

Energy Management Smart Modular Power Analyzer Type WM30 96

CARLO GAVAZZI



- One RS232 and RS485 port (on request)
- Communication protocol: MODBUS-RTU
- MODBUS TCP/IP Ethernet port (on request)
- BACnet-IP over Ethernet port (on request)
- BACnet MS/TP over RS485, BTL approved (on request)
- Ethernet/IP port, ODVA approved (on request)
- Profibus DP V0 port (on request)
- Up to 2 digital outputs (pulse, alarm, remote control) (on request)
- Up to 4 freely configurable virtual alarms
- Up to 2 analogue outputs (+20mA, +10VDC) (on request)

- Class 0.5S (kWh) according to EN62053-22
- Class C (kWh) according to EN50470-3
- Class 2 (kvarh) according to EN62053-23
- Accuracy $\pm 0.2\%$ RDG (current/voltage)
- Instantaneous variables readout: 4x4 DGT
- Energies readout: 9+1 DGT
- System variables: VLL, VLN, A, VA, W, var, PF, Hz, Phase-sequence-asymmetry-loss.
- Single phase variables: VLL, VLN, AL, An (calculated), VA, W, var, PF
- Both system and single phase variables with average and max calculation
- Harmonic analysis (FFT) up to the 32nd harmonic (current and voltage)
- Energy measurements (imported/exported): total and partial kWh and kvarh
- Energy measurements according to ANSI C12.20 CA 0.5, ANSI C12.1 (revenue grade)
- Run hours counter (8+2 DGT)
- Real time clock function
- Application adaptable display and programming procedure (Easyprog function)
- Universal power supply: 24-48 VDC/AC, 100-240 VDC/AC
- Front dimensions: 96x96 mm
- Front protection degree: IP65, NEMA4X, NEMA12

Product Description

Three-phase smart power analyzer with built-in advanced configuration system and LCD data displaying. Particularly recommended for the measurement of the main electrical variables. WM30 is based on a modular housing for V0 communication ports, pulse panel mounting with IP65 (front) and alarm outputs. Parameters protection degree. Moreover, the analyzer can be provided with digital outputs that can be

either for pulse proportional to the active and reactive energy being measured or/and for alarm outputs. The instrument can be equipped with the following modules: RS485/RS232, Ethernet, BACnet-IP, BACnet MS/TP or Profibus DP communication ports, pulse panel mounting with IP65 (front) and alarm outputs. Parameters protection degree. Moreover, programming and data reading can be easily performed by means of WM3040Soft.

How to order WM30-96 AV5 3 H R2 A2 S1 XX

Model _____
 Range code _____
 System _____
 Power Supply _____
 A Outputs _____
 B Outputs _____
 Communication _____
 Option _____

Type Selection

Range codes	System	Power supply	A Outputs
AV4: 400/690V _{LL} AC 1(2)A V _{LN} : 160V to 480V _{LN} V _{LL} : 277V to 830V _{LL}	3: balanced and unbalanced load: 3-phase, 4-wire; 3-phase, 3-wire; 2-phase, 3-wire; 1-phase, 2-wire	H: 100-240 +/-10% (90 to 255) VDC/AC (50/60 Hz) L: 24-48 +/-15% (20 to 55) VDC/AC (50/60 Hz)	XX: none O2: Dual channel static output R2: Dual channel relay output
AV5: 400/690V _{LL} AC 5(6)A V _{LN} : 160V to 480V _{LN} V _{LL} : 277V to 830V _{LL}			
AV6: 100/208V _{LL} AC 5(6)A V _{LN} : 40V to 144V _{LN} V _{LL} : 70V to 250V _{LL}	Options	Communication	B Outputs
AV7: 100/208V _{LL} AC 1(2)A V _{LN} : 40V to 144V _{LN} V _{LL} : 70V to 250V _{LL}	XX: none	XX: none S1: RS485/RS232 port E2: Ethernet / Internet port B1: BACnet (IP) over Ethernet B3: BACnet (MS/TP) over RS485 E6: Ethernet/IP port P1: Profibus DP/V0 port	XX: none A2: Dual channel 20mA DC output V2: Dual channel 10V DC output

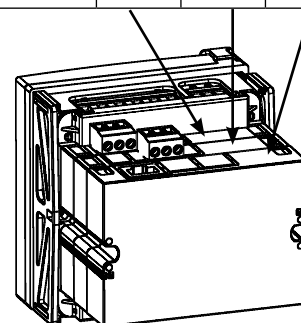
Position of modules and combination

Ref	Description	Main features	Part number	Pos. A	Pos. B	Pos. C
1	WM30 base provided with display, power supply, measuring inputs	• Inputs/system: AV5.3 • Power supply: H	WM30 AV5 3 H			
2		• Inputs/system: AV6.3 • Power supply: H	WM30 AV6 3 H			
3		• Inputs/system: AV4.3 • Power supply: H	WM30 AV4 3 H			
4		• Inputs/system: AV7.3 • Power supply: H	WM30 AV7 3 H			
		• Inputs/system: AV5.3 • Power supply: L	WM30 AV5 3 L			
		• Inputs/system: AV6.3 • Power supply: L	WM30 AV6 3 L			
		• Inputs/system: AV4.3 • Power supply: L	WM30 AV4 3 L			
		• Inputs/system: AV7.3 • Power supply: L	WM30 AV7 3 L			
5	Dual relay output (SPDT)	• 2-channel • Alarm or/and pulse output	M O R2	X		
6	Dual static output (AC/DC Opto-Mos)	• 2-channel • Alarm or/and pulse output	M O O2	X		
7	Dual analogue output (+20mADC)	• 2-channel	M O A2		X	
8	Dual analogue output (+10VDC)	• 2-channel	M O V2		X	
9	RS485 / RS232 port module	• Max. 115.2 Kbps	M C 485 232			X
10	Ethernet port module	• RJ45 10/100 BaseT	M C ETH			X
11	BACnet-IP port module	• Based on Ethernet bus	M C BAC IP			X
12	BACnet-MS/TP port module	• Over RS485	M C BAC MS			X
13	Ethernet/IP	• Based on Ethernet	M C E I			X
14	Profibus module	• Profibus DP V0 • Over RS485	M C P B			X

NOTE:

The position of the modules shall respect the sequence A-B-C. Possible arrangements are M, M-A, M-B, M-C, M-A-B, M-A-C, M-B-C and M-A-B-C where "M" is the basic module.

It is possible to use the WM30-96 without any additional module as a simple indicator.



Input specifications

Rated inputs	System type: 1, 2 or 3-phase Galvanic insulation by means of built-in CT's AV5 and AV6: 5(6)A AV4 and AV7: 1(2)A	Energy additional errors	According to EN62053-22, ANSI C12.20, Class B or C according to EN50470-3, EN62053-23, ANSI C12.1
Input type		Influence quantities	
Current range (by CT)		Total Harmonic Distortion (THD)	±1% FS (FS: 100%) AV4: Imin: 5mARMS; Imax: 3A; Umin: 30VRMS; Umax: 679Vp AV5: Imin: 5mARMS; Imax: 15Ap; Umin: 30VRMS; Umax: 679Vp AV6: Imin: 5mARMS; Imax: 15Ap; Umin: 30VRMS; Umax: 204Vp AV7: Imin: 5mARMS; Imax: 3A; Umin: 30VRMS; Umax: 204Vp
Voltage (by direct connection or VT/PT)	AV4, AV5: 400/690VLL; AV6, AV7: 100/208VLL	Temperature drift	≤200ppm/°C
Accuracy (Display + RS485) (@25°C ±5°C, R.H. ≤60%, 48 to 62 Hz)	In: see below, Un: see below	Sampling rate	3200 samples/s @ 50Hz, 3840 samples/s @ 60Hz
AV4 model	In: 1A, Imax: 2A; Un: 160 to 480VLN (277 to 830VLL)	Measurements	See "List of the variables that can be connected to:" TRMS measurements of distorted wave forms. By means of CT's
AV5 model	In: 5A, Imax: 6A; Un: 160 to 480VLN (277 to 830VLL)	Method	
AV6 model	In: 5A, Imax: 6A; Un: 40 to 144VLN (70 to 250VLL)	Coupling type	
AV7 model	In: 1A, Imax: 2A; Un: 40 to 144VLN (70 to 250VLL)	Crest factor	AV5, AV6: ≤3 (15A max. peak) AV4, AV7: ≤3 (3A max. peak)
Current AV4, AV5, AV6, AV7 models	From 0.01In to 0.05In: ±(0.5% RDG +2DGT) From 0.05In to Imax: ±(0.2% RDG +2DGT) In the range Un: ±(0.2% RDG +1DGT) In the range Un: ±(0.5% RDG +1DGT)	Current Overloads	Continuous (AV5 and AV6) 6A, @ 50Hz Continuous (AV4 and AV7) 2A, @ 50Hz For 500ms (AV5 and AV6) 120A, @ 50Hz For 500ms (AV4 and AV7) 40A, @ 50Hz
Phase-neutral voltage	±0.01Hz (45 to 65Hz)	Voltage Overloads	Continuous 1.2 Un For 500ms 2 Un
Phase-phase voltage	From 0.01In to 0.05In, PF 1: ±(1%RDG+1DGT) From 0.05In to Imax PF 0.5L, PF1, PF0.8C: ±(0.5%RDG+1DGT) ±[0.001+0.5% (1.000 - "PF RDG")]	Input impedance	400VL-L (AV4 and AV5) > 1.6MΩ 208VL-L (AV6 and AV7) > 1.6MΩ 5(6)A (AV5 and AV6) < 0.2VA 1(2)A (AV4 and AV7) < 0.2VA
Frequency	From 0.05In to Imax, senφ 1: ±(1%RDG+1DGT)	Frequency	40 to 440 Hz
Active and Apparent power	From 0.05In to 0.1In, senφ 0.5L/C: ±(1.5%RDG+1DGT) From 0.1In to Imax, senφ 0.5L/C: ±(1%RDG+1DGT) Class 0.5S according to EN62053-22, ANSI C12.20 Class C according to EN50470-3.		
Power Factor	Class 2 according to EN62053-23, ANSI C12.1.		
Reactive power	5mA		
Active energy	1mA		
Reactive energy			
Start up current AV5, AV6			
Start up current AV4, AV7			

Output specifications

Relay outputs (M O R2)			
Physical outputs	2 (max. 1 module per instrument)	Pulse type	Programmable from 0.001 to 10.00 kWh/kvarh per pulse. The above listed variables can be connected to any output.
Purpose	For either alarm output or pulse output	Pulse duration	≥100ms < 120msec (ON), ≥120ms (OFF), according to EN62052-31
Type	Relay, SPDT type	Remote controlled outputs	The activation of the outputs is managed through the serial communication port
Configuration	AC 1-5A @ 250VAC; AC 15-1.5A @ 250VAC	Insulation	See "Insulation between inputs and outputs" table
Function	By means of the front key-pad		
	The outputs can work as alarm outputs but also as pulse outputs, remote controlled outputs, or in any other combination.		
Alarms	Up alarm and down alarm linked to the virtual alarms, other details see Virtual alarms	20mA analogue outputs (M O A2)	
Min. response time	≤200ms, filters excluded. Set-point on-time delay: "0 s".	Number of outputs	2 per module (max. 1 module per instrument)
Pulse		Accuracy (@ 25°C ±5°C, R.H. ≤60%)	±0.2%FS
Signal retransmission	Total: +kWh, -kWh, +kvarh, -kvarh. Partial: +kWh, -kWh, +kvarh, -kvarh. Programmable from 0.001 to 10.00 kWh/kvarh per pulse. The above listed variables can be connected to any output.	Range	0 to 20mA
		Configuration	By means of the front key-pad
Pulse type	Programmable from 0.001 to 10.00 kWh/kvarh per pulse. The above listed variables can be connected to any output.	Signal retransmission	The signal output can be connected to any instantaneous variable available in the table "List of the variables that can be connected to".
Pulse duration	≥100ms < 120msec (ON), ≥120ms (OFF), according to EN62052-31	Scaling factor	Programmable within the whole range of retransmission.
Remote controlled outputs	The activation of the outputs is managed through the serial communication port	Response time	≤400 ms typical (filter excluded)
	See "Insulation between inputs and outputs" table	Ripple	≤1% (according to IEC 60688-1, EN 60688-1)
Insulation		Total temperature drift	≤500 ppm/°C
		Load	≤600Ω
		Insulation	See "Insulation between inputs and outputs" table
Static outputs (M O O2)		10VDC analogue outputs (M O V2)	
Physical outputs	Opto-Mos type	Number of outputs	2 (max. 1 module per instrument)
Purpose	2 (max. 1 module per instrument)	Accuracy (@ 25°C ±5°C, R.H. ≤60%)	±0.2%FS
Signal	For either pulse output or alarm output	Range	0 to 10 VDC
Configuration	V _{ON} : 2.5VAC/DC/max.100mA	Configuration	By means of the front key-pad
Function	V _{OFF} : 42VDC max.	Signal retransmission	The signal output can be connected to any instantaneous variable available in the table "List of the variables that can be connected to".
	By means of the front key-pad		Programmable within the whole range of retransmission;
Alarms	The outputs can work as alarm outputs but also as pulse outputs, remote controlled outputs, or in any other combination.	Scaling factor	≤400 ms typical (filter excluded)
	Up alarm and down alarm linked to the virtual alarms, other details see Virtual alarms	Response time	≤1% (according to IEC 60688, EN 60688)
Min. response time	≤200ms, filters excluded. Set-point on-time delay: "0 s".	Ripple	≤350 ppm/°C
Pulse		Total temperature drift	≥10kΩ
Signal retransmission	Total: +kWh, -kWh, +kvarh, -kvarh. Partial: +kWh, -kWh, +kvarh, -kvarh.	Load	See "Insulation between inputs and outputs" table
		Insulation	

Output specifications (cont.)

RS485 (on request) Type Connections Addresses Protocol Data (bidirectional) Dynamic (reading only) Static (reading and writing only) Data format Baud-rate Driver input capability Note Insulation	Multidrop, bidirectional (static and dynamic variables) 2-wire Max. distance 1000m, termination directly on the module 247, selectable by means of the front key-pad MODBUS/JBUS (RTU) System and phase variables: see table "List of variables..." All the configuration parameters. 1 start bit, 8 data bit, no/ even/odd parity, 1 stop bit Selectable: 9.6k, 19.2k, 38.4k, 115.2k bit/s 1/5 unit load. Maximum 160 transceivers on the same bus. With the rotary switch (on the back of the basic unit) in lock position the modification of the programming parameters and the reset command by means of the serial communication is not allowed anymore. In this case just the data reading is allowed. See "Insulation between inputs and outputs" table	Ethernet/Internet port (on request) Protocols IP configuration Port Client connections Connections Data (bidirectional) Dynamic (reading only) Static (reading and writing only) Note Insulation	Modbus TCP/IP Static IP / Netmask / Default gateway Selectable (default 502) Max 5 simultaneously RJ45 10/100 BaseTX Max. distance 100m System and phase variables: see table "List of variables..." All the configuration parameters. With the rotary switch (on the back of the basic unit) in lock position the modification of the programming parameters and the reset command by means of the serial communication is not allowed anymore. In this case just the data reading is allowed. See "Insulation between inputs and outputs" table
RS232 port (on request) Type Connections Protocol Data (bidirectional) Dynamic (reading only) Static (reading and writing only) Data format Baud-rate Note Insulation	Bidirectional (static and dynamic variables) 3 wires. Max. distance 15m MODBUS RTU /JBUS System and phase variables: see table "List of variables..." All the configuration parameters 1 start bit, 8 data bit, no/ even/odd parity, 1 stop bit Selectable: 9.6k, 19.2k, 38.4k, 115.2k bit/s With the rotary switch (on the back of the basic unit) in lock position the modification of the programming parameters and the reset command by means of the serial communication is not allowed anymore. In this case just the data reading is allowed. See "Insulation between inputs and outputs" table	BACnet-IP (on request) Protocols BACnet-IP IP configuration Port Device object instance Supported services Supported objects IP configuration Modbus TCP/IP Client connections Connections	BACnet-IP (for measurement reading purpose and to write object description) and Modbus TCP/IP (for measurement reading purpose and for programming parameter purpose) Static IP / Netmask / Default gateway Fixed: BAC0h 0 to 9999 selectable by key-pad 0 to 2 ²² -2 = 4.194.302, selectable by programming software or by BACnet. "I have", "I am", "Who has", "Who is", "Read (multiple) Property" Type 2 (analogue value, including COV property), Type 5 (binary-value for up to 16 virtual alarm re-transmission) Type 8 (device) Static IP / Netmask / Default gateway See "Ethernet/Internet port" above Modbus only: max 5 simultaneously RJ45 10/100 BaseTX Max. distance 100m

Output specifications (cont.)

Data Dynamic (reading only)	System and phase variables (BACnet-IP and Modbus): see table "List of variables"	Connections	RJ45 10/100 BaseTX Max. distance 100m
Static (reading and writing only)	All the configuration parameters (Modbus only) With the rotary switch (on the back of the basic unit) in lock position the modification of the programming parameters and the reset command by means of the serial communication is not allowed anymore. In this case just the data reading is allowed. See "Insulation between inputs and outputs" table	Data Dynamic (reading only)	System and phase variables: see table "List of variables..."
Note		Static (reading and writing only)	All the configuration parameters (Modbus only). With the rotary switch (on the back of the basic unit) in lock position the modification of the programming parameters and the reset command by means of the serial communication is not allowed anymore. In this case just the data reading is allowed. See "Insulation between inputs and outputs" table
Insulation		Note	
BACnet MS/TP (on request)		Insulation	See "Insulation between inputs and outputs" table
Available ports	2: RS485 and Ethernet	Approval	BTL
RS485 port Type	Multidrop, mono-directional (dynamic variables) 2-wire Max. distance 1000m, termination directly on the module	Ethernet/IP (on request) Protocols	Ethernet/IP (for measurement reading purpose) and Modbus TCP/IP (for programming parameter purpose)
Connections	0 to 9999 selectable by key-pad	IP configuration	Static IP / Netmask / Default gateway
Device object instance	0 to 2 ²² -2 = 4.194.302, selectable by programming software or by BACnet.	Modbus Port	Selectable (default 502)
Protocol	BACnet MS/TP (for measurement reading purpose and to write object description)		Modbus only: max 5 simultaneously RJ45 10/100 Base TX Max distance 100m
Supported services	"I have", "I am", "Who has", "Who is", "Read (multiple) Property"	Ethernet/IP port Topology	Star
Supported objects	Type 2 (analogue value, including COV property), Type 5 (binary-value for up to 16 virtual alarm re-transmission) Type 8 (device)	Level Connection	RJ45 standard Max distance 100m Commercial level Connection establishment: target
Data (mono-directional) Dynamic	System and phase variables: see table "List of variables..."	Messaging	Class 1 and class 3 messaging
Static	Not available	Supported features	ACD (Address Conflict Detection) UCMM List service 0x0004 List identity 0x0063 Register session 0x0065 Unregister session 0x0066 Send RR data 0x006F Send Unit Data 0x0070
Data format	1 start bit, 8 data bit, no parity, 1 stop bit	Data Dynamic (reading only)	System and phase variables (Ethernet/IP): see Ethernet/IP protocol document
Baud-rate	Selectable: 9.6k, 19.2k, 38.4k or 76.8k kbit/s	Static (reading and writing only)	All the configuration parameters (Modbus TCP only)
Driver input capability	1/5 unit load. Maximum 160 transceivers on the same bus.	Insulation	See "Insulation between inputs and outputs" table
MAC addresses	Selectable: 0 to 127	Approval	Ethernet IP conformance tested (ODVA)
Ethernet port Protocol	Modbus TCP/IP (for programming parameter purpose)		
IP configuration	Static IP / Netmask / Default gateway		
Modbus Port	Selectable (default 502)		
Client connections	Modbus only: max 5 simultaneously		

Output specifications (cont.)

Profibus (MCPB)			
Available ports	2: USB and Profibus DP V0	Connector	RS485 DB9
USB		Protocol	Profibus DP V0 slave
Purpose	Programmable parameters setting	Baudrate	9.6 k to 12 Mbps (9.6, 19.2, 45.45, 93.75, 187.5, or 500 kbps; 1.5, 3, 6, or 12 Mbps)
Connector	USB micro B	Address	2-125 (default 126)
Protocol	Modbus RTU	Note	With the rotary switch (on the back of the basic unit) in lock position the modification of the programming parameters and the reset command by means of the serial communication is not allowed. In this case just the data reading is allowed. See "Insulation between inputs and outputs" table
Data format	1 start bit, 8 data bit, no parity, 1 stop bit		
Baudrate	autorange depending on the master (max 115200 bps)		
Address	1		
Profibus		Insulation	
Purpose	Data reading (12 programmable profiles realtime selectable); remote output control; remote tariff control; output up to 4 bytes, input up to 62 words		
Modules Selectable:	totalizers : FLOAT or INT32;		
Data format (profiles)	electrical variables: FLOAT or INT16; status variables : UINT16		

Energy meters

Meters			
Total	4 (9+1 digit)		Min. -9,999,999,999 kWh/kvarh
Partial	4 (9+1 digit)		Max. 9,999,999,999 kWh/kvarh.
Pulse output	Connectable to total and/or partial meters	Type	
Energy meter recording	Storage of total and partial energy meters. Energy meter storage format (EEPROM)	Total energy meters	+kWh, +kvarh, -kWh, -kvarh
		Partial energy meters	+kWh, +kvarh, -kWh, -kvarh

Harmonic distortion analysis

Analysis principle	FFT		
Harmonic measurement			
Current	Up to the 32nd harmonic	System	The same for the other phases: L2, L3.
Voltage	Up to the 32nd harmonic		The harmonic distortion can be measured in 3-wire or 4-wire systems. Tw: 0.02 sec@50Hz without filter
Type of harmonics	THD (VL1 and VL1-N) The same for the other phases: L2, L3. THD (AL1)		

Display, LED's and commands

Display refresh time	≤ 250 ms	Energy consumption kWh pulsating	Red LED (only kWh) 0.001 kWh/kvarh by pulse if the Ct ratio by VT ratio is ≤7 0.01 kWh/kvarh by pulse if the Ct ratio by VT ratio is ≥7.1 ≤70.0 0.1 kWh/kvarh by pulse if the Ct ratio by VT ratio is ≥70.1 ≤700.0 1 kWh/kvarh by pulse if the Ct ratio by VT ratio is ≥700.1 ≤7000 10 kWh/kvarh by pulse if the Ct ratio by VT ratio is ≥7001 ≤70.00k 100 kWh/kvarh by pulse if the Ct ratio by VT ratio is >70.01k Max frequency: 16Hz, according to EN50470-1
Display	4 lines, 4-DGT, 1 lines, 10-DGT		
Type	LCD, single colour backlight	Back position LEDs On the base On the communication modules	Green as power-on Two LEDs: one for TX (green) and one for RX (amber).
Digit dimensions	4-DGT: h 9.5mm; 10-DGT: h 6.0mm		
Instantaneous variables read-out	4-DGT		
Energies variables read-out	Imported Total/Partial: 8+2DGT, 9+1DGT or 10DGT; Exported Total/Partial: 8+2DGT, 9+1DGT or 10DGT (with "-" sign).		
Run Hours counter	8+2 DGT (99.999.999 hours and 59 minutes max)		
Overload status	EEEE indication when the value being measured is exceeding the "Continuous inputs overload" (maximum measurement capacity)	Key-pad	For variable selection, programming of the instrument working parameters, "dmd", "max", total energy and partial energy Reset
Max. and Min. indication	Max. instantaneous variables: 9999; energies: 9 999 999 999. Min. instantaneous variables: 0.000; energies 0.0		
Front position LEDs			
Virtual alarms	4 red LED available in case of virtual alarm (AL1-AL2-AL3-AL4). Note: the real alarm is just the activation of the proper static or relay output if the proper module is available.		

Main functions

Password	Numeric code of max. 4 digits; 2 protection levels of the programming data:	System 3-Ph.2 balanced load	3-phase (2-wire), one current and 1-phase (L1) to neutral voltage measurement.
1st level	Password "0", no protection;	System 2-Ph	2-phase (3-wire)
2nd level	Password from 1 to 9999, all data are protected	System 1-Ph	1-phase (2-wire)
System selection		Transformer ratio	
System 3-Ph.n unbalanced load	3-phase (4-wire)	VT (PT)	1.0 to 999.9 / 1000 to 9999.
System 3-Ph. unbalanced load	3-phase (3-wire), three currents and 3-phase to phase voltage measurements, or in case of Aaron connection two currents (with special wiring on screw terminals) and 3-phase to phase voltage measurements.	CT	1.0 to 999.9 / 1000 to 9999 (up to 10kA in case of CT with 1A secondary current and up to 50kA in case of CT with 5A secondary current).
System 3-Ph.1 balanced load	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.	Filter	
		Operating range	Selectable from 0 to 100% of the input display scale
		Filtering coefficient	Selectable from 1 to 32
		Filter action	Measurements, analogue signal retransmission, serial communication (fundamental variables: V, A, W and their derived ones).

Main functions (cont.)

[illegible]

General specifications

Operating temperature	-25°C to +55°C (-13°F to 131°F) (R.H. from 0 to 90% non-condensing @ 40°C) according to EN62053-21, EN50470-1 and EN62053-23	EMC Electrostatic discharges Immunity to irradiated electromagnetic fields	According to EN62052-11 15kV air discharge
Storage temperature	-30°C to +70°C (-22°F to 158°F) (R.H. < 90% non-condensing @ 40°C) according to EN62053-21, EN50470-1 and EN62053-23	Burst	Test with current: 10V/m from 80 to 2000MHz Test without any current: 30V/m from 80 to 2000MHz On current and voltage measuring inputs circuit: 4kV
Installation category	Cat. III (IEC60664, EN60664)	Immunity to conducted disturbances	10V/m from 150KHz to 80MHz
Insulation (for 1 minute)	See “Insulation between inputs and outputs” table	Surge	On current and voltage measuring inputs circuit: 4kV; on “L” auxiliary power supply input: 1kV
Dielectric strength	4kVAC RMS for 1 minute	Radio frequency suppression	According to CISPR 22
Noise rejection CMRR	100 dB, 48 to 62 Hz		

General specifications (cont.)

Standard compliance		Housing DIN	
Safety	IEC60664, IEC61010-1 EN60664, EN61010-1 EN62052-11.	Dimensions (WxHxD)	Module holder: 96x96x50mm. "A" and "B" type modules: 89.5x63x16mm. "C" type module: 89.5x63x20mm. With 3 modules (A+B+C): 81.7 mm
Metrology	EN62053-22, EN62053-23, EN50470-3.	Max. depth behind the panel	ABS/Nylon PA66, self-extinguishing: UL 94 V-0
Pulse output	DIN43864, IEC62053-31	Material	Panel mounting
Approvals	Eligible System performance Meter for Go Solar California, CE, cULus "Listed"	Mounting	
Connections		Protection degree	
Cable cross-section area	Screw-type max. 2.5 mm ² . min./max. screws tightening torque: 0.4 Nm / 0.8 Nm. Suggested screws tightening torque: 0.5 Nm	Front Screw terminals	IP65, NEMA4x, NEMA12 IP20
		Weight	Approx. 420 g (packing included)

Insulation between inputs and outputs

	Power Supply (H o L)	Mesuring inputs	Relè output (MOR2)	Static ouput (MOO2)	Serial port	Ethernet port	Analogue outputs
Power Supply (H o L)	-	4kV	4kV	4kV	4kV	4kV	4kV
Mesuring inputs	4kV	-	4kV	4kV	4kV	4kV	4kV
Relè output (MOR2)	4kV	4kV	2kV	-	4kV	4kV	4kV
Static ouput (MOO2)	4kV	4kV	-	2kV	4kV	4kV	4kV
Serial port	4kV	4kV	4kV	4kV	-	-	4kV
Ethernet port	4kV	4kV	4kV	4kV	-	-	4kV
Analogue outputs	4kV	4kV	4kV	4kV	4kV	4kV	4kV ⁽¹⁾

(1): respect another module 4kV, in the same module 0kV.

-: combination not allowed.

NOTE: all the models have, mandatory, to be connected to external current transformers because the isolation among the current inputs is just functional (100VAC).

List of the variables that can be connected to:

- Communication port (all listed variables)
- Analogue outputs (all variables with the only exclusion of “energies” and “run hour counter”)
- Pulse outputs (only “energies”)
- Alarm outputs (“energies”, “hour counter” and “max” excluded)

No	Variable	1-ph. sys	2-ph. sys	3-ph. 3/4-wire balanced sys	3-ph. 2-wire balanced sys	3-ph. 3-wire unbal. sys	3-ph. 4-wire unbal. sys	Notes
1	VL-N sys	O	X	X	X	#	X	sys= system= Σ
2	VL1	X	X	X	X	#	X	
3	VL2	O	X	X	X	#	X	
4	VL3	O	O	X	X	#	X	
5	VL-L sys	O	#	X	X	X	X	sys= system= Σ
6	VL1-2	#	X	X	X	X	X	
7	VL2-3	#	O	X	X	X	X	
8	VL3-1	#	O	X	X	X	X	
9	Asys	O	X	O	O	X	X	
10	An	#	X	O	O	O	X	
11	AL1	X	X	X	X	X	X	
12	AL2	O	X	X	X	X	X	
13	AL3	O	O	X	X	X	X	
14	VA sys	X	X	X	X	X	X	sys= system= Σ
15	VA L1	X	X	X	X	#	X	
16	VA L2	O	X	X	X	#	X	
17	VA L3	O	O	X	X	#	X	
18	var sys	X	X	X	X	X	X	sys= system= Σ
19	var L1	X	X	X	X	#	X	
20	var L2	O	X	X	X	#	X	
21	var L3	O	O	X	X	#	X	
22	W sys	X	X	X	X	X	X	sys= system= Σ
23	WL1	X	X	X	X	#	X	
24	WL2	O	X	X	X	#	X	
25	WL3	O	O	X	X	#	X	
26	PF sys	X	X	X	X	X	X	sys= system= Σ
27	PF L1	X	X	X	X	#	X	
28	PF L2	O	X	X	X	#	X	
29	PF L3	O	O	X	X	#	X	
30	Hz	X	X	X	X	X	X	
31	Phase seq.	O	X	X	X	X	X	
32	Asy VLL	O	O	X	X	X	X	Asymmetry
33	Asy VLN	O	X	#	O	#	X	Asymmetry
34	Run Hours	X	X	X	X	X	X	
35	kWh (+)	X	X	X	X	X	X	Total
36	kvarh (+)	X	X	X	X	X	X	Total
37	kWh (+)	X	X	X	X	X	X	Partial
38	kvarh (+)	X	X	X	X	X	X	Partial
39	kWh (-)	X	X	X	X	X	X	Total
40	kvarh (-)	X	X	X	X	X	X	Total
41	kWh (-)	X	X	X	X	X	X	Partial
42	kvarh (-)	X	X	X	X	X	X	Partial
43	A L1 THD	X	X	X	X	X	X	
44	A L2 THD	O	X	X	X	X	X	
45	A L3 THD	O	O	X	X	X	X	
46	V L1 THD	X	X	X	X	O	X	
47	V L2 THD	O	X	X	X	O	X	
48	V L3 THD	O	O	X	X	O	X	
49	V L1-2 THD	X	X	X	X	X	X	
50	V L2-3 THD	O	X	X	X	X	X	
51	V L3-1 THD	O	O	X	X	X	X	

(X) = available; (O) = not available (variable not available on the display); (#) Not available (the relevant page is not displayed)

Power supply specifications

Auxiliary power supply

H: 100-240 +/-10% (90 to 255) VDC/AC (50/60 Hz);
L: 24-48 +/-15% (20 to 55) VDC/AC (50/60 Hz)

Power consumption

AC: 20 VA;
DC: 10 W

List of selectable applications

	Description	Notes
A	Cost allocation	Imported energy metering
B	Cost control	Imported and partial energy metering
C	Complex cost allocation	Imported/exported energy (total and partial)
D	Solar	Imported and exported energy metering with some basic power analyzer function
E	Complex cost and power analysis	Imported/exported energy (total and partial) and power analysis
F	Cost and power quality analysis	Imported energy and power quality analysis
G	Advanced energy and power analysis for power generation	Complete energy metering and power quality analysis

Display pages

Var Type	No	Line 1	Line 2	Line 3	Line 4	Line 5	Note	Applications						
		Variable Type	Variable Type	Variable Type	Variable Type	Variable Type		A	B	C	D	E	F	G
	0	Home page	Programmable					x	x	x	x	x	x	x
a	1	Total kWh (+)	b, c, d	b, c, d	b, c, d	b, c, d		x	x	x	x	x	x	x
a	2	Total kvarh (+)	b, c, d	b, c, d	b, c, d	b, c, d		x	x	x	x	x	x	x
a	3	Total kWh (-)	b, c, d	b, c, d	b, c, d	b, c, d				x	x	x		x
a	4	Total kvarh (-)	b, c, d	b, c, d	b, c, d	b, c, d				x	x	x		x
a	5	kWh (+) partial	b, c, d	b, c, d	b, c, d	b, c, d			x	x		x	x	x
a	6	kvarh (+) part.	b, c, d	b, c, d	b, c, d	b, c, d			x	x		x	x	x
a	7	kWh (-) partial	b, c, d	b, c, d	b, c, d	b, c, d				x		x		x
a	8	kvarh (-) part.	b, c, d	b, c, d	b, c, d	b, c, d				x		x		x
a	9	Run Hours (99999999.99)	b, c, d	b, c, d	b, c, d	b, c, d				x	x	x	x	x
b	10	a/Phase seq.	VLN Σ	VL1	VL2	VL3	(1) (2)				x	x	x	x
b	11	a/Phase seq.	VLN Σ	VL1-2	VL2-3	VL3-1	(1) (2)				x	x	x	x
b	12	a/Phase seq.	An	AL1	AL2	AL3	(1) (2)				x	x	x	x
b	13	a/Phase seq.	Hz	“ASY”	VLL sys (% asy)	VLL sys (% asy)	(1) (2)				x	x	x	x
b	14	a/Phase seq.	A Σ	AL1	AL2	AL3	(1) (2)				x	x	x	x
c	15	a/Phase seq.	W Σ	WL1	WL2	WL3	(1) (2)				x	x	x	x
c	16	a/Phase seq.	var Σ	var L1	var L2	var L3	(1) (2)					x	x	x
c	17	a/Phase seq.	PF Σ	PF L1	PF L2	PF L3	(1) (2)					x	x	x
c	18	a/Phase seq.	VA Σ	VA L1	VA L2	VA L3	(1) (2)					x	x	x
d	19	a/Phase seq.		THD V1	THD V2	THD V3	(1) (2)						x	x
d	20	a/Phase seq.		THD V12	THD V23	THD V31	(1) (2)						x	x
d	21	a/Phase seq.		THD A1	THD A2	THD A3	(1) (2)						x	x

Note: the table refers to system 3P.n.

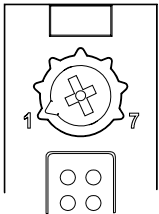
(1) Also maximum value storage (no EEPROM storage).

(2) Also average (dmd) value (no EEPROM storage).

Additional available information on the display

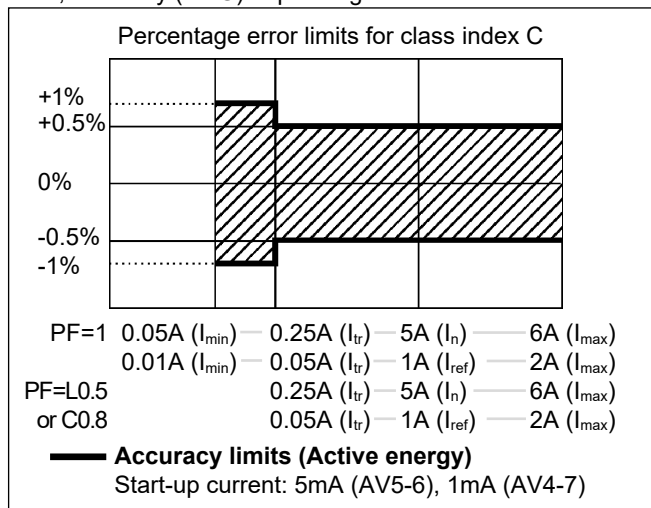
No	Line 1	Line 2	Line 3	Line 4	Line 5	Note	Applications						
							A	B	C	D	E	F	G
1	Lot n. (text) xxxx	Yr. (text) xx	SYS (text)	x (1/2/3)	1...60 (min) "dmd"		x	x	x	x	x	x	x
2	Conn. xxx.x (3ph.n/3ph/3ph./ 3ph.2/1ph/2ph)	CT.rA (text)	1.0 ... 99.99k	PT.rA (text)	1.0...9999		x	x	x	x	x	x	x
3	LED PULSE (text) kWh	xxxx kWh per pulse					x	x	x	x	x	x	x
4	PULSE out1 (text) kWh/kvarh	xxxx kWh/kvarh per pulse	+/- tot/PAr				x	x	x	x	x	x	x
5	PULSE out2 (text) kWh/kvarh	xxxx kWh/kvarh per pulse	+/- tot/PAr				x	x	x	x	x	x	x
6	Remote out	out1 (text)	on/oFF	Out2 (text)	on/oFF		x	x	x	x	x	x	x
7	Alarm 1 nE/nd	None / out 1 / out 2	Set 1	Set 2	(measurement)					x	x	x	x
8	Alarm 2 nE/nd	None / out 1 / out 2	Set 1	Set 2	(measurement)					x	x	x	x
9	Alarm 3 nE/nd	None / out 1 / out 2	Set 1	Set 2	(measurement)					x	x	x	x
10	Alarm 4 nE/nd	None / out 1 / out 2	Set 1	Set 2	(measurement)					x	x	x	x
11	Analogue 1	Hi:E	0.0 ... 9999	Hi.A	0.0 ... 100.0%					x	x	x	x
12	Analogue 2	Hi:E	0.0 ... 9999	Hi.A	0.0 ... 100.0%					x	x	x	x
13	COM port	None / out 1 / out 2	xxx (address)	bdr (text)	9.6/19.2/ 38.4/115.2		x	x	x	x	x	x	x
14	IP address	XXX	XXX	XXX	XXX		x	x	x	x	x	x	x

Back protection rotary switch

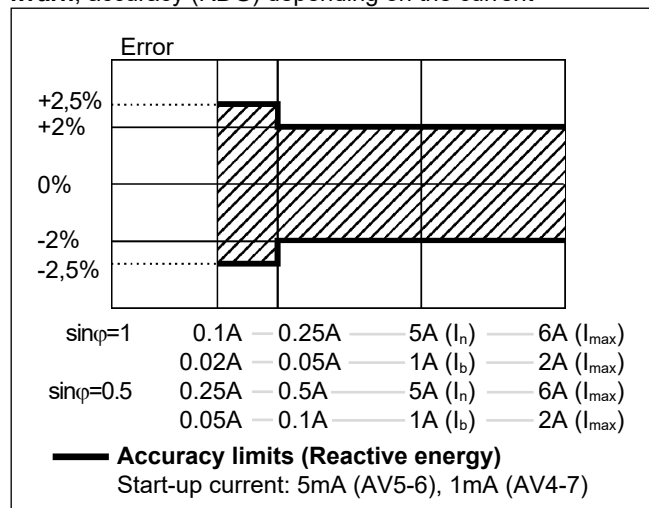
	Function	Rotary switch position	Description
	Unlok	1	All programming parameters are freely modifiable by means of the front key-pad and by means of the communication port.
	Lock	7	The key-pad, as far as programming is concerned and the data through the serial communication cannot be changed (no writing into meter allowed). Data reading is allowed.

Accuracy (According to EN50470-3 and EN62053-23)

kWh, accuracy (RDG) depending on the current



kvarh, accuracy (RDG) depending on the current



WM3040Soft parameter progr. and var. reading software

WM3040Soft

Multi-language software (Italian, English, French, German, Spanish) for variable reading, instrument calibration and parameters programming. The program runs under Windows XP/ Vista/7

Working mode

Three different working modes can be selected:

- management of local RS232 (MODBUS);
- management of a local RS485 network (MODBUS);
- managed via TCP port

Used calculation formulas

Phase variables

Instantaneous effective voltage

$$V_{1N} = \sqrt{\frac{1}{n} \cdot \sum_{i=1}^n (V_{1N})_i^2}$$

Instantaneous active power

$$W_1 = \frac{1}{n} \cdot \sum_{i=1}^n (V_{1N})_i \cdot (A_1)_i$$

Instantaneous power factor

$$\cos \varphi_1 = \frac{W_1}{V A_1}$$

Instantaneous effective current

$$A_1 = \sqrt{\frac{1}{n} \cdot \sum_{i=1}^n (A_1)_i^2}$$

Instantaneous apparent power

$$V A_1 = V_{1N} \cdot A_1$$

Instantaneous reactive power

$$\text{var}_1 = \sqrt{(V A_1)^2 - (W_1)^2}$$

System variables

Equivalent three-phase voltage

$$V_{\Sigma} = \frac{V_1 + V_2 + V_3}{3} \cdot \sqrt{3}$$

Voltage asymmetry

$$A S Y_{LL} = \frac{(V_{LL \max} - V_{LL \min})}{V_{LL} \Sigma}$$

$$A S Y_{LN} = \frac{(V_{LN \max} - V_{LN \min})}{V_{LN} \Sigma}$$

Three-phase reactive power

$$\text{var}_{\Sigma} = (\text{var}_1 + \text{var}_2 + \text{var}_3)$$

Three-phase active power

$$W_{\Sigma} = W_1 + W_2 + W_3$$

Three-phase apparent power

$$V A_{\Sigma} = \sqrt{W_{\Sigma}^2 + \text{var}_{\Sigma}^2}$$

Total harmonic distortion

$$T H D_N = 100 \sqrt{\frac{\sum_{n=2}^N |X_n|^2}{|X_1|^2}}$$

Three-phase power factor

$$\cos \varphi_{\Sigma} = \frac{W_{\Sigma}}{V A_{\Sigma}} \quad (\text{TPF})$$

Energy metering

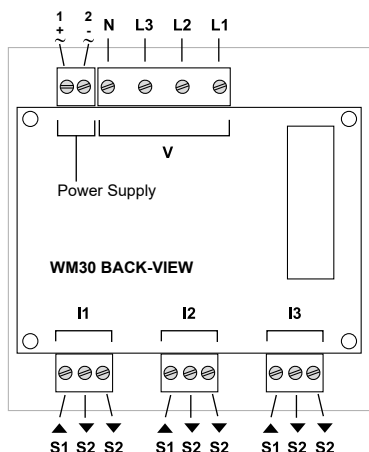
$$k \text{ var hi} = \int_{t_1}^{t_2} Q_i(t) dt \cong \Delta t \sum_{n=1}^{n_2} Q_{nj}$$

$$k W h i = \int_{t_1}^{t_2} P_i(t) dt \cong \Delta t \sum_{n=1}^{n_2} P_{nj}$$

Where:

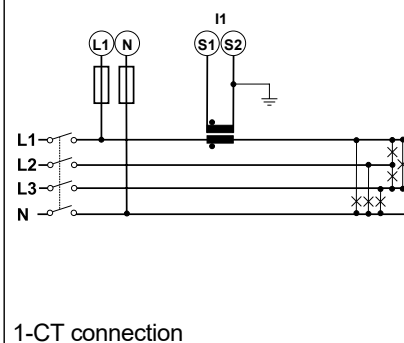
i= considered phase (L1, L2 or L3)
P= active power; **Q**= reactive power;
t₁, **t₂**=starting and ending time points of consumption recording; **n**= time unit Δt ; **t**= time interval between two successive power consumptions;
n₁, **n₂**= starting and ending discrete time points of consumption recording

Wiring diagrams

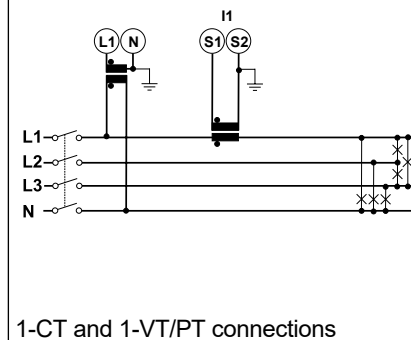


System type selection: 3-Ph.2

3-ph, 2-wire, balanced load **Fig. 1**

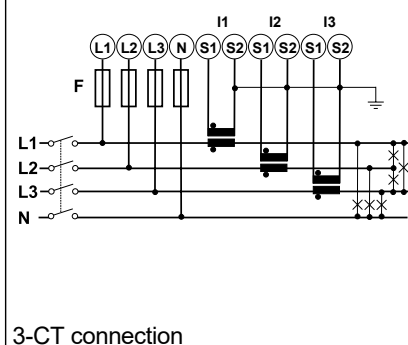


3-ph, 2-wire, balanced load **Fig. 2**

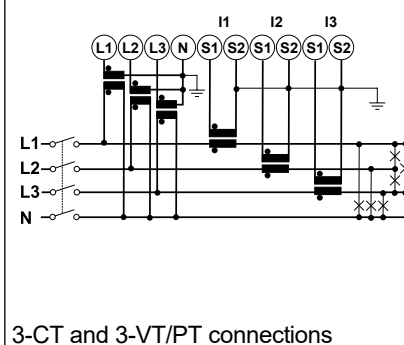


System type selection: 3-Ph.n

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

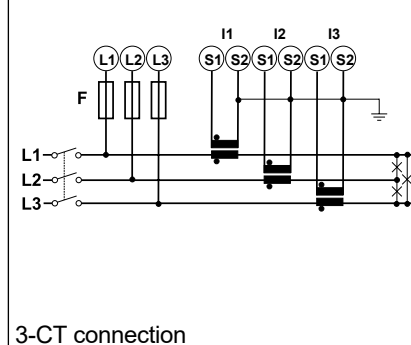


3-ph, 4-wire, unbalanced load **Fig. 4**



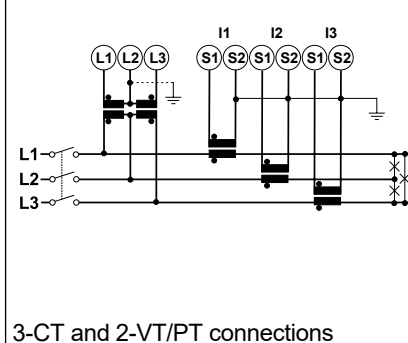
System type selection: 3-Ph

3-ph, 3-wire, unbalanced load **Fig. 5**

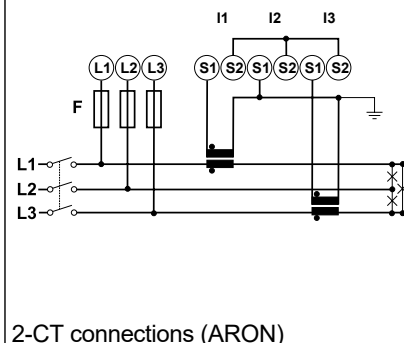


System type selection: 3-Ph (cont.)

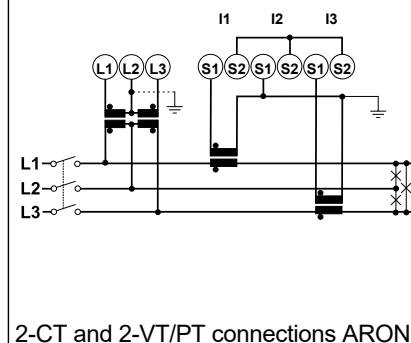
3-ph, 3-wire, unbalanced load **Fig. 6**



3-ph, 3-wire, unbalanced load **Fig. 7**



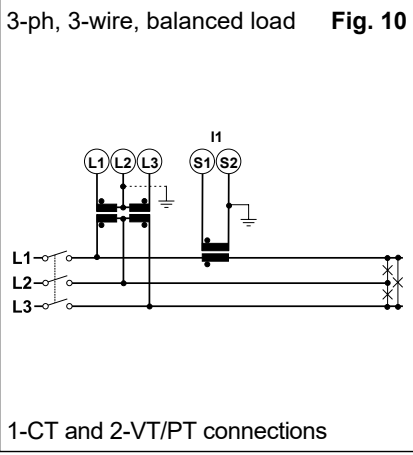
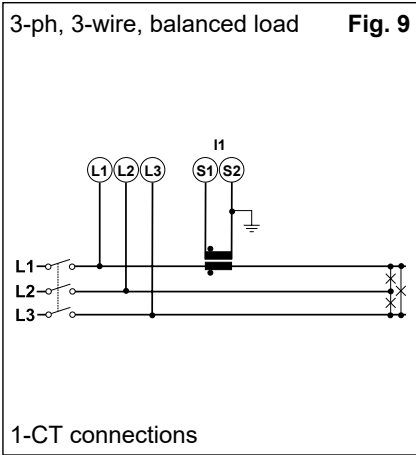
3-ph, 3-wire, unbalanced load **Fig. 8**



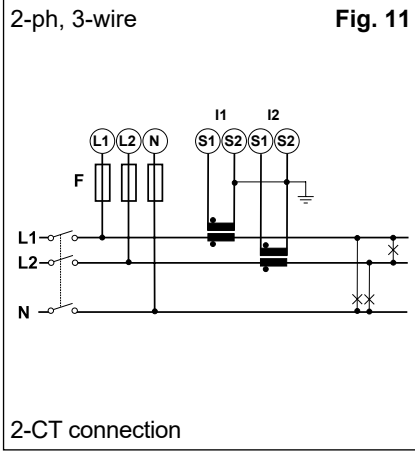


Wiring diagrams

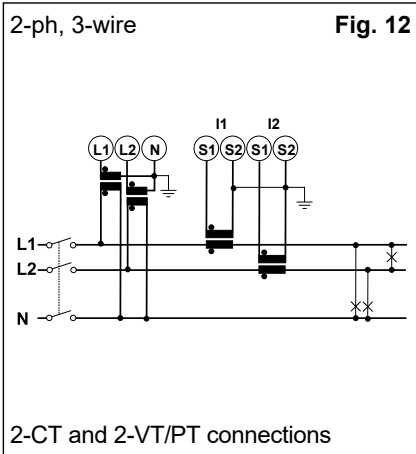
System type selection: 3-Ph.1



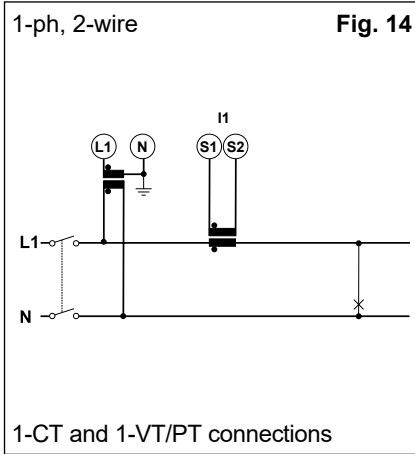
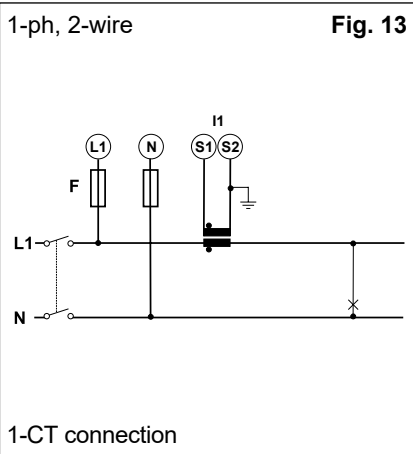
System type selection: 2-Ph



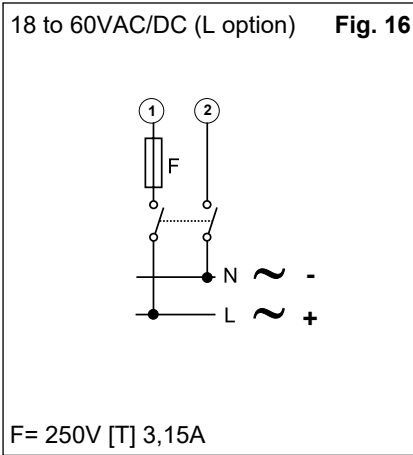
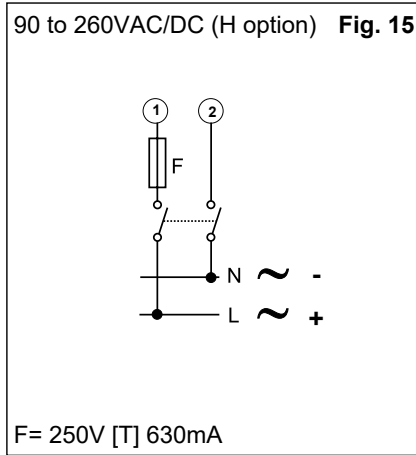
System type selection: 2-Ph (cont.)



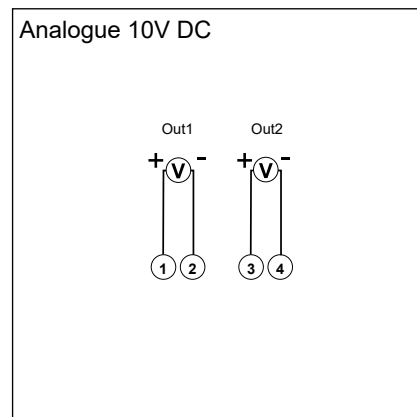
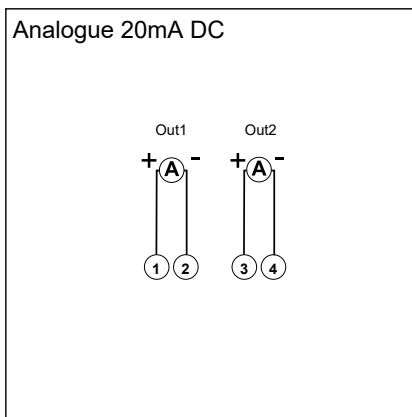
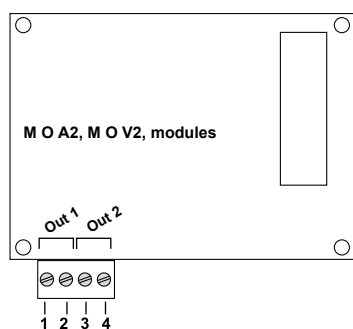
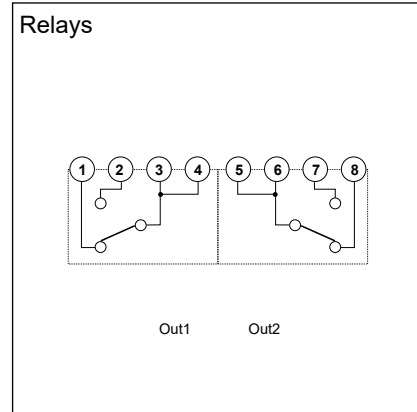
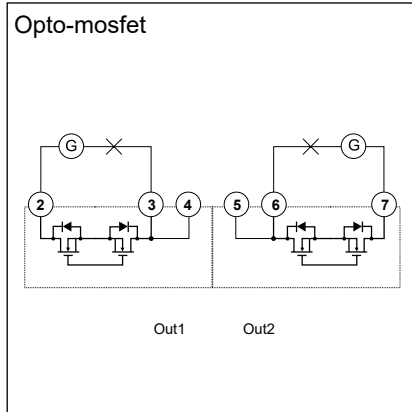
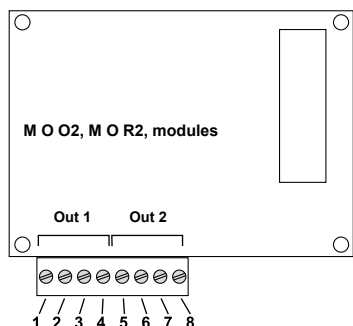
System type selection: 1-Ph



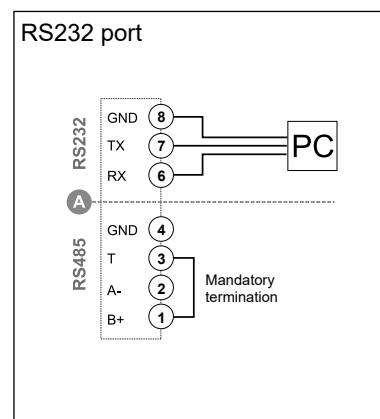
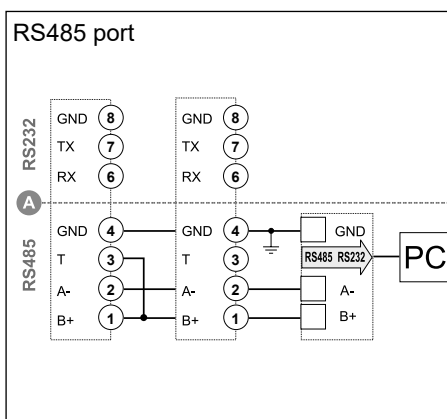
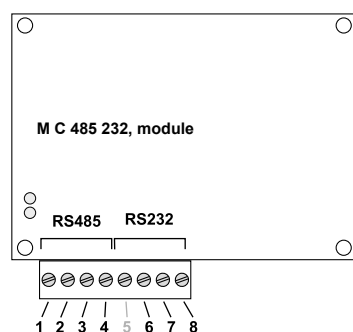
Power Supply



Static, relay and analogue outputs wiring diagrams



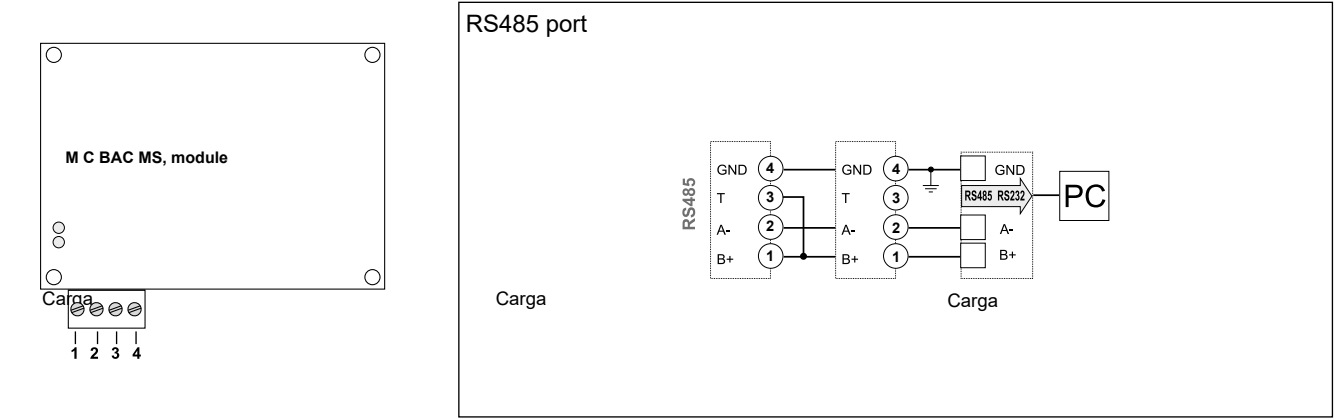
RS485 and RS232 wiring diagrams



NOTE. RS485: additional devices provided with RS485 are connected in parallel. 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). : the communication RS232 and RS485 ports **can't be** connected and used simultaneously.



RS485 wiring diagram of Bacnet module



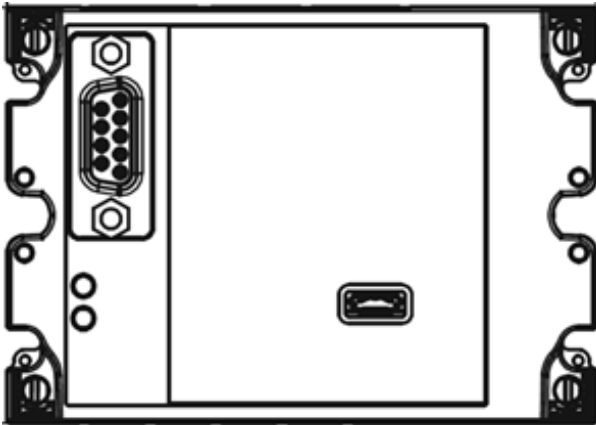
NOTE. RS485: additional devices provided with RS485 are connected in parallel. The termination of the serial output is carried out only on the last instrument of the network, by means of a jumper between (B+) and (T).

Ethernet and BACnet-IP connections



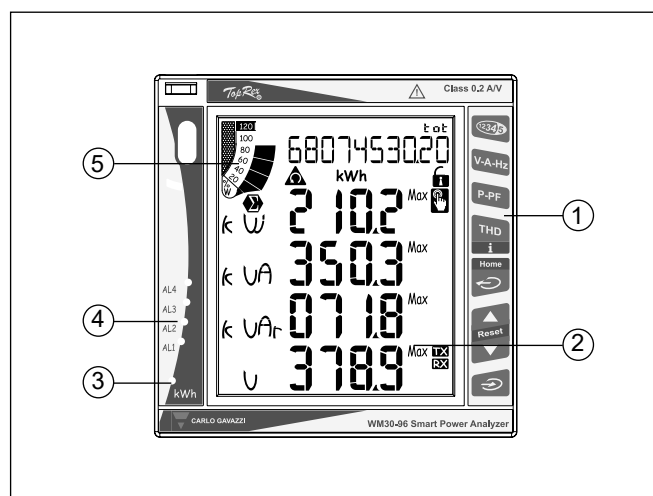
Connection to Ethernet or BACnet modules using the RJ45 connector.

Profibus module connections



Connection to the Profibus module using USB micro type B (Modbus RTU) and RS485 DB9 (Profibus DP-V0).

Front panel description



1. **Key-pad**
To program the configuration parameters and scroll the variables on the display.
2. **Display**
LCD-type with alphanumeric indications to:
 - display configuration parameters;
 - display all the measured variables.
3. **kWh LED**
Red LED blinking proportional to the energy being measured
4. **Alarm LED's**
Red LED's light-on when virtual alarms are activated.
5. **Main bar-graph**
To display the power consumption versus the installed power.

Dimensions and Panel cut-out

