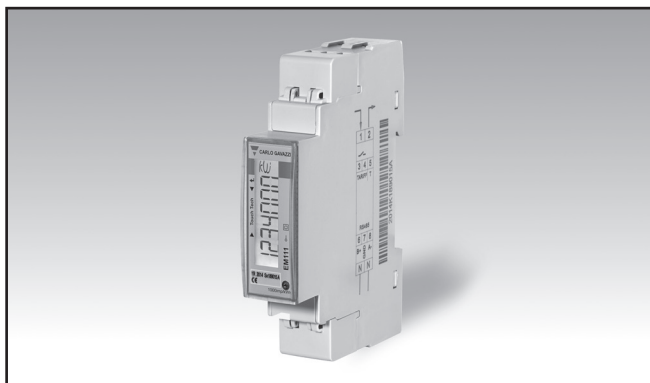


# Energy Management Energy Analyzer Type EM111

CARLO GAVAZZI



- M-Bus port (optional)
- Digital input (for tariff management)
- Easy connection or wrong current direction detection
- 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 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 mm<sup>2</sup>
- 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)

## 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

Model \_\_\_\_\_  
 Range code \_\_\_\_\_  
 System \_\_\_\_\_  
 Power supply \_\_\_\_\_  
 Output \_\_\_\_\_  
 Option \_\_\_\_\_  
 Measurement \_\_\_\_\_

## Type Selection

Range code	System	Power supply	Output
<b>AV8:</b> 230VLN AC - 5(45)A (Direct connection up to 32 A)	<b>1:</b> 1-phase 2-wire	<b>X:</b> Self power supply	<b>O1:</b> pulse output <b>S1:</b> RS485 Modbus port <b>M1:</b> M-Bus port
Option	Measurement		
<b>PF:</b> Certified according to MID Directive. Can be used for fiscal (legal) metrology.	<b>A:</b> 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>B:</b> Only the total positive energy meter is certified according to MID. Operating temperature: from -25 to +55°C/from -13 to +131°F		
	<b>A70:</b> 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		
	<b>B70:</b> 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
<b>AV8:</b> 230VLN ac - 5(45)A (Direct connection up to 32 A)	<b>1:</b> 1-phase 2-wire	<b>X:</b> Self power supply	<b>O1:</b> pulse output <b>S1:</b> RS485 Modbus port <b>M1:</b> M-Bus port
<b>AV7:</b> 120VLN ac - 5(45)A (Direct connection up to 32 A). Available on request (MOQ 100 pcs)			
<b>AV5:</b> 230VLN ac - 5(6)A (CT connection), <b>S1</b> output only			

**Option**

**X:** none



## Digital input specifications

<b>Digital inputs</b>	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

<b>RS485 serial port</b>	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)		
Baud rate	9.6, 19.2, 38.4, 57.6, 115.2 kbaud, 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.	<b>Static output</b>	
		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
Rx/Tx indication	Rx segment on display is shown when a valid Modbus command is sent to that specific meter Tx segment on display is shown when a valid Modbus reply is sent back to the master	Pulse ON duration	Max 1000 or 3000 pulses/kWh according to pulse ON duration Selectable: 30ms or 100 ms according to EN62052-31
		Output type	open collector PNP
		Load	$V_{ON}$ 1 VDC max. 100mA $V_{OFF}$ 80 VDC max. not available with AV5 range code
<b>M-Bus port</b>	M-Bus by screw connection.	Note	
Function	For communication of measured data		
Protocol	M-Bus according to EN13757-3		
Baud rate	0.3, 2.4, 9.6 kbaud		
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

<b>Operating temperature</b> PF option (standard or with suffixes from 01 to 60)	From -25 to +55°C/from -13 to +131°F	<b>Metrology</b>	EN62053-21, EN50470-3 (PF option only)
PF option (with suffixes from 61 to 99)	From -25 to +70°C/from -13 to +158°F	<b>Approvals</b>	CE, 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% noncondensing @ 40°C)	<b>Connections</b> Cable cross-section area	Measuring inputs: max. 6 mm <sup>2</sup> with/without metallic cable ferrule; Max. screw tightening torque: 1.1 Nm 1.5 mm <sup>2</sup> , Min./Max. screws tightening torque: 0.4 Nm
<b>Storage temperature</b>	-30°C to +80°C (R.H. < 90% noncondensing @ 40°C)	Other terminals	
<b>Overvoltage category</b>	Cat. III	<b>Housing</b> Dimensions (WxDxH)	17,5 x 63 x 91,5 mm
<b>Insulation (for 1 minute)</b>	4000 VAC RMS between measuring inputs and digital/serial output (see table) 4000 VAC RMS	Material	PBT, self-extinguishing: UL 94 V-0
<b>Dielectric strength</b>	4000 VAC RMS for 1 minute	Sealing covers	Included
<b>EMC</b>	According to EN62052-11	<b>Mounting</b>	DIN-rail
<b>Standard compliance</b> Safety	EN62052-11	<b>Protection degree</b> Front	IP51
		Screw terminals (cable inputs)	IP20
		<b>Weight</b>	Approx. 80 g (packing included)

## Power supply specifications

<b>Power supply</b>	self power supply	<b>Power consumption</b>	≤ 1.0W, ≤ 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	-	-

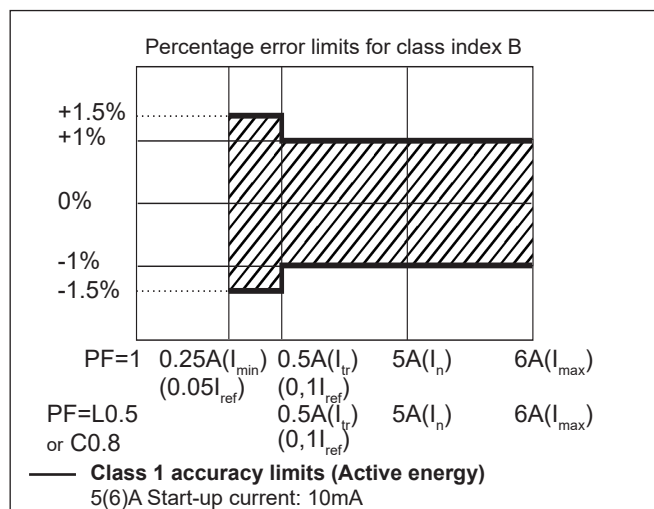
AV5 model	Voltage input	Serial output
CT input	2 kV	4 kV
Voltage input	-	4 kV

## MID compliance (PF option only)

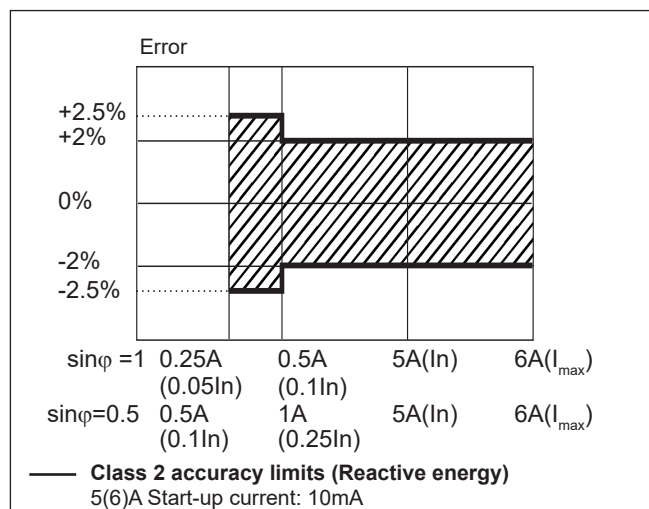
<b>Accuracy</b>	0.9 $U_n \leq U \leq 1.1 U_n$ ; 0.98 $f_n \leq f \leq 1.02 f_n$ ; $f_n$ : 50 Hz; cos $\phi$ : 0.5 inductive to 0.8 capacitive. Class B Considering listed $I_b$ or $I_n$ values
<b>Operating temperature</b>	PF option (standard or with suffixes from 01 to 60): from -25 to +55°C/from -13 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)
<b>EMC compliance</b>	E2
<b>Mechanical compliance</b>	M2

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

kWh, accuracy (RDG) depending on the current

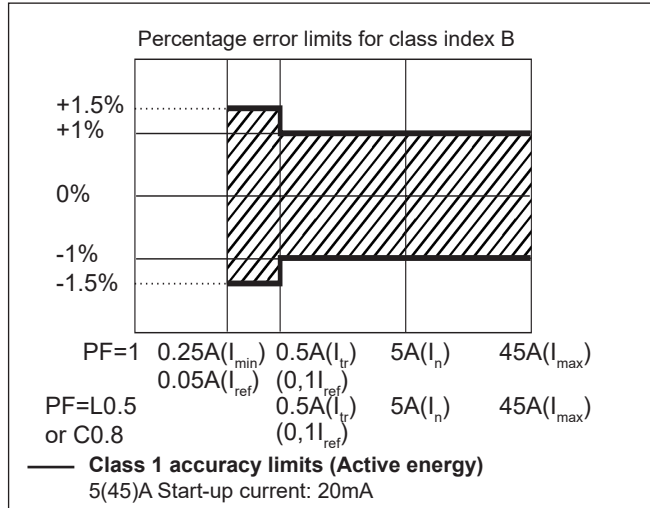


kvarh, accuracy (RDG) depending on the current

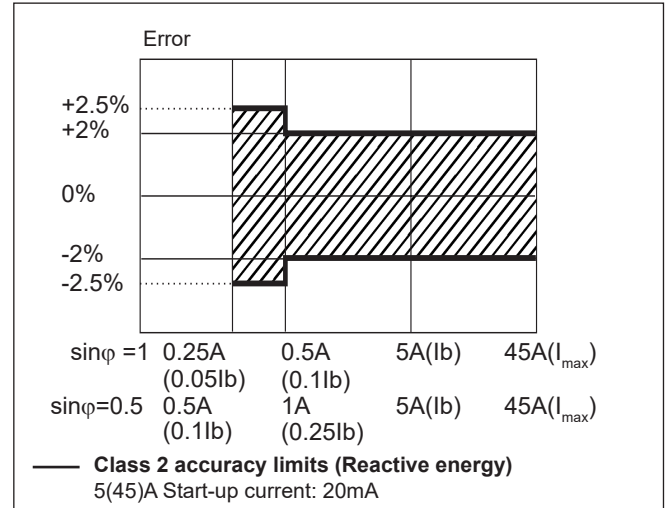


## Accuracy (according to EN50470-3 and EN62053-23) - AV7/AV8 model

kWh, accuracy (RDG) depending on the current



kvarh, accuracy (RDG) depending on the current



## 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 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.

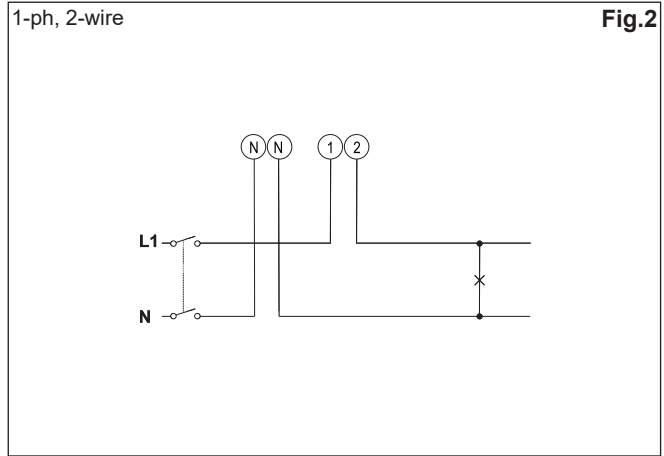
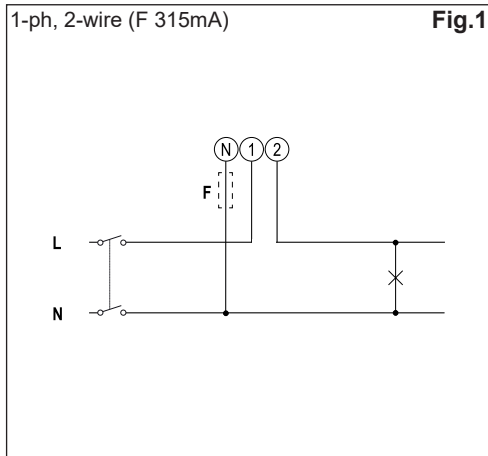


## Additional available information on the display (\*)

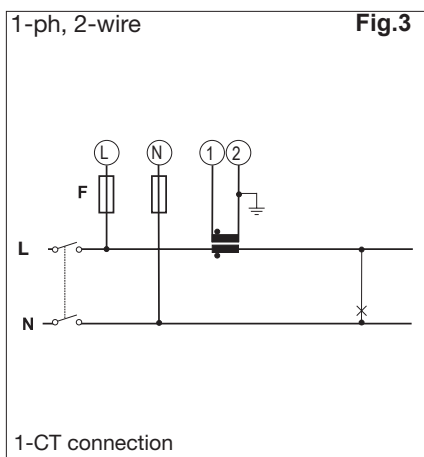
Type	Page	Description
Info page 1	YEA <sub>r</sub> (2013)	Year of production
Info page 2	SE <sub>R</sub> I <sub>A</sub> L (dddnnnA)	Serial number (ddd= day of the year; nnn=progressive number; A= production line, internal use only)
Info page 3	rEV (A.01)	Firmware revision
Info page 4	Ct Ra <sub>t</sub> lo	Current transformer ratio
Info page 5	MEAS <sub>u</sub> rE	Measurement type
Info page 6	P int	Integration time for Wdmd calculation
Info page 7	ModE	Set of variables on display
Info page 8	tAr <sub>I</sub> 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 <sub>r</sub> tY	Modbus parity
Info page 9 (M1)	Pr <sub>I</sub> Add	M-Bus primary address
Info page 10 (M1)	bAud	M-Bus baud rate
Info page 12	ChE <sub>C</sub> kSu <sub>M</sub>	FW checksum

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

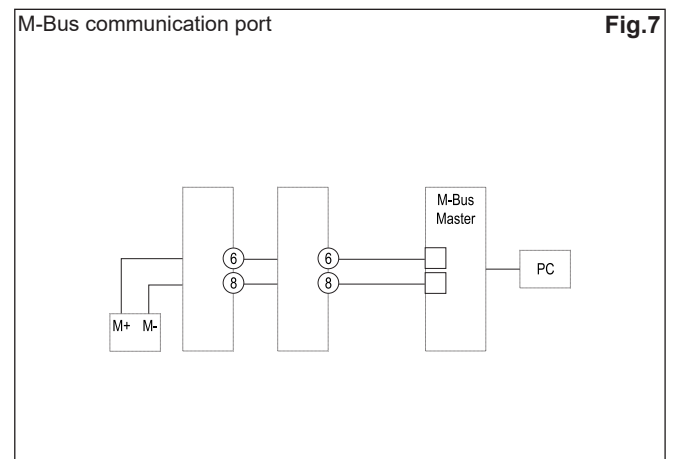
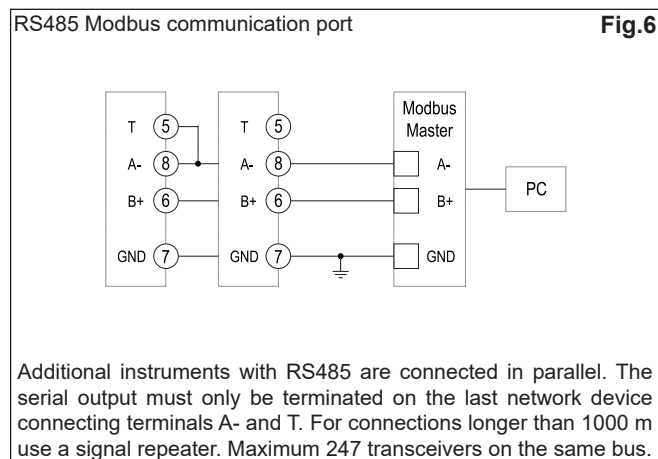
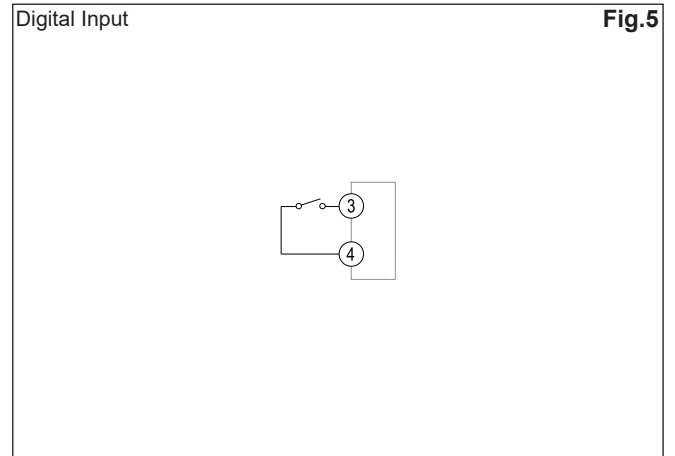
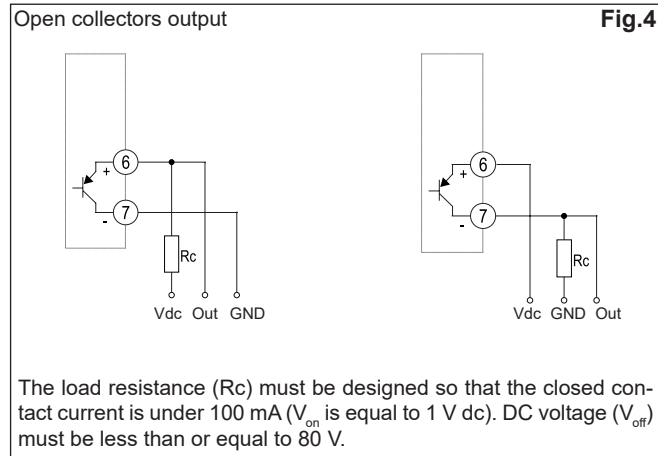
## AV7, AV8 wiring diagrams



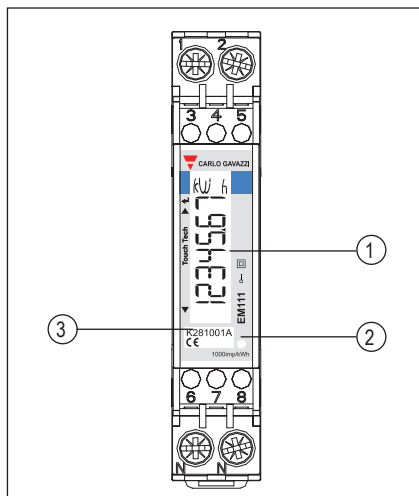
## AV5 wiring diagrams



## 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)

