ELECTREX
the energy saving technology

Engineered and manufactured in Italy
Made in Italy
Pensato, progettato e prodotto in Italia

LOW ENERGY CONSUMPTION

Kilo D6 & Kilo 96

- High Performance (accuracy class 0,5S)
- Flexibility (open platform)
- Reliability (high quality of components)
- Connectivity (Ethernet, Wi-Fi, RS485, ExpBus, NFC)
- Continuous monitoring projects (E.g. ISO 50001)
- Energy efficiency (E.g. 2012-27 EU-Directive and EEC)

(Power Quality) Energy Analyzer & (Wi-Fi) Data Manager

Power Quality Energy Analyzer & (Wi-Fi) Web Data Manager

Kilo RJ45 PQ (DIN rail or 96x96) is a Power Quality Energy Analyzer & Data Manager with a Dual Core Cortex-M4 microprocessor. Extremely versatile and precise, it is designed to satisfy the most sophisticated applications of monitoring of electrical parameters and energy management in the industrial, commercial, public and residential sectors. The high accuracy class, 0.5 S for Active Energy, and measures of individual harmonics up to 51st order are obtained by continuously sampling the waveforms of voltages and currents with a very high resolution, thus ensuring the maximum accuracy even in the presence of rapidly varying loads in time (.eg. spot welding). Power quality is managed with functions related to the EN 50160 standard (swells, dips, interruptions, harmonics) and to EN 61000-4-30 for the S class with graphic detail of the event, table and timeline of events, campaigns of measurement with selectable parameters and programmable sampling frequency.
Kilo RJ45 PQ is equipped with a slave RS485 port and an Ethernet port (**Wi-Fi** option) and, depending on the version, it can be equipped with an internal module for inputs/outputs or environmental sensors. It is equipped with a 128 MB high capacity memory for implementing, through PUK codes, various features. Its architecture allows the firmware upload & update even remotely. It is equipped as well with an expansion bus, ExpBus, for the connection of

digital and analog inputs/outputs, environmental sensors modules and supports NFC(Near Field Communication).

Kilo net PQ Web is a Power Quality Energy Analyzer & Web Data Manager, an open platform connected to the Ethernet / Internet via RJ45 (or Wi-Fi optional). It represents the starting point for the continuous monitoring of the energy efficiency through the measurement and management of the energy parameters (electricity, gas, water, etc.), environmental parameters (temperature, luminosity, CO2, etc.) and process parameters. It measures electrical parameters and power quality and it is a Web and FTP Server. It communicates with/manages the other Electrex devices via the RS485 master port and the ExpBus port.

The **Wi-Fi** versions permits to manage/display the data from any device having a browser (PC, Smartphone, tablet, etc.) in an existing Wi-Fi network.

Simplicity

Version D6: equipped with a FSTN dot matrix display with high contrast, back-lighted with white LEDs allowing the simultaneous displaying of 4 measurements and of their identification symbol with high visibility characters.

The 6 keys keypad Joystick positioned and menu list type on the display for configuration provide a simple and rational use of the instrument, while the default page displayed when powering on is user definable.
On the front panel 2 calibration and control LEDs pulse with a frequency proportional to the imported Active and Reactive Energy for the on-field calibration with optical devices. The red LED pulsing under the symbol by the Electrex logo indicates the functioning state. 2 additional LEDs positioned under the white band report instead the activity on the RS485 port. While for the RJ45 port the 2 built-in LEDs indicate the Ethernet activity. In order to reduce the energy consumption it is possible to configure the display's back-lighting, the state LED and the ones related to the RS485 port in order to reduce the consumption to the minimum.

Versatility

Kilo D6 and **Kilo 96** are suitable for all type of electrical grid systems, single phase, bi-phase, three phase 3- and 4-wire, symmetrical and asymmetrical, balanced or unbalanced, LV/MV, with 1, 2 or 3 CTs as well as for 2 and 4 quadrant (import/export) measurement. A simple configuration from the keyboard (or via our Energy Brain software) allows to configure all the operating parameters like network type, BT/MT, CT and VT (if present) ratio, integration time (1-60 min) and alarms (threshold, delay, hysteresis), digital outputs and configuration parameters of the connected optional modules.

Conformity with EN 50470 and 62053-22

All the versions of the **Kilo** meet the essential requirements of the standards EN 50470-1 + 50470-3 and 62053-22 as requested for the Energy Efficiency Certificates (White Certificates).

Measures

Parameters	Type	L1	L2	L3	n	Σ	P(8)	Range
Voltage	U_{L-N}	•	•	•		•		20,0V...400 kV
	U_{L-L}	•	•	•		•		
	$U_{L-N\ MAX}$	•	•	•				
	$U_{L-L\ MAX}$	•	•	•				
	$U_{L-N\ MIN}$	•	•	•				
	$U_{L-L\ MIN}$	•	•	•				
Current	I	•	•	•	•	•		10 mA…10,0 kA Electrex Flexible CT(7): 1A … (5A - 500A) 4A … (20A - 2000A) 8A … (40A - 4000A)
	I_{MAX}	•	•	•				
	$I_{AVG\ THERM}$ (1)	•	•	•				
	$I_{MD\ THERM}$ (1)	•	•	•				
Power Factor	PF	•	•	•		•		0,00ind..1,00..0,00cap
Frequency	F	•						45 … 65 Hz
Phase sequence	132 CCW	•	•	•				
Harmonic Distortion	THD-U_{L-N}	•	•	•		•		0…199,9%
	THD-U_{L-L}	•	•	•		•		
	THD-I	•	•	•		•		
Active Power	P	•	•	•		•		± 0,00…1999 MW
	P_{AVG} (2)					•		
	P_{MD} (2)					•		
	P_{MAX} (3)	•	•	•				
Reactive Power	Q_{IND}	•	•	•		•		± 0,00…1999 Mvar
	Q_{CAP}	•	•	•		•		
	$Q_{AVG\ IND}$ (2)					•		
	$Q_{AVG\ CAP}$ (2)					•		
	$Q_{MD\ IND}$ (2)					•		
	$Q_{MD\ CAP}$ (2)					•		
Apparent Power	S	•	•	•		•		± 0,00…1999 MVA
	S_{AVG} (2)					•		
	S_{MD} (2)					•		
Life Time	h, h/100					•	•	0,01…99.999,99 hours
Active Energy	$E_{a\ IMP}$ (5)	•	•	•		•	•	0,1 kWh…100 GWh
	$E_{a\ EXP}$ (5)	•	•	•		•	•	
Reactive Energy	$E_{r\ IND\ IMP}$ (5)	•	•	•		•	•	0,1 kvarh…100 Gvarh
	$E_{r\ CAP\ IMP}$ (5)	•	•	•		•	•	
	$E_{r\ IND\ EXP}$ (5)	•	•	•		•	•	
	$E_{r\ CAP\ EXP}$ (5)	•	•	•		•	•	
Apparent Energy	$E_{s\ IMP}$ (5)	•	•	•		•	•	0,1kVAh…100 GVAh
	$E_{s\ EXP}$ (5)	•	•	•		•	•	
Pulse Counter	CNT (6)					•	•	
Analog Measure	(6)					•	•	

For all the "instantaneous measures": mean over 10 cycles - example: 200ms at 50Hz.

(1) *Mean value (rolling average) over the integration time (1.. 60 min. program.) and peak (MD).*

(2) *Average value (moving average) in both import and export over the integration time (1..60 min programmable) and peak (MD) that is the maximum average value.*

(3) *Maximum Power values for both import and export.*

(4) *Non resettable total lifetime counter. 4 partial lifetime counters.*

(5) *Import/Export energies displayed as 9 digits in floating-point readings; internal energy counters are logged with a 64 bit resolution which assures a minimum definition of 0,1 Wh and a max count of 100 GWh*

(6) *Only for versions with digital and analog inputs.*

(7) *With Flexible Electrex CT, accuracy Class 1 for both the devices, within the current ranges denoted above with brackets.*

(8) *Three partial counters for each measure marked*

Kilo H : Single Harmonics

Parameters		L1	L2	L3	Σ	Management
Harmonics analysis	H Voltage	•	•	•		Value (H01), % (H02-H51)
	H Current	•	•	•		Value (H01), % (H02-H51)

(9) *FFT method calculation of the harmonics, amplitude and phase, up to the 51-st for the 3 voltages and currents per each phase, 3 active powers of each phase with direction (accumulated in 10 periods).*

Kilo PQ: Events U and I, measurement campaign

Parameters (9) (10) (11)	L1	L2	L3	Σ	Management
Dips and peaks. .	•	•	•		Events logged in the internal memory with time-stamp
Overvoltage and overcurrent	•	•	•		
Sags and interruptions	•	•	•		

(10) *Event logging with date and time, duration, max/min value. Programmable thresholds. EN 50160 and EN 61000-4-30.*

(11) *Event's graphic detail: nr. of samples (programmable e.g. 1 second) retrieved previously and after the event (dips, peaks and interruptions).*

(12) *Distribution table of the events based on the threshold exceeded and duration following UNIPEDE (http://www.eurelectric.org/) and Timeline of the events.*

(13) *Programmable measurement campaigns (choice of parameters and of the sampling time). See Memory Management section.*

Harmonics measurement up to the 51-st order

Kilo PQ displays the single harmonics up to the 51st order for the 3 voltages and currents of each phase. FFT method calculation of the harmonics for amplitude and phase.

Phase sequence

On the three phase voltages and the frequency menu page, is displayed also the phase sequence, the correct one is L132.

Ethernet and/or serial via RS485 communication

Kilo is equipped with a 10/100 Base-TX (RJ45) Auto-MDIX **Ethernet port** for the "http" communications (real-time measurements and memory logs) and "Modbus over IP" (real-time measurements). It is equipped also with **a serial RS485** port, protected against overvoltage, using Modbus-RTU "*full compliant*" (instantaneous measurements). The data are read as numerical registers composed by mantissa and exponent in the IEEE format. The communication speed of the RS485 port is configurable, up to 115.200bps, with max. 125 registers requested (equivalent to 62 parameters) with no waiting time between two requests.

Versions of Kilo D6 and Kilo 96

- 1DI 2DO Self-Powered: 1 self powered digital input and 2 digital outputs rated at 250V 100mA;
- 2AO 4-20mA: 2 analog self-powered 4-20mA outputs for loads up to 250 ohm, power supply needed for higher loads;
- 2DI 1RO Self-Powered: 2 self-powered digital inputs and 1 relay (24VDC);
- 2RO24VDC: 2 relay outputs (24VDC);
- 4DI: 4 digital inputs;
- 4DO: 4 digital outputs;
- 2DI 2DO: 2 digital inputs and 2 digital outputs;
- 2DI2DO 4COMMON(or 4DI or 4DO) con separate commons
- 4AI: 4 analog inputs 0÷10V (4÷20mA);
- 4PT100 or 4PT1000 or 4NTC: for the relative sensors
- SI: for environmental sensors (T, H, L, P, etc);

Digital Inputs

The versions **.. 1DI or 2DI or 4DI** are equipped with an optically insulated digital input with programmable filter for input glitches. The digital input is set to operate for external pulse count of, example, water meters, gas meters (insulation to meet the ATEX requirements), water meters, quantity counters, etc. For the 1DI or the 2DI 1RO the max sampling frequency is 100Hz (5ms), while for the 2DI 2DO and the 4DI 500Hz (1ms). Other user selectable operative modes are ON/OFF state input (example for reading the ON/OFF state of machines and switches) and tariff change input (example for day-night tariff changeover). The digital input requires an external 10-30Vdc power supply.
The **1DI 2DO Self-Powered** and **2DI 1RO Self-Powered** versions instead are provided with self powered digital inputs.

Analog Inputs and PT100 or PT1000 or NTC

The **.. 4AI** version is equipped with 4 analog inputs rated at -10÷10V (compatible with 0÷10V, 0÷5V, -5÷5V, 4÷20mA at 200 ohm). While the **.. 4PT100** or **4PT1000** or **4NTC Electrex** versions have 4 independent inputs for the relative sensors.

Environmental Sensors Inputs

The **..SI version** is equipped with a Sensor Bus I^2C for connecting many sensors (up to 8 parameters among temperature and relative humidity or 1 for the temperature, 1 for the humidity, 1 for the luminosity and 1 for the air pressure). The max total distance of the Sensor Bus is 20 m.

Relay outputs

The **.. 2DI 1RO Self-Powered** and the **.. 2RO 24Vdc** versions are equipped with relay outputs with changeover contact rated at max 30V max 2A (resistive load).

Digital outputs

The **.. 2DO or 4DO** versions are equipped with two optically insulated transistor outputs rated 27 Vdc 27 mA according to DIN 43864 standards. The outputs may be set for the transmission of pulses or alternatively configured as outputs of the internal alarms (see Alarms) or as remote output devices controlled via serial line and Modbus commands.
The **..1DI 2DO Self-Powered** version instead is equipped with two opto-mos outputs rated at max 250V 100mA AC/DC.

Internal alarms

The **.. 2DO** or **4DO** or **1RO** or **2RO** versions are equipped with outputs which can be related to the internal alarms. Each alarm can be linked to any one of the parameters available, for example, either as a minimum and/or as a maximum. All the alarm outputs can be linked to the same parameter in order to have more alarm thresholds. It is possible to set a delay on the activation / deactivation of each alarm (from 1s to 99 min), the hysteresis (% of the threshold value) and the polarity of the output contact (NA, NC, except for the **1RO** which is always NC). The alarms state information is always available on serial communication as Modbus "*coils*". Due to the numerous combinations available, only a part of them are programmable by keyboard while are entirely programmable via serial port with the Energy Brain software or via serial port using Modbus *Holding registers*.

Analog 4-20mA and/or 0-10V outputs

The **.. 2AO4-20mA** version is equipped with 2 galvanic insulated analogue outputs 4-20 mA or 0-20 mA providing an extremely high accuracy and signal stability. The outputs are active self powered for resistor loads up to 250 ohm, while for higher loads an external power supply (12Vdc) is needed (up to 750 ohm). In order to transform the output in a 0-10V type must be connected in parallel a 500Ohm resistance. The outputs ensure a response time of max. 200mS. Each output can be associated to any of the detected parameters.

Wi-Fi EDA and NFC (Near Field Communication)

The **Wi-Fi EDA** version (with a connector for an external antenna) communicates using the existing Wi-Fi network without the need to be connected to an Ethernet cable while the presence of **NFC** opens the possibility for the creation of specific APPs for mobile devices for the energy management.

The Kilo F version for Electrex Flexible CTs (Flex)

Kilo F are equipped with current inputs exclusively for the Electrex Flexible split core current transformers FCTS (mV output and appropriate internal linearization in order to maximize measurement accuracy).
WARNING: Do not connect to these current inputs of CT with output in current (eg. ../1A or ../5A) because it may damage both the Kilo F and the CT.
Selectable Full Scale independent from the internal diameter of the Flex CT used: 500A or 2.000A or 4.000A (8.000A on request), Class 1 accuracy (overall accuracy: flexible CT + Kilo F) between the full scale of current and its 1/100. Minimum measurable current equal to 1/500 of the full scale.

FCTS 070-500 Flexible split CT, internal diameter 4 cm
FCTS 120-1000 Flexible split CT, internal diameter 10 cm
FCTS 200-2000 Flexible split CT, internal diameter 20 cm
FCTS 280-4000 Flexible split CT, internal diameter 28 cm

Load curves and data of consumption / production

Kilo PQ continuously logs the data of consumption / production of energy and power by organizing them into separate daily files, containing the data necessary for the reconstruction of the load profile and the analysis of the trend of buying/selling of energy (files downloadable via RJ45 port / Ethernet or Wi-Fi using Energy Brain or via Http).

Astronomical Clock Calendar

Kilo PQ is equipped with a clock / calendar with astronomical real time management of the Coordinated Universal Time (UTC). It manages also the rules for the automatic switching from Standard Time at summer time (Daylight Saving Time) and vice versa. Automatic synchronization via NTP.

System clock	
UTC time	Thu 10 Nov 2016 15:41:23
Local time	Thu 10 Nov 2016 16:41:23
UTC offset	+01:00
DST offset	+00:00
Next DST change	Sun 26 Mar 2017 02:00:00
Easter day	Sun 27 Mar 2016
Day begin	07:07
Day end	16:55
Solar noon	12:01
Day duration	9:48
NTP synchronization state	Synced!
Next NTP synchronization	Thu 17 Nov 2016 08:49:55

Operating time counter

With an appropriate programming, **Kilo PQ,** in addition to consumption/production, is equipped with partial time counters logging the operating time of a load or a machine. The counter can be triggered from the exceeding of a threshold related to a measurement or the status change of a digital input.

Tariffs TOU

Activating the Calendars and Energy Automation options and configuring the device in a proper way the **Kilo PQ** can manage energy tariffs based on a calendar or on the digital inputs state.

Example of a 3 Tariffs system

Firmware and Special versions on request

Kilo PQ can be provided also with other power supply or hardware versions and the firmware is upgradeable, remotely, at any time, in order to add and/or replace the existing characteristics with new and different functions.

Expansions via ExpBus

Kilo PQ is an evolutionary instrument capable to be adapted to the needs of the customer, even after it has been installed.
The system architecture is designed to allow the implementation on the field of hardware expansions thanks to the ExpBus, providing therefore to the customers the ability to modulate the investment and / or to respond to new needs.

UTP cable for the ExpBus (max 10m)	
VCC	Blue
Exp L	White & Blue
Exp H	Brown
GND	White & Brown

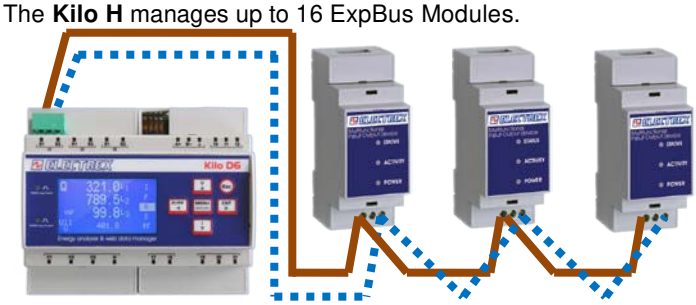
ExpBus

The **ExpBus,** configurable via the Ethernet port from Web pages:

- allows a multicast communication to 250kb/sec with collision management
- has a maximum length of 10 meters
- manages up to 16 nodes (modules) but technically it can manage up to 126

The connecting cable is a UTP where 4 wires are used:
2 for the power supply at 9 Vcc
2 for the bidirectional communication
The modules power the ExpBus
The cable must be connected in the in-out modality (multi-drop) as for the RS485 Bus.
Each node must have an unique Modbus address

The **Kilo H** manages up to 16 ExpBus Modules.



ExpBus Module suitable for the Kilo series

ExpBus Module D2

The *ExpBus Module D2* must be used with an external power supply of 24Vdc (e.g. Switching Power Supply D1 24VDC 400mA code PFTP100-Q2) and can contain up to 2 modules similar to the one shown here (of which, however, only one of the two types can be self powered, therefore only one for 1DI 2DO Self-Powered or 2AO4-20mA or 2DI 1RO Self Powered). Max. weight 45 gr. Configuration via Web interface.

ExpBus Module D4

The ExpBus Module D4 have a built-in 230-240Vac power supply (other power supply version on request) and can contain up to 2 modules, also self-powered. Max. weight 100 gr. Configuration via Web interface.

UTP cable for the I²C Sensor Bus (max 20m)	
VCC	Orange
SCL	White Orange
SDA	Green
GND	White Green

ExpBus Module catalog codes

Type	*Code*
ExpBus Module D2 24VDC 4DI 4DO	*PFAB20E-N5P*
ExpBus Mod. D2 24VDC 2DI 2DO 2AO4-20mA	*PFAB20E-Q56*
ExpBus Mod. D2 24VDC 4AI 2DI 2DO	*PFAB20E-R5Q*
ExpBus Mod. D2 24VDC 2DI 2DO SI	*PFAB20E-Q5T*
ExpBus Mod. D4 230V 4DI 4DO	*PFAB40E-N2P*
ExpBus Mod. D4 230V 2DI 2DO 2AO4-20mA	*PFAB40E-Q26*
ExpBus Mod. D4 230V 4AI 2DI 2DO	*PFAB40E-R2Q*
ExpBus Mod. D4 230V 2DI 2DO SI	*PFAB40E-Q2T*

How to order ExpBus Module

Description **Code**

ExpBus Module D2 *versions (2 DIN rail modules):*

Possible hardware combinations with 1 or 2 different modules (of which, however, only 1 can be a self-powered type, e.g. only one 1DI 2DO Self-Powered or 2AO4-20mA or 2DI 1RO Self Powered module). Requires external power supply 24Vdc:

Switching Power Supply D1 24VDC 400mA…..PFTP100-Q2

ExpBus Module D4 *versions (4 DIN rail modules):*

Possible hardware combinations with 1 or 2 different modules which can be also self-powered type.

Internal power supply 230Vac or other power supplies on request, see building code diagram below.

BUILDING CODE: ..... ***PFAB 4 0 E – N 2 P***

PFAB = External modules
Dimension in DIN modules: **4** = 4 modules
2 = 2 modules
Bus Type: ..... **E** = ExpBus

Internal modules:..... *Characters for code:*

No module.....***0***
Module 1DI 2DO ***1***
Module 2DI 1 RO Self Powered ***2***
Module 2RO24VDC ***5***
Module 2AO4-20mA ***6***
Module 2RO230V ***8***
Module 1DI 2DO Self Powered .....***E***
Module 4DI .....***N***
Module 4DO .....***P***
Module 2DI 2DO .....***Q***
Module 4AI .....***R***
Module SI (Sensor Bus I²C) .....***T***
Module 4PT100.....***U***
Module 4PT1000.....***X***
Module 4NTC.....***Y***

Power Supply:

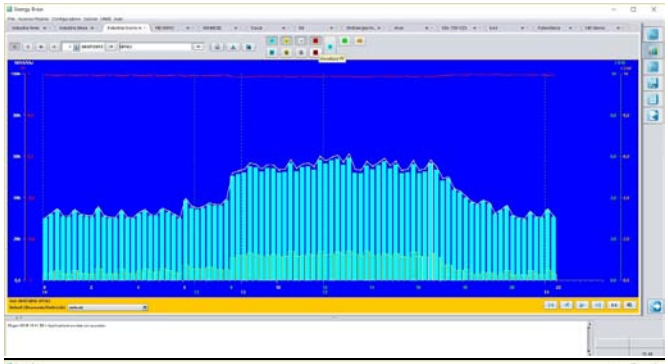
24Vdc +/- 10% ***only for*** *Module D2*.....***5***
230Vac +/- 10% ***only for*** *Module D4*.....***2***
15÷36Vac/18÷60Vdc ***only for*** *Module D4*.....***8***
9÷24Vac/ 9÷36Vdc ***only for*** *Module D4*.....***7***

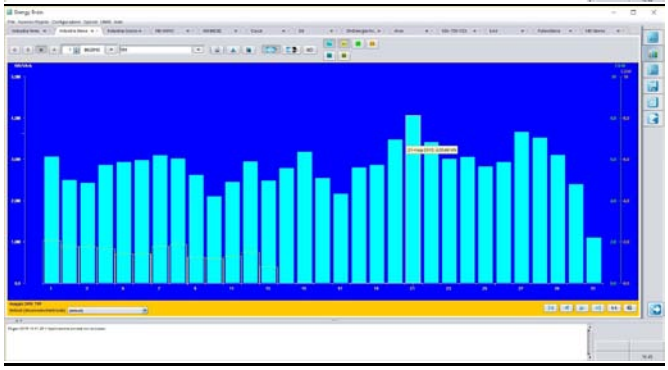
Data memory management (via Ethernet port or Wi-Fi)

The **Kilo PQ** family of devices manages the 128 MB flash memory in a flexible way for the storing of the different log services and event logs. Each log service can contain a maximum of 255 files and is characterized by a predetermined sampling frequency; The number of channels (e.g. instruments) that can be stored for each service depends on the activated PUKs and the amount of free memory. In the same memory are hosted also the web pages for the configuration and display of measures (standard and customized). In the **Kilo PQ** version the memory is also used for log of events and for the measurement campaigns. The memory can be read from **Ethernet port or Wi-Fi** network using the Energy Brain software and / or the HTTP protocol.

LOGGED PARAMETERS CHARTS

The **Kilo RJ45 PQ** continuously logs the data on the consumption/production in daily files containing by default the 96 quarters of hour. The logged data can be displayed using the software Energy Brain on a daily, weekly, monthly and yearly basis.

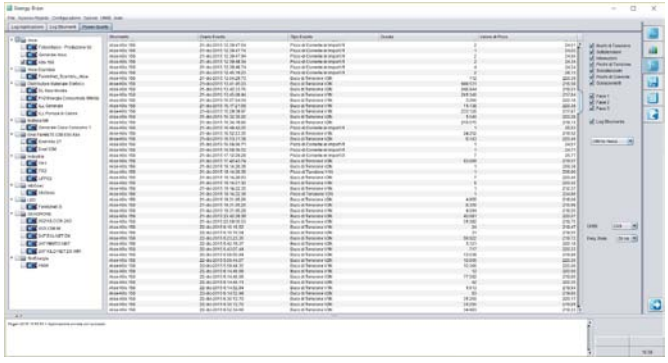




POWER QUALITY (Class S - EN 61000-4-30): Events Log

The **Kilo Rj45 PQ** detects and logs various events with a resolution of one cycle (with date / time * of each event, type of event, phase involved, duration, min / max value reached during the event and UNIPEDE classification) useful for monitoring the quality of energy (functions related also to the EN 50160 and EN 61000-4-30 standards for the S class). The parameters for defining abnormal events are programmable. Event types:

- **Voltage Dip**
- **Voltage Swell**
- **Over current and its direction**
- **Interruption**



(*) Date/hour expressed in hours, minutes, seconds and milliseconds referring to the instruments' (local time).

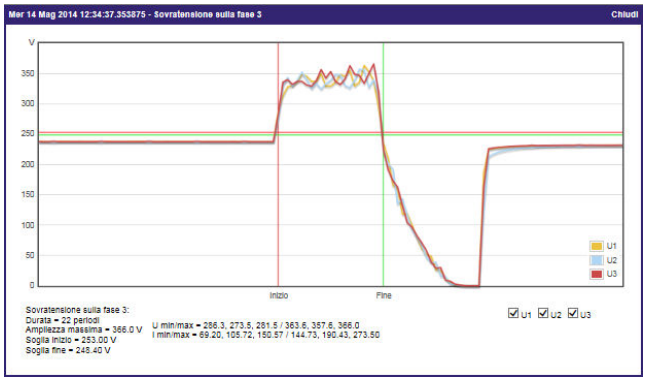
EVENT'S GRAPHIC DETAIL (KILO NET WEB)

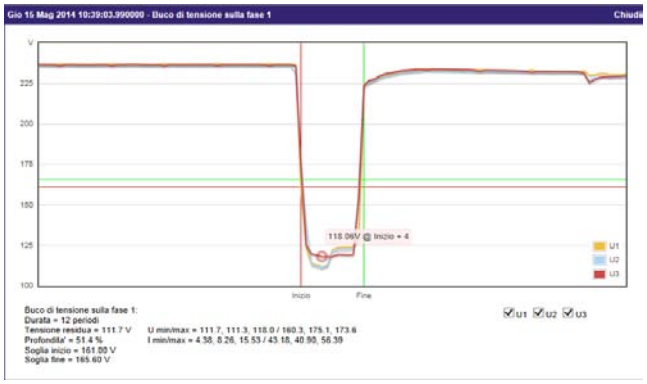
In the **Kilo net PQ Web Charts** in addition to the list of PQ events displayed in the web interface (available on the Kilo net PQ Web)

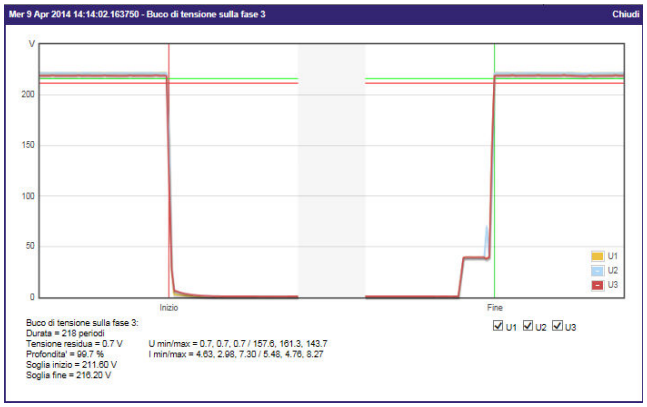
Data/ora	Evento	Fase	Durata [comsa.us]	Durata [periodi]	Valore [V]	Classificazione UNIPEDE
2014-05-12 16:15:10.986375	Avvio logger	---	---	---	---	-
2014-05-14 12:34:37.353875	Sovratensione	1	0:00:00.440250	22	363.6	S1
2014-05-14 12:34:37.353875	Sovratensione	2	0:00:00.440250	22	357.6	S1
2014-05-14 12:34:37.353875	Sovratensione	3	0:00:00.440250	22	366.0	S1
2014-05-14 12:34:37.854250	Buco di tensione	1	0:00:00.360125	18	0.2	X2
2014-05-14 12:34:37.854250	Buco di tensione	2	0:00:00.380250	19	0.3	X2
2014-05-14 12:34:37.874250	Buco di tensione	3	0:00:00.360250	18	0.2	X2
2014-05-14 12:34:38.054375	Interruzione	3	0:00:00.160000	8	0.2	-
2014-05-14 12:34:38.074375	Interruzione	1	0:00:00.140000	7	0.2	-
2014-05-14 12:34:38.074375	Interruzione	2	0:00:00.140000	7	0.3	-
2014-05-15 10:39:03.990000	Buco di tensione	1	0:00:00.240125	12	111.7	C2
2014-05-15 10:39:04.010000	Buco di tensione	2	0:00:00.220125	11	111.9	C2

Elementi: 33

it is included also the functionality named "event's graphic detail" that allows to record and display the trends of the beginning and end of the event with a time frame (for both beginning and end) of a second (programmable).







EVENTS TIMELINE AND THE UNIPEDE TABLE

The **Kilo net PQ Web Charts** can display a timeline of the succession of events

and maintains a diagram of distribution of events based on the % of the parameter considered in relation to its reference value and duration, according to the dictates of UNIPEDE (International Union of Producers and Distributors of Energy - http://www.eurelectric.org/).

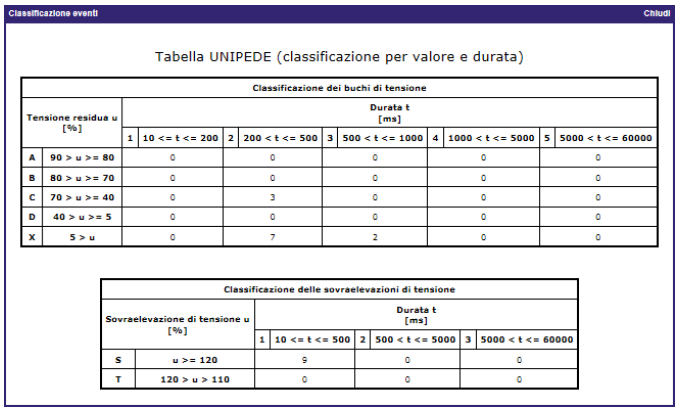


Tabella UNIPEDE (classificazione per valore e durata)

Classificazione dei buchi di tensione										
Tensione residua u [%]		Durata t [ms]								
		1	10 <= t <= 200	2	200 < t <= 500	3	500 < t <= 1000	4	1000 < t <= 5000	5	5000 < t <= 60000
A	90 > u >= 80	0		0		0		0		0	
B	80 > u >= 70	0		0		0		0		0	
C	70 > u >= 40	0		3		0		0		0	
D	40 > u >= 5	0		0		0		0		0	
X	5 > u	0		7		2		0		0	

Classificazione delle sovraelevazioni di tensione						
Sovraelevazione di tensione u [%]		Durata t [ms]				
		1	10 <= t <= 500	2	500 < t <= 5000	3	5000 < t <= 60000
S	u >= 120	9		0		0
T	120 > u > 110	0		0		0

Example: in the last column of the table here below , the S1 denotes a Voltage Swell with a duration between 10 and 500 mS (refer to the UNIPEDE table above),while the X2 denotes a Voltage Dip lower than 5% of the nominal voltage value with a duration between the 10 and 200 mS (refer to the UNIPEDE table above).

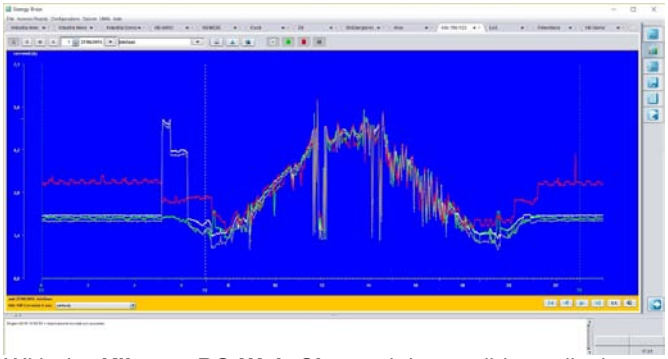
Data/ora	Evento	Fase	Durata [comcs.us]	Durata [periodi]	Valore [V]	Classificazione UNIPEDE
2014-05-12 16:15:10.986375	Avvio logger	---	---	---	---	-
2014-05-14 12:34:37.353875	Sovratensione	1	0:00:00.440250	22	363.6	S1
2014-05-14 12:34:37.353875	Sovratensione	2	0:00:00.440250	22	357.6	S1
2014-05-14 12:34:37.353875	Sovratensione	3	0:00:00.440250	22	366.0	S1
2014-05-14 12:34:37.854250	Buco di tensione	1	0:00:00.360125	18	0.2	X2
2014-05-14 12:34:37.854250	Buco di tensione	2	0:00:00.380250	19	0.3	X2
2014-05-14 12:34:37.874250	Buco di tensione	3	0:00:00.360250	18	0.2	X2
2014-05-14 12:34:38.054375	Interruzione	3	0:00:00.160000	8	0.2	-
2014-05-14 12:34:38.074375	Interruzione	1	0:00:00.140000	7	0.2	-
2014-05-14 12:34:38.074375	Interruzione	2	0:00:00.140000	7	0.3	-
2014-05-15 10:39:03.990000	Buco di tensione	1	0:00:00.240125	12	111.7	C2
2014-05-15 10:29:04.010000	Buco di tensione	2	0:00:00.220125	11	111.3	C2

Elementi: 33

MEASUREMENT CAMPAIGN

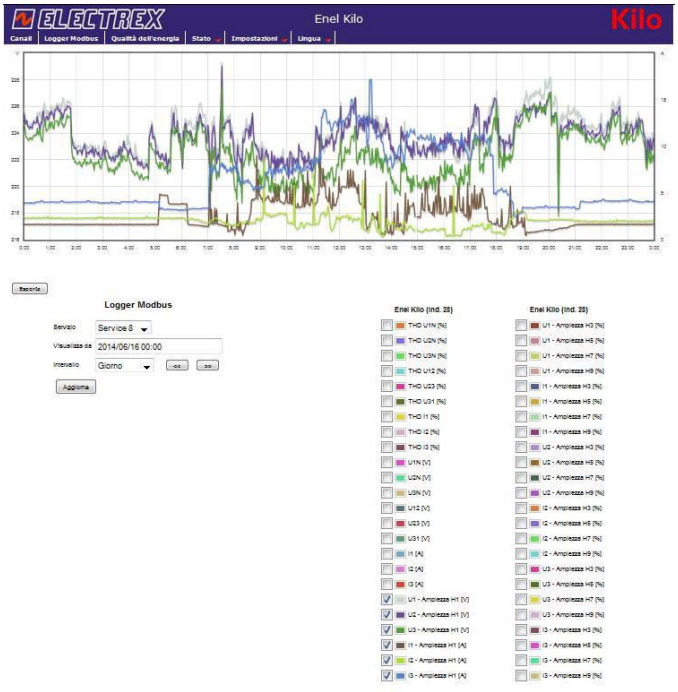
In the **Kilo PQ** it is possible to configure the measurement campaign in order to log, in the built-in memory, the various parameters with a programmable sampling rate, for example every 1 min., for 10 days (FIFO) in daily files. Data logged: U, I per each phase (per each parameter will be logged the nominal value and the % value of the fundamental; while the % value for the 3°,5°,7°,9° harmonic and THD). The data can be displayed using Energy Brain software.

Example of a daily measurement campaign of the 3 currents:



With the **Kilo net PQ Web Charts** it is possible to display on the web interface the measurement campaigns.

Example of a daily measurement campaign of the 3 voltages every 15 seconds:



FUNCTIONAL LOG

The instrument's memory is used also for other operative functions such as:

- Functional log for the recording of all the operations that alter the functioning of the instrument since the first use.
- Tariff Calendar file for the management of the tariffs and other files for memory configuration.

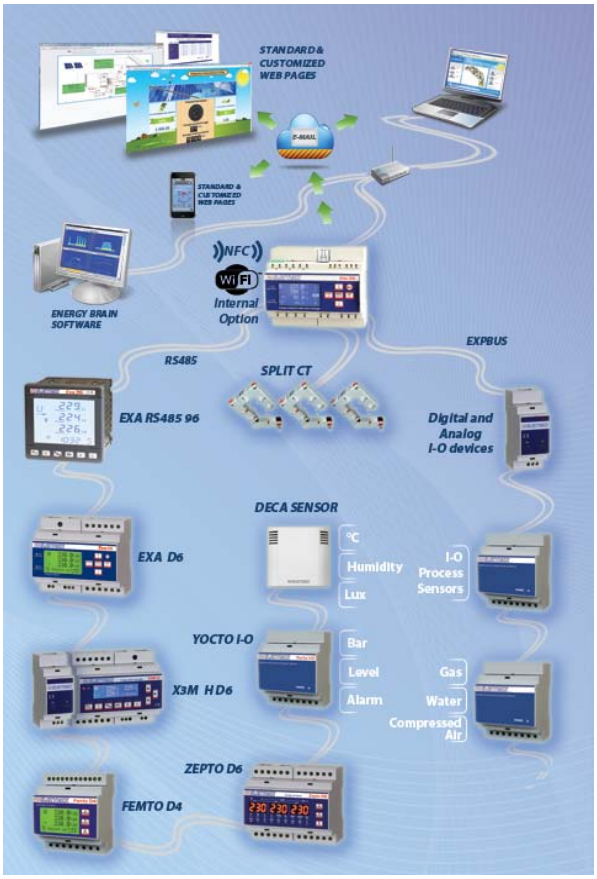
Considering the quantity and the complexity of the data contained in the memory, the memory management and the configuration of the services can be made exclusively via Ethernet port or Wi-Fi using FTP and HTTP commands, more simply by using Web pages and/or the software Energy Brain.

Kilo net

Power Quality Energy Analyzer & (Wi-Fi) Web Data Manager

Kilo net main features

The **Kilo net PQ Web** in addition to the features of the Kilo PQ already included, is also a: **WEB Server** used for the configuration, via WEB Browser, of the Kilo Net and of the other devices in the sub-network. The HTTP communication can be used for the instantaneous readings and for accessing the memory logs. It is also an FTP server for file transmissions; **Modbus-TCP Server** acting as a bridge between the Ethernet network (Modbus-TCP protocol for the instantaneous measures) and the RS485 port; **Arbiter** function between the Ethernet port (or Wi-Fi) and the expansion bus ExpBus (if other interfaces are used); Synchronization of the internal clock is made via NTP server; Static or dynamic IP address (DHCP protocol).
The **Kilo net PQ Web** can record the trend over time of the energy/environmental parameters retrieved by the Electrex devices *(called also channels)* connected in its RS485 port. The Kilo net has by default 2 active Log 8 storage services of which a service for storing energy/environmental parameters typically every quarter hour (with daily, weekly, monthly or yearly display options) and one for the measurement campaigns (see Open Log PUK). Each service is characterized by the same time base (sampling rate).



Net Upgrade Kilo PQ to Kilo Net (PUK) PFSU940-82

Transforms the **Kilo RJ45 PQ** in **Kilo net PQ Web**.

Additional functions activated via PUK code

It is possible to implement the following functions on the Kilo net ordering the Net upgrade options which are PUK codes to be inserted in a Web page for the activation.

Enabled - Net upgrade WEB (PUK) PFSU940-05

Enables the display of measures on web pages for the Kilo Net itself and each instrument connected to its RS485 port.

Enabled – 2 x Net upgrade Log 8 (PUK) PFSU940-01

Each Log 8 enables 1 logging service (e.g. log of 8 instruments/Modbus registers, power / energy just in import).
It is possible to activate up to 8 upgrade Log 8 (and then double those from Log 8 to Log 16 purchasing a PUK Log 16).

Net upgrade Log 16 (PUK) PFSU940-02

Doubles the capacity of the storage services from Log 8 to Log 16. The Net upgrade Log 8 (PUK) code PFSU940-01 must have been installed previously.

Enabled–1x Net upgrade Open Log(PUK) PFSU940-25

Allows to modify the sampling frequency and the choice of parameters to be logged for an existing Log 8 service for e.g. when performing a measurement campaigns. The sampling duration will depend on the sampling frequency set (minimum 5s or 10s) and the number of parameters selected. The Log 8 services to be modified must already be active and if, for example, it is needed to modify two Log 8 services, it is necessary to activate two PUK Open Log. By default is enabled one Open Log option for the measurement campaign, logging every 1 minute for 10 days of the 3 x voltages and currents, both THD and the single Harmonics of the 1°, 3°, 5°, 7° and 9° order.

Net upgrade Open WEB (PUK) PFSU940-10

Adds to the Kilo net the ability to upload and display custom Web pages.

Net upgrade Charts (PUK) PFSU940-30

Allows to display on a web page charts, related to a programmable period of time, of electricity, temperature, humidity, luminosity, etc. obtained from the files stored in the Kilo net with the possibility to export to CSV files.

Net upgrade Energy Automation (PUK) PFSU940-16

Adds the ability to manage Energy Automation tasks using the Ladder programming language for implementing ON/OFF switches, alarm and notifications and automations related to events and/or calendars (the Calendars option must be active) and/or the sending of e-mail/sms (if relative PUKS are active).

Net upgrade Calendars (PUK) PFSU940-20

Allows to create calendars to be used for the time tariffs and / or in combination with the Energy Automation option (if active).

Net upgrade eMail PFSU940-15 (& Sms PFSU940-17)

Adds the function of sending notification / alarm emails (and/or SMS by adding a specific modem/router with code PFC3510 with SIM for data and activating the Puk). It can also be used in combination with the Energy Automation option (if active).

Net upgrade Sending Files – PFSU940-50

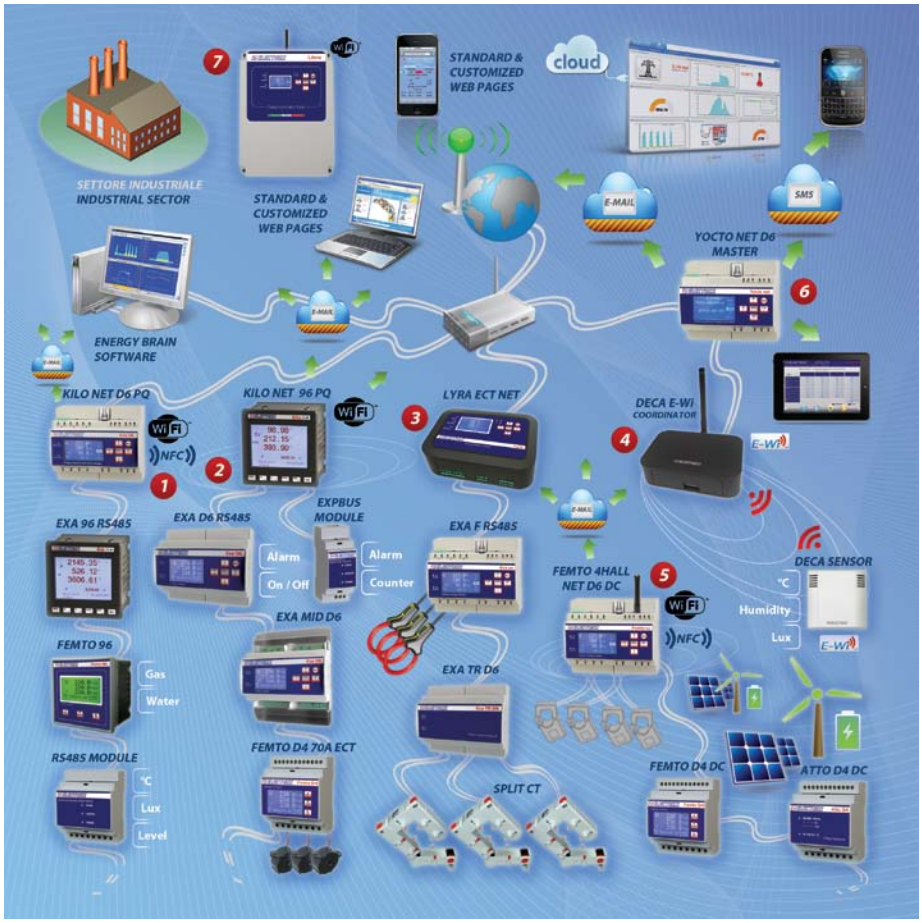
Adds the ability to send standard xml files (custom on request) through the function 'ftp report' or json strings through the 'http report' function. Additional costs for customizations. Requires activation of Energy Automation.

Net upgrade Net to Net Master (PUK) PFSU940-86

Transforms the Kilo in **Kilo net Master** which is able to communicate with all the Electrex in the Ethernet network and their relative sub-nodes.

Net upgrade New Features – PFSU940-40

Upgrade to new Kilo net firmware versions that add new features to the instrument.



Production plant energy monitoring solution example

The diagram above represents a part of a monitoring solution in a production plant powered by a main MV load and equipped with 2 MV/LV transformers (one of them replaced recently) that serves 2 production lines, while the offices are powered by a LV system. The monitoring system consists of branches 1 and 2 to monitor the transformers and a part of the production lines, while branches 3, 4, 6 and 7 take care of the building with the offices, the testing department, a Photovoltaic on the roof and R & D building. These branches are connected to the company Ethernet network via the Kilo net D6 PQ (branch 1), the Lyra ECT net (branch 3) and the Yocto net D6 Master (branch 6) and via Wi-Fi the Kilo net Wi-Fi EDA 96 PQ (branch 2) and the Femto 4Hall net Wi-Fi EDA D6 DC (branch 5). The various instruments and sensors inserted in each branch are responsible for monitoring the relevant main users.

- In branch 1 the Kilo net D6 PQ (gateway and datalogger) monitors the quantity and power quality under the transformer 1 and the Exa 96 RS485 in sub-grid RS485 to the Kilo net controls a machining center, while the Femto 96 is equipped with digital inputs in addition to taking care of lighting consumption and also of gas and water consumption. The RS485 Module detects some parameters from existing analogue probes.
- In branch 2 the Kilo net Wi-Fi EDA 96 PQ (gateway datalogger) monitors the quantity and power quality under the transformer 2; one of the several Exa D6 RS485 in sub-network RS485 under the Kilo 96 detects a compressor while the Exa MID D6 is used to de-tax the energy of a galvanic processing. The ExpBus module connected to the Kilo net 96 deals with alarms and counting. There is also a Femto D4 ECT for monitoring an area with LED lighting. In Kilo net 96 the Energy Automation was activated to automate and make more efficient the switching on and off of three compressors by piloting the digital outputs of the same number of Exa D6 RS485.
- In branch 3 that starts from the technical room there is a Lyra ECT net (gateway datalogger) that takes care of the general lighting of the offices having in RS485 sub-network an Exa F D6 Rs485 TA opening flexible (easier to insert) for the testing desk of large engines and an Exa TR D6 for testing of smaller engines.
- In point 4 there is a Deca Coordinator E-Wi 868 that acts as an E-Wi 868MHz radio gateway for a Deca Sensor E-Wi 868 that detects the environmental parameters of a laboratory. The Deca Coordinator is connected in RS485 to the Yocto net Master which acts as the datalogger of the branch.
- Branch 5 deals with continuous side monitoring (Femto 4Hall net DC, Femto D4 DC and Atto D4 DC) of a 50kWp photovoltaic system placed on the roof of the building.

In the Ethernet network, the Yocto Net D6 Web Master, branch 6, has enabled customized web pages (including those of the HVAC) to display the supervision pages on the PCs, tablets and smartphones of the managers and maintainers as well as sending alarms via eMail to warn in case of anomalies.

To monitor the Research & Development building across the street, a Libra (quick to install) panel was used connected to a router with data SIM, item 7.

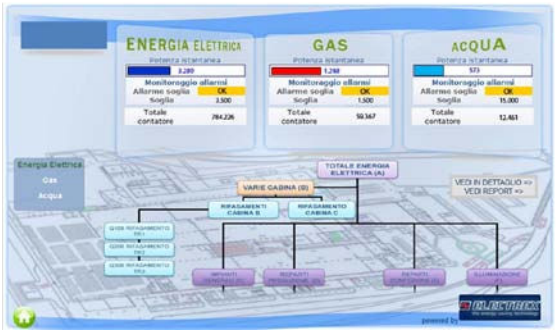
The Energy Manager uses his Notebook both when it is in the plant (locally) and when it is out (remotely), to connect to the company Lan network and evaluate the effectiveness of energy efficiency interventions through data that the software Energy Brain PRO periodically downloads from Electrex devices. Recently, in order to continuously improve in terms of energy efficiency (ISO 50001), the Energy Manager has also involved in the Energy Management System the department managers, making available their consumption data that can be viewed from a PC, tablet and smartphone at any time via the Energy Brain Cloud which is also active in the Control Room. The management is implementing different levels of interconnection (hardware and software) with a view to Industry 4.0.

Examples of measurement web pages – PFSU940-05

Through the 'Net upgrade WEB' option it is possible to view the standard web pages displaying real-time measurements, the mean values of powers and the energy counters both from the Kilo net Web and from all the devices connected in the sub-network via RS485. The images on the side show real-time measurements, the average values and the energy counters related to a laboratory building with offices.

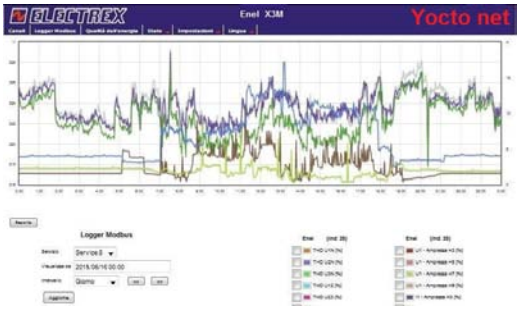
Examples of custom web pages – PFSU940-10

Enabling the 'Net upgrade WEB' and the 'Net upgrade WEB open' functionalities it is possible to activate a memory part in the memory of the Kilo Net Web where it can be uploaded custom web pages. Alongside are reported an example of real time monitoring of the electricity, gas and water of a production plant with the possibility of setting thresholds and alarms. It is possible to connect to sub-pages detailing the consumption of the departments and machinery and through a link to connect to the historical data . The pages residing on the web server of the Kilo Net are easily accessible from any the browser of a PC, Smartphone, etc., typing just the IP address.



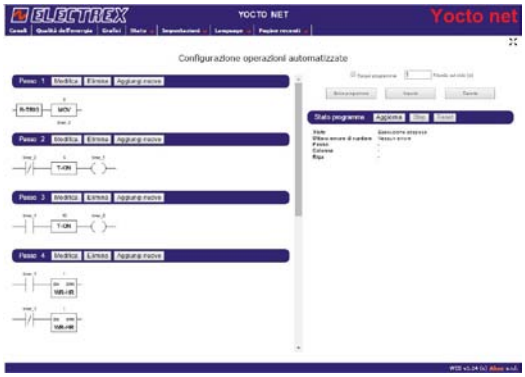
Web charts examples – PFSU940-30

Enabling the 'Net upgrade Charts' option it is possible to display on a web page the charts obtained from the files stored in the Kilo Net. In the example, the chart shows the load profile of active energy produced and consumed from PV system.



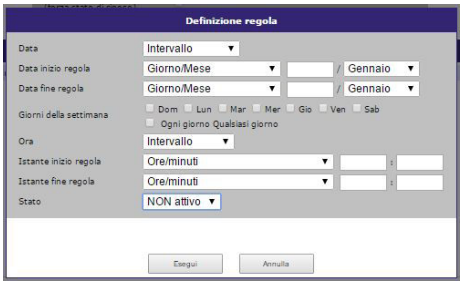
Measurement campaign example – PFSU940-25

Enabling the 'Net upgrade Open Log' option related to an existing Log 8 logging service of the Kilo net it is possible to implement measurement campaigns for any parameter retrieved from Electrex devices connect to it with the chosen sampling frequency. In the example it is shown the measures campaign for the 3 phase-currents and 3 phase-voltages logged every 1 minute



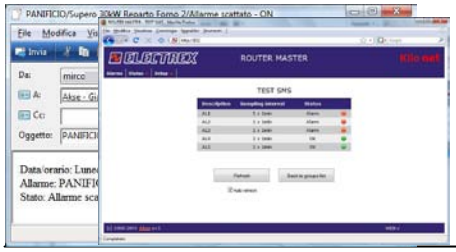
Energy Automation – PFSU940-16

Enabling the 'Net upgrade Energy Automation' option it is possible to automate even complex operations such as power on / off, alarms / alerts and operations triggered by events. The programming of the logic is in Ladder language. It is possible to combine the programming features also with customized calendars (if implemented Upgrade Calendars option) and / or with the sending of e-mail / SMS (if implemented Upgrade E-Mail / SMS option).



Upgrade Calendars – PFSU940-20

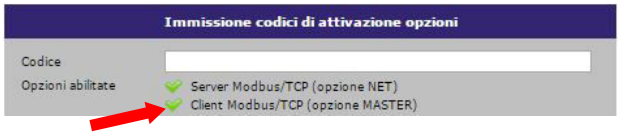
Enabling the 'Upgrade Calendars' option it is possible to configure Calendars to be used for e.g. for tariffs and/or combined with the Energy Automation option for scheduled tasks of power ON/OFF. The astronomic type clock is synchronized via NTP server (connection via Internet or to an internal LAN one).



E-mail alarms/notifications examples – (Sms – PFSU940-17)

Enabling the 'Upgrade E-Mail / SMS' it is possible to configure the Kilo net Web to send email alarms and notifications for example related to the status of a digital input. If connected to a suitable external router it is possible to send also SMS. The example images show the e-mail alarm of a load in a bakery and the graphical status display in the specific web page of Kilo net Web.

Net upgrade Net to Master Version – PFSU940-86



Implementing this option the Kilo net Web becomes a Master device capable of communicating with all the Electrex gateways and devices connected to the same Ethernet network (LAN or WAN). The option is very useful in case of customized web pages displaying measurements/alarm status from different nodes of the network or when a single public IP address is given for a multitude of gateways present in the network.

Technical Specifications of Kilo

Measurements

Voltage ..... $U_{1\text{-}N}$, $U_{2\text{-}N}$, $U_{3\text{-}N}$, $U_{1\text{-}2}$, $U_{2\text{-}3}$, $U_{3\text{-}1}$, $U_{LL\,\Sigma}$, $U_{LN\,\Sigma}$
Max (ABSOLUTE VALUE): .. $U_{L1\text{-}N}$, $U_{L2\text{-}N}$, $U_{L3\text{-}N}$, $U_{L1\text{-}L2}$, $U_{L2\text{-}L3}$, $U_{L3\text{-}L1}$
Min (ABSOLUTE VALUE): $U_{L1\text{-}N}$, $U_{L2\text{-}N}$, $U_{L3\text{-}N}$, $U_{L1\text{-}L2}$, $U_{L2\text{-}L3}$, $U_{L3\text{-}L1}$
Current ..... I_1, I_2, I_3, I_Σ, $I_{neutral}$
Max (ABSOLUTE VALUE):..... I_1, I_2, I_3
Therm: ..... I_1, I_2, I_3
Power Factor ..... PF_1, PF2, PF_3, PF_Σ
Frequency ..... f
Voltage THD ..... THD-U_1, THD-U_2, THD-U_3, THD-U_Σ
Current THD ..... THD-I_1, THD-I_2, THD-I_3, THD-I_Σ
Instantaneous Power... P_1,P_2,P_3,P_Σ - Q_1,Q_2,Q_3,Q_Σ - S_1,S_2,S_3,S_Σ
Average Power..... PmΣ, QmΣ(ind), QmΣ(cap), SmΣ (imp/exp)
PmΣ, QmΣ(ind), QmΣ(cap), SmΣ (imp/exp)
Powers peak ..... PmdΣ, QmdΣ(ind), QmdΣ(cap), SmdΣ (imp/exp)
Active Energy (also per each phase)..... Ea (import/export)
Reactive Energy (also per each ph.) Er(ind/cap)(import/export)
Apparent Energy (also per each phase) ..... Es (import/export)
Life Time TOTAL and 3 PARTIALS: ..... h, h/100
Pulse counting (per each digital input): ..... $C_{NT\,T}$, $C_{NT\,Part.}$
Analog measure(per each analog input): ..... Instantaneous
Harmonics (FFT) ....H_{U1}, H_{U2}, H_{U3} (1-51° order)
H_{I1}, H_{I2}, H_{I3} (1-51° order)

Load profile and consumption/production (via Ethernet port)
Tariff calendar
Logged Events (Kilo Q - EN 50160 and EN 61000-4-30):
Voltage Dip (sags/dips)
Voltage swell and peaks
Current peaks and direction
Interruptions
Overvoltage/Undervoltage
Overcurrent and direction
Event classification
Functional logs - Harmonics measurement (Kilo PQ)

Electrical characteristics

Connection .....3-phase, 1-phase and 2-phase, LV,MV,HV
balanced, unbalanced, 3- and 4-wires
Voltage inputs .....from 20 to 500V phase-phase
(max. 1,7 crest factor)
With external VT (max. 400 kV primar.)
VT value: programmable
Overload ..... max, 900 Vrms peak per 1 sec.
Current Inputs..... 1, 2 or 3 CT external
max. 10kA primary .../1A and ../5A secondary
CT value: programmable
Overload .... max, 100 Arms peak per 1 sec..
Load on the CT .....< 0,5 VA
For the Kilo F Net versions suitable with Electrex flexible CT:
max. 500/2000/8000A primary .../mV secondary
Power supply .....85÷265 Vac/100÷374 Vdc
or others on request e.g. 15÷40 Vac/18÷60 Vdc
or 9÷24 Vac/ 9÷36 Vdc
Power supply toward other modules, max:.....5 VA
Self consumption.....< 2 W
Frequency:..... 45-65 Hz

Front panel

Display.....LCD, FSTN dot-matrix 128 x 64 points
Visible area .....22 x 44 mm
Backlight .....White Led
Keyboard ..... 6 keys keypad Joystick positioned
On the front panel:
Calibration LED ..... 2 red for the Ea and Er
Functioning / State LED..... 1 red under the symbol

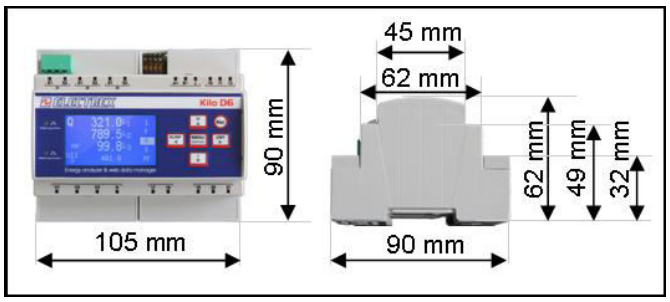
Communication RS485 LED 1 green and 1 red under the white band

Functional characteristics

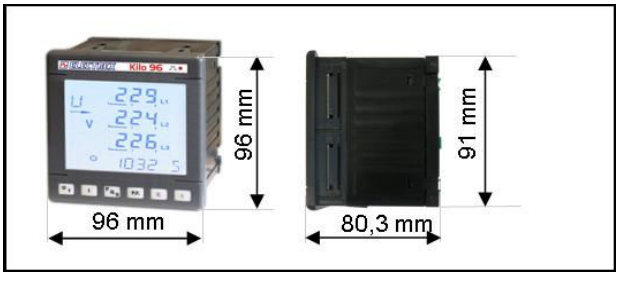
Measurement.....True-RMS up to the 51st harmonic
Quadrants..... 2 or 4 quadrants (programmable)
Accuracy: ..... Class 0,5S for Active Energy - EN 62053-22
.....Class C according to EN 50470-3
Class 1 for Reactive Energy - EN 62053-24
Sampling: Continuous sampling of voltage and current waveforms
Compensation ..... Automatic of the amplifiers' offsets
Scale Change: .....Automatic on the current inputs
(highest resolution)
Insulation .....Galvanic on all the inputs and outputs
Standards: - Safety: .....IEC EN 61010 class 2
- E.M.C.: .....IEC EN 61326-1A

Mechanical characteristics

Working temperature .....-20/+60 °C
Humidity..... 95% R.H. non condensing
Enclosure.....Self-extinguishing plastic material class UL 94 V-0
Protection degree ..... Front panel IP40 IP20 (Terminals side)
Size..... 6 DIN modules
Mounting.....DIN rail
Terminals:..... screw connector cables max. section up to 4 mm^2
Weight .....about 260 gr. net



Size Kilo 96.....96 x 96 x 78 mm
Panel cutout..... 92 x 92 mm
Terminals: ....plug-in connector cables max. section up to 4 mm^2
Weight ..... circa. 260 gr. net



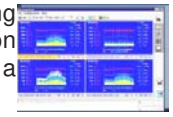
The Energy Brain 6.x and PRO 6.x software (to be installed on a PC, optional)

The Energy Brain software is uesd for the management of instrument networks, also very complex ones, both locally or remotely.
It is suitable for applications with Electrex instruments equipped with a communication port, and provides all the necessary functions for monitoring and accurate management of energy efficiency (consumption / production of electricity, gas, water, etc..), environmental parameters (temperature, humidity, luminosity, CO2, etc.) and process parameters.

Main features

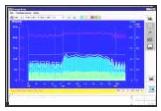
Configuration

- The available options allow for maximum flexibility in adapting the software to the network instruments (even to different types of networks connected simultaneously) and the operator needs.
  - Remote set-up of the devices (CT, alarms, etc.)
  - Network configuration (per each device, per each client, per groups, per locations) with individual setting of the local connection (direct RS485, E-Wi, Ethernet) or remote (Internet, Wi-Fi) and of the communication parameters (speed, etc.).
  - Configuration of scheduled downloading specific for each location and customer, on a daily, weekly or monthly basis through a programmable agenda.



Load chart and curves of consumption/production

- Charts of the daily, weekly, monthly, yearly power curves.
- Charts of the daily, weekly, monthly, yearly consumption curves.
- Charts of powers, power peaks and energy per each tariff.
- Up to 4 simultaneous charts.
- Zoom and selection of measures functions.
- Numerical and graphical data print.

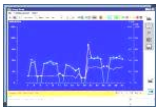


Parameters displaying

- Displays on-line all the measures provided by each of the instruments on the field

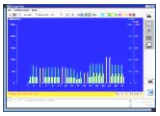
Data archive

- Automatic or manual download of the data of power, energy and other variables from the devices connected and automatic archiving in the internal PostgresSQL® database.
- Export data to other DB via ODBC module or .txt or .xls format files.



Tariffs

- Management of the data per each tariff
- Configuration Editor for tariffs and calendars



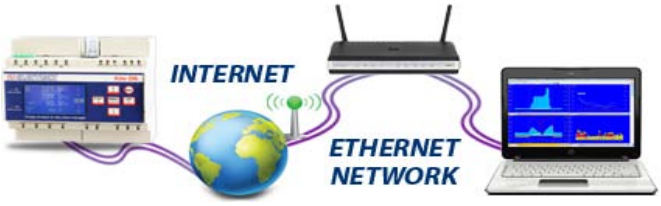
Virtual and Multiple Channels

- Creating virtual channels, so of "groups" of instruments (e.g. "summation" of various departments) and display those, on graphical form, in the same way of a physical channel
- Creation of multiple channels in order to view curves of more instruments in the same chart for a quick comparison.
- Inclusion of variables and mathematical formulas, even highly complex ones, particularly useful, for example, to perform simulations.

Other types of Energies / Measurements

- Creating charts of data obtained from Electrex Deca Sensors and / or third party transducers with pulse output (e.g. luminosity, temperature, gas, calories, etc.).

Connections between PC and Kilo D6 or 96: direct Ethernet Rj45 port, Wi-Fi, Ethernet network, Internet

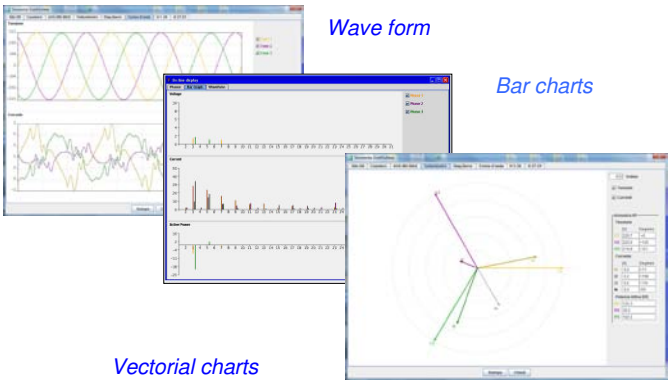


Specific functions for Kilo PQ

- Downloads, logs and displays the events recorded in the internal memory of the Kilo PQ in compliance with EN 50160 and EN 61000-4-30.

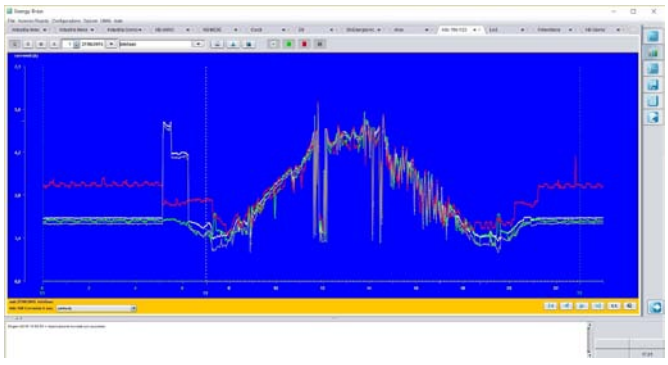
Graphical display of the instantaneous measures

- Manages the charts for the **Kilo D6** and **96** devices.



Harmonics measurement campaign and other parameters

- It is possible to configure a measurement campaign:



The software Energy Brain PRO 6.x

- For more info on the additional functions introduced in the PRO 6.x version please refer to the Energy Brain software datasheet.

Energy Brain software is expandable and it is available in different versions according to the functions and the number of channels required. For more details about the software: www.electrex.it/en

How to order Kilo D6 and Kilo 96

Description	Code
Kilo RJ45 D6 PQ 85÷265V 2DI 2DO	PFNK6-1Q7Q9-0MM

*The **Kilo RJ45 PQ** or **F RJ45 PQ** can evolve in **Kilo Net PQ Web o Kilo F Net PQ Web** by activating the following Upgrade (PUK):*

Upgrade RJ45 PQ to Net PQ Web version	*PFSU940-82*
Kilo net D6 PQ Web Log 16 85÷265V 2DI 2DO	PFNK6-1Q5Q9-121

*The **Kilo Net PQ Web** or **Kilo F Net PQ Web** can evolve in **Kilo Net Master PQ Web** o **Kilo F Net Master PQ Web** by activating the following Upgrade (PUK):*

Net Upgrade Net to Master version	*PFSU940-86*
Kilo net D6 PQ Web Log 16 Charts 85÷265V 2DI 2DO	PFNK6-1Q5Q9-A21
Kilo net D6 PQ Web Log 16 Full 85÷265V 2DI 2DO	PFNK6-1Q5Q9-F21
Kilo net Wi-Fi EDA D6 PQ Web Log 16 85÷265V 2DI 2DO	PFNK6-1QAQ9-121
Kilo net D6 PQ Web Log 16 18÷60VDC 2DI 2DO	PFNK6-1Q5Q8-121
Kilo net D6 PQ Web Log 16 85÷265V 4DO	PFNK6-1Q5P9-121
EB 8 6.x Kit Kilo Net D6 PQ Web Log 16 Charts 2DI 2DO	PFAK614-116
EB PRO 8 6.x Kit Kilo Net D6 PQ Web Log16 Charts 2DI 2DO	PFAKP614-116

*The sequence of codes listed above is repeated for the **Kilo F D6** (F - the 7th digit of the code), the **Kilo 96** (9 - the 5th digit of the code) and the **Kilo F 96** (9 - the 5th digit of the code and F - the 7th digit of the code), the same for the **EB 8 6.X Kit** while for the **EB PRO 8 6.X Kit** will change the 6th and the 8th digit. For e.g.:*

Kilo F RJ45 96 H 85÷265V 2DI 2DO	PFNK9-FH7Q9-0M0

*The **Kilo Net** and **Kilo F Net** can implement additional features in subsequent times after the purchase by activating the following Net upgrade (PUK):*

Net Upgrade Log 8 (PUK)	PFSU940-01
Net Upgrade Log 16 (PUK)	PFSU940-02
Net Upgrade Open Web (PUK)	PFSU940-10
Net Upgrade Charts (PUK)	PFSU940-30
Net Upgrade Open Log (PUK)	PFSU940-25
Net Upgrade Energy Automation (PUK)	PFSU940-16
Net Upgrade eMail (PUK)	PFSU940-15
Net Upgrade Sms (PUK)	PFSU940-17
Net Upgrade Calendars (PUK)	PFSU940-20
Net Up. Bundle En. Autom., Calendars, eMail (PUK)	PFSU940-22
Net Up.Bundle En.Autom., Calendars, eMail, Sms (PUK)	PFSU940-23
Net Upgrade Sending Files (PUK)	PFSU940-50
Net Upgrade New Features (PUK)	PFSU940-40
Upgrade RJ45 PQ to Net PQ Web version (PUK)	*PFSU940-82*
Net Upgrade Net to Master version (PUK)	*PFSU940-86*

Flexible Current Transformers Codes

FCTS 070-500 Flex Split Current Transformer	PFCF021
FCTS 120-1000 Flex Split Current Transformer	PFCF022
FCTS 200-2000 Flex Split Current Transformer	PFCF023
FCTS 280-4000 Flex Split Current Transformer	PFCF024

Other versions of Kilo D6 and Kilo 96

CODE | P | F | N | K | | - | | | | | | | | |

Description	*Code*
BUILDING CODE	**PFN K 6 - 1 Q 5 Q 9 - 1 2 1**
Family Kilo = **K**	
Dimension 6 modules DIN = **6**	
Flush mount 96x96 = **9**	
Current Input ../5A & ../1A = **1**	
Flexible Split Core CT = **F**	
Power Quality = **Q**	
Communication	
RJ45 **7**	
Net **5**	
Wi-Fi EDA **A**	
Internal module	
Module 2DI 1 RO Self Powered **2**	
Module 2RO24VDC **5**	
Module 2AO4-20mA **6**	
Module 1DI 2DO Self Powered **E**	
Module 4DI **N**	
Module 4DO **P**	
Module 2DI 2DO 4COMMON **D**	
Module 4DI 4COMMON **B**	
Module 4AI **R**	
Module 4SI (Sensor Bus I²C) **T**	
Module 4PT100 **U**	
Module 4PT1000 **X**	
Module 4NTC **Y**	
Power supply:	
85÷265Vac/100÷374Vdc **9**	
15÷40Vac/18÷60Vdc **8**	
9÷24Vac/9÷36Vdc **7**	
NOT Master version **-**	
Master **M**	
Sending Files **F**	
Master e Sending Files **N**	
Additional functionality:	
No additional functionality **0**	
Functionality Web **1**	
Functionality Web Charts **A**	
Functionality Web Energy Automation **5**	
Functionality Web eMail **7**	
Functionality Web Calendars **8**	
Fun. Web Energy Automation eMail Calendars **9**	
Fun. Web Full (Charts Autom. eMail Calendars) **F**	
Functionality Open Web **2**	
Functionality Open Web Charts **C**	
Fun. Open Web Automation eMail Calendars **B**	
Functionality Open Web Full **D**	
Log service for the internal analyzer **M**	
Net: N. of active Log 8 services **1 - 8**	
Log 8 services doubled to Log 16 **9**	
Open Log for the internal analyzer **M**	
Net: N. of active Open Log **1 - 8**	

ELECTREX the energy saving technology

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