

Atto

Transducer Energy Analyzer



Atto is a microprocessor based Transducer / Energy Analyzer with outstanding flexibility and accuracy designed to meet the most demanding applications of electrical parameters analyses and energy supply monitoring in the industrial and residential environment. DC versions is available for direct current readings (e.g. photovoltaic and batteryzed systems).

True-RMS

All the readings are “true-RMS” and they are obtained with a continuous sampling of the voltage and current waveforms in order to ensure the maximum metering accuracy of rapidly varying loads (e.g. spot welding).

A sophisticated digital measurement method with a compensation system of the internal amplifiers’ offsets ensure the maximum metering accuracy and stability irrespective of the signal level and the environmental working conditions.

Versatile in application

Atto is suitable for virtually all type of electrical grid, 3- and 4-wire, symmetrical and asymmetrical, balanced or unbalanced, single- 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.

The instrument supports extensive configuration of its operating mode in order to meet most diverse application. The instrument programming takes place via RS485 serial port by means of the Energy Brain software (or by other Modbus compatible software). It allows the setting of all the operational parameters such as grid type, LT/HT, CT and VT ratios (free setting) integration time (1-60 min), digital output and alarms (thresholds, delays, hysteresis), digital input (operating mode) and serial communication parameters.



Two Led indicators located on the front panel provide an indication of instrument’s state and RS485 port operation.

Readings

Parameter	Type	L1	L2	L3	n	Σ	P	Range
Voltage	U _{L-N}	•	•	•	•	•		20,0V...400 kV
	U _{L-L}	•	•	•	•	•		
	U _{L-N} MAX (1)	•	•	•	•	•		
	U _{L-L} MAX (1)	•	•	•	•	•		
	U _{L-N} MIN (1)	•	•	•	•	•		
Current	I	•	•	•	•	•		10 mA...10,0 kA
	I _{MAX} (1)	•	•	•	•	•		
	I _{THERM} (2)	•	•	•	•	•		
Power Factor	PF	•	•	•	•	•		0,00ind..1,00..0,00cap
Frequency	f	•	•	•	•	•		45 ... 65 Hz
Harmonic distortion	THD-U _{L-N}	•	•	•	•	•		0...199,9%
	THD-U _{L-L}	•	•	•	•	•		
	THD-I	•	•	•	•	•		
Active Power	P	•	•	•	•	•		± 0,00...1999 MW
	P _m (3)					•		
	P _{MD} (3)					•		
Reactive Power	Q _{IND}	•	•	•	•	•		± 0,00...1999 Mvar
	Q _{CAP}	•	•	•	•	•		
	Q _m IND (3)					•		
	Q _m CAP (3)					•		
	Q _{MD} IND (3)					•		
Apparent Power	S	•	•	•	•	•		± 0,00...1999 MVA
	S _m (3)					•		
	S _{MD} (3)					•		
Temperature	T	•	•	•	•	•		-10...+50 °C
Life Time	h (1/100 h)					•	•	0,01...99.999,99 ore
Active Energy	E _a IMP (5)	•	•	•	•	•	•	0,1 kWh...99.999,9 MWh
	E _a EXP (5)					•	•	
Reactive Energy	E _r IND IMP (5)	•	•	•	•	•	•	0,1 kvarh...99.999,9 Mvarh
	E _r CAP IMP (5)					•	•	
	E _r IND EXP (5)					•	•	
	E _r CAP EXP (5)					•	•	
Apparent Energy	E _s IMP (5)	•	•	•	•	•	•	0,1kVAh...99.999,9 MVAh
	E _s EXP (5)					•	•	
Pulse Counter	CNT					•	•	

- (1) Absolute value (mean over 10 cycles - example: 200ms at 50Hz).
- (2) Mean value (rolling average) over the integration time (1.. 60 min. programmable).
- (3) Import /Export mean value (rolling average) over the integration time (1.. 60 min. programmable).
- (4) Internal temperature of the Microprocessor.
- (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.

Digital or Analogue 4-20mA outputs

Atto 1DI 2DO is equipped, as standard feature, with two optically insulated transistor outputs rated 27Vdc 27mA per DIN 43864 standards. The two outputs are factory set to the transmission of pulses proportional to the Active energy and the Reactive 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.

Atto 2AO4-20mA is equipped with 2 galvanically 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 they become passive and an external power supply will be needed (12Vdc). The outputs ensure a response time with max. 200 ms.update interval. Each of the two outputs may be linked to any one of the metered parameters.

Digital input

Atto 1DI 2DO is equipped, as standard feature, 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), 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.

Serial communication

Atto is 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.

Energy Brain software

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



Configuration

The available choices enable the maximum flexibility in adapting the software to the type of network (several types of simultaneously connected networks too) and to the operator needs.

Several Energy Brain versions are available according to the functions and the number of channels required.

Alarms

Atto 1DI 2DO is complete with 2 programmable alarms offering the maximum configuration flexibility for adapting to the most diverse requirements. Each alarm can be selected to link to any one of the parameters available, either as a minimum or as a maximum alarm. Linking of both alarms to the same parameter is also possible for operating as dual threshold alarm. The alarms configuration includes the option of precise setting of 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". The alarms are entirely programmable via serial port with the Energy Brain software or via serial port by means of Modbus Holding registers.

Power supply

Atto is equipped with 230-240Vac power supply (transformer type). On request 115/120Vac or 400 Vac transformer power supply and 15÷36Vac/18÷60Vdc (switching type).

Standard versions

Atto is available in 5 versions:

- **Basic** without inputs and outputs
- **1DI 2DO** with 1 digital input and 2 digital outputs
- **2AO4-20mA**..... with two 4-20mA analogue outputs (external power supply needed for loads over 250 ohm)
- **DC 230-240Vac**..... for direct current readings

Types on request

Several hardware configurations are available on request. They include different power supply and Input/Output configurations.

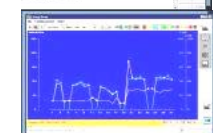
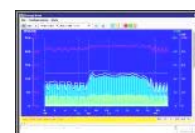
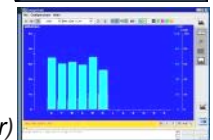
On line readings display

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



Load and energy profiles/graphs

- Demand profiles (day, month and year)
- Energy profiles (day, month and year)
- MD and TOU tariff profiles (month and year)
- Up to 4 graphs displayed simultaneously
- Zoom and parameter selection tools
- Graphical and numerical print-out
- Data export



Electrical characteristics

Connection: single-, bi-phase & 3-phase, LT and HT grids, balanced, unbalanced, 3- and 4-wire

Voltage inputs:

Direct: up to 300 Vrms phase-neutral or 519 Vrms phase-phase

Via external VTs:

Primary: programmable (max. 400 kV)

Secondary: programmable (max. 300 V)

Frequency: 45÷65 Hz

Max voltage to ground: 300 Vrms

Input burden: < 0,3 VA

Input impedance > 2 MΩ

Overload: 900 Vrms phase-phase per 1 sec

Current Inputs:

with external CT:

Primary: programmable (max. 10 kA)

Secondary: 1 or 5 A

Max current: 1,2 or 6 Arms

Input burden: < 0,7 VA

Overload: 40 Arms, 1 sec.

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)- per DIN 43864

Max voltage: 27 Vdc

Max current: 27mA

Analogue 4-20mA Output:

Range: 0-20mA or 4-20mA (programmable)

Max load: 250 ohm (750 ohm if powered with 12 Vdc)

Max current: 27 mA

Accuracy: 1% from 4 to 20Ma

..... (For loads over 250ohm an external power supply is needed)

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

Self consumption: < 3VA

Galvanic insulation:

Power supply (separate): 4 kV

RS485 serial port: 1,5 kV

Digital Input & Outputs: 1,5 kV

Analogue 4-20mA Outputs: 1,5 kV

Accuracy

Voltage: 0,5% of reading +/- 1 digit from 40 to 300V, min. reading: 10V

Current: 0,5% of reading +/- 1 digit from 0,02 to 1,2A or from 1,2 to 6A, min. reading: 10mA

Frequency: 0,02Hz from 45 to 65 Hz

Power: 1% of reading +/- 1 digit

Active Energy: Class 1 complying with IEC EN 62053-21

Reactive Energy: Class 2 complying with IEC EN 62053-21

Standards

Safety: IEC EN 61010-1 CAT III-300V, class 2

E.M.C.: IEC EN 61326-1A

Accuracy: IEC EN 62053-21

Digital Output: DIN 43864

MTBF (165.000 hours): MIL-HDBK-217F

Environmental conditions

Working temperature range: -10/+50 °C

Storage temperature range: -15/+60 °C

Relative Humidity RH< 95% non-condensing

Mechanical characteristics

Enclosure Self-extinguishing plastic material class V0

Protection degree Front panel IP40

Terminals side IP20

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

Mount: DIN rail

Terminals: screw connector

Max cable size: 2,5 mm² (stranded cable) /

4 mm² (solid cable)

How to order

Type	Code
Atto D4 RS485 230-240V	PFA7411-02
Atto D4 RS485 230-240V 1DI 2DO	PFA7411-12
Atto D4 RS485 230-240V 2AOA-20mA	PFA7411-62
Atto D4 DC RS485 230-240V	PFA7471-02
Other types on request	

Subject to modification without prior notice

Data-sheet Atto 2008 12 16 -ENG

Your distributor