

Exa, Exa E-Wi, Exa TR and Exa MID

Energy analyzer

Exa is the new energy analyzer suitable for harsh environments. Equipped with an extremely versatile and precise microprocessor and designed to meet the most demanding applications of monitoring of electrical parameters and management of consumption of electrical energy in the industrial, civil and tertiary sectors.

The device performs the functions of analyzer, meter and multimeter.

Exa E-Wi has the same characteristics as the **Exa** but no inputs and no outputs and in addition **receives / transmits all the data, without limitation**, via radio waves (wireless) using the E-Wi protocol based on IEEE 802.15.4.

Exa TR and **Exa TR-E Wi** are the transducers, respectively, identical to **Exa** and **Exa E-Wi**, but without a display and keyboard.

Exa MID is instead the version of the **Exa** which complies with MID Annex MI-003 for fiscal meters normative.



True-RMS and measurement accuracy

The measures, in TrueRMS, obtained by continuously sampling the waveforms of voltages and currents, the automatic offset compensation of the internal amplifiers and of the angle error of the internal current transformers, ensure the maximum precision regardless the load variability in time (e.g. spot welding), the signal level and the environmental conditions of exercise. The resolution of 64 bits ensures also a high accuracy of the energy measurement even in the presence of small loads (e.g. equipment in stand-by).

Simple to use

Exa, Exa E-Wi and Exa MID are equipped with an LCD graphic display (dot matrix) with LED backlighting and 2 levels of contrast. Simultaneous reading of 4 parameters and of their symbols with high visibility mode.



The 6-key Joystick keypad and the menu column on the display for configuring provide a simple and rational instrument use. In addition the initial page displayed when the instrument is turned on can be defined by the user.

On the front panel two red LEDs, for calibration checking, pulse with a frequency proportional to the active and reactive energy imported. Under the sine wave symbol next to the Electrex logo a red LED indicates the operation status, while 2 other LEDs (one red and one green) below the white band indicate the communication activities of the RS485 port.

Versatile in application

All **Exa** (except Exa MID) are equipped with RS485 port and suitable for use on any type of grid, 3 or 4 wire, symmetrical or asymmetrical, balanced or unbalanced, two-phase, single-phase, low and medium voltage, with 1, 2 or 3 CTs as well as for measurements on 2/4 quadrant (import / export). A keyboard programming allows you to set all operating parameters such as RS485 port, network type, LV / MV, CT and eventual VT ratio (free setting), integration time (1-60 min.) and depending on the version: analog outputs, digital outputs, relay and alarm outputs (thresholds, delay and hysteresis), analog and digital inputs. The programming system is password protected against unwanted changes.

Exa MID is instead suitable for insertions in three-phase 3 and 4 wires, low voltage systems.

Measures

Parameters	Type	L1	L2	L3	n	Σ	P	Range
Voltage	U _{L-N}	(Except Exa MID) 20,0V...400 kV
	U _{L-L}	Exa MID U _{L-N} 230V ±15% U _{L-L} 400V ±10%
	U _{L-N} MAX (1)	.	.	.	.	.	.
	U _{L-L} MAX (1)	.	.	.	.	.	.
	U _{L-N} MIN (1)	.	.	.	.	.	.
U _{L-L} MIN (1)	.	.	.	.	.	.	.
Current	I	10 mA...10,0 kA
	I MAX (1)	.	.	.	.	.	.
	I _{AVG} THERM (2)	.	.	.	.	.	.
	I _{MD} THERM (2)	
Power Factor	PF	0,00ind...1,00...0,00cap
Frequency	f	45 ... 65 Hz
Harmonics Distortion	THD-U _{L-N}	0 ... 199,9%
	THD-U _{L-L}	.	.	.	.	.	.
	THD-I	.	.	.	.	.	.
Active Power	P	± 0,00... 1999 MW
	P _{AVG} (3)	.	.	.	.	.	.
	P _{MD} (4)	.	.	.	.	.	.
	P _{MAX} (1)	.	.	.	.	.	.
Reactive Power	Q _{IND}	± 0,00... 1999 Mvar
	Q _{CAP}	.	.	.	.	.	.
	Q _{AVG} IND (3)	.	.	.	.	.	.
	Q _{AVG} CAP (3)	.	.	.	.	.	.
	Q _{MD} IND (3)	.	.	.	.	.	.
Q _{MD} CAP (3)	.	.	.	.	.	.	.
Apparent Power	S	± 0,00... 1999 MVA
	S _{AVG} (3)	.	.	.	.	.	.
	S _{MD} (3)	
Life Time	h (1/100 h)	0,01...99.999,99 ore
Active Energy	E _a IMP (4)	0,1 kWh...99.999,9 MWh
	E _a EXP (4)	.	.	.	.	.	.
Reactive Energy	E _r IND IMP (4)	0,1 kvarh...99.999,9 Mvarh
	E _r CAP IMP (4)	.	.	.	.	.	.
	E _r IND EXP (4)	.	.	.	.	.	.
	E _r CAP EXP (4)	.	.	.	.	.	.
Apparent Energy	E _s IMP (4)	0,1kVAh...99.999,9 MVAh
	E _s EXP (4)	.	.	.	.	.	.
Pulse Counter	CNT (5)	
Analog Measure	(6)	

- (1) Absolute value (average on 10 cicli - example: 200mS at 50Hz).
- (2) Average value (rolling average) over the integration time (1.. 60 min. programmable) and peak (MD).
- (3) Import /Export mean value (rolling average) over the integration time (1.. 60 min. programmable) and peak (MD) that is, the maximum average value.
- (4) Import/Export energy counters are displayed as 9 digits in floating-point readings; The internal counters are logged with a resolution of 64 bit assuring a minimum definition of 0.1 Wh and a total max. roll-over value of 99.999.999.9999 kWh
- (5) Only for versions with digital inputs.
- (6) Only for versions with analog inputs.

Serial Communication

Exa 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.

Exa D6 and Exa TR D6 versions

The **Exa D6** and **Exa TR D6** are 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 **Exa .. 1DI or 2DI or 4DI** are equipped with optically insulated digital inputs complete with programmable filter for input glitches. The digital input is set by default 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. The **Exa 1DI 2DO Self-Powered** and **Exa 2DI 1RO Self-Powered** instead are provided with self powered digital inputs.

Analog Inputs

The **Exa 4AI** are equipped with 4 analog inputs rated at - 10÷10V (compatible with 0÷10V, 0÷5V, -5÷5V, 4÷20mA).

Digital Outputs

The **Exa .. 2DO or 4DO** are equipped with two optically insulated transistor outputs rated 27 Vdc 27 mA per DIN 43864 standards.

The **Exa 1DI 2DO SELF-POWERED** instead are provided with two opto-mos outputs rated at max. 250V or 100mA AC/DC.. The 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.

Relay Output

The **Exa 2DI 1RO** or **Exa 2RO** are equipped with one or two relay outputs with changeover contact rated at max 30V max 2A (resistive load). The outputs may be configured as outputs of the internal alarms (see Alarms) or as remote output devices controlled via serial line and Modbus commands.

Alarms

The **Exa .. 2DO or 4DO or 1RO** 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 **Exa 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 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 **Exa 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 maximum total distance of the I2C bus is 20m.

Exa E-Wi and Exa TR E-Wi

Exa E-Wi and **Exa TR E-Wi** have the same features of respectively Exa and Exa TR without inputs and outputs and in addition **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 space.

The E-Wi versions use the E-Wi protocol based on IEEE 802.15.4 and transmit to the Coordinator (please refer to the datasheet of the Yocto E-Wi and Kilo net E-Wi) in addition to the measures also the intensity and the quality of the signal in order to facilitate the setting of the correct communication modality.

Special versions and power supply on request

Exa can also be requested in other hardware configurations as for example with a different power supply range.

The **Exa** are equipped with a transformer power supply of 230-240Vac. Other special power supply versions available on request are 115/120 Vac or 400Vac (transformer) and switching power supply 15÷36Vac/18÷60Vdc.

Exa MID

Exa MID, Exa MID 2DI 2DO, Exa MID 4DI, Exa MID 4DO comply with the MID Annex MI-003 for fiscal meters normative and are suitable for LV insertions in 3 phase, 3 and 4 wires (Phase-Neutral 230V ±15% and Phase - Phase 400V ±10%) systems.

Technical Specifications

Functional characteristics and Inputs/Outputs

Measurement system:

- True-RMS measurement 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 internal current transformers

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
- Programmable 10/100 Hz filter for input glitches suppression.
- External powered needed: 10-30Vdc
- Absorbed current:..... from 2 to 10mA or self powered (Self-Powered version)

Analog Inputs (depending on type):

- -10÷10V (compatible with 0÷10V, 0÷5V, -5÷5V, 4÷20mA)

Digital outputs (depending on type):

- Galvanically insulated
- NPN comply with DIN 43864 (27Vdc, 27mA)
- Or alternative version Self-Powered with solid state relay (opto-mos) up to 250V 100mA AC/DC

Analogue 4-20mA Outputs (depending on type):

- Scale: 0-20mA or 4-20mA (programmable)
- Galvanically insulated
- Update interval: 200ms
- Programmable functionality: external weighted pulse count, alarm notification, remote control.
- Maximum load resistance:..... 250 ohm (750 ohm with external power supply 12Vdc)
- Maximum output current:..... 27 mA
- Accuracy: 1% of reading from 4 to 20mA

Relay output (depending on type):

- Programmable functionality: alarm notification, remote control.
- switch contact 30V 2A (resistive load)

Receive & transmit features for Exa E-Wi and Exa TR E-Wi:

- The transceiving internal module replaces the one dedicated to inputs and outputs, therefore this last ones are not available in the E-Wi versions.
- Operating range can reach up to 800 m in open space
- E-Wi protocol based on IEEE 802.15.4 standard
- Auto-connection in case of temporary obstacle preventing the communication
- transmission up to 13,7dBm (higher, up to 20 dBm only where permitted)
- reception -102dBm

Front panel(Exa, Exa E-Wi and Exa MID)

Display:..... : graphic LCD with adjustable, 2 levels, contrast 100x64 dots
Visible area 43x25mm

Backlight: yellow/green Led

Display update interval: 1s

Keyboard: 6-key Joystick keypad

Led: . 2 for impulses related to Active and Reactive Energy
..... 1 for checking functionality / status
..... 2 for the serial RS485 port activity

Electrical characteristics (except Exa MID)

Connection: single, bi-phase & 3-phase, LT and HT grids, balanced, unbalanced, 3- and 4-wires, 1, 2 or 3 CT
Voltage inputs:

Direct: up to 290 Vrms single phase and bi-phase
up to 502 Vrms phase - phase in 3-phase systems

Via external VTs:

Primario: programmabile (max. 400 kV)

Secondario: programmabile (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 for 1 sec

Current Inputs (standard type):

with external CTs:

Primary: programmabile (max. 10 kA)

Secondario: 1 or 5 A

Max current: 1,2 or 6 Arms

Input burden: < 0,7 VA

Overload: 40 Arms, 1 sec.

Power supply (except Exa MID):

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: < 2,5VA

Galvanic insulation (except Exa MID)::

Power supply (separate): 4 kV

RS485 serial port: 1,5 kV

Digital Input & Outputs: 1,5 kV

4-20mA Analogue Outputs: 1,5 kV

Accuracy (except Exa MID)

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 (2 scales),
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 62053-23

Standards (except Exa MID)

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 (100.000 hours) MIL-HDBK-217F

Electrical characteristics Exa MID

Connection:LV 3-phase 4 wires 3 CT and 3 wires 2 CT
Voltage inputs:

Direct: up to 290 Vrms single phase and bi-phase
up to 502 Vrms phase - phase in 3-phase systems
Frequency:.....45-65 Hz
Max voltage to ground:300 Vrms
Input burden: < 0,3 VA
Input impedance: > 2 MΩ
Overload: 900 Vrms phase - phase for 1 sec

Current Inputs (standard type):

with external CTs:
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.

Self-powered Exa MID: F-N 230Vac +/- 15% 50/60Hz
..... F-F 400Vac +/- 10% 50/60Hz
(remains powered even if missing 2 phases)

Self consumption: < 2,5VA

Accuracy Exa MID

Active Energy:..... Class B EN50470
Reactive Energy: Class 2 EN62053-23

Standards EXA MID

General:..... CEI EN 50470-1
Static counters: CEI EN 50470-3

Environmental conditions

Working temperature range Exa and Exa MID: -25/+55 °C
Working temperature range Exa TR: -25/+70 °C
Storage temperature range:..... -30/+70 °C
Relative Humidity : 95% non-condensing

Mechanical characteristics

Enclosure:..... Self-extinguishing plastic material class V0
Protection degree Front panel IP40
Terminals side IP20
Size: 105 x 90 x 58 mm (6 modules DIN)
Max cable size: 2,5 mm² (stranded cable) /
4 mm² (solid cable)

How to order

Type	Code
Exa D6 RS485 230-240V	PFAE611-02
Exa D6 RS485 230-240V 1DI 2DO	PFAE611-12
Exa D6 RS485 230-240V 1DI 2DO Self-Pow. ...	PFAE611-E2
Exa D6 RS485 230-240V 2AO4-20mA	PFAE611-62
Exa D6 RS485 230-240V 2DI 1RO Self-Pow. ...	PFAE611-22
Exa D6 RS485 230-240V 2RO	PFAE611-52
Exa D6 RS485 230-240V 4DI	PFAE611-N2
Exa D6 RS485 230-240V 4DO	PFAE611-P2
Exa D6 RS485 230-240V 2DI 2DO.....	PFAE611-Q2
Exa D6 RS485 230-240V 4AI	PFAE611-R2
Exa D6 RS485 230-240V I2C	PFAE611-T2
Exa D6 E-Wi HI RS485 230-240V	PFAE611H-L2
Other types on request	
Exa TR D6 RS485 230-240V	PFAE6N1-02
Exa TR D6 RS485 230-240V 1DI 2DO	PFAE6N1-12
Exa TR D6 RS485 230-240V 1DI 2DOSelf-Pow	PFAE6N1-E2
Exa TR D6 RS485 230-240V 2AO4-20mA	PFAE6N1-62
Exa TR D6 RS485 230-240V 2DI 1ROSelf-Pow	PFAE6N1-22
Exa TR D6 RS485 230-240V 2RO	PFAE6N1-L2
Exa TR D6 RS485 230-240V 4DI	PFAE6N1-N2
Exa TR D6 RS485 230-240V 4DO	PFAE6N1-P2
Exa TR D6 RS485 230-240V 2DI 2DO	PFAE6N1-Q2
Exa TR D6 RS485 230-240V 4AI	PFAE6N1-R2
Exa TR D6 RS485 230-240V I2C	PFAE6N1-R2
Exa TR D6 E-Wi HI RS485 230-240V	PFAE6NH-L2
Other types on request	
Exa MID D6 RS485 85-440V	PFAE6M1-0A
Exa MID D6 RS485 85-440V 2DI 2DO	PFAE6M1-QA
Exa MID D6 RS485 85-440V 4DI	PFAE6M1-NA
Exa MID D6 RS485 85-440V 4DO	PFAE6M1-PA

Subject to modification without prior notice
Data-sheet Exa, Exa E-Wi, Exa TR and Exa MID 2013 07 08-ENG

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