

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:

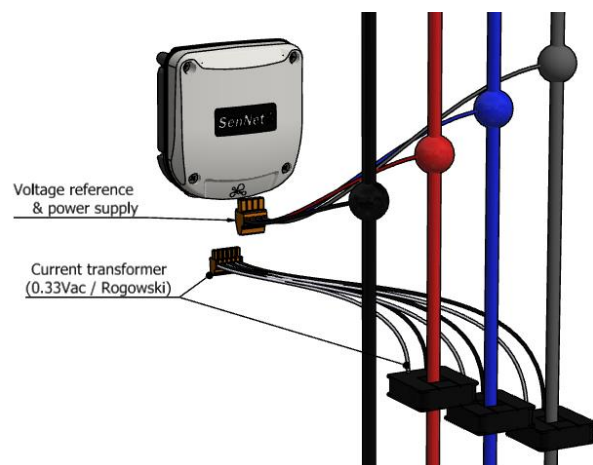
- Through APP SenNet NFC (IOS or Android).
- Micro-usb connection and console/terminal.
- Downlink message on sigfox backend.

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)



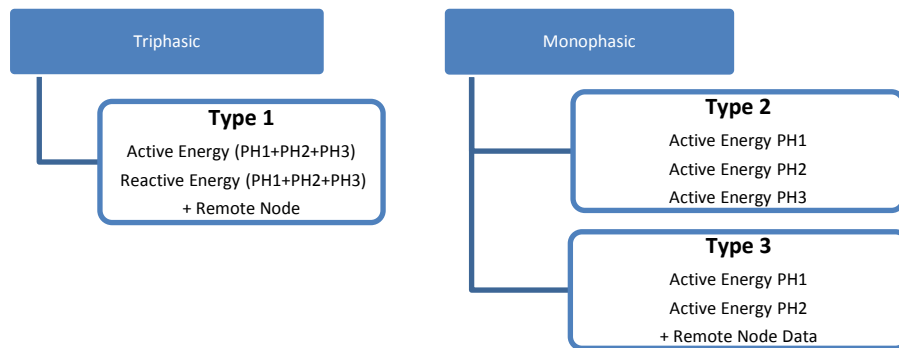
Local RF Network
Remotes Nodes

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> type 0 (info)					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 1								0x00 – No local Network			No Remote = 000			
	02 - PC LongNet			type 2								0x01 - PC LongNet			Remote ID = 001 _b = 01 _d			
	03 - TH LongNet			type 3								0x02 - TH LongNet			= 010 _b = 02 _d			
	04 - CO2 LongNet			type 4								0x03 - CO2 LongNet			= 011 _b = 03 _d			
	05 - PM LongNet			type 5 (not defined)								0x04 - PM LongNet			= 100 _b = 04 _d			
	06 – GW Modbus LN			type 6 (not defined)								0x05 – GW Modbus LN			= 101 _b = 05 _d			
	07 – Not defined			..								0x06 – Analog Input			= 110 _b = 06 _d			
				type 15 (not defined)								0x07 – Not defined			(6 nodes maximum)			
									<u>Feedback Error</u>									
Bit	7	6	5	4	3	2	1	0	7	6		5	4	3	2	1	0	
	Byte1			Byte1					Byte1	Byte2		Byte2			Byte2			
	Bit 7-6-5			Bit 4-3-2-1					Bit 0	Bit 7-6		Bit 5-4-3			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)							Temperature Payload (± 1°C)						Hum. Payload (± 6%)				
	CO2=Payload*12.6984+400							T=Payload*1.111-10						H= Payload*6.66				
Particulate Matter - 868	2 bytes (integer type) - <i>under development</i>																	
Gateway Modbus – 868	2 bytes (custom) – <i>under development</i>																	
Gateway Custom Protocol – 868	2 bytes (custom) - <i>under development</i>																	

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.

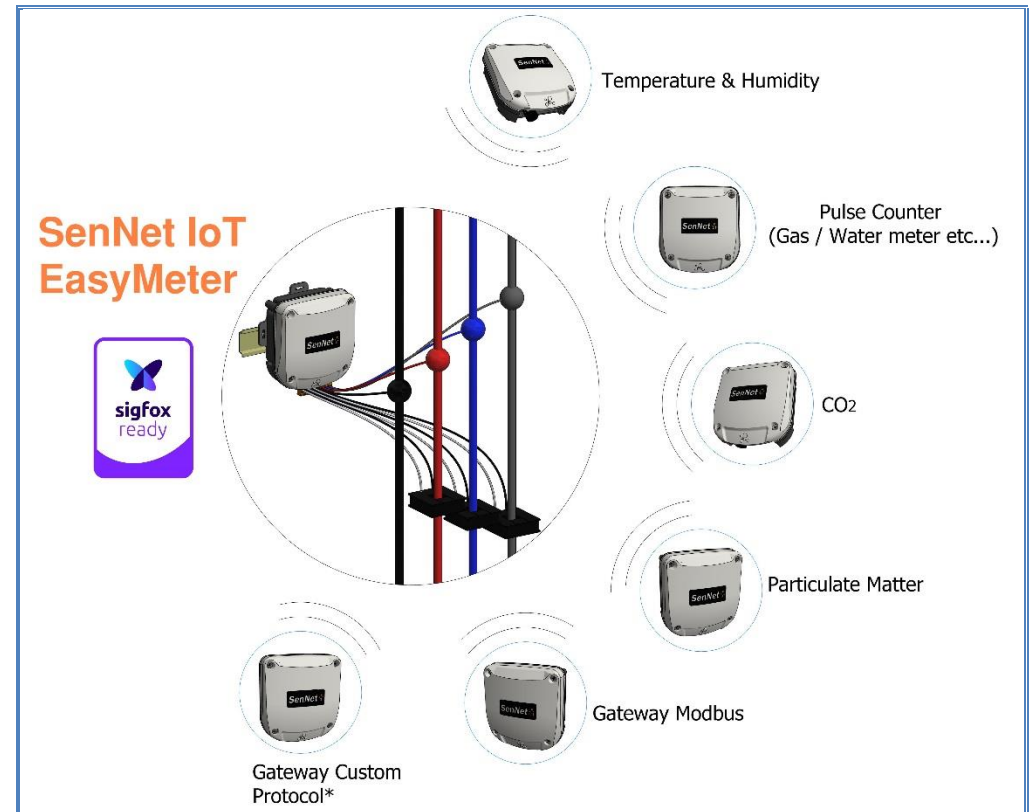
Byte	1	2 - 5	6	7	8
Field	Easy Meter Setup byte (1byte)	Set time (4bytes)	Type uplink Message (1 byte)	CT value (2 byte) (hex. value)	
Value	Bit 7 1 (by default)	{Time-Epox}	01 02 03 ..	High Part	Low Part
	Bit 6 1/0 enable/disable set Time				
	Bit 5 1/0 enable/disable set Type uplink Message				
	Bit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

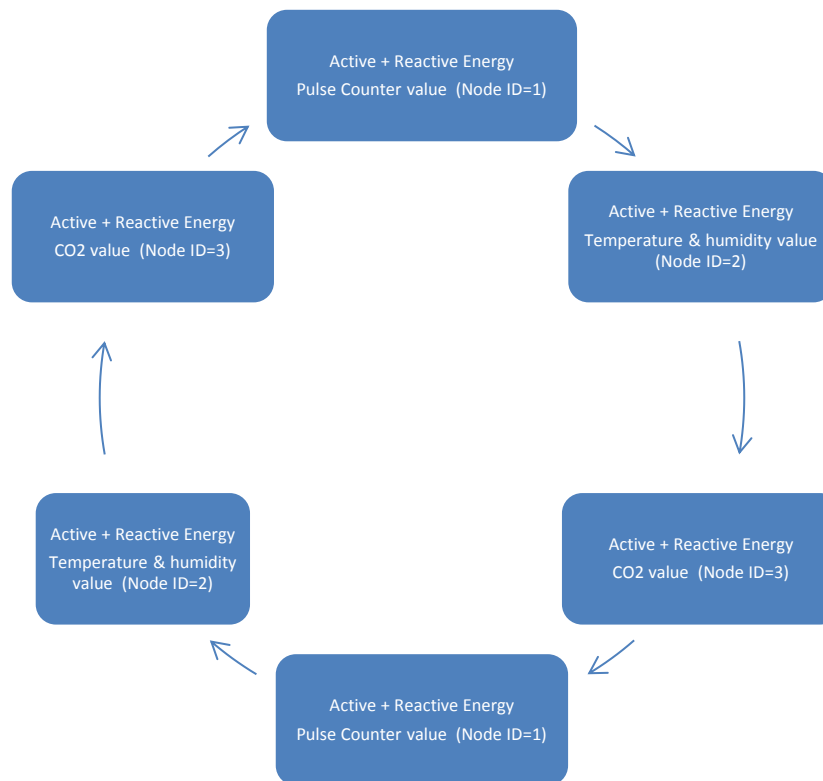
F8 {time} 01 00 32 → With this downlink message set the remote device on time, with type of message 01 and CT value 50 Amps.

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



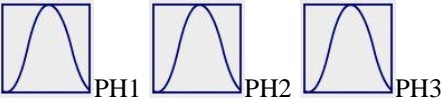

Temperature & Humidity
Node ID=2

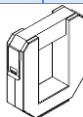
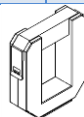
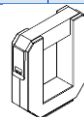


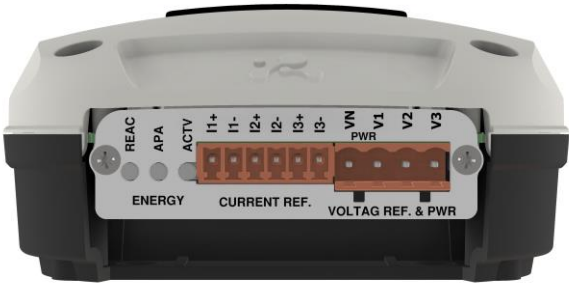
CO2
Node ID=3

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

