



Efento Bluetooth Low Energy Loggers

User manual

V 1.5

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Product overview

Product description

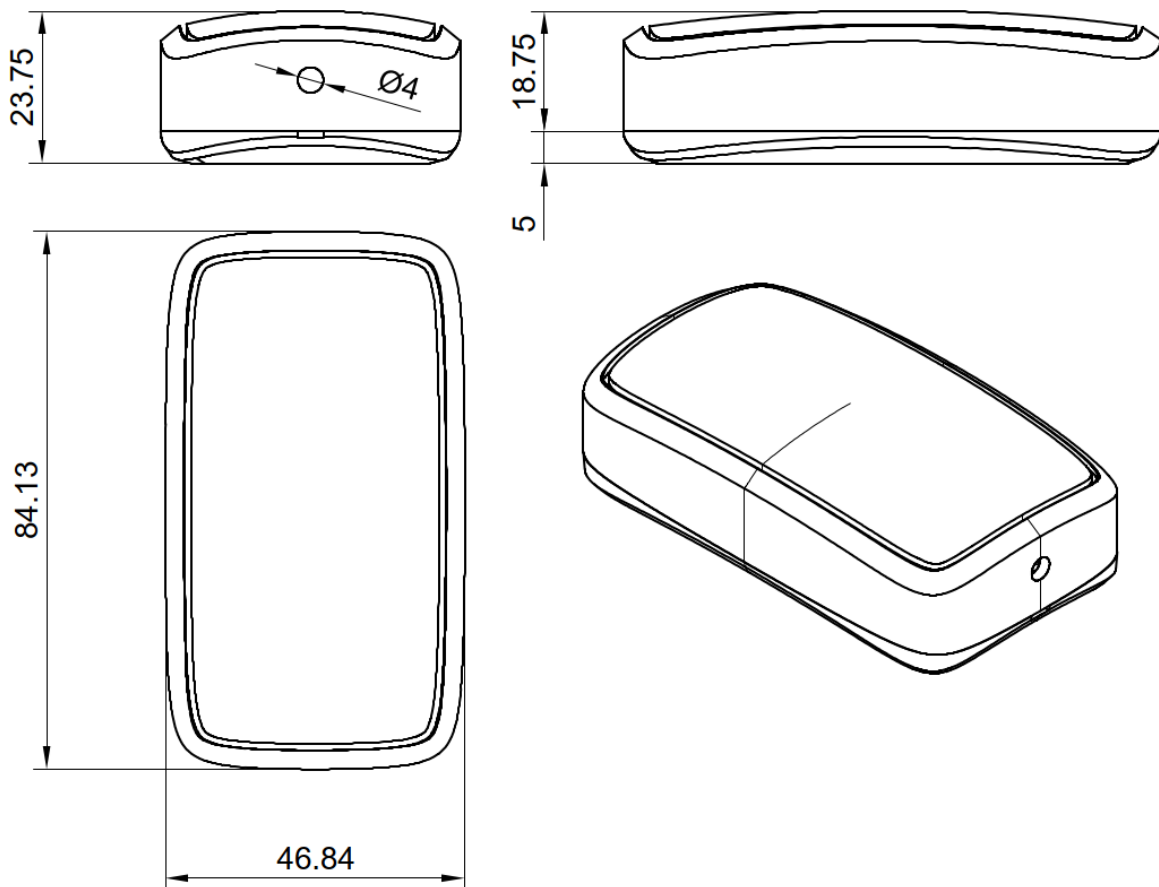
Efento Bluetooth Low Energy loggers transmit the data over Bluetooth Low Energy interface, what allows quick and easy configuration and data access with a smartphone. Moreover, devices can work with Efento Gateway, which sends the data to Efento Cloud or any other cloud platform.

Loggers are battery powered and can operate (depending on the settings) up to 5 years without any maintenance.

Technical data

Battery	1 x AA, 3.6V batteries, 2400 mAh Batteries lifetime up to 5 years
Measured values	Each logger can have up to three slots Each slot can measure: temperature (internal logger or probe), humidity (internal logger or probe), air pressure, VOC, open/close, pulse counter, leakage
Measurement interval	Configurable by user Measurement interval: 1 second – 10 days
Memory	60 000 measurements
Communication protocols	Bluetooth Low Energy (for communication with smartphones or Efento Gateway)
Indicators (troubleshooting)	All logger's information can be accessed with Efento mobile application
Mechanics	Enclosure material: ABS Size: 23.75 x 46.84 x 84.13 mm, 60 g Probes length (for logger with probes only): by default 1 meter, other lengths are available on request Operating range: -35°C to +70°C Mounting: double side adhesive tape with acrylic glue or 2 x M3 screws
Certifications	-

Physical dimensions



Logger types

Efento loggers measure various physical values / environmental conditions. One logger can have up to three channels with a probe / sensor assigned to it. The measured values include: temperature, humidity, air pressure, differential pressure, open/close, pulse counters, VOC, water leakage. The full and up to date list of sensor types can be found at getefento.com. The settings below are common for all types of sensors. If Efento Logger is used as a pulse counter, there are some settings that are different. This is described in "Pulse counters" chapter.

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Operating modes

Depending on your needs, Efento Bluetooth loggers can work with Efento gateway or with Efento mobile application.

Efento Gateway

Efento Gateway is a network device that sends the data from Efento loggers to Efento Cloud or any other cloud platform / server. Efento Gateway can receive and forward to a cloud platform data from up to 128 wireless loggers. Device is equipped with a large memory which stores up to 500 000 measurements from the assigned loggers. If there are any connectivity issues, it will automatically resend the missing data.

Efento Gateway supports many security features, including communication encryption: both between loggers and gateway (AES128) and gateway and server (TLS / SSL), proxy server and custom HTTP headers authorisation.

The device may be powered by USB power supply (5V, 1A) or by PoE (802.3af). Efento Gateway sends the logger data over REST protocol (HTTPS or HTTP). The range of Efento Gateway is up to 100 meters in the open space and 20 – 30 m in the buildings, depending on the building type (thickness and material of the walls, etc.).

To learn how to configure Efento Gateway to send the data to Efento Cloud, please refer to our support section: getefento.com/support

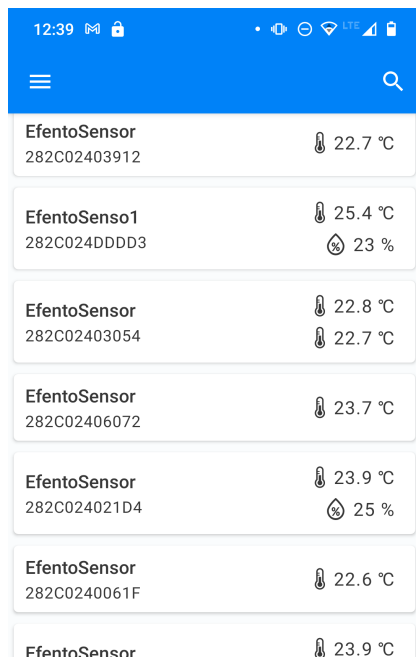
Efento mobile application

Efento mobile application allows users to interact with all Efento loggers (configuration, reading the measurements) and Efento Cloud platform (access to the loggers measurements and all cloud functions through a mobile device). Application is available free of charge in Google Play. Users can switch between the application modes (nearby and cloud) at any time. Application works with mobile devices equipped with Android 5.0 or newer and Bluetooth Low Energy interface.

Application installation

Download and install Efento mobile application from Google Play. The application is free and available for devices equipped with Bluetooth 4.0 and Android 5.0 or newer. After launching the application, please set it to “Nearby devices” mode.

Searching for loggers and displaying the data



Logger Name	Serial Number	Measurement
EfentoSensor	282C02403912	22.7 °C
EfentoSenso1	282C024DDDD3	25.4 °C 23 %
EfentoSensor	282C02403054	22.8 °C 22.7 °C
EfentoSensor	282C02406072	23.7 °C
EfentoSensor	282C024021D4	23.9 °C 25 %
EfentoSensor	282C0240061F	22.6 °C
EfentoSensor		23.9 °C

Remove protective tape from the logger's battery holder. Open the application, after a few seconds the application will automatically detect all loggers within range of your phone / tablet. The list shows the names of the loggers, their serial numbers and their current measurement values.

The padlock icon on the left side of the logger's serial number means that communication between logger and mobile devices is encrypted. The padlock icon displayed instead of the measurement value means the logger communication is encrypted and the mobile device is not able to decrypt the data (logger communication encryption is described in further parts of this user manual).

Warnings

The application notifies user of:

- **Low battery level** - a red battery icon next to the logger's name. After the icon appears, you have approximately 30 days to replace the battery. In the event of battery discharge, data that has already been saved in the logger memory will not be lost. After replacing the battery you will be able to read them from the logger memory
- **Measurement problem** - exclamation mark icon next to the logger's name. Logger is damaged and can't take proper measurements (measurements are out of scale, or the device is not able to take measurements at all). If you see this warning, contact Efento's support team at help.efento.io.
- **Logger has not been restarted** - during the first startup, we recommend resetting the logger to set the measurement period and time. If the logger has not been reset, all measurements data will be lost after removing the battery.
- **Software update** - if a new version of the software is available, information about it will appear under the logger name and serial number. To update the logger's software, simply click on it and enter the logger's PIN code (you can find it on the sticker on the enclosure).

Application configuration

To configure the application settings, click on the menu in the upper left corner of the application. Open the settings where you will be able to:

- **Activation Energy** settings are a constant used when calculating the average kinetic temperature. Its default value is 83.14472 kJ / mol.
- **Default encryption keys** settings are used to automatically decrypt the logger communication when it is encrypted with the same key (e.g. key "qwerty123" has been added as the default encryption key in the application. From now on, each logger encrypted with the key "qwerty123" will be decrypted by the application automatically). It can add up to five default encryption keys.
- **Location in PDF reports** - if this option is selected, the address of the place where the report was generated will be added to the footer of PDF reports generated by the application. The address is downloaded based on the GPS signal from Google Maps
- **Forget logger** - the application removes the encryption keys and reset codes of the selected logger

Logger configuration

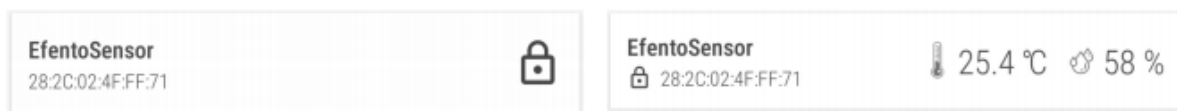
From the list of the loggers in range, select the one you want to configure and tap on it. If you selected an encrypted logger, enter the correct encryption key to allow the application to communicate with it. The application will connect to the logger and you will be able to configure the logger. Enter the settings menu by tapping three dots icon in the upper right corner of the screen to:

- **Change logger's name** - enter the new name of the selected logger, and then enter the PIN code (The PIN code is a four-digit number 4 assigned to each logger - you can find it on a sticker on the logger's enclosure). If you have entered the correct PIN, you will be able to change the device name. The new name will be visible on every phone / tablet that connects to the logger.
- **Clear logger's memory and / or change the measurement period** - select a new measurement period using the sliders and enter the PIN code (you will not be asked to enter the PIN code, if you have already entered the PIN code for this logger before). The application automatically calculates how many measurements will be stored in the logger's memory with the selected measurement period - this information is visible at the bottom of the screen. Save changes, logger memory will be cleared and a new measurement period will be set. By default, the measurement period is set to 3 minutes. For loggers, which measure physical / chemical values (e.g. temperature, humidity), the measurement will be taken with the set period. For pulse counters, the logger will count the number of pulses in that particular period of time (e.g. if the measurement period is set to 60 minutes, logger will count the number of pulses in each 60 minutes window). It is recommended to reset the device during the first configuration.

- **Encrypt logger communication** - communication between Efento loggers and mobile devices / Efento gateways can be encrypted (AES128 encryption). If the encryption is on, only the devices with the proper encryption key will be able to decrypt the data sent by the logger. Using encryption has been described in the next part of this document.
- **Pulse counter conversion ratio** (water and electricity pulse counters only) - user can define how many Wh / liters represents a single pulse. This allows users to set the proper conversion ratio based on the meter type and a value represented by a single pulse.
- In the case of NB-IoT loggers, full device configuration is accessible from this menu. The configuration has been described in the Efento NB-IoT loggers user manual

Encryption

Enabling the encryption will result in encrypting the data sent by the logger over Bluetooth Low Energy interface. The encrypted data sent by the logger can only be decrypted by a device with the encryption key. This feature is useful, if you need to be sure that only the authorized personnel can read the data over Bluetooth interface. Users who do not know the encryption key, will not be able to read the data.



If the logger communication is encrypted, only devices with a proper encryption key can read its measurements (right). Devices without the encryption key are not able to read the data (left)

In order to set the encryption key:

1. Connect to the logger with Efento Logger, tap on the three dots in the upper right corner -> "Settings" -> "Device settings" -> "Turn encryption on"
2. Key in the encryption key. Make sure you write it down as you will need to add it in mobile devices that will access the logger data
3. From now on, the communication is encrypted. You will need to add the encryption key in Efento Logger in order to see the data sent by the logger

In order to switch the encryption off:

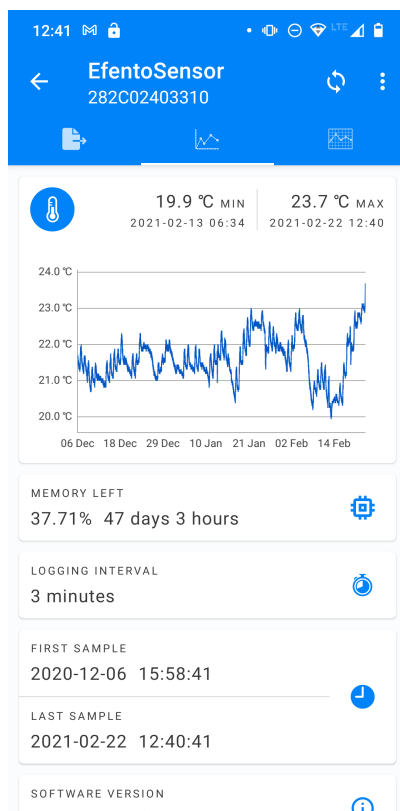
1. Connect to the logger with Efento Logger, tap on the three dots in the upper right corner -> "Settings" -> "Device settings" -> "Turn encryption off"

If the encryption has been turned on, once you try to connect to the logger with Efento Logger, you will be asked to key in the encryption key. Once you add it, the application will store the encryption key and you will be able to access the logger without adding it again. Efento Logger allows you to add up to five default encryption keys. If a logger communication is encrypted with any of the added keys, Efento Logger will automatically decrypt the data. This is useful for managing a fleet of loggers. In order to add a default encryption key in Efento Logger:

1. Enter the application settings (menu icon in the upper left corner -> “Settings”)
2. Select “Default keys”
3. Press “Add encryption key” button
4. Add the encryption key and its label

If you want to delete an encryption key:

1. Enter the application settings (menu icon in the upper left corner -> “Settings”)
2. Select “Default keys”
3. Tap and hold the encryption key you want to remove

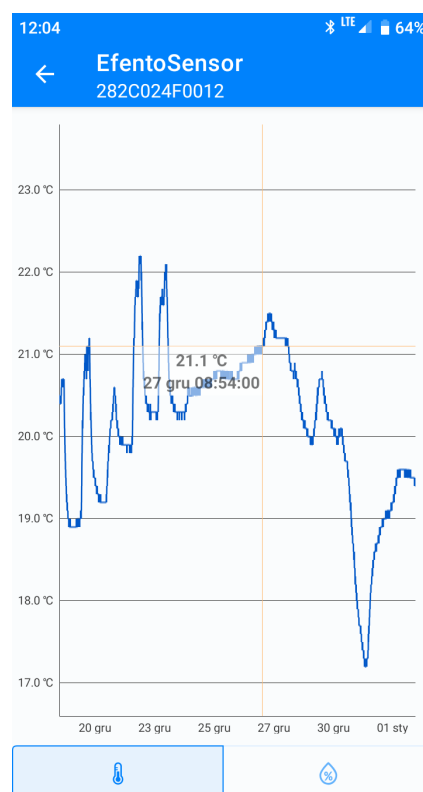


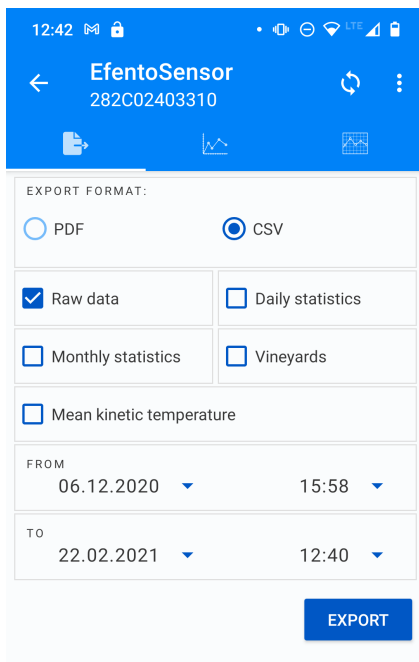
Reading data from the logger memory

After connecting to the logger and downloading the data you will see a screen with a summary of the measurements downloaded from the logger’s memory. The summary includes: date and time of the first and the last measurements; minimum and maximum values in the series for each of the measured physical values together with the date and time of their occurrence; graph showing the measurement values over time; measurement period along with information about available device’s memory and the number of days it is enough for it; logger software version.

Charts

Click on the chart in the general view to zoom it in. Use your fingers to zoom in / out the chart and scroll it. Red and blue lines on the chart indicate the minimum and maximum values in the measurement series. If the logger measures more than one physical value, select the one you want to display on the chart using the dropdown at the top of the screen.





Exporting the data

To export the data, from the top menu select the export icon (first icon on the left). Select the type of data you want to export (measurements, daily statistics, monthly statistics, SAT and GDDC values and mean kinetic temperature) and the range from which the data should be exported and press "Export". Data can be shared using any application installed on your phone - you can send it by email, save it to Google Drive / Dropbox, send it to an FTP server or print it using a printer connected via Bluetooth or WiFi. The data can be exported in CSV format, which is supported by many popular data processing programs (Excel, Matlab, etc.) or PDF - not editable file, good for documentation. CSV report contains data only, PDF report contains a chart.

Statistics

The application calculates statistical values from the downloaded data series. To display statistics, select the statistics icon from the top menu (first icon on the right). Currently supported statistics include:

- **Average values** - average value of the measurements on a daily or monthly basis;
- **Minimum and maximum values** - the minimum and maximum measurement value on a daily or monthly basis;
- **SAT and GDDC** - parameters used in grapes cultivation;
- **The length of the growing season (LGS)** - determines the number of days, in which the average daily temperatures were above 10 Celsius degrees. The region is widely considered as suitable for viticulture, if the LGS value is higher than 182.
- **The Huglin index** is the sum of active temperatures from the beginning of April to the end of September. HI includes day length as well as average and maximum daily temperatures. It is divided into 6 climate classes, from very cold ($HI \leq 1500$) to very warm ($HI > 3000$). The heliothermal index using sums of air temperatures and latitudes is one of the most common methods used to identify relevant wine growing areas. The Efento Logger application uses GPS to determine the user's position and takes it into account when calculating the Huglin Index. Thanks to this, the index values are precisely calculated for the specific place where the measurements have been taken
- **The Cool nights index (CNI)** defines a relative measure of ripening potential equal to the average minimum temperature during the month before harvest. In the

northern hemisphere: CI = average minimum temperature in September, in the southern hemisphere: CI = average minimum temperature in March

- **Mean kinetic temperature** - allows users to assess the effect of temperature changes on maintaining the quality of the drug. If the permissible storage temperatures are exceeded temporarily, it may be part of the assessment of the medicine's usability.

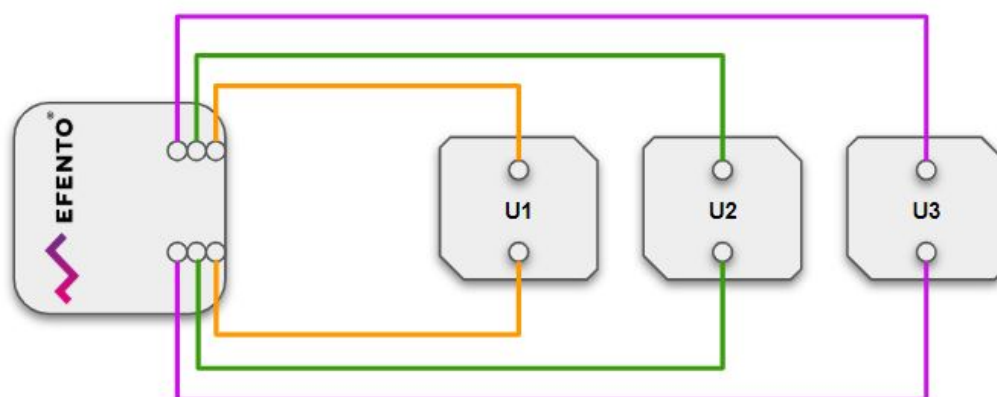
Pluse counters

Pulse counters are special types of sensors that are used to count the number of pulses provided by a third party device / meter. There are various use cases of the pulse counters, including reading water / electricity / gas meters or counting the number of events (e.g. door opening and closing).

Efento offers three types of pulse counters: water pulse counter, electricity pulse counter and generic pulse counter. From the hardware perspective, the devices are identical. The only difference is on the software side - water pulse counter converts the number of pulses to litres, electricity pulse counters converts the number of pulses to Wh and generic pulse counter returns the number of pulses counted in the set time period.

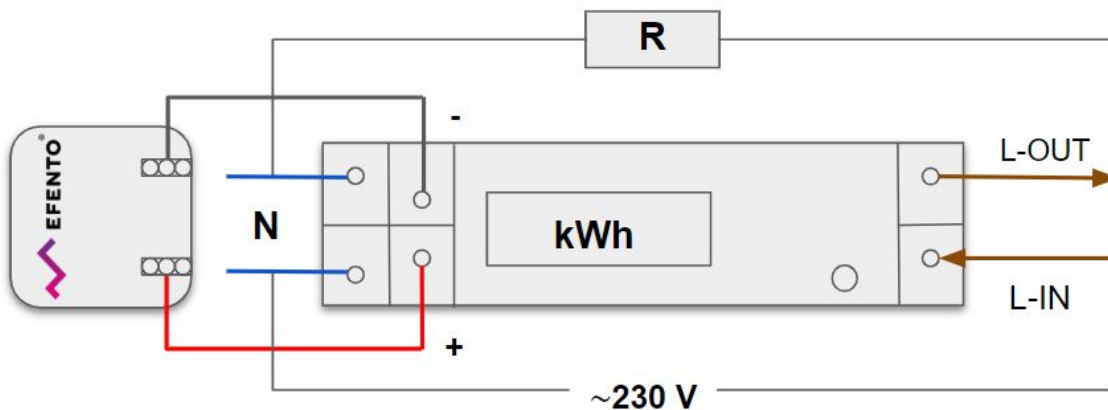
Connecting pulse counters

Efento pulse counters can be equipped with three channels, each of them counting the pulses separately. **Efento pulse counters support devices, which provide SO pulses (dry contact)**. The device, which provides pulses should be wired to Efento pulse counter's CH and GND pins (in case of a multi-channel pulse counter: CH1-GND, CH2-GND, CH3-GND)



Efento pulse counter - wiring scheme

Efento electricity pulse counter should be wired to SO output of an electricity meter.



Efento electricity pulse counter - wiring scheme

CAUTION! Risk of electric shock! To avoid a shock hazard:



- Shut OFF all power sources and equipment to be attached to this product
- Attach all cables to the devices
- Turn ON all the power sources

ALWAYS read and follow the user manual of the electricity meter, which you connect to the Efento pulse counter.

Conversion ratio

Efento water and electricity pulse counters allow users to set the conversion ratio for each of the channels. Pulse counter will convert the number of pulses counted in the set period of time based on this ratio. For instance, if the user sets the water meter's conversion ratio to '1', the device will treat a single pulse as 1 litre. If the conversion rate has been set to '10', each pulse will represent 10 liters. In case of the electricity pulse counters, users may set the number of Watt-hours (Wh) represented by a single pulse.

In order to change the conversion rate, connect to the device, and from the settings menu select "Advanced" -> "Pulse count. conversion ratio".

Pulse duration control

It is possible to set the maximum length of a pulse accepted by Efento Pulse Counter. If a pulse counter receives a pulse longer than the set value, it will be considered as an error and reported over NB-IoT / Bluetooth. This feature is useful if Efento Pulse Counters work with utility meters equipped with pulse outputs with defined pulse lengths. By setting the maximum accepted length of a pulse user may control the correct operation of the meter. By default the pulse duration control is off and Efento Pulse Counters treats all pulses length as acceptable.

FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

RF Exposure Information

The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.