THINGSLOG

User Manual

Low power mobile data logger

ThingsLog LPMDL-110X

v.4.9.6

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Contents

1 Overview

ThingsLog LPMDL-110X is a series of universal, low power mobile data loggers able to gather input from various kinds of pulse meters and analog sensors. The loggers series supports transmitting the metered data over 2/4G, 2G/CatM1/NB-IoT, and LoRa/LoRaWAN.

LPMDL-110X has the following key characteristics:

Power supply - LPMDL-110X is able to operate in low power mode (on battery), with a solar power supply, or with a 12V power supply.

Intelligence - the data is transmitted over a widely distributed, cellular network and is automatically gathered in the ThingsLog platform.

Pulse metering - **LPMDL-110X** has the ability for an independent counting of pulse output meters for water, gas, electricity, and heating. With a single data logger, you can meter two meters for example for cold and hot water, or if your meters are in proximity distance you can meter with a single device gas, electricity, and heating.

Analog sensors metering - LPMDL-110X has 4 inputs for connecting analog sensors with 4-20 mA output. An example could be connecting two pressure sensors or one pressure and one temperature sensor.

Combined monitoring - LPMDL-110X can fulfill use cases where a single logger has to be monitored by one water meter and two pressure sensors. For example monitoring of pressure reduction areas by measurements of pressure sensors before and after the pressure reduction valve and its water meter.

Alarms and notifications - LPMDL-110X together with the ThingsLog platform is able to monitor consumption and notify the customer or the utility company for leaks, high or low consumption, fraud, or thresholds bridging of certain sensor values or a combination of a sensor and metered value.

Application - LPMDL-110X fulfills various use cases in Water, Electricity, and Gas distribution utilities but also many other use cases in property management, hotel, manufacturing, condominium sub-metering, or in common need is spread.

Ability to work in any environment - **LPMDL-110X** has IP68 dust and leakage protection and is suitable for any kind of home or industrial usage.

2 Technical specification

Technical parameter	Value
Length	132.3 mm / 5.2 in 155 mm / 6.1 in
Height	52 mm / 2.04 in
Width	70 mm / 2.75 in
Weight	130 grams
Temperature range:	-40 - +60 °C
Dust & Water protection	IP68
Power supply options:	• Battery powered: Requires 1x3.6V Li-SOCl2 battery with 20F supercapacitor, with current leakage less than 10uA, check 4.1) • 12V power supply Requires additional power supply module, check 4.2. • Solar PV panel Requires additional inverter module and liIon 18650 battery, check 4.3)
Power supply options for external sensors:	• Directly powered from the logger power supply, requires low power sensor with and consumption less than 10uA (check 5.1) • Control-switched powered from the logger power supply, requires sensors with current consumption less than 20 mA (check 5.2) • Sensors that require power supply > 3.6V, requires additional step-up convertor,

	applicable only for battery power supply(check 5.3)

Table I Technical specification

3 Nomenclature

The name of the logger is formed as follows:

LPMDL-110X-EE-YYYY-ZZZZ-AA-RR-SSS

X – Modem

1 - GSM only (depricated)
2 - NB-IoT only (depricated)
3 - LoRa EU (depricated)
4 – GSM/4G
5- LoRa (30-EU, 31 - NA, 32 AU/AS)
6 - CatM1/NB-IoT/GSM

EE - Power supply

B0 - 3.6V LiS02 battery
B1 - Customer provided 3.6V LiS02 battery
E0 - 12V external power supply
S0 - Solar PV panel
S1 - Solar PV with customer provided 18650 battery

YYYY – Pulse input

2R0S - 2 reed switch (dry contact) pulse inputs
0R2S - 2 S0 (open collector) pulse inputs
1R1S - 1 reed switch (dry contact) pulse input and 1 S0 (open collector) pulse input

ZZZZ – Analog input

4V0C - 4 voltage (0-3V)
0V4C - 4 current (4-20mA)
2V2C - 2 voltage, 2 current
1V3C - 1 voltage, 3 current
3V1C - 3 voltage, 1 current
0000 - no analog inputs

AA - Alarm inputs
00 - No alarm inputs
11 - 2 Alarm inputs

RR - Relay outputs
00 - No relay outputs
11 - 2 relay outputs

SSS – Sensor power supply
LNS - Sensor is powered by logger power supply (Sensor should be low power);
LAS - Sensor is powered by logger power supply only for configurable settling time, this option is not compatible with E0 power supply option;
S12 - Sensor is powered with 12V power supply generated by the logger (configurable settling time), this option is not compatible with E0 power supply option;
000 - Sensor is not power by the logger;

4 Communication technical characteristics

4.1 2/4G

Table 2 2G transmission characteristics

Technical parameter	Value
Supported bands	LTE: B1,B3,B7,B8, B20 GSM: B3/B8
GNSS	GPS/GLONASS/Galileo/BDS/SBAS/QZSS
Physical data transmission layer	GSM/LTE

4.2 2G/NB-IoT/CatM1

Table 3 NB-IoT transmission characteristics

Technical parameter	Value
Supported bands	Cat M1: B1/B2/B3/B4/B5/B8/ B12/B13/B18/B19/ B20/B25/B26/B27/ B28/B66/B85 NB-IoT: B1/ 2/ 3/ 4/ 5/ 8/ 12/ 13/ 18/ 19/ 20/ 25/ 28/ 66/ 71/ 85 GPRS: 850/900/ 1800/1900 MHz
GNSS	GPS/GLONASS/BDS/ Galileo/QZSS

Physical data transmission layer	CatM1, CatNB2, GSM

4.3 LoRa/LoRaWAN

Table 4 LoRa/LoRaWAN transmission characteristics

Technical parameter	**Value**
Supported bands	868MHz, 915MHz, 928MHz
Maximum transmission power	+22 dBm
Sensitivity	-137 dBm
Physical transmission layer	LoRa
MAC transmission layer:	LoRaWAN

5 Power supply options

5.1 Battery powered device (LPMDL-110X-B0/B1)

Requires 1x3.6V Li-SOCl2 battery with 20F super capacitor, with current leakage less than 10uA. The capacitor should be connected in parallel to the battery.

The battery should be connected to the board on the board socket marked with a red rectangle in the picture below. The polarity of the connection is denoted with + and - signs on the board.

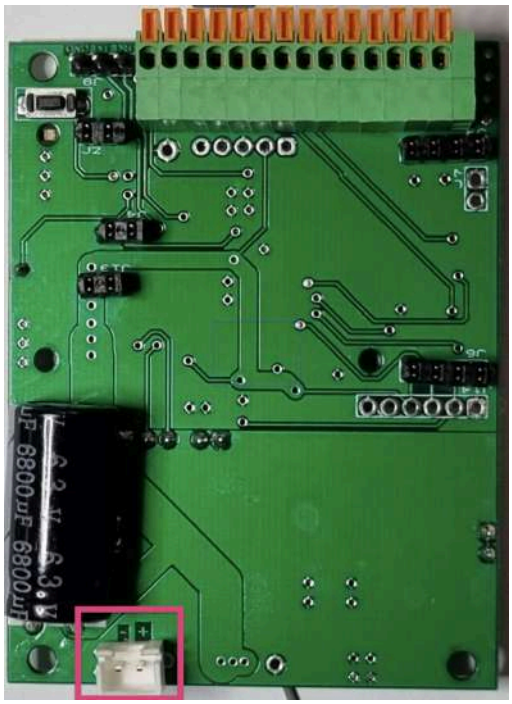


Figure 1. Base-board power supply connector for battery

NOTE: if you connect the supercapacitor parallel to the battery, you need to make sure that the battery is charged to a voltage that is near the voltage of the battery. Otherwise, the supercapacitor can drain significant current from the battery, which can damage the battery or even cause fire.

5.2 12V power supply (LPMDL-110X-E0)

Requires additional power supply module. The module is marked on the picture with a red rectangle. Note that when you use 12V Power supply you should not connect a battery to the connection terminal described in the previous section.

When the module is attached the power supply should be connected: pin 1 - to the positive terminal of the power supply; pin 2 - to the negative terminal of the power supply.

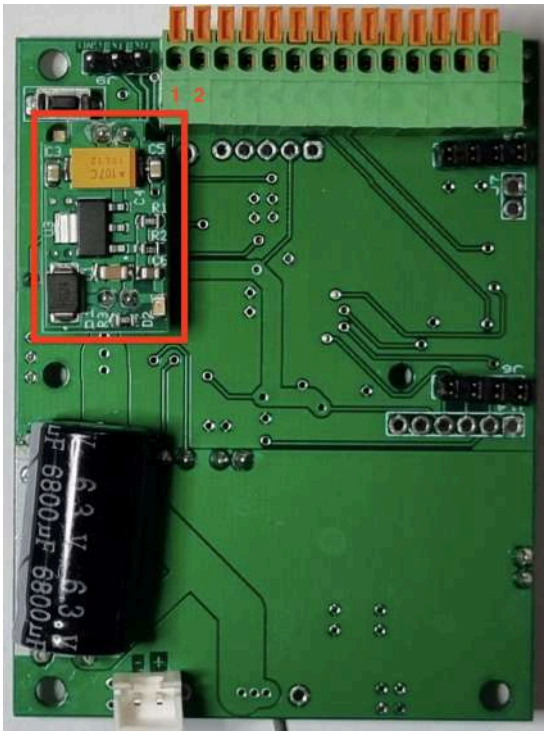


Figure 2. The 12 V power supply option requires an additional module marked with a red rectangle. The module is essentially an LDO that converts the external power supply of 12 V to 3.6 V, which is the working voltage of the DataLogger. Input 1 must be connected to the positive terminal of the power supply. Input 2 must be connected to the negative terminal of the power supply.

5.3 Solar PV panel (LPMDL-110X-S0/S1)

Requires additional inverter module and liIon 18650 battery.

The inverter module should be connected as it is marked with a red rectangle in Figure 3.

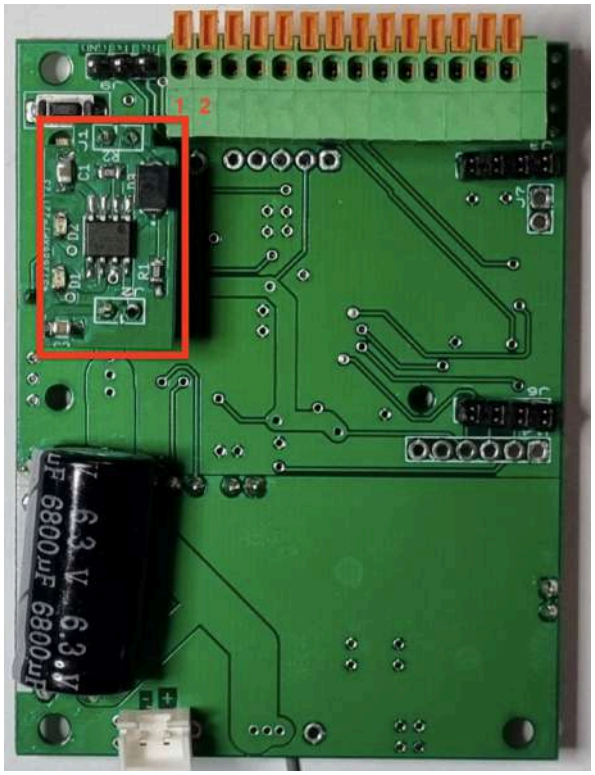


Figure 3. PV inverter module marked with a red rectangle is essentially a low-power inverter module that provides 3.6 V voltage to the data logger at the same time it manages the solar power and the charging and discharging of the battery. Input 1 must be connected to the positive terminal of the power supply. Input 2 must be connected to the negative terminal of the power supply.

6 Powering external sensors options

6.1 Directly powered from the logger power supply

This option requires a low-power sensor with and consumption of less than 10uA. The lifetime of the battery strongly depends on the current consumption of the sensors and should be taken into account for the calculations. For more information about the power consumption of the data logger consult with section 6.

6.2 Control-switched powered from the logger power supply

This option is applicable only to the battery power supply. It requires sensors with a current consumption of less than 20 mA. This option also required an analog switch module marked with a red rectangle in the figure below.

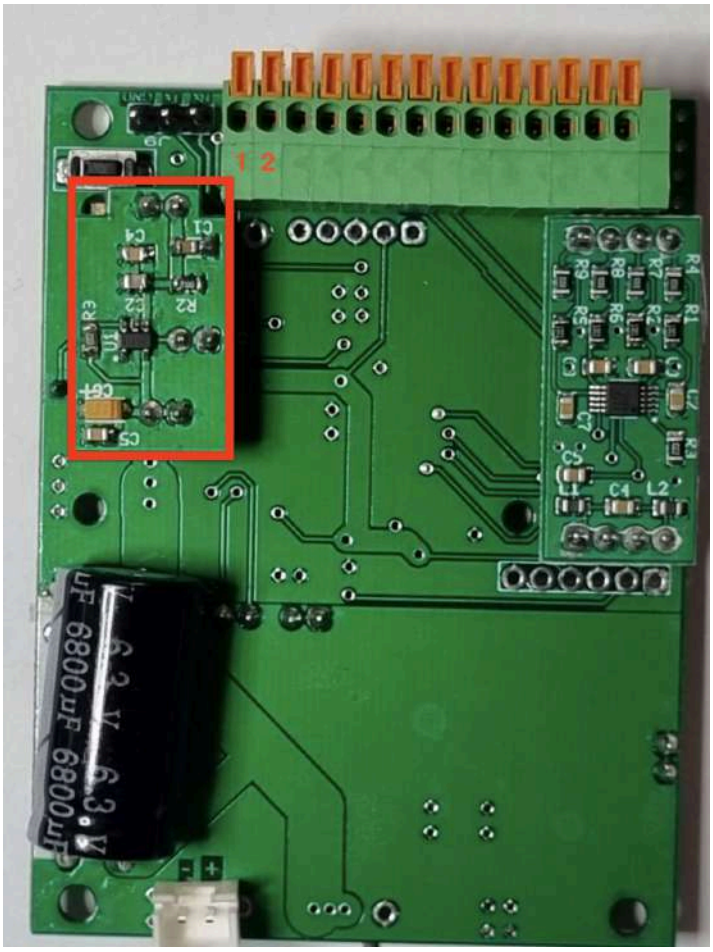


Figure 4. Analog Switch module used to power external sensors with consumption less than 20 mA.

The switch is controlled by the data logger. It is turned on for the adc_read time parameter configured in the service mode of the logger. For more information see the CLI User Guide. Input 1 must be connected to the positive terminal of the power supply. Input 2 must be connected to the negative terminal of the power supply.

6.3 Sensors that require a power supply > 3.6V, require an additional step-up converter

This option is applicable only for battery power supply. It requires sensors with a current consumption of less than 20 mA. This option also required a step-up converter module marked with a red rectangle in the figure below. The step-up converter converts the voltage of the battery from 3.6 to 12 V, with the same switching mechanism described in the previous section for the control-switched sensor supply.

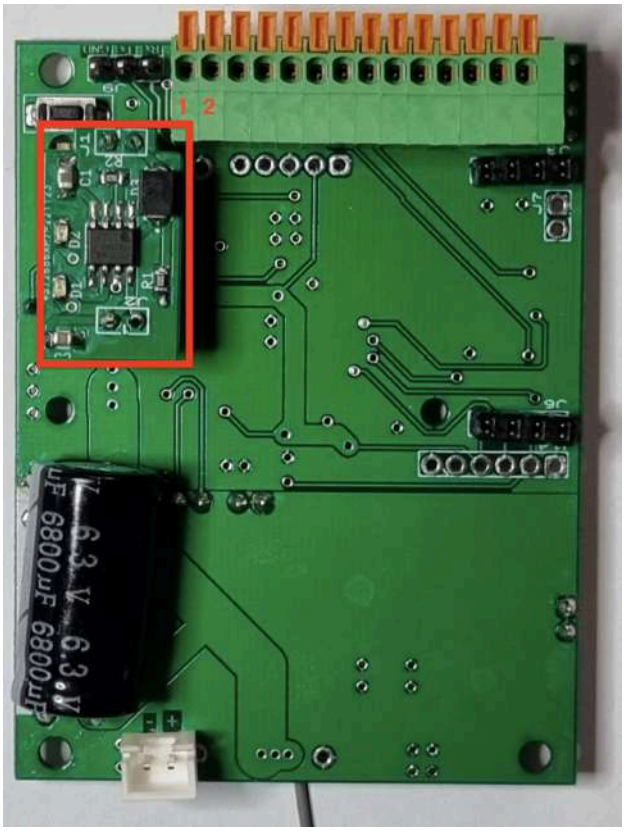


Figure 5. Powering external sensors requires a 3.6 to 12 V power supply.

Input 1 must be connected to the positive terminal of the power supply. Input 2 must be connected to the negative terminal of the power supply.

7 Battery Lifetime calculation

The LPMDL-110x has the following modes of operation:

7.1 Sleep mode

During this mode the Data Logger consumes continuously less than 6.5 uA current.

However if one attaches sensors to the battery of the logger the sensor current should be taken into account for the calculation of the battery lifetime.

7.2 Reading mode

If the data logger reads pulses from a dry contact then in this mode it consumes 50 uA if the contact is on. The pulses are counted even if the logger is in sleep mode.

If the data logger reads pulses from S0 contact then in this mode it consumes 500 uA if the contact is on. Note that usually, S0 is on for a short period of time - usually 50 ms. The pulses are counted even if the logger is in sleep mode.

7.3 Wakeup mode

On a predefined period the data logger wakes up and saves the values from the low-power asynchronous counters into its RAM memory.

If the logger is configured to read analog values, then it turns on the external sensor's power supply and waits adc_read time in order for the sensor to be settled. During this time one has to consider the power consumption of the battery when the sensor is on.

7.4 Transmission mode

In this mode the logger transmits readings stored in its internal memory to the ThingsLog platform.

The power consumption depends on the network technology, network coverage, and signal level.

For the average signal level, the power consumption is 0.33 mAh per transmission for 4G network.

8 Functional specification

- **Pulse metering:** the logger supports pulses generated by reed contacts, halll sensors or S0 pulse outputs of water, gas, and electricity meters
- **Analog sensor metering:** The logger supports analog sensors with output from 4 to 20 mA or 0-3V
- **Digital sensor metering:** i2c and 1-wire
- **Data transmission:** LPMDL-110X supports 2/4G, CAT-M1, NB-IoT and LoRaWAN
- **Low powered:** Preinstalled interchangeable long-life battery able to support more than 5000 transmissions of millions of individual counter values
- **Average battery life:** 5 years
- **Antenna: Internal or optional external SMA**
- **Secured configuration**
- **Certified for both industrial and home usage**

9 Safe and Healthy instructions

Important information	Please read the complete information, the specifications, the installation instruction and the electrical interconnect schema prior to working with this product.

	For your own health and safety and for the equipment to function correctly please ensure that you understand completely the contents of this guide, prior to installation, configuration, operations, or prophylactics.
CE	From a license point of view, unauthorized modifications or additions are not authorized.
Terms of use	The data logger is intended for use in the following environmental conditions: ● for use indoors or outdoors without prolonged exposure to direct UV radiation ● for altitudes up to 2000 m ● for ambient temperatures from -40 ° C to + 60 ° C, with continuous exposure to temperatures of -20 to -40 ° C not recommended ● for relative humidity of 4% to 100% ● for supply voltage deviation of up to + 20% and -15% of declared voltage ● for use under the overvoltage category I; ● for environment with pollution degree 3 (PD3).
Health and safety rules for installation	All installation work has to be performed in accordance with the local regulations on health and safety at work in electrical systems as well as the regulations governing the electrical system and networks. Only engineers or technicians with product expertise that has previously read and understood this guide should install this product.
Installation and maintenance	Installation is done in accordance with the instructions in this document. Incorrect installation may cause damage to the logger and inaccurate measurements. That is why the installation, and the initial configuration must be done with due attention. Incorrect installation results in violation of warranty conditions and failure of the warranty. An example of improper installation is to connect the pulse or analog input of the device shortly or to a power source. If you need to connect the logger to equipment in an ATEX zone 0, 1,2 please do so outside the zone and through an external IC circuit barrier.
Transport and storage	Store in dry rooms without access to water or other liquids at temperatures not lower than -20 ° C and not higher than 60 ° C in the original package. Transportation is allowed to happen accidentally at temperatures below -20 ° C

	but not more than 8 hours. Protect against shocks and avoid extreme conditions.
Subsequent maintenance	Once installed, the data logger should be cleaned using a dry or lightly moistened cloth, explicitly prohibiting the use of aggressive and abrasive detergents. Every six months, it is desirable for the user of the logger to check the enclosure integrity and the integrity and waterproofness of the cable and connecting terminals to the measured device or sensor.
Recycling	When recycling the product and its disposal, local and national legislation and regulations must be observed. If you hesitate, please return the appliance, we will recycle it for you.

Table II Health and safety instructions

10 Physical installation

Figure 6 LPMDL-110X Logger outlook

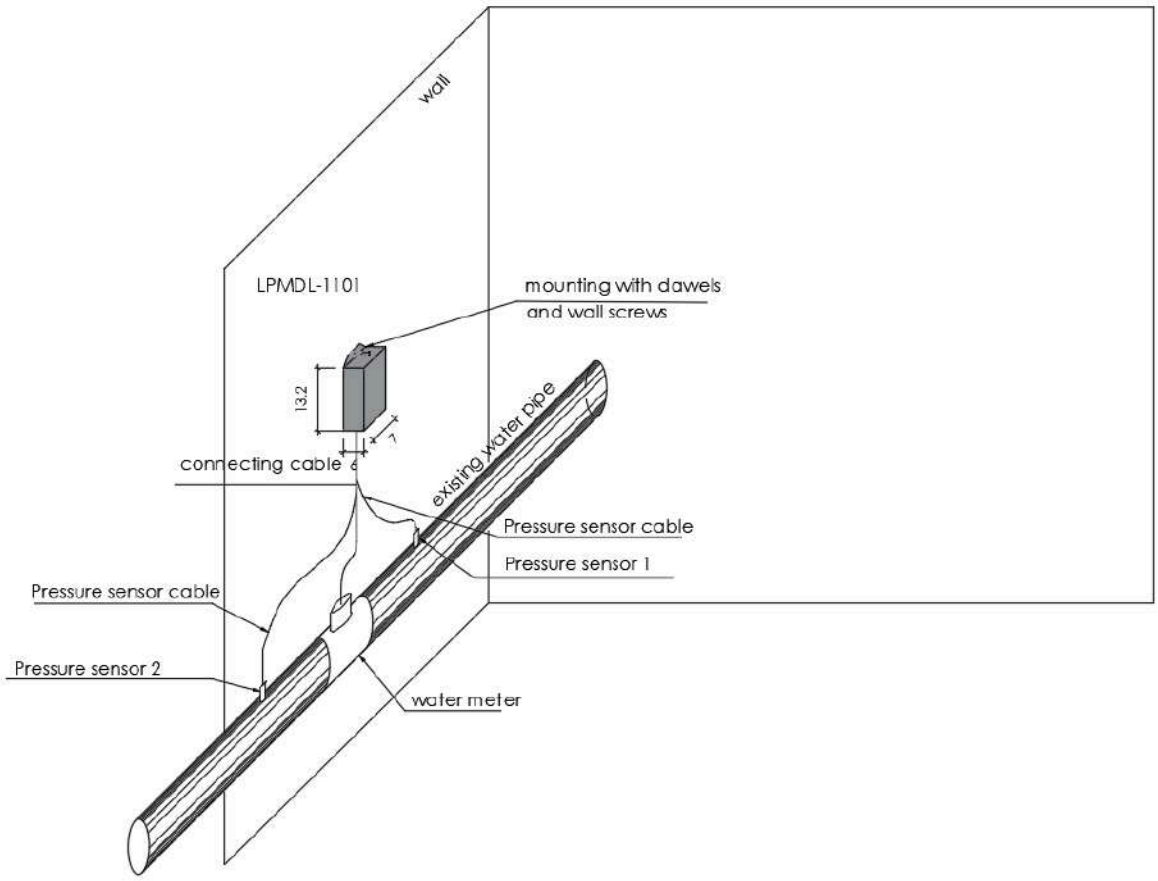


Figure 7 Example installation schema for interconnecting LPMDL-110X-B0 with a water meter and 2 pressure sensors

- Prior to installing the logger please review the health and safety instructions described in Chapter 4.
- The data logger comes with an installation manual and an optional attachment kit
- In order to attach the logger you will need a wall with stiff, flat surface close to the meter or the sensor that you would like to measure.
- Mark and drill holes with size 4x25 mm for attaching the logger to the wall.
- Attach the logger input/outputs to the connecting cable.
- Attach the corresponding connecting cable input/outputs to the meters/sensors.

11 Input/output ports

LPMDL-110X has 14 input/output ports.

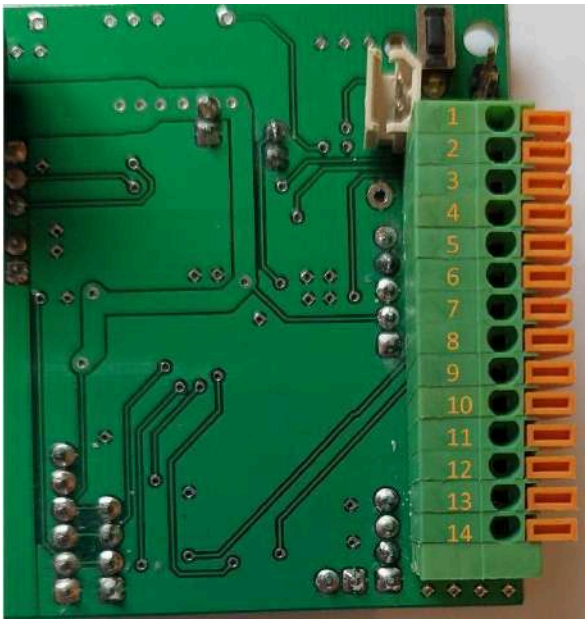


Figure 8 Logger input/output ports

1) Power supply:
   a) output for external sensors - for models: LPMDL-110X-EE-YYYY-ZZZZ-AA-RR-S12/LAS/LNS.
      (1) S12 is 12V power supply. It is switched by the logger for a short period of time (settling time parameter) configured in the logger, during the measurements.
      (2) LAS is 3.6V or 4.5V depending on the logger battery. It is switched by the logger for a short period of time, during the measurements.
      (3) LNS is 3.6V or 4.5V depending on the logger battery. I am not switched by the logger so the sensors should be low power.
   b) input from external source – for models: LPMDL-110X-EE-YYYY-ZZZZ-LLLL--AA-RR-L1/L0-000
      (1) The external power supply can be in the range from 5-12V.
   c) not connected – for models: LPMDL-110X-EE-YYYY-ZZZZ-LLLL--AA-RR-00-000
2) Ground
3) ON/OFF alarm input 1. The alarm on the transition from OFF (opened circuit - the pin is not grounded) to ON (closed circuit - the pin is grounded)
4) ON/OFF alarm input 2. The alarm on the transition from OFF (opened circuit - the pin is not grounded) to ON (closed circuit - the pin is grounded)
5) Ground
6) Pulse input 2
   a) can be dry contact (reed contact) – for models: LPMDL-110X-EE-2R0S-ZZZZ-LLLL-AA-RR-SSS
   b) S0 (open collector) – for models LPMDL-110X-EE-0R2S/1R1S-ZZZZ-LLLL-AA-RR-SSS
7) Pulse input 1
   a) can be dry contact (reed contact) – for models: LPMDL-110X-EE-2R0S/1R1S-ZZZZ-LLLL-AA-RR-SSS
   b) S0 (open collector) – for models: LPMDL-110X-EE-0R2S-ZZZZ-LLLL-AA-RR-SSS
8) Ground
9) ON/OFF output 1 (open collector)

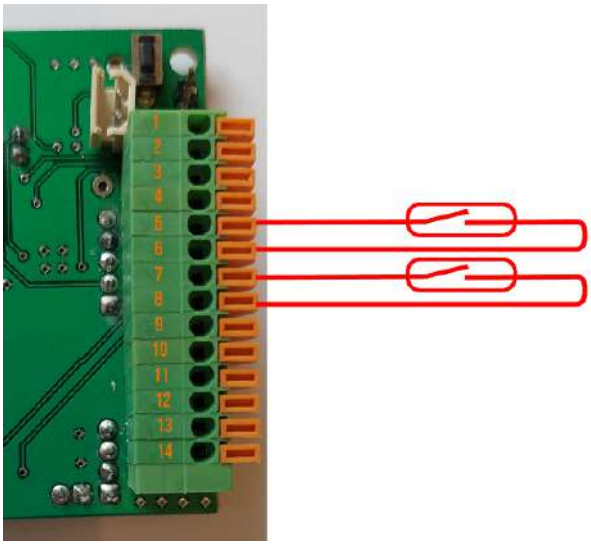
10) ON/OFF output 2 (open collector)
11) Analog input 4
    a) 4-20 mA - for models: LPMDL-110X-EE-YYYY-0V4C/1V3C/2V2C/3V1C-LLLL-AA-RR-SSS
    b) 0-3 V - for models: LPMDL-110X-EE-YYYY-4V0C-LLLL-AA-RR-SSS
    c) Not connected – for models: LPMDL-110X-EE-YYYY-0000-LLLL-AA-RR--SSS
12) Analog input 3
    a) 4-20 mA - for models: LPMDL-110X-EE-YYYY-0V4C/1V3C/2V2C-LLLL-AA-RR-SSS
    b) 0-3 V - for models: LPMDL-110X-EE-YYYY-4V0C/3V1C-LLLL-AA-RR-SSS
    c) Not connected – for models: LPMDL-110X-EE-YYYY-0000-LLLL-AA-RR-SSS
13) Analog input 2
    a) 4-20 mA - for models: LPMDL-110X-EE-YYYY-0V4C/1V3C-LLLL-AA-RR-SSS
    b) 0-3 V - for models: LPMDL-110X-EE-YYYY-4V0C/3V1C/2V2C-LLLL-AA-RR-SSS
    c) Not connected – for models: LPMDL-110X-EE-YYYY-0000-LLLL-AA-RR-SSS
14) Analog input 1
    a) 4-20 mA - for models: LPMDL-110X-EE-YYYY-0V4C-LLLL-AA-RR-SSS
    b) 0-3 V - for models: LPMDL-110X-EE-YYYY-4V0C/3V1C/2V2C/1V3C-LLLL-AA-RR-SSS
    c) Not connected – for models: LPMDL-110X-EE-YYYY-0000-LLLL-AA-RR-SSS

11.1 Example connection circuits

1. Connect 2 reed pulse inputs

    a. You need the following logger models: LPMDL-110X-EE-2R0S-0000-LLLL-AA-RR-SSS

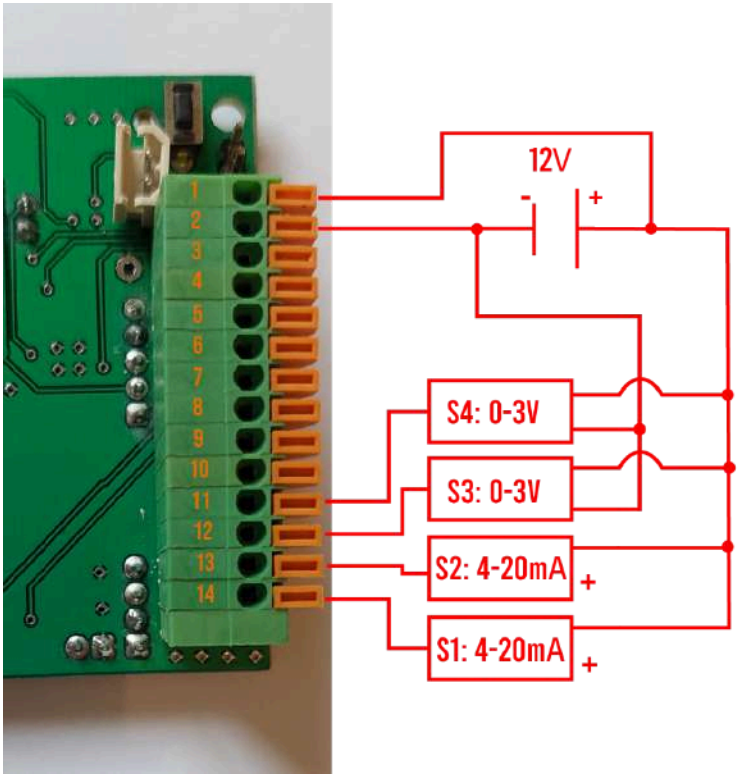
    b. Circuit



2. Connect 2 analog 4-20 mA and 2 analog 0-3V inputs. The analog sensors 4-20 mA are powered by an external power supply (non-low power case). The logger is powered by an external power supply.

    a. You need the following logger models: LPMDL-110X-EE-YYYY-2V2C-LLLL-AA-RR-000

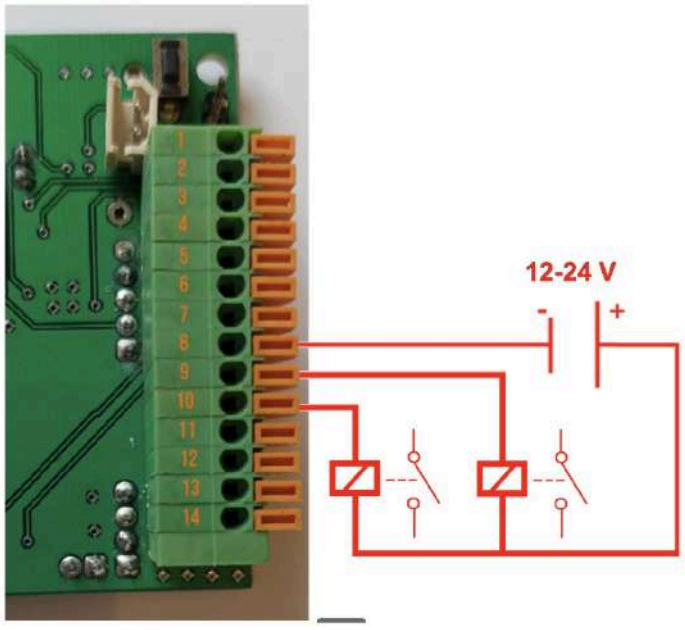
    b. Circuit



3. 2 ON/OFF relay outputs

   You need the following logger models: LPMDL-110X-EE-YYYY-4V0C-LLLL-AA-11--LAS

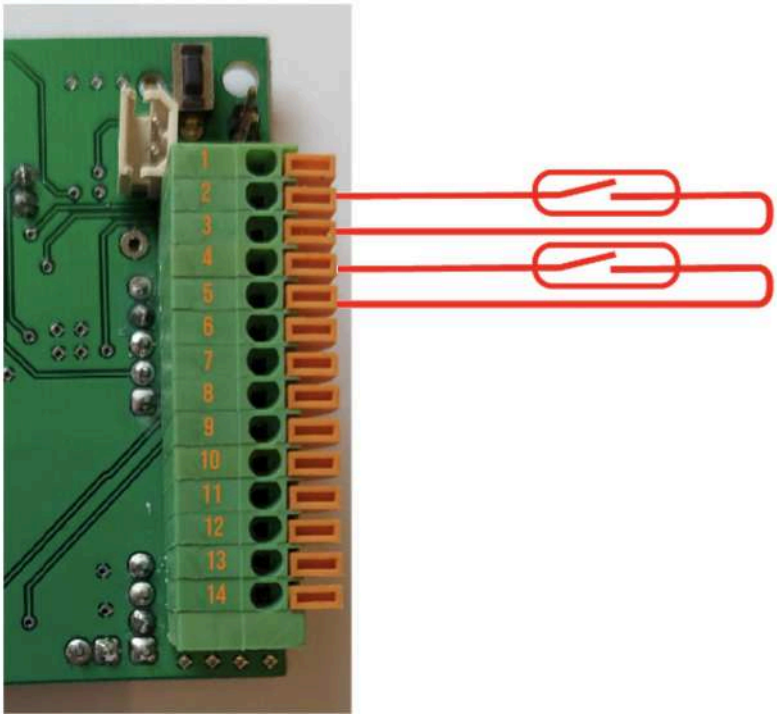
   Circuit



12 2 ON/OFF alarm inputs

You need the following logger models: LPMDL-110X-EE-YYYY-4V0C-LLLL-11-RR--LAS

Circuit



13 User guide

13.1 Login to ThingsLog platform

1. In order to perform the initial configuration you should have an account for the ThingsLog IoT platform. If you don't have an account please contact us at support@thingslog.com.

2. Once you have the account navigate to https://iot.thingslog.com

3. You should be able to see a device list with the devices associated to your profile.

13.2 Initial configuration ThingsLog LPMDL-110X

1. Connect your logger to your meters and sensors as described in the section on physical installation.

2. Navigate to the menu “All Devices” - and pick your newly added logger.

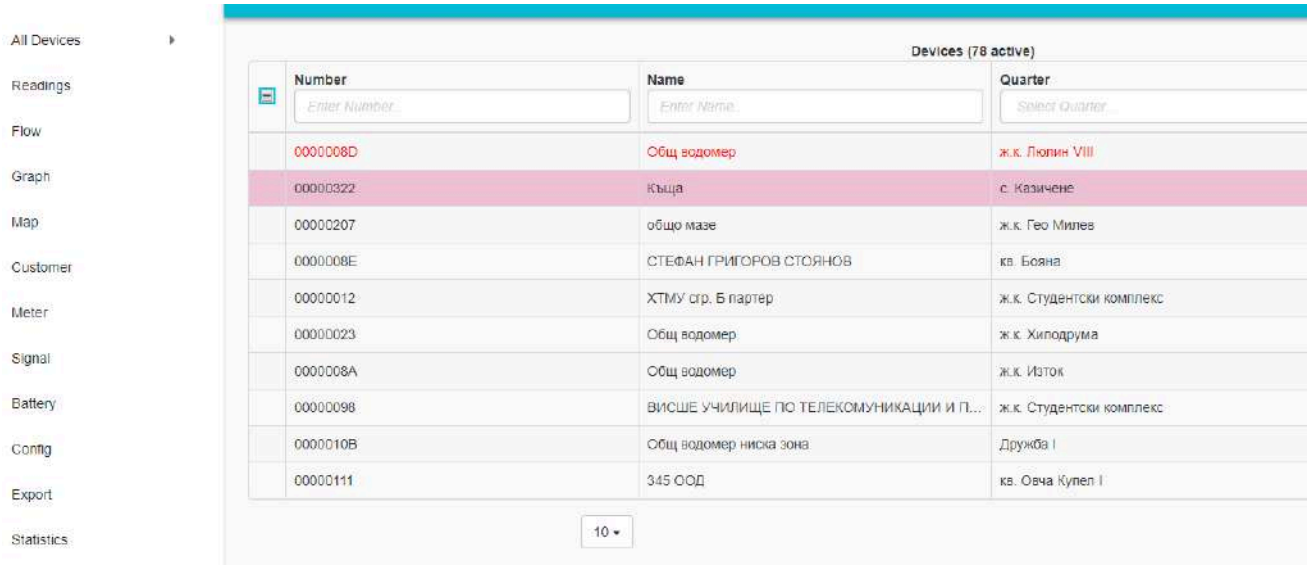


Figure 9 Menu “Devices”

3. From the menu choose “Config” and then a similar configuration dialog will appear.

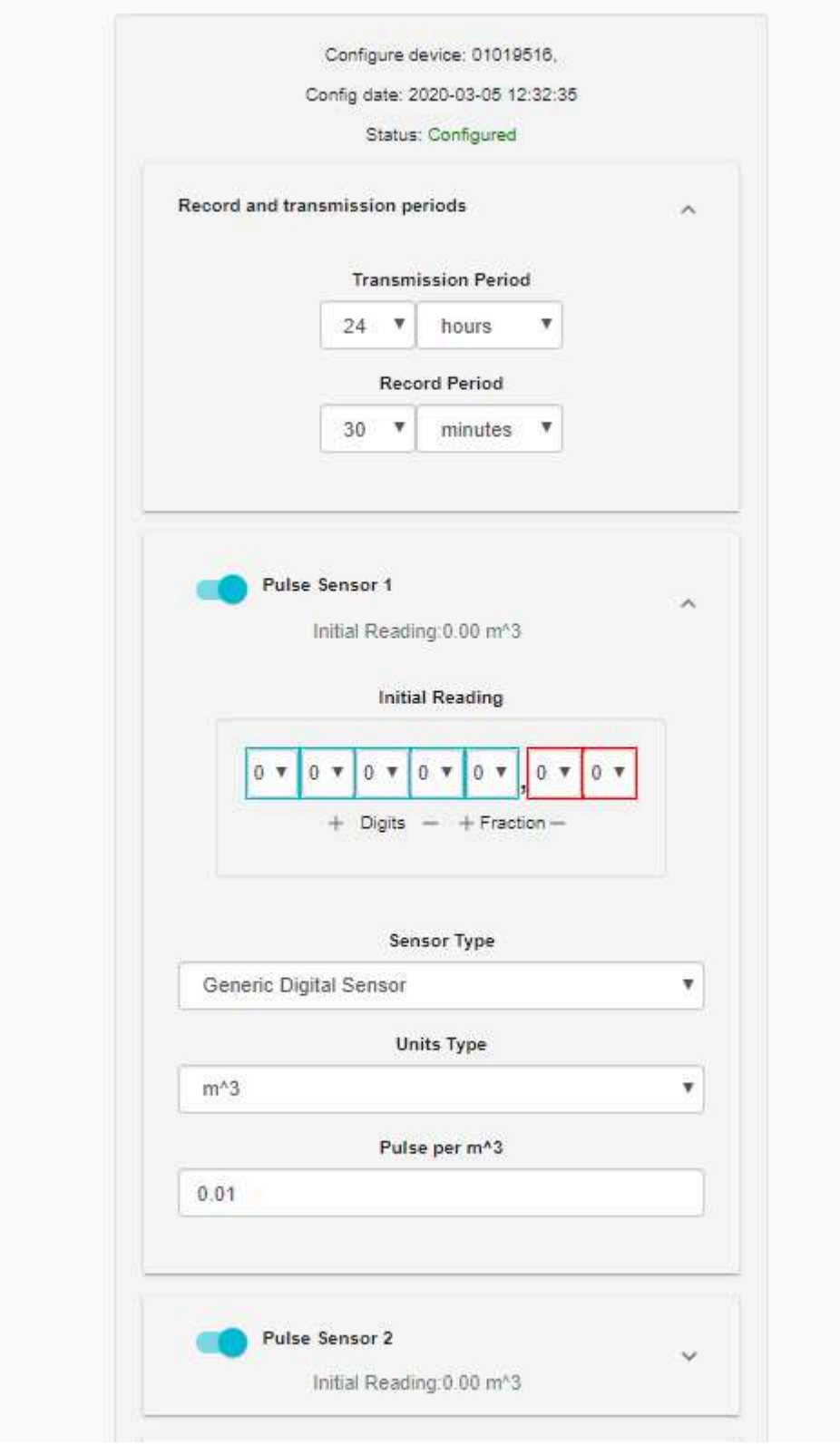


Figure 10 Configuration dialog

On the top you can see the logger id, date when it was configured for the last time and current configuration status.

Then follows the common section for all inputs/outputs.

- *Transmission period* - Number of minutes/hours/days between the logger scheduled transmissions

- *Record period* - Could be Minutes or Hours. This is the period on which the logger will log in memory the reading values from the pulse inputs or the period on which it will perform low power reading of its analog current inputs.

4. Pulse sensors

Pulse sensors are typically meters connected to a pulse input port or buttons. To enable the port please slide the slider to the right and enter. Once the port is enabled you have to set the following.

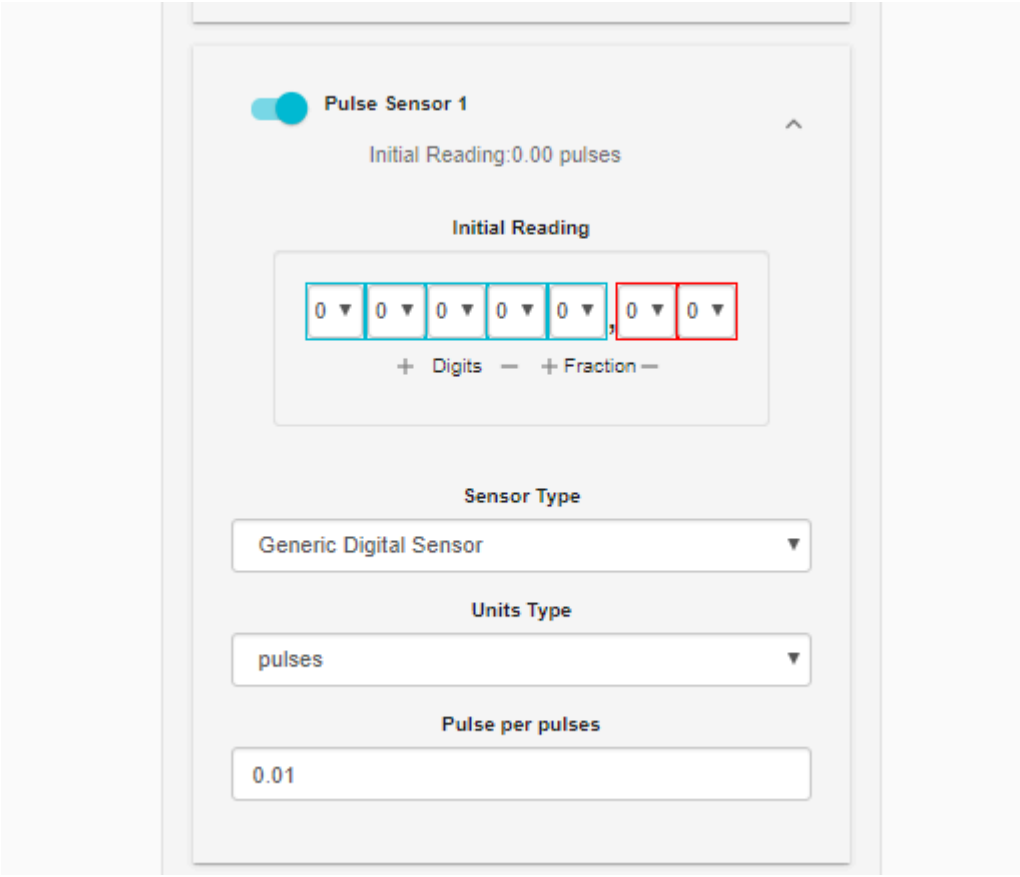


Figure 11 Pulse input port configuration dialog

- *Digits* - Number of digits - equals to the number of digits on the display of the meter

- *Fraction* - Number of digits after the decimal pointer on the display of the meter

- *Initial reading* - Initial value of the counter of the meter
- *Sensor type* – the type of the sensor could be water, gas, power, etc meter.
- *Units type* – the dimension of the metered values – m3, kw, etc.
- *Pulse per unit* – how much of the measured value is equal to one pulse

5. Analog sensors

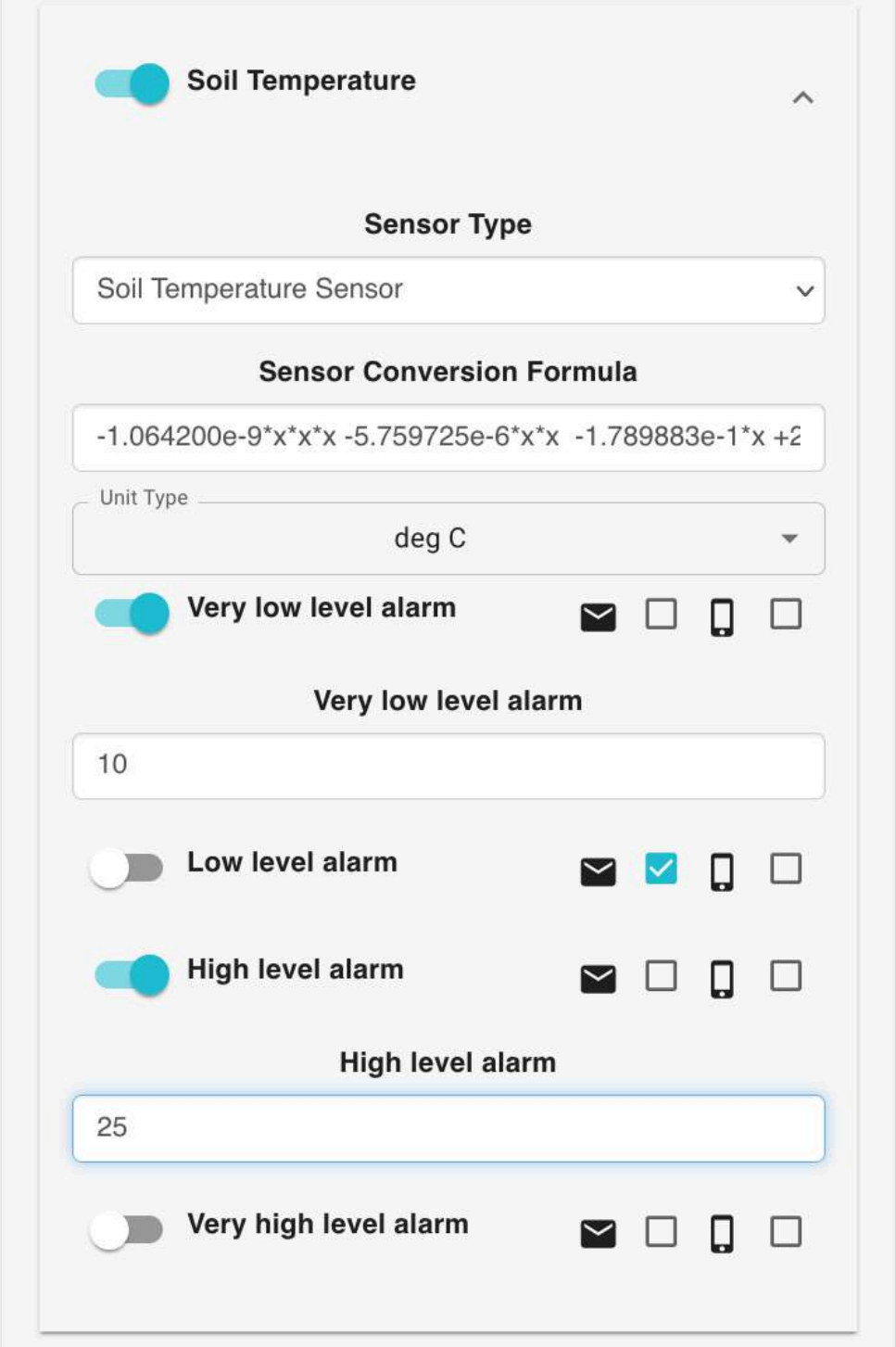


Figure 12 Analog input port configuration dialog

To enable analog sensor readings (connected to the analog inputs) just slide the slider to the right and configure:

- Sensor type – the type of analog sensor we are measuring

- Sensor conversion formula – convert the “x” into bars or something else based on the formula for conversation of mA to the required dimension of your sensor. If you leave it as x you will get values in mA.
- Units type – the type of the unit – mA, bar, etc.
- Low-Level Alarm – Instant alarm for reaching a certain low-level analog sensor value
- Very-Low-Level-Alarm - instant alarm for reaching a certain low-level analog sensor value lower than the low-level-alarm
- High-Level Alarm - Instant alarm for reaching a certain high-level analog sensor value
- Very-High-Level-Alarm - instant alarm for reaching a certain high-level analog sensor value lower than the low-level-alarm

6. ON/OFF alarm sensors

Figure 12 ON/OFF alarm input port configuration dialog

To enable the ON/OFF alarm sensors slide the slider to the right. The sensors have to be normally open ON/OFF sensors. If the port is enabled and the sensor goes from OFF to ON the logger will wake and will transmit an instant alarm.

7. ON/OFF relay sensors

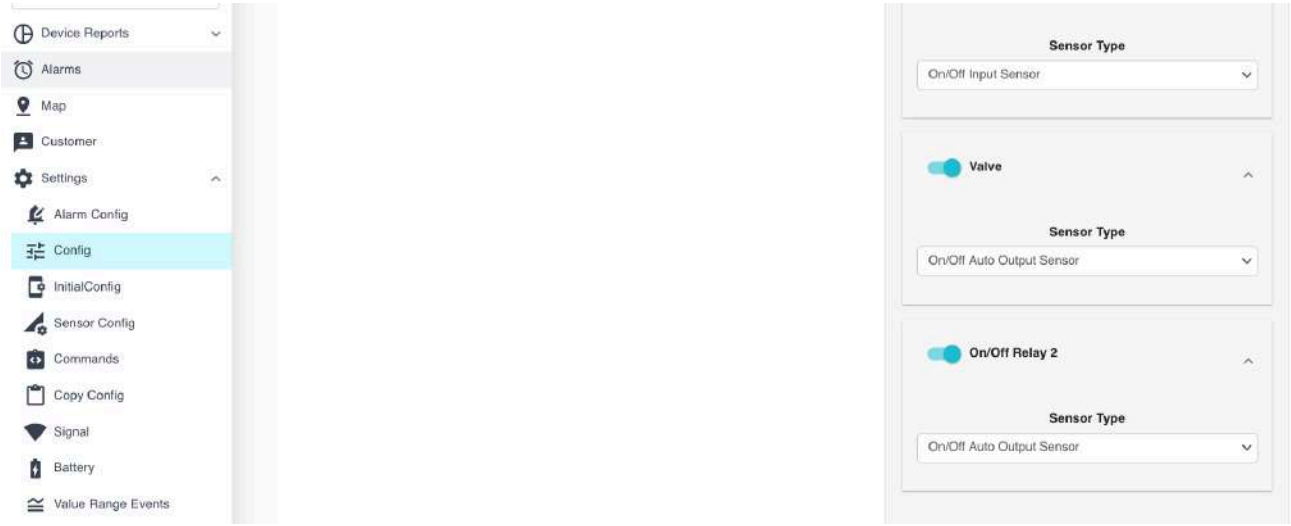


Figure 13 ON/OFF relay output port configuration dialog

To enable the ON/OFF relay sensors slide the slider to the right. The sensors have to be normally open ON/OFF sensors. If the port is enabled and the device gets an ON/OFF relay command it will trigger the port.

8. *Delete old counters* - once you are ready with the inputs configuration decide do you want to keep the old values or not. If not choose "NO" else choose "YES".

9. Once you are ready press the "**Start Setup**" button.

This will start a 1000-second counter. You will have to touch the logger with a magnet prior to the counter expiry. This will put the logger into configuration mode and it will try to obtain its configuration from the server.

10. If the logger gets configured successfully you will be able to see the following message on your screen.

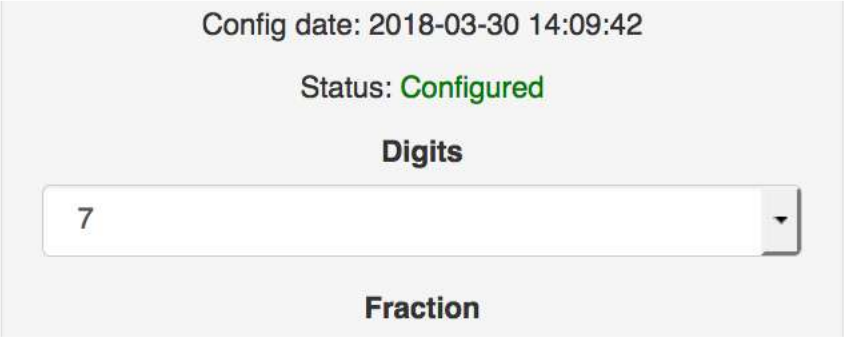


Figure 13 Confirmation of successful configuration

If the configuration process is unsuccessful and the device stays in “Not configured” mode please ensure that the device has been placed in an area with proper GSM coverage. If you are not sure that such is available in your area please let us know at support@thingslog.com.

13.3 Reconfiguration over the air

Once the logger has been initially configured with the magnet a user with company administrator privileges could attempt to reconfigure the logger over the air.

Reconfiguration over the air allows the user to change:

- Record period
- Transmission period
- Enable/disable ports
- Set high/low-level alarms
- Change K factors (pulse per m3)
- Set on/off alarms

What could be changed but loggers will ignore the changes is:

- Initial readings for pulse input ports.

If you need to change those you have to be physically close to the meter and the logger and attempt normal configuration with a magnet.

To reconfigure the logger over the air use the same “Config” menu as we do for normal setup.

Once the new config is set press start Config.

The logger will obtain its new configuration on the next successful transmission.

13.4 Normal operation mode & short functional description

Once configured the logger will start to collect and transmit readings from the attached sensors. The logger supports the following main functionalities:

13.4.1 Readings

From the readings menu the user has access to the readings gathered by the logger. The user can select a time interval and export the readings to a file in csv/excel file format.

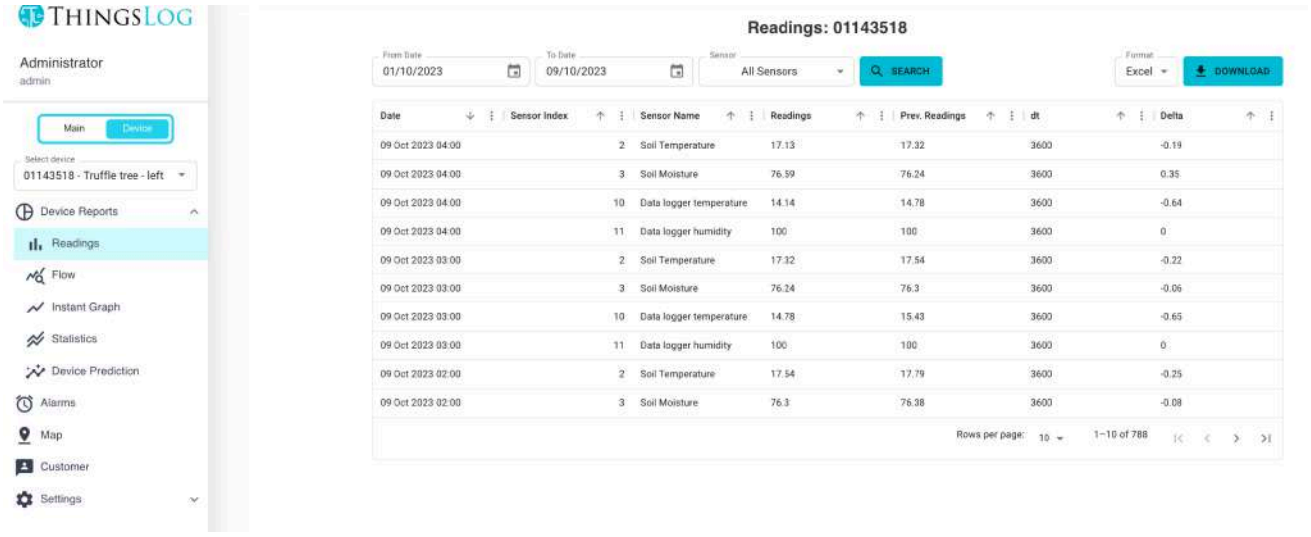


Figure 14 Readings

13.4.2 Instant graph

The Instant graph page presents the data in graph/bar/table data format.

Figure 15 Cumulative consumption graph

13.5 Operational considerations

13.5.1 Dashboard

Navigate from the menu to the “Dashboard” where you can verify the operational status of your loggers.

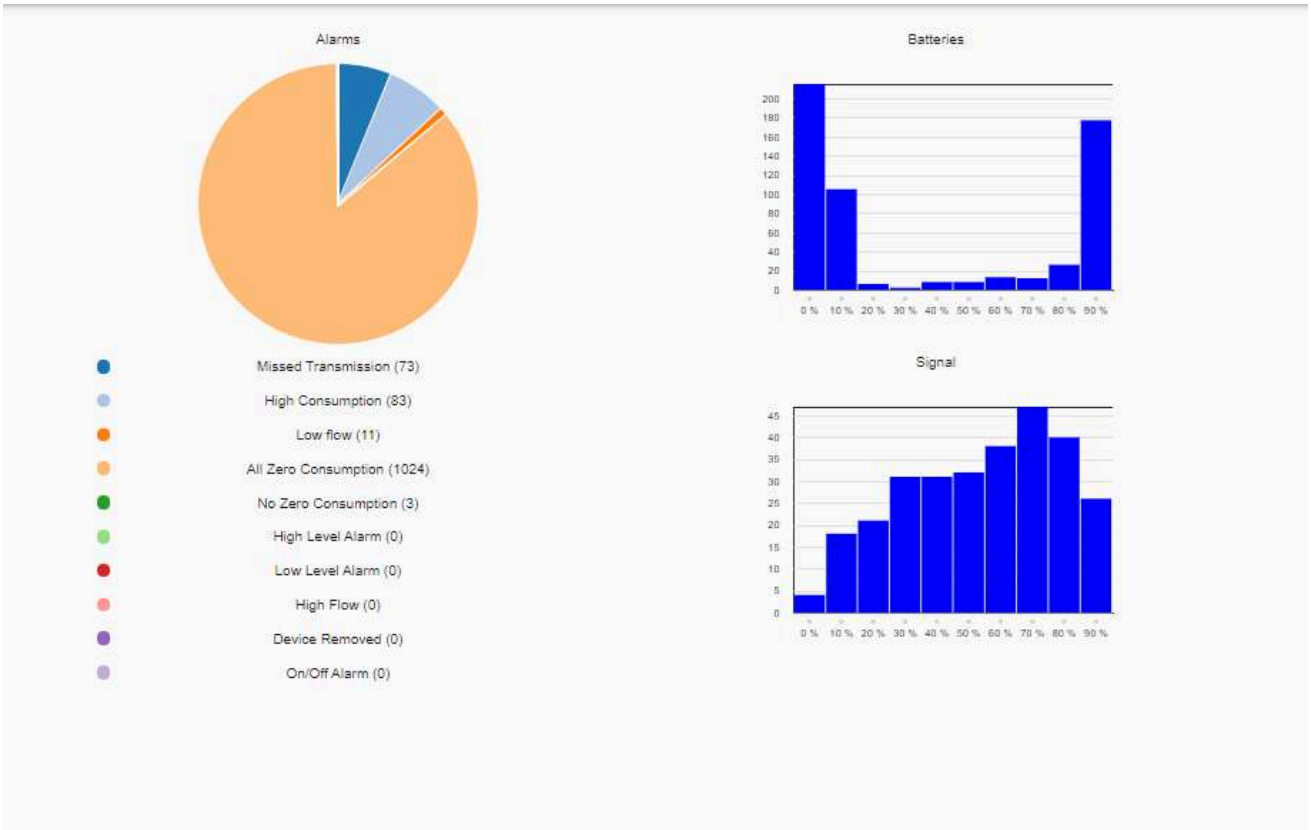


Figure 18 operational status dashboards

ThingsLog™ supports the following kinds of alarms:

- **NO_ZERO_CONSUMPTION** - alarm for non-zero consumption. The non-zero consumption is defined as a condition in which the logger is detecting constant consumption over a period equal to the transmission period.
- **HIGH_CONSUMPTION** - alarm indicating consumption higher than a certain preconfigured level over a certain period. For example $1m^3$ over 1 hour.
- **MISSED_TRANSMISSION** - alarm indicating that the transmission from the logger did not happen.
- **LOW_FLOW** - alarm indicating that the flow time interval is lower than the expected value per second.

- **HIGH_FLOW**- alarm indicating that the flow time interval is lower than the expected value per second.
- **HIGH_CONSUMPTION** - alarm indicating that the consumption time interval is lower than the expected one.
- **ALL_ZERO_CONSUMPTION** - alarm signaling zero consumption through a certain time period. For there is no consumption for 24 hours. This could potentially indicate a fault meter.
- **DEVICE_REMOVED** - alarm indicating that the meter has been disconnected from the logger.
- **LOW_BATTERY** - alarm indicating that the battery of the logger is under 20%.
- **ON/OF alarm** – on/off sensor is enabled and an instant alarm is triggered

13.5.2 Battery status

Displayed as % of your logger. The same could be reviewed in more detail if you navigate to the “Battery” section of the product.

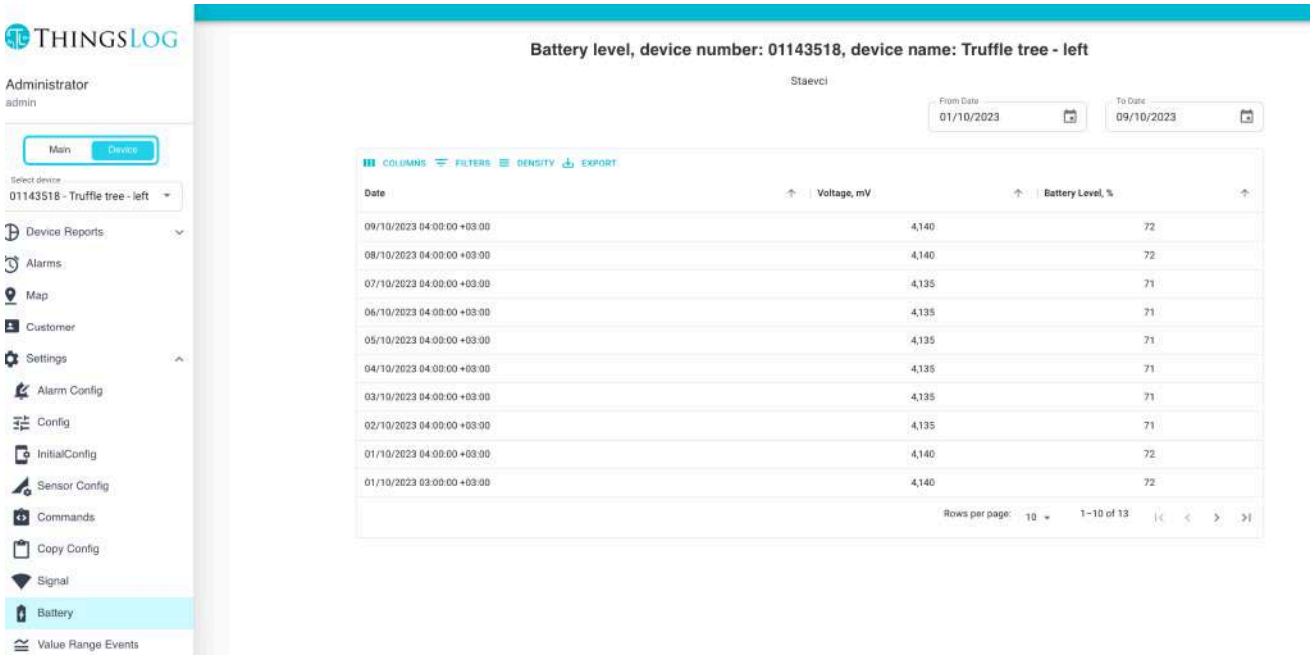


Figure 19 Battery status

Since our loggers are with battery holders we sometimes don't exactly know what kind of a battery is inside the logger. Therefore the more important value is the voltage in mV. The level in % might be incorrect depending on the type of the logger and the battery you have placed in.

13.5.3 Signal status

On each transmission, the loggers are sending their current measured RSSI (Received Signal Strength Indication) and BER (Bit Error Ratio) if there is an error.

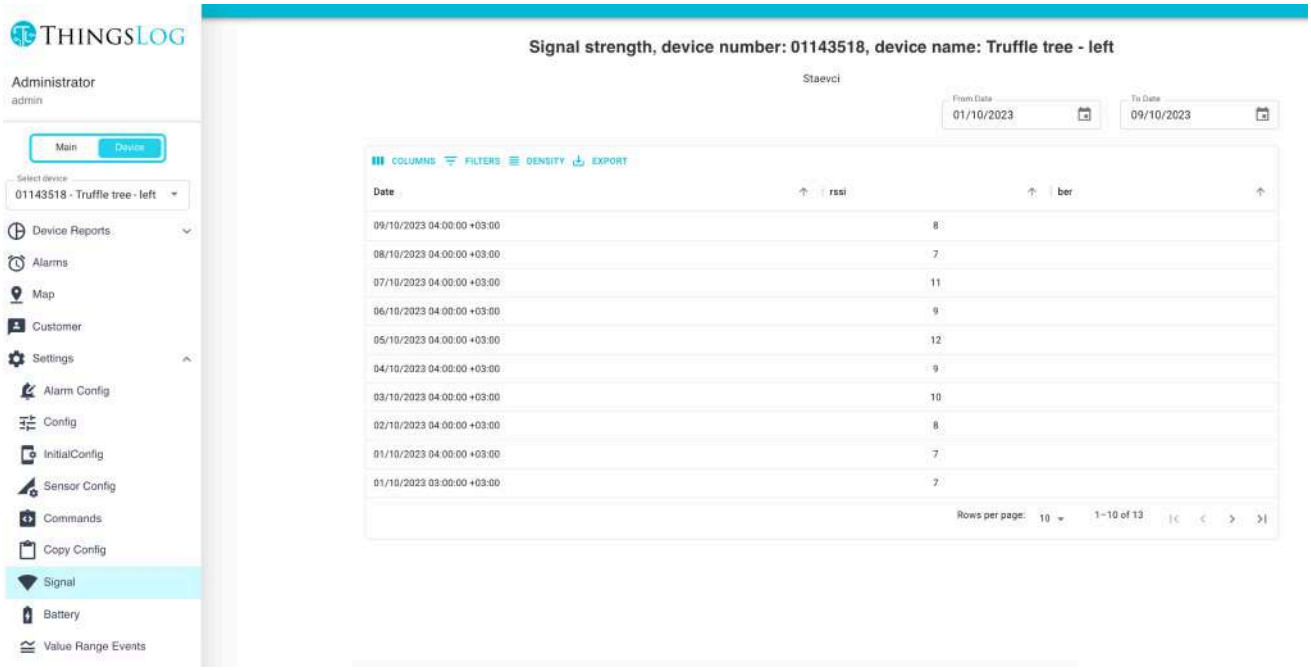


Figure 20 Signal status