Energy Management
Power Analyzer with plug-in Output Modules
Type WM22-DIN

- **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**
- **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**
- **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; 18 to 60VDC, 77 to 143VDC**
- **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 mm^2.
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

- **Model**
- **Range code**
- **System**
- **Power supply**
- **Slot A**
- **Slot B**

Important note:
- The models from AV0 to AV7 can be equipped with any type of available modules (slot A and B).
- The models AV8 and AV9 can be equipped only with the "O" and "R" type modules.
- The AV8 and AV9 models can measure all the parameters even if the three phase system being connected is missing one phase.
- The Av2 model is suitable only for three-phase unbalanced system without neutral.

Type selection

Range Code

Auxiliary Power Supply:
AV0: 208V_{L-L}/20(90)AAC [3]
AV1: 400V_{L-L}/20(90)AAC [1]
AV3: 660V_{L-L}/20(90)AAC [2]
AV4: 208V_{L-L}/5(10)AAC [3]
AV5: 400V_{L-L}/5(10)AAC [1]
AV6: 100V_{L-L}/5(10)AAC [3]
AV7: 660V_{L-L}/5(10)AAC [2]
Self Power Supply:
AV2: 220V_{L-L}/20(90)AAC [4]
AV8: 208V_{L-L}/20(90)AAC [1]
AV9: 400V_{L-L}/20(90)AAC [1]

System

3 : Three-phase, unbalanced load with or without neutral

Power supply

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
4: 18 to 60VDC
5: 77 to 143VDC
AV2, AV8 and AV9 only
X: Self Power Supply
400V_{L-L} (-20+15%, 50-60Hz)
208V_{L-L} (-20+15%, 50-60Hz)
220V_{L-L} (-10+15%, 50-60Hz)

Slot A (retransmission)

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)

R: AO2910 module.
One relay output + one open collector output.
Operation modes like module AO2900.

Slot B (retransmission)

Only with A-B-C-D-4 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

[1] Un: -20+15% [2] Un: -30+15% [3] Un: -20+20% [4] Un: -10 +15%

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Input specifications

Number of inputs	
Current	3
Voltage	4
Accuracy (display, RS485)	Ib: 5A, Imax: 10A Ib: 20A, Imax:90A Un: see previous page "Range code"
Current	from 0.003Ib to 0.2Ib: ±(0.5%RDG +3DGT) from 0.2Ib to Imax: ±(0.5%RDG +1DGT)
Voltage	in the range Un: ±(0,5% RDG + 1DGT)
Frequency	±0.1% RDG (50 to 60 Hz)
Active power (@ 25°C ± 5°C, R.H. ≤ 90%)	±(1% RDG +1DGT). PF 1, 0.1Ib to Imax, in the Un range; PF 0.5L, PF 0.8C, 0.2Ib to Imax, in the Un range
Reactive power (@ 25°C ± 5°C, R.H. ≤ 90%)	±(2% RDG +1DGT). sinφ 1, 0.05Ib to Imax, in the Un range; sinφ 0.5L, sinφ 0.5C, 0.1Ib to Imax, in the Un range
Apparent power (@ 25°C ± 5°C, R.H. ≤ 90%)	±(1% RDG +1DGT). PF 1, 0.1Ib to Imax, in the Un range
Energies (@ 25°C ± 5°C, R.H. ≤ 90%)	Class 1 acc. to EN61036 Class 2 acc. to EN61268 Ib: 5A, Imax: 10A 0.1Ib: 500mA, Start up current: 20mA Un: see table "range code" Ib: 20A, Imax: 90A 0.1Ib: 2A, Start up current: 80mA Un: see table "range code"
Harmonic distortion (@ 25°C ± 5°C, R.H. ≤ 90%)	±3% f.s. (f.s.: 100%) up to the 7th harmonic; Un: see table "range code"
Ib 5A	Imin: 500mA; Imax: 15Ap;
Ib 20A	Imin: 2A; Imax: 127Ap;

Additional errors	Acc. to EN61036, EN61268
Wave form	<1% (3rd harmonic: 10%)
Voltage asymmetry	< 0.5% (referred to Un)
Magnetic induction	0 (up to 0.5 mT)
HF Electromagnetic fields	< 1%
Operation of accessories	0
Temperature drift	≤ 200ppm/°C
Sampling rate	1000 samplings/s @ 50Hz
Display	
Type	Back-lighted LCD
Instantan. variables read-out	4x3½ DGT
Energies	Total:1x7½ DGT Partial: 1x7½ DGT
Max. and Min. indication	Max. 1999 (19999999), Min. 0
Measurements	Current, voltage, power, energy, power factor, frequency, harmonic distortion (see display specs). TRMS measurements of distorted wave forms.
Coupling type	Direct
Crest factor	
Ib 5A	≤3 (15A max. peak)
Ib 20A	≤6 (127A max. peak)
Current overload	
5(10) A, for 10ms	300 A max, @ 50Hz
5(10) A, for 500ms	200 A max, @ 50Hz
5(10) A, permanent	10A, @ 50Hz
20(90) A, for 10ms	2700A max, @ 50Hz
20(90) A, permanent	90A, @ 50Hz
Voltage overload	
Permanent	1.2 Un
For 1s	2 Un
Input impedance	
$400V_{L-L}$ (AV1-AV5-AV9)	> 720KΩ
$208V_{L-L}$ (AV0-AV4-AV8-AV2)	> 720KΩ
$660V_{L-L}$ (AV3-AV7)	> 1.97MΩ
$100V_{L-L}$ (AV6)	> 400KΩ
5(10) A (AV4-AV5-AV6-AV7)	< 0.3VA
20(90) A (AV0-AV1-AV3-AV8-AV9)	< 4VA
20(90) A (AV2)	< 4VA
Frequency	50 to 60 Hz

Interface module specifications

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

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Interface module specifications (cont.)

	2000 V_{RMS} between output and power supply input
RS422/RS485 (on request)	AR2950 module
Type	Multidrop bidirectional (static and and dynamic variables)
Connections	2 or 4 wires, max. distance 1200m, termination directly on the module
Addresses	255, selectable by key-pad
Protocol	MODBUS/JBUS
Data (bidirectional)	
Dynamic (reading only)	Phase and system variables: see table “Display pages”
Static (writing only)	All the programming data, reset of energy, activation of static output.
	Stored energy (EEPROM) max. 19.999.999 kWh/kvarh
Data format	1 start bit, 8 data bit, no parity, 1 stop bit
Baud-rate	9600 bit/s
Insulation	By means of optocouplers, 2000 V_{RMS} output to measuring inputs 2000 V_{RMS} output to supply input
Digital outputs (on request)	
AO2900 module	To be used as alarm, energy retransmission, or remote static outputs. 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)
Insulation	According to DIN43864 By means of optocouplers, 2000 V_{RMS} outputs to measuring inputs, 2000 V_{RMS} output to supply input. Insulation between the two outputs: functional
Alarm output	
Number of outputs	1
Alarm type	Up alarm, down alarm phase asymmetry, phase loss.
Setpoint adjustment	0 to 100% of the electrical scale
Hysteresis	0 to 100% of the electrical scale
On-time delay	0 to 255 seconds
Response time	
system variables	V, W, VA, var, PF (cosφ)
FFT off, filter off	700ms
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.
Insulation	By means of optocouplers, 2000 V_{RMS} output to measuring input, 2000 V_{RMS} output to supply input. Insulation between the two outputs: functional
AO2910 module	Relay + open collector output. Working mode like AO2900.
Pulse output	One static output+one relay output, other characteristics like AO2900.
Alarm output	Only relay output, other characteristics like AO2900.
Output type	Static type like module AO2900; Relay type: SPDT, AC1, AC15: 1AAC @250VAC
Insulation	By means of optocouplers, 2000 V_{RMS} outputs to measuring inputs, 2000 V_{RMS} output to supply input. Insulation between the two outputs: 2000 V_{RMS}

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Software functions

Password	Numeric code of max. 3 digits 2 protection levels of the programming data
1st level	Password "0", no protection
2nd level	Password from 1 to 1000, all data are protected
System selection	Three-phase with neutral Three-phase without neutral
Transformer ratio	
CT	1 to 5000
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)
Scaling factor	
Operating mode	Compression/expansion of the measuring range to be connected to the analogue output.
Electrical range	Programmable within the whole measuring range.
Filter	
Filter operating range	0 to 99.9% of the input electrical scale.
Filter coefficient	1 to 16
Filter action	Alarm, analogue and serial output (fundamental variables: V, A, W and their derived ones).
Display	Up to 4 variables per page
System variables	Page 1: W-var-PF (cosφ)
	Page 2: W dmd - VA dmd - Hz
Single phase variables	Page 3: THD-V
	Page 4: THD-A
System variables	Page 5: kWh total
	Page 6: kvarh total
	Page 7: kWh partial
	Page 8: kvarh partial
Single phase variables	Page 9: V_{L-N}
	Page 10: A
20(90) A 5(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)

Supply specifications

Self supplied version	400V_{L-L} -20% +15%, 50-60Hz 208V_{L-L} -20% +15% , 50-60Hz 220V_{L-L} -10% +15% , 50-60Hz
Auxiliary power supply	230VAC -15 +10%, 50-60Hz
	115VAC -15 +10%, 50-60Hz 48VAC -15 +10%, 50-60Hz 24VAC -15 +10%, 50-60Hz 18 to 60VDC 77 to 143VDC
Energy consumption	≤ 7VA

General Specifications

Operating temperature	0 to +55°C (R.H. < 90% non-condensing 40°C)
Storage temperature	-20 to +60°C (R.H. < 90% non-condensing 40°C)
Installation category	Cat. III (IEC 664)
Insulation	2000 VRMS between all inputs / outputs to earth
Dielectric strength	4000 VRMS for 1 minute
Noise rejection	
CMRR	100 dB, 48 to 62 Hz
EMC	
Burst	4kV/level 4 (EN61000-4-4)
Immunity to irradiated electromagnetic fields	10V/m 26-1000MHz (EN61000-4-3)
Electrostatic discharges	15kV (EN61000-4-2)
Radio frequency emissions	according to CISPR 14 and CISPR 22
Pulse voltage (1.2/50µs)	8kV (EN61000-4-5)
Standards	
Safety	IEC664-1
Metrology	Energy measurements: EN61036, EN61268.
Pulse output	DIN43864
Approvals	CE
Connections 5(10) A	Screw-type,
Cable cross-section area	4 mm²
Connections 20(90) A	Screw-type,
Min./Max. cable cross-section area	6 mm² / 35 mm²
Min./Max. screws tightening torque	2 Nm / 6 Nm
Housing	
Dimensions	162.5 x 90 x 63 mm
Material	ABS, NORYL, PC self-extinguishing: UL 94 V-0
Mounting	DIN-rail and wall
Degree of protection	Front: IP40 Connections: IP20
Weight	800 g approx. (packing included)

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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.

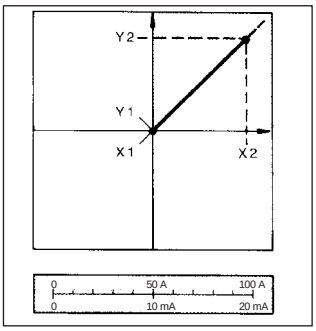


Figure B
The sign of measured quantity and output quantity remains the same. With the measured quantity being zero, the output quantity already has the value Y1 = 0.2 Y2.
Live zero output.

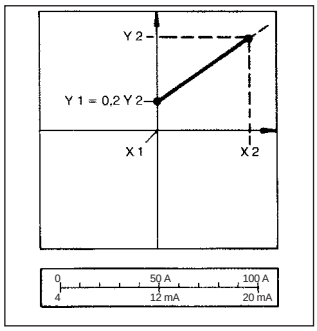
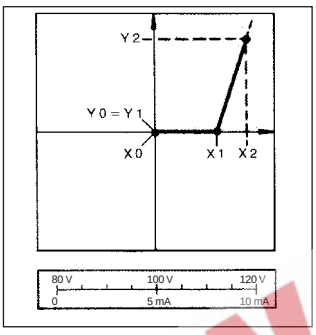


Figure C
The sign of measured quantity and output quantity remains the same. On the range X0...X1, the output quantity is zero. The range X1...X2 is delineated on the entire output range Y0=Y1...Y2 and thus presented in strongly expanded form.



Mode of Operation

Waveform of the signals that can be measured

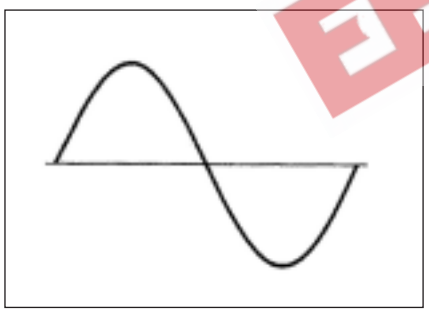


Figure D
Sine wave, undistorted

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

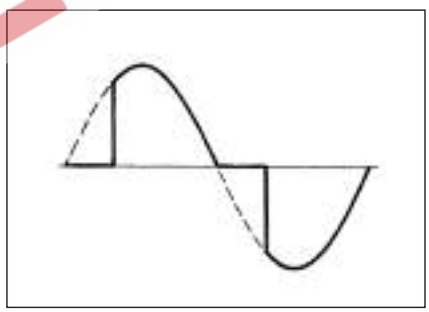


Figure E
Sine wave, indented

Fundamental content	10...100%
Harmonic contents	0...90%

Frequency spectrum: 3rd to the 16th harmonic
Additional error: <1% rdg

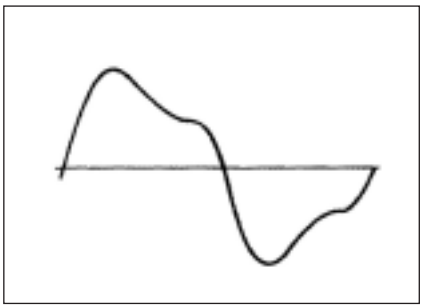


Figure F
Sine wave, distorted

Fundamental content	70...90%
Harmonic content	10...30%

Frequency spectrum: 3rd to the 16th harmonic
Additional error: <0.5% rdg

Harmonic distortion analysis

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

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Display pages

Variables that can be displayed

No	1st variable	2nd variable	3rd variable	4th 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_{L-3}	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
14	Var_{L1}	Var_{L2}	Var_{L3}	Var sys	if the neutral is not connected
15	PF_{L1}	PF_{L2}	PF_{L3}	PF sys	

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 (TPF)

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

Instantaneous effective current

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

Instantaneous apparent power

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

Instantaneous reactive power

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

System variables

Equivalent system voltage

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

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 (TPF)

$$\cos\phi_{\Sigma} = \frac{W_{\Sigma}}{VA_{\Sigma}}$$

Total harmonic distortion

$$THD_i = \frac{\sqrt{\sum_{n,n\neq 1} T_{n,i}^2}}{T_{1,i}}$$

Note:
i = phase (L1, L2 or L3)
T = variable (V or I)
n = harmonic order

Consumption recording

$$kWh_i = \int_{t_1}^{t_2} P_i(t)\,dt \cong \Delta t \sum_{n_1}^{n_2} P_{n,i} \qquad kVarh_i = \int_{t_1}^{t_2} Q_i(t)\,dt \cong \Delta t \sum_{n_1}^{n_2} Q_{n,i}$$

Note:
i = phase (L1, L2 or L3)
P = active power
Q = reactive power
t_1, t_2 = starting and ending time points of consumption recording
n = time unit
Δt = time interval of consumption recording
n_1, n_2 = starting and ending discrete time points of consumption recording

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

N°	Variable	Notes
1	V sys	sys = system
2	W sys	sys = system
3	var sys	sys = system
4	VA sys	sys = system
5	PF sys	sys = system

N°	Variable	Notes
6	THD-V	Max. THD value among the three phases
7	THD-A	Max. THD value among the three phases
8	VA dmd	Power demand in the selected integration time
9	W dmd	
10	ASY	Phase asymmetry

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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 AV2.3.D.	220V_{L-L}, 20(90)A	Self power-supply	AF2144
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	115VAC, 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
WM22-DIN AV1.3.4 / [5]	400V_{L-L}, 20(90)A	18-60VDC [77-143VDC]	AF2130 [AF2137]
WM22-DIN AV0.3.4 / [5]	208V_{L-L}, 20(90)A	18-60VDC [77-143VDC]	AF2131 [AF2138]
WM22-DIN AV3.3.4 / [5]	660V_{L-L}, 20(90)A	18-60VDC [77-143VDC]	AF2132 [AF2139]
WM22-DIN AV5.3.4 / [5]	400V_{L-L}, 5(10)A	18-60VDC [77-143VDC]	AF2133 [AF2140]
WM22-DIN AV4.3.4 / [5]	208V_{L-L}, 5(10)A	18-60VDC [77-143VDC]	AF2134 [AF2141]
WM22-DIN AV7.3.4 / [5]	660V_{L-L}, 5(10)A	18-60VDC [77-143VDC]	AF2135 [AF2142]
WM22-DIN AV6.3.4 / [5]	100V_{L-L}, 5(10)A	18-60VDC [77-143VDC]	AF2136 [AF2143]

Available modules

Type	Channels	Code
Open collector output	2	AO2900
0-20mADC analogue output	1	AO2920
Relay + open c. output	2	AO2910

Type	Channels	Code
0-10VDC Analogue Output	1	AO2921
RS485 Serial Output	1	AR2950

Possible module combinations

Power supply	Self p.s.		Auxiliary p.s.	
Basic unit	Slot A	Slot B	Slot A	Slot B
Open collector output	●		●	
Relay + open c. output	●		●	

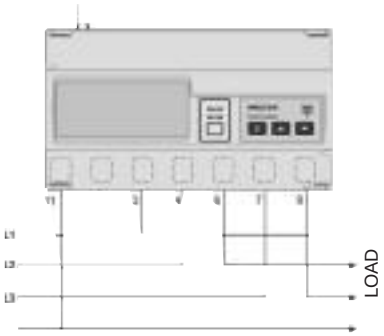
Power supply	Self p.s.		Auxiliary p.s.	
Basic unit	Slot A	Slot B	Slot A	Slot B
Analogue output		●(*)		●
RS485 Serial Output		●(*)		●

(*) AV2 only

Wiring diagrams

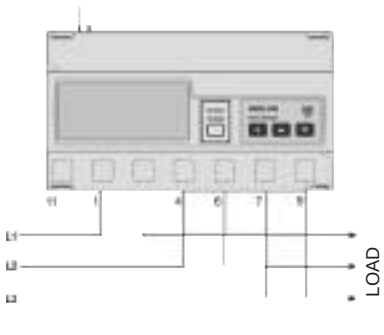
20(90)A model: three-phase unbalanced load

Auxiliary power supply Fig. 1
AC power supply



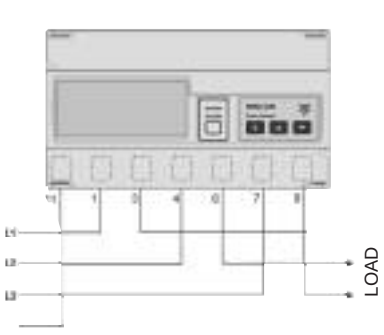
Direct connection (3-phase system+N)

Auxiliary power supply Fig. 2
AC power supply



Direct connection (3-phase system)

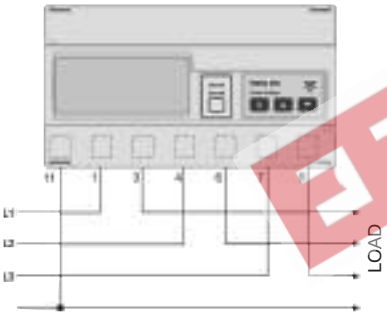
Self-power supply Fig. 3



Direct connection (3-phase system)

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

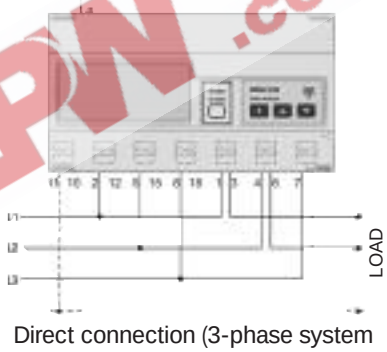
Self-power supply Fig. 4



Direct connection (3-phase system + N)

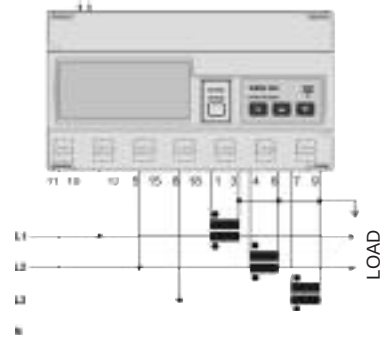
5(10)A model: three-phase unbalanced load

Auxiliary power supply Fig. 5
AC power supply



Direct connection (3-phase system with or without neutral)

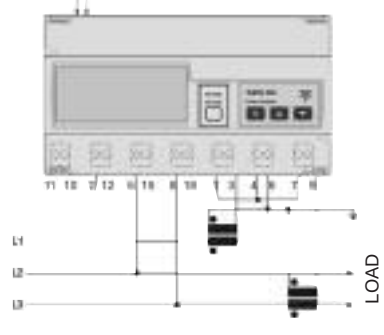
Auxiliary power supply Fig. 6
AC power supply



CT connection (3-phase system+N)

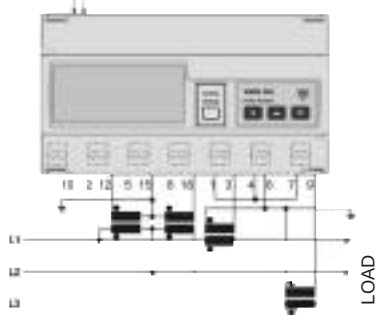
5(10)A model: three-phase unbalanced load

Auxiliary power supply Fig. 7
AC power supply



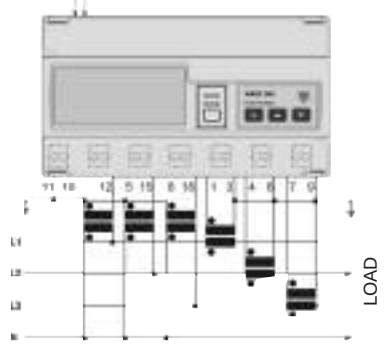
CT ARON connection (3-phase system)

Auxiliary power supply Fig. 8
AC power supply



VT and CT ARON connection (3-phase system)

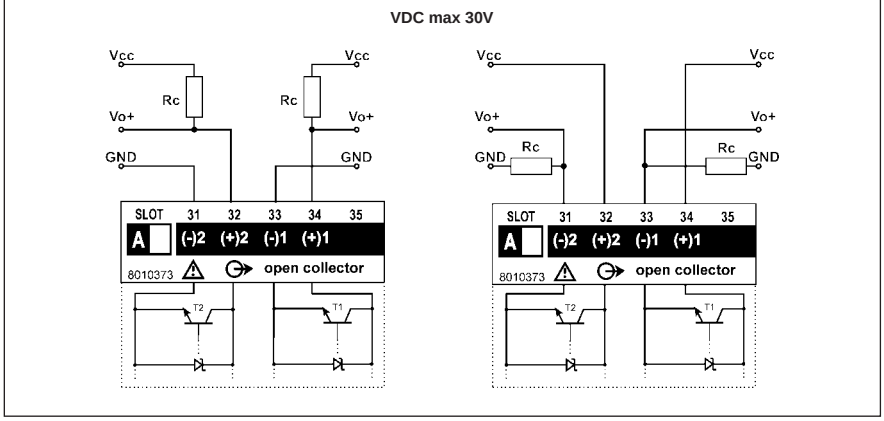
Auxiliary power supply Fig. 9
AC power supply



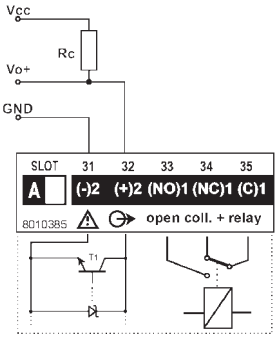
VT and CT connection (3-phase system + N)

Wiring diagrams (optional modules)

Open collector output Fig.10

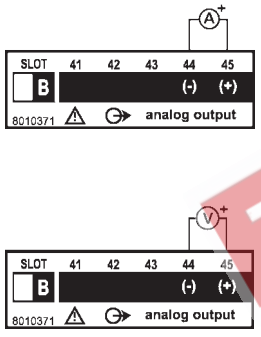


Relay + open collector output Fig. 11



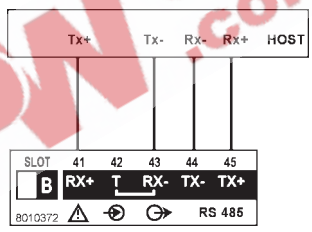
Only open collector outputs: the grounds of the outputs are separated, and therefore it's possible to carry out, for the same module, two different connections. The load resistance (Rc) must be designed so that the closed contact current is lower than 100mA; the VDC voltage must be lower than or equal to 30V. VDC: power supply voltage output. Vo+: positive output contact (open collector transistor). GND: ground output contact (open collector transistor).

Analogue output Fig. 12



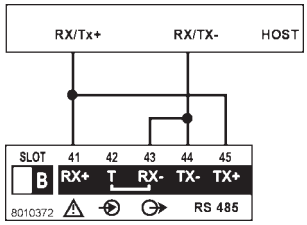
Current and voltage

RS485 Serial output Fig. 13



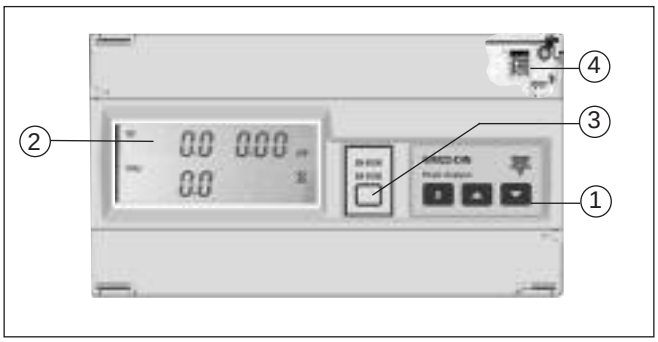
4-wire connection

RS485 Serial output Fig. 14



2-wire connection

Front panel description



1. Key-pad
To program configuration parameters and to display variables.

S

S-key to enter programming and confirm selections;

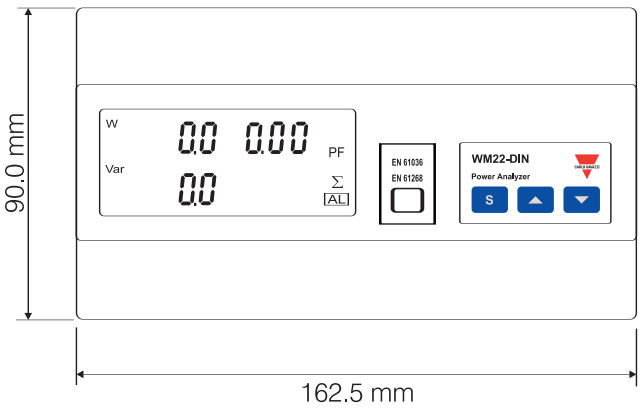
Keys for:
- value programming;
- function selection;
- displaying the measuring pages.

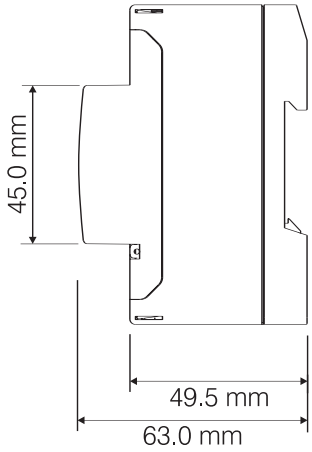
2. Display
LCD with alphanumeric indications to:
- display configuration parameters;
- display all the measured variables.

3. Removable label
Label to write the instrument ID number.

4. Hidden dip-switch
Enable/ disable the access to the programming procedure.

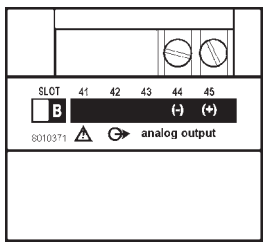
Dimensions and panel cut-out





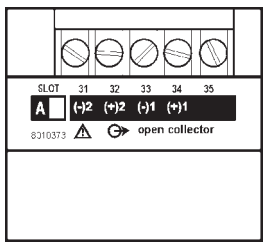
Terminal boards

Analogue output module



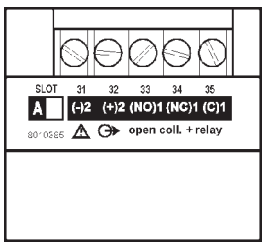
AO 2920: 0-20 mA
AO 2921: 0-10 V

Dual output open collector module



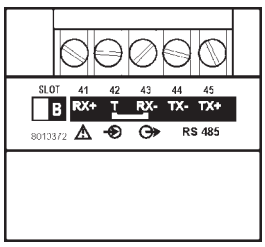
AO 2900

Relay output module + open collector output



AO 2910

RS485 serial output module



AR 2950