Limited Liability Company
“NPK MORSVYAZAVTOMATICA”

POWER SUPPLY UNIT
PS-303

Operating manual

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INTRODUCTION

This operating manual (hereinafter referred to as OM) is intended to describe the structure, operating principles, technical specifications and service of Power supply units PS-303 (hereinafter referred to as the Product, the PSU).

In addition to the instructions given in this document, the safety regulations and rules applicable in the field shall be observed.

Only those who have read and understood this document and those who have had special training shall be permitted to operate with the Product according to the applicable regulations.

Terms and abbreviations:

OM – operating manual;

TS – technical service;

PSU – power supply unit PS-303;

SC – short circuit;

CL – check list;

LFSG – large fine-pored silica gel granular.

1 DESCRIPTION AND OPERATION OF THE PRODUCT

1.1 DESCRIPTION

The PSU operates with AC single-phase mains, 50 (60) Hz, voltage 220 V or 12 V DC or 24 V DC and provides stabilized power supply 12 V DC or 24 V DC to different shipborne and industrial equipment.

1.2 MAIN TECHNICAL SPECIFICATIONS

The Product provides:

a) power supply from AC power mains, frequency 50 (60) Hz with rated voltage 220 V or DC with rated voltage 24 V, or standby DC network with rated voltage 12 V or 24 V;

b) automatic switchover to standby power in case of main power failure and vice versa;

c) output contacts protection against SC.

Technical specifications and used fuses are represented in Tables 1, 2.

Table 1 – General technical specifications of the Product's types

Characteristics	**PS-303-A2-2 (4.2 A)**	**PS-303-A2-2 (6.5 A)**	**PS-303-A2-2 (12.5 A)**	**PS-303-A2-1 (8.5 A)**	**PS-303-A1-1 (12.5 A)**	**PS-303-A1-1 (18.5 A)**	**PS-303-22-1 (8.5 A)**	**PS-303-22-2 (4.2 A)**	**PS-303-22-2 (14.6 A)**	**PS-303-21-1 (12.5 A)**	**PS-303-21-1 (27.5 A)**	**PS-303-11-1(8.5 A)**
Input voltage (main), V	220 (198 to 242)*, AC, frequency 50 (60) Hz						24 (19 to 36)*, DC					
Input voltage (standby), V DC	24 (19 to 36)*				12 (9 to 18)*		24 (19 to 36)*			12 (9 to 18)*		
Output voltage, V DC	24	24	24	12	12	12	12	24	24	12	12	12
Subtype	See Figures B.1–B.4											
	A	B	B	A	B	B	C	C	D	D	D	D
Pulses, mV	150	200	150	120	150	150	120	150	150	120	120	120
Output power, W	100.8	156.0	300.0	102.0	150.0	222.0	102.0	100.8	350.4	150.0	330.0	102.0
Efficiency, at least %	66.2	84.0	83.0	66.7	82.5	80.0	57.7	51.3	75.0	70.0	70.0	75.0
Galvanic isolation from power mains	+	+	+	+	+	+	+	+	+	+	+	+
Galvanic isolation from standby mains	+	–	–	+	–	–	+	+	–	–	–	–
Switchover to standby power	automatic (automatic restoration in case of power recovery)											
Built-in protection	– load SC; – current overload (fuses); – reverse polarity (fuses)											
LEDs	main power and power from standby source											
Overall dimensions, mm	288.0 × 278.5 × 100.3											
Operating temperature, °C	–15 to +55											
Limiting temperature, °C	–60 to +70											
Weight, kg	4.5											
Protection degree	IP22											

Notes
1 If external alarm unit AU-106 is connected, it ensures sound and light signaling in case of main-standby power transfer. Arrange external alarm unit AU-106 at order (it is not included in the scope of delivery).
2 «*» – power voltage range is given in parenthesis.

Table 2 – Number of fuses for the Product types

Fuses	PS-303-A2-2 (4.2 A)	PS-303-A2-2 (6.5 A)	PS-303-A2-2 (12.5 A)	PS-303-A2-1 (8.5 A)	PS-303-A1-1 (12.5 A)	PS-303-A1-1 (18.5 A)	PS-303-22-1 (8.5 A)	PS-303-22-2 (4.2 A)	PS-303-22-2 (14.6 A)	PS-303-21-1 (12.5 A)	PS-303-21-1 (27.5 A)	PS-303-11-1(8.5 A)
Automotive fuse 5.0 A	1	-	-	-	-	-	-	2	-	-	-	1
Automotive fuse 7.5 A	-	-	-	-	-	-	1	-	-	1	-	-
Automotive fuse 10.0 A	-	1	-	1	-	-	1	-	-	-	-	1
Automotive fuse 15.0 A	-	-	1	-	1	-	-	-	-	1	-	-
Automotive fuse 20.0 A	-	-	-	-	-	1	-	-	2	-	1	-
Automotive fuse 30.0 A	-	-	-	-	-	-	-	-	-	-	1	-
Fuse 5x20 mm, 1.0 A	1	-	-	1	-	-	-	-	-	-	-	-
Fuse 5x20 mm, 2.0 A	-	1	-	1	1	1	-	-	-	-	-	-
Fuse 5x20 mm, 3.0 A	-	-	1	-	-	-	-	-	-	-	-	-

1.3 Structure and operation of the Product

1.3.1 General description

The PSUs are produced in metal casing; a piano type switch (On/Off) is located on the Product casing.

1.3.2 Controls and LEDs

The Product's layout of main functional elements, controls and LEDs is represented in Figure 1.

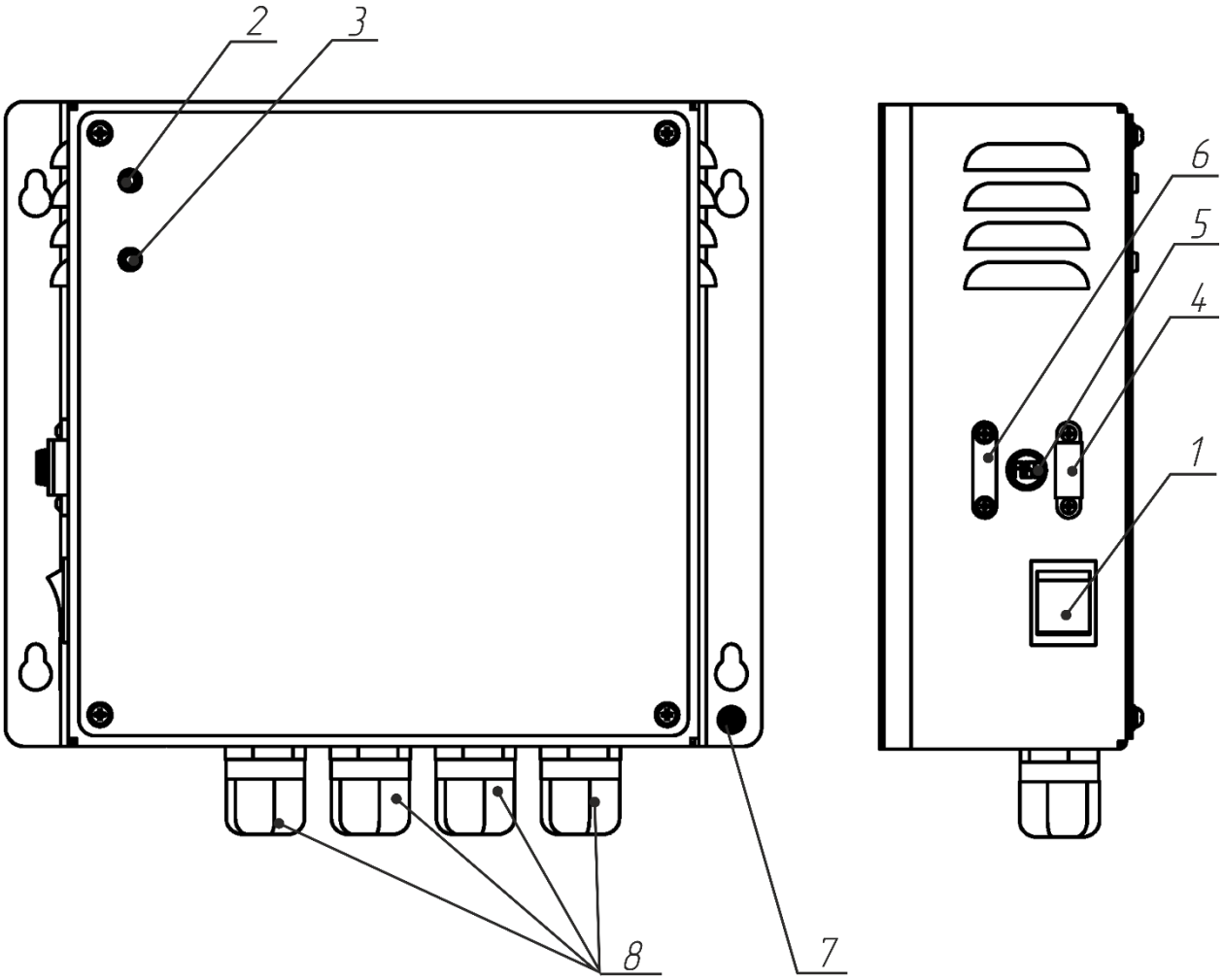


Figure 1 – The Product layout

The Product's main functional elements, controls and LEDs are located on the casing; for more data on their assignment, see Table 3.

Table 3 – Assignment of functional elements, controls and LEDs

№	Element	Type, size and identifier	Description
1	Piano type switch	–	Piano type switch (PSU's power supply On/Off)
2	LED	«Main»	Main power availability
3		«Standby»	Standby bower availability
4	Fuse holder	Automotive	Fuse installation to protect input circuit against overload and SC
5		Fuse	
6	Blank plug	–	Place to install fuse
7	Stud	M5x15	Main element of grounding
8	Cable gland	MG-20	Cable gland to connect main and standby power and loads
Note – № are shown in Figure 1.			

1.3.3 The Product's connection

Main and standby power is supplied to PSU terminals to ensure failure-free operation of the connected equipment. Connection diagram and description of connector terminals are represented in Figure 2 and Table 4.

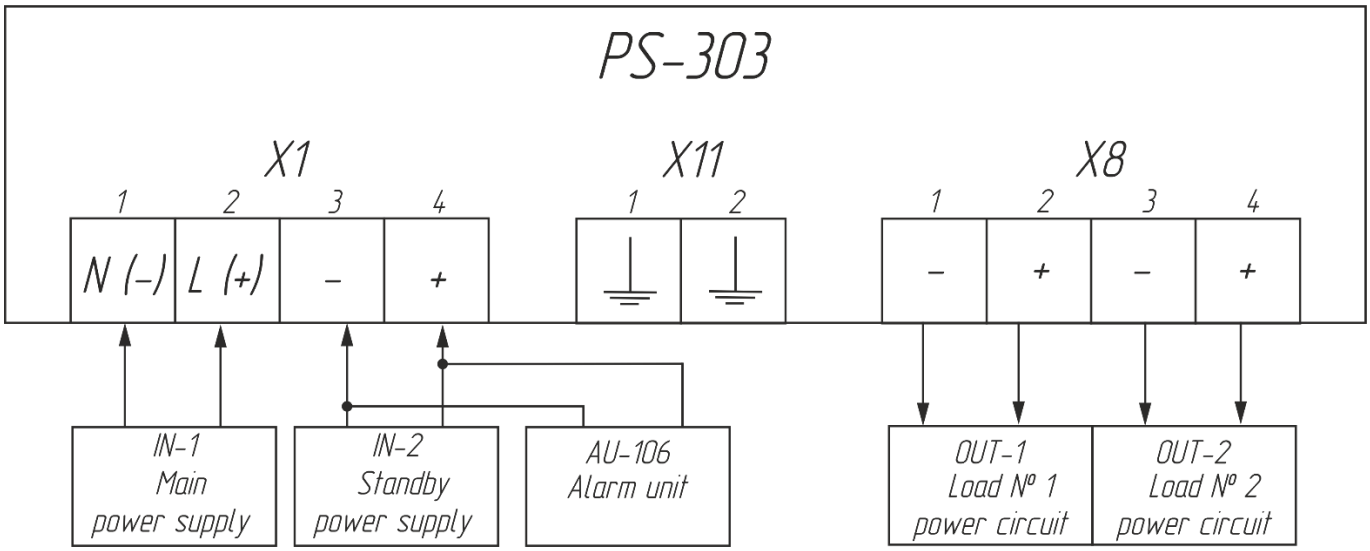


Figure 2 – Connection diagram of the Product

Table 4 – Description of the Product's connector terminals

Connector	Terminal №	Description
X1	1	To connect main power 220 V 50 Hz or 24 V DC
	2	
	3	To connect standby power 12 V; 24 V DC
	4	
X11	1	⏚
	2	
X8	1	To connect load №1 12 V; 24 V DC
	2	
	3	To connect load №2 12 V; 24 V DC
	4	

1.4 MEASUREMENT INSTRUMENTS, TOOLS AND APPLIANCES

Consumables required for the TS are represented in Table 5.

Table 5 – Consumables required for the TS

Name and identifier of consumables	Amount of consumables	Note
Cleaning cloth	0.10 kg	To clean contamination from the surfaces
Rectified hydrolytic technical ethyl alcohol	0.01 l	1 To remove severe contamination. 2 To clean the Products surface in case of coating damage
Varnish	0.05 kg	To cover surfaces of the Product in case of paint coating damage
Abrasive cloth	0.06 x 0.06 m	To polish surfaces of the Product in case of paint coating damage

1.5 MARKING AND SEALING

The Product has a nameplate indicating name, serial number, date of manufacturing, weight, IP rating, input voltage: main and standby, output voltage and output power.

The sealing of the Product is not provided.

1.6 PACKAGING

At the time of delivery the Product is packed in a corrugated board box and inner packaging (air bubble film) ensuring its transportation and storage at the warehouse.

Transport packaging is also used as a returnable packaging for transportation of the Product to the repair location and back.

The sealing of transport packaging is not provided.

2 INTENDED USE OF THE PRODUCT

2.1 OPERATIONAL CONSTRAINTS

Install the Product in compliance with overall dimensions.

Caution! Distance between the installation site and magnetic compass shall not be less than 1 m!

Select the installation site in compliance with operational constraints (operating temperature and protection degree – IP).

2.2 USAGE PREPARATIONS

2.2.1 Safety features

While preparing the Product for operation, check it visually after unpacking; mechanical damage shall be absent.

Connection to power mains shall be provided only in compliance with input power requirements.

Before connecting the Product shall be switched off and have a proper grounding.

While using the Product the staff shall follow “The technical rules for operation of electric installation” and “Safety rules for operation of electric installation” while testing electrical circuits and insulation resistance.

2.2.2 Visual check procedure

Before switching the Product on:

a) observe visually integrity and initial position of the controls on the front panels;

b) check the absence of dust and dirt on the Product casing; clean with a soft cloth if necessary;

c) check that cable connectors are securely connected to the Product.

2.2.3 **Switching on instructions**

While connecting the Product and preparing it for operation follow the steps below:

a) transfer circuit breakers of main power switchboard to “OFF” position;

b) connect de-energized power cable to input terminals;

c) transfer circuit breakers of main power switchboard to “ON” position»;

d) transfer a piano type switch on the Product’s casing to “ON” position;

e) take off the cover and measure output voltage of connector X8 (terminals 1, 2 and 3, 4) by voltmeter, see Figure 2. Voltage shall be 24 V or 12 V DC depending on the Product type. If the voltage does not comply with the abovementioned, the Product is not considered to be ready for operation; contact the Manufacturer;

f) if the X8 voltage complies with the abovementioned, transfer piano type switch and a circuit breaker of switchboard to "OFF" position. Connect load to X8 connector;

g) close the cover and transfer a circuit breaker of switchboard and piano type switch on the Product casing to "ON" position; check the load operation.

2.2.4 To switch The Product off:

a) Switch the load off (only if it may be switched off by a breaker on its casing, otherwise, the load switches off after the Product's powering off);

b) Transfer a piano type switch on the Product's casing to "OFF" position then transfer circuit breakers of main power switchboard to "OFF" position».

2.3 USAGE OF THE PRODUCT

To use the Product:

a) Switch on a circuit breakers of main power switchboard;

b) Transfer a piano type switch on the Product's casing to "ON" position.

Availability of main or standby power is indicated by LED glowing: "Main" or "Standby" respectively, see Figure 1.

3 TECHNICAL SERVICE OF THE PRODUCT

3.1 GENERAL DESCRIPTION

The Product's TS shall be provided by the staff acquainted with its composition, structure and operation features.

In order to provide safe and reliable operation for the Product, the staff shall maintain all types of TS:

a) TS-1 – semi-annual TS;

b) TS-2 – annual TS.

TS-1 and TS-2 shall be provided by the staff on the running equipment.

3.2 SAFETY FEATURES

While maintaining the TS, observe 4.2.

3.3 MAINTENANCE ROUTINE

List of works by TS types is represented in Table 6. Maintenance routine procedure is given in CL, represented in Tables 7–10.

The list of works for all types of TS is given in Table 5.

Table 6 – List of works by TS types

CL No.	Work	TS Type	
		TS-1	TS-2
1	Visual check of the Product	+	+
2	The Product operability test	+	+
3	Power circuit insulation resistance check	–	+
4	Test of output voltage compliance to the values given in Table 1	–	+
Notes 1 «+» – work is obligatory. 2 «–» – work is not obligatory.			

Table 7 – CL № 1. Visual check of the Product

To be done	Routine	Man-hours per 1 Product
Visually examine the Product	1 check completeness and appearance of the Product; mechanical damage, paint defects must be absent; marking plates shall be present; legends are to be read easily. 2 clean up the Product surfaces with clean cloth; 3 remove severe contamination, parts of corrosion, oil spots from the metal surfaces – using ethyl alcohol, avoiding its penetration inside the Product; all surfaces clean dry by clean cloth and dry up; 4 If varnish paint coating is damaged, polish it with sand paper, then clean with alcohol-soaked cloth, cover with varnish and dry up	1 person 5 minutes
Check reliability of cable and bus connection to the Product	1 check that connectors and attaching screws are fastened tight; provide further fastening if needed; 2 check the cable integrity (mechanical damage shall be absent) within visibility	1 person 5 minutes

Table 8 – CL № 2. Operability check of the Product

To be done	Routine	Man-hours per 1 Product
Check the Product's operability	1 Switch the Product's power on; 2 Make sure that main or standby power is available by glowing of corresponding LEDs - "Main" or "Standby", located on the Product's casing	1 person 5 minutes

Table 9 – CL № 3. Test insulation resistance of power supply circuits

To be done	Routine	Man-hours per 1 Product
Test insulation resistance of power supply circuits	Test insulation resistance between conductors and the Product casing by means of megaohmmeter, generator type. Attach positive and negative, or L and N, power cable cores to the first probe at the same time; and grounding contact of power core or grounding stud - to another probe. Set test voltage on the megaohmmeter 100 V – for 12 to 24 V circuits, and 500 V – for circuits with power supply more than 220 V. Turn on the megaohmmeter and measure the insulation resistance of the Product; it shall not exceed 1 MOhm. Repeat the test for the power cable of standby power source	1 person 15 minutes

Table 10 – CL № 4. Test of output voltage compliance

To be done	Routine	Man-hours per 1 Product
Test of output voltage compliance	Connect voltmeter and measure voltage of X8 connector (terminals 1, 2 and 3, 4). Voltage values shall comply with those listed in Table 1	1 person 15 minutes

3.4 PRESERVATION

The Product and set of operational documents are stored in preserved condition in Manufacturer's packaging boxes.

The time of represervation – 2 years from the Manufacturer's commissioning.

The preservation is done in full terms, for 2 years, applying protection and packaging.

The represervation is done in heated rooms in the same order as the preservation.

The represerved Product and documents are placed in package.

4 CURRENT REPAIR OF THE PRODUCT

4.1 GENERAL DESCRIPTION

Availability of main power is indicated by glowing of «Main» LED. Availability of standby power is indicated by glowing of «Standby» LED.

To diagnose the problem, see Table 11.

If you cannot diagnose the problem, contact the Manufacturer's service centre.

4.2 SAFETY FEATURES

Any repair works must be provided by personnel examined and received proper qualifications in the area of the occupational safety.

Check grounding of the PSU before providing any repair works.

It is PROHIBITED to put a poster "DO NOT switch on! Under Operation!", when power supply switch is in OFF position.

Replacing damaged parts, boards, modules is **PROHIBITED** if power supply of the repaired unit is on.

Installation, aligning and repair works are **PROHIBITED** in the room, where less than 2 people are present.

4.3 CURRENT REPAIR

The list of malfunctions that can be eliminated by own employees is represented in Table 11.

The repair of other defects shall be provided only by the Manufacturer's specialists or authorized representatives.

Table 11 – The list of possible malfunctions and troubleshooting

Malfunction	Possible reasons	To be done
"Main" LED is not glowing	No power supply voltage	Turn the ON/OFF key switch on the product to the "ON" position
		Apply the mains voltage
		Check the connection of the main power cable
		Main power supply malfunction
	Fuse malfunction	Replace fuse
"Standby" LED is not glowing	No standby power supply voltage	Turn the ON/OFF key switch on the product to the "ON" position
		Backup power supply
		Check connection of backup power cable
		Backup power supply malfunction
	Fuse malfunction	Replace fuse

5 STORAGE

The Product must be stored in packaging inside areas complying with the required storage conditions (+5 °C to + 40 °C) with the concentration of dust, oil, moisture and aggressive impurities in the air within the required limits for the working areas of production facilities.

After storage or transportation of the device below +10 °C, it must be unpacked only in heated premises and left in normal climate conditions for 12 hours beforehand.

6 TRANSPORTATION

The Product must be transported in the Manufacturer's transportation package in closed means of transport.

Types of shipment:

- motor vehicle and railroad transportation in closed means of transport (covered cars, multipurpose containers);
- air transportation (in sealed and heated compartments);
- sea transportation (in dry service premises).

The Product must be transported in compliance with transportation rules applicable for each means of transport.

During loading / unloading operations and transportation, the requirements indicated on warning labels on the boxes/packaging must be observed, and no impacts are permitted since they can affect the safety and performance of the Product.

Inside the means of transport, the packed device must be firmly secured / fastened.

7 DISPOSAL

New equipment, the parts of the Product damaged during operation, and any overage equipment must not be disposed as standard household wastes, since they contain the materials suitable for re-use.

Decommissioned and non-used components of the Product must be delivered to a special waste disposal center licensed by local authorities. You can also send an overage equipment / unit to the manufacturer for its further disposal.

Proper disposal of Product components allows avoiding possible negative environmental and health impacts, and it also allows for proper restoration of components with substantial energy and resources saving.

During operation and upon completion of its service life, the equipment is not hazardous for health and environment

This unit must be disposed according to the rules applied to electronic devices

	**Any products marked with a crossed trash bin must be disposed separately from standard house-hold wastes**

ANNEX A
(MANDATORY)
OUTLINE AND INSTALLATION DIMENSIONS

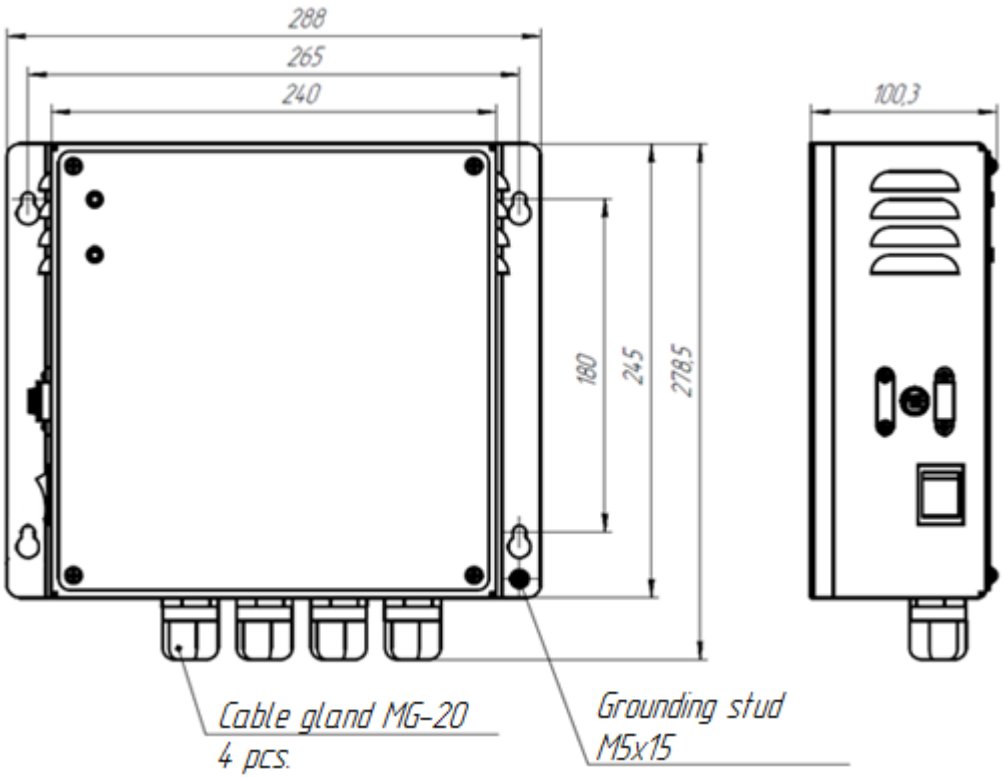
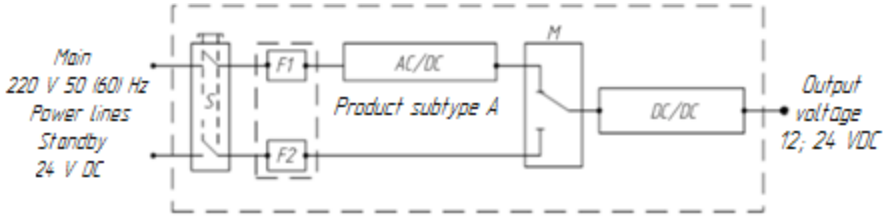


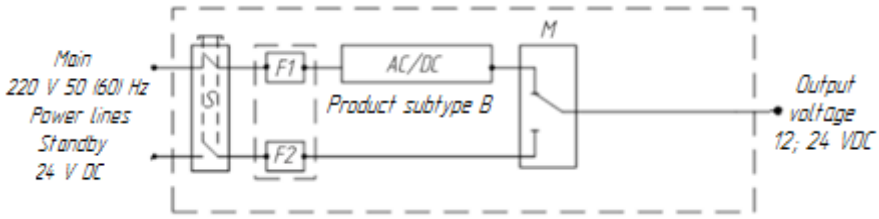
Figure A.1 – PS-303 outline and installation dimensions

ANNEX B
(MANDATORY)
STRUCTURAL DIAGRAMS OF PRODUCT TYPES



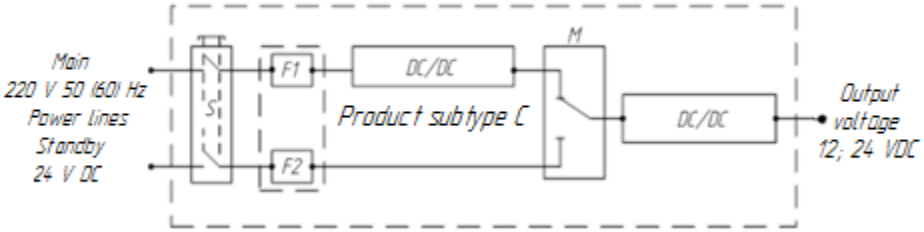
S – switcher; F1, F2 – fuse;
AC/DC and DC/DC – power converter; M – switching module.

Figure B.1 – Generalized structural diagram of Product subtype A



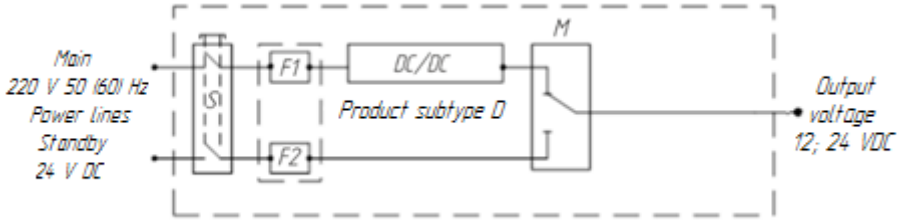
S – switcher; F1, F2 – fuse;
AC/DC – power converter; M – switching module.

Figure B.2 – Generalized structural diagram of Product subtype B



S – switcher; F1, F2 – fuse;
DC/DC – power converter; M – switching module.

Figure B.3 – Generalized structural diagram of Product subtype C



S – switcher; F1, F2 – fuse;
DC/DC – power converter; M – switching module.

Figure B.4 – Generalized structural diagram of Product subtype D