSSI > -64** **on 3G network:** **1 flashing: RSSI >= -103** **2 flashings: RSSI between -102 and -92** **3 flashings: RSSI - between 91 and -65** **4 flashings: RSSI > -64** **on 4G LTE network:** **1 flashing: RSSI >= -122** **2 flashings: RSSI between -121 and -107** **3 flashings: RSSI between -106 and -85** **4 flashings: RSSI > -84**
LED 2 **Firmware status**	**During** network **registration**: led is **active** **During** network **searching**: *blinking once per second* - When **connected to the network** and the **IP connection** is okay: *blinking twice per second* - When the mobile **network** access technology was **changed**: *quick flashing will be relied:* 2G → **2 flashing per second** 3G → **3 flashing per second** 4G LTE → **4 flashing per second** - If **there is no available cellular network** detected: the led will be **blank** **During the CSD call and IP data forwarding, the LED is ligthing continuously**

The LED number we listed here is the same as can be found on the PCB – from left to right the sequence is the following: LED title **LED1** (**blue**, left), **LED3** (**green**, middle), **LED2** (**red**, right)).

Over the factory default settings, the operation of the LED signals and its sequence can be changed by the **WM-E Term®** configuration tool, at the **Standard Meter Interface** parameter group, where you can define one of the following functions of the leds (LED1..LED3) according the next list:
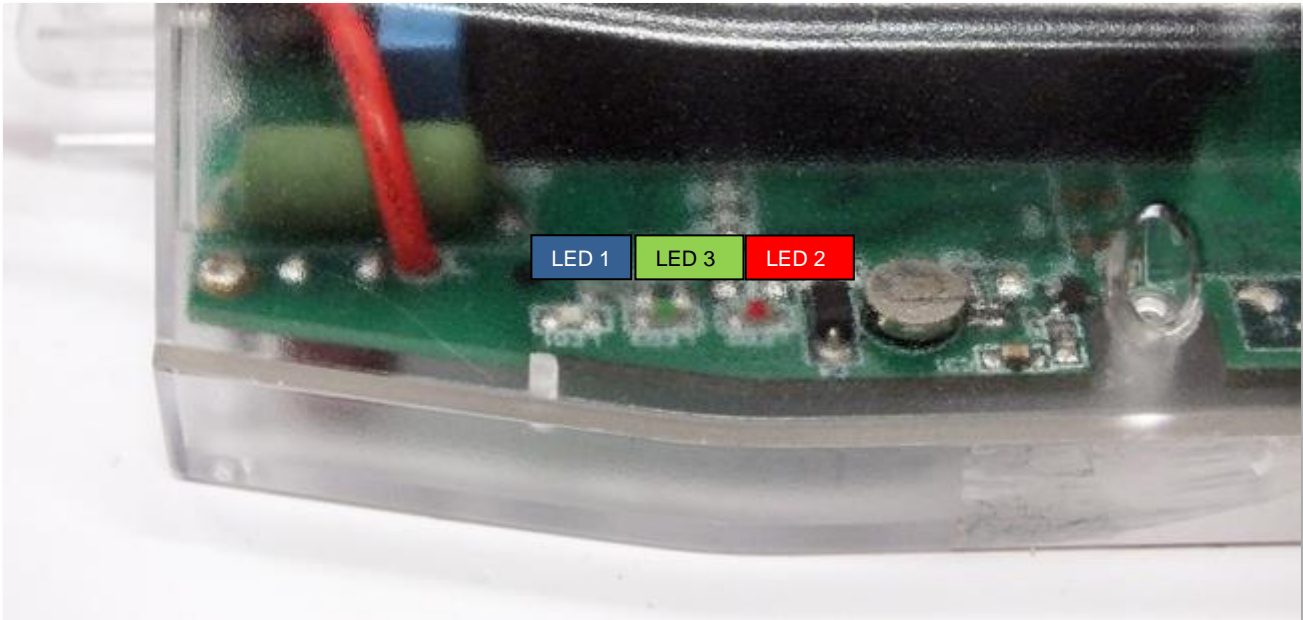
There you can define one of the following functions of the leds (LED1..LED3) according the next list:

Selectable LED status (in the WM-E Term program)
Not used
GSM / GPRS status
SIM status (wrong PIN flashing slow or without SIM)
E-meter status
E-meter relay status (not usable here)
M-Bus status (not usable here)
Firmware status
Network status and access technology
Meter status with IEC polling
AMM (IEC) client state (not usable here)

Further configurable LED status signals:

LED status	Event
E-meter relay status – Relay* output status (not available on this modem)	- Default: "Ready" / stand-by – the LED is **flashing once per second** "Active" mode – at *relay switching turns on the LED** "Normal" mode – **at *relay release turns off the LED**
Firmware status	- If the modem firmware starts the **LED will be active** - If the meter⬅➡modem connection was built up, the **LED is flashing twice per second**
Network status and access technology	- Network registration: the **LED is active** - During the network searching: **flashing once per second** - When connected to the network and the IP connection is fine: **flashing twice per second** - If the cellular network access technology was changed: **signed by quick flashing** *according the technology by the following:* 2G ➔ *2 flashing / second* 3G ➔ *3 flashing / second* 4G ➔ *4 flashing / second* - If there is no available network: the **LED is inactive**

Meter status with IEC polling	• When the modem←→meter starts the communication, the **LED is flashing once per second**. • When the meter answers to the modem during the communication, the **LED will be turned on.** • When the modem cannot communicate with the meter permanently, the **LED will be turned off.**
AMM (IEC) client state	• By default, or in case of finishing the communication of the modem←→EI client the **LED is turned off** • During the modem←→ EI client ** connection build-up the LED **flashing shortly once in every second** • The EI client** at login request **– flashing once per second** • The EI client**←→modem communication was built – **the LED is active**

The listed relay can be used for control the power supply of the e-meter. This is not used for tariff change!

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

During the firmware uploading the LEDs are operating as it is normal – there is no significal LED signal for the FW refresh progress.

After the FW installation all LEDs will be blank. Then the modem will be restarted automatically, and will be operating by the new firmware.

At starting the **LED3** will be flashing quickly by **green** for 15 seconds. The starting requires 2-3 minutes while the modem will be available on its interfaces.

Afterall, the LED will be operating ordinary as it is listed in the LED operation behaviour description.
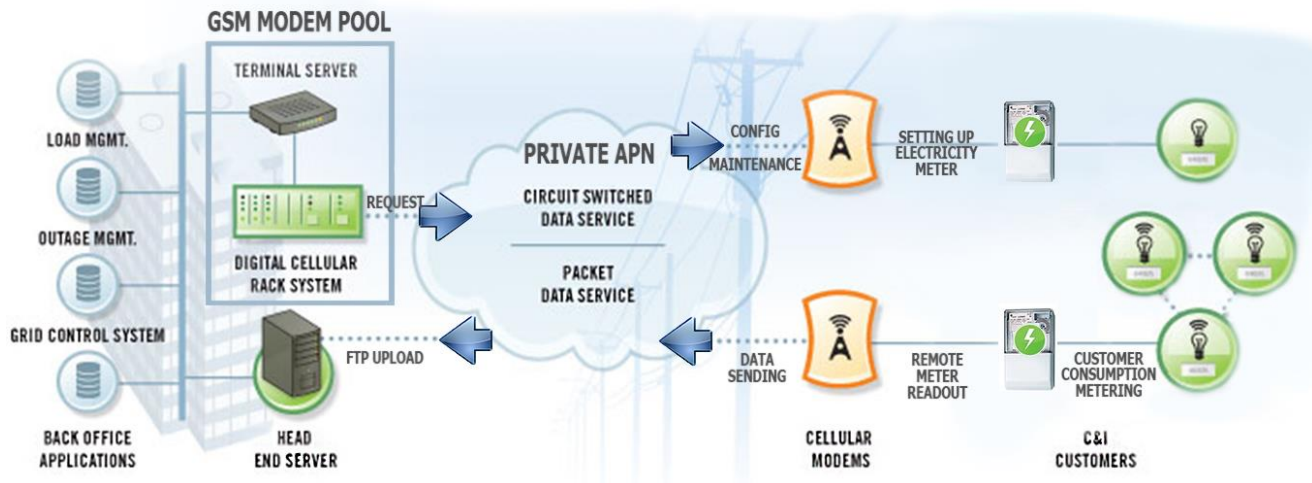
2.5. Operation of the modem

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

There is an 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 centre).

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

The devices needs to be connected to cellular network for the proper operation.

2.6 Power outage management

The modem supports the LastGASP feature, which 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 presence of the super-capacitor parts, the modem is the detecting the loss of mains/input power source, and it generates a "POWER LOST" event, when the message will be immediately transmitted b 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.

Chapter 3. Modem Configuration

3.1 Configuration

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

Over the parameter settings of meter, modem and communication, you can also test the modem communication by the configuration program.

Important!

During the configuration, you have to remove the meter←→modem RJ45 connection (2) and you have to connect the modem's connector to your computer by the following hints.

Until the configuration the modem is not connected to the meter, therefore it cannot readout the parameter values through the RJ45 interface.

The modem can be connected with the RJ45 cable (2) and by using the RJ45-to--USB converter by directly to your computer.

Important!

During the configuration, the power supply of the modem must be assured by its AC plug from an external power source (from 100-240V AC or by the meter 57-100V AC).

Use the WM-E Term® configuration software to perform the settings according its user manual – check the manual for settings.

For the serial cable connection configure COM port settings of the connected computer according to the modem serial port properties. In the Windows® it can be found in the **Start** / **Control Panel** / **Device Manager** / **Ports** (**COM and LTP**) menu Properties:

- o *Baud: 9600*
- o *Databits: 8*
- o *Parity: No*
- o *Stopbits: 1*
- o *Bandwith control: no*

Warning!

If the COM port will not visible after connecting the device to the computer, and you cannot found the COM port number in the Windows Device Manager, then you need to install the proper driver - *FTDI VPC* – to your computer, which can be downloaded from here:

http://www.ftdichip.com/Drivers/VCP.htm

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 configured by using the WM-E Term® software through the RJ45 connection.

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

If you want to readout the meter parameter values during the PC-modem connection, after the RJ45-configuration you made, then you should select a different configuration port to the meter as TCP/IP or Optical, etc.

For newer modem firmware versions it is optional to use the **Communication password** for the modem configuration. Ask your sales about the default password of your modem type! You can check the written password by the Show option at right.

(Note that you can change the communication password of the modem anytime by choosing the

 icon from the menu.)

3.2 Configuring the modem by WM-E Term®

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

For modem configuration and testing you will need an APN/data package enabled, active SIM-card with.

Sure, the configuration is possible without a SIM card, but in this case the modem is performing restart periodically, and some modem features will be not available until the SIM card is inserted (e.g. remote access).

3.3 Configuring the modem by WM-E Term®

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

For modem configuration and testing you will need an APN/data package enabled, active SIM-card with.

Sure, the configuration is possible without a SIM card, but in this case the modem is performing restart periodically, and some modem features will be not available until the SIM card is inserted (e.g. remote access).
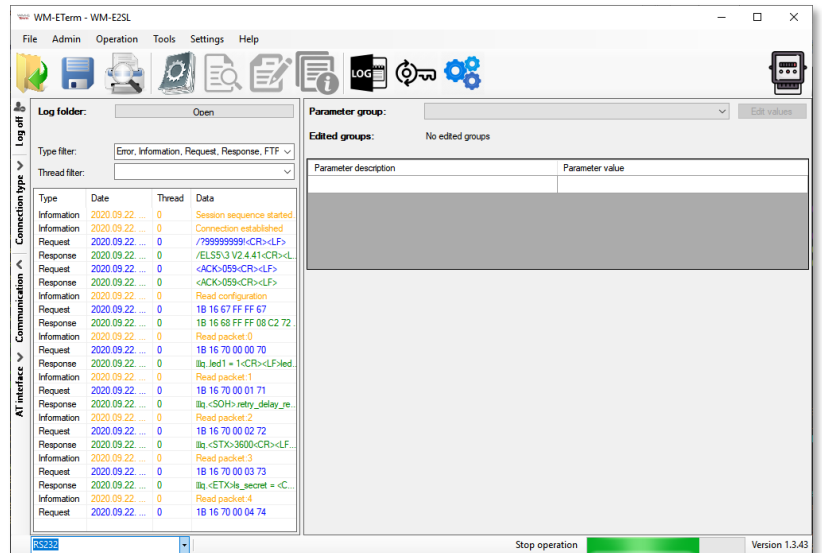
If the modem was not supplied by power for a long time, it needs to be charged before usage. It takes about ~2 minutes to charge if it the supercapacitor was exhausted / discharged. *See: LED signals part*

Download the WM-E Term® software by this link from your browser:
https://www.m2mserver.com/m2m-downloads/WM_ETerm_v1_3_80.zip

Unzip the .zip file and start the software by the **WM-ETerm.exe** file.

You can login into the configuration software by the default password. You can change the password for the configuration anytime you want. Check the **WM-E Term® User Manual** for more!

WM-E Term description:
https://www.m2mserver.com/m2m-downloads/WM-E-TERM_User_Manual_V1_94.pdf

3.3 Parameter configuration

The general operation requires to make the cellular communication settings and SIM settings of the modem (APN, APN username, password and PIN code, network usage method).

The meter communication requires to define the communication port, the RS232 settings (transparent mode, baudrate, data format, transmitting speed), LEDs settings and to save the settings by the WM-E Term® software then upload/send to the modem by the *User Manual* of the software.

Main settings:

1. Choose the **Parameter read** icon to connect to readout the current settings of the modem.

2. Choose the **APN** *Parameter group*, and push to the **Edit settings** button. Add the *APN server name* value, if necessary give the *APN username* and *APN password* values and push to the **OK** button.

3. Then choose the **M2M** *Parameter group,* and push to the **Edit settings** button. At the *Transparent (IEC) meter readout port,* give the *PORT number*, which you are attempted to readout the meter. Add this *PORT number* to the *Configuration and firmware download*, which you want to use for remote paraterization of the modem / for the further firmare exhange.

4. If you have to use *SIM PIN* then choose the **Mobil network** *Parameter group*, and add the *SIM PIN* to the field. Here you can change a *Frequency band* 4G only, LTE to 2G (for fallback feature), etc). You also can select here a dedicated mobile network provider (auto or manual). Then push to the **OK** button.

5. For configuring the RS232 serial port and transparent settings, open the **Trans. / NTA** parameter group. Basic device settings are the **Multi utility mode**: ***transparent mode***, **Meter port baud rate**: to the standard ***9600***), **Fixed 8N1** data format (by checking the box at the meter). Confirm the setting with the **OK** button.

6. Then open the **RS485 meter interface** *parameter group*, configure the **RS485 mode** to the ***Disable*** value. Then push the **OK** button.

7. When you have finished, choose the **Parameter write** icon to send the changed settings to the modem. The status of the configuration process can be seen at the bottom of the screen. At the end of the upload, the modem will be restarted and operating according to the new settings.

Further options

- To refine the modem handling choose a **Watchdog** *parameter group*.

- Save the current last good configuration at the File/Save menu item. Later you can distribute this setting (file) to another modem devices by one click.
- Firmware refresh: choose the **Devices** menu, **Single Firmware refresh** item by choosing the appropriate firmware file (with .DWL file extension).

Attention! Ask our sales about the available newest firmware!

3.4 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 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.) <u>Active mode - Use periodical ping, set the ping:</u>
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.) <u>Passive mode - If you don't use the ping - set the connection retry:</u>
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.*
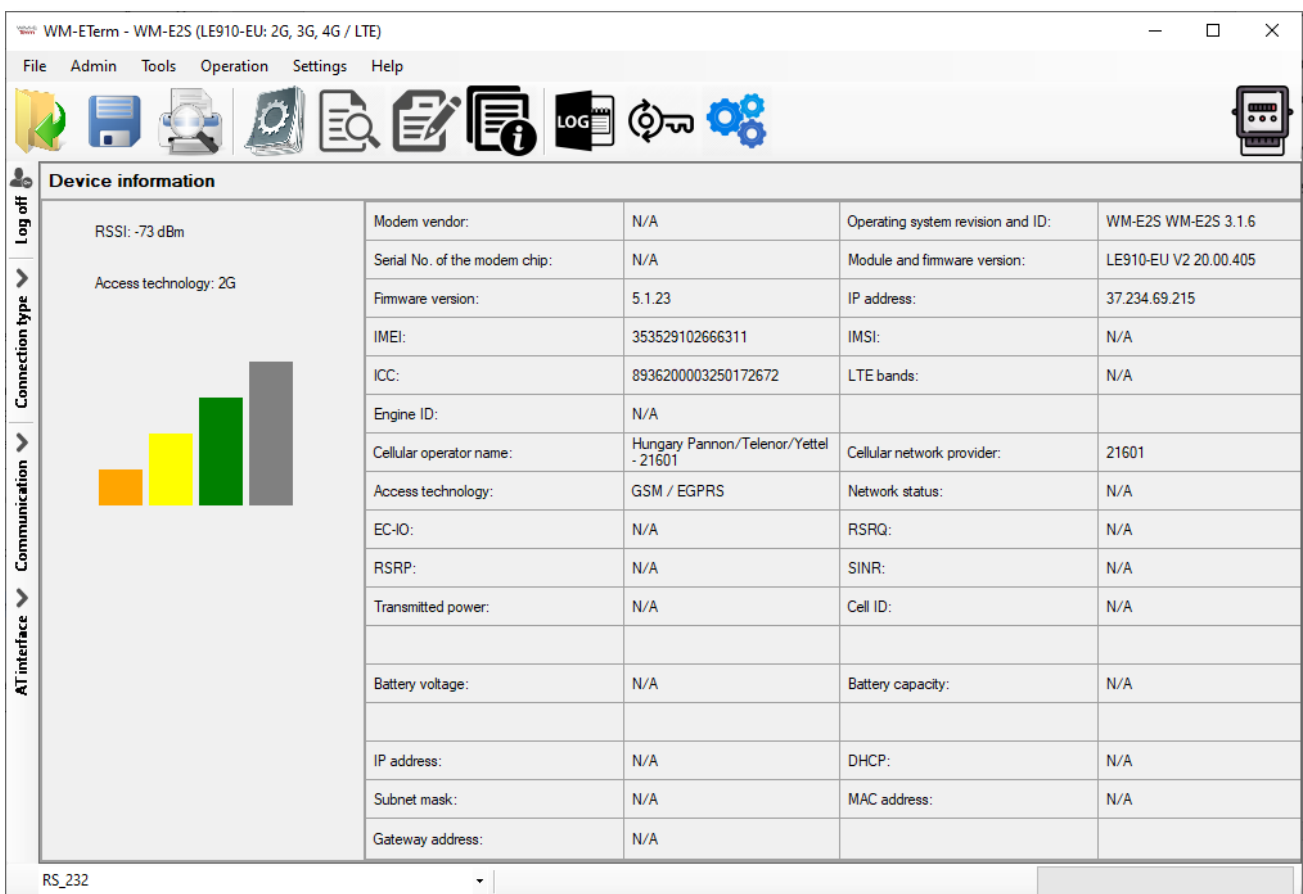
Therefore under no circumstances should you set this value lower than what your mobile service provider recommends. (e.g. there are mobile network providers that limit the number of times a modem can logon to the network in a given time).
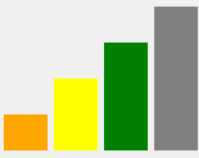
3.5 Signal strength

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).

WM-ETerm - WM-E2S (LE910-EU: 2G, 3G, 4G / LTE)

File   Admin   Tools   Operation   Settings   Help

Device information

RSSI: -73 dBm

Access technology: 2G

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		

Log off | Connection type | Communication | AT interface

RS_232

3.6 Power outage management

The firmware version of the modem is supporting the LastGASP feature, which 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.

3.7 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 read out 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. Afterall, 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 a 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://m2mserver.com/en/product/wm-e1s-modem-for-sl7000-meters/