SenNet IoT Easy Meter

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

General description

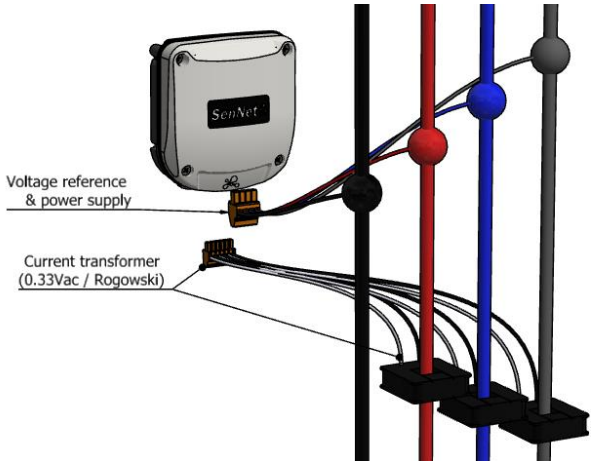
SenNet IoT Easy Meter is a device that monitors 3PH energy electrical circuits, with two options of current transformer, 0.33Vac or flexible Rogowski. This device has the possibility to create a local RF Network with remote nodes with different features: Pulse Counter / Temperature-Humidity / CO2 / Particulate Matter etc.., and send all this information in one Sigfox message.
The configuration of all these features is possible by two ways:
- Micro-usb connection and console/terminal.
- Trough APP SenNet NFC (IOS or Android).

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 intall:

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 connectivity

sigfox

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

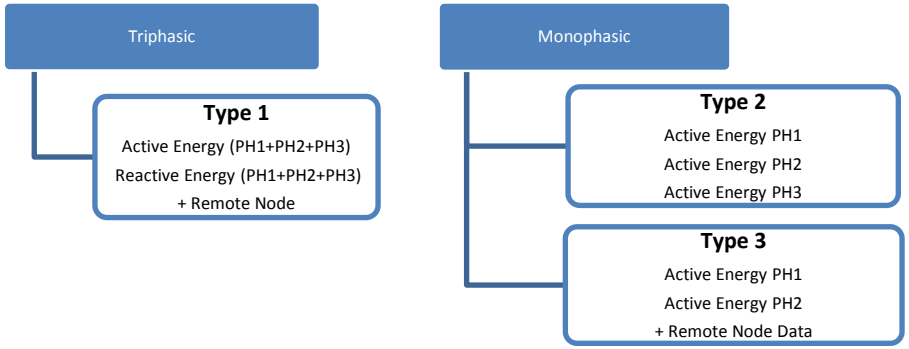
Local RF Network
Remotes Nodes

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**									
	Type Master Device 01 - Easy Meter 02 - PC LongNet 03 - TH LongNet 04 - CO2 LongNet 05 - PM LongNet 06 – GW Modbus LN 07 – Not defined			**Type Message** type 0 (info) type 1 type 2 type 3 type 4 type 5 (not defined) type 6 (not defined) .. type 15 (not defined)				**Some Phase in generation mode** **Feedback Error**	**Voltage secuence error**	**Overvoltage / SAG / Internal meter error**	**Type Remote Nodes** 0x00 – Info Remote 0x01 - PC LongNet 0x02 - TH LongNet 0x03 - CO2 LongNet 0x04 - PM LongNet 0x05 – GW Modbus LN 0x06 – Analog Input 0x07 – Not defined			**ID Remote Nodes** **No Remote** = 000 **Remote ID = $010_b = 02_d$** **= $011_b = 03_d$** **= $100_b = 04_d$** **= $101_b = 05_d$** **= $110_b = 06_d$** **= $111_b = 07_d$** (6 nodes maximum)		
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				Float 32 bits				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 [-10ºC…60ºC] 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	
CO2 LongNet – 868	2 bytes (integer type)	
	byte 2 -High part- (7 6 5 4 3 2 1 0)	byte 1 -Low part- (7 6 5 4 3 2 1 0)
	CO2 Payload (± 12ppm)	Temperature Payload (± 1ºC) / Hum. Payload (± 6%)
	CO2=Payload*12.6984+400	T=Payload*1.111-10 / 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.

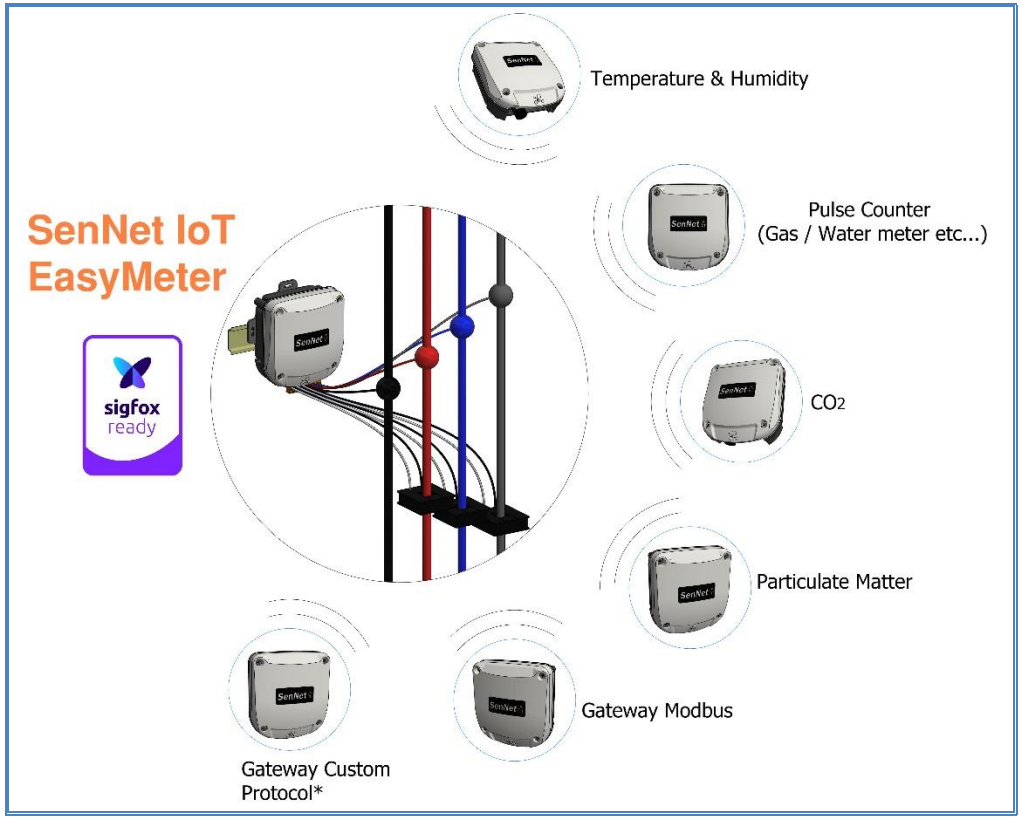
Byte	**1**		**2 - 5**	**6**	**7**	**8**
Field	Easy Meter Setup byte (1byte)		Set time (4bytes)	Type uplink Message (1 byte)	CT value (2 byte) (hex. value)	
Value	Bit 0	1 (by default)	{Time-Epox}	01 02 03 ..	High Part	Low Part
	Bit 1	1/0 enable/disable set Time				
	Bit 2	1/0 enable/disable set Type uplink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

Example for downlink message:

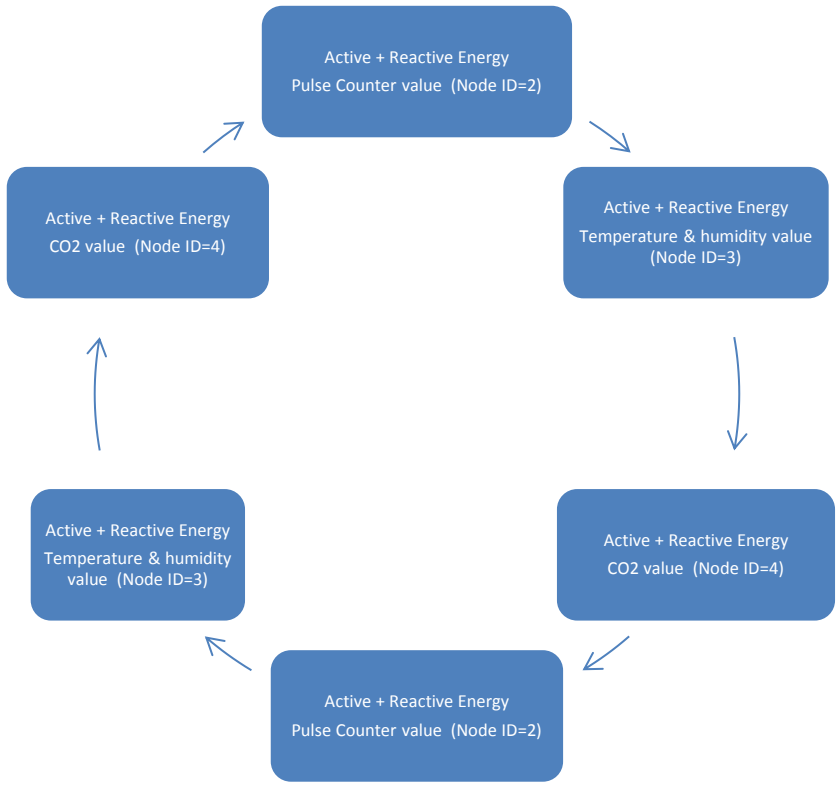
F8 {time} 01 00 32 → With this downlink message set the remote device on time, with type of message 01 and CT value 50 Amps.

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
Coordinator ID=1

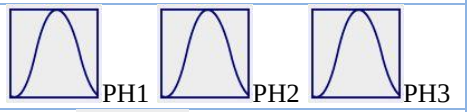
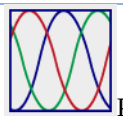
Pulse Counter
Node ID=2

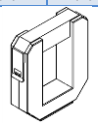
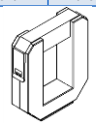
Temperature & Humidity
Node ID=3

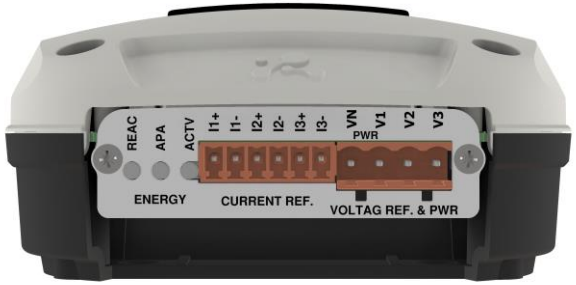
CO2
Node ID=4

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 monitorize.

Type of load to monitorized	
3 single-phase loads independient	 PH1 PH2 PH3
1 three-phase load	 PH1 / PH2 / PH3

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 measureament	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 requeriment)
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

Holding case

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