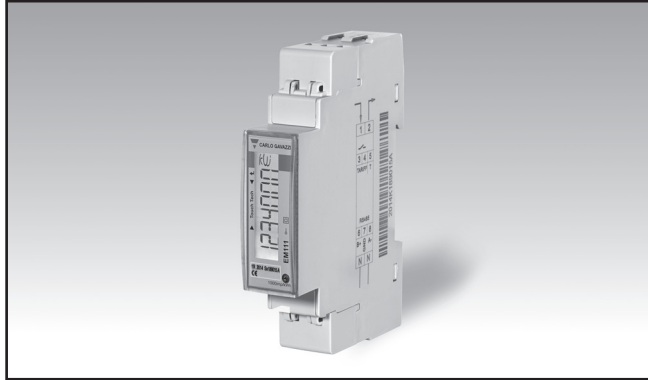


Energy Management Energy Analyzer Type EM111

CARLO GAVAZZI



- 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 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 (optional, by open collector PNP)
- RS485 Modbus port (optional)
- M-Bus port (optional)
- Digital input (for tariff management)
- 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

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

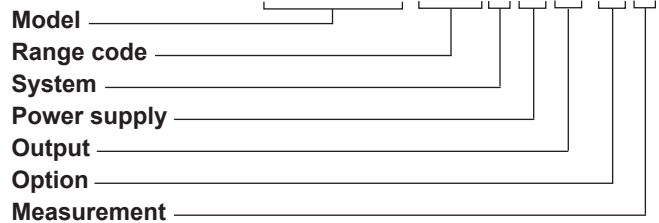
applications up to 32 A (direct connection) or up to 300 A (CT connection), with dual tariff management availability. It can measure imported and exported energy or be

programmed to consider only the imported one. Housing for DIN-rail mounting, with IP51 front degree protection. The meter is optionally 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



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

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

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			

Option

X: none

Input specifications

Rated Inputs			PF	0.001
Current type			Energies (positive)	0.001 kWh or kvarh
	AV7, AV8	1-phase loads, direct connection up to 32 A	Energies (negative)	0.001 kWh or kvarh
	AV5	1-phase loads, CT connection (5A) Note: max CT ratio = 60 (300 A)	Energy additional errors	According to EN62053-21
Nominal current range			Temperature drift	≤200ppm/°C
	AV7, AV8	5(45)A, I _b 5 A, I _{max} 45 A, I _{min} 0.25 A	Sampling rate	4096 samples/s @ 50Hz 4096 samples/s @ 60Hz
	AV5	5 (6) A, I _n 5A, I _{max} 6 A, I _{min} 0.25	Display and touch key-pad	
Nominal voltage			Type	Backlit LCD, 7-digit, h 6 mm
	AV5, AV8	230 VLN -30% +20 %	Read-out	Energy: 7 digit. Variables: 4 digit
	AV7	120 VLN -20% +20%	Touch key	2 (Enter/DOWN and UP).
Note		EM111 with direct connection (AV7, AV8) can be used up to 45 A if a 6 mm ² section wire complies with local regulations and/or installation needs.	Max. and Min. indication	Max. 9 999 999 Min. 0.00
Accuracy (@25°C ±5°C, R.H. ≤60%, 45 to 65 Hz)			Memory energy storage	
Energies			Energy	10 ¹⁰ cycles. Energy value is saved every time the less significant digit increases.
Active energy		Class 1 according to EN62053-21	Programming parameters	10 ¹⁰ cycles. When a parameter is modified, only the relevant memory cell is overwritten
		Class B (kWh) according to EN50470-3 (AV8 only)	LEDs	Flashing red light pulses according to EN50470-3, EN62052-11
Reactive energy		Class 2 according to EN62053-23	Pulse weight	AV7, AV8: 1000 pulses/kWh (min. period: 90ms, max. frequency: 11 Hz) AV5: Depending on CT ratio: CT ≤ 25: 1000 pulse/kWh 25 < CT < 60: 100 pulses/kWh
Start-up current			Note	Fix orange light: wrong current direction only with PFB option or with "B" measurement selection in case of X option
	AV7, AV8	20 mA, positive or negative		
	AV5	10 mA, positive or negative		
Start-up voltage			Current overloads	
	AV5, AV8	161 VLN	Continuous	AV7, AV8: 45 A AV5: 6 A
	AV7	96 VLN	For 10ms	AV7, AV8: 1350 A AV5: 120 A
Resolution			Voltage Overloads	
Current		Display	Continuous	1.2 Un
Voltage		0.1 A	For 500ms	2 Un
Power		0.1 V	Input impedance	
Frequency		0.1 Hz	Voltage input	2.8 Mohm
PF		0.01 kW or kVar	Current input	< 0.5 VA
Energies (positive)		0.1 Hz		
Energies (negative)		0.01 kWh or kvarh		
		0.01 kWh or kvarh		
		Serial communication		
Current		0.001 A		
Voltage		0.1 V		
Power		0.1 kW or kvar		
Frequency		0.1 Hz		

Digital input specifications

Digital inputs	Free of voltage contact	Overload	In case a voltage is erroneously applied to the digital input, the input is not damaged up to 30 V ac/dc.
Function	Tariff management (switch between t1-t2)		
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	RS485 by screw connection.	Other	Available functions: wild card, header, initialisation SND_NKE, and req_udr management. Management of primary address modification via M-Bus. VIF, VIFE, DIF and DIFE: see protocol not available with AV5 range code
Function	For communication of measured data, programming parameters		
Protocol	Modbus RTU (slave function)	Note	
Baud rate	9.6, 19.2, 38.4, 57.6, 115.2 kbaud, even or no parity,		
Address	1 to 247 (default: 1)		
Driver input capability	1/8 unit load. Maximum 247 transceivers on the same bus.	Static output	
Data refresh time	1 s	Purpose	For pulse output proportional to the active energy (kWh)
Read command	50 words available in 1 read command	Pulse rate	Selectable in multiple of 100 Max 1000 or 3000 pulses/kWh according to pulse ON duration
M-Bus port	M-Bus by screw connection.	Pulse ON duration	Selectable: 30ms or 100 ms according to EN62052-31 open collector PNP
Function	For communication of measured data	Output type	V _{ON} 1 VDC max. 100mA
Protocol	M-Bus according to EN13757-3	Load	V _{OFF} 80 VDC max. not available with AV5 range code
Baud rate	0.3, 2.4, 9.6 kbaud	Note	
Meters in the M-Bus network	250		
Primary address	Selectable		
Secondary address	Univocally defined in each unit		
Secondary address	from 50000000 to 69999999		

General specifications

Operating temperature PF option (standard or with suffixes from 01 to 60) PF option (with suffixes from 61 to 99) X option	From -25 to +55°C/from -13 to +131°F From -25 to +70°C/from -13 to +158°F From -25 to +65°C/from -13 to +149°F indoor, (R.H. from 0 to 90% noncondensing @ 40°C)	Metrology	EN62053-21, EN50470-3 (PF option only) IEC/EN61557-12 (active power and active energy, MID models only)
Storage temperature	-30°C to +80°C (R.H. < 90% noncondensing @ 40°C)	Approvals	CE, MID (PF option only), cULus (AV7 option only)
Overvoltage category	Cat. III	Connections	Cable cross-section area Other terminals
Insulation (for 1 minute)	4000 VAC RMS between measuring inputs and digital/serial output (see table) 4000 VAC RMS	Housing	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
Dielectric strength	4000 VAC RMS for 1 minute	Material	17,5 x 63 x 91,5 mm PBT, self-extinguishing: UL 94 V-0 Included
EMC	According to EN62052-11	Sealing covers	Included
Standard compliance Safety	EN62052-11	Mounting	DIN-rail
		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	$\leq 1.0W, \leq 8VA$
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Insulation (for 1 minute) between inputs and outputs

	Measuring input	Digital or serial output	Digital input
Measuring input	-	4 kV	4 kV
Digital or serial output	4 kV	-	-
Digital input	4 kV	-	-

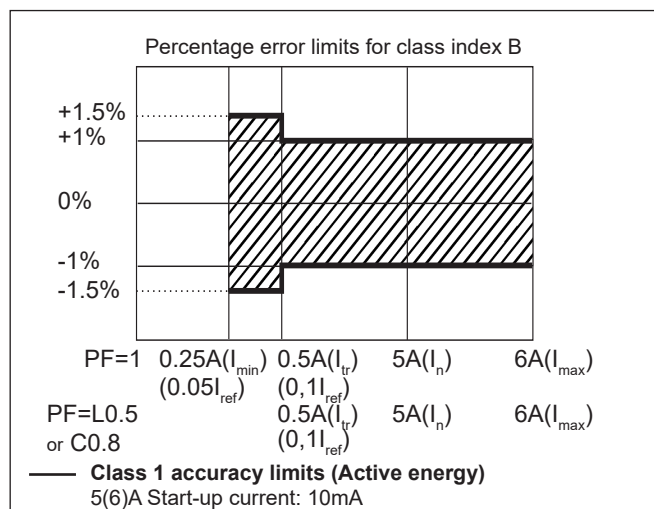
AV5 model	Voltage input	Serial output
CT input	2 kV	4 kV
Voltage input	-	4 kV

MID compliance (PF option only)

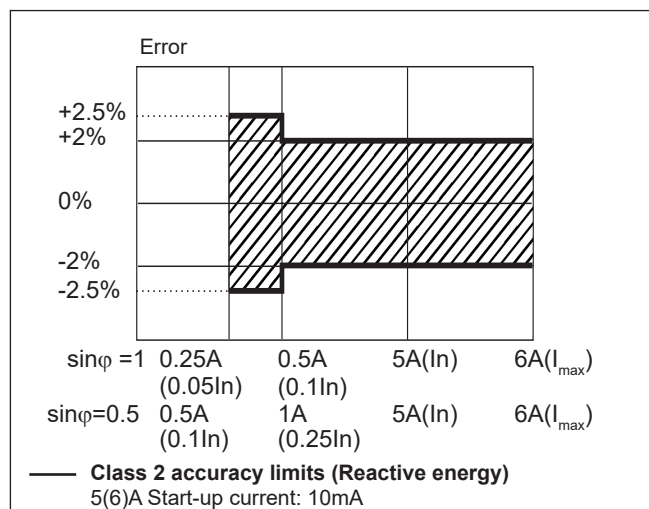
Accuracy	0.9 $U_n \leq U \leq 1.1 U_n$; 0.98 $f_n \leq f \leq 1.02 f_n$; f_n : 50 Hz; cos ϕ : 0.5 inductive to 0.8 capacitive. Class B Considering listed I_b or I_n values
Operating temperature	PF option (standard or with suffixes from 01 to 60): from -25 to +55°C/from -13 to +131°F PF option (with suffixes from 61 to 99): from -25 to +70°C/from -13 to +158°F X option: from -25 to +65°C/from -13 to +149°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

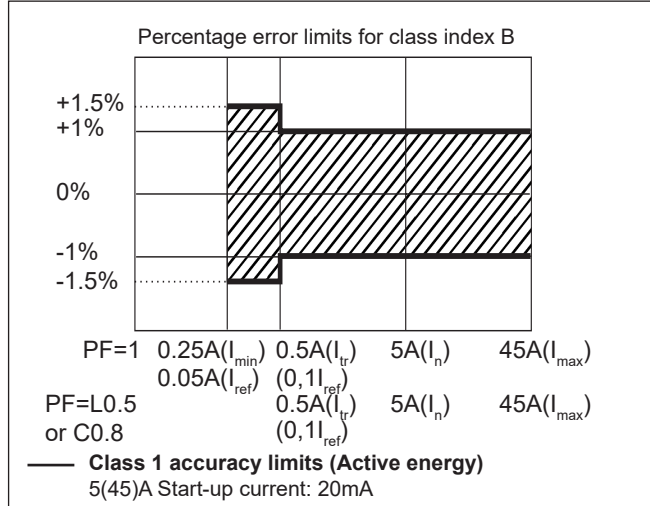


kvarh, accuracy (RDG) depending on the current

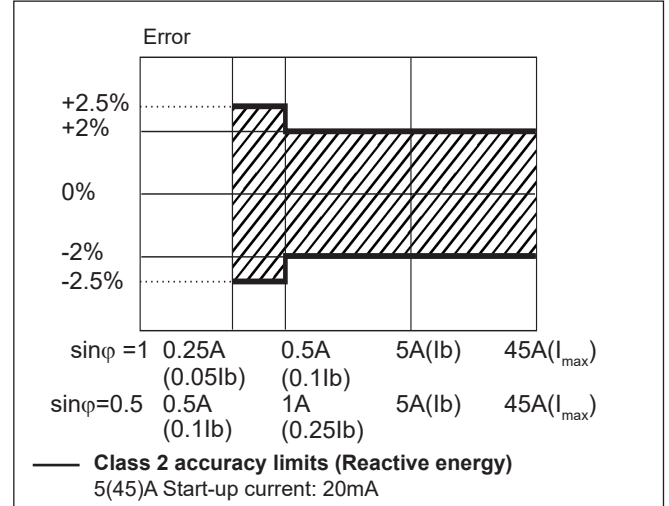


Accuracy (according to EN50470-3 and EN62053-23) - AV7/AV8 model

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

Specification are subject to change without notice EM111 DS 020221

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 Ratio (AV5)	Current transformer ratio	From 1 to 60	1
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		

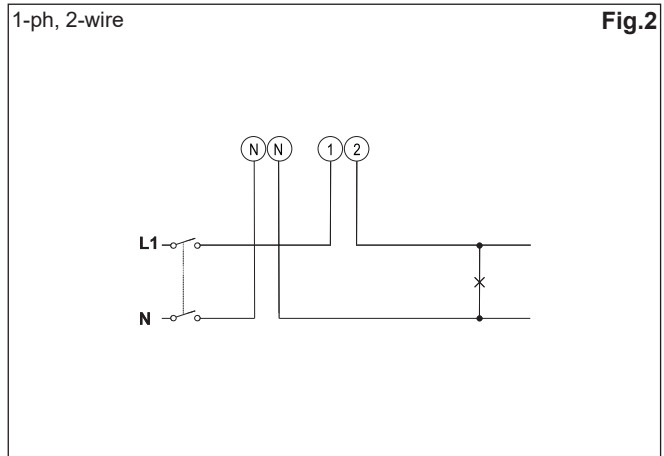
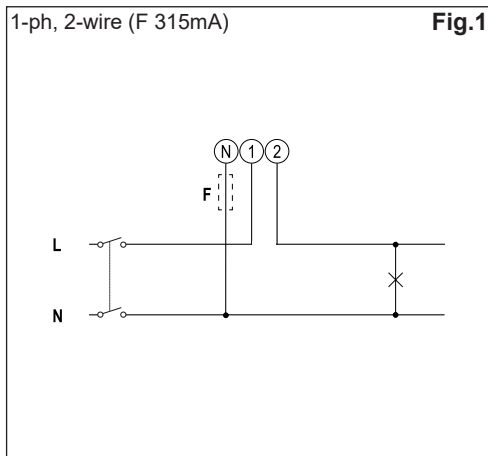
Note: after the confirmation of a new parameter value, the value is stored in the memory without the need to exit the programming mode.

Additional available information on the display (*)

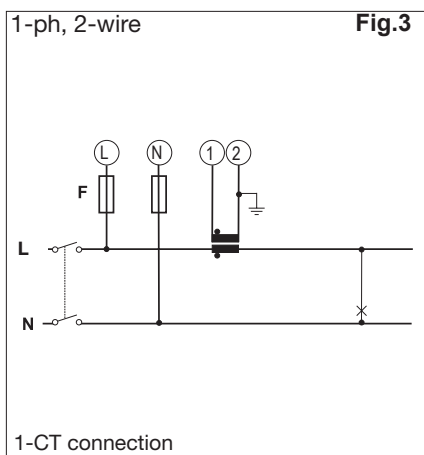
Type	Page	Description
Info page 1	YEA _r (2013)	Year of production
Info page 2	SE _R I _A L (dddnnnA)	Serial number (ddd= day of the year; nnn=progressive number; A= production line, internal use only)
Info page 3	rEV (A.01)	Firmware revision
Info page 4	Ct Ra _t lo	Current transformer ratio
Info page 5	MEAS _u rE	Measurement type
Info page 6	P int	Integration time for W _d md calculation
Info page 7	ModE	Set of variables on display
Info page 8	tAr _I FF	Tariff enabling
Info page 9 (O1)	PULSE	Pulse ON duration
		Pulse weight
Info page 9 (S1)	AddrESS	Modbus serial address
Info page 10 (S1)	bAud	Modbus baud rate
Info page 11 (S1)	PA _r tY	Modbus parity
Info page 9 (M1)	Pr _I Add	M-Bus primary address
Info page 10 (M1)	bAud	M-Bus baud rate
Info page 12	ChECKSuM	FW checksum

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

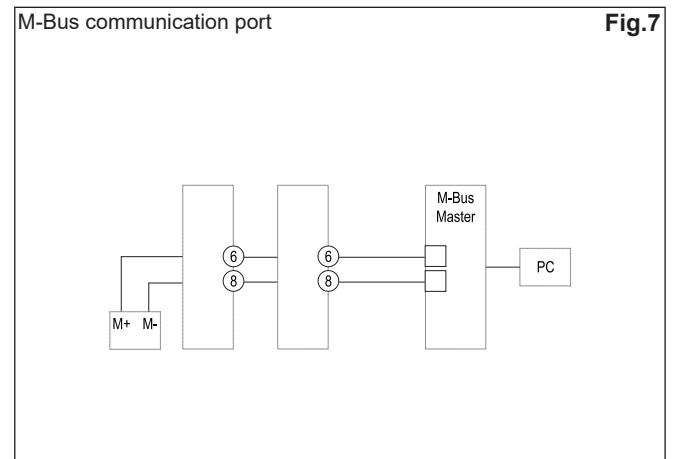
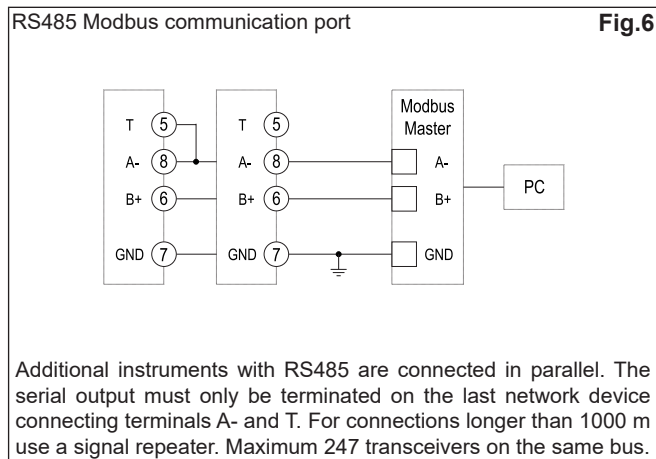
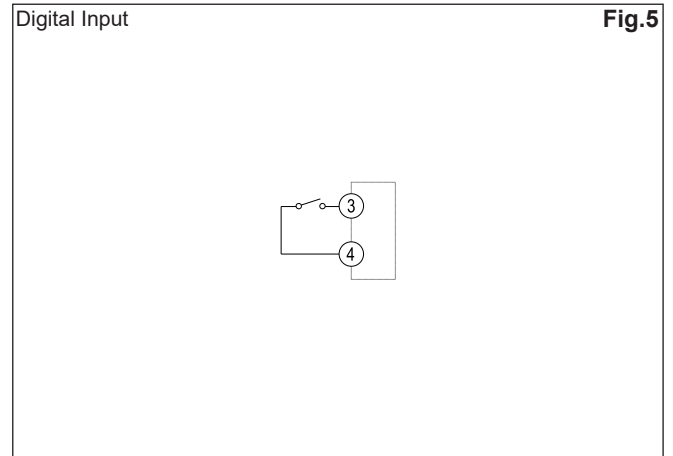
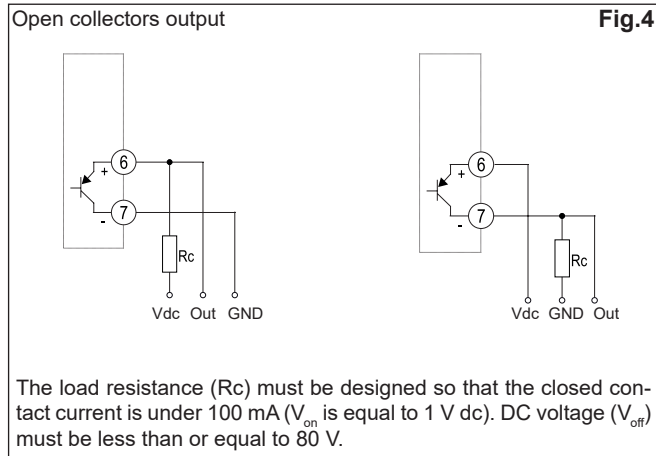
AV7, AV8 wiring diagrams



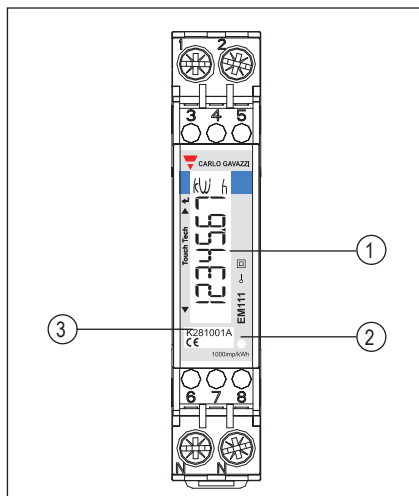
AV5 wiring diagrams



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)

