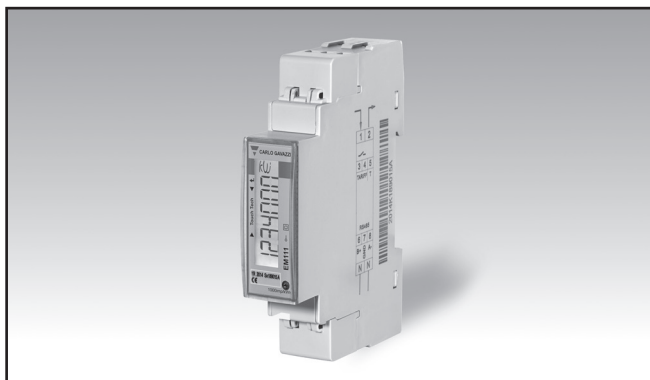


Energy Management Energy Analyzer Type EM111

CARLO GAVAZZI



- Easy connection or wrong current direction detection
- Compliant with the international accuracy standard IEC/EN62053-21, and the IEC/EN61557-12 performance requirements (active power and active energy).
- Certified according to MID Directive (option PF only): see "how to order" below

- Single phase energy analyzer
- Class 1 (kWh) according to EN62053-21
- Class B (kWh) according to EN50470-3
- Accuracy $\pm 0.5\%$ RDG (current/voltage)
- Current measurement via 333 mV current sensor up to 600 A (MV5)
- Current measurement via CT up to 300 A (AV5)
- Rated primary current: 32 A (AV7, AV8)
- Max primary current: 45 A (AV7, AV8)
- Max cable cross section: 6 mm²
- Backlit LCD display with integrated touch key-pad
- Energy readout on display: 7 digit
- Variable readout on display: 4 digit
- Energy measurement: kWh and kvarh (imported/exported); kWh+ by 2 tariffs
- System variables, kW, kvar, V, A, PF, Hz, kWdmd, kWdmd peak
- Self power supply
- Dimensions: 1-DIN module
- Protection degree (front): IP51
- Pulse output (by open collector PNP)
- RS485 Modbus port
- M-Bus port
- Digital input (for tariff management)

Product description

Single-phase energy analyzer with backlit LCD display with integrated touch keypad. Particularly indicated for active energy metering and for cost allocation in applications up to 32 A (direct connection) or up to 300 A (CT connection) or up to 600 A (333 mV current sensor with basic insulation), with dual tariff management availability. It can measure imported and exported

energy or be programmed to sum them into an unique totalizer. Housing for DIN-rail mounting, with IP51 front degree protection. The meter is provided with pulse output proportional to the active energy being measured, RS485 Modbus port or M-Bus port.

MID 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 EM111-DIN AV8 1 X O1 PF B

Model _____
Range code _____
System _____
Power supply _____
Output _____
Option _____
Measurement _____

Type Selection

Range code	System	Power supply	Output
AV8: 230VLN AC - 5(45)A (Direct connection up to 32 A)	1: 1-phase 2-wire	X: Self power supply	O1: pulse output S1: RS485 Modbus port M1: M-Bus port
Option	Measurement		
PF: Certified according to MID Directive. Can be used for fiscal (legal) metrology.	A: The power is always integrated (both in case of positive imported and negative exported power) and the total energy meter is certified according to MID. Operating temperature: from -25 to +55°C/from -13 to +131°F		
	B: Only the total positive energy meter is certified according to MID. Operating temperature: from -25 to +55°C/from -13 to +131°F		
	A70: The power is always integrated (both in case of positive imported and negative exported power) and the total energy meter is certified according to MID. Operating temperature: from -25 to +70°C/from -13 to +158°F		
	B70: Only the total positive energy meter is certified according to MID. Operating temperature: from -25 to +70°C/from -13 to +158°F		



STANDARD

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

How to order **EM111-DIN AV8 1 X O1 X**



Type Selection

Range code	System	Power supply	Output
AV8: 230VLN ac - 5(45)A (Direct connection up to 32 A)	1: 1-phase 2-wire	X: Self power supply	O1: pulse output S1: RS485 Modbus port M1: M-Bus port
AV7: 120VLN ac - 5(45)A (Direct connection up to 32 A). Available on request (MOQ 100 pcs)			
AV5: 230VLN ac - 5(6)A (CT connection), S1 output only			
MV5: 230VLN ac - 333 mV (current sensor connection), S1 output only			
Option			
X: none			

Input specifications

Rated Inputs		PF	0.001
Current type	AV7, AV8	Energies (positive)	0.1 or 0.001 kWh or kvarh
		Energies (negative)	0.1 or 0.001 kWh or kvarh
	AV5	Energy additional errors	
		Influence quantities	According to EN62053-21
Nominal current range	AV7, AV8	Temperature drift	≤200ppm/°C
		Sampling rate	4096 samples/s @ 50Hz 4096 samples/s @ 60Hz
	MV5	Display and touch key-pad	
		Type	Backlit LCD, 7-digit, h 6 mm
Nominal voltage	AV7, AV8	Read-out	Energy: 7 digit. Variables: 4 digit
		Touch key	2 (Enter/DOWN and UP).
	AV5	Max. and Min. indication	Max. 9 999 999 Min. 0.00
		Memory energy storage	Energy
Note	AV5, AV8	10 ¹⁰ cycles. Energy value is saved every time the less significant digit increases.	
		10 ¹⁰ cycles. When a parameter is modified, only the relevant memory cell is overwritten	
	AV7	LEDs	
		Flashing red light pulses according to EN50470-3, EN62052-11	
Accuracy (@25°C ±5°C, R.H. ≤60%, 45 to 65 Hz)	AV7, AV8	Pulse weight	AV7, AV8
			AV5
	MV5		MV5
		Note	Fix orange light: wrong current direction only with PFB option or with "B" measurement selection in case of X option
Active energy	AV7, AV8	Current overloads	
		Continuous	AV7, AV8 45 A
	MV5		AV5 6 A
			MV5 400 mV
Reactive energy	AV7, AV8	For 10ms	AV7, AV8 1350 A
			AV5 120 A
	MV5	Voltage Overloads	
		Continuous	1.2 Un
Start-up current	AV7, AV8	For 500ms	2 Un
		Input impedance	
	MV5	Voltage input	2.8 Mohm
		Current input	AV7, AV8 < 0.5 VA
Start-up voltage	AV7, AV8		AV5 <0.05 VA
			MV5 1 kohm
	MV5	Resolution	
		Current	0.001 A
Accuracy (@25°C ±5°C, R.H. ≤60%, 45 to 65 Hz)	AV7, AV8	Voltage	0.1 V
		Power	0.1 kW or kVar
	MV5	Frequency	0.1 Hz
		PF	0.01
Active energy	AV7, AV8	Energies (positive)	0.01 kWh or kvarh
		Energies (negative)	0.01 kWh or kvarh
	MV5	Serial communication	
		Current	0.001 A
Reactive energy	AV7, AV8	Voltage	0.1 V
		Power	0.1 kW or kVar
	MV5	Frequency	0.1Hz

Digital input specifications

Digital inputs

Function	Free of voltage contact Tariff management (switch between t1-t2)	Overload	In case a voltage is erroneously applied to the digital input, the input is not damaged up to 30 V ac/dc.
Number of inputs	1		
Contact measurement voltage	5 V		
Input impedance	1kohm		
Contact resistance	≤ 1kohm, close contact ≥ 100kohm, open contact		

Output specifications

RS485 serial port

Function	RS485 by screw connection. For communication of measured data, programming parameters	Other	69999999 Available functions: wild card, header, initialisation SND_NKE, and req_uds management. Management of primary address modification via M-Bus.
Protocol	Modbus RTU (slave function)		VIF, VIFE, DIF and DIFE: see protocol
Baud rate	9.6, 19.2, 38.4, 57.6, 115.2 kbaud,		not available with AV5 and MV5 range code
parity control	even or no parity,	Note	
Address	1 to 247 (default: 1)		
Driver input capability	1/8 unit load. Maximum 247 transceivers on the same bus.	Static output	
		Purpose	For pulse output proportional to the active energy (kWh)
Data refresh time	1 s		
Read command	50 words available in 1 read command	Pulse rate	Selectable in multiple of 100

M-Bus port

Function	M-Bus by screw connection. For communication of measured data		Max 1000 or 3000 pulses/kWh according to pulse ON duration
Protocol	M-Bus according to EN13757-3	Pulse ON duration	Selectable: 30ms or 100 ms according to EN62052-31
Baud rate	0.3, 2.4, 9.6 kbaud	Output type	open collector PNP
Meters in the M-Bus network	250	Load	V _{ON} 1 VDC max. 100mA
Primary address	Selectable		V _{OFF} 80 VDC max.
Secondary address	Univocally defined in each unit	Note	not available with AV5 and MV5 range code
Secondary address	from 50000000 to		

General specifications

Operating temperature PF option (standard or with suffixes from 01 to 60)	From -25 to +55°C/from -13 to +131°F		power and active energy, MID models only)
PF option (with suffixes from 61 to 99)	From -25 to +70°C/from -13 to +158°F	Approvals	CE, UKCA, MID (PF option only), cULus (AV7 option only)
X option	From -25 to +65°C/from -13 to +149°F indoor, (R.H. from 0 to 90% non- condensing @ 40°C)	Connections Cable cross-section area	Measuring inputs: max. 6 mm ² with/without metallic cable ferrule; Max. screw tightening torque: 1.1 Nm 1.5 mm ² , Min./Max. screws tightening torque: 0.4 Nm
Storage temperature	-30°C to +80°C (R.H. < 90% non-condensing @ 40°C)	Other terminals	
Overvoltage category	Cat. III	Housing Dimensions (WxDxH)	17,5 x 63 x 91,5 mm
Insulation (for 1 minute)	See table below	Material	PBT, self-extinguishing: UL 94 V-0
EMC	According to EN62052-11 (X option) According to EN50470-1 (PF option)	Sealing covers	Included
Standard compliance Safety	EN62052-11 (X option) EN50470-1 (PF option)	Mounting	DIN-rail
Metrology	EN62053-21, EN62053- 23, EN50470-3 (PF option only) IEC/EN61557-12 (active	Protection degree Front	IP51
		Screw terminals (cable inputs)	IP20
		Weight	Approx. 80 g (packing included)

Power supply specifications

Power supply	self power supply	Power consumption	≤ 1.0W, ≤ 8VA
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Insulation (for 1 minute) between inputs and outputs

AV7, AV8 model	Measuring input	Digital or serial output	Digital input
Measuring input	-	4 kV	4 kV
Digital or serial output	4 kV	-	-
Digital input	4 kV	-	-

AV5 model	CT input (5 A)	Voltage input	Serial output	Digital input
CT input (5 A)	-	2 kV	4 kV	4 kV
Voltage input	2 kV	-	4 kV	4 kV
Serial output	4 kV	4 kV	-	4 kV
Digital input	4 kV	4 kV	4 kV	-

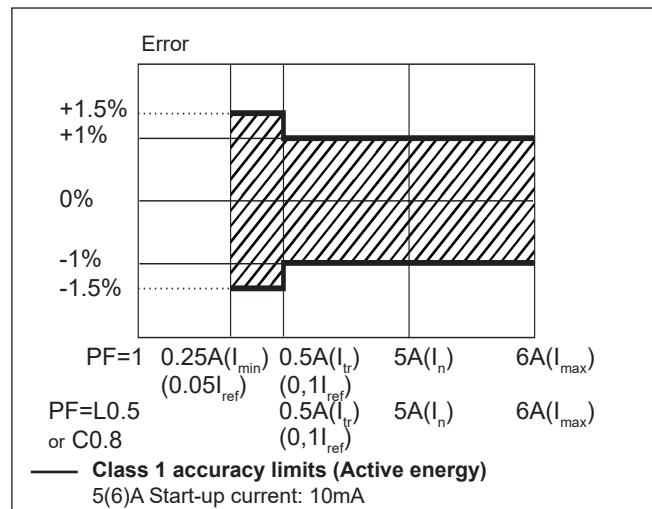
MV5 model	CT input (333 mV)	Voltage input	Serial output	Digital input
CT input (333 mV)	-	-	4 kV	4 kV
Voltage input	-	-	4 kV	4 kV
Serial output	4 kV	4 kV	-	4 kV
Digital input	4 kV	4 kV	4 kV	-

MID compliance (PF option only)

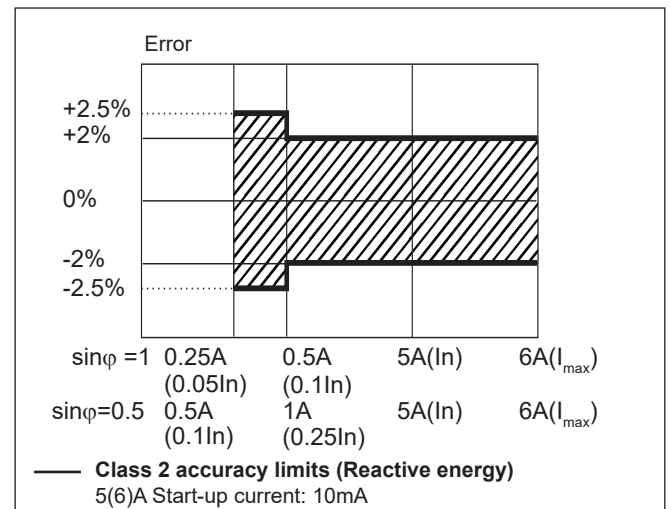
Accuracy	$0.9 U_n \leq U \leq 1.1 U_n$; $0.98 f_n \leq f \leq 1.02 f_n$; f_n : 50 Hz; $\cos\phi$: 0.5 inductive to 0.8 capacitive. Class B Considering listed I_b or I_n values
Operating temperature	PF option (standard or with suffixes from 01 to 60): from -25 to $+55^\circ\text{C}$ /from -13 to $+131^\circ\text{F}$ PF option (with suffixes from 61 to 99): from -25 to $+70^\circ\text{C}$ /from -13 to $+158^\circ\text{F}$ X option: from -25 to $+65^\circ\text{C}$ /from -13 to $+149^\circ\text{F}$ indoor (R.H. from 0 to 90% non-condensing @ 40°C)
EMC compliance	E2
Mechanical compliance	M2

Accuracy (according to EN62053-21 and EN62053-23) - AV5 model

kWh, accuracy (RDG) depending on the current

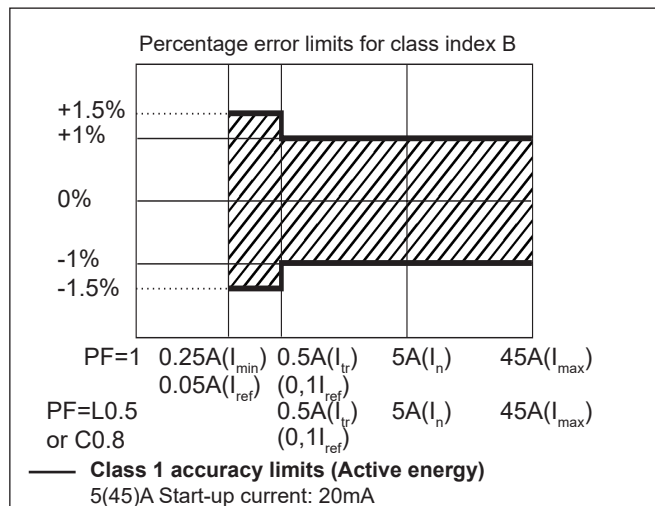


kvarh, accuracy (RDG) depending on the current

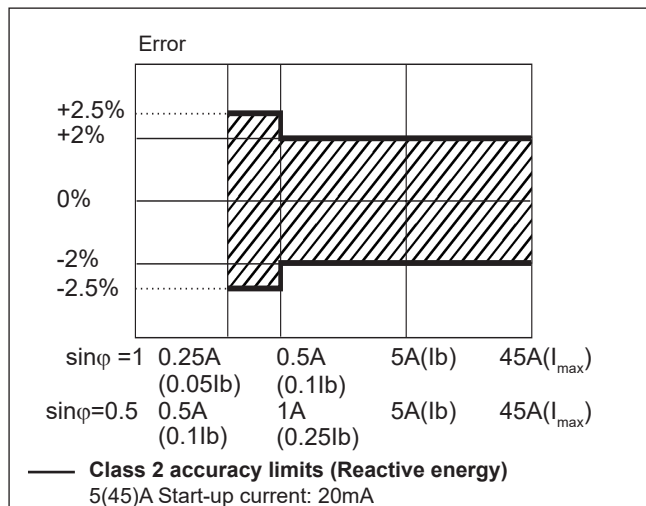


Accuracy (according to EN50470-3 and EN62053-23) - AV7/AV8 model

kWh, accuracy (RDG) depending on the current



kvarh, accuracy (RDG) depending on the current



Measurement accuracy according to IEC/EN61557-12 (MID versions)

Active power

Performance class 1

Active energy

Performance class 2

Display pages

No	Variable	“Full” mode	“Easy” mode	Note
0	kWh+ (imported)	X	X	In PF version (MID) this is the only certified energy meter. In PFA version and in X version with Measurement menu set to “A”, this is considering the total energy without considering the current direction.
1	kWh- (exported)	X	X	In PFB version and in X version with Measurement menu set to “B”
2	kW	X	X	
3	V	X	X	
4	A	X	X	
5	PF	X		
6	Hz	X		
7	kvarh+ (imported)	X		In PFA version and in X version with Measurement menu set to “A”, this is considering the total positive reactive energy without considering the current direction.
8	kvarh- (exported)	X		In PFB version and in X version with Measurement menu set to “B”
9	kvar	X		
10	kW dmd	X		
11	kW dmd peak	X		
12	kWh (t1)	X	X	Only relevant to kWh+, with Tariff menu set to ON
13	kWh (t2)	X	X	Only relevant to kWh+, with Tariff menu set to ON

X= available

List of available menus

Menu name and description		Range	Default setting
PASS	Password request	From 0000 to 9999	0000
nPASS	New password	From 0000 to 9999	0000
Ct Ratlo (AV5)	Current transformer ratio	From 1 to 60	20
PrI Curr (MV5)	Primary current	From 1 to 600	100
MEASurE	Measurement type (A=easy connection; B=bidirectional, imported and exported energy). Not available in PFA and PFB versions (MID)	A; b	A
P int	Integration time for Wdmd calculation	1 to 30 min	1
Mode	Selection of complete or simplified set of variables on display	Full or Easy	Full
Tariff	Tariff enabling	Yes/No	No
PULSE (O1 option)	Selection of pulse ON duration	30 or 100 ms	30
	Selection of the pulse weight (multiplies of 100 pulses/kWh)	100 to 1000 (if duration is 100ms) 100 to 3000 (if 30 ms)	1000
Address (S1 option)	Modbus serial address	1 to 247	01
Baud (S1)	Modbus baud rate	9.6; 19.2; 38.4; 57.6, 115.2 kbps	9.6
Parity (S1)	Modbus parity	No/even	No
PrI Add (M1 option)	M-Bus primary address	1 to 250	0
Baud (M1)	M-Bus baud rate	0.3; 2.4; 9.6 kbps	2.4
RESEt	Allow the reset of tariff meters and W dmd peak (kWh/ kvarh partial meter reset available only via serial communication)	Yes/No	No
End	Exit to measuring mode		

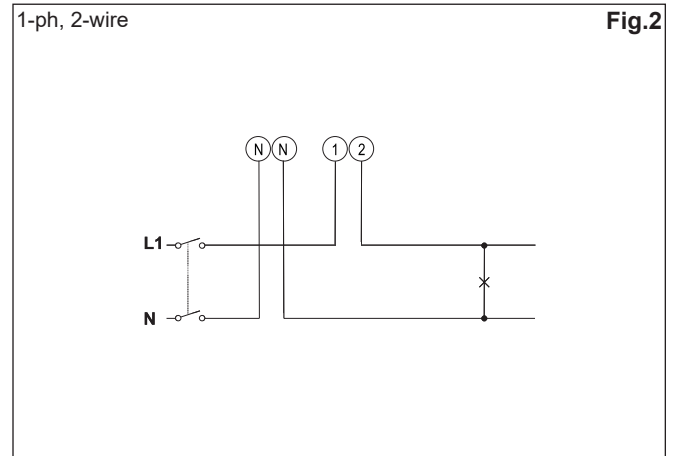
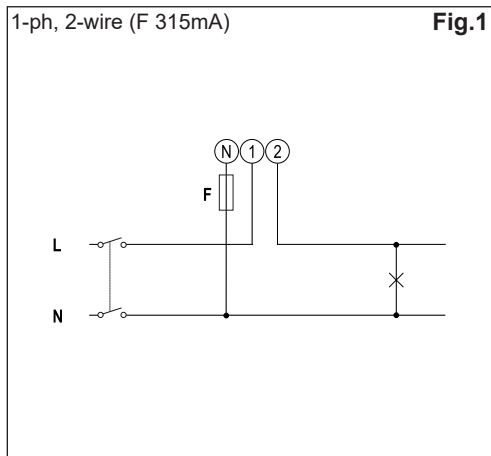
Note: after the confirmation of a new parameter value, the value is stored in the memory without the need to exit the programming mode.

Additional available information on the display (*)

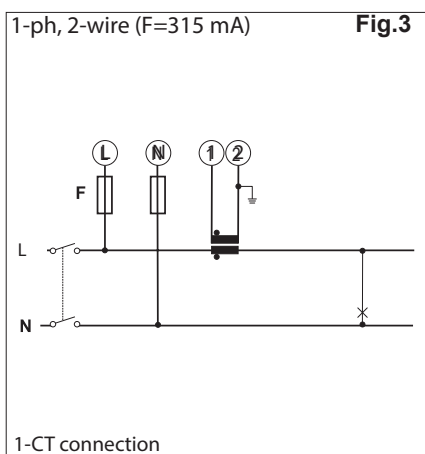
Type	Page	Description
Info page 1	YEA _r (2013)	Year of production
Info page 2	SE _r I _A L (dddnnnA)	Serial number (ddd= day of the year; nnn=progressive number; A= production line, internal use only)
Info page 3	rEV (A.01)	Firmware revision
Info page 4	Ct Ra _t lo (AV5)	Current transformer ratio
Info page 5	Pr _i Cu _r r (MV5)	Primary current
Info page 6	MEASu _r E	Measurement type
Info page 7	P i _{nt}	Integration time for Wdmd calculation
Info page 8	ModE	Set of variables on display
Info page 9	tAr _I FF	Tariff enabling
Info page 10 (O1)	PULSE	Pulse ON duration
		Pulse weight
Info page 10 (S1)	AddrESS	Modbus serial address
Info page 11 (S1)	bAud	Modbus baud rate
Info page 12 (S1)	PA _r l _t Y	Modbus parity
Info page 10 (M1)	Pr _i Add	M-Bus primary address
Info page 11 (M1)	bAud	M-Bus baud rate
Info page 13	ChECk_ _S	FW checksum

(*) can be reached by pressing simultaneously the 2 touch keys

AV7, AV8 wiring diagrams

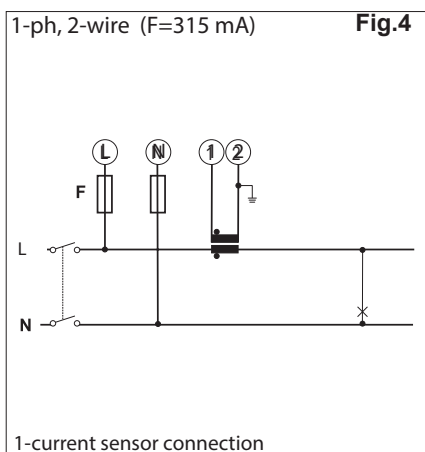


AV5 wiring diagrams



Note: current transformers must be grounded or not according to national regulations.

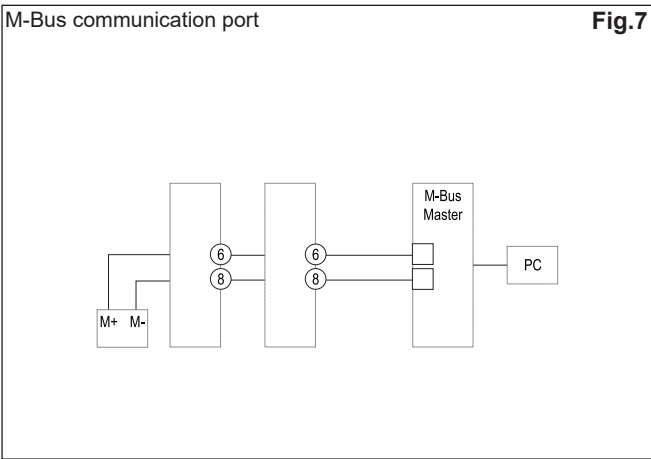
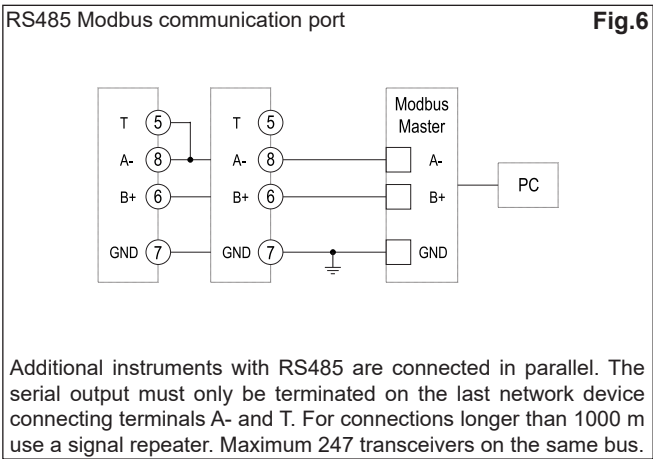
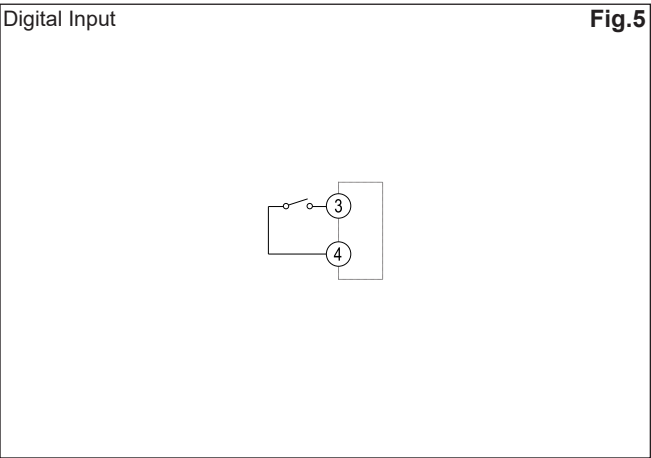
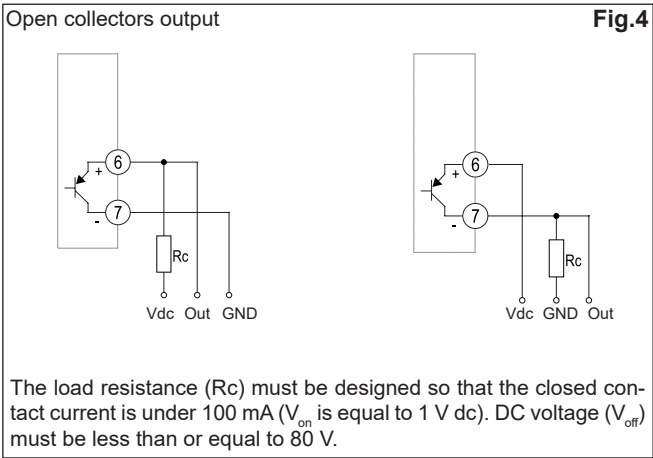
MV5 wiring diagrams



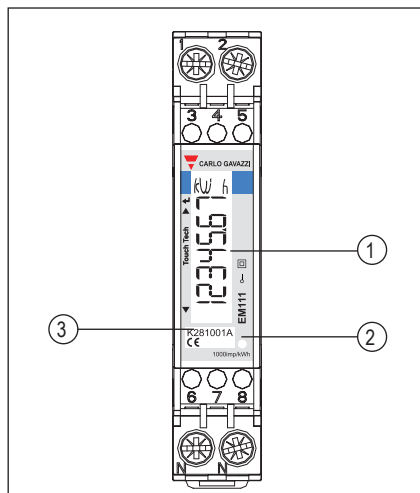
WARNING: terminals 1 and 2 are connected to live parts, use only current sensors that have, at least, basic insulation.



Input/output communication



Front panel description



1. **Display**
Backlit LCD display with touch key-pad.
Upper part: enter
2. **LED**
LED proportional to kWh reading
3. **Serial number and MID data**
Area reserved to serial number and MID-relevant data in PF versions

Dimensions (mm)

