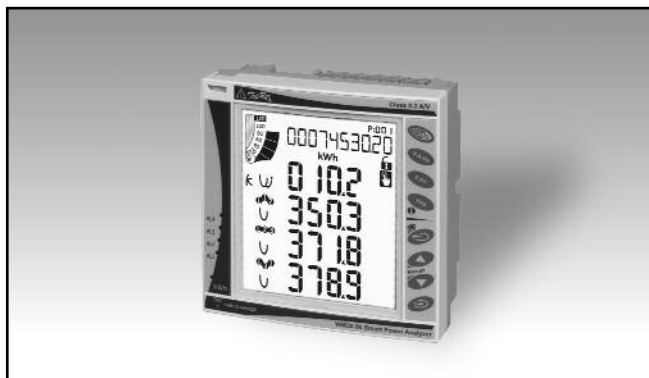# Energy Management
Smart Modular Power Analyzer
Type WM30 96

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)
- Up to 2 digital outputs (pulse, alarm, remote control) (on request)
- Up to 4 freely configurable virtual alarms
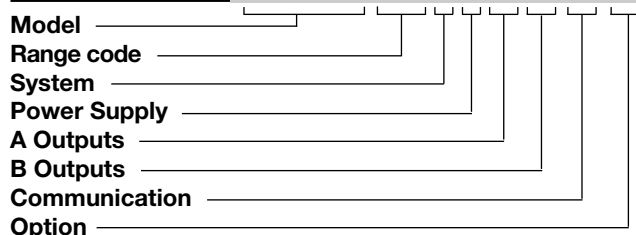- Up to 2 analogue outputs (+20mA, +10VDC) (on request)

- Class 0.5 (kWh) according to EN62053-22
- Class C (kWh) according to EN50470-3
- Class 2 (kvarh) according to EN62053-23
- Accuracy ±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 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

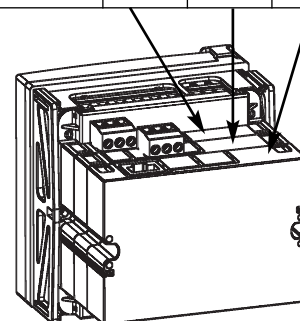| Range codes	System	Power supply	A Outputs
AV4: 400/690V_{LL} AC 1(2)A V_{LN}: 160V to 480V_{LN} V_{LL}: 277V to 830V_{LL}	**3:** balanced and unbalanced load: 3-phase, 4-wire; 3-phase, 3-wire; 2-phase, 3-wire; 1-phase, 2-wire	**H:** 100-240 +/-10% (90 to 255) VDC/AC (50/60 Hz)	**XX:** none **O2:** 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}		**L:** 24-48 +/-15% (20 to 55) VDC/AC (50/60 Hz)	
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	**XX:** none **A2:** Dual channel 20mA DC output **V2:** Dual channel 10V DC output

CARLO GAVAZZI

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

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
Input type	Galvanic insulation by means of built-in CT's
Current range (by CT)	AV5 and AV6: 5(6)A AV4 and AV7: 1(2)A
Voltage (by direct connection or VT/PT)	AV4, AV5: 400/690VLL; AV6, AV7: 100/208VLL

Accuracy (Display + RS485) (@25°C ±5°C, R.H. ≤60%, 48 to 62 Hz)	In: see below, Un: see below
AV4 model	In: 1A, Imax: 2A; Un: 160 to 480VLN (277 to 830VLL)
AV5 model	In: 5A, Imax: 6A; Un: 160 to 480VLN (277 to 830VLL)
AV6 model	In: 5A, Imax: 6A; Un: 40 to 144VLN (70 to 250VLL)
AV7 model	In: 1A, Imax: 2A; Un: 40 to 144VLN (70 to 250VLL)
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)
Phase-neutral voltage	In the range Un: ±(0,2% RDG +1DGT)
Phase-phase voltage	In the range Un: ±(0.5% RDG +1DGT)
Frequency	±0.01Hz (45 to 65Hz)
Active and Apparent power	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)
Power Factor	±[0.001+0.5% (1.000 - "PF RDG")]
Reactive power	From 0.02In to 0.05In, senφ 1: ±(1.5%RDG+1DGT) From 0.05In to Imax, senφ 1: ±(1%RDG+1DGT) 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)
Active energy	Class 0.5 according to EN62053-22, ANSI C12.20 Class C according to EN50470-3.
Reactive energy	Class 2 according to EN62053-23, ANSI C12.1.
Start up current AV5, AV6	5mA
Start up current AV4, AV7	1mA

Energy additional errors	According to EN62053-22, ANSI C12.20,
Influence quantities	Class B or C according to EN50470-3, EN62053-23, ANSI C12.1
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
Temperature drift	≤200ppm/°C
Sampling rate	3200 samples/s @ 50Hz, 3840 samples/s @ 60Hz
Measurements	See "List of the variables that can be connected to:"
Method	TRMS measurements of distorted wave forms.
Coupling type	By means of CT's
Crest factor	AV5, AV6: ≤3 (15A max. peak) AV4, AV7: ≤3 (3A max. peak)

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
Voltage Overloads	
Continuous	1.2 Un
For 500ms	2 Un
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	40 to 440 Hz

Output specifications

Relay outputs (M O R2)

Physical outputs	2 (max. 1 module per instrument)
Purpose	For either alarm output or pulse output
Type	Relay, SPDT type AC 1-5A @ 250VAC; AC 15-1.5A @ 250VAC
Configuration	By means of the front key-pad
Function	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
Min. response time	≤200ms, filters excluded. Set-point on-time delay: "0 s".
Pulse	
Signal retransmission	Total: +kWh, -kWh, +kvarh, -kvarh. Partial: +kWh, -kWh, +kvarh, -kvarh.
Pulse type	Programmable from 0.001 to 10.00 kWh/kvarh per pulse.The above listed variables can be connected to any output.
Pulse duration	≥100ms <120msec (ON), ≥120ms (OFF), according to EN62052-31
Remote controlled outputs	The activation of the outputs is managed through the serial communication port
Insulation	See "Insulation between inputs and outputs" table

Static outputs (M O O2)

	Opto-Mos type
Physical outputs	2 (max. 1 module per instrument)
Purpose	For either pulse output or alarm output
Signal	V_{ON}: 2.5VAC/DC/max.100mA V_{OFF}: 42VDC max.
Configuration	By means of the front key-pad
Function	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
Min. response time	≤200ms, filters excluded. Set-point on-time delay: "0 s".
Pulse	
Signal retransmission	Total: +kWh, -kWh, +kvarh, -kvarh. Partial: +kWh, -kWh, +kvarh, -kvarh.
Pulse type	Programmable from 0.001

	to 10.00 kWh/kvarh per pulse.The above listed variables can be connected to any output.
Pulse duration	≥100ms < 120msec (ON), ≥120ms (OFF), according to EN62052-31
Remote controlled outputs	The activation of the outputs is managed through the serial communication port
Insulation	See "Insulation between inputs and outputs" table

20mA analogue outputs (M O A2)

Number of outputs	2 per module (max. 1 module per instrument)
Accuracy (@ 25°C ±5°C, R.H. ≤60%)	±0.2%FS
Range	0 to 20mA
Configuration	By means of the front key-pad
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".
Scaling factor	Programmable within the whole range of retransmission.
Response time	≤400 ms typical (filter excluded)
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

10VDC analogue outputs (M O V2)

Number of outputs	2 (max. 1 module per instrument)
Accuracy (@ 25°C ±5°C, R.H. 60%)	±0.2%FS
Range	0 to 10 VDC
Configuration	By means of the front key-pad
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".
Scaling factor	Programmable within the whole range of retransmission;
Response time	≤400 ms typical (filter excluded)
Ripple	≤1% (according to IEC 60688, EN 60688)
Total temperature drift	≤350 ppm/°C
Load	≥10kΩ
Insulation	See "Insulation between inputs and outputs" table

      Specifications are subject to change without notice   WM30 96 DS 240914

Output specifications (cont.)

RS485 (on request)

Type	Multidrop, bidirectional (static and dynamic variables)
Connections	2-wire
	Max. distance 1000m, termination directly on the module
Addresses	247, selectable by means of the front key-pad
Protocol	MODBUS/JBUS (RTU)
Data (bidirectional)	
Dynamic (reading only)	System and phase variables: see table "List of variables..."
Static (reading and writing only)	All the configuration parameters.
Data format	1 start bit, 8 data bit, no/even/odd parity,1 stop bit
Baud-rate	Selectable: 9.6k, 19.2k, 38.4k, 115.2k bit/s
Driver input capability	1/5 unit load. Maximum 160 transceivers on the same bus.
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.
Insulation	See "Insulation between inputs and outputs" table

RS232 port (on request)

Type	Bidirectional (static and dynamic variables)
Connections	3 wires. Max. distance 15m
Protocol	MODBUS RTU /JBUS
Data (bidirectional)	
Dynamic (reading only)	System and phase variables: see table "List of variables..."
Static (reading and writing only)	All the configuration parameters
Data format	1 start bit, 8 data bit, no/even/odd parity,1 stop bit
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.
Insulation	See "Insulation between inputs and outputs" table

Ethernet/Internet port (on request)

Protocols	Modbus TCP/IP
IP configuration	Static IP / Netmask / Default gateway
Port	Selectable (default 502)
Client connections	Max 5 simultaneously
Connections	RJ45 10/100 BaseTX
	Max. distance 100m
Data (bidirectional)	
Dynamic (reading only)	System and phase variables: see table "List of variables..."
Static (reading and writing only)	All the configuration parameters.
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.
Insulation	See "Insulation between inputs and outputs" table

BACnet-IP (on request)

Protocols	BACnet-IP (for measurement reading purpose and to write object description) and Modbus TCP/IP (for measurement reading purpose and for programming parameter purpose)
BACnet-IP	
IP configuration	Static IP / Netmask /Default gateway
Port	Fixed: BAC0h
Device object instance	0 to 9999 selectable by key-pad 0 to $2^{22}-2$ = 4.194.302, selectable by programming software or by BACnet.
Supported services	"I have", "I am", "Who has", "Who is", "Read (multiple) Property"
Supported objects	Type 2 (analogue value, including COV property), Type 5 (binary-value for up to 16 virtual alarm re-transmission) Type 8 (device)
IP configuration	Static IP / Netmask / Default gateway
Modbus TCP/IP	See "Ethernet/Internet port" above
Client connections	Modbus only: max 5 simultaneously
Connections	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"
Static (reading and writing only)	All the configuration parameters (Modbus only)
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.
Insulation	See "Insulation between inputs and outputs" table

BACnet MS/TP (on request)

Available ports	2: RS485 and Ethernet
RS485 port	
Type	Multidrop, mono-directional (dynamic variables)
Connections	2-wire Max. distance 1000m, termination directly on the module
Device object instance	0 to 9999 selectable by key-pad 0 to $2^{22}-2 = 4.194.302$, selectable by programming software or by BACnet.
Protocol	BACnet MS/TP (for measurement reading purpose and to write object description)
Supported services	"I have", "I am", "Who has", "Who is", "Read (multiple) Property"
Supported objects	Type 2 (analogue value, including COV property), Type 5 (binary-value for up to 16 virtual alarm re-transmission) Type 8 (device)
Data (mono-directional)	
Dynamic	System and phase variables: see table "List of variables..."
Static	Not available
Data format	1 start bit, 8 data bit, no parity,1 stop bit
Baud-rate	Selectable: 9.6k, 19.2k, 38.4k or 76.8k kbit/s
Driver input capability	1/5 unit load. Maximum 160 transceivers on the same bus.
MAC addresses	Selectable: 0 to 127
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
Connections	RJ45 10/100 BaseTX Max. distance 100m
Data	
Dynamic (reading only)	System and phase variables: see table "List of variables..."
Static (reading and writing only)	All the configuration parameters (Modbus only).
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.
Insulation	See "Insulation between inputs and outputs" table
Approval	BTL

Ethernet/IP (on request)

Protocols	Ethernet/IP (for measurement reading purpose) and Modbus TCP/IP (for programming parameter purpose)
IP configuration	Static IP / Netmask / Default gateway
Modbus Port	Selectable (default 502) Modbus only: max 5 simultaneously RJ45 10/100 Base TX Max distance 100m
Ethernet/IP port	
Topology	Star RJ45 standard Max distance 100m
Level	Commercial level
Connection	Connection establishment: target
Messaging	Class 1 and class 3 messanging
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	
Dynamic (reading only)	System and phase variables (Ethernet/IP): see Ethernet/IP protocol document
Static (reading and writing only)	All the configuration parameters (Modbus TCP only)
Insulation	See "Insulation between inputs and outputs" table
Approval	Ethernet IP conformance tested (ODVA)

Specifications are subject to change without notice   WM30 96 DS 240914

CARLO GAVAZZI

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**	
			Total energy meters	+kWh, +kvarh, -kWh, -kvarh
Energy meter recording	Storage of total and partial energy meters. Energy meter storage format (EEPROM)		Partial energy meters	+kWh, +kvarh, -kWh, -kvarh

Harmonic distortion analysis

Analysis principle	FFT			
Harmonic measurement			**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
Current	Up to the 32nd harmonic			
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		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			
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)			
			Back position LEDs	
Max. and Min. indication	Max. instantaneous variables: 9999; energies: 9 999 999 999. Min. instantaneous variables: 0.000; energies 0.0		On the base On the communication modules	Green as power-on Two LEDs: one for TX (green) and one for RX (amber).
			Key-pad	For variable selection, programming of the instrument working parameters, "dmd", "max", total energy and partial energy Reset
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:			(always on) to 255 minutes
		Virtual alarms		
1st level	Password "0", no protection;	Working condition	In case of basic unit or with the addition of M O R2 or M O O2 digital output modules.	
2nd level	Password from 1 to 9999, all data are protected			
		No. of alarms	Up to 4	
System selection		Working mode	Up alarm and down alarm.	
System 3-Ph.n unbalanced load	3-phase (4-wire)	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. 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.			
		Set-point adjustment	From 0 to 100% of the display scale	
		Hysteresis	From 0 to 100% of the display scale	
System 3-Ph.1 balanced load	3-phase (3-wire), one current and 3-phase to phase voltage measurements	On-time delay	0 to 255s	
		Min. response time	≤ 200ms, filters excluded. Set-point on-time delay: "0 s".	
	3-phase (4-wire), one current and 3-phase to neutral voltage measurements.	**Reset**	By means of the front key-pad. It is possible to reset the following data: - all the max and dmd values. - total energies: kWh, kvarh; - partial energies: kWh, kvarh	
System 3-Ph.2 balanced load	3-phase (2-wire), one current and 1-phase (L1) to neutral voltage measurement.			
System 2-Ph	2-phase (3-wire)			
System 1-Ph	1-phase (2-wire)	**Harmonic analysis**	Up to the 32nd harmonics on current and voltage	
Transformer ratio		**Clock**		
VT (PT)	1.0 to 999.9 / 1000 to 9999.	Functions	Universal clock and calendar.	
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).	Time format	Hour: minutes: seconds with selectable 24 hours or 12H AM/PM format.	
		Date format	Day-month-year with selectable DD-MM-YY or MM-DD-YY format.	
		Battery life	10 years	
Filter		**Easy programming function**	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 "C", "D", "E" and "G" types (see "display pages" table). For those latter selections the energies can be either "imported" or "exported" depending on the current direction.	
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).			
Displaying				
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.			
Backlight	The backlight time is programmable from 0			

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** Safety	IEC60664, IEC61010-1 EN60664, EN61010-1 EN62052-11.
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	Metrology	EN62053-22, EN62053-23, EN50470-3.
		Pulse output	DIN43864, IEC62053-31
		Approvals	Eligible System performance Meter for Go Solar California, CE, cULus "Listed"
Installation category	Cat. III (IEC60664, EN60664)	**Connections** Cable cross-section area	Screw-type max. 2.5 mm². min./max. screws tightening torque: 0.4 Nm / 0.8 Nm. Suggested screws tightening torque: 0.5 Nm
Insulation (for 1 minute)	See "Insulation between inputs and outputs" table		
Dielectric strength	4kVAC RMS for 1 minute		
Noise rejection CMRR	100 dB, 48 to 62 Hz		
EMC Electrostatic discharges Immunity to irradiated	According to EN62052-11 15kV air discharge Test with current: 10V/m from 80 to 2000MHz	**Housing DIN** Dimensions (WxHxD)	Module holder: 96x96x50mm. "A" and "B" type modules: 89.5x63x16mm. "C" type module: 89.5x63x20mm.
Electromagnetic fields	Test without any current: 30V/m from 80 to 2000MHz		
Burst	On current and voltage measuring inputs circuit: 4kV	Max. depth behind the panel	With 3 modules (A+B+C): 81.7 mm
Immunity to conducted disturbances	10V/m from 150KHz to 80MHz	Material	ABS/Nylon PA66, self-extinguishing: UL 94 V-0
Surge	On current and voltage measuring inputs circuit: 4kV; on "L" auxiliary power supply input: 1kV	Mounting	Panel mounting
		Protection degree Front Screw terminals	IP65, NEMA4x, NEMA12 IP20
Radio frequency suppression	According to CISPR 22	**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).

CARLO GAVAZZI

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= $\sum$
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= $\sum$
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= $\sum$
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= $\sum$
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= $\sum$
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= $\sum$
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

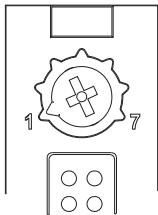| Var Type	No	Line 1 Variable Type	Line 2 Variable Type	Line 3 Variable Type	Line 4 Variable Type	Line 5 Variable Type	Note	A	B	C	D	E	F	G
	0	Home page	Programmable					x	x	x	x	x	x	x
a	1	Total kWh (+)	b, c, d	b, c, d	b, c, d	b, c, d		x	x	x	x	x	x	x
a	2	Total kvarh (+)	b, c, d	b, c, d	b, c, d	b, c, d		x	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 ∑	VL1	VL2	VL3	(1) (2)			x	x	x	x
b	11	a/Phase seq.	VLN ∑	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 ∑	AL1	AL2	AL3	(1) (2)			x	x	x	x
c	15	a/Phase seq.	W ∑	WL1	WL2	WL3	(1) (2)			x	x	x	x
c	16	a/Phase seq.	var ∑	var L1	var L2	var L3	(1) (2)				x	x	x
c	17	a/Phase seq.	PF ∑	PF L1	PF L2	PF L3	(1) (2)				x	x	x
c	18	a/Phase seq.	VA ∑	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).

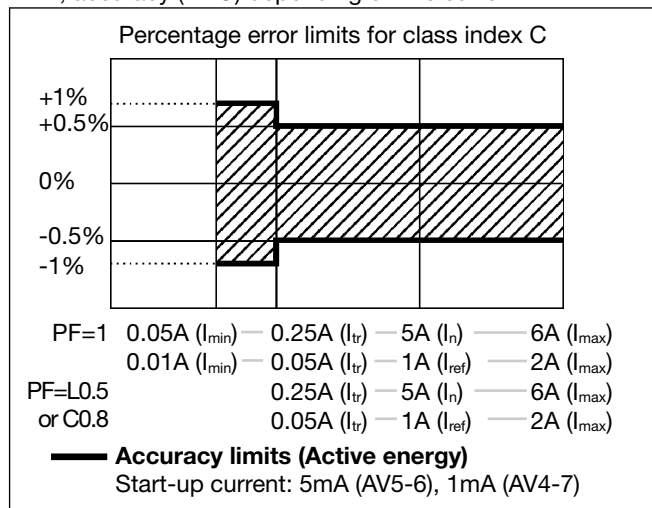# Additional available information on the display

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.

CARLO GAVAZZI

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

kWh, accuracy (RDG) depending on the current

Percentage error limits for class index C

```
+1%
+0.5%
0%
-0.5%
-1%
```

PF=1	0.05A (I_{min}) — 0.25A (I_{tr}) — 5A (I_n) — 6A (I_{max})
	0.01A (I_{min}) — 0.05A (I_{tr}) — 1A (I_{ref}) — 2A (I_{max})
PF=L0.5	0.25A (I_{tr}) — 5A (I_n) — 6A (I_{max})
or C0.8	0.05A (I_{tr}) — 1A (I_{ref}) — 2A (I_{max})

━━ Accuracy limits (Active energy)
Start-up current: 5mA (AV5-6), 1mA (AV4-7)

kvarh, accuracy (RDG) depending on the current

Error

```
+2,5%
+2%
0%
-2%
-2,5%
```

sinj=1	0.1A — 0.25A — 5A (I_n) — 6A (I_{max})
	0.02A — 0.05A — 1A (I_b) — 2A (I_{max})
sinj=0.5	0.25A — 0.5A — 5A (I_n) — 6A (I_{max})
	0.05A — 0.1A — 1A (I_b) — 2A (I_{max})

━━ Accuracy limits (Reactive energy)
Start-up current: 5mA (AV5-6), 1mA (AV4-7)
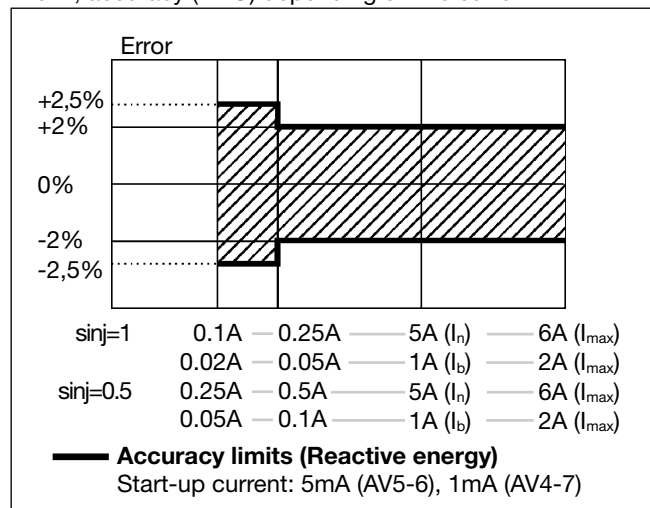
WM3040Soft parameter progr. and var. reading software

| **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

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

Instantaneous active power

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

Instantaneous power factor

$$\cos\varphi_1 = \frac{W_1}{VA_1}$$

Instantaneous effective current

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

Instantaneous apparent power

$$VA_1 = V_{1N} \cdot A_1$$

Instantaneous reactive power

$$var_1 = \sqrt{(VA_1)^2 - (W_1)^2}$$

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

$$var_\Sigma = (var_1 + var_2 + var_3)$$

Three-phase active power

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

Three-phase apparent power

$$VA_\Sigma = \sqrt{W_\Sigma^2 + var_\Sigma^2}$$

Total harmonic distortion

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

Three-phase power factor

$$\cos\varphi_\Sigma = \frac{W_\Sigma}{VA_\Sigma} \qquad \text{(TPF)}$$

Energy metering

$$k\,var\,hi = \int_{t1}^{t2} Qi(t)dt \cong \Delta t \sum_{n1}^{n2} Qnj$$

$$kWhi = \int_{t1}^{t2} Pi(t)dt \cong \Delta t \sum_{n1}^{n2} Pnj$$

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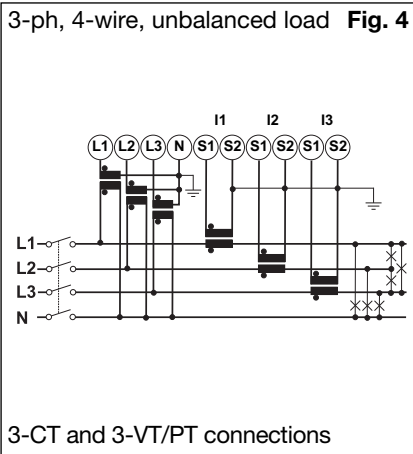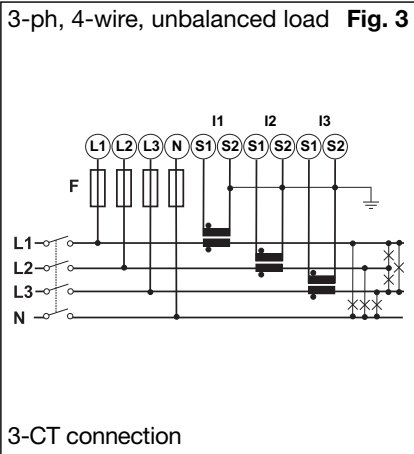**n₁, n₂** = starting and ending discrete
time points of consumption recording

CARLO GAVAZZI
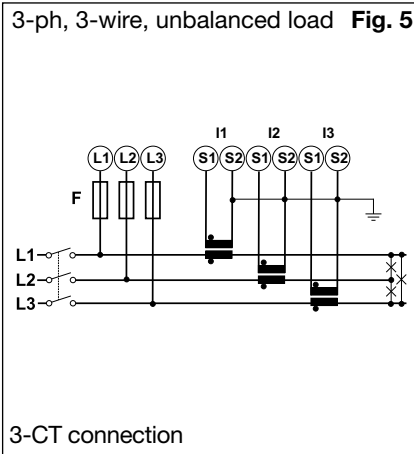
Wiring diagrams

Power Supply

WM30 BACK-VIEW

System type selection: 3-Ph.2

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

1-CT connection

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

1-CT and 1-VT/PT connections
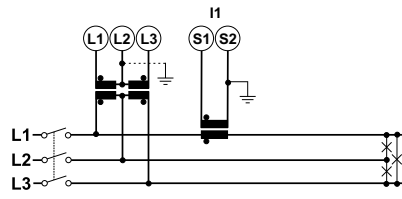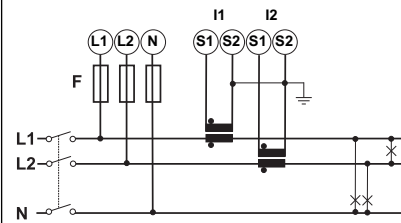
System type selection: 3-Ph.n

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

3-CT connection

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

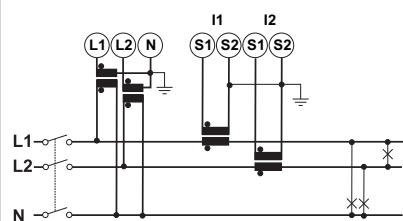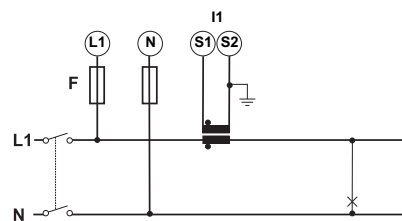
3-CT and 3-VT/PT connections

System type selection: 3-Ph

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

3-CT connection

System type selection: 3-Ph (cont.)

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

3-CT and 2-VT/PT connections

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

2-CT connections (ARON)

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

2-CT and 2-VT/PT connections ARON

Wiring diagrams

System type selection: 3-Ph.1

3-ph, 3-wire, balanced load	**Fig. 9**

L1 L2 L3 (S1)(S2) I1

L1
L2
L3
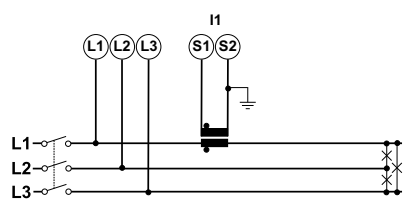
1-CT connections

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

L1 L2 L3 (S1)(S2) I1

L1
L2
L3

1-CT and 2-VT/PT connections

System type selection: 2-Ph

2-ph, 3-wire	**Fig. 11**

(L1)(L2)(N) (S1)(S2)(S1)(S2) I1 I2

F

L1
L2
N

2-CT connection

System type selection: 2-Ph (cont.)

2-ph, 3-wire	**Fig. 12**

(L1)(L2)(N) (S1)(S2)(S1)(S2) I1 I2

L1
L2
N

2-CT and 2-VT/PT connections

System type selection: 1-Ph

1-ph, 2-wire	**Fig. 13**

(L1) (N) (S1)(S2) I1

F

L1
N

1-CT connection

1-ph, 2-wire	**Fig. 14**

(L1) (N) (S1)(S2) I1

L1
N
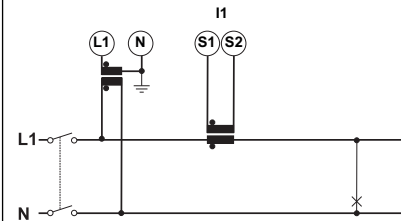
1-CT and 1-VT/PT connections

Power Supply

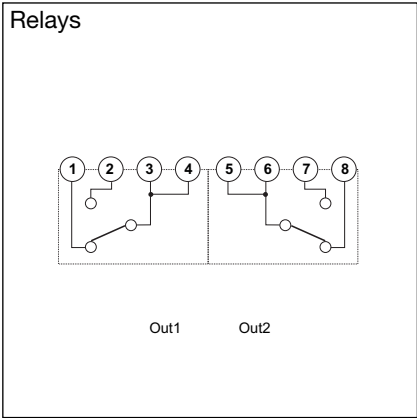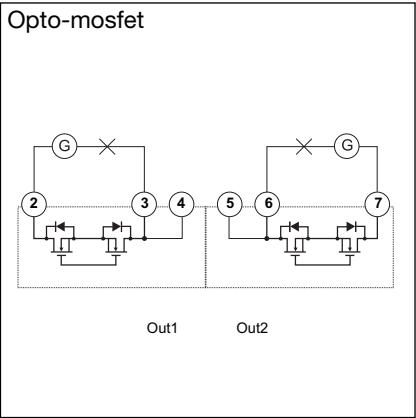| 90 to 260VAC/DC (H option)	**Fig. 15**

1 2

F

N ~ -
L ~ +
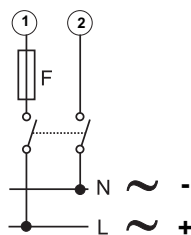
F= 250V [T] 630mA

18 to 60VAC/DC (L option)	**Fig. 16**

1 2

F

N ~ -
L ~ +

F= 250V [T] 3,15A

CARLO GAVAZZI
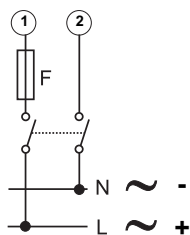
Static, relay and analogue outputs wiring diagrams

M O O2, M O R2, modules

Out 1   Out 2

1 2 3 4 5 6 7 8

Opto-mosfet

Out1   Out2

Relays

Out1   Out2

M O A2, M O V2, modules

Out 1   Out 2

1 2 3 4

Analogue 20mA DC

Out1   Out2

+ A -   + A -

1 2   3 4

Analogue 10V DC

Out1   Out2

+ V -   + V -

1 2   3 4
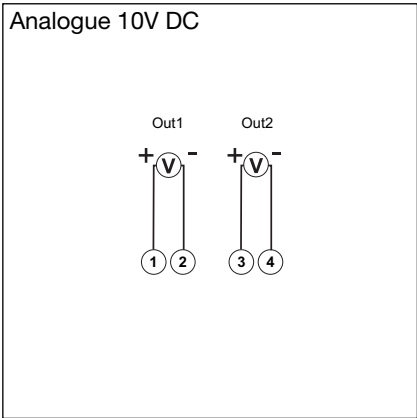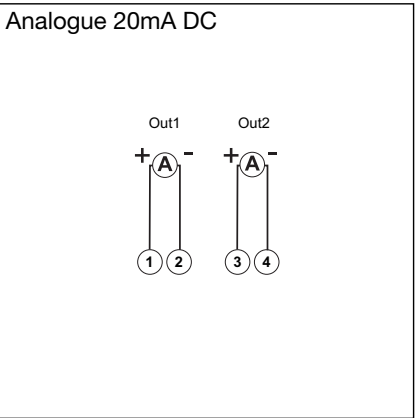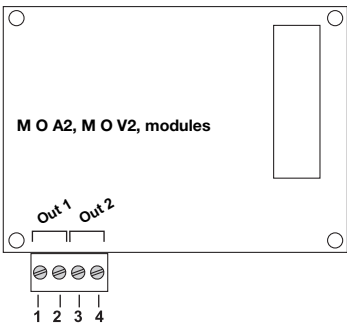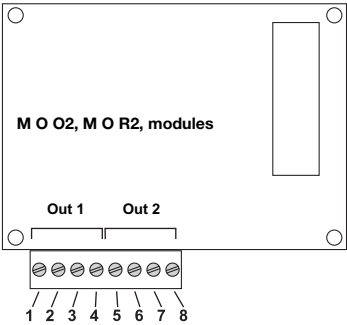
RS485 and RS232 wiring diagrams
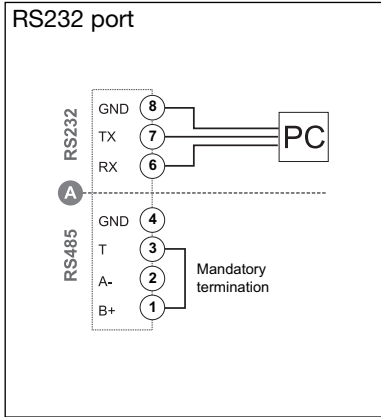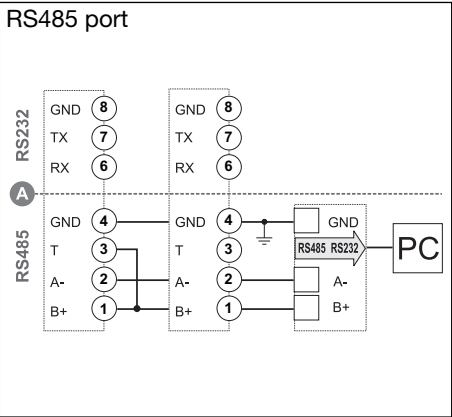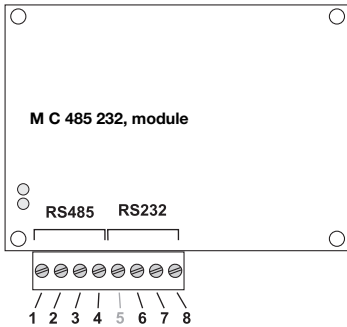
M C 485 232, module

RS485   RS232

1 2 3 4 5 6 7 8

RS485 port

RS232
GND 8
TX 7
RX 6

RS485
GND 4
T 3
A- 2
B+ 1

RS232
GND 8
TX 7
RX 6

RS485
GND 4
T 3
A- 2
B+ 1

GND
RS485 RS232
A-
B+

PC

RS232 port

RS232
GND 8
TX 7
RX 6

PC

RS485
GND 4
T 3
A- 2
B+ 1

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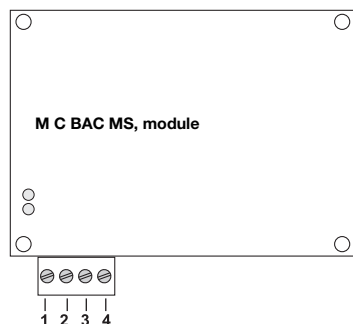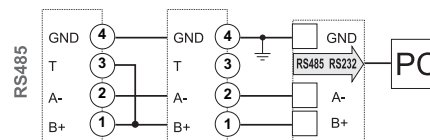
NOTE. RS485: additional devices provided with RS485 are connected in parallel. The termination of the serial output is carried out only on the last instrument of the network, by means of a jumper between (B+) and (T). **A**: the communication RS232 and RS485 ports **can't be** connected and used simultaneously.

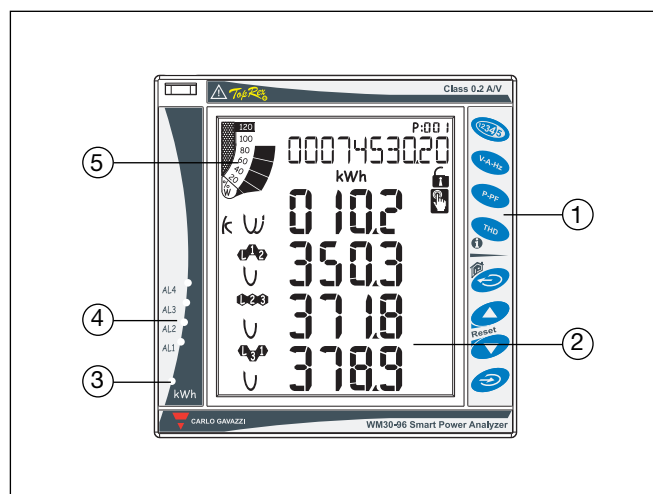# RS485 wiring diagram of Bacnet module

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.

CARLO GAVAZZI

Dimensions and Panel cut-out

Specifications are subject to change without notice   **WM30 96 DS 240914**