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EGK-LW22PLG Operating Manual

Important safety information



Read this manual before attempting to install the device! Failure to observe recommendations included in this manual may be dangerous or cause a violation of the law. The manufacturer will not be held responsible for any loss or damage resulting from not following the instructions of this operating manual.

- Do not dismantle or modify in any way.
- The device is not intended to be used as a reference sensor, and Angel4Future Srl will not be held liable for any damage which may result from inaccurate readings.
- Avoid mechanical stress
- Do not use any detergent or alcohol to clean the device.
- The device can only be connected to sockets with protective earth contact.
- Risk of explosion if the battery is replaced with an incorrect type
- Risk of explosion if the battery pack is subjected to a short circuit
- Risk of explosion if the battery is burned or placed near high heat sources
- Risk of explosion if the battery is crushed, punctured or cut
- Do not expose the battery to contact with liquid substances.

Disposal information for users



Pursuant to and in accordance with Article 14 of the Directive 2012/19/EU of the European Parliament on waste electrical and electronic equipment (WEEE), and pursuant to and in accordance with Article 20 of the Directive 2013/56/EU of the European Parliament on batteries and accumulators and waste batteries.

The barred symbol of the rubbish bin shown on the equipment indicates that, at the end of its useful life, the product must be collected separately from other waste.

Please note that the lithium batteries must be removed from the equipment before it is given as waste and disposed separately. For additional information and how to carry out disposal, please contact the certified disposal service providers.

1. Description

The EGK-LW22PLG is a compact C-class LoRaWAN® meter that can monitor and switch a 230Vac-16Amp Load (active, reactive and apparent energy, Class 0.2s), equipped with a rechargeable battery for mains outage detection, with configurable default power-on status.



2. Overview

2.1 Technical data

- CPU ARM Cortex M4
- Class C LoRaWAN® 1.0.2 , EU868
- OTAA/ABP activation
- Metering and switch of a 230Vac - 16Amp Load (active, reactive and apparent energy, Class 0.2s)
- Configurable default power-on status
- Instantaneous reading of active, reactive and apparent power, voltage and current
- Power supply from line, 230 VAC, 50 Hz
- Bicolor led (green, blue), for output and LoRaWAN status
- Overload protection
- Rechargeable battery for powerline outage detection
- Embedded antenna
- Pushbutton for forcing transmission or Re-Join, ON/OFF (lockable),
- Time interval based or thresholds based uplink
- Transmission @ 868 MHZ, 14dBm max.
- BLE 5.0 interface for configuration, data reading and FW upgrade
- Remote configuration
- Storage temperature -10°C ÷ +70°C
- Working temperature -10°C ÷ +40°C ¹⁾
- Dimensions: 110x62x35mm
- Protection grade: IP20
- Weight: 140g

2.2 Installation

2.2.3 LoRa Tool

To deploy the sensor, download the latest **LoRa Tool** Android App to setup LoRaWAN® credentials and other preferences :



2.2.4 Connection

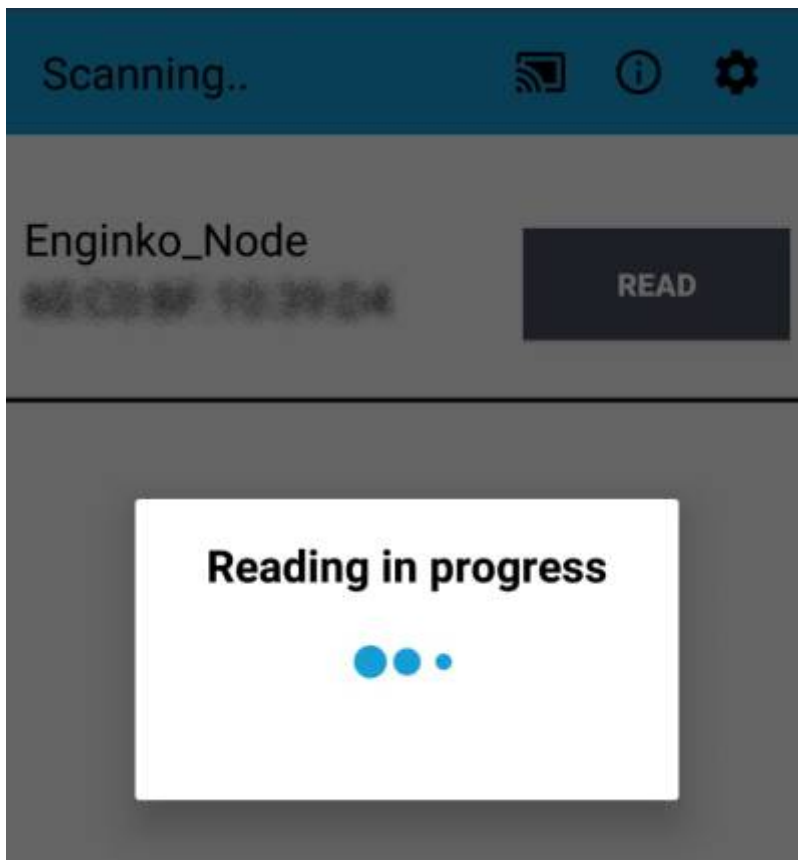
Enable the Bluetooth on the smartphone and open the App:



once the sensors list appears (as BLE MAC address), select the sensor you need to configure:




and read it:



2.4 System leds

The device has two leds, green and blue, behind the pushbutton.

During the LoRaWAN® operations they indicate the status of the communications, following this table:

LoRaWAN® not configured		Slow flashing
Joining		Quick flashing
Sending		Quick flashing
Receiving		Quick flashing
Steady state		Fixed (5s timeout)
Data error		Flashing 2 seconds (5s timeout)
Connection error		Flashing 1 second (5s timeout)

In case of LoRaWAN® disabled, or during the steady state, the blue led indicates the output status:



2.6 Push button

The function of the button changes depending on how long it is pressed:

≈ 0.5s	change output state
> 2s	force an uplink (all metering value)
> 5s	reboot the device

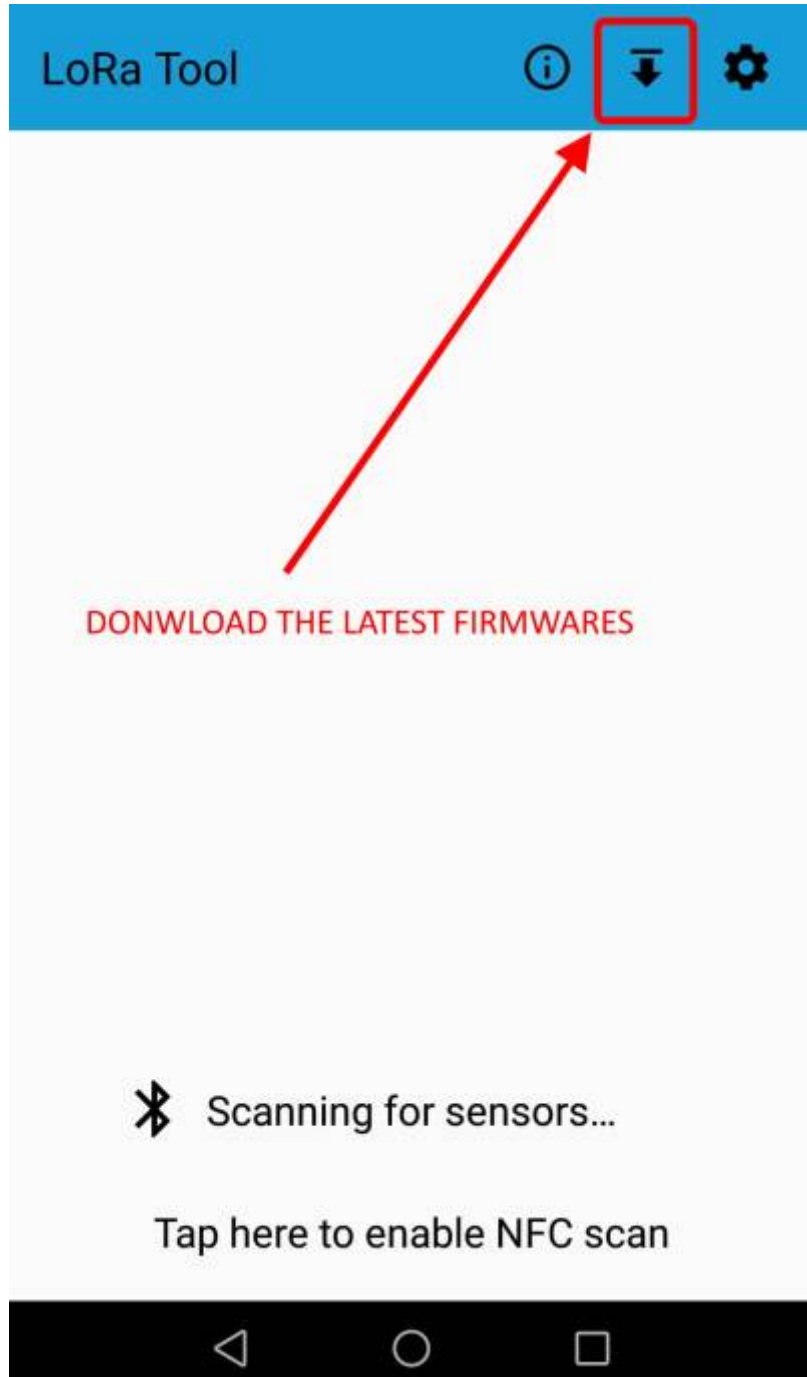
2.7 Battery

This sensor contains lithium battery, which must be disposed of separately.

Please note that the EGK-LW22PLG, at the first power-on, must be powered for at least 5 hours to ensure the full operation of the battery.

2.7 Firmware update

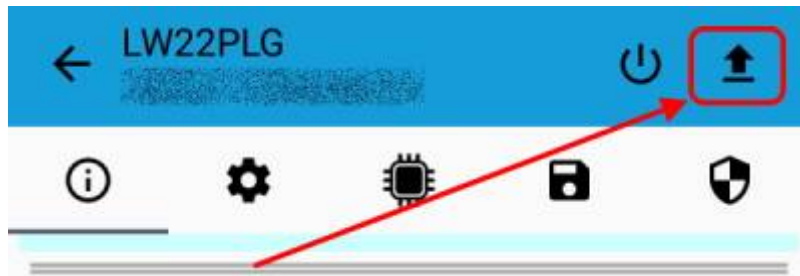
Download the latest firmwares available on the smartphone with LoRaTool app:







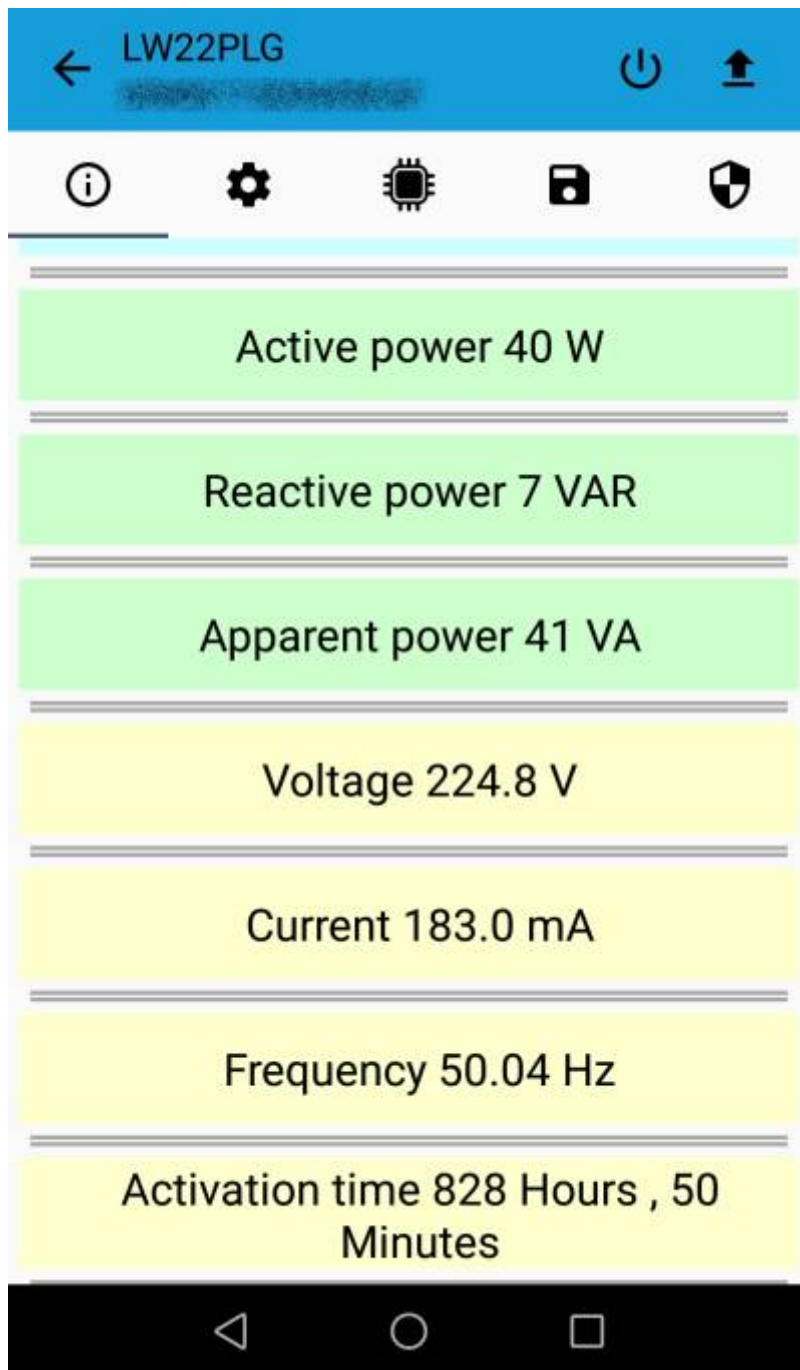
Update the sensor with LoRaTool:



3. Measures

On each reading of the sensor by LoRaTool, the measures are shown on the main page:





Once provisioned on a LoRaWAN® network, the device sends the measures to the server via uplink.

4 I/O

The input status represents the status of the mains (1 for mains present, 0 for mains not present).

As default, the device sends a message every time the power supply presence or the output changes.

A downlink with new output status forces the device to send back an uplink with the new status. If the output status is the same of current one, the sensor will not send back any message.

Downlink examples (hex):

turn ON the output:	0400 0100 0000 0000 0000
---------------------	--------------------------

turn off the output:	0400 0000 0000 0100 0000
receive the current status:	0400 0000 0000 0000 0000

Is possible to set a period (in minutes) to receive a recurrent periodic message with the I/O status.

4.1 Output

Contact mode	SPDT
Maximum switching voltage	230Vac~
Max. current	16A

The output has pulse capability (minimum pulse duration is 100ms, maximum around 100 minutes), so, instead to send two different commands (one to turn on and one to turn off the ouput), is possible to send a duration command.

As application example, to safely turn on an output, send a ON-pulse command for a defined time (for example, for the maximum allowed interval), and before the expiring time, another ON-pulse command (making a kind of watchdog) if the output still needs to be ON, or a simply OFF command if you want to turn it off.

4.1.1 Time schedule

It is possible to program the device with a weekly calendar, based on day of the week and time, to turn ON and OFF the output at a defined time:



The screenshot shows the 'Programming' section of a web interface. It features a navigation bar with 'DEVICES', 'UPLINK', 'DOWNLINK', and 'TIME SCHEDULE' (the active tab). Below the navigation, there are buttons for 'Add new action', 'View existing time schedule', and 'Save current schedule'. The main area contains a table for scheduling actions:

#	Label	Week							Feedback	Hours	Outputs									
		Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday			1	2	3	4	5	6	7	8		
1	Mon-Fri sign ON	🟡	🟢	🟢	🟢	🟢	🟢	🟡	Yes	08:00	🟢	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡
2	Sat-Sun sign ON	🟢	🟡	🟡	🟡	🟡	🟡	🟢	Yes	08:30	🟢	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡
3	Sat-Sun sign OFF	🟢	🟡	🟡	🟡	🟡	🟡	🟢	Yes	12:30	🔴	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡
4	Mon-Fri sign OFF	🟡	🟢	🟢	🟢	🟢	🟢	🟡	Yes	-20:00	🔴	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡

and generate and XLS file that can be downloaded by downlinks:

Label	Hour	Minute	Sun	Mon	Tue	Wed	Thu	Fri	Sat	MC	Payload
Mon-Fri sign ON	8	0	0	1	1	1	1	1	0	0	0400010000000000000000
Sat-Sun sign ON	8	30	1	0	0	0	0	0	1	0	0400010000000000000000
Sat-Sun sign OFF	12	30	1	0	0	0	0	0	1	0	0400000000000010000000
Mon-Fri sign OFF	20	0	0	1	1	1	1	1	0	0	0400000000000010000000

5 LoRaWAN network

The sensor is compliant with **LoRaWAN® specification 1.0.2, regional 1.0.2b, class C.**



5.1 Activation

The device supports the following activations on a LoRaWAN® network:

1. **NONE**: sensor not activated
2. **OTAA**: the JoinEUI and the AppKey not setted, must be written to the device;
3. **OTAA MCF88**: Over the air activation, fixed keys: JoinEUI = 904e915000000003, AppKey on request;
4. **OTAA ENGINKO**: Over the air activation, fixed keys: JoinEUI = 904e915000000003, AppKey on request;
5. **ABP**: requires writing to the device of NwkSkey, AppSkey, DevAddr.



The device exits factory activated with **OTAA ENGINKO** mode. On request devices can be shipped already activated.

Note: in **OTAA** AppKey is write only, in reading the field will always be empty, even if set.

Time sync

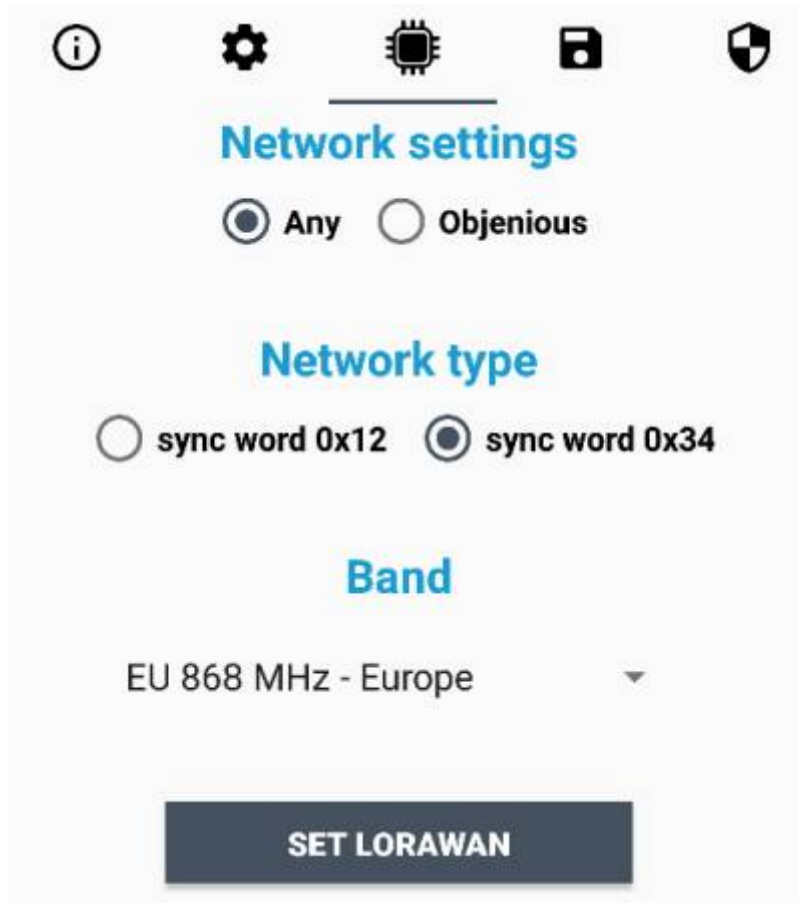


Normally sensor asks for a time sync at every power on (uplink starting with 01) or once a week. If no or wrong reply received it will retry after 1 hour.

If not handled in the right way can cause a unnecessary battery consumption (battery life < 2 years).

Please check chapter 2.1 [DATA FRAME FORMAT](#).

5.2 Other settings



Network settings:

please keep "Any" settings. Change it only if Objenious network is used (default: any).

Network type:

LoRa syncword can be setted as "private"(0x12) instead "public" (0x34), but the NS must be setted accordingly (default: public).

Band:

select the right LoRaWAN ® band settings accodingly to country requirements.

**DST:**

set to change DST (default: none).

No time sync:

set to disable time synchronization request (default: enabled).

UnConfirmed:

set for unconfirmed uplinks (default: confirmed uplink).

Led OFF:

set to disable the device status led (default: enabled).

Output Led OFF:

set to disable the output status led (default: enabled).

Single join/day:

set for to allow only one join per day (default: multiple join allowed).

RESET COUNTERS:

tap to reset the cumulative counters.

OUT:

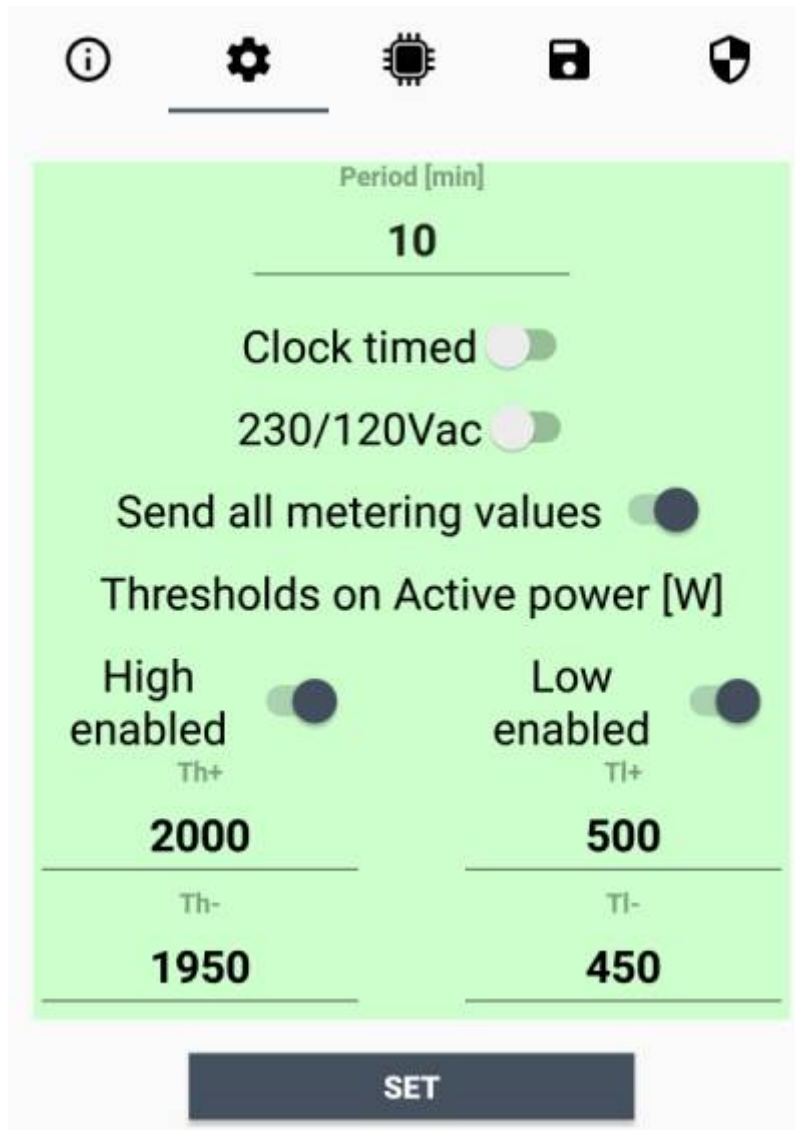
set to force a change of the output (default: ON).

OUT Init:

set the output status at power-on (default: ON).

I/O period [min]:

set the I/O periodic message (default: 0 - only on event).



Period:

time interval between two measures (in minutes).

Clock timed:

set to sincronize the reading with the internal clock (default: off).

230/120Vac:

set is line voltage is 120Vac (default: 230Vac).

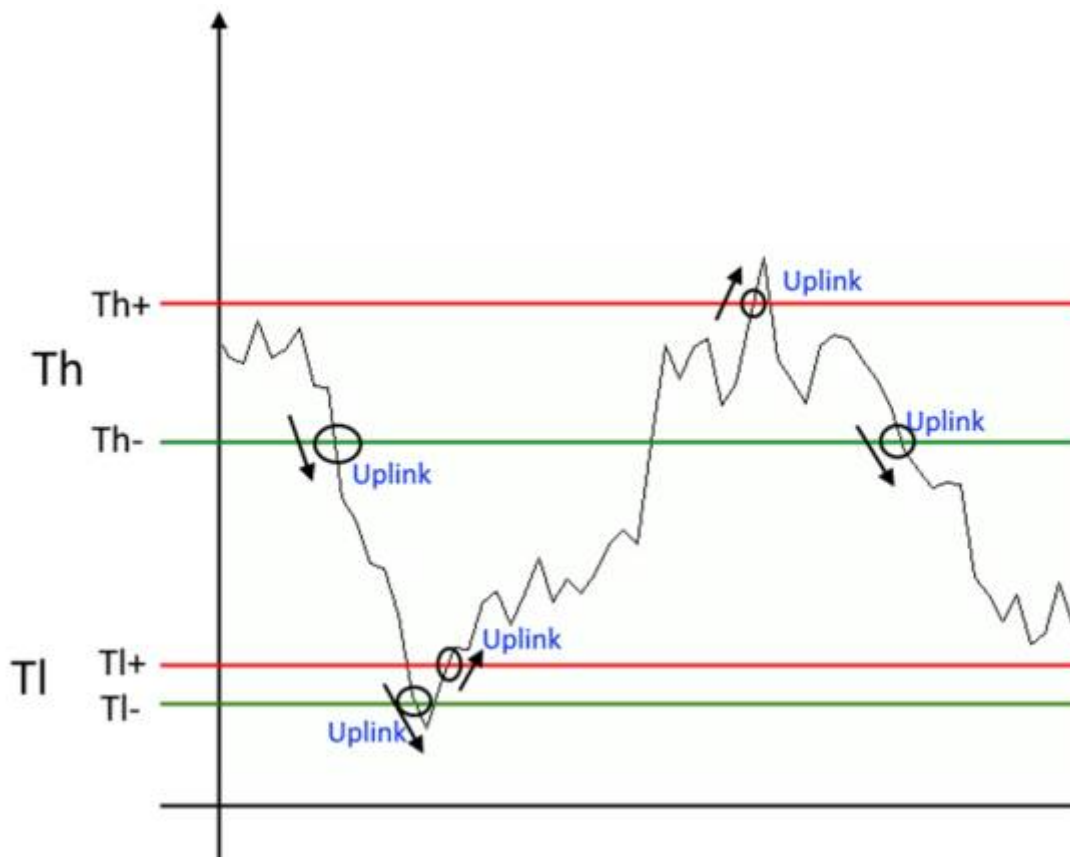
Send all metering value:

set to send cumulative and istantaneous values (default = off).

5.2.1 Thresholds

Is possible to set 4 thresholds for the active power:

- Th+ = Threshold High Rising
- Th- = Threshold High Falling
- TI+ = Threshold Low Rising
- TI- = Threshold Low Falling



When target values are rising and exceed the positive thresholds, the device sends an uplink with the the latest measure.

When values are falling below the negative thresholds, the device sends a new uplink with the latest measure.

Thresholds can be enabled, disabled and changed via LoRaTool or with downlinks.

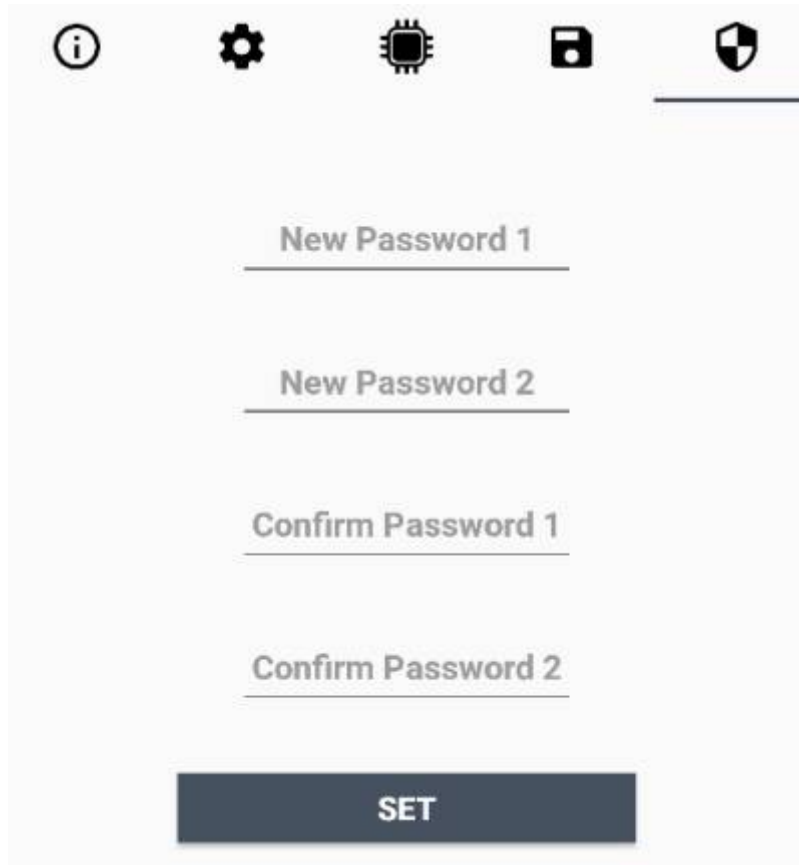
6 Passwords

The device can be protected by passwords, to avoid unauthorized persons to read data or modify parameters.

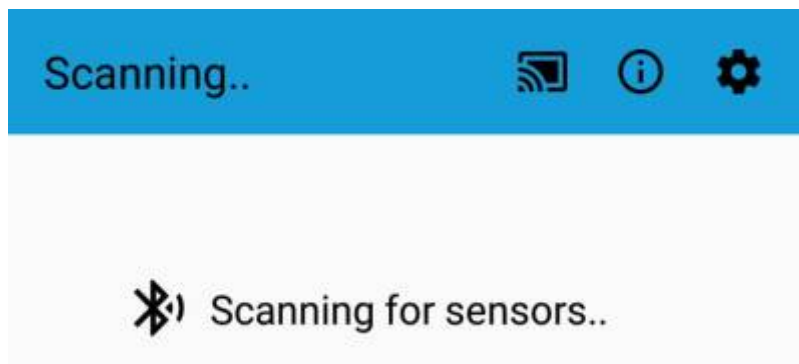
As default passwords are equal to 0.

Allowed values range from 0 to 999999999 (only numbers).

To change the passwords, set the new values with the LoRa Tool App:



Once the passwords are setted, to gain access from LoRa Tool to the sensor, open the App:



and set the right values before reading from the device:



To bring back the sensor to factory default and reset the passwords, a reset code must be requested to Angel4Future (please provide the DevEUI of the sensor when you ask for that code).

7 Configuration file

With LoRa Tool App is possible to configure the device using an XML file, instead to manually adjust the parameters (for details about the file format please ask to Angel4Future). This is very useful especially in case of multiple devices configuration.

With “Save” button an XML file with the actual configuration of the sensor will be generated. This is useful to store or clone the configuration, or to send it to Angel4Future's support if needed.



7.1 Multi devices configuration

With LoRa Tool App is possible to configure many devices in an easy way.

For multi-configuration is needed at least one XML file with the parameters to set.

Settings on this file will be applied to all the sensors.

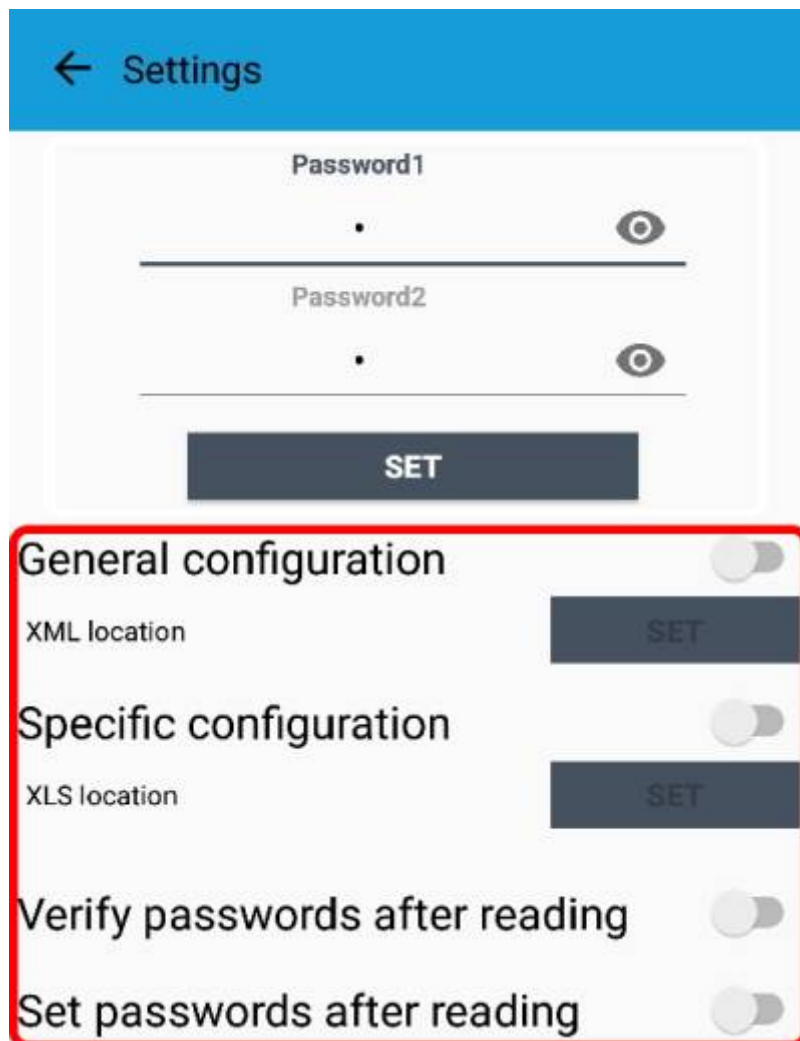
With an additional XLS file is possible to load different LoRa configuration parameters (Activation Type, AppKey, AppEUI, NetKey, DevAddress, Band, Private option) for each sensor, based on DevEUI.

When the sensor is approached, if one parameter is different from files, the APP will ask you if you want to overwrite.

XLS is prevailing on the XML, so if both files are enabled, if the DevEUI of the device matches one of the DevEUIs in the XLS file, LoRa parameters will be setted from this one.

These configuration can be done in the in the Settings:

- Enable or disable the use of the general configuration by file;
- Enable or disable the use of the specific configuration by file;
- Verify the passwords;
- Writing the passwords.



For details on files format please ask to Angel4Future.

8 LoRaWEB Tool

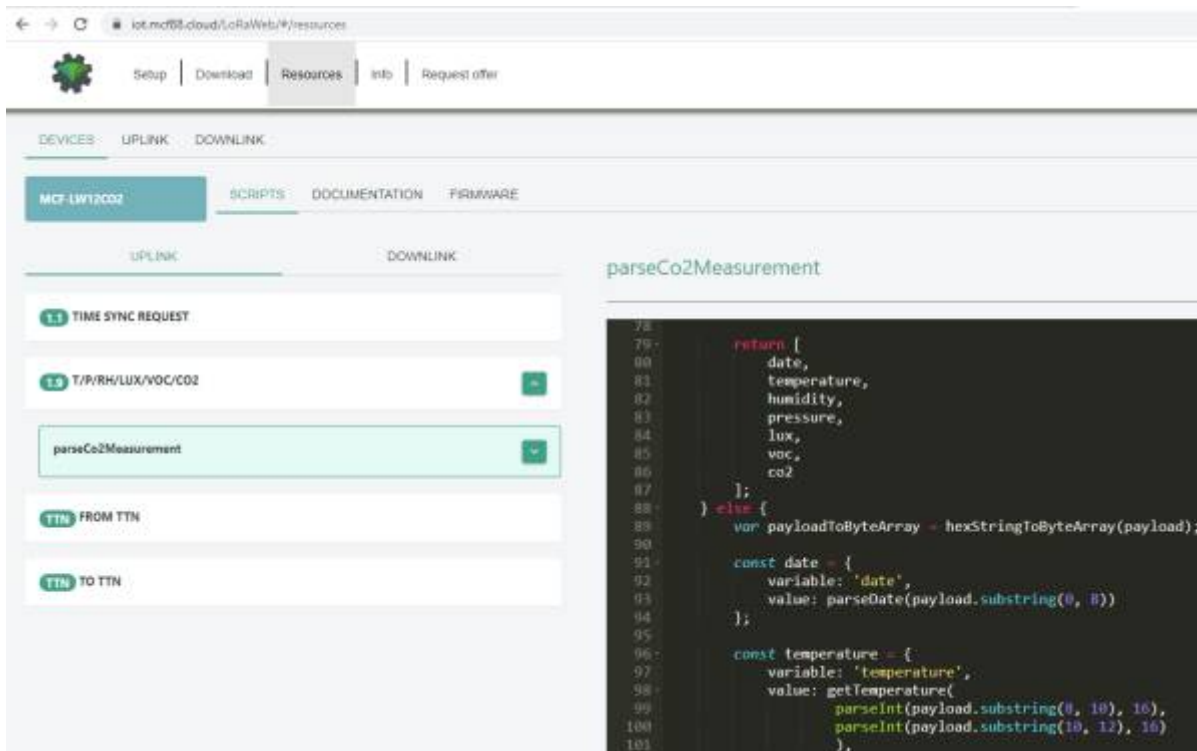
Angel4Future provides free **LoRaWEB** online tool, where for each sensor it is possible to find documentation, javascript examples for parsing, downlink generator and uplink decoder:

[LoRaWEB Tool](http://iot.mcf88.cloud/LoRaWeb) (iot.mcf88.cloud/LoRaWeb)

Registration page:

[Login](http://iot.mcf88.cloud/LoRaWeb/#/login) (iot.mcf88.cloud/LoRaWeb/#/login)





9 Payload

For payload descriptions, uplinks and downlinks format and available commands please refer to this document:

[DATA FRAME FORMAT](#)

10 Ordering code

Ordering Code	Description
EGK-LW22PLG	LoRaWAN® energy meter plug with ON/OFF
EGK-LW22PLG01	LoRaWAN® energy meter plug with ON/OFF UK version

11 Declaration of conformity

Declarations of conformity are available from Angel4Future by sending a request email to sensors@enginko.com.

12 Contacts

Angel4Future S.r.l.

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E : info@angel4future.com

W: enginko.com

Document rev. 2

1)

Working temperature $-10^{\circ}\text{C} \div +50^{\circ}\text{C}$ limited to a 12A current max

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