Fludia
Smart Energy Components

tagawatt – User Guide

IoT sensors for plug&play submetering

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Product references:

watt-L: tagawatt control box
Ref: watt-L

wattag: tagawatt wattmeter, measures current and computes active power
Ref: wattag_S, wattag_M

voltag: tagawatt voltmeter, measures voltage
Ref: voltag_1P

Firmware versions

This documentation refers specifically to products including the following firmware versions:

Product	Element	Reference	Firmware versions
tagawatt	watt_L	watt_L	v1.0.1
	wattag	wattag_S	v1.0.2, v1.0.3
		wattag_M	v1.0.2, v1.0.3
	voltag	voltag_1P	v1.0.2, v1.0.3

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Revision history

Version	Notes	Date
1.0.1	Initial document	2025-02-24
1.0.2	Numerous improvements	2025-03-20

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1. Overview

Tagawatt is an IoT system dedicated to electricity submetering. The goal is to measure energy consumption related to subcircuits (distinct end-uses, typically) inside a distribution board.

The system includes current (watTag) and voltage (volTag) sensors that can be linked in a daisy-chain configuration.

A concentrator (watt-L) is positioned at one end of the chain. It collects the measurement values and uploads them through a communication network (NB-IoT/LTE-M or LoRaWAN).

Active power is calculated every second and averaged over successive periods of one minute or more.

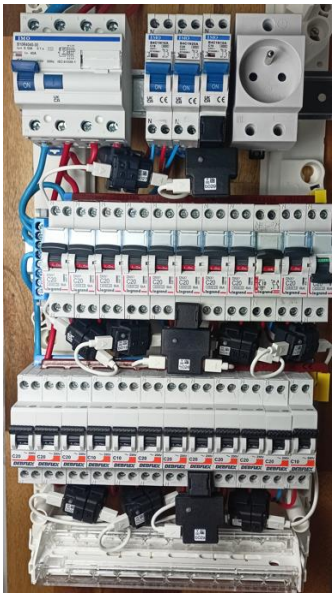


Fig. 1 – example of tagawatt installed (8 watTags and 3 volTags)

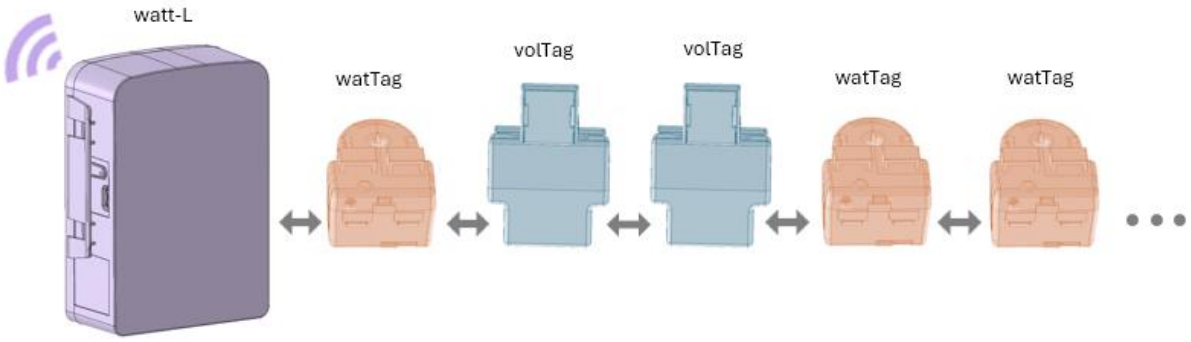


Fig. 2 – watt-L and sensors in a chain

List of elements included in tagawatt:

watTag

Plug&play wattmeter measuring current and calculating active power.

Fig. 3 - watTag_S

Fig. 4 - watTag_M

Fig. 5 – watTag_S installed

volTag

Plug&play voltmeter measuring voltage (to be positioned on an existing circuit breaker)

Fig. 6 – volTag_1P

Fig. 7 – volTag_1P installed

Watt-L

Fig. 8 – watt-L

Fig. 9 – watt-L with a 5V adapter and the first wire of the chain

Tag_Plyers

Fig. 10 – tag_Plyers

Fig. 11 – tag_Plyers inserted in a watTag

Fig. 12 – tag-Plyers used to position a watTag

2. Installing the system

2.1 Setting up the watt-L

2.1.1 Power supply

Find a convenient position for the tagawatt watt-L box and power it up by connecting it to the 5V adapter. The micro-USB connector to use is on the left side (green panel).

Green and red LEDs blink together: attempting connection to an accessible NB-IoT or LTE-M network.

Green light blinks alone (1 flash every 5 seconds): connection attempt has been successful.

Red blinks alone (1 flash every 5 seconds): connection attempts have failed.

2.1.2 Access to configuration

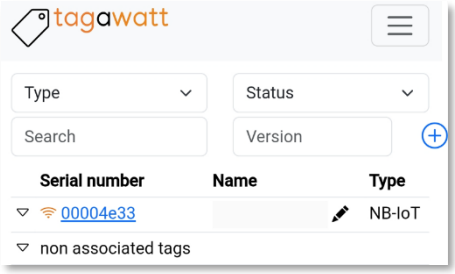
The main purposes of the configuration phase are:

- To choose the data communication mode
- To associate the correct voltag with each wattag
- Optionally, to give names to the tags

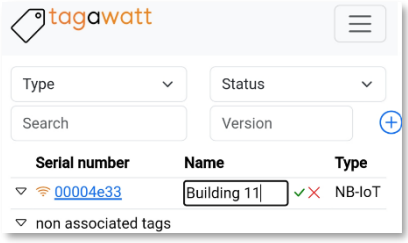
With any computer, phone or tablet, access the config interface URL: https://www.tagawatt.com

Enter your credentials (sent in an email when the system was shipped).

The interface will look like this:

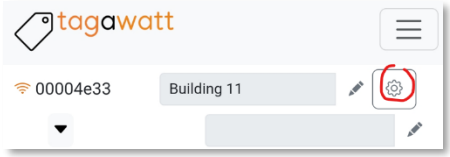


Click on the pencil icon to name the watt-L (optional).

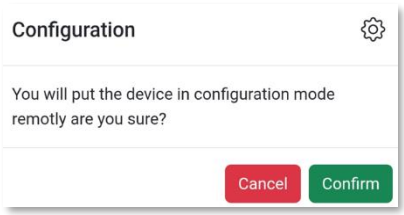


Click on the watt-L Serial Number to access its dedicated page.

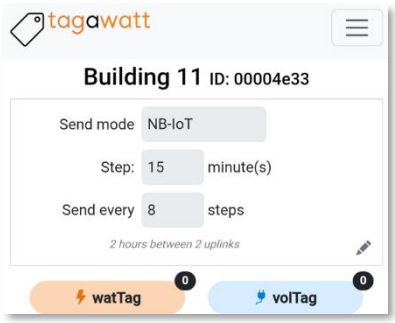
Click on the gear icon.



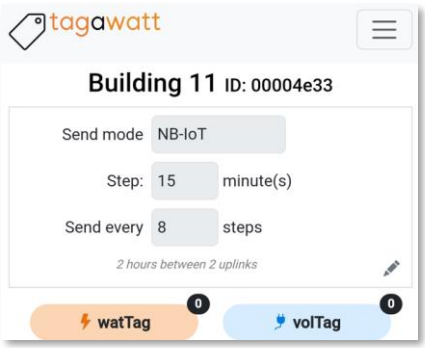
A confirmation pop-up appears. Click on the Confirm button.



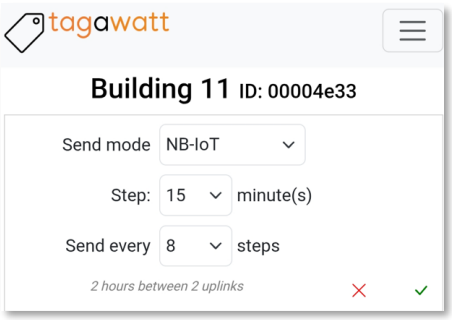
You have reached the configuration page:



2.1.3 *Selection of a data communication option*



You can set up communication parameters by clicking on the pencil icon.



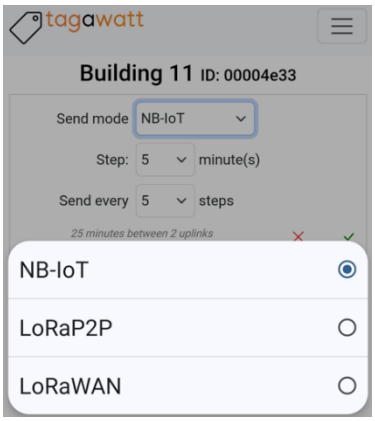
If needed, change the measurement/uplink frequencies and the communication mode.

“Step 15 minutes” means that the values will be averaged over successive 15-minute periods.

“Send every 8 steps” means messages will be uploaded once 8 values have been created, so in this case every 8x15 minutes = 120 minutes = 2 hours.

Communication mode can be:

- NB-IoT (or LTE-M). This is the default communication mode.
- LoRaWAN: if you want to use a LoRaWAN network and have registered the tagawatt keys in said network, the watt-L box will try to join this Network as soon as you confirm.
- LoRaP2P: LoRa Point-to-Point (with a proprietary protocol), used to connect to an F-Bridge or F-Link.



2.2 Connecting and configuring the tags

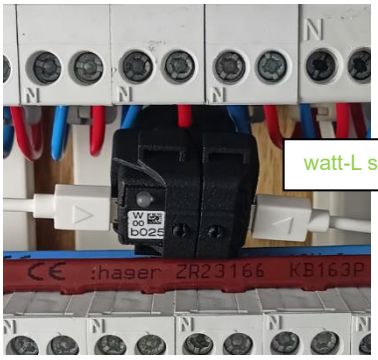
2.2.1 Plug the tags

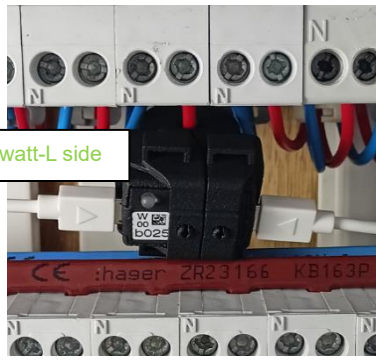
Plug a first tag to the watt-L by using one of the cables. Choose the cable length according to how far the tag will be installed.

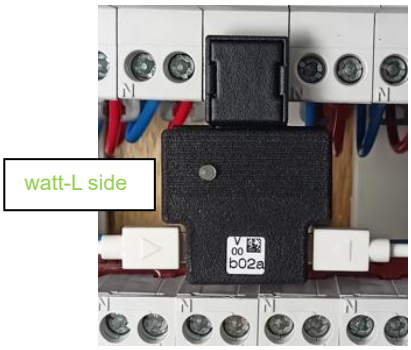
You can then position the tag in the distribution board. If it is a wattag it should be positoned by using the tag_Plyers.

If it is a wattag, you can enter on the right or on the left. In other words, in a tagawatt chain, the side of the chain that starts with the watt-L can be on the right side or on the left side of a wattag.

But, if it is a voltag, you must enter on the left. In other words, the side of the chain that starts with the watt-L must be on the left side of the voltag.



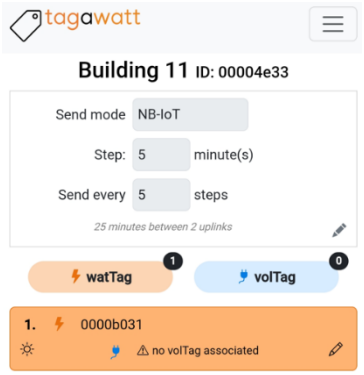




The tags can be in any order.

Once a tag has been connected to the chain, it appears in the configuration page.

Background color is orange for a wattag and blue for a voltag.



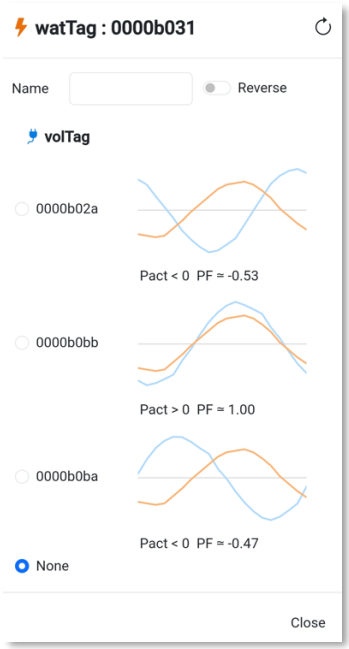
One by one, you can connect the tags to the chain and see them appear in the configuration page.

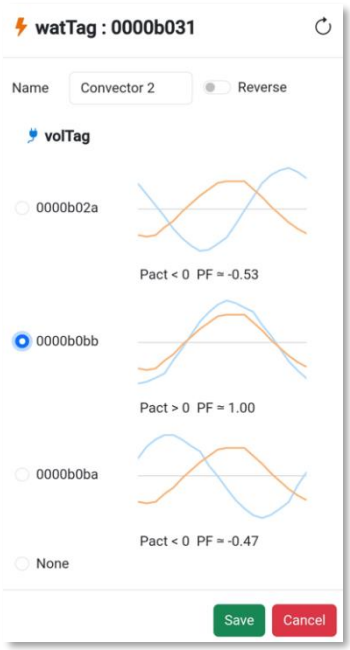
2.2.2 *Choose the voltag*

Click on the pencil icon for one wattag. A pop up will appear to help you choose which voltag should be selected to perform the active power calculation.

If there is only 1 voltag (single phase), there is only one choice, but if there are 3 voltags, you must pick the correct one.

In case you are not sure which phase to choose, the graphs and numbers in the pop up can be helpful: usually the correct choice is the one with the highest PF (Power Factor).

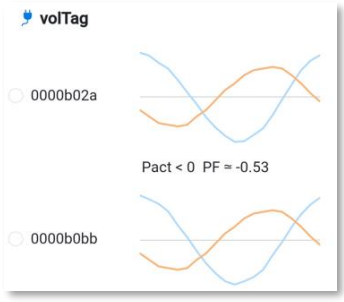




The graphs show the shape of the current signal and of the different voltage signals. To be noted: these are not the real measurement signals but slightly less accurate “patterns” (so the PF value can be slightly different from the real value).

Apart from offering visual confirmation of the voltag to choose (the one most in sync, usually), these graphs can also help detect installation errors.

For example, the error could be that two voltags are on the same phase (see screenshot with two identical voltage blue lines). Or it could be that the wattag is upside down. If a wattag is upside down, you can select “reverse” and the current signal will be reversed before active power calculation.



2.2.3 Exit config mode

Important: the tagawatt starts measuring only after you exit the config mode. To do so, click on the tagawatt logo at the top of the page.

2.3 Other possibilities

2.3.1 Making a LoRa jump to an F-Bridge or an F-Link

In case there is no NB-IoT or LTE-M coverage next to the distribution board (and no LoRaWAN network), there is a possibility to configure the watt-L to make a LoRaP2P (LoRa Point-to-Point, using a proprietary protocol) jump to an F-Bridge or an F-Link.

The F-Bridge can receive the LoRaP2P messages and forward them through NB-IoT or LTE-M. This is convenient because this F-Bridge can be positioned in another location in the building where there is coverage.

The F-Link follows the same principle but can connect to a WiFi network or an Ethernet cable.

Pairing the watt-L to an F-Bridge consists of:

- Short press twice on the F-Bridge button
- Start the pairing on the watt-L side (access to the watt-L configuration can be performed either by temporarily moving it where there is NB-IoT coverage, next to the F-Bridge for example, or by using a special ftdi cable connected to an android smartphone).
- If the watt-L had to be temporarily moved, put it back in place

Pairing the watt-L to an F-Link consists of:

- Short press twice on the F-Link button
- Start the pairing on the watt-L side (access to the watt-L configuration can be performed by temporarily moving it where there is NB-IoT coverage, or by using a specific cable connected to an android smartphone).
- If the watt-L had to be temporarily moved, put it back in place

2.3.2 Configuring the watt-L for LoRaWAN with a special cable

The watt-L comes by default with an NB-IoT/LTE-M SIM card (from 1nce). It is the default means to configure the watt-L and offers several advantages:

- Corrections in the configuration can be performed remotely
- Firmware can be remotely upgraded

But if there is no NB-IoT/LTE-M coverage, the watt-L can be configured by connecting it to an android smartphone with an specific cable (ftdi cable with adequate connectors) and with the help of a tagawatt android app.

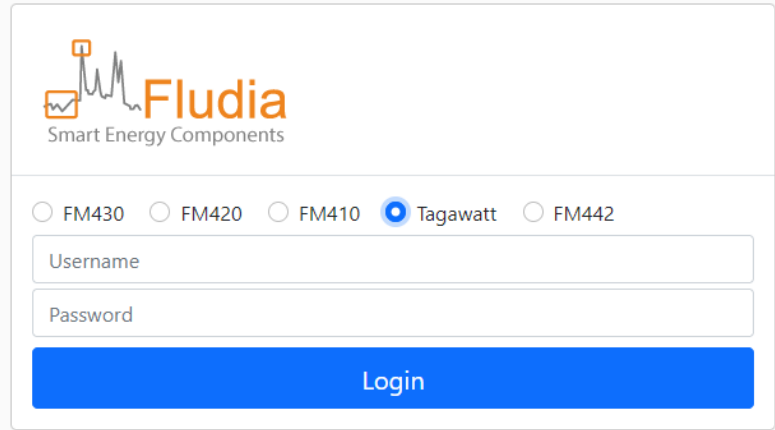
3. Accessing measurements

3.1 NB-IoT/LTE-M

Measurements can be retrieved by using the tagawatt API.

The API is described in a swagger:

https://swagger.fludia.com



Make sure to select Tagawatt.

Test credentials

Username: example

Password: example

You can also use your own credentials, communicated by email after purchase of the first units (email sent at the moment of product shipping)

Alternatively, csv files can be downloaded from the tagawatt Web App (https://www.tagawatt.com).

3.2 LoRaWAN

LoRaWAN keys are provided with each watt-L.

Each LoRaWAN message contains a series of ID/value pairs. ID: wattag unique ID number. Value: energy index in Wh (or cumulative current in tens of mAh if there was no voltag associated with the wattag).

There can be up to 6 wattags par message and up to two successive messages, so a total of 12 wattags for 1 watt-L. The second message is sent 5 minutes after the first.

3.2.1 Message format description

- **Octet #1** Header 0x75
- **Octet #2** Time shift (either 0x00 or 0x05. Gives the delay in minutes before the message was sent). When there are more than 6 wattags, we have to send two messages, the first one just after measurement and the second one 5 minutes later.

- **Octet #3** Specifies which values are energy (index in Wh) and which are current (cumulative current in tens of mAh). This Byte should be considered in binary et read from right to left. For example 0x02 => 0000 0010 indicates that the first wattag is current, the second wattag is energy and the others are current (see 3.2.3 Example).
  In case all the wattags are associated to voltags, they all transmit energy so there is no need to decode this Byte.

Then, for each wattag:

- 4 Bytes for the ID
- 4 Bytes for the value (cumulative energy or cumulative current). Attention: cumultive energy can be negative (in case the wattag was « reversed » without a « reverse » correction in the config / in case of measurement of a total building with self-consumption and cumulative production exceeds cumulative consumption).

3.2.2 Error codes

The error codes refer to what the watt-L has received or not from the tags.

Cumulative energy error codes

- 0x80000000: nothing has been received
- 0x80000001: at least 1 correct value (1 second power) has been received AND some error codes have been received AND there is the correct number of receptions
- 0x80000002: there are only error codes AND there is the correct number of receptions
- 0x80000003: there is a mix of correct values and error codes AND there are less receptions than expected
- 0x80000004: there are only correct values AND there are less receptions than expected
- 0x80000005: there are only error codes

Cumulative current error codes

- 0xFFFFFFFF: nothing has been received
- 0xFFFFFFFE: at least 1 correct value (1 second current) has been received AND some error codes have been received AND there is the correct number of receptions
- 0xFFFFFFFD: there are only error codes AND there is the correct number of receptions
- 0xFFFFFFFC: there is a mix of correct values and error codes AND there are less receptions than expected
- 0xFFFFFFFB: there are only correct values AND there are less receptions than expected
- 0xFFFFFFFA: there are only error codes

3.2.3 *Example*

Message example: 7505050000AE15009A72DC0000AE220000119F0000AE1780000002

- 0x75 tagawatt LoRaWAN Header
- 0x05 measurements are from 5 minutes ago
- 0x05=> 00000101

  00000101: first tag is energy (index in Wh)
  - 0x0000AE15: ID (« 00 ae15 » on the wattag label)
  - 0x009A72DC => 10121948 Wh

  00000101: second tag is current (cumulative current in tens of mAh)
  - 0x0000AE22: ID (« 00 ae22 » on the wattag label)
  - 0x0000119F => 4511 x 10^1 mAh = 45.11Ah

  00000101: third tag is energy (index in Wh)
  - 0x0000AE17: ID (« 00 ae17 » on the wattag label)
  - 0x80000002 => error code

  etc.

3.2.4 *Javascript decoder*

https://github.com/Fludia-IoT/LoRaWAN-decoders/blob/master/tagawatt-decoder.js

4. Contact

For further information or advice please contact us:

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