Klemsan

EMD1 Series
User Manual

EMD1 Series

GENERAL
INFORMATION

Klemsan EMD1 series devices are energy meters that measure and record the basic electrical parameters required for monitoring a single-phase electric power line.

The following parameters are optionally measured in the devices.
- Voltage
- Current
- Frequency
- Active power
- Reactive power
- Apparent power
- Power factor
- THDV
- THDI
- Odd harmonics up to 31
- 4 quadrants energy

Product	145-0W-V1	145-1M-V2	145-0M-V1
Stock Code	606360	606361	606362
Connection type	Direct Connection	Direct Connection	Direct Connection
Current Measurement	45A Direct Connection	45A Direct Connection	45A Direct Connection
Mains Network	1P2W	1P2W	1P2W
Haberleşme	-	RS485 (Modbus RTU)	-
Dijital Çıkış	1 fixed	-	1 fixed
Impulse	√	√	√
Demand	-	√	-
Demand Estimation	-	-	-
Measured Parameters*	kWh (Import)	Multiple Measurement	Multiple Measurement
Tariff	1	2	1
Real-time Clock	-	-	-
Active Energy Measurement Class	Class 1	Class 1	Class 1
Reactive Energy Measurement Class	Class 2	Class 2	Class 2

*The above-mentioned parameter measurements are made in devices that can make multiple measurements.

In addition to the measurement features, the devices have the following functions depending on its model;

- Support for direct connections of up to 45 amps
- Import active, export active, import reactive, export reactive
- Calculates the demand values for current, active power, reactive power and apparent power and stores them in its memory
- Determines the maximum and minimum values of current, voltage, frequency, PF and power values and stores them in its memory
- 2 tariff options
- Unauthorized-access protection with user password
- LCD display (energy measurement, instant measurements and device information)
- Modbus RTU communication via RS485 interface
- Backlight on time setting

EMD1 Series

INSTALLATION

2.1 Preparation for Installation

• Assembly and related connections of the product must be implemented by authorized persons in accordance with the instructions of the user manual. The device should not be operated without making the correct connections.
• Before connecting the device to the mains, make sure that the power is cut off.
• Use a dry cloth to clean and dust the device. Do not use alcohol, thinner or any abrasive material.
• The device should only be commissioned after all connections have been made.
• Do not open or dismantle the cover of the device. There are no user-serviceable parts inside.
• The device should be kept away from humid, wet, vibrating and dusty environments.

> **!** The manufacturer is not responsible for any undesirable situations that may arise as a result of not applying the above precautions.

2.2 Mounting
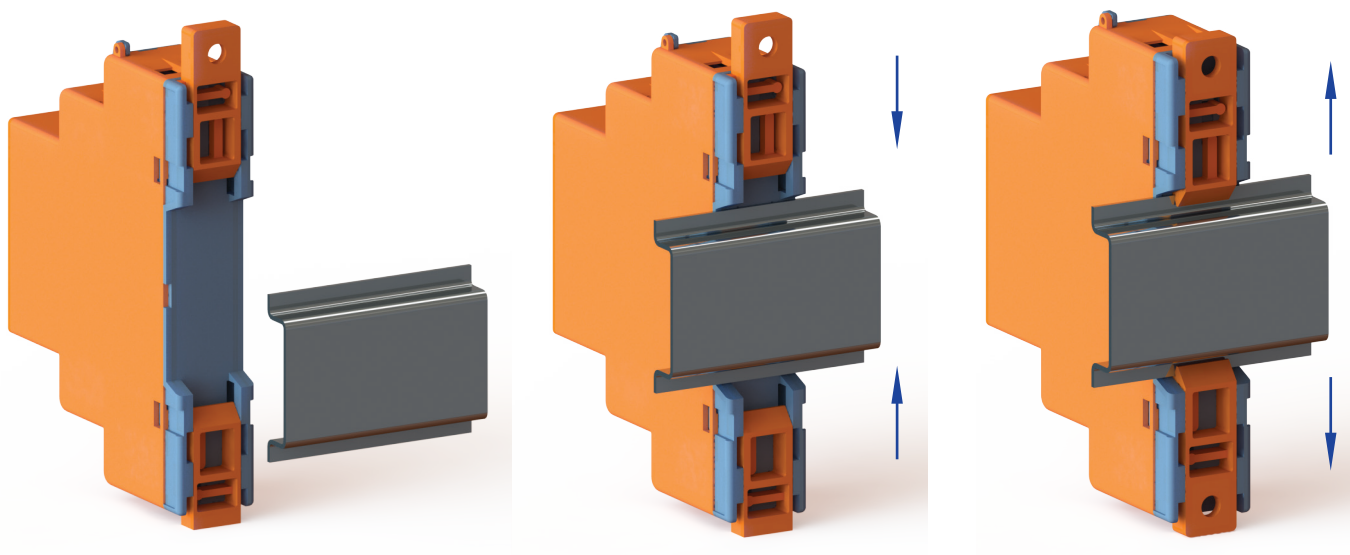
2.3 Terminals and Wiring
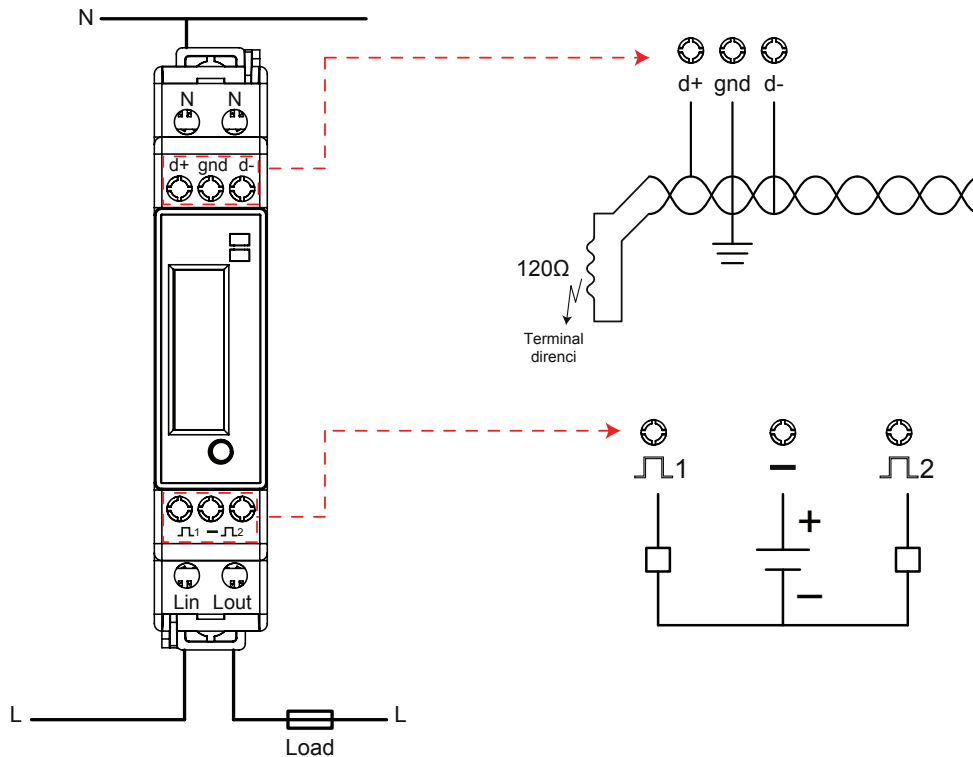
2.3.1 Products with Direct Connection

Lin: It is the terminal where the phase input of the device is connected.

Lout: Phase entering from "Lin" terminal exits from "Lout" terminal. From here it must be connected to the load.

N: It is the terminal where the neutral connection of the line is connected.

> **!** The supply and measurement inputs of the device are common and are made through the "Lin" and "N" terminals. The supply voltage of the device is in the range of 85 .. 300 V AC. Direct connection can be made up to 45 A.

Pulse1 Output " 〓 " : It is the output terminal of the DC voltage applied to the "-" terminal when digital output 1 is active.

The related pulse output is fixed and gives 1000 impulses (1000 imp/kWh) for each measured kWh. The pulse duration is 100 ms.

 "-" Input: It is the terminal to which the positive end of the DC voltage to be digitally switched will be connected (common).

d+: It is the data+ input of the RS-485 interface.

gnd: It is the input where the ground connection of the RS-485 interface is made.

d-: It is the data- input of the RS-485 interface.

> **!** The terminal instructions are general and vary according to the models.

EMD1 Serisi

Depending on its model, the device shows respectively;
- Total Energy (Import & Export),
- Active Energy (Import & Export),
- Reactive Energy (Import & Export),
- Voltage,
- Current,
- Active Power,
- Reactive Power,
- Apparent Power,
- Power Factor,
- Frequency,
- Communication parameters.

! THDV, THDI and odd harmonic values are shown over communication.

! The menu features are general and vary according to the models.
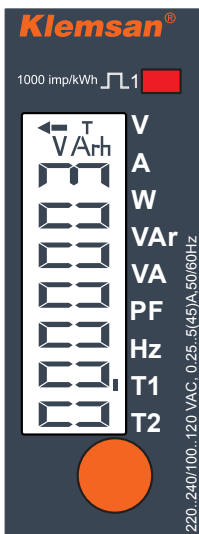

Total Import Active Energy

Total Export Active Energy

Total Import Active Energy

Total Export Reactive Energy

T1 Import Active Energy
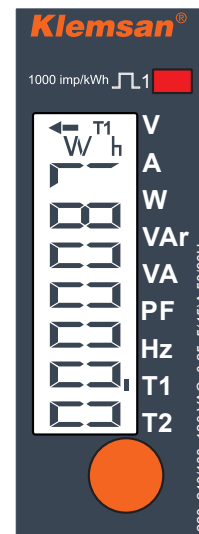
T1 Export Active Energy
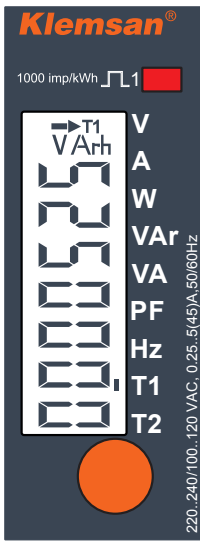
T1 Import Reactive Energy

T1 Export Reactive Energy

T2 Import Active Energy
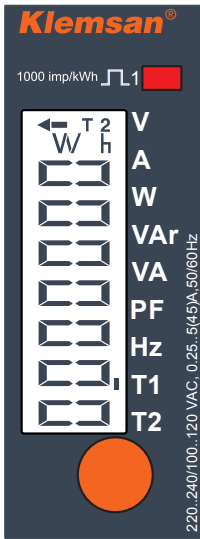
T2 Export Active Energy
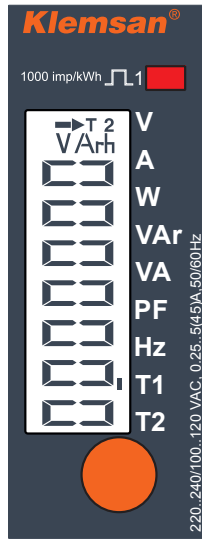
T2 Import Reactive Energy
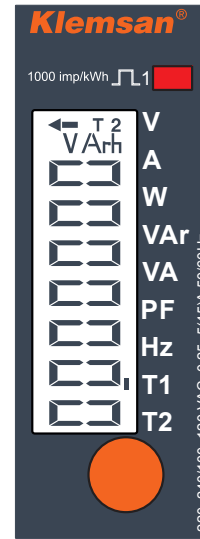
T2 Export Reactive Energy
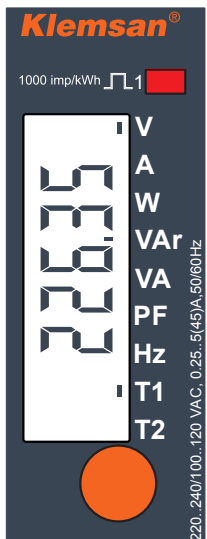
Voltage
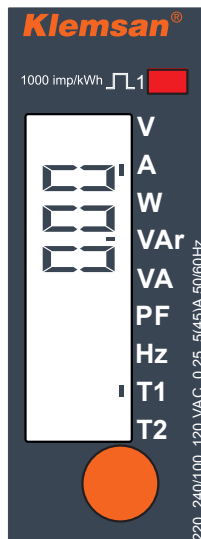
Current
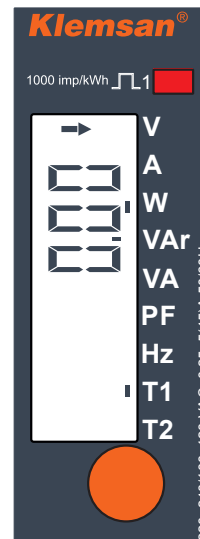
Active Power
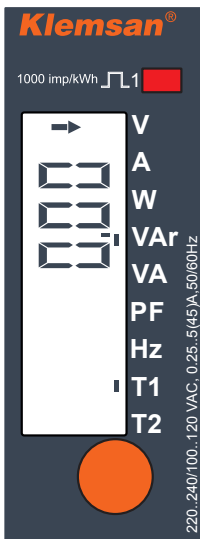
Reactive Power
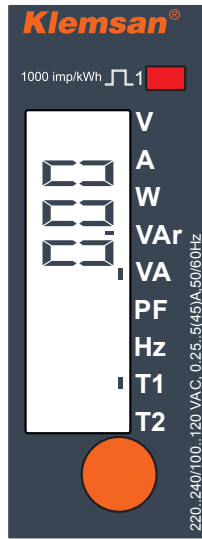
Apparent Power
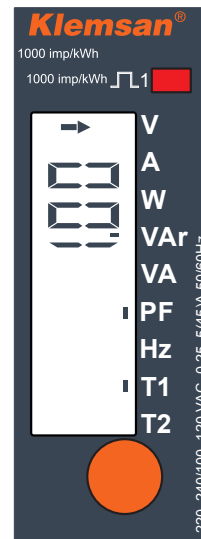
Power Factor

Frequency

Slave ID

Baudrate

! Each time the button on the device is pressed, the menu is switched. Pressing for more than 2 seconds shows the display of the total energy values.

! Configuration cannot be made through the device. Configurations are made via the user interface program and/or various Modbus test interfaces.

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4 Quadrant Measurement

The difference in angle (Ø) between voltage and current gives us information about the direction of energy flow. If the active/reactive power is positive, it means that the active/reactive power is consumed. If the active/reactive power is negative, it means that the active/reactive power is produced.

Reactive Power Axis

Quadrant-2

P	=> negative
Q	=> positive&capacitive
CosØ	=> capacitive
PF	=> negative

Counters
Ür. active
Cons. reactive

Quadrant-1

P	=> positive
Q	=> positive&inductive
CosØ	=> inductive
PF	=> positive

Counters
Cons. active
Cons. reactive

S
Q
Ø
P

Active Power Axis

Quadrant-3

P	=> negative
Q	=> negative&inductive
CosØ	=> inductive
PF	=> negative

Counters
Pr. active
Pr. reactive

Quadrant-4

P	=> positive
Q	=> negative&capacitive
CosØ	=> capacitive
PF	=> positive

Counters
Cons. active
Pr. reactive

NOTE: By looking at the signs of P and Q, it can be understood in which quadrant the device is measuring.

For example;

P= +10kW, Q= +5kVAr → Q-1
P= -10kW, Q= +5kVAr → Q-2
P= -10kW, Q= -5kVAr → Q-3
P= +10kW, Q=-5kVAr → Q-4

EMD1 Series

USER INTERFACE
SOFTWARE

EMD1 Series

Configuration operations on devices are not performed on the device. Device configuration is done via the user interface program "Klemsan Configuration Wizard" and/or various Modbus test interfaces.

In order for the device to be configured via the Klemsan Configuration Wizard, the related file must be downloaded from the Klemsan web page.

With the user interface program, devices are read and configured. You can find the support document (KlemsanConfigurationWizard_Yardım) for the interface program here.

4.1   Read Operations

Device identification procedures should be carried out as mentioned in the document KlemsanConfigurationWizard_Yardım.

There are 2 different reading processes: "Manual Reading" and "Periodic Reading". After the desired reading type is selected, the device to be read must also be selected.

Manual Reading: All parameters in the selected device are read at the same time. For reading, click on the "Read" icon on the screen.
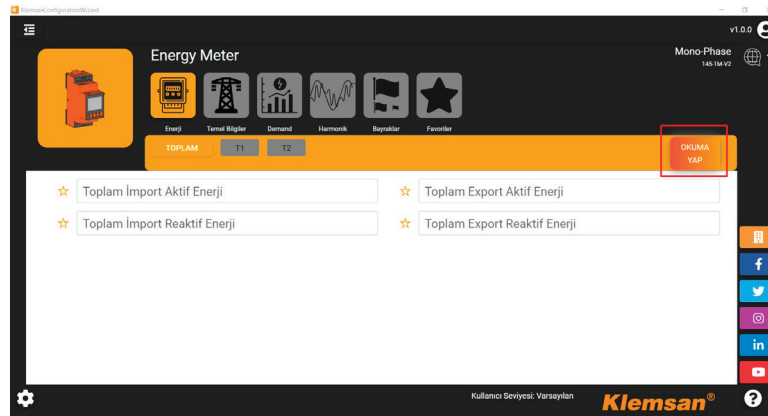
After clicking on the "Read" icon, all parameters that can be measured on the device are read. You can see the last reading time on the left side of the icon.

Periodic Reading: The data on the selected devices is read continuously in an adjustable period. The period time (sec) must be entered and then the start icon must be clicked on for the data reading to be started.
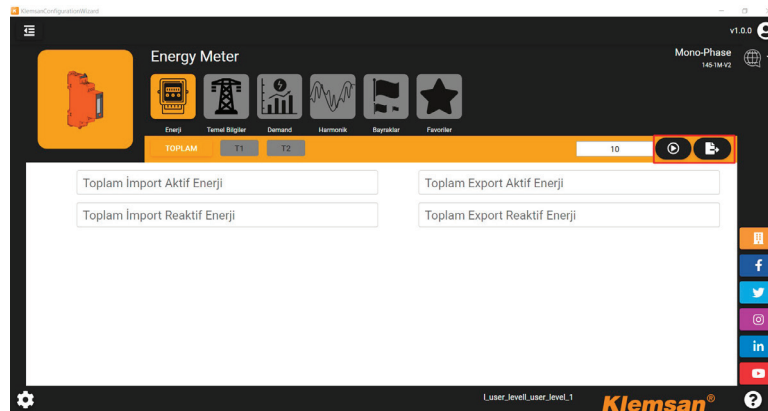
The recorded data can be exported in scv format by clicking on the export icon [icon] next to the period start icon [icon] . A total of 1000 data records can be made. No data can be recorded after capacity is filled.

> **!** In the periodic reading, only the data on that page is read. Reading must be restarted for each new page. If you leave the current page without exporting the data, the saved data will be deleted.

When periodic reading is performed, only the reading process of the current page is performed.

In Read Operations;

• Energy
Import and export energy data measured in the device are displayed.

• Basic Info
This is the screen where basic electrical parameters such as Current, Voltage, Frequency, and Power values are displayed.

• Demand
Current and power demand values are displayed.

• Harmonic
Odd harmonics (up to 31) are displayed for current and voltage.

• Flags
The alarm conditions according to the measurement parameters are displayed.
A warning is displayed in case of reversing the current direction.

• Commands
This is the page where the commands are sent to the device (For example, "Return to Default Settings").

• Favorites
This is the page where 10 parameters that are added to favorites for the user are displayed in tabs.
In order to send the parameters that are selected to be read at the same time to the Favorites page, you must click on the favorites [icon] . A total of 10 parameters can be added to the "Favorites" tab.

> **!** Adding parameters to the Favorites tab can only be done in the "Manual Reading" section.

> **!** Operations such as "Slave ID" and "Active Tariff" change of the device can only be done from the "Commands" tab in the "Manual Reading" section.
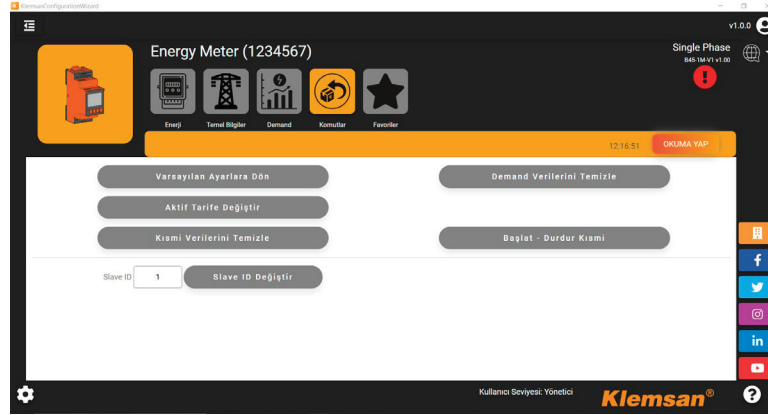
4.2 Configuration Operations

Device configurations can be made under this tab. Configuration can be done in two different ways, online and offline. While the configurations made with the interface software can be written directly to the device, they can also be saved as a file. The saved configuration files can then be opened with the interface software and written to different devices.

All parameters in the opened configuration file are empty. The parameters to be configured can be changed via these parameters.

> **!** Not all parameters have to be configured in the configuration file. When the related configuration file is requested to be written to the device, the parameters without any changes will not be written to the device.

> **!** In order to save the same configuration file to different devices, the "Slave ID" setting is made from the "Commands" tab under the "Read Operations" heading.

For example, if the pulse settings of 10 devices are to be configured, only the parameters of the pulse settings should be filled and saved as a file. Then the saved file should be sent to all devices.

General

Under this tab, you can make the general settings of the device, communication and demand settings.
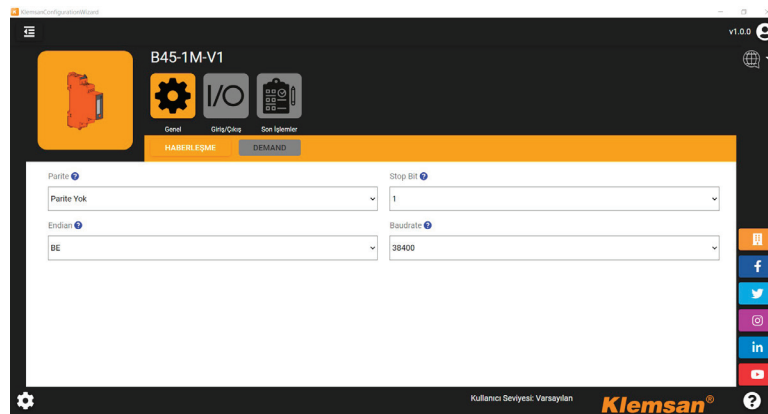
Alarm

Alarm settings in devices are made via communication. You can set alarms for:
• Voltage
• Current
• Frequency
• Active Power
• Reactive Power
• Apparent Power
• Power Factor

! An incorrect statement entered in the configuration file is shown in the "Final Action" tab.

! Writing to the device can only be done with the "Administrator" user level.

The "Get from Device" tab should be used to configure a previously connected device and see configuration parameters.

The configuration for the connected devices using the "Get from Device" tab is the same as above, and after the desired revision, it can be saved as a new file through the "Final Action" tab, overwrite an existing file or send it to an existing device.

EMD1 Series

RS485
COMMUNICATION

EMD1 series devices communicate using the "Modbus RTU" protocol, thanks to the optional RS485 interface on it. Supported functions are:

• Function 03H: This function reads the readable addresses in the Modbus table.
• Function 10H: This function writes the writable addresses in the Modbus table.

Item	Address	Varaible	Type	Read / Write	Function	Description	Default
1	0	Voltage	float	r	03H		
2	2	Current	float	r	03H		
3	4	Active Power	float	r	03H		
4	6	Reactive Power	float	r	03H		
5	8	Apparent Power	float	r	03H		
6	10	Power Factor	float	r	03H		
7	12	Frequency	float	r	03H		
8	14	THDV	float	r	03H		
9	16	THDI	float	r	03H		
10	18	Ø	float	r	03H		
11	20	Voltage Harmonic 1	float	r	03H		
12	22	Voltage Harmonic 3	float	r	03H		
13	24	Voltage Harmonic 5	float	r	03H		
14	26	Voltage Harmonic 7	float	r	03H		
15	28	Voltage Harmonic 9	float	r	03H		
16	30	Voltage Harmonic 11	float	r	03H		
17	32	Voltage Harmonic 13	float	r	03H		
18	34	Voltage Harmonic 15	float	r	03H		
19	36	Voltage Harmonic 17	float	r	03H		
20	38	Voltage Harmonic 19	float	r	03H		
21	40	Voltage Harmonic 21	float	r	03H		
22	42	Voltage Harmonic 23	float	r	03H		
23	44	Voltage Harmonic 25	float	r	03H		
24	46	Voltage Harmonic 27	float	r	03H		
25	48	Voltage Harmonic 29	float	r	03H		
26	50	Voltage Harmonic 31	float	r	03H		
27	52	Current Harmonic 1	float	r	03H		
28	54	Current Harmonic 3	float	r	03H		
29	56	Current Harmonic 5	float	r	03H		
30	58	Current Harmonic 7	float	r	03H		
31	60	Current Harmonic 9	float	r	03H		
32	62	Current Harmonic 11	float	r	03H		
33	64	Current Harmonic 13	float	r	03H		
34	66	Current Harmonic 15	float	r	03H		
35	68	Current Harmonic 17	float	r	03H		
36	70	Current Harmonic 19	float	r	03H		
37	72	Current Harmonic 21	float	r	03H		
38	74	Current Harmonic 23	float	r	03H		
39	76	Current Harmonic 25	float	r	03H		
40	78	Current Harmonic 27	float	r	03H		
41	80	Current Harmonic 29	float	r	03H		
42	82	Current Harmonic 31	float	r	03H		
43	84	Minimum Voltage	float	r	03H		
44	86	Maximum Voltage	float	r	03H		
45	88	Minimum Current	float	r	03H		
46	90	Maximum Current	float	r	03H		
47	92	Minimum Import Active Power	float	r	03H		

Item	Address	Varaible	Type	Read / Write	Function	Description	Default
48	94	Maximum Import Active Power	float	r	03H		
49	96	Minimum Export Active Power	float	r	03H		
50	98	Maximum Export Active Power	float	r	03H		
51	100	Minimum Import Reactive Power	float	r	03H		
52	102	Maximum Import Reactive Power	float	r	03H		
53	104	Minimum Export Reactive Power	float	r	03H		
54	106	Maximum Export Reactive Power	float	r	03H		
55	108	Minimum Apparent Power	float	r	03H		
56	110	Maximum Apparet Power	float	r	03H		
57	112	Minimum Import Power Factor	float	r	03H		
58	114	Maximum Import Power Factor	float	r	03H		
59	116	Minimum Export Power Factor	float	r	03H		
60	118	Maximum Export Power Factor	float	r	03H		
61	120	Minimum Frequency	float	r	03H		
62	122	Maksimum Frequency	float	r	03H		
63	300	Total Import Active Energy	double	r	03H		
64	304	T1 Import Active Energy	double	r	03H		
65	308	T2 Import Active Energy	double	r	03H		
66	312	Total Export Active Energy	double	r	03H		
67	316	T1 Export Active Energy	double	r	03H		
68	320	T2 Export Active Energy	double	r	03H		
69	324	Total Import Reactive Energy	double	r	03H		
70	328	T1 Import Reactive Energy	double	r	03H		
71	332	T2 Import Reactive Energy	double	r	03H		
72	336	Total Export Reactive Energy	double	r	03H		
73	340	T1 Export Reactive Energy	double	r	03H		
74	344	T2 Export Reactive Energy	double	r	03H		
75	500	Current Demand	float	r	03H		
76	502	Import Active Power Demand	float	r	03H		
77	504	Export Active Power Demand	float	r	03H		
78	506	Import Reactive Power Demand	float	r	03H		
79	508	Export Reactive Power Demand	float	r	03H		
80	510	Apparent Power Demand	float	r	03H		
81	512	Max. Current Demand	float	r	03H		
82	514	Max. Import Active Power Demand	float	r	03H		
83	516	Max. Export Active Power Demand	float	r	03H		
84	518	Max. Import Reactive Power Demand	float	r	03H		
85	520	Max. Export Reactive Power Demand	float	r	03H		
86	522	Max. Apparent Power Demand	float	r	03H		
93	700	Slave ID	uint32_t	r / w	03H / 10H	1-247	1
94	702	Baudrate	uint32_t	r / w	03H / 10H	0 = 1200 1 = 2400 2 = 4800 3 = 9600 4 = 19200 5 = 38400 6 = 57600 7 = 115200	5
95	704	Parite	uint32_t	r / w	03H / 10H	0 = None 1 = Tek 2 = Çift	0
96	706	Stopbit	uint32_t	r / w	03H / 10H	0 = Stop Bit 1 1 = Stop Bit 2	0

Item	Address	Varaible	Type	Read / Write	Function	Description	Default
97	708	Endian	uint32_t	r / w	03H / 10H	0 = Big Endian 1 = Little Endian 2 = Big Endian Byte Swap 3 = Little Endian Byte Swap	
98	710	Demand Method	uint32_t	r / w	03H / 10H	0 = Fixed 1 = Sliding 2 = Rolling	1
99	712	Demand Period	uint32_t	r / w	03H / 10H	1 - 60 sn.	15
100	714	Sub-interval	uint32_t	r / w	03H / 10H	1 - 60 sn.	1
101	754	Low Voltage	float	r / w	03H / 10H	0 - 10000	200
102	756	High Voltage	float	r / w	03H / 10H	0 - 10000	250
103	758	Delay	uint32_t	r / w	03H / 10H	1 - 600 sn	5
104	760	Voltage Hysteresis	float	r / w	03H / 10H	0 - 20	2
105	764	Low Current	float	r / w	03H / 10H	0 - 10000	
106	766	High Current	float	r / w	03H / 10H	0 - 10000	
107	768	Delay	uint32_t	r / w	03H / 10H	1 - 600 sn	
108	770	Current Hysteresis	float	r / w	03H / 10H	0 - 20	
109	774	Low Active Power	float	r / w	03H / 10H	0 - 100000	
110	776	High Active Power	float	r / w	03H / 10H	0 - 100000	
111	778	Delay	uint32_t	r / w	03H / 10H	1 - 600 sn	
112	780	Active Power Hysteresis	float	r / w	03H / 10H	0 - 20	
113	784	Düşük Reaktif Güç	float	r / w	03H / 10H	0 - 100000	
114	786	Low Reactive Power	float	r / w	03H / 10H	0 - 100000	
115	788	Delay	uint32_t	r / w	03H / 10H	1 - 600 sn	
116	790	Reactive Power Hysteresis	float	r / w	03H / 10H	0 - 20	
117	794	Low Apparent Power	float	r / w	03H / 10H	0 - 100000	
118	796	High Apparent Power	float	r / w	03H / 10H	0 - 100000	
119	798	Delay	uint32_t	r / w	03H / 10H	1 - 600 sn	
120	800	Apparent Power Hysteresis	float	r / w	03H / 10H	0 - 20	
121	804	Low Power Factor	float	r / w	03H / 10H	0 - 1	
122	806	High Power Factor	float	r / w	03H / 10H	0 - 1	
123	808	Delay	uint32_t	r / w	03H / 10H	1 - 600	
124	810	Power Factor Hysteresis	float	r / w	03H / 10H	0 - 20	
125	814	Low Frequency	float	r / w	03H / 10H	45 -65	
126	816	High Frequency	float	r / w	03H / 10H	45- 65	
127	818	Delay	uint32_t	r / w	03H / 10H	1 - 600	
128	820	Frequency Hysteresis	float	r / w	03H / 10H	0 - 20	
129	5000	Error Flag	uint32_t	r	03H	0: Pulse error 1: Akım yönü	
130	5002	Alarm Flag	uint32_t	r	03H		

The Alarm Flags are as follows:

Alarm Status Flags																
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	**Maximum**
									F	PF	S	Q	P	I	V(L-N)	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	**Minimum**
									F	PF	S	Q	P	I	V(L-N)	

Bit	Description
0	V(L-N) Low phase-neutral voltage alarm
1	I - Low Current Alarm
2	P - Low Active Power Alarm
3	Q - Low Reactive Power Alarm
4	S - Low Apparent Power Alarm
5	PF - Low Power Factor Alarm
6	F - Low Frequency Alarm
16	V(L-N) High phase-neutral voltage alarm
17	I - High Current Alarm
18	P - High Active Power Alarm
19	Q - High Reactive Power Alarm
20	S - High Apparent Power Alarm
21	PF - High Power Factor Alarm
22	F - High Frequency Alarm

Address	Function	Type	Read / Write	Description
2000	**6H**	uint16_t	wo	**Command Address**
Value		**Command**		**Description**
100		Save configuration		
110		Return to defults		
120		Restart		
200		Clear Demand Values		
300		Clear Min/Max Values		
400		Clear Energy Values		

Address	Function	Type	Read / Write	Description
3000	**6H**	uint16_t	wo	**Command Address**
Value		**Command**		**Description**
220		Change Active Tariff		

! In order to activate the writable addresses of the device, the password of the device must be entered into the following addresses. Otherwise, the device cannot be configured.

Item	Address	Variable	Type	Read / Write	Function
1	6000	Password 0-2	3 byte char	r/w	03H/10H
2	6002	Password 3-7	4 byte char	r/w	03H/10H

The default password for the device is 0000001. The ASCII equivalent of each character must be entered in the relevant addresses as hex. For example, for a device with a password 1234567, a data entry should be made to the relevant registers as follows.

Address	Value (hex)	Value
6000	0x0037	'NULL' '7'
6001	0x3635	6' '5'
6002	0x3433	5' '3'
6003	0x3231	2' '1'

EMD1 Series

TECHNICAL SPECIFICATIONS

EMD1 Series

Technical Specifications	
General Specifications	
Supply Voltage	Supply Voltage
Current Measurement	
Input Consumption	0.2VA
Starting Current (Ist)	20mA
Minimum Current (Imin)	0,25A
Transition Current (Itr)	0.5A
Reference Current (Iref)	5A
Maximum Current (Imax)	45A
Voltage Measurement	
Measuring Range	220-240 VAC / 100-120 VAC
Consumption	<3VA
Frequency Measurement	
Frequency Measurement	45-65 Hz
Energy Measurement	
Active Energy	Class C & Class B (EN 50470)
Reactive Energy	Class 2 (IEC 62053-23
Resolution	1Wh & 1VArh
Power Consumption	
Power Consumption	2.12 VA & 0.86 W
Pulse Output	
Type	Opto-isolated 5..27VDC
Switching Current	50mA
Isolation	5000Vrms optical isolation
Max. contact separation time	18µs
Max. contact engagement time	18µs
Screen	
Type	7-digit LCD with backlight
Refreshing time	1 sec.
Display Backlight activation time	Adjustable 10 - 600 sec.
Active Energy	00000.00 - 9999999 MWh
Reactive Energy	00000.00 - 9999999 MVArh
Communication	
Interface	RS485 2 wires/half duplex
Protocol	Modbus, RTU mode
Baudrate	1200 - 115200 Isolation 2500Vrms
Environmental Factors	
Operating temperature	-25°C to +55°C
Storage temperature	-25°C to +70°C
Humidity	<80% non condensing
Enclosure	
Dimensions WxHxD	18 x 90 x 67,5
Mounting	DIN Rail
Protection Class	Front IP51 - Casing IP20
Insulation Class	Class II

6.1   Dimensions
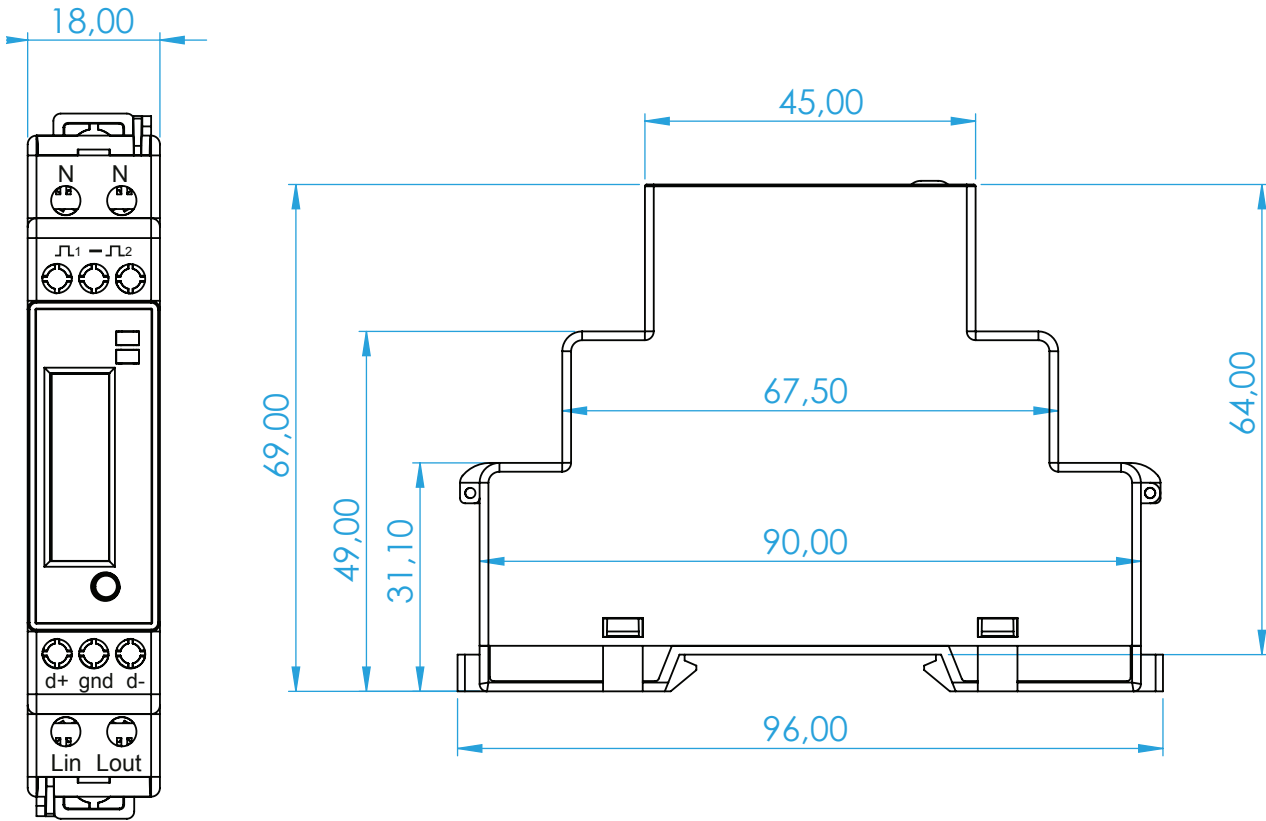
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HEADQUARTERS - FACTORY

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