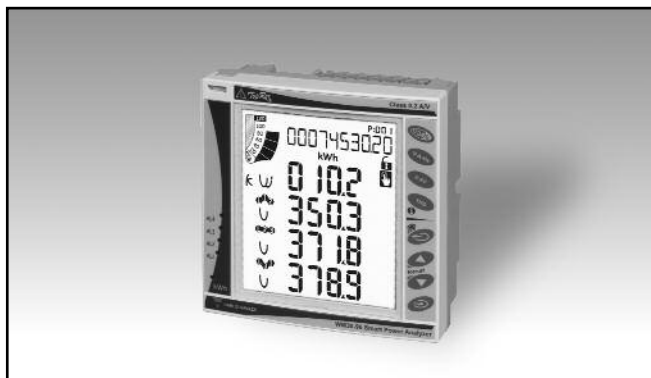


Energy Management Smart Modular Power Analyzer Type WM30 96

CARLO GAVAZZI



- One RS232 and RS485 port (on request)
- Communication protocol: MODBUS-RTU, iFIX SCADA compatibility
- MODBUS TCP/IP Ethernet port (on request)
- BACnet-IP over Ethernet port (on request)
- BACnet MS/TP over RS485 (on request)
- Ethernet/IP 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 0.5 (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: 18 to 60VAC/DC, 90 to 260AC/VDC
- 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 panel mounting with IP65 (front) 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 or BACnet MS/TP communication ports, pulse and alarm outputs. Parameters 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: 90 to 260V AC/DC (48 to 62Hz)	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}		L: 18 to 60VAC/DC (48 to 62Hz)	
AV6: 100/208V _{LL} AC 5(6)A V _{LN} : 40V to 144V _{LN} V _{LL} : 70V to 250V _{LL}			
AV7: 100/208V _{LL} AC 1(2)A V _{LN} : 40V to 144V _{LN} V _{LL} : 70V to 250V _{LL}	Options XX: none	Communication 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	B Outputs 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: AV5.3 - Power supply: L	WM30 AV5 3 L			
4		- Inputs/system: AV6.3 - Power supply: L	WM30 AV6 3 L			
5	Dual relay output (SPDT)	2-channel - Alarm or/and pulse output	M O R2 (1)	X		
6	Dual static output (AC/DC Opto-Mos)	2-channel - Alarm or/and pulse output	M O O2 (1)	X		
7	Dual analogue output (+20mADC)	2-channel	M O A2 (2)		X	
8	Dual analogue output (+10VDC)	2-channel	M O V2 (2)		X	
9	RS485 / RS232 port module	Max. 115.2 Kbps	M C 485 232 (3)			X
10	Ethernet port module	RJ45 10/100 BaseT	M C ETH (3)			X
11	BACnet-IP port module	Based on Ethernet bus	M C BAC IP (3)			X
12	BACnet-MS/TP port module	Over RS485	M C BAC MS (3)			X
13	Ethernet/IP	Based on Ethernet	M C E I (3)			X

NOTE:

(1) Only one A type module per meter in a maximum combination of 3 total mixed modules on the same meter.

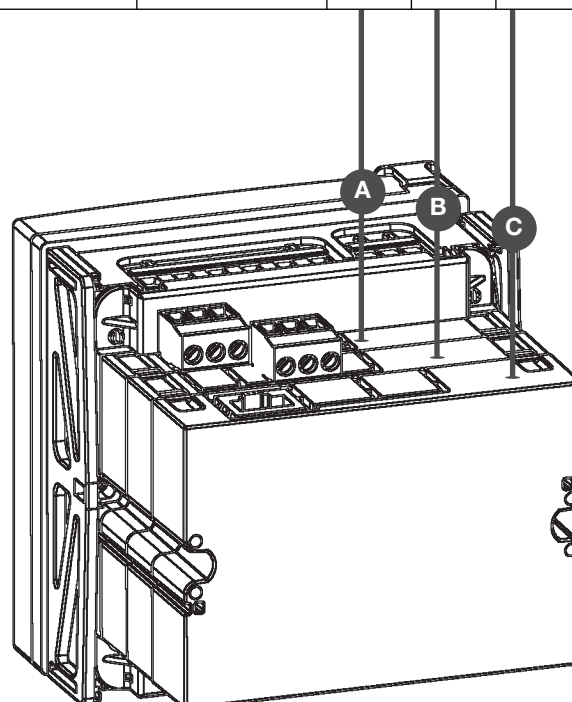
(2) Only one B type module per meter in a maximum combination of 3 total mixed modules on the same meter.

(3) Only one C type module per meter in a maximum combination of 3 total mixed modules on the same meter.

The B-C position is not mandatory, if to fulfil the application, module "A" is not necessary, just "B" can be mounted.

Another example: if modules "A" and "B" (anyone) are not needed, then just module "C" maybe be mounted. If "A" module is needed, it is mandatory to put it in "A" position.

When no modules are mounted, then WM30-96 becomes 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: 679V AV5: Imin: 5mARMS; Imax: 15Ap; Umin: 30VRMS; Umax: 679V AV6: Imin: 5mARMS; Imax: 15Ap; Umin: 30VRMS; Umax: 204V AV7: Imin: 5mARMS; Imax: 3A; Umin: 30VRMS; Umax: 204V
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%, 45 to 65 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:"
AV5 model	In: 5A, Imax: 6A; Un: 160 to 480VLN (277 to 830VLL)	Method	TRMS measurements of distorted wave forms.
AV6 model	In: 5A, Imax: 6A; Un: 40 to 144VLN (70 to 250VLL)	Coupling type	By means of CT's
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) 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)	Voltage Overloads	Continuous 1.2 Un For 500ms 2 Un
Phase-phase voltage	±[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	0.02In to 0.05In, senφ 1: ±(1.5%RDG+1DGT) 0.05In to Imax, senφ 1: ±(1%RDG+1DGT) 0.05In to 0.1In, senφ 0.5L/C: ±(1.5%RDG+1DGT) 0.1In to Imax, senφ 0.5L/C: ±(1%RDG+1DGT)	Frequency	40 to 440 Hz
Active and Apparent power	Class 0.5 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	+kvarh, -kvarh. The above listed variables can be connected to any output. Programmable from 0.001 to 10.00 kWh/kvarh per pulse.
Purpose	For either alarm output or pulse output	Pulse duration	≥100ms < 120msec (ON), ≥120ms (OFF), according to EN62052-31
Type	Relay, SPDT type AC 1-5A @ 250VAC; AC 15-1.5A @ 250VAC DC 12-5A @ 24VDC; DC 13-1.5A @ 24VDC	Remote controlled outputs	The activation of the outputs is managed through the serial communication port See "Insulation between inputs and outputs" table
Configuration	By means of the front key-pad	Insulation	
Function	The outputs can work as alarm outputs but also as pulse outputs, remote controlled outputs, or in any other combination.	20mA analogue outputs (M O A2)	
Alarms	Up alarm and down alarm linked to the virtual alarms, other details see Virtual alarms	Number of outputs	2 (max. 1 module per instrument)
Min. response time	≤200ms, filters excluded. Set-point on-time delay: "0 s".	Accuracy (@ 25°C ±5°C, R.H. ≤60%)	±0.2%FS
Pulse		Range	0 to 20mA
Signal retransmission	Total: +kWh, -kWh, +kvarh, -kvarh. Partial: +kWh, -kWh, +kvarh, -kvarh.	Configuration	By means of the front key-pad
Pulse type	The above listed variables can be connected to any output. Programmable from 0.001 to 10.00 kWh/kvarh per pulse.	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 See "Insulation between inputs and outputs" table	Response time	≤400 ms typical (filter excluded)
Insulation		Ripple	≤1% (according to IEC 60688-1, EN 60688-1)
		Total temperature drift	≤500 ppm/°C
		Load	≤600Ω
		Insulation	See "Insulation between inputs and outputs" table

Static outputs (M O O2)

Physical outputs	Opto-Mos type 2 (max. 1 module per instrument)	10VDC analogue outputs (M O V2)	
Purpose	For either pulse output or alarm output	Number of outputs	2 (max. 1 module per instrument)
Signal	V _{ON} : 2.5VAC/DC/max.100mA V _{OFF} : 260VAC/DC max.	Accuracy (@ 25°C ±5°C, R.H. 60%)	±0.2%FS
Configuration	By means of the front key-pad	Range	0 to 10 VDC
Function	The outputs can work as alarm outputs but also as pulse outputs, remote controlled outputs, or in any other combination.	Configuration	By means of the front key-pad
Alarms	Up alarm and down alarm linked to the virtual alarms, other details see Virtual alarms	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".
Min. response time	≤200ms, filters excluded. Set-point on-time delay: "0 s".	Scaling factor	Programmable within the whole range of retransmission;
Pulse		Response time	≤400 ms typical (filter excluded)
Signal retransmission	Total: +kWh, -kWh, +kvarh, -kvarh. Partial: +kWh, -kWh,	Ripple	≤1% (according to IEC 60688, EN 60688)
		Total temperature drift	≤500 ppm/°C
		Load	≥10kΩ
		Insulation	See "Insulation between inputs and outputs" table

Output specifications (cont.)

RS485 (on request)		Ethernet/Internet port (on request)	
Type	Multidrop, bidirectional (static and dynamic variables)	Protocols	Modbus TCP/IP
Connections	2-wire Max. distance 1000m, termination directly on the module	IP configuration	Static IP / Netmask / Default gateway
Addresses	247, selectable by means of the front key-pad	Port	Selectable (default 502)
Protocol	MODBUS/JBUS (RTU)	Client connections	Max 5 simultaneously
Data (bidirectional)		Connections	RJ45 10/100 BaseTX
Dynamic (reading only)	System and phase variables: see table "List of variables..."	Data (bidirectional)	Max. distance 100m
Static (reading and writing only)	All the configuration parameters.	Dynamic (reading only)	System and phase variables: see table "List of variables..."
Data format	1 start bit, 8 data bit, no/even/odd parity, 1 stop bit	Static (reading and writing only)	All the configuration parameters.
Baud-rate	Selectable: 9.6k, 19.2k, 38.4k, 115.2k bit/s	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 anymore. In this case just the data reading is allowed.
Driver input capability	1/5 unit load. Maximum 160 transceivers on the same bus.	Insulation	See "Insulation between inputs and outputs" table
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 anymore. In this case just the data reading is allowed.	BACnet-IP (on request)	
Insulation	See "Insulation between inputs and outputs" table	Protocols	BACnet-IP (for measurement reading purpose) and Modbus TCP/IP (for measurement reading purpose and for programming parameter purpose)
RS232 port (on request)		Device object instance	0 to 9999 selectable by key-pad
Type	Bidirectional (static and dynamic variables)	Protocol	0 to $2^{22}-2 = 4.194.302$, selectable by programming software or by BACnet.
Connections	3 wires. Max. distance 15m	Supported services	BACnet MS/TP (for measurement reading purpose and to write object description)
Protocol	MODBUS RTU /JBUS	Supported objects	"I have", "I am", "Who has", "Who is", "Read (multiple) Property"
Data (bidirectional)	System and phase variables: see table "List of variables..."		Type 2 (analogue value, including COV property),
Dynamic (reading only)	All the configuration parameters		Type 5 (binary-value for up to 16 virtual alarm re-transmission)
Static (reading and writing only)	All the configuration parameters	IP configuration	Type 8 (device)
Data format	1 start bit, 8 data bit, no/even/odd parity, 1 stop bit	BACnet-IP Port	Static IP / Netmask / Default gateway
Baud-rate	Selectable: 9.6k, 19.2k, 38.4k, 115.2k bit/s	Modbus Port	Fixed: BAC0h
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 anymore. In this case just the data reading is allowed.	Client connections	Selectable (default 502)
Insulation	See "Insulation between inputs and outputs" table	Connections	Modbus only: max 5 simultaneously
		Data	RJ45 10/100 BaseTX
		Dynamic (reading only)	Max. distance 100m
			System and phase variables (BACnet-IP and

Output specifications (cont.)

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

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	
Energy meter recording	Storage of total and partial energy meters. Energy meter storage format (EEPROM)	
	Energy Meters	
	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. The harmonic distortion can be measured in 3-wire or 4-wire systems. Tw: 0.02 sec@50Hz without filter
Voltage	Up to the 32nd harmonic	
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		
Display	4 lines, 4-DGT, 1 lines, 10-DGT	kWh pulsating	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
Type	LCD, single colour backlight		
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: 9+1DGT or 10DGT; Exported Total/Partial: 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)		
Max. and Min. indication	Max. instantaneous variables: 9999; energies: 9 999 999 999. Min. instantaneous variables: 0.000; energies 0.0		
Front position LEDs		Back 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.	On the base	Green as power-on Two LEDs: one for TX (green) and one for RX (amber).
Energy consumption	Red LED (only kWh)	On the communication modules	
		Key-pad	For variable selection, programming of the instrument working parameters, “dmd”, “max”, total energy and partial energy Reset

Main functions

Password	Numeric code of max. 4 digits; 2 protection levels of the programming data: Password "0", no protection;		programmable from 0 (always on) to 255 minutes
1st level	Password from 1 to 9999, all data are protected		
2nd level			
System selection		Virtual alarms	
System 3-Ph.n unbalanced load	3-phase (4-wire)	Working condition	In case of basic unit or with the addition of M O R2 or M O O2 digital output modules.
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.	No. of alarms	Up to 4
	3-phase (3-wire), one current and 3-phase to phase voltage measurements	Working mode	Up alarm and down alarm.
	3-phase (4-wire), one current and 3-phase to neutral voltage measurements.	Controlled variables	The alarms can be connected to any instantaneous variable available in the table "List of the variables that can be connected to".
System 3-Ph.1 balanced load	3-phase (2-wire), one current and 1-phase (L1) to neutral voltage measurement.	Set-point adjustment	From 0 to 100% of the display scale
	2-phase (3-wire)	Hysteresis	From 0 to 100% of the display scale
System 3-Ph.2 balanced load	1-phase (2-wire)	On-time delay	0 to 255s
System 2-Ph		Min. response time	≤ 200ms, filters excluded.
System 1-Ph			Set-point on-time delay: "0 s".
Transformer ratio		Reset	
VT (PT)	1.0 to 999.9 / 1000 to 9999.		By means of the front key-pad. It is possible to reset the following data:
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).		- all the max and dmd values.
		Harmonic analysis	Up to the 32 nd harmonics on current and voltage
Filter		Clock	
Operating range	Selectable from 0 to 100% of the input display scale	Functions	Universal clock and calendar.
Filtering coefficient	Selectable from 1 to 32	Time format	Hour: minutes: seconds with selectable 24 hours or 12H AM/PM format.
Filter action	Measurements, analogue signal retransmission, serial communication (fundamental variables: V, A, W and their derived ones).	Date format	Day-month-year with selectable DD-MM-YY or MM-DD-YY format.
		Battery life	10 years
Displaying		Easy programming function	
Number of variables	Up to 5 variables per page. See "Front view". 7 different set of variables available (see "Display pages") according to the application being selected. One page is freely programmable as combination of variables.		For all the display selections, both energy and power measurements are independent from the current direction. The displayed energy is always "imported" with the only exception of "D", "F" and "G" types (see "display pages" table). For those latter selections the energies can be either "imported" or "exported" depending on the current direction.
Backlight	The backlight time is		

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	Standard compliance	
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	Safety	IEC60664, IEC61010-1 EN60664, EN61010-1 EN62052-11.
Installation category	Cat. III (IEC60664, EN60664)	Metrology	EN62053-22, EN62053-23, EN50470-3.
Insulation (for 1 minute)	See "Insulation between inputs and outputs" table	Pulse output	DIN43864, IEC62053-31
Dielectric strength	4kVAC RMS for 1 minute	Approvals	Eligible System performance Meter for Go Solar California, CE, cULus "Listed"
Noise rejection CMRR	100 dB, 48 to 62 Hz	Connections	
EMC		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
Electrostatic discharges	According to EN62052-11 15kV air discharge	Housing DIN	
Immunity to irradiated	Test with current: 10V/m from 80 to 2000MHz	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
Electromagnetic fields	Test without any current: 30V/m from 80 to 2000MHz	Max. depth behind the panel	ABS/Nylon PA66, self-extinguishing: UL 94 V-0
Burst	On current and voltage measuring inputs circuit: 4kV	Material	Panel mounting
Immunity to conducted disturbances	10V/m from 150KHz to 80MHz	Mounting	
Surge	On current and voltage measuring inputs circuit: 4kV; on "L" auxiliary power supply input: 1kV	Protection degree	
Radio frequency suppression	According to CISPR 22	Front Screw terminals	IP65, NEMA4x, NEMA12 IP20
		Weight	Approx. 400 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: 90 to 260VAC/DC;
L: 18 to 60VAC/DC (48 to 62Hz)

Power consumption

AC: 6 VA;
DC: 3.5 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.

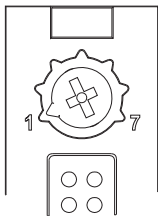
(1) Also maximum value storage (no EEPROM storage).

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

Additional available information on the display

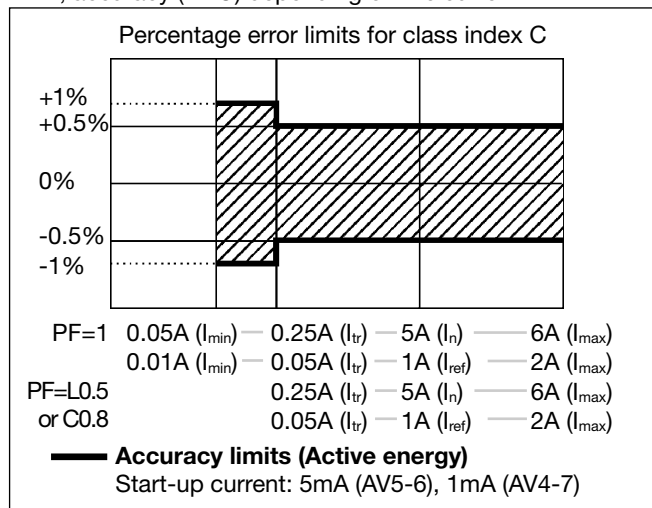
No	Line 1	Line 2	Line 3	Line 4	Line 5	Note	Applications						
							A	B	C	D	E	F	G
1	Lot n. (text) xxxx	Yr. (text) xx	SYS (text)	x (1/2/3)	1...60 (min) "dmd"		x	x	x	x	x	x	x
2	Conn. xxx.x (3ph.n/3ph/3ph./ 3ph.2/1ph/2ph)	CT.rA (text)	1.0 ... 99.99k	PT.rA (text)	1.0...9999		x	x	x	x	x	x	x
3	LED PULSE (text) 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

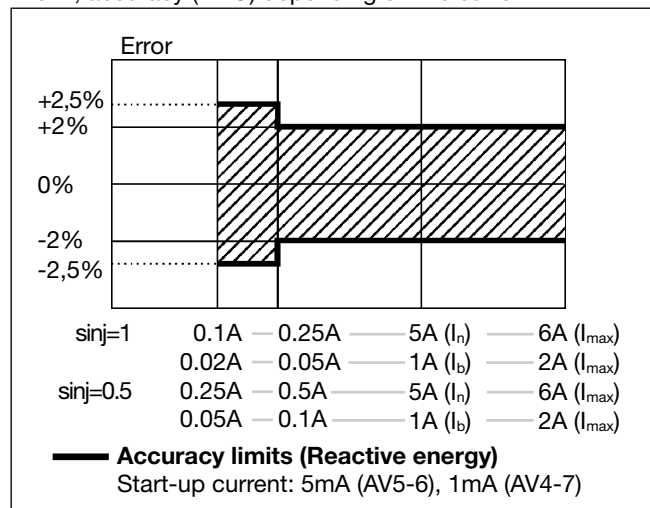
	Function	Rotary switch position	Description
	Unlok	1	All programming parameters are freely modifiable by means of the front key-pad and by means of the communication port.
	Lock	7	The key-pad, as far as programming is concerned and the data through the serial communication cannot be changed (no writing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

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

Instantaneous active power

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

Instantaneous power factor

$$\cos \phi_1 = \frac{W_1}{VA_1}$$

Instantaneous effective current

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

Instantaneous apparent power

$$VA_1 = V_{IN} \cdot A_1$$

Instantaneous reactive power

$$\text{var}_1 = \sqrt{(VA_1)^2 - (W_1)^2}$$

System variables

Equivalent three-phase voltage

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

Voltage asymmetry

$$ASY_{LL} = \frac{(V_{LL \max} - V_{LL \min})}{V_{LL \Sigma}}$$

$$ASY_{LN} = \frac{(V_{LN \max} - V_{LN \min})}{V_{LN \Sigma}}$$

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

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

Total harmonic distortion

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

Three-phase power factor

$$\cos \phi_{\Sigma} = \frac{W_{\Sigma}}{VA_{\Sigma}} \quad (\text{TPF})$$

Energy metering

$$k \text{ var hi} = \int_{t_1}^{t_2} Q_i(t) dt \cong \Delta t \sum_{n_1}^{n_2} Q_{nj}$$

$$kWh_i = \int_{t_1}^{t_2} P_i(t) dt \cong \Delta t \sum_{n_1}^{n_2} P_{nj}$$

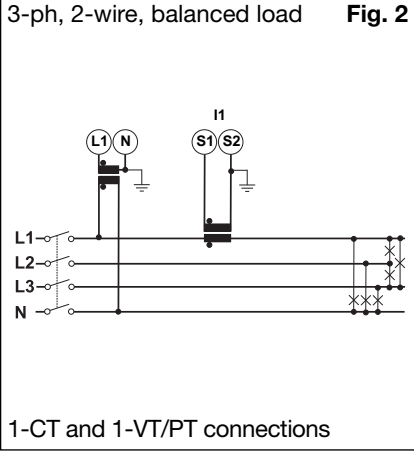
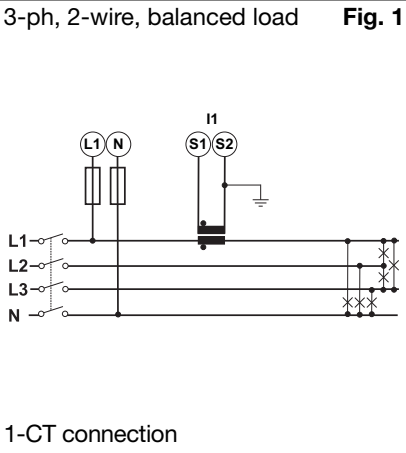
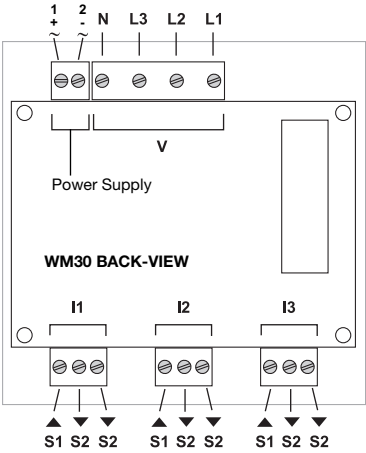
Where:

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; **t**= time interval between two successive power consumptions;
n₁, **n₂**= starting and ending discrete time points of consumption recording

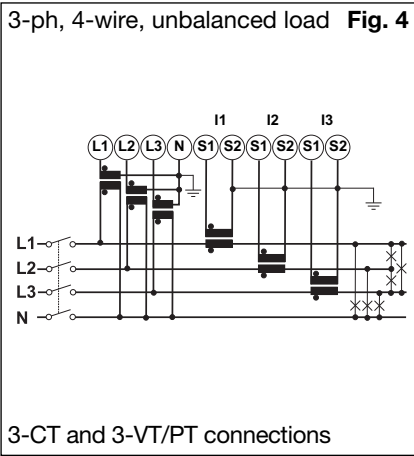
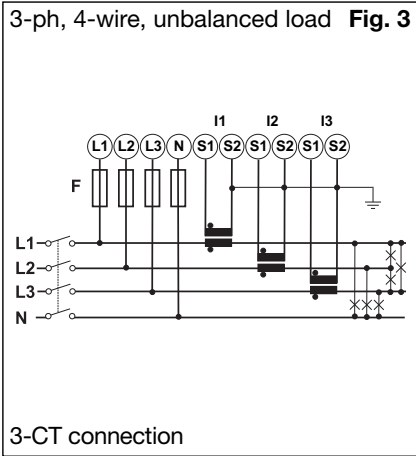


Wiring diagrams

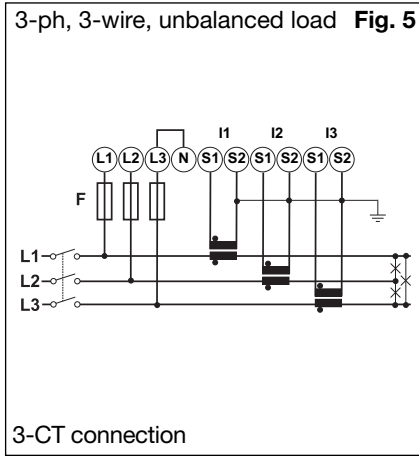
System type selection: 3-Ph.2



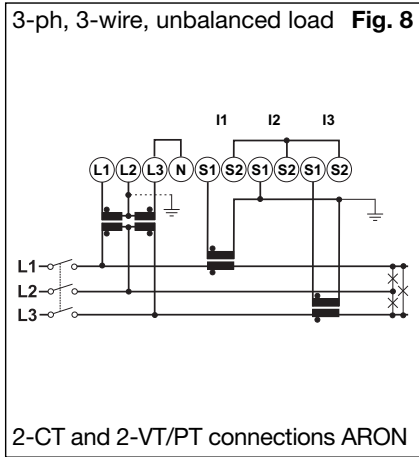
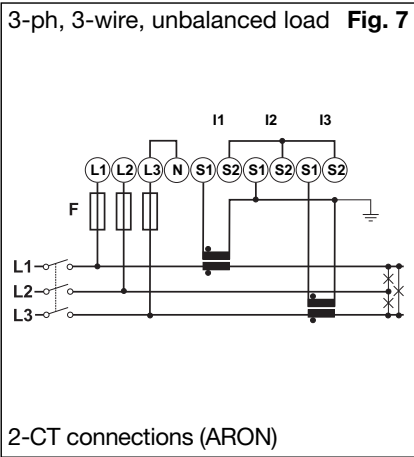
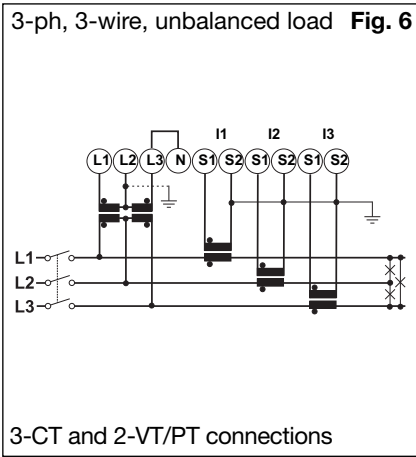
System type selection: 3-Ph.n



System type selection: 3-Ph

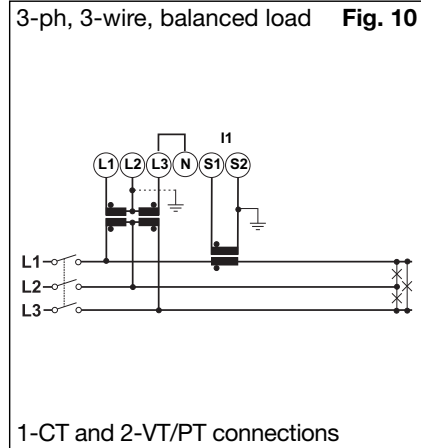
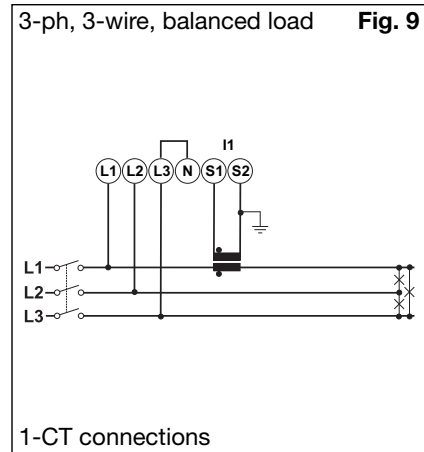


System type selection: 3-Ph (cont.)

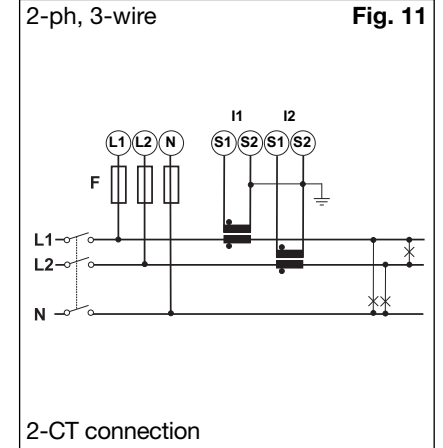


Wiring diagrams

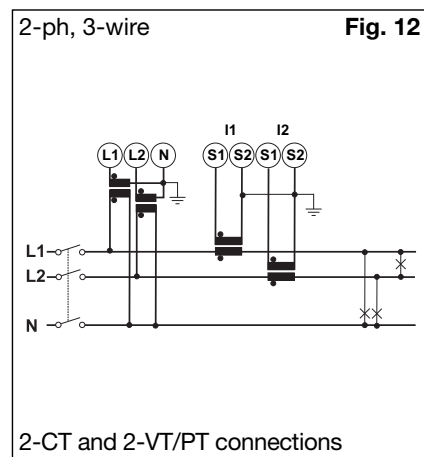
System type selection: 3-Ph.1



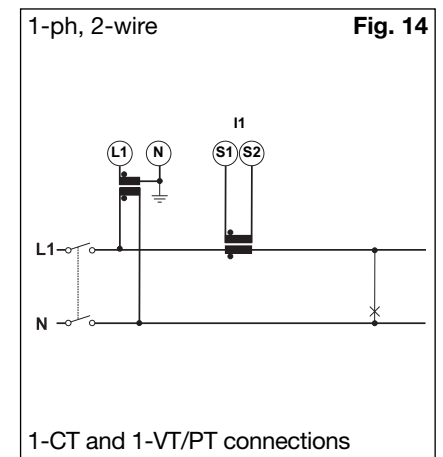
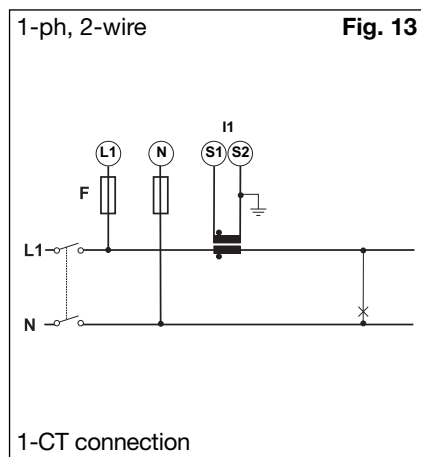
System type selection: 2-Ph



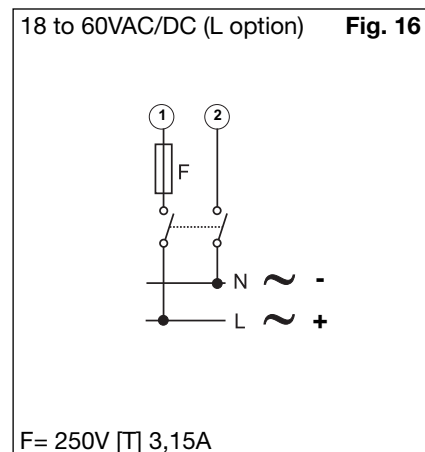
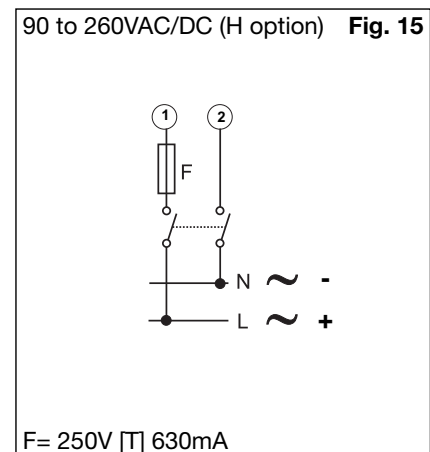
System type selection: 2-Ph (cont.)



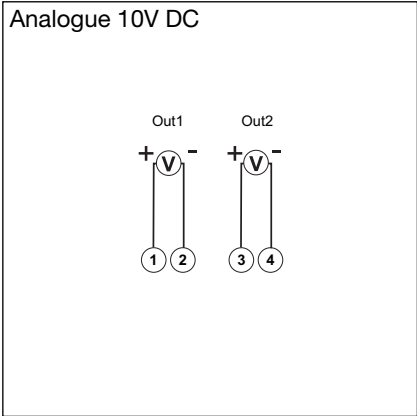
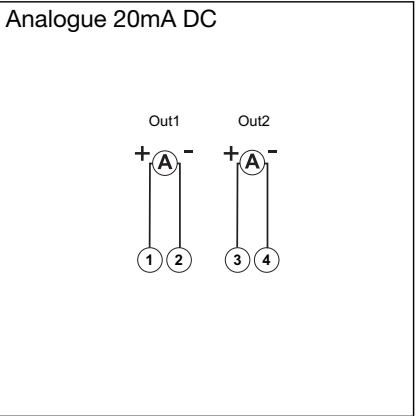
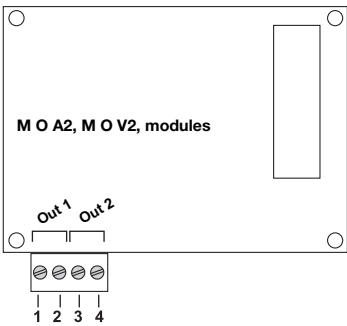
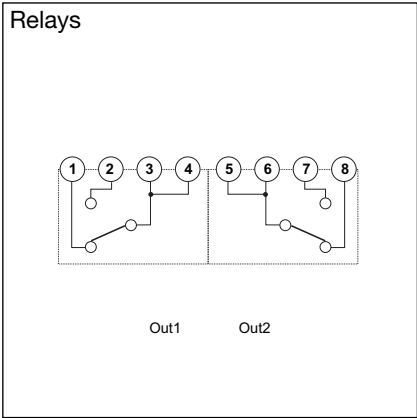
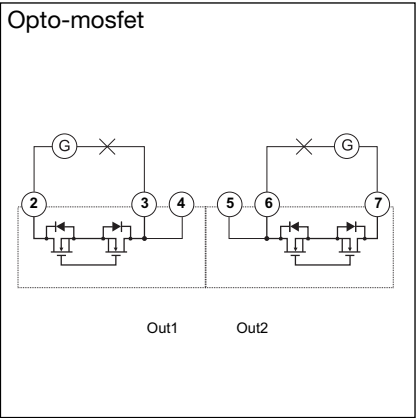
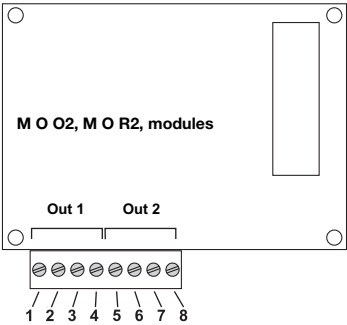
System type selection: 1-Ph



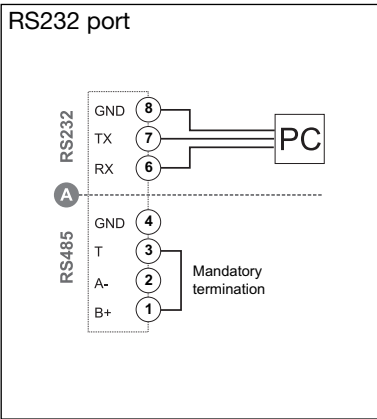
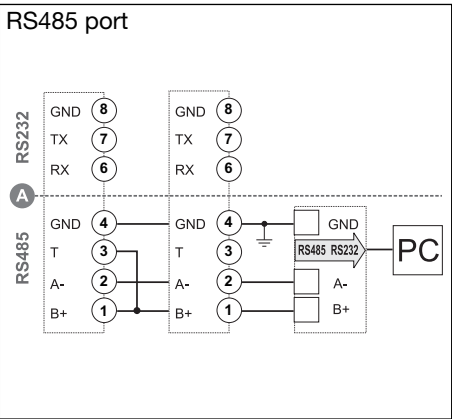
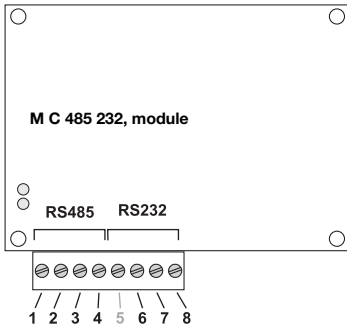
Power Supply



Static, relay and analogue outputs wiring diagrams

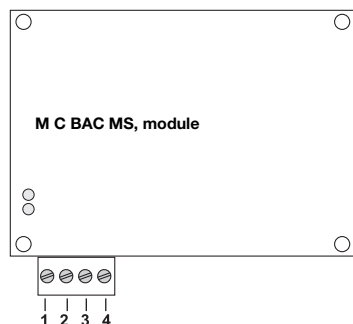


RS485 and RS232 wiring diagrams

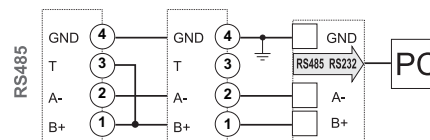


NOTE. RS485: additional devices provided with RS485 are connected in parallel. The termination of the serial output is carried out only on the last instrument of the network, by means of a jumper between (B+) and (T). **A**: the communication RS232 and RS485 ports **can't be** connected and used simultaneously.

RS485 wiring diagram of Bacnet module

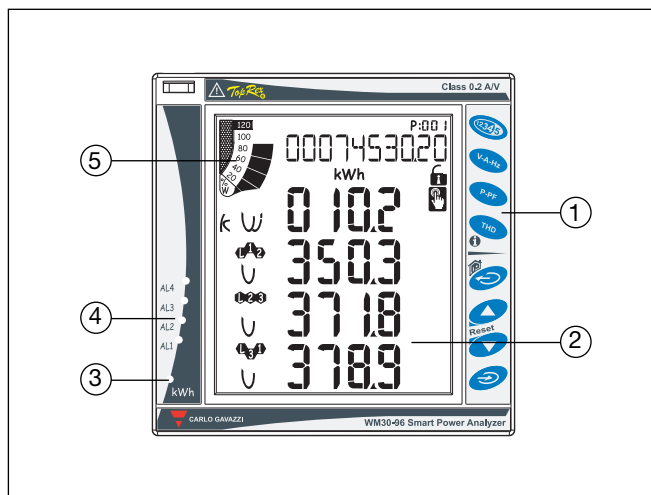


RS485 port



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).

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

