Energy Management Modular Smart Power Quality Analyzer Type WM3-96





- Sampling rate: 10 samples/s
- Harmonic distorsion analysis (FFT) up to 50th harmonic with both graph and numerical indication (of current and voltage)
- Harmonics source detection
- Optional RS232 + real time clock function with data logging of alarm and MIN/MAX events, montly energy metering recording

Product Description

32-bit µP-based smart power quality analizer with a built-in configuration key-pad.

The housing is for panel mounting and ensures a degree of protection (front) of IP 65. The instrument is particularly indicated for those application where there is the need to control the power supply quality. The variables being displayed are more than 400.

- Class 0.5 (current/voltage)
- 32-bit µP-based modular smart power quality analyzer
- Graph display (128x64 dots)
- Front size: 96x96 mm
- Measurements of single phase and system variables: W, Wdmd, VA, VAdmd, PF, PFavg, V, A, An dmd (for all of them max. and min. values). Energies: ±kWh, 4 quadrant varh measurement.
- Neutral current measurement
- TRMS measurement of distorted waves (voltage/current)
- Current and voltage inputs with autoranging capability
- 4x4-dgt instantaneous variable read-out
- 4x9-dgt total energies read-out
- 4x6-dgt partial energies read-out
- 48 independent energy meters to be used as single, dual, multi-time energy management
- Degree of protection (front): IP 65
- Up to 4 optional alarm setpoints
- Up to 4 optional pulse outputs
- Up to 4 optional analogue outputs
- Optional serial RS 422/485 output
- Universal power supply: 18 to 60VAC/DC 90 to 260 VAC/DC
- MODBUS RTU, JBUS, N2 METASYS protocols (on request)

Ordering Key WM3-96AV53H XX XX XX XX X

Model	
Range code ——	
System ———	
Power supply ——	
Slot A ———	
Slot B ———	
Slot C	
Slot D	
Options ———	

Type Selection

¹⁾On request

Rang	Range code		A (signal retransmission)	Slot I	B (communication)	Slot (C (alarm or pulse out)
AV5:	240/415 VAC - 1/5 AAC	XX: A1:	None Single analogue output, 20mADC (standard)	XX: B1:	None Dual analogue output, 20mADC (standard)	XX: R1:	None Single relay output, (AC1-8AAC, 250VAC) ¹⁾
	(max. 300 V (L-N)/ 520 V (L-L) - 6 A)	A2:	Single analogue output, ±5mADC ¹⁾	B2:	Dual analogue output, ±5mADC ¹⁾	R2:	(AC1-8AAC, 250VAC) ¹ Dual relay output, (AC1-8AAC, 250VAC) ¹
AV7:	(standard) 400/690VAC -	A3:	Single analogue output, ±10mADC ¹⁾	B3:	Dual analogue output, ±10mADC ¹⁾	01:	Single open collector output (30V/100mADC) ¹⁾
	1/5 AAC (max. 480V (L-N) /	A4:	Single analogue output, ±20mADC ¹⁾	B4:	Dual analogue output, ±20mADC ¹⁾	02:	Dual open collector out- put (30V/100mADC) ¹⁾
_	830 V (L-L) / 6 A ¹⁾	B1:	Dual analogue output, 20mADC (standard)	W1:	Dual analogue output, 10VDC (standard)	D1:	3 digital inputs ¹⁾
System		B2:	Dual analogue output, ±5mADC ¹⁾	W2:	Dual analogue output, ±1VDC ¹⁾	Slot [D (alarm or pulse out)
3:	One phase, three-	B3:	Dual analogue output, ±10mADC ¹⁾	W3:	Dual analogue output, ±5VDC ¹⁾		/
	phase system (3 or 4 wires, balan-	B4:	Dual analogue output, ±20mADC ¹⁾	W4:	Dual analogue output, ±10VDC ¹⁾	XX: R2:	None Dual relay output,
	ced load) Three phase system	V1:	Single analogue output, 10VDC (standard)	S1:	Serial port, RS485 multidrop,	02:	(AC1-8AAC, 250VAC) ¹⁾ Dual open collector out-
	(3 or 4 wires, unba- lanced load)	V2:	Single analogue output, ±1VDC ¹⁾		bidirectional ¹⁾	04:	put (30V/100mADC) ¹⁾ 4 open collector out-
		V3:	Single analogue output, ±5VDC ¹⁾	Note:	:		puts (30V/100mADC) 1)
Powe	er supply	V4:	Single analogue output, ±10VDC ¹⁾		A + Slot B 4 analogue outputs	Optio	ons
L:	18 to 60VAC/DC ¹⁾	W1:	Dual analogue output, 10VDC (standard)		C + Slot D	X:	None
H:	90 to 260VAC/DC	W2:	Dual anàlogue output, ±1VDC ¹⁾		4 digital outputs	S: N:	Serial RS232 + RTC With N2 Metasys protocol
		W3:	Dual analogue output, ±5VDC ¹⁾			C:	options: S+N
$1) \cap n$	roquoot						

Specifications are subject to change without notice WM3-96DS0303

W4:

Dual analogue output,

±10VDC 1

Input Specifications

Number of inputs		Magnetic field	≤ 0.5%RDG, @ 400 A/m
Current	2 (system code: 3)	Temperature drift	≤200ppm/°C
N / 11	6 (system code: 3)	Sampling rate	6400 samples/s @ 50Hz
Voltage	2 (system code: 3) 4 (system code: 3)	Display	Graph LCD, 128x64dots,
Digital	3 free of voltage con- tacts for Wdmd, VAdmd, An dmd, PFavg synchronization Reading voltage/current: 17.5 to 25VDC/<8mA	ызрау	back-lighted. Selectable read-out for the instanta- neous variables: 4x4-dgt or 4x3 ¹ / ₂ -dgt Total Energies: 4x9-dgt;
Accuracy (display, RS232, RS485)	In: 5A, If.s.: 6A, start-up I: 15mA		Partial: 4x6-dgt
Current (A_{L1} , A_{L2} , A_{L3})	±0.5% RDG (0.2 to1.2 ln) ±5mA (0.02 to 0.2 ln)	Max. and min. indication	Max. 9999 (999999999), Min9999 (–999999999)
Current (A _n)	±1% RDG (0.2 to 1.2 ln)	Measurements	Current, voltage, power,
	@ 40 to 100 Hz		energy, harmonic distortion
Voltage AV5 range:	±0.5% RDG (48 to 300 V _{L-N}) ±1% RDG (84 to 519 V _{L-L})		(see "Display pages" table). TRMS measurement of a dis- torted wave (voltage/current).
AV7 range:	$\begin{array}{l} \pm 0.5\% \mbox{ RDG} (80 \mbox{ to } 480 \mbox{ V}_{L-N}) \\ \pm 1\% \mbox{ RDG} (139 \mbox{ to } 830 \mbox{ V}_{L-L}) \\ includes also: \\ frequency, power supply \end{array}$		Coupling type: Direct Crest factor: ≤3 (max. 15Ap/500Vp (V L-N) or 15Ap/800Vp (V L-N)
Frequency	and output load influences ±0.1% RDG (40 to 440 Hz)	Ranges (impedances)	
Frequency Active power	±0.1% NDG (40 to 440 Hz)	AV5	58/100 V (>500 kΩ) -
Active power (@ 25°C ± 5°C, R.H. ≤ 60%)	±0.5% (RDG + FS) (PF 0.5 L/C, 0.1 to 1.2 ln, AV5 range) or ±1% RDG (PF 0.5 L/C, 0.1 to 1.2 ln, AV5 range)		1 AAC (≤ 0.3 VA) 58/100 V (>500 kΩ) - 5 AAC (≤ 0.3 VA) 240/415 V (>500 kΩ) -
Reactive power	0.1 to 1.2 m, / wo range)		1 AAC (≤ 0.3 VA)
(@ 25°C ± 5°C, R.H. ≤ 60%)	±0.5% (RDG + FS) (PF 0.5 L/C, 0.1 to 1.2 ln, AV5 range) or ±1% RDG (PF 0.5 L/C, 0.1 to 1.2 ln, AV5 range)	AV7	240/415 V (>500 kΩ) - 5 AAC (≤ 0.3 VA) 100/170 V ((>500 kΩ) 1 AAC (≤ 0.3 VA)
Apparent power			100/170 V (>500 kΩ) - 5 AAC (≤ 0.3 VA)
(@ 25°C ± 5°C, R.H. ≤ 60%)	±0.5% (RDG + FS) (0.1 to 1.2 ln, AV5 range) or ±1% RDG (0.1 to 1.2 ln, AV5 range)		400/690 V (>500 kΩ) - 1 AAC (\leq 0.3 VA) 400/690 V (>500 kΩ) - 5 AAC (\leq 0.3 VA)
Energies (@ 25°C ± 5°C, R.H. ≤ 60%)	Active: class 1 according to	Frequency range	40 to 440 Hz
$(@ 25 0 \pm 5 0, 11.11. \le 0070)$	EN61036	Over-load protection	10 10 110 112
	Reactive: class 2 according to EN61268	Continuous: voltage/current	AV5: 300 V _{LN} /520 V _{LL} /6A AV7: 480 V _{LN} /830 V _{LL} /6A
	Ib: 5A, Imax: 6A	For 1 s	
	0.11b: 500mA Start up current: 20mA	AV5	600 V _{LN} /1040 V _{LL} /120A
	Un: 240V (AV5), 400V (AV7)	AV7	960 V _{LN} /1660 V _{LL} /120A
Harmonic distorsion (@ 25°C \pm 5°C, R.H. \leq 60%)	1% FS (FS: 100%) phase: ±2°; Imin: 0.1Arms; Imax: 15Ap; Umin: 50Vrms; Umax: 500Vp Sampling frequency 6400 samples/s @ 50Hz	Keypad	4 keys: "S" for enter programming phase and password confir- mation, "UP" and "DOWN" for value programming/function selection, page scrolling
Additional errors			"F" for special functions
Humidity Input frequency	\leq 0.3%RDG, 60% to 90% R.H. \leq 0.4%RDG, 62 to 400 Hz		

Output Specifications

Analogue outputs (on request)	
Number of outputs	Up to 4 (on request)
Accuracy	±0.2% FS)
2	(@ 25°C ±́5°C, R.H. ≤60%)
Range	0 to 20 mADC,
-	0 to ±20 mADC

0 to ± 10 mADC, 0 to ± 5 mADC 0 to 10 VDC, 0 to ± 10 VDC 0 to ± 5 VDC 0 to ± 1 VDC



Output Specifications (cont.)

whole range of retransmissionJata format1-start bit, 8-data bit,ision; it allows the retransmission management of all values from; 0 to 20 mADC, 0 to 20 mADC, 0 to 20 mADC, 0 to 20 mADC, 0 to 210 mADC, 1100 0 to 25 mADC, 1100 0 to 210 m	Cooling foots:		Compactions	
sinc; it allows the retransmission management of all values from: 0 to 20 mADC, 0 to ±20 mADC, 0 to ±20 mADC, 0 to ±0 VDC, 0 to ±10 VDC, 10 VDC, 112 dgt indication) 112 to mA output 110 V Output 110	Scaling factor	0		3 wires, max. distance 15m,
mission management of all values from: 0 to 20 mADC, 0 to ±0 NDC, 0 to ±10 VDC, 0 to ±10 VDC, 2 200 ppm/°C 2 200 ppm/°C 1 10 Q output ± 10 mA output ± 5 mA output ± 10 mA output ± 10 mA output ± 10 mA output ± 10 kΩ ± 5 V output ± 10 kΩ to ±10 kΩ to			Data Iomiat	
variables to be retransmitted values from: 0 to 20 mADC, 0 to ±0 VDC Protocol MODEUS (JEUS), 2 as a soft 3242/485 Variables to be retransmitted Al (see table? List of the variables that can be connected to?) Eventues 2 200 ms typical Up to 4 outputs (con request) Up to 4 outputs (con request) Ripple ≤ 200 ms typical (filter excluded, 3 1/2 dgt indication) Pulse outputs (on request) Up to 4, independent rom to 10 to 10 VDC, 0 to ±50 MD Pulse outputs (on request) Up to 4, independent rom 1 to 1000 progra pulses for K-MG Wh, KL Vor: 30 VDC max. Up to 4, independent rom 1 to 1000 progra pulses for K-MG Wh, KL Vor: 30 VDC max. Pulse outputs (on request) Up to 4, independent rom 1 to 1000 progra pulses for K-MG Wh, KL Vor: 30 VDC max. Up to 4, independent rom 1 to 1000 progra pulses for K-MG Wh, KL Vor: 30 VDC max. 10 V output ± 10 V output Addresses ≥ 10 kQ ± Vormac variables) Pulse duration measuring input 4000Vme output to supply input MUB (arctional (state on the charecteristics and dynamic variables) Note Pulse duration By means of optocouplers, Number of setpoints Al (see table? List of the variables on the module that can be connected to?) Al (see table? List of the variables in tata ca be connected to?) Al (see table? List of the variab			Baud-rate	
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D to ±10 mADC, 0 to ±5 mADC 0 to ±10 VDC, 0 to ±10 VDC, 0 to ±10 VDC 0 to ±10 VDC 0 to ±10 VDC 0 to ±10 VDC 0 to ±5 VDC 0 to ±10 VDC 0 to ±10 VDC 10 to ±1 VDC 0 to ±10 VDC 10 to ±10 VDC 110 V output ±10 mA output ±10 V output ±10 K2 ±10 VA2 ±10 V output ±10 V output ±10 K2 ±10 K2 ±10 V output ±10 K2 ±10 K2 to to ±10 K20 Cancelable the table visable visable visable the table visable visable visable that can be connected to")Definition (bit is table visable the table visable visable that can be connected to")Definition (bit is table visable that can be connected to")Data (bidirectional) Dynamic (reading only)NoteDit of 4, independent Visable visable that can be connected to")Up to 4, independent Visable visable that can be connected to")Data formatAld cesses that can be connected to")NoteUp to 4, independent Visable visable that can be connected to")Data formatAld cesses that can be connected to")Visable visable visable that can be connected to")Data formatAld cesses of energy, activation of<		· · · · · · · · · · · · · · · · · · ·	Other data	as for RS422/485
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Variables to be retransmitted 0 to 10 VDC, 0 to ± 10 VDC The working of the or pulse or alarm or bot them is fully program and is independent it chosen output modu puts remotely controlled Response time < 200 nms typical (filter excluded, FFT excluded 3 1/2 dg indication) Yulse outputs (on request) Ripple < 11% according to IEC 60688-1 and EN 60688-1 200 ppm/°C Winse of outputs 200 ppm/°C Temperature drift 200 ppm/°C Load: 200 mA output ± 200 mA output < 505 0.2 ± 110 mA output ± 5 V output < 10 kΩ ± 10 voutput ± 6 V output < 10 kΩ ± 10 voutput ± 10 voutput < 10 kΩ ± 10 voutput donotput ± 10 voutput < 10 kΩ ± 10 voutput connections 4 wires, max. distance 1000W _{mes} output to supply input 4000W _{acts} output to supply input for nequest) Data (bidirectional) Pynamic (reading only) All display variables (see also the table, "List of the variables that can be connected fo") All configuration parameters, reset of energy, activation of digital output, "List of the variables that can be connected fo"		· ·		tion of alarms and pulse
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HippleStatic (writing only)Hit display variables h display variables that table, Min. response timeHuse outputs (on request) Number of outputs TypeUp to 4, independent From 1 to 1000 program pulses tor K-M-G Wh, KA open collector (NPN th Vork 30 NDC max. Vorge 30 NDC max. Outputs connectable and partial energy man. ConnectionsUp to 4, independent From 1 to 1000 program pulses tor K-M-G Wh, KA open collector (NPN th Vork 30 NDC max. Outputs connectable and partial energy man. ConnectionsUp to 4, independent From 1 to 1000 program pulses tor K-M-G Wh, KA Open collector (NPN th Vork 30 NDC max. Outputs connectable and partial energy man. Outputs 210 KΩRS422/RS485 output (on request)Multidrop bidirectional (static and dynamic variables) 4 wires, max. distance that table, "List of the variables that table, "List of the variables that table, energy (EEPRON) max. 999 999 sWh/K/Wh Data formatAll display variables (see also the table, "List of the variables in tar an be connected to") All configuration parameters, reset of energy, activation of digital outputVariables to be controlled All configuration parameters, reset of energy, activation of digital outputVariables to be controlled All configuration parameters, reset of energy, activation of digital outputVariables to be controlled All configuration parameters, reset of energy, activation of digital outputVariables to be controlled All configuration parameters, reset of energy, activation of digital outputVariables to be controlled All configuration parameters, reset of energy, activation of digital outputVariables to be controlled All configuration parameters, reset of energy, acti				puts remotely controlled by
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Temperature drift 200 ppm°C Load: 20 mA output ±20 mA output ≤ 600 Ω ±20 mA output ≤ 550 Ω ±10 mA output ≤ 550 Ω ±10 mA output ≤ 10 kΩ ± 5 ma output ≥ 10 kΩ ± 10 V output ≥ 10 kΩ ± 10 V output ≥ 10 kΩ by output ≥ 10 kΩ by output ≥ 10 kΩ hsulation by means of optocouplers, 4000V _{RMS} output to supply input RS422/RS485 output Multidrop (on request) Multidrop bidirectional (static and dynamic variables) Addresses 1 to 255, selectable by key-pad MODBUS RTU /JBUS, N2 MEATSYS (on request) Addresses 1 to 255, selectable by key-pad MODBUS RTU /JBUS, N2 MEATSYS (on request) Data (bidirectional) All display variables (see also the table, "List of the variables that can be connected to") All configuration parameters, reset of energy, activation or digital output Static (writing only) Data format max. 99.999.990 Wh/kWA/kh Data format max. 99.999.990 Wh/kWA/kh	Ripple			Up to 4, independent
Temperature drift Load: 20 mA output ± 20 mA output ± 20 mA output ± 20 mA output ± 5 mA output ± 5 mA output ± 5 mA output ± 10 voutput ± 10 Voutput ± 10 Voutput ± 10 Voutput ± 10 Voutput ± 10 KQ ± 5 Voutput ± 10 kQ ± 1 Voutput ± 1 Voutput ± 10 kQ ± 1 Voutput ± 1 Voutput to neasuring input dynamic variables) Aldresses ProtocolPulse duration Huitdrop bidirectional (static and dynamic variables) All display variable (see also that can be connected to") All display variables (see also that can be connected to") All configuration parameters, reset of energy, (EEPROM) max Stored energy (EEPROM) max set of energy (EEPROM) <br< td=""><td>ippic</td><td></td><td>Туре</td><td>From 1 to 1000 programmable</td></br<>	ippic		Туре	From 1 to 1000 programmable
Load: 20 mA output ≤ 600 Ω open collector (NPN tr Von 1.2 VDC/max. 1 ±20 mA output ≤ 550 Ω Von 1.2 VDC/max. 1 Von 1.2 VDC/max. 1 ±10 mA output ≤ 10 kΩ Pulse duration Outputs connectable and partial energy m ±10 V output ≥ 10 kΩ Pulse duration 220 ms (ON), ≥ 220 m ± 5 V output ≥ 10 kΩ Pulse duration By means of optocouplers, 4000V _{FMS} output to measuring input Note Insulation By means of optocouplers, 4000V _{FMS} output to measuring input Note The outputs can be e open collector type of 4000 V _{mm} output to ype (for this latter on the characteristics m Connections Multidrop bidirectional (static and dynamic variables) Number of setpoints Alarm type Up to 4, independent Up alarm, down alam alarm with latch, phase assy phase loss, neutral to All configuration parameters, Nall configuration parameters, erset of energy, activation digital output Variables to be controlled Setpoint adjustment Hysteresis Up to 4, independent Up alarm, down alam alarm with latch, phase assy phase loss, neutral to 0 to 100% of the electric 0 to 100% of th	Temperature drift			pulses for K-M-G Wh, K-M-G VArh,
±20 mA output≤ 1100 Ω± 10 mA output≤ 10 kΩ± 5 mA output≥ 200 Ω10 V output≥ 10 kΩ± 10 V output≥ 10 kΩ± 5 V output≥ 10 kΩ± 1 V output≥ 10 kΩ± 1 V output≥ 10 kΩInsulationBy means of optocouplers, 4000V _{rais} output to measuring input 4000V _{rais} output to supply inputRS422/RS485 output (on request)Multidrop bidirectional (static and dynamic variables) 4 wires, max. distance 1200m, termination directly on the moduleAddresses Protocol10 255, selectable by key-pad MODBUS RTU /JBUS, N2 MEATSYS (on request)Data (bidirectional) Dynamic (reading only)All display variables (see also that can be connected to") All configuration parameters, or digital outputData formatAll configuration parameters, od parity, vere parity, od parity, 1 stop bitData format1-start bit, 8-data bit, no parity/even parity, od parity, 1 stop bitData format1-start bit, 8-data bit, no parity/even parity, odd parity, 1 stop bitData format1-start bit, 8-data bit, no parity/even parity, odd parity, 1 stop bitData format1-start bit, 8-data bit, no parity/even parity, odd parity, 1 stop bitData format1-start bit, 8-data bit, no parity/even parity, odd parity, 1 stop bitData format1-start bit, 8-data bit, no parity/even parity, odd parity, 1 stop bitData format1-start bit, 8-data bit, no parity/even parity, odd parity, 1 stop bitData format1-start bit, 8-data bit, no parity/even parity, odd p		$\leq 600 \Omega$		open collector (NPN transistor)
± 10 fix 6 utput≤ 110 02± 5 mA output≥ 2200 Ω10 V output≥ 10 kΩ± 10 V output≥ 10 kΩ± 5 V output≥ 10 kΩ± 1 V output≥ 10 kΩ± 1 V output≥ 10 kΩlnsulationBy means of optocouplers, 4000V _{RMS} output to measuring input 4000V _{RMS} output to supply inputRS422/RS485 output (on request)Multidrop bidirectional (static and dynamic variables)ConnectionsMultidrop bidirectional (static and dynamic variables)Addresses Protocol1 to 255, selectable by key-pad MODBUS RTU /JBUS, N2 MEATSYS (on request)Data (bidirectional) Dynamic (reading only)All display variables (see also the table, "List of the variables that can be connected to") All configuration parameters, reset of energy, activation of digital output Stored energy, activation of digital output Data formatAll display variables (see also that table, "List of the variables that can be connected to") All configuration parameters, reset of energy, activation of digital output Stored energy (EEPROM) max. 999.999.999 kWh/kVArh 1-start bit, 8-data bit, no parity/even parity, odd parity, 1 stop bitVariables to be controlledAll cesponse time that can be connected to") All configuration parameters, reset of energy, activation of digital outputStatic (writing only)All cesponse time that can be connected to") All configuration parameters, reset of energy, activation of digital outputStatic formally energized, normally energized, normally energized, normally 		\leq 550 Ω		
10 V output≥ 10 kΩ±10 V output≥ 10 kΩ±10 V output≥ 10 kΩ± 5 V output≥ 10 kΩ± 1 V output≥ 10 kΩhsulationBy means of optocouplers, 4000V _{RMS} output to measuring input 4000V _{RMS} output to supply inputRS422/RS485 output (on request)Multidrop bidirectional (static and dynamic variables) 4 wires, max. distance 1200m, termination directly on the moduleAddresses ProtocolMultidrop bidirectional) Dynamic (reading only)Atdresses ProtocolAl display variables (see also that can be connected to") All configuration parameters, reset of energy, activation of digital outputData format1-start bit, 8-data bit, no parity/even parity, odd parity, 1 stop bitData format1-start bit, 8-data bit, no parity/even parity, odd parity, 1 stop bitMin. response timeMin. response timeMin. response timeAt format1-start bit, 8-data bit, no parity, even parity, odd parity, 1 stop bit				Outputs connectable to total
10 V output ≥ 10 kΩ 20 ms (ON), ≥ 220 ms (ON), ≥ 20				and partial energy meters
±10 V output ≥ 10 kΩ According to DIN438 ± 5 V output ≥ 10 kΩ By means of optocouplers, 4000V _{max} output to measuring input, 4000V _{max} output to measuring input, 4000V _{max} output to supply input 4000V _{max} output to supply 4000V _{max} output 50 selectable is to define the characteristics m 4000V _{max} output to 4000V _{max} output			Pulse duration	220 ms (ON), \geq 220 ms (OFF)
± 1 V output ≥ 10 kΩ By means of optocouplers, 4000V _{RMS} output to 4000V _{RMS} output to supply input RS422/RS485 output Multidrop bidirectional (static and dynamic variables) Note The outputs (an request) Connections Multidrop bidirectional (static and dynamic variables) A wires, max. distance 1200m, termination directly on the module Number of setpoints Up to 4, independent Addresses 1 to 255, selectable by key-pad Protocol N2 MEATSYS (on request) Number of setpoints Up to 4, independent Data (bidirectional) N2 MEATSYS (on request) Variables to be controlled All (see tabe [®] List of the variables that can be connected to [™]) Static (writing only) All configuration parameters, reset of energy, activation of digital output Static (writing only) All configuration parameters, reset of energy, activation of digital output Stored energy (EPROM) max. 999.999.999 wWh/kVArh Data format 1-start bit, 8-data bit, no parity/even parity, odd parity, 1 stop bit Min. response time Alin. response time				According to DIN43864
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odd parity, 1 stop bit Min, response time < 150 ms, filter exclu		1 5		
	Doud rate		Min. response time	\leq 150 ms, filter excluded,
Baud-rate 1200, 2400, 4800 and 9600 FFT excluded, selectable bauds	Daud-rate			
legulation Dy magne of antegounlare	Insulation			setpoint on-time delay: "0s"
4000 V output to	nomation		Insulation	
measuring inputs				
4000 V/ autout to Sup			Note	4000V _{RMS} output to supply input The outputs can be either
Note The outputs can be e			INDIG	relay type or open collector
	S232 output (on request)	Bidirectional (static and		type (for this latter one, see
dynamic variables) the characteristics m	,			the characteristics mentio-
ned in the PULSE OUT				ned in the PULSE OUTPUTS).

Software Functions

Password 1st level	Numeric code of max. 3 di- gits; 2 protection levels of the programming data Password "0", no protection	Filter action	Display, alarm, analogue and serial outputs (fundamental variables: V, A, W and their derived ones)
2nd level Transformer ratio	Password from 1 to 499, all data are protected For CT up to 30000 A, For VT up to 600 kV	Event logging	Only with RS232 + RTC module. The alarms max/min values will be stored with time (hh:mm:ss) and date
Scaling factor Operating mode	Electrical scale: compression/		(dd:mm:yy) references Max. capacity: 480 events
Electrical range	expansion of the input scale to be connected to up to 4 analogue outputs. Programmable within the whole measuring range	Page Variables	Max. 4/page, one freely prog. page + 26 variable pages + according to the kind of period selection: up to 12 energy meter pages.
Filter Filter operating range Filtering coefficient	0 to 99.9% of the input electrical scale 1 to 255	Display language	English, Italian, French, Ger- man, Spanish

Supply Specifications

AC/DC voltage

90 to 260VAC/DC (standard), 18 to 60VAC/DC (on request),

Power consumption

 \leq 30VA/12W (90to 260V) \leq 20VA/12W (18 to 60V)

General Specifications

Operating temperature0 to +50°C (32 to 122°F) (R.H. < 90% non-condensing)		Product requirements	Energy measurements: EN61036, EN61268.	
Storage temperature	-10 to +60°C (14 to 140°F)	Pulse output:	DIN43864	
Insulation reference voltage	(R.H. < 90% non-condensing) 300 V _{RMS} to ground (AV5 input)	Approvals	CE, UL, CSA	
Insulation	4000 V _{RMS} to ground (403 mput) 4000 V _{RMS} between all inputs/ outputs to ground	Connector	Screw-type, max. 2.5 mm ² wires x 2	
Dielectric strength	4000 V _{RMS} for 1 minute Housing			
Noise rejection CMRR	100 dB, 48 to 62 Hz	Dimensions Material	96x96x140 mm ABS, self-extinguishing: UL 94 V-0	
EMC	EN 50081-2, EN 50082-2	Degree of protection	Front: IP65	
Other standards Safety requirements: Product requirements:	IEC 61010-1, EN 61010-1 IEC 60688-1, EN 60688-1	Weight	Approx. 600 g (packing included)	

Function Description

Input and output scaling capability

Working of the analogue outputs (y) versus input variables (x)

Figure A

The sign of measured quantity and output quantity remains the same. The output quantity is proportional to the measured quantity.

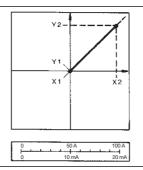
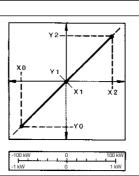


Figure B

The sign of measured quantity and output quantity changes simultaneously. The output quantity is proportional to the measured quantity.



Y2

= Y

хc

100 V

120

ΥO

Figure C

The sign of measured quantity and output quantity remains the same. On the range X0...X1, the output quantity is zero. The range X1...X2 is delineated on the entire output range Y0 = Y1...Y2 and thus presented in strongly expanded form.

Figure D

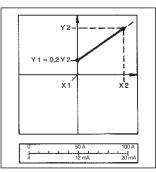
The sign of measured quantity and output quantity remains the same. With the measured quantity being zero, the output quantity already has the value Y1 = 0.2 Y2. Live zero output.

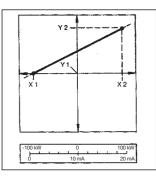


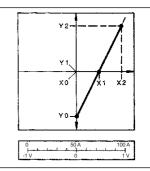
The sign of the measured quantity changes but that of the output quantity remains the same. The output quantity steadily increases from value X1 to value X2 of the measured quantity.

Figure F

The sign of the measured quantity remains the same, that of the output quantity changes as the measured quantity leaves range X0...X1 and passes to range X1...X2 and vice versa.







Mode of Operation

Waveform of the signals that can be measured

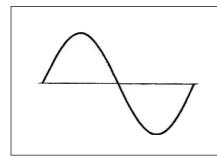


Figure GSine wave, undistortedFundamental content100%Harmonic content0% $A_{rms} =$ $1.1107 | \overline{A} |$

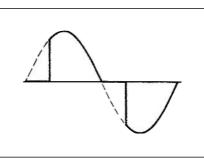


Figure HSine wave, indentedFundamental content10...100%Harmonic content0...90%Frequency spectrum 3rd to 50th harmonic

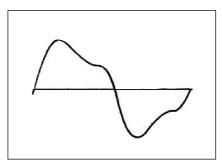


Figure ISine wave, distortedFundamental content70...90%Harmonic content10...30%Frequency spectrum 3rd to 50th harmonic

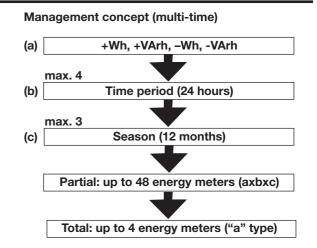


Analysis principle	FFT		wires the angle cannot be measured.
Harmonic measurement Current Voltage	Up to 50th harmonic Up to 50th harmonic	Harmonic details	For every THD page it is pos- sible to see the harmonic
Type of harmonics THD (VL1) THD odd (VL1) THD even (VL1) and also for the other phases: L2, L3. THD (IL1) THD odd (IL1) THD odd (IL1) THD even (IL1) and also for the other phases: L2, L3.		Display pages	order. The harmonics content is displayed as a graph showing the whole harmonic spectrum. The information is given also as numerical information: THD in % / RMS value THD odd in % / RMS value THD even in % / RMS value single harmonic in % / RMS
Harmonic phase angle	The instrument measures the angle between the single har- monic of "V" and the single harmonic of "I" of the same order. According to the value of the electrical angle, it is possible to know if the distor- tion is absorbed or generated. Note: if the system has 3	Others	value The harmonic distortion can be measured in both 2-wire, 3-wire or 4-wire systems. Tw: 0.02

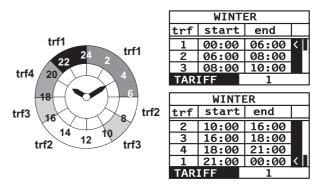
Harmonic distortion analysis

Energy time period management

Time periods	Selectable: single time, dual time and multitime
Single time Number of energy meters	Total: 4 (9-digit) (no partial meters)
Dual time Number of energy meters Time periods	Total: 4 (9-digit) Partial: 8 (6-digit) 2, programmable within 24 hours
Multi time Number of energy meters Time periods Time seasons	Total: 4 (9-digit) Partial: 48 (6-digit) 4, programmable within 24 hours 3, programmable within 12 months
Pulse outputs	Connectable to total and partial energy meters (Dual time, Multi time periods)
Energy metering recording	Energy consumption story, recording of energy metering by months, oldest data: 2 months before current month. Recording of total and partial energy metering



Example of Multi-time energy metering





Display pages

No	1st variable	2nd variable	3rd variable	4th variable	Note
	Selectable	Selectable	Selectable	Selectable	
1	V L1	V L2	V L3	V L-N sys	Sys = Σ
2	V L1-2	V L2-3	V L3-1	V L-L sys	Sys = Σ
3	A L1	A L2	A L3	An	
4	W L1	W L2	W L3	W sys	Sys = Σ
5	var L1	var L2	var L3	var sys	$Sys = \Sigma$
6	VA L1	VA L2	VA L3	VA sys	$Sys = \Sigma$
7	PF L1	PF L2	PF L3	PF sys	
8	V L1	A L1	PF L1	W L1	
9	V L2	A L2	PF L2	W L2	
10	V L3	A L3	PF L3	W L3	
11	V L-L sys	PF sys	var sys	W sys	$Sys = \Sigma$
12	An	PF sys	Hz	W sys	Sys = Σ
13	A n dmd	VA dmd	PF avg	W dmd	dmd=demand, avg=average
14	(MAX1)	(MAX2)	(MAX3)	(MAX4)	The MAX value can be one of the
15	(MAX5)	(MAX6)	(MAX7)	(MAX8)	above mentioned (No. 1 to No. 13)
16	(MAX9)	(MAX10)	(MAX11)	(MAX12)	-
17	(MIN1)	(MIN2)	(MIN3)	(MIN4)	The MIN value can be one of the
18	(MIN5)	(MIN6)	(MIN7)	(MIN8)	above mentioned (No. 1 to No. 13)
19	Histogram FFT	V1 (THD, TADo, THD	•	Only if analysis V1-A1 is activated	
20	Histogram FFT /	A1 (THD, TADo, THD	Only if analysis V1-A1 is activated		
21	Histogram FFT	V2 (THD, TADo, THD	Only if analysis V2-A2 is activated		
22	Histogram FFT /	A2 (THD, TADo, THD	Only if analysis V2-A2 is activated		
23	Histogram FFT	V3 (THD, TADo, THD	Only if analysis V3-A3 is activated		
24	Histogram FFT	A3 (THD, TADo, THE	Only if analysis V3-A3 is activated		
25	KWh + TOT	KWh – TOT	Kvar+ TOT	Kvar– TOT	
26	KWh+	KWh-	Kvar+	Kvar–	Partial energy meters

Variables that can be displayed in case of a three-phase system, 4-wire connection.

Used Calculation Formulas

Formulas being used for single-phase measurements

Instantaneous effective voltage

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

Instantaneous active power

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

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

Instantaneous effective current

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

Instantaneous apparent power $VA_1 = V_{1N} \cdot A_1$

Instantaneous reactive power

 $VAr_{1} = \sqrt{(VA_{1})^{2} - (W_{1})^{2}}$

Formulas being used for 3-phase measurements

Equivalent three-phase voltage

$$V_{\Sigma} = \frac{V_{12} + V_{23} + V_{31}}{3}$$

Three-phase reactive power

 $VAr_{\Sigma} = (VAr_1 + VAr_2 + VAr_3)$

Neutral current

 $An = \overline{A}_{L1} + \overline{A}_{L2} + \overline{A}_{L3}$

Three-phase active power

 $W_{\Sigma} = W_1 + W_2 + W_3$ Three-phase apparent power

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

Equivalent three-phase power factor
 $\cos\phi_{\Sigma} = \frac{W_{\Sigma}}{VA_{\Sigma}}$ (TPF)

Total harmonic distortion $THD_{i} = \frac{\sqrt{\sum T_{a,1}^{2}}}{T_{i,i}}$

Harmonic values: THDi-THD of parameter T at phase i Tn,i - value of parameter T at the n'th harmonic of phase $\ensuremath{\mathsf{i}}$

Energy metering

$$kWh_i = \int_{t_1}^{t_2} P_i(t) dt \cong \Delta t \sum_{n_1}^{n_2} P_{n_2}$$
$$kVath_i = \int_{Q_1}^{t_2} Q_i(t) dt \cong \Delta t \sum_{n_2}^{n_2} Q_{n_2}$$

tı ti
kWh_i = total consumed active energy
at phase i
kVArh_i = total consumed reactive
energy at phase i
P_i(t) = total RMS active power at
phase i of time t
Q_i(t) = total RMS reactive power at
phase i of time t
t₁ t₂ = starting and ending time points
of consumption recording
P_{n,i} = total RMS active power at
phase i of discrete time n
Q_{n,i} = total RMS reactive power at
phase i of discrete time n

$$\Delta t$$
 = time interval between two successive power consumptions

cessive power consumptions n1, n2 = starting and ending discrete time points of consumption recording



List of the variables that can be connected to:

• max/min variable detection;

• analogue outputs;

• alarm outputs.

No	Variable	1-phase Sys.	3-ph. + N Bal. Sys.	3-ph. + N Unbal. Sys.	3-ph. Bal. Sys.	3-ph. Unbal. Sys.	Note
1	V L1	0	х	х	0	0	
2	V L2	0	х	х	0	0	
3	V L3	0	Х	Х	0	0	
4	V L-N sys	0	х	Х	0	0	Sys = Σ
5	V L1-2	х	Х	Х	Х	Х	
6	V L2-3	0	х	Х	х	X	
7	V L3-1	0	Х	X	Х	X	
8	V L-L sys	0	Х	X	Х	X	Sys = Σ
9	A L1	х	Х	X	Х	X	
10	A L2	0	Х	X	Х	X	
11	A L3	0	Х	X	Х	X	
12	An	0	Х	X	0	0	Neutral current
13	W L1	х	Х	X	0	0	
14	W L2	0	Х	X	0	0	
15	W L3	0	Х	X	0	0	
16	W sys	0	Х	X	х	Х	Sys = Σ
17	var L1	х	Х	X	0	0	
18	var L2	0	Х	X	0	0	
19	var L3	0	Х	X	0	0	
20	var sys	0	Х	X	Х	Х	Sys = Σ
21	VA L1	х	Х	X	0	0	
22	VA L2	0	Х	X	0	0	
23	VA L3	0	Х	X	0	0	
24	VA sys	0	Х	X	Х	X	Sys = Σ
25	PF L1	х	х	X	0	0	
26	PF L2	0	Х	X	0	0	
27	PF L3	0	х	X	0	0	
28	PF sys	0	Х	X	Х	X	Sys = Σ
29	Hz	Х	Х	X	Х	Х	
30	THD V1	Х	Х	X	Х	X	if FFT V1-A1 is activated
31	THDo V1	Х	х	X	х	Х	if FFT V1-A1 is activated
32	THDe V1	Х	х	X	х	X	if FFT V1-A1 is activated
33	THD V2	0	Х	X	Х	Х	if FFT V2-A2 is activated
34	THDo V2	0	Х	X	Х	X	if FFT V2-A2 is activated
35	THDe V2	0	Х	X	х	X	if FFT V2-A2 is activated
36	THD V3	0	Х	X	х	X	if FFT V3-A3 is activated
37	THDo V3	0	Х	X	Х	Х	if FFT V3-A3 is activated
38	THDe V3	0	Х	X	Х	X	if FFT V3-A3 is activated
39	THD A1	Х	X	X	Х	X	if FFT V1-A1 is activated
40	THDo A1	Х	x	X	Х	X	if FFT V1-A1 is activated
41	THDe A1	Х	X	X	X	X	if FFT V1-A1 is activated
42	THD A2	0	Х	X	Х	X	if FFT V2-A2 is activated
43	THDo A2	0	х	X	Х	X	if FFT V2-A2 is activated
44	THDe A2	0	X	X	X	Х	if FFT V2-A2 is activated
45	THD A3	0	X	X	Х	X	if FFT V3-A3 is activated
46	THDo A3	0	х	X	х	Х	if FFT V3-A3 is activated
47	THDe A3	0	X	X	Х	X	if FFT V3-A3 is activated
48	A n dmd	Х	X	X	Х	Х	Integration time programmable from 1 to 30 minutes
49	VA dmd	Х	X	X	X	X	Integration time prog. from 1 to 30 min.
50	PF avg	Х	X	X	Х	X	Integration time prog. from 1 to 30 min.
51	W dmd	Х	X	X	Х	Х	Integration time prog. from 1 to 30 min.
52	ASY	0	Х	X	Х	X	Integration time prog. from 1 to 30 min.

Note: (x) stands for an "available" variable, (o) stands for a "not-available" variable.

The available modules

Туре	N. of	Ordering
	channels	code
WM3-96 base		AD 1016
WM3-96 N2 METASYS base		AD 1016N2
AV5.3 measuring inputs		AQ 1018
AV7.3 measuring inputs		AQ 1019
18-60VAC/DC power supply		AP1021
90-260VAC/DC power supply		AP1020
20mADC analogue output	1	AO1050
10VDC analogue output	1	AO1051
±5mADC analogue output	1	AO1052
±10mADC analogue output	1	AO1053
±20mADC analogue output	1	AO1054
±1VDC analogue output	1	AO1055
±5VDC analogue output	1	AO1056
±10VDC analogue output	1	AO1057
20mADC analogue output	2	AO1026
10VDC analogue output	2	AO1027
±5mADC analogue output	2	AO1028
±10mADC analogue output	2	AO1029
±20mADC analogue output	2	AO1030
±1VDC analogue output	2	AO1031
±5VDC analogue output	2	AO1032
±10VDC analogue output	2	AO1033
RS485 output	1	AR1034
Relay output	1	AO1058
Relay output	2	AO1035
Open collector output	1	AO1059
Open collector output	2	AO1036
Open collector output	4	AO1037
Digital inputs	3	AQ1038
RS232 output + RTC (1)	1	AR1039

The possible module combinations

Basic unit	Slot A	Slot B	Slot C	Slot D
Single analogue output				
Dual analogue output				
RS485 input/output				
Single relay output (*)				
Single open collector out (*)				
Dual relay output (*)				
Dual open coll. out (*)				
4 open coll. output (*)				
3 digital inputs				
Basic unit	Slot E			
RS232 input/output + RTC				

(*) alarm or pulse

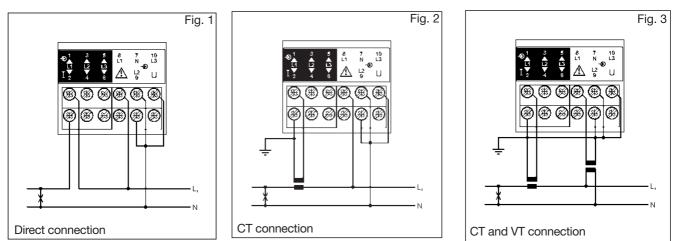


N2-Open Metasys protocol full compatibility (available on request).

(1) The RS232 communication port works as alternative of the RS485 module.

Wiring Diagrams

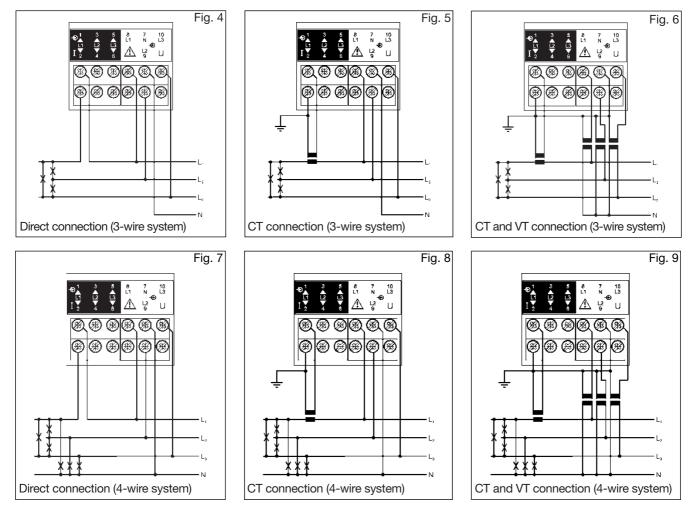
Single phase input connections



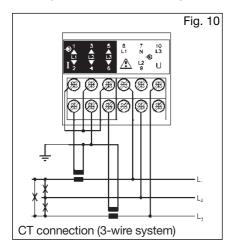


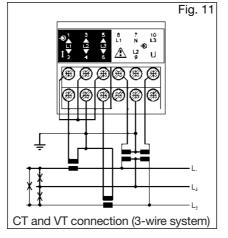
Wiring Diagrams (cont.)

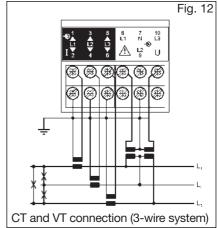
Three-phase wire input connections - Balanced loads



Three-phase, 3-wire ARON input connections - Unbalanced loads



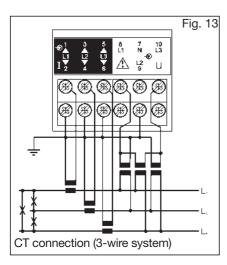


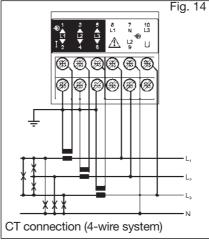




Wiring Diagrams (cont.)

Three-phase three-wire input connections Unbalanced load

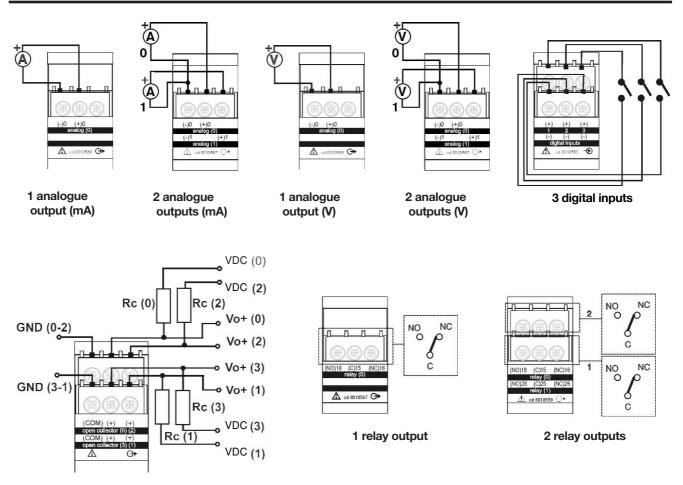




Three-phase four-wire input connections - Unbalanced load

Fig. 15

Wiring diagrams (optional modules)

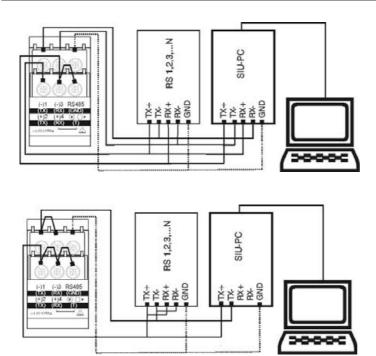


4 open collector outputs: The load resistance (Rc) must be designed so that the closed contact current is lower than 100mA; the VDC voltage must be lower than or equal to 30V.

VDC: power supply voltage output. Vo+: positive output contact (open collector transistor). GND: ground output contact (open collector transistor).



Wiring diagrams (optional modules, cont.)



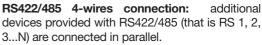
Front Panel Description

1. Key-pad

Set-up and programming procedures are easily controlled by the 4 pushbuttons.

- "S" for enter programming phase and password confirmation,

Dimensions



The termination of the serial output is carried out only on the last instrument of the network, by means of a jumper between (Rx+) and (T).

RS422/485 2-wires connection: additional devices provided with RS422/485 (that is RS 1, 2, 3...N) 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 (Rx+) and (T).

- for value programming/function selection, page scrolling
- "F" for special functions

2. Display

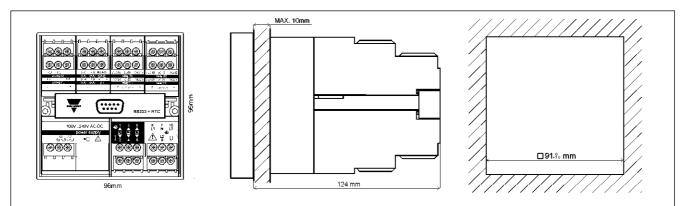
Istantaneous measurements:

- 4-digit (maximum read-out 9999)

- Energies:
- 9-digit (maximum read-out 99999999).

Alphanumeric indication by means of LCD display for:

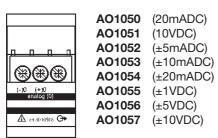
- Displaying the configuration parameters
- All the measured variables.



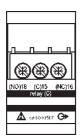


Terminal boards

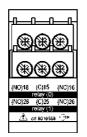
Single analogue output modules



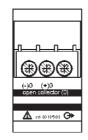
Digital output modules



AO1058 Single relay output



AO1035 Dual relay output



(-)0 (+)0 analog (0)

(-)1 (+)1 <u>ana vg (1)</u> ▲ sa 801(582 G↔

+)1

Dual analogue outputs

AO1026

AO1027

AO1028

AO1029

AO1030

AO1031

AO1032

AO1033

(20mADC)

(±5mADC)

(±10mADC)

(±20mADC)

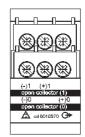
(10VDC)

(±1VDC)

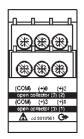
(±5VDC)

(±10VDC)

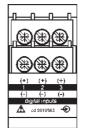
AO1059 Single open collector output



AO1036 Dual open collector output

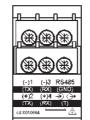


AO1037 4 open collector outputs



Other input/output modules

AQ1038 3 Digital inputs

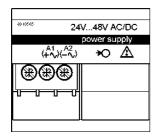


AR1034 RS485 port

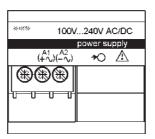


RS232 port + RTC

Power supply modules



AP1021 18-60VAC/DC power supply



AP1020 90-260 VAC/DC power supply