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DMM-3T
DIGITAL MULTIMETER INDICATOR
three-phase

www.fif.com.pl

F&F products are covered by an 24 months warranty from date of purchase

Information of safety use of multimeter are identified by symbols. All information and recommendations bearing these symbols should be strictly observed.

Danger of electric shock.

The potentially dangerous situation which could lead to threats to personnel or damage to the operating of multimeter.

Information concerning the construction, operation and maintenance of multimeter.

Important information, a valuable tip.

Practical advice, solve the problem.

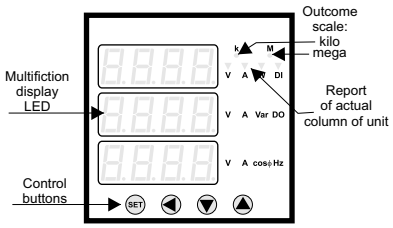
An example of the use or performance.

INTRODUCTION

DMM-3T is a microprocessor multimeter designed for monitoring three-phase power supply. Multimeter enables execution of high precision measurements of all the basic network parameters, such as phase voltages and currents, voltage wire, frequency, active power, passive power, apparent power, and power ratio. In addition, multimeter enables full, four-quadrant measure of energy (both charged, and casted to the network).

To monitor of the measured svalues and configuration of the equipment used is located on the front panel multifunction display, and LEDs. Programming of multimeter allows four-buttons keyboard. Built-in RS485 interface, and implemented a communication protocol MODBUS RTU, communication device provides a wide range of hardware and software industries.

HANDLING OF MULTIMETER



Picture 5) View of control panel

In order to ensure a comfortable handle of multimeter on the control panel was placed three lines multifunction LED display and six LEDs to indicate the measured value and unit of scale result. The programming device is used four control buttons:

SET *In monitor mode (display of measured values), press this button to go to the programming mode of multimeter. In programming mode, this button is used to enter the selection of menus, and saving the parameter values..*

The move button. When you move on the menus of press it cause to return to the previous menu item. In the numerical change mode of value of parameter, press it cause to move the cursor one digit to the left. When the value is displayed the total active power, passive power, or total ratio of power, the press it can see the successive measured values for the various phases..

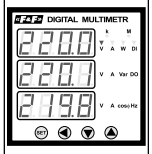
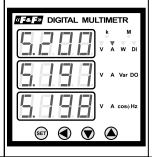
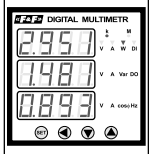
In programming mode, the buttons are used to increase or decrease the value of the parameter being edited. In monitor mode, the buttons are used to switch on preview of the next measured value (Table 6)

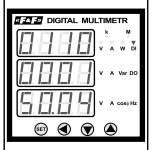
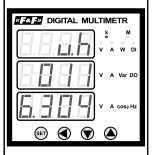
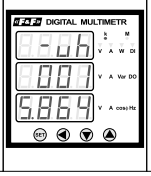
MONITOR

The primary mode of multimeter is the monitor mode that displays the measured values. Depending on configuration, it is possible to set a continuous display of views of one of the eight measured values, or cyclical switch between them. The displayed value can be directly changed from the keyboard by pressing buttons ▲ or ▼.

Detailed discussion of the various views presented on the following pages (Table 6). The program way ofset the views will presented in further parts of the instructions.

Please take particular attention to the explanations of communications as part of the value is displayed in two rows of the display, which can lead to misinterpretation of results.

SYMBOL		EXAMPLE	DESCRIPTION
0	CYC		*Cyclic view of all monitored values.*
1	3U		Values of voltage: U_A,U_B,U_C - to four-wire network; U_{AB},U_{BC},U_{AC}-to three-wire network Example: voltage U_A = 220.0 V voltage U_B = 220.1 V voltage U_C = 219.8 V To observe the voltage between wires of four wire network press the button ◀.
2	3A		Values of phases current. Example: current I_A = 5.200 A currnte I_B = 5.197 A current I_C = 5.198 A
3	PAPF		Displayed various values .Example: Toltal active power 2.951 kW Total passive power 1.481 kvar Total power ratio 0.893 (the signof power ratio complies with the sign of the active power) To see the power values for the various phases, press ▯

SYMBOL		EXAMPLE	DESCRIPTION
4	InH2		Monitoring: Digital inputs (the first row of display), Frequency (the third row of display) Example: Inputs: fourth and first are opened, second and third are closed Frequency: 50.04 Hz
5	Ah		Displayed plus value of active power. Shown on the example of the value of taken active power; 116.304 kWh:
6	-Ah		Displayed negative value of active power. Shown on the example of the value of casted active power; 15.864 kWh

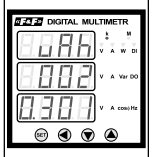
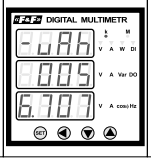
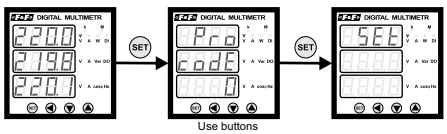
SYMBOL		EXAMPLE	DESCRIPTION
7	rAh		Display plus value of passive power. Shown on the example of the value of taken passive power 20.301 kvarh
8	-rAh		Display negative value of passive power. Shown on the example of the value of casted passive power 56.707 kvarh

Table 6) Summary of views of the measured volumes.

CONFIGURATION

To access the configuration options should be in monitor mode, press the SET button. Next, put a password to access the device and enter it with the SET. An example of the case is shown in the following picture.



Picture 6) Diagram of entering access password.

The new device have default set password on the value 0.

Menu is organized on a hierarchical order. To navigate the menus, use the ▲ and ▼ buttons. *The pass to the submenu, or to edit the parameter allows the SET button, while the withdrawal of the higher-level menu provides button* ◀.

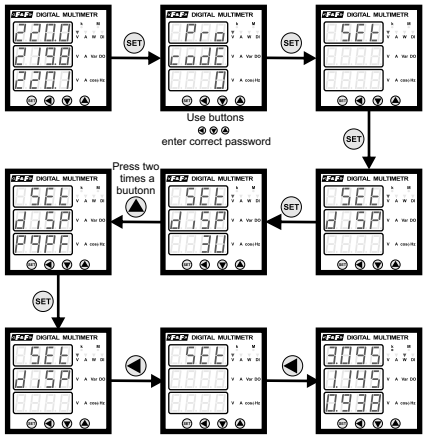
As presented in the following pages are presented in Table 8, all configuration options of multimeter.

Particular attention should be taken in the event of a change password to access the parameters. Do not remember the new password will prevent access to the configuration multimeter.

MESSAGE ON DISPLAY			VALUE OF PARAMETER	DESCRIPTION
FIRST ROW	SECOND ROW	THIRD ROW		
Pro	codE	0000	/	Entering password (enter - by button SET)
SEt	diSP	0000		Select information displayed in monitor mode (Table8)
	t	0000	1.0 ~ 20.0	Display time (in sec.) of various parameters in the cyclical switching views.
	FiLt	0000	0 ~ 50	Fixed digital filter (up to the number of samples averaged will be measured).
	codE	0000	0 ~ 9999	Defining new access password.
	CLrE	0000	YES	Pressing button SET cause reset of energy meter.

MESSAGE ON DISPLAY			VALUE OF PARAMETER	DESCRIPTION
FIRST ROW	SECOND ROW	THIRD ROW		
Set parameters of measured network				
inP	nEt		n3.3	Type of connected network: n3.3 - three-wire network n3.4 - four-wire network
			n3.4	
	U		57.7	Range of measured voltages [V]
			100	
			220	
			380	
	Pt		1~ 9999	Transmission of transformer in voltage line
	A		1A	Measurement current range [A]
			5A	
	Ct		1~ 9999	Transmission of transformer in current line
Conn	Addr		1 ~ 247	Address of device in MODBUS RTU (Rs485) network.
	bAud		oFF	Speed transfer oFF - Communication disabled 1200 - 1200 bit/s 2400 - 2400 bit/s 4800 - 4800 bit/s 9600 - 9600 bit/s
			1200	
			2400	
			4800	
			9600	

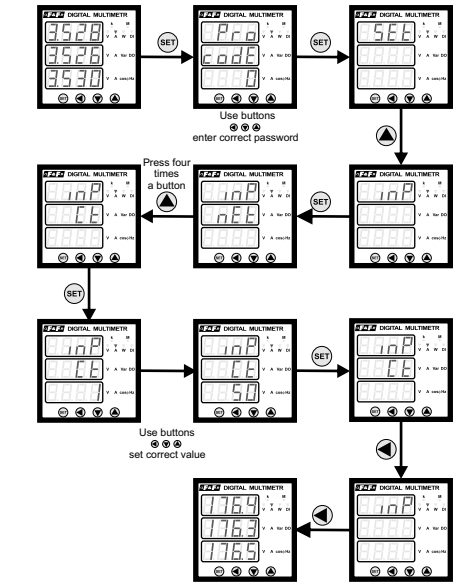
Example - Program change of displayed value



Picture 7) Change of monitor settings

Example - Change value of current relay

The next picture shows the changes value of a current relay of value 1 to 50.



Picture 8) Change settings of current relay.

COMMUNICATION PROTOCOL

Multimeter DMM-3T is equipped with RS485 interface and it supports the MODBUS RTU communication protocol.

Communications in MODBUS RTU network is paramount between the device (MASTER) and child devices (SLAVE). However, communication may only make your MASTER, but devices of type SLAVE can only respond to query.

Data between device and child device are sent in the form of bytes arranged in 11-bit packages. Each package starts with a start bit (value zero), then is sent to the byte with data(8 bits), and finally sent two stop bit (value 1).

Individual packages make up the frame of a certain communication structure::

ADDRESS	FUNCTION	DATA	CRC
1 BYTE	1 BYTE	N BYTES	2 BYTES

Table 10) The format of the frame of data protocol MODBUS RTU.

The device MASTER begins to each frame from the address of SLAVE device to which the consignment is addressed. Each device SLAVEmust have a unique address from 1 to 247. In the event that the SLAVE device sends a response to query, it is placed in the address field the address of its own to identify the network address. It make possible bfrom where came the respond. The next byte frames sent by the MASTER device contains the code to be executed by the device SLAVE. In response SLAVE sends a frame with the same function code. Multimeter identifies and supports two command codes:

***03H** - The number of registers to read from the device SLAVE*

***10H** - The command to save many records for the device SLAVE.*

(More detailed information about this topic can be found later in this guide). Subsequently, the sending or receiving data. The number of transmitted data depends on the function code.

After sending / receiving of data frames are attached to two bytes of the CRC checksum. CRC sum is intended to eliminate errors that may occur during transmission, for example due to the impact of strong electromagnetic interference. A checksum is always preparing a device which sends data frame. Receiving device then calculates the CRC again with the data received and compares the received value. If the sum of the two match, the device proceeds to the processing of orders. If you receive an error message that is ignored.

To calculate the sum of the CRC is taken into account, only eight bits of data in each packet. Does not take into account the start bit and stop bits.

The checksum algorithm is as follows:

1) *Prepared a special 16-bit register (denote it by REGISTER_CRC) to which the recorded value is FFFFH.*
2) *Then calculated the function XOR (Exclusive-Or) between the first received data byte and the another byte REGISTER_CRC.*
3) *REGISTER_CRC is shifts by one bit to the right, in addition to free space on the right side by zero.*
4) *Checks the value of the bit which has been "pushed" from the register this transfer. If its value was zero, then again repeats the second step. If the value of the bit was one, then the content of REGISTER_CRC is calculated XOR function with the value A001H.*
5) *Repeated the third and fourth step until the whole process the received data byte. That is so long until done eight shifts of REGISTER_CRC to right.*
6) *You must repeat the operation from the second to the fifth step, the next byte of data is received.*
7) *When processed in this way will be the first five bytes of data, determining a checksum is completed. Value of the sum will be stored in REGISTER_CRC.*

ERROR PROCESSING

If an error is etched in the transmitted information (other than the sum of incorrect CRC) receiving device will react to it by sending a specially crafted error.

This communication consists of five bytes. The first byte of the address. The second byte contains a code taken from the order in which to beat the highest value was further set to one (to distinguish it from the code function error code). Next byte contains the code of one of the four described in Table 11 errors. Communication frame ends two bytes with the sum CRC.

Code	Error name	Error description
01H	Wrong function code	This device do not suport order with that code
02H	Wrong register number	Address of register is located outside the device's address
03H	Wrong number of registers	Number of registers to read/write addresses exceeds the area
04H	Wrong content of register	Number recorded in the register exceeds the permitted value for

Table 11) Error codes gives by multimeter

Example - Reading data from the multimeter

This example contains a sample frame of retrieving the device SLAVE address 01H contents of two registers, starting with the register address 28H.

Device address		01H
Read command code contents of registers		03H
Address of first register to be read	Up byte	00H
	Up byte	28H
Number of the read registers	Up byte	00H
	Up byte	02H
Checksum CRC	Up byte	44H
	Up byte	03H

Table 12) Message from device MASTER to SLAVE.

Device address		01H
Read command code contents of registers		03H
Contents of register 028H	Up byte	44H
	Up byte	89H
Contents of register 029H	Up byte	80H
	Up byte	00H
Contents of register CRC	Up byte	5EH
	Up byte	E9H

Table 13) Respond of device SLAVE to MASTER

Example- Recording registers to multimeter

This example contains a sample frame saves to record three numbers multimeter 0001H, 0002H and 0064H. These numbers will be stored in three registers, starting with the register address 04H.

Device address		01H
Save command code to register		10H
Address of first save register	Up byte	00H
	Lower byte	04H
Number of save register	Up byte	00H
	Lower byte	03H
Value wrote to registry 04H	Up byte	00H
	Lower byte	01H
Value wrote to registry 05H	Up byte	00H
	Lower byte	02H
Value wrote to registry 06H	Up byte	00H
	Lower byte	64H
Checksum CRC	Up byte	3AH
	Lower byte	BEH

Table 14) Message from device MASTER to SLAVE.

Device address		01H
Save command data to register		10H
Address of first save register	Up byte	00H
	Lower byte	04H
Number of save registers	Up byte	00H
	Lower byte	03H
Checksum CRC	Up byte	C1H
	Lower byte	C9H

Table 15) Respond from device SLAVE to MASTER

REGISTER LIST

In two next tables, all records are arranged by multimeter available through the communication interface.

Configuration parameter values presented in Table 16, are recorded in a whole number. It follows that the parameters which are defined with an precision of one digit after the decimal point, shall be kept in registers in the form of actual multiplied by 10 So for example, 10.3 -> 103

ADDRES	SYMBOL	DESRIPTION	TYPE	ATR.
00H	diSP	Selection of displayed note (Table 4)	int	R/W
01H	t	Display the next time parameters (the cyclical switching views)	int	R/W
02H	FiLt	Fixed digital filter (with how many samples will be averaged with the measurements)	int	R/W
03H	codE	Defining a new password value	int	R/W
04H	nEt	Type of connected electrical network	int	R/W
05H	U	Range of measured voltages	int	R/W
06H	Pt	Transmission of voltage transformer	int	R/W

ADDRES	SYMBOL	DESCRIPTION	TYPE	ATR.
07H	A	Range of measured currents	int	R/W
08H	Ct	Transsmision of current transformer	int	R/W
09H	Addr	Addres of device in Modbus network	int	R/W
0AH	bAud	Transmision speed in Modbus network	int	R/W
0BH	AL1P	Channel 1 - Alarm source	int	R/W
0CH	AL1L	Channel 1 - Low threshold of alarm	int	R/W
0DH	AL1H	Channel 1 - Up threshold of alarm	int	R/W
0EH	AL2P	Channel 2 - Alarm source	int	R/W
0FH	AL2L	Channel 2 - Low threshold of alarm	int	R/W
10H	AL2H	Channel 2 - Up threshold of alarm	int	R/W
11H	AL3P	Channel 3 - Alarm source	int	R/W
12H	AL3L	Channel 3 - Low threshold of alarm	int	R/W
13H	AL3H	Channel 3 - Up threshold of alarm	int	R/W
14H	AL4P	Channel 4 - Alarm source	int	R/W
15H	AL4L	Channel 4 - Low threshold of alarm	int	R/W
16H	AL4H	Channel 4 - Up threshold of alarm	int	R/W
17H	dF.dt	Delay of alarm activation	int	R/W
18H	Sd1P	Signal on output OUT1	int	R/W
19H	Sd1L	Low value of signal on OUT1	int	R/W
1AH	Sd1H	Up value of signal on OUT1	int	R/W
1BH	Sd2P	Signal on output OUT2	int	R/W
1CH	Sd2L	Low value of signal on OUT2	int	R/W
1DH	Sd2H	Up value of signal on OUT2	int	R/W
1EH	Sd3P	Signal on output OUT3	int	R/W
1FH	Sd3L	Low value of signal on OUT3	int	R/W
20H	Sd3H	Up value of signal on OUT3	int	R/W
21H	Sd4P	Signal on output OUT4	int	R/W
22H	Sd4L	Low value of signal on OUT4	int	R/W
23H	Sd4H	Up value of signal on OUT4	int	R/W
24H	Sdt	Work mode of analog outputs	int	R/W

Table 16) Register list with configuration parameters

ADRESS	SYMBOL	DESCRIPTION	TYPE	ATR.
40H 41H	UA	Phase A - Phase voltage [V]	float	R
42H 43H	UB	Phase B - Phase voltage [V]	float	R
44H 45H	UC	Phase C - Phase voltage [V]	float	R
46H 47H	IA	Phase A - Phase current [A]	float	R
48H 49H	IB	Phase B - Phase current [A]	float	R
4AH 4BH	IC	Phase C - Phase current [A]	float	R
4CH 4DH	PFA	Phase A - Power ratio	float	R
4EH 4FH	PFB	Phase B - Power ratio	float	R
50H 51H	PFC	Phase C - Power ratio	float	R
52H 53H	PFT	Total power ratio	float	R
54H 55H	FREQ	Network frequence	float	R
56H 57H	UAB	Phase A and B - Wire voltage	float	R
58H 59H	UBC	Phase B and C - Wire voltage	float	R
5AH 5BH	UCA	Phase C and A - Wire voltage	float	R
5CH 5DH	+Wh	Positive active energy [Wh]	float	R
5EH 5FH	-Wh	Negative active energy [Wh]	float	R
60H 61H	+varh	Positive passive energy [varh]	float	R
62H 63H	-varh	Negative passive energy [varh]	float	R

Table 17) Register list with measure values.

ADDRES	SYMBOL	DESCRIPTION	TYPE	ATR.
25H	WRST	Entering into this register the value 0x55AA will reset state energy meters	int	R/W
26H	DO	The first four bits of this register correspond to the successive digital outputs (0 - joint open, 1 - joint closed)	int	R/W
27H	DI	The first four bits of this register correspond to the successive digital inputs (0 - contact open, 1 - contact closed)	int	R
28H 29H	PA	Phase A - Active power [W]	float	R
2AH 2BH	PB	Phase B - Active power [W]	float	R
2CH 2DH	PC	Phase C - Active power [W]	float	R
2EH 2FH	PT	Total active power [W]	float	R
30H 31H	QA	Phase A - Passive power [var]	float	R
32H 33H	QB	Phase B - Passive power [var]	float	R
34H 35H	QC	Phase C - Passive power [var]	float	R
36H 37H	QT	Total passive power [var]	float	R
38H 39H	SA	Phase A - Apparent power [VA]	float	R
3AH 3BH	SB	Phase B - Apparent power [VA]	float	R
3CH 3DH	SC	Phase V - Apparent power [VA]	float	R
3EH 3FH	ST	Total apparent power [VA]	float	R

LEGEND:

ATR *- Atribut of register*
R *- Values only to read*
R/W *- Value to read and save*
TYPE *- Format with in the number is stored in memory.*
int *- Integer with a sign, with a length of two bytes (16 bits). First, the upper byte is written to a number (address), then the lower (ADDRESS+ 1). The highest bit indicates the sign of the number: 0 - number of positive, 1 - negative number. The registry of type int so you can store integers in the range -32,768 ÷ 32,767.*
float *-four-byte number of Floating, recorded in accordance with IEEE-754. Number format is presented in Table 18*

ADDRESS	ADDRESS + 1	ADDRESS + 2	ADDRESS + 3	ADDRESS + 4
CONTENS	SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM

Table 18) Format number type float

where:
S *- bit of sign (0 - positive number, 1 - negative number)*
E *- 8-bit feature*
M *- 23-bit mantissa*

Limiting the number of the form shown in Table 18, to a real number F takes place according to the following dependencies.

$$F = (-1)^{S} * 2^{(E-127)} * (1 + {}^{M}/_{2^{23}})$$

EXAMPLE - record the number of actual -12.5 (type is C14800000H hexadecimal) as the number of float

ADDRESS	ADDRESS +1	ADDRESS +2	ADDRESS +3	ADDRESS +4
HEX	C1F	48F	00F	00F
BIN	11000001	01001000	00000000	00000000

ASSEMBLY

ATTENTION!

Multimeter installations and connections must be made by qualified personnel. Should take into account all available protection requirements

The table should be prepared hole with dimensions corresponding to the size of the panel. Thickness of the material from which made the array must not exceed 10mm.

STERING PANEL			FRAM SIZE			MOUNT HOLE	
TYPE	LEN.	WID.	LEN.	WID.	DEP.	LEN.	WID.
96 x 96	96	96	91	91	100	92	92

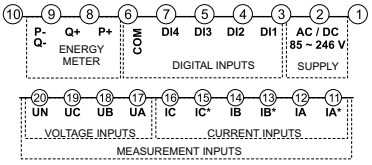
TabLE 6: Frame size and mounting hole

ATTENTION!

Do not install equipment which is damaged or incomplete.

Multimeter should be put on the front plate, with all the cables separated. When you insert to a hole, attach the measure through the introduction of the handles on the side of the housing, and then pushing them to the surface of the plate.

After mounting the multimeter on the plate, you're ready to connect cabling. Schematic layout of pins is shown in picture 1.



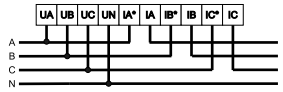
Picture 1: Location of loyout

ATTENTION!

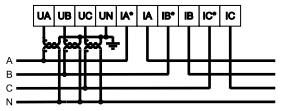
It is recommended that the power supply circuit breaker was switched multimeter 1A. In the case of very fluktuance source voltage is recommended to use additional filters.

Measured three-phase network, depending on the type of network, and the values of voltages and currents should be connected to the multimeter to one of the ways shown in Picture 2 (for four-wire network) or in Picture 3 (for three-wire network).

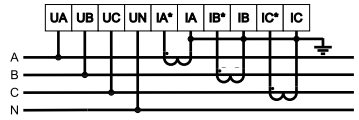
Picture 2: Connection diagram for four-wire networki



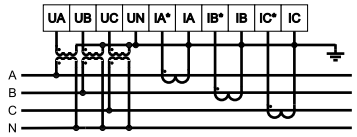
a) Direct measurement of voltage and current



b) Indirect measurement of voltage and direct current measurement

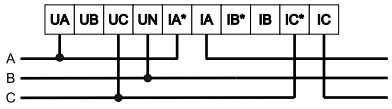


c) Direct measurement of voltage and indirect current measurement

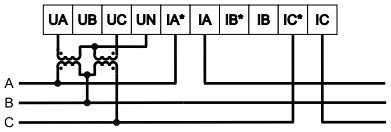


d) Indirect measurement of voltage and current

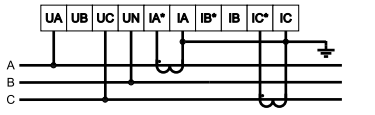
Picture 3) Connection diagram for three-wire network.



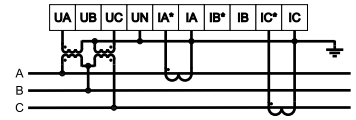
a) Direct measurement of voltage and current



b) Indirect measurement of voltage and direct current measurement



c) Direct measurement of voltage and indirect current measurement



d) Indirect measurement of voltage and current

When indirect measurement of voltages and currents, remember to account for the size of configuration parameters multimeter value of voltage and current transmission.

CONNECTING EXTERNAL DEVICES

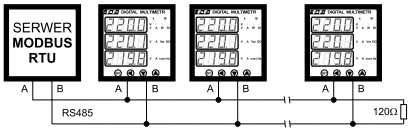
PULSE OUTPUT OF ENERGY METER

This is an optically isolated output transistor as open collector (OC). Maximum voltage applied to the transistor must be less than 48V and the current flowing through the transistor less than 50 mA.

Outputs pulse of energy meter indicates the actual energy measured by a multimeter. In the case of current transformers or voltage, multiply the result obtained by the value of the transmission Outputs pulse power meter indicates the actual power measured by a multimeter. In the case of current transformers or voltage, multiply the result obtained by the value of the voltage and current transmission.

RS485 COMMUNICATION PORT

Multimeter enables communication with external devices by the RS485 interface and MODBUS RTU protocol. The RS485 network can also be connected to a 32 devices (Picture 4), each of them must have its own unique address.



Picture 4) Device connection in RS485 network

ENERGY METER	OUTPUT	Dual-channel transistor output IMPULSE (OC) with optoisolation
	STABLE OF PULSING	Active power: 10000 imp/kWh Passive power: 10000 imp / kVArh
COMMUNICATION PROTOCOL	INTERFACE	RS 485
	PROTOKÓŁ	MODBUS RTU
	TRANSMISION SPEED	1200, 2400, 4800, 9600 bps
DIGITAL INPUTS	NUMBER OF CHANNELS	FOUR
	INPUT SIGNAL	JOINT WITHOUT CURRENT (TO COM JOINT)

Table 3:Parameters of signal inputs/outputs.

CLASS OF PRECISION	VOLTAGE, CURRENT	± (0.5% OF FULL SCALE + 1 DIGIT)
	ACTIVE, PASSIVE , APPARENT POWER	± (0.5% P..
	FREQUENCY	± 0.1 Hz
	POWER RATIO	± 0.01
	ACTIVE ENERGY	± 0.5 %
	PASSIVE ENERGY	± 2 %

Table 4: Measurement precision of devices

Connection between devices on the RS485 network should be achieved by wire-type "twisted pair" cable with a diameter of not less than 0.5 mm^2 and with copper braid . Communication cable should be kept as far away from high voltage wires and other sources of strong interference. Maximum length shall not exceed 1200m. At the end of the line signal must appear as a terminator as fuse 120Ω.

A detailed description of communication protocol and a summary of supported commands is given later in this manual

TCHNICAL DATA

NETWORK		THREE-PASES, THREE OR FOUR - WIRE
MEASURED INPUT VOLTAGE	RATED VOLTAGE	AC: 230V; 400V
	OVERVOLTAGE PROTECTION	120% U_{ZN} - continuous; 200% U_{ZN} - by 30 SEC.
	POWER CONSUMP.	< 0.5 VA / phase
	INPUT IMPEDANCE	> 500 kΩ / phase
MEASURED INPUT CURRENT	RATED CURRENT	AC: 1A, 5A
	OVERCURRENT PROTECTION	120% I_{ZN} - continuous; 2000% U_{ZN} - by 1 SEC.
	INPUT IMPEDANCE	< 20 mΩ / phase
FREQUENCY		45 - 65 Hz

Table 2: Parameters measuring voltage and current inputs

To obtain the greatest possible precision voltage and current measuring ranges should be (and possibly a transformer voltage and current) chosen in such a way that the measured volume adopt as much value.

SUPPLY	VOLTAGE SUPPLY	AC/DC, 85 ~ 264 V
	POWER CONSUMPTION	< 5 VA
PROTECTION	VOLTAGE TESTS FOR ENTER MEASUREMENT AND POWER	> 2 kV (50 Hz) / 1 sec
	VOLTAGE TESTS FOR INPUT/ OUTPUT CONTROL	> 1 kV (50 Hz) / 1 sec
	RESISTANCE OF ISOLATION	> 20 MΩ˚
	PROTECTION LEVEL	Fron panel: IP42 Connection: IP20
ENVIRONMENTAL CONDITION	TEMPERATURE	Functioning: -10 ~ 50 °CStorage: -25 ~ 70 °C
	HUMIDITY	85%,non-condensing aggressive and gas
	HIGHT	3000 m.n.p.m.

Table 5: Work condition.

WARRANTY

1. The duration of the warranty is 24 months from the date of purchase.
2. The warranty is valid with the receipt only.
3. Complaints must be filed at the point of purchase or directly with the producer (tel. no. 42-2270971, e-mail: dztech@fif.com.pl).
4. Within the warranty period, the producer undertakes to repair or replace the relay within 14 days from the date the unit is delivered to the service point.
5. The purchaser has the right to have the relay replaced or to receive a refund if an indelible defect is revealed.
6. This warranty does not cover the following:
-mechanical or chemical defects,
-defects which stem from improper use contrary to the user's manual,
-defects which appear after the unit has been sold due to accidents or other events for which neither the producer nor the point of sale can be held responsible, e.g. transport damage, etc.
7. This warranty does not cover any operations which, according to the manual, should be done by the user, e.g. mounting of the relay, installation of the electrical system, installation of other required electrical protection devices, recommended inspections and tests, etc.

ATTENTION!

No unauthorised modifications are to be made in the relay otherwise the device may be damaged or malfunction which in turn may lead to damage of the protected engine and jeopardise its operators. Should this warning be ignored, the producer cannot be held responsible for any related events and is entitled to deem this warranty invalid in the case of any complaint.

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