FEMTO MID D4 ECT
INSTALLATION GUIDE

COPYRIGHT

WARRANTY

This product is covered by a warranty against material and manufacturing defects for a 24 months period from the manufacturing date.
The warranty does not cover the defects that are due to:
• Negligent and improper use
• Failures caused by atmospheric hazards
• Acts of vandalism
• Wear out of materials
• Firmware upgrades
Akse reserves the right, at its discretion, to repair or substitute the faulty products
The warranty is not applicable to the products that will result defective in consequence of a negligent and improper use or an operating procedure not contemplated in this manual.

RETURN AND REPAIR FORMALITIES

Akse accepts the return of instruments for repair only when authorized in advance. The transport costs are at customer charge.

RE-SHIPPING OF REPAIRED PRODUCT

The terms for re-shipment of repaired products are ex-works, i.e. the transport costs are at customer charge.
Products returned as detective but found to be perfectly working by our laboratories, will be charged a flat fee to account for checking and testing time irrespective of the warranty terms.

SAFETY

This instrument was manufactured and tested in compliance with IEC 61010-1 CAT III - 300V class 2 standards for operating voltages up to 300 VAC rms phase to neutral.
In order to maintain this condition and to ensure safe operation, the user must comply with the indications and markings contained in the following instructions:

• When the instrument is received, before starting its installation, check that it is intact and no damage occurred during transport.
• Before mounting, ensure that the instrument operating voltages and the mains voltage are compatible then proceed with the installation.
• The instrument power supply needs no earth connection.
• The instrument is not equipped with a power supply fuse; a suitable external protection fuse must be foreseen by the contractor.
• Maintenance and/or repair must be carried out only by qualified, authorized personnel
• If there is ever the suspicion that safe operation is no longer possible, the instrument must be taken out of service and precautions taken against its accidental use.

Operation is no longer safe when:
•There is clearly visible damaged.
•The instrument no longer functions.
•After lengthy storage in unfavorable conditions.
• After serious damage occurred during transport

The instruments must be installed in respect of all the local regulations.

OPERATOR SAFETY

Warning: Failure to observe the following instructions may lead to a serious danger of death.

• During normal operation dangerous voltages can occur on instrument terminals and on voltage and current transformers. Energized voltage and current transformers may generate lethal voltages. Follow carefully the standard safety precautions while carrying out any installation or service operation.
• The terminals of the instrument must not be accessible by the user after the installation. The user should only be allowed to access the instrument front panel where the display is located.
• Do not use the digital outputs for protection functions nor for power limitation functions. The instrument is suitable only for secondary protection functions.
• The instrument must be protected by a breaking device capable of interrupting both the power supply and the measurement terminals. It must be easily reachable by the operator and well identified as instrument cut-off device.
• The instrument and its connections must be carefully protected against short-circuit.

Precautions: Failure to respect the following instructions may irreversibly damage to the instrument.

• The outputs and the options operate at low voltage level; they cannot be powered by any unspecified external voltage.
• The application of currents not compatible with the current inputs levels will damage to the instrument.

Further documentation may be downloaded from our web site www.electrex.it.
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REFERENCE STANDARDS

EN 50470-1	Devices for measuring electricity (AC). General requirements, tests and test conditions.		
EN 50470-3	Devices for measuring electricity (AC). Special requirements.		
Active energy at the terminals (MID)	Class B EN 50470-1 EN 50470-3	Active energy primary side	EN 62053-21
Reactive energy	Class 2 EN 62053-23		

ENVIRONMENTAL CONDITIONS

Working temperature	-25°C / +55°C	Storage temperature	-25°C / +70°C
Mechanical environment	M1	Electromagnetic environment	E2
Relative humidity max.	95% non-condensing		

READINGS

Keep pressed for 2 seconds to display:
- Type of instrument
- Firmware version
- Serial number
- RS485 address

READINGS TABLE
(The parameters available vary according to instrument configuration)

meas								
meas	ULN f	ULL f		I In		P	Q	S	PF
page	ULN THD	ULL THD		I Σ		P AVG +/-	Q L AVG +/-	S AVG +/-	
Press to scroll readings	ULN MIN	ULL MIN		I THD		P MD +/-	Q C AVG +/-	S MD +/-	
	ULN MAX	ULL MAX		I MAX			Q L MD +/-		
				I AVG			Q C MD +/-		
				I MD					

meas	Ea +/- MAIN	Er L +/- MAIN	Er C +/- MAIN	Es +/- MAIN	C1 MAIN	C2 MAIN	C3 MAIN	C4 MAIN	t MAIN
page	Ea +/- P1	Er L +/- P1	Er C +/- P1	Es +/- P1	C1 P1	C2 P1	C3 P1	C4 P1	t P1
Press to scroll readings	Ea +/- P2	Er L +/- P2	Er C +/- P2	Es +/- P2	C1 P2	C2 P2	C3 P2	C4 P2	t P2
	Ea +/- P3	Er L +/- P3	Er C +/- P3	Es +/- P3	C1 P3	C2 P3	C3 P3	C4 P3	t P3
	Ea + Phase	Er L + Phase	Er C + Phase	Es + Phase					t LIFE
	Ea - Phase	Er L - Phase	Er C - Phase	Es - Phase					

LEGEND OF PARAMETERS AND SYMBOLS

U	Voltage	THD	Total Harmonic Distortion
LN	Phase Neutral	AVG	Average (rolling) value
LL	Phase Phase	MD	Maximum Demand
I	Current	MIN	Minimum values (10 cycles time base)
In	Neutral current	MAX	Maximum values (10 cycles time base)
P	Active Power	+	Import value
Q	Reactive Power	-	Export value
S	Apparent Power	Er L	Inductive
PF	Power Factor	Er C	Capacitive
f	Frequency	t	Time counting
Ea	Active Energy	C	Pulse counting
Er	Reactive Energy	MAIN	Total
Es	Apparent Energy	P1,P2,P3	Partial 1,2,3
		LIFE	Device life time

MECHANICAL CHARACTERISTICS

Case	Self-extinguishing plastic material class V0		
Protection degree	IP40 on the front panel, IP20 on the terminal side (IP51 degree of protection is guaranteed only if the meter is installed in a junction box with IP51 degree or higher.)		
Size	70 x 90 x 58 mm (4 DIN modules)		

FREQUENCY MEASUREMENT

NOMINAL FREQUENCY	50 Hz	FREQUENCY RANGE	47-63 Hz

VOLTAGE INPUT

Self consumption:	< 2,5VA	Ref. 3 Phase voltage Un	400V +- 15%

CURRENT INPUTS

Istart	80mA	Imin	1A	Itr	2A	Iref	20A	Imax	100A

MODELS

PFA64M1-0A-B	FEMTO MID D4 ECT RS485 85-440V ENERGY ANALYZER

DEVICE SETUP

ENTER THE SETUP		EXIT THE SETUP	
Push both simultaneously for 2 seconds	▲ meas ☞ / ▼ page / ► cnt ☞	Push for 2 seconds	▲ meas / ▼ page / ► cnt ☞

OPERATING KEYS

	▲ meas	▼ page	► cnt
Click	Change selected field value	Change selected field value	Go to next field
Click 2 sec	Go to next window	Back to initial entry field	Exits setup

SETUP SEQUENCE

PAGE	PARAMETERS	VALUES AVAILABLE	DEFAULT
PASSWORD			
PASSWORD 0000	PASSWORD	0000 ... 9999	0000
NETWORK			
BASIC SETTINGS	TYPE *(note n.1)*	3P4W, 3P3W	3P-4W
WIRING 3P4W	MUL-I	65535/100	00100/100
MUL-I 00100/100 MUL-U 000001/001	MUL-U	400000/300	000001/001
AVG-MD TIME *(note n.2)*			
AVG-MD TIME	POWERS	1...60 (minutes)	15
POWER 15 CURRENTS 08	CURRENTS	1...60 (minutes)	8
RS-485			
RS-485	ADDR (485 address)	1 ... 247	27
	COM (Baud rate)	2400, 4800, 9600, 19200, 38400	38400
ADDR 027	COM (Data Bit)	7 or 8	8
COM 38400-8-N-2	COM (Parity)	N = no parity, E = even parity, O = odd parity	N
S.T. 100	COM (Stop bit)	1 or 2	2
	S.T. (Silent Time)	0 ... 1000 mS (Step of 10)	100
ALARM 1 / A *(note n.7)*			
ALARM 1/A	MODE *(note n.3)*	NORMAL, UNBAL%, UNBAL, 3-OF-3, 1-OF-3	NORMAL
MODE NORMAL	TYPE *(note n.4)*	MAX, MIN	MIN
TYPE MIN MEAS 276	MEAS *(note n.5)*	Controlled measure. See table n.1 for register selection	276
THRE 0.000	THRE *(note n.5)*	Threshold value	0
ALARM 1 / B			
ALARM 1/B	HYST	1...99 (%)	1
HYST 01 DELAY 01 S/01 S	DELAY	1...99 (seconds)	1
OUT NORMAL	OUT *(note n.6)*	NORMAL, HOLD	NORMAL
ALARM 2 / A *(see ALARM 1/A)*			
ALARM 2 / B *(see ALARM 1/B)*			
ALARM 3 / A *(see ALARM 1/A)*			
ALARM 3 / B *(see ALARM 1/B)*			
ALARM 4 / A *(see ALARM 1/A)*			
ALARM 4 / B *(see ALARM 1/B)*			
S0-1			
S0-1	ENERGY *(note n.9)*	EA, ER L, ER C, ES, EA+, ER L+, ER C+, ES+, EA-, ER L-, ER C-, ES-	EA
ENERGY EA PRIMARY NO	PRIMARY *(note n.10)*	YES, NO	NO
WEIGHT 1.00 WIDTH 0030	WEIGHT	0.01 ... 9.99 (Wh, VArh, VAh) (K,M)	1
	WIDTH	10 ... 1000 mS	0030
DISPLAY			
DISPLAY	LIGHT HIGH	1 ... 3	3
LIGHT HIGH 3 LIGHT LOW 1	LIGHT LOW	0 ... 3	1
CNTRAST 7	CONTRAST	0 ... 15	7
ENTER NEW PASSWORD			
ENTER NEW PASSWORD 0000	ENTER NEW PASSWORD	0000 ... 9999	0000

RESTORE FACTORY SETTINGS			
RESTORE FACTORY SETTINGS NO	RESTORE FACTORY SETTINGS	NO, YES	NO
CLEAR REGS/A			
CLEAR REGS/A	PHASE NRGY	NO, YES	NO
	MD POWER	NO, YES	NO
PHASE NRGY NO MD POWER NO	MD CURRENT	NO, YES	NO
MD CURRENT NO PEAKS NO	PEAKS	NO, YES	NO
CLEAR REGS/B			
CLEAR REGS/B	CNT MAIN	NONE,TIMER,ENERGY,ALL	NO
	CNT P1	NONE,TIMER,ENERGY,ALL	NO
CNT MAIN NONE CNT P1 NONE	CNT P2	NONE,TIMER,ENERGY,ALL	NO
CNT P2 NONE CNT P3 NONE	CNT P3	NONE,TIMER,ENERGY,ALL	NO

TABLE n.1 - Part of ModBus Registers for alarm configuration (Contact us for the full list).

REGISTER	DESCRIPTION	SYMBOL	UNIT
218	Frequency of U1N	f	[Hz]
220	Phase to Neutral Voltage, RMS Amplitude	U1N	[V]
222	Phase to Neutral Voltage, RMS Amplitude	U2N	[V]
224	Phase to Neutral Voltage, RMS Amplitude	U3N	[V]
226	Phase to Phase Voltage, RMS Amplitude	U12	[V]
228	Phase to Phase Voltage, RMS Amplitude	U23	[V]
230	Phase to Phase Voltage, RMS Amplitude	U31	[V]
232	Phase Current, RMS Amplitude	I1	[A]
234	Phase Current, RMS Amplitude	I2	[A]
236	Phase Current, RMS Amplitude	I3	[A]
238	Neutral Current, RMS Amplitude	IN	[A]
240	Phase Active Power (Imp/ Exp)	P1	[W]
242	Phase Active Power (Imp/ Exp)	P2	[W]
244	Phase Active Power (Imp/ Exp)	P3	[W]
246	Phase Reactive Power (Imp/ Exp)	Q1	[var]
248	Phase Reactive Power (Imp/ Exp)	Q2	[var]
250	Phase Reactive Power (Imp/ Exp)	Q3	[var]
252	Phase Apparent Power	S1	[VA]
254	Phase Apparent Power	S2	[VA]
256	Phase Apparent Power	S3	[VA]
258	Phase Power Factor (Imp/ Exp)	PF1	[-]
260	Phase Power Factor (Imp/ Exp)	PF2	[-]
262	Phase Power Factor (Imp/ Exp)	PF3	[-]
270	Phase to Neutral Voltage, Mean RMS Amplitude	UI	[V]
272	Phase to Phase Voltage, Mean RMS Amplitude	UD	[V]
274	Three phase current, RMS Amplitude	I	[A]
276	Total active power (Imp/ Exp)	PS	[W]
278	Total reactive power (Imp/ Exp)	QS	[var]
280	Total apparent power	SS	[VA]
282	Total power factor (Imp/ Exp)	PFS	[-]
332	Phase Current, RMS Amplitude, AVG	I1 AVG	[A]
334	Phase Current, RMS Amplitude, AVG	I2 AVG	[A]
336	Phase Current, RMS Amplitude, AVG	I3 AVG	[A]
344	Total imported active power, AVG	P Imp AVG	[W]
346	Total imported inductive power, AVG	Qind Imp AVG	[var]
348	Total imported capacitive power, AVG	Qcap Imp AVG	[var]
350	Total imported apparent power, AVG	S Imp AVG	[VA]
352	Total exported active power, AVG	P Exp AVG	[W]
354	Total exported inductive power, AVG	Qind Exp AVG	[var]
356	Total exported capacitive power, AVG	Qcap Exp AVG	[var]
358	Total exported apparent power, AVG	S Exp AVG	[VA]

NOTE n.1			
3P4W	3 phases	4 wires	Star
3P3W	2 phases	3 wires	Triangle

NOTE n.2	
POWERS	Integration time of the average value (AVG) and peak value (MD) for power (from 1 to 60 minutes)
CURRENTS	Integration time of the average value (AVG) and peak value (MD) for current (from 1 to 60 minutes)

NOTE n.3	
NORMAL	Classic Alarm with reference to a fixed threshold or to maximum and minimum delay and applicable hysteresis. "AVG" parameter is not used.
UNBAL%	Considers also the 2 following registers of the selected one in "MEAS". "THRE" parameter becomes a % value. Alarm goes on when one of the three register is different from the percentage set on "THRE" comply with the higher value of the three read register if "MAX" is set on "TYPE", or comply with the lower value of the three register if "MIN" is set on "TYPE" With delay and applicable hysteresis.
UNBAL	Considers also the 2 following registers of the selected one in "MEAS". "THRE" parameter becomes a ???? value. Alarm goes on when one of the three register is different from the percentage set on "THRE" comply with the higher value of the three read register if "MAX" is set on "TYPE", or comply with the lower value of the three register if "MIN" is set on "TYPE" With delay and applicable hysteresis.
3-OF-3	Considers also the 2 following registers of the selected one in "MEAS". Works on a fixed max or min threshold with delay and applicable hysteresis. When all the three register exceed the threshold the alarm goes on. "AVG" parameter is not used.
1-OF-3	Consider also the 2 following registers of the selected one in "MEAS". Works on a fixed max or min threshold with delay and applicable hysteresis. If one of the three register exceed the threshold the alarm goes on. "AVG" parameter is not used.

NOTE n.4	
MAX	Alarm setting in excess compared with the established conditions. With the exception of "UNBAL and UNBAL%".
MIN	Alarm setting in decrease compared with the established conditions. With the exception of "UNBAL and UNBAL%"

NOTE n.5	
MEAS	Indicates which register (measure) the alarm is related to. See table n.1 input register.
THRE	Alarm threshold in absolute value, with the exception made for "DERIV" and "UNBAL" in which the value inserted becomes a percentage.

NOTE n.6	
NORMAL	Alarm remains active during the duration of the event. It restores automatically.
HOLD	Alarm remains active until the manual reset via Modbus.

NOTE n.7	
ALARM 1	MODBUS Alarm (Related to output 1 if present)
ALARM 2	MODBUS Alarm (Related to output 2 if present)
ALARM 3	MODBUS Alarm (Related to output 3 if present)
ALARM 4	MODBUS Alarm (Related to output 4 if present)

NOTE n.8		
LED-1	OFF	LED remains OFF
	S0-1, 2, 3, 4	LED blinks following the pulse generator selected

NOTE n.9	
EA	Power (Energy) Imported/Exported Active
ER L	Power (Energy) Imported/Exported Reactive Inductive
ER C	Power (Energy) Imported/Exported Reactive Capacitive
ES	Power (Energy) Imported/Exported Apparent
EA+	Power (Energy) Imported Active
ER L+	Power (Energy) Imported Reactive Inductive
ER C+	Power (Energy) Imported Reactive Capacitive
ES+	Power (Energy) Imported Apparent
EA-	Power (Energy) Exported Active
ER L-	Power (Energy) Exported Reactive Inductive
ER C-	Power (Energy) Exported Reactive Capacitive
ES-	Power (Energy) Exported Apparent

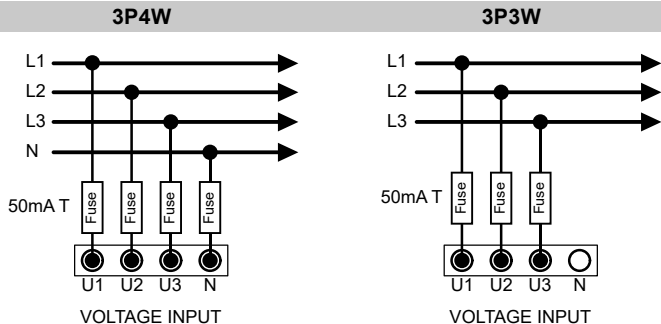| NOTE n.10	
YES	Referred to CT primary
NO	Referred to CT secondary

ALARM SETUP EXAMPLE

To ensure that the exit "DIGITAL OUT 1" remains excited for the alarm duration (latching) when average active power (MEAS 344) exceeds the value of 100 kW, hysteresis, 5% and latency of 5 seconds set the parameters such as table:

|			
ALARM 1 / A	MODE (note n.3)	NORMAL,UNBAL%,UNBAL,3-OF-3,1-OF-3	NORMAL
	TYPE (note n.4)	MAX, MIN	MAX
	MEAS (note n.5)	Controlled measure. See table n.1 for register selection.	344
	THRE (note n.5)	Threshold value	100000
ALARM 1 / B	HYST	1...99 (%)	5
	DELAY	1...99 (seconds)	5
	AVG (note n.6)	1...99 (seconds)	1
	OUT (note n.7)	NORMAL, HOLD	NORMAL
DIGITAL OUT 1	FUNCTION	S0-1,ALARM,REMOTE	ALARM
	POLARITY	N.O.,N.C.	NO
	MODE	NORMAL,PULSE,	NORMAL

VOLTAGE CONNECTION

Use cables with max cross-section of 2,5 mm² if stranded, 4 mm² if rigid and connect them to the clamps marked VOLTAGE INPUT on the instrument according to the applicable diagrams that follow.

3P4W	3P3W

L1
L2
L3
N

50mA T Fuse Fuse Fuse Fuse

U1 U2 U3 N

VOLTAGE INPUT

L1
L2
L3

50mA T Fuse Fuse Fuse

U1 U2 U3 N

VOLTAGE INPUT

CURRENT CONNECTION

Use only the CT's provided with the instrument. Connect the CT outputs to the terminals marked I1, I2, I3 according to the applicable diagrams that follow.

3P4W	3P3W

I1 I2 I3
L1
L2
L3

I1 I3
L1
L2
L3
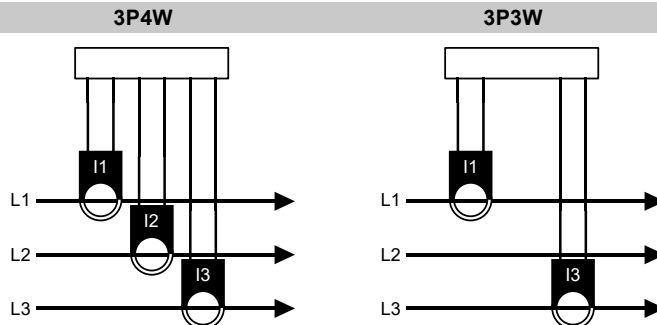
Note: Scrupulously respect the matching of phase between the voltage signals and current signals. Failure to comply with this correspondence and connection diagrams gives rise to measurement errors.
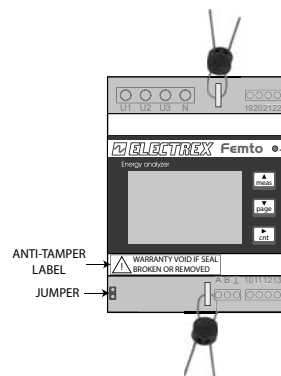
METROLOGICAL MEASUREMENTS

On this page it is possible to read the metrologically relevant measurements.
The page appears when the CNT button is pressed or automatically displayed after 30 seconds of inactivity. The energy counters displayed on this page do not take into account the CT and VT ratio.

ELECTREX Femto
Energy analyzer
Ea MID 3P4W kwh
0.00 +
0.00 -
meas
page
cnt
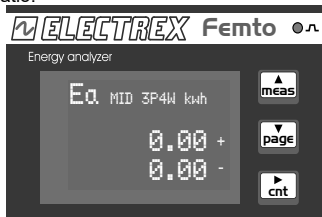
SECURITY SEALS

Sealing of voltage and current inputs. In the image below, positioning of the seals.
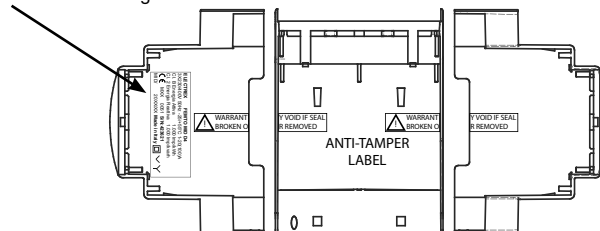**The sealing of the terminal cover must be performed by professional qualified operators.**

U1 U2 U3 N   19202122

ELECTREX Femto
Energy analyzer
meas
page
cnt

ANTI-TAMPER LABEL — WARRANTY VOID IF SEAL BROKEN OR REMOVED   A B ⊥ 10111213

JUMPER →

JUMPER

Using the jumper it is possible to prevent the modification of the instrument parameters from the display and from the Modbus protocol.

	PRESENT	- Modbus read/write protocol - Display setup enabled
	NOT PRESENT	- Modbus protocol in read only modality - Limited display setup

⚠ **ONCE THE INSTALLATION HAS BEEN FINISHED, THE JUMPER MUST REMAIN DISCONNECTED AND INACCESSIBLE TO THE USER.**
ATTENTION. INSERT OR REMOVE THE JUMPER WHEN INSTRUMENT IS OFF.

CASE SEALING LABEL

Label with metrological information

WARRANTY VOID IF SEAL BROKEN OR REMOVED
ANTI-TAMPER LABEL
WARRANTY VOID IF SEAL BROKEN OR REMOVED

PHASE SEQUENCE

L123	Correct sequence
L132	Incorrect sequence
L---	Indicates that the device is not able to define the sequence

Please consider that:
• only the voltage sequence is detected;
• the detection considers the hypothesis that the tensions are sinusoidal (or at least slightly distorted) and belonging to a symmetrical (or almost) triad;
• independently from the insertion 3W/4W, it is considered exclusively the sign of voltage 2 and 3 in the zero-crossing of voltage for phase 1 - it is not calculated the effective phase of the voltage fundamentals;
• the phase sequence is indicated with the "L123", "L132", "L—" symbols next to frequency, in the voltages displaying page.

It is assumed:
L1 is the voltage with phase 0°
L2 is the voltage with phase 240° (in delay to L1)
L3 is the voltage with phase 120° (in advance to L1)

REFERENCE STANDARDS

EN 50470-1	Devices for measuring electricity (AC). General requirements, tests and test conditions.
EN 50470-3	Devices for measuring electricity (AC). Special requirements.
Active energy (MID)	Class B EN 50470
Reactive energy	Class 2 EN 62053-23
Active energy primary side	EN 62053-21

ENVIRONMENTAL CONDITIONS FOR INTERNAL USE

Working temperature	-25°C / +55°C	Mechanical environment	M1
Storage temperature	-25°C / +70°C	Electromagnetic environment	E2
Relative humidity max.	95% non-condensing		

MESSAGE "CFG ERROR"

During the set up operation a "CFG ERROR" message could appear. This means that some wrong parameters are typed. To restore the factory default settings use the following procedure (RESTORE FACTORY SETTING):

CFG ERROR   cnt 👈   RESTORE FACTORY SETTINGS YES   cnt 👈

Once this procedure is done the meter is configured with its factory default settings.
Logged data for counters, energy and timer will remain after the restore operation.
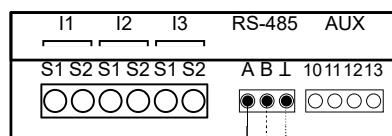
SERIAL LINE CONNECTION

I1	I2	I3	RS-485	AUX
S1 S2	S1 S2	S1 S2	A B ⊥	10 11 12 13

Max cable length: 1000 meters.

RS485	
Address	27
Baud rate	38400
Parity	None
Bit of Stop	2

ELECTREX
the energy saving technology
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