Energy Management Energy Analyzer Type EM112

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- **Single phase energy analyzer**
- **Class 1 (kWh) according to EN 62053-21**
- **Class B (kWh) according to EN 50470-3**
- **Accuracy ±0.5% RDG (current/voltage)**
- **Direct current measurement up to 100 A AC**
- **Backlit LCD display (3x8-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**

- **Compliant with the international accuracy standard IEC/EN 62053-21, and the IEC/EN 61557-12 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 100 A (direct connection), with dual tariff management availability.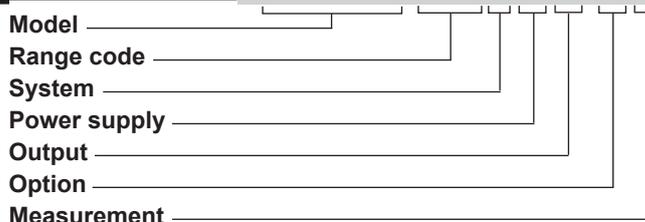 It can measure imported and exported energy or be programmed to consider only the imported one. Housing for DIN-rail mounting, with IP51 front degree protection. The analyzer is optionally provided with pulse output proportional to the active energy being measured, RS485 Modbus port or M-bus port.

| **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 O1 PF B

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

Type Selection

Range code	System	Power supply	Output
AV0: 230 V LN AC - 5 (100) A (Direct connection)	**1:** 1-phase 2-wire	**X:** Self power supply -30% +20% of the rated measuring input voltage, 50 Hz	**O1:** pulse output **S1:** RS485 Modbus port **M1:** M-bus port

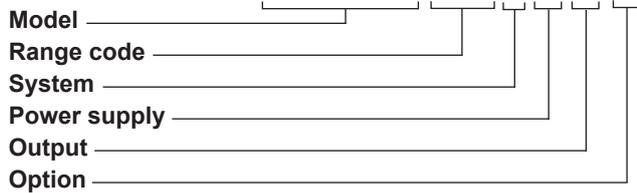| Option	Measurement
PF: Certified according to MID Directive. Can be used for fiscal (legal) metrology.	**A:** The power is always integrated (both in case of positive imported and negative exported power) and the total energy meter is certified according to MID. **B:** Only the total positive energy meter is certified according to MID.

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<table>
<tr><td colspan="2">**How to order**</td><td>**EM112-DIN AV0 1 X O1 X**</td></tr>
<tr><td>Model</td><td></td></tr>
<tr><td>Range code</td><td></td></tr>
<tr><td>System</td><td></td></tr>
<tr><td>Power supply</td><td></td></tr>
<tr><td>Output</td><td></td></tr>
<tr><td>Option</td><td></td></tr>
</table>

STANDARD

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

Type Selection

Range code	System	Power supply	Output
AV0: 240 V LN AC - 5(100) A (Direct connection)	**1:** 1-phase 2-wire	**X:** Self power supply -30% +20% (AV0) or -30% +30% (AV1) of the rated measuring input voltage, 45 to 65 Hz	**O1:** pulse output
AV1: 120 V LN AC - 5 (100) A (Direct connection). Available on request (MOQ 100 pcs)			**S1:** RS485 Modbus port
			M1: M-bus port

Option

X: none

Input specifications

Rated Inputs	
Current type	1-phase loads, direct connection
Current range	5 (100) A
Nominal voltage	240 V LN AC (AV0_X), 230 V LN (AV0_PF), 120 V LN (AV1)

Accuracy (@25°C ±5°C, R.H. ≤60%, 45 to 65 Hz)	
AV1	I_{min}= 0.25 A; I_b= 5 A, I_{max}= 100 A; U_n= 120 V LN -30% +30%
AV0_PF	I_{min}= 0.25 A; I_b= 5 A; I_{max}= 100 A; U_n= 230 V LN -30% +20%
AV0_X	I_{min}= 0.25 A; I_b= 5 A; I_{max}= 100 A; U_n= 240 V LN -30% +20%
Energies Active energy	Class 1 according to EN 62053-21 (in AV0 version, class 1 accuracy is guaranteed also at 120 V LN) Class B (kWh) according to EN 50470-3
Reactive energy	Class 2 according to EN 62053-23
Start-up current:	40 mA (AV0, AV1), positive or negative Self-consumption is not measured.
Start-up voltage	84 V LN (AV1), 168 V LN (AV0_X), 161 V LN (AV0_PF)

Resolution	Display
Current	0.1 A
Voltage	0.1 V
Power	0.01 kW or kVar
Frequency	0.1 Hz
PF	0.01
Energies (positive)	0.01 kWh or kvarh
Energies (negative)	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
PF	0.001
Energies (positive)	0.001 kWh or kvarh
Energies (negative)	0.001 kWh or kvarh
Energy additional errors	

Influence quantities	According to EN 62053-21
Temperature drift	≤ 200 ppm/°C
Sampling rate	4096 samples/s @ 50 Hz 4096 samples/s @ 60 Hz

Display and touch key-pad	
Type	Backlit LCD, 3 rows by 8-digit each, h 5 mm
Read-out	Energy: 8 digit. Variables: 4 digit
Touch key	2 (Enter/DOWN and UP).

Max. and Min. indication	
Energies	Max. 99 999 999 Min. 0.01
Variables	Max. 9999 Min. 0.01

Memory energy storage	
Energy	10^{10} cycles. Energy value is saved every time the less significant digit increases.
Programming parameters	10^{10} cycles. When a parameter is modified, only the relevant memory cell is overwritten

LEDs	Flashing red light pulses according to EN 50470-3, EN 62052-11, 1000 imp./kWh (max. frequency: 9.2 Hz) Fix orange light: wrong current direction (only with PFB option or with "B" measurement selection in case of X option)

Current overloads	
Continuous	100 A, @ 50 Hz
For 10 ms	3000 A

Voltage Overloads	
Continuous	1.2 U_n
For 500 ms	2 U_n

Input impedance	
Voltage input 230 V LN	1.88 MΩ (AV0_PF)
Voltage input 240 V LN	1.88 MΩ (AV0_X)
Voltage input 120 V LN	1.88 MΩ (AV1)
Current inputs: 5 (100) A	< 2 VA

Digital input specifications

Digital inputs	Voltage free contact		
Function	Tariff management (digital input between 7-8 terminals)	Overload	100 kΩ, open contact 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	≤ 1 kΩ		
Contact resistance	≥ 1 kΩ, close 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
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,	**Static output**	
Address	1 to 247 (default: 1)	Purpose	For pulse output proportional to the active energy (kWh)
Driver input capability	1/8 unit load. Maximum 247 transceivers on the same bus.		
Data refresh time	1 s	Pulse rate	Selectable in multiple of 100 Max 500 or 2000 pulses/kWh according to pulse ON duration
Read command	125 words available in 1 read command		
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	Selectable: 30 ms or 100 ms according to EN 62052-11
		Output type	open collector PNP
		Load	V_{ON} 1 V dc max. 100 mA V_{OFF} 80 V dc max.
M-bus port	M-bus by screw connection.		
Function	For communication of measured data		
Protocol	M-bus according to EN 13757-3		
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 range	from 7000 0000 to 7999 9999		

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General specifications

Operating temperature	-25 to +65 °C, indoor, (R.H. from 0 to 90% non-condensing @ 40 °C)	Material	PTB, self-extinguishing: UL 94 V-0
Storage temperature	-30 to +80 °C (R.H. < 90% non-condensing @ 40°C)	Sealing covers	Included
Overvoltage category	Cat. III	**Mounting**	DIN-rail
Insulation (for 1 minute)	4000 V AC RMS between measuring inputs and digital/serial output (see table) 4000 V AC RMS	**Protection degree**	
		Front	IP51
		Screw terminals (cable inputs)	IP20
Dielectric strength	4000 V AC RMS for 1 minute	**Weight**	Approx. 170 g
EMC	According to EN 62052-11		
Standard compliance			
Safety	EN 62052-11		
Metrology	EN 62053-21, EN 50470-3 IEC/EN 61557-12 (active power and active energy, MID models only)		
Approvals	CE, MID (PF option only)		
Connections			
Cable cross-section area	Measuring inputs: max. 25 mm², min. 5 mm² with/without metallic cable ferrule; Max. screw tightening torque: 2.8 Nm		
Other terminals	1.5 mm², Min./Max. screws tightening torque: 0.5 Nm		
Housing			
Dimensions (WxHxD)	35 x 63 x 90 mm		

Power supply specifications

Self power supply		**Power consumption**	≤ 1 W, ≤ 8 VA
AV0_PF	230 V AC V LN, -30% +20% 45-65 Hz		
AV0_X	240 V AC V LN, -30% +20% 45-65 Hz		
AV1	120 V AC V LN, -30% +30% 45-65 Hz		

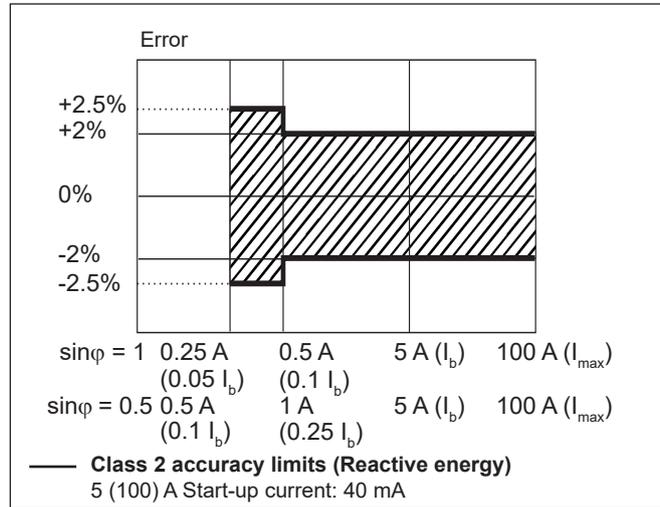## Insulation (for 1 minute) between inputs and outputs

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

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Accuracy (according to EN 50470-3 and EN 62053-23)

kWh, accuracy (RDG) depending on the current

Percentage error limits for class index B

+1.5%
+1%
0%
-1%
-1.5%

PF = 1 0.25 A (I_{min}) 0.5 A (I_{tr}) 5 A (I_n) 100 A (I_{max})
0.05 A (I_{ref}) (0,1 I_{ref})

PF = L 0.5 0.5 A (I_{tr}) 5 A (I_n) 100 A (I_{max})
or C 0.8 (0,1 I_{ref})

—— **Class 1 accuracy limits (Active energy)**
5 (100) A Start-up current: 40 mA

kvarh, accuracy (RDG) depending on the current

Error

+2.5%
+2%
0%
-2%
-2.5%

$\sin\varphi$ = 1 0.25 A 0.5 A 5 A (I_b) 100 A (I_{max})
(0.05 I_b) (0.1 I_b)

$\sin\varphi$ = 0.5 0.5 A 1 A 5 A (I_b) 100 A (I_{max})
(0.1 I_b) (0.25 I_b)

—— **Class 2 accuracy limits (Reactive energy)**
5 (100) A Start-up current: 40 mA
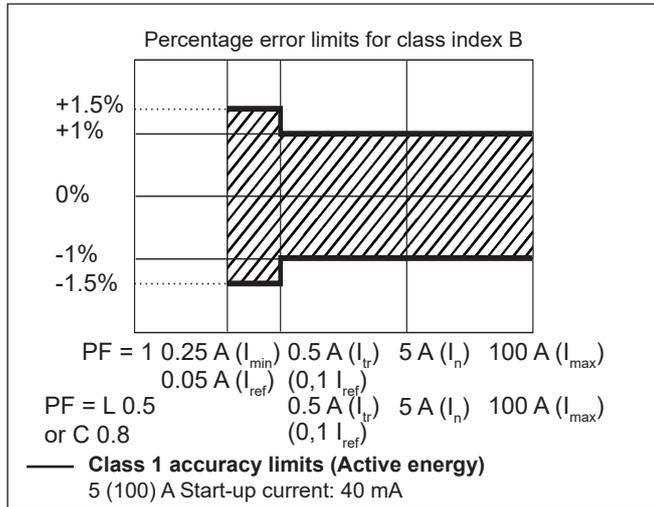
Measurement accuracy according to IEC/EN61557-12 (MID versions)

Active power	Performance class 1	**Active energy**	Performance class 2

MID compliance (PF option only)

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

Specification are subject to change without notice EM112 DS 20/10/2025

Display pages

No	1ˢᵗ row	2ⁿᵈ row	3ʳᵈ 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	X	Only relevant to kWh+, with Tariff menu set to ON.
10	kWh (t2)	"t2"	kW	X	X	Only relevant to kWh+, with Tariff menu set to ON.

X= available

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List of available menus

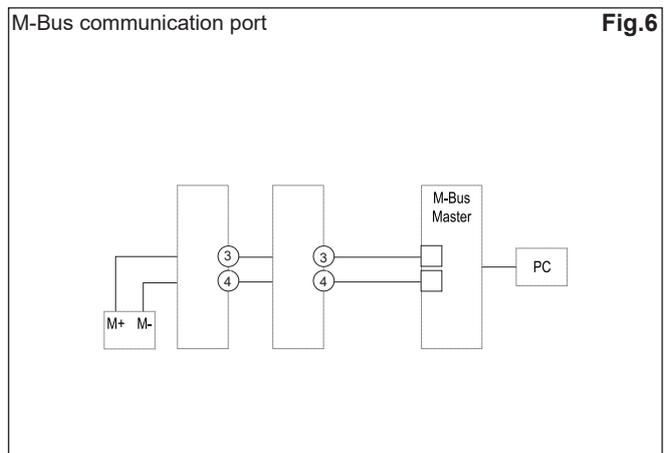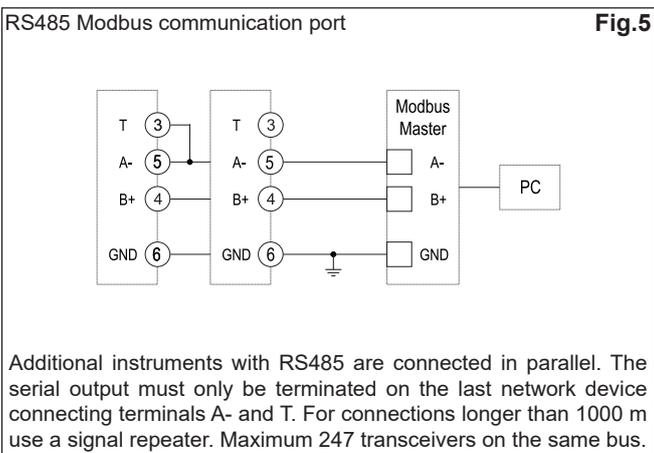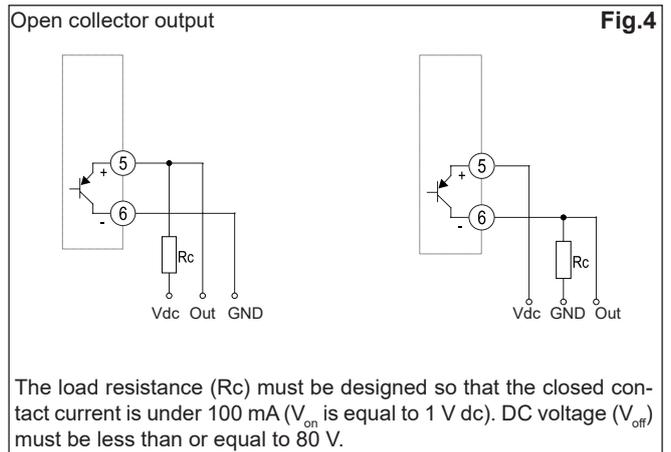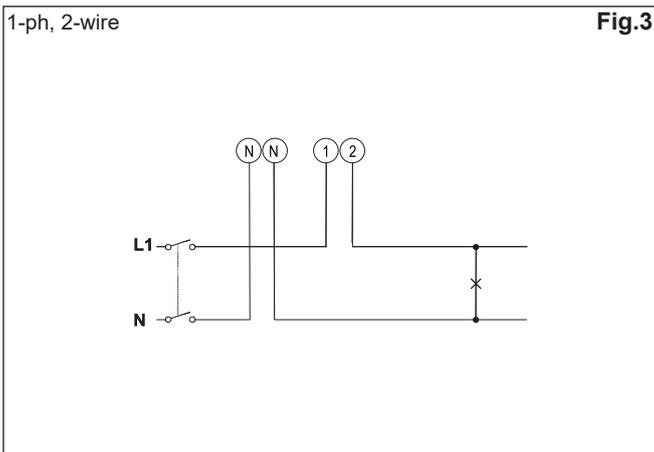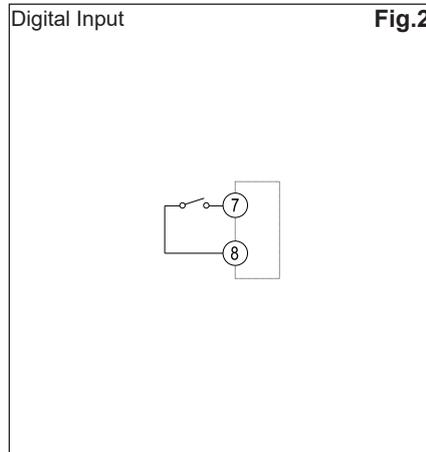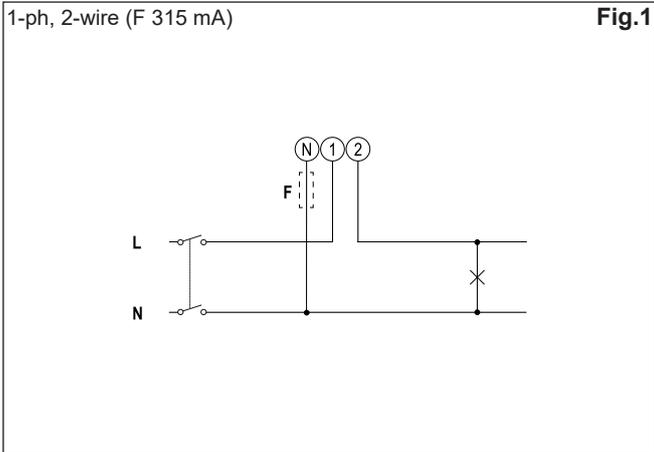| Menu name and description		Range	Default setting
PASS	Password request	From 0000 to 9999	0000
nPASS	New password	From 0000 to 9999	0000
Measure	Measurement type (A=easy connection; B=bidirectional, imported and exported energy). Not available in PFA and PFB versions (MID)	A; b	A
P int	Integration time 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 10	0
PULSE (O1 option)	Selection of pulse ON duration	30 or 100 ms	30
	Selection of the pulse weight (multiples of 100 pulses/kWh)	100 to 500 (if duration is 100 ms) 100 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
ParItY (S1)	Modbus parity	No/even	No
	Stopbit (available only if parity is set to "No")	1;2	1
PrI Add (M1 option)	M-bus primary address	1 to 250	0
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 (kWh/kvarh 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.

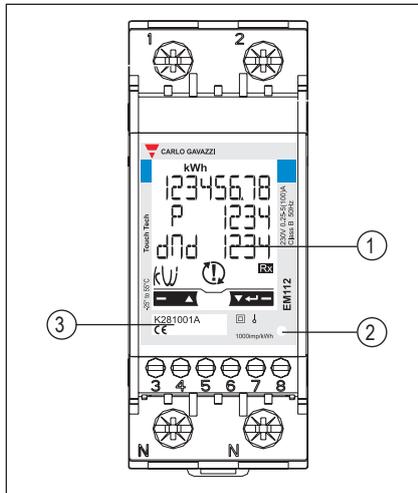## Additional available information on the display (*)

Page	Code	Description
YEAr	InFO 1	Year of manufacture
SErIAL n	InFO 2	Serial number, corresponds to the one indicated on the front print
rEVISIon	InFO 3	Firmware revision – *XY.nn*:
PuLS Led	InFO 4	Front LED pulse weight
MEASurE	P3	Measurement type (only X option)
P int	P4	Requested average power calculation interval
ModE	P5	Display mode
tArIFF	P6	Tariff management enabling and current tariff
HoME	P7	Measurement page set as home page (only X option)
CHEkSuM	InFO 6	Firmware checksum
Pages specific to the S1 version		
AddrESS	P10	Modbus address
bAUd	P11	Baud rate
PArITY	P12–1	Parity
StoP bit	P12–2	Stop bit
Pages specific to the O1 version		
PULSE	P8–1	Duration
PuL rAtE	P8–2	Pulse weight
Pages specific to the M1 version		
Pr I Add	P9	M-Bus primary address
bAUd	P11	Baud rate
SEC Add	InFO 5	M-Bus secondary address, univocal and set during production

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

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Wiring diagrams

1-ph, 2-wire (F 315 mA)   **Fig.1**

Digital Input   **Fig.2**

1-ph, 2-wire   **Fig.3**

Open collector output   **Fig.4**

The load resistance (Rc) 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**
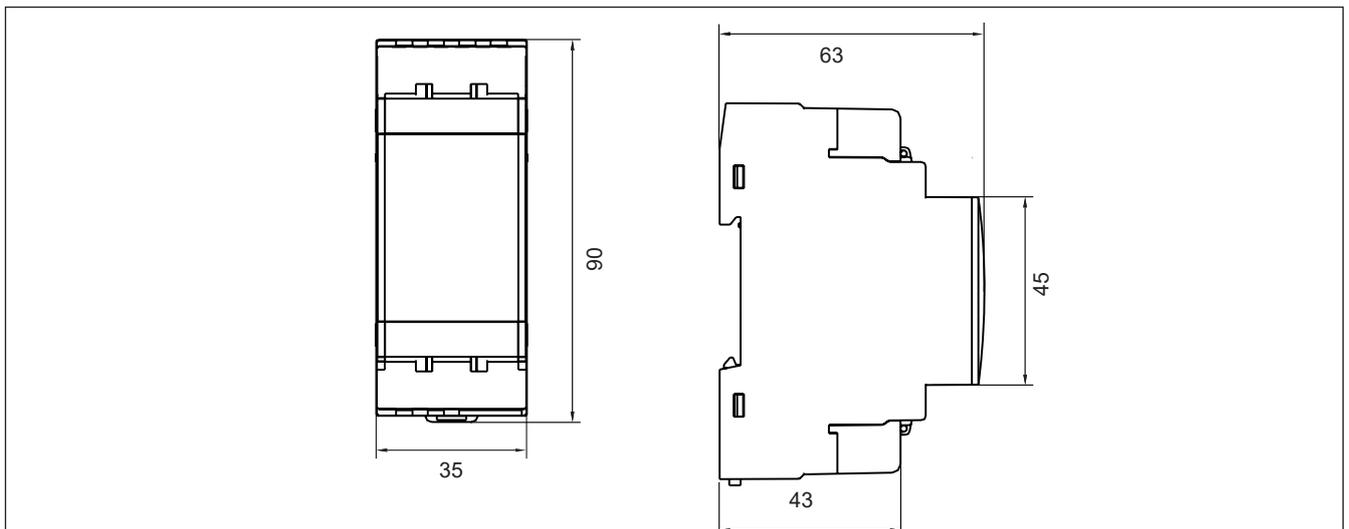
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Front panel description

1. **Display**
   Backlit LCD display with touch key-pad.
   Right key: enter, down
   Left key: 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)

Annex A for EM112
(For product produced before 2025)

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Introduction

This Annex provides additional information regarding engineering changes introduced in the EM112 energy analyzer starting from the 2025 production series. It has been added to this document to help users identify the correct version of the device and understand the key differences between models. The distinction between the two product versions is based on the serial number:

•   Devices with a serial number starting from **2025150000Z** are considered the updated models with the 2025 engineering changes.
•   Devices with a lower serial number belong to the pre-2025 generation and follow the specifications outlined in the previous version of the datasheet (see below).

In the following section, only the technical specifications that were modified with the 2025 update will be reported. All other specifications not explicitly mentioned remain unchanged and equally applicable to both versions.

Technical Specifications for EM112 Units Produced Before 2025

Input specifications

Rated Inputs	
Nominal voltage	230 V LN (AV0 option), 120 V LN (AV1 option)
Accuracy (@25°C ±5°C, R.H. ≤60%, 45 to 65 Hz)	
AV1	I_{min}=0.25 A; I_b: 5 A; I_{max}: 100 A; U_n: 120 V LN -30% +30%;
AV0	I_{min}=0.25 A; I_b: 5 A; I_{max}: 100 A; U_n: 230 V LN -30% +20%
Start-up voltage	84 V LN (AV1), 161 V LN (AV0)
Input impedance	
Voltage input 230 VLN	1.2 MΩ
Voltage input 120 VLN	1.2 MΩ
LEDs	Flashing red light pulses according to EN 50470-3, EN 62052-11, 1000 imp./kWh (min. period: 90 ms, max. frequency: 11 Hz) Fix orange light: wrong current direction (only with PFB option or with "B" measurement selection in case of X option)

Power supply specifications

Self power supply	
AV0_PF	230 VAC V LN, -30% +20% 45-65 Hz
AV1	120 VAC V LN, -30% +30% 45-65 Hz

Output specifications

Data refresh time	1 s
Read command	50 words available in 1 read command

General specifications

Approvals	CE, UKCA, MID (PF option only) , UL (AV1 models only)
Weight	Approx. 160 g (packing included)