ENERGY METER

EV1

User Manual

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1 General Information

1.1 Responsibility

The owner or provider is responsible for the proper use of the device. The installation, putting into operation and reinstallation of the meter is only allowed to be done by electrically skilled persons, which got knowledge about the contents of this user manual.

1.2 Common safety instructions

For installation, setting into operation and installation of the device the local requirements for safety requirements must be observed.

Danger



Inappropriate use of parts under high voltage may lead to grave injuries and accidents, which may be fatal even with 230V.

The conductors which are connected to the device must be disconnected to the mains during assembling and installation. It must be used a prevention for being switched on accidentally.

The device is not allowed to be used out of specifications.

1.3 Service and warranty instructions

Damaged devices can’t be repaired by you. The warranty and liability will be terminated with opening the device. The same applies to damages caused by external influences.

For the device no servicing is required.

1.4 Disposal (product end of life information)



This meter was designed and built by ABB to provide many years of service and is backed by our commitment to provide high quality support. When it eventually reaches the end of its serviceable life, it should be disposed in accordance with local or national legislation.

1.5 Environment

This meter is designed for indoor or in a cabinet environment only (avoiding extreme weather conditions) in accordance with EN50470-1 and EN50470-3, with the terminal cover fitted.

1.6 Service and Warranty

This meter product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period ABB will at its option, either repair or replace products which prove to be defective. For warranty service or repair, this product must be returned to a service facility designated by ABB. ABB does not warrant that the operation of the meter or firmware will be uninterrupted or error free.

Damaged devices can't be repaired by you. The warranty and liability will be terminated with opening the device. The same applies to damages caused by external influences.

For the device no servicing is required.

1.7 Cyber Security Disclaimer

EV meter is designed to be connected and to communicate information and data via a network interface, which should be connected to a secure network. It is your sole responsibility to provide and continuously ensure a secure connection between the product and your network or any other network (as the case may be) and to establish and maintain appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of antivirus programs, etc.) to protect the meter, the network, its system and interfaces against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB S.p.A. and its affiliates are not liable for damages and/or losses related to such security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.

Although ABB S.p.A. provides functionality testing on the products and updates that we release, you should institute your own testing program for any product updates or other major system updates (to include but not limited to code changes, configuration file changes, third party software updates or patches, hardware change out, etc.) to ensure that the security measures that you have implemented have not been compromised and system functionality in your environment is as expected.

1.8 Symbols

	**Danger through Electric Voltages** The symbol indicates warnings, which may lead to personal injuries or death if it is ignored. Take all necessary precautions to avoid danger!

	**Warning** The symbol indicates warnings to a possible dangerous situation which may lead to personal injuries or damage to properties. Avoid dangerous situations!
	**Attention!** “Attention” indicates warnings, which may lead to damage of properties if not observed.
	**Notice** “Notice” indicates important information in the manual.

2 Technical data

2.1 Abbreviations

+A	Import active energy (to customer)
EN	European Standard
Imp/kWh	Quantity of pulses each kWh
LCD	Liquid Crystal Display
LED	Light Emitting Diode
OBIS	Object Identification System
+P	Import active power

2.2 Technical specifications

Type	One phase direct
Voltage	
Nominal voltage U_n	230 Vac
Voltage range	$0.8 – 1.15U_n$
Frequency	
Nominal frequency f_n	50 Hz
Frequency range	$0.98 – 1.02\ f_n$
Current	
Reference current $I_{ref} = I_b = 10\ I_{tr}$	5 A
Maximum current I_{max}	65A
Minimum current I_{min}	0.25 A
Starting current I_{st}	$\leq 0.004\ I_b$
Accuracy	
Cl. B	Class B in compliance with EN 50470-3
Measuring Active Energy	
Two Energy Directions	+A reverse locking

Meter constant	
LED-Output	1000 Imp/kWh
Display	
LCD	6 digits
Life cycle	> 12 years
RS485- Data Interface	
Connector	Two screws type
Parameter	9600/19200/38400 bps, 8E1/8N1/8O1
Communication protocol	Modbus RTU
Power Consumption	
Voltage circuit	< 0.4 W / 5.5VA at Un
Current circuit	< 0.012 VA at I_b
Temperature Range and humidity	
Typical Operation	-30°C to +70°C
Storage	-40°C to +85°C
Humidity	95% RH non condensing
EMC Properties	
Isolation	4 kV AC, 50 Hz, 1min
High Voltage	7kV, Impulse 0.1/2000 µs
Housing	
Dimension	DIN-Rail 86x35x62 mm
Material	fiber-glass reinforced Polycarbonate (flame resistant EN 62053-21)
Class of protection	II
Degree of protection	IP21 (IP 51 in protective enclosure)
Weight	
Weight	appr. 0,13 kg
Environment	
Mechanical environment	Class M1 as per 2014/32/EU Directive.
Electromagnetic environment	Class E2 as per 2014/32/EU Directive.

Tab. 1: Technical Properties

2.2.1 Technical Standards

EN 50470-1: Electricity metering equipment (AC) -Part 1: General requirements, test and test conditions Metering equipment (class indexes A, B, and C);

EN 50470-3: Electricity metering equipment (AC) -Part 3: Particular requirement Static meters for active energy (class indexes A, B, and C);

EN 50022: Low voltage switchgear and control gear for industrial use; mounting rails,

top hat rails, 35 mm wide, for snap-on mounting of equipment

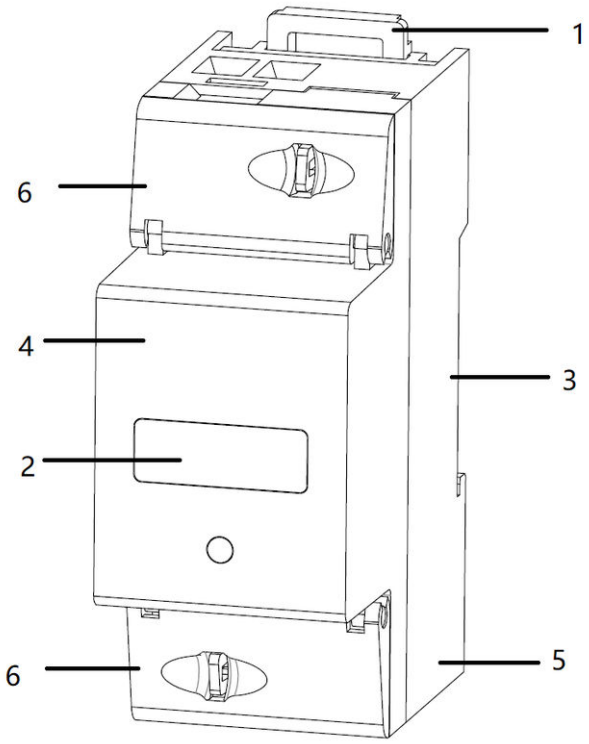
IEC 62053-21: Static meters for active energy (classes 1 and 2)

IEC 62052-11: Electricity metering equipment (AC)-General requirements, tests and test conditions –part 11: metering equipment

3 Dimension, Assembling and Installation EV1 012-100

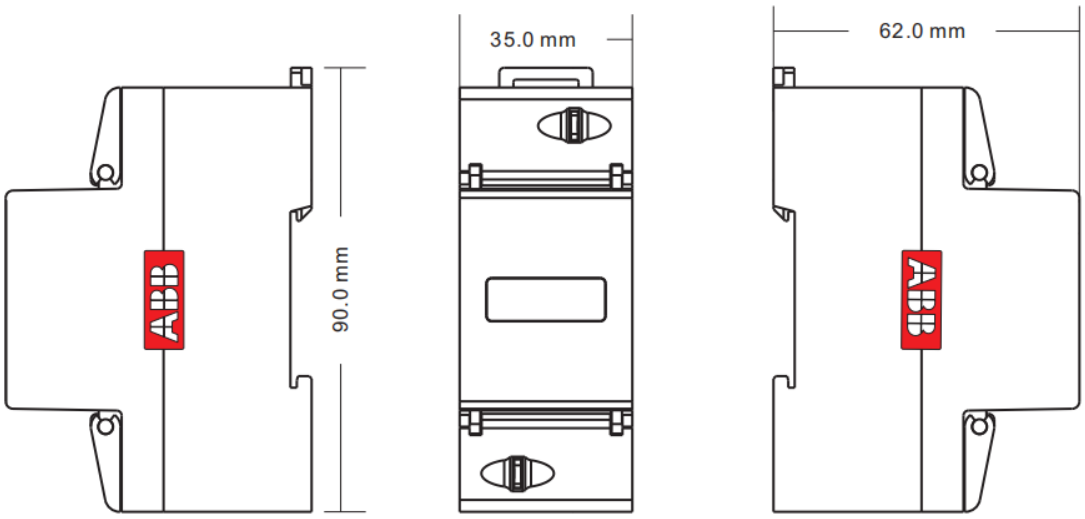
3.1 Assembling and dimensions

The meter constructed for assembling on DIN-rail TH 35-7.5 according to IEC 60715.

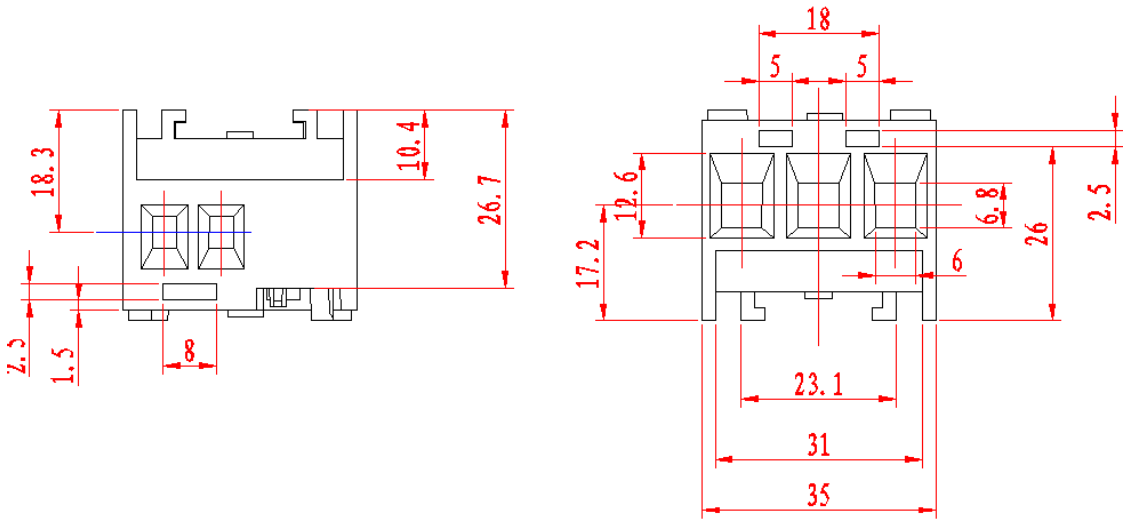


1. Housing

Nr.	Element
1	Meter Hook
2	LCD
3	DIN rail space
4	Meter cover
5	Meter case
6	Terminal Block with cover



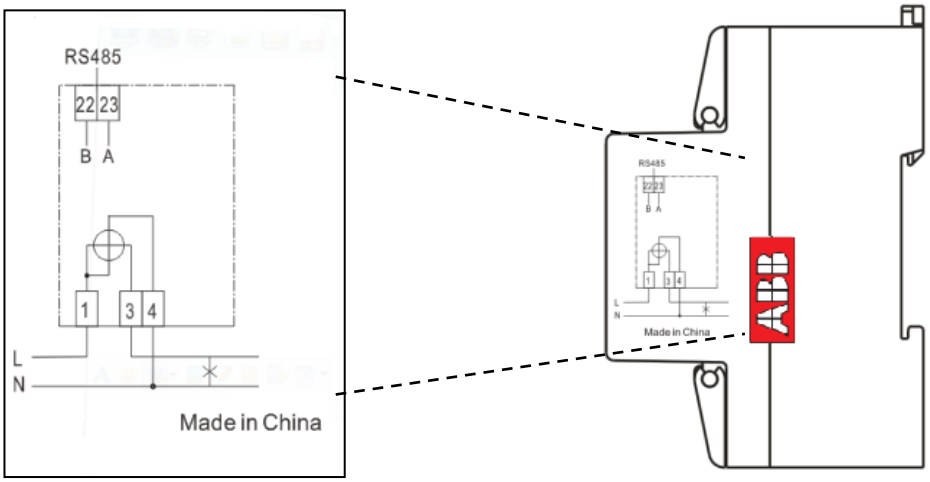
2. Housing dimension (mm)



3. Terminal block

3.2 Installation

The connection diagram printed on the housing needs to be considered connecting the meter to the mains power.



4. Connection diagram

Nr.	Terminal	Terminal Nr.	Terminal-Ø[mm]	Terminal screw	Torque M [Nm]
1	Current In L1	1	6,3*5,6 (L*W)	M4 Pozidrive PZ1 Philips PH1	1,2 Nm< M < 1,5Nm
2	Current Out L1	3			
3	Voltage	4			
Data Interface					
1	RS485 Interface B	22	5,0 x 3,2 (L*W)	M3 Pozidrive PZ1 Philips PH1	0,5Nm < M < 0,7Nm
2	RS485 Interface A	23			

Warning

The requirements of the net provider need to be full filled.

Selective hedges must be used according to requirements of the net providers.

Attention!

Damage of the terminals due to high torque



The specified maximum torques must not be exceeded!

Ensure that the connected lines are fixed with the needed torque compliant to EN 60999 for a safe connection. The needed torque depends on the type of used lines and the maximum current.

3.3 Protection Housing and sealing

As indicated in image 1, the cover of the terminal blocks can be sealed after installation.

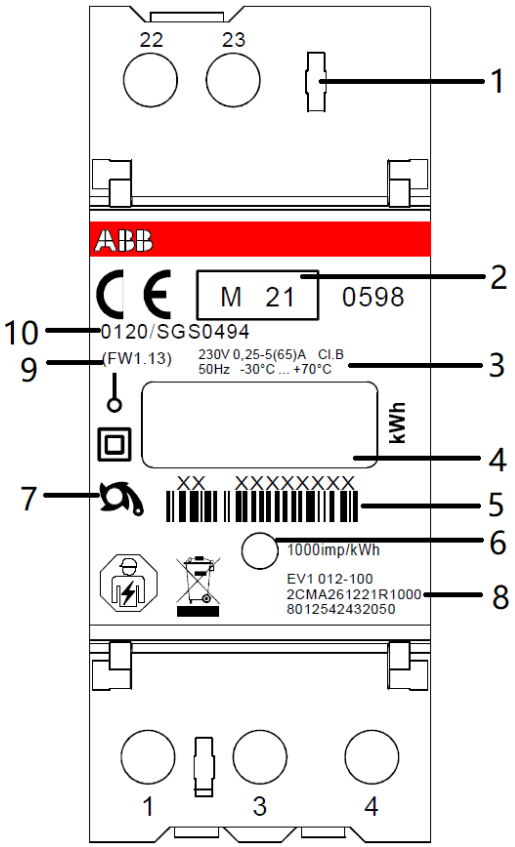
The assembled meter base and meter cover will be protected against unauthorized opening with a manufacturer label (format 8x20 mm, corner radius 0.5 mm) on both sides of the housing

Important



Warranty and accuracy are void if sealing labels are removed.

4 Nameplate



5. EV1 Nameplate

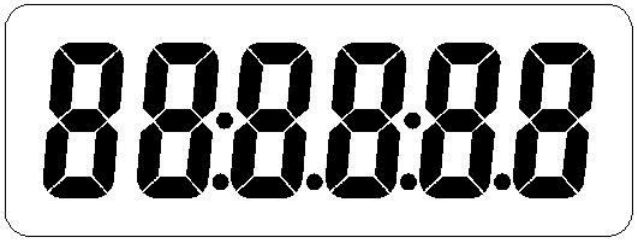
Nr.	Element	Function
1	Sealing terminal cover	
2	Manufacture year	
3	Technical nominal data	
4	LCD	6 digits without decimal
5	Serial number	number and barcode 128
6	LED	test LED 1000 Imp/kWh
7	Symbols	single phase
		protection class
		reverse locking
8	Meter type	EV1 012-100

9	Firmware version	Will be consistent with the actual certified version
10	Number approval document year of certification	CE sign, year of certification, named body for MID approval

5 LCD-Display

The LCD has the following format:

- LCD size: 24.39mm × 9mm
- Digit size: 2.72mm × 6mm



6. EV1 LCD

The counter value of energy for +A is displayed. On the right side the unit kWh is printed on the housing.

Configurable display items:

Modbus Address	Register	Units	LCD displayed
5B14	Active power	W	yes
5B00	Voltage	V	yes
5B0C	Current	A	yes
5B2C	Frequency	Hz	yes
5B3A	Power factor	-	yes
0402	Serial number	-	yes
8908	Firmware version	-	yes
8912	Check Sum	-	yes
5000	Current_Total-(Import kWh)	kWh	yes

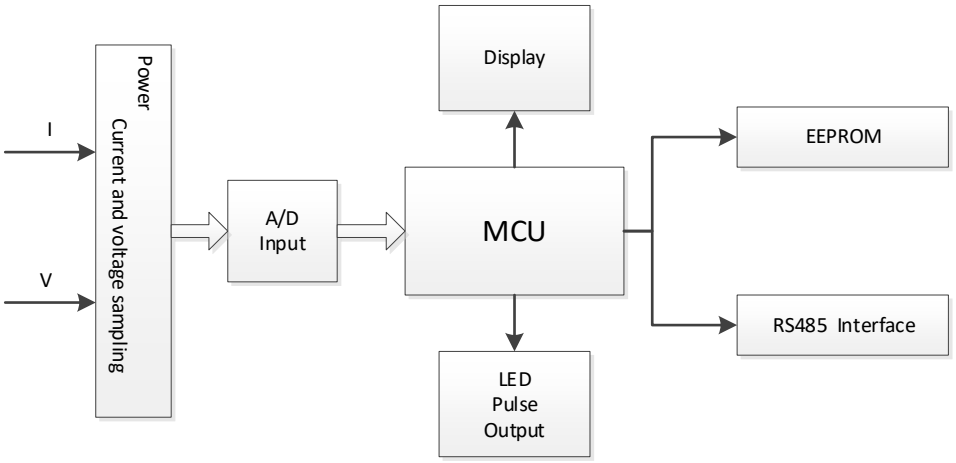
6 Test LED

The meter has one pulse LED for active energy with 1000 Imp/kWh.

The ON-time of a pulse is 40 ms.

7 Components

7.1 Block diagram



7. Block diagram

Current measuring:	Manganin shunt
Voltage measuring:	Resistor divider
A/D:	Analog to digital converter for the sampled voltage and current
MCU:	Micro Controller Unit
Communication interface:	RS485-Interface
Data storage EV1:	Nonvolatile storage for energy register +A and meter parameter in EEPROM
Display EV1:	LCD with 6 digits
LED Pulse output:	Active energy +A 1000 Imp/kWh

8 Functionality

8.1 Measurement

The meter measures one phase active energy +A with accuracy class B.

8.1.1 Instantaneous parameter measurements

The instantaneous values can be read out via RS485 interface.

- Voltage and current
- Power factor
- Active power
- Frequency

8.2 Fatal Error

The meter has implemented a self-monitoring system. If the meter recognizes improper operation so that billing relevant values may not be used anymore, it displays “--FF--”. This status will be indicated with current display items flashing (1Hz).

9 RS485 Interface & Registers

Default Modbus settings:

Baud rate = 9600 (settable)

Device Address = 1 (settable)

Parity = Even

Stop bit, parity bit and data bit can be configured via Modbus as 8E1, 8N1 or 8O1.

Registers are listed in document 9AKK107992A5721