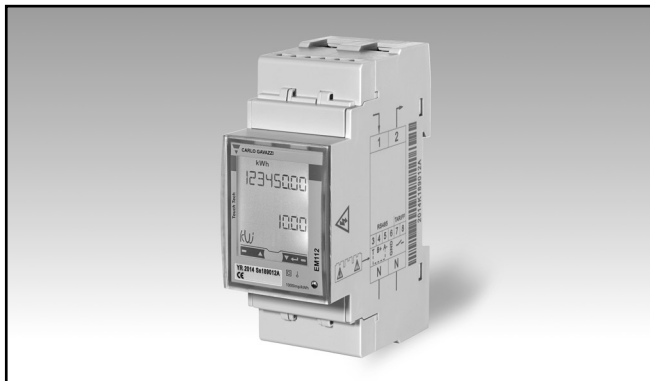


# Energy Management Energy Analyzer Type EM112

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 100AAC
- Backlit LCD display (3x 8-digit) with integrated touch key-pad
- Energy readout on display: 8 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: 2-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

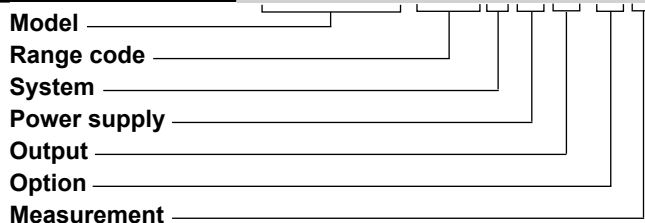
## Product description

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 100 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 analyzer 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 EM112-DIN AV0 1 X 01 PF B



## Type Selection

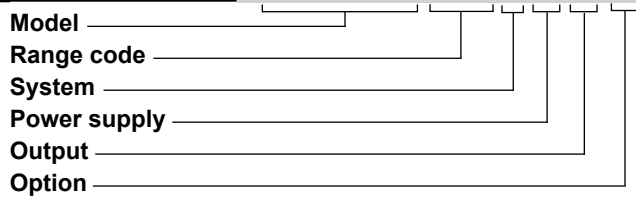
Range code	System	Power supply	Output
<b>AV0:</b> 230VLN AC - 5(100)A (Direct connection)	<b>1:</b> 1-phase 2-wire	<b>X:</b> Self power supply -30% +20% of the rated measuring input voltage, 50Hz	<b>O1:</b> pulse output <b>S1:</b> RS485 Modbus port <b>M1:</b> M-bus port
<b>AV1:</b> 120VLN AC - 5(100)A (Direct connection)			
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. <b>B:</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** **EM112-DIN AV0 1 X O1 X**



**Type Selection**

Range code	System	Power supply	Output
<b>AV0:</b> 230VLN AC - 5(100)A (Direct connection)	<b>1:</b> 1-phase 2-wire	<b>X:</b> Self power supply -30% +20% of the rated measuring input voltage, 45 to 65Hz	<b>O1:</b> pulse output <b>S1:</b> RS485 Modbus port <b>M1:</b> M-bus port
<b>AV1:</b> 120VLN AC - 5(100)A (Direct connection)			

**Option**

**X:** none

## Input specifications

<b>Rated Inputs</b>		<b>Energy</b>	10 <sup>10</sup> cycles. Energy value is saved every time the less significant digit increases.
Current type	1-phase loads, direct connection	<b>Programming parameters</b>	10 <sup>10</sup> cycles. When a parameter is modified, only the relevant memory cell is overwritten
Current range	5(100)A		
Nominal voltage	230VLN AC (AV0 option), 120 VLN (AV1 option)		
<b>Accuracy</b> (@25°C ±5°C, R.H. ≤60%, 45 to 65 Hz)		<b>LEDs</b>	Flashing red light pulses according to EN50470-3, EN62052-11, 1000 imp./ kWh (min. period: 90ms, max. frequency: 11 Hz) Fix orange light: wrong current direction (only with PFB option or with "B" measurement selection in case of X option)
AV1	I <sub>min</sub> =0.25A; I <sub>b</sub> : 5A, I <sub>max</sub> : 100A; U <sub>n</sub> : 120VLN -30% +30%		
AV0	I <sub>min</sub> =0.25A; I <sub>b</sub> : 5A, I <sub>max</sub> : 100A; U <sub>n</sub> : 230VLN -30% +20%		
<b>Energies</b>		<b>Current overloads</b>	
Active energy	Class 1 according to EN62053-21 Class B (Class B (kWh) according to EN50470-3)	Continuous	100A, @ 50Hz
Reactive energy	Class 2 according to EN62053-23	For 10ms	3000 A
Start-up current:	40mA (AV0, AV1), positive or negative	<b>Voltage Overloads</b>	
Start-up voltage	Self-consumption is not measured. 84VLN (AV1), 161VLN (AV0)	Continuous	1.2 U <sub>n</sub>
		For 500ms	2 U <sub>n</sub>
<b>Resolution</b>	Display/serial communication	<b>Input impedance</b>	
Current	0.1/0.001 A	Voltage input 230VL-N	1.2Mohm
Voltage	0.1/0.1 V	Voltage input 120VL-N	1.2Mohm
Power	0.01 kW or kVar/ 0.1 W or var	Current inputs: 5(100) A	< 1.25VA
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		
<b>Energy additional errors</b>			
Influence quantities	According to EN62053-21		
<b>Temperature drift</b>	≤200ppm/°C		
<b>Sampling rate</b>	4096 samples/s @ 50Hz 4096 samples/s @ 60Hz		
<b>Display and touch key-pad</b>			
Type	Backlit LCD, 3 rows by 8-digit each, h 5 mm		
Read-out	Energy: 8 digit. Variables: 4 digit		
Touch key	2 (Enter and UP).		
<b>Max. and Min. indication</b>			
Energies	Max. 99 999 999 Min. 0.01		
Variables	Max. 9999 Min. 0.01		
<b>Memory energy storage</b>			

## 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 VAC/DC.
Function	Tariff management (switch between t1-t2)		
Number of inputs	1		
Contact measurement voltage	5 V		
Contact 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 and reset of partial energy via M-bus available. VIF, VIFE, DIF and DIFE: see protocol
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,		
Address	1 to 247 (default: 01)		
Driver input capability	1/8 unit load. Maximum 247 transceivers on the same bus.	<b>Static output</b>	
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 500 or 2000 pulses/kWh according to pulse ON duration Selectable: 30ms or 100 ms according to EN62052-31
<b>M-bus port</b>	M-bus by screw connection.	Output type	open collector PNP
Function	For communication of measured data	Load	$V_{ON}$ 1 VDC max. 100mA $V_{OFF}$ 80 VDC max.
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 range	from 7000 0000 to 7999 9999		

## General specifications

<b>Operating temperature</b>	-25 to +65 °C, indoor, (R.H. from 0 to 90% non-condensing @ 40°C)	<b>Standard compliance</b>	EN62052-11 EN62053-21, EN50470-3
<b>Storage temperature</b>	-30°C to +80°C (R.H. < 90% noncondensing @ 40°C)	<b>Safety</b>	
<b>Overvoltage category</b>	Cat. III	<b>Metrology</b>	
<b>Insulation (for 1 minute)</b>	4000 VAC RMS between measuring inputs and digital/serial output (see table) 4000 VAC RMS	<b>Approvals</b>	CE, MID (PF option only)
<b>Dielectric strength</b>	4000 VAC RMS for 1 minute	<b>Connections</b>	
<b>EMC</b>	According to EN62052-11 15kV air discharge;	Cable cross-section area	Measuring inputs: max. 25 mm <sup>2</sup> , min. 5 mm <sup>2</sup> with/without metallic cable ferrule; Max. screw tightening torque: 2.8 Nm
Electrostatic discharges		Other terminals	1.5 mm <sup>2</sup> , Min./Max. screws tightening torque: 0.5 Nm
Immunity to irradiated electromagnetic fields	Test with current: 10V/m from 80 to 2000MHz; Test without any current: 30V/m from 80 to 2000MHz;	<b>Housing</b>	
Burst	On current and voltage measuring inputs circuit: 4kV	Dimensions (WxHxD)	35 x 63 x 90 mm
Immunity to conducted disturbances	10V/m from 150KHz to 80MHz	Material	Noryl, self-extinguishing: UL 94 V-0
Surge	On current and voltage measuring inputs circuit: 4kV;	Sealing covers	Included
Radio frequency	According to CISPR 22	<b>Mounting</b>	DIN-rail
		<b>Protection degree</b>	
		Front	IP51
		Screw terminals (cable inputs)	IP20
		<b>Weight</b>	Approx. 160 g (packing included)

## Power supply specifications

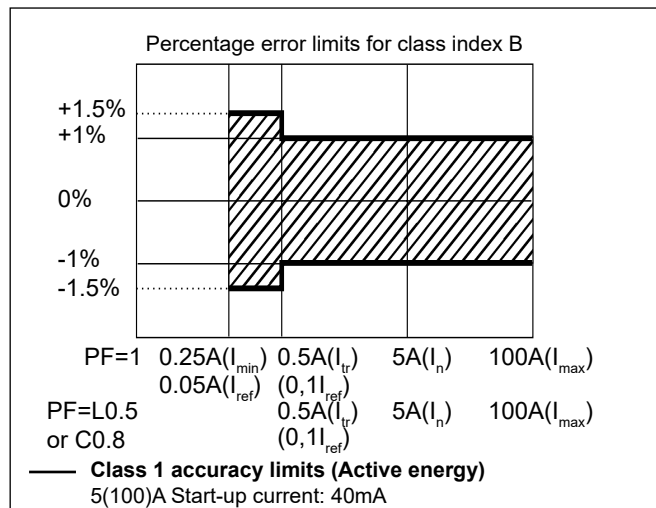
<b>Self power supply</b>		<b>Power consumption</b>	≤ 1.0W, ≤ 8VA
AV0	230VAC VL-N, -30% +20% 50/60Hz		
AV1	120VAC VL-N, -30% +30% 50/60Hz		

## Insulation (for 1 minute) between inputs and outputs

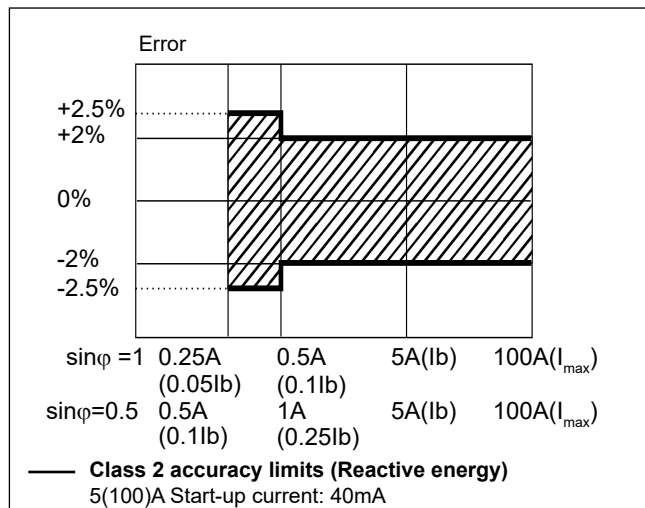
	Measuring input	Digital or serial output	Digital input
Measuring input	-	4 kV	4 kV
Digital or serial output	4 kV	-	0 kV
Digital input	4 kV	0 kV	-

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

kWh, accuracy (RDG) depending on the current



kvarh, accuracy (RDG) depending on the current



## MID compliance (PF option only)

<b>Accuracy</b>	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
<b>Operating temperature</b>	-25 to +55°C (-13°F to 131°F) (R.H. from 0 to 90% non-condensing @ 40°C)
<b>EMC compliance</b>	E2
<b>Mechanical compliance</b>	M2

## Display pages

No	1 <sup>st</sup> row	2 <sup>nd</sup> row	3 <sup>rd</sup> row	"Full" mode	"Easy" mode	Note
0	kWh+ (imported)		kW	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)		kW	X	X	In PFB version and in X version with Measurement menu set to "B"
2	kWh+ (imported)		V	X	X	
3	kWh+ (imported)		A	X	X	
4	kWh+ (imported)		PF	X		
5	kWh+ (imported)		Hz	X		
6	kvarh+ (imported)		kvar	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.
7	kvarh- (exported)		kvar	X		In PFB version and in X version with Measurement menu set to "B"
8	kWh+ (imported)	kWdmd peak	kWdmd	X		
9	kWh (t1)	"t1"	kW	X		Only relevant to kWh+, with Tariff menu set to ON.
10	kWh (t2)	"t2"	kW	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
Home	Home page selection (default page at power-on and after 120 s time-out from other pages). Not available in PFA and PFB versions (MID).	0 to 9	0
PULSE (O1 option)	Selection of pulse ON duration	30 or 100 ms	30
	Selection of the pulse rate	100 to 500 (if duration is 100ms) or to 2000 (if 30 ms)	100
Address (S1 option)	Modbus serial address	1 to 247	01
Kbaud (S1)	Modbus baud rate	9.6; 19.2; 38.4; 57.6, 115.2 kbps	9.6
ParlTY (S1)	Modbus parity	No/even	No
PrI Add (M1 option)	M-bus primary address	1 to 250	1
Kbaud (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 <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	MEAS <sub>ur</sub> E	Measurement type
Info page 5	P int	Integration time for Wdmd calculation
Info page 6	ModE	Set of variables on display
Info page 7	tAr <sub>I</sub> FF	Tariff enabling
Info page 8	HoME	Selected home page
Info page 9 (O1)	PULSE	Pulse ON duration
		Pulse rate
Info page 9 (S1)	AddrESS	Modbus serial address
Info page 10 (S1)	bAud	Modbus baud rate
Info page 11 (S1)	PAR <sub>I</sub> tY	Modbus parity
		Stop bit (in case of No parity only)
Info page 9 (M1)	Pr <sub>I</sub> Add	M-bus primary address
Info page 10 (M1)	bAud	M-bus baud rate

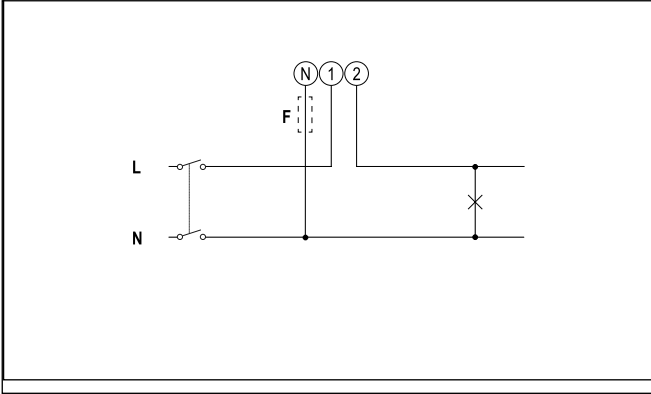
(\*) can be reached by pressing simultaneously the 2 touch keys



# Wiring diagrams

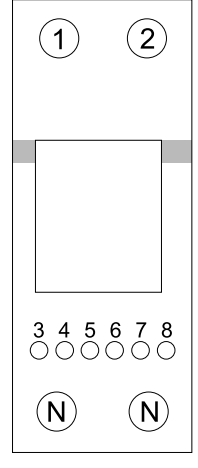
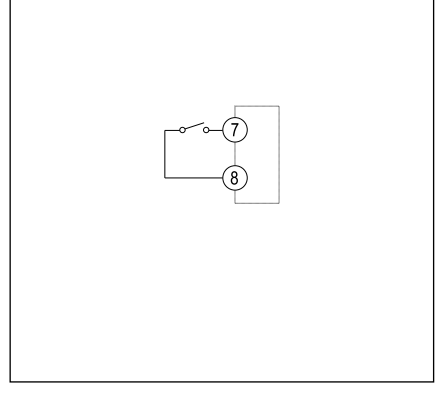
1-ph, 2-wire (F 315mA)

Fig.1



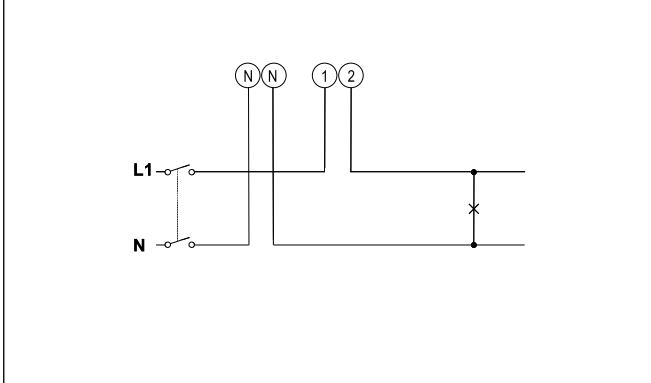
Digital Input

Fig.2



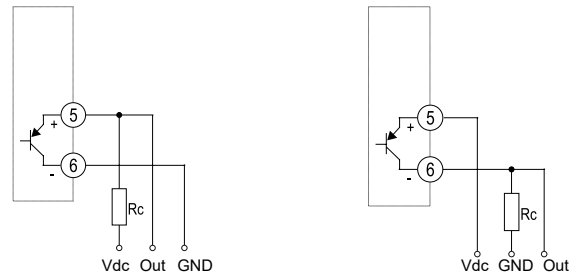
1-ph, 2-wire

Fig.3



Open collectors output

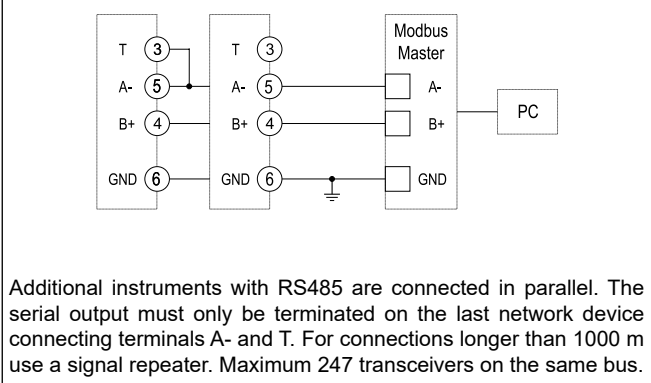
Fig.4



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.

RS485 Modbus communication port

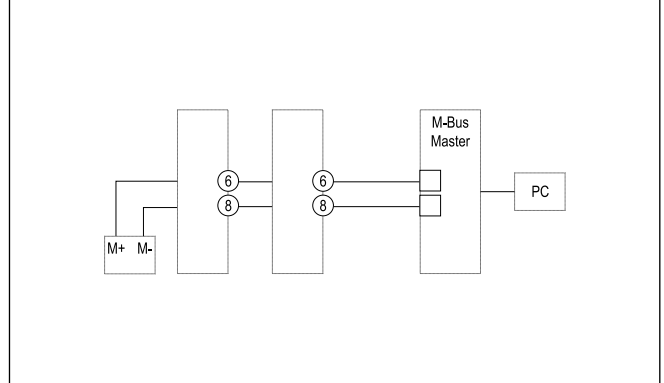
Fig.5



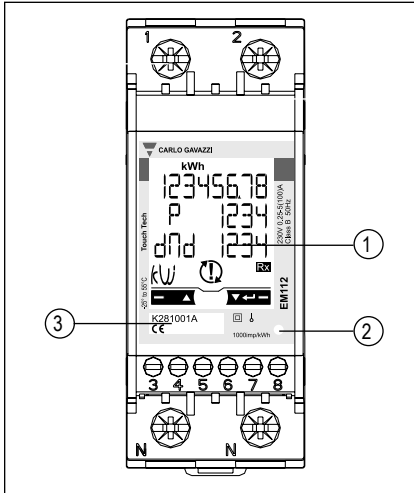
Additional instruments with RS485 are connected in parallel. The serial output must only be terminated on the last network device connecting terminals A- and T. For connections longer than 1000 m use a signal repeater. Maximum 247 transceivers on the same bus.

M-Bus communication port

Fig.6

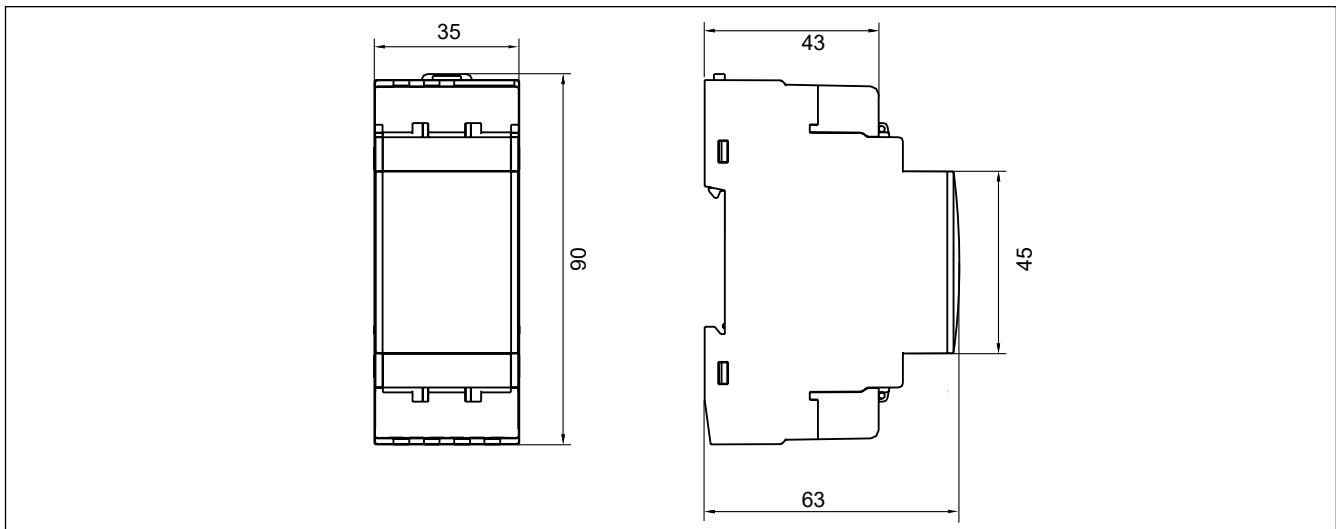


## Front panel description



1. **Display**  
Backlit LCD display with touch key-pad.  
Right key ("E"): enter  
Left key ("up"): UP
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)



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[DFC01DB48](#) [DHA51CM24S8](#)