SenNet IoT Easy Meter Sigfox

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

General description

SenNet IoT Easy Meter Sigfox 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:
- Trough APP *SenNet IoT* (IOS or Android).
- Downlink message on sigfox backend.
- Micro-usb connection and console/terminal.

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

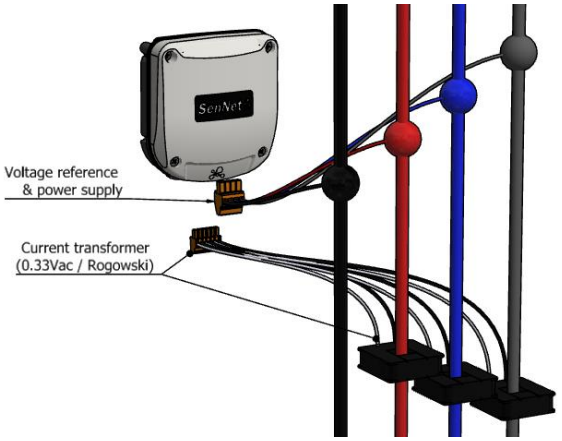
The device uses voltage reference as the power supply (100-265VAC @ 50HZ), it's important just to use Neutral Line Vn and V1. There is an internal fuse to protect the device against surge damages.

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

Easy to set with **SenNet IoT** APP
iOS & Android (phones with NFC)

SenNet IoT (iOS version) Link

SenNet IoT (Android version) Link



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 throught SenNet IoT APP.

Sigfox Ready Certification / Class U0

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

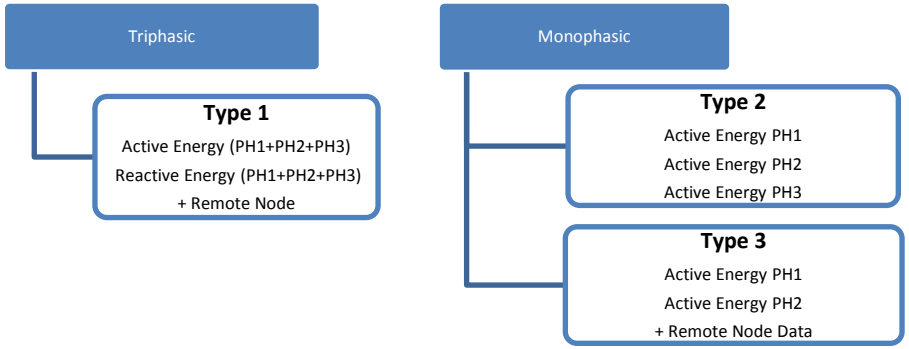
Local RF Network
868.224MHz (EU)
2FSK / 300bps / 6.25Khz
(by default)

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 Device **01 - Easy Meter** 02 – Pulse Counter 03 – Not defined 04 – Enviroment Sensor 05 - PM 06 – GW Modbus 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 – No local Network 0x01 - PC LongNet 0x02 - TH LongNet 0x03 - CO2-TH LongNet 0x04 - PM LongNet 0x05 – GW Modbus LN 0x06 – Analog Input 0x07 – Not defined			**ID Remote Nodes** No Remote = 000 Remote ID = $001_b = 01_d$ $= 010_b = 02_d$ $= 011_b = 03_d$ $= 100_b = 04_d$ $= 101_b = 05_d$ $= 110_b = 06_d$ (6 nodes maximum) Type Message 0 (Debug) $= 111_b = 07_d$		
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

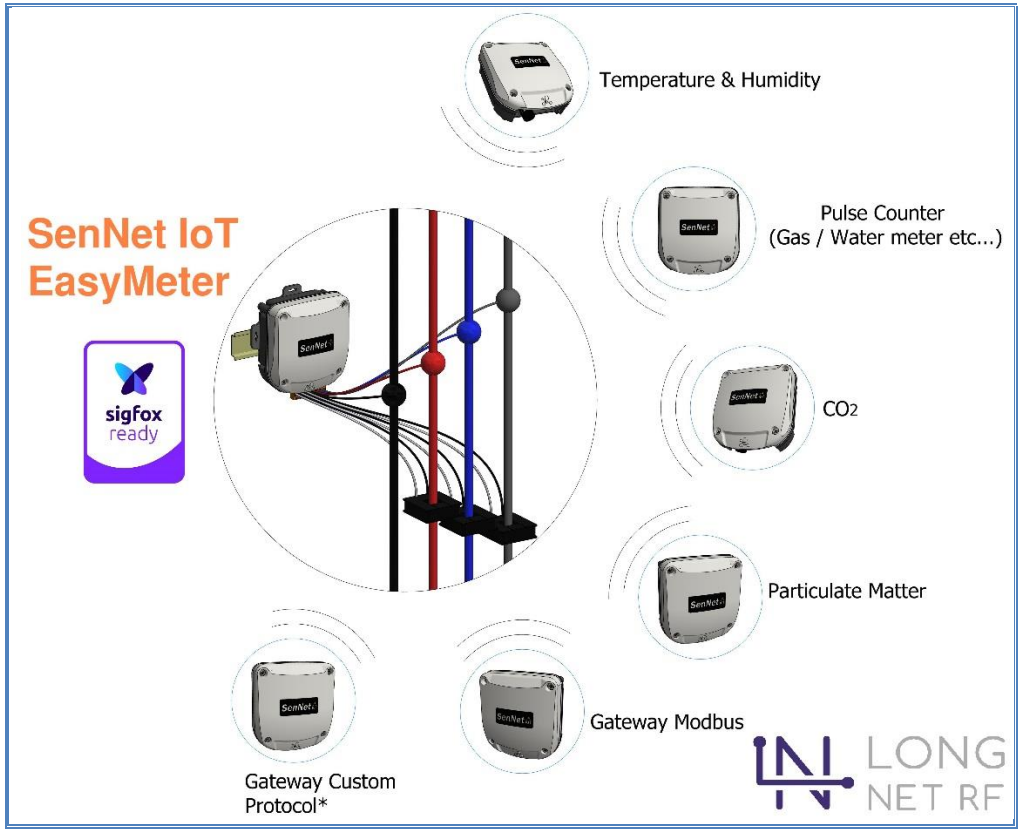
Type 3: Active Energy PH1 + Active Energy PH2 + Remote Node Data												
Field	Info		Active Energy PH1				Active Energy PH2				Data from Remote Node	
Type data	See Table 1		Float 32 bits				Float 32 bits				Depending on Remote node type	
Byte	1	2	3	4	5	6	7	8	9	10	11	12

Remote Node Data:

Type of Remote Node		
TH LongNet – 868	1 byte temperature Payload [-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 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 (± 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*	

Local RF Network & types of Remotes Nodes

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



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	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 Messsage				
	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, all debug messages disables.

Debug option

It's possible debug on remote this device, it's necessary enable with downlink message this feature. There are tree types of debug message , Debug 1 (version HW/FW), Debug 2 (internals errors), Debug 3 (instant power meter values).

If this feature is enabled one time per day or in power up will be update these messages, with this secuence:

Debug 1 (9 bytes) → **Debug 2 (11 bytes)** → **Debug 3 (8 bytes)**

Type 0 : Debug 1 (9 bytes)						
Field	Info		HW device	Version FW	Revision FW	Not used
Type data	***See Table 1***					-
Byte	1	2	3	4	5	6-9

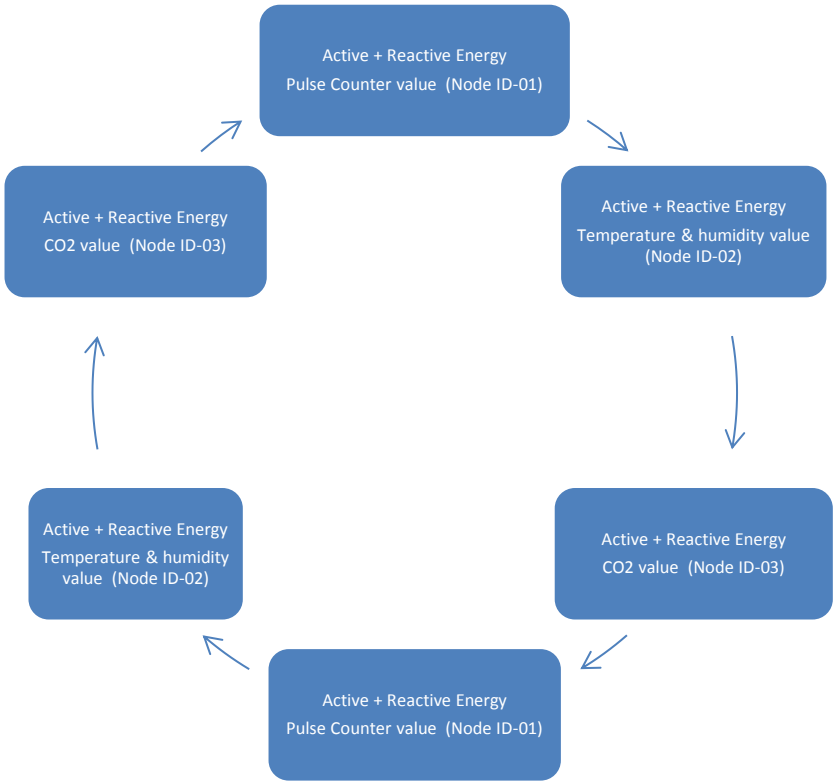
Type 0 : Debug 2 (11 bytes)													
Field	Info		Reset event	Internal error	Wrong voltage frequency	Error PH1	Error PH2	Error PH3	Voltage event 1		Voltage event 2		Gen.
Type data	***See Table 1***		-	-	Freq =!50Hz	-	-	-	Bit0	SAG-PH1	Bit0	PH1<50v	-
									Bit1	SAG-PH2	Bit1	PH2<50v	
									Bit2	SAG-PH3	Bit2	PH3<50v	
									Bit3	OVER-PH1	Bit3	Voltage secuence	
									Bit4	OVER-PH2	Bit4	-	
									Bit5	OVER-PH3	Bit5	-	
									Bit6	-	Bit6	-	
									Bit7	-	Bit7	-	
Byte	1	2	3	4	5	6	7	8	9		10		11

For normal function all fields must be 0.

Type 0 : Debug 3 (8 bytes)					
Field	Info		Active Power PH1	Active Power PH2	Active Power PH3
Type data	***See Table 1***		Signed int (Value*100)Watt	Signed int (Value*100)Watt	Signed int (Value*100)Watt
Byte	1	2	3 - 4	5 - 6	7 - 8

With this last one debug message is possible detect wrong installation issues, for example CT with wrong orientation. Use this extra feature to analisys or debug installation.

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 loop.
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

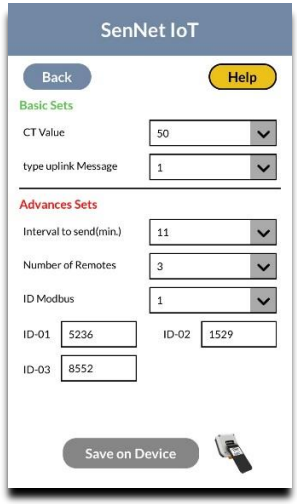
Pulse Counter
Node ID-01
LongNet ID=5236

Temperature & Humidity
Node ID-02
LongNet ID=1529

CO2
Node ID-03
LongNet ID=8552

Set ID of each remote device, taking note of LongNet ID on the label and assigning it through APP phone (Android or iOS version).

For previous example, it's defined Number of remotes=3, and assigned each position (ID-01 / ID-02 / ID-03) at LongNet ID from label of each device, in this particulate example:



Steps for install Easy Meter with remotes nodes, first must be installed Easy Meter and power supply. Later install one by one each remote device, to analyzed if link coverage is fine, set each remote device on 'RF_prog' mode '1', sliding the switch to mini-usb connector side.

Remote device enter in beacon send mode each 5 seconds, if Easy Meter receive this beacon sound 5 beeps on Easy Meter side. After check that coverage is enough return switch of remote device to `RF_prog' mode 0, and reset it.

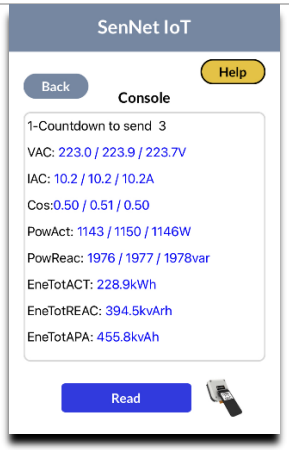
By this way you check that link between remote device and Easy Meter works fine.

SenNet IoT APP – Android and iOS (only phones with NFC feature)

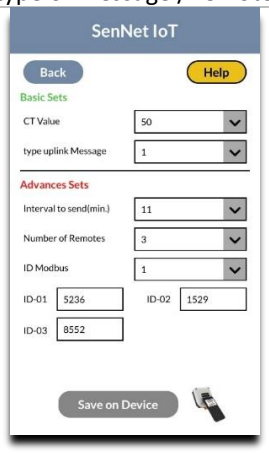
Use APP of freely download to set and read measurement from Easy Meter.

Main screen with data about Easy Meter & Sigfox connection

Read measurement

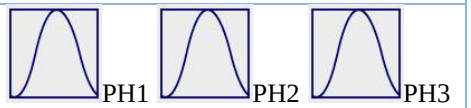
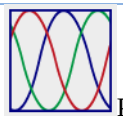


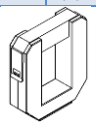
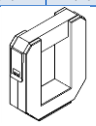
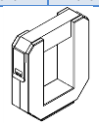
Set: CT / type of message / remote devices

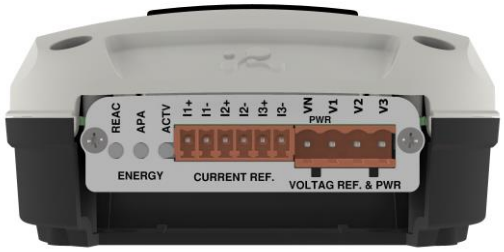


Power Meter features

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 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									



*with CT-0.33Vac is possible wire several CT with same nominal value, on device must be set with add value of these CT's.
This method allow measure several loads on one single input.

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)

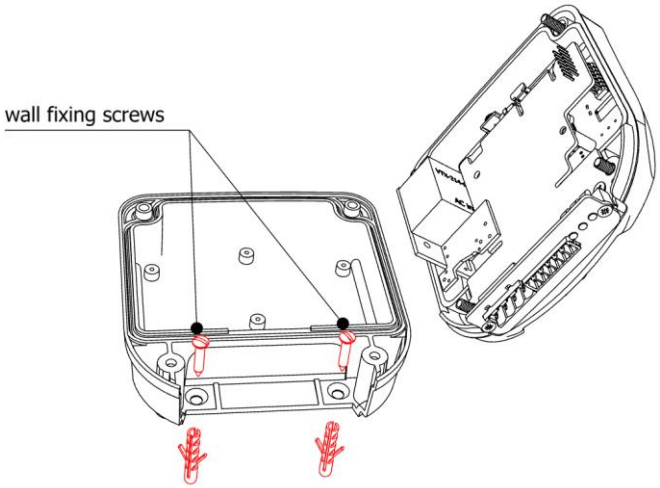
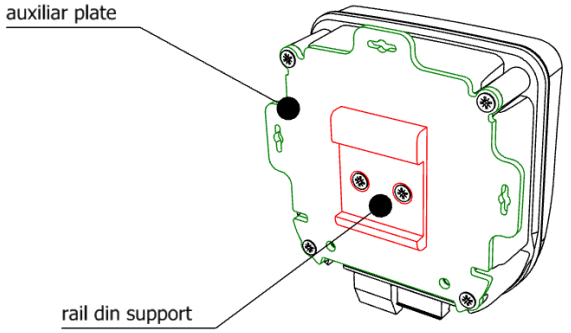
(*)Must use flexible SenNet Rogowski model to certificate Class 1. (Factory Calibrated)

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

wall mount (by default)	rail din mount (accesory)
	 *specify on your order

Warranty

Satel Spain guarantees its products against all manufacturing defects for a period of 1 year.

No return of material will be accepted, nor will any equipment be repaired if it is not accompanied by a report (RMA) indicating the defect observed or the reasons for the return.
The warranty will be void if the equipment has suffered "misuse" or the storage, installation or maintenance instructions in this manual have not been followed. “Misuse” is defined as any use or storage situation contrary to the National Electrical Code or that exceeds the limits indicated in this manual.
Satel Spain declines all responsibility for possible damage to the equipment or to other parts of the installations and will not cover possible penalties derived from a possible breakdown, poor installation or "misuse" of the equipment. Consequently, the guarantee is not applicable to breakdowns produced in the following cases.

- Due to overvoltage and/or electrical disturbances in the supply.
- By water, if the product does not have the appropriate IP rating.
- For exposing the equipment to extreme temperatures, which exceed the operating or storage temperature limit.
- Due to a modification of the product by the client without prior notice to Satel Spain.

Faced with possible errors in this technical sheet, keep it updated in our website.