Femto Pro & Atto Pro RS485

- **High Performance in accuracy class 0.5S**
- **Harmonic analysis and Power Quality**
- **Integrated data-logger**
- **Plug version with connectors and Clamp version with terminals**

Femto Pro and Atto Pro are extremely versatile and precise microprocessor **Harmonic & Power Quality Energy Analyzer** designed to meet the most sophisticated applications of monitoring electrical parameters and managing electrical energy in industrial, commercial, public and residential sectors. **The high precision class 0.5S** for Active Energy (including CT for ECT family) and the measurements of **individual harmonics** up to the 31st order are obtained by continuously sampling the waveforms of voltages and currents with a very high resolution, thus ensuring maximum accuracy even in the presence of loads that vary rapidly over time (e.g. spot welders). Depending on the version, it monitors **Power Quality** with functions relating to the EN 50160 standard (peaks, dips, interruptions, harmonics) and EN 61000-4-30.

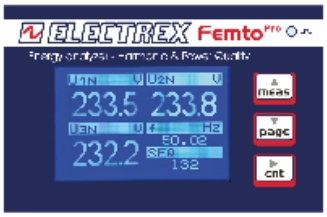
Femto Pro and Atto Pro are equipped with a slave **RS485 port** for reading data via standard Modbus RTU protocol or for integration into an existing Electrex monitoring network. Thanks to its high capacity memory, it allows the **implementation of multiple functions via PUK codes (even after commissioning)** and has an architecture that allows **the firmware to be updated/modified via remote upload. Integrated data-logger** for pre-set measurement campaigns of the main parameters: total and phase energy (load curve), frequency and voltages, currents, total and phase powers, average and maximum voltage and current harmonics, voltage events (Power Quality). Available in various versions with **digital and/or analog inputs/outputs or SIO (Sensor Input Output)** expansion bus for the integration at any time of additional modules (**Milli Pro**) with digital and/or analog inputs/outputs and/or Milli Pro Sensor environmental parameter sensors (various combinations up to 4 Milli Pro I/O and Sensor).

Versatility

Femto Pro and Atto Pro are suitable for monitoring any type of load and for applications on any type of network: three-phase with 3 and 4 wires, symmetrical or asymmetrical, balanced or unbalanced, two-phase, up to 3 single-phase lines, low and medium voltage, with 1, 2 or 3 CTs as well as for measurements on 2/4 quadrants (import/export). Keyboard programming allows you to set all the operating parameters such as RS485 port, type of network, LV/MV, ratio of CTs and any VTs (free value), integration time and depending on the version: digital or analog inputs/outputs, environmental sensors and alarms (thresholds, delay and hysteresis). The programming system is password protected against unwanted changes.

Simplicity

Femto Pro D4 and 96 are equipped with a graphic LCD display (dot matrix) with white/blue LED backlight and adjustable contrast. Simultaneous reading of 4 or more measurements and their identification symbol with high visibility characters.



The 3-key keyboard (6 for the Femto Pro 96) allows for simple and rational use of the instrument, while the page displayed upon power-up can be defined by the user. On the front, a red LED for calibration control pulses with a frequency proportional to the power (configurable).

IEC EN 50470 and 62053-22

All versions of Femto Pro meet the essential requirements of IEC 50470-1 + 50470-3 as well as 62053-22 as required for white certificates

Different versions for every application

The Femto and Atto Pro are available in two versions:
Femto Pro D4 and Atto Pro D4: for DIN rail installation
Femto Pro 96: for front panel mounting (96x96)
Thanks to **flexible and expandable firmware**, each model can be configured with different features, based on specific electrical load monitoring needs.
Below are some available versions (others can be freely configured using the code creation table):

- **Femto/Atto Pro (basic):** Real-time THD and TDD measurements of voltages and currents, neutral current, average, minimum, and maximum voltage, current, and power values. Includes total and single-phase energy counters. Phase sequence detection and configuration function. Up to 4 operating times and 8 alarms, configurable even with complex logic.
- **Femto/Atto Pro H:** Adds real-time analysis of individual harmonics up to the 31st order of the 3 phase voltages and 3 line currents to the previous measurements.
- **Femto Pro H PQ Log Energy:** Real-time measurements, harmonic analysis, and integrated data logger for recording total and phase energy counters and voltage events (interruptions, dips, and swells) useful for monitoring power quality.
- **Femto Pro Full:** Complete version with all the advanced PUK features (see dedicated section). Real-time analysis and data logger for recording 4 harmonic components, total and phase energy counters (load curves), voltage events (interruptions, dips, and swells), and average, minimum, and maximum voltage, current, power, and frequency values.

Plug RJ45 and Clamp series

Femto Pro D4 and Atto Pro D4 are available in **Clamp** (screw terminals) or **Plug** (RJ45 connectors and removable terminals) versions, for faster and less error-prone installation.

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Enabling additional features via PUK activation codes

The following functions can be remotely implemented in the Femto and Atto Pro instruments by ordering the PUK Pro Upgrades:

- **Pro Upgrade H:** Real-time harmonic analysis and display.
- **Pro Upgrade Log PQ:** Detection and storage (datalogger) of voltage events (interruptions, voltage sags, and swells) useful for monitoring power quality.
- **Pro Upgrade Log Energy:** Storage (datalogger) of total and phase energy counters (load curves).
- **Pro Upgrade Log H:** Storage (datalogger) of average and maximum amplitudes of four voltage and current harmonic components.
- **Pro Upgrade Log Voltages & Currents:** Storage (datalogger) of average, minimum, and maximum voltage and current values.
- **Pro Upgrade Log Powers:** Storage (datalogger) of average, minimum, and maximum power values.
- **Pro Upgrade Log Options:** Data logging of internal options (digital, analog inputs/outputs, etc.) and/or Milli devices connected to the instrument's SIO bus (see the dedicated section).
- **Pro Upgrade Advanced Alarms:** Enables the ability to generate even complex alarms using internal logic (see Alarms section).
- **Pro Upgrade Full Bundle:** Puk bundle that enables all the previous features.

True-RMS and measurement accuracy

The true-RMS measurements, obtained by continuously sampling (on intervals of 10 periods at 50 Hz and 12 periods at 60 Hz) the voltage and current waveforms, and the automatic compensation of the internal amplifier offsets ensure maximum precision regardless of the variability of the loads over time (e.g. spot welders), the signal level and the environmental operating conditions. **The 64-bit resolution** also ensures high accuracy of the energy measurement even in the presence of small loads (e.g. equipment in stand-by).

Harmonics Measurement up to 31st order

Femto/Atto Pro H measures the individual harmonics up to the 31st order of the 3 phase voltages and the 3 line currents. The harmonics calculation is performed with FFT method in amplitude and phase.

Power Quality (EN 61000-4-30): Events Log

Femto/Atto Pro PQ detects and stores various voltage events with a period resolution (and updates every half-period), useful for monitoring energy quality (Functions also related to the EN 50160 and EN 61000-4-30 standards). The following information is stored for each event: date/time indication, type of event, phase involved, duration and min/max voltage value reached. The parameters for defining the anomalous event are programmable. Event types:

- **Voltage dip (dip)**
- **Overvoltage (swell)**
- **Interruption**

Indication of the phases sequence

Femto Pro detects the phase sequence and allows you to sort it in case of wiring errors. The correct phase sequence is L123.

Measures

Parameter	Type	Range
Voltage	U L-N	20,0V...400 kV
	U L-L	
	U L-N Min	
	U L-L Min	
	U L-N Max	
	U L-L Max	
Current	I	10 mA …10,0 kA ECT: 10 mA … 400 A TA FCTS[7]: 5A … 4000A
	I Max	
	I AVG *(1)*	
	I MD *(1)*	
Power Factor	PF	0,00ind..1,00..0,00cap
Frequency	F	45 … 65 Hz
Phases sequence		123 / 132 / L---
Harmonic distortion	U THD L-N	0…199,9%
	U THD L-L	
	I THD	
	I TDD	
Active Power	P	± 0,00…1999 MW
	P Max *(3)*	
	P AVG *(2)*	
	P MD *(2)*	
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)*	
Operating time (4)	h, h/100 *(4)*	0,01…99.999,99 h
Active Energy	Ea Imp *(5)*	0,1 kWh…100 GWh
	Ea Exp *(5)*	
Reactive Energy	Er Ind Imp *(5)*	0,1 kvarh…100 Gvarh
	Er Cap Imp *(5)*	
	Er Ind Exp *(5)*	
	Er Cap Exp *(5)*	
Apparent Energy	Es Imp *(5)*	0,1kVAh…100 GVAh
	Es Exp *(5)*	
Pulse Counter	CNT *(6)*	

Femto / Atto Pro H - Single Harmonics

Parameters [9]		Management
Harmonics analysis	H voltage	Value (H01), % (H02-H31)
	H current	Value (H01), % (H02-H31)

Femto / Atto Pro PQ - Voltage Events

Parameters [9]	Management
Dips and swells	Events logged in the internal memory with time-stamp
Overvoltage	
Sags and interruptions	

All instantaneous measurements are calculated on 10 cycles, for example 200mS at 50Hz.
(1) Average value on the integration time (1.. 60 min. programmable) and peak (MD).
(2) Average value (moving average) both in Import and Export on the integration time (1.. 60 min. programmable) and peak (MD) i.e. the maximum average value.
(3) Maximum Power values both in Import and Export.
(4) Non-resettable life time and four operating times.
(5) The energies both in Import and Export are displayed in 9 digits (one decimal). The internal counters are stored with 64-bit resolution that ensures a minimum definition of 0.1 Wh and a maximum count of 100 GWh
(6) Only for versions with digital inputs or analog inputs
(7) With Electrex Flexible CTs Class 1 overall with currents in brackets
(8) Three partial counters for each marked measurement
(9) Calculation with FFT method of the harmonics in amplitude and phase up to the 31st for the 3 phase voltages and the 3 line currents accumulated for 10 cycles at 50Hz and 12 cycles at 60Hz, as prescribed by 61000-4-30.
10) Recording of events with date and time, duration of the event, maximum / minimum value. Programmable thresholds EN 50160 and EN 61000-4-30.

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Serial communication

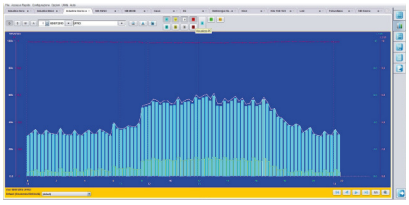
Femto Pro is equipped with an RS485 serial port with overvoltage protection. The communication protocol used is the Modbus-RTU "full compliant" suitable for communications with PLC and SCADA programs. The processed data are read as numeric registers composed of mantissa and exponent in IEEE format. A transmission of up to 115,200 bps (default 38,400) with max. 125 requestable registers (equal to approximately 62 parameters) ensure an unsurpassed dialogue speed.

Built-in memory

Femto Pro is equipped with an 8 MB flash memory for recording various information divided into files, each file can contain a maximum of 1024 records and is characterized by a pre-established sampling frequency. The memory is also used for recording energy quality events (see paragraph Power Quality), instrument start-up and shutdown and configuration changes (max 128 events in memory). The memory is divided into files readable by Modbus port via the Energy Brain Pro software and/or third-party systems.

Load profiles and consumption/production data

Femto Pro continuously stores consumption/production and power data, organizing them into daily files, each of which contains all the information needed to build the load diagram and study the trend of consumption/production (downloadable from the Modbus port with the Energy Brain Pro software). The stored data can be viewed by day, week, month and year using the Energy Brain Pro software:



Integrated Clock

Femto Pro is equipped with a real-time astronomical clock with rules for the automatic transition from solar time (Standard Time) to daylight saving time (Daylight Saving Time) and vice versa and with the configurable management of Coordinated Universal Time (UTC).

Alarms

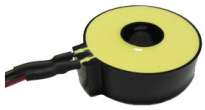
Femto Pro (depending on the version) is equipped with **8 alarm channels that can be associated via logical combinations (or/nor/and/nand/xor/xnor) to 8 configurable comparators;** the alarms can be used to drive digital outputs and/or to generate states on Modbus registers. Each comparator can be associated with any of the available parameters (e.g. voltages, currents, power, etc.) and can be configured either as a min/max threshold or as a comparison between two variables (e.g. voltage imbalance). All alarm outputs can also refer to the same parameter to have multiple alarm thresholds. It is possible to set the activation and deactivation delay of each alarm (from 1 second to 99 minutes), the hysteresis (in % of the threshold value) and the polarity of the output contact (NA/NC). The alarm status is always available on the serial line (via Modbus "coils"). Given the numerous combinations available, only a part of the alarms can be programmed via keyboard while they can be completely programmed via Energy Brain Pro software or via serial line via "holding registers" with Modbus protocol.

Operating time counters

Femto Pro can record the life time of the instrument and are equipped with four operating time partial counters that can be activated by internal alarms through configuration via the Energy Brain software; for example, to manage the operating time of a user/machinery when it is operating, when it is in standby and when it is off. The partial operating time counters can be reset.

Femto Pro ECT using Electrex series ECT CTs

The Femto Pro ECT have current inputs dedicated exclusively to Electrex ECT Current Transformers (not included in the package). Unlike traditional CTs, the ECT CTs maintain the precision class even on small current readings. **The combination of the analyzer plus CTs allows you to guarantee the 0.5S precision class for the active energy of the entire measurement group (analyzer+CTs).**
Possibility of choosing between 2 current scales (Low / High) to increase the precision of the instrument. Up to 400A via direct insertion and/or indirect insertion **via non-invasive reading of existing CTs on the system** (insertion of ECT CTs **on the secondary of existing CTs** /1 or /5 A) WARNING: do not connect current CTs (e.g. ../1A or ../5A) to these current inputs because this could damage both the instrument and the CTs.
Order codes for ECT CTs (others available on request):



SOLID CODE - CLOSED RING:
- **PFAE000-09 - ECT TA 100A 13mm**
- **PFAE000-10 - ECT TA 200A 20mm**
- **PFAE000-11 - ECT TA 400A 30mm**

SPLIT CORE:
- **PFAE000-02 - TA ECT CTS 16-100A**
- **PFAE000-05 - TA ECT CTS 24-200A**
- **PFAE000-04 - TA ECT CTS 36-400A**

*maximum cable length 10m.

Femto Pro F using Flexible Electrex FCTS CTs

The Femto Pro F have current inputs (RJ45 connectors) dedicated exclusively to the Electrex FCTS Series Flexible CTs (Rogowski). This type of CT is particularly suitable in cases where the installation of traditional Current Transformers is difficult. Configurable full scale up to 4000 A and independent of the internal diameter of the FCTS CT used. E**ach FCTS CT is assigned a sensitivity value to be entered on the Femto Pro to maximize measurement accuracy.** With a calibrated and correctly positioned flexible CT, **Class 1 overall accuracy (Femto Pro F+ flexible CTs)** is achieved between the full-scale current and five percent of it (minimum measurable current approximately two percent of full scale). Measurement accuracy is influenced by several factors, including correct positioning.
WARNING: do not connect current CTs (e.g. ../1A or ../5A) to these current inputs because this could damage both the Femto D4 F and the CTs
Ordering codes for FCTS CTs (others available on request):
- **PFCF021 - FCTS 070-500***: Inner Diameter 7 cm*
- **PFCF022 - FCTS 120-1000***: Inner Diameter 12 cm*
- **PFCF023 - FCTS 200-2000***: Inner Diameter 20 cm*
- **PFCF024 - FCTS 280-4000***: Inner Diameter 28 cm*

Power supply and Special versions on request

All the versions of **Femto Pro** can also be requested in other hardware configurations such as with different power supply:

- Transformer type rated 230/240 Vac (Standard)
- Transformer type rated 110/120 Vac
- Transformer type rated 400/440 Vac
- Switching type: 15÷36Vac / 18÷60Vdc
- Switching type: 9÷24Vac / 9÷36Vdc
- Switching type: 85÷265Vac/100÷374Vdc (only for 96)

Types of inputs/outputs modules of Exa Pro

The **Femto Pro** an be equipped with internal modules with inputs/outputs, the main types available are as follows:

- **Standard:** No built-in inputs or outputs
- **4DI 4COMMON:** 4 digital inputs and separate commons
- **4DO 4COMMON:** 4 digital outputs and separate commons
- **2DI 2DO 4COMMON:** 2 digital inputs and 2 digital outputs
- **2AO4-20mA: 2 analog outputs 4-20mA**
- **4AI***: with 4 analog inputs 0÷10V (4-20mA)*
- **Bus SIO:** port for integrating Milli Pro I/O and Milli Pro sensor expansion modules

Digital inputs

The **2DI or 4DI** versions are supplied with opto-isolated digital inputs with separate common terminals and equipped with programmable anti-bounce filter. The inputs are normally used to count externally generated pulses, such as gas meters (a galvanic separator is required according to ATEX regulations), water, piece counters, etc. Maximum sampling frequency 500Hz (2ms). The inputs can also function as remote status indicators (e.g. ON/OFF of machines, switches, etc.). They require an external 10-30Vdc power supply.

Digital outputs

The **2DO or 4DO** versions are equipped with opto-isolated transistor outputs with a capacity of 27 Vdc 27 mA according to DIN 43864. The outputs are programmable for the transmission of pulses, including weighted ones, or as outputs of internal alarms (see Alarms paragraph) or as output units controlled remotely via serial line and Modbus commands.

Analog inputs

The **4AI** version is equipped with four analogue inputs -10÷10V (compatible 0÷10V, 0÷5V, -5÷5V, 4÷20mA with 200 ohm resistance) available to integrate measurements coming from field sensors.

Analog 4-20mA outputs

The version **2AO4-20mA** are 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 for resistor loads up to 250 ohm, for higher loads an external power supply (12Vdc) will be needed (up to 750 ohm).

The outputs ensure a response time of max. 200 ms. Each output can be associated to any of the parameters.

SIO (Sensor Input Output) Bus Communication

The **Femto Pro SIO** version is equipped with a SIO Bus port that allows the integration of expansion modules from the Electrex Milli Pro I/O range with digital and/or analog inputs/outputs and/or Milli Pro Sensor environmental parameter sensors (various combinations up to 4 Milli Pro). The maximum overall distance of the SIO Bus is 20 m..

Additional inputs/outputs via Milli Pro I/O

The **Femto Pro SIO supports Milli Pro I/O RJ Box**, expansion modules with digital or analog inputs/outputs equipped with RJ45 ports for quick connection to Electrex devices with SIO BUS. The input and/or output circuits require external power supply (e.g. 12Vdc or 24Vdc). Black box size: 38x73x20 mm.

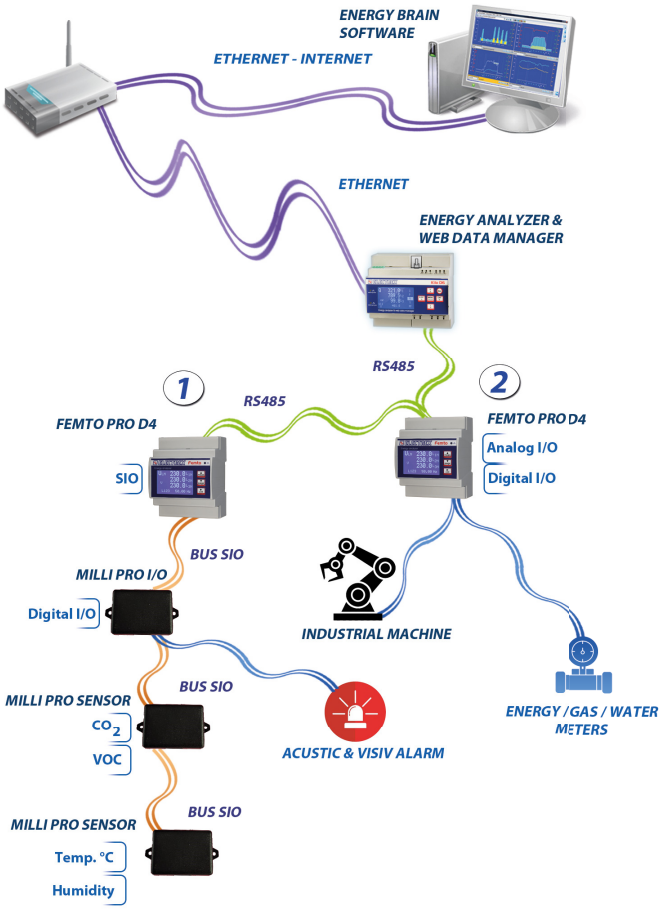
Environmental measurements using Milli Pro Sensor

The **Femto Pro SIO supports Milli Pro Sensor environmental sensors**. Up to 4 sensors can be connected to the same Bus with various combinations. Different sensors are available such as Temperature, Humidity, Lux and air quality parameters. The maximum total distance of the SIO Bus is 20 m.

Electrex Monitoring Network Example with Femto Pro D4

In the image below, two examples of Electrex monitoring networks with Femto Pro D4 are shown, both Femto Pro D4 are connected in RS485 subnet to an Electrex Net instrument, which acts as a Master Gateway. Looking in detail:

1. The Femto Pro D4 is equipped with a SIO BUS, to which both Milli Pro I/O with digital inputs/outputs and Milli Pro Sensor environmental sensors (Temp, Hum, Lux etc.) are connected.
2. The Femto Pro D4 is equipped with digital and/or analog inputs/outputs for counting pulses from existing meters (Energy, Gas, Water etc.) and for carrying out commands for machinery or alarms.



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The Energy Brain 7.x and PRO 7.x software (additional option)

Energy Brain is the software created for the creation of instrument networks, even very complex ones, both locally and remotely. It is suitable for application with all Electrex instruments equipped with a communication port and provides all the necessary functions for the monitoring and accurate management of **energy efficiency** (consumption / production of electricity, gas, water, etc.), of the **environmental** (temperatures, humidity, brightness, CO2, etc.) and **process parameters**.

MAIN FEATURES

Configuration

The available options allow maximum flexibility in adapting the software to the network of instruments (even to different types of networks connected simultaneously) and to the needs of the operator.

- Remote instrument configuration (CT, TV, alarms, etc.)
- Network configuration (per instrument, per customer, in groups, per location) with autonomous setting of the type of local connection (direct RS485, Ethernet, E-Wi) or remote (Internet, Wi-Fi) and of the communication parameters (speed , etc.).
- Configuration of the data download frequency divided by location, by customer, on a daily, weekly or monthly basis via programmable agenda.

Display of graphs and consumption / production curves

- Graphs of daily, weekly, monthly, yearly power curves.
- Graphs of daily, weekly, monthly, yearly consumption curves.
- Electrex environmental sensor graphics and / or commercial transducers with pulse / analog output (light, temperature, gas, calories, etc.).
- Graphs of powers, power peaks and energies divided by tariffs.
- Up to 4 simultaneous graphs
- Export and printing of graphs and numerical data.

Parameter display

- Online display of all the measurements provided by each of the instruments in the field.

Data storage

- Automatic or manual download of power, energy and other variables data from connected instruments and automatic archiving in PostgresSQL® database.
- Data export to other DBs via ODBC module or txt or xls format.

Tariffs

- Data management by tariffs
- Tariffs and calendar configuration editor

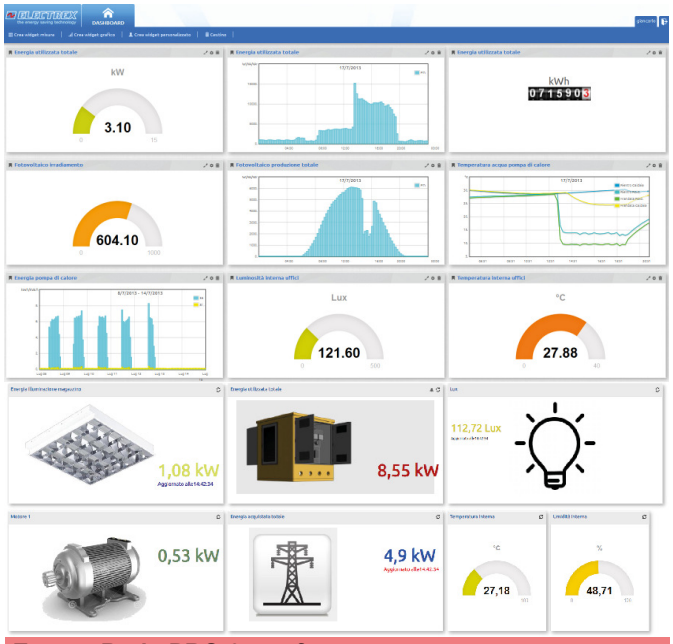
Virtual and Multiple Channels

- Creation of virtual channels that is “groups” of instruments (example “summation” of various departments) and their display, in graphic form, in the same way as a physical channel
- Creation of multiple channels to be able to view overlapped graphs of multiple instruments for quick comparison.
- Insertion of variables and mathematical formulas, even very complex ones, particularly useful, for example, for simulations.

ENERGY BRAIN CLOUD

Energy Brain Cloud is the software that allows to display and manage via a web browser, on a variety of devices such as PCs, tablets, Smart phones, data, measures and real-time and historical charts acquired by Electrex instruments.
Taking advantage of the technology of cloud computing, users can manage the data collected through a standard Internet browser without installing any software on their computer or mobile device.
Energy Brain Cloud can be used in 4 modalities:

1. **Energy Brain Personal Cloud** is a single-user version that can only be used on the PC where the Energy Brain application is installed.
2. Energy Brain Cloud is installed and managed directly by the end user of the Electrex monitoring networks.
3. A third party (Energy Consultants, Energy Saving Company, associations, etc.). Installs and manages Energy Brain Cloud and makes available to its customers/members the access to their data as a service.
4. Electrex offers to the end users of the monitoring solutions access to their data through Energy Brain Cloud as a service.



Energy Brain PRO 6.x software

For a description of all the additional functions introduced by the PRO 6.x version, refer to the product sheet of the Energy Brain software.
The Energy Brain software is available in various versions according to the functions and the number of channels required.
For more details on the software: www.electrex.it/en

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TECHNICAL SPECIFICATIONS

Functional characteristics

Measurement system	True-RMS meas. up to the 31st harmonic	
	2 and 4 quadrant measurement (programmable)	
	12bit A/D converter (6-channel)	
	Continuous sampling of voltage and current waveforms (64 sampling per period, with PLL)	
	Automatic compensation of the offset and of the angle error of the current transformer	
RS485 serial port	Galvanically insulated	
	2.400 to 38.400 bps programmable speed	
	Built-in over-voltage protection	
	Modbus-RTU protocol, full compliant	
Digital Input (depending on type):	Galvanically insulated	
	Programmable functionality: external pulse count, ON/OFF state detection , tariff change-over	
	Programmable 10/100 Hz filter for input glitches (500Hz for versions 2DI 2DO and 4DI)	
	External powered needed	10-30Vdc
	Current absorbed	2 ... 10mA
Digital Output (depending on type):	Galvanically insulated	
	Programmable function: weighted pulse outputs, alarm signaling, control outputs	
	NPN compliant with DIN 43864 (max 27Vdc, 27mA)	
	Or Self-Powered version with a solid state relay (opto-mos) (max 250V 100mA ac/dc)	
Analog 4-20mA output (depending on type):	Galvanically insulated	
	Scale: 0-20mA or 4-20mA (programmable)	
	Update interval: 200 mS	
	Max load resistance:	250 ohm
	Maximum current supplied:	27 mA
	Accuracy: 1% of the reading from 4 to 20mA	

Accuracy

Voltage	0,25% of reading +/- 1 from 40 to 300V, min. reading: 10V	
Current	Standard CTs	0,25% of reading +/- 1
	ECT CTs	0,25% of reading +/- 1, min. reading: 10mA
Frequency	0,02 Hz from 45 to 65 Hz	
Power	0,5% of reading +/- 1	
Active Energy	Class 0,5S according to CEI EN 62053-22 Class C according to EN 50470-3	
Reactive Energy	Class 1 EN 62053-24	

Standards

General	EN 50470-1
Static counters	EN 50470-3
Safety	CEI EN 61010-1 CAT III-300V, class 2
E.M.C.	CEI EN 61326-1A
Accuracy	CEI EN 62053-22, EN 50470-1, EN 50470-3
Digital Outputs	DIN 43864
MTBF (100.000 h)	MIL-HDBK-217F

Electrical characteristics

Connection	single-, bi-phase & 3-phase, LT and MT systems, balanced, unbalanced, 3- and 4 wires	
Voltage inputs	Direct	from 20 to 500V PH-PH (max. 1,7 crest factor)
	Via external VTs	max. 400 kV primary max 300V secondary (programmable)
	Max voltage to ground:	300 Vrms
	Absorbed power	< 0,3 VA
	Input impedance	> 2 MΩ
	Overload	max, 900 Vrms PH-PH for 1 sec.
Current Inputs	External ECT CTs	max. 400A primary mA secondary output
	FCTS Flexible split CTs	max. 4000A primary mV secondary output
	Load on the CT	< 0,7 VA
	Overload	max. 40 Arms peak for 1 sec
Auxiliary power supply	230/240 Vac +/- 10% 50/60 Hz	
	115/120 Vac +/- 10% 50/60Hz	
	400 Vac +/- 10% 50/60 Hz	
	15÷36 Vac 50/60 Hz, 18÷60 Vdc	
	9÷24 Vac 50/60 Hz, 9÷36 Vdc	
Consumption	< 2,5 VA	
Frequency	45-65 Hz	

Mechanical characteristics

Working temperature range	Femto/Atto Pro D4	-25/+60 °C
	Femto Pro 96	-25/+70 °C
Relative Humidity	95% R.H. non condensing	
Enclosure	Self-extinguishing plastic material class UL94 V-0	
Protection degree	IP40 (Front panel), IP20 (Terminals side)	
Mounting	Femto/Atto Pro D4	DIN rail
	Femto Pro 96	flush mount 96x96
Size	Femto/Atto Pro D4	70 x 90,5 x 62 mm (4 DIN rail modules)
	Femto Pro 96	96 x 96 x 78 mm (Cut out 92x92mm)
Terminals	voltage and power supply inputs	6-pole removable screw terminal, maximum cable section 4 mm2
	all other connections	RJ45 connectors
Weight	around 260 gr. net, 315 g (packaging included)	

Front panel (Femto Pro D4 and 96)

Display	D4	graphic LCD white/blue with adjustable contrast 100x64 dots
	96	graphic LCD white/blue with adjustable contrast 240x260 dots
Size of the visible area HxL	D4	43x25mm
	96	49x71,8mm
Keyboard	D4	3 keys
	96	6 linear keys
Backlight	White / Blue LEDs	
Calibration LEDs	1 for Active Energy (10.000 pulses / kWh)	

Electrex is a brand of Akse srl
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Engineered and manufactured in Italy
Made in Italy
Pensato, progettato e prodotto in Italia

HOW TO ORDER

FEMTO PRO	
TYPE	**CODE**
Femto Pro D4 5A Clamp (terminals)	
Femto Pro D4 5A Clamp RS485 230-240V	PFA64-10102-E00
Femto Pro D4 5A Clamp RS485 H 230-240V	PFA64-1H102-E00
Femto Pro D4 5A Clamp RS485 H PQ Log Energy 230-240V	PFA64-1B102-EM0
Femto Pro D4 5A Clamp RS485 Full 230-240V SIO	PFA64-1B1Z2-EMF
Femto Pro D4 ECT Plug (RJ45 Connectors)	
Femto Pro D4 ECT Plug RS485 230-240V	PRA64-E0102-E00
Femto Pro D4 ECT Plug RS485 H 230-240V	PRA64-EH102-E00
Femto Pro D4 ECT Plug RS485 H PQ Log Energy 230-240V	PRA64-EB102-EM0
Femto Pro D4 ECT Plug RS485 Full 230-240V SIO	PRA64-EB1Z2-EMF
Femto Pro D4 ECT Clamp (terminals)	
Femto Pro D4 ECT Clamp RS485 230-240V	PFA64-E0102-E00
Femto Pro D4 ECT Clamp RS485 H 230-240V	PFA64-EH102-E00
Femto Pro D4 ECT Clamp RS485 H PQ Log Energy 230-240V	PFA64-EB102-EM0
Femto Pro D4 ECT Clamp RS485 Full 230-240V SIO	PFA64-EB1Z2-EMF
Femto Pro D4 F Plug (RJ45 Connectors)	
Femto Pro D4 F Plug RS485 230-240V	PRA64-F0102-E00
Femto Pro D4 F Plug RS485 H 230-240V	PRA64-FH102-E00
Femto Pro D4 F Plug RS485 H PQ Log Energy 230-240V	PRA64-FB102-EM0
Femto Pro D4 F Plug RS485 Full 230-240V SIO	PRA64-FB1Z2-EMF
Femto Pro 96 ECT	
Femto Pro 96 ECT RS485 230-240V	PFA69-E0102-E00
Femto Pro 96 ECT RS485 H 230-240V	PFA69-EH102-E00
Femto Pro 96 ECT RS485 H PQ Log Energy 230-240V	PFA69-EB102-EM0
Femto Pro 96 ECT RS485 Full 230-240V SIO	PFA69-EB1Z2-EMF
Femto Pro 96 F	
Femto Pro 96 F RS485 230-240V	PFA69-F0102-E00
Femto Pro 96 F RS485 H 230-240V	PFA69-FH102-E00
Femto Pro 96 F RS485 H PQ Log Energy 230-240V	PFA69-FB102-EM0
Femto Pro 96 F RS485 Full 230-240V SIO	PFA69-FH1Z2-EMF
Atto Pro D4 5A Clamp (terminals)	
Atto Pro D4 5A Clamp RS485 230-240V	PRA74-E0102-E00
Atto Pro D4 5A Clamp RS485 H 230-240V	PRA74-EH102-E00
Atto Pro D4 ECT Plug (RJ45 Connectors)	
Atto Pro D4 ECT Plug RS485 230-240V	PRA74-E0102-E00
Atto Pro D4 ECT Plug RS485 H 230-240V	PRA74-EH102-E00

ECT TYPE CTs	
TYPE	**CODE**
TA tipo ECT chiusi	
ECT TA 100A 13mm	PFAE000-09
ECT TA 200A 20mm	PFAE000-10
ECT TA 400A 30mm	PFAE000-11
ECT Type CTs Split	
ECT CTS 16-100A	PFAE000-02
ECT CTS 24-200	PFAE000-05
ECT CTS 36-400	PFAE000-04
FCTS Type CTs (Rogowski)	
FCTS 070-500	PFCF021
FCTS 120-1000	PFCF022
FCTS 200-2000	PFCF023
FCTS 280-4000	PFCF024

Other versions of Femto Pro

Building code

Example: P R[1] A 6[2] 4[3] - E[4] B[5] 1 Z[6] 2[7] - E[8] M[9] F[10]

N. DIGIT [X]	AVAILABLE VERSIONS	CODE
1	***Connection format***	***R***
	Traditional terminals	**F**
	RJ45 Connectors	**R**
2	***Product Series***	***6***
	Femto Pro	**6**
	Atto Pro	**7**
2	***Size***	***4***
	4 DIN Rail modules	**4**
	96x96	**9**
4	***Current Inputs***	***E***
	../5A and ../1A	**1**
	ECT CTs (Electrex Current Transformer)	**E**
	FCTS CTs Flexible Split Core (Rogowski)	**F**
5	***Harmonic Analysis and Power Quality***	***B***
	None	**0**
	Real-time harmonics visualization	**H**
	Voltage event log (power quality)	**Q**
	Voltage event log and Real-time harmonics	**B**
6	***Internal module***	***Z***
	No internal module	**0**
	Module 2DI 1 RO Self Powered	**2**
	Module 2RO24VDC	**5**
	Module 2AO4-20mA	**6**
	Module 1DI 2DO Self Powered	**E**
	Module 4DI 4COMMON	**B**
	Module 4DO 4COMMON	**C**
	Module 2DI 2DO 4COMMON	**D**
	Module 4AI	**R**
	Module SIO (Sensor Input Output)	**Z**
	Module 4PT100	**U**
	Module 4PT1000	**X**
	Module 4NTC	**Y**
7	***Power Supply***	***2***
	120Vac +/- 10%	**1**
	230Vac +/- 10%	**2**
	400Vac +/- 10%	**3**
	9÷24Vac/9÷36Vdc	**7**
	15÷36Vac/18÷60Vdc	**8**
	85÷265Vac/100÷374Vdc	**9** (96)
8	***Alarms***	***E***
	None	**0**
	Alarms logics	**L**
	Comparator Alarms	**K**
	Comparison Alarms and Logic	**E**
9	***Data storage services***	***M***
	None	**0**
	Log Energy counters	**M**
10	***Advanced Log Services***	***F***
	None	**0**
	Harmonics Log	**H**
	Voltage and Current Log	**U**
	Power Log	**P**
	Harmonics, Voltage, Current, and Power Log	**S**
	AI/DI and Sensor Options Log	**R**
	Full (complete with all features)	**F**

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Subject to change without prior notice
Datasheet Femto Pro & Atto Pro RS485
2025 07 25-ENG

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