

# Energy Management Energy Analyzer Type EM11 DIN



• Other versions available (not certified, option X): see “how to order” on the next page

- Class 1 (kWh) according to EN62053-21
- Class B (kWh) according to EN50470-3
- Class 2 (kvarh) according to EN62053-23
- Accuracy  $\pm 0.5$  RDG (current/voltage)
- Energy analyzer
- Instantaneous variables readout: 4 DGT
- Energies readout: 6 DGT
- Instantaneous variables: V, A, W, Wdmd, Wdmd max, var, PF, Hz
- Single phase variables: VLL, VLN, A, VA, W, var, PF
- Energy measurements: total kWh and kvarh
- TRMS measurements of distorted sine waves (voltages/currents)
- Self power supply
- Dimensions: 1-DIN module
- Protection degree (front): IP40
- 1 pulse output on request
- 1 alarm output on request
- Certified according to MID Directive (option PF only): see “how to order” below

## Product Description

One-phase energy analyzer with built-in configuration push button and LCD data displaying; particularly indicated for active and reactive energy metering and for cost allocation. Housing for DIN-rail mounting, IP40 (front) protection degree. Direct connection up to

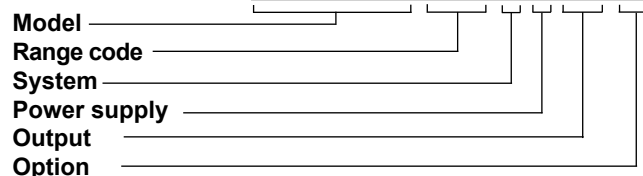
32A. Moreover the meter can be provided with either pulse output proportional to the active energy being measured or alarm control on the available instantaneous variables.



Certified according to MID Directive, Module B and Module D of Annex II, for legal metrology relevant to active electrical energy meters (see Annex V, MI003, of MID). Can be used for fiscal (legal) metrology.

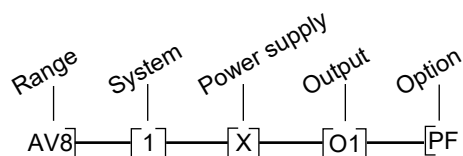
## How to order

**EM11 DIN AV8 1 X O1 PF**



## Type Selection

Range code	System	Power supply	Option
<b>AV8:</b> 230V <sub>LN</sub> AC - 5(32)A (direct connection)	<b>1:</b> 1-phase	<b>X:</b> Self power supply (from 48 to 62Hz). The instrument works on the range from -20% to +20% of the measuring input nominal voltage.	<b>PF:</b> Certified according to MID Directive. Can be used for fiscal (legal) metrology.
	<b>Output</b>		
	<b>O1:</b> Pulse type (open collector output)		



**NOTE:** please check the availability of the needed code on the verification path diagram on left before order.

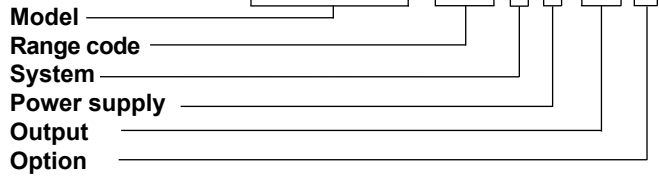


**STANDARD**

Not certified according to MID directive. Cannot be used for fiscal (legal) metrology.

**How to order**

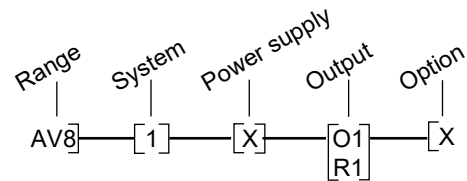
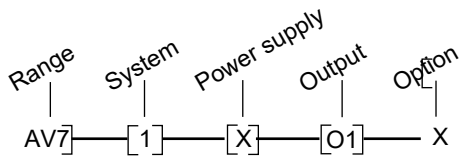
**EM11 DIN AV8 1 X O1 X**



**Type Selection**

Range code	System	Power supply	Option
<b>AV7:</b> 120V <sub>LN</sub> AC - 5(32)A (direct connection)	<b>1:</b> 1-phase	<b>X:</b> Self power supply (from 48 to 62Hz). The instrument works on the range from -20% to +20% of the measuring input nominal voltage.	<b>X:</b> none
<b>AV8:</b> 230V <sub>LN</sub> AC - 5(32)A (direct connection)	<b>Output</b>		
	<b>O1:</b> Pulse type (open collector output)		
	<b>R1:</b> Alarm type (relay output)		

**NOTE:** please check the availability of the needed code on the verification path diagrams below before order.



## Input specifications

<b>Rated inputs</b>	System: 1	Type	LCD, h 7mm
Current range (by shunt)	AV7 and AV8: 5(32) A	Instantaneous variables read-out	4 DGT (V and A) 3 DGT (W, var, Wdmd, Wdmd max, Hz, PF)
Voltage range	AV7: 120 VLN AC AV8: 230 VLL AC	Min. Max. indication	Max. 9 999; Min. 0 (0.0)
<b>Accuracy (Display)</b> (@25°C ±5°C, R.H. ≤60%, 48 to 62Hz)		Energies	Total: 6 DGT
AV7 model	Ib: 5A, I <sub>max</sub> : 32A; Un: 120VLN (-20% +20%)	<b>LEDs</b>	Red LED (Energy consumption), 1000 pulses/kWh (Max Frequency 16 Hz) according to EN62053-11
AV8 model	Ib: 5A, I <sub>max</sub> : 32A; Un: 230VLN (-20% +20%)	<b>Measurements</b>	See "Measuring variables and Min. Max. indications"
Current	From 0.04Ib to 0.2Ib, PF=1: ±(0.5% RDG +3DGT) From 0.2Ib to I <sub>max</sub> , PF=1: ±(0.5% RDG +1DGT).	Method	TRMS measurements of distorted wave forms
Voltage	In the Un range: ±(0.5% RDG +2DGT)	Coupling type	Direct
Frequency	±0.1Hz (48 to 62Hz)	<b>Crest factor</b>	Ib 5A ≤4 (45A max. peak)
Active power	±(1%RDG +2DGT)	<b>Current Overload</b>	
Reactive power	±(2%RDG +2DGT)	Continuous	32A, @ 50Hz
Active energy	Class 1 according to EN62053-21 and Class B according to EN50470-3.	For 10ms	960A, @ 50Hz
Reactive energy	Class 2 according to EN62053-23.	<b>Voltage Overload</b>	
Reference values	Ib: 5A, I <sub>max</sub> : 32A, 0.1 Ib: 0.5A	Continuous	1.2 Un
Start up current:	20mA	For 500ms	2 Un
<b>Energy additional errors</b>		<b>Input impedance</b>	
Influence quantities	According to EN62053-21, EN62053-23	120VL-N (AV7)	>720KΩ
<b>Temperature drift</b>	≤200ppm/°C	230VL-N (AV8)	>720KΩ
<b>Sampling rate</b>	4096 samples/s @ 50Hz 4096 samples/s @ 60Hz	5(32) A (AV7-AV8)	< 0.5VA
<b>Display refresh time</b>	1 sec.	<b>Frequency</b>	48 to 62 Hz
<b>Display</b>	1 line (max: 6 DGT)	<b>Key-pad</b>	1 push-button for variable selection and programming of the instrument working parameters. Not available in case of "PF" option.

## Output specifications

<b>Digital output</b>		Alarm modes	DC 13-1.5A @ 24VDC
Number of outputs	1, open collector programmable, from 0.001 to 1 kWh for each pulse.	Controlled variables	Up alarm or down alarm kW, kWdmd, kvar, PF, A, V, Hz
X Option	Fixed, 0,001 kWh/pulse	Set-point adjustment	Programmable on all the measuring range (see "Measuring variables and Min. Max. indications")
PF option	V <sub>ON</sub> 1.2 VDC/ max. 100 mA	Hysteresis	programmable on all the measuring range (see "Measuring variables and Min. Max. indications")
Signal	V <sub>OFF</sub> 30 VDC max.	On-time delay	0 to 9999s (166min)
Pulse duration	≥100ms < 120msec (ON), ≥120ms (OFF), according to EN62052-31	Off-time delay	0 to 9999s (166min)
Insulation	By means of optocouplers, 4000 VRMS output to measuring inputs	Min. response time	1s, set-point on-time delay: "0 s"
<b>Alarm output</b>	Not available in case of PF option.	Insulation	4000 VRMS output to measuring inputs
Number of outputs	1		
Type	Relay, SPST type AC 1-5A @ 250VAC DC 12-5A @ 24VDC AC 15-1.5A @ 250VAC		

## Software functions (Not available in case of PF option)

<b>Password</b>	Numeric code of max. 4 digits; 2 protection levels of the programming data:	<b>Displaying</b>	1 variable per page (See «Measuring variables and Min. Max. indications»)
1st level	Password "0", no protection;	<b>Reset</b>	By means of the front key-pad:
2nd level	Password from 1 to 9999, all data are protected		- W dmd max; - energies: kWh, kvarh

## General specifications

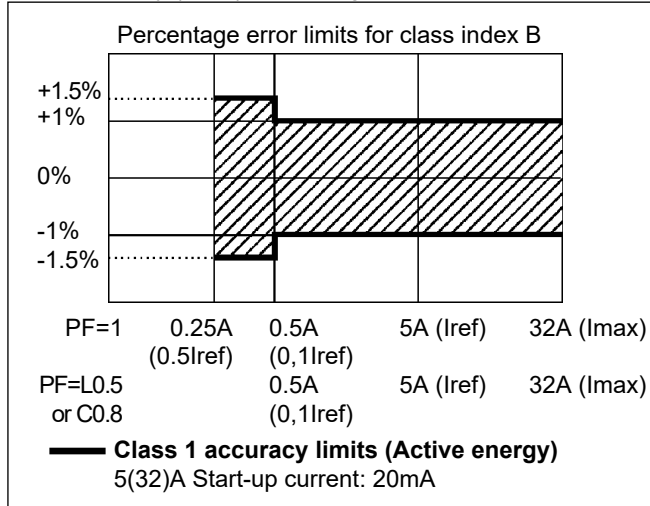
<b>Operating temperature</b>	-25°C to +55°C (-13°F to 131°F) (R.H. from 0 to 90% non-condensing @ 40°C) according to EN62053-21, EN50470-1 and EN62053-23	<b>Surge</b>	80MHz On current and voltage measuring input circuits: 4kV;
<b>Storage temperature</b>	-30°C to +70°C (-22°F to 140°F) (R.H. < 90% non-condensing @ 40°C) according to EN62053-21, EN50470-1 and EN62053-23	<b>Radio frequency suppression</b>	According to CISPR 22
<b>Installation category</b>	Cat. III (IEC60664, EN60664)	<b>Standard compliance</b>	
<b>Insulation (for 1 minute)</b>	4000 VRMS between measuring inputs and digital output (O1 and R1).	<b>Safety</b>	IEC60664, IEC61010-1 EN60664, EN61010-1 (EN62052-11) EN50470-1, EN62053-21, EN62053-23, EN50470-3.
<b>Dielectric strength</b>	4000 VRMS for 1 minute	<b>Metrology</b>	DIN43864, IEC62053-31
<b>CMRR Noise rejection</b>	100 dB, 48 to 62 Hz	<b>Approvals</b>	CE, cULus (X option) MID (PF option)
<b>EMC</b>	According to EN62052-11	<b>Connections</b>	Screw-type Measuring inputs: min. 2.5 mm <sup>2</sup> , max. 10 mm <sup>2</sup> ; Min./Max. screws tightening torque: 0.5 Nm / 1.1 Nm Other terminals: 1.5 mm <sup>2</sup> . Screws tightening torque: 0.5 Nm
Electrostatic discharges	8kV air discharge;	<b>DIN Housing</b>	
Immunity to irradiated electromagnetic fields	Test with applied current: 10V/m from 80 to 2000MHz; Test without any applied current: 30V/m from 80 to 2000MHz;	<b>Dimensions (WxHxD)</b>	17.5 (+0.5 -0) x 90 x 67.5 mm
Burst	On current and voltage measuring input circuits: 4kV	<b>Material</b>	Nylon PA66, self-extinguishing: UL 94 V-0
Immunity to conducted disturbances	10V/m from 150KHz to	<b>Mounting</b>	DIN-rail
		<b>Protection degree</b>	
		Front	IP40
		Screw terminals	IP20
		<b>Weight</b>	Approx. 100 g (packing included)

## Power supply specifications

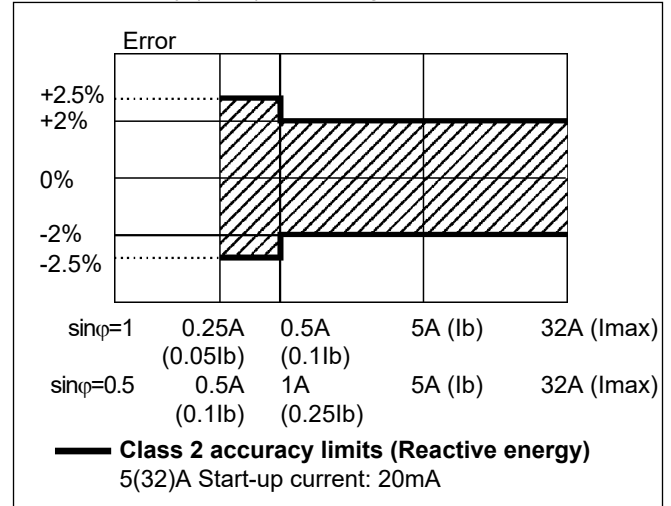
<b>Self supplied version</b>	120VLN (AV7), 230 VLN (AV8) (-20% +20%) 48-62Hz	<b>Power consumption</b>	≤ 3VA
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## Accuracy (according to EN50470-3 and EN62053-23)

**kWh, accuracy (RDG) depending on the current**



**kvarh, accuracy (RDG) depending on the current**



## MID compliance (PF option only)

<b>Accuracy</b>	0.9 Un ≤ U ≤ 1.1 Un; 0.98 fn ≤ f ≤ 1.02 fn; fn: 50 or 60Hz; cosφ: 0.5 inductive to 0.8 capacitive. Class B I st: 0.02A; I min: 0.25A; I tr: 0.5A; I ref: 5A; I max: 32A.	<b>EMC compliance</b>	E2
<b>Operating temperature</b>	-25°C to +55°C (-13°F to 131°F) (R.H. from 0 to 90% non-condensing @ 40°C)	<b>Mechanical compliance</b>	M2
		<b>Protection degree</b>	in order to achieve the protection against dust and water required by the norms harmonized to MID, the meter must be used only installed in IP51 (or better) cabinets.

## Used calculation formulas

### Phase variables

Instantaneous effective voltage

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

Instantaneous active power

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

Instantaneous power factor

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

Instantaneous effective current

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

Instantaneous apparent power

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

Instantaneous reactive power

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

Where: n= sample number

### Energy metering

$$kWh_1 = \int_{t_1}^{t_2} P_1(t) dt \cong \Delta t \sum_{j=n_1}^{n_2} P_1(j)$$

$$k \text{ var } h_1 = \int_{t_1}^{t_2} Q_1(t) dt \cong \Delta t \sum_{j=n_1}^{n_2} Q_1(j)$$

Where:

**P**= active power;

**Q**= reactive power;

**t<sub>1</sub>, t<sub>2</sub>** =starting and ending time points of consumption recording;

**n<sub>j</sub>**= time unit;

**Δt**= time interval between two successive power consumptions;

**n<sub>1</sub>, n<sub>2</sub>** = starting and ending discrete time points of consumption recording

## Measuring variables and Min. Max. indications

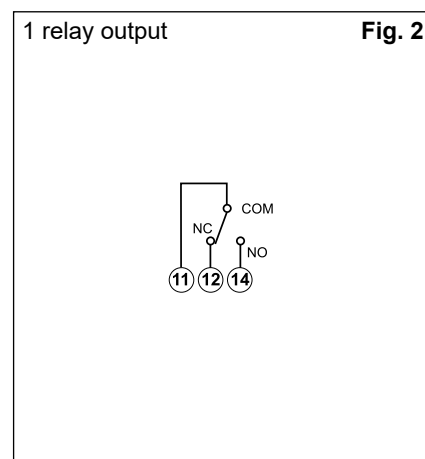
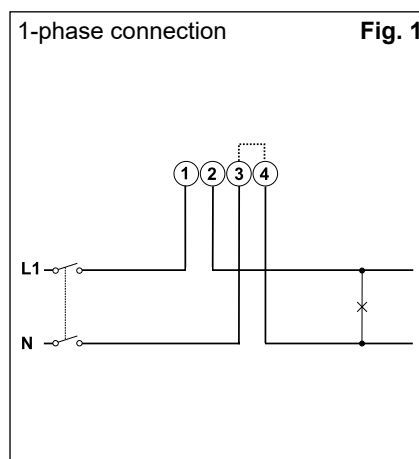
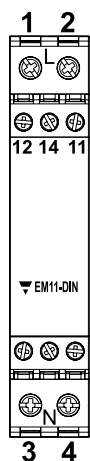
Page number	Variable	Min. Max. Indication	Notes
1	kWh	from 0.01 to 999999, autoranging.	Total (only consumed energy)
2	kvarh	from 0.0 to 99999.9	Total (only consumed energy)
3	kW	from 0.00 to 9.99	
4	kW dmd	from 0.00 to 9.99	Integration time programmable from 1 to 30 minutes
5	kW dmd max	from 0.00 to 9.99	Max value with data storage (in EEPROM)
6	V	from 0.0 to 999.9	
7	A	from 0.0 to 32.00	
8	Hz	from 48.0 to 62.0	
9	PF (cosφ)	from L/C. 00 to L/C. 99	
10	kvar	from 0.00 to 9.99	

**Note:** In case of X option all the variables above can be scrolled using the front push button, in case of PF option the push button is not available and the variables are automatically scrolled.

## Insulation between inputs and outputs

	Measuring inputs	Relay output	Open collector output	AC self-power supply
Measuring inputs	-	4kV	4kV	0kV
Relay output	4kV	-	4kV	4kV
Open collector output	4kV	4kV	-	4kV
AC self-power supply	0kV	4kV	4kV	-

## Wiring diagrams and relay output (R1)



**NOTE:** The 3 and 4 terminals, in the instrument, are wired together

## Wiring diagrams and open collector output (O1)

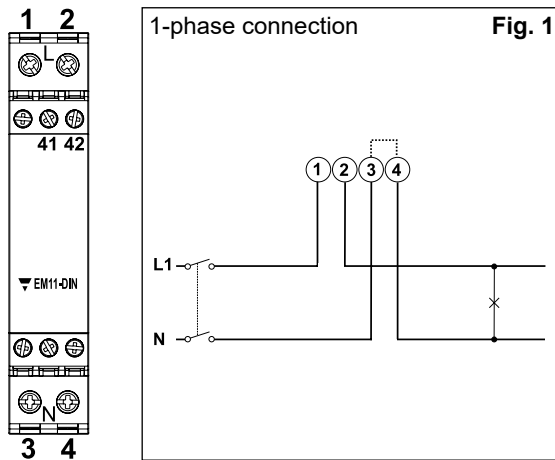


Fig. 1

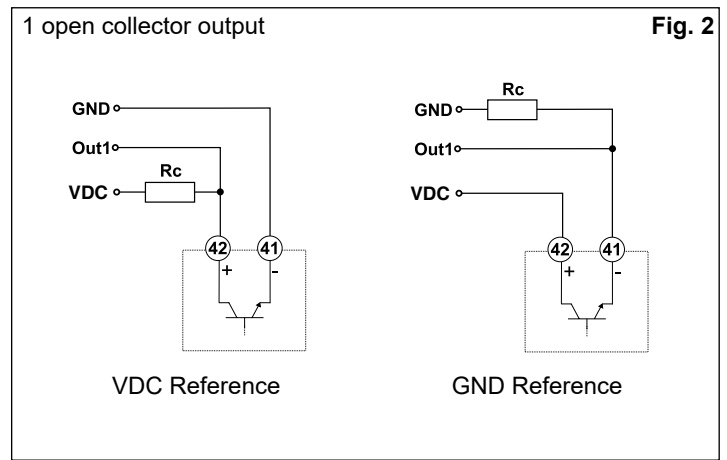
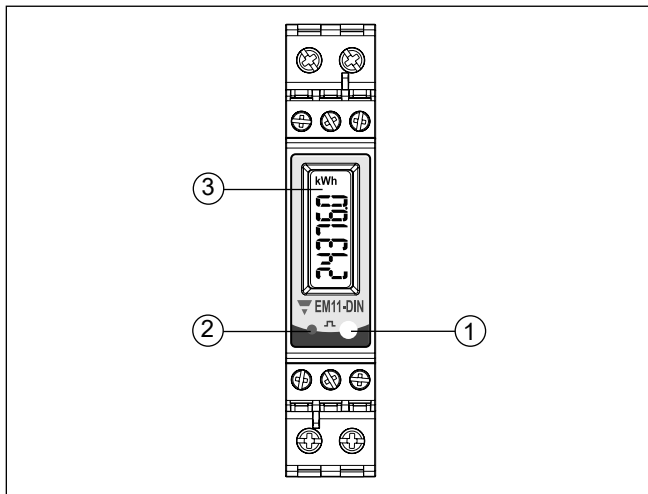


Fig. 2

**NOTE:** The 3 and 4 terminals, in the instrument, are wired together

The load resistances ( $R_C$ ) must be designed so that the close contact current is lower than 100mA; the VDC voltage must be lower than or equal to 30VDC.

## Frontal panel description



**1. Push button**

To program the configuration parameters and the display of the variables.  
Not available in case of PF option.

**2. LED**

Red LED to show the consumed energy.

**3. Display**

LCD-type with alphanumeric indication to:  
- display configuration parameters;  
- display all the measured variables.

## Dimensions and panel cut-out

