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ЭЛЕМЕР
SCIENCE AND PRODUCTION COMPANY

RELIABLE DEVICES AND SYSTEMS OF TECHNOLOGICAL MONITORING

POWER SUPPLY SOURCES OF DIRECT CURRENT

БП 906А/24-4КР

Certificate

НКГЖ.436714.008ПС

For APP

Подп. и дата | Инв. № дубл. | Взам. инв. № | Подп. и дата | Инв. № подл.

CONTENT

1. PURPOSE

Power supply sources of direct current БП 906А (hereinafter – power supply source), enumerated in the table 1.1, are designed for conversion of mains voltage of 220 V into stabilized voltage of 24 V.

Table 1.1

Modification code	Designation	Output voltage V	Number of output channels	Construction features
БП 906А/24-4КР	НКГЖ.436714.008	24	four with resistors	with power backup
БП 906А/24-4К	НКГЖ.436714.008-01	24	four with resistors	without power backup

Power supply sources БП 906А (of increased reliability) are produced in the version for Nuclear Power Station, they are used as components of control systems of technological processes of Nuclear Power Station (NPS).

Power supply sources are designed for operation in continuous mode and for power supply of self-cancellation bridge in instruments of thermocontrol of the system СКУД NPS «Busher».

In accordance with State Standards 12997-84 the power supply sources perform auxiliary function.

Power supply sources have embodiment without power backup and with power backup (the input of power backup is galvanically uncoupled from the mains).

The power supply sources have four galvanically uncouples channels.

The power supply sources have galvanic uncoupling between:

- circuits of mains and power backup, output circuits and grounding clamps;
- circuits of mains and power backup;
- output circuits;
- power supply circuits and output circuits.

Power supply sources are mounted on the metal DIN-batten (DIN N 43760).

In accordance with НП-001-97 (ОПБ-88/97) power supply sources belong to:

- according to purpose – to elements of normal operation of classes 2 or 3;
- according to influence on safety – to elements important for safety of classes 2НУ or 3НУ.

According to stability to climatic impact during operation power supply sources correspond to:

- version group С3 by State Standards 12997-84 at the temperature of ambient air from minus 10 to plus 60 °С (order index t1060);
- version group С2 by State Standards 12997-84 at the temperature of ambient air from minus 40 to plus 50 °С (order index t4050);

- type of climatic version T3 by State Standards 15150-69 at the temperature of ambient air from minus 25 to plus 60 °C (order index t2560);
- type of climatic version TB3 by State Standards 15150-69 at the temperature of ambient air from minus 25 to plus 60 °C (order index t2560).

According to protectability from environment impact in accordance with State Standards 14254-96 the degree of protection from water and dust getting into a power supply source it belongs to IP20.

According to stability to mechanical impact during operation power supply sources belong to the execution group M6 in accordance with State Standards 17516.1-90.

Power supply sources belong to the I category of seismic resistance according to НП-031-01 and to group Б of the version 3 by РД 25 818-87.

Power supply sources are durable, strong and resilient to an impact of an earthquake with a level of seismicity of 9 points by the scale MSK-64 on the setting level of up to 50 meters over the zero level accordance with State Standards 25804.3-80.

According to stability to electromagnetic interference power supply sources in accordance with State Standards P 50746-2000 belong to:

- version group III, criteria of quality of functioning – A;
- version group IV (besides microsecond pulse interferences of high energy in the power backup circuit during power supply from alternate current by the transmission circuit «wire-ground»), criteria of quality of functioning – A.

2. TECHNICAL DATA AND SPECIFICATIONS

2.1. Nominal output voltage of idle run 24 V.

2.1.1. Tolerable deviation of voltage from nominal one ±2 %.

2.1.2. Additional tolerable deviation of voltage during temperature variation for every 10 °C within the limits of operational temperatures ±0,2 %.

2.2. Effective value of pulse of output voltage not more than 50 mV.

2.3. Instability of output voltage during variation of mains voltage from 130 to 249 V not more than ±0,2 %;

2.4. Power supply is performed from the circuit of alternate current with frequency of (50±1) Hz and nominal voltage of 220 V with a tolerable deviation from 130 to 249 V.

The power backup is performed from the alternate current circuit of voltage from 130 to 249 V or from the circuit of direct current of voltage from 150 to 300 V (of any polarity).

Switching of power supply from mains to backup power and back do not result in collapse of output voltage.

2.5. Consumed power supply is not more than 5 V·A.

2.6. The time setting of operation mode is not more than 15 sec.

2.7. Making current of power supply (starter current) 5 A (during 2 ms).

2.8. Overall dimension, mm, not over 70x101x125.

2.9. The mass, kg, not over 0,4.

2.10. Power supply sources are durable to ambient air temperature impact:

- from minus 10 to plus 60 °C (order index t1060) for climatic version C3 by State Standards 12997-84;
- from minus 40 to plus 50 °C (order index t4050) for climatic version C2 by State Standards 12997-84;
- from minus 25 to plus 60 °C (order index t2560) for climatic version T3 by State Standards 15150-69;
- from minus 25 to plus 60 °C (order index t2560) for climatic version TB3 by State Standards 15150-69.

2.11. Insulation of electrical circuits of mains and power backup relative to grounding clamps and between themselves depending on conditions of testing withstands during 1 minute an impact of testing voltage of practically sinusoidal form with a frequency from 45 to 65 Hz:

- 1500 V at the temperature of ambient air (20±5) °C and of the relative humidity from 30 to 80 %;
- 900 V at the relative humidity of (90±3) % and the temperature of ambient air (25±3) °C.

2.11.1. Insulation of electrical circuits of the mains and power backup relative to output circuits, joined together, depending on conditions of testing withstands during 1 minute an impact of testing voltage of practically sinusoidal form with a frequency from 45 to 65 Hz:

1500 V at the temperature of the ambient air of (20±5) °C and of the relative humidity from 30 to 80 %;

- 900 V at the relative humidity of (90±3) % and the temperature of ambient air of (25±3) °C.

2.11.2. Insulation of electrical circuits between themselves and output circuits, joined together, relative to the grounding clamp depending on conditions of testing withstands during 1 minute an impact of testing voltage of practically sinusoidal form with a frequency from 45 to 65 Hz.

- 500 V at the temperature of the ambient air (20±5) °C and the relative humidity from 30 to 80 %;
- 300 V at the relative humidity (90±3) % and the temperature of the ambient air (25±3) °C.

2.12. Electrical resistance of insulation between output circuits and power supply circuits as well as output circuits between themselves is not less than:

- 20 MOhm at the temperature of the ambient air of (20±5) °C and relative humidity from 30 to 80 %;
- 5 MOhm at the temperature of ambient air of (50±3) °C [or plus 60 °C] and relative humidity from 30 to 80 %;
- 1 MOhm at relative humidity of (90±3) % and the temperature of ambient air of (25±3) °C.

2.13. Power supply sources are durable to impact of ambient air humidity of up to 95 % at the temperature of 35 °C.

Power supply sources in transport tare are durable to impact of humidity of up to 98 % at the temperature of 35 °C.

2.14. Power supply sources are durable to impact of sinusoidal vibrationwithin the frequency range from 1 to 100 Hz at the amplitude of vibratory acceleration of 20 m/s^2.

2.15. Power supply sources have no structural components and units with resonance frequencies from 5 to 25 Hz.

2.16. Power supply sources are durable and resilient to impact of single mechanical shocks with a peak acceleration of 20 m/s^2, duration of a shock pulse from 2 to 20 ms and the total number of the shocks is 30.

2.17. Power supply sources are durable and resilient to impact of multiple mechanical shocks with a peak shock acceleration of 30 m/s^2, with a preferable duration of shocking acceleration being 10 мс (tolerable duration – from 2 to 20 ms) and total number of shocks in every direction is 20.

2.18. Power supply sources are durable to impact of shocking vibration with the number of shocks of 80 during one minute, an average quadratic acceleration of 98 m/s^2 and 1 hour duration of impact.

2.19. Power supply sources are durable during seismic impact, equivalent to impact of vibration with parameters, mentioned in the table 2.1.

Table 2.1

Frequency, Hz	1,0	2,0	3,0	4,0	5,0	6,0	8,0	10,0	15,0	20,0	30,0
Acceleration, m/s	6,0	15,0	29,0	51,0	48,0	43,0	38,0	31,0	20,0	19,0	14,0

2.20. Provision of electromagnetic compatibility and noise immunity

2.20.1. According to stability to electromagnetic interferences power supply sources in compliance with State Standards P 50746-2000 correspond to:

- Version group III, criteria of quality functioning – A;
- Version group IV (except for microsecond pulse interferences of high energy in the circuit of the power backup in case of alternate current power supply by transfer circuit «wire - ground»), criteria of quality functioning – A.

2.20.2. Power supply sources function normally and do not produce any interferences in conditions of joint operation with equipment of systems and elements for which it is designed as well as with equipment designed for other purposes, that may be used together with the present power supply source in a typical interference situation.

3. COMPLETE SET

3.1. Power supply sources are supplied in the complete set, provided in the table 3.1.

Table 3.1 – Complete set of power supply sources

Name	Marking	Number	Notes
1. Power supply sources of direct current БП 906А/24-4КР	НКГЖ.436714.008	1 piece	
БП 906А/24-4К	НКГЖ.436714.008-01	1 piece	
2. The complete set of the instruments and of accessories for БП 906А/24-4КР			
2.1. Socket 5ESDV-02P		5 pieces	one for every channel and for connection of reserve power supply
2.2. Socket 2ESDV-03P		1 piece	For connection of cir-cuit power supply
3. The complete set of instruments and accessories for БП 906А/24-4К			
3.1. Socket 5ESDV-02P		4 pieces	One for every channel
3.2. Socket 2ESDV-03P		1 piece	For connection of cir-cuit power supply
4. Power supply sources of direct current БП 906А. Certificate		1 piece.	

4. DESIGN AND FUNCTIONING OF THE DEVICES

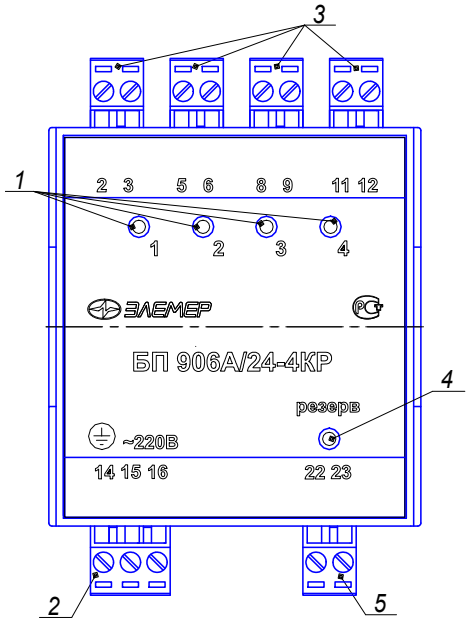
4.1. The power supply source consists of a pulse converter of mains voltage with galvanically decoupled outputs, module of line stabilizers with fault protection and overload protection, indication module, connection module and the module of reserve commutation for the power supply source with power backup.

4.2. On front panels of power supply sources (see picture 4.1) are located:

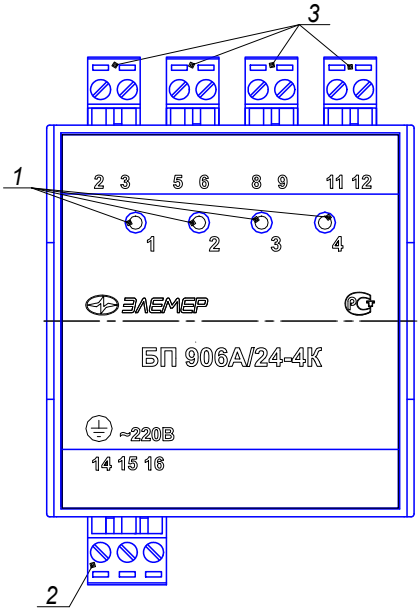
– single indicators (one per channel) of green colour indicating presence of output voltage;
– single indicators of red color indicating power backup actuation (for power supply sources with the power backup);
– clamp blocks of connection of mains, of power backup (for the power supply source with the power backup) and output circuits.

4.3. On the upper panel of the housings there are special opening located for access to resistors of conversion of output currents of channels (see the picture 4.2).

The front panel
БП 906А/24-4КР



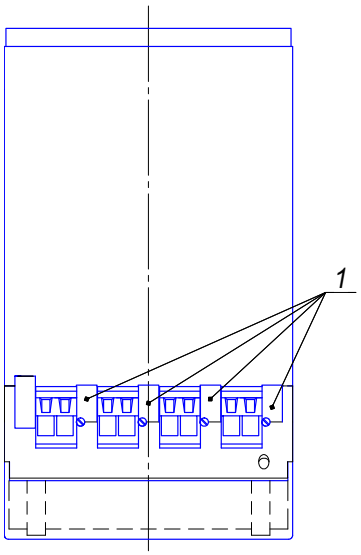
The front panel
БП 906А/24-4К



1 – single indicators (one per channel) of green color indicating presence of output voltage;
2 – clamp blocks of the mains power connection;
3 - clamp blocks of the output circuits connection;
4 – single indicator of red color indicating power backup actuation (for power supply sources with the power backup);
5 - clamp blocks of connection of mains, of power backup (for the power supply source with the power backup) and output circuits.

Picture 4.1

Upper panel of the housings
БП 906А/24-4КР, БП 906А/24-4К



1 – variable resistor

Picture 4.2

5. SAFETY MEASURES REGULATIONS

5.1. The power supply source in accordance with НП–001-97 (ОПБ – 88/97) belongs to the security class 2 or 3:

- according to purpose – to elements of normal operation;
- according to influence on safety – to elements important for safety;
- according to nature of functions – to controlling elements.

Example of classification designations 2НУ or 3НУ.

5.2. According to the method of protection of people from electrical shock the power supply source corresponds to class I of State Standards 12.2.007.0-75 and meets the safety requirements in accordance with State Standards Р 51350-99.

5.3. The power supply source has a grounding clamp according to State Standards 2.2.007.0-75.

5.4. Connection of primary and secondary converters to power supply source should be performed when power supply source is switched off.

5.5. The power supply source is fireproof, that is a probability of a fire in the power supply source foes not exceed 10^{-6} per year in accordance with State Standards 12.1.004-91 under normal as well as under emergency conditions of operation of a Nuclear Power Station. A fire is an open fire appearing on the outside surfaces of a power supply source or an outburst of flaming particles out of it.

5.6. When testing and operating a power supply source it is necessary to follow the requirements of НП-001-97 (ОПБ-88/97), ПНАЭ Г-1-024-90 (ПБЯ РУ АС-89), State Standards 12.3.019-80, «Regulations of technical operation of electrical appliances of consumers», «Regulations of safety engineering when operating of electrical appliances of consumers» и «Regulations of electric appliances arrangement», approved by Gosenergonadzor.

5.7. Safety requirements when testing insulation and measuring its resistance should correspond to State Standards 12.3.019-80.

6. PREPARATION FOR OPERATION

6.1. Unpack the power supply source. Make external examination, during this examination correspondence to the following requirements should de established:

1) the power supply source should be completed in accordance with the section 3 of this certificate;

2) factory number on the power supply source should correspond to the one provided in the certificate;

3) the power supply source should not have any mechanical damages, which may prevent its operation.

6.2. Make sure that the power supply mains is capable of withstanding the starting current of power supply sources, that operates during 2 ms and reaches 5 A.

6.3. The power supply source is connected to the power supply mains and loads in accordance with the connection chart, provided in the picture A.1 of Appendix A.

7. OPERATION PROCEDURE

7.1. Switch on the power supply source to the mains. After actuation an indicator of nominal value of voltage is lighted.

7.2. In case of need adjustment of currents in loads is performed with the aid of alternate resistors (1), located on the upper panel (see the picture 4.2).

8. RULES OF TRANSPORTATION AND STORAGE

8.1. The power supply source may be transported by any transportation means in sheltered vehicles. Fixation of tare in transportation vehicles should be performed according to the regulations for corresponding types of transport.

8.2. Conditions of transportation should correspond to conditions 5 of State Standards 15150-69 at the temperature of ambient air from minus 50 to plus 50 °C [or plus 60 °C] complying with measures of protection from shocks and vibration.

8.3. Conditions of storage of a power supply source in transport tare in a store of the manufacturer and a consumer should correspond to conditions 1 of State Standards 15150-69. There should be no aggressive ingredients in the air.

9. ACCEPTANCE CERTIFICATE

9.1. Power supply sources of direct current БП 906А/24-КР factory number № _____ safety category ___2Н____ by ОПБ-88/97 was manufactured and accepted in accordance with mandatory requirement of State Standards, of actual technical documentation and recognized suitable for operation.

9.1.1. Climate version Т3.

9.1.2. Version group by ЭМС IVA.

9.2. Technological testing during 72 hours has been carried out.

Head of the quality control department

Seal _____ _____
(personal signature) (signature deciphering)

_____
(year, month, day)

Equipment was manufactured under monitoring.

Representative of FSUE BO «Safety»

Seal _____ _____
(personal signature) (signature deciphering)

_____
(year, month, day)

10. PACKAGING CERTIFICATE

10.1. Power supply sources of direct current БП 906А/24-КР factory number № _____ packed by science and production company «ELEMER» according to the requirements provided by designers documents.

Date of packing _____

Seal

Packing was made by _____
(signature)

Device was accepted after packing _____
(signature)

11. RESOURCES, SERVICE LIFE AND SHELF LIFE MANUFACTURER'S GUARANTIES (SUPPLIER'S GUARANTIES)

11.1. The resource of the power supply sources makes up 50000 hours within the 10 years service life including the storage time of 6 month from the moment of manufacturing in packaging of the producer in a store.

The resource of the power supply sources are designed for operation NPS «Busher» 125000 hours within the 15 years service life including the storage time of 6 month from the moment of manufacturing in packaging of the producer in a store.

The above mentioned resource, service life and shelf life are valid only if a consumer follows the requirements of the operating in-line documentation.

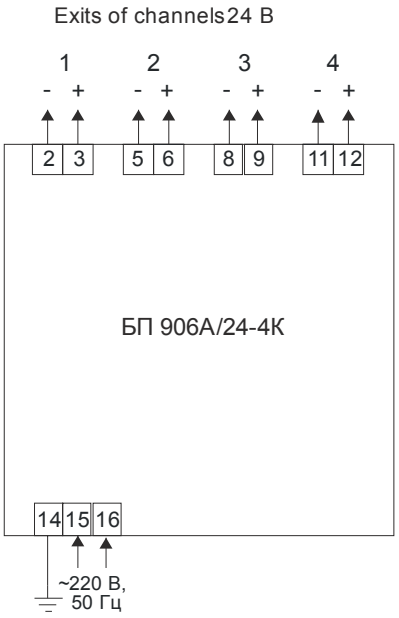
11.2. Guaranty term of operation is determined to be 6 years from the date of sale of power supply sources.

11.3. In case of loss of effectiveness of power supply sources, the device is repaired at the manufacturing factory at the address:

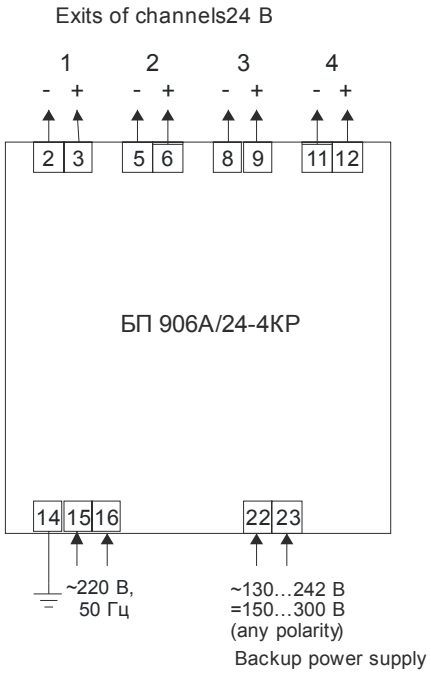
124460 Russia, Moscow
Zelenograd, 1145, n/p 1
The research-and-production enterprise «Elemer»
Phone: (495) 925-5147
Fax: (499) 710-0001
e-mail: elemer@elemer.ru

APPENDIX A

CONNECTION CHART
БП 906А/24-4К



CONNECTION CHART
БП 906А/24-4КР



Picture A.1

Appendix Б

Example of the record of designation when ordering

БП 906	– АЭС	– 24	– 4К	– -	– РП	– Т3	- IVA	– -	- ТУ 4229-070-13282997-07
1	2	3	4	5	6	7	8	9	10

1. Type of the instrument
2. Version type: NPP – nuclear approved by Rostechnadzor
3. the output voltage: 24 V
4. the number of channels: four channels with a resistor 500 Ohm each channel for compensation bridge of temperature of a cold end of ТП (order index 4К)
5. Maximal current of a load on channel (according to item 2.2 for the limits of conversion of output current of every channel)
6. The power backup (order index РП)
7. Climate version (in accordance with item. 2.11)
8. Version group by ЭМС: order index IV (in accordance with item. 2.21.1)
9. Additional technological run-in.
10. Designation of specifications (ТУ)

List of changes registration

Changes	Number of pages				Total number of pages in the document	№ document	Reg. number of the accompany-ing document and date	Signature	Date
	changed	replaced	new	annulled					