

# Femto 70A Net



- ▶ Flexibility (open platform)
- ▶ Reliability (high quality of components)
- ▶ Connectivity (RS485, E-Wi, ExpBus, Ethernet, Wi-Fi, NFC)

## Energy Analyzer & (Wi-Fi) Web Data Manager

Femto 70A Net D6 is an Energy & Web Data Manager, an open platform connected to Ethernet / Internet through the RJ45 port. Designed for the range of power up to 6kW single phase and up to 18-20kW three phase, where 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 includes the Femto 70A device for the measurement of the electrical parameters and of the quality of energy in electrical single phase systems (from 1 to 3 measuring points simultaneously) or three phase systems.

It is a Web and FTP Server which communicates and manages the other Electrex devices both through the RS485 master port in the sub-network and the ExpBus port. The Wi-Fi option permits to manage / display the data from any device having a browser (PC, Smartphone, tablet, etc.) allowing also a rapid connection through NFC enabled devices.

### Simplicity

The Femto 70A Net D6 is equipped with a FSTN dot matrix display with high contrast, back-lighted, 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 will 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.

### Versatility

The measuring device internal to the Femto 70A Net D6 (including 1 external Electrex 70A CT) is suitable for virtually all type of electrical grid systems, single phase (from 1 to 3 measuring points simultaneously), bi-phase, three phase 3- and 4-wire, symmetrical and asymmetrical, balanced or

unbalanced, Low Tension, 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, CT's full scale (70A or 14A), integration time (1-60m) and alarms (threshold, delay, hysteresis), digital outputs and configuration parameters related to optional modules connected.

### Measures

Parameters	Type	L1	L2	L3	n	Σ	P	Range
Voltage	U <sub>L-N</sub>	•	•	•	•	•		20,0V...400 kV
	U <sub>L-L</sub>	•	•	•	•	•		
	U <sub>L-N</sub> MAX (1)	•	•	•	•	•		
	U <sub>L-L</sub> MAX (1)	•	•	•	•	•		
	U <sub>L-N</sub> MIN (1)	•	•	•	•	•		
	U <sub>L-L</sub> MIN (1)	•	•	•	•	•		
Current	I	•	•	•	•	•		10 mA...10,0 kA
	I MAX (1)	•	•	•	•	•		
	I <sub>AVG</sub> THERM (2)	•	•	•	•	•		
	I <sub>MD</sub> THERM (2)	•	•	•	•	•		
Power Factor	PF	•	•	•	•	•		0,00ind...1,00...0,00cap
Frequency	F	•	•	•	•	•		45 ... 65 Hz
Harmonic Distortion	THD-U <sub>L-N</sub>	•	•	•	•	•		0...199,9%
	THD-U <sub>L-L</sub>	•	•	•	•	•		
	THD-I	•	•	•	•	•		
Active Power	P	•	•	•	•	•		± 0,00...1999 MW
	P <sub>AVG</sub> (3)	•	•	•	•	•		
	P <sub>MD</sub> (3)	•	•	•	•	•		
	P <sub>MAX</sub> (1)	•	•	•	•	•		
Reactive Power	Q <sub>IND</sub>	•	•	•	•	•		± 0,00...1999 Mvar
	Q <sub>CAP</sub>	•	•	•	•	•		
	Q <sub>AVG</sub> IND (3)	•	•	•	•	•		
	Q <sub>AVG</sub> CAP (3)	•	•	•	•	•		
	Q <sub>MD</sub> IND (3)	•	•	•	•	•		
	Q <sub>MD</sub> CAP (3)	•	•	•	•	•		
Apparent Power	S	•	•	•	•	•		± 0,00...1999 MVA
	S <sub>AVG</sub> (3)	•	•	•	•	•		
	S <sub>MD</sub> (3)	•	•	•	•	•		
Life Time	g, h, m, s	•	•	•	•	•		0,01...99.999,99 h
Active Energy	E <sub>a</sub> IMP (4)	•	•	•	•	•		0,1 kWh...99.999,9 MWh
	E <sub>a</sub> EXP (4)	•	•	•	•	•		
Reactive Energy	E <sub>r</sub> IND IMP (4)	•	•	•	•	•		0,1 kvarh...99.999,9 Mvarh
	E <sub>r</sub> CAP IMP (4)	•	•	•	•	•		
	E <sub>r</sub> IND EXP (4)	•	•	•	•	•		
	E <sub>r</sub> CAP EXP (4)	•	•	•	•	•		
Apparent Energy	E <sub>s</sub> IMP (4)	•	•	•	•	•		0,1kVAh...99.999,9 MVAh
	E <sub>s</sub> EXP (4)	•	•	•	•	•		
Pulse Counter	CNT	•	•	•	•	•		
Analog Measure	(6)	•	•	•	•	•		

(1) Absolute value (mean over 10 cycles - example: 200ms at 50Hz).  
 (2) Mean value (rolling average) over the integration time (1.. 60 min. programmable) and peak (MD).  
 (3) Average value (moving average) in both import and export over the integration time (1..60 min programmable) and peak (MD) in other words maximum average value.  
 (4) 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 99.999.999,9999 kWh  
 (5) Only for versions with digital inputs. (6) Only for versions with analog inputs

## Phase sequence

The **Femto 70A Net D6** allows the identification of the correct phase sequence.

## Ethernet communication and sub network via RS485

The **Femto 70A Net D6** 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), while the serial RS485 master port, protected against overvoltage, is available for connecting other Electrex instruments/devices in a sub-network and the transmitting speed is configurable up to 38.400bps.

## Femto 70A Net D6 versions

The **Femto 70A Net D6** is available in various versions:

- *Basic*.....without inputs or outputs
- *1DI 2DO*.....with 1 digital input and 2 digital outputs
- *1DI 2DO Self-Powered*..... with 1 self powered digital input and outputs rated at 250V 100mA
- *2AO4-20mA*..... with 2 analog 4-20mA outputs (external power supply for resistances > 250 ohm needed)
- *2DI 1RO*..... with 2 digital inputs and 1 relay output
- *2RO*.....with 2 relay outputs
- *4DI*..... with 4 digital inputs
- *4DO*..... with 4 digital outputs
- *2DI 2DO*..... with 2 digital inputs and 2 digital outputs
- *4AI*..... with 4 analog inputs 0÷10V (4-20mA)
- *I2C*.....for environmental param. sensors (T, H, L, P, etc)
- *E-Wi*.....for wireless comm. using E-Wi protocol

## Digital Inputs

The **Femto 70A Net D6 .. 1DI or 2DI or 4DI** is equipped with an optically insulated digital input complete 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 count, etc. 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 **Femto 70A Net D6 1DI 2DO Self-Powered** and **Femto 70A Net D6 2DI 1RO Self-Powered** instead are provided with a self powered digital input.

## Analog Inputs

**Femto 70A Net D6 4AI** are equipped with 4 analog inputs rated at -10÷10V (compatible with 0÷10V, 0÷5V, -5÷5V, 4÷20mA at 200 ohm).

## Digital Outputs

I **Femto 70A Net D6 .. 2DO or 4DO** are equipped with two optically insulated transistor outputs rated 27 Vdc 27 mA per DIN 43864 standards. The two 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 **Femto 70A Net D6 1DI 2DO Self-Powered** instead are provided with two opto-mos outputs rated at max. 250V or 100mA AC/DC.

## Relay Output

The **Femto 70A Net D6 2DI 1RO Self-Powered** and **Femto 70A Net D6 2RO** are equipped with one or two relay outputs with changeover contact rated at max 30V max 2A (resistive load).

## Alarms

The **Femto 70A Net D6 .. 2DO or 4DO or 1RO or 2RO** are equipped with outputs programmable as alarms. Each alarm is associated to any of the parameters available, for example, either as a minimum alarm and / or as a maximum. All alarm outputs can also refer to the same parameter For having more alarm

thresholds. You can set the delay of activation of each alarm (1-99 sec.), the hysteresis (in% of the threshold value) and the polarity of the output contacts (NO, NC). The alarm status is always available on the serial line (via Modbus "coils"). Because of the many combinations available only part of the alarm is programmable from the keyboard while they are completely Web Page or through the Energy Brain software or by "holding registers" of the Modbus protocol.

## Analog Outputs 4-20mA

The **Femto 70A Net 2AO4-20mA** 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 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 is associated to any of the parameters.

## I2C Bus

The **Femto 70A Net I2C** is equipped with an I2C Bus for connecting up to 4 sensors (up to 4 for the temperature or up to 1 for the temperature, 1 for the humidity, 1 for the luminosity and 1 for the air pressure). The max total distance of the I2C bus is 20 m.

## Femto 70A Net Coordinator E-Wi

The **Femto 70A Net Coordinator E-Wi** acts as the coordinator of the wireless network using E-Wi protocol and deals with the data-logging (recording of trends over time) of the wireless E-Wi devices connected to it. The E-Wi versions use the E-Wi protocol based on IEEE 802.15.4 **and receive and transmit all data, without limitation**, to 250kbps on the frequency of 2.4 GHz at a distance, without signal boosting, can reach up to 800 m in open field.

## Femto 70A Net Wi-Fi

The **Femto 70A Net Wi-Fi D6** is a version of Femto 70A Net D6 that communicates directly with the Wi-Fi network / Wi-Fi devices without the need to be connected to an Ethernet cable.

## NFC (Near Field Communication)

In case of mobile devices with NFC (Near Field Communication), such as some NFC smartphones, it is enough to position it closer to the Femto 70A Net Wi-Fi to enable the Wi-Fi communication without the need to enter the ID and password. This feature opens the possibility of creating specific APPs for mobile devices related to energy management.

## Astronomical Clock Calendar

The **Femto 70A Net D6** 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.

## Load curves and data of consumption / production

The **Femto 70A Net D6** continuously stores the data of consumption / production and power by organizing them into separate files (daily, weekly, monthly and yearly), each of which contains all the information necessary for the reconstruction of the load chart and study the trend of withdrawals / inputs (downloadable via RJ45 port / Ethernet). The memory is readable by RJ45 port / Ethernet or Wi-Fi via Web pages and / or the Energy Brain software and / or HTTP protocol.

## Firmware and Special versions on request

The **Femto 70A Net D6** firmware is upgradeable, remotely, at any time, in order to add and/or replace the existing characteristics with new and different functionalities. The **Femto 70A Net D6** can be also requested in other configurations.

## Functional memory

The memory of the **Femto 70A Net D6** is also used for other operational functions such as:

- Functional event log with the registration of all operations affecting the functioning of the instrument since it has been produced.
- Special files for programming and/or functions that can be implemented in the future by up-load.

*Considering the amount and complexity of data stored in the instrument memory, the memory management and configuration of the various services are exploited Ethernet port using the Energy Brain software and / or through Web pages.*

## Femto 70A Net D6 and the Net upgrade (PUK)

The **Femto 70A Net D6** in addition to having all the features of the Energy Analyzer Femto 70A is also a Modbus-TCP Server acting as bridge between the Ethernet network (Modbus-TCP protocol) and RS485 (Modbus-RTU protocol) and acting as an arbiter between the Ethernet port (optional Wi-Fi) and any eventual E-Wi wireless port (optional) and the expansion Bus ExpBus. It is also a:

- WEB server for the configuration of the Femto Net 70A and the instruments in subnetwork via WEB Browser.
- Static or dynamic (DHCP) IP address.
- FTP server for file transmission.
- Clock synchronization via NTP server.

It is also possible to implement the following net Upgrade:

## Already activated 1 Net upgrade Log 8 (PUK) - PFSU940-01

With the activation of the PUK Log 8 you can record the trend over time of the energy / environmental parameters acquired by Electrex devices (also called channels) connected under the RS485 port of the Femto 70A Net. A Net upgrade Log 8 enables storage service for 8 instruments, power / energy just in import, therefore a Femto 70A Net becomes a Femto 70A Net log 8, or a Femto 70A Net log 24 becomes a Femto 70A Net log 32. The "storage service" is characterized by an univocal time base (sampling frequency). It is possible to use more Log 8 for further services (e.g. daily, weekly, monthly, yearly or else) or to expand a single service. Example:

- Femto 70A Net log 16: 2 storage services (2 x 8 channels) or 1 service of 16 channels.
- Femto 70A Net log 24: 3 storage services (3 x 8 channels) or 2 where one service of 8 channels and the other of 16 channels or just a single service of 24 channels.

It is possible to activate up to a maximum of 8 Upgrade Log 8 services.

## Net upgrade WEB (PUK) - PFSU940-05

Enables the display of the measures on web pages of each instrument connected to the RS485 port of the Femto 70A Net.

## Net upgrade WEB Open (PUK) - PFSU940-10

Adds to the Femto 70A Net the ability to upload and display **custom Web pages**. The software implementation Net upgrade Web (PUK) code PFSU940-05 **must** be installed previously. The custom Web pages can be programmed by technicians who have attended a specific course.

## Net upgrade Mail Alarm (PUK) - PFSU940-15

Adds to the Femto 70A Net the ability to send alarm emails and / or ModBus commands (e.g. to close a contact or edit a ModBus registry).

## Net upgrade Calendar (PUK) - PFSU940-20

Adds to the Femto 70A Net the ability to manage Energy Automation functions such as on / off switches, alarms / alerts and automatism conditioned to events and / or an annual calendar configurable in minutes / hours / days / months.

## Net upgrade Charts (PUK) - PFSU940-30

Allows you to display on a web page daily charts of electricity, temperature, humidity, luminosity, etc. obtained from the files stored in the Femto 70A Net log with the possibility to export to CSV files.

## Net upgrade New Features – PFSU940-40

**Upgrade** to new versions of the firmware of the Femto 70A Net that add new features to the instrument.

## Monitoring network example for the Small Tertiary / Residential sectors



In the diagram above is represented a monitoring network of a branch (but could be a shop, a holiday villa or another activity with a **low voltage load up to 18-20kW three phase**). In the specific case the monitoring system consists of a Femto Net 70A which is the head of the system for the other instruments which control the most energy consuming. For example the internal instrument with 3 CT 70A of the same Femto Net 70A, for monitoring the withdrawal point below the fiscal meter, the instrument Femto D4 3I 70A in the subnetwork for monitoring 3 single-phase loads (such as the air conditioning, plugs and lighting), the *RS485 Module* for monitoring of impulses from gas meters, water and calories and *Deca Sensor* for measuring the ambient temperature. In the headquarters a copy of the Energy Brain Cloud software is installed for monitoring the consumption of all branches; the software administrator authorizes each branch manager to the display via a web browser (PC, tablet, Smartphone) the energy consumption and measures related specifically to its subsidiary. In case of anomalies the alarm system will alert with an e-mail the administrator, the branch manager and the maintainer who can access also remotely to the instantaneous measurements of the various devices to define the priority of the intervention.





**Examples of standard web pages – PFSU940-0**

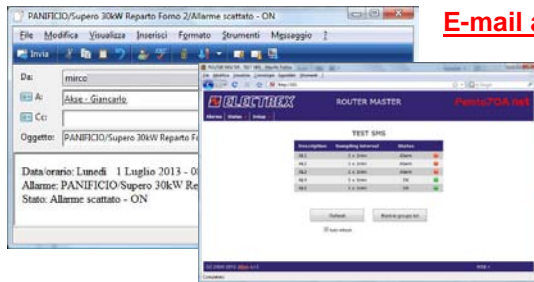
Enabling the 'Net upgrade WEB' functionality it is possible to view the standard web pages displaying real-time measurements, the average values and the energy counters both of the internal instrument and of every instrument connected in the RS485 subnetwork to the Femto 70A Net. In the example on the side are shown the web page with the instantaneous measurements and below the one with the average values of power and the energy counters of a Femto 70A Net D6 which measures the general supply of a R&D lab 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 Femto 70A Net where can be uploaded custom web pages. Alongside are reported an example of managing energy / environment parameters of an office (could be shops, bank branches, villas or other) and an example of efficiency gains between production and energy consumption of a building which uses the surplus of energy production for heating the boiler's water through the insertion of different resistances (a similar logic has been adopted for industrial, commercial and public entities). Both pages include real-time measurements of various devices represented graphically in a static and / or dynamic way. The pages residing on the web server of the Femto Net are easily accessible from any the browser of a PC, Smartphone, etc., typing just the IP address and password.



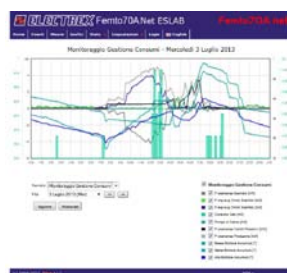
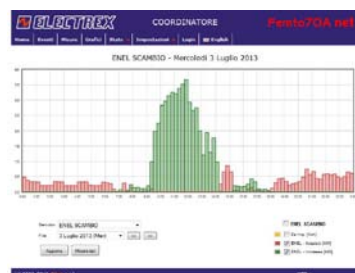
**E-mail alarms examples – PFSU940-15**



Enabling the 'Net upgrade email alarm' you can configure the Femto 70A Net to send emails and / or commands (On / Off, change ModBus registers, etc.) in the case where one or more instruments in the subnetwork have exceeded the thresholds set. The example shows the alarm e-mail of a department in a bakery and a graphical display in the specific web page of Femto 70A Net.

**Calendar event example – PFSU940-20**

Enabling the 'Net upgrade Calendar' functionality in the Femto 70A Net it is possible to manage Energy Automation functions such as on / off switches, alarms / alerts and automatisms conditioned to events and / or an annual calendar configurable in minutes / hours / days / months which may be conditioned to the occurrence of various events detected by Electrex instruments in the subnetwork. The astronomical clock is synchronized via NTP (references from the Internet or from a PC on the internal network) and the configuration of the time-zone enables you to identify the sunrise, the sunset and the Christian Easter Monday. You can manage up to 32 Events / Calendars different that you can match a Modbus command for ON-OFF.



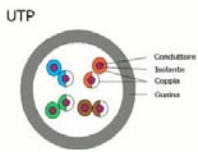
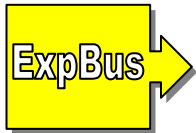
**Web charts examples – PFSU940-30**

Enabling the 'Net upgrade Charts' functionality in the Femto 70A Net log it is possible to display on a web page, daily charts of electricity, temperature, humidity, luminosity, etc. obtained from the files stored in the same Femto 70A Net log with the possibility to export to CSV files. In the examples, the first chart shows the active energy purchased and the energy produced by the PV system, while in the second there are also the curves of the gas consumption and temperature.

**Expansions via ExpBus**

The **Femto 70A Net D6** 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)	
VDC	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 8 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 Vdc  
2 for the bidirectional communication

The modules power the ExpBus

The cable must be connected in the in-out modality (multidrop) as for the RS485 Bus

The **Femto 70A Net D6** manages up to 8 ExpBus Modules.



**ExpBus Module suitable for the Femto 70A net family**

**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 at the (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.

When the ExpBus Module D2 is connected, the Femto 70A Net D6 recognizes it and allows you to configure it via Web page.

**ExpBus Module D4**

The ExpBus Module D4 have a built-in 230Vac power supply (24Vdc power supply version on request) and can contain up to 2 modules, also self-powered Max. weight 100 gr.



When the ExpBus Module D4 is connected, the Femto 70A Net D6 recognizes it and allows you to configure it via Web page.

**Types of internal modules for ExpBus Module D2 and D4**

- **1DI 2DO**: 1 digital input and 2 digital outputs;
- **1DI 2DO Self-Powered**: 1 self powered digital input and 2 digital outputs;
- **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 output rated at 30V 2A (resistive load);
- **2 RO**: 2 relay output rated at 30V 2A (resistive load);
- **4DI**: 4 digital inputs;
- **4DO**: 4 digital outputs;
- **2DI 2DO**: 2 digital inputs and 2 digital outputs;
- **4AI**: 4 analog inputs -10÷10V (compatible with 0÷10V, 0÷5V, -5÷5V, 4÷20mA);
- **I2C**: for connecting environmental sensors Deca Sensor Bus Unit Box (T, TH, TL, THL, THLB, L, B, up to 4 T)
- **E-Wi**: for communicating in the wireless E-Wi network

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

**The Energy Brain software installed on a PC (separate option)**

Energy Brain software developed for the establishment of networks of instruments, including very complex ones, both locally or remotely.



It is suitable for applications with all the 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 functions**

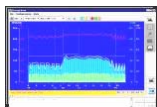
**Configuration**

- 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.



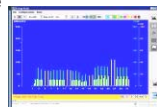
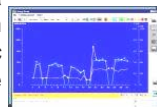
**Parameters displaying**

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



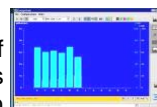
**Data archive**

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



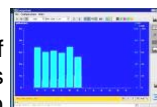
**Tariffs**

- 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.

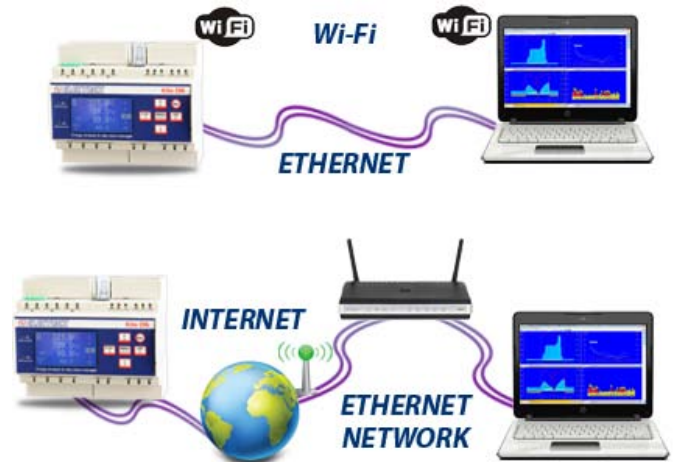


**Other types of Energies / Measurements**

- 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 Femto 70A Net**

direct Ethernet Rj45 port, Wi-Fi, Ethernet network, Internet



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](http://www.electrex.it/en)

**Energy Brain Cloud**

Energy Brain Cloud is the software that allows you 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 three modalities:

1. Energy Brain Cloud is installed and managed directly by the end user of the Electrex monitoring networks
2. 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
3. Electrex provides to end users of the Electrex monitoring networks access to their data through Energy Brain Cloud as a service





**Technical Specifications Femto 70A Net**


**Measurements**

Voltage .....  $U_{1-N}, U_{2-N}, U_{3-N}, U_{1-2}, U_{2-3}, U_{3-1}, U_{LL\Sigma}, U_{LN\Sigma}$   
 Max (ABSOLUTE VALUE): ..  $U_{L1-N}, U_{L2-N}, U_{L3-N}, U_{L1-L2}, U_{L2-L3}, U_{L3-L1}$   
 Min (ABSOLUTE VALUE):  $U_{L1-N}, U_{L2-N}, U_{L3-N}, U_{L1-L2}, U_{L2-L3}, U_{L3-L1}$   
 Current .....  $I_1, I_2, I_3, I_{\Sigma}, I_{neutral}$   
 Max (ABSOLUTE VALUE): .....  $I_1, I_2, I_3$   
 Therm: .....  $I_1, I_2, I_3$   
 Power Factor .....  $PF_1, PF_2, PF_3, PF_{\Sigma}$   
 Frequency .....  $f$   
 Voltage THD .....  $THD-U_1, THD-U_2, THD-U_3, THD-U_{\Sigma}$   
 Current THD .....  $THD-I_1, THD-I_2, THD-I_3, THD-I_{\Sigma}$   
 Instantaneous Power ...  $P_1, P_2, P_3, P_{\Sigma} - Q_1, Q_2, Q_3, Q_{\Sigma} - S_1, S_2, S_3, S_{\Sigma}$   
 Average Power .....  $Pm_{\Sigma}, Qm_{\Sigma}(ind), Qm_{\Sigma}(cap), Sm_{\Sigma} (imp/exp)$   
 Powers peak .....  $Pmd_{\Sigma}, Qmd_{\Sigma}(ind), Qmd_{\Sigma}(cap), Smd_{\Sigma} (imp/exp)$   
 Active Energy (also per each phase) .....  $E_a (import/export)$   
 Reactive Energy (also per each ph.)  $Er(ind/cap)(import/export)$   
 Apparent Energy (also per each phase) .....  $E_s (import/export)$   
 Life Time TOTAL and 3 PARTIALS: .....  $h, h/100$   
 Pulse counting (per each digital input): .....  $C_{NTT}, C_{NTPart}$   
 Analog measure(per each analog input): ..... Instantaneous  
 Load profile and consumption/production (via Ethernet port)

**Electrical characteristics**

Connection 3-phase, 1-phase (1, 2 or 3points) and 2-phase, LV balanced, unbalanced, 3- and 4-wires  
 Voltage inputs ..... from 20 to 500V phase-phase (max. 1,7 crest factor)  
 Overload ..... max, 900 Vrms peak per 1 sec.  
 Current Inputs ..... external CT 70A Electrex 1 included)  
 Primary: ..... max. 70A  
 Secondary: ..... voltage output  
 Hole diameter: ..... 9 mm  
 Plastic body  
 Power supply ..... 85÷265 Vac/100÷374 Vdc or others on request e.g. 15÷40 Vac/18÷60 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  $E_a$  and  $E_r$   
 Functioning / State LED ..... 1 red under the symbol   
 Communication RS485 LED1 green and 1 red under the white band

**Functional characteristics**

Measurement ..... True-RMS up to the 31<sup>st</sup> harmonic  
 Quadrants ..... 2 or 4 quadrants (programmable)  
 Accuracy: ..... Class 1 for Active Energy - EN 62053-22  
 Class 2 for Reactive Energy - EN 62053-23  
 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  
 Accuracy: ..... EC EN 61036

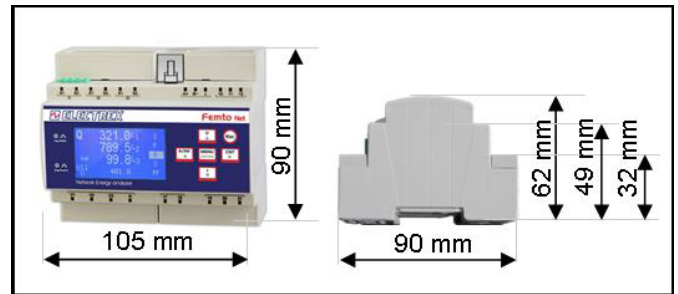
**Mechanical characteristics**

Working temperature ..... -20/+60 °C  
 Humidity ..... 95% R.H. non condensing  
 Enclosure ..... Self-extinguishing plastic material class V0

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<sup>2</sup>  
 Weight ..... about 260 gr. net

**Hardware characteristics**

Nr. 1 Master Serial port RS-485 galvanically insulated for connection of Electrex devices in the subnetwork  
 Nr.1 Ethernet Port 10/100 BASE-TX (RJ45) Auto-MDIX .  
 Nr.1 Wi-Fi Ethernet Port  
 Nr.1 NFC - Near Field Communication Port  
 Nr. 1 ExpBus Port for the management of ExpBus modules  
 Microprocessor: Cortex-M4 Dual Core  
 Astronomical Clock / Calendar with battery backup.  
 128MB Flash memory (non volatile) available for the measurements management, for the Web pages and/or data logging and/or other functionalities as e-mail alarms.  
 Disk access via Ethernet port through HTTP protocol.



**How to order and versions of Femto 70A Net**

Type	Code
<b>Versions of Femto 70A Net D6 or Femto 70A Net Wi-Fi D6:</b>	
Femto 70A Net D6 Web 85÷265V .....	PFA6635-091
Femto 70A Net Wi-Fi D6 Web 85÷265V .....	PFA663W-091
NOTE: all the Femto 70A Net include already in the packaging 1 CT 70A, if additional 1 or 2 are needed those should be purchased separately using the following code:	
TA 70A (Specific CT not replaceable) .....	PFAE000-00
For the coding of the different possible versions of the Femto 70A Net (can be equipped with 1 module * and / or Web functionalities ** and / or Log 8 ***) refer to the tables following.	
The Femto 70A Net can implement additional features activating the following Net upgrade (PUK):	
Net Upgrade Log 8 (PUK).....	PFSU940-01
Net Upgrade Web (PUK) .....	PFSU940-05
Net Upgrade Web Open (PUK).....	PFSU940-10
Net Upgrade Mail Alarm (PUK).....	PFSU940-15
Net Upgrade Calendar (PUK) .....	PFSU940-20
Net Upgrade Bundle Mail Alarm, Calendar (PUK).....	PFSU940-21
Net Upgrade Charts (PUK) .....	PFSU940-30
Net Upgr. Bundle Web, Log 8, Mail, Calendar, Charts (PUK).....	PFSU940-31
<b>ExpBus Module D2 versions (2 DIN rail modules):</b>	
ExpBus Module D2 24VDC 4DI 4DO .....	PFAB20E-N5P
ExpBus Module D2 24VDC 2AO4-20mA 2DI 2DO .....	PFAB20E-65Q
Possible hardware combinations with 1 or 2 modules (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). For the coding of the different possible versions refer to the tables following.	
Needs external 24Vdc power supply:	
Switching Power Supply D1 24VDC 400mA.....	PFTP100-Q2
<b>ExpBus Module D4 versions (4 DIN rail modules):</b>	
ExpBus Module D4 230V 4DI 4DO .....	PFAB40E-N2P
ExpBus Module D4 230V 2AO4-20mA 2DI 2DO .....	PFAB40E-62Q
Possible hardware combinations with 1 or 2 modules also self-powered versions. For the coding of the different possible versions refer to the tables following.	
Internal 230Vac power supply, other power supply versions on request.	

**Table for the coding of Femto 70A Net versions**

Type	Code
<ul style="list-style-type: none"> <li>* <b>Table</b> for versions of Femto 70A Net and ExpBus Module (in order to define the <b>type of internal module</b>)                      For the construction of the product code insert the number / letter of the internal module needed as the 9<sup>th</sup> character for the <b>Femto 70A Net</b> (while for the <b>ExpBus Module</b> also as the 11<sup>th</sup> character for the eventual second module):</li> </ul>	
Example for Femto 70A Net Web 1DI 2DO: .....	PFA6635-191
Example for ExpBus Module D2 2DI 2DO 2AO4-20mA: .....	PFAB20E-Q56
<b>Versions differing on the internal module/Character per code:</b>	
No module .....	0
Module 1DI 2DO .....	1
Module 2DI 1 RO Self Powered .....	2
Module 2RO .....	5
Module 2AO4-20mA .....	6
Module 1DI 2DO Self Powered.....	E
Module E-Wi .....	L
Module 4DI .....	N
Module 4DO .....	P
Module 2DI 2DO .....	Q
Module 4AI .....	R
Module I2C .....	T
<ul style="list-style-type: none"> <li>** <b>Table</b> for versions of Femto 70A Net (in order to define the type of the <b>Web functionality</b>)                      For the construction of the product code insert the number / letter of Web functionality needed as the 11<sup>th</sup> character:                      E.g.: for the Femto 70A Net Web 1DI 2DO : .....</li> </ul>	
.....	PFA6635-191
<b>Versions differing on Web functionality / Character per code:</b>	
No Web functionality .....	0
Functionality Web .....	1
Functionality Web open .....	2
Functionality Mail alarm .....	3
Functionality Calendar .....	4
Functionality Mail alarm Calendar.....	5
Functionality Charts.....	6
Functionality Web Mail alarm.....	7
Functionality Web Calendar.....	8
Functionality Web Mail alarm Calendar Charts .....	A
Functionality Web open Mail alarm Calendar .....	B
Functionality Web open Charts.....	C
Functionality Web open Mail alarm Calendar Charts.....	D
<ul style="list-style-type: none"> <li>*** <b>Table</b> for versions of Femto 70A Net (in order to define <b>how many Log 8</b>). For the construction of the product code insert the number / letter of the amount of Log 8 needed as the 8<sup>th</sup> character (instead of the dash):                      E.g. for Femto 70A Net Web Log 8 1DI 2DO: PFA6635-1191</li> </ul>	
<b>Versions differing on Log 8 number: ..... Character per code:</b>	
From Log 8 to Log 64 (multiples of 8) .....	from 1 – to 8

Subject to modification without prior notice

Datasheet Femto 70A Net 2013 09 30-ENG

Distributor
-------------