



## Femto D4 DC & Hall

Counter / analyzer of DC Energy



## Atto D4 DC & Hall

Transducer of DC Energy

**Femto D4 DC** is a counter / analyzer of DC Energy with backlight LCD graphic display, while the **Atto D4 DC** is a DC energy transducer. Both are equipped with an extremely accurate and versatile microprocessor designed to meet the most demanding applications of electrical parameters analyses and energy supply monitoring in the photovoltaic, telecommunication, battery systems, and more. Measures voltage, current, power and energy, max and min values of voltage and current. Input of 60mV or 100mV for shunt. The instruments can be integrated with other Electrex products in order to set up a monitoring system for energy or other parameters (temperature, humidity, luminosity, etc.), alarms even with remote access (via GSM / Internet). In this way it is possible to constantly monitor the status of the plant, check promptly and automatically possible malfunctions (e.g. a string of the photovoltaic plant that stops producing photovoltaic energy), any theft or tampering (e.g. solar panels) or access to restricted areas.

The **Femto D4 DC HALL** and **Atto D4 DC HALL** have the same features of the Femto D4 DC and Atto D4 DC but have been designed for the **CTS DC Hall** current transformers connected to the instruments through specific converters.

### Measurement system

All the readings are obtained with a continuous sampling of the voltage and current in order to ensure the maximum metering accuracy even for small loads.

### Simple to use

The **Femto D4 DC** are equipped with a graphic dot matrix LCD display with a LED backlight and adjustable contrast allows the simultaneous reading of 2 parameters and their symbols with high visibility digits. 3 keys make the instrument use simple and rational, while the page displayed when powering on the device is configurable by the user.



Through a simple keyboard set up is possible to set all the operative parameters like integration time (1-60 min), digital outputs and alarms (threshold, delay and hysteresis), digital input, RS485 address. The set-up is password protected. The **Atto D4 DC** are equipped with 2 LED on the frontal panel denoting the device's status and the functioning of the RS485 port.

### Serial communication

The **Femto D4 DC** and **Atto DC** are equipped, as standard feature on all types, with an optoinsulated and over-voltage protected RS485 serial communication port. The protocol is a full compliant Modbus- RTU suitable for communication with PLCs and with SCADA programs. The instrument data are read as numerical registers composed by mantissa and exponent in the IEEE format. A transmission speed of up to 38.400 bps, with maximum 125 registers (equivalent to 62 parameters) per query with no waiting time between queries, ensure an unrivalled communication speed and dialogue efficiency.

### Digital outputs

The **2DO** versions are equipped with two optically insulated transistor outputs rated 27 Vdc 27 mA per DIN 43864 standards. The two outputs are factory set to the transmission of pulses proportional to the imported and exported energy (pulse weight and length are user programmable). The outputs may be alternatively configured as outputs of the internal alarms (see Alarms) or as remote output devices controlled via serial line and Modbus commands.

### Digital input

The **1DI** versions are 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, for example, water meters, gas meters (insulation to meet the ATEX requirements), 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.

### Measures

Parameters	Type	Range
Voltage	U	10,0V...300V
	U <sub>MAX</sub> (1)	
	U <sub>MIN</sub> (1)	
Current	I	Through shunt of 60 or 100mV
	I <sub>MAX</sub> (1)	
	I <sub>AVG</sub> (2) I <sub>MD</sub> (2)	
Active Power	P	± 0,00...1999 MW
	P <sub>AVG</sub> (3) P <sub>MD</sub> (3)	
Temperature	T (°C e F) (4)	-10...+50 °C
Time life	h (1/100 h)	0,01...99.999,99 hours
Active energy	E <sub>a</sub> IMP (5)	0,1 kWh...99.999,9 MWh
	E <sub>a</sub> EXP (5)	
Pulse counter	CNT (6)	

- (1) Value at a time of 500ms.
- (2) Average value (rolling average) over the integration time (1.. 60 min. programmable).
- (3) Import /Export average value (rolling average) over the integration time (1.. 60 min. programmable).
- (4) Microprocessor internal temperature
- (5) Import/Export energies displayed as 9 digits in floating-point readings; internal energy metering performed with 0,1 Wh minimum resolution and 99.999.999,9999 kWh maximum energy count before rollover.
- (6) Total and partial (versions with digital inputs)

**Special versions on request**

Femto D4 DC and Atto DC in different hardware configurations are available on request. They include different power supply and Input/Output configurations.

**Allarmi**

The 2DO versions are equipped with 2 outputs programmable as alarms offering the maximum configuration flexibility for adapting to the most diverse requirements. Each alarm can be related to any one of the parameters available, for example, either as a minimum and/or as a maximum. Linking of both alarms to the same parameter is also possible for operating as dual threshold alarm. The alarms configuration includes the option of setting a delay time (1-99 sec), an hysteresis cycle (in % of threshold value) and the polarity of the output contacts (NO, 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 by means of Modbus Holding registers.

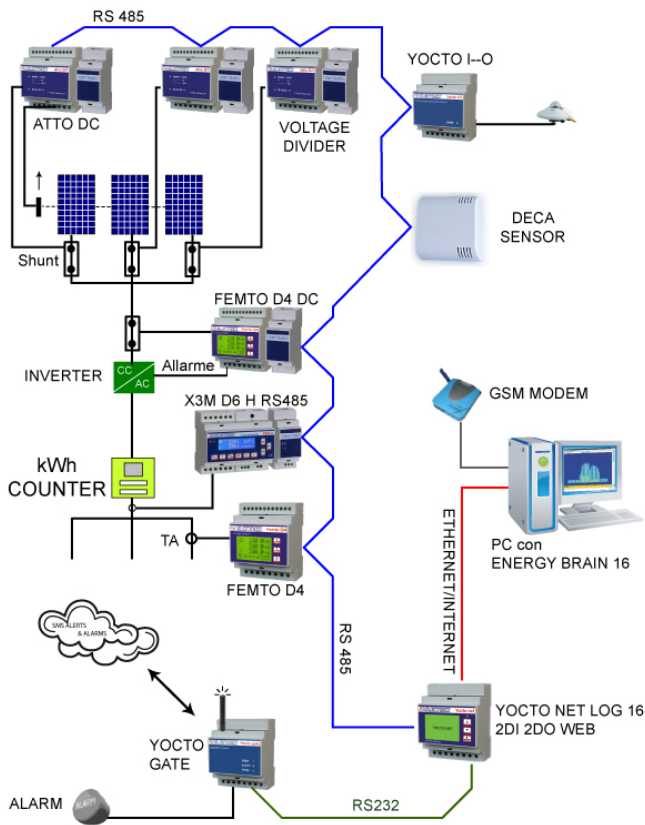
**Voltage Divider**

Femto D4 DC and Atto DC can measure directly up to 300V. For voltages up to 900V it is necessary the use of a voltage divider with a 3/1 ratio (e.g. 900V in input correspond to 300V in output). The divider size is 2 DIN Rail modules.

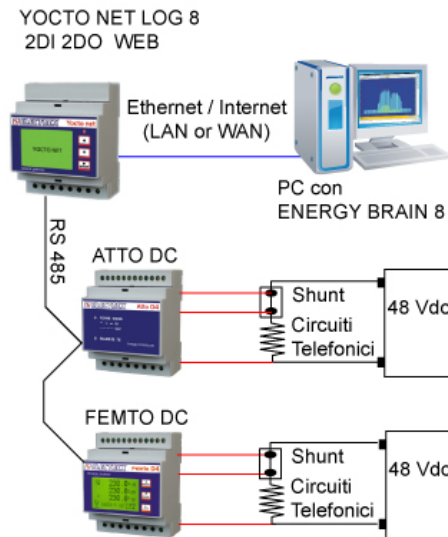


**Shunt**

Femto D4 DC and Atto DC can be used with DC shunt in class 0.5% with voltage drop 60mV or 100mV. Versions are available with flow from 10A and 25A based plastic support and 50A and 100A without support base. Other versions, from 1A to 15.000A, are available on request. All models are in accordance with the standards DIN43703.



Example of a monitoring system of a PV plant with remote management of measures and alarms.



Example of monitoring a DC load system in the telecommunication sector.

**Femto D4 DC E-Wi and Atto D4 DC E-Wi**

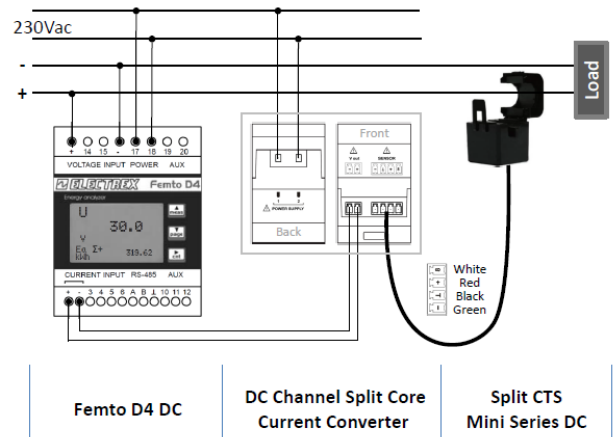
Have the same features of the Femto D4 DC and Atto D4 DC in the version without inputs and outputs and in addition transceive the data via radio waves (wireless), without any limitation, at 250kbps using a 2.4 GHz frequency, at a distance that, without signal boost, can reach the 800 m in open space.

The Femto D4 DC E-Wi and Atto D4 DC E-Wi use the E-Wi protocol based on the IEEE 802.15.4 standard and transmit to the Coordinator (see datasheet of Yocto E-Wi device on our website) in addition to the measurements also the signal intensity and quality of the signal in order to make easier the setting of the correct communication level.

**Femto D4 DC Hall and Atto D4 DC Hall**

**Femto D4 DC HALL** and **Atto D4 DC HALL** have the same features of the Femto D4 DC and Atto D4 DC but have been designed for the current transformers of the **CTS DC Hall Mini Series** which must be connected to the **DC Channel Split Core Current Converter** as shown in the diagram beside.

The DC Channels Split Core Current Converter are available in the versions with 1 or 3 channels and serve as interface between the measuring instrument and the Split CTS Mini Series DC which are powered by the converter through which the signal is conditioned and normalized for the reading by the measuring instrument.



**Technical Specifications**

**Measures**

- Voltage: .....  $U$
- Max: .....  $U_{MAX}$
- Min: .....  $U_{MIN}$
- Current: .....  $I$
- Max: .....  $I_{MAX}$
- Average (AVG): .....  $I_{AVG}$
- Peak (MD): .....  $I_{MD}$
- Active Power,  $IMPORT$ : .....  $P_{IMP}$
- $EXPORT$ : .....  $P_{EXP}$
- Average (AVG)  $IMPORT$ : .....  $P_{AVG IMP}$
- $EXPORT$ : .....  $P_{AVG EXP}$
- Peak (MD)  $IMPORT$ : .....  $P_{MD IMP}$
- $EXPORT$ : .....  $P_{MD EXP}$
- Active Energy;  $IMPORT$ : .....  $E_a IMP$
- $EXPORT$ : .....  $E_a EXP$
- Time life  $TOTAL$  and  $PARTIAL$ : ..... Hours, 1/100 hour
- Microprocessor internal temperature: ..... °C, °F
- Pulse counter (for each input): .....  $C_{NTT}$ ,  $C_{NT Part.}$

**Functional Characteristics**

- Measurement system:
  - Energy counter on 2 quadrant (programmable)
  - 12 bit A/D converter (2 channels)
  - Continuous sampling of voltage and current
  - Automatic offset compensation
  - AVG values, peak, max and min stored in a non-volatile memory
- Communication port RS-485:
  - Galvanically insulated
  - Baud rate from 2400 to 38400 bps
  - Over voltage protected
  - Protocol Modbus-RTU, full compliant
- 1 digital input
  - Galvanically insulated
  - Programmable functionality: external pulse count, ON/OFF state detection, tariff changeover (max 2 tariffs).
  - Programmable 10/100 Hz filter for input glitches suppression
- 2 digital output:
  - Galvanically insulated
  - DIN 43864 (27Vdc, 27mA)
  - Programmable functionality: pulse output, alarm contact, remote control

**Front Panel: Femto D4 DC**

- Display: . LCD graphic LCD with adjustable contrast 100x64 points  
Visible area .....43x25mm
- Backlight: ..... yellow/green Led
- Display update interval: ..... 1s
- Keyboard: ..... 3 keys

**Front Panel: Atto D4 DC**

- LED..... 1 for the Status and 1 for the RS485 port

## Electrical Characteristics

### Voltage input:

Direct input: ..... 300 Vdc (max 360)  
With voltage divider: ..... 900 Vdc

### Current Input

#### With external shunt:

Primary: ..... programmable (max. 10 kA)  
Secondary: ..... 60 - 100 mV

### Current Input (versions for CTS DC Hall)

#### The DC Channel Converter must be used between:

CTS DC Hall mini ..... 50 / 100 / 250 / 500A  
Measures up to 150% of the nominal value

### Digital Inputs (depending on type):

Power supply (external): ..... 10 to 30 Vdc  
Absorbed current: ..... 2 to 10mA  
Max counting frequency: ..... 10 or 100Hz (programmable)

### Digital Outputs (depending on type)

Type: .... open collector (NPN) – compliant with DIN 43864  
Max voltage: ..... 27 Vdc  
Max current: ..... 27mA

### Power supply (separate from voltage inputs):

standard type: ..... 230/240Vac +/- 10% 50/60Hz  
on request: ..... 115/120Vac +/- 10% 50/60Hz  
400Vac +/- 10% 50/60Hz  
15÷36Vac 50/60Hz, 18÷60Vdc  
9÷24Vac 50/60Hz, 9÷36Vdc

Self consumption: ..... < 3VA

### Galvanic insulation:

Power supply (separate): ..... 4 kV  
RS485 serial port: ..... 1,5 kV  
Digital Input & Outputs: ..... 1,5 kV

## Working Conditions

Working temperature: ..... -10°C/+50°C, 14,00°F /+ 122,00°F

Storage temperature: ..... -15°C/+60°C, 5,00°F/+ 140,00°F

Max relative humidity: ..... 95% without condensation

## Mechanical Characteristics

Case: ..... self extinguish plastic V0 class

Protection degree: ..... IP40 on frontal panel

..... IP20 on terminal side

Size: ..... 70 x 90 x 58 mm (4 DIN modules)

Mount: ..... DIN rail

## How to order

Type	Code
FEMTO D4 DC RS485 230-240V 1DI 2DO	PFA6471-12
FEMTO D4 DC RS485 18÷60VDC 1DI 2DO	PFA6471-18
FEMTO D4 DC E-WI HI 230-240V	PFA647H-02
ATTO D4 DC RS485 230-240V	PFA7471-02
ATTO D4 DC RS485 230-240V 1DI 2DO	PFA7471-12
ATTO D4 DC RS485 18÷60VDC 1DI 2DO	PFA7471-18
ATTO D4 DC E-WI HI 230-240V	PFA747H-02
SHUNT 10A 60mV WITH SOCKET	PFARQ70010
SHUNT 25A 60mV WITH SOCKET	PFARQ70025
SHUNT 50A 60mV	PFAR070050
SHUNT 100A 60mV	PFAR070100
SHUNT - other versions on request	
VOLTAGE DIVIDER D2 DC 900V/300V	PFAQ280-00
Hall Effect versions:	
FEMTO D4 DC HALL RS485 230-240V	PFA64B1-02
FEMTO D4 DC HALL 3I RS485 230-240V	PFA64C1-02
ATTO D4 DC HALL RS485 230-240V	PFA74B1-02
ATTO D4 DC HALL 3I RS485 230-240V	PFA74C1-02
DC D2 230V 1 CHANNEL CONVERTER	PFC0551-02
DC D2 230V 3 CHANNELS CONVERTER	PFC0561-02
CTS DC HALL 10-50 MINI	PFC0500
CTS DC HALL 16-100 MINI	PFC0501
CTS DC HALL 24-250 MINI	PFC0502
CTS DC HALL 36-500 MINI	PFC0503
VOLTAGE DIVIDER D2 DC 900V/300V	PFAQ280-00

Subject to modification without prior notice  
Datasheet Femto and Atto D4 DC, Hall and E-Wi 2015 02 24-ENG

Distributor