

SenNet IoT Easy Meter

Energy Meter 3PH CT/Rogowski & Gateway for remote nodes

General description

SenNet IoT Easy Meter is a device that monitors 3PH energy electrical circuits, with two options of current transformer, 0.33Vac or flexible Rogowski. This device has the possibility to create a local RF Network with remote nodes with different features: Pulse Counter / Temperature-Humidity / CO₂ / Particulate Matter etc., and send all this information in one Sigfox message.

The configuration of all these features is possible by three ways:

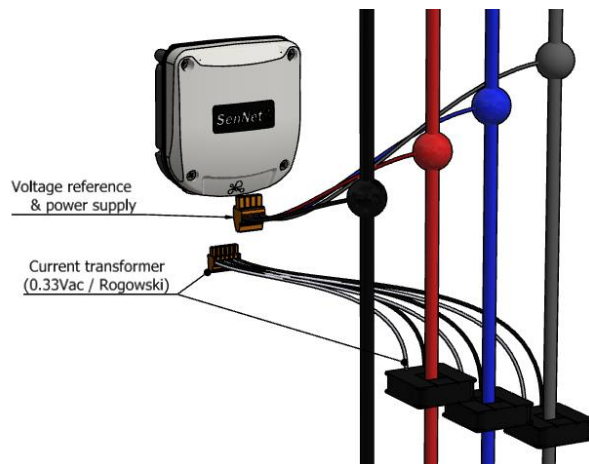
- Through APP SenNet NFC (IOS or Android).
- Micro-usb connection and console/terminal.
- Downlink message on sigfox backend.

The end-user can select what kind of energy data and remote device wants to upload to the cloud, must select the type of message (see in the next section).

Power supply

The device uses voltage reference as the power supply (100-265VAC @ 50HZ), it's important just to use Neutral Line Vn and V1. There is an internal fuse to protect the device against surge damages.

| | |
|----------------------|-------------------|
| Voltage power supply | 100-265VAC @ 50HZ |
| Power | <1W |



Basic steps to install:

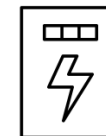
1. Set the type Current Transformer:
CT-0.33Vac: 50A, 100A, 150A, 400A , 800A
Flexible-Rogowski: 3500A, 3700A, 5000A
2. Set the type of message to use and take note to parse this data on your preferred platform.
3. Take note ID / PAC to sign the device on Sigfox Cloud.
4. Connect voltage reference (feed internal power supply) and current reference.

Additional steps:

- Define and install remotes devices that will join to Local Network
- Set an univoque ID at each remote device



Sigfox Ready Certification / Class U1



Power Meter
3 Phase Class 1
(CT's 0.33v -Rogowski)



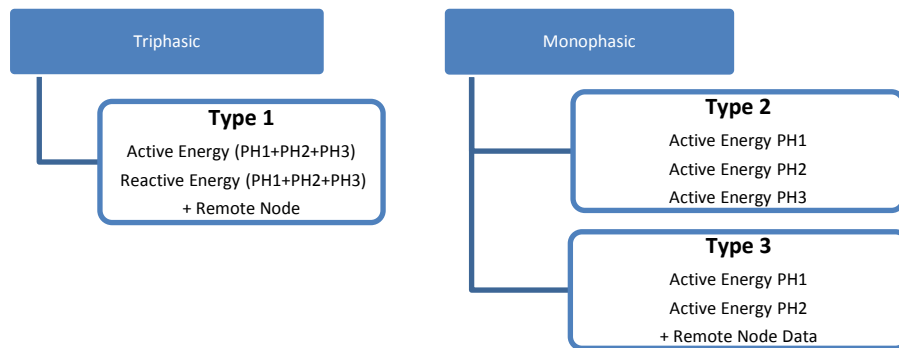
Local RF Network
Remotes Nodes

Type Message

SenNet IoT Easy Meter is a powerful Energy Meter, the client must select what kind of data will be uploaded to the platform. For that reason, the devices have been defined by default several types of message what includes the main information from each electricity measurement.

The main interest always is the total Energy accumulated, if your interest is on another parameter you can contact with our technical department to ask for it.

Depending on the type of load to be monitored (triphasic or monofasic) you may choose these types of uplink messages:



A common point in all types of messages is the head (defined with 2 bytes) that includes important information embedded in the message (type device/type message/errors.. etc). In the next table are defined the mean of these info-fields.

| Field Info | | | | | | | | | | | | | | | | |
|------------|---------------------------|---|---|-----------------------|---|---|---|-------------------------------|------------------------|---|--------------------------------------|---|---|--|---|---|
| Byte | Byte 1 | | | | | | | Byte 2 | | | | | | | | |
| | <u>Type Master Device</u> | | | <u>Type Message</u> | | | | Some Phase in generation mode | Voltage sequence error | Overvoltage /SAG / Internal meter error | <u>Type Remote Nodes</u> | | | <u>ID Remote Nodes</u> | | |
| | 01 - Easy Meter | | | type 0 (info) | | | | | | | 0x00 – No local Network | | | No Remote = 000 | | |
| | 02 - PC LongNet | | | type 1 | | | | | | | 0x01 - PC LongNet | | | Remote ID = 001 _b = 01 _d | | |
| | 03 – Not defined | | | type 2 | | | | | | | 0x02 - TH LongNet | | | = 010 _b = 02 _d | | |
| | 04 – Enviroment Sensor | | | type 3 | | | | | | | 0x03 - CO2 LongNet | | | = 011 _b = 03 _d | | |
| | 05 – Not defined | | | type 4 | | | | 0x04 - PM LongNet | | | = 100 _b = 04 _d | | | | | |
| | 06 – GW Modbus LN | | | type 5 (not defined) | | | | 0x05 – GW Modbus LN | | | = 101 _b = 05 _d | | | | | |
| | 07 – Not defined | | | type 6 (not defined) | | | | 0x06 – Analog Input | | | = 110 _b = 06 _d | | | | | |
| | | | | .. | | | | 0x07 – Not defined | | | (6 nodes maximum) | | | | | |
| | | | | type 15 (not defined) | | | | Feedback Error | | | | | | | | |
| Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| | Byte1 Bit 7-6-5 | | | Byte1 Bit 4-3-2-1 | | | | Byte1 Bit 0 | Byte2 Bit 7-6 | | Byte2 Bit 5-4-3 | | | Byte2 Bit 2-1-0 | | |

Table 1

| Type 1 : Active + Reactive Energy + Remote Node | | | | | | | | | | | |
|---|-------------|---|---------------------------|---|---|---|-----------------------------|---|---|----|-------------------------------|
| Field | Info | | Active Energy PH1+PH2+PH3 | | | | Reactive Energy PH1+PH2+PH3 | | | | Data from Remote node |
| Type data | See Table 1 | | Float 32 bits unit kWh | | | | Float 32 bits unit kvArh | | | | Depending on Remote node type |
| Byte | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 12 |

| Type 2: Active Energy PH1 + Active Energy PH2 + Active Energy PH3 | | | | | | | | | | | |
|---|-------------|---|---------------------------------|---|---|---------------------------------|---|---|---------------------------------|----|----|
| Field | Info | | Active Energy PH1 | | | Active Energy PH2 | | | Active Energy PH3 | | |
| Type data | See Table 1 | | resolution=100wh Max. 1.6Mwh | | | resolution=100wh Max. 1.6Mwh | | | resolution=100wh Max. 1.6Mwh | | |
| Byte | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |

| Type 3: Active Energy PH1 + Active Energy PH2 + Remote Node Data | | | | | | | | | | | |
|--|-------------|---|-------------------|---|---|---|-------------------|---|---|----|-------------------------------|
| Field | Info | | Active Energy PH1 | | | | Active Energy PH2 | | | | Data from Remote Node |
| Type data | See Table 1 | | Float 32 bits | | | | Float 32 bits | | | | Depending on Remote node type |
| Byte | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 12 |

Remote Node Data:

| Type of Remote Node | | |
|--------------------------------------|---|---|
| TH LongNet – 868 | 1 byte temperature Payload [-10°C...60°C] conversion function Temperature=Payload*0.2745-10 | 1 byte humidity Payload [0-100%] Humidity=Payload |
| Pulse Counter LongNet – 868 | 2 bytes (integer type) - maximum value 65535 Only is enabled input 1 "C1" | |
| CO2 LongNet – 868 | 2 bytes (integer type) | |
| | byte 2 -High part- | byte 1 -Low part- |
| | 7 6 5 4 3 2 1 0 | 7 6 5 4 3 2 1 0 |
| | CO2 Payload (± 12ppm) CO2=Payload*12.6984+400 | Temperature Payload (± 1°C) T=Payload*1.111-10 Hum. Payload (± 6%) H= Payload*6.66 |
| Particulate Matter - 868 | 2 bytes (integer type) - under development | |
| Gateway Modbus – 868 | 2 bytes (custom) – under development | |
| Gateway Custom Protocol – 868 | 2 bytes (custom) - under development | |

Downlink Message

It's possible to set the device in the cloud without interacting with it locally, defining this type of downlink message and CT value on the sigfox backend or in your platform. That method is optional but it's not necessary.

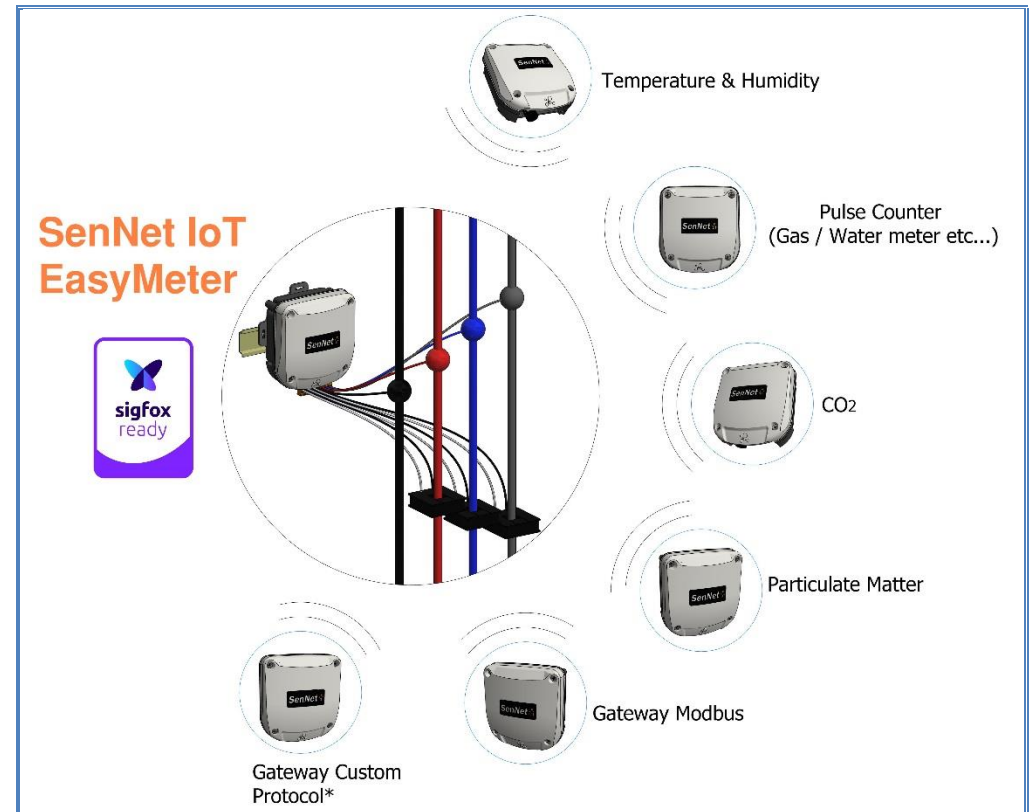
| Byte | 1 | 2 - 5 | 6 | 7 | 8 |
|-------|--|----------------------|---------------------------------|--------------------------------------|-------------|
| Field | Easy Meter Setup byte (1byte) | Set time (4bytes) | Type uplink Message (1 byte) | CT value (2 byte) (hex. value) | |
| Value | Bit 7 1 (by default) | {Time-Epox} | 01 02 03 .. | High Part | Low Part |
| | Bit 6 1/0 enable/disable set Time | | | | |
| | Bit 5 1/0 enable/disable set Type uplink Message | | | | |
| | Bit 4 1/0 enable/disable set value CT | | | | |
| | Bit 3 1 (by default) | | | | |
| | Bit 2 1/0 enable/disable Debug 1 (versión HW/FW) | | | | |
| | Bit 1 1/0 enable/disable Debug 2 (internals errors) | | | | |
| | Bit 0 1/0 enable/disable Debug 3 (instant power value) | | | | |

Example for downlink message:

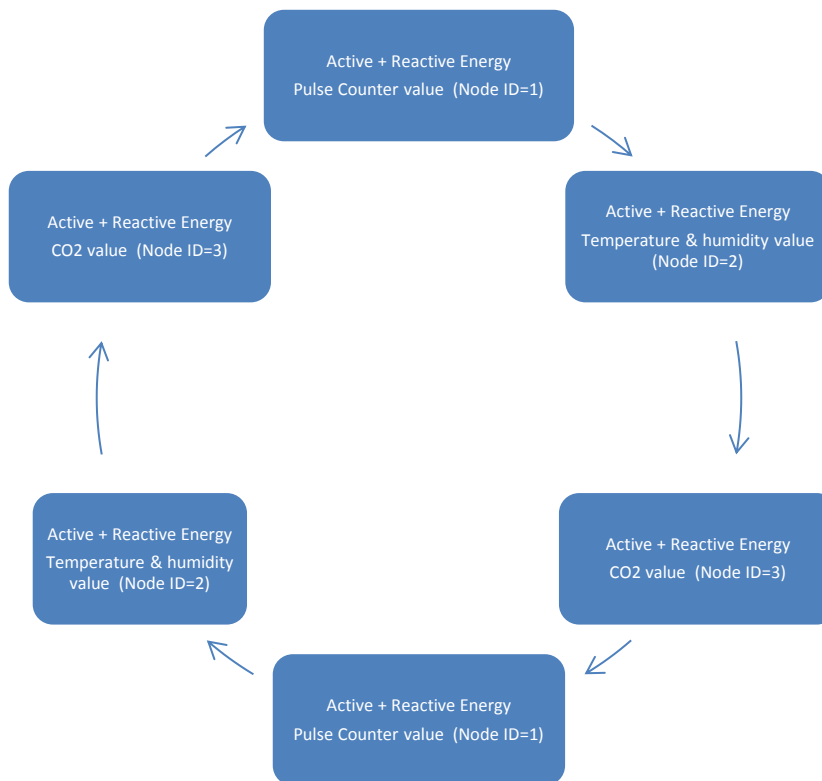
F8 {time} 01 00 32 → With this downlink message set the remote device on time, with type of message 01 and CT value 50 Amps.

Local RF Network & types of Remotes Nodes

SenNet IoT Easy Meter can works like sigfox gateway for up to 6 remotes nodes.



An example for sending a message type 1 with 3 remotes devices defined in the local network.
The data of each remote device is sent alternatively in this bucle.
To parse the data from Remote node the client must use the **Info** field (see *table 1*).



SenNet Easy Meter works as Local
Network coordinator and gateway
for Remotes Nodes



Easy Meter



Pulse Counter
Node ID=1



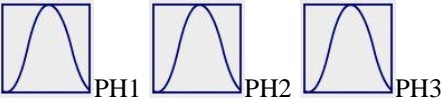

Temperature & Humidity
Node ID=2

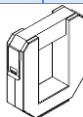
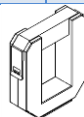
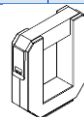


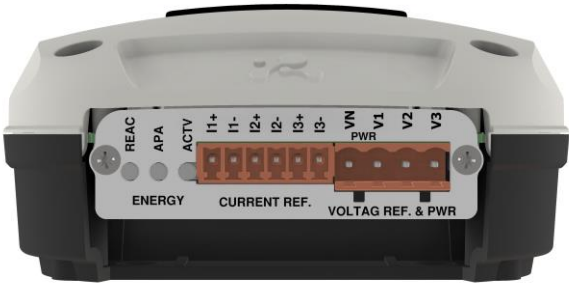
CO2
Node ID=3

Power Meter features


These devices include advanced technology for metering power electricity loads, using a current reference and voltage reference. It's possible to use this device like a 3 single-phase meter or 1 three-phase meter, it depends on the client's goal to monitor.

| Type of load to monitorized | |
|----------------------------------|--|
| 3 single-phase loads independent |  |
| 1 three-phase load |  |

| Led output pulse | Current Reference | | | | | | Voltage Reference & Power Supply | | | |
|--|--|------------|--|------------|--|------------|-----------------------------------|------------|------------|------------|
| | I1+ (1) | I1- (2) | I2+ (3) | I2- (4) | I3+ (5) | I3- (6) | Vn (19) | V1 (20) | V2 (21) | V3 (22) |
| Reactive Power Aparent Power Active Power 1 pulse/seg = 1kw |  PH1 | |  PH2 | |  PH3 | | Power Supply 100-265VAC @ 50HZ | | | |
| Type CT current transformer (CT – 0.33vac) 50A, 100A, 150A, 400A , 800A, (Rogowski type) 5000A | | | | | | | | | | |



Voltage reference

| | |
|--|---|
| Range | 110-220/240VAC (CAT III – 400V) |
| Frequency | 50-60Hz |
| Electrical isolation | 2.5Kv @ 60second |
| Power supply requirement | 0.1 VA per phase |
| Accuracy | Class 0.2 (+/-0.2%) |
|  | Recommend using electrical protection before connecting this reference. |

Current reference

This device can use current transformers (CT) of two types 0.33Vac and flexible type (Rogowski), depending on each type has a different type of accuracy.

| Types | Range of measurement | Output type | Accuracy |
|------------------------------|----------------------|-------------|-----------------------|
| CT 50 A | 1....50 A | 0.33VAC | +/-1% (5%....100% In) |
| CT 100 A | 1....100 A | 0.33VAC | +/-1% (5%....100% In) |
| CT 150 A | 1....150 A | 0.33VAC | +/-1% (5%....100% In) |
| CT 400 A | 1....400 A | 0.33VAC | +/-1% (5%....100% In) |
| CT 800 A | 1....800 A | 0.33VAC | +/-1% (5%....100% In) |
| Flexible 5000 A (7cm Ø) (*) | 10....5000 A | Rogowski | +/-1% (centered) |
| Flexible 5000 A (12cm Ø) (*) | 10....5000 A | Rogowski | +/-1% (centered) |
| Flexible 5000 A (20cm Ø) (*) | 10....5000 A | Rogowski | +/-1% (centered) |

(*)Must use flexible SenNet Rogowski model to certificate Class 1. (Factory Calibrated)

Accuracy on current measurement

| | | |
|---------------------------------------|---------|-------------------------------|
| Easy Meter + SenNet CT 0.33Vac | Class 1 | (Class 0.5 under requirement) |
| Easy Meter + Flexible SenNet Rogowski | Class 1 | Factory Calibrated |

Electrical isolation

| | |
|--------------------------|-------------------------|
| SenNet CT 0.33Vac | 2.5KV / 0.5mA / 3second |
| Flexible SenNet Rogowski | 600V CAT IV |

Tabla – Modbus RTU , a través de Gateway Modbus LongNet

- Modbus RTU: 9600 kbits – 8N1
- Formato: Float inverse
- 16 bit cada registro (2 bytes)
- Base 0

| Meter 1 | Register | Register | Description | Format | Units |
|---------|----------|----------|---------------------------------|----------------------|-------|
| 1 | 00000 | 00001 | Frequency Hz | 32 bit Float Inverse | Hz |
| 1 | 00002 | 00003 | Phase 1 Power factor | 32 bit Float Inverse | |
| 1 | 00004 | 00005 | Phase 2 Power factor | 32 bit Float Inverse | |
| 1 | 00006 | 00007 | Phase 3 Power factor | 32 bit Float Inverse | |
| 1 | 00008 | 00009 | Phase 1 to Neutral Voltage | 32 bit Float Inverse | V |
| 1 | 00010 | 00011 | Phase 2 to Neutral Voltage | 32 bit Float Inverse | V |
| 1 | 00012 | 00013 | Phase 3 to Neutral Voltage | 32 bit Float Inverse | V |
| 1 | 00014 | 00015 | Phase 1 Line current | 32 bit Float Inverse | A |
| 1 | 00016 | 00017 | Phase 2 Line current | 32 bit Float Inverse | A |
| 1 | 00018 | 00019 | Phase 3 Line current | 32 bit Float Inverse | A |
| 1 | 00020 | 00021 | Phase 1 Active Power | 32 bit Float Inverse | W |
| 1 | 00022 | 00023 | Phase 2 Active Power | 32 bit Float Inverse | W |
| 1 | 00024 | 00025 | Phase 3 Active Power | 32 bit Float Inverse | W |
| 1 | 00026 | 00027 | Phase 1 Reactive Power | 32 bit Float Inverse | VAr |
| 1 | 00028 | 00029 | Phase 2 Reactive Power | 32 bit Float Inverse | VAr |
| 1 | 00030 | 00031 | Phase 3 Reactive Power | 32 bit Float Inverse | VAr |
| 1 | 00032 | 00033 | Phase 1 Apparent Power | 32 bit Float Inverse | kVA |
| 1 | 00034 | 00035 | Phase 2 Apparent Power | 32 bit Float Inverse | kVA |
| 1 | 00036 | 00037 | Phase 3 Apparent Power | 32 bit Float Inverse | kVA |
| 1 | 00038 | 00039 | Phase 1 Active Energy Partial | 32 bit Float Inverse | kWh |
| 1 | 00040 | 00041 | Phase 2 Active Energy Partial | 32 bit Float Inverse | kWh |
| 1 | 00042 | 00043 | Phase 3 Active Energy Partial | 32 bit Float Inverse | kWh |
| 1 | 00044 | 00045 | Phase 1 Reactive Energy Partial | 32 bit Float Inverse | kVArh |
| 1 | 00046 | 00047 | Phase 2 Reactive Energy Partial | 32 bit Float Inverse | kVArh |
| 1 | 00048 | 00049 | Phase 3 Reactive Energy Partial | 32 bit Float Inverse | kVArh |
| 1 | 00050 | 00051 | Phase 1 Apparent Energy Partial | 32 bit Float Inverse | kVAh |
| 1 | 00052 | 00053 | Phase 2 Apparent Energy Partial | 32 bit Float Inverse | kVAh |
| 1 | 00054 | 00055 | Phase 3 Apparent Energy Partial | 32 bit Float Inverse | kVAh |
| 1 | 00056 | 00057 | Phase 1 Active Energy Total | 32 bit Float Inverse | kWh |
| 1 | 00058 | 00059 | Phase 2 Active Energy Total | 32 bit Float Inverse | kWh |
| 1 | 00060 | 00061 | Phase 3 Active Energy Total | 32 bit Float Inverse | kWh |
| 1 | 00062 | 00063 | Phase 1 Reactive Energy Total | 32 bit Float Inverse | kVArh |
| 1 | 00064 | 00065 | Phase 2 Reactive Energy Total | 32 bit Float Inverse | kVArh |
| 1 | 00066 | 00067 | Phase 3 Reactive Energy Total | 32 bit Float Inverse | kVArh |
| 1 | 00068 | 00069 | Phase 1 Apparent Energy Total | 32 bit Float Inverse | kVAh |
| 1 | 00070 | 00071 | Phase 2 Apparent Energy Total | 32 bit Float Inverse | kVAh |
| 1 | 00072 | 00073 | Phase 3 Apparent Energy Total | 32 bit Float Inverse | kVAh |
| 1 | 00074 | 00075 | Active Energy Total | 32 bit Float Inverse | kWh |
| 1 | 00076 | 00077 | Reactive Energy Total | 32 bit Float Inverse | kVArh |
| 1 | 00078 | 00079 | Apparent Energy Total | 32 bit Float Inverse | kVAh |

Holding case

| IP Grade | IP-60 |
|---------------------|-------------------|
| Temperature details | |
| Working temperature | -20°C...+70°C |
| Store temperature | -20°C...+75°C |
| Holding | |
| Dimensions | 119 x 111 x 53 mm |
| Type mount | Wall or din rail |
| Plastic Material | ABS – V0 |

