ELECTREX
the energy saving technology

Engineered and manufactured in Italy
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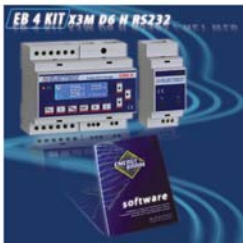
EB 4 KIT X3M H

Energy and Harmonics monitoring Kit



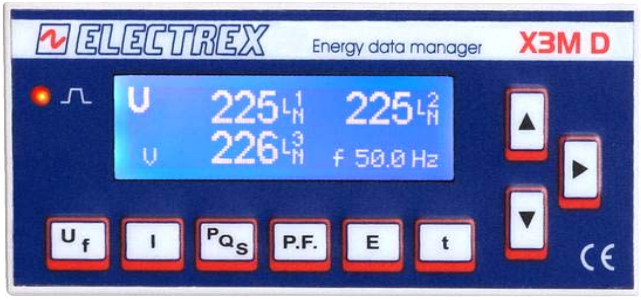
Each of the 4 versions of **EB 4 KIT X3M H** monitors the Electrical Energy both quantitative and qualitative in the industrial, tertiary and residential sectors. The 2 **NET WEB** versions are often the starting point of a more complex network with connection through Ethernet / Internet to PC and / or Smart Phone.
Based on the technology of X3M H DIN, conserves all the features and functions such as measurement of electrical parameters, storage of data intended to facilitate analysis of load curves and the recording of events such as maximum and minimum, interruptions and harmonics, plus the possibility of upgrading through internal firmware updates. The Yocto net adds to the peculiarities of X3M the ability to display by PC the standard measures Web pages beyond the activation of new functionalities through PUK as the Alarms via Email.

General features

The measures, in True-RMS value, are obtained by continuously sampling the tensions waveforms and currents, ensuring high precision also when the loads change quickly (for example point welder) this makes it also more suitable for the function of supervising the energy quality. A digital measurement system with automatic scale changing on the current input and a compensation system of internal amplifier assures the maximum precision of the measure independently from the signal level and environmental condition.
Instrument architecture allow implementation for firmware modification by an anytime upload of new firmware with the purpose of expanding or substituting the old characteristics with new or different one.

Semplicity

A large high-contrast, dot-matrix LCD display, with white backlight and adjustable contrast allows the simultaneous reading of 4 parameters and their symbols with high visibility digits.



9 keys, with clear indication of their function, make the instrument's use simple and intuitive. A Led indicator, pulsing with a frequency proportional to the active import power, is also provided on the front panel for field calibration verification by means of external optical devices.

Versatility

It is suitable virtually for all type of electrical grid, 3- and 4-wire, symmetrical and asymmetrical, balanced or unbalanced, single-phase and bi-phase, Low Tension and High Tension, with 1, 2 or 3 CTs as well as for 2 and 4 quadrant (import/export) measurement.
Through a simple keyboard you can set all the operational parameters such as CT ratios and integration time (5-60 min).

Measure

Parameters	*Type*	L1	L2	L3	Σ	*Range*
Tension	V L-N	•	•	•	•	*20,0V...400 kV*
	V L-L	•	•	•	•	
Current	I-Phase	•	•	•		*10 mA…10,0 kA*
	I-Neutral				•	
Power Factor	PF	•	•	•	•	*0,00ind...1,00…0,00cap*
Frequency	Hz				•	*45 … 65 Hz*
Harmonic Distortion	THD-V	•	•	•	•	*0…199,9%*
	THD-I	•	•	•	•	
Timelife	h (1/100 h)				•	*0,01…99.999,99 ore*
Active power	P	•	•	•	•	*± 0,00…1999 MW*
	Pm (1)				•	
	Pmd (1)				•	
Reactive power	Q	•	•	•	•	*± 0,00…1999 Mvar*
	Qm-ind (1)				•	
	Qm-cap (1)				•	
	Qmd-ind (1)				•	
	Qmd-cap (1)				•	
Apparent power	S	•	•	•	•	*± 0,00…1999 MVA*
	Sm (1)				•	
	Smd (1)				•	
Active energy	KWh (2)				•	*0,1 kWh…99.999,9 MWh*
Reactive energy	Kvarh-ind (2)				•	*0,1 kvarh…99.999,9 Mvarh*
	Kvarh-cap (2)				•	
Apparent Energy	KVAh (2)				•	*0,1kVAh…99.999,9 MVAh*
Harmonic analysis	*H Voltage*	•	•	•		*Valore (H01), % (H02-H31)*
	H Current	•	•	•		*Valore (H01), % (H02-H31)*
	H Power &	•	•	•		*Valore (H01), % (H02-H31)*

(1) Mean value (rolling average) over the integration time (1.. 60 min. programmable)
2) Energies displayed as 6 digit floating-point readings; internal energy metering performed with 0,1 Wh minimum resolution and 99.999.999,9999 kWh maximum energy count before rollover.

Power quality (EN50160)

Parameter	L1	L2	L3	Σ	*Handling*
Leak, Peak, microinterruptions	•	•	•		*Event Log saved With date and time*
Over-U, Over-I,	•	•	•		
Under-U, Interruptions	•	•	•		
Min/Max Value	•	•	•		

Inside the Kits

EB 4 KIT X3M D6 (or 96) H RS 232 - *PFE865-00* (or *PFE861-00*) includes:
- X3M D6 H RS232 or X3M 96 H RS232
- Energy Brain 4 software and RS232 cable;

EB 4 KIT X3M D6 (or 96) H RS 485 / NET WEB - *PFA5613-82* (or *PFA5C13-82*) includes:
- X3M D6 H RS485 or X3M 96 H RS485
- Yocto net web with Power Supply
- Energy Brain 4 software.

Data Storage Memories

The **X3M H** is equipped with a 2 MB flash disk memory for the storage of numerous data and events. The large memory capacity supports the storage of up to 255 days of load profiles (with 15 min. samples) or over 50.000 logs as well as other repartition according to the type of events. The memory is structured with the file system and the data is saved as distinct files, organized by type of services that can be read from serial port trough MODBUS commands ("read general file" and "write general file") or through Energy brain Software.

Power Quality Events (EN 50160 standards)

The **X3M H** detects and stores, with individual date-time stamp, several events giving an accurate monitoring of the power supply quality according to the EN 50160 standards.

- **Voltage sags/dips**
- **Temporary over voltage/swell**
- **Temporary current peak and direction of flow**

i.e. ***short duration events*** (1 cycle resolution) with registration of date-time, event type, phase involved, duration in number of cycles and min/max parameter value attained during each event. Example:

Date	*Time (*)*	*Event type*	*Duration (Cycles)*	*Min/Max Value*
20 Dic. 06	16.35.30.67	Voltage Hole V1N	10	21,25
12 Feb. 06	16.35.15,21	Voltage Hole V2N	30	66,32
16 Feb. 06	16.35.32.20	Voltage Swell V3N	25	273,12
16 Feb. 06	16.39.58.87	Current Hole import I2	5	152,51
16 Feb. 06	16.41.30.91	Current Hole import I3	7	163,56
16 Feb. 06	16.41.45.07	Current Hole import I1	3	155,83

- **Under voltage/voltage interruption**
- **Over voltage**
- **Over current and direction of flow**

i.e. ***medium and long duration events*** with registration of event start-end date/time, event type, phase involved and parameter min/max value attained during each event. Example:

Data	*Tempo (*)*	*Tipo Evento*	*Min/Max*
19 Gen. 06	15.59.02.17	Under voltage start V3N	-
19 Gen. 06	15.59.17.31	Under voltage end V3N	20,48
20 Feb 06	16.37.46.49	Under voltage start V2N	-
20 Feb. 06	16.41.45.88	Under voltage end V3N	60,34
01 Mar. 06	16.08.19.27	Over voltage start V2N	-
01 Mar. 06	16.08.19.99	Over voltage end V2N	264,35
01 Mar. 06	16.02.29.23	Import overcurrent Start I1	-
01 Mar. 06	16.08.19.72	Import overcurrent End I1	213,74

The event type is programmable for each parameter in terms of duration (trigger-on value and trigger-off value, number of cycles).

Instrument power supply interruptions are also logged in order to provide a complete picture of the activities.

16 Jan. 06	16.34.49.88	Power OFF
16 Jan. 06	16.35.03.50	Power ON
16 Jan. 06	16.35.04.10	Start readings

MIN. and MAX. value logs

The **X3M H** records the absolute minimum and/or maximum instantaneous value (RMS over 1 sec) attained by the most significant parameters and logs the event in memory with date and time stamp.

- Voltage ..... minimum and maximum value per phase
- Current ..... maximum value per phase
- Active and Apparent power ..... maximum value per phase
- Power factor ..... minimum value per phase

(*) all time stamps in hours, minutes, seconds and seconds/100.

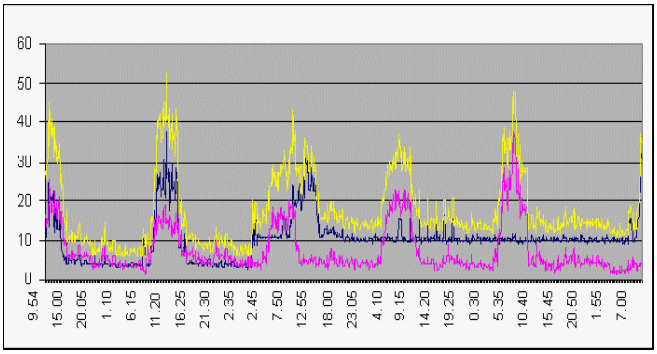
Load profiles and consumption data

The **X3M H** systematically stores the consumption and demand data into *day files* containing all the necessary information for drawing accurate load profiles and also for comprehensive consumption analyses over long periods.

- Daily load profiles on the 4 quadrants with sampling according to the integration period. Up to 60 days' data default capacity with 15 min. samples.
- Max. Demand on the 4 quadrants and for each tariff, where programmed.
- Energy consumption on the 4 quadrants and for each tariff, where programmed.

Harmonics surveys

A date/time stamped sample of 42 default readings is automatically saved in the instrument's built-in memory on a circular buffer (FIFO) covering a 10-day survey period with samples taken every 2 minutes and data organised in daily files.



- *Tens*ion: **U**, **THD-U**, **H1-U**, **H3-U**, **H5-U**, **H7-U** and **H9-U** per phase
- *Current*: **I**, **THD-I**, **H1-I**, **H3-I**, **H5-I**, **H7-I** and **H9-I** per phase

Memorized data can be downloaded through serial port in HTML, XLS or TXT.

Functional logs

The memory is also used for several additional operations such as:

- Functional logs tracking all the operations that insert a settings change of the instrument since initial install.
- TOU calendar files for the handling of TOU tariffs and other memory configuration files.
- Specific files for special programming and/or for future implementation of new functions by means of up-loads.

As a consequence of the large amount and complexity of the data collected in the memory, the configuration of the various memory services and the data downloads are exploited via serial port.
The Energy Brain software represents an easy all-users tool.
The use of the "read general file" and "write general file" Modbus commands is otherwise available.

Harmonics analysis

The FFT harmonics of **X3M H** adds all the parameters necessary for a comprehensive Harmonics analyses. It supports a 32 bit calculation which gives superior metering accuracy and enables to classify the **X3M H** as a genuine Energy & Harmonics analyser with a performance comparable with many sophisticated and expensive analysers. The FFT harmonics supports all the readings that are needed for a superior analyses of the problems related to harmonics. Readings give both the harmonics power and the direction providing an invaluable tool for immediate examination of the harmonics flow inside a specific plant and for identifying potentially undesirable imported problems.

Modbus communication

A total of 384 readings related to harmonics are enabled as Modbus registers on serial port by the FFT harmonics option.

- Current and voltage harmonics per order and per phase
- Phase angle in degrees (range -180,0÷180.0°) per harmonic order, per phase, referred to U_{L1} fundamental.
- These parameters may be used for external reconstruction of vectorial graphs such as those supported by the Energy Brain software (v. 5.4 or higher).

Technical characteristics

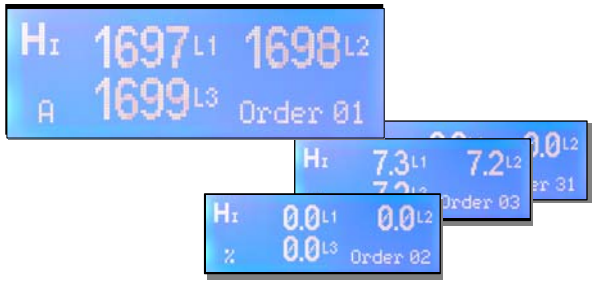
Harmonics range ..... Odd and Even harmonics up to 31st order
Parameters ... H_U, H_I, H_P & sign (direction) per order, per phase
Parameters up date interval..... approx. 1 s
Readings indication:
H01 .. floating pnt. values with automatic unit/K/M exponent
H02-31... values in % of fund. (3½ digit, range 0,0÷100,0%)
H direction ..... (+) or (-) sign on power
Modbus readings:
Voltage, current , phase angle per harmonic order, per phase
Accuracy:
H_U & H_I ..±(0,1%rdg.+1LSD) for H01 to max. ±2,0% for H31
H_P .....±(0,2%rdg.+2LSD) for H01 to max. ±2,0% for H31
Phase angles ....±0,1deg. for H01 to max ±3,0deg. for H31
Sampling frequency .....64 x f (mains frequency)
FFT size ..... 64 points
FFT calculation accuracy ..... 32 bits
Window ..... rectangular
Minimum reading..... 1%

Harmonics readings

- **Voltages Harmonics**
  - H01: value in Vrms per phase
  - H02...31: value in % of the fundamental per phase

key to show H01 values
keys to scroll H02...H31 values.

- **Currents Harmonics**
  - H01: value in Arms per phase
  - H02...31: value in % of the fundamental per phase



key to show H01 values
keys to scroll H02...H31 values.

- **Harmonics Powers/Direction**
  - H01: value in W per phase
  - H02...31: value in % of the fundamental per phase
  - + or – sign indicating the harmonics origin downstream (load) or upstream (source) the measurement point.

key to show H01 values
keys to scroll H02...H31 values

For versions with Yocto net - main functions

Modbus/TCP server (max. 4 simultaneous connections) with bridge functions between RS485 line (Modbus-RTU) and Ethernet line (Modbus/TCP).

WEB Server for configuration of Yocto net through WEB Browser.

FTP Server for firmware update.

Arbiter function between Ethernet and RS232 serial port (Modbus-RTU protocol with possibility of supporting a PC, PLC or Yocto gate connection) toward RS485 port (Modbus-RTU protocol).

Static or dynamic IP address (DHCP protocol).

Activation of new functionality by PUK code

It is possible to activate new functions on Yocto net (***see Yocto net data sheet for more informations***) ordering a PUK code to be entered by a Web page. For example: Yocto net upgrade mail alarm (PUK) adds the possibility to send an e-mail with various user programmable alarm (and SMS alarms if connected to a Yocto gate). Standard measures Web pages are already activated.

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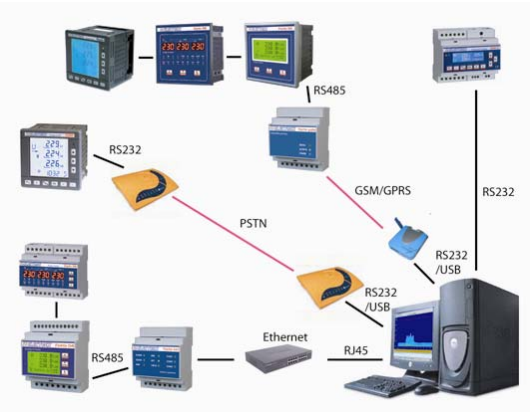
Energy Brain 4

The Energy Brain 4 is the software package, upgradable, designed for the realization of all types of local and/or wide area networks of instruments.
It is suitable for all the Electrex instruments equipped with communication port supplying the functions needed for an accurate monitoring and targeting of industrial energy consumption.



Main functions

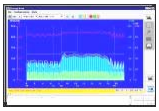
Configuration

The available options give maximum flexibility, adapting the software to the type of network (several types of simultaneously connected networks too) and to the operator needs.

- Field instruments set up (CT, PT, alarms, etc.)
- Network configuration (instrument, customer, groups, locations, etc) with individual setting of the communication mean local (by RS232/RS485, Ethernet) or remote (by Modem, GSM, Internet) and communication parameters (speed, etc.)
- Scheduling of the data collection and download agenda (distinct for location and customer) with daily, weekly or monthly intervals

Load and energy profiles/graphs

- Demand profiles (day, month and year)
- Energy profiles (day, month and year)
- Time-of-use Demand and Energy profiles
- MD profiles (per month, year and per tariff)



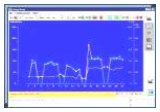
- Up to 4 graphs displayed simultaneously
- Zoom and parameter selection tools
- Graphical and numerical print-out

On line readings display

- On line display of the readings supplied by the field instruments.

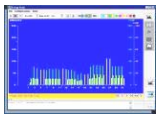
Data collection and storage

- Automatic or manual download of power and energy data from the field instrument with automatic saving into the internal data base (Access® PostgresSQL® or MySQL®).



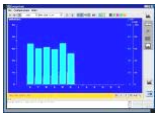
- Data export to other DBs by means of built-in ODBC or in txt format.

Time-of-use tariffs



- Handling of time of use tariffs
- Built in editor for TOU tariff & Calendar set up.

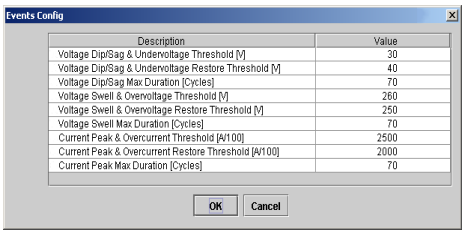
Virtual channels



- Creation of virtual channels (e.g. “summation” of departments, channel “combinations”, etc.). Data display and treatment likewise a physical channel.
- Merging of variables and complex mathematical formulas particularly useful, example, for carrying out simulations

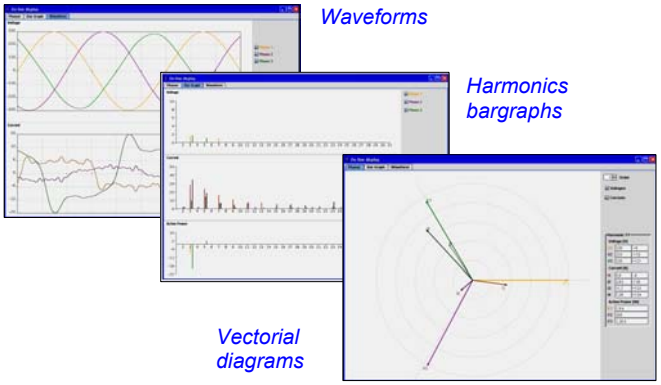
Functions for X3M H instruments

- Download, storage to PC and display of the events and logs collected by the X3M H instruments (all types).
- Set up of events and discrimination in terms of duration (trigger-on value and trigger-off value, number of cycles).



On-line graphs

- Available only with on-line connected Instrument(s).



Several Energy Brain software versions are available to meet user requirements and number of channels required. Information available separately.

Order Code

Type	Code
EB 4 KIT X3M D6 H RS 232	PFE865-00
EB 4 KIT X3M 96 H RS 232	PFE861-00
EB 4 KIT X3M D6 H RS 485 / NET WEB	PFA5613-82
EB 4 KIT X3M 96 H RS 485 / NET WEB	PFA5C13-82

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Your distributor

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