

Energy Management

Three-phase power analyzer with output modules

Type WM22-DIN



- Class 0.5 (current/voltage)
- Three-phase power analyzer
- Back-lighted LCD
- 4 x 3 1/2 DGT instantaneous variables read out
- 7 1/2 DGT energy read-out
- Measurements of system and phase variables: W, Wdmd, var, VA, VAdmd, PF (cosφ), V, A, Hz, THD-A, THD-V
- Measurements of total energies: kWh, kvarh
- Measurements of partial energies: kWh, kvarh
- Energy measurements according to EN61036 and EN61268
- TRMS measurements of distorted wave forms (voltages/currents)
- Two basic models: direct connection 20(90)AAC, CT 5(10)AAC and VT connection

- Front dimensions: 9 DIN modules
- Analogue output by means of optional module (20mA or 10VDC)
- RS 422/485 Serial port by means of optional module
- Alarm output by means of optional module
- Dual pulse output by means of optional module

- Control of phase asymmetry
- Maximum value indication of W dmd and VA dmd (only 5A version); maximum value indication of A (only 90A version)
- Self power supply (available for some models only) or auxiliary power supply: 24V, 48V, 115V, 230V, 50-60Hz
- Degree of protection (front): IP 40

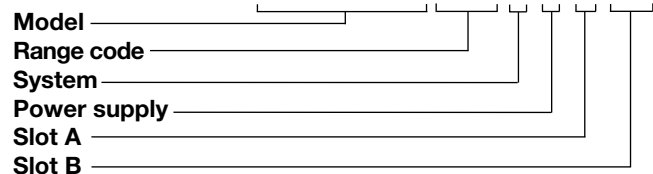
Product description

Three-phase power analyzer with built-in configuration key-pad; Particularly indicated for the analysis of main, secondary and energy metering electrical variables. Housing for DIN-rail or wall-mounting, IP40 (front) protection degree. Completely sealable housing. In case of direct connection up to 90A, the measuring input terminals are suitable for cables with a cross-section

area from 6 to 35 mm². The special design of the instrument's housing allows to add at any time the interface modules, even when the instrument is already installed. The following modules are available:

- for all versions: pulses output;
- only for the versions with auxiliary power supply: analogue output, RS485 port or alarm output.

How to order WM22-DIN AV5 3 X X XX



Type selection

Range Code	Power supply	Slot A (retransmission)	Slot B (retransmission)
Auxiliary Power Supply: AV0: 208V _{L-L} /20(90)AAC [1] AV1: 400V _{L-L} /20(90)AAC [1] AV3: 660V _{L-L} /20(90)AAC [2] AV4: 208V _{L-L} /5(10)AAC [1] AV5: 400V _{L-L} /5(10)AAC [1] AV6: 100V _{L-L} /5(10)AAC [3] AV7: 660V _{L-L} /5(10)AAC [2]	For all versions A: 24VAC -15+10%, 50-60Hz B: 48VAC -15+10%, 50-60Hz C: 115VAC -15+10%, 50-60Hz D: 230VAC -15+10%, 50-60Hz Only for AV0 and AV1 versions X: Self Power Supply 400V _{L-L} -20+15%, 50-60Hz 208V _{L-L} -20+15%, 50-60Hz	X: None O: AO2900 module Dual open collector output Three operating modes: • two pulse outputs (kWh and kvarh); • one alarm output and one pulse output (kWh or kvarh) • one output which is remotely controlled by a serial port and one pulse output (kWh or kvarh)	Only with A-B-C-D power supply XX: None A1: AO2920 module 0-20mADC analogue output V1: AO2921 module 0-10VDC analogue output S0: AR2950 module RS422/485 serial port
System 3: Three-phase, balanced and unbalanced load with or without neutral			

[1] Un: -20+15% [2] Un: -30+15% [3] Un: -20+20%

Input specifications

Number of inputs		Additional errors	Acc. to EN61036, EN61268
Current	3	Wave form	<1% (3 rd harmonic: 10%)
Voltage	4	Voltage asymmetry	< 0.5% (referred to Un)
Accuracy (display, RS485)	Ib: 5A, I _{max} : 10A Ib: 20A, I _{max} :90A Un: see previous page "Range code"	Magnetic induction	0 (up to 0.5 mT)
Current	from 0.003Ib to 0.2Ib: ±(0.5%RDG +3DGT) from 0.2Ib to I _{max} : ±(0.5%RDG +1DGT)	HF Electromagnetic fields	< 1%
Voltage	in the range Un: ±(0,5% RDG + 1 DGT)	Operation of accessories	0
Frequency	±0.1% RDG (50 to 60 Hz)	Temperature drift	≤ 200ppm/°C
Active power (@ 25°C ± 5°C, R.H. ≤ 90%)	±1% RDG ±1DGT (PF 1, 0.1Ib to I _{max} , in the Un range; PF 0.5L, PF 0.8C, 0.2Ib to I _{max} , in the Un range)	Sampling rate	1000 samplings/s @ 50Hz
Reactive power (@ 25°C ± 5°C, R.H. ≤ 90%)	±2% RDG ±1DGT (sinφ 1, 0.05Ib to I _{max} , in the Un range; sinφ 0.5L, sinφ 0.5C, 0.1Ib to I _{max} , in the Un range)	Display	Type Instantan. variables read-out Energies
Apparent power (@ 25°C ± 5°C, R.H. ≤ 90%)	±1% RDG ±1DGT (PF 1, 0.1Ib to I _{max} , in the Un range)	Max. and Min. indication	Back-lighted LCD 4x3 ¹ / ₂ DGT Total:1x7 ¹ / ₂ DGT Partial: 1x7 ¹ / ₂ DGT
Energies (@ 25°C ± 5°C, R.H. ≤ 90%)	Class 1 acc. to EN61036 Class 2 acc. to EN61268 Ib: 5A, I _{max} : 10A 0.1Ib: 500mA, Start up corrent: 20mA Un: see table "range code" Ib: 20A, I _{max} : 90A 0.1Ib: 2A, Start up current: 80mA Un: see table "range code"	Measurements	Current, voltage, power, energy, power factor, frequen- cy, harmonic distortion (see display specs). TRMS measurements of distorted wave forms.
Harmonic distortion (@ 25°C ± 5°C, R.H. ≤ 90%)	±3% f.s. (f.s.: 100%) up to the 7 th harmonic; Un: see table "range code"	Coupling type	Direct
Ib 5A	I _{min} : 500mA; I _{max} : 15Ap;	Crest factor	Ib 5A Ib 20A
Ib 20A	I _{min} : 2A; I _{max} : 127Ap;	5(10) A, for 10ms 5(10) A, for 500ms 5(10) A, permanent 20(90) A, for 10ms 20(90) A, permanent	≤3 (15A max. peak) ≤6 (127A max. peak)
		Current overload	300 A max, @ 50Hz 200 A max, @ 50Hz 10A, @ 50Hz 2700A max, @ 50Hz 90A, @ 50Hz
		Voltage overload	Permanent For 1s
		Input impedance	1.2 Un 2 Un
		400V _{L-L} (AV1-AV5-AV9) 208V _{L-L} (AV0-AV4-AV8) 660V _{L-L} (AV3-AV7) 100V _{L-L} (AV6) 5(10) A (AV4-AV5-AV6-AV7) 20(90) A (AV0-AV1-AV3-AV8-AV9)	> 720KΩ > 720KΩ > 1.97MΩ > 400KΩ < 0.3VA < 4VA
		Frequency	50 to 60 Hz

Interface module specifications

Analogue outputs (on request)			the following ranges: 0 and 20mADC, 0 and 10VDC
Number of outputs	1	Response time	V, W, VA, var, PF (cosφ)
Range	0 to 20 mADC (AO2920 module slot B, only for versions with auxiliary power supply) 0 to 10VDC (AO2921 module slot B, only for versions with auxiliary power supply)	System variables FFT off, filter off FFT on, filter on variables Filter off	900ms 1.4s THD-V, THD-A 3s
Accuracy	±0.5% F.S.	Ripple	≤ 1% according to IEC 60688-1, EN 60688-1
Temperature drift	≤ 300 ppm/ °C	Load	≤ 500 Ω ≥ 10 kΩ
Scaling factor	Programmable within the whole range of retransmission; it allows the retransmission of all the values included in	20 mADC 10 VDC Insulation	By means of optocouplers, 2000 V _{RMS} between output and measuring input

Interface module specifications (cont.)

	2000 V _{RMS} between output and power supply input		
RS422/RS485 (on request)	AR2950 module	Insulation	According to DIN43864
Type	Multidrop bidirectional (static and dynamic variables)		By means of optocouplers, 2000 V _{RMS} outputs to measuring inputs, 2000 V _{RMS} output to supply input.
Connections	2 or 4 wires, max. distance 1200m, termination directly on the module		Insulation between the two outputs: functional
Addresses	255, selectable by key-pad	Alarm output	
Protocol	MODBUS/JBUS	Number of outputs	1
Data (bidirectional)		Alarm type	Up alarm, down alarm phase asymmetry, phase loss.
Dynamic (reading only)	Phase and system variables: see table "Display pages"	Setpoint adjustment	0 to 100% of the electrical scale
Static (writing only)	All the programming data, reset of energy, activation of static output.	Hysteresis	0 to 100% of the electrical scale
	Stored energy (EEPROM) max. 19.999.999 kWh/kvarh	On-time delay	0 to 255 seconds
Data format	1 start bit, 8 data bit, no parity, 1 stop bit	Response time	
Baud-rate	9600 bit/s	system variables	V, W, VA, var, PF (cosφ)
Insulation	By means of optocouplers, 2000 V _{RMS} output to measuring inputs	FFT off, filter off	700ms
	2000 V _{RMS} output to supply input	FFT on, filter on	1.2s
		variables	THD-V, THD-A
		Filter off	3s
		Output type	Open collector (transistor NPN) V _{ON} 1.2 VDC / max. 100 mA V _{OFF} 30 VDC max.
Digital outputs (on request)	AO2900 module	Insulation	By means of optocouplers, 2000 V _{RMS} output to measuring input, 2000 V _{RMS} output to supply input.
	To be used as alarm, energy retransmission, or remote static outputs.		Insulation between the two outputs: functional
	Three working modes are selectable:		
	• two pulse outputs (kWh and kvarh);		
	• one alarm output and one pulse output (kWh or kvarh)		
	• one output remotely controlled by means of the serial port and one pulse output (kWh or kvarh)		
Pulse outputs			
Number of outputs	2		
Number of pulses	From 0.01 to 100 pulses programmable according to the selected CT and VT ratios		
Output type	Open collector (transistor NPN) V _{ON} 1.2 VDC / max. 100 mA V _{OFF} 30 VDC max.		
Pulse duration	220 ms (ON), ≥ 220 ms (OFF)		

Software functions

Password	Numeric code of max. 3 digits 2 protection levels of the programming data Password "0", no protection Password from 1 to 1000, all data are protected	Electrical range	Programmable within the whole measuring range.
1 st level 2 nd level		Filter	
System selection	Three-phase with neutral Three-phase without neutral	Filter operating range	0 to 99.9% of the input electrical scale.
Transformer ratio		Filter coefficient	1 to 16
CT	1 to 5000	Filter action	Alarm, analogue and serial output (fundamental variables: V, A, W and their derived ones).
VT	1.0 to 199.9 and 200 to 1999 Note: The CT ratio* VT ratio must never exceed the value 5000. The current measuring inputs can manage CT's with a secondary of 1A and 5A (the accuracy always refer to 5A)	Display	
Scaling factor		System variables	Up to 4 variables per page Page 1: W-var-PF (cosφ) Page 2: W dmd - VA dmd - Hz Page 3: THD-V Page 4: THD-A Page 5: kWh total Page 6: kvarh total Page 7: kWh partial Page 8: kvarh partial Page 9: V _{L-N} Page 10: A Page 11a: A _{MAX} Page 11b: W dmd _{MAX} VA dmd _{MAX} Page 12: W Page 13: VA Page 14: var Page 15: PF (cosφ)
Operating mode	Compression/expansion of the measuring range to be connected to the analogue output.	Single phase variables	
		System variables	
		Single phase variables	
		20(90) A 5(10) A	

Supply specifications

Self supplied version	400V _{L-L} -20% +15%, 50-60Hz 208V _{L-L} -20% +15% , 50-60Hz	115VAC -15 +10%, 50-60Hz 48VAC -15 +10%, 50-60Hz 24VAC -15 +10%, 50-60Hz
Auxiliary power supply	230VAC -15 +10%, 50-60Hz	
		Energy consumption
		≤ 7VA

General Specifications

Operating temperature	0 to +55°C (R.H. < 90% non-condensing 40°C)	Pulse voltage (1.2/50μs)	8kV (EN61000-4-5)
Storage temperature	-20 to +60°C (R.H. < 90% non-condensing 40°C)	Standards	
Installation category	Cat. III (IEC 664)	Safety	IEC664-1
Insulation	2000 V _{RMS} between all inputs / outputs to earth	Metrology	Energy measurements: EN61036, EN61268. DIN43864
Dielectric strength	4000 V _{RMS} for 1 minute	Pulse output	DIN43864
Noise rejection		Approvals	CE
CMRR	100 dB, 48 to 62 Hz	Connections 5(10) A	Screw-type, 4 mm ²
EMC		Connections 20(90) A	Screw-type, 6 mm ² / 35 mm ² Min./Max. screws tightening torque 2 Nm / 6 Nm
Burst	4kV/level 4 (EN61000-4-4)	Housing	
Immunity to irradiated electromagnetic fields	10V/m 26-1000MHz (EN61000-4-3) 15kV (EN61000-4-2) according to CISPR 14 and CISPR 22	Dimensions	162.5 x 90 x 63 mm
Electrostatic discharges		Material	ABS, NORYL, PC self-extinguishing: UL 94 V-0
Radio frequency emissions		Mounting	DIN-rail and wall
		Degree of protection	Front: IP40 Connections: IP20
		Weight	800 g approx. (packing included)

Function description

Input and output scaling capability

Working examples of the analogue output (Y) versus the input variable (x) - (input/output scaling possibilities).

Figure A

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

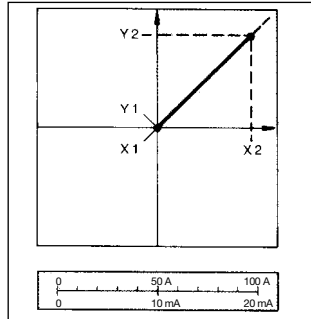


Figure B

The sign of measured quantity and output quantity remains the same. With the measured quantity being zero, the output quantity already has the value $Y_1 = 0.2 Y_2$. Live zero output.

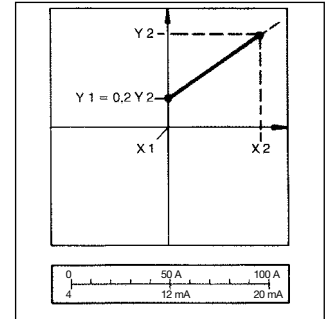
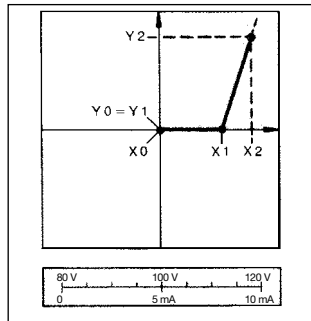


Figure C

The sign of measured quantity and output quantity remains the same. On the range $X_0 \dots X_1$, the output quantity is zero. The range $X_1 \dots X_2$ is delineated on the entire output range $Y_0 = Y_1 \dots Y_2$ and thus presented in strongly expanded form.



Mode of Operation

Waveform of the signals that can be measured

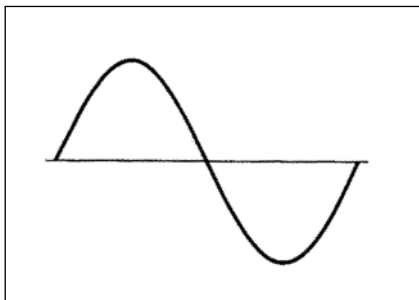


Figure D

Sine wave, undistorted

Fundamental content 100%
 Harmonic content 0%
 $A_{rms} = 1.1107 | \bar{A} |$

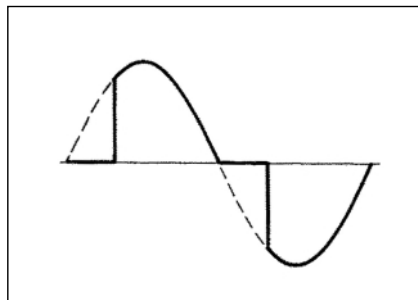


Figure E

Sine wave, indented

Fundamental content 10...100%
 Harmonic contents 0...90%
 Frequency spectrum: 3rd to the 16th harmonic
 Additional error: <1% rdg

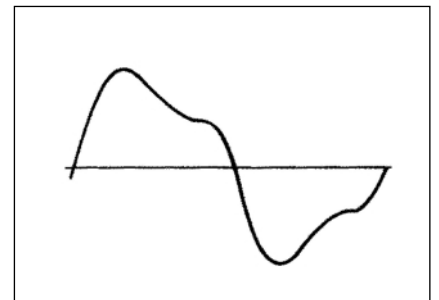


Figure F

Sine wave, distorted

Fundamental content 70...90%
 Harmonic content 10...30%
 Frequency spectrum: 3rd to the 16th harmonic
 Additional error: <0.5% rdg

Harmonic distortion analysis

Analysis principle	FFT	Read-out	THD (AL2), THD (AL3)
Harmonic measurement		System	THD %
Current	Up to the 7 th harmonic		
Voltage	Up to the 7 th harmonic		
Type of harmonics	THD (VL1), THD (VL2), THD (VL3), THD (AL1)		The harmonic distortion can be measured in 3-wire or 4-wire systems.

Display pages

Variables that can be displayed

No	1 st variable	2 nd variable	3 rd variable	4 th variable	Notes
1	W sys	PF sys	VAr sys		sys = system
2	W dmd	Hz	VA dmd		dmd = demand (integration time from 1 to 30 minutes)
3	V _{L1} THD	V _{L2} THD	V _{L3} THD		THD = tot. harmonic distortion
4	A _{L1} THD	A _{L2} THD	A _{L3} THD		THD = tot. harmonic distortion
5	kWh				total energy
6	kVArh				total energy
7	kWh				partial energy
8	kVArh				partial energy
9	V _{L1}	V _{L2}	V _{L3}	V _{L-L} sys	sys = system
10	A _{L1}	A _{L2}	A _{L3}	Err	Err = in case of negative power
11a	W dmd MAX	VA dmd MAX			Only version 1-5A, dmd = demand
11b	A _{L1} MAX	A _{L2} MAX	A _{L3} MAX		Only version 90A
12	W _{L1}	W _{L2}	W _{L3}	W sys	sys = system
13	VA _{L1}	VA _{L2}	VA _{L3}	VA sys	The system value remains always 0 if the neutral is not connected
14	VAr _{L1}	VAr _{L2}	VAr _{L3}	VAr sys	
15	PF _{L1}	PF _{L2}	PF _{L3}	PF sys	

Used calculation formulas

Phase variables

Instantaneous effective voltage

$$V_{IN} = \sqrt{\frac{1}{n} \cdot \sum_1^n (V_{IN})_i^2}$$

Instantaneous active power

$$W_1 = \frac{1}{n} \cdot \sum_1^n (V_{IN})_i \cdot (A_1)_i$$

Instantaneous power factor

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

Instantaneous effective current

$$A_1 = \sqrt{\frac{1}{n} \cdot \sum_1^n (A_1)_i^2}$$

Instantaneous apparent power

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

Instantaneous reactive power

$$VAr_1 = \sqrt{(VA_1)^2 - (W_1)^2}$$

System variables

Equivalent system voltage

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

System reactive power

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

System active power

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

System apparent power

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

System power factor

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

Total harmonic distortion

$$\text{THD}_i = \frac{\sqrt{\sum_{n \neq 1}^n T_{1i}^2}}{T_{1i}}$$

Note:

i = phase (L1, L2 or L3)

T = variable (V or I)

n = harmonic order

Consumption recording

$$kWh_i = \int_{t_1}^{t_2} P_i(t) dt \approx \Delta t \sum_{n_1}^{n_2} P_{i,j}$$

$$kVarh_i = \int_{t_1}^{t_2} Q_i(t) dt \approx \Delta t \sum_{n_1}^{n_2} Q_{i,j}$$

Note:

i = phase (L1, L2 or L3)

P = active power

Q = reactive power

t₁, t₂ = starting and ending time points of consumption recording

n = time unit

Δt = time interval of consumption recording

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

Available models

Type	Inputs	Power supply	Ordering code
WM22-DIN AV9.3.X.	400V _{L-L} , 20(90)A	Self power supply	AF2100
WM22-DIN AV8.3.X.	208V _{L-L} , 20(90)A	Self power-supply	AF2101
WM22-DIN AV1.3.D.	400V _{L-L} , 20(90)A	230VAC, 50-60Hz	AF2102
WM22-DIN AV0.3.D.	208V _{L-L} , 20(90)A	230VAC, 50-60Hz	AF2103
WM22-DIN AV3.3.D.	660V _{L-L} , 20(90)A	230VAC, 50-60Hz	AF2104
WM22-DIN AV1.3.C.	400V _{L-L} , 20(90)A	115VAC, 50-60Hz	AF2105
WM22-DIN AV0.3.C.	208V _{L-L} , 20(90)A	115AC, 50-60Hz	AF2106
WM22-DIN AV3.3.C.	660V _{L-L} , 20(90)A	115VAC, 50-60Hz	AF2107
WM22-DIN AV1.3.B.	400V _{L-L} , 20(90)A	48VAC, 50-60Hz	AF2108
WM22-DIN AV0.3.B.	208V _{L-L} , 20(90)A	48VAC, 50-60Hz	AF2109
WM22-DIN AV3.3.B.	660V _{L-L} , 20(90)A	48VAC, 50-60Hz	AF2110
WM22-DIN AV1.3.A.	400V _{L-L} , 20(90)A	24VAC, 50-60Hz	AF2111
WM22-DIN AV0.3.A.	208V _{L-L} , 20(90)A	24VAC, 50-60Hz	AF2112
WM22-DIN AV3.3.A.	660V _{L-L} , 20(90)A	24VAC, 50-60Hz	AF2113
WM22-DIN AV5.3.D.	400V _{L-L} , 5(10)A	230VAC, 50-60Hz	AF2114
WM22-DIN AV4.3.D.	208V _{L-L} , 5(10)A	230VAC, 50-60Hz	AF2115
WM22-DIN AV7.3.D.	660V _{L-L} , 5(10)A	230VAC, 50-60Hz	AF2116
WM22-DIN AV5.3.C.	400V _{L-L} , 5(10)A	115VAC, 50-60Hz	AF2117
WM22-DIN AV4.3.C.	208V _{L-L} , 5(10)A	115VAC, 50-60Hz	AF2118
WM22-DIN AV7.3.C.	660V _{L-L} , 5(10)A	115VAC, 50-60Hz	AF2119
WM22-DIN AV5.3.B.	400V _{L-L} , 5(10)A	48VAC, 50-60Hz	AF2120
WM22-DIN AV4.3.B.	208V _{L-L} , 5(10)A	48VAC, 50-60Hz	AF2121
WM22-DIN AV7.3.B.	660V _{L-L} , 5(10)A	48VAC, 50-60Hz	AF2122
WM22-DIN AV5.3.A.	400V _{L-L} , 5(10)A	24VAC, 50-60Hz	AF2123
WM22-DIN AV4.3.A.	208V _{L-L} , 5(10)A	24VAC, 50-60Hz	AF2124
WM22-DIN AV7.3.A.	660V _{L-L} , 5(10)A	24VAC, 50-60Hz	AF2125
WM22-DIN AV6.3.D.	100V _{L-L} , 5(10)A	230VAC, 50-60Hz	AF2126
WM22-DIN AV6.3.C.	100V _{L-L} , 5(10)A	115VAC, 50-60Hz	AF2127
WM22-DIN AV6.3.B.	100V _{L-L} , 5(10)A	48VAC, 50-60Hz	AF2128
WM22-DIN AV6.3.A.	100V _{L-L} , 5(10)A	24VAC, 50-60Hz	AF2129

Available modules

Type	Channels	Code	Type	Channels	Code
Open collector output	2	AO2900	0-10VDC Analogue Output	1	AO2921
0-20mADC analogue output	1	AO2920	RS485 Serial Output	1	AR2950

Possible module combinations

Power supply	Self p.s.		Auxiliary p.s.		Power supply	Self p.s.		Auxiliary p.s.	
	Slot A	Slot B	Slot A	Slot B		Slot A	Slot B	Slot A	Slot B
Basic unit					Basic unit				
Open collector output	●		●		Analogue output				●
					RS485 Serial Output				●

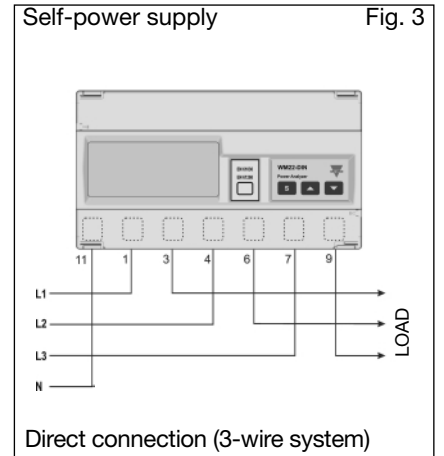
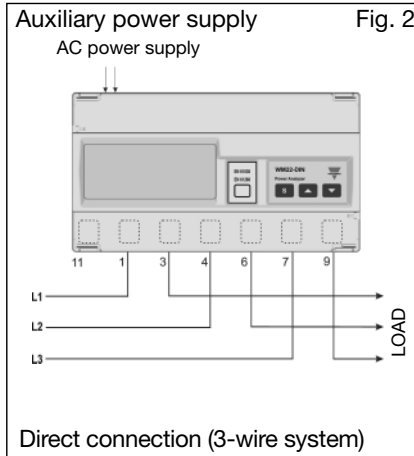
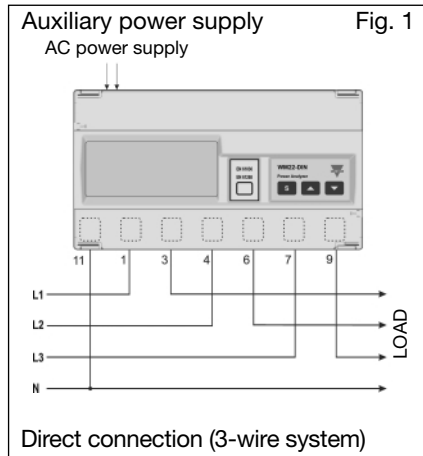
List of the of the variables that can be connected to the analogue and alarm output

N°	Variable	Notes	N°	Variable	Notes
1	V sys	sys = system	6	THD-V	Max. THD value among the three phases
2	W sys	sys = system	7	THD-A	Max. THD value among the three phases
3	var sys	sys = system	8	VA dmd	Power demand in the selected
4	VA sys	sys = system	9	W dmd	integration time
5	PF sys	sys = system	10	ASY	Phase asymmetry

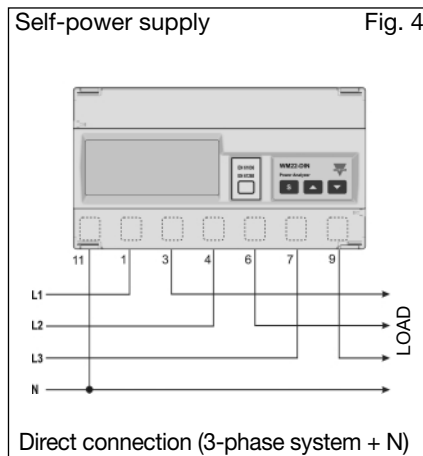


Wiring diagrams

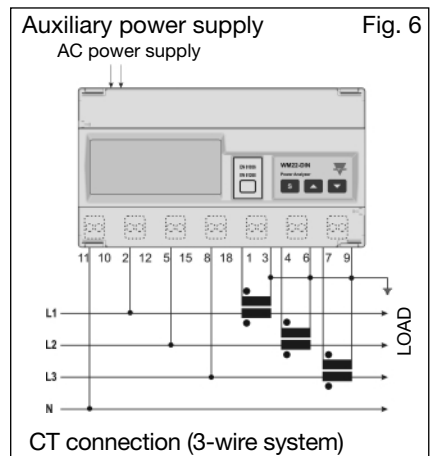
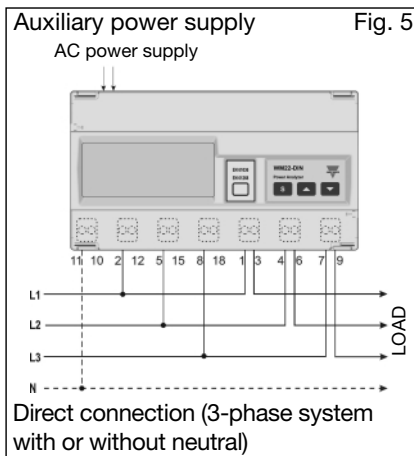
20(90)A model: three-phase unbalanced load



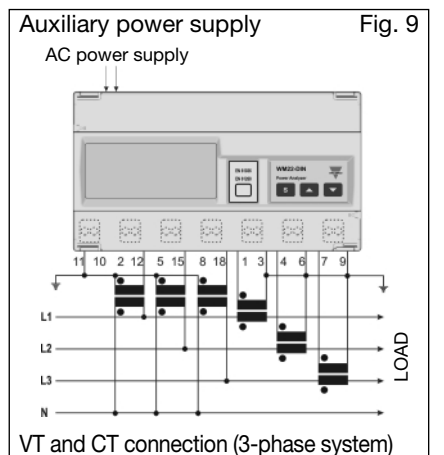
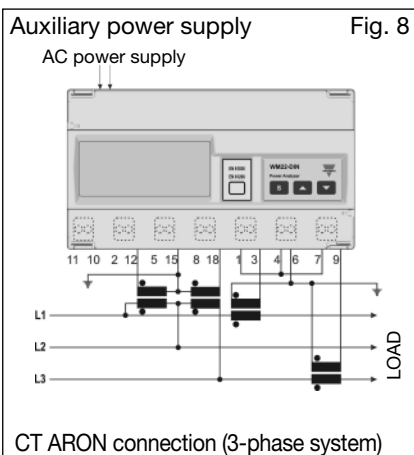
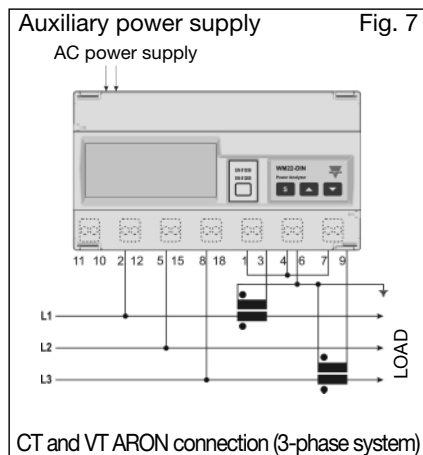
20(90)A model: three-phase unbalanced load



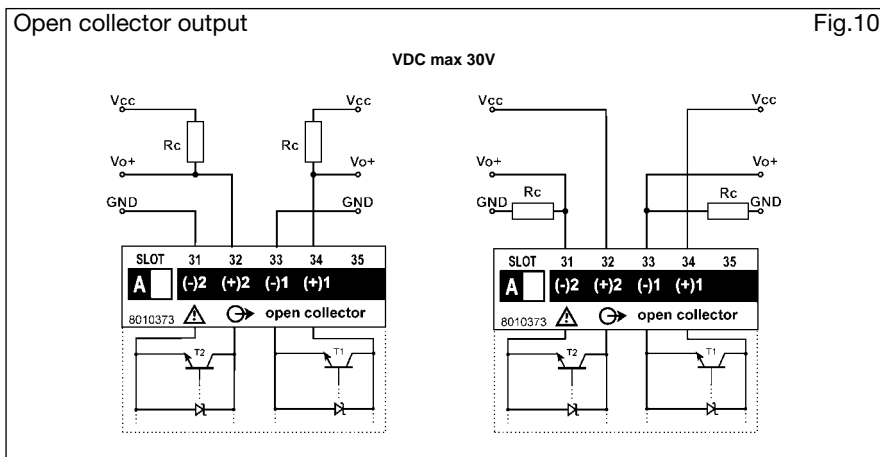
5(10)A model: three-phase unbalanced load



5(10)A model: three-phase unbalanced load

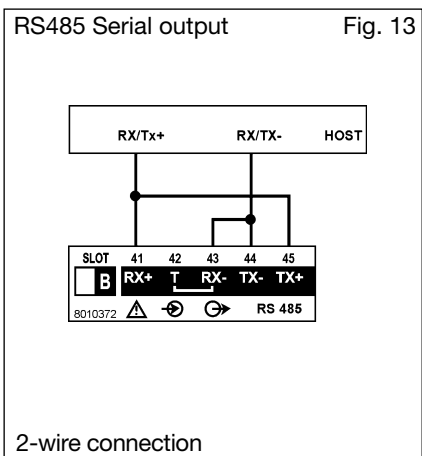
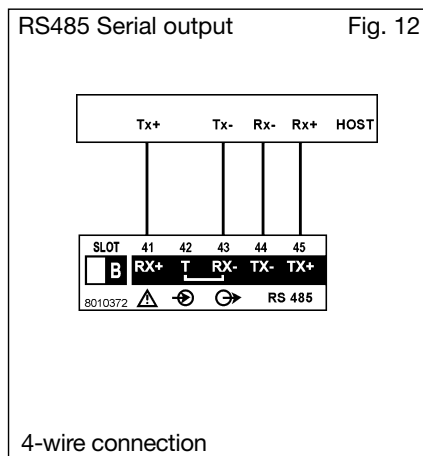
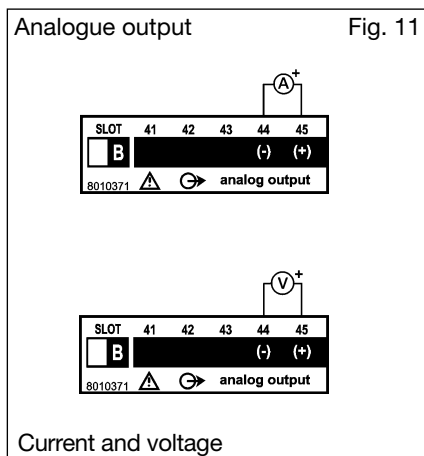


Wiring diagrams (optional modules)

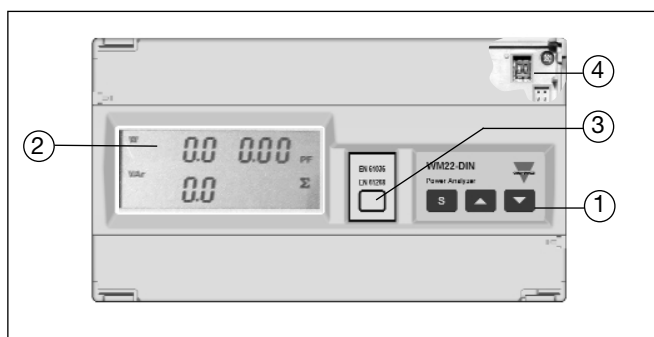


The grounds of the outputs are separated, and therefore it's possible to carry out, for the same module, two different connections. The load resistance (R_c) must be designed so that the closed contact current is lower than 100mA; the VDC voltage must be lower than or equal to 30V.

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



Front panel description



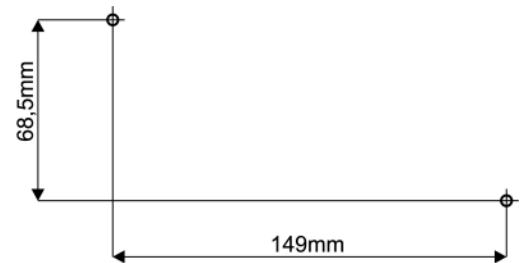
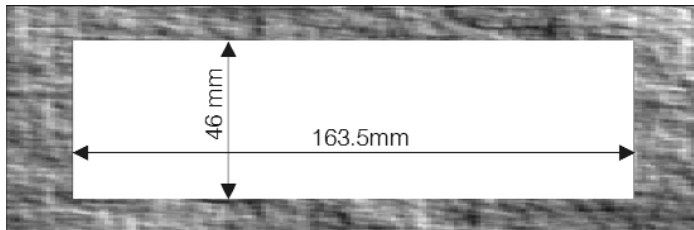
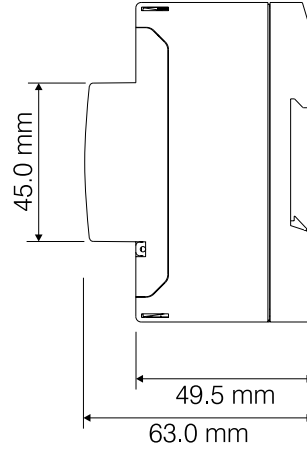
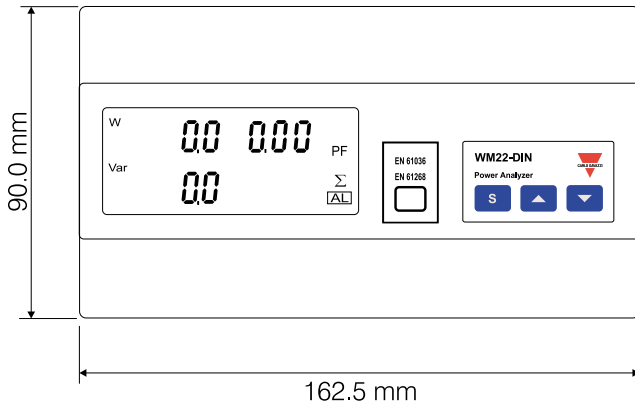
- 1. Key-pad**
 To program configuration parameters and to display variables.
 S-key to enter programming and confirm selections;



- Keys for:
- value programming;
 - function selection;
 - displaying the measuring pages.

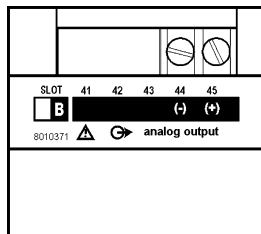
- 2. Display**
 LCD with alphanumeric indications to:
 - display configuration parameters;
 - display all the measured variables.
- 3. Removable label**
 Label to write the instrument ID number.
- 4. Hidden dip-switch**
 Enable/ disable the access to the programming procedure.

Dimensions and panel cut-out



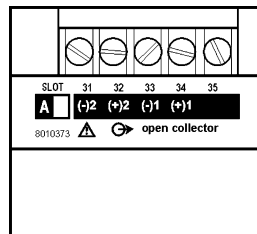
Terminal boards

Analogue output module



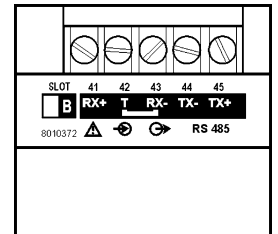
AO 2920: 0-20 mA
AO 2921: 0-10 mA

Dual output open collector module



AO 2900

RS485 serial output module



AR 2950