

iNode Energy Meter

instruction manual

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1. About iNode

We would like to introduce you to the family of **iNode** devices operating in Bluetooth Low Energy ® technology. We will show you that BLE is not only tags for finding lost keys or location tags, but something more.

Our devices can do this and more:

- These are primarily battery devices.
- Operate without replacing it for up to 12 months depending on the application and method of use.
- They have memory for recording events, measurement readings etc.
- Precise temperature, humidity, acceleration or magnetic field sensors allow for precise control of home automation or care for the elderly.
- As remote control devices, despite their low power consumption, they have a large range and features inaccessible to other competing devices - own user password, AES encryption, control directly from a smartphone.
- BT4.0 - LAN or BT4.0 - GSM gateways connect **iNode** sensors with the Internet.

iNode can also help control the movement of people or goods, saving the time of appearance and disappearance from the range of the recorder (active RFID® with a long range). New functionalities related to product development are also not a problem - it enables remote firmware exchange from a PC or smartphone with Bluetooth 4.0® and Bluetooth Low Energy® (Bluetooth Smart®) support.

iNode Energy Meter is a wireless energy monitor with built-in memory where the results are saved, even every 1 minute. It is designed primarily for home automation. Analysis of daily consumption may help reduce the cost of electricity consumption by choosing better matched fares and changing the habits of users. Measured energy counters: minute and total are broadcasted (live usage monitoring) with a period of 0.32 to 10 seconds (can be set using iNodeSetup.exe). Available in three versions: with photo detector element (electrical energy meters) or magnetic field sensor (for water meters) or reflective sensor (for water meters). **iNode Energy Meter** can be used in Home Automation to work with existing elements. You can use for this miniature computer Raspberry Pi 2 running the script in Python (iNode-LAN) or Bash (BlueZ and BT4.0 USB adapter). Running on a Raspberry Pi 2 Python or Bash script(easy to modify only in a text editor because it does not require compilation) receives the data and analyze them. It can send them further to virtual sensors of Domoticz Home Automation System or to the ThingSpeak.com collection of data and their visualization. Both Domoticz and ThingSpeak are free, while the sample script is available for download on <http://support.inode.pl/> (user: inode without a password).

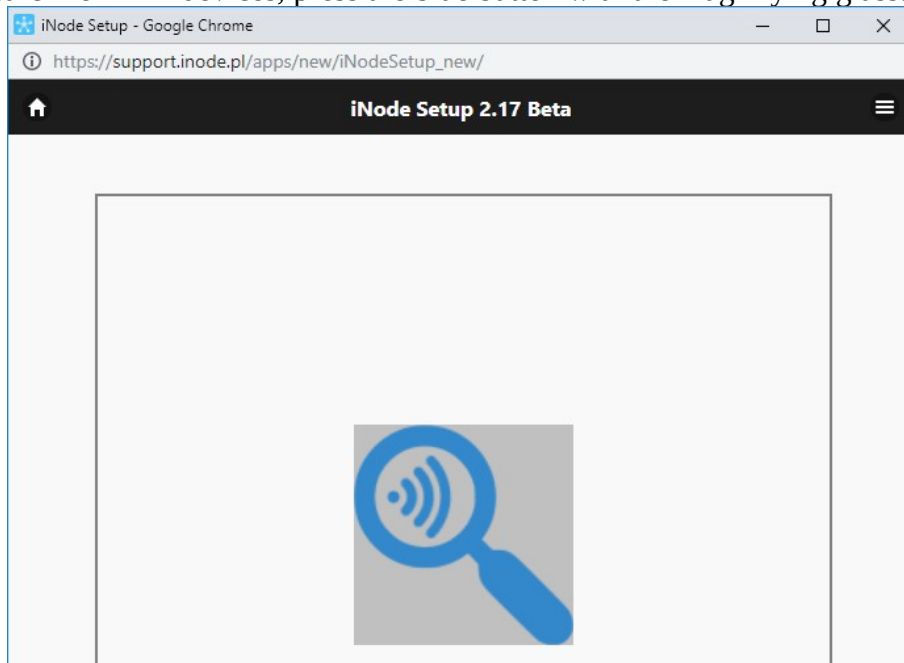
Trademarks or registered trademarks:

Bluetooth Low Energy ®, Bluetooth 4.0 ®, RFID®,CSR®,Windows®, Android, Google, Microsoft, ThingSpeak, Raspberry Pi, Domoticz, BlueZ, Linux are used for informational purposes only.

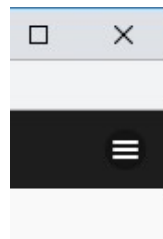
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2. iNode Energy Meter

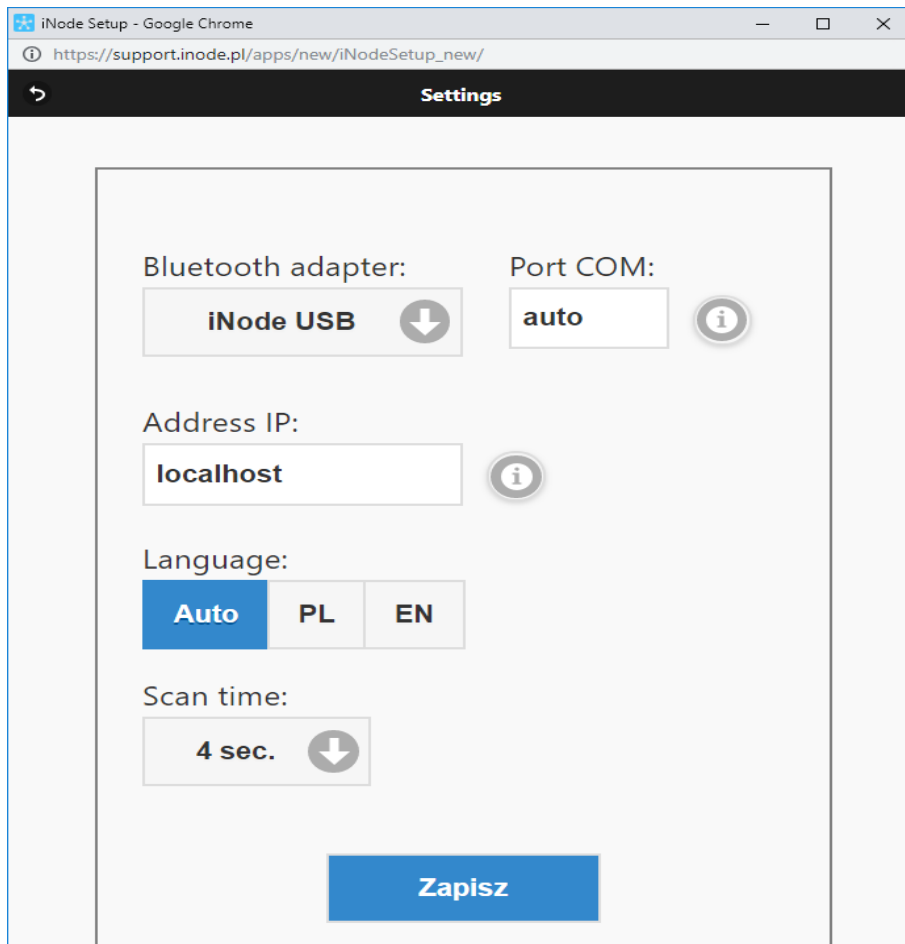
Run the **iNode Setup** application in your browser (preferably Chrome). Depending on the system, it may be necessary to install an additional program that allows the application to communicate with the USB adapter. On Windows 10 it is **iNode Hub Server** while on Android OS it is **iNode Service**. To search for BLE devices, press the blue button with the magnifying glass.



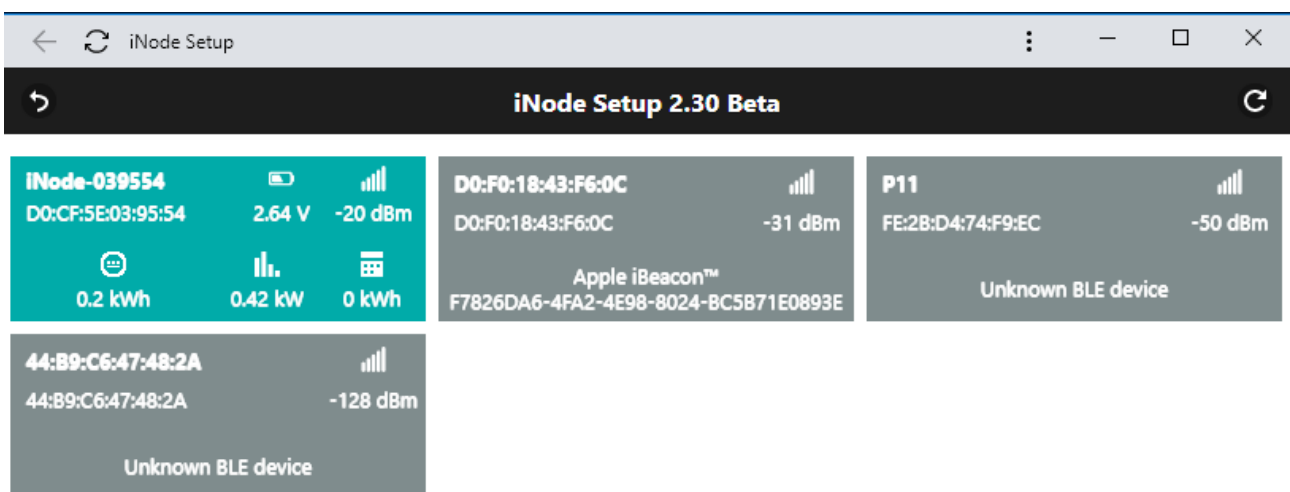
By clicking on the image



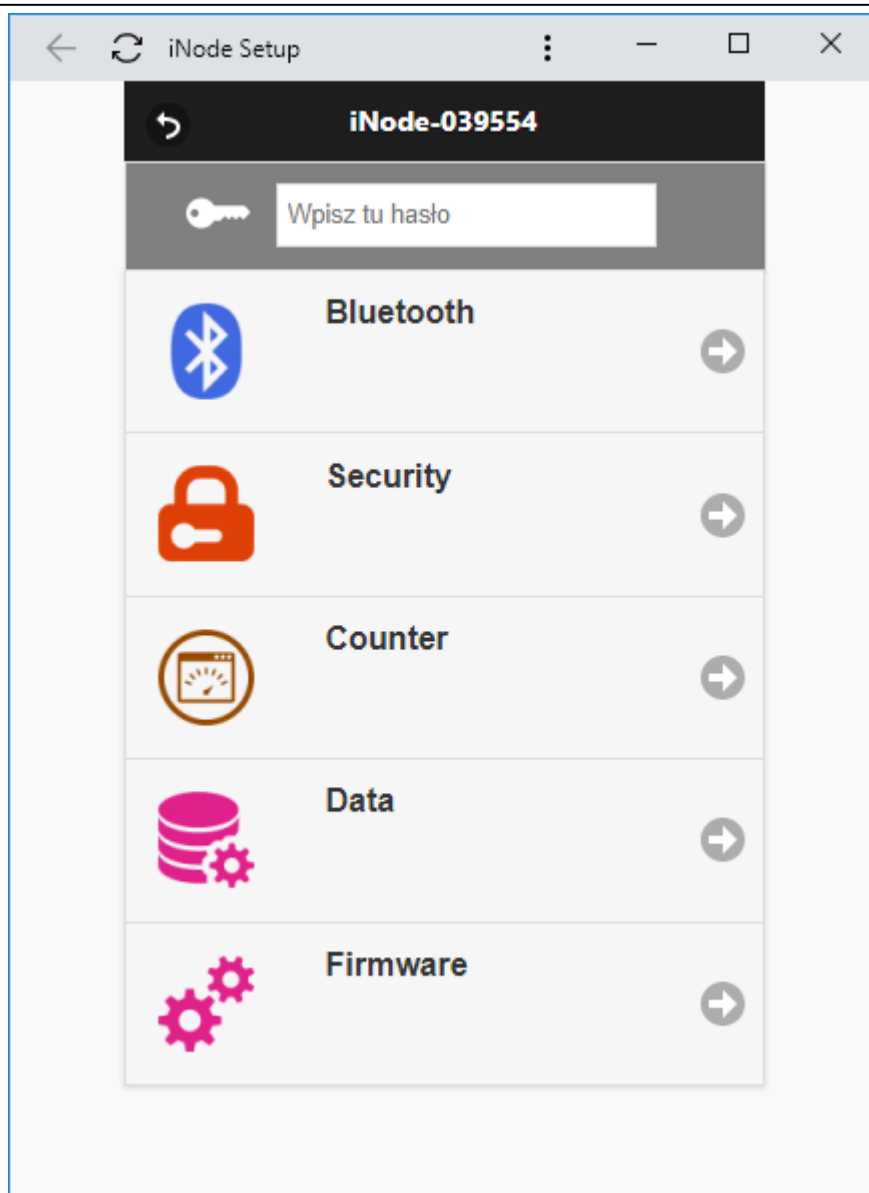
you can also choose the type of USB BT4.0 adapter with which the program works. It is also possible to use the **iNode LAN** series devices for communication, for which you must enter the IP address at which they are visible in the local network.



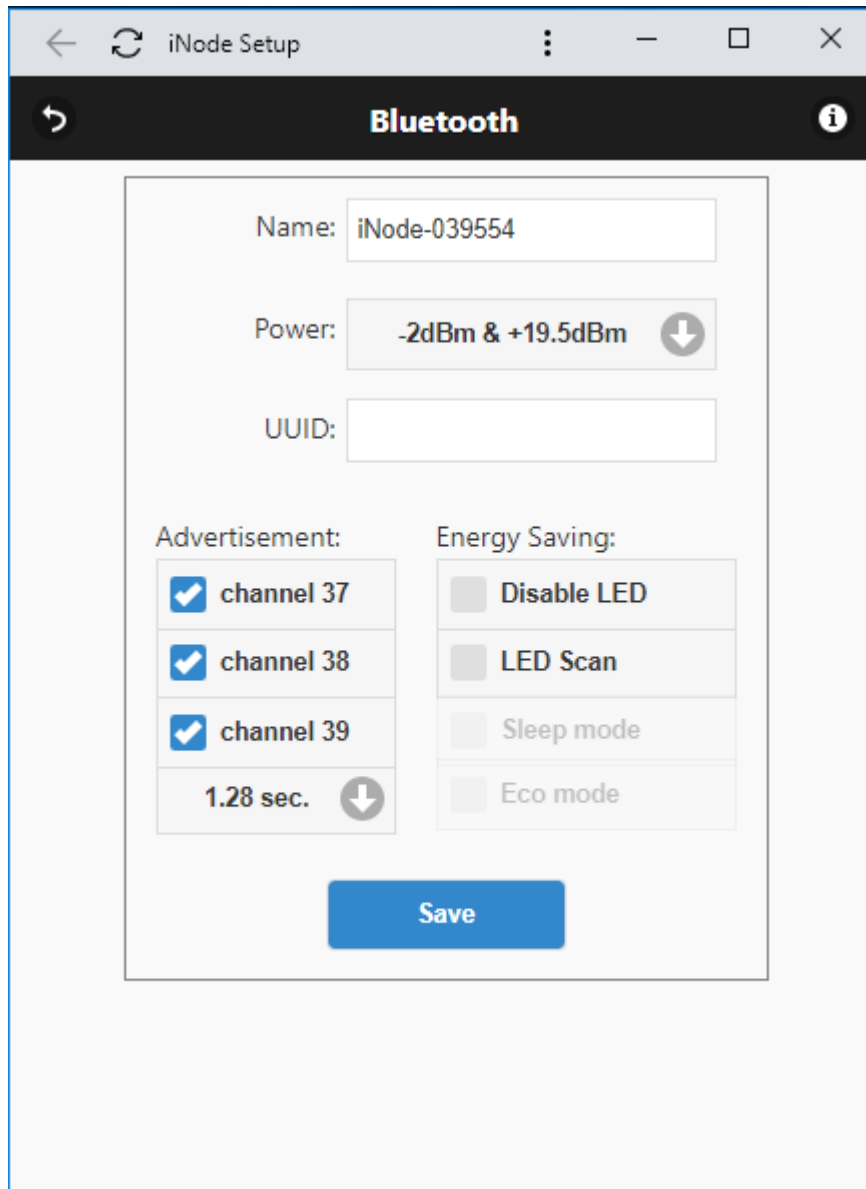
The program will search for the selected BT4.0 adapter and nearby **iNode** devices. For **iNode Beacon** this is the first image from the left in the first row in the window below.



To configure the **iNode Energy Meter** device, left-click the image. The program will connect to it and read the configuration parameters set in it. If a password has been set in the device with which we want to connect, enter it in the window with the key.



After selecting the Bluetooth tab, the following window will appear:



The screenshot shows a mobile application window titled "iNode Setup" with a "Bluetooth" tab selected. The window contains the following configuration options:

- Name:** iNode-039554
- Power:** -2dBm & +19.5dBm (with a dropdown arrow)
- UUID:** (empty text box)
- Advertisement:**
 - channel 37
 - channel 38
 - channel 39
 - 1.28 sec. (with a dropdown arrow)
- Energy Saving:**
 - Disable LED
 - LED Scan
 - Sleep mode
 - Eco mode

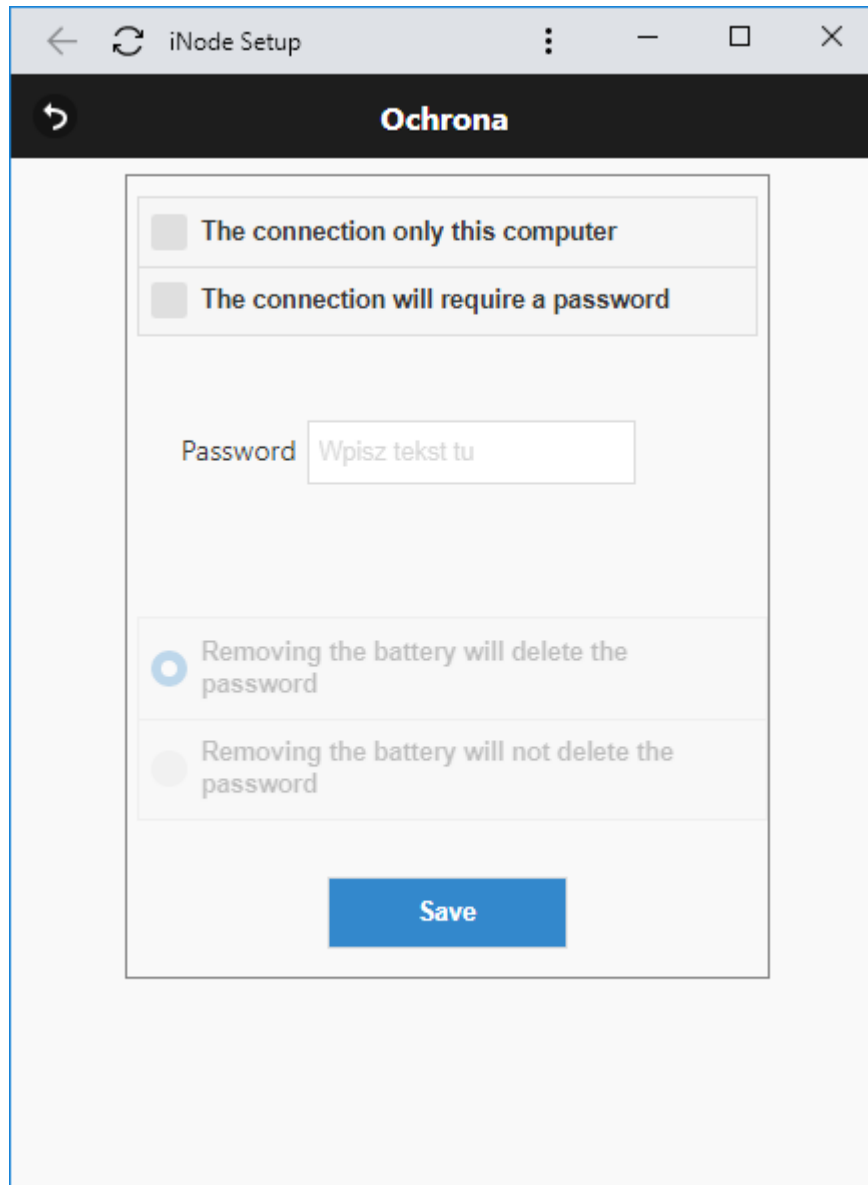
A blue "Save" button is located at the bottom center of the configuration area.

At the **Bluetooth** tab there are following items:

- **Name:** you can change default device name typing a new one in this text box. Its length is 16 characters maximum.
- **Power:** determines with what power the device transmits. For the Long Range version, two powers are given. With a second more power, the device transmits every 10th frame.
- **Advertisement:** we define the channels on which **iNode Energy Meter** is broadcast, which in some applications may reduce battery consumption, however, the device may be less well detected. In addition, we can specify the period with which the broadcast frame is sent.
- **Energy saving:** we can turn off the LEDs or switch them to scan detection mode - **LED scan**.

Pressing the **Save** button will save the modified settings to your device.

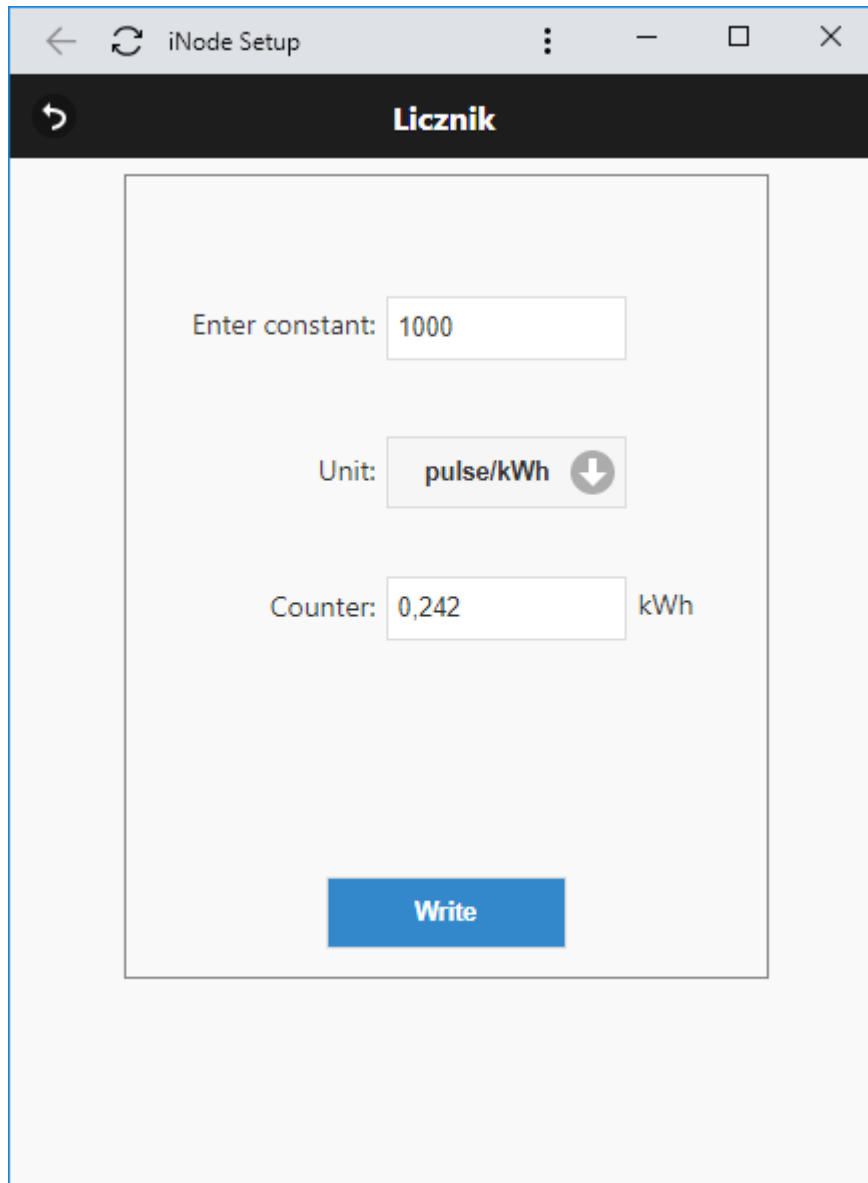
After selecting the **Security** tab the following window will appear:



- **The connection only from this computer:** we can secure ourselves against connecting to **iNode Energy Meter** from a different computer or smartphone than the one we are using now (in fact, the unique identifier of the BT4.0 adapter is remembered). You can only reset this setting by removing the battery from the device.
- **The connection will require a password:** we secure access to **iNode Energy Meter** with a password, which can be up to 16 ASCII characters.
- **Removing the battery will delete the password:** the option will be active only if the **The connection will require a password** option is enabled, the password will be required. Unchecking this option will save the password in the non-volatile memory of the device and removing the battery for a long time will not delete it. If the user forgets the password, the only way to regain access to the device will be to send it to the service.

Pressing the **Save** button will save the modified settings to your device.

After selecting the **Counter** tab the following window will appear:



The screenshot shows a mobile application window titled "iNode Setup" with a sub-header "Licznik". The main content area contains three input fields and a button:

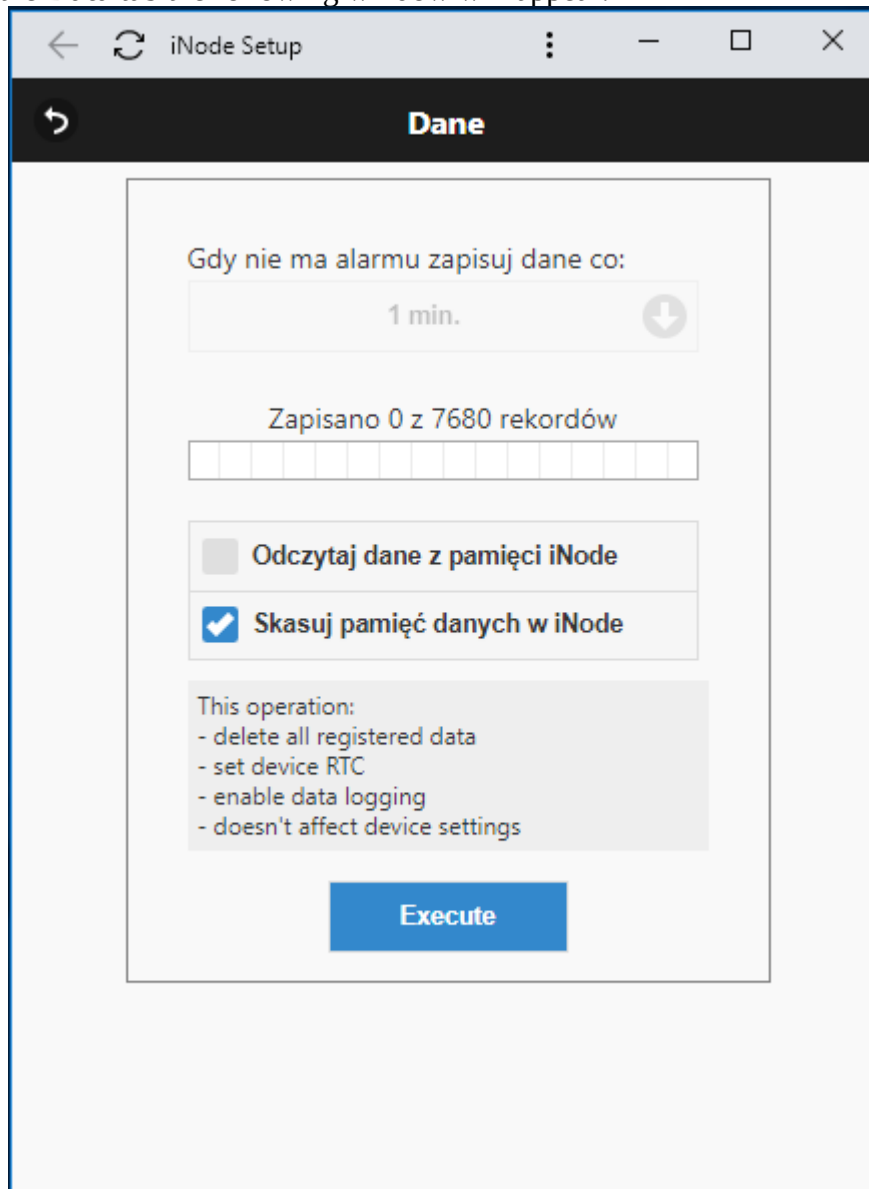
- "Enter constant:" followed by a text input field containing the value "1000".
- "Unit:" followed by a dropdown menu currently showing "pulse/kWh" and a downward arrow icon.
- "Counter:" followed by a text input field containing the value "0,242" and the unit "kWh" to its right.
- A blue button labeled "Write" centered at the bottom of the form.

W polu:

- **Enter constant:** enter the number of flashes with the LED per selected counting unit (1kWh or 1 m³) here. This value can be read from the meter nameplate. It is used to automatically convert the number of pulses to the amount of measured energy in iNode Monitor or iNode Energy programs.
- **Units:** here you can choose in which units the counting result in iNode Monitor or iNode Energy programs should be displayed: kWh, m³ or pulses.
- **Counter:** you can enter the initial meter reading - integer here. This value is converted into pulses according to the meter constant given above.

Pressing the **Write** button will save the modified settings to your device.

After selecting the **Data** tab the following window will appear:



Data in the memory are cyclically saved, i.e. when it is full, the oldest data is deleted. The memory has a capacity of approx. 8192 records - standard version or 7680 records, Long Range version. One record is a time stamp and each entry with **iNode Energy Meter**. The data is compressed, i.e. if the instantaneous (in a given minute) energy consumption differs from that in the previous period by more than +/- 1 then the record is saved. The total counter of counted pulses can be reset by removing the battery from the device for a long time (minimum 60 seconds)

There are two options that can be selected when reading data:

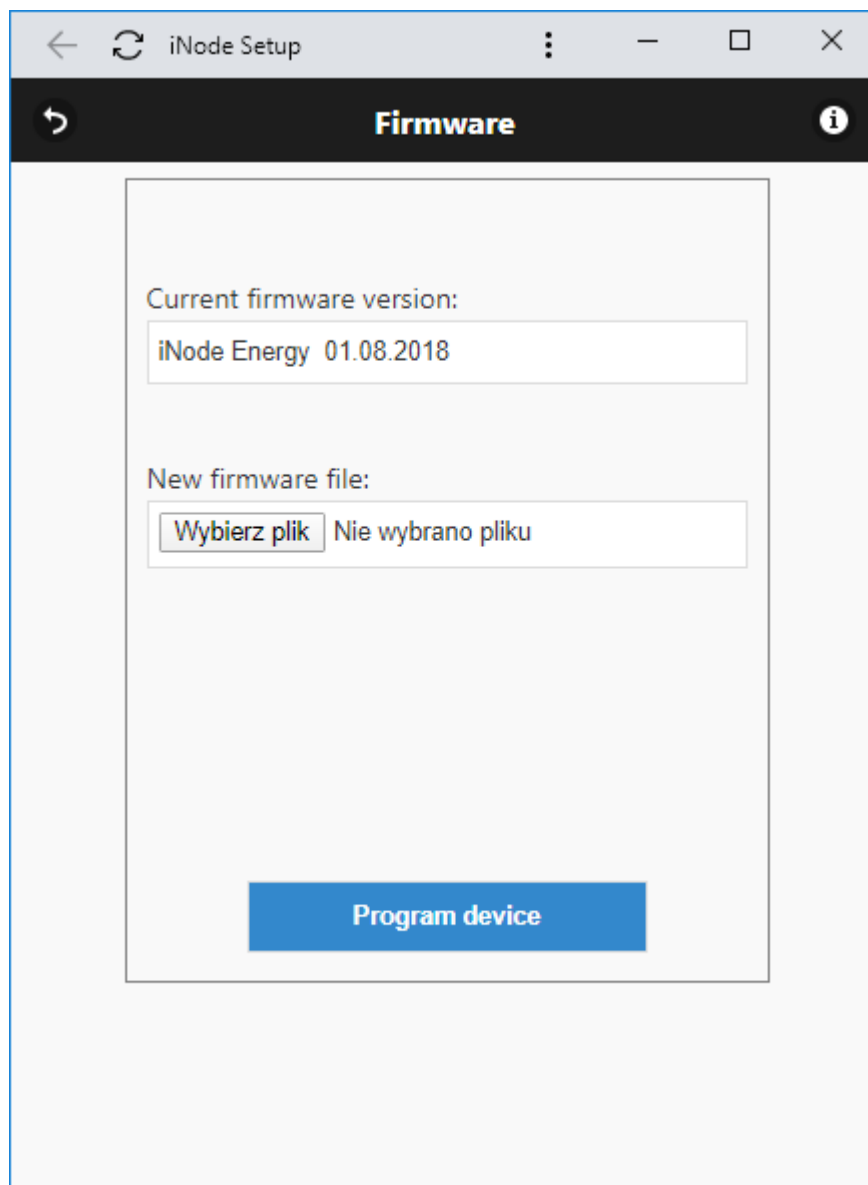
Read data from memory iNode: reads data from memory.

Delete data memory in iNode: erase data in memory, RTC setting and enable data logging.

Pressing the **Execute** button will save the modified settings to the device.

After selecting the **Firmware** tab, the following window will appear:

The firmware version of the device is displayed in the **Current firmware version** field and the date it was created.

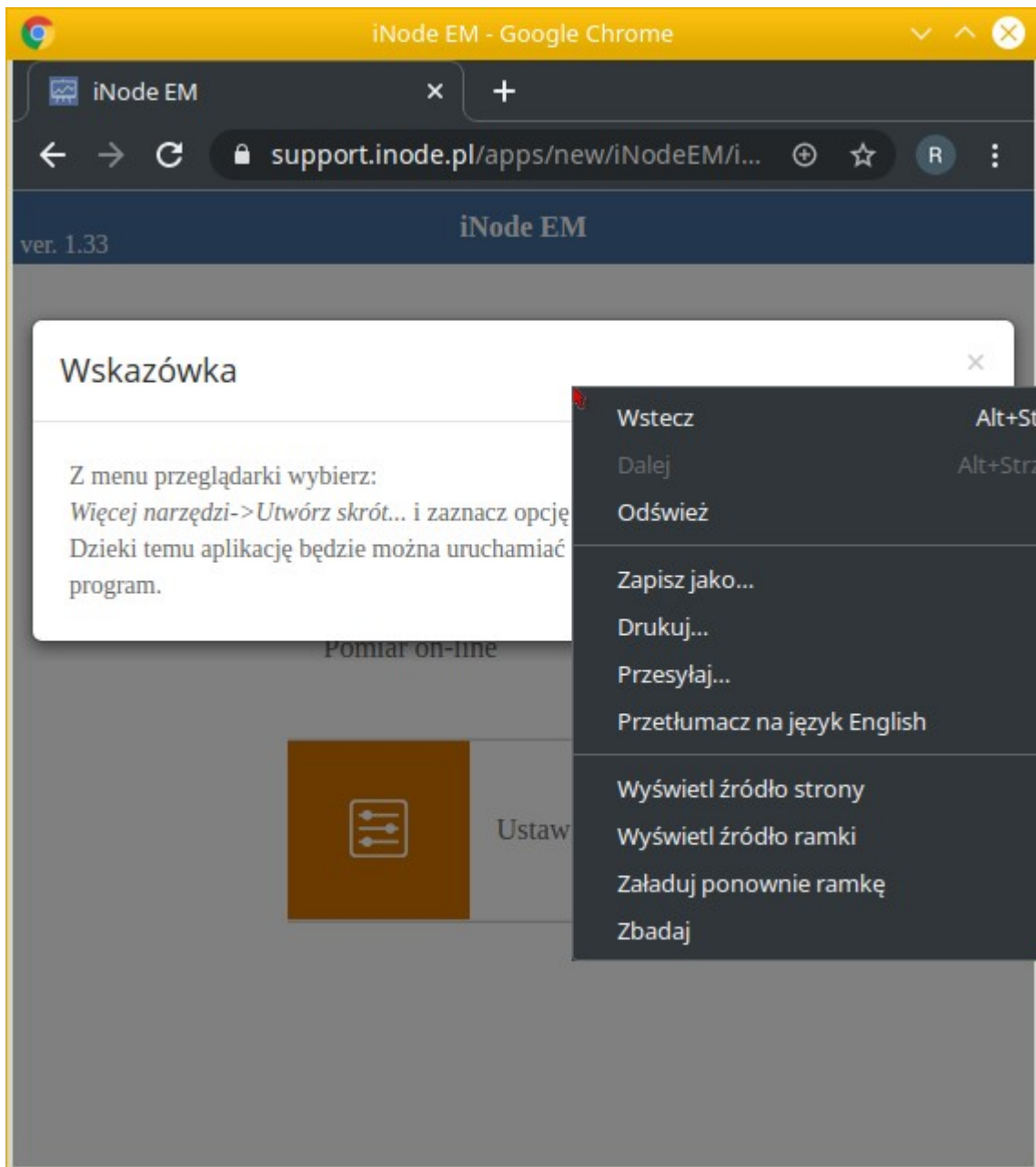


In the **New firmware file** field we can select a file with new firmware for the device. After pressing the **Program device** button, the program checks whether the selected firmware can be entered into the device. This avoids the situation that we enter, for example, firmware from the **iNode** device that requires pressing the button to make it broadcast to a device that does not have such a button (then we will lose the opportunity to communicate with such reprogrammed **iNode**).

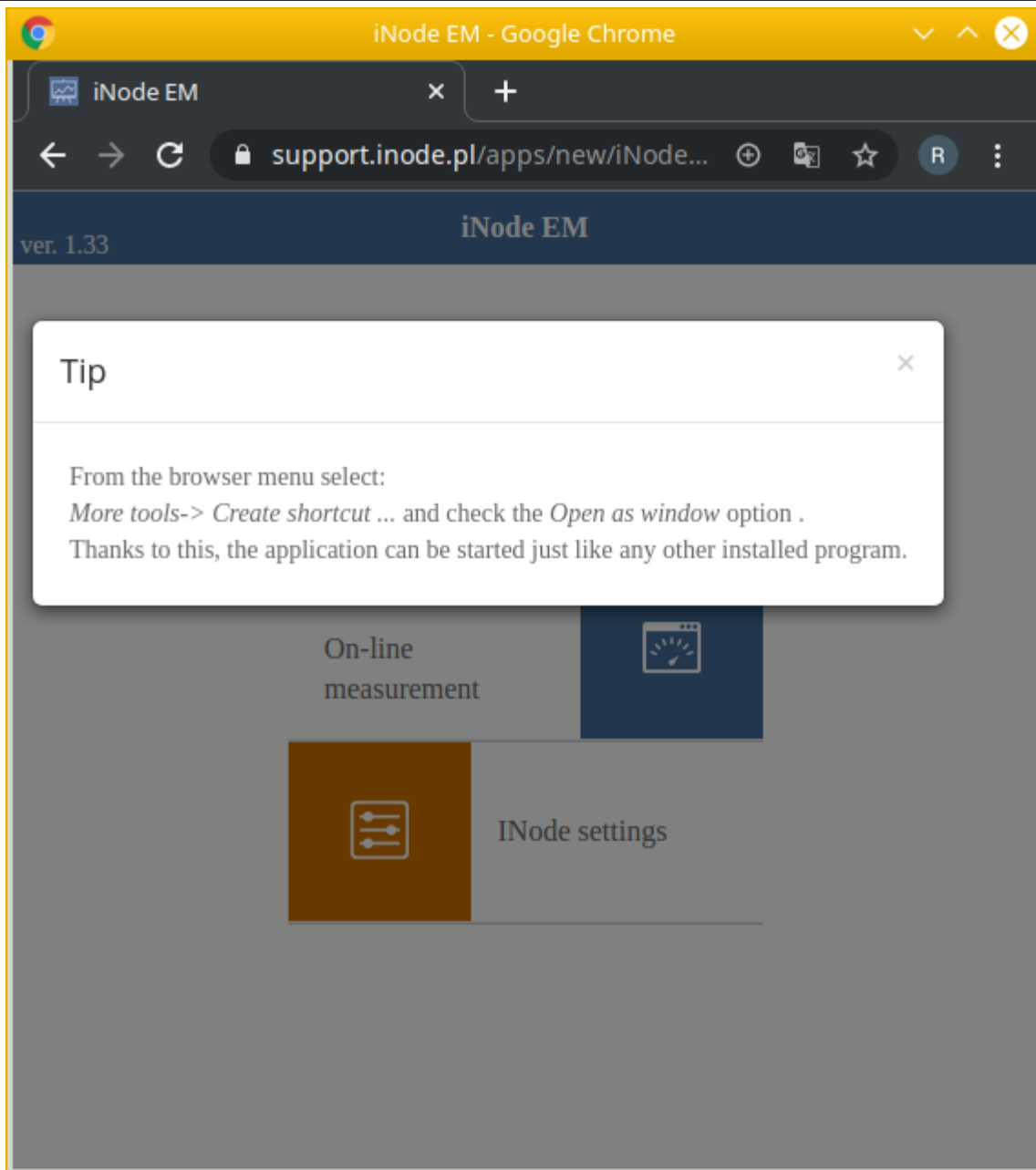
The fep files with firmware, instructions or application software can be downloaded from the support site: <https://support.inode.pl/> user: **inode** without password.

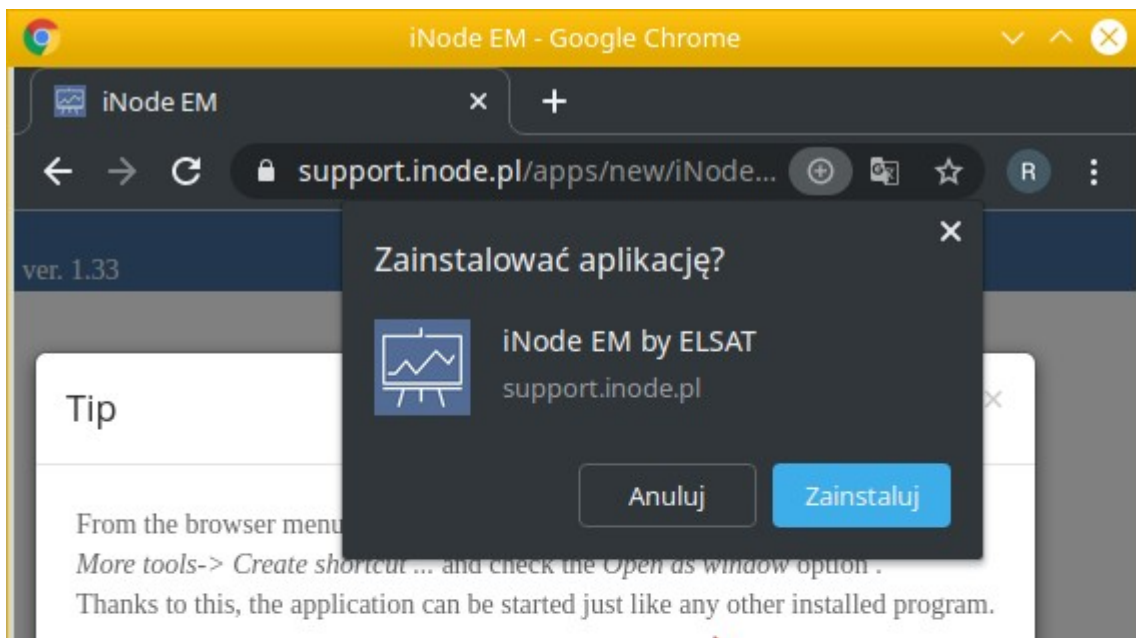
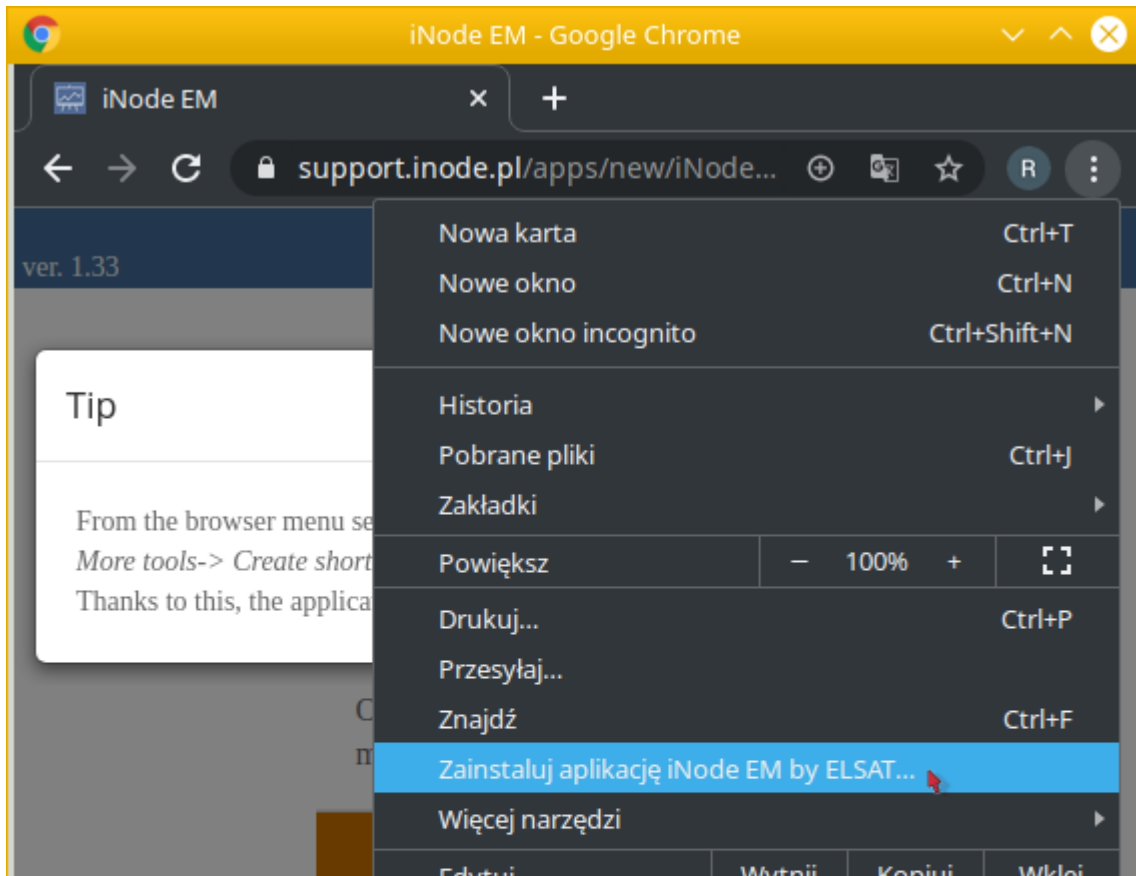
3. iNode EM application

The **iNode EM** application - <https://support.inode.pl/apps/new/iNodeEM/>, which works only in the Chrome browser, allows you to configure the iNode Energy Meter from an Android phone. After starting it, we see a message saying that it can be added to the desktop.

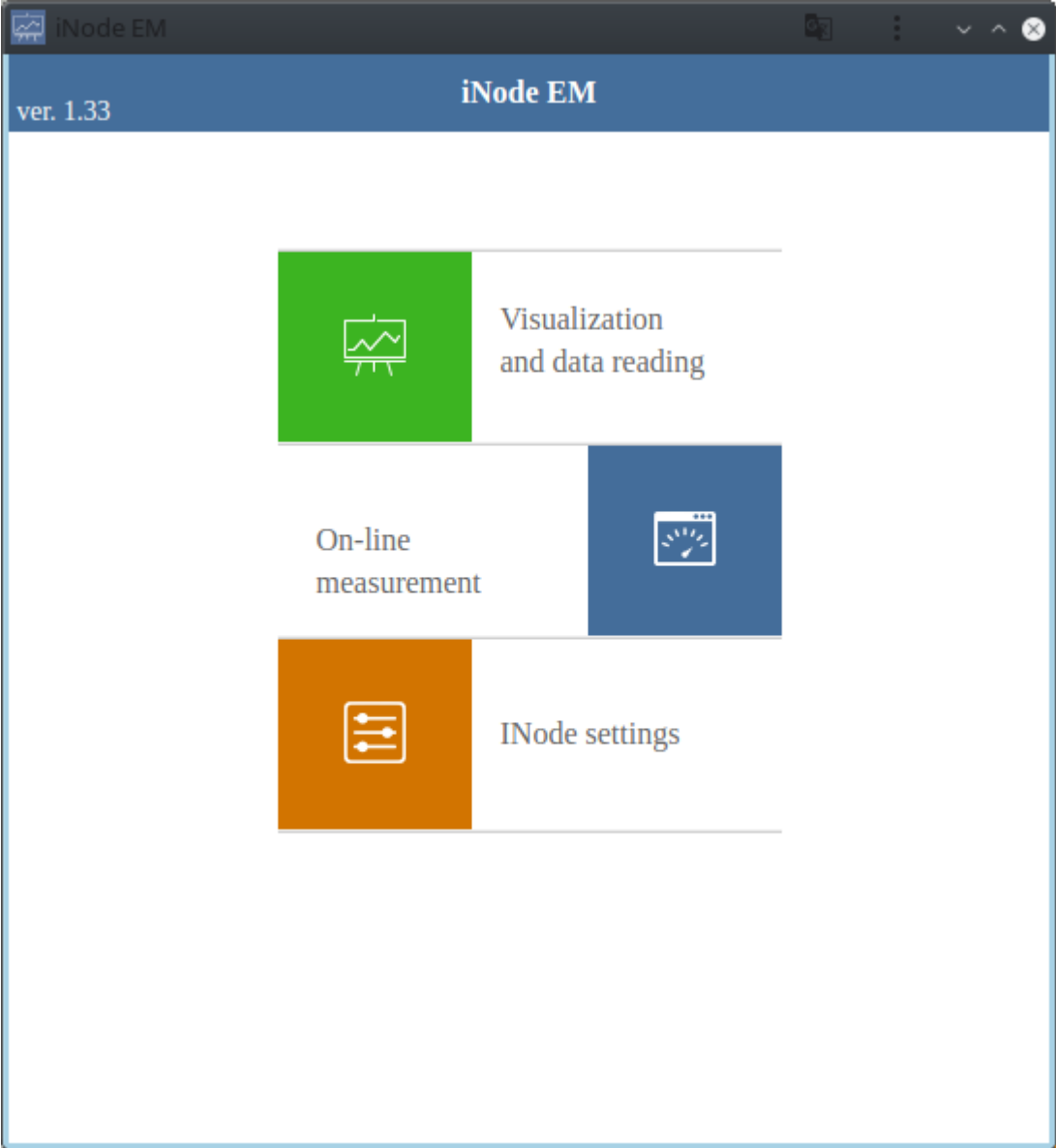


After pressing the right mouse button, if the cursor is on the application screen, we can choose the option of translating it into, for example, English.



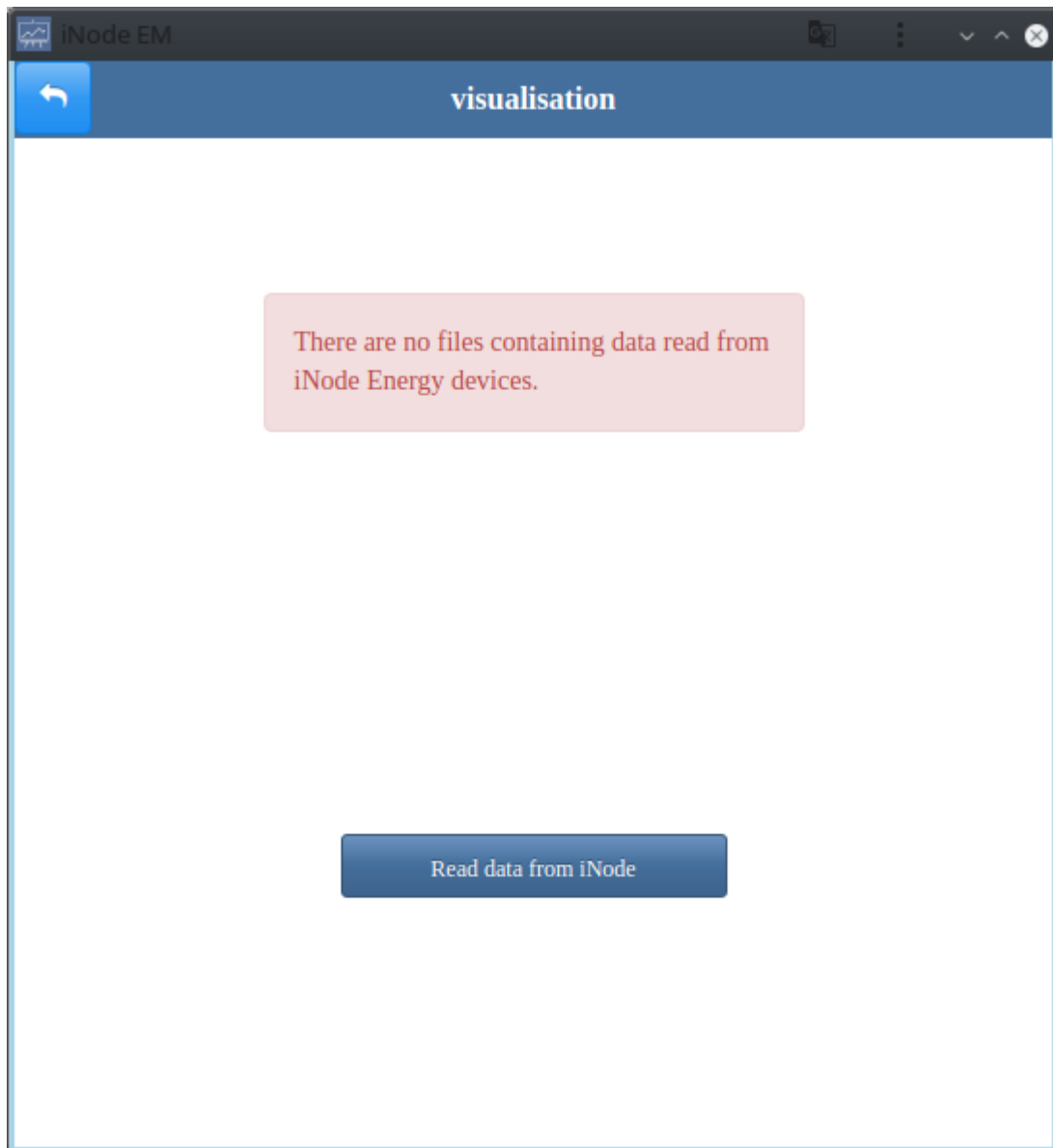


After closing the message, we see a screen with three options to choose from:

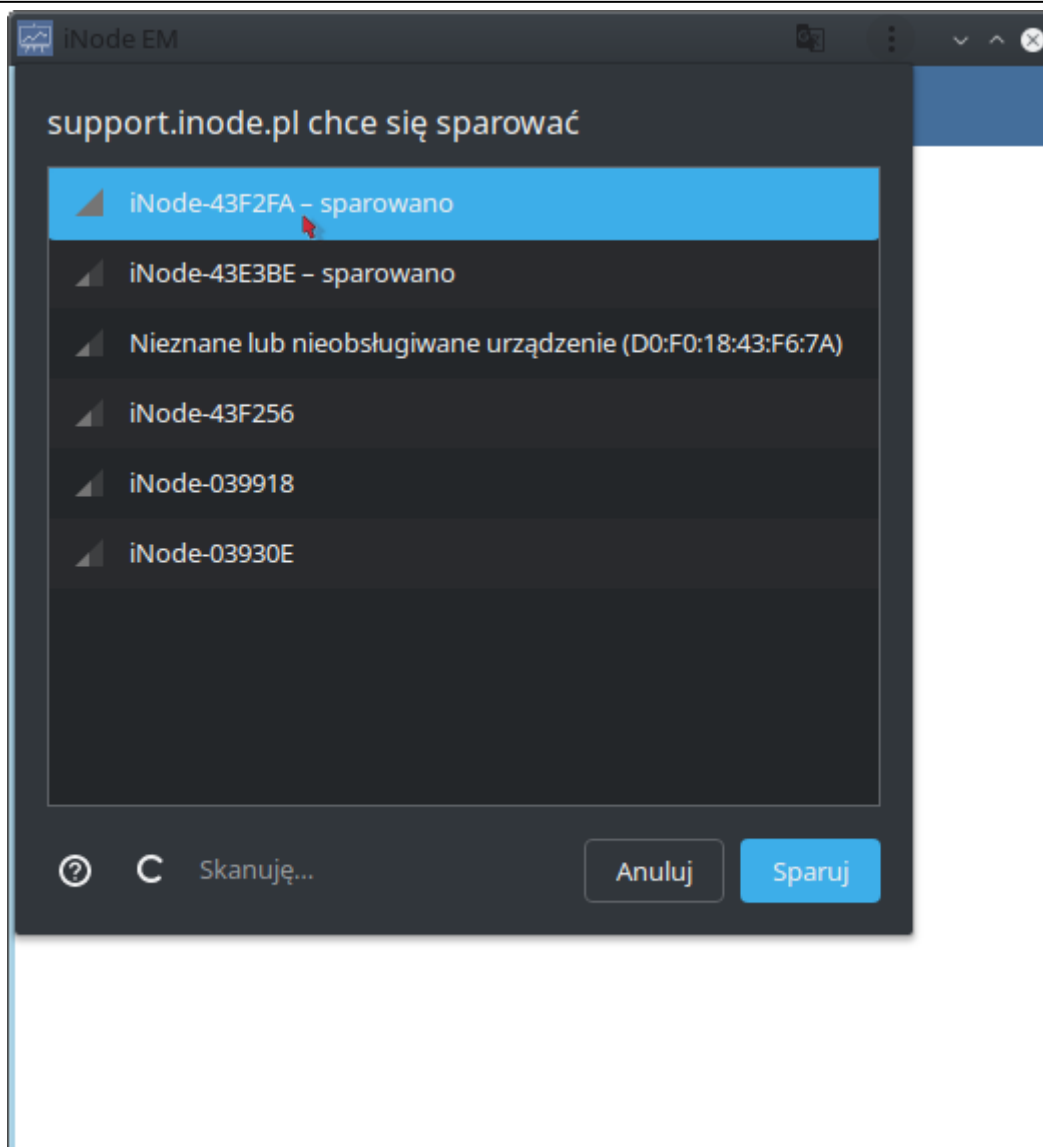


3.1 Visualization and data reading

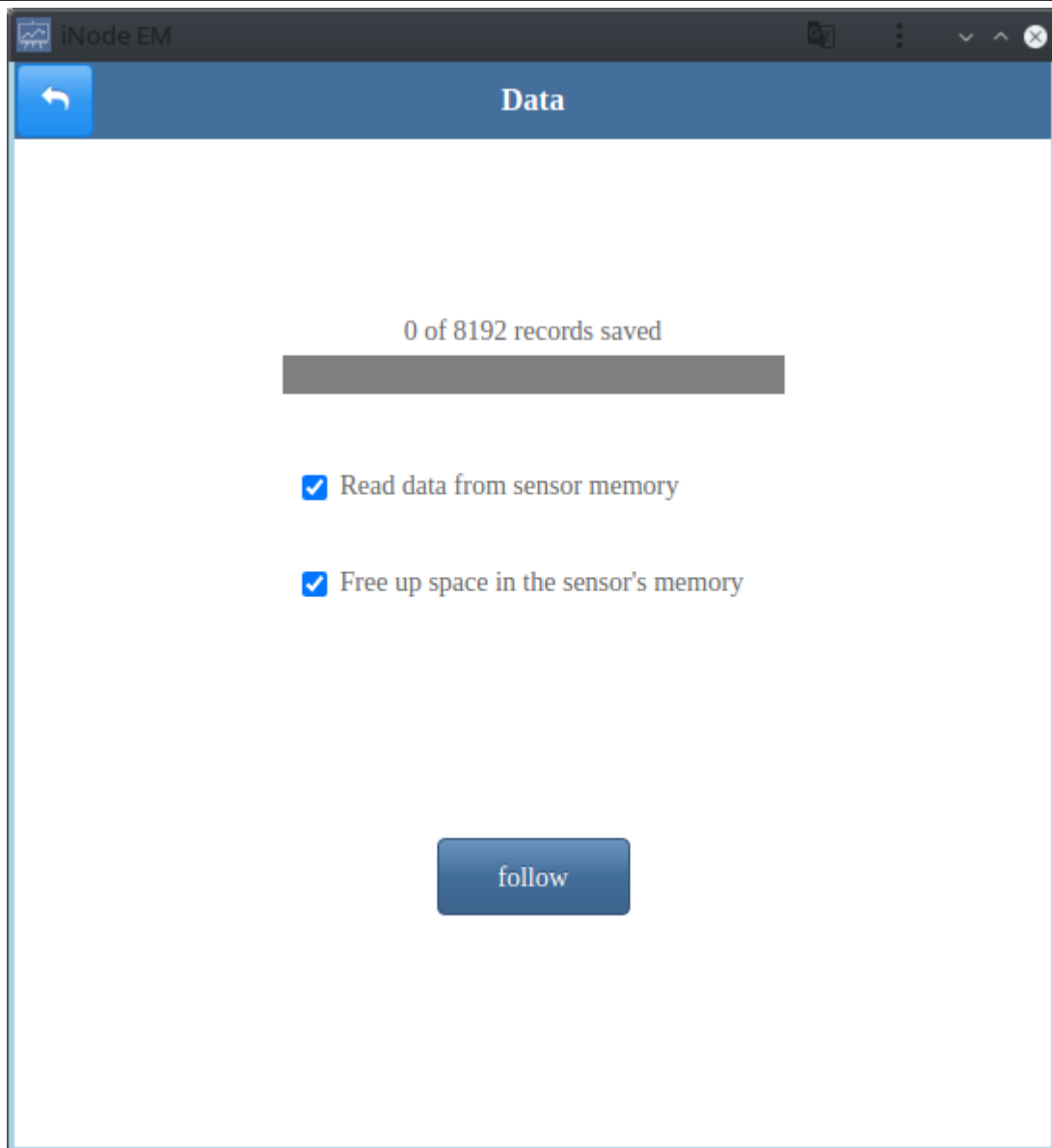
If any data has already been read from the **iNode Energy Meter**, it can be displayed here. The data is saved in the Chrome browser file system.



The **Read data from iNode** button allows you to read data from an **iNode Energy Meter**. First, a system window appears that allows you to select the Bluetooth device to which the application should connect.



After selecting the device and pressing the **Pair** button, the application will connect to it and read the data.



There are two options to choose from:

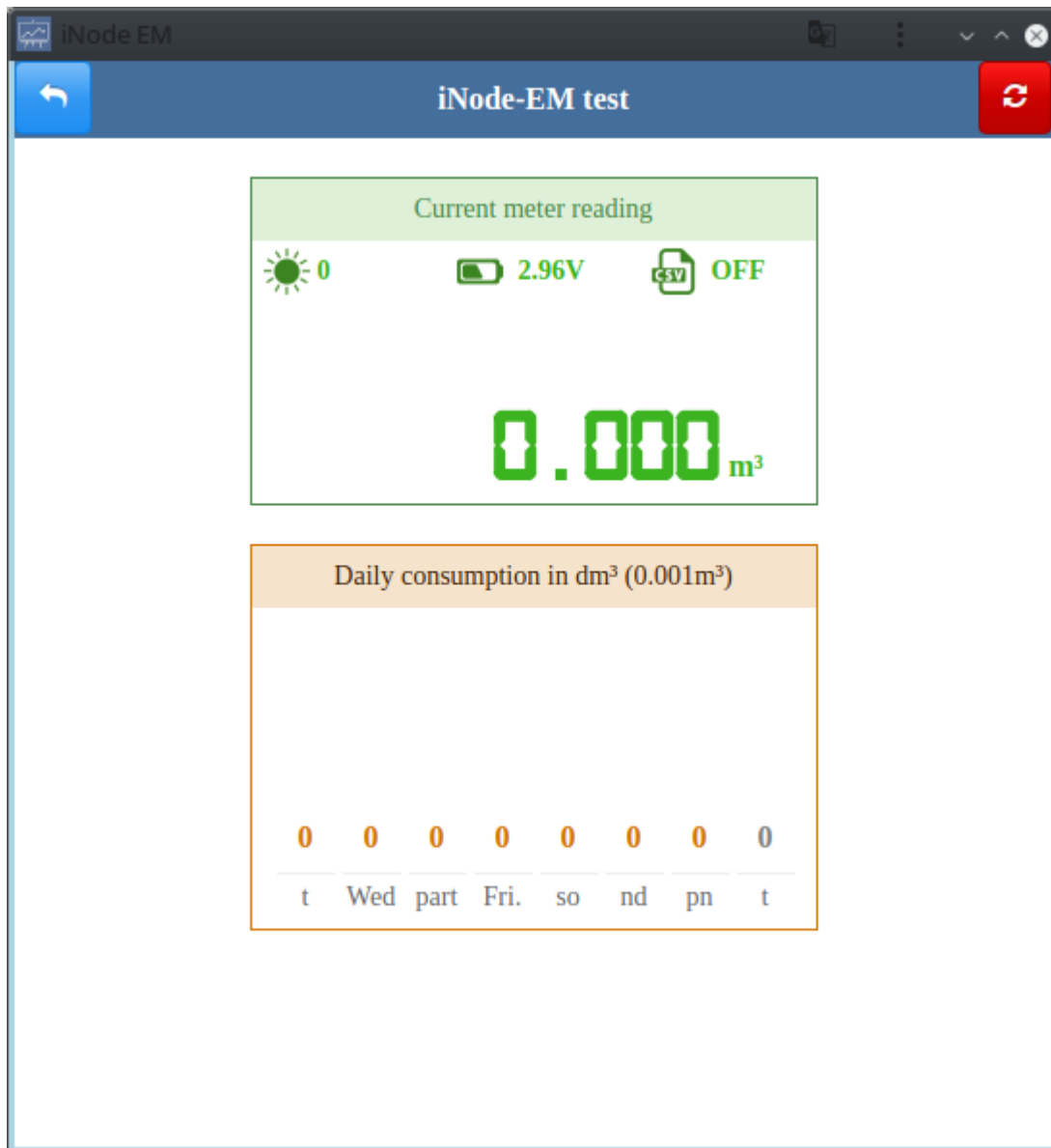
Read data from sensor memory - reads data from the sensor.

Free up space in the sensor's memory - deleting data in the sensor's memory.

The **Follow** button will connect the application to the **iNode Energy Meter**.

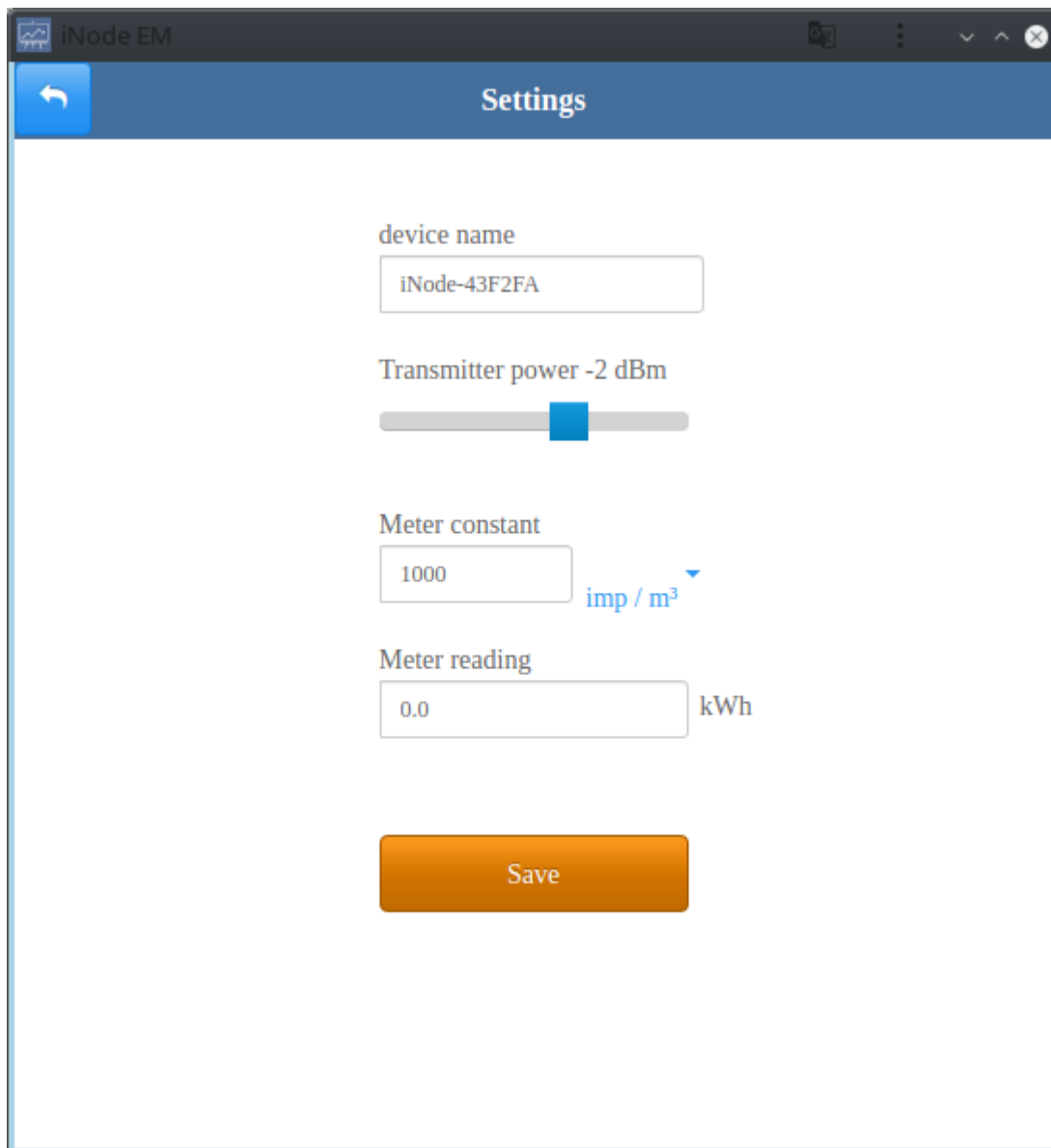
3.2 On-line measurement

Data received from the **iNode Energy Meter** are displayed on an ongoing basis. Data on registered daily consumption for the last 7 days are also provided.



3.3 iNode settings

We can change the basic parameters of the **iNode Energy Meter** here.



Those are:

Device Name – we are changing the device name here. Can have up to 20 characters.

Transmitter power – we set the power with which the device emits via BLE. The range depends on the device version.

Meter constant – depending on the type of meter with which the device works, enter the number of counted pulses per unit of counted pulses - kWh, m³ or pulses.

Meter reading - we can change the current meter status here.

The displayed settings are saved in the **iNode Energy Meter** after pressing the **Save** button.

4. Battery replacement

The **iNode Beacon** CR2032 battery should last up to 6 months. In the case of a 14250 battery that has five times the capacity, it will be correspondingly longer. In fact, the speed of its consumption depends on many factors, e.g. operating temperature, frequency of cooperation with a PC or smartphone (reading of recorded data), set transmission power level, etc. The battery voltage characteristics as a function of time (energy consumed from it) is for a long time. practically flat. Only at the end of the battery voltage begins to decrease rapidly, and its internal resistance increases, which leads to rapid wear.

To replace the CR2032 battery:

- Open the housing:

The **iNode** case can be opened without using tools. It is most convenient to do it just like a nut shell opens. That is, insert your thumb nails into the gap between the two parts of the housing and open it. Inside is a printed circuit board, most of which is occupied by a metal battery holder.

- Remove the circuit board from the housing. The battery is inserted into the side grip. It cannot be removed if the board is in the housing.
- Slide the old battery out of the holder.
- Insert a new battery:

The battery, like a coin, has two sides. One of them has a large "+" sign and usually the name of the company. The other side usually has no markings. The battery should be inserted so that the side marked with "+" touches the metal handle (the "+" sign also has it). If the operation was carried out correctly, the LED should start flashing.

- Insert the plate into the housing:

The circuit board is not perfectly round. It has a slight chamfer on one side. It corresponds to a small bulge inside the housing. When inserting the plate into the housing, make sure that these two elements are opposite each other.

- Close the housing:

On one of the housing parts there is a pin that prevents the battery from sliding out of the holder. It must be set so that it is close to the bevel described in the previous point. Only with this setting can the housing be closed.

To replace the 14250 battery:

1. Open the housing;
2. Slide the old battery out of the holder.
3. Insert a new battery paying attention to the polarity (minus in the direction of contact with the spring or as described).
4. Close the housing:

5. Technical information

Radio parameters:

- RX / TX:
 - BLE: 2402-2480 MHz
- output power (maximum):
 - BLE: + 8dBm or + 20dBm
- modulation:
 - BLE: GFSK
- antenna:
 - internal PCB

Software parameters:

- configurable from a PC:
 - power with which the device works in the range from -18 dBm to + 8 / 20dBm (depending on the device version);
 - device name;
 - meter constant and its initial value;
 - mask of channels used for broadcasting;
 - broadcast frame data and with the answer to the query in imitation mode of another BLE device;
 - user password;
 - device access password; independent of the user's password, the password for authorizing the application on a smartphone or PC (protects against copying it and against use by another client);

Power supply:

- CR2032 or 14250 (1/2 AA) or CR2 battery;

Housing:

- plastic;
 - dimensions:
 - CR2032: Ø 32 mm x 9.5 mm;
 - 14250: Ø 39 mm x 38 mm;
 - CR2 / 14250: 52mm x 32 mm x 19 mm;

Others:

- signaling by means of LEDs:
 - work in broadcast mode
 - scanning by another BLE device
- working temperature: from -20 to 45 ° C;
- humidity: 20 - 80% RHG;
- weight: 5 - 30 g;

Depending on the device version, it has one of the following sensors:

- optical passive – photo-transistor:
 - view angle: $\pm 12^\circ$;
 - spectral range: 620 nm – 960 nm;
 - frequency: 50Hz max.;
- magnetic field – Hall sensor:
 - sensitivity: 700 μ T typ., 1100 μ T max.;
 - type: omnipolar sensing- activates with either pole from a magnet;
 - frequency: 5 Hz max.;
- optical active – reflective:
 - built-in visible light cut-off filter;

Equipment:

- CR2032 or 14250 (1/2 AA) or CR2 battery depending on the housing;

Software:

- Windows NT/XP/Vista/7.0/8.0/8.1/10.0;
- Linux;
- Android;

Chipset:

- CSR1010 or EFR32;

THE MANUFACTURER RESERVES THE RIGHT TO MAKE CHANGES AND/OR IMPROVEMENTS IN DESIGNS, FEATURES & DIMENSIONS WITHOUT NOTICE AND WITHOUT INCURRING OBLIGATION

6. Correct disposal of the product (waste electrical and electronic equipment)



The packaging materials are 100% suitable for use as a secondary raw material. The packaging should be disposed of in accordance with local regulations. Keep packaging materials out of the reach of children as they pose a source of danger. The marking on the product or in related texts indicates that the product should not be disposed of with other household waste after it has expired. To avoid harmful effects on the environment and human health due to uncontrolled waste disposal, please separate the product from other types of waste and recycle responsibly to promote the reuse of material resources as a permanent practice.

Correct disposal of the device:



In accordance with WEEE Directive 2012/19 / EU, the symbol of a crossed-out wheeled waste container means all electrical and electronic equipment subject to separate collection. At the end of its useful life, this product may not be disposed of together with normal municipal waste, but should be taken to a collection point and recycling of electrical and electronic devices. This is indicated by the symbol of the crossed-out wheeled waste container, placed on the product or in the operating instructions

or packaging.

- The plastics used in the device can be reused in accordance with their markings. Thanks to the reuse, use of materials or other forms of use of used devices, you make a significant contribution to the protection of our natural environment.
- For information on the appropriate disposal point for used electrical and electronic devices, please contact your local municipality administration or the seller of the device.
- Used, completely discharged batteries and accumulators must be disposed of in specially marked containers, taken to special waste collection points or sellers of electrical equipment.
- Users in companies should contact their supplier and check the terms of the purchase contract. The product should not be disposed of with other household waste.

DEKLARACJA ZGODNOŚCI WE
EC DECLARATION OF CONFORMITY

My/We: **ELSAT s.c.**
(nazwa producenta / producer's name)
ul. Warszawska 32E/1, 05-500 Piaseczno k/Warszawy
(adres producenta / producer's address)

niniejszym deklarujemy, że następujący wyrób:

declare, under our responsibility, that the electrical product:

iNode Energy Meter

(nazwa wyrobu / product's name)

0x0801
CR2032; CR2/14250;
(model / model)

spełnia wymagania następujących norm:

to which this declaration relates is in conformity with the following standards:

PN-ETSI EN 300 328 V2.1.1:2016-11
PN-ETSI EN 301 489-1 V2.1.1:2016-11
PN-ETSI EN 301 489-17 V3.1.1:2016-11
PN-EN 50498:2010
PN-EN IEC 63000:2019-01
PN-EN 62479:2010

jest zgodny z postanowieniami następujących dyrektyw:

following the provisions following directives:

Dyrektywa RED 2014/53/UE
Dyrektywa EMC 2014/30/UE
Dyrektywa LVD 2014/35/UE
Dyrektywa RoHS 2011/65/UE

Rok, w którym umieszczono oznaczenie CE na produkcie: 2014

The year in which the CE marking placed on the product: 2014

08.02.2019 r.

Piaseczno k/Warszawy
(data i miejscowość / date and place)

Paweł Rzepecki



Współwłaściciel
(podpis i stanowisko / signature and function)

