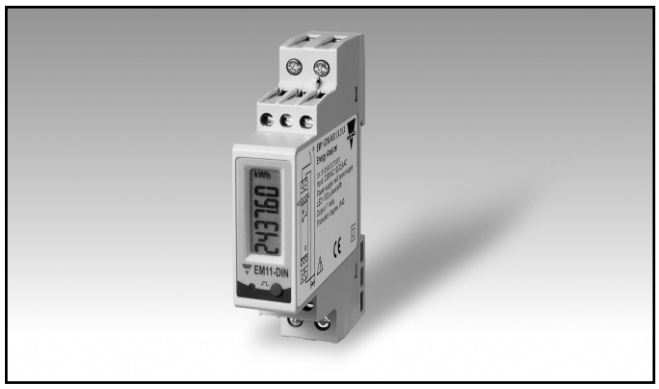
Energy Management
Energy Analyzer
Type EM11 DIN

CARLO GAVAZZI



- **Other versions available (not certified, option X and P): 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 ±0.5 RDG (current/voltage)**
- **Energy analyzer**
- **Instantaneous variables readout: 4 DGT**
- **Energies readout: 5+1 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.

MID Certified according to MID Directive, Annex "B" + Annex "D" or Annex “B” + Annex “F” for legal metrology relevant to active electrical energy meters (see Annex MI-003 of MID). Can be used for fiscal (legal) metrology.

How to order

EM11 DIN AV8 1 X O1 PF

- **Model**
- **Range code**
- **System**
- **Power supply**
- **Output**
- **Option**

Type Selection

Range code

AV8: $230V_{LN}$ AC - 5(32)A (direct connection)

System

1: 1-phase

Output

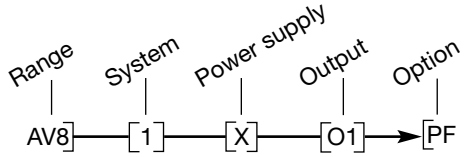
O1: Pulse type (open collector output)

Power supply

X: Self power supply (from 48 to 62Hz). The instrument works on the range from -20% to +20% of the measuring input nominal voltage.

Option

PF: Certified according to MID Directive, Annex "B" + Annex "D" or Annex “B” + Annex “F” for legal metrology relevant to active electrical energy meters (see Annex MI-003 of MID). Can be used for fiscal (legal) metrology.



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

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STANDARD

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

How to order

EM11 DIN AV8 1 X O1 X

- **Model**
- **Range code**
- **System**
- **Power supply**
- **Output**
- **Option**

Type Selection

Range code

AV7: 120V_{LN} AC - 5(32)A (direct connection)
AV8: 230V_{LN} AC - 5(32)A (direct connection)

System

1: 1-phase

Output

XX: None
O1: Pulse type (open collector output)
R1: Alarm type (relay out-put)

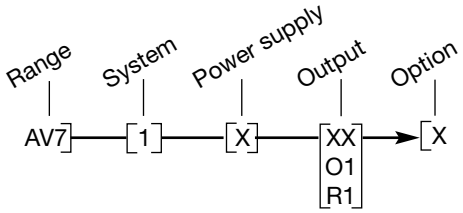
Power supply

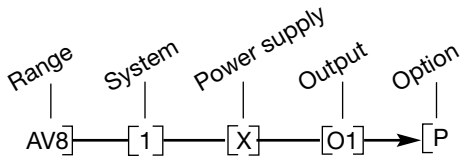
X: Self power supply (from 48 to 62Hz). The instrument works on the range from -20% to +20% of the measuring input nominal voltage.

Option

X: none
P: Bearing EC “Type examination” (annex B of MID) relevant to active electrical energy meters (see Annex MI-003

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





Input specifications

Rated inputs	System: 1
Current range (by shunt)	AV7 and AV8: 5(32)A
Voltage range	AV7: 120 VLN AC AV8: 230 VLL AC
Accuracy (Display) (@25°C ±5°C, R.H. ≤60%, 48 to 62Hz)	
AV7 model	Ib: 5A, Imax: 32A; Un: 120VLN (-20% +20%)
AV8 model	Ib: 5A, Imax: 32A; Un: 230VLN (-20% +20%)
Current	From 0.04Ib to 0.2Ib: ±(0.5% RDG +3DGT) From 0.2Ib to Imax: ±(0.5% RDG +1DGT).
Voltage	In the Un range: ±(0.5% RDG +2DGT)
Frequency	±0.1Hz (48 to 62Hz)
Active power	±(1%RDG +2DGT)
Reactive power	±(2%RDG +2DGT)
Active energy	Class 1 according to EN62053-21 and Class B according to EN50470-3.
Reactive energy	Class 2 according to EN62053-23.
Reference values	Ib: 5A, Imax: 32A, 0.1 Ib: 0.5A
Start up current:	20mA
Energy additional errors	
Influence quantities	According to EN62053-21, EN62053-23
Temperature drift	≤200ppm/°C
Sampling rate	4096 samples/s @ 50Hz 4096 samples/s @ 60Hz
Display refresh time	1 sec.
Display	1 line (max: 5+1 DGT)
Type	LCD, h 7mm

Instantaneous variables read-out	4 DGT (V and A) 3 DGT (W, var, Wdmd, Wdmd max, Hz, PF)
Min. Max. indication	Max. 9 999; Min. 0 (0.0)
Energies	Total: 5+1 DGT
LEDs	Red LED (Energy consumption), 1000 pulses/kWh (Max Frequency 16 Hz) according to EN62053-11
Measurements	See “Measuring variables and Min. Max. indications”
Method	TRMS measurements of distorted wave forms
Coupling type	Direct
Crest factor	Ib 5A ≤4 (45A max. peak)
Current Overload	
Continuous	32A, @ 50Hz
For 10ms	960A, @ 50Hz
Voltage Overload	
Continuous	1.2 Un
For 500ms	2 Un
Input impedance	
120VL-N (AV7)	>720KΩ
230VL-N (AV8)	>720KΩ
5(32) A (AV7-AV8)	< 0.5VA
Frequency	48 to 62 Hz
Key-pad	1 push-button for variable selection and programming of the instrument working parameters. Not available in case of “P” and “PF” options.

Output specifications

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

Software functions (Not available in case of “P” and “PF”options)

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

General specifications

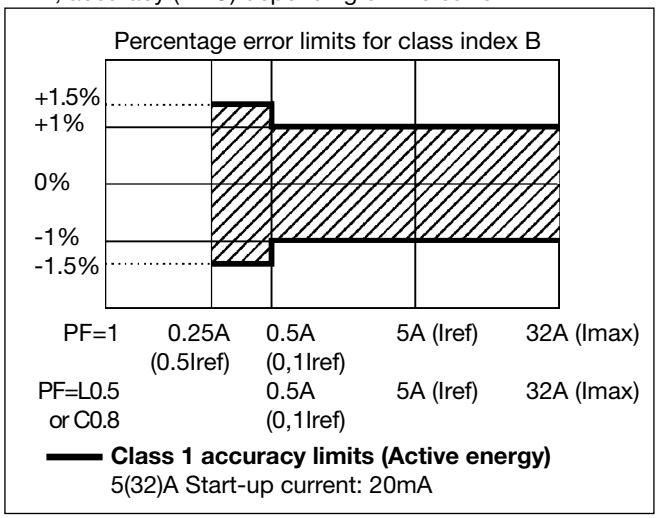
Operating temperature	-25°C to +55°C (-13°F to 131°F) (R.H. from 0 to 90% non-condensing @ 40°C) according to EN62053-21, EN50470-1 and EN62053-23
Storage temperature	-30°C to +70°C (-22°F to 140°F) (R.H. < 90% non-condensing @ 40°C) according to EN62053-21, EN50470-1 and EN62053-23
Installation category	Cat. III (IEC60664, EN60664)
Insulation (for 1 minute)	4000 VRMS between measuring inputs and digital output (O1 and R1).
Dielectric strength	4000 VRMS for 1 minute
CMRR **Noise rejection**	100 dB, 48 to 62 Hz
EMC	According to EN62052-11
Electrostatic discharges	8kV air discharge;
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;
Burst	On current and voltage measuring input circuits: 4kV
Immunity to conducted disturbances	10V/m from 150KHz to 80MHz
Surge	On current and voltage measuring input circuits: 4kV;
Radio frequency suppression	According to CISPR 22
Standard compliance	
Safety	IEC60664, IEC61010-1 EN60664, EN61010-1 (EN62052-11) EN50470-1.
Metrology	EN62053-21, EN62053-23, EN50470-3.
Pulse output	DIN43864, IEC62053-31
Approvals	CE, cULus MID (option PF only)
Connections	Screw-type
Cable cross-section area	Min. 2.5 mm^2, Max. 10 mm^2 (measuring inputs); Other terminals: 1.5 mm^2 Min./Max. screws tightening torque: 0.5 Nm / 1.1 Nm
DIN Housing	
Dimensions (WxHxD)	17.5 (+0.5 -0) x 90 x 67.5 mm
Material	Nylon PA66, self-extinguishing: UL 94 V-0
Mounting	DIN-rail
Protection degree	
Front	IP40
Screw terminals	IP20
Weight	Approx. 100 g (packing included)

Power supply specifications

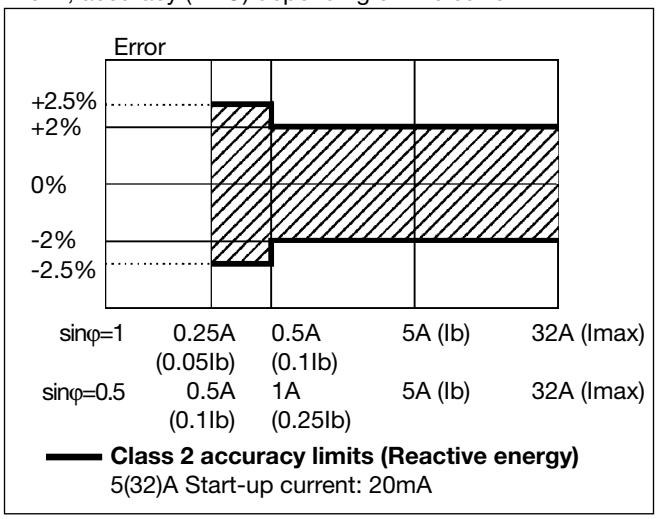
Self supplied version	120VLN, 230 VLN (-20% +20%) 48-62Hz
Power consumption	≤ 3VA

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

kWh, accuracy (RDG) depending on the current



kvarh, accuracy (RDG) depending on the current



MID "Annex MI-003" compliance (PF option only)

Accuracy	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.
Operating temperature	-25°C to +55°C (-13°F to 131°F) (R.H. from 0 to 90% non-condensing @ 40°C)

EMC compliance	E2
Mechanical compliance	M2
Protection degree	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

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

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

$$kWh_1 = \int_{t1}^{t2} P_1(t)dt \cong \Delta t \sum_{j=n1}^{n2} P_1(j)$$

$$k\,\text{var}\,h_1 = \int_{t1}^{t2} Q_1(t)dt \cong \Delta t \sum_{j=n1}^{n2} Q_1(j$$

Where:
P= active power;
Q= reactive power;
t_1, t_2 =starting and ending time points of consumption recording;
nj= time unit;
Δt= time interval between two successive power consumptions;
n_1, n_2 = 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 0.0 to 99999.9 from 0.01 to 999999 Autoranging. PF model only.	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 progammable 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	

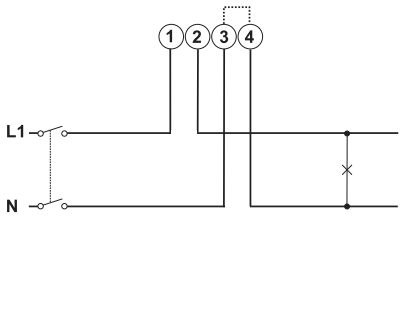
Note: In case of “X” option all the variables above can be scrolled using the front push button, in case of “P” and “PF” options the push button is not available and the variables are automatically scrolled.

Insulation between inputs and outputs

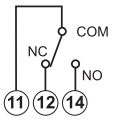
	Measuring inputs	Relay output	Open collector output	AC self-power supply
Measuring inputs	-	4kV	4kV	0kV
Relay output	4kV	-	4kV	4kV
Open collector output	4kV	4kV	-	4kV
AC self-power supply	0kV	4kV	4kV	-

Wiring diagrams and relay output (R1)

1-phase connection **Fig. 1**



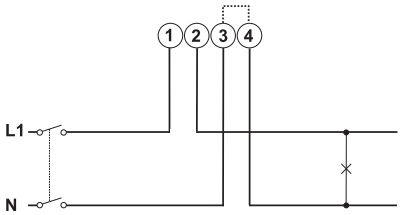
1 relay output **Fig. 2**



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

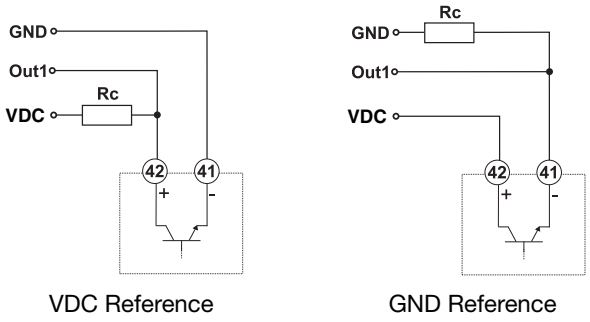
Wiring diagrams and open collector output (O1)

1-phase connection **Fig. 1**



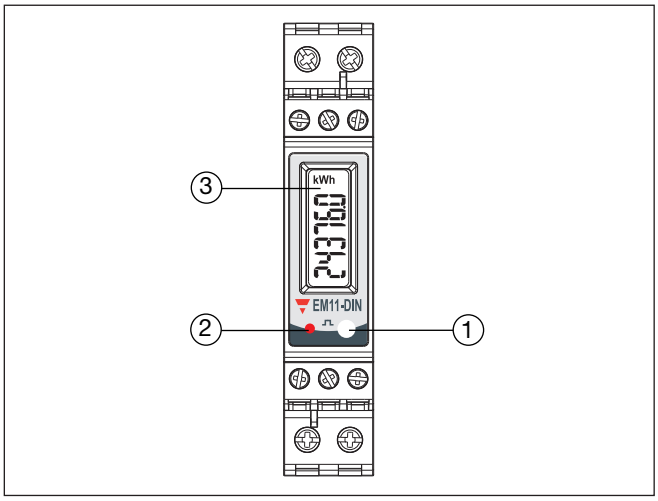
NOTE: The 3 and 4 terminals, in the instrument, are wired together

1 open collector output **Fig. 2**



The load resistances (RC) 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 “P” and “PF” options.
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