Energy Management
Energy Meter
Type EM23 DIN

CARLO GAVAZZI

- 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: 3 DGT
- Energies readout: 6+1 DGT
- System variables: W, var, Phase-sequence.
- Single phase variables: A
- Energy measurements: total kWh and kvarh
- TRMS measurements of distorted sine waves (voltages/currents)
- Self power supply
- 1 pulsating output
- Dimensions: 4-DIN modules
- Protection degree (front): IP50
- Easy connections management
- MID "annex MI-003" (Measuring Instruments Directive) compliant

Product Description

Three-phase energy meter with built-in configuration joystick and LCD data displaying; particularly indicated for active and reactive energy metering and for cost allocation. Housing for DIN-rail mounting with IP50 (front) protection degree. Direct connection up to 65A. Moreover the meter is provided with one pulsating output proportional to the active energy being measured.

How to order EM23 DIN AV9 3 X O1 X

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

Type Selection

Range codes	System	Output	Power supply
AV9: 400V$_{LL}$ AC - 10(65)A (Direct connection)	**3:** balanced and unbalanced load: 3-phase, 4-wire; 3-phase, 3-wire;	**O1:** open collector type (single pulse output)	**X:** Self power supply -15% +20% of the rated measuring input voltage, 45 to 65 Hz

Options

X:	none

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Input specifications

Rated inputs			
Current type	System type: 3	Overload status	7DGT;
Voltage	By direct connection		EEE indication when the
Current range (direct)	400 VLL AC		value being measured is
	10 (65)AAC		exceeding the "Continuous
Accuracy (Display)	Ib: see below, Un: see below		inputs overload" (maximum
(@25°C ±5°C, R.H. ≤60%, 48 to 62Hz)			measurement capacity)
AV9 model	Ib: 10A, Imax: 65A; Un: 184	Max. and Min. indication	Max. instantaneous vari-
	to 276VLN (318 to 480VLL)		ables: 999; energies:
			999 999.9 or 9 999999.
Current	From 0.004Ib to 0.2Ib:		Min. instantaneous vari-
	±(0.5% RDG +3DGT)		ables: 0; energies 0.0
	From 0.2Ib to Imax:		
	±(0.5% RDG +1DGT).	**LEDs**	Red LED (Energy con-
Phase-neutral voltage	In the range Un: ±(0,5% RDG		sumption),
	+1DGT)		1000 imp./kWh
Phase-phase voltage	In the range Un: ±(1% RDG		Max frequency: 16Hz
	+1DGT)		according to EN50470-1
Active power	±(1%RDG +2DGT)	**Measurements**	See "List of the variables
Reactive power	±(2%RDG +2DGT)		that can be connected to:"
Active energy	Class 1 according to	Method	TRMS measurements of
	EN62053-21 and Class B		distorted wave forms.
	MID Annex MI-003	Coupling type	Direct
Reactive energy	Class 2 according to	**Crest factor**	Ib 10A ≤4 (91A max. peak)
	EN62053-23	**Current Overloads**	
	Ib: 10A, Imax: 65A;	Continuous	65A, @ 50Hz
	0.1 Ib: 1,0A,	For 10ms	1920A max, @ 50Hz
	Start up current: 40mA	**Voltage Overloads**	
Energy additional errors		Continuous	1.2 Un
Influence quantities	According to EN62053-21,	For 500ms	2 Un
	EN62053-23 and	**Input impedance**	
	EN50470-1-2	400VL-L	Refer to "Power Consump-
Temperature drift	≤200ppm/°C		tion"
Sampling rate	1600 samples/s @ 50Hz	10(65) A	< 4VA
	1900 samples/s @ 60Hz	**Frequency**	45 to 65 Hz
Display refresh time	750 msec.	**Joystick**	For variable selection.
Display	2 lines (1 x 7 DGT; 1 x 3DGT)		
Type	LCD, h 9mm		
Instantaneous variables read-out	3 DGT		
Energies	Imported: 6+1DGT or		

Output specifications

Digital outputs			
Pulse type		**Static output**	
Number of outputs	100 pulses per kWh	Purpose	For pulse output
	(0.01kWh/pulse).	Signal	V_{ON} 1.2 VDC/ max. 100 mA
Type	Output connected to the		V_{OFF} 30 VDC max.
	active energy	Insulation	By means of optocuplers,
Pulse duration	≥100ms < 120msec (ON),		4000 VRMS between out-
	≥120ms (OFF), according		put to measuring inputs.
	to EN62052-31		

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Software functions

System selection		
System 3-Phase unbalanced load	3-phase (4-wire); 3-phase (3-wire).	Both energy and power measurements are independent from the current direction. The displayed energy is always "imported"
Displaying	Up to 3 variables per page	
Easy connection function	Automatic phase sequence detection with current and voltage synchronisation.	

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 and EN62053-23	Surge	On current and voltage measuring inputs circuit: 4kV.
		Radio frequency suppression	According to CISPR 22
Storage temperature	-30°C to +70°C (-22°F to 158°F) (R.H. < 90% non-condensing @ 40°C) according to EN62053-21 and EN62053-23	**Standard compliance**	
		Safety	IEC60664, IEC61010-1 EN60664, EN61010-1 EN62052-11
		Metrology	EN62053-21, EN62053-23, MID "annex MI-003"
Installation category	Cat. III (IEC60664, EN60664)	Pulse output	DIN43864, IEC62053-31
		Approvals	CE
Insulation (for 1 minute)	4000 VRMS between measuring inputs and digital output	**Connections**	Screw-type
		Cable cross-section area	Max. 16 mm^2 Min. 2.5 mm^2 (measuring inputs); Min./Max. screws tightening torque: 1.7 Nm / 3 Nm Output terminals: 1.5 mm^2 Min./Max. screws tightening torque: 0.4 Nm / 0.8 Nm
Dielectric strength	4000 VRMS for 1 minute		
Noise rejection CMRR	100 dB, 48 to 62 Hz		
EMC	According to EN62052-11		
Electrostatic discharges	15kV air discharge;		
Immunity to irradiated	Test with current: 10V/m from 80 to 2000MHz;		
Electromagnetic fields	Test without any current: 30V/m from 80 to 2000MHz;	**Housing DIN**	
		Dimensions (WxHxD)	71 x 90 x 64.5 mm
		Material	Nylon PA66, self-extinguishing: UL 94 V-0
Burst	On current and voltage measuring inputs circuit: 4kV	Mounting	DIN-rail
		Protection degree	
Immunity to conducted disturbances	10V/m from 150KHz to 80MHz	Front	IP50
		Screw terminals	IP20
		Weight	Approx. 400 g (packing included)

Power supply specifications

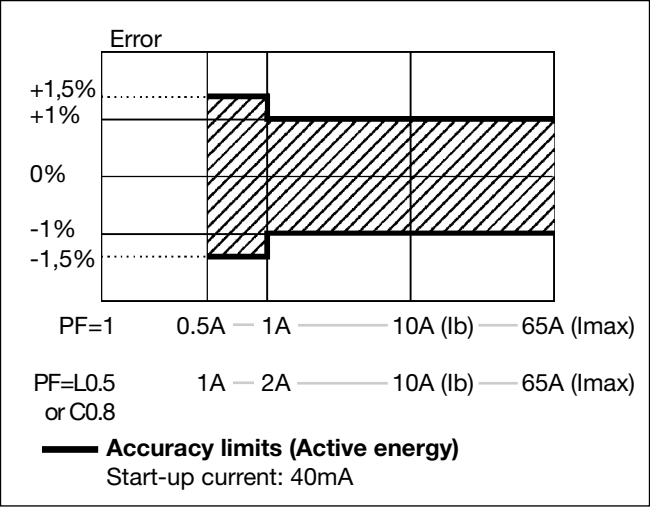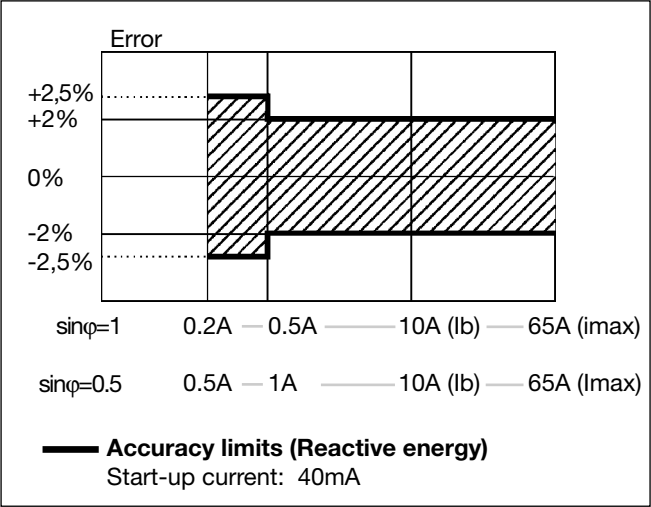|			
Self supplied version	"O1" option only: -15% +20% of Un, 48-62Hz.		in a 3-phase system with neutral may work also if one or two phases are missing.
Note	The instrument provided with "O1" option, working		
		Power consumption	≤20VA/1W

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Accuracy (according to EN62053-21 and EN62053-23)

kWh, accuracy (RDG) depending on the current

```
        Error
+1,5% ┄┄┄┄
+1%

0%

-1%
-1,5% ┄┄┄┄

      PF=1        0.5A — 1A ———— 10A (Ib) ——— 65A (Imax)

      PF=L0.5     1A — 2A ————— 10A (Ib) ——— 65A (Imax)
      or C0.8

   ▬▬ Accuracy limits (Active energy)
      Start-up current: 40mA
```

kvarh, accuracy (RDG) depending on the current

```
        Error
+2,5% ┄┄┄┄
+2%

0%

-2%
-2,5% ┄┄┄┄

      sinφ=1       0.2A — 0.5A ———— 10A (Ib) ——— 65A (imax)

      sinφ=0.5     0.5A — 1A ————— 10A (Ib) ——— 65A (Imax)

   ▬▬ Accuracy limits (Reactive energy)
      Start-up current:  40mA
```

MID "Annex MI-003" compliance

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: 0.04A; I min: 0.5A; I tr: 1A; I max: 65A.

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

List of the variables that can be connected to:

• Pulse output (only "Eneries")

No	Variable	3-ph. 4-wire bal. system	3-ph. 4-wire unbal. system	3 ph. 3-wire bal. system	3 ph. 3-wire unbal. system	Notes
1	A L1	x	x	x	x	
2	A L2	x	x	x	x	
3	A L3	x	x	x	x	
4	var sys	x	x	x	x	sys=system
5	W sys	x	x	x	x	sys=system
6	Phase seq.	x	x	x	x	
7	kWh	x	x	x	x	Total
8	kvarh	x	x	x	x	Total

(x) = available
(o) = not available (zero indication on the display)

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Display pages

Display variables in 3-phase systems with or without neutral

No	1st line	2nd line	Phase Sequence	Notes
1	Total kWh	kW sys	Warning triangle if reverse sequence	
2	Total kvarh	kvar sys	Warning triangle if reverse sequence	
3	AL1 - AL2	AL3	Warning triangle if reverse sequence	

Note: whatever page the user has selected, after 60s it goes back to page 1.
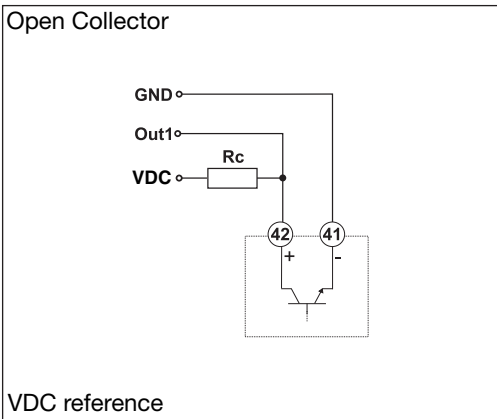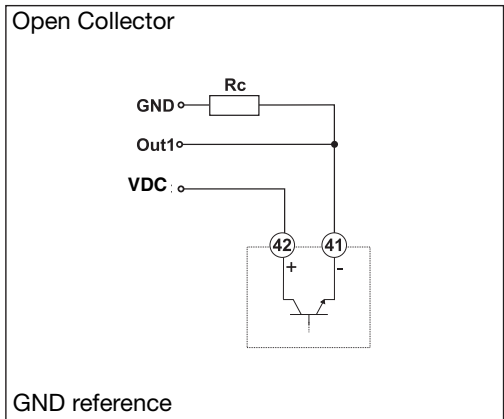
Insulation between inputs and outputs

	Measuring Inputs	Open collector outputs	Self power supply
Measuring Inputs	-	4kV	0kV
Open collector outputs	4kV	-	4kV
Self power supply	0kV	4kV	-

Wiring diagrams

3-ph, 4-wire, unbal./bal. load **Fig.1**

3-ph, 3-wire, unbal./bal. load **Fig. 2**
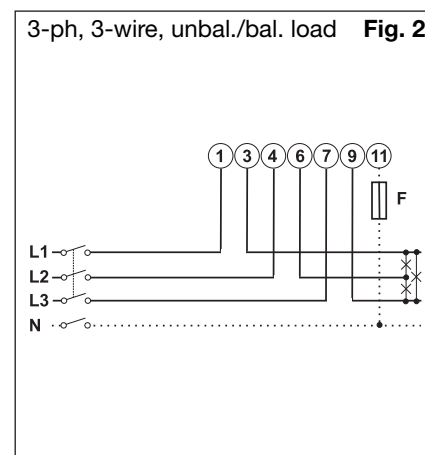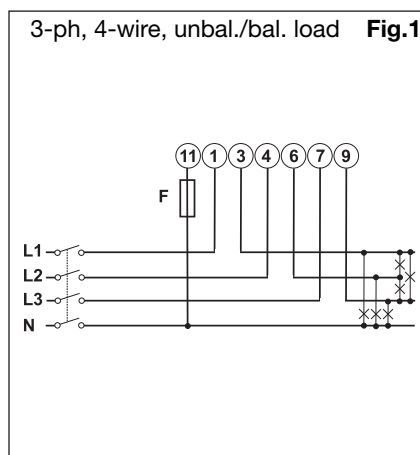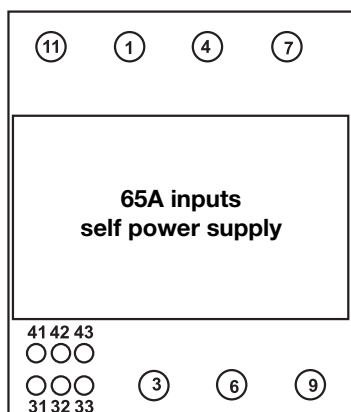
Open collector output wiring diagrams

Open Collector

GND reference
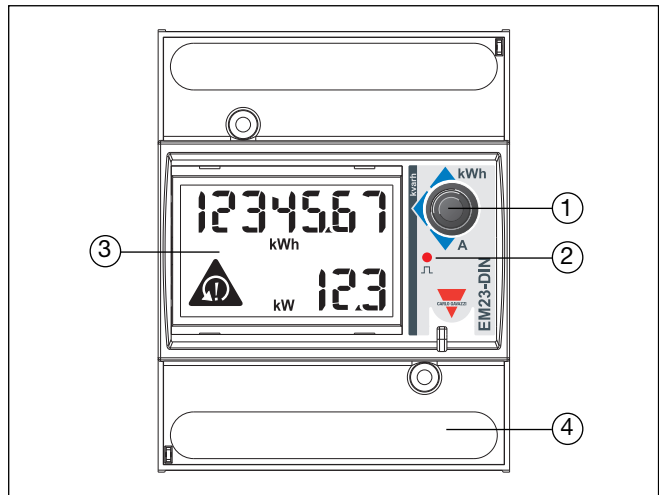
Open Collector

VDC reference

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.

Front panel description

1. **Joystick**
   To scroll the variables on the display.
2. **LED**
   Red LED blinking proportional to the energy being measured.
3. **Display**
   LCD-type with alphanumeric indications to display all the measured variables.
4. **Connections**
   Screw terminal blocks for instrument wiring.

Dimensions