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# 1-phase energy consumption meter **LE-01MW v.2**

## **User manual**

v. 1.0.1

Safety information regarding the use of the controller is indicated by the following symbols. All information and recommendations bearing these symbols must be strictly observed.

	Danger of electric shock.
	Potentially dangerous situation that could endanger operating personnel or damage the unit.
Information on the design, operation and handling of the controller is indicated by symbols:	
	Important information, valuable tip.
	Practical advice, a solution to a problem.
	Example of application or operation.

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## Part 1. Purpose

The LE-01MR v2 is an electronic, legalized (MID declaration) AC electricity meter designed for direct current measurement in 2-wire system.

The meter provides 4-quadrant energy and power measurement as well as monitoring of many additional network parameters such as voltage, current, active power, reactive power, apparent power, frequency, power factor. The meter has additional, resettable active and reactive energy meters. Thanks to the built-in real-time clock with battery backup, it is possible to measure energy consumption by user-set four tariff zones. The tariff-switching program can be made date-dependent (e.g. a different cycle in the summer months, a different one in the winter months) and exceptions can still be made to this in the form of user-defined holidays with separate tariff distribution. The LE01MW v.2 meter is also equipped with RS485 communication interface with Modbus RTU protocol support for remote meter reading and configuration. The touch button located on the front panel of the meter allows you to select the displayed parameter and change the meter settings. The backlit LCD display makes it easy to read the measured values. The meter is also equipped with auxiliary energy (active and reactive) consumption meters, operating independently from the main meter, which can be reset by the user.





## Part 2. Operation

Under the influence of the flowing current and applied voltage, the meter measures precisely the energy consumption and many additional electrical parameters (power, voltage, current, frequency...). The meter records in non-volatile memory the total (\*) consumption of active and reactive energy, imported and exported active and reactive energy, and active and reactive energy by tariff zone. The other parameters indicated by the meter are temporary and show the current values of the measured parameters that are not written to non-volatile memory.

(\*) The method of calculating the total energy consumption is set in the meter configuration. By default, total energy is the sum of energy imported and exported.





## Part 3. Installation

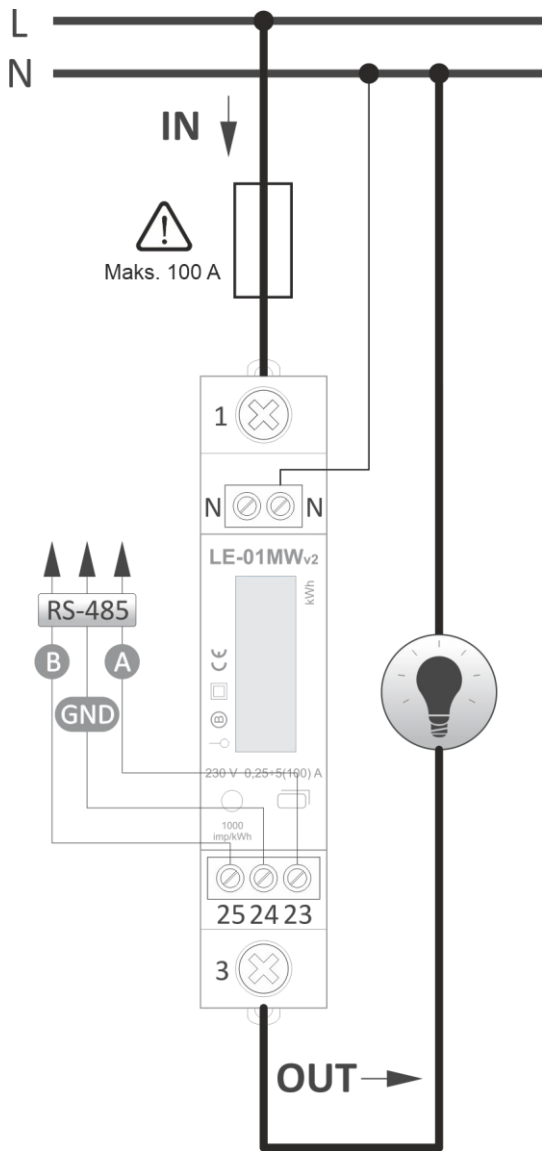
### Security measures

	Installation of the device should be carried out by a qualified installers with knowledge and experience in the field of electrical installations. Please read the operating instructions before installation.	
	All installation work must be carried out with the supply voltage switched off. Ensure that the wires are carefully tightened – loose wires can lead to sparking, or in the extreme case to ignition of the device.	

### Installation

The meter should be connected to the electrical installation according to the following diagram.

	It is recommended to protect the current circuit of the meter with a fuse with a level of protection adapted to the level of load current, but not exceeding the maximum current of the meter (100 A).															
	<p>The diameter of the wires must be adapted to the value of the currents flowing through the current circuit of the meter (terminals 1 – 3). The minimum recommended diameter of current wires is 4 mm<sup>2</sup>, the maximum (with sleeve) is 25 mm<sup>2</sup>. Approximate diameters of the wires depending on the load current are presented in the table below:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Cross-section [mm<sup>2</sup>]</th> <th>Load capacity [A]</th> </tr> </thead> <tbody> <tr> <td>2.5</td> <td>26</td> </tr> <tr> <td>4.0</td> <td>34</td> </tr> <tr> <td>6</td> <td>44</td> </tr> <tr> <td>10</td> <td>61</td> </tr> <tr> <td>16</td> <td>82</td> </tr> <tr> <td>25</td> <td>108</td> </tr> </tbody> </table>	Cross-section [mm <sup>2</sup> ]	Load capacity [A]	2.5	26	4.0	34	6	44	10	61	16	82	25	108	
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**Functions of the meter terminals**

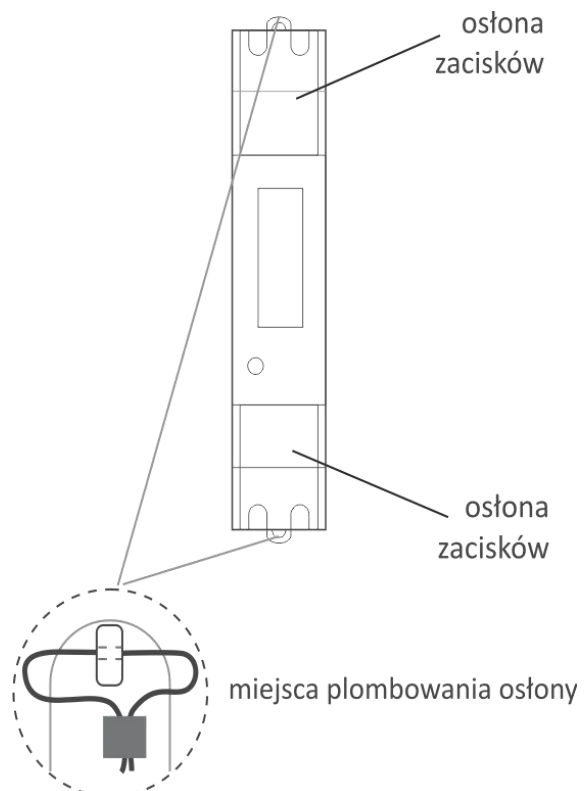
1	Meter current input – connection of the phase wire of the power supply line. High current cable
3	Current output - phase wire output to supply power to the receiver. High current cable
N	Neutral wire input. This connection is only used to supply the meter and to measure the voltage, therefore a large diameter cable is not required.
23	Modbus RS-485 communication output – line A
25	Modbus RS-485 communication output – line B
24	Ground (GND) of the RS485 communication interface.

## Sealing

After connecting the meter, access to its terminals can be secured with seals connecting the meter body to the terminal covers.

osłona zacisków – terminal cover

miejsce plombowania – cover sealing spot

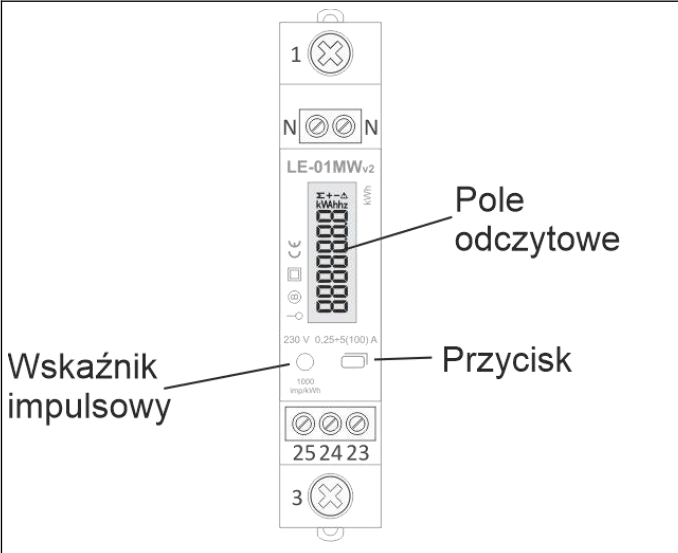


Security seals are not provided with the meter.



## Part 3. Usage

Direct reading of the measured values and configuration of the meter can be accessed via the controls on the front panel of the display.

 <p>The diagram shows the front panel of the LE-01MW v.2 meter. At the top is a terminal labeled '1' with a cross symbol. Below it are terminals for 'N' and 'N'. The meter model 'LE-01MW v.2' is printed above the LCD display, which shows '000000.00 kWh'. To the right of the display is a touch button labeled 'Przycisk'. Below the display is a pulse indicator LED labeled 'Wskaźnik impulsowy' and a small rectangular window showing '1000 imp/kWh'. Below that are terminals for '25 24 23' and a terminal labeled '3' with a cross symbol.</p>	<p><b>Reading field</b> [Pole odczytowe] – LCD digital indicator displaying the value of the measured parameter.</p> <p><b>Button</b> [Przycisk]– touch button. A short press of the button switches the view to the next displayed parameter. Long press activates the meter configuration mode.</p> <p><b>Pulse indicator</b> [Wskaźnik impulsowy] – the blinks of this LED correspond to the registered increase in active energy consumption. A single blink is equivalent to the consumption of 1 Wh of energy (1000 pulses = 1 kWh).</p>
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### Measurements displayed on the LCD screen

The LE-01MW v.2 meter allows you to display many values measured and registered by the meter. Switching to the next parameter is done by short pressing the button located on the front panel of the meter. By default, the meter is also configured to cycle between measured values.



The list of measurements available from the LCD display is summarised in the table below.

No	Feature	Format	Unit	Symbol
1	Total active energy	00000.00 (5+2)	kWh	$\Sigma^{+-\Delta}$ kW <sub>rhz</sub>
2	Active energy imported	00000.00 (5+2)	kWh	$\Sigma^{+-\Delta}$ kW <sub>rhz</sub>
3	Active energy exported	00000.00 (5+2)	kWh	$\Sigma^{+-\Delta}$ kW <sub>rhz</sub>
4	Total reactive energy	00000.00 (5+2)	kvarh	$\Sigma^{+-\Delta}$ kVAr <sub>rhz</sub>
5	Inductive reactive energy imported	00000.00 (5+2)	kvarh	$\Sigma^{+-\Delta}$ kVAr <sub>rhz</sub>
6	Inductive reactive energy exported	00000.00 (5+2)	kvarh	$\Sigma^{+-\Delta}$ kVAr <sub>rhz</sub>



7	T1 tariff – total active energy	00000.00 (5+2)	kWh	$\sum_{t1}^{+-\Delta} \text{kWh} / \text{h}z$
8	T1 tariff – total reactive energy	00000.00 (5+2)	kvarh	$\sum_{t1}^{+-\Delta} \text{kVArh} / \text{h}z$
9	T2 tariff – total active energy	00000.00 (5+2)	kWh	$\sum_{t2}^{+-\Delta} \text{kWh} / \text{h}z$
10	T2 tariff – total reactive energy	00000.00 (5+2)	kvarh	$\sum_{t2}^{+-\Delta} \text{kVArh} / \text{h}z$
11	T3 tariff – total active energy	00000.00 (5+2)	kWh	$\sum_{t3}^{+-\Delta} \text{kWh} / \text{h}z$
12	T3 tariff – total reactive energy	00000.00 (5+2)	kvarh	$\sum_{t3}^{+-\Delta} \text{kVArh} / \text{h}z$
13	T4 tariff – total active energy	00000.00 (5+2)	kWh	$\sum_{t4}^{+-\Delta} \text{kWh} / \text{h}z$
14	T4 tariff – total reactive energy	00000.00 (5+2)	kvarh	$\sum_{t4}^{+-\Delta} \text{kVArh} / \text{h}z$
15	Resettable auxiliary active energy meter	00000.00 (5+2)	kWh	reset / $\sum^{+-\Delta} \text{kWh} / \text{h}z$
16	Resettable auxiliary reactive energy meter	00000.00 (5+2)	kvarh	reset / $\sum^{+-\Delta} \text{kVArh} / \text{h}z$
17	Voltage	000.00 (3+2)	V	$\sum^{+-\Delta} \text{kVArh} / \text{h}z$
18	Current	000.00 (3+2)	A	$\sum^{+-\Delta} \text{kVA} / \text{h}z$
19	Active power	00000 (5+0)	W	$\sum^{+-\Delta} \text{kW} / \text{h}z$
20	Reactive power	00000 (5+0)	var	$\sum^{+-\Delta} \text{kVAr} / \text{h}z$
21	Apparent power	00000 (5+0)	VA	$\sum^{+-\Delta} \text{kVA} / \text{h}z$
22	Power factor	0.00 (1+2)	-	PF
23	Frequency	00.00 (2+2)	Hz	$\sum^{+-\Delta} \text{kVArh} / \text{h}z$
24	Demand for imported active power	00000 (5+0)	W	$d + \sum^{+-\Delta} \text{kW} / \text{h}z$
25	Maximum demand for imported active power	00000 (5+0)	W	$P + \sum^{+-\Delta} \text{kW} / \text{h}z$



26	Demand for exported active power	00000 (5+0)	W	$d + \frac{\Sigma + - \Delta}{kWh}$
27	Maximum demand for exported active power	00000 (5+0)	W	$P + \frac{\Sigma + - \Delta}{kWh}$
28	Demand for imported reactive power	00000 (5+0)	var	$d + \frac{\Sigma + - \Delta}{kVarh}$
29	Maximum demand for imported reactive power	00000 (5+0)	var	$P + \frac{\Sigma + - \Delta}{kVarh}$
30	Demand for exported reactive power	00000 (5+0)	var	$d + \frac{\Sigma + - \Delta}{kVarh}$
31	Maximum demand for exported reactive power	00000 (5+0)	Var	$P + \frac{\Sigma + - \Delta}{kVarh}$

	The time for which a single parameter is displayed on the screen can be set in the range of 0 - 99 seconds directly from the meter settings or via the RS-485 interface.	
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## Preview of the meter settings

By pressing the button on the front panel of the meter for three seconds, a menu will be displayed that allows you to read the current meter settings. In order to switch the view to the next parameter, short press the button on the meter panel.

No	Feature	Value
1	Setup	
2	Number of the meter	000000000000
3	Meter address in the RS-485 network	<b>1</b> (default) – 247
4	Baud rate	<b>6 – 9600 bps</b> (default) 7 – 19200 bps 8 – 38400 bps 9 – 57600 bps 10 – 76800 bps 11 – 115200 bps
5	Parity	<b>0 – None</b> (default)





		1 – Odd 2 – Even										
6	Number of stop bits	<b>Stop 1 – 1</b> (default) Stop 2 – 2										
7	Current tariff	t1, t2, t3, t4										
8	Current date	Date displayed in the following format: DD.MM.YY (day – month – year)										
9	Current time	Time displayed in the following format: HH.MM.SS (hour – minute – second)										
10	Parameter display time	Lcd xx, where xx is the time after which the meter view will automatically switch to display the next parameter. A value of 0 stops automatic switching.										
11	Calculation of total energy consumption	<p>A parameter that shows how the total energy consumption reading is obtained:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Operation</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Total energy = Import (energy imported)</td> </tr> <tr> <td>2</td> <td>Total energy = Export (energy exported)</td> </tr> <tr> <td>3</td> <td><b>Total energy = Import + Export</b></td> </tr> <tr> <td>4</td> <td>Total energy = Import Export</td> </tr> </tbody> </table> <p>The default value is 3.</p>	Value	Operation	1	Total energy = Import (energy imported)	2	Total energy = Export (energy exported)	3	<b>Total energy = Import + Export</b>	4	Total energy = Import Export
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1	Total energy = Import (energy imported)											
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3	<b>Total energy = Import + Export</b>											
4	Total energy = Import Export											
12	The period of calculating power demand	<p>Length of time interval (in minutes) from which the value of power demand will be calculated.</p> <p>The parameter is set in the range from 1 to 30 minutes, the default value is 15 minutes.</p>										
13	System software version											
14	Software checksum											
 To exit the settings preview menu, press and hold the button on the front of the device until the previous measurement is displayed.												

## Meter configuration

The operating parameters of the meter can be configured directly from the meter (using the display and a button on the front of the device), or remotely using the RS-485 interface and the Modbus RTU protocol. Access to the configuration from the meter can be secured with a PIN number.

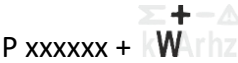
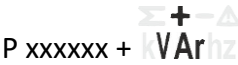
To enter the configuration of the LE-01MW v.2 meter you should:







- press and hold down (for approx. 3 seconds) the button on the front of the meter until the **Setup** message is displayed;
- press and hold the button again until the field for entering the PIN number is displayed (initially it is only zeroes);
- the blinking character indicates which digit of the PIN number is currently being edited;
- set the set value of the edited digit with short presses of the button;
- confirmation of the digit value is done by long pressing the button, after which the edit indicator will be moved to the next digit;
- set and confirm all digits of the PIN number in the same way,
- If the PIN number is entered incorrectly, an error message is displayed on the screen and the operation must be repeated from the beginning.

	The default PIN number is set to <b>0000</b> .	
	If the set PIN number is lost, access to the configuration, including recovery of the PIN number, is available via the RS-485 communication interface.	

- after passing the PIN verification, the first of the available configuration parameters - **Id** address of the meter in the RS-485 network - is displayed;
- the transition between the parameters is made by short pressing the button, long pressing takes you to the edition of the selected parameter;
- the parameter is set by short presses of the button, a long press of the button confirms the new value.

No	Configuration parameters	Value
1	Meter address in the RS-485 network	<b>1</b> (default) – 247
2	Baud rate	<b>6 – 9600 bps</b> (default) 7 – 19200 bps

		<p>8 – 38400 bps</p> <p>9 – 57600 bps</p> <p>10 – 76800 bps</p> <p>11 – 115200 bps</p>
3	Parity	<p><b>0 – None</b> (default)</p> <p>1 – Odd</p> <p>2 – Even</p>
4	Number of stop bits	<p><b>Stop 1 – 1</b> (default)</p> <p>Stop 2 – 2</p>
5	Resetting the auxiliary active energy meter	The display cyclically shows the <b>reset</b> text and the current value of the auxiliary meter. Press and hold down the button on the front of the meter to reset the indication.
6	Resetting the auxiliary reactive energy meter	The display cyclically shows the <b>reset</b> text and the current value of the auxiliary meter. Press and hold down the button on the front of the meter to reset the indication.
7	Resetting the maximum active power demand indicator	<p>The registered value of the maximum active power demand appears on the display as</p> <p style="text-align: center;">  </p> <p>Press and hold down the button on the front of the meter to reset the indication.</p>
8	Resetting the maximum active power consumption indicator	<p>The registered value of the maximum active power demand appears on the display as</p> <p style="text-align: center;">  </p> <p>Press and hold down the button on the front of the meter to reset the indication.</p>
9	Setting the date	Date displayed in the following format: DD.MM.YY (day – month – year)
10	Setting the date	Time displayed in the following format: HH.MM.SS (hour – minute – second)
11	Setting the display time of a parameter	Lcd xx, where xx is the time after which the meter view will automatically switch to display the next parameter. Setting range 0 – 99 Seconds. A value of 0 means stopping of

		automatic scrolling.										
12	Setting the period for power demand calculation	<p>Length of time interval (in minutes) from which the value of power demand will be calculated.</p> <p>The parameter is set in the range from 1 to 30 minutes, the default value is 15 minutes.</p>										
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3	<b>Total energy = Import + Export</b>											
4	Total energy = Import Export											
14	Setting up the PIN number	<p>You can set your own code to secure access to the meter configuration.</p> <table border="1"> <tr> <td style="text-align: center;"></td> <td>The PIN code restricts access to the meter configuration through the meter control panel. Access via the RS-485 communication port is not blocked.</td> <td style="text-align: center;"></td> </tr> </table>		The PIN code restricts access to the meter configuration through the meter control panel. Access via the RS-485 communication port is not blocked.								
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## Part 4. RS-485 communication

The meter is equipped with a RS-485 communication interface that supports the Modbus RTU protocol.

### Default communication settings

No	Parameter	Default value:
3	Meter address in the RS-485 network	1
4	Baud rate	9600 bps
5	Parity	None
6	Number of stop bits	1



### List of the measurement registers

All measurement results are read-only. Data reading, according to Modbus RTU protocol, is carried out using the **Read Holding Register** command (command code 0x03).

#### Data format:

**INT32** – 32-bit signed integer

**INT16** – 16-bit signed integer

	<p>The data is encoded as an integer. To obtain the actual value of the measured data, multiply the read value by the multiplier given in the table below.</p> <p><b>Example:</b></p> <p>The register with the voltage value has the value of 241700. To obtain the correct value in V, perform the following action: <math>241700 * 0.001 = 241,700 \text{ V}</math></p>	
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No.	Parameter	Address		R/W	Number of registers	Format	Unit	Multiplier
		HEX	DEC					
1	Voltage	0x100	256	R	2	INT32	V	0.001
2	Current	0x102	258	R	2	INT32	A	0.001

3	Active power	0x104	260	R	2	INT32	W	1
4	Apparent power	0x106	262	R	2	INT32	VA	1
5	Reactive power	0x108	264	R	2	INT32	Var	1
6	Frequency	0x10A	266	R	1	INT16	Hz	0.1
7	Power factor	0x10B	267	R	1	INT16	-	0.001
8	Total consumed (imported) active energy	0x10E	270	R	2	INT32	kWh	0.01
9	T1 tariff – consumed active energy	0x110	272	R	2	INT32	kWh	0.01
10	T2 tariff – consumed active energy	0x112	274	R	2	INT32	kWh	0.01
11	T3 tariff – consumed active energy	0x114	276	R	2	INT32	kWh	0.01
12	T4 tariff – consumed active energy	0x116	278	R	2	INT32	kWh	0.01
13	Total returned (exported) active energy	0x118	280	R	2	INT32	kWh	0.01
14	T1 tariff – exported active energy	0x11A	282	R	2	INT32	kWh	0.01
15	T2 tariff – exported active energy	0x11C	284	R	2	INT32	kWh	0.01
16	T3 tariff – exported active energy	0x11E	286	R	2	INT32	kWh	0.01
17	T4 tariff – exported active energy	0x120	288	R	2	INT32	kWh	0.01
18	Total active energy	0x122	290	R	2	INT32	kWh	0.01
19	T1 tariff total active energy	0x124	292	R	2	INT32	kWh	0.01
19	T2 tariff total active energy	0x126	294	R	2	INT32	kWh	0.01
20	T3 tariff total active energy	0x128	296	R	2	INT32	kWh	0.01
21	T4 tariff total active energy	0x12A	298	R	2	INT32	kWh	0.01
22	Total consumed (imported) reactive energy	0x12C	300	R	2	INT32	kvarh	0.01
23	T1 tariff – consumed reactive energy	0x12E	302	R	2	INT32	kvarh	0.01
24	T2 tariff – consumed reactive energy	0x130	304	R	2	INT32	kvarh	0.01



25	T3 tariff – consumed reactive energy	0x132	306	R	2	INT32	kvarh	0.01
26	T4 tariff – consumed reactive energy	0x134	308	R	2	INT32	kvarh	0.01
27	Total returned (exported) reactive energy	0x136	310	R	2	INT32	kvarh	0.01
28	T1 tariff – exported reactive energy	0x138	312	R	2	INT32	kvarh	0.01
29	T1 tariff – exported reactive energy	0x13A	314	R	2	INT32	kvarh	0.01
30	T3 tariff – exported reactive energy	0x13C	316	R	2	INT32	kvarh	0.01
31	T4 tariff – exported reactive energy	0x13E	318	R	2	INT32	kvarh	0.01
32	Total reactive energy	0x140	320	R	2	INT32	kvarh	0.01
33	T1 tariff – total reactive energy	0x142	322	R	2	INT32	kvarh	0.01
34	T2 tariff – total reactive energy	0x144	324	R	2	INT32	kvarh	0.01
35	T3 tariff – total reactive energy	0x146	326	R	2	INT32	kvarh	0.01
36	T4 tariff – total reactive energy	0x148	328	R	2	INT32	kvarh	0.01
37	Total reactive energy in the first quadrant	0x14A	330	R	2	INT32	kvarh	0.01
38	Tariff T1 reactive energy in the first quadrant	0x14C	332	R	2	INT32	kvarh	0.01
39	Tariff T2 reactive energy in the first quadrant	0x14E	334	R	2	INT32	kvarh	0.01
40	Tariff T3 reactive energy in the first quadrant	0x150	336	R	2	INT32	kvarh	0.01
41	Tariff T4 reactive energy in the first quadrant	0x152	338	R	2	INT32	kvarh	0.01
42	Total reactive energy in the second quadrant	0x154	340	R	2	INT32	kvarh	0.01
43	Tariff T1 reactive energy in the second quadrant	0x156	342	R	2	INT32	kvarh	0.01
44	Tariff T2 reactive energy in the second	0x158	344	R	2	INT32	kvarh	0.01



	quadrant							
45	Tariff T3 reactive energy in the second quadrant	0x15A	346	R	2	INT32	kvarh	0.01
46	Tariff T4 reactive energy in the second quadrant	0x15C	348	R	2	INT32	kvarh	0.01
47	Total reactive energy in the third quadrant	0x15E	350	R	2	INT32	kvarh	0.01
48	T1 tariff reactive energy in the third quadrant	0x160	352	R	2	INT32	kvarh	0.01
49	T2 tariff reactive energy in the third quadrant	0x162	354	R	2	INT32	kvarh	0.01
50	T3 tariff reactive energy in the third quadrant	0x164	356	R	2	INT32	kvarh	0.01
51	T4 tariff reactive energy in the third quadrant	0x166	358	R	2	INT32	kvarh	0.01
52	Total reactive energy in the fourth quadrant	0x168	360	R	2	INT32	kvarh	0.01
53	T1 tariff reactive energy in the fourth quadrant	0x16A	362	R	2	INT32	kvarh	0.01
54	T2 tariff reactive energy in the fourth quadrant	0x16C	364	R	2	INT32	kvarh	0.01
55	T3 tariff reactive energy in the fourth quadrant	0x16E	366	R	2	INT32	kvarh	0.01
55	T4 tariff reactive energy in the fourth quadrant	0x170	368	R	2	INT32	kvarh	0.01
56	Resettable auxiliary active energy meter	0x172	370	R	2	INT32	kWh	0.01
57	Resettable auxiliary reactive energy meter	0x174	372	R	2	INT32	kvarh	0.01
58	Consumed (imported) active power demand	0x176	374	R	2	INT32	W	0.1



59	Maximum consumed (imported) active power demand	0x178	376	R	2	INT32	W	0.1
60	Returned (exported) active power demand	0x17A	378	R	2	INT32	W	0.1
61	Maximum returned (exported) active power demand	0x17C	380	R	2	INT32	W	0.1
62	Consumed (imported) reactive power demand	0x180	384	R	2	INT32	var	0.1
63	Maximum consumed (imported) reactive power demand	0x182	386	R	2	INT32	var	0.1
64	Returned (exported) reactive power demand	0x184	388	R	2	INT32	var	0.1
65	Maximum returned (exported) reactive power demand	0x186	390	R	2	INT32	var	0.1

## List of the configuration registers

To write configuration data to the LE-01MW v.2 meter you can use commands with codes:

- **0x06 – Write Single Register**
- **0x10 – Write Multiple Register**

	If a parameter is written to more than one register, then writing to this parameter must be done using the Write Multiple Register command and it must include all registers of the parameter being edited once.	
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	For remote configuration of the meter, it is recommended to use the free <b>LE Config</b> software (for PCs with the Windows operating system), available on the <a href="http://www.fif.com.pl">www.fif.com.pl</a> page on the product subpage.	
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No.	Parameter	Address		R/W	Number of registers	Description
		HEX	DEC			
1	Serial number of the meter	0x1000	4096	R/W	6	12-digit meter identification number. The number is stored as a BCD number.

						For example, a hexadecimal number in the form 0x123456789012 indicates a meter with the serial number 123456789012																		
2	MODBUS address	0x1003	4099	R/W	1	Meter address in the Modbus RTU network. Values between 1 and 247 are allowed.																		
3	Software version	0x1004	4100	R	1	Values indicate the version of the meter and control software.																		
4	Electronics version	0x1005	4101	R	1																			
5	CRC checksum	0x1006	4102	R	1																			
6	Time and date	0x1007	4103	R/W	4	<p>The date and time are encoded as BCD numbers on consecutive bytes of the parameter in order:</p> <table border="1"> <thead> <tr> <th>Byte</th> <th>Feature</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0x00</td> </tr> <tr> <td>1</td> <td>Year (00 – 99)</td> </tr> <tr> <td>2</td> <td>Month (1 12)</td> </tr> <tr> <td>3</td> <td>Day (1 – 31)</td> </tr> <tr> <td>4</td> <td>Day of the week: 0 – Sunday, 1 – Monday, ..... 6 – Saturday</td> </tr> <tr> <td>5</td> <td>Hour (0 23)</td> </tr> <tr> <td>6</td> <td>Minute (0 59)</td> </tr> <tr> <td>7</td> <td>Second (0 59)</td> </tr> </tbody> </table>	Byte	Feature	0	0x00	1	Year (00 – 99)	2	Month (1 12)	3	Day (1 – 31)	4	Day of the week: 0 – Sunday, 1 – Monday, ..... 6 – Saturday	5	Hour (0 23)	6	Minute (0 59)	7	Second (0 59)
Byte	Feature																							
0	0x00																							
1	Year (00 – 99)																							
2	Month (1 12)																							
3	Day (1 – 31)																							
4	Day of the week: 0 – Sunday, 1 – Monday, ..... 6 – Saturday																							
5	Hour (0 23)																							
6	Minute (0 59)																							
7	Second (0 59)																							
7	Parameter display time	0x100B	4107	R/W	1	Time encoded in seconds. Setting range 0 - 99 seconds, value 0 means stopping automatic parameter view switching.																		

8	RS485 communication speed	0x100C	4108	R/W	1	The communication rate is encoded in numerical form, according to the following table:	
						Value	Bitrate
						6	9600 bps
						7	19200 bps
						8	38400 bps
						9	115200 bps
9	RS-485 – parity check	0x100D	4109	R/W	1	Value	Settings
						0	None
						1	Odd
						2	Even
10	RS-485 – number of stop bits	0x100E	4110	R/W	1	Value	Settings
						1	1 – stop bit
						2	2 – stop bits
11	Calculation of total energy consumption	0x100F	4111	R/W	1	The total energy is equal to:	
						Value	Settings
						1	Energy consumed (import)
						2	Energy returned (export)
						3	Import + Export
						4	Import Export
12	Calculating power demand	0x1010	4112	R/W	1	Value	Operation



						0	Power demand is calculated on the basis of successive, full time intervals
						1	Power demand calculated on the basis of the moving average over a given period of time
13	The period of calculating power demand	0x1011	4113	R/W	1		Value in minutes. Setting range from 1 to 30 minutes.
14	Configuration of the measured values indicated on the display	0x1012	4114	R/W	4		<p>Parameter that allows you to limit the number of measured values visible on the LCD.</p> <p>Each parameter corresponds (in order as shown in the LCD description table) to one bit of that parameter. Bit set to 1 means the measurement is visible on the LCD, bit set to 0 means the parameter is not visible.</p> <p><b>Note:</b> the data is stored in the two upper registers (0x1014-0x1015).</p> <p><b>Please note:</b> If the entire parameter is reset, no values will be displayed on the meter screen.</p>
15	PIN	0x1016	4118	R/W	1		The PIN code restricts access to the meter configuration through the panel on the front of the meter.
16	Time of operation of the meter when the load is exceeded.	0x1018	4120	R/W	2		The operating time of the meter when the current flowing through the meter is greater than the value set in the 0x101A register.

						<p>Entering a value of 0 resets the meter value.</p> <p><b>This meter can be used to record the time of exceeding the limit load of the meter.</b></p>	
17	Overload threshold setting	0x101A	4122	R/W	2	<p>The value of the current (in mA) which, if exceeded, will start the timer available in register 0x1018.</p> <p>By default, this parameter is set to 120% of the meter's maximum current.</p>	
18	Auxiliary energy meter reset	0x2001	8193	R/W	1	Value	Operation
						0x1000	Active energy meter reset
						0x2000	Reactive energy meter reset
						0x3000	Active and reactive energy meter reset
19	Power demand meters reset	0x2002	8195	R/W	1	To reset the selected power demand value, enter one of the following values into the register	
						Value	Operation
						0xA501	Demand for active power
						0xA502	Demand for reactive power
						0xA504	Maximum active power demand



						0xA508	Maximum reactive power demand



## Multi-tariff mode management

The LE-01MW v.2 meter allows recording energy consumption divided into four tariffs. Tariff plans can be created separately for weekdays, weekends (Saturday – Sunday), and user-set holidays. Within each plan, a 24-hour day can be divided into up to eight time segments and one of the four supported tariffs can be substituted for each segment.

	For remote configuration of the meter, it is recommended to use the free <b>LE Config</b> software (for PCs with the Windows operating system), available on the <a href="http://www.fif.com.pl">www.fif.com.pl</a> page on the product subpage.	
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## Weekday tariff breakdown

	Record of tariff breakdown must be performed in one record cycle, starting from address 0x8100 and covering the entire data array of 16 registers.	
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	The data written to the meter is automatically sorted in ascending order.	
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No.	Parameter	Address		R/W	Number of registers	Description	
		HEX	DEC				
1	Zone 1 – time	0x8100	33024	R/W	1	Start of zone 1 hour and minute  Time is encoded in the form of numbers written in the order of	
						Upper byte Hour	Lower byte Minute



						(0 – 23)	(0 59)
2	Zone 1 – tariff	0x8101	33025	R/W	1	Zone 1 – tariff number  From the time set in the previous register, energy consumption will be charged to the tariff set in this parameter (0 – 3).	
3	Zone 2 – time	0x8102	33026	R/W	1	Start of zone 2 hour and minute	
4	Zone 2 – tariff	0x8103	33027	R/W	1	Zone 2 – tariff number	
5	Zone 3 – time	0x8104	33028	R/W	1	Start of zone 3 hour and minute	
6	Zone 3 – tariff	0x8105	33029	R/W	1	Zone 3 – tariff number	
7	Zone 4 – time	0x8106	33030	R/W	1	Start of zone 4 hour and minute	
8	Zone 4 – tariff	0x8107	33031	R/W	1	Zone 4 – tariff number	
9	Zone 5 – time	0x8108	33032	R/W	1	Start of zone 5 hour and minute	
10	Zone 5 – tariff	0x8109	33033	R/W	1	Zone 5 – tariff number	
11	Zone 6 – time	0x810A	33034	R/W	1	Start of zone 6 hour and minute	
12	Zone 6 – tariff	0x810B	33035	R/W	1	Zone 6 – tariff number	
13	Zone 7 – time	0x810C	33036	R/W	1	Start of zone 7 hour and minute	
12	Zone 7 – tariff	0x810D	33037	R/W	1	Zone 7 – tariff number	
13	Zone 8 – time	0x810E	33038	R/W	1	Start of zone 8 hour and minute	
12	Zone 8 – tariff	0x810F	33039	R/W	1	Zone 8 – tariff number	



Example record of the breakdown of the day into tariff zones:



Time	Tariff	Register	Data	
			Hex	Dec
0:00	1	0x8100	0x0000	0
		0x8101	0x0001	1
05:30	2	0x8102	0x051E	1310
		0x8103	0x002	2
10:00	3	0x8104	0x0A00	2560
		0x8105	0x0003	3
14:30	2	0x8106	0x0E1E	3614
		0x8107	0x0002	2
19:00	1	0x8108	0x1300	4864
		0x8109	0x0001	1

Tariffs will be charged on a cycle basis:

Start	End	Tariff
0:00	05:30	1
15:30	10:00	2
10:00	14:30	3
14:30	19:00	2
19:00	0:00	1

## Breakdown of tariffs for weekends (Saturday and Sunday)



	Record of tariff breakdown must be performed in one record cycle, starting from address 0x8110 and covering the entire data array of 16 registers.	
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	The data written to the meter is automatically sorted in ascending order.	
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No.	Parameter	Address		R/W	Number of registers	Description	
		HEX	DEC				
1	Zone 1 – time	0x8110	33040	R/W	1	Start of zone 1 hour and minute	
						Time is encoded in the form of numbers written in the order of	
						Upper byte	Lower byte
						Hour (0 – 23)	Minute (0 59)
2	Zone 1 – tariff	0x8111	33041	R/W	1	Zone 1 – tariff number From the time set in the previous register, energy consumption will be charged to the tariff set in this parameter (0 – 3).	
3	Zone 2 – time	0x8112	33042	R/W	1	Start of zone 2 hour and minute	
4	Zone 2 – tariff	0x8113	33043	R/W	1	Zone 2 – tariff number	
5	Zone 3 – time	0x8114	33044	R/W	1	Start of zone 3 hour and minute	
6	Zone 3 – tariff	0x8115	33045	R/W	1	Zone 3 – tariff number	

7	Zone 4 – time	0x8116	33046	R/W	1	Start of zone 4 hour and minute
8	Zone 4 – tariff	0x8117	33047	R/W	1	Zone 4 – tariff number
9	Zone 5 – time	0x8118	33048	R/W	1	Start of zone 5 hour and minute
10	Zone 5 – tariff	0x8119	33049	R/W	1	Zone 5 – tariff number
11	Zone 6 – time	0x811A	33050	R/W	1	Start of zone 6 hour and minute
12	Zone 6 – tariff	0x811B	33051	R/W	1	Zone 6 – tariff number
13	Zone 7 – time	0x811C	33052	R/W	1	Start of zone 7 hour and minute
12	Zone 7 – tariff	0x811D	33053	R/W	1	Zone 7 – tariff number
13	Zone 8 – time	0x811E	33054	R/W	1	Start of zone 8 hour and minute
12	Zone 8 – tariff	0x811F	33055	R/W	1	Zone 8 – tariff number

## Tariff breakdown for public holidays

	<p>The list of holidays (in the form of month - day) is programmed by the user via registers 0x8140 - 0x81A4.</p> <p>A maximum of 100 holidays can be stored in the meter's memory.</p>	
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	<p>Record of tariff breakdown must be performed in one record cycle, starting from address 0x8130 and covering the entire data array of 16 registers.</p>	
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	<p>The data written to the meter is automatically sorted in ascending order.</p>	
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No.	Parameter	Address		R/W	Number of registers	Description				
		HEX	DEC							
1	Zone 1 – time	0x8130	33072	R/W	1	<p>Start of zone 1 hour and minute</p> <p>Time is encoded in the form of numbers written in the order of</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Upper byte</td> <td style="text-align: center;">Lower byte</td> </tr> <tr> <td style="text-align: center;">Hour</td> <td style="text-align: center;">Minute</td> </tr> </table>	Upper byte	Lower byte	Hour	Minute
Upper byte	Lower byte									
Hour	Minute									
2	Zone 1 – tariff	0x8131	33073	R/W	1	<p>Zone 1 – tariff number</p> <p>From the time set in the previous register, energy consumption will be charged to the tariff set in this parameter (1 – 4).</p>				
3	Zone 2 – time	0x8132	33074	R/W	1	Start of zone 2 hour and minute				
4	Zone 2 – tariff	0x8133	33075	R/W	1	Zone 2 – tariff number				
5	Zone 3 – time	0x8134	33076	R/W	1	Start of zone 3 hour and minute				


6	Zone 3 – tariff	0x8135	33077	R/W	1	Zone 3 – tariff number
7	Zone 4 – time	0x8136	33078	R/W	1	Start of zone 4 hour and minute
8	Zone 4 – tariff	0x8137	33079	R/W	1	Zone 4 – tariff number
9	Zone 5 – time	0x8138	33080	R/W	1	Start of zone 5 hour and minute
10	Zone 5 – tariff	0x8139	33081	R/W	1	Zone 5 – tariff number
11	Zone 6 – time	0x813A	33082	R/W	1	Start of zone 6 hour and minute
12	Zone 6 – tariff	0x813B	33083	R/W	1	Zone 6 – tariff number
13	Zone 7 – time	0x813C	33084	R/W	1	Start of zone 7 hour and minute
12	Zone 7 – tariff	0x813D	33085	R/W	1	Zone 7 – tariff number
13	Zone 8 – time	0x813E	33086	R/W	1	Start of zone 8 hour and minute
12	Zone 8 – tariff	0x813F	33087	R/W	1	Zone 8 – tariff number

## List of public holidays

 A maximum of 100 holidays can be stored in the meter's memory. 

 Writing the list of holidays must be done in one record cycle, starting with writing register 0x8140. 

No.	Parameter	Address		R/W	Number of registers	Description				
		HEX	DEC							
1	Holiday 1	0x8140	33088	R/W	1	Holiday 1 – Month and day  Date is encoded in the form of numbers written in the order of  <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Upper byte</td> <td style="text-align: center;">Lower byte</td> </tr> <tr> <td style="text-align: center;">Day</td> <td style="text-align: center;">Month</td> </tr> </table>	Upper byte	Lower byte	Day	Month
Upper byte	Lower byte									
Day	Month									
2	Holiday 2	0x8140	33089	R/W	1	Holiday 2 – Month and day				
...	...	...	...	R/W	1	....				
100	Holiday 100	0x81A4	33188	R/W	1	Holiday 100 – Month and day				

Sample record of holidays					
	Date		Register	Data	
	Month	Day		Hex	Dec
	January	1	0x8140	0x0101	257
	August	15	0x8141	0x080F	2063
	November	11	0x8142	0x0B0B	5413
	December	25	0x8143	0x0C19	3097

## Part 8. Technical data

Installation		2-wire
Rated voltage		230 V DC
Current	minimum	0.02 A
	base	5 A
	maximum	100 A
Voltage measurement range		100 – 289 V AC
Accuracy of measurement (EN50470-1)		Class B
Rated frequency		50 Hz
Insulation protection class		Class II
Housing		PC material
Meter power consumption		10 VA, 1 W
Meter display range		0 – 99999.99 kWh
Display		7-digit, LCD backlit (blue)
Meter constant		1000 pulse/kWh
Communication		
interface		RS-485
communication protocol		Modbus RTU
Modbus address		<b>1</b> <sup>(*)</sup> 245
baud rate		<b>9600</b> <sup>(*)</sup> , 19200, 38400, 115200 bps
parity control		<b>None</b> <sup>(*)</sup> , Even, Odd
stop bits		1
Energy reading indication		LED, red



Operating temperature	-25 ÷ +55 °C
Terminal	
100 A current circuits (terminals 1, 3)	25 mm <sup>2</sup> screw terminals
neutral wire (terminals N)	1 mm <sup>2</sup> screw terminals
communication (terminals 23, 24, 25)	1 mm <sup>2</sup> screw terminals
Dimensions	1 module (18 mm)
Installation	on TH-35 rail
Ingress protection	IP40

(\*) Factory setting

## Part 9. History of changes

Date	Version	Description
2023.07.05	1.0.0	First version of the manual
2023.07.10	1.0.1	Improving the example of tariff zone configuration

## Part 10. WARRANTY

1. The meter is covered by a 24-month warranty. The warranty period is measured from the moment of the purchasing of the device.
2. The warranty is valid only with proof of purchase.
3. A warranty claim should be submitted at the point of purchase or directly to the manufacturer:

**F&F Filipowski sp. k.**  
ul. Konstytucyjna 79/81  
**95-200 Pabianice**  
Phone (42) 227-09 71  
e-mai: dztech@fif.com.pl

4. The complaint should be accompanied by written information about the nature of the fault and the circumstances in which it occurred.
5. F&F Filipowski sp. k. undertakes to handle complaints in accordance with the provisions of Polish law.
6. The choice of the way in which the complaint will be settled: the replacement of the faulty goods with the defect-free, repair or refund belongs to the manufacturer.
7. The warranty does not cover:
  - a. Mechanical and chemical damage
  - b. Damage caused by improper use or use not in accordance with the operating instructions
  - c. Post-sale damage resulting from accidents or other events for which the manufacturer or the point of sale is not responsible, such as damage during transport.
8. The warranty does not cover activities that according to the instructions should be performed by the user, such as installation of the multimeter, electrical installation, installation of other required electrical protection.
9. The guarantee shall not limit the rights of the buyer arising from the non-conformity of the goods with the contract.

## Part 11. CE declaration

F&F Filipowski sp. j. declares that the XXX device is in conformity with the essential requirements of The Low Voltage Directive (LVD) 2014/35/EU and the Electromagnetic Compatibility (EMC) Directive 2014/30/UE. The MID and CE Declaration of Conformity, along with the references to the standards in relation to which conformity is declared, can be found at [www.fif.com.pl](http://www.fif.com.pl) on the product page.