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Energy Management
Energy Meter
Type EM23 DIN

CARLO GAVAZZI

- **Certified according to MID Directive (option PF only): see “how to order” below**
- **Other version 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 ±0.5 RDG (current/voltage)**
- **Energy meter**
- **Instantaneous variables readout: 3 DGT**
- **Energies readout: 7 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 (optional)**
- **RS485 serial communication port (MODBUS-RTU) optional**
- **Dimensions: 4-DIN modules**
- **Protection degree (front): IP50**
- **Easy connections management**

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 either one pulsating output proportional to the active energy being measured or a serial commonication port.

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

How to order

EM23 DIN AV9 3 X O1 PF A

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

Type Selection

Range codes

AV2: 400V_{LL}AC 10(65)A (direct connection)
V_{LN} : 113V to 265V_{LN}
V_{LL} : 196V to 460V_{LL}

AV9: 400V_{LL} AC - 10(65)A (direct connection)
V_{LN} : 184V to 276V_{LN}
V_{LL} : 318V to 480V_{LL}

System

3: Balanced and unbalanced load: 3-phase, 4-wire

Output

O1: Open collector type (single pulse output)

S1: RS485 port

Power supply

X: Self power supply

Measurement

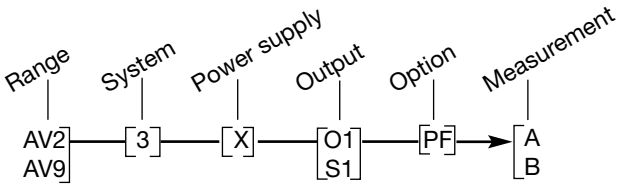
A: The power is always integrated -both in case of positive (imported) and negative (exported) power

B: only the positive (imported) power is integrated - no integration in case of negative (exported) power

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

Options

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



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STANDARD

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

How to order EM23 DIN AV9 3 X O1 X

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

Type Selection

Range codes

AV2: 400V_{LL}AC 10(65)A (direct connection)
V_{LN} : 113V to 265V_{LN}
V_{LL} : 196V to 460V_{LL}

AV9: 400V_{LL} AC - 10(65)A (direct connection)
V_{LN} : 184V to 276V_{LN}
V_{LL} : 318V to 480V_{LL}

System

3: Balanced and unbalanced load: 3-phase, 4-wire; 3-phase, 3-wire;

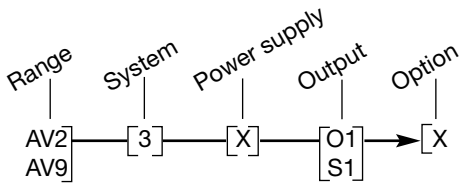
Output

O1: Open collector type (single pulse output)

S1: RS485 port

Power supply

X: Self power supply -15% +20% of the rated measuring input voltage, 45 to 65 Hz



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

Options

X: none

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Input specifications

Rated inputs	System type: 3
Current type	By direct connection
Voltage	AV2: 133/230 V_{LN} AC 230/400 V_{LL} AC AV9: 230 V_{LN}/400 V_{LL} AC
Current range (direct)	AV2 and AV9: 10 (65)AAC
Accuracy (Display) (@25°C ±5°C, R.H. ≤60%, 48 to 62Hz)	Ib: see below, Un: see below
AV2 model	Ib: 10A, Imax: 65A; Un: 113 to 265V_{LN} (196 to 460V_{LL})
AV9 model	Ib: 10A, Imax: 65A; Un: 184 to 276V_{LN} (318 to 480V_{LL})
Current (AV2, AV9)	From 0.004Ib to 0.2Ib: ±(0.5% RDG +3DGT). From 0.2Ib to Imax: ±(0.5% RDG +1DGT).
Phase-neutral voltage	In the range Un: ±(0,5% RDG +1DGT)
Phase-phase voltage	In the range Un: ±(1% RDG +1DGT)
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
AV2, AV9 models	Ib: 10A, Imax: 65A; 0.1 Ib: 1A, Start up current: 40mA
Energy additional errors	
Influence quantities	According to EN62053-21, EN62053-23 and EN50470-1-2
Temperature drift	≤200ppm/°C
Sampling rate	1600 samples/s @ 50Hz 1900 samples/s @ 60Hz
Display refresh time	750 msec.
Display	2 lines (1 x 7 DGT; 1 x 3DGT)
Type	LCD, h 9mm
Instantaneous variables read-out	3 DGT
Energies (imported)	Autorange 5+2, 6+1 or 7 DGT
Overload status	EEE indication when the value being measured is exceeding the "Continuous inputs overload" (maximum measurement capacity)
Max. and Min. indication	Max. instantaneous variables: 999; energies: 9 999 999. Min. instantaneous variables: 0; energies 0.00
LEDs	Red LED (Energy consumption), 0.001 kWh by pulse Max frequency: 16Hz according to EN50470-1
Measurements	See "List of the variables that can be connected to:"
Method	TRMS measurements of distorted wave forms.
Coupling type	Direct
Crest factor	Ib 10A ≤4 (91A max. peak)
Current Overloads	
Continuous	65A, @ 50Hz
For 10ms	1920A max, @ 50Hz
Voltage Overloads	
Continuous	1.2 Un
For 500ms	2 Un
Input impedance	
Voltage (AV2, AV9)	Refer to "Power Consumption"
Current (AV2, AV9)	< 4VA
Frequency	45 to 65 Hz
Joystick	For variable selection.

Output specifications

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

RS485 communication port

Type	Multidrop, bidirectional (static and dynamic variables)
Connections	2-wire max. distance 1000m
Addresses	247, selectable by means of the front joystick
Protocol	MODBUS/JBUS (RTU)
Data (bidirectional)	
Dynamic (reading only)	System and phase variables: see table “List of variables...”
Static (reading and writing)	Communication address and baud-rate parameters.
Static (reading only)	Serial number, year of production and firmware revision
Data format	1 start bit, 8 data bit, no parity,1 stop bit
Baud-rate	4800, 9600 bits/s
Driver input capability	1/5 unit load. Maximum 160 transceivers on the same bus.
Insulation	By means of optocouplers, 4000 VRMS output to measuring input

Software functions

System selection	
System 3-Phase unbalanced load	3-phase (4-wire); 3-phase (3-wire) X option only.
Displaying	Up to 3 variables per page
Easy connection function	Automatic phase sequence detection with current and voltage synchronisation.
X and PFA options	Both energy and power measurements are independent from the current direction. The total energy is displayed as “imported”.
PFB option	Both energy and power measurements are dependent on the current direction. The displayed energy is only the “imported” one, the “exported” energy is not measured nor displayed.

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, EN62053-23 and EN50470-1
Storage temperature	-30°C to +70°C (-22°F to 158°F) (R.H. < 90% non-condensing @ 40°C) according to EN62053-21, EN62053-23 and EN50470-1
Installation category	Cat. III (IEC60664, EN60664)
Insulation (for 1 minute)	4000 VRMS between measuring inputs and digital output
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 Electromagnetic fields	Test with current: 10V/m from 80 to 2000MHz; Test without any current: 30V/m from 80 to 2000MHz;
Burst	On current and voltage measuring inputs circuit: 4kV.
Immunity to conducted disturbances	10V/m from 150KHz to 80MHz
Surge	On current and voltage measuring inputs circuit: 4kV.
Radio frequency suppression	According to CISPR 22
Standard compliance	
Safety	IEC60664, IEC61010-1 EN60664, EN61010-1
Metrology	EN62052-11, EN50470-1 EN62053-21, EN62053-23, EN50470-3. MID “Annex MI-003”
Pulse output	DIN43864, IEC62053-31
Approvals	CE, MID (PF option only)
Connections	Screw-type
Cable cross-section area	measuring inputs terminals max. 16 mm^2; min. 2.5 mm^2 (by cable lug) Min./Max. screws tightening torque: 1.7 Nm / 3 Nm Output terminals: 1.5 mm^2 Screws tightening torque: 0.5 Nm

General specifications (cont.)

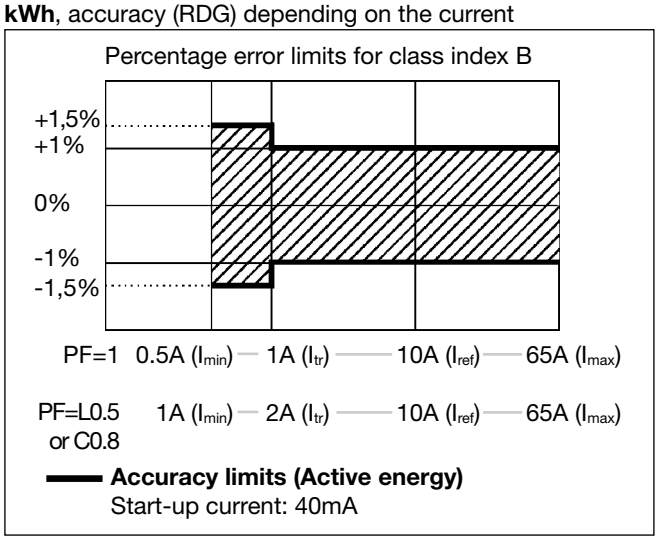
Housing DIN	
Dimensions (WxHxD)	71 x 90 x 64.5 mm
Material	Nylon PA66, self-extinguishing: UL 94 V-0
Mounting	DIN-rail
Protection degree	
Front	IP50
Screw terminals	IP20
Weight	Approx. 400 g (packing included)

Power supply specifications

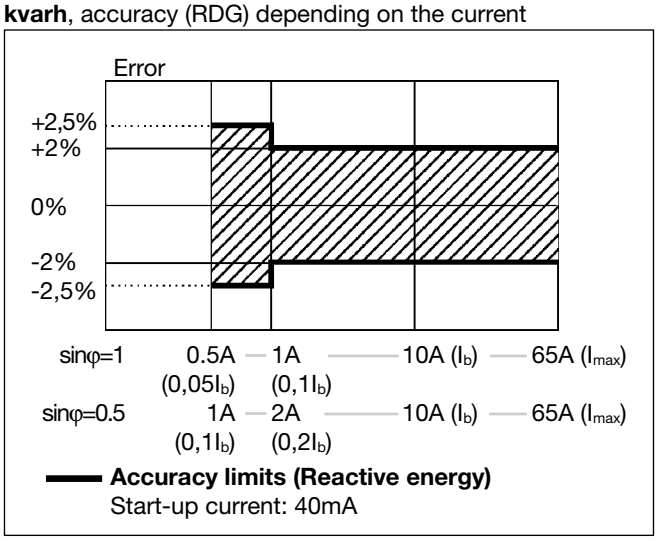
Self supplied version	
AV2 model	-15% +15% of Un, 45-65Hz.
AV9 model	-15% +20% of Un, 45-65Hz.
Note	S1 option only: -15% +10% of Un, 45-65Hz. The instrument provided with “S1” option will work only if all the voltage inputs are connected (3-phase and neutral); if a 1-phase connection has to be performed, the L1 and L2 voltage inputs have to be short circuited. The instrument working in a 3-phase system with neutral may work also if one or two phases are missing.
Power consumption	
AV2-AV9 models	≤20VA/1W
AV2-AV9 models (S1 option only)	≤12VA/2W

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: 0.04A; 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
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.

List of the available variables

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

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	Joystick position: up
2	Total kvarh	kvar sys	Warning triangle if reverse sequence	Joystick position: left
3	AL1 - AL2	AL3	Warning triangle if reverse sequence	Joystick position: down
4	Information	Information		Joystick position: right

Note: whatever page the user has selected, after 60s it goes back to page 1.

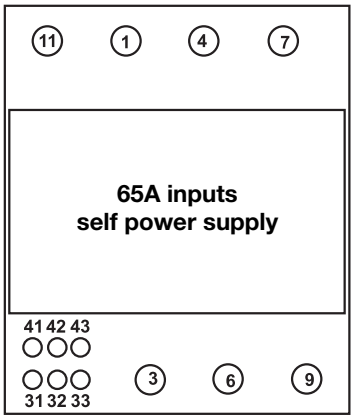
Additional available information on the display (only for S1 version)

Type	1st line	2nd line	Note
Meter information 1	Secondary address (1234567)	Sn (text)	For M-bus connection via VMU-B Available also via RS485
Meter information 2	Year of production (Yr 2009)	Firmware revision (A.00)	Available also via e RS485
Meter information 3	Serial communication Address (Adr 1)	Communication speed (4.8 or 9.6)	Available also via RS485

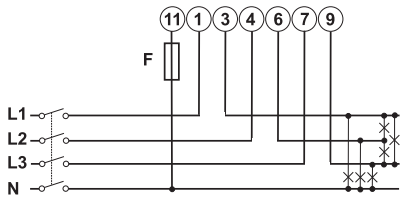
Insulation between inputs and outputs

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

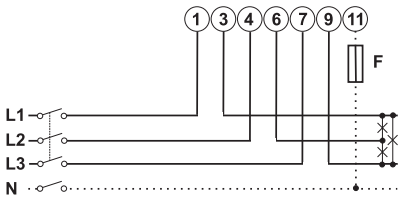
Wiring diagrams



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



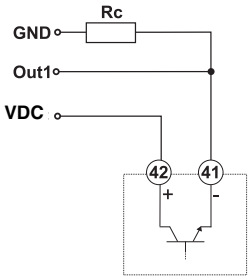
3-ph, 3-wire, unbal./bal. load **Fig. 2**



NOTE: on AV9 version the N connection is mandatory

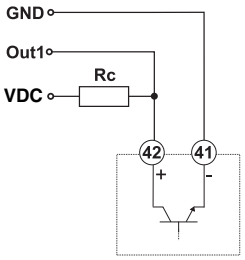
Open collector output and RS485 wiring diagrams

Open Collector **Fig. 1**



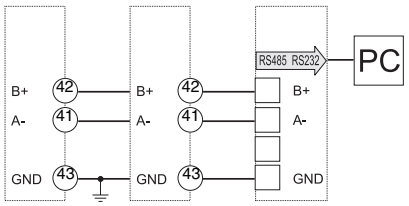
GND reference

Open Collector **Fig. 2**



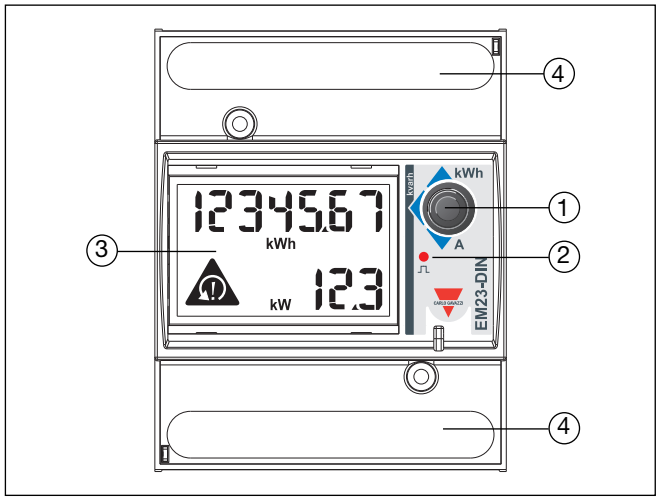
VDC reference

RS485 port **Fig. 3**



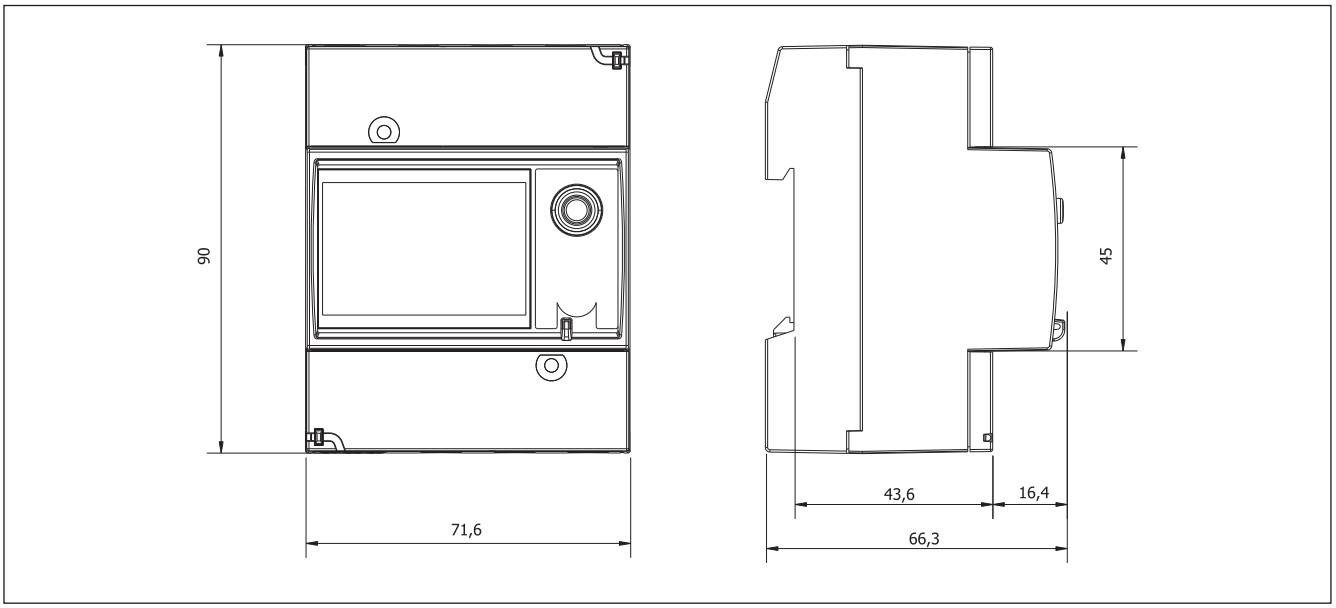
The load resistances (Rc) must be designed so that the close contact current is lower than 100mA; the VDC voltage must be lower than or equal to 30VDC.

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



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Product	Code	Reference	Product link
Selected parameters FUNCTION MID Energy meters MOUNTING DIN Rail POWER SUPPLY Self power supply OUTPUT DIGITAL INPUT DC output (Open Collector) INPUT TYPE 3-phase AC CONNECTION Direct COMMUNICATION RS485 Others RANGE 196V to 460VLL 10 (65)A DISPLAY 6+1 DGT VARIABLES A, W, var, Phase-sequence DIGITAL INPUTS none PULSE none ALARMS none ANALOGUE none	EM23DINAV23XS1PFA		Buy on EAN