

# Energy Management Energy Analyzer Type EM210



- Current inputs AV option: CT 5A
- Current inputs MV option: current sensor 333 mV (CTV series) or ROG4X/ROG4U, Rogowski coil by Carlo Gavazzi without necessity of external integrator

- Class 1 (kWh) according to EN62053-21
- Class 2 (kvarh) according to EN62053-23
- Accuracy  $\pm 0.5$  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, THD (A,V, up to the 15th harmonic)
- Energy measurements: total kWh (imported and exported); kvarh
- TRMS measurements of distorted sine waves (voltages/currents)
- Self power supply
- Dimensions: 4-DIN modules and 72x72mm
- Protection degree (front): IP40
- Application adaptable display and programming procedure (Easy-prog function)
- Easy connections management
- Detachable display
- Multi-use housing: for both DIN-rail and panel mounting applications

## Product description

Three-phase energy meter with removable front LCD display unit. The same unit can be used either as a DIN-rail mounting or a panel mounting energy meter. This general purpose three-phase energy meter is suitable for both active 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) harmonic distortion information are available for the voltages and the currents, up to the 15th harmonic. An hourcounter meter is available to link the energy consumption to the

relevant working hours and an hourcounter to link the exported energy to production hours. Housing for DIN-rail mounting with IP40 (front) protection degree. Current measurements carried out by means of external current transformers transformers, 5A or 333mV (CTV series), or ROG4X/ROG4U, Rogowski coil solution without external

integrator. 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.

## How to order

**EM210 72D AV5 3 X O X X**



## Type Selection

Range code	System	Power supply	Options
<b>AV5:</b> 240/415 V AC, 5(6)A (CT connection)	<b>3:</b> balanced and unbalanced load: 3-phase, 4-wire; 3-phase, 3-wire (without N connection); 2-phase, 3-wire; 1-phase, 2-wire	<b>X:</b> Self power supply (connection VL2-VL3)	<b>X:</b> none
<b>AV6:</b> 133/230 V AC 5(6)A (VT/PT and CT connections)			
<b>MV5:</b> 240/415 V AC, 0.333V (current sensor CTV series or ROG4X/ROG4U connection)			
<b>MV6:</b> 133/230 V AC, 0.333V (VT/PT and current sensor CTV series or ROG4X/ROG4U connection)			

Output 1	Output 2
<b>O:</b> Single static output (opto-mosfet)	<b>X:</b> None
	<b>S:</b> RS485 port

## Input specification

<b>Rated Input</b>	System type: 3	Overload status	EEE indication when the value being measured is exceeding the "Continuous inputs overload" (maximum measurement capacity)
Current type	Not isolated (shunt inputs). Note: the external current transformers can be connected to earth individually.	Max. and Min. indication	Max. instantaneous variables: 999; energies: 9 999 999. Min. instantaneous variables: 0; energies 0.00.
Current range AV5, AV6	In: primary current corresponding to 5 A secondary output. Imax: 1.2 In (6A secondary).	<b>LEDs</b>	
Current range MV5, MV6	In: primary current corresponding to 0.333 V secondary output. Imax: 1.2 In (0.4V secondary).	Red LED (energy consumption) AV5, AV6	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.
Voltage (direct or by VT/PT)	AV5, MV5: 240/415 V; 6A; Un: 160 to 240VLN (277 to 415VLL). AV6, MV6: 133/230 V 6A; Un: 57.7 to 133VLN (100 to 230VLL).	Red LED (energy consumption) MV5, MV6	0.001kWh/pulse if VT ratio multiplied by In < 35.0 0.01kWh/pulse if VT ratio multiplied by In ≥35.0 and <350.0 0.1kWh/pulse if VT ratio multiplied by In ≥ 350.0 and <3500.0 1kWh/pulse if VT ratio multiplied by In ≥ 3500.0 16Hz EN50470-3.
<b>Accuracy</b> (Display + RS485) (@25°C ±5°C, R.H. ≤60%, 50Hz)		<b>Measurements</b>	See "List of the variables that can be connected to:"
Current	From 0.02In to 0.2In: ±(0.5% RDG +3DGT). From 0.2In to Imax: ±(0.5% RDG +1DGT).	Method	TRMS measurements of distorted wave forms.
Phase-neutral voltage	In the range Un: ±(0,5% RDG +1DGT).	Coupling type	By means of external CT's.
Phase-phase voltage	In the range Un: ±(1% RDG +1DGT).	<b>Crest factor</b>	AV5, AV6: ≤3 (15A max. peak). MV5, MV6: 1.414 @ Imax (Imax=1.2 In = 0.4V). In any case: Vpeak max = 0.565V.
Frequency	Range: 45 to 65Hz; resolution: 1Hz	<b>Current Overloads</b>	
Active power	±(1%RDG +2DGT).	Continuous	1.2In, @ 50Hz.
Power factor	±[0.001+1%(1.000 - "PF RDG")].	For 500ms	20In, @ 50Hz.
Reactive power	±(2%RDG +2DGT).	<b>Voltage Overloads</b>	
Active energy	class 1 according to EN62053-21.	Continuous	1.2 Un
Reactive energy	class 2 according to EN62053-23.	For 500ms	2 Un
<b>Energy additional errors</b>			
Influence quantities	According to EN62053-21, EN62053-23		
<b>Temperature drift</b>	≤200ppm/°C.		
<b>Sampling rate</b>	1600 samples/s @ 50Hz, 1900 samples/s @ 60Hz		
<b>Display refresh time</b> 1 second			
<b>Display</b>	2 lines 1st line: 7-DGT or 3-DGT+3-DGT 2nd line: 3-DGT LCD, h 7mm.		
Type	3-DGT.		
Instantaneous variables read-out	3-DGT.		
Energies	Total: 5+2, 6+1 or 7DGT		

## Input specification (cont.)

<b>Current input impedance</b> AV5, AV6 MV5, MV6	< 0.3VA >100 kΩ	<b>Frequency</b> <b>Keypad</b>	45 to 65 Hz. Two push buttons for variable selection and programming of the instrument working parameters.
<b>Voltage input impedance</b> Self-power supply	Power consumption: < 4VA		

## Output specifications

<b>Pulse output</b> Number of outputs Type Pulse duration Output Load Insulation	1 Programmable from 0.01 to 9.99 kWh per pulses. Output connectable to the energy meter (+kWh) TOFF ≥120ms, according to EN62052-31. TON selectable (30 ms or 100 ms) according to EN62053-31 Static: opto-mosfet. VON 2.5 VAC/DC, 70 mA max. VOFF 260 VAC/DC max. By means of optocouplers, 4000 VRMS output to measuring inputs.	<b>Connections</b> <b>Addresses</b> <b>Protocol</b> Data (bidirectional) Dynamic (reading only) Static (reading and writing) <b>Data format</b> <b>Baud-rate</b> <b>Driver input capability</b>	2-wire max. distance 1000m, termination directly on the instrument. 247, selectable by means of the front keypad MODBUS/JBUS (RTU) System and phase variables: see table "List of variables..." All the configuration parameters. 1 start bit, 8 data bit, and even parity, 1 or 2 stop bit. 9.6, 19.2, 38.4, 57.6, 115.2 kbps. 1/5 unit load. Maximum 160 transceiver on the same bus. By means of optocouplers, 4000 VRMS output to measuring input.
<b>RS485</b> Type	Multidrop, bidirectional (static and dynamic variables)	<b>Insulation</b>	

## Software functions

<b>Password</b>	Numeric code of max. 3 DGT; 2 protection levels of the programming data: Password "0", no protection; Password from 1 to 999, all data are protected By means of potentiometer (back-side of the display module) it is possible to lock the access to all the configuration parameters.	<b>Transformer ratio</b>	1.0 to 99.9 / 100 to 999 1.0 to 99.9 / 100 to 999 The max CTxVT product for AV5 models is 1187, for AV6 models is 2421. Primary current 10 to 10000 (333mV output current sensor).
1st level		VT (PT) ratio	
2nd level		CT (AV5, AV6)	
Programming lock		CT (MV5, MV6)	
<b>System selection</b>	3-phase (4-wire) 3-phase (3-wire) without neutral connection. • 3-phase (3-wire) one current and 3-phase to phase voltage measurements. • 3-phase (4-wire) one current and 3-phase to neutral voltage measurements. 2-phase (3-wire) 1-phase (2-wire)	<b>Displaying</b>	Up to 3 variables per page. 6 different set of variables available.
System 3-P.n unbalanced load		<b>Reset</b>	By means of the front keypad: total energies (kWh, kvarh).
System 3-P unbalanced load		<b>Easy connection function</b>	Wrong phase detection and displaying. For all the display selections (except "D" and "E") the current, power and energy measurement are independent on the current direction.
System 3-P.1 balanced load			
System 2P			
System 1P			

## General specifications

<b>Operating temperature</b>	-25°C to +55°C (-13°F to 131°F) (R.H. from 0 to 90% non-condensing) according to EN62053-21 and EN62053-23.	<b>Housing</b>	72 x 72 x 65 mm self-extinguishing: UL 94 V-0 Panel and DIN-rail
<b>Storage temperature</b>	-30°C to +70°C (-22°F to 158°F) (R.H. < 90% non-condensing) according to EN62053-21 and EN62053-23)	Dimensions (WxHxD)	
<b>Overvoltage category</b>	Cat. III	Material	
<b>Insulation (for 1 minute)</b>	4000 VRMS between measuring inputs and digital output.	Mounting	
<b>Dielectric strength</b>	4000VAC RMS for 1 minute	<b>Protection degree</b>	IP40 IP20
<b>Noise rejection CMRR</b>	100 dB, 48 to 62 Hz	Front	
<b>EMC</b>	According to EN62052-11, EN62053-21	Screw terminals	
<b>Standard compliance</b>	EN61010-1 EN62053-21, EN62053-23 DIN43864, IEC62053-31 CE, UKCA, cULus listed	<b>Weight</b>	Approx. 400g (packing included)
Safety			
Metrology			
Pulse output			
Approvals			
<b>Connections</b>	Screw type 2.4 x 3.5 mm Min./Max. screws tightening torque: 0.4 Nm / 0.8 Nm		
Cable cross-section area			

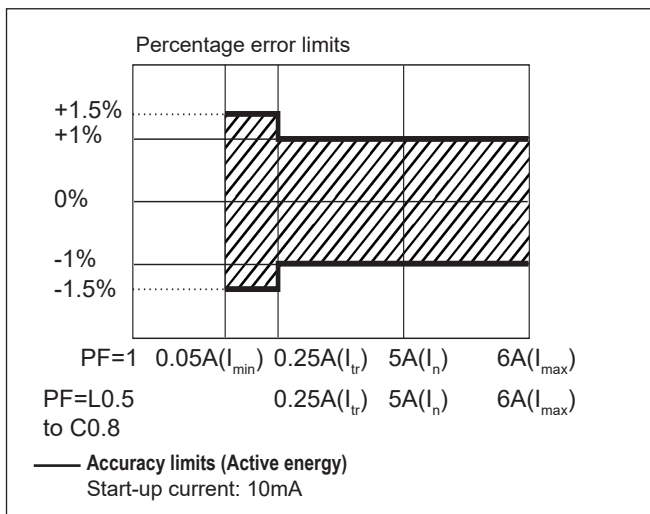


## Power supply specifications

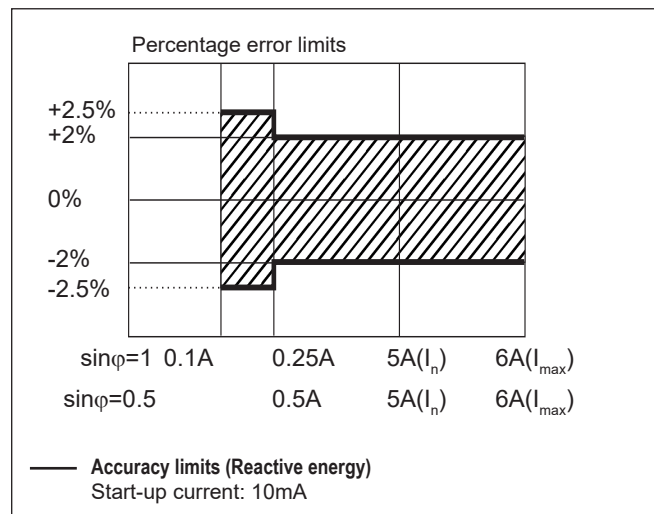
Self power supply	Across input "VL2" and "VL3" (45-65Hz)	Power consumption	4V
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## Accuracy AV5, AV6

kWh, accuracy (RDG) depending on the current

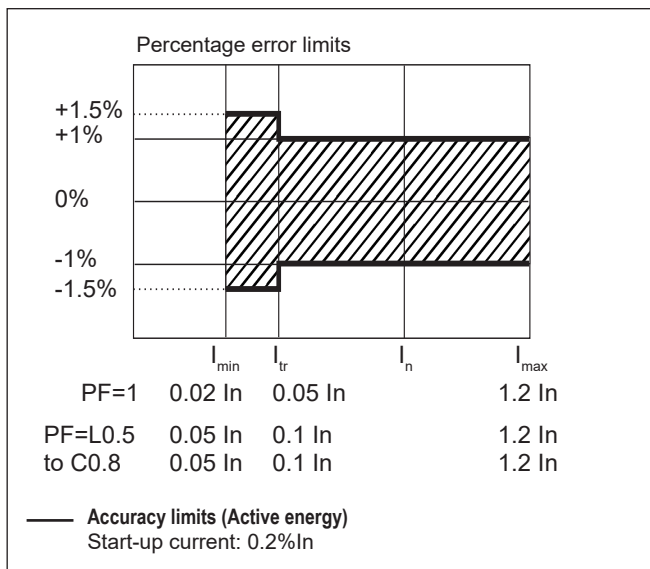


kvarh, accuracy (RDG) depending on the current

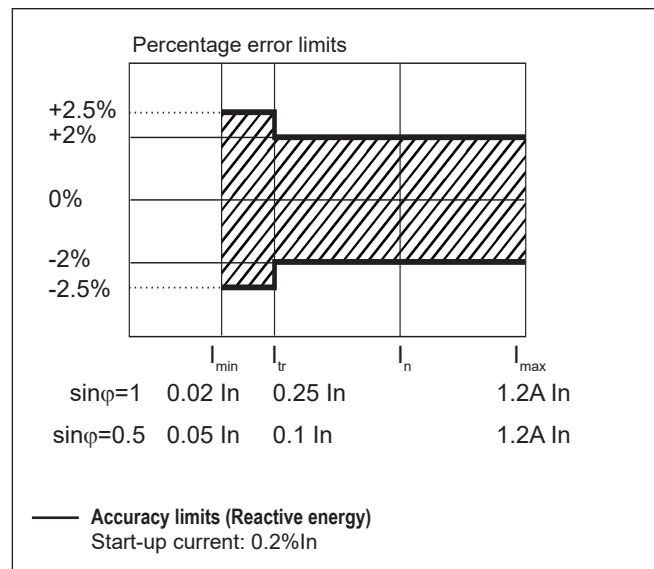


## Accuracy MV5, MV6

kWh, accuracy (RDG) depending on the current



kvarh, accuracy (RDG) depending on the current



## Insulation between inputs and outputs

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	Measuring input	Opto-Mosfet output	Communication port	Self power supply
Measuring inputs	-	4kV	4kV	0kV
Opto-Mosfet output	4kV	-	-	4kV
Communication port	4kV	-	-	4kV
Self power supply	0kV	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	1-ph. sys. (1P)	2-ph. sys. (2P)	3-ph. 4-wire balanced system (3P.1)	3-ph. 4-wire unbalanced system (3P.n)	3-ph. 3-wire balanced system (3P.1)	3-ph. 3-wire unbalanced system (3P)	Notes
1	kWh	x	x	x	x	x	x	Total (2)
2	kvarh	x	x	x	x	x	x	Total (3)
3	V L-N sys (1)	o	x	x	x	x	x	sys=system (Σ)
4	V L1	x	x	x	x	x	x	
5	V L2	o	x	x	x	x	x	
6	V L3	o	o	x	x	x	x	
7	V L-L sys (1)	o	x	x	x	x	x	sys=system (Σ)
8	V L1-2	o	x	x	x	x	x	
9	V L2-3	o	o	x	x	x	x	
10	V L3-1	o	o	x	x	x	x	
11	A L1	x	x	x	x	x	x	
12	A L2	o	x	x	x	x	x	
13	A L3	o	o	x	x	x	x	
14	VA sys (1)	x	x	x	x	x	x	sys=system (Σ)
15	VAL1 (1)	x	x	x	x	x	x	
16	VAL2 (1)	o	x	x	x	x	x	
17	VAL3 (1)	o	o	x	x	x	x	
18	var sys	x	x	x	x	x	x	sys=system (Σ)
19	var L1 (1)	x	x	x	x	x	x	
20	var L2 (1)	o	x	x	x	x	x	
21	var L3 (1)	o	o	x	x	x	x	
22	W sys	x	x	x	x	x	x	sys=system (Σ)
23	W L1 (1)	x	x	x	x	x	x	
24	W L2 (1)	o	x	x	x	x	x	
25	W L3 (1)	o	o	x	x	x	x	
26	PF sys	x	x	x	x	x	x	sys=system (Σ)
27	PF L1	x	x	x	x	x	x	
28	PF L2	o	x	x	x	x	x	
29	PF L3	o	o	x	x	x	x	
30	Hz	x	x	x	x	x	x	
31	Phase sequence	o	o	x	x	x	x	
32	THD VL1N	X	X	X	X	X	X	only if THD enabled
33	THD VL2N	O	X	X	X	X	X	only if THD enabled
34	THD VL3N	O	O	X	X	X	X	only if THD enabled
35	THD A L1	X	X	X	X	X	X	only if THD enabled
36	THD A L2	O	X	X	X	X	X	only if THD enabled
37	THD A L3	O	O	X	X	X	X	only if THD enabled
38	THD V L1-2	O	X	X	X	X	X	only if THD enabled
39	THD V L2-3	O	O	X	X	X	X	only if THD enabled
40	THD V L3-1	O	O	X	X	X	X	only if THD enabled
41	A n	O	X	O	X	O	O	

(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					+	
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	
7	V L1	V L2	V L3				x	x		
8	"thd"	"L1"	THD VL1-N			x	x	x	x	x
9	"thd"	"L2"	THD VL2-N			x	x	x	x	x
10	"thd"	"L3"	THD VL3-N			x	x	x	x	x
11	"thd"	"L1"	THD A L1			x	x	x	x	x
12	"thd"	"L2"	THD A L2			x	x	x	x	x
13	"thd"	"L3"	THD A L3			x	x	x	x	x
14	"thd"	"L1"	THD VL1-2			x	x	x	x	x
15	"thd"	"L2"	THD VL2-3			x	x	x	x	x
16	"thd"	"L3"	THD VL3-1			x	x	x	x	x
17	"A n"		A n			x	x	x	x	x
18	"working hours"(rel. to kWh+)		h				x	x	x	x
19	"working hours"(rel. to kWh-)		h-						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./SEnSO r (Ct,roG)	value /CtPrin	Current transformer ratio /Sensor type
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)

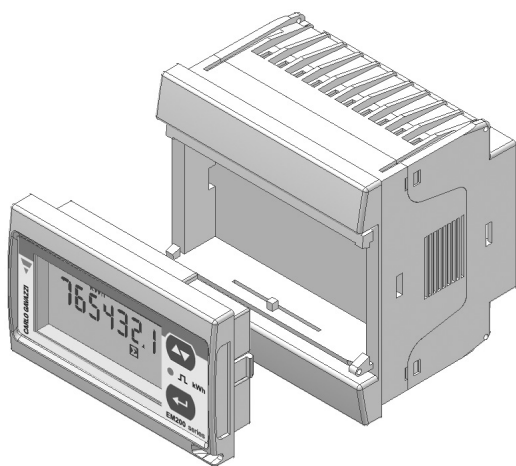
## List of selectable applications

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

### Notes:

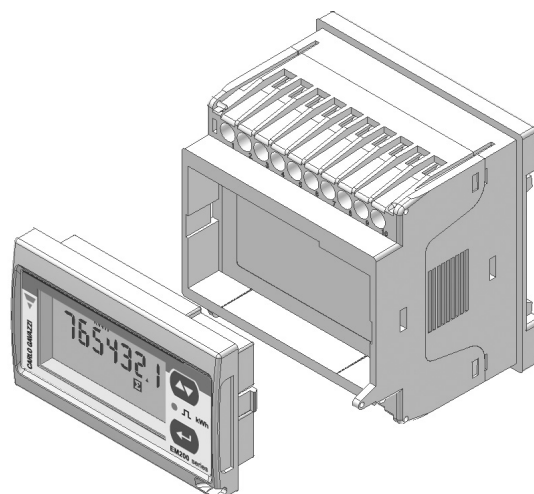
+ Only in "D" and "E" applications the actual direction of the current is considered.

## One instrument with double mounting capability



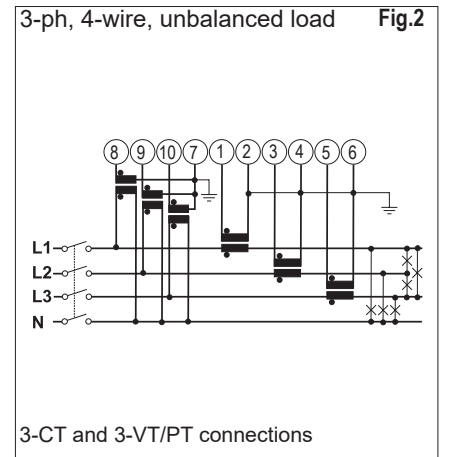
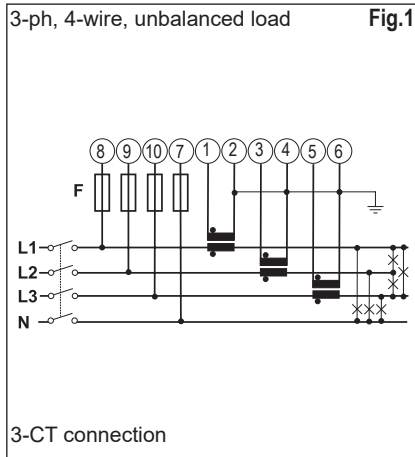
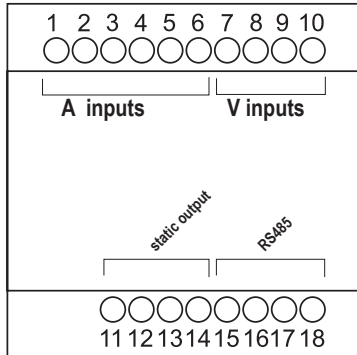
... as DIN-rail mounting meter.

By means of the patented detachable display it is possible to configure the same instrument either as a panel mounting meter or...

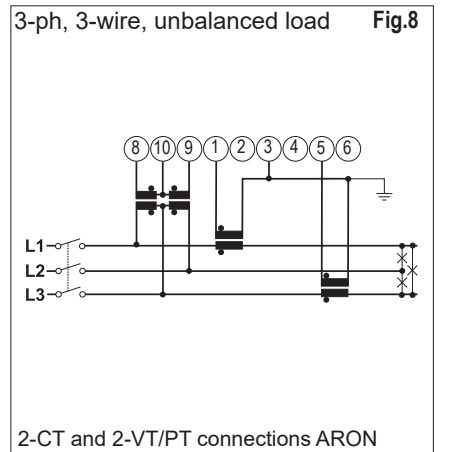
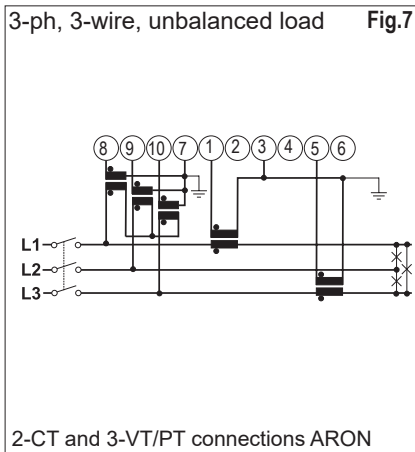
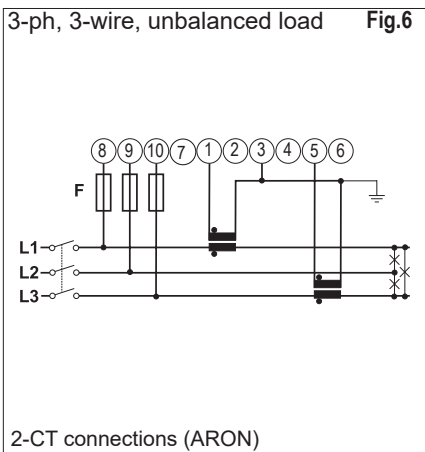
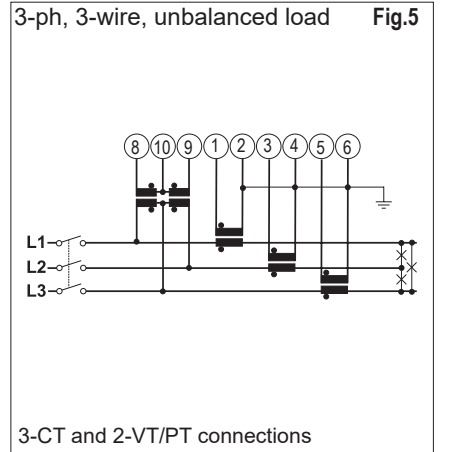
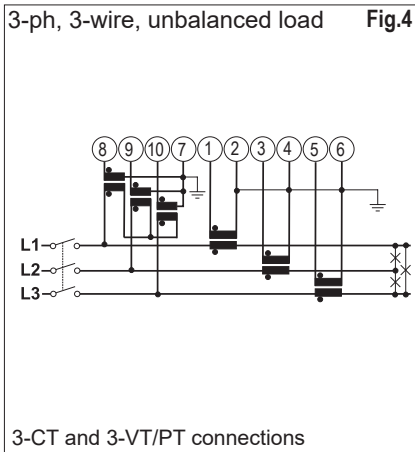
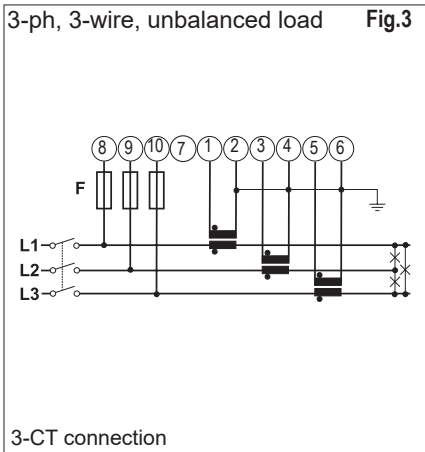


# Wiring diagrams

Self power supply, system type selection: 3P.n



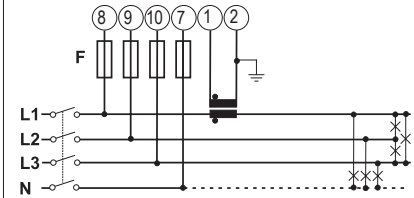
System type selection: 3P



## Wiring diagrams

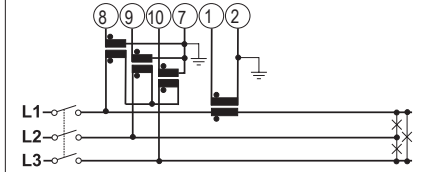
Self power supply, system type selection: 3P.1

3-ph, 3/4-wire, balanced load Fig.9  
1-CT connection



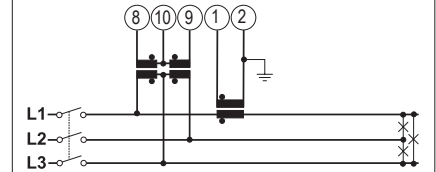
N connection is optional.  
NOTE: in the calculations, it is considered only the voltage relevant to L1

3-ph, 3-wire, balanced load Fig.10



1-CT and 3-VT/PT connections

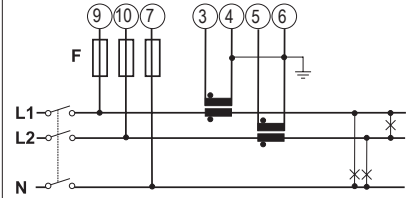
3-ph, 3-wire, balanced load Fig.11



1-CT and 2-VT/PT connections

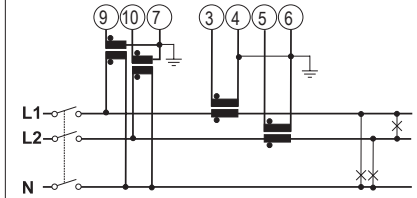
System type selection: 2P

2-ph, 3-wire Fig.12



2-CT connection

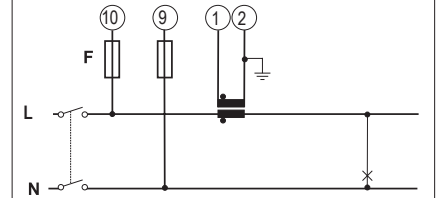
2-ph, 3-wire Fig.13



2-CT and 2-VT/PT connections

System type selection: 1P

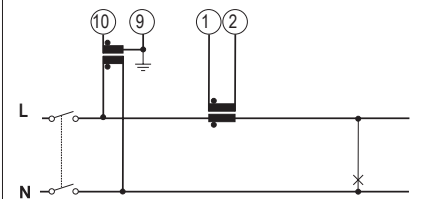
1-ph, 2-wire Fig.14



1-CT connection

System type selection: 1P

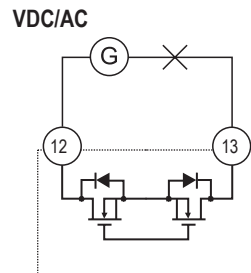
1-ph, 2-wire Fig.15



1-CT and 1-VT connections

## Static output wiring diagram

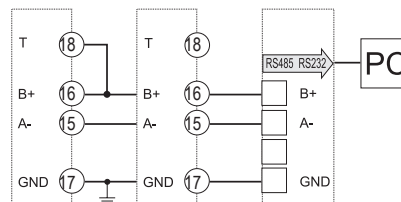
Opto-mosfet



VDC/AC supply

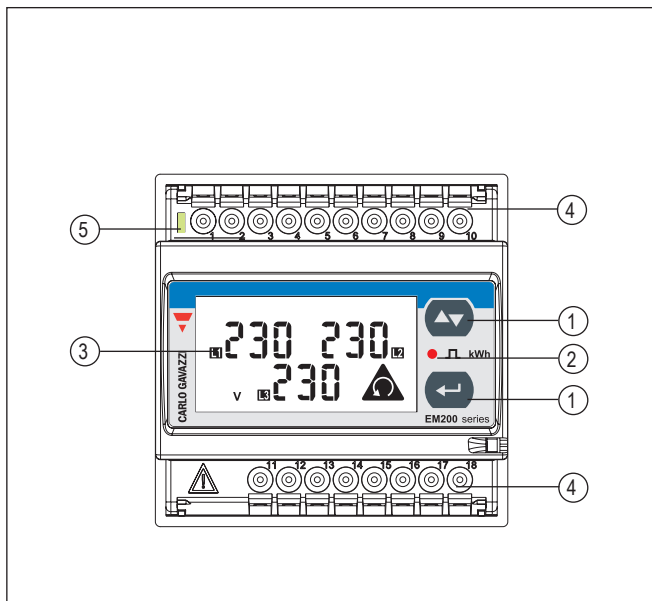
## RS485 port wiring diagram

RS485 port



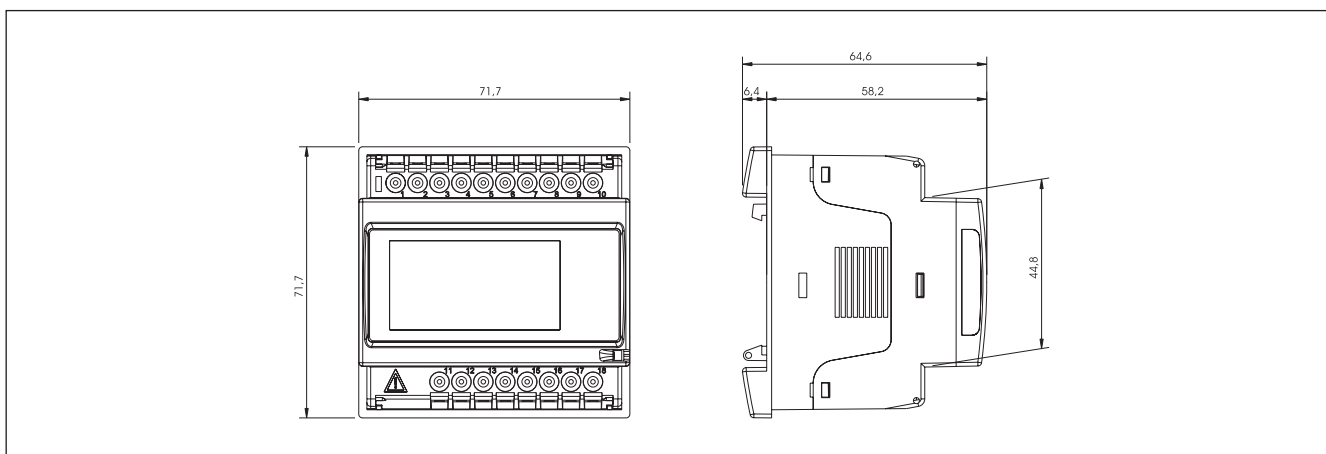
**RS485 NOTE:** additional devices provided with RS485 are connected as per the picture above. The termination of the serial output is carried out only on the last instrument of the network, by means of a jumper between (B+) and (T).

## 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)

