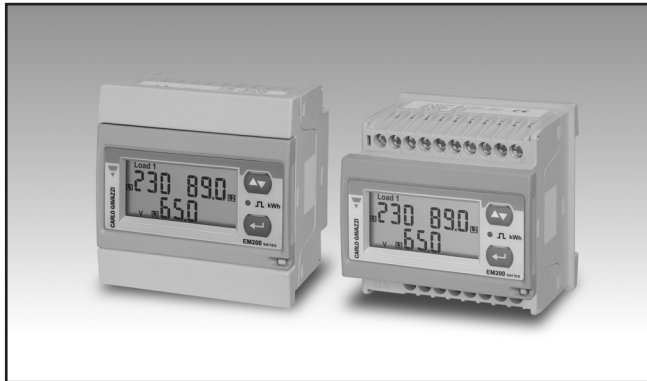# Energy Management
Energy Analyzer
Type EM210 MID

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- **Compliant with the international accuracy standard IEC/EN62053-21, and the IEC/EN61557-12 performance requirements (active power and active energy).**
- **MID (Measuring Instruments Directive) compliant**

- **Class B (kWh) according to EN50470-3**
- **Class 2 (kvarh) according to EN62053-23**
- **Accuracy ±0.5 RDG (current/voltage)**
- **Energy meter**
- **Instantaneous variables readout: 3 DGT**
- **Energies readout: 7 DGT**
- **System variables: W, var, PF, Hz, Phase-sequence.**
- **Single phase variables: VLL, VLN, A, PF**
- **Energy measurements: total kWh (imported and exported); kvarh**
- **TRMS measurements of distorted sine waves (voltages/currents)**
- **Auxiliary power supply**
- **Dimensions: 4-DIN modules and 72x72mm**
- **Protection degree (front): IP40**
- **Application adaptable display and programming procedure (Easyprog function)**
- **Easy connections management**
- **Multi-use housing: for both DIN-rail and panel mounting applications**

Product description

Three-phase energy meter with front LCD display unit. The device is available either as a DIN-rail mounting or a panel mounting energy meter. This general purpose three-phase energy meter is suitable for both acti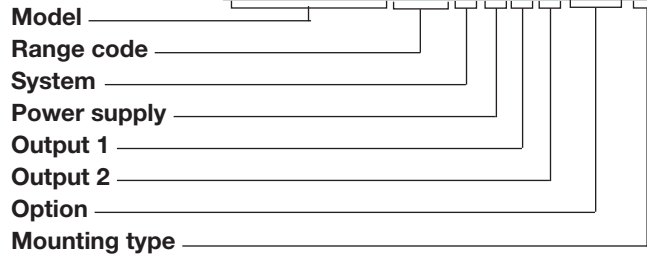ve and reactive energy metering for cost allocation but also for main electrical parameter measurement and retransmission (transducer function). Possibility to display also exported active energy (e.g. in case of regenerated energy in lifts or similar applications). Housing with IP40 (front) protection degree. Current measurements carried out by means of external current transformers and voltage measurements carried out either by means of direct connection or by means of potential transformers. EM210 is provided, as standard, with a pulsating output for active energy retransmission. In addition a 2-wire RS485 communication port is available as an option.

MID Certified according to MID Directive, Module B and Module D of Annex II, " for legal metrology relevant to active electrical energy meters (see Annex V, MI003, of MID). Can be used for fiscal (legal) metrology. Only the total active energy meter is certified according to MID.

How to order   EM210 72D AV5 3 H O X PFA D

Model ——————
Range code ——————
System ——————
Power supply ——————
Output 1 ——————
Output 2 ——————
Option ——————
Mounting type ——————

Type Selection

Range code	System	Power supply	Option
AV5: 230/400VL AC, 5(6)A (CT connection)	**3:** balanced and unbalanced load: 3-phase, 4-wire; 3-phase, 3-wire (without N connection);	**H:** auxiliary power supply from 65 V to 400 V ac, 45 to 65 Hz	**PFA:** certified according to MID Directive). Can be used for fiscal (legal) metrology. The power is always integrated -both in case of positive (imported) and negative (exported) power.
AV6: 57.7(100)/133(230)V AC 5(6)A (VT/PT and CT connections)			**PFB:** Certified according to MID Directive). Can be used for fiscal (legal) metrology. Only the positive (imported) power is integrated - no integration in case of negative (exported) power.

Output 1	Output 2	Mounting type
O: Single static output (opto-mosfet)	**X:** None	**D:** DIN-rail mounting
	S: RS485 port	**P:** Panel mounting

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Input specification

Rated Input	
	System type: 3
Current type	Not isolated (shunt inputs). Note: the external current transformers can be connected to earth individually.
Current range	In: primary current corresponding to 5 A secondary output. Imax: 1.2 In (6A secondary).
Voltage (direct or by VT/PT)	AV5: 230/400VL; 6A; Un: 230VLN/400VLL. AV6: 57.7(100)/133(230) V; 6A; Un: 57.7 to 133 VLN (100 to 230VLL).

Accuracy (Display + RS485)	(@25°C ±5°C, R.H. ≤60%, 50 Hz)
Current	From 0.02In to 0.2In: ±(0.5% RDG +3DGT). From 0.2In to Imax: ±(0.5% RDG +1DGT).
Phase-neutral voltage	In the range Un: ±(0,5% RDG +1DGT).
Phase-phase voltage	In the range Un: ±(1% RDG +1DGT).
Frequency	resolution: 1Hz
Active power	±(1%RDG +2DGT).
Power Factor	±[0.001+1%(1.000 - "PF RDG")].
Reactive power	±(2%RDG +2DGT).
Active energy	class B according to EN50470-1/3.
Reactive energy	class 2 according to EN62053-23. Start up current: 10 mA.

Energy additional errors	
Influence quantities	According to EN50470-1/3.
Temperature drift	≤200ppm/°C.
Sampling rate	1600 samples/s @ 50 Hz
Display refresh time	1 second
Display	2 lines 1st line: 7-DGT or 3-DGT+3-DGT 2nd line: 3-DGT
Type	LCD, h 7mm.
Instantaneous variables read-out	3-DGT.
Energies	Total: 5+2, 6+1 or 7DGT
Overload status	EEE indication when the value being measured is exceeding the "Continuous inputs overload" (maximum measurement capacity)
Max. and Min. indication	Max. instantaneous variables: 999; energies: 9 999 999. Min. instantaneous variables: 0; energies 0.00.

LEDs	
Red LED (Energy consumption)	0.001 kWh by pulse if CT ratio x VT ratio is <7; 0.01 kWh by pulse if CT ratio x VT ratio is ≥ 7.0 < 70.0; 0.1 kWh by pulse if CT ratio x VT ratio is ≥ 70.0 < 700.0; 1 kWh by pulse if CT ratio x VT ratio is ≥ 700.0.
Max frequency	16Hz, according to EN50470-3.
Green LED (on the terminal blocks side)	for power on (steady) and communication status: RX-TX (in case of RS485 option only) blinking.

Measurements	See "List of the variables that can be connected to:"
Method	TRMS measurements of distorted wave forms.
Coupling type	By means of external CT's.
Crest factor	≤ 3 (15A max. peak).
Current Overloads	
Continuous	1.2In, @ 50 Hz.
For 500ms	20In, @ 50 Hz.
Voltage Overloads	
Continuous	1.2 Un
For 500ms	2 Un
Current input impedance	
AV5, AV6	< 0.3VA
Voltage input impedance	
AV5, AV6	>1000 k Ω
Frequency	50 Hz.
Keypad	Two push buttons for variable selection and programming of the instrument working parameters.

Output specifications

Pulse output		Connections	2-wire max. distance 1000m, termination directly on the instrument.
Number of outputs	1		
Type	Programmable from 0.01 to 9.99 kWh per pulse. Output connectable to the energy meter (+kWh)	Addresses	247, selectable by means of the front keypad
		Protocol	MODBUS/JBUS (RTU)
Pulse duration	TOFF ≥120ms, according to EN62052-31. TON selectable (30 ms or 100 ms) according to EN62053-31	Data (bidirectional)	
		Dynamic (reading only)	System and phase variables: see table "List of variables..."
Output	Static: opto-mosfet.	Static (reading and writing)	All the configuration parameters.
Load	VON 2.5 VAC/DC, 70 mA max. VOFF 260 VAC/DC max.	Data format	1 start bit, 8 data bit, no and even parity,1 or 2 stop bit.
Insulation	By means of optocouplers, 4000 VRMS output to measuring inputs.	Baud-rate	9.6, 19.2, 38.4, 57.6, 115.2 kbps.
RS485		Driver input capability	1/5 unit load. Maximum 160 transceiver on the same bus.
Type	Multidrop, bidirectional (static and dynamic variables)	Insulation	By means of optocouplers, 4000 VRMS output to measuring input.

Software functions

Password	Numeric code of max. 3 DGT; 2 protection levels of the programming data:	**Displaying**	Up to 3 variables per page.
		Measurement mode	For all the display selections (except "D" and "E") the current, power and energy measurement are independent on the current direction.
1st level	Password "0", no protection;		
2nd level	Password from 1 to 999, all data are protected.		
System selection			
System 3-Ph.n unbalanced load	3-phase (4-wire) 3-phase (3-wire) without neutral connection.		
Transformer ratio			
VT (PT) (AV6 only)	1.0 to 99.9 / 100 to 999		
CT	1.0 to 99.9 / 100 to 999 The max CTxVT product for AV5 models is 525, for AV6 models is 908.		

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General specifications
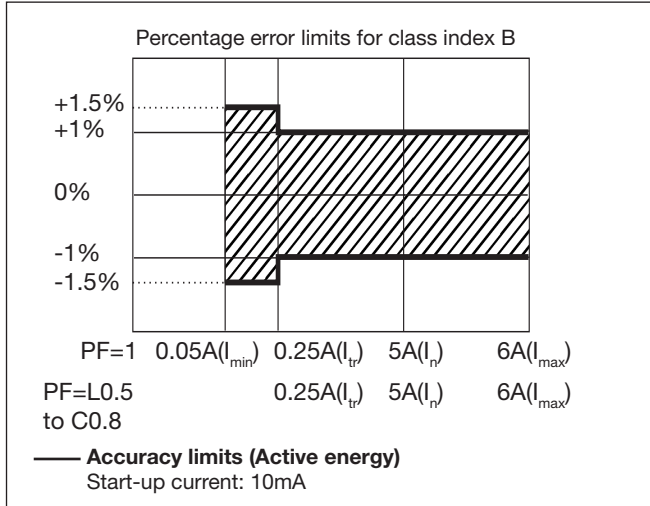
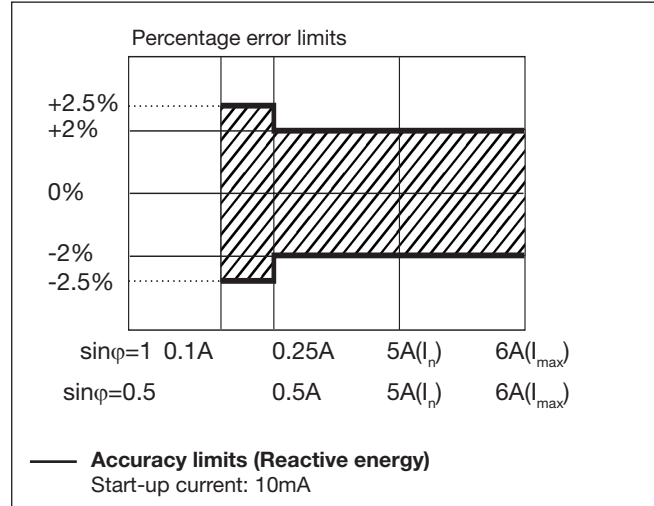|			
Operating temperature	-25°C to +55°C (-13°F to 131°F) (R.H. from 0 to 90% non-condensing) according to EN50470-1.	**Housing** Dimensions (WxHxD) Material Mounting	72 x 72 x 65 mm self-extinguishing: UL 94 V-0 Panel or DIN-rail
Storage temperature	-30°C to +70°C (-22°F to 158°F) (R.H. < 90% non-condensing) according to EN50470-1)	**Protection degree** Front Screw terminals	IP40 IP20
Overvoltage category	Cat. III	**Weight**	Approx. 400g (packing included)
Insulation (for 1 minute)	4000 VRMS between measuring inputs and digital output.		
Dielectric strength	4000 V ac RMS for 1 minute		
Noise rejection CMRR	100 dB, 48 to 62 Hz		
EMC	According to EN50470-1		
Standard compliance Safety Metrology Pulse output Approvals	EN50470-1 EN50470-1, EN50470-3 IEC/EN61557-12 (active power and active energy, MID models only) DIN43864, IEC62053-31 CE, MID		
Connections Cable cross-section area	Screw type 2.4 x 3.5 mm Min./Max. screws tightening torque: 0.4 Nm / 0.8 Nm		

Power supply specifications

Auxiliary power supply	65 to 400 V ac -20%/+15% (45-65Hz)	**Power consumption**	≤4VA

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Accuracy AV5, AV6 (According to EN50470-3 and EN62053-23)

kWh, accuracy (RDG) depending on the current

Percentage error limits for class index B

```
+1.5% ........
+1%

0%

-1%
-1.5% ........
```

PF=1   0.05A(I_min) 0.25A(I_tr)   5A(I_n)   6A(I_max)

PF=L0.5   0.25A(I_tr)   5A(I_n)   6A(I_max)
to C0.8

—— Accuracy limits (Active energy)
    Start-up current: 10mA

kvarh, accuracy (RDG) depending on the current

Percentage error limits

```
+2.5% ........
+2%

0%

-2%
-2.5% ........
```

sinφ=1 0.1A   0.25A   5A(I_n)   6A(I_max)

sinφ=0.5   0.5A   5A(I_n)   6A(I_max)

—— Accuracy limits (Reactive energy)
    Start-up current: 10mA

Measurement accuracy according to IEC/EN61557-12 (MID versions)

Active power	Performance class 1	Active energy	Performance class 2

MID compliance

Accuracy	0.9 Un ≤ U ≤ 1.1 Un; 0.98 fn ≤ f ≤ 1.02 fn; fn: 50Hz; cosφ: 0.5 inductive to 0.8 capacitive. Class B I st: 0.01A; I min: 0.05A; I tr: 0.25A; I n: 5A I max: 6A.	Electromagnetic class	E2
		Mechanical class	M2
		Protection degree	in order to achieve the protection against dust and water required by the norms harmonized to MID, the meter must be used only installed in IP51 (or better) cabinets.
Operating temperature	-25°C to +55°C (-13°F to 131°F) (R.H. from 0 to 90% non-condensing @ 40°C)		

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Insulation between inputs and outputs

	Measuring input	Opto-Mosfet output	Communication port	Auxiliary power supply
Measuring inputs	-	4kV	4kV	4kV
Opto-Mosfet output	4kV	-	-	4kV
Communication port	4kV	-	-	4kV
Auxiliary power supply	4kV	4kV	4kV	-

NOTE: all the models have, mandatorily, to be connected to external current transformers.

List of the variables that can be connected to:

• RS485 communication port
• Pulse outputs (only "energies")

N°	Variable	3-ph. 3,4-wire unbalanced system	Notes
1	kWh	x	Total (2)
2	kvarh	x	Total (3)
3	V L-N sys (1)	x	sys=system (Σ)
4	V L1	x	
5	V L2	x	
6	V L3	x	
7	V L-L sys (1)	x	sys=system (Σ)
8	V L1-2	x	
9	V L2-3	x	
10	V L3-1	x	
11	A L1	x	
12	A L2	x	
13	A L3	x	
14	VA sys (1)	x	sys=system (Σ)
15	VA L1 (1)	x	
16	VA L2 (1)	x	
17	VA L3 (1)	x	
18	var sys	x	sys=system (Σ)
19	var L1 (1)	x	
20	var L2 (1)	x	
21	var L3 (1)	x	
22	W sys	x	sys=system (Σ)
23	W L1 (1)	x	
24	W L2 (1)	x	
25	W L3 (1)	x	
26	PF sys	x	sys=system (Σ)
27	PF L1	x	
28	PF L2	x	
29	PF L3	x	
30	Hz	x	
31	Phase sequence	x	

(x) = available
(o) = not available (zero indication on the display)
(1) = Variable available only through the serial communication port RS485
(2) = also kWh- (exported) with application E (see next table)
(3) = sum (not algebraic) of kvarh imported and exported with application F (see next table)

Display pages

No	1st variable (1st half-line)	2nd variable (2nd half-line)	3rd variable (2nd line)	Note	Applications					
					A	B	C	D	E	F
		Phase sequence		The phase sequence triangle appears in any page only if there is a phase reverse	x	x	x	x	x	x
1		Total kWh	W sys		x	x	x	x	x	x
1b		Total kWh (-)	"NEG"	Exported active energy					x	
2		Total kvarh	kvar sys			+	+	+	+	T
3		PF sys	Hz	Indication of C, -C, L, -L depending on the quadrant		x	x	x	x	x
4	PF L1	PF L2	PF L3	Indication of C, -C, L, -L depending on the quadrant			x	x	x	x
5	A L1	A L2	A L3				x	x	x	x
6	V L1-2	V L2-3	V L3-1				x	x	x	x
7	V L1	V L2	V L3				x	x	x	x

Notes: x = available

+ = only positive kvarh is measured (kvar sys is the algebraic sum of the phase kvar)

T = positive and negative kvarh are summed and measured in the same kvarh meter

(kvarsys is the sum of the absolute values of each phase kvar). The phase kvar are displayed with the correct sign.
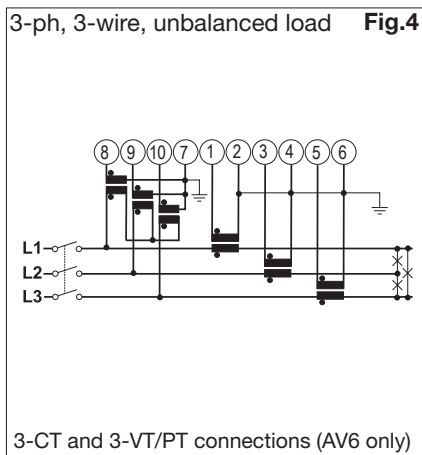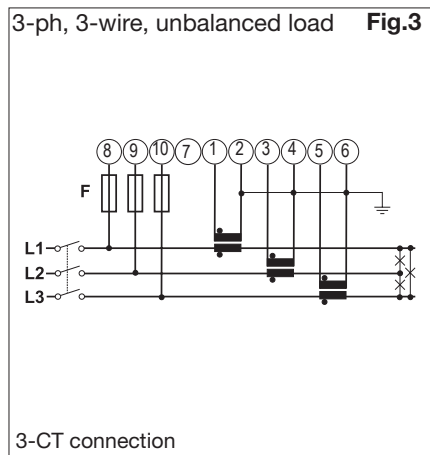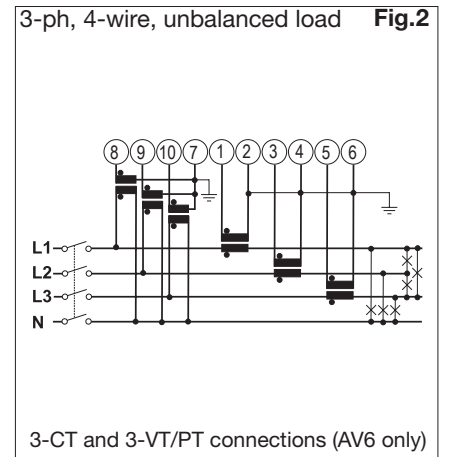
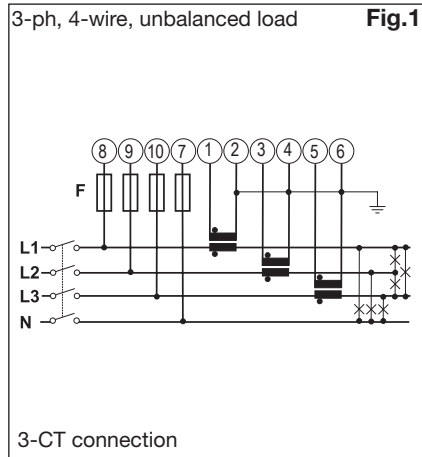## Additional available information on the display

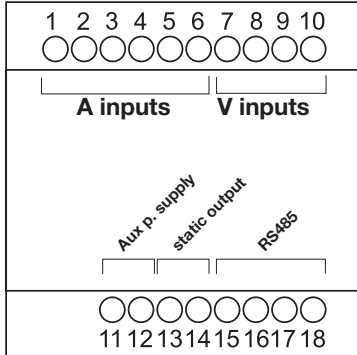| Type	Detail 1	Detail 2	Note
Meter information 1	Y. 2007	r.A0	Year of production and firmware release
Meter information 2	value	LEd (kWh)	KWh per pulse of the LED
Meter information 3	SYS [3P.n]	value	System type and connection type
Meter information 4	Ct rAt.	value	Current transformer ratio
Meter information 5	Ut rAt.	value	Voltage transformer ratio
Meter information 6	PuLSE (kWh)	value	Pulse output: kWh per pulse
Meter information 7	Add/PAritY/bAud/ bStoP	value	Serial communication details
Meter information 8	value	Sn	Secondary address (M-bus protocol)

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List of selectable applications
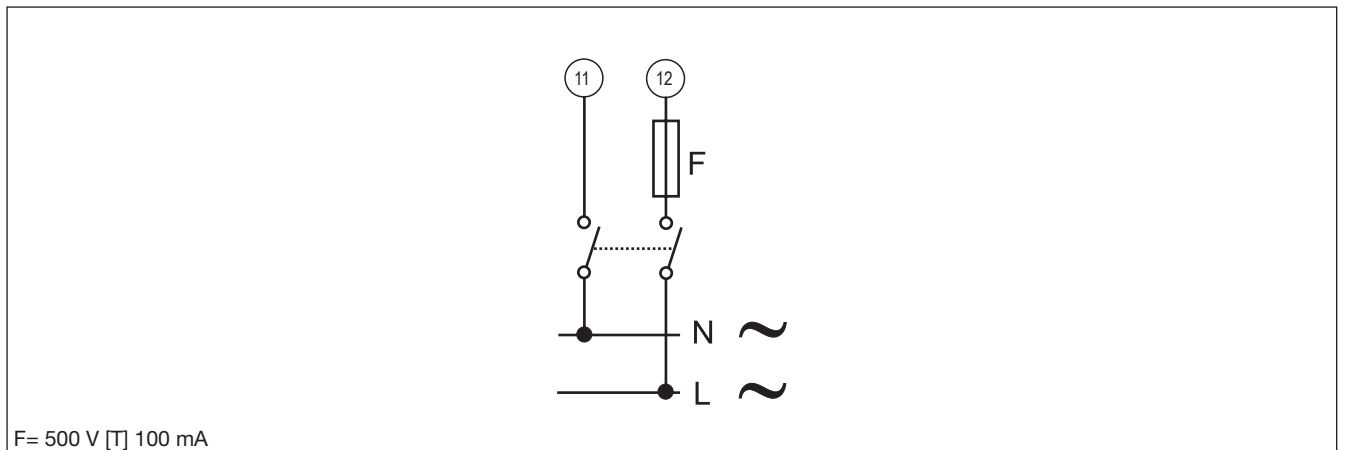
	Description	Notes	Option
A	Active energy meter	Active energy measurement with some minor parameters, easy connection	PFA
B	Active and reactive energy meter	Active and reactive energy measurement with some minor parameters, easy connection	PFA
C	Full set of variables	Full set of available variables can be displayed, easy connection	PFA
D	Full set of variables +	Full set of available variables can be displayed, bidirectional	PFB
E	Full set of variables +	Full set of variables with exported (negative) kWh meter, bidirectional	PFB
F	Full set of variables	Full set of variables with algeabric sum of positive and negative reactive energy, easy connection	PFA

Notes: only in "D" and "E" applications (PFB option) the actual direction of the current is considered.
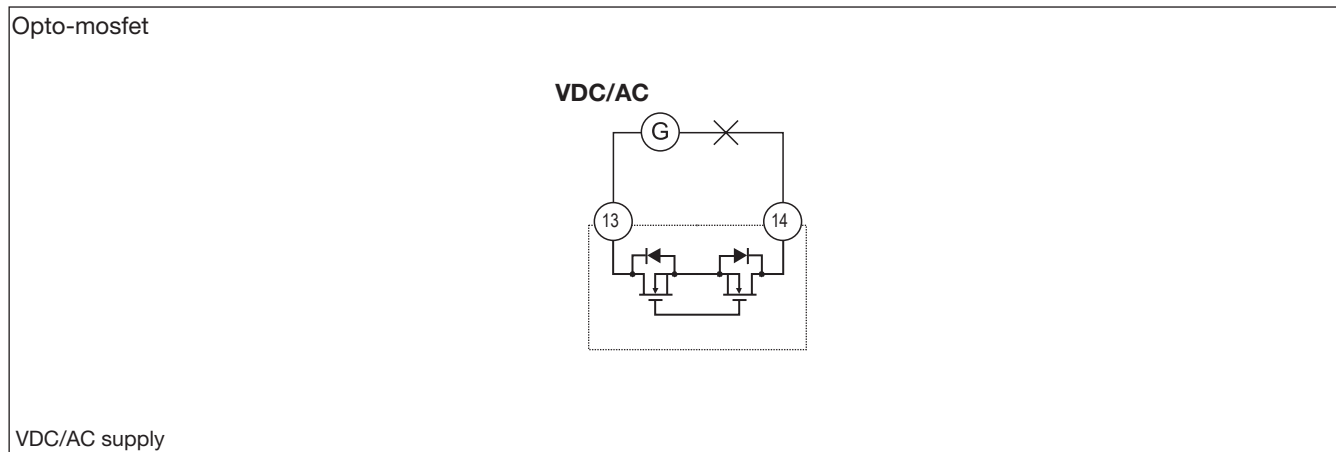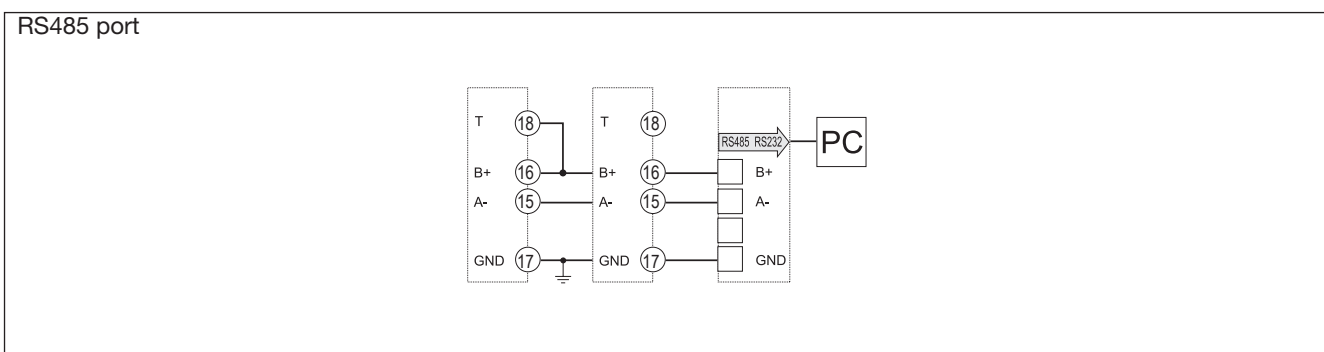
Wiring diagrams

1 2 3 4 5 6 7 8 9 10

A inputs **V inputs**

Aux p. supply static output RS485

11 12 13 14 15 16 17 18

3-ph, 4-wire, unbalanced load **Fig.1**

8 9 10 7 1 2 3 4 5 6

F

L1
L2
L3
N

3-CT connection

3-ph, 4-wire, unbalanced load **Fig.2**

8 9 10 7 1 2 3 4 5 6

L1
L2
L3
N

3-CT and 3-VT/PT connections (AV6 only)

3-ph, 3-wire, unbalanced load **Fig.3**

8 9 10 7 1 2 3 4 5 6

F

L1
L2
L3

3-CT connection

3-ph, 3-wire, unbalanced load **Fig.4**

8 9 10 7 1 2 3 4 5 6

L1
L2
L3

3-CT and 3-VT/PT connections (AV6 only)

Auxiliary power supply

11 12

F

N ~

L ~

F= 500 V [T] 100 mA

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Static output wiring diagram
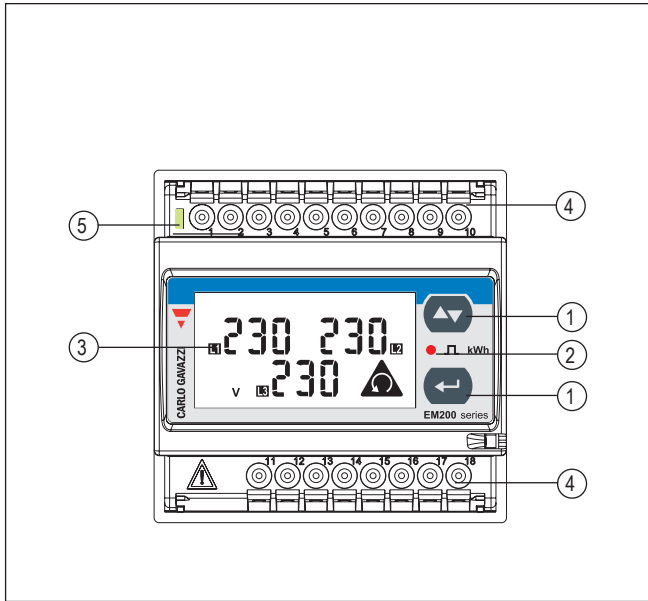
Opto-mosfet

VDC/AC

VDC/AC supply

RS485 port wiring diagram

RS485 port

RS485 NOTE: additional devices provided with RS485 are connected as per the picture above. The termination of the serial output is carried out only on the last instrument of the network, by means of a jumper between (B+) and (T).

Front panel description

1. **Keypad**
   To program the configuration parameters and scroll the variables on the display.
2. **Pulse output LED**
   Red LED blinking proportional to the energy being measured.
3. **Display**
   LCD-type with alphanumeric indications to display all the measured variables.
4. **Connections**
   Screw terminal blocks for instrument wiring.
5. **Green LED**
   Lit when power supply is available.

Dimensions (DIN configuration)
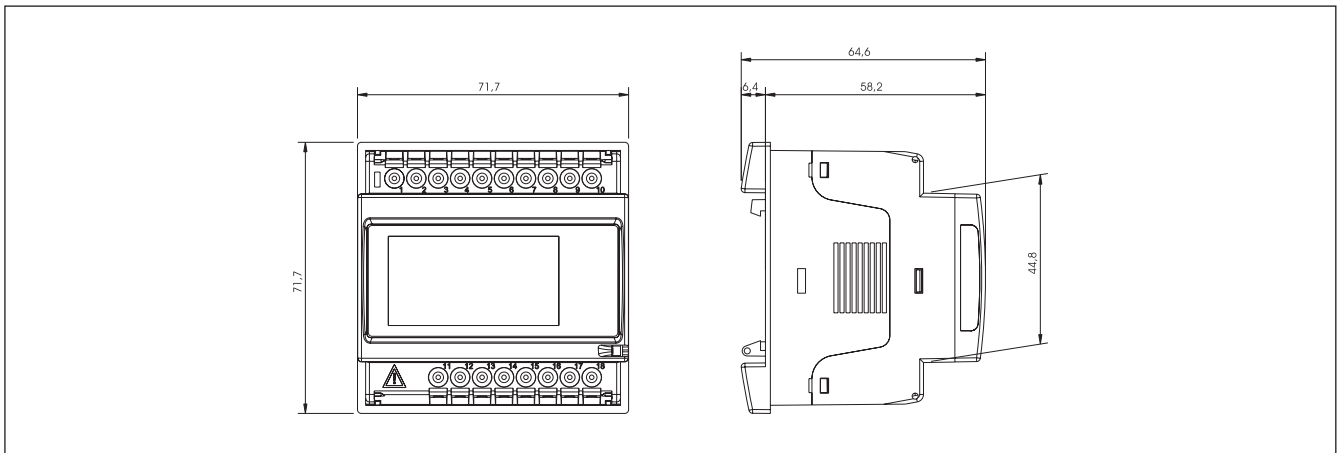
Dimensions and panel cut out (72x72 panel mounting configuration)