EFEN

Multifunction metering device
70830-0010 DMM-5T-2
Operation manual

Information regarding operational safety of the device is marked with the following symbols. All information and recommendations marked with those symbols must be strictly obeyed.

	Electric shock risk
	Potentially dangerous situation that can lead to operator's hazard or damage to the device
Information regarding construction, functioning and operation of the analyzer	
	Important information, useful tip
	Practical guideline, solution to the problem
	An example of usage or function

Contents

Introduction

DMM-5T-2 is a multifunction, universal metering device used for overall monitoring of one- or three-phase power supply line parameters. The analyzer enables the user to make high-precision measurements of all crucial network parameters, such as: voltage and phase currents, phase-to-phase voltage, active power, reactive power, apparent power, power factor. In addition, the analyzer ensures full, four-quadrant metering (both imported and exported to the network) and analyzes the distribution of harmonics of voltage and current up to 63rd harmonic inclusive.

Technical data

Meter circuit	
Network	1P2W - one-phase, two-wire 3P3W – three-phase, three-wire 3P4W - three-phase, four-wire
Current sensing	
Nominal current I_n	0.25 – 5 (6) A
	(real value of measured current will depend on the size of applied current transformers)
Overload capacity (continuous)	120% I_n
Power consumption	≤ 0,5 VA/phase
Voltage measurement	
Measuring range	58 – 230 V AC (phase voltage L-N)
	100 – 400 V AC (phase-to-phase voltage L-L)
Frequency	45~55 Hz
Overload capacity (continuous)	120 % U_n
Working conditions	
Total power consumption	typical ≤ 2 VA temporary ≤ 15 VA
Working temperature	-25°C~55°C
Storage temperature	-40°C~70°C
Relative humidity	0~95% (without condensation of steam and aggressive gases)
Pollution class	2
Enclosure flammability	UL94-V0
Protection standard	Front – IP54 Rear – IP20
Enclosure dimensions	96 x 96 x 62 mm
Mounting hole dimensions	92 x 92 mm
Panel thickness	1-5 mm
Communication	
Impulse outputs (not available in standard version)	2
Port RS-485	Communication port in accordance with Modbus RTU interface. Transmission rate: 2400/4800/9600/19200/38400 bps Parity: no, even, odd Stop bits: 1, 2

Multimeter operation DMM-5T-2

Technical data

Parameter	Displayed value	Accuracy
Voltage	0~9999,9 kV	0,2 %
Current	0~9999,9 kV	0,2 %
Power factor	-1~+1	1 %
Frequency	45~65 Hz	0,2 %
Active power	0~3600 MW	0,5 %
Reactive power	0~3600 MVAr	1 %
Apparent power	0~3600 MVA	1 %
Active energy	0~9999999,9 kWh	Class 0.5S (IEC62053-22)
Reactive energy	0~9999999,9 kVArh	2 %
Phase angle		2 %
Current distortion factor (overall or individual from the 2nd – 63 rd harmonic)	0~100%	2 %
Voltage distortion factor (overall or individual from the 2nd – 63 rd harmonic)	0~100%	2 %

Multimeter operation DMM-5T-2

Assembly

Safety precautions

	**The analyzer must be installed and connected by qualified personnel. All available safety requirements must be taken into consideration.**	
	**Supply voltage** DMM-5T-2 Multimeter is powered through potential terminals V1, V2, V3, N and doesn't require auxiliary power supply. **It is recommended to protect power supply and voltage circuits of the meter using 1A fuse link.**	
	**Measurement voltage** Maximum value of measurement voltage cannot exceed 280 V AC (phase voltage between terminals L-N) or 500 V AC (phase-to-phase voltage between terminals L-L). When maximum value of measurement voltage is exceeded, it may lead to damage to the device.	
	**Measurement current** The Multimeter can be applied for direct measurements of current with application of current transformers with the secondary current of 5 A. If measurement current exceeds 6 A, it may lead to damage to the device.	
	**Environmental conditions** The device can be operated at the temperature from -25°C to +55°C and air humidity lower than 90%. Exceeding those limiting parameters may lead to improper operation and damage to multimeter.	

You must make a hole 92x92mm in the panel, thickness of the material the panel was made of cannot exceed 5 mm. Multimeter is adapted for mounting in E3 system frames, e.g. 36422-0010.

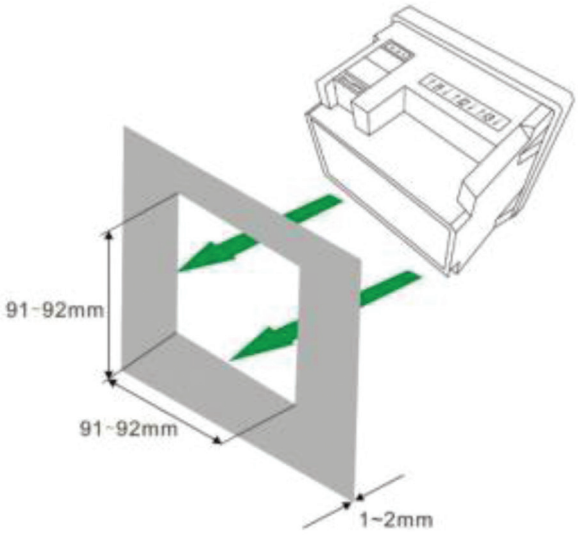


Fig. 1. Multimeter assembly method

Multimeter must be inserted from the front of the panel, when all wires are disconnected, and must be pressed to the surface of the panel. Having assembled the multimeter on the panel, you can proceed to connecting the wires. Distribution of terminals scheme is presented in Fig. 2.

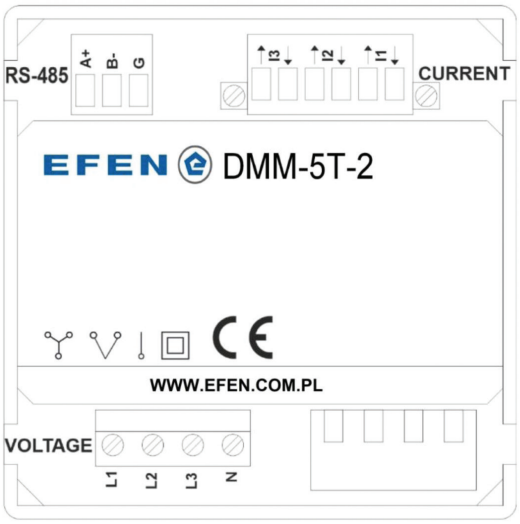


Fig. 2. View of multimeter from the side of terminal strips

Multimeter operation DMM-5T-2

Assembly

Safety precautions

Terminal block	Terminal	Function		Notes
VOLTAGE	L1	Voltage measurement circuit Meter power supply		The method of connecting voltage terminals to the measured system must be adapted to the type of measured system, in accordance with diagrams in Fig.3 - Fig.7.
	L3			
	L3			Voltage circuits of the meter must be protected with 1A time-delay fuse link
	N			
CURRENT	I1 ↑ I1 ↓	Current measurement circuit		Current measurement circuit can be used for connection of current transformers with secondary current of 5A and power of min. 0,5 VA.
	I2 ↑ I2 ↓			Current input of the meter marked with this symbol ↓, must be connected to terminal S1 of current transformer. Current input of the meter marked with this symbol ↑, must be connected to terminal S2 of current transformer.
	I3 ↑ I3 ↓			To prevent occurrence of high potentials on transformer terminals, all S2 terminals of transformers should be connected grounded.
PULSE	P1+ COM P2+	Impulse outputs (not available in standard version)	Passive impulse outputs (open collector), in accordance with Class A IEC 62053-31 P1 – Programmable impulse outputs (function and number of impulses) P2 – Energy consumption indication (3200 imp/kWh) COM – common outputs ground P1 and P2.	
				Maximum load of a single impulse output: Voltage ≤ 30 V Current ≤ 20 mA
RS485	A+	Communication interface RS485		It is recommended to use screened wires dedicated for RS485 communication. Terminating resistors of 120 Ω must be connected at the ends of the bus. Up to 32 DMM-5T-2 meters can be connected to one limb of the RS485 bus.
	B-			
	G			

Assembly

Connections diagrams

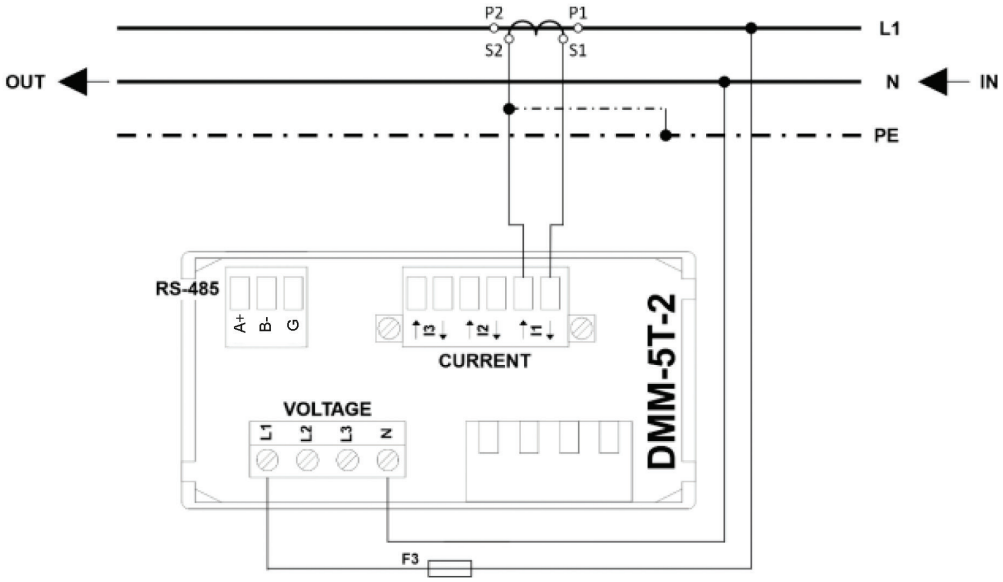


Fig. 3. 1P2W circuit – 1-phase, 2-wire system, semi-indirect-measurement

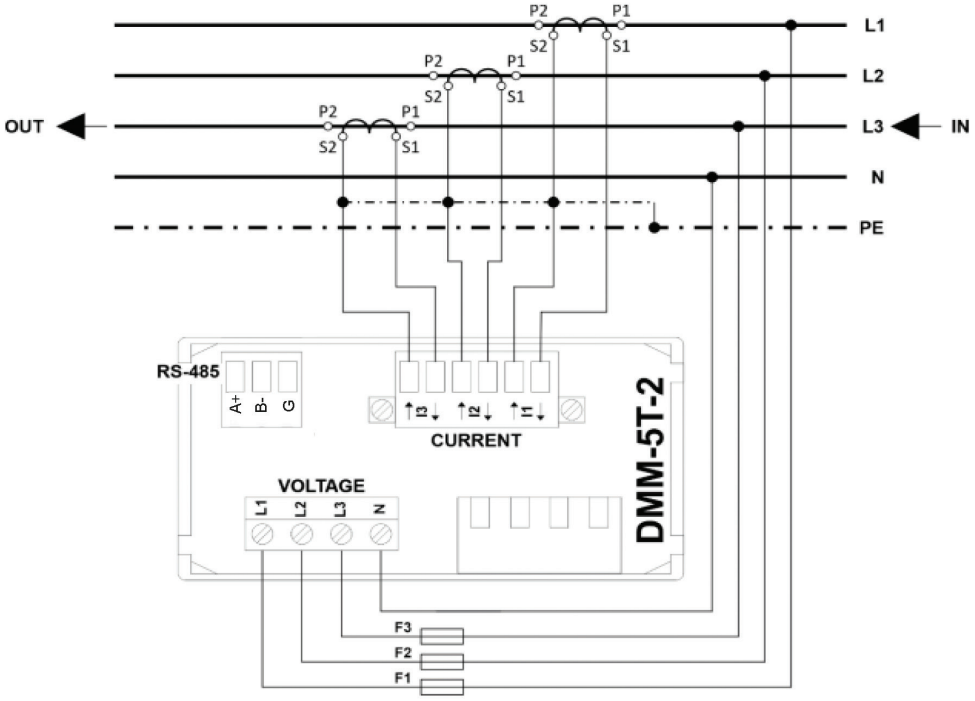


Fig. 4. 3P4W system – 3-phase, 4-wire system, semi-indirect-measurement

Multimeter operation DMM-5T-2

Assembly

Connections diagrams

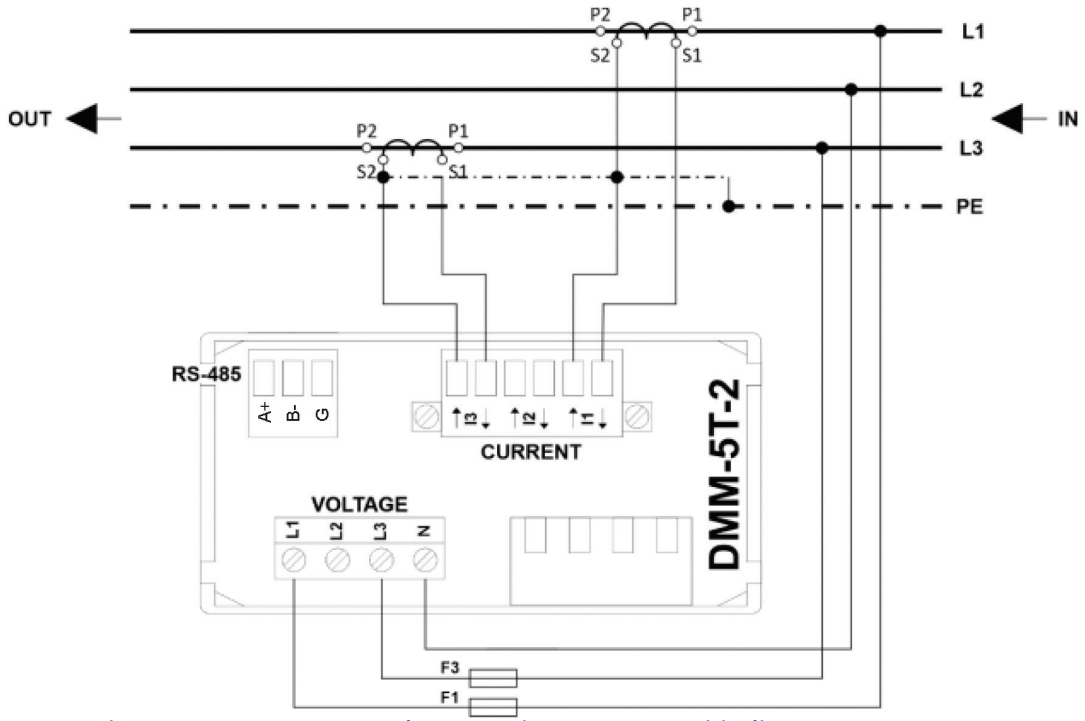


Fig. 5. 3P3W system – 3-phase, 3-wire system, semi-indirect-measurement

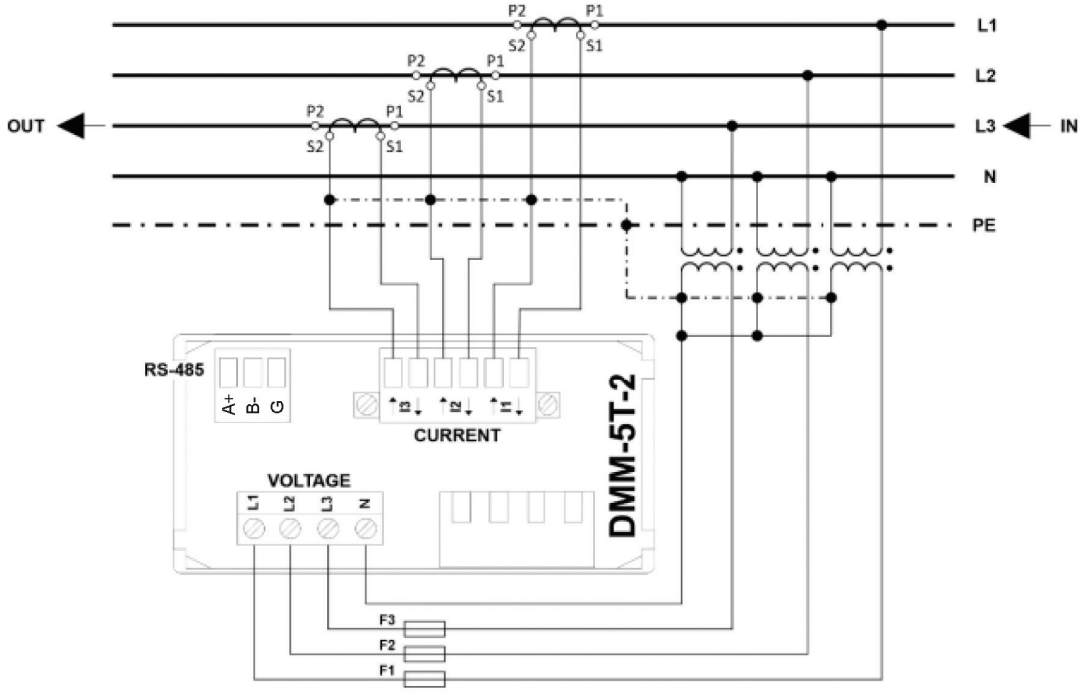


Fig. 6. 3P4W system –3-phase, 4-wire system, indirect measurement

Assembly

Connections diagrams

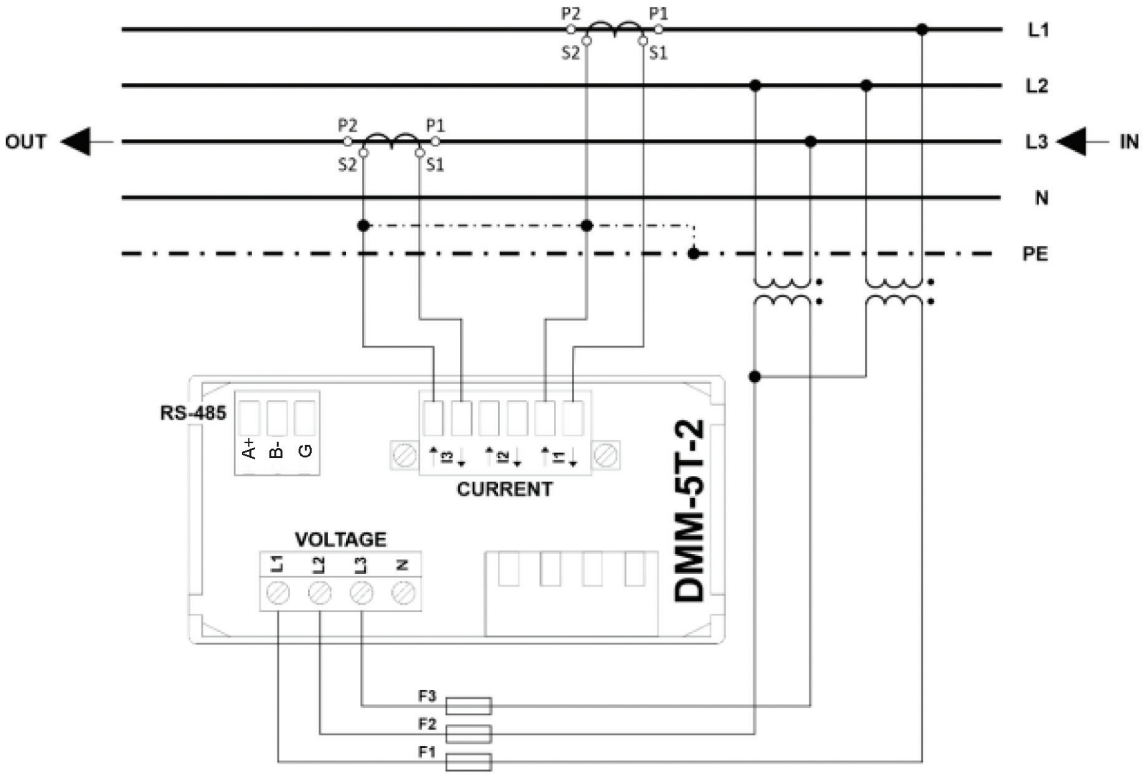


Fig. 7. 3P3W system –3-phase, 3-wire system, indirect measurement

Multimeter operation DMM-5T-2

Multimeter operation

Operating panel

DMM-5T operating panel consists of 2 parts - multifunction LCD display providing convenient parameters reading and five keys that enable the change of displayed parameters and module configuration.

Fig. 8. View of multimeter front panel

Key	Short pressing	Long pressing (2 seconds)
Ph S ESC	• Voltage, current, active power, active and reactive energy for the respective phases; • In configuration mode return to previous menu **ESC.**	• Turn on / off the mode of automatic change of measured values display.
V/A	• Phase voltages; • Phase-to-phase voltages; • Phase currents; • Harmonics (total) of voltage and current divided into phases; • Phase sequence • In configuration mode or value selection mode – Key **Left**.	• Voltage harmonics (from 1 to 63), change of displayed harmonics through keys **Up** or **Down**.
MD PF Hz	• Frequency and total power factor; • Power factor divided into phases; • Maximum and medium current consumption; • In configuration mode or value selection mode – Key **Up** (increase of value).	• Current harmonics (from 1 to 63), change of displayed harmonics through keys **Up** or **Down**.

Multimeter operation DMM-5T-2

Multimeter operation

Operating panel

Key	Short pressing	Long pressing (2 seconds)
	• Active power divided into phases; • Reactive power divided into phases; • Apparent power divided into phases; • Total active, reactive and apparent power; • In configuration mode or value selection mode – Key **Down** (decrease of value).	• Device working time.
	• Total active energy; • Total reactive energy; • Imported active energy; • Imported reactive energy; • Exported active energy; • Exported reactive energy; • In configuration mode or value selection mode – Key **Right**.	• Entering configuration mode; • Confirmation of parameter value.

Description of display elements

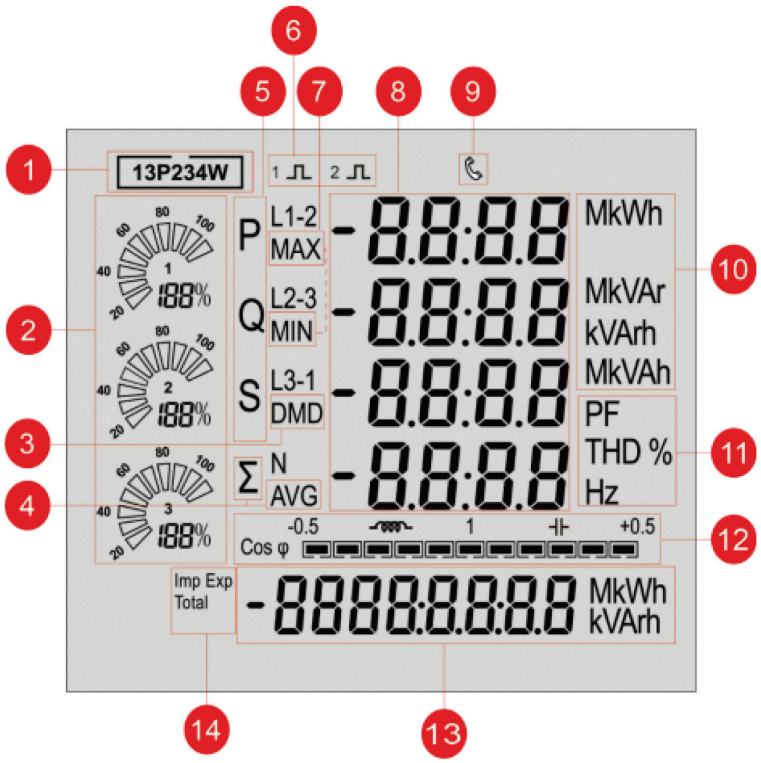


Fig. 9. Display description

Multimeter operation DMM-5T-2

Multimeter operation

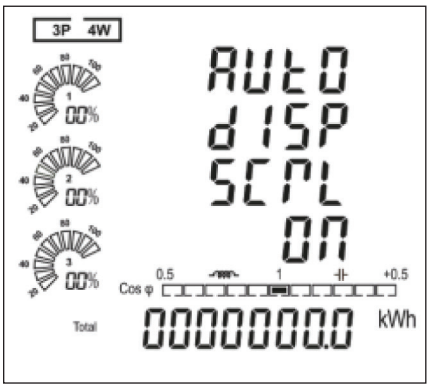
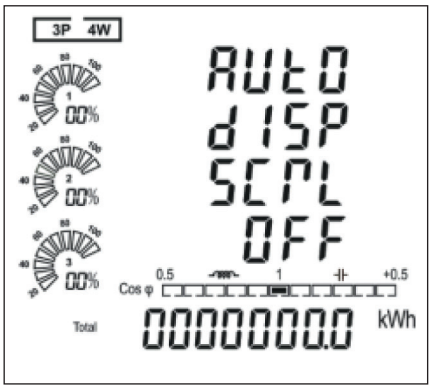
Operating panel

Number	Description
1	Indicator of the selected system type: • **1P2W** – 1-phase, 2-wire system, • **3P3W** – 3-phase, 3-wire system, • **3P4W** – 3-phase, 4-wire system,
2	Bargraph indicating power consumption on individual phases
3	**DMD – display of demand indication**
4	**AVG – display of mean value of all phases**
5	Power display indicator: • **P** – active, • **Q** – passive, • **S** – apparent.
6	Indication of impulse outputs functioning
7	Value display: • **MIN** – minimum, • **MAX** – maximum.
8	Measured values indicator
9	RS-485 communication indicator
10	Shows units of displayed measured values
11	Indicators: • **PF** – power factor, • **THD %** - percentage content of harmonics, • **Hz** – frequency.
12	Graphic indicator of power factor
13	Energy consumption indicator with given unit
14	Shows type of energy displayed in the field 13: • **TOTAL** – total energy consumption, • **IMP** – imported energy, • **EXP** – exported energy.

Multimeter operation

Indicator mode –network parameters display

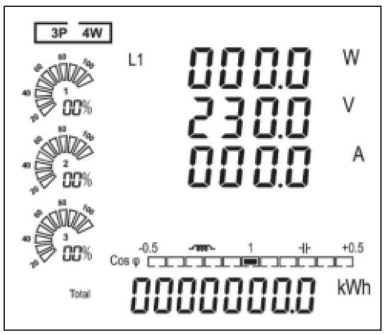
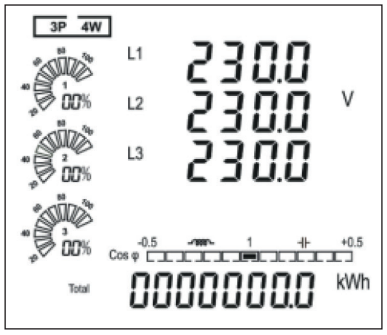
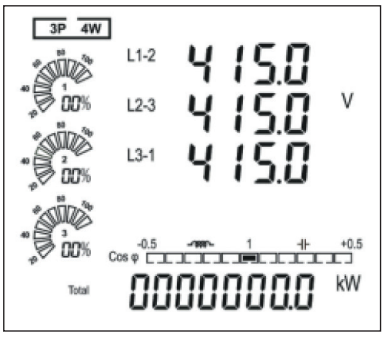
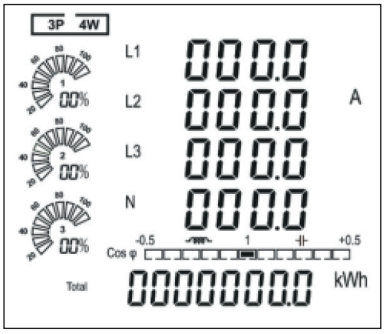
The choice of displayed measured value is made by short or long pressing of the respective keys on the front side of the multimeter. List of views with keys that activate them is presented in the following table.

<table>
<tr><td rowspan="2"></td><td colspan="2">Multimeter can permanently display a selected view with measured values or automatically switch views in accordance with the determined cycle. Fast change between those views is available after long pressing of the ESC key.</td><td rowspan="2"></td></tr>
<tr><td>Automatic display switch ON
 
</td><td>Automatic display switch OFF
 
</td></tr>
</table>

Multimeter operation DMM-5T-2

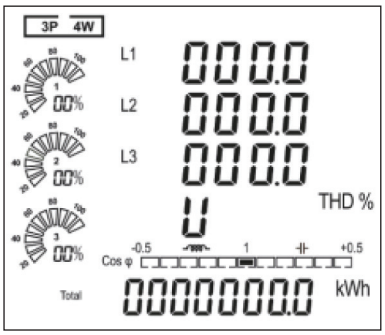
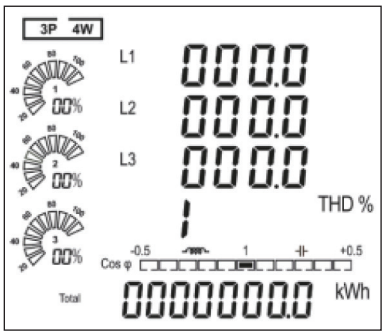
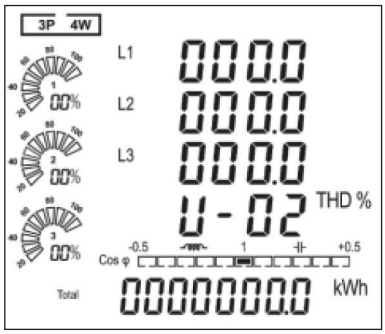
Multimeter operation

Indicator mode –network parameters display

Key	Function	Panel view
Ph S ESC	Display of voltage, current, active power and active or reactive energy parameters divided into separate phases. View available after pressing **ESC**. Switching between the consecutive phases and the view of active or reactive energy can be done by further pressing of **ESC**.	 Fig. 10
V/A	Phase voltage	 Fig. 11
V/A	Phase-to-phase voltages	 Fig. 12
V/A	Phase currents and neutral wire current	 Fig. 13

Multimeter operation

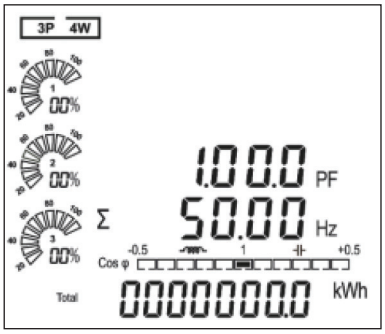
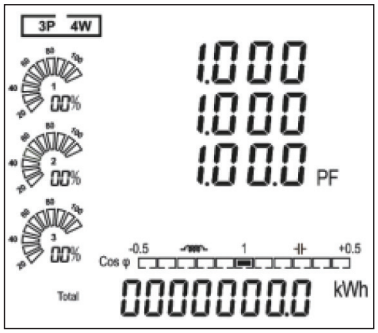
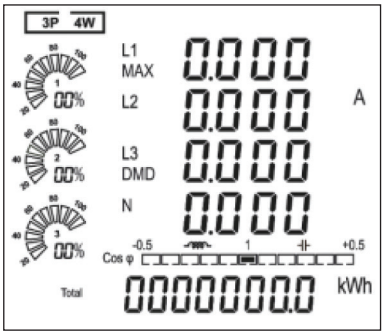
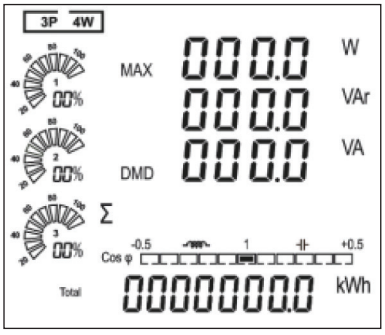
Indicator mode –network parameters display

Key	Function	Panel view
V/A	Total content of voltage harmonics divided into phases	 Fig. 14
V/A	Total content of current harmonics divided into phases	 Fig. 15
V/A	Phase sequence indicator (measured in relation to voltage and current terminals)	 Fig. 16
V/A	Selected voltage harmonics Press the key for two seconds and then select the number of the harmonic using keys **Up** or **Down**.	 Fig. 17

Multimeter operation DMM-5T-2

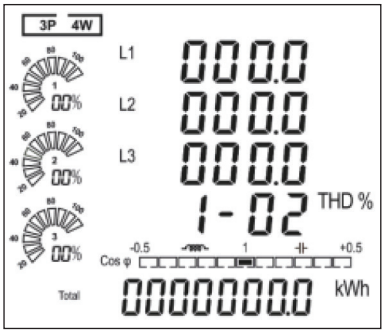
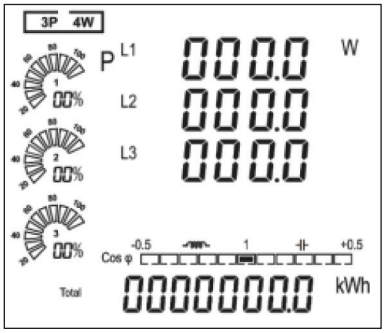
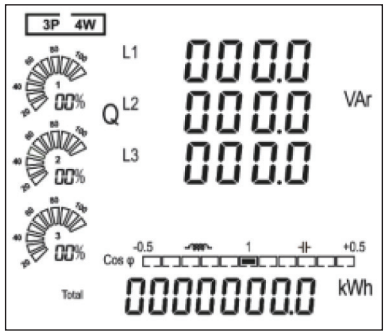
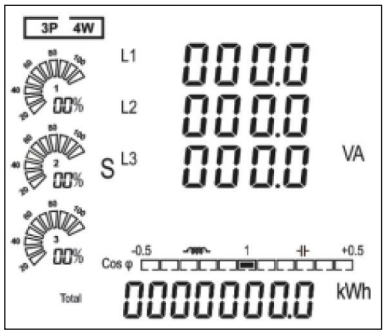
Multimeter operation

Indicator mode –network parameters display

Key	Function	Panel view
MD PF Hz	Total power factor and frequency	 Fig. 18
MD PF Hz	Power factor for the respective phases	 Fig. 19
MD PF Hz	Maximum current demand	 Fig. 20
MD PF Hz	Maximum power demand	 Fig. 21

Multimeter operation

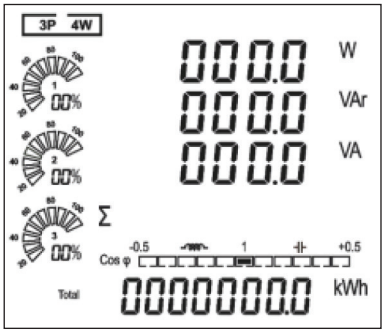
Indicator mode –network parameters display

Key	Function	Panel view
MD PF Hz	Selected current harmonic Press the key for two seconds and then select the number of the harmonic using keys **Up** or **Down**.	 Fig. 22
P	Active power dived into phases	 Fig. 23
P	Reactive power dived into phases	 Fig. 24
P	Apparent power dived into phases	 Fig. 25

Multimeter operation DMM-5T-2

Multimeter operation

Indicator mode –network parameters display

Key	Function	Panel view
P	Total active, reactive and apparent power	 Fig. 26
E	Total active energy	 Fig. 27
E	Total reactive energy	 Fig. 28
E	Imported active energy	 Fig. 29
E	Exported active energy	 Fig. 30
E	Imported reactive energy	 Fig. 31
E	Exported reactive energy	 Fig. 32

Multimeter operation

Configuration

	The method of parameters edition is always the same: If a parameter consists of a multi-digit number, then only one “flashing” digit of this number is edited at a time. To increase the value of the digit by 1 - press the **Up** key. To decrease the value of the digit by 1 - press the Down key. If you want to move on to edit next digit, press **Left** or **Right** key. To confirm the value of the parameter, hold the **Right** key pressed for at least two seconds. To leave the edition mode and return to the previous menu - press **ESC**.	

						
	ESC	**Left**	**Up**	**Down**	**Right**	

Configuration
Entering PIN number

In order to enter parameters edition mode, you need to enter PIN number.

	Multimeter is delivered with a default **PIN** number of **1000**	

When PASS is displayed, you must enter PIN number of the controller and confirm your choice by pushing **Right** for two seconds. If a wrong PIN number has been entered, error message will be displayed.

Note: You have to enter PIN number each time you want to enter settings.

	NOTE: **You need to make sure you will not lose or forget the password. If the password gets lost, you will not be able to enter configuration parameters of the meter.**	

Multimeter operation DMM-5T-2

Multimeter operation

Configuration

DMM-5T-2 settings are divided into five basic groups. You can change the group by pressing **Up** or **Down** key. In order to enter the selected group, you need to press **Right** for at least two seconds.

Symbol	Function
	RS-485 communication parameters: • device address in Modbus RTU network, • communication speed, • parity, • number of stop bits.
	Current ratio: • secondary side current, • primary side current.
	Voltage ratio: • secondary side current, • primary side current.
	Function of the first impulse output: • signalled value, • number of impulses, • duration of an impulse.
	Calculation of power demand: • method of power demand calculation, • length of calculation period.
	Time parameters: • time of display backlight, • period of view display in automatic view switching mode.
	System parameters: • type of measuring system, • correction of the current transformer connection direction • change of PIN code, • initiation of automatic view switching mode.
	Counters reset: • energy, • power demand.

Multimeter operation
Configuration
Communication parameters

A group of parameters enabling to connect multimeter as a slave device in Modbus RTU communication bus.

Network address	 Fig. 33	Multimeter address in Modbus RTU network Settings range: **1 – 247** Default value: **1**
Transmission rate	 Fig. 34	Multimeter address in Modbus RTU network Settings: **2400, 4800, 9600, 19200, 38400** bps Default value: **9600** bps
Parity	 Fig. 35	Settings of transmission parity in Modbus RTU network Settings: **None** – no parity control **Even** – parity control **Odd** – odd parity control Default value: **None**
Number of stop bits	 Fig. 36	Number of stop bits in data byte Settings: **1, 2** Default value: **1**

Multimeter operation DMM-5T-2

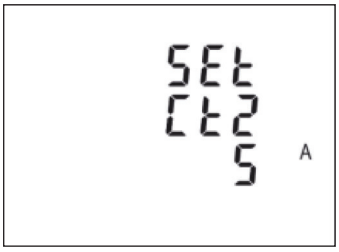
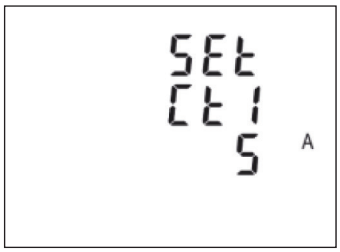
Multimeter operation

Configuration

CT current ratio

Parameters setting of current transformers connected to DMM-5T-2.

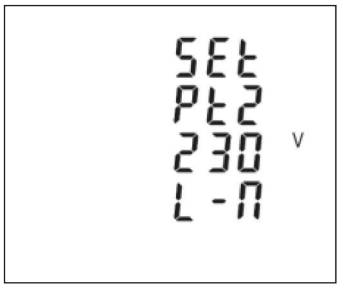
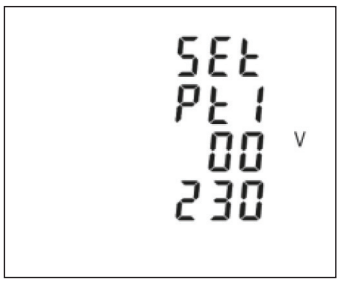
	When programming current transformers parameter in the meter you should set the value of the primary side for **CT1** parameter and secondary side for **CT2** parameter. For example, for the **100/5** transformer the following parameters should be set: **CT1 = 100** **CT2 = 5**	

CT2 – Secondary side current of current transformer	 Fig. 37	Nominal current of current transformer secondary side. Settings range: **1 or 5** A Default value: **5** A
CT1 – Primary side current of current transformer	 Fig. 38	Nominal current of primary side Settings range: **1 – 9999** Default value: **5**

Multimeter operation
Configuration
PT voltage ratio

Parameter settings of voltage transformers used when DMM- 5T-2 meter is used in a system for indirect measurement.

	When programming voltage transformers parameter in the meter, you should set the value of voltage ratio of the transformer $^{PT2}/_{PT1}$.	

PT2 – Secondary side voltage of voltage transformer	 Fig. 39	Nominal current of voltage transformer secondary side. Secondary side voltage of voltage transformer should be entered as L - N Settings range: **100 - 480 V** Default value: **100 V**
PT1 – Primary side voltage of voltage transformer	 Fig. 40	Nominal current of voltage transformer primary side. Settings range: **174 – 500000 V** Default value: **230 V**

Multimeter operation DMM-5T-2

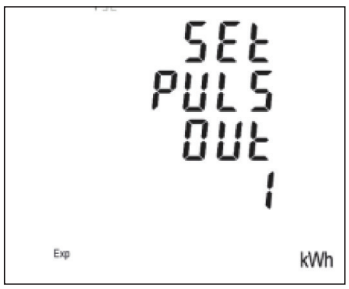
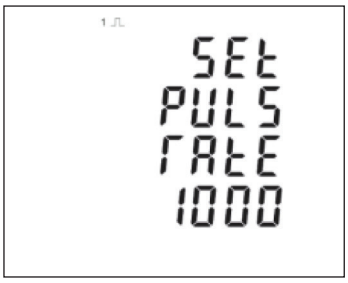
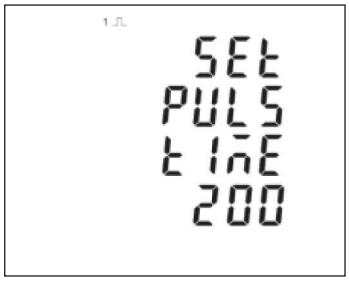
Multimeter operation

Configuration

PULSE impulse output

DMM-5T-2 is equipped with two impulse outputs (not available in standard version)

Output	Terminal	Function
Out 1	P1+	Universal, programmable impulse output. Selection of function, number and length of impulse.
Out 2	P2+	**Active energy** consumption indication. Pulse constant **3200 imp./kWh.**

Output function Out 1	 Fig. 41	Selection of measured value indicated on impulse output Out 1. Available values: **Total kWh** – Total active energy consumption **Total kVarh** – Total reactive energy consumption **Imp kWh** – Imported active energy **Exp kWh** – Exported active energy **Imp kVarh** – Imported reactive energy **Exp kVarh** – Exported reactive energy Default value: **Exp kWh**
Impulsing constant for output OUT 1	 Fig. 42	Number of impulses at OUT 1 output for the change of monitored value by 1 kWh / 1 kVarh. Available values: **0.001, 0.01, 0.1, 1, 10, 100, 1000** imp./(kWh, kVarh) Default value: **0.001** imp./(kWh, kVarh)
Impulse duration for output OUT 1	 Fig. 43	Duration of impulse at OUT 1 output Available values: **60, 100, 200** ms Default value: **100** ms

Multimeter operation

Configuration

Power demand

Parameters enabling the user to define the method of power demand calculating and to define the time on the ground of which the value of maximum power and current demand will be determined.

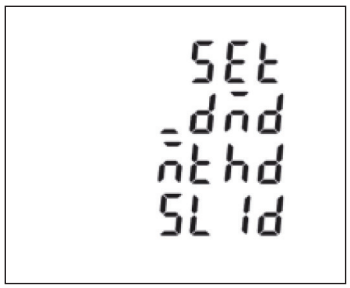
<table>
<tr>
<td>Method of calculating power demand</td>
<td> 

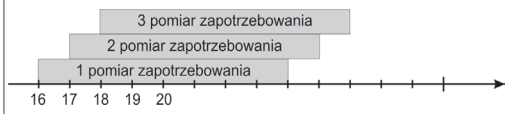
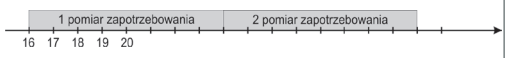
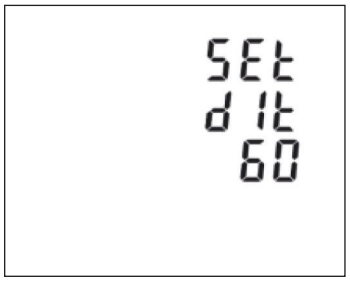
Fig. 44</td>
<td>Parameter determining how maximum current and power demand will be calculated.
Available settings:
<table>
<tr>
<td>SLid</td>
<td>Measurement of power and energy consumption is made every minute. Each new measurement and (n-1) of previous measurements is used for determination of present power demand.
 
</td>
</tr>
<tr>
<td>FIX</td>
<td>Measurement of power and energy consumption is made every minute. Power demand is calculated only after making full n measurements.
 
</td>
</tr>
</table>
<table>
<tr>
<td></td>
<td>Power demand indicates the biggest value of power demand falling on a set time period. Decrease or removal of the load does not trigger decrease of the calculated demand.
In order to reset the present demand, you must use the Rest menu described in the further part of the manual.</td>
</tr>
</table></td>
</tr>
<tr>
<td>Time of calculating power demand</td>
<td> 

Fig. 45</td>
<td>Time period that is considered in calculating maximum power demand.

Available settings: OFF (power demand calculating switched OFF) 5, 8, 10, 15, 20, 30, 60 min.

Default value: 60 min.</td>
</tr>
</table>

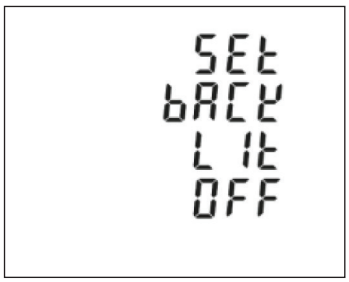
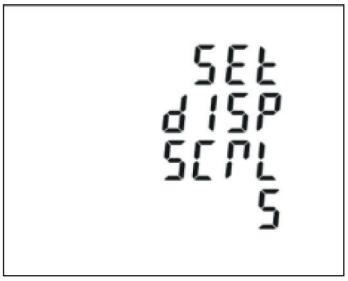
Multimeter operation DMM-5T-2

Multimeter operation

Configuration

Time functions

A set of parameters connected with:

Time of display backlight	 Fig. 46	Parameter setting the idle time (calculated from the moment of the last pressing the key after which LCD display backlight will be switched off). Available settings: **OFF** (always switched off), **ON** (always switched on), **5, 10, 30, 60 min.** Default value: **60 min.**
Frequency of automatic view switching	 Fig. 47	If the meter is equipped with the option of automatic switching of view with measured values, then this parameter determines how long a single view is displayed. Available settings: **1 – 255 s.** Default value: **5 s.** Switching ON/OFF automatic view switching is available through **Syst** menu, or by long pressing of **ESC**.

Multimeter operation
Configuration
System parameters

A group of parameters connected with:
- selection of measuring system,
- correction of current transformer connection direction,
- change of PIN code,
- activation of automatic view switching mode.

<table>
<tr>
<td>Configuration of measuring system</td>
<td> 

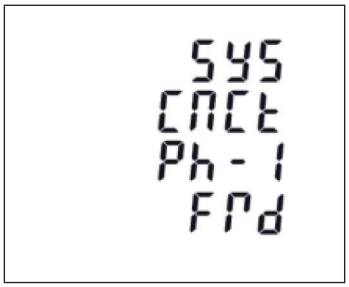
Fig. 48</td>
<td>Selection of measuring system:
<table>
<tr><td>⚠</td><td>The type of measuring system set here must be in accordance with the real connection system of the meter and the type of the measured electric network.</td></tr>
</table>
Available settings:
<table>
<tr><td>1P2</td><td>One-phase, two-wire network
(L + N)</td></tr>
<tr><td>3P3</td><td>Three-phase, three-wire network
(L1 + L2 + L3)</td></tr>
<tr><td>3P4</td><td>Three-phase, four-wire network
(L1 + L2 + L3 + N)</td></tr>
</table></td>
</tr>
<tr>
<td>Correction of current transformers connection</td>
<td> 

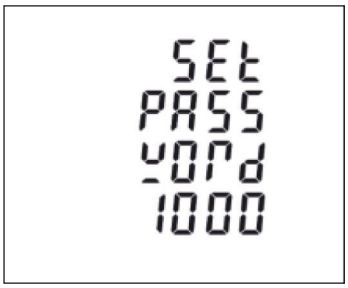
Fig. 49</td>
<td>In the situation when current transformers secondary windings direction has been connected in the wrong direction, it is possible to correct them through the program without the necessity to make changes in the electrical system.

First, through the key Up or Down you must select the number of the phase for which the correction is to be made, next confirm your selection by long pressing of OK, and finally with the keys Up or Down choose and confirm the proper option.

Available settings:
<table>
<tr><td>FNd</td><td>When the current transformer is connected correctly</td></tr>
<tr><td>rEV</td><td>When the current transformer is connected in the reverse way</td></tr>
</table></td>
</tr>
</table>

Multimeter operation DMM-5T-2

Multimeter operation
Configuration
System parameters

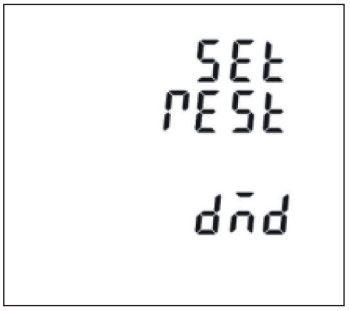
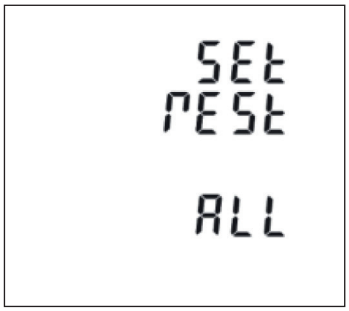
PIN number	 Fig. 50	Entering a new **PIN** number limiting the access to the meter. Available settings: **0 - 9999** Default value: **1000.** **NOTE:** **You need to make sure you will not lose or forget the password. If the password gets lost, you will not be able to enter configuration parameters of the meter.**
Automatic view switching	 Fig. 51	This parameter decides whether the meter will display continuously one view with measurement results or automatic view switching will take place. Available settings: OFF — Automatic view switching **switched off** On — Automatic view switching **switched on** The time of a single view display is set in **time** menu, **disp SCrL** parameter.

Multimeter operation

Configuration

Meters reset

A group of parameters intended to reset energy consumption meters and power demand calculations.

Energy meters reset	 Fig. 52	Reset of all active and reactive energy meters. In order to reset indications of meters, press **OK** until **Engy** starts flashing. Next, release and long press **Engy** key again.
Power demand indicators reset	 Fig. 53	Reset of power and current demand indicators In order to reset power demand indicators, press **OK** until **dmd** starts flashing. Next, release and long press **dmd** key again.
Reset of all meters	 Fig. 54	This option enables simultaneous reset of energy consumption meters and current demand indicators In order to reset all meters, press **OK** until **ALL** starts flashing. Next, release and long press **ALL** key again.

Multimeter operation DMM-5T-2

Multimeter operation

Configuration

Connection method

Communication lines A and B of the RS485 interface should be connected to terminals A+ (line A) and B- (line B) of the multimeter.

	It is recommended to use dedicated communication wires suitable for RS485 transmission. In each case the communication wire should be shielded and one of the shield ends should be connected to **PE** level.	

Read / Write of parameters through RS485

Access to parameters is accomplished in accordance with the Modbus RTU standard. Available parameters are divided into two groups - in the first one all measurement results are available, in the second - meter configuration parameters are gathered.

List of registers with measurement results

	Measurement registers readout: • command **0x04 – Read Input Registers** no possibility to write in measurement registers Data format: • **Float** – Floating point number, 32-bits (4-bytes) Availability of measurements results depends on the selected measuring system • **T** – measurement available for the selected measuring system • **-** – measurement unavailable	

Modbus Register		Parameter	Unit	Measuring system		
Dec	Hex			3P4W	3P3W	1P2W
0	0x0000	Phase L1-phase voltage (L1-N)	V	T	-	T
2	0x0002	Phase L2-phase voltage (L2-N)	V	T	-	-
4	0x0004	Phase L3-phase voltage (L3-N)	V	T	-	-
6	0x0006	Phase L1-current	A	T	T	T
8	0x0008	Phase L2-current	A	T	T	T
10	0x000A	Phase L3-current	A	T	T	T
12	0x000C	Phase L1-active power	W	T	-	T
14	0x000E	Phase L2-active power	W	T	-	-
16	0x0010	Phase L3-active power	W	T	-	-
18	0x0012	Phase L1-apparent power	VA	T	-	T
20	0x0014	Phase L2-apparent power	VA	T	-	-
22	0x0016	Phase L3-apparent power	VA	T	-	-

Communication

List of registers with measurement results

Modbus Register		Parameter	Unit	Measuring system		
Dec	Hex			3P4W	3P3W	1P2W
24	0x0018	Phase L1-reactive power	Var	T	-	T
26	0x001A	Phase L2-reactive power	Var	T	-	-
28	0x001C	Phase L3-reactive power	Var	T	-	-
30	0x001E	Phase L1-power factor (1)	-	T	-	T
32	0x0020	Phase L2-power factor (1)	-	T	-	-
34	0x0022	Phase L3-power factor (1)	-	T	-	-
36	0x0024	Phase L1-phase shift	°	T	-	T
38	0x0026	Phase L2-phase shift	°	T	-	-
40	0x0028	Phase L3-phase shift	°	T	-	-
42	0x002A	Average phase voltage (L – N)	V	T	T	T
46	0x002E	Average phase current	A	T	T	T
48	0x0030	Sum of phase currents	A	T	T	T
52	0x0034	Total active power	W	T	T	T
56	0x0038	Total apparent power	VA	T	T	T
60	0x003C	Total reactive power	VAr	T	T	T
62	0x003E	Total power factor (1)	-	T	T	T
66	0x0042	Total angular shift	°	T	T	T
70	0x0046	Voltage frequency	Hz	T	T	T
72	0x0048	Imported active power (since the last reset)	kWh	T	T	T
74	0x004A	Exported active power (since the last reset)	kWh	T	T	T
76	0x004C	Imported reactive power (since the last reset)	kVArh	T	T	T
78	0x004E	Exported reactive power (since the last reset)	kVArh	T	T	T
80	0x0050	VAh number (since the last reset)	kVAh	T	T	T
82	0x0052	Ah number (since the last reset)	VAh	T	T	T
84	0x0054	Total power demand (2)	W	T	T	T
86	0x0056	Maximum power demand (2)	W	T	T	T
88	0x0058	Power import demand	W	T	T	T
90	0x005A	Maximum power import demand	W	T	T	T
92	0x005C	Power export demand	W	T	T	T
94	0x005E	Maximum power export demand	W	T	T	T

Multimeter operation DMM-5T-2

Communication

List of registers with measurement results

Modbus Register		Parameter	Unit	Measuring system		
Dec	Hex			3P4W	3P3W	1P2W
100	0x0064	Total apparent power demand	VA	T	T	T
102	0x0066	Maximum apparent power demand	VA	T	T	T
104	0x0068	Current demand of the neutral conductor	A	T	-	-
106	0x006A	Maximum current demand of the neutral conductor	A	T	-	-
108	0x006C	Total reactive energy demand (2)	VAr	T	-	T
110	0x006E	Maximum reactive energy demand (2)	VAr	T	-	T
160	0x00A0	Phase sequence (measurement at voltage inputs) 1 – positive phase sequence 2 – negative phase sequence	-	T	T	-
162	0x00A2	Phase sequence (measurement at current inputs) 1 – positive phase sequence 2 – negative phase sequence	-	T	T	-
192	0x00C0	Resultant load character 1 – resistive 2 – inductive 3 – capacitive	-	T	T	T
194	0x00C2	Phase L1 – load character 1 – resistive 2 – inductive 3 – capacitive	-	T	T	T
196	0x00C4	Phase L2 – load character 1 – resistive 2 – inductive 3 – capacitive	-	T	T	-
198	0x00C6	Phase L3 – load character 1 – resistive 2 – inductive 3 – capacitive	-	T	T	-
200	0x00C8	Phase-to-phase voltage L1 – L2	V	T	T	-
202	0x00CA	Phase-to-phase voltage L2 – L3	V	T	T	-
204	0x00CC	Phase-to-phase voltage L3 – L1	V	T	T	-
206	0x00CE	Average phase-to phase voltage	V	T	T	-
224	0x00E0	Current of the neutral conductor	A	T	-	-
234	0x00EA	Phase L1 – Contents of voltage harmonics (L1 – N)	%	T	T	T
236	0x00EC	Phase L2 – Contents of voltage harmonics (L2 – N)	%	T	-	-

Communication

List of registers with measurement results

Modbus Register		Parameter	Unit	Measuring system		
Dec	Hex			3P4W	3P3W	1P2W
238	0x00EE	Phase L3 – Contents of voltage harmonics (L3 – N)	%	T	-	-
240	0x00F0	Phase L1 – Contents of current harmonics	%	T	T	T
242	0x00F2	Phase L2 – Contents of current harmonics	%	T	T	-
244	0x00F4	Phase L3 – Contents of current harmonics	%	T	T	-
248	0x00F8	Average phase contents of voltage harmonics	%	T	-	T
250	0x00FA	Average phase contents of current harmonics	%	T	T	T
258	0x0102	Phase L1 – current demand	A	T	T	T
260	0x0104	Phase L2 – current demand	A	T	T	-
262	0x0106	Phase L3 – current demand	A	T	T	-
264	0x0108	Phase L1 – mmaximum current demand	A	T	T	T
266	0x010A	Phase L2 – maximum current demand	A	T	T	-
268	0x010C	Phase L3 – maximum current demand	A	T	T	-
334	0x014E	Phase-to-phase voltage L1 – L2: contents of harmonics	%	T	T	-
336	0x0150	Phase-to-phase voltage L2 – L3: contents of harmonics	%	T	T	-
338	0x0152	Phase-to-phase voltage L3 – L1: contents of harmonics	%	T	T	-
340	0x0154	Phase-to-phase voltages: average contents of harmonics	%	T	T	-
342	0x0156	Total consumption of active energy ([3])	kWh	T	T	T
344	0x0158	Total consumption of reactive energy ([3])	kVArh	T	T	T
346	0x015A	Phase L1: imported active energy	kWh	T	T	T
348	0x015C	Phase L2: imported active energy	kWh	T	T	-
350	0x015E	Phase L3: imported active energy	kWh	T	T	-
352	0x0160	Phase L1: exported active energy	kWh	T	T	T
354	0x0162	Phase L2: exported active energy	kWh	T	T	-
356	0x0164	Phase L3: exported active energy	kWh	T	T	-
358	0x0166	Phase L1: Total consumption of active energy	kWh	T	T	T
360	0x0168	Phase L2: Total consumption of active energy	kWh	T	T	-
362	0x016A	Phase L3: Total consumption of active energy	kWh	T	T	-
364	0x016C	Phase L1: imported reactive energy	kVArh	T	T	T
366	0x016E	Phase L2: imported reactive energy	kVArh	T	T	-
368	0x0170	Phase L3: imported reactive energy	kVArh	T	T	-

Multimeter operation DMM-5T-2

Communication

List of registers with measurement results

Modbus Register		Parameter	Unit	Measuring system		
Dec	Hex			3P4W	3P3W	1P2W
370	0x0172	Phase L1: exported reactive energy	kVArh	T	T	T
372	0x0174	Phase L2: exported reactive energy	kVArh	T	T	-
374	0x0176	Phase L3: exported reactive energy	kVArh	T	T	-
376	0x0178	Phase L1: Total consumption of reactive energy	kVArh	T	T	T
378	0x017A	Phase L2: Total consumption of reactive energy	kVArh	T	T	-
380	0x017C	Phase L3: Total consumption of reactive energy	kVArh	T	T	-
402-524	0x0192-0x020C	Phase L1: Voltage harmonics (2 … 63)	%	T	T	T
526-648	0x020E-0x0288	Phase L2: Voltage harmonics (2 … 63)	%	T	T	-
650-772	0x028A-0x0304	Phase L3: Voltage harmonics (2 … 63)	%	T	T	-
774-896	0x0306-0x0380	Phase L1: Current harmonics (2 … 63)	%	T	T	T
898-1020	0x0382-0x03FC	Phase L2: Current harmonics (2 … 63)	%	T	T	-
1022-1144	0x03FE-0x0478	Phase L3: Current harmonics (2 … 63)	%	T	T	-
1146	0x047A	Phase L1: Sum of voltage harmonics	%	T	T	T
1148	0x047C	Phase L2: Sum of voltage harmonics	%	T	T	-
1150	0x047E	Phase L3: Sum of voltage harmonics	%	T	T	-
1152	0x0480	Phase L1: Sum of current harmonics	%	T	T	T
1154	0x0482	Phase L2: Sum of current harmonics	%	T	T	-
1156	0x0484	Phase L3: Sum of current harmonics	%	T	T	-

(1) Power factor has a sign indicating the current flow direction.

(2) Total power demand is calculated as a difference of the imported and exported value (import – export)

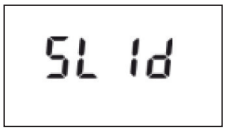
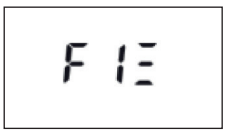
(3) Total active and reactive energy consumption is calculated as a sum of imported and exported energy (import + export).

Communication

List of registers with meter configuration

Read of configuration registers:
instruction **0x03 – Read Holding Registers**
Write data into configuration registers
instruction **0x10 – Write Multiple Register**
Access to registers:
- **R** – only read register
- **R/W** – read-write register
- **W** – only write register

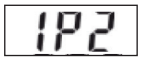
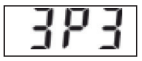
Data format:
- **Float** – Floating point number, 32-bits (4-bytes)
- **U16** – Integer number, no sign, 16-bits (2-bytes)

Register		Access	Format	Function
Dec	Hex			
0	0x0000	R	Float	Time (in minutes) remaining to the first full determination of current demand. If the value is bigger than 0, it means that calculation of the demand has not been finished.
2	0x0002	R/W	Float	Time period on the ground of which current and power demand will be calculated. Settings range: **0 – 60 min.**
4	0x0004	R/W	Float	In case of „Slide" setting of the power demand calculation method, this parameter defines the interval (in minutes) of updating the value of current and power demand. Settings range: 1 – (Register 0x0002 – 1)
6	0x0006	R/W	Float	The method of power demand calculating Settings: 0 –  – This value is calculated on the ground of the period set in register 0x0002, but its value update will be made with a step set in register 0x0004. 1 –  – This value is calculated on the ground of the period set in register 0x0002 and updated after the end of a full calculation period.

Multimeter operation DMM-5T-2

Communication

List of registers with meter configuration

<table>
<tr><th colspan="2">Register</th><th>Access</th><th>Format</th><th>Function</th></tr>
<tr><th>Dec</th><th>Hex</th><th></th><th></th><th></th></tr>
<tr><td>10</td><td>0x000A</td><td>R/W</td><td>Float</td><td>Choice of measuring system
Settings:<table><tr><td>1</td><td>  </td><td>One-phase, two-wire network</td></tr><tr><td>2</td><td>  </td><td>Three-phase, three-wire network</td></tr><tr><td>3</td><td>  </td><td>Three-phase, four-wire network</td></tr></table><table><tr><td></td><td>The change requires first of all entering PIN number in the register 0x000E and unlocking the access to critical settings.</td></tr></table></td></tr>
<tr><td>12</td><td>0x000C</td><td>R/W</td><td>Float</td><td>Impulse output OUT1 – impulse duration</td></tr>
<tr><td>14</td><td>0x000E</td><td>R/W</td><td>Float</td><td>Unlocking access to critical settings of the meter.<table><tr><td></td><td>Some parameters crucial from the meter correct operation point of view require additional confirmation in the form of entered PIN number.
Once entered PIN number unlocks the access to configuration until the moment when power supply is off or access is locked by entering a wrong PIN number to this register.</td></tr></table>Read:<table><tr><td>0</td><td>Access to critical parameters locked</td></tr><tr><td>100</td><td>Access to critical parameters unlocked</td></tr></table>Write: PIN number of the meter</td></tr>
<tr><td>18</td><td>0x0012</td><td>R/W</td><td>Float</td><td>RS485-communication – Parity control and number of stop bits.
Settings:<table><tr><td>0</td><td>1 stop bit, no parity control</td></tr><tr><td>1</td><td>1 stop bit, parity control (even)</td></tr><tr><td>2</td><td>1 stop bit, odd parity control (odd)</td></tr><tr><td>3</td><td>2 stop bits, no parity control</td></tr></table></td></tr>
<tr><td>20</td><td>0x0014</td><td>R/W</td><td>Float</td><td>RS485-communication – Address of the meter in Modbus network
Settings: 1-247</td></tr>
</table>

Communication

List of registers with meter configuration

<table>
<tr><th colspan="2">Register</th><th rowspan="2">Access</th><th rowspan="2">Format</th><th rowspan="2">Function</th></tr>
<tr><th>Dec</th><th>Hex</th></tr>
<tr><td>22</td><td>0x0016</td><td>R/W</td><td>Float</td><td>Impulse output OUT1 – Pulse constant
Settings:<table><tr><td>0</td><td>0.001 imp/kWh</td></tr><tr><td>1</td><td>0.01 imp/kWh</td></tr><tr><td>2</td><td>0.1 imp/kWh</td></tr><tr><td>3</td><td>1 imp/kWh</td></tr><tr><td>4</td><td>10 imp/kWh</td></tr><tr><td>5</td><td>100 imp/kWh</td></tr><tr><td>6</td><td>1000 imp/kWh</td></tr></table></td></tr>
<tr><td>24</td><td>0x0018</td><td>R/W</td><td>Float</td><td>PIN number
  Write to register 0x0018 changes PIN number of the meter
Settings: 1-9999</td></tr>
<tr><td>28</td><td>0x001C</td><td>R/W</td><td>Float</td><td>RS485-communication – transmission speed
Settings:<table><tr><td>0</td><td>2400 bps</td></tr><tr><td>1</td><td>4800 bps</td></tr><tr><td>2</td><td>9600 bps</td></tr><tr><td>3</td><td>19200 bps</td></tr><tr><td>4</td><td>38400 bps</td></tr><tr><td>5</td><td>1200 bps</td></tr></table></td></tr>
<tr><td>46</td><td>0x002E</td><td>R/W</td><td>Float</td><td>Voltage ratio – primary voltage PT1
Nominal voltage of the primary side. Settings: 174 – 500000 V
  The change requires first of all entering PIN number in the register 0x000E and unlocking the access to critical settings.</td></tr>
<tr><td>48</td><td>0x0030</td><td>R/W</td><td>Float</td><td>Voltage ratio – secondary voltage PT2
Nominal voltage of the secondary side. Settings: 100 – 480 V
  The change requires first of all entering PIN number in the register 0x000E and unlocking the access to critical settings.</td></tr>
</table>

Multimeter operation DMM-5T-2

Communication

List of registers with meter configuration

<table>
<tr><th colspan="2">Register</th><th>Access</th><th>Format</th><th>Function</th></tr>
<tr><th>Dec</th><th>Hex</th><th></th><th></th><th></th></tr>
<tr><td>50</td><td>0x0032</td><td>R/W</td><td>Float</td><td>Current ratio – Primary current CT1
Nominal current of the primary side of current transformer.
Settings: 1 – 9999 A
The change requires first of all entering PIN number in the register 0x000E and unlocking the access to critical settings.</td></tr>
<tr><td>52</td><td>0x0034</td><td>R/W</td><td>Float</td><td>Current ratio – Secondary current CT2
Nominal primary current of the secondary side of the current transformer. Settings:
1 – 1A
5 – 5A
The change requires first of all entering PIN number in the register 0x000E and unlocking the access to critical settings.</td></tr>
<tr><td>56</td><td>0x0038</td><td>R/W</td><td>Float</td><td>Correction of current transformer connection direction.
This parameter allows correction through the program of the direction of current transformer connection.
In the situation when the transformer on a respective phase is connected correctly, then you must select option T, in case of reverse connection - option N.
Settings:
0 – T T T
1 – N T T
2 – T N T
3 – N N T
4 – T T N
5 – N T N
6 – T N N
7 – N N N
The change requires first of all entering PIN number in the register 0x000E and unlocking the access to critical settings.</td></tr>
</table>

Communication

List of registers with meter configuration

Register		Access	Format	Function
Dec	Hex			
58	0x003A	R/W	Float	Time period of switching views with measurements If the option of automatic switching of views with measured values is active in the meter, then this parameter determines how long a single view is displayed. Settings range: 1 – 255 s
60	0x003C	R/W	Float	Display backlight time This parameter sets the idle time (counted from the moment of the last pressing of the key) after which LCD backlight will be switched off. Settings range: 0 – 120 min. 0 value means that the display will be backlit all the time
86	0x0056	R/W	Float	Impulse output OUT1 – selection of indicated value The selection of parameter whose change will be indicated on the impulse output OUT1 Settings: 1 – Imported active energy 2 – Total active energy 4 – Exported active energy 5 – Imported reactive energy 6 – Total reactive energy 8 – Exported reactive energy
61456	0xF010	W	U16	Meter indicators reset Settings: 0 – Reset of current and power demand indicators 3 – Reset of energy meters

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