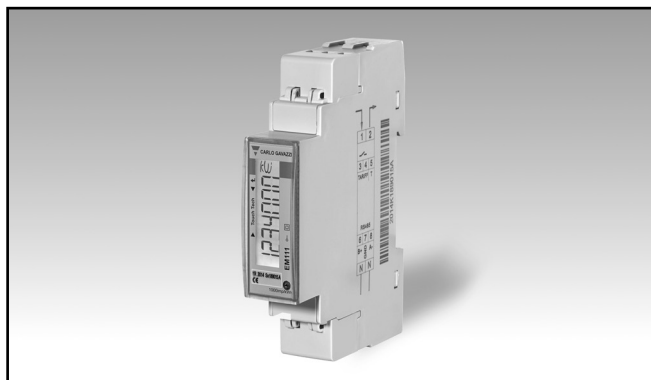


Energy Management Energy Analyzer Type EM111

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)
- Direct current measurement up to 45AAC
- 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
- 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 45 A (direct 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 01 PF B

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

Type Selection

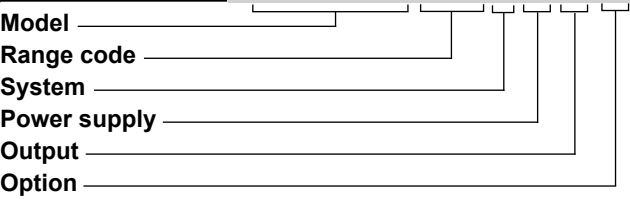
Range code	System	Power supply	Output
AV8: 230VLN AC - 5(45)A (Direct connection)	1: 1-phase 2-wire	X: Self power supply -30% +20% of the rated measuring input voltage, 50Hz	O1: pulse output S1: RS485 Modbus port M1: M-bus port
AV7: 120VLN AC - 5(45)A (Direct connection)			
Option	Measurement		
PF: Certified 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. B: Only the total positive energy meter is certified according to MID.		



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)	1: 1-phase 2-wire	X: Self power supply -30% +20% of the rated measuring input voltage, 45 to 65Hz	O1: pulse output S1: RS485 Modbus port M1: M-bus port
AV7: 120VLN AC - 5(45)A (Direct connection)			
Option			
X: none			

Input specifications

Rated Inputs		Touch key	2 (Enter and UP).
Current type	1-phase loads, direct connection	Max. and Min. indication	Max. 999 999.9 Min. 0.0
Current range	5(45)A	Memory energy storage	
Nominal voltage	230VLN AC (AV8 option), 120 VLN (AV7 option)	Energy	10 ¹⁰ cycles. Energy value is saved every time the less significant digit increases.
Accuracy (@25°C ±5°C, R.H. ≤60%, 45 to 65 Hz)		Programming parameters	10 ¹⁰ cycles. When a parameter is modified, only the relevant memory cell is overwritten
AV7	I _{min} =0.25A; I _b : 5A, I _{max} : 45A; U _n : 120VLN -30% +30%	LEDs	Flashing red light pulses according to EN50470-3, EN62052-11, 1000 imp./kWh (min. period: 90ms, max. frequency: 11 Hz)
AV8	I _{min} =0.25A; I _b : 5A, I _{max} : 45A; U _n : 230VLN -30% +20%		Fix orange light: wrong current direction only with PFB option or with "B" measurement selection in case of X option
Energies		Current overloads	
Active energy	Class 1 according to EN62053-21 Class B (Class B (kWh) according to EN50470-3)	Continuous	45A, @ 50Hz
Reactive energy	Class 2 according to EN62053-23	For 10ms	1350 A
Start-up current:	20mA (AV7, AV8), -20mA (AV7, AV8) positive or negative	Voltage Overloads	
	Self-consumption is not measured.	Continuous	1.2 U _n
Start-up voltage	84VLN (AV7), 161VLN (AV8)	For 500ms	2 U _n
Resolution	Display/serial communication	Input impedance	
Current	0.1/0.001 A	Voltage input 230VL-N	1.2 Mohm
Voltage	0.1/0.1 V	Voltage input 120VL-N	1.2 Mohm
Power	0.01 kW or kVar/ 0.1 W or var	Current inputs: 5(45) A	< 0.5 VA
Frequency	0.1 Hz/0.1Hz		
PF	0.01/ 0.001		
Energies (positive)	0.01 kWh or kvarh / 0.1 kWh or kvarh		
Energies (negative)	0.01 kWh or kvarh / 0.1 kWh or kvarh		
Energy additional errors			
Influence quantities	According to EN62053-21		
Temperature drift	≤200ppm/°C		
Sampling rate	4096 samples/s @ 50Hz 4096 samples/s @ 60Hz		
Display and touch key-pad			
Type	Backlit LCD, 7-digit, h 6 mm		
Read-out	Energy: 7 digit. Variables: 4 digit		

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 VAC/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	Available functions: wild card, header, initialisation SND_NKE, and req_udr management. Management of primary address modification via M-bus and reset of partial energy via M-bus available. VIF, VIFE, DIF and DIFE: see protocol
Protocol	ModBus RTU (slave function)		
Baud rate	9.6, 19.2, 38.4, 57.6, 115.2 kbaud, even or no parity, 1 to 247 (default: 01)		
Address	1 to 247 (default: 01)		
Driver input capability	1/8 unit load. Maximum 247 transceivers on the same bus.	Static output	
Data refresh time	1sec	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
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 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.

M-bus port

Function	M-bus by screw connection. For communication of measured data
Protocol	M-bus according to EN13757-1
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 5000 0000 to 6999 9999

General specifications

Operating temperature	-25 to +65 °C, indoor, (R.H. from 0 to 90% non- condensing @ 40°C)	Standard compliance	EN62052-11 EN62053-21, EN50470-3
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	
Insulation (for 1 minute)	4000 VAC RMS between measuring inputs and digital/serial output (see table) 4000 VAC RMS	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
Dielectric strength	4000 VAC RMS for 1 minute	Other terminals	
EMC		Housing	
Electrostatic discharges	According to EN62052-11 15kV air discharge;	Dimensions (WxDxH)	17,5 x 63 x 91,5 mm
Immunity to irradiated electromagnetic fields	Test with current: 10V/m from 80 to 2000MHz; Test without any current: 30V/m from 80 to 2000MHz;	Material	Noryl, self-extinguishing: UL 94 V-0
Burst	On current and voltage measuring inputs circuit: 4kV	Sealing covers	Included
Immunity to conducted disturbances	10V/m from 150KHz to 80MHz	Mounting	DIN-rail
Surge	On current and voltage measuring inputs circuit: 4kV;	Protection degree	
Radio frequency	According to CISPR 22	Front	IP51
		Screw terminals (cable inputs)	IP20
		Weight	Approx. 80 g (packing included)

Power supply specifications

Self power supply		Power consumption	≤ 1.0W, ≤ 8VA
AV8	230VAC VL-N, -30% +20% 45 to 65 Hz		
AV7	120VAC VL-N, -30% +30% 45 to 65 Hz		



Insulation (for 1 minute) between inputs and outputs

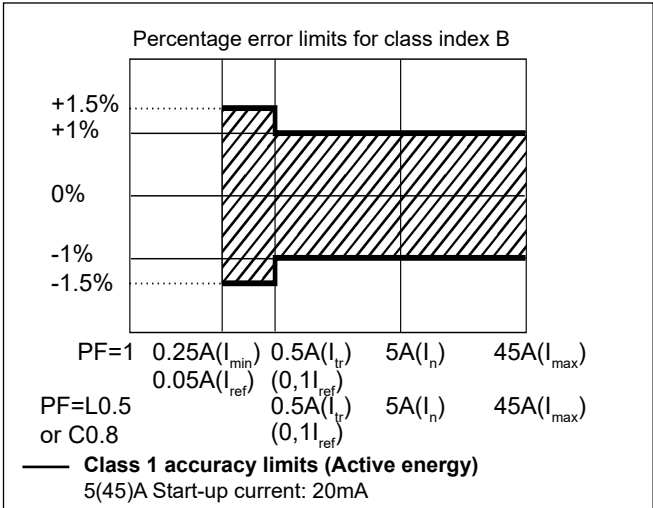
	Measuring input	Digital or serial output	Digital input
Measuring input	-	4 kV	4 kV
Digital or serial output	4 kV	-	-
Digital input	4 kV	-	-

MID compliance (PF option only)

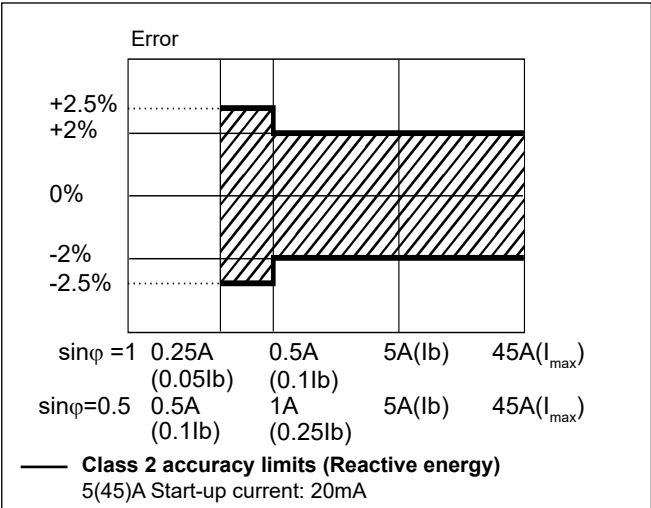
Accuracy	0.9 Un ≤ U ≤ 1.1 Un; 0.98 fn ≤ f ≤ 1.02 fn; fn: 50 Hz; cosφ: 0.5 inductive to 0.8 capacitive. Class B Considering listed Ib or In values
Operating temperature	-25 to +55°C (-13°F to 131°F) (R.H. from 0 to 90% non-condensing @ 40°C)
EMC compliance	E2
Mechanical compliance	M2

Accuracy (according to EN50470-3 and EN62053-23)

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
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 rate	100 to 1000 (if duration is 100ms) or to 3000 (if 30 ms)	100
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	1
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 and of the kWh/kvarh partial meter 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	Description	Note
Info page 1	YEA _r (2013)	Year of production
Info page 2	SErIAL (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	MEASurE	Measurement type
Info page 5	P int	Integration time for Wdmd calculation
Info page 6	ModE	Set of variables on display
Info page 7	tArIFF	Tariff enabling
Info page 8 (O1)	PULSE	Pulse ON duration
		Pulse rate
Info page 8 (S1)	AddrESS	Modbus serial address
Info page 9 (S1)	bAud	Modbus baud rate
Info page 10 (S1)	PARItY	Modbus parity
Info page 8 (M1)	PrI Add	M-bus primary address
Info page 9 (M1)	bAud	M-bus baud rate

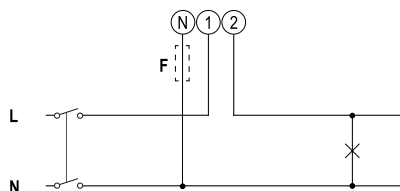
(*) can be reached by pressing simultaneously the 2 touch keys

Wiring diagrams



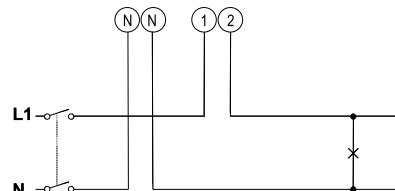
1-ph, 2-wire (F 315mA)

Fig.1



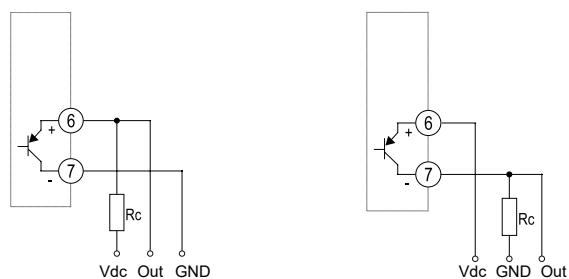
1-ph, 2-wire

Fig.2



Open collectors output

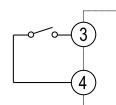
Fig.3



The load resistance (R_c) must be designed so that the closed contact current is under 100 mA (V_{on} is equal to 1 V dc). DC voltage (V_{off}) must be less than or equal to 80 V.

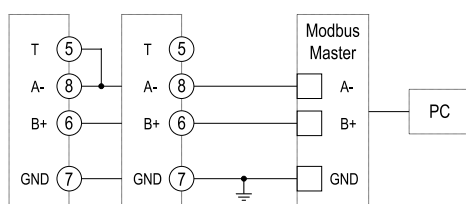
Digital Input

Fig.4



RS485 Modbus communication port

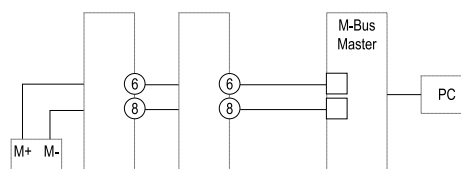
Fig.5



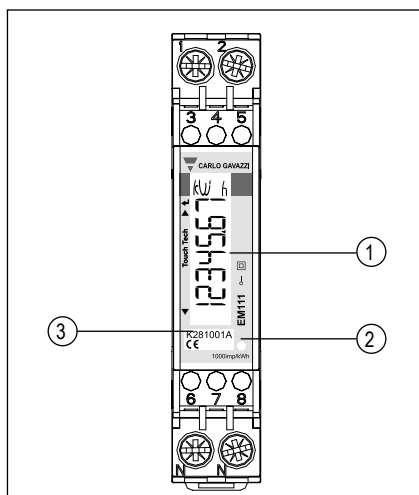
Additional instruments with RS485 are connected in parallel. The serial output must only be terminated on the last network device connecting terminals A- and T. For connections longer than 1000 m use a signal repeater. Maximum 247 transceivers on the same bus.

M-Bus communication port

Fig.6



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)

