engineering center
energoservice

Display panels
ENMI

Manual

ENMI.422953.001 Rev 05.2023

Table of contents

Introduction

The Manual contains information about functions, recommendations to use, maintenance, packing, transportation, storage and other information.

Read this manual carefully before using the device.

Typical users

Electrical engineering personnel: planners, operators, commissioning engineers, service and maintenance personnel.

Validity range

This manual applies to following versions of display panels:

- ENMI-3;
- ENMI-4m;
- ENMI-4e;
- ENMI-6;
- ENMI-7;

Support

For all questions about devices, please contact with technical support of “Engineering center “Energoservice”:

Website: www.enip2.com

Phone: +7 (8182) 65-75-65

E-mail: enip2@ens.ru

Electromagnetic compatibility certificate № E032/02

CE EN 61010-1:2010, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, 61000-4-6, 61000-4-8, 61000-4-11.

RoHS Declaration of conformity

RoHS Directive 2011/65EUof the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

ATTENTION:

- Use ENMI only as described in this manual;
- ENMI should be installed, operated and maintained by qualified personnel only;
- Do not use any cleanser except recommended;
- Save ENMI from impact;
- Before connecting ENMI, ensure that the local power supply conditions agree with the specifications on the label on the ENMI.

NOTICE:

- The information contained in this document is subject to change without notice;
- New features may be added to devices without notice.

1 General information

Display panels ENMI displays values of main measured and calculated parameters received from multifunctional measuring device ENIP-2 or ESM. Also, ENMI may be used for displaying service data from other devices and systems.

Figure 1.1. ENMI-3-24-2

Figure 1.2. ENMI-3-24-1

Figure 1.3. ENMI-4m/4e-24-2

Figure 1.4. ENMI-4m/4e-X-4

Figure 1.5. ENMI-6-24-2

Figure 1.6. ENMI-7-24-1.

Figure 1.7. ENMI-3 connected to ENIP-2

ENMI is multifunctional, repairable, restorable device. It designed for long-term operation in industrial environments.

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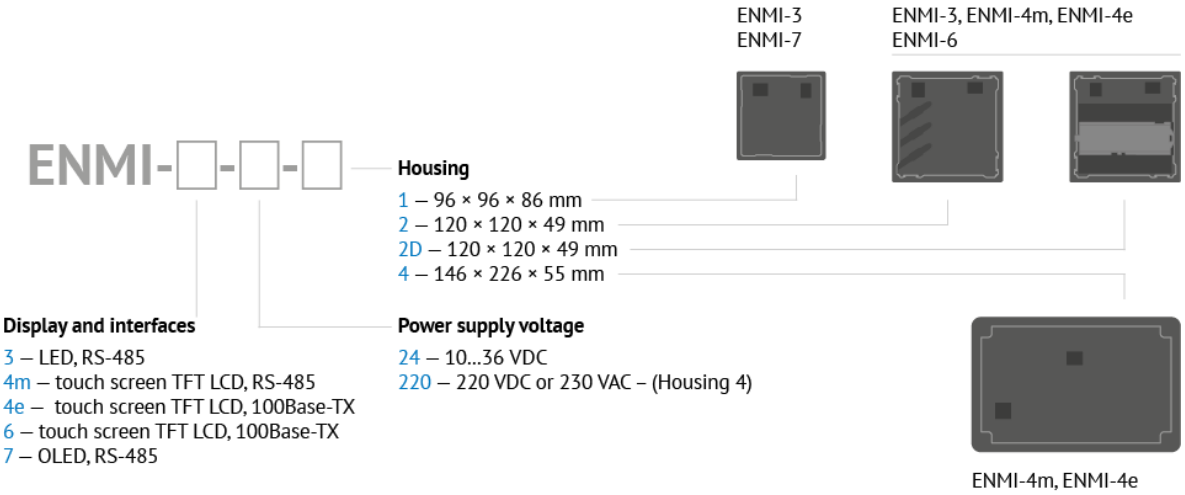
1.1 Naming Convention



Example of ENMI naming convention in documentation and order information:

«Display panel ENMI-4m-24-2» - ENMI with power supply 18...30 V=, touch screen TFT LCD display, for mounting on panel or cabinet (in 111 x 111 mm square cutout).

1.2 Specifications

Parameter	ENMI-3	ENMI-7
Display type	7-digit LED (3 lines of 4 digits), digit height: 20 x 11 mm (ENMI-3-24-2) 12 x 7 mm (ENMI-3-24-1)	2.42″, OLED 128 x 64 px
Supported devices	ENIP-2	ENIP-2, ESM
Interfaces	RS-485	
Protocols	Modbus RTU	
Baud rate, bps	9600, 19200, 38400, 57600	
Supply voltage, V=	18...36	
Power consumption, VA	10	2
Operating temperature, °C	from -40 to +55	
Dimensions, mm	120 x 120 x 49, or 96 x 96 x 86	96 x 96 x 86
Mounting cutoff, mm	111 x 111, (91 x 91)	91 x 91
Housing	PC/ABS plastic, IP30	
Net weight, kg	0,4	
Gross weight, kg	0,6	

Parameter	ENMI-4m-24-2	ENMI-4e-24-2
Display type	4.3", TFT touch screen 480 x 272 px	
Supported devices	ENIP-2, ESM	
Interfaces	RS-485, USB	Ethernet, USB
Protocols	Modbus RTU	Modbus RTU over TCP
Baud rate	9600, 19200, 38400, 57600 bps	100 Mbps
Supply voltage, V=	18...36	
Power consumption, VA	3	
Operating temperature, °C	from -20 to +55	
Dimensions, mm	120 x 120 x 49	
Mounting cutoff, mm	111 x 111	
Housing	PC/ABS plastic, IP30	
Net weight, kg	0,4	
Gross weight, kg	0,6	

Parameter	ENMI-4m-X-4	ENMI-4e-X-4
Display type	7", TFT touch screen 800 x 480 px	
Supported devices	ENIP-2, ESM	
Interfaces	RS-485, USB	Ethernet, USB
Protocols	Modbus RTU	Modbus RTU over TCP
Baud rate	9600, 19200, 38400, 57600 bps	100 Mbps
Supply voltage, V=	18...36	
Power consumption, VA	3	
Operating temperature, °C	from -20 to +55	
Dimensions, mm	120 x 120 x 49	
Mounting cutoff, mm	111 x 111	
Housing	PC/ABS plastic, IP30	
Net weight, kg	0,5	
Gross weight, kg	0,7	

Parameter	ENMI-6
Display type	4.3", TFT touch screen 480x272 px
Supported devices	Any SNMPv1/v2
Interface (protocol)	Ethernet (SNMP, Modbus TCP)
Baud rate	100 Mbps
Supply voltage, V=	18...36
Power consumption, VA	5
Operating temperature, °C	from -20 to +55
Dimensions, mm	120 x 120 x 49
Mounting cutoff, mm	111 x 111
Net weight, kg	0,4
Gross weight, kg	0,6

- Operation mode is continuous.
- Turn-on time is less than 30 seconds.
- Mean time between failures is 100000 hours.
- Device life is not less than 15 years.
- Average time of recovery is less than 1 hour.

1.3 Data display

Available data to display to user:

Parameters	ENMI-3	ENMI-4m/4e	ENMI-7
• Voltage – phase/line-to-line, average; • Current –phase and average; • Power: P (W), Q (VAr), S(VA) – phase and total; • Frequency; • Power factor – phase and total; • Energy: Wh, VArh – total (import and export);	ENIP-2	ENIP-2, ESM	ENIP-2, ESM
Discrete Inputs states	ENIP-2	ENIP-2, ESM	ENIP-2, ESM
Control commands	-	ENIP-2, ESM	-
Mimic diagram based on digital signals of ENIP-2	-	ENIP-2, ESM	-
• Imitation of pointer instrument; • Phasor diagram; • Trends of parameters for last time.	-	ENIP-2, ESM	-
Alarms		ENIP-2, ESM	
Power quality	-	ESM	-
Harmonics	-	ESM	-
Selection one of several ENIP-2/ESM on RS-485 bus (Master mode)	ENIP-2	ENIP-2, ESM	ENIP-2, ESM
Possibility of receiving data by several ENMI on RS-485 bus (Slave mode) from one ENIP-2 (in periodic broad-cast mode)	ENIP-2	ENIP-2, ESM	ENIP-2, ESM

1.4 Package contents

Display panel ENMI	1
Steel mounting elements	2
Product certificate ENMI.422953.001 PC	1
Manual ENMI.422953.001	see on enip2.com;
Software for configuration: “ES Configurator”	

Documentation and software updates available on http://www.enip2.com/support

2 Installation

2.1 Before performing installation

After receiving ENMI from distributer, make sure that the package has no defects.

Unpacking ENMI, check the package contents (see page 10).

Compare characteristics in passport with label on front side of device.

ENMI operation should be as user manual only.

Before connecting or disconnecting ENMI to digital interface, make sure that all sources of power supply are disconnected.

Connect ENMI to ENIP-2, or ESM according to manual.

Do not use ENMI in explosive or corrosive environment.

Save ENMI from heating above 70 °C, large temperature variations and strong electro-magnetic fields.

2.2 Types of ENMI housings

The execution of the housing type is encoded by the last digit in the symbol name of the ENMI.

Table 2.1.

Housing type	ENMI modifications	Miscellaneous	
...-1	ENMI-3 ENMI -7	Installation in a square window 91 x 91 mm	
...-2	ENMI -3 ENMI -4m ENMI -4e ENMI -6	Installation in a 111 x 111 mm square window or on a DIN rail, if option available	
...-2D	ENMI -3 ENMI -4m ENMI -4e	Installation in a square window 111 x 111 mm, or combined installation with ENIP-2/ESM	
...-4	ENMI -4m ENMI -4e	Installation in a rectangular window 208 x 128 mm	

2.2.1 ENMI-X-24-1

ENMI is mounted on panel or cabinet. It is installed in square cutout 91 x 91 mm and fixed by steel mount elements (in package). Dimensions (in mm) see on figure 2.1.

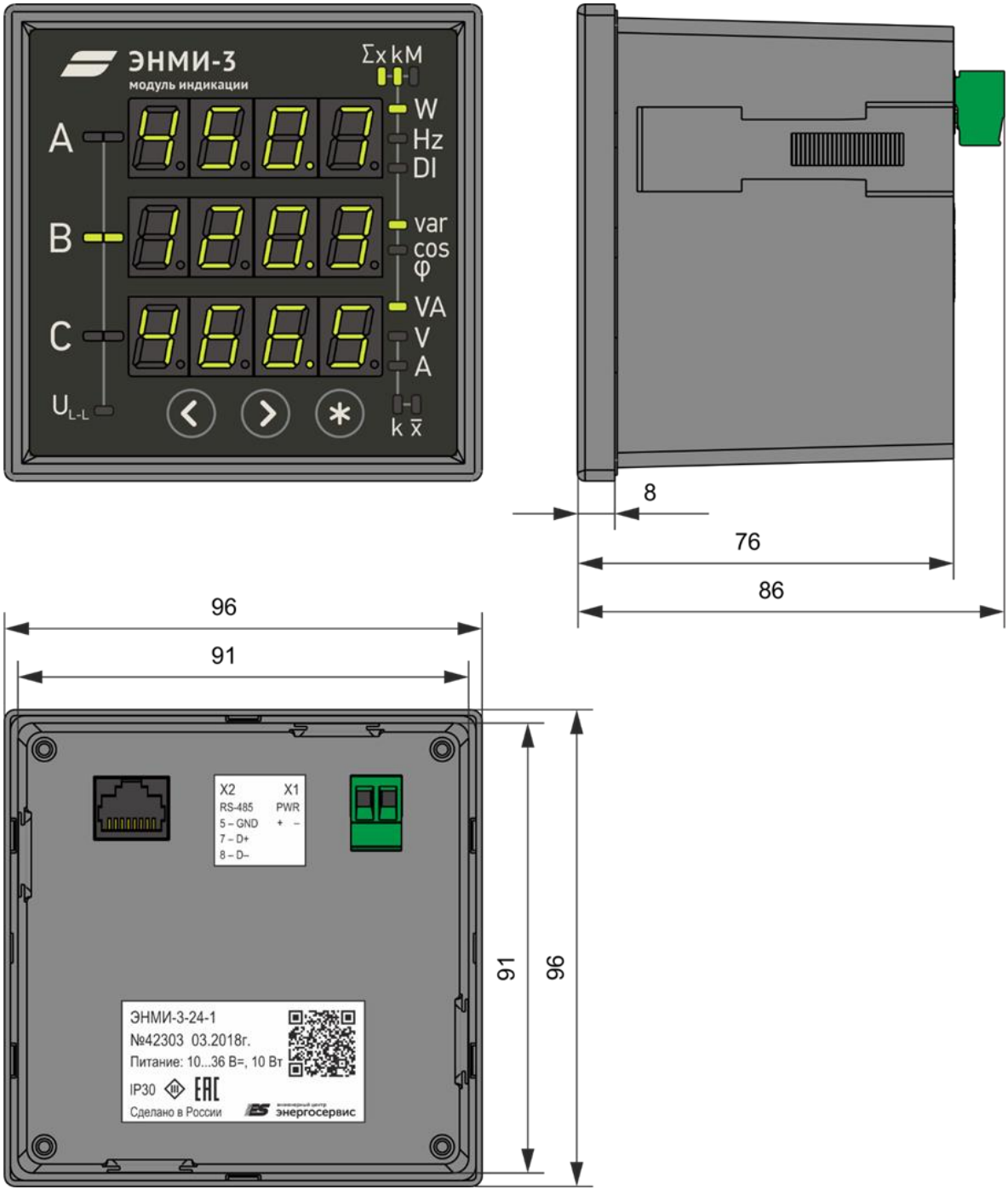


Figure 2.1. ENMI-X-24-1 dimensions in mm

2.2.2 ENMI-X-24-2

ENMI is mounted on panel or cabinet. It is installed in square cutout 111 x 111 mm and fixed by steel mount elements (in package). Dimensions (in mm) see on figure 2.2.

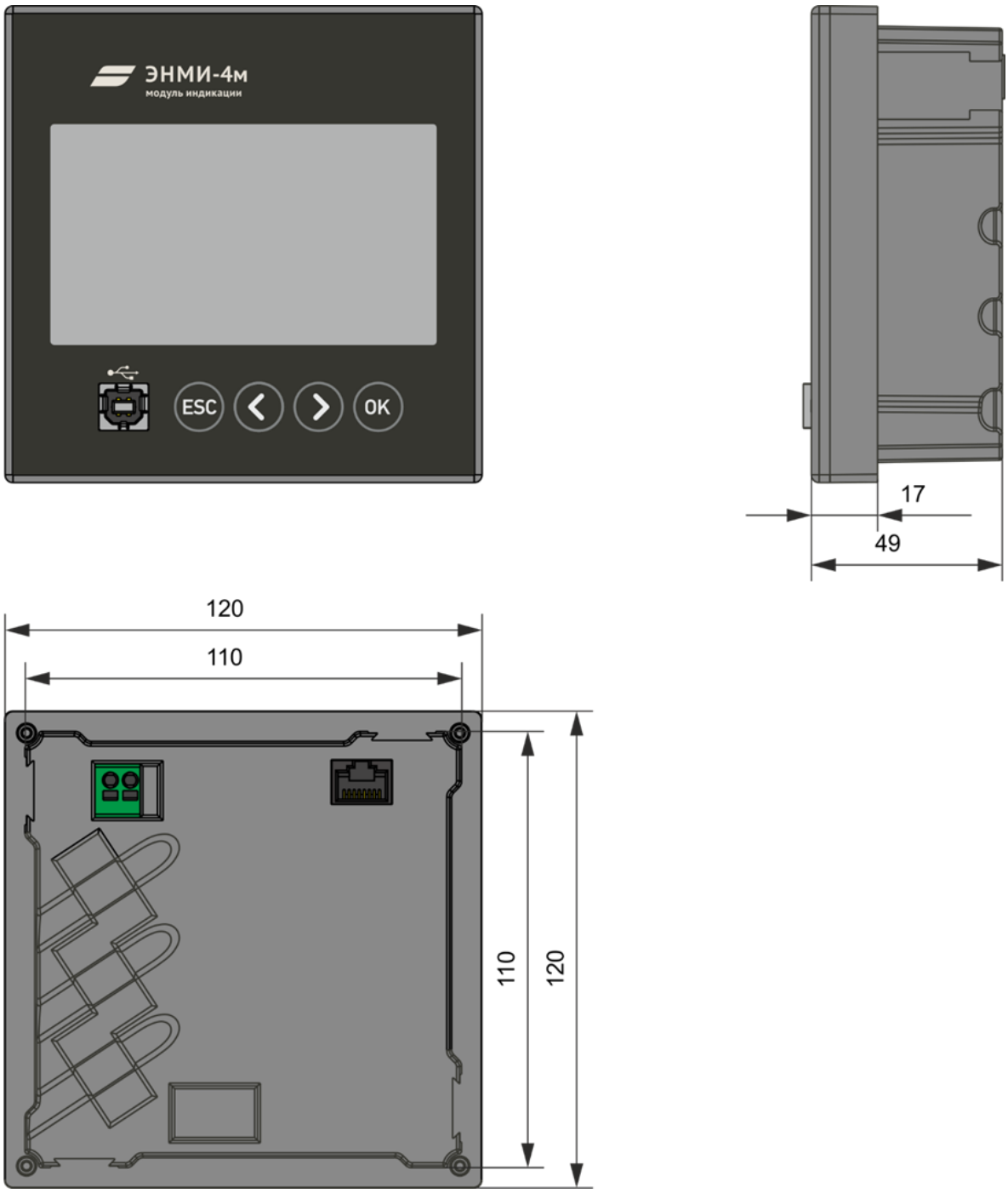


Figure 2.2. ENMI-X-24-2 dimensions, mm

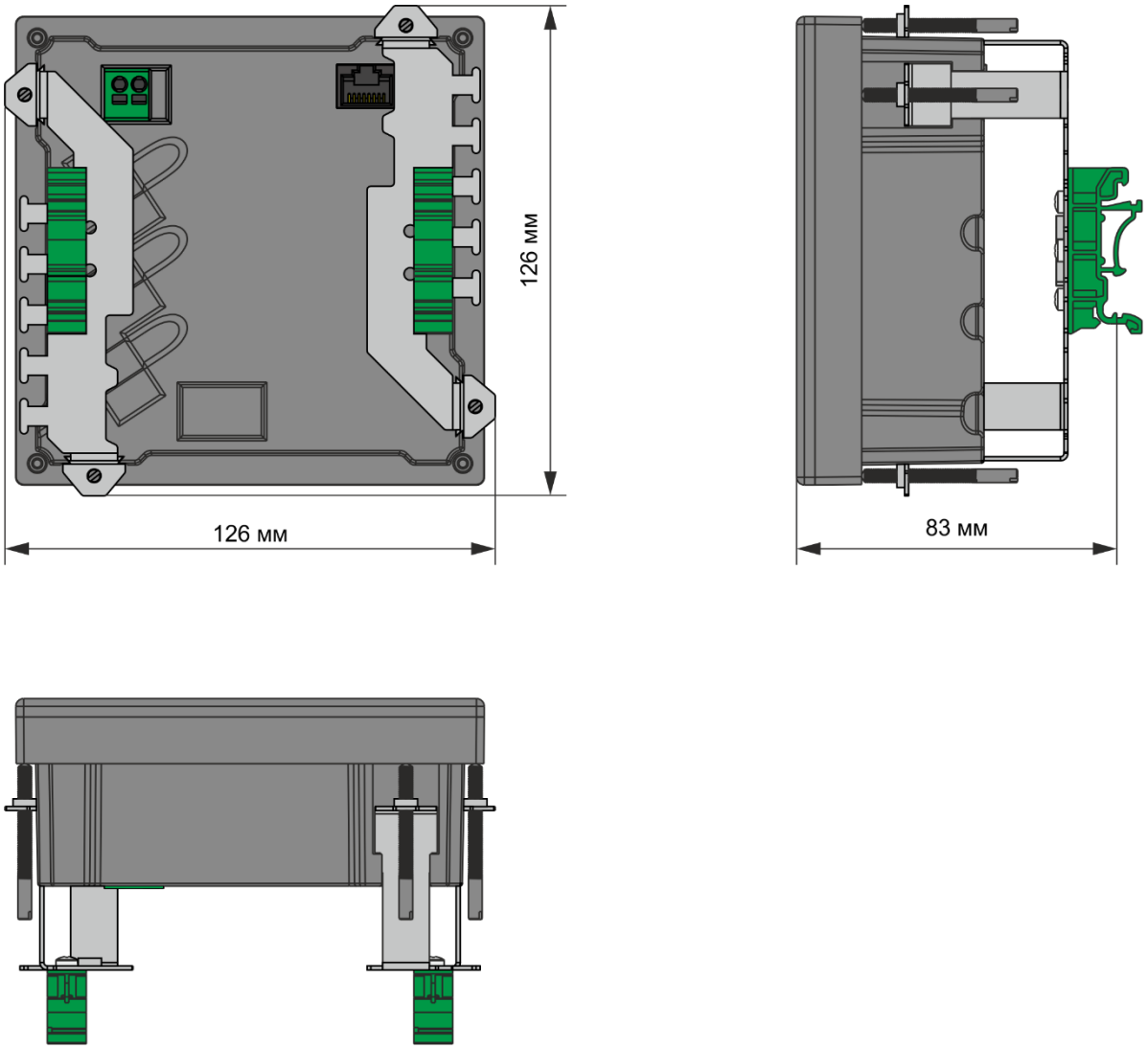


Figure 2.3. ENMI-X-24-2 with a bracket for mounting on a DIN rail dimensions in mm

2.2.3 ENMI-X-24-2D

ENMI is mounted on panel or cabinet. It is installed in square cutout 111 x 111 mm and fixed by steel mount elements (in package). Dimensions (in mm) see on figure 2.4.

Dimensions (in mm) when ENIP-2 constructively associated with ENMI see on figure 2.5.

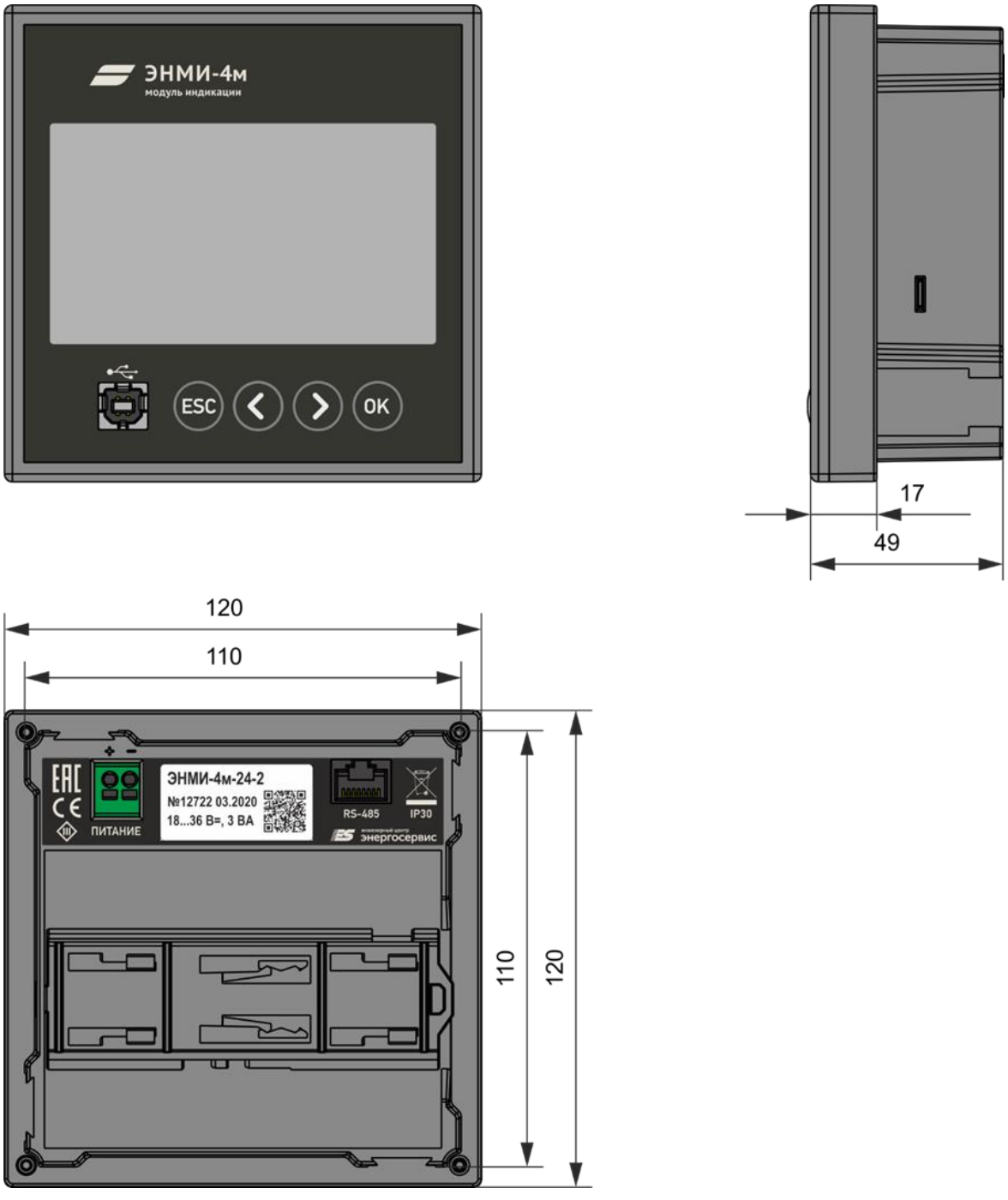


Figure 2.4. ENMI-X-24-2-2D dimensions, mm

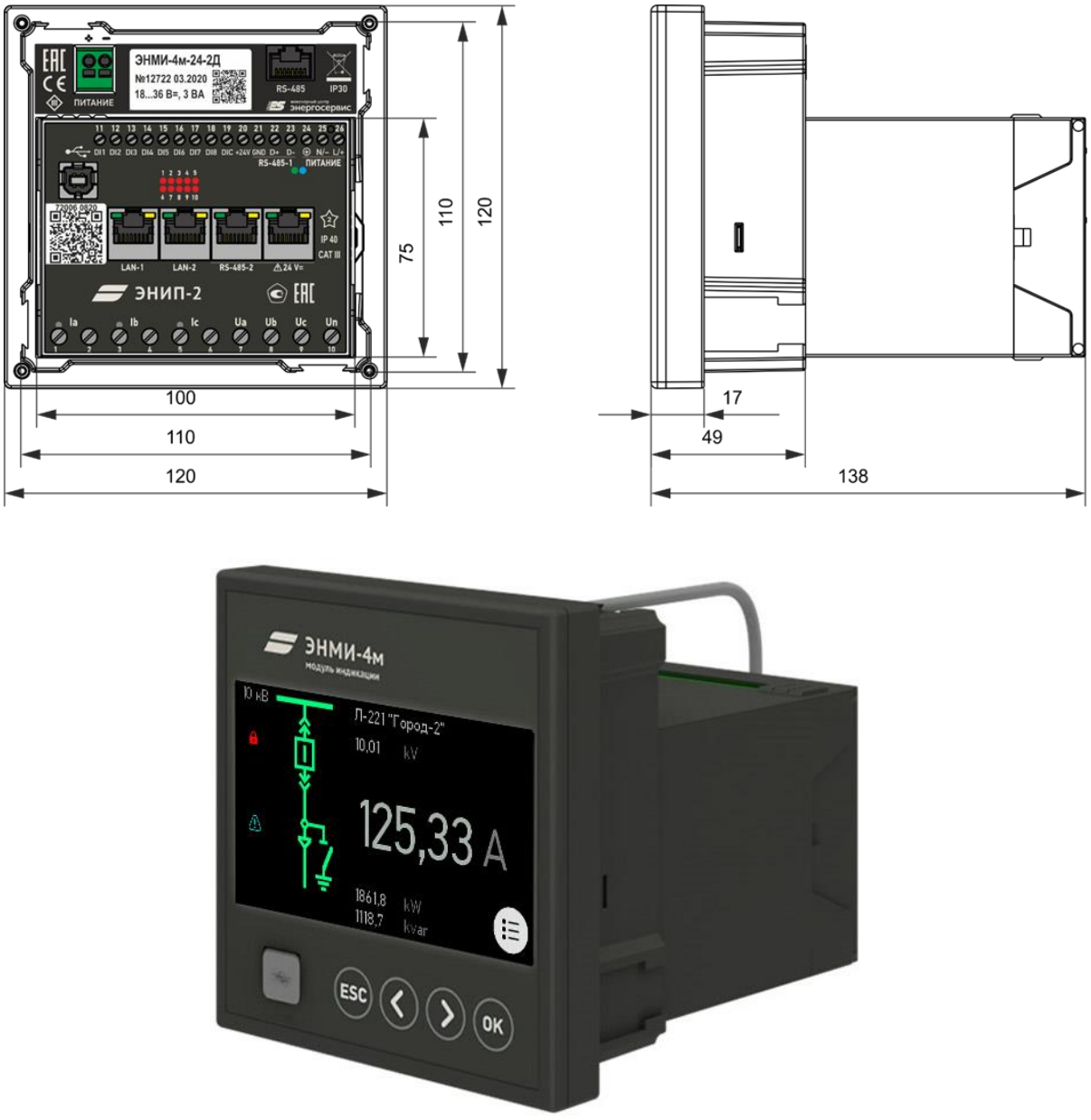


Figure 2.5. ENMI-X-24-2 + ENIP-2, in mm

Use steel mounting elements for install ENMI-X-24-2(2D) to panel (Fig. 2.6 and 2.7). Cutout dimension is 111 x 111 mm; thickness of the panel must be less than 6 mm.

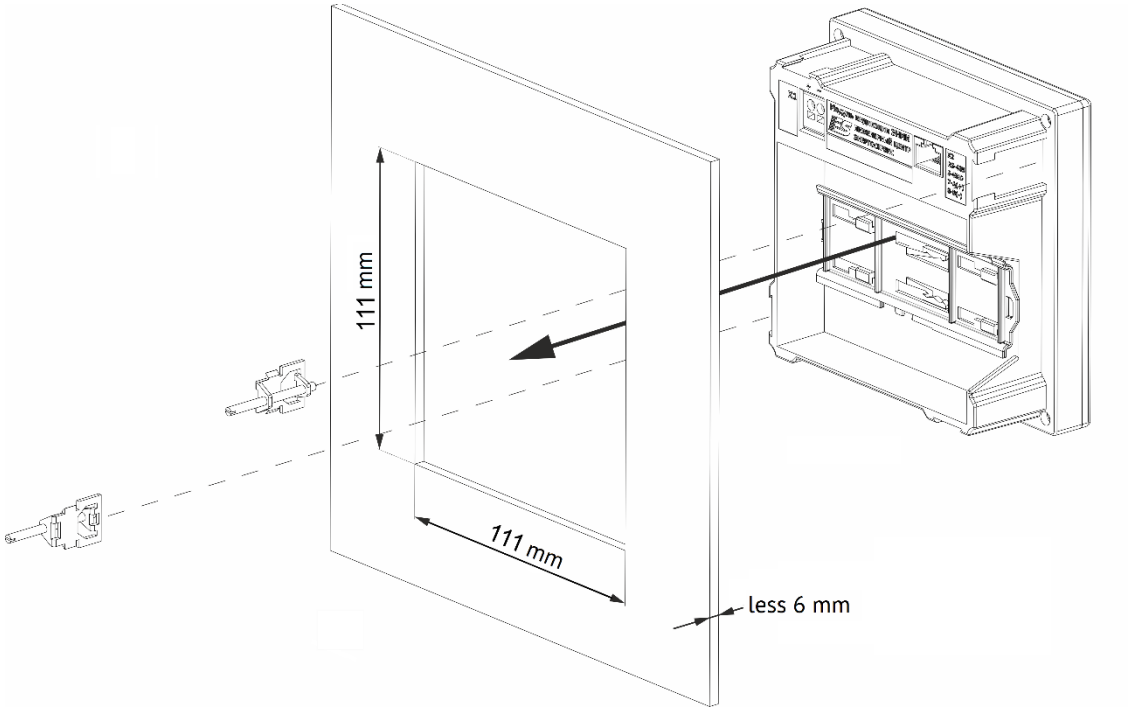


Figure 2.6. ENMI-X-24-2(2D) mounting schema

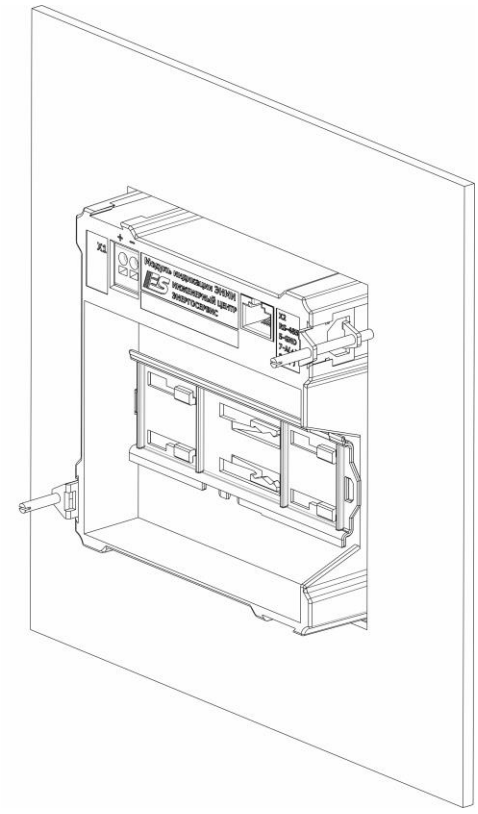


Figure 2.7. Mounted ENMI-X-24-2D

2.2.4 ENMI-X-X-4

ENMI is mounted on panel or cabinet. It is installed in square cutout 208 x 128 mm and fixed by mount elements (in package). Dimensions (in mm) see on figure 2.8.

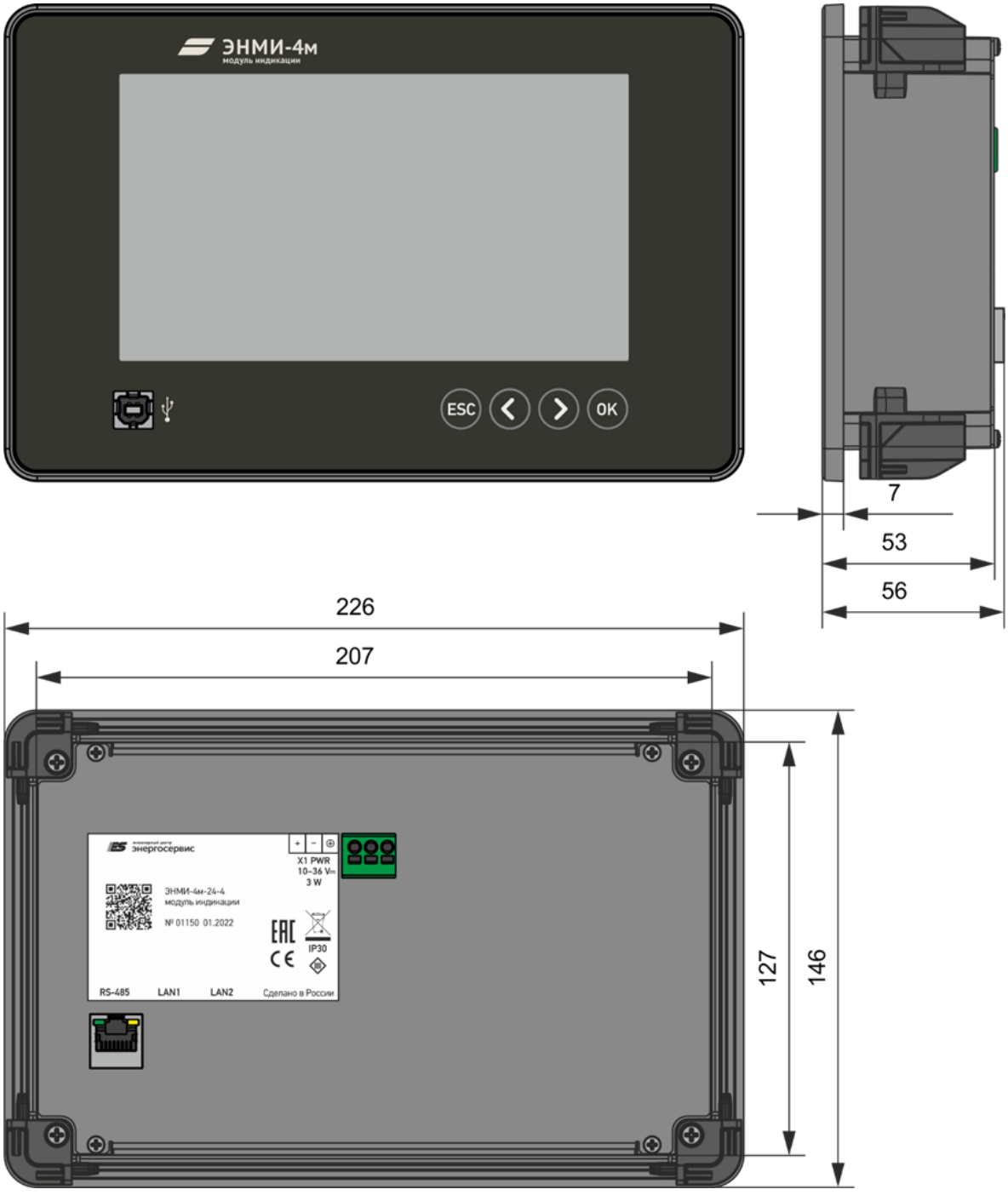


Figure 2.8. ENMI-X-X-4 dimensions, mm

2.3 Power for ENMI-3, ENMI-4m/4e-24-X, ENMI-7

Power supply must be connected to “X1” terminals or “X2” (from ENIP-2/ESM via combined interface: power + RS-485).

Table 2.2. Power connection “X1”

Terminal	Pin	ENMI-3/4m/7-24-1/2	ENMI-4m/4e-24-4
Power (X1) (screw terminal)	+	positive supply voltage 24 B=	
	−	negative supply voltage	
	PE	-	protective earth

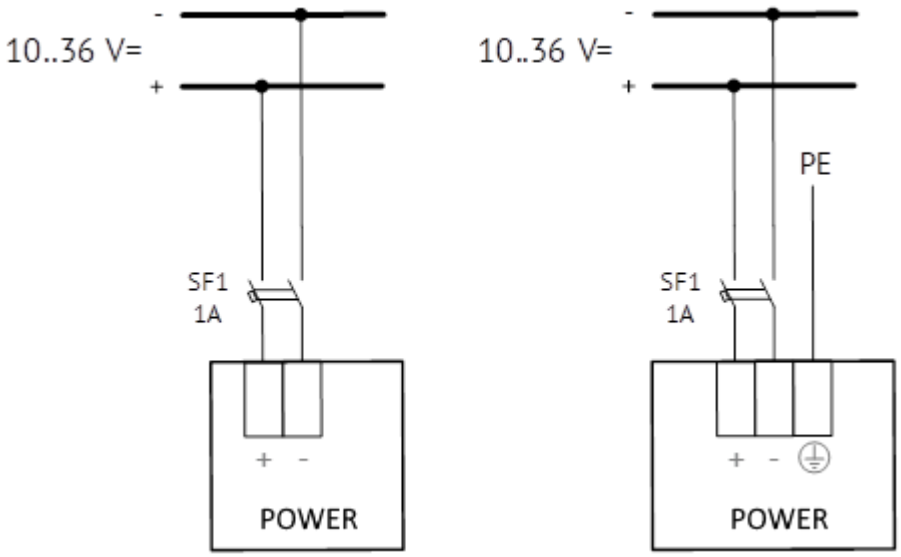


Figure 2.9. Power connection diagram of ENMI-3/4m/7-24-1/2 (left) and ENMI-4m/4e-24-4 (right)

Digital interface must be connected to “X2 via the RS-485 interface (ENMI-3/4 m/7) or Ethernet (ENMI-4e).

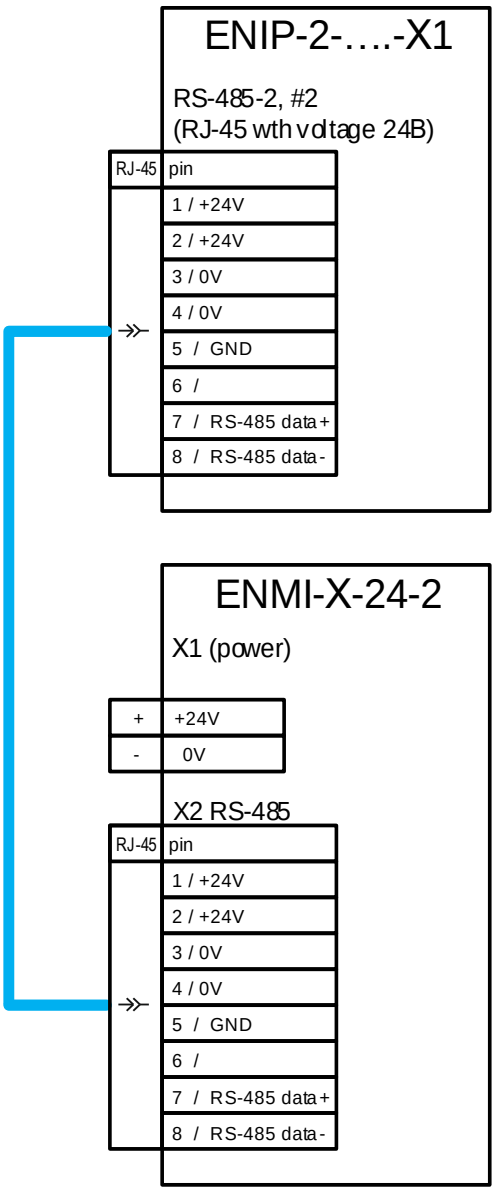
Table 2.3. Port connection “X2”

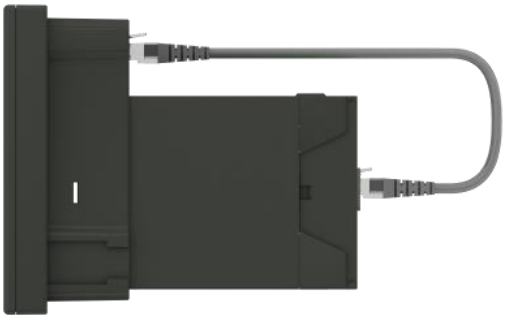
Terminal	Description		ENMI-3/4e/7-24-X	ENMI-4e-24-X
“X2” Serial interface RS-485, power supply 24 V= (RJ-45)	1		Power (+24 B)	Ethernet TX+
	2		Power (+24 B)	Ethernet TX-
	3		Power (0 B)	Ethernet RX+
	4		Power (0 B)	-
	5		GND	-
	6		-	Ethernet RX-
	7		RS-485 Data+ (A)	-
	8		RS-485 Data- (B)	-

If the length of the RS-485 line between ENMI and ENIP-2/ESM exceeds 20 m, it is not recommended to use the power supply method via a combined cable.

For the modification of ENMI-4e-X-X, power from ENIP-2/ESM is not available.

Figure 2.5 contains variations of connection ENIP and ENMI via RS-485 network.





ENIP-2/ESM and ENMI-X-24-2D connected via standard UTP patch cord. Patch cord used for power supply of ENMI from ENIP-2/ESM (24 V DC) and for connecting them via RS-485.

Figure 2.5. ENMI and ENIP-2/ESM connection

2.4 Power for ENMI-4m/4e-220-4

Power supply must be connected to “Power” terminal. Digital interface must be connected to “LAN” terminal.

Таблица 2.4

Terminal	Description	ENMI-4m-220-4	ENMI-4e-220-4
Power (terminal clips)	+	positive supply voltage 220 V= (phase supply wire 220 В~)	
	−	negative supply voltage 220 V= (neutral supply wire 220 В~)	
	PE	protective earth	
LAN (RJ45)	1	-	Ethernet TX+
	2	-	Ethernet TX-
	3	-	Ethernet RX+
	4	-	-
	5	GND	-
	6	-	Ethernet RX-
	7	RS-485 Data+ (A)	-
	8	RS-485 Data- (B)	-

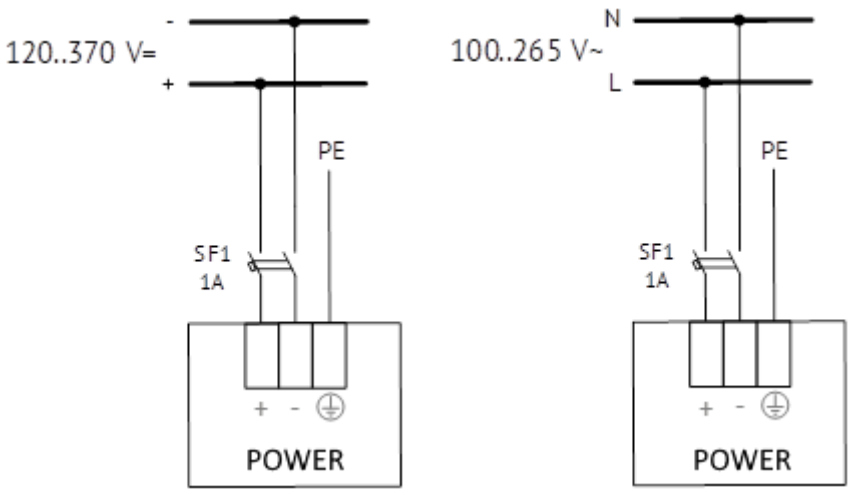


Figure 2.10. Power connection diagram of ENMI-..-220-4 for DC (left) and AC (right) voltage

3 ENMI-3

3.1.1 Display modes

ENMI-3 display consists of three lines of four seven-segments LED, which displays values, measured by ENIP-2. All values are grouped in 17 display modes. Selection of display mode is made by pressing buttons  . Suitable units and sign are lighted in depend of display mode.

The following table contain available display modes.

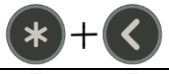
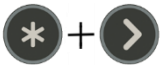
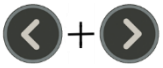
Table 4.1. ENMI-3-X-2 view modes

№	View modes	Displayed values	Units
1	Voltage (U_{L-N})	U_A, U_B, U_C	V, kV
2	Voltage (U_{L-L})	U_{AB}, U_{BC}, U_{CA}	V, kV
3	Current (I)	I_A, I_B, I_C	A, kA
4	Active power (P)	P_A, P_B, P_C	W, kW, MW
5	Reactive power (Q)	Q_A, Q_B, Q_C	var, kvar, Mvar
6	Apparent power (S)	S_A, S_B, S_C	VA, kVA, VA
7	PF ($\cos\phi_\phi$)	$\cos\phi_A$, $\cos\phi_B$, $\cos\phi_C$	–
8	Total active, reactive power; average current (P, Q, I)	$\sum$ X (P, Q), $\overline{X}$ (I)	W, kW, MW var, kvar, Mvar A, kA
9	Total active, reactive power; average voltage (P, Q, U_{L-N})	$\sum$ X (P, Q), $\overline{X}$ (U)	W, kW, MW var, kvar, Mvar V, kV
10	Total active, reactive power; average voltage (P, Q, U_{L-L})	$\sum$ X (P, Q), $\overline{X}$ (U_{L-L})	W, kW, MW var, kvar, Mvar V, kV
11	Total active, reactive, apparent power (P, Q, S)	$\sum$ X (P, Q, S)	W, kW, MW var, kvar, Mvar VA, kVA, VA
12	Frequency, total power factor (Hz, cosϕ)	Hz, cosϕ	Hz, -
13	Digital inputs status (DI)	DI	-
14	Active energy (forward direction)	+Wh	Wh
15	Active energy (reverse direction)	-Wh	Wh
16	Reactive energy (forward direction)	+VArh	VArh
17	Reactive energy (reverse direction)	-VArh	VArh

3.1.2 Button functions

Control buttons are located on front panel. Buttons functions describe in table 4.2.

Table 4.2. ENMI-3's buttons functions.

Combination	Function
	Change display mode left
	Change display mode right
	Select ENIP-2 for poll, left. ENMI displays ENIP address and number of object (number of object is set by ENMI configurator).
	Select ENIP-2 for poll, right. ENMI displays ENIP address and number of object (number of object is set by ENMI configurator).
	Save display mode. Present settings displayed on screens: ENIP-2 address, protocol, baud rate; PT ratio, CT ratio; ENIP rated current and voltage; Number of object; ENMI serial number; ENMI firmware version. For screen selection press  or  .
	Change brightness. Hold  2-3 sec, ENMI displays level of present brightness. Press  or  to change level.
	Reset to default setting. Press buttons for 5 seconds, all LED are lighting and settings will reset to default.

3.1.3 Other functions

- **Alarms**

ENMI can supervise the limits. When one of the parameters violates the preset limits, there is a specific indication and display visualizes this parameter on the screen.

Available parameters:

– Line-to-neutral voltage (Ua, Ub, Uc);

– Line-to-line voltage (Uab, Ubc, Uca);

– Current (Ia, Ib, Ic);

– Total active, reactive and apparent power (P, Q, S);

– Frequency (Hz).

Each alarm has priority from 1 to 7. If several alarms start together, ENMI will display alarm with higher priority. For cancel alarm press  . Display mode returned to previous.

After value return to limits (with hysteresis 5% (frequency hysteresis – 1%)), alert ready to start.

Values for alarm	Display mode
U_A, U_B, U_C	1
U_{AB}, U_{BC}, U_{CA}	2
I_A, I_B, I_C	3
$\sum$ X (total P)	11
$\sum$ X (total Q)	11
$\sum$ X (total S)	11
Hz	12

Limits and priorities can be setup by “ENMI Configurator”.

- **Sleep mode**

In sleep mode ENMI’s LEDs has low brightness. Sleep mode turn on after preset time.

If an alarm is generated, sleep mode turns off. After value returned to limits, or personnel canceled alarm ENMI enters in sleep mode.

4 ENMI-4m/4e

ENMI-4m and ENMI-4e has 4.3” or 7” touchscreen that allows to display measurements in tables, graphs or diagram view from ESM or ENIP-2 devices.

4.1 Screen forms

ENMI-4m/4e has color TFT 480x272 or 800 x 480 display with touch screen function. Main screen form includes several menus.

- Meas – Measurement data from ENIP-2 or ESM;
- IO– Input/Output signals from ENIP-2;
- Mimic – mimic diagram for ENIP-2;
- Meter – ESM energy;
- Settings – ENMI-5 setup parameters;
- Quality – ESM power quality parameters;
- Info – view information about ENMI-4m/4e and connected device (ENIP-2 or ESM).

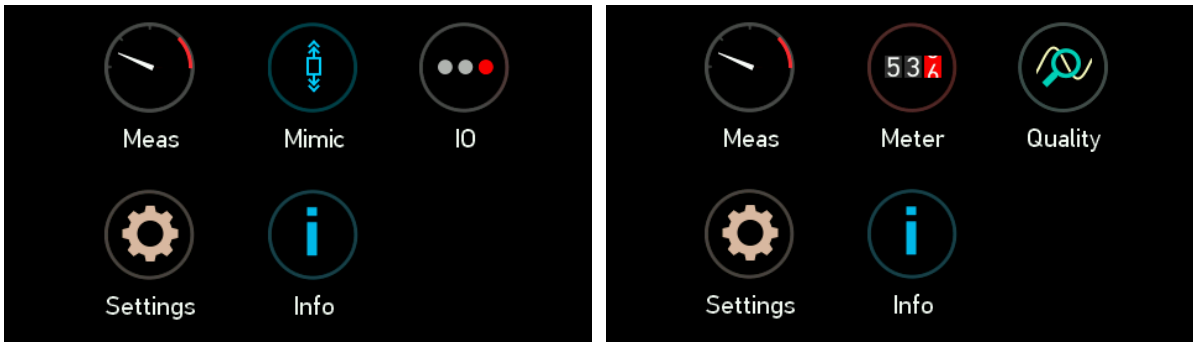


Figure 4.1. ENMI-5 – ENIP-2 and ESM main menu.

4.1.1 Meas

Measurements menu shows available formats to display measuring data, received from ENIP-2 or ESM.

Figure 4.2. ENMI-5 – Main forms for measurements display.

Meas -> Analog

Analog form for displaying data:

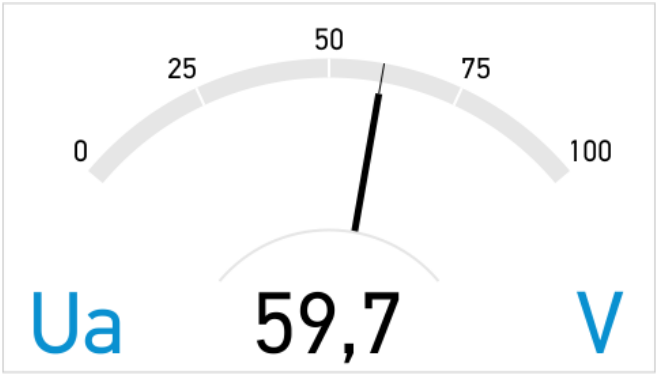


Figure 4.3. ENMI-5 – Analog view.

Available values to display at settings screen:

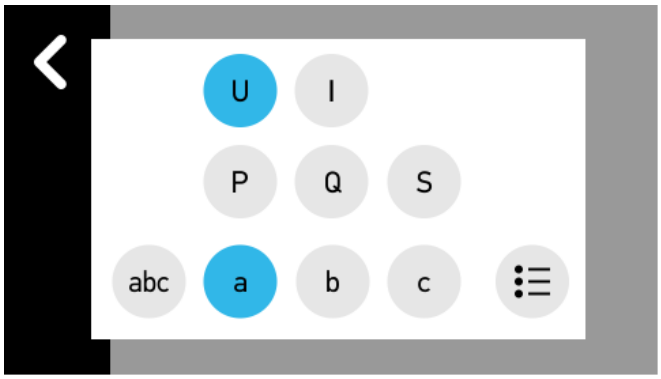
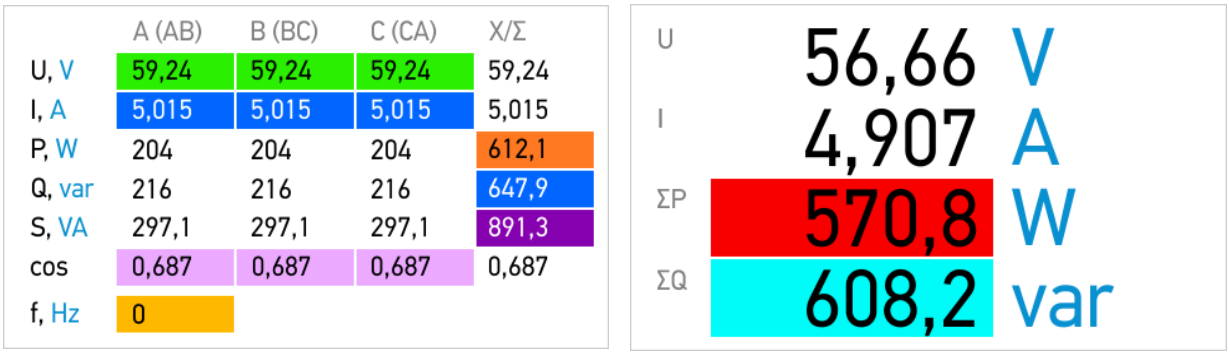


Figure 4.4. ENMI-5 – Analog form settings.

Meas -> Digital

Form for displaying data in digital format.



	A (AB)	B (BC)	C (CA)	X/Σ
U, V	59,24	59,24	59,24	59,24
I, A	5,015	5,015	5,015	5,015
P, W	204	204	204	612,1
Q, var	216	216	216	647,9
S, VA	297,1	297,1	297,1	891,3
cos	0,687	0,687	0,687	0,687
f, Hz	0			

Figure 4.5. ENMI-5 – Digital form.

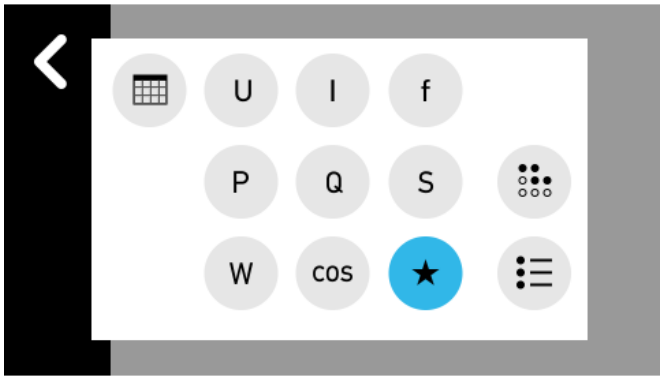


Figure 4.6. ENMI-5 – Settings for digital form.

Meas -> Graphs

On the Graph form you can see data in the graph mode.

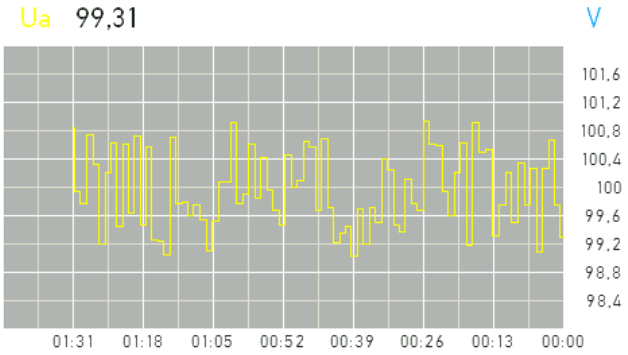


Figure 4.7. ENMI-5 – Graph form.

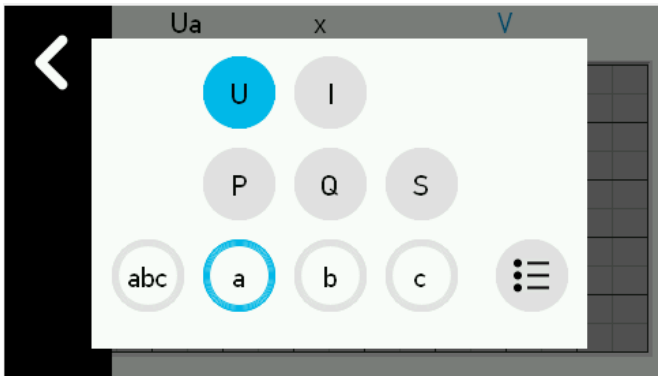


Figure 4.8. ENMI-5 – Graph form settings.

Meas -> Diagram

On the Diagram form you can see three-phase phasor diagram and power diagram.

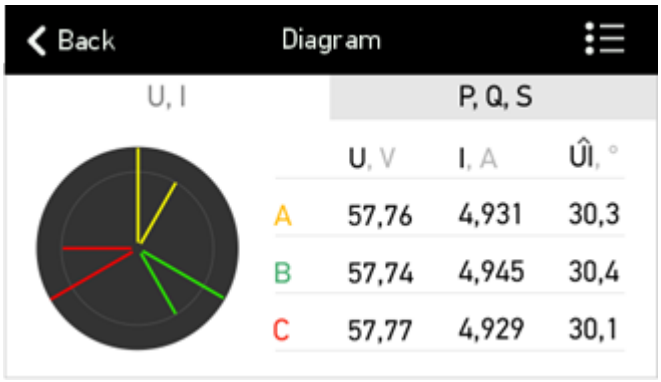


Figure 4.9. ENMI-5 – Three-phase phasor diagram.

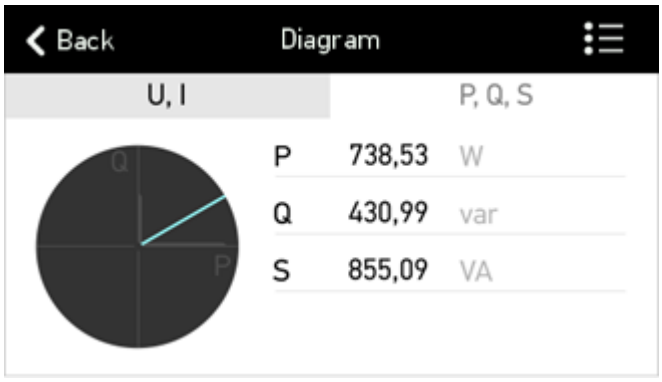


Figure 4.10. ENMI-5 – Power settings.

Alarm display

Graphs, analog and digital forms display alarms, if set up. On the fig 4.11 and 4.12 you can see colored data, that means triggered alarms.

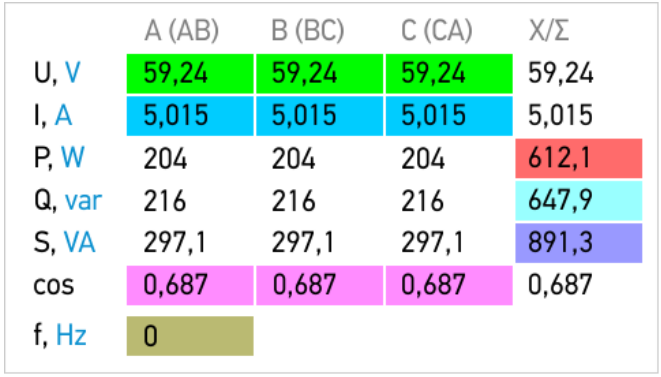


Figure 4.11. ENMI-5 – Triggered alarms on the digital form.

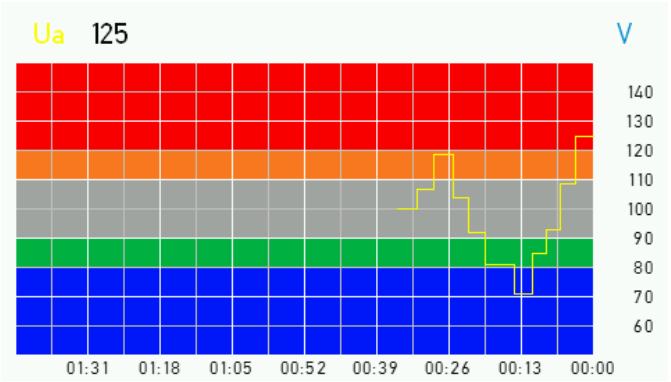


Figure 4.12. ENMI-5 –Alarms on the graph form.

Setup display colors

With “ENMI configurator” software you can setup colors of all elements on the ENMI-5 display forms. For example, see figure below with changed colors form.

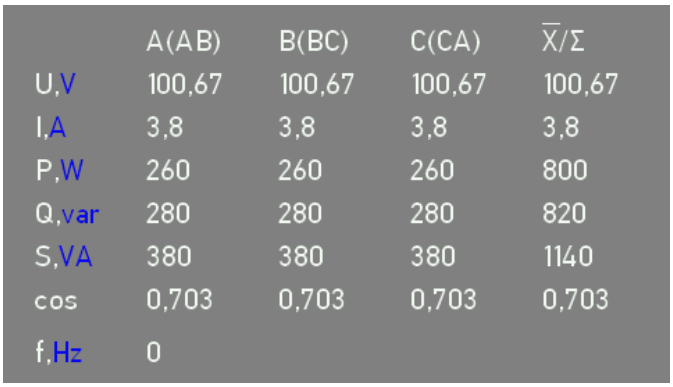


Figure 4.13. ENMI-5 – Custom colored digital form.

4.1.2 Input/Output

The menu displays the state ENIP-2 discrete inputs and enables to send command to control discrete outputs. Function of sending discrete commands has password protection. Default password is ***0000***.

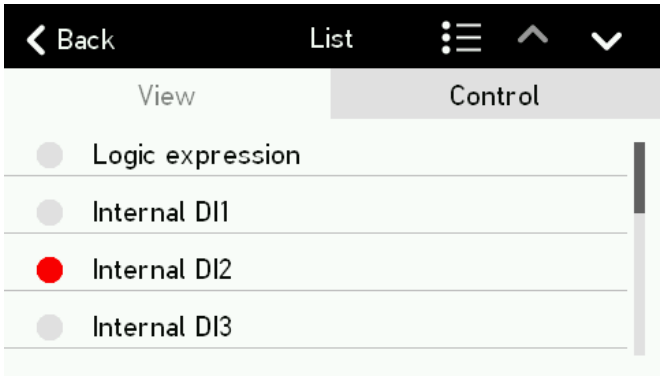


Figure 4.14. ENMI-5 – Digital Inputs states.

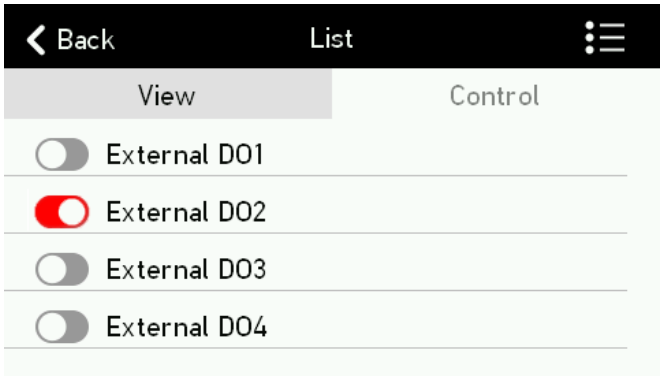


Figure 4.15. ENMI-5 – Digital Outputs states and control.

4.1.3 Info

There is you can see information about display module and information about selected ENIP-2 or ESM.

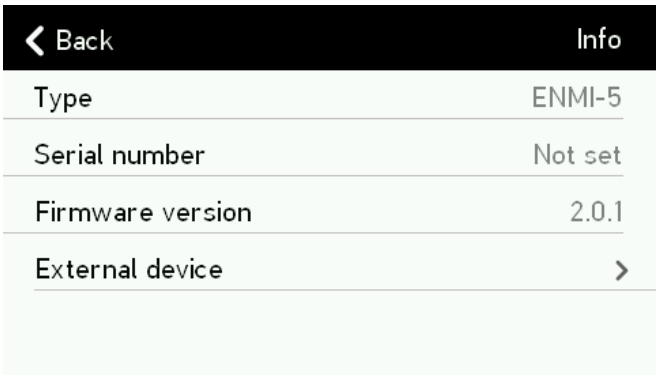


Figure 4.16. ENMI-5 – ENMI info.

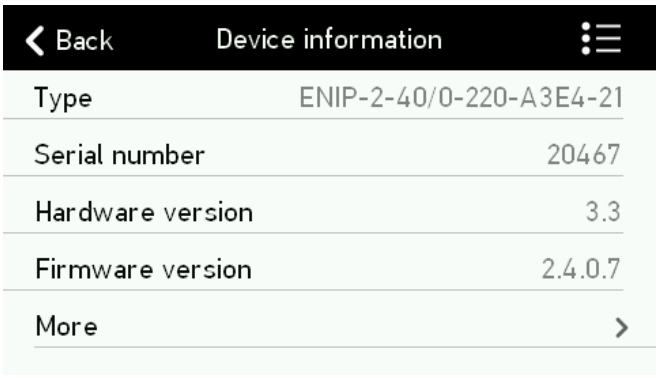


Figure 4.17. ENMI-5 – ENIP-2 info.

4.1.4 Mimic

The mimic menu is used to display the status of switching devices, additional signals, as well as current, voltage and power.

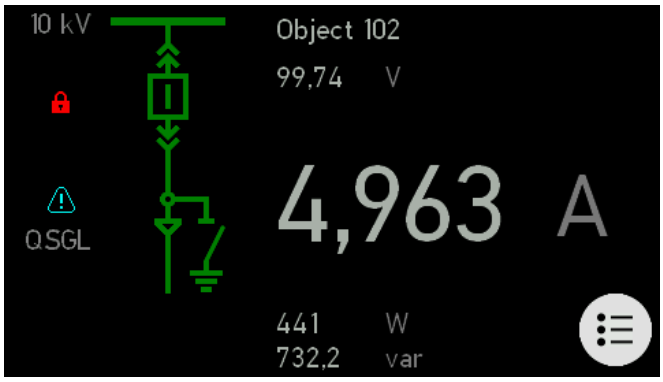


Figure 4.18. Mimic diagram.

The configuration of the mimic elements and association with ENIP-2 discrete signals is carried out using the «ENMI Configurator» software.

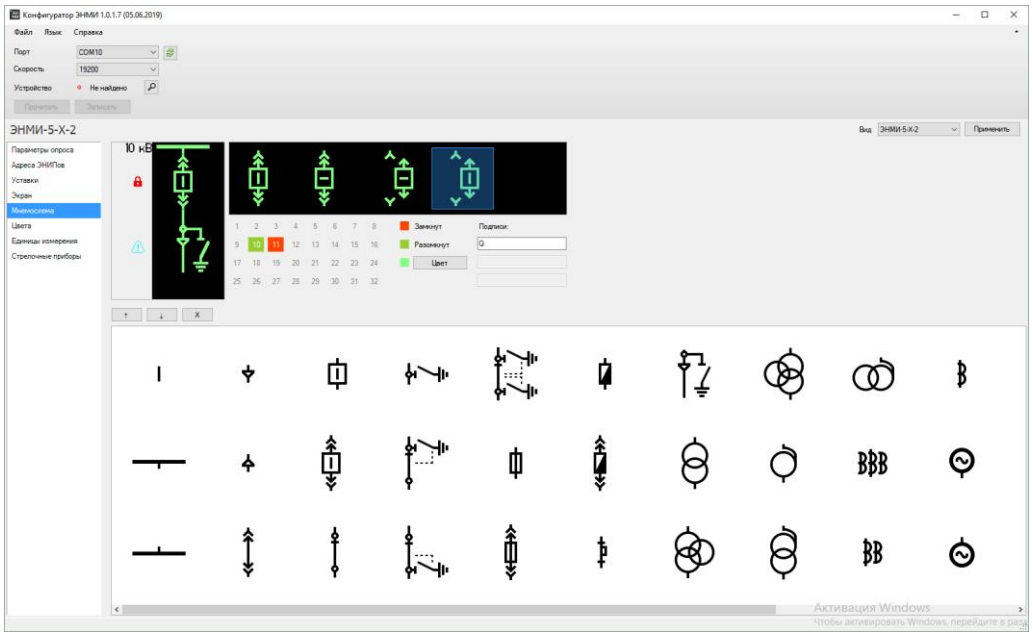


Figure 4.19. Mimic diagram setting at «ENMI configurator» software.

4.1.5 Meter

«Meter» menu contents energy data in table (Data) and analog (Mech) view.

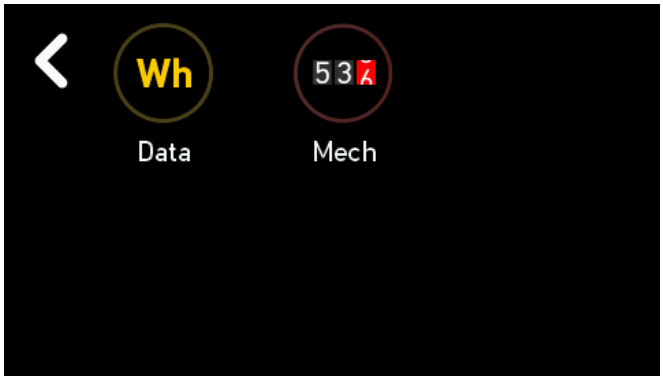


Figure 4.20. «Meter».

Meter -> Data

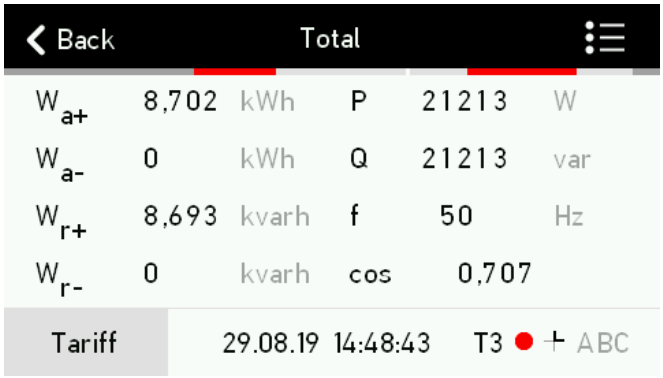


Figure 4.21. «Meter» -> «Data».

At the top line shown back button; tariff; button for device choosing.

At the left column: active and reactive energy in forward and reverse direction.

At the right column: active and reactive power, frequency, power factor.

At the bottom line: button for tariff choosing; current time and date; current tariff; impulse counter; current power quadrant; phase indicator.

Meter -> Mech

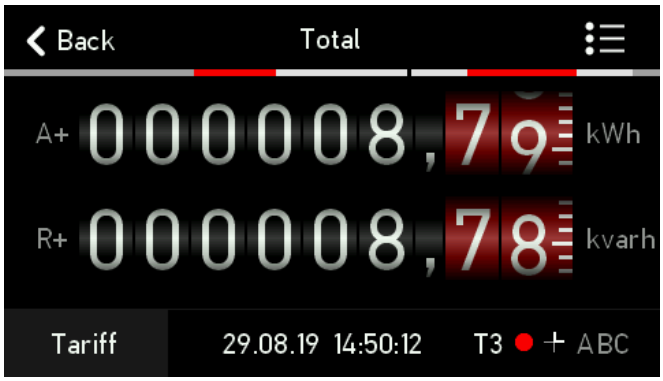


Figure 4.22. «Meter» -> «Mech».

At the top line shown back button; tariff; button for device choosing.

At the center: active and reactive energy in forward direction.

At the bottom line: button for tariff choosing; current time and date; current tariff; impulse counter; current power quadrant; phase indicator.

4.1.6 Quality

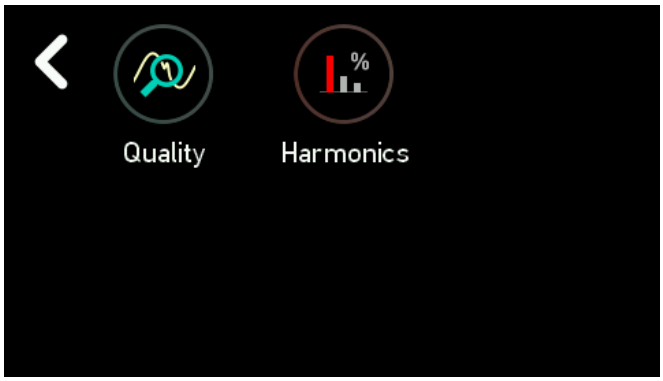


Figure 4.23. «Quality».

Quality -> Quality

Quality menu consists of two screens: sequences («0,1,2») and coefficients («KdX»).

	0	1	2
U, V	0	59,24	0
I, A	0	5,015	0
P, W	0	204	0
Q, var	0	216	0
S, VA	0	297,1	0
KuU	0		0
KuI	0		0

Figure 4.24. «Quality» -> «Quality» -> «0,1,2».

At first screen shown zero/positive/negative sequences for current, voltage and power; zero/negative current and voltages unbalance.

	A (AB)	B (BC)	C (CA)	X̄/Σ
KdU	0	0	0	0
KdI	0	0	0	0
THDp	0	0	0	0
THDq	0	0	0	0
THDs	0	0	0	0

Figure 4.25. «Quality» -> «Quality» -> «KdX».

At second screen shown voltage, current and power Total Harmonics Distortion.

Quality -> Harmonics

Current and voltage harmonics value at digital and graphs views.

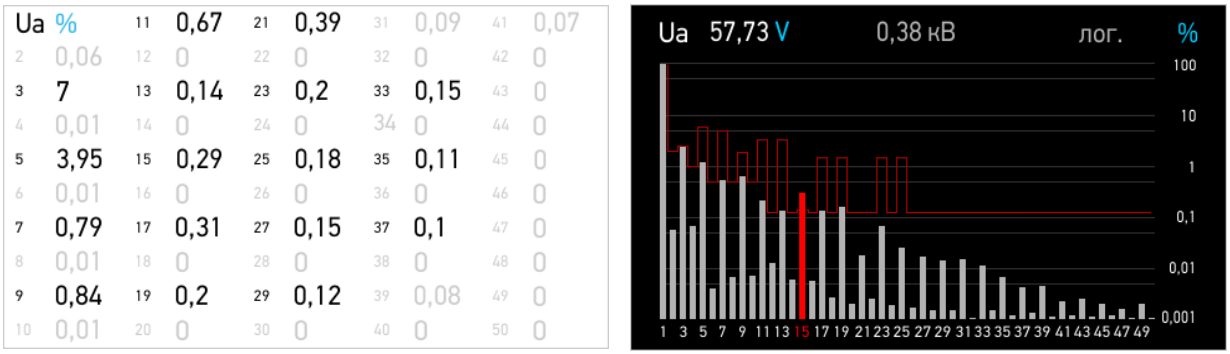


Figure 4.26. «Quality» -> «Harmonics».

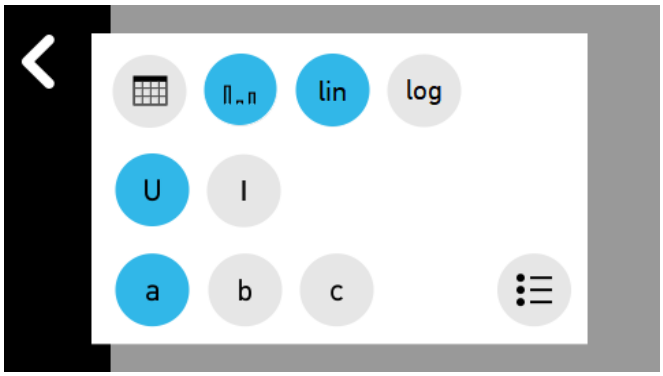


Figure 4.27. «Harmonics» settings.

At settings screen available a choosing of digital/graphs view; linear/logarithmic scales; current/voltage value; L1/L2/L3 phase.

5 ENMI-6

ENMI-6 is diagnostic panel for SNMP devices. It allows polling SNMPv1 devices and to signal faults with a discrete output or through Modbus TCP protocol.

6 ENMI-7

ENMI-7 have OLED display, which displays values measured by ENIP-2 or ESM. All values are grouped in several view modes.

Table 6.1. ENMI-7 view mode

View mode	Screen	Units	ESM	ENIP-2
Current	I_A; I_B; I_C; I_{av}	A, kA	+	+
Phase voltage	U_A; U_B; U_C; U_{av}	V, kV	+	+
Line voltage	U_{AB}; U_{BC}; U_{CA}; U_{av}	V, kV	+	+
Power	P_A, Q_A; P_B, Q_B; P_C, Q_C; P_Σ, Q_Σ	W/kW/MW var/kvar/Mvar	+	+
Main measurements	I, U, Ul; P, Q, S; cos, Hz		+	+
Energy	WA+, WA-, WR+, WR-	kWh, kvarh	+	+
Voltage harmonics	U1...U10; U11...U20; U21...U30; U31...U40; U41...U50	%	+	
Current harmonics	I1...I10; I11...I20; I21...I30; I31...I40; I41...I50;	%	+	
Digital signals	DIO1...32 DIO33...DIO64		+	+
Vector diagram	Table view; Diagram view		+	

Table 4.2. ENMI-7 buttons functions.

Combination	Function
	Previous View mode
	Next View mode
	Change screen
	Open settings
 Hold 2 sec	Reset to default settings

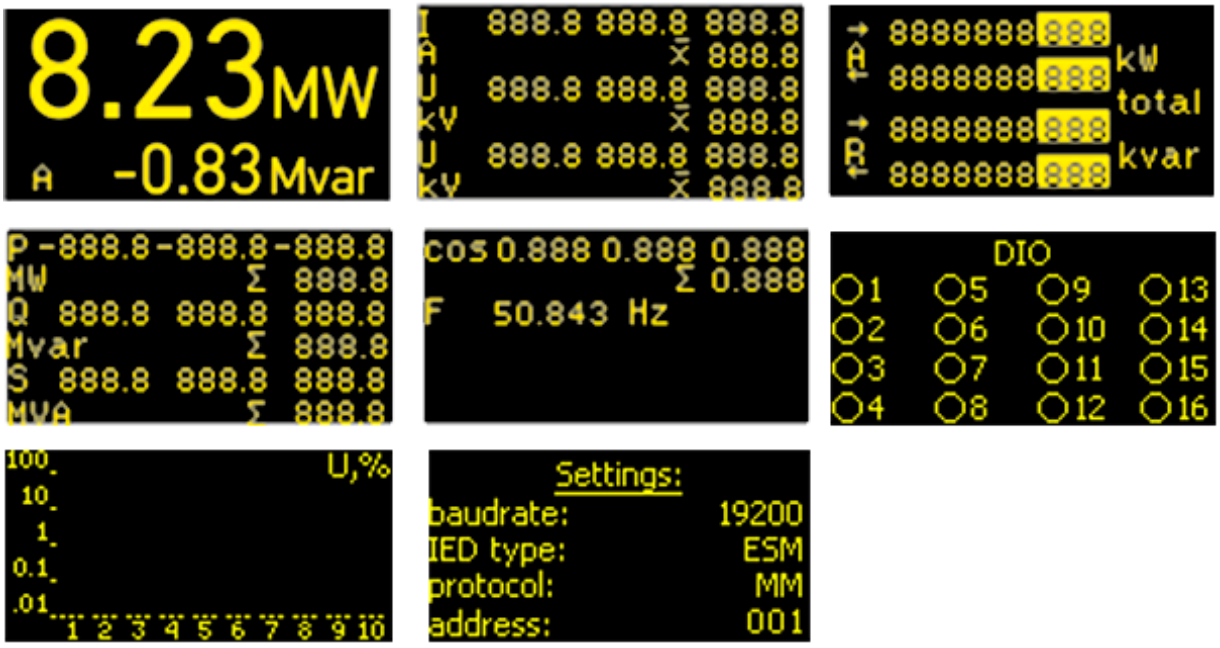


Figure 6.1. ENMI-7 screens example.

Available settings:

- Baudrate – RS-485 baudrate, bps;
- IED type – ESM or ENIP-2;
- Protocol – polling protocol, MM – Modbus master, MS – Modbus slave;
- Address – polling device slave address.

7 Settings

Configuring of ENMI consist of setting up parameters for communication port (RS-485), setting up alarm conditions, display settings, compose and animate mimic diagram (only for ENMI-4m/4e).

All available parameters can be setup throw USB/RS-485/Ethernet port using «ES configurator» software. Basic setup communication parameters and display settings can be setting up through using controls on the front panel of ENMI (available for ENMI-4m/4e/7).

7.1 Firmware update

We are working all days for add new features and improvements for ENMI modules. So, before using of ENMI, please, check the latest firmware and software on our web site for ENMI. For writing new firmware to ENMI use special update utility “ES BootLoader”. In addition, you can download it from our web site too.

Download latest firmware and software: http://www.enip2.com/support/firmware/

For firmware updating of ENMI (for example through RS-485), setup connection to ENMI’s communication port. Launch update utility “ES BootLoader”. Select connection type: «COM-port». Set the number of serial port in your system, which connected to ENMI. Set baudrate of serial port (19200 is default).

Select the type of your display module. In the field “firmware” open file with last version of ENMI’s firmware (see figure 7.1).

To start writing firmware, press button “Auto”. Automatic writing process will start, including: connection to device, erasing current firmware, writing new firmware, verify written firmware and reset device. If after pressing “Auto”, upgrading not started, turn off the power supply of ENMI and turn it on.

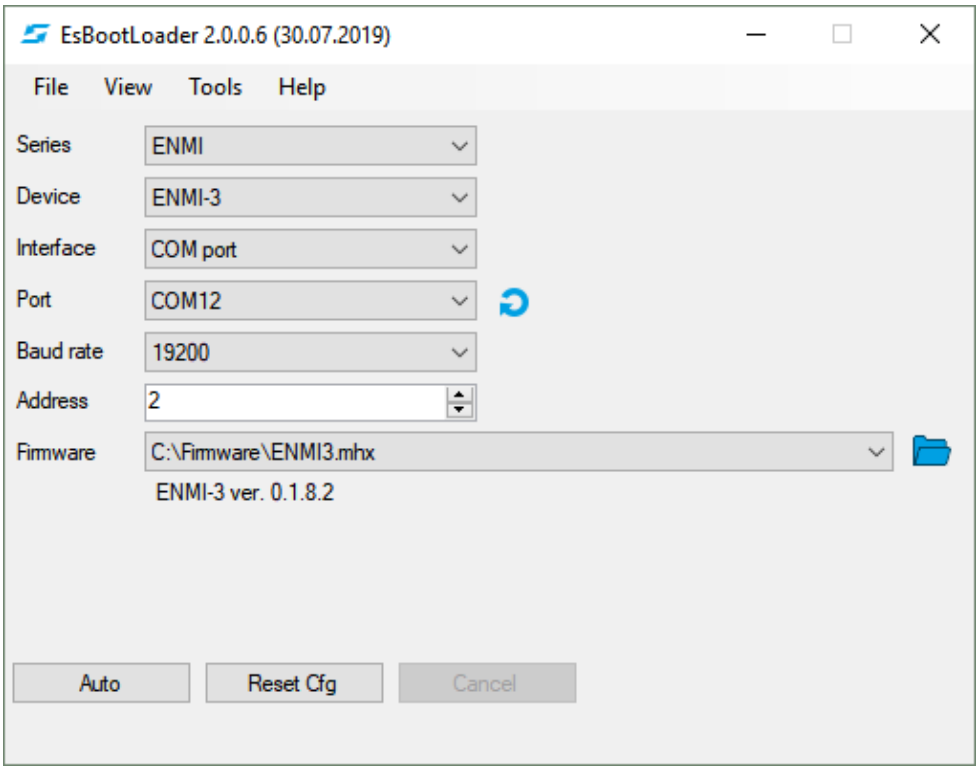


Figure 7.1. “ES BootLoader” software main window

After updating firmware, please check, that you use the last version of configuration software.

7.2 “ES Configurator” software

“ES Configurator” software is used for configuring display modules ENMI. The last version of configuration software you can download here:

http://enip2.ru/software/esconfigurator.zip

System requirements: Windows XP or newer and .NET Framework 4.

Download .NET Framework 4 distributive from the official site here: www.microsoft.com/downloads

To install the program, just copy and unzip downloaded archive file in some folder on your PC.

To launch the program, just run the executable file *ESConfigurator.exe*.

7.3 Reset configuration to default settings

For reset configuration to default settings, use PC with utility “ES Bootloader”:

- Connect ENMI to COM-port or USB of PC,
- Run «ES BootLoader»,
- Set connection settings,
- Click Reset Cfg,
- If after pressing “Reset Cfg”, upgrading not started, turn off the power supply of ENMI and turn it on.

8 Maintenance

Maintenance should be according to this manual. Only qualified personnel should perform it.

Repair of defective device produced by manufacturer. Do not open the housing during operation. Opening the ENMI voids the warranty.

For preventive maintenance, follow instruction bellow:

- Disconnect power supply and digital interface;
- Remove dust;
- Check device for defects;
- Check mount;
- Connect power supply and digital interface.

For cleaning use nonabrasive detergent or 70% ethanol-water solution.

9 Transport, packing and storage

ENMI is transported in any covered transport (railway, car, aviation). There are transports conditions: temperature –50...+70ºC, relative humidity 95 % at 30ºC.

ENMI is delivered in packaging case. Package has content according to page 10.

Storage condition in follow table:

Condition	Device in manufacturer packing	Device without manufacturer packing
Temperature	5-40 °C	10-35 °C
Relative humidity	80% (at 25 °C)	80% (at 25 °C)

Appendix A. Protocol Modbus

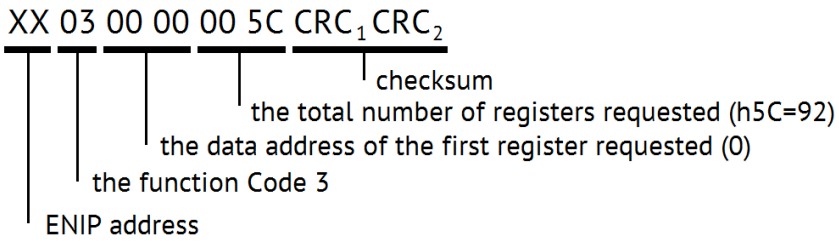
About Modbus

Modbus (Schneider Electric trademark) is a serial communications protocol. Full description see on www.modbus.org. This protocol is used for data communication between ENMI and ENIP connected via RS-485 interface.

Master/slave mode

ENMI can operate in master and slave modes.

In master mode ENMI send request to ENIP and receive data with all values. Available addresses of ENIP from 01 to 254 (01-hFE). Format of request follow:



In slave mode ENMI receive data from ENIP. Periodic broadcast mode should be active on ENIP. In this mode ENIP send broadcast data with address 255.

Available command

h03 read holding registers;

Registers address

Address		Quantity of registers	Displayed value	Type
dec	hex			
Integer* RMS				
0	0x00	1	Ua	unsigned short
1	0x01	1	Ub	unsigned short
2	0x02	1	Uc	unsigned short
3	0x03	1	Average U	unsigned short
4	0x04	1	Uab	unsigned short
5	0x05	1	Ubc	unsigned short
6	0x06	1	Uca	unsigned short
7	0x07	1	Average line-to-line U	unsigned short
8	0x08	1	Ia	unsigned short
9	0x09	1	Ib	unsigned short
10	0x0A	1	Ic	unsigned short
11	0x0B	1	Average I	unsigned short
12	0x0C	1	Pa	short
13	0x0D	1	Pb	short
14	0x0E	1	Pc	short
15	0x0F	1	Total P	short
16	0x10	1	Qa	short

Address		Quantity of registers	Displayed value	Type
dec	hex			
17	0x11	1	Qb	short
18	0x12	1	Qc	short
19	0x13	1	Total Q	short
20	0x14	1	Sa	unsigned short
21	0x15	1	Sb	unsigned short
22	0x16	1	Sc	unsigned short
23	0x17	1	Total S	unsigned short

Integer first harmonic**

24	0x18	1	Ua1	unsigned short
25	0x19	1	Ub1	unsigned short
26	0x1A	1	Uc1	unsigned short
27	0x1B	1	Average U1	unsigned short
28	0x1C	1	Uab1	unsigned short
29	0x1D	1	Ubc1	unsigned short
30	0x1E	1	Uca1	unsigned short
31	0x1F	1	Average line-to-line U1	unsigned short
32	0x20	1	Ia1	unsigned short
33	0x21	1	Ib1	unsigned short
34	0x22	1	Ic1	unsigned short
35	0x23	1	Average I1	unsigned short
36	0x24	1	Pa1	short
37	0x25	1	Pb1	short
38	0x26	1	Pc1	short
39	0x27	1	Total P1	short
40	0x28	1	Qa1	short
41	0x29	1	Qb1	short
42	0x2A	1	Qc1	short
43	0x2B	1	Total Q1	short
44	0x2C	1	Sa1	unsigned short
45	0x2D	1	Sb1	unsigned short
46	0x2E	1	Sc1	unsigned short
47	0x2F	1	Total S1	unsigned short

cos, frequency, power quality parameters, energy, quantums, CT/PT ratio, temperature, DIO, timestamp, reserve

48	0x30	1	cos φ, phase A	short
49	0x31	1	cos φ, phase B	short
50	0x32	1	cos φ, phase C	short
51	0x33	1	cos φ, total	short
52	0x34	1	F	unsigned short
53	0x35	1	U0 – voltage zero sequence	unsigned short
54	0x36	1	U1 - voltage positive sequence	unsigned short
55	0x37	1	U2 – voltage negative sequence	unsigned short
56	0x38	1	KuU – voltage unbalance	unsigned short
57	0x39	1	KdU – voltage distortion	unsigned short
58	0x3A	1	I0 - current zero sequence	unsigned short
59	0x3B	1	I1 - ток positive sequence	unsigned short
60	0x3C	1	I2 - ток negative sequence	unsigned short
61	0x3D	1	KuI – current unbalance	unsigned short
62	0x3E	1	KdI – current distortion	unsigned short
63	0x3F	1	THD - total harmonic distortion	short
64	0x40	2	WP+ active energy, forward direction	unsigned long
66	0x42	2	WP- active energy, reverse direction	unsigned long

Address		Quantity of registers	Displayed value	Type
dec	hex			
68	0x44	2	WQ+ reactive energy, forward direction	unsigned long
70	0x46	2	WQ- reactive energy, reverse direction	unsigned long
72	0x48	2	DIO – DI/DO status	unsigned long
74	0x4A	2	Time - timestamp UTC, seconds	unsigned long
76	0x4C	1	Time - timestamp UTC, milliseconds	unsigned short
77	0x4D	1	T – inside temperature	short
78	0x4E	1	KU – PT ratio	unsigned short
79	0x4F	1	KI – CT ratio	unsigned short
80	0x50	1	QU – voltage quantum	unsigned short
81	0x51	1	QI – current quantum	unsigned short
82	0x52	1	reserve	
83	0x53	1	reserve	

ENMV-2 values:

84	0x54	1	Ua	unsigned short
85	0x55	1	Ub	unsigned short
86	0x56	1	Uc	unsigned short
87	0x57	1	I0	unsigned short
88	0x58	1	U0	unsigned short
89	0x59	1	diagnostic	short
90	0x5A	1	reserve	
91	0x5B	1	reserve	

ENIP-2-...-32 values:

84	0x54	1	UL1	unsigned short
85	0x55	1	UL2	unsigned short
86	0x56	1	UL3	unsigned short
87	0x57	1	reserve	
88	0x58	1	reserve	
89	0x59	1	diagnostic	short
90	0x5A	1	reserve	
91	0x5B	1	reserve	

* - integer values are converted to displayed values using formula: $M_{dspl} = \frac{M_{int}}{Q \cdot K}$,
where Q – quantum, K – transformer ratio;
** - values are marked by gray font not available for displaying.