

Energy Management  
Energy Meter  
Type EM23 DIN



- 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 communication port.



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	System	Output	Power supply
<b>AV2:</b> 400V <sub>LL</sub> AC 10(65)A (direct connection) V <sub>LN</sub> : 113V to 265V <sub>LN</sub> V <sub>LL</sub> : 196V to 460V <sub>LL</sub>	<b>3:</b> Balanced and unbalanced load: 3-phase, 4-wire	<b>O1:</b> Open collector type (single pulse output) <b>S1:</b> RS485 port	<b>X:</b> Self power supply
<b>AV9:</b> 400V <sub>LL</sub> AC - 10(65)A (direct connection) V <sub>LN</sub> : 184V to 276V <sub>LN</sub> V <sub>LL</sub> : 318V to 480V <sub>LL</sub>		<b>Measurement</b>	<b>Options</b>
		<b>A:</b> The power is always integrated -both in case of positive (imported) and negative (exported) power only the positive (imported) power is integrated - no integration in case of negative (exported) power	<b>PF:</b> 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.

Range System Power supply Output Option Measurement

AV2 AV9 [3] [X] [O1 S1] [PF] [A B]

**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

EM23 DIN AV9 3 X O1 X

Model

Range code

System

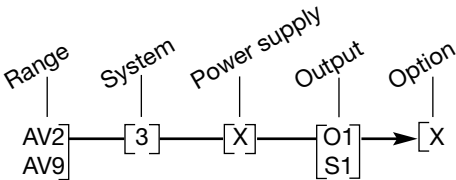
Power supply

Output

Option

Type Selection

Range codes	System	Output	Power supply
<b>AV2:</b> 400V <sub>LL</sub> AC 10(65)A (direct connection) V <sub>LN</sub> : 113V to 265V <sub>LN</sub> V <sub>LL</sub> : 196V to 460V <sub>LL</sub>	<b>3:</b> Balanced and unbalanced load: 3-phase, 4-wire; 3-phase, 3-wire;	<b>O1:</b> Open collector type (single pulse output)	<b>X:</b> Self power supply -15% +20% of the rated measuring input voltage, 45 to 65 Hz
<b>AV9:</b> 400V <sub>LL</sub> AC - 10(65)A (direct connection) V <sub>LN</sub> : 184V to 276V <sub>LN</sub> V <sub>LL</sub> : 318V to 480V <sub>LL</sub>		<b>S1:</b> RS485 port	



Options

X: none

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

## Input specifications

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

## Output specifications

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

## RS485 communication port

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

## Software functions

<b>System selection</b> System 3-Phase unbalanced load	3-phase (4-wire); 3-phase (3-wire) X option only.	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.
<b>Displaying</b>	Up to 3 variables per page		
<b>Easy connection function</b>  X and PFA options	Automatic phase sequence detection with current and voltage synchronisation. Both energy and power measurements are independent from the current direction. The total energy is displayed as "imported".		

## 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, EN62053-23 and EN50470-1	Immunity to conducted disturbances	10V/m from 150KHz to 80MHz
<b>Storage temperature</b>	-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	Surge	On current and voltage measuring inputs circuit: 4kV.
<b>Installation category</b>	Cat. III (IEC60664, EN60664)	Radio frequency suppression	According to CISPR 22
<b>Insulation (for 1 minute)</b>	4000 VRMS between measuring inputs and digital output	<b>Standard compliance</b>	
<b>Dielectric strength</b>	4000 VRMS for 1 minute	Safety	IEC60664, IEC61010-1 EN60664, EN61010-1 EN62052-11, EN50470-1 EN62053-21, EN62053-23, EN50470-3. MID "Annex MI-003"
<b>Noise rejection CMRR</b>	100 dB, 48 to 62 Hz	Metrology	DIN43864, IEC62053-31 CE, MID (PF option only)
<b>EMC</b>		<b>Connections</b>	
Electrostatic discharges	According to EN62052-11 15kV air discharge; Test with current: 10V/m from 80 to 2000MHz;	Cable cross-section area	Screw-type measuring inputs terminals max. 16 mm <sup>2</sup> ; min. 2.5 mm <sup>2</sup> (by cable lug) Min./Max. screws tightening torque: 1.7 Nm / 3 Nm Output terminals: 1.5 mm <sup>2</sup> Screws tightening torque: 0.5 Nm
Immunity to irradiated	Test without any current: 30V/m from 80 to 2000MHz;		
Electromagnetic fields	On current and voltage measuring inputs circuit: 4kV.		
Burst			

## General specifications (cont.)

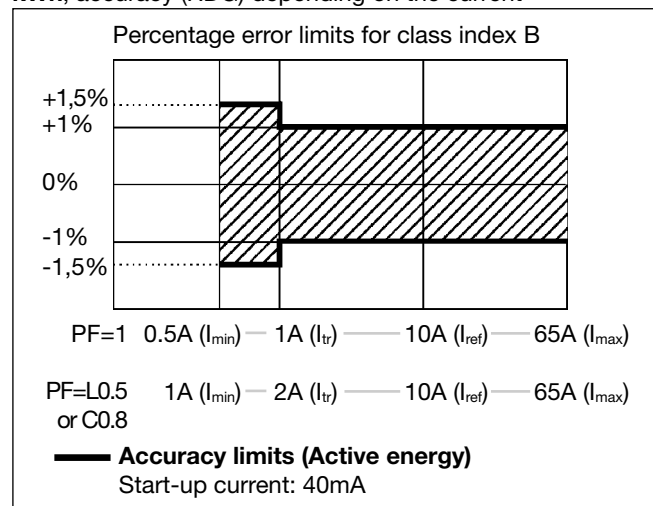
<b>Housing DIN</b>		<b>Protection degree</b>	
Dimensions (WxHxD)	71 x 90 x 64.5 mm	Front	IP50
Material	Nylon PA66, self-extinguishing: UL 94 V-0	Screw terminals	IP20
Mounting	DIN-rail	<b>Weight</b>	Approx. 400 g (packing included)

## Power supply specifications

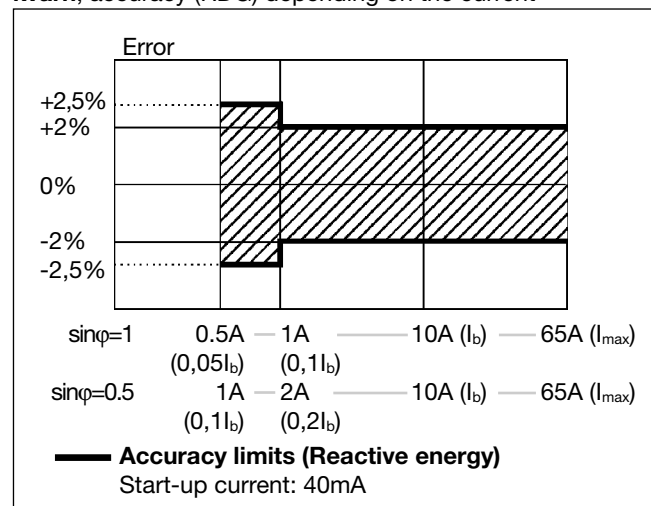
<b>Self supplied version</b>		
AV2 model	-15% +15% of $U_n$ , 45-65Hz.	1-phase connection has to be performed, the L1 and L2 voltage inputs have to be short circuited. The instrument working in a 3-phase system with neutral may work also if one or two phases are missing.
AV9 model	-15% +20% of $U_n$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

## 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)

<b>Accuracy</b>	0.9 $U_n \leq U \leq 1.1 U_n$ ; 0.98 $f_n \leq f \leq 1.02 f_n$ ; $f_n$ : 50 or 60Hz; $\cos\varphi$ : 0.5 inductive to 0.8 capacitive. Class B $I_{st}$ : 0.04A; $I_{\min}$ : 0.5A; $I_{tr}$ : 1A; $I_{\max}$ : 65A.	<b>EMC compliance</b>	E2
		<b>Mechanical compliance</b>	M2
<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>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.

## 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	1 <sup>st</sup> line	2 <sup>nd</sup> 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.

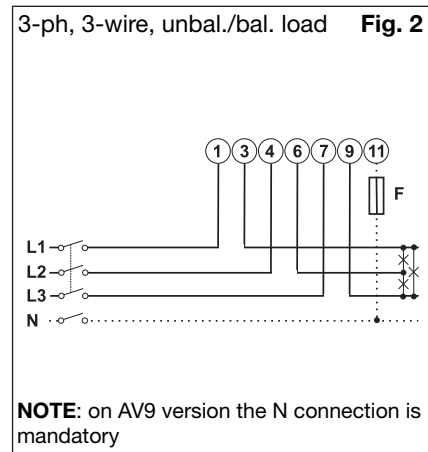
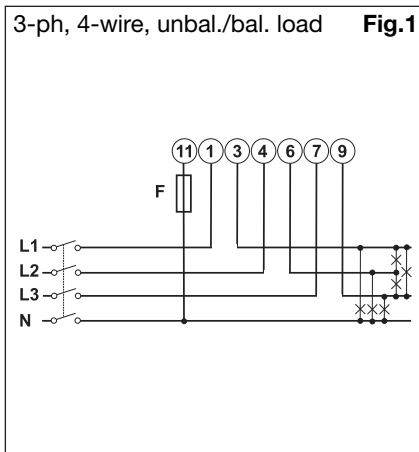
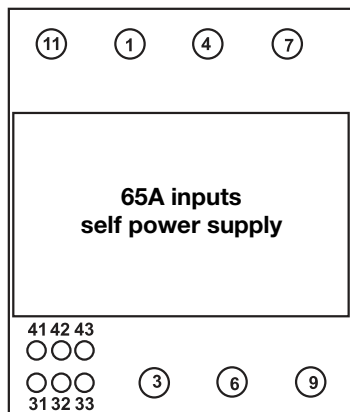
## Additional available information on the display (only for S1 version)

Type	1 <sup>st</sup> line	2 <sup>nd</sup> 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

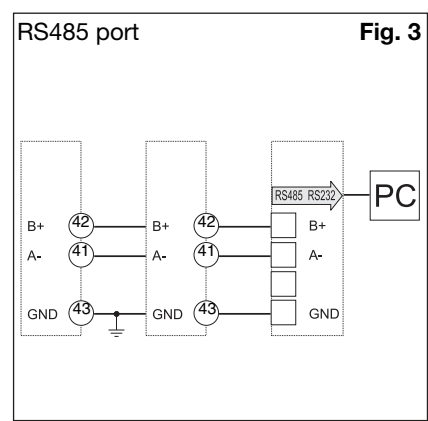
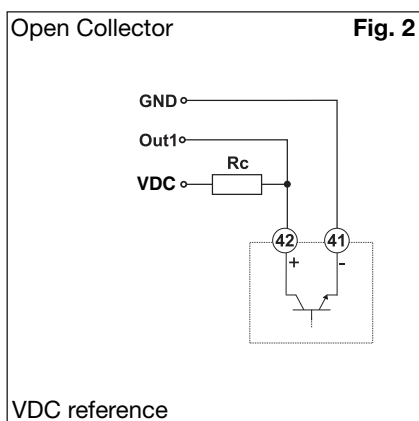
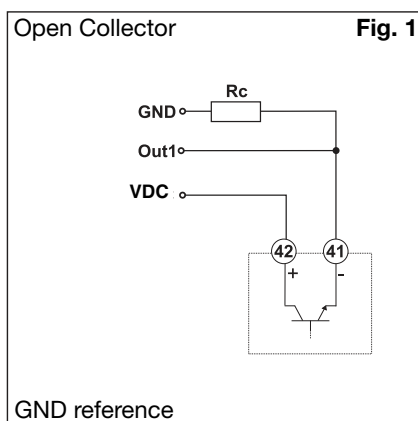
## Insulation between inputs and outputs

	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

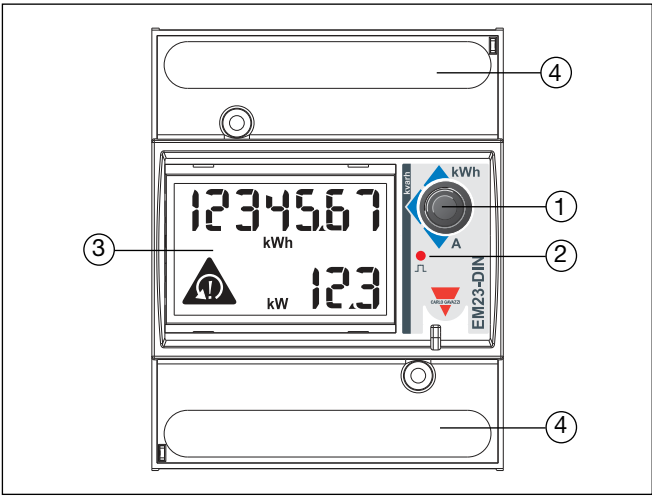


## Open collector output and RS485 wiring diagrams



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.

## 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

