ELECTREX
the energy saving technology

Engineered and manufactured in Italy
Made in Italy
Pensato, progettato e prodotto in Italia

LOW ENERGY CONSUMPTION

Exa D6 & 96, Exa TR & Exa MID

Energy Analyzers

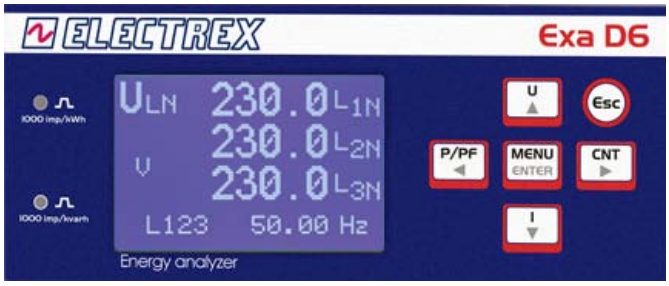
The Exa series are microprocessor-based energy meters / analyzers suitable for harsh environments. Equipped with an RS485 Modbus RTU port. Indication of the phase sequence, four operating time counters in addition to more than one hundred measurements. Versions with digital and analogue inputs - outputs. Perform the functions of analyzer, counter and multimeter.

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 D6, 96 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.

EN 50470 and 62053-22 standards

The **Femto D4** & **Atto D4** meet the essential requirements of the EN 50470-1 + 50470-3 standards as well as for the 62053-22 as required for White Energy Certificates normative.

Measures

Parameters	*Type*	L1	L2	L3	n	Σ	P(8)	*Range*
Voltage	U_{L-N}	•	•	•		•		*(Escluso Exa MID) 20,0V...400 kV*
	U_{L-L}	•	•	•		•		
	$U_{L-N\ MAX}$	•	•	•				*Exa MID*
	$U_{L-L\ MAX}$	•	•	•				U_{L-N} *230V* ±10%
	$U_{L-N\ MIN}$	•	•	•				U_{L-L} *400V* ±10%
	$U_{L-L\ MIN}$	•	•	•				
Current	I	•	•	•	•	•		*10 mA…10,0 kA*
	I_{MAX}	•	•	•				*F(9)[1A … (5A - 500A)] [4A … (20A - 2000A)] [8A … (40A - 4000A)]*
	$I_{AVG\ THERM}$ (1)	•	•	•				
	$I_{MD\ THERM}$ (1)	•	•	•				
Power Factor	PF	•	•	•		•		*0,00ind..1,00..0,00cap*
Frequency	F	•						*45 … 65 Hz*
Phases sequence	132 CCW	•	•	•				
Harmonics Distortion	THD-U_{L-N}	•	•	•		•		*0…199,9%*
	THD-U_{L-L}	•	•	•		•		
	THD-I	•	•	•		•		
Active Power	P	•	•	•		•		*± 0,00…1999 MW*
	P_{AVG} (2)					•		
	P_{MD} (2)					•		
	P_{MAX} (3)	•	•	•				
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)					•		
Life Time(4)	h, h/100					•	•	*0,01…99.999,99 h*
Active Energy(7)	$E_{a\ IMP}$ (5)	•	•	•		•	•	*0,1 kWh…100 GWh*
	$E_{a\ EXP}$ (5)	•	•	•		•	•	
Reactive Energy	$E_{r\ IND\ IMP}$ (5)	•	•	•		•	•	*0,1 kvarh…100 Gvarh*
	$E_{r\ CAP\ IMP}$ (5)	•	•	•		•	•	
	$E_{r\ IND\ EXP}$ (5)	•	•	•		•	•	
	$E_{r\ CAP\ EXP}$ (5)	•	•	•		•	•	
Apparent Energy	$E_{s\ IMP}$ (5)	•	•	•		•	•	*0,1kVAh…100 GVAh*
	$E_{s\ EXP}$ (5)	•	•	•		•	•	
Pulse Counter	CNT (6)					•	•	

Absolute value (average on 10 cycles - example: 200mS at 50Hz).
((1) Average value (rolling average) over the integration time (1.. 60 min. programmable) and peak (MD).
(2) Import /Export mean value (rolling average) over the integration time (1.. 60 min. programmable) and peak (MD) that is, the maximum average value.
(3) Import / Export max. power values.
(4) Lifetime not resettable and four partial operating times.
(5) 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 100GWh.
(6) Only for versions with digital inputs.
(7) For MID models the frequency is between 45 Hz and 55 Hz. The energy counters at the terminals level (total and each phase) in both Import and Export are non-resettable (MID) and resettable partial total counters are displayed at 9 digits (one decimal); internal counters are logged as in point (5).
(8) Three partial counters for each measurement marked
(9) For use with Electrex Flex CT – primary value as listed

Phase sequence

Phase sequence identification on the menu page showing three voltages per each phase and frequency. E.g. as**:** L123.

Serial port communication

The **Exa** are equipped, as a standard feature in all types, with an RS485 serial port with overvoltage protection. The communication protocol used is the "full compliant" Modbus-RTU 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 up to 38.400bps with max. 125 registers that can be requested per each query (equal to about 62 parameters) without waiting times between two requests ensure an unrivalled communication speed.

Operating time counters

The **Exa** display 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.

Versions of Exa D6, 96 and Exa TR D6

The **Exa** are available in different versions:

- *Standard*..... no inputs and outputs
- *1DI 2DO Self-Powered*..... 1 self powered digital input and 2 digital outputs rated at 250V 100mA
- *2DI 1RO24VDC Self powered……. with 2 digital inputs self powered and 1 relay output (24VDC)*
- *2RO24VDC*……..with 2 relay outputs (24VDC)
- *2RO24VDC*.....con 2 uscita a relè (24VDC)
- *4DI*.....4 digital inputs
- *4DO*.....4 digital outputs
- *2DI 2DO 4COMMON* (or 4DI or 4DO) ..separate common

Digital Inputs and Tariffs

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. The 1DI .. or the 2DI 1RO the max sampling rate is 100Hz (5ms), while for the 2DI 2DO and the 4DO 500Hz (2ms). 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) applying a 10-30Vdc to the digital input (2 tariffs) or to two digital inputs (4 tariffs). An external 10-30Vdc power supply is required. The **Exa 1DI 2DO Self-Powered** and **Exa 2DI 1RO Self-Powered** instead are provided with self powered digital inputs.

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 outputs

The **Exa 2DI 1RO** or **Exa 2RO24VDC** are equipped with one or two relay outputs with changeover contact rated at max 30V max 2A (resistive load). The **Exa D6 2RO230V** are equipped with one or two relay outputs with changeover contact rated at max 230V max 2A (resistive load).

The outputs are programmable as outputs of the internal alarms (see Alarms) or as remotely controlled output units 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 the alarm outputs can be linked to the same parameter in order to have more alarm thresholds. It is possible to set a delay on the activation / deactivation of each alarm (from 1s to 99 min), the hysteresis (% of the threshold value) and the polarity of the output contact (NA, NC, except for the **1RO** which is always 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 using Modbus *Holding registers*.

Analog 4-20mA outputs

The .. **2AO4-20mA** version 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). In order to transform the output in a 0-10V type a 500 ohm resistance must be connected in parallel. The outputs ensure a response time of max. 200 ms. Each output can be associated to any of the parameters.

The Exa 96 F using Electrex Flex CT (FCTS)

The **Exa 96 F** are equipped with dedicated current inputs exclusively for Electrex Flex CT series FCTS (mV output and on request calibration to specific device for more accuracy).

WARNING: Do not connect to these current inputs of CT with output in current (eg. ../1A or ../5A) because it may damage both the Exa 96 F and the CT.

Selectable Full Scale independent from the internal diameter of the Flex CT used: 500A or 2.000A or 4.000A.

FCTS 070-500 Flexible split CT, internal diameter 7 cm

FCTS 120-1000 Flexible split CT, internal diameter 12 cm

FCTS 200-2000 Flexible split CT, internal diameter 20 cm

FCTS 280-4000 Flexible split CT, internal diameter 28 cm.

Firmware and special versions on request

With the exception of the Exa MID which, having been certified, cannot be modified, the other Exa's firmware can be remotely updated and can be requested in other hardware configurations such as for example with a different power supplì. In addition to the 230-240Vac version, other alternatives are: 115/120 Vac or 400Vac; or the switching 15 ÷ 36Vac / 18 ÷ 60Vdc or 9 ÷ 24Vac / 9 ÷ 36Vdc.

Exa MID

Exa MID and **Exa MID 2DI 2DO** are comliant with EN 50470-1 + EN 50470-3 and are suitable for LV insertions in 3 phase, 3 and 4 wires (Phase-Neutral 230V ±15% and Phase - Phase 400V ±15%) 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. (500Hz for 2DI 2DO and 4DI versions).*
- *External powered needed: 10-30Vdc*
- *Absorbed current:..... from 2 to 10mA or self powered (Self-Powered version)*

Digital outputs (depending on type):

- *Galvanically insulated*
- *Programmable functionality: external weighted pulse count, alarm notification, remote control.*
- *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*
- *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)*
- *or switch contact 250V 2A (resistive load)*

Front panel Exa D6 and Exa MID D6

Display:.....graphic LCD 2 levels contrast (100x64 dots)
Visible area ……..…..43x25mm
Backlight: .....white/blue Led
Display update interval: …… .....……..1s
Keyboard: …… .....……6-key Joystick keypad
Led:..2 for impulses related to Active and Reactive Energy
10.000 pulses per kWh or Kvarh
1 for checking functionality/status; 2 for RS485 port activity

Front panel Exa 96

Display:.....graphic LCD 2 levels contrast (240x260 dots)
Visible area ……..…..49x71,8mm
Backlight: .....white/blue Led (1s)
Keyboard: ..... 6-key linear keypad
Led:. .....1 per impulsi Energia Attiva (10.000 impulsi al kWh)
Operation / diagnostic Led: ..... 1 red under the symbol

Electrical characteristics (except Exa MID)

Connection: . single, bi-phase & 3-phase, LT and MT systems, ... balanced, unbalanced, 3- and 4-wires, 1, 2 or 3 CT
Voltage inputs:
Direct: .....up to 300 Vrms single phase and bi-phase
up to 519 Vrms phase - phase in 3-phase systems
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 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.
For Exa 96 F series using Electrex Flex CT:
Max. 500/2000/4000A primary ..... /mV secondary.

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
9÷24Vac 50/60Hz, 9÷36Vdc
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
Active Energy:..... Class 0.5S complying with IEC EN 62053-22
.....Class C according to EN 50470-3
Reactive Energy: .....Class 1 complying with IEC EN 62053-24

Standards (except Exa MID)

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

Conditions of use

Working temperature ExaD6:.....-25/+60 °C
Working temperature Exa96: .....-20/+70 °C
Working temperature Exa TR: .....-25/+70 °C
Working temperature Exa MID:.....-25/+55 °C
Storage temperature:.....-30/+70 °C
Relative Humidity :..... 95% non-condensing

Electrical characteristics Exa MID

Connection: .....LV 3-phase 4 wires 3 CT and 3 wires 2 CT
Voltage inputs:
Direct insertion:..... U_{L-N} 230V ±10%
U_{L-L} 400V ±10%
Frequency:.....45÷65 Hz
Max voltage to ground:.....300 Vrms

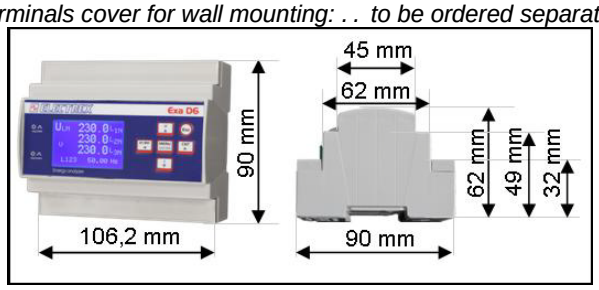
Current Inputs (standard type):
with external CTs:
Primary:.....programmable (max. 10 kA)
Secondary:..... 5 A
Max current:.....6 Arms
Input burden: ..... < 0,7 VA
Overload: ..... 40 Arms, 1 sec.
Self-powered Exa MID:.....Ph-N 230Vac +/- 15% 50/60Hz
..... Ph-Ph 400Vac +/- 10% 50/60Hz
(remains powered even if missing 2 phases)
Self consumption: ..... < 2,5VA

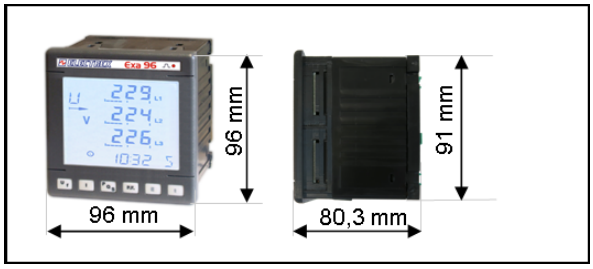
Standards and Accuracy Exa MID

General:.....CEI EN 50470-1
Static counters:.....CEI EN 50470-3
Active Energy:.....Class 1 EN62053-21
Active Energy:..... Class B EN50470-3
Reactive Energy: Class 2 EN62053-23

Mechanical characteristics

MID: terminals..... sealable
Enclosure:.....Self-extinguishing plastic material class UL94 V-0
Protection degree ..... Front panel IP40
Terminals side IP20
D6 Size: ..... 106,3 x 90,5 x 62 mm (6 modules DIN)
96 Size: ..... 96 x 96 x 78 mm (cut-out 92x92mm)
Max cable size .....: 2,5 mm^2 (stranded cable) / 4 mm^2 (solid cable)
Weight Exa D6 basic version: ..... about 385 g
Terminals cover for wall mounting: . . to be ordered separately





How to order

Type	Code
Exa D6 RS485 230-240V	PFAE611-02-B
Exa D6 RS485 230-240V 2DI 2DO 4C	PFAE611-D2-B
Exa D6 RS485 230-240V 2AO4-20mA	PFAE611-62-B
Exa TR D6 RS485 230-240V	PFAE6T1-02-B
Exa TR D6 RS485 230-240V 2DI 2DO 4C	PFAE6T1-D2-B
Exa TR D6 RS485 230-240V 2AO4-20mA	PFAE6T1-62-B
Exa MID D6 RS485 85÷440V	PFAE6M1-0A
Exa MID D6 RS485 85÷440V 2DI 2DO 4C	PFAE6M1-DA
Exa MID D6 Terminal Cover	PFE950-00
Exa 96 RS485 230-240V	PFAEC11-02-B
Exa 96 RS485 230-240V 2DI 2DO 4C	PFAEC11-D2-B
Exa 96 RS485 230-240V 2AO4-20mA	PFAEC11-62-B
Exa 96 F RS485 230-240V	PFAECF1-02-C
Exa 96 F RS485 230-240V 2DI 2DO 4C	PFAECF1-D2-C
Exa 96 F RS485 230-240V 2AO4-20mA	PFAECF1-62-C

Other versions of Exa RS485

CODE P F A E _ _ 1 - _ _

Type	Code
BUILDING CODE	**PFA E 6 T 1 - 6 2 - B**

Exa series = **E**

Size 6 moduli DIN = **6**
Size 96x96 = **C**

Type
Analyzer Exa D6 / 96 = **1**
Transducer Exa TR = **T**
Analyzer Exa MID D6 = **M**
Analyzer Exa 96 F = **F**

Communication..... RS485 = **1**

Internal module
No internal modules ***0***
Module 2DI 1RO24VDC Self Powered ***2***
Module 2RO24VDC ***5***
Module 2AO4-20mA ***6***
Module 1DI 2DO Self Powered..... ***E***
Module 4DI ..... ***N***
Module 4DO ..... ***P***
Module 2DI 2DO 4COMMON ..... ***D***

Power Supply:
230Vac +/- 10% **only for** Exa D6/96 & Exa TR ***2***
120Vac +/- 10% **only for** Exa D6/96 & Exa TR ***1***
400Vac +/- 10% **only for** Exa D6/96 & Exa TR ***3***
15÷36Vac/18÷60Vdc **only for** Exa D6/96 & Exa TR ***8***
9÷24Vac/9÷36Vdc **only for** Exa D6/96 & Exa TR ...***7***

Ph-N 230Vac +/- 10% & Ph-Ph 400Vac +/- 10%
(*remains powered even if missing 2 phases*)
only for Exa MID D6: ..... ***A***

Second generation..... **B**

Subject to modification without prior notice
Data sheet Exa D6,96, Exa TR and Exa MID 2020 02 04-ENG

Distributor

ELECTREX the energy saving technology

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