

# **VOLT** control

## VOLTAGE RELAY RN-118 / RN-119



## OPERATING MANUAL

*The quality management system of development and production complies with the requirements of ISO 9001:2015*

**Dear Customer,**

NOVATEK-ELECTRO Ltd. Company thanks you for purchasing our products.  
You will be able to use properly the device after carefully studying the Operating Manual.  
Store the Operating Manual throughout the service life of the device.

**ATTENTION! ALL REQUIREMENTS OF THIS OPERATION MANUAL ARE COMPULSORY TO BE MET!**



**WARNING! THE DEVICE TERMINALS AND INTERNAL COMPONENTS ARE UNDER POTENTIALLY LETHAL VOLTAGE.**

**TO ENSURE THE DEVICE SAFE OPERATION IT IS STRICTLY FORBIDDEN THE FOLLOWING:**

**– TO CARRY OUT INSTALLATION WORKS AND MAINTENANCE WITHOUT DISCONNECTING THE DEVICE FROM THE MAINS;**

**– TO OPEN AND REPAIR THE DEVICE WITHOUT ANY PROFESSIONAL HELP;**

**– TO OPERATE THE DEVICE WITH MECHANICAL DAMAGES OF THE HOUSING.**

**IT IS NOT ALLOWED WATER PENETRATION ON TERMINALS AND INTERNAL ELEMENTS OF THE DEVICE.**

During operation and maintenance the regulatory document requirements must be met, namely:

Regulations for Operation of Consumer Electrical Installations;  
Safety Rules for Operation of Consumer Electrical Installations;  
Occupational Safety in Operation of Electrical Installations;

Installation, adjustment and maintenance of the device must be performed by the skilled professionals having studied this Operation Manual.

The device is safe for use under keeping of the operating rules.

This Operation Manual is intended to familiarize you with the design, the requirements for safety, operation and maintenance procedures of the voltage relay RN-118 (the voltage relay RN-119) (hereinafter referred to as the "device"; "relay"; RN-118/RN-119).

Note: The abbreviations RN-118 or RN-119 are used separately when the characteristics of the relay types are different.

**The device meets the requirements of the following:**

- EN 60947-1, Low-voltage switchgear and controlgear; Part 1; General rules;
- EN 60947-6-2, Low-voltage switchgear and controlgear; Part 6-2; Multiple function equipment; Control and protective switching devices;
- EN 55011, Electromagnetic compatibility; Industrial, scientific and medical RF equipment; Electromagnetic interference characteristics; Limits and methods of measurement;
- IEC 61000-4-2, Electromagnetic compatibility; Part 4-2; Testing and measurement techniques; Electrostatic discharge immunity test.

Harmful substances in amounts exceeding maximum permissible concentrations are not available.

**Terms and abbreviations:**

The term "**Normal voltage**" means that the input voltage corresponds to all the parameters set by the user.

**Display** is three-digit indicator;

**AR** is automatic reclosing;

**MS** is magnetic starter;

**U<sub>min</sub>** is the minimum voltage operation threshold for RN-118/RN-119;

**U<sub>max</sub>** is the maximum voltage operation threshold for RN-118/RN-119;

**NO** – (Normal Open) – is normally open relay contact;

**NC** – (Normal Closed) – is normally closed relay contact;

**C** - (Common) – is common relay contact.

**1. SERVICE**

**1.1. Device service**

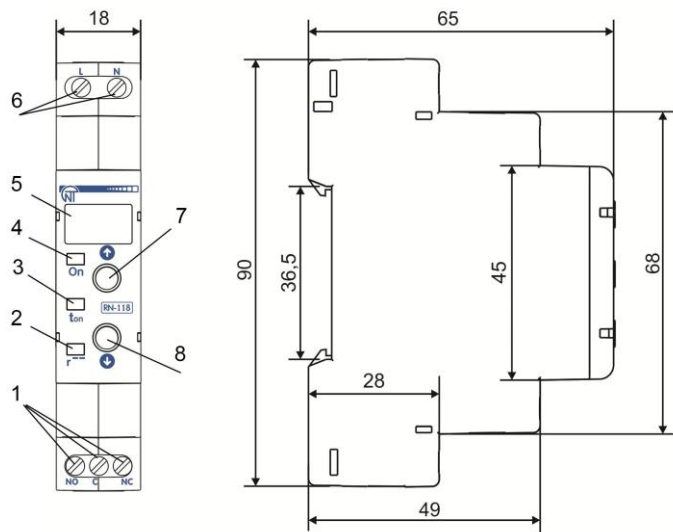
RN-118/RN-119 is designed to disconnect the household and industrial single-phase load in case of unacceptable voltage fluctuations in the mains, and then automatically turns on after restoring the mains parameters.

In case of load power of up to 2.3 kW (current is up to 10 A) for RN-118 or load power of up to 3.6 kW (current is up to 16 A) for RN-119, the disconnection is done directly by the device the output contacts of which are included in power supply load outage.

In case of higher power, the disconnection is done by the magnetic starter of the appropriate power, the output contacts of the device are included in the coil power supply circuit disconnection (MS is not included in the delivery set).

RN-118/RN-119 detects the maximum and minimum voltage values from the moment the power supply voltage is applied to the device or since the last time the stored values were viewed.

RN-118/RN-119 indicates the actual value of the input voltage and the state of the output relay contacts.



**1.2 Controls, overall and mounting dimensions of the device are shown in Fig. 1.**

- 1 – output contacts for load connection;
- 2 – indicator for the mode of **Overvoltage relay**( $r^{-}$ );
- 3 – indicator for AR countdown (**ton**);
- 4 – indicator for power load on (**On**);
- 5 – display;
- 6 – input contacts for power supply connection;
- 7 – UP button;
- 8 – DOWN button.

**Fig. 1** – Controls, overall and mounting dimensions of RN-118/RN-119

**1.3. Operation conditions**

The device is intended for operation in the following conditions:

- Ambient temperature: from minus 35 to +55 °C;
- Atmospheric pressure: from 84 to 106.7 kPa;
- Relative humidity (at temperature of +25 °C): 30 ... 80 %.

**ATTENTION! The device is not intended for operation in the following conditions:**

- Significant vibration and shocks;

- High humidity;
- Aggressive environment with content in the air of acids, alkalis, etc., as well as severe contaminations (grease, oil, dust, etc.).

## 2. TECHNICAL SPECIFICATIONS

General data is given in Table 1.

The basic technical specifications of the device are given in Table 2.

The device output contacts specifications are given in Table 3.

Variable parameters of the device are shown in Table 4.

**Table 1 – General Data**

Description	Value
Device service	Switchgear and controlgear
Rated operating condition	Continuous
Installation (mounting) of the device	Standard 35 mm DIN-rail
Protection class rating of the front panel	IP40
Protection class rating of the terminal block	IP20
Electric shock protection class	II
Climatic design version	UHL 3.1
Permissible contamination level	II
Overvoltage category	II
Rated voltage of insulation, V	450
Rated impulse withstand voltage, kV	2.5
Conductor cross-section for connecting to terminals, mm <sup>2</sup>	0.3 – 3.3
Tightening torque of the terminal screws of input contacts, N*m	0.4

**Table 2 – Basic Technical Specifications**

Description	Value
AC single-phase operating supply voltage, V	230/240
Mains frequency, Hz	47 – 65
Harmonic composition (unsinusoidality) of supply voltage	DSTU EN 50160:2014
Control range for U <sub>min</sub> , V	160 – 220
Control range for U <sub>max</sub> , V	230 – 290
Control range for AR (ton), s	5 – 900
Fixed time of U <sub>max</sub> response, s	0.5
Fixed time of response in case of voltage spike of more than 420 V when pulse duration reaching more than 1.5 ms, max., s	0.02
Fixed off-delay due to U <sub>min</sub> , s	7
Fixed time of response when voltage reducing less than 145 V, s	0.15
Maximum switched current (with active load) of RN-118, A	10
Maximum switched current (with active load) of RN-119, A	16
Accuracy of determination of the voltage operation threshold, V	Up to 3
Minimum voltage when maintaining serviceability, V	100
Maximum switched current with active load, V	420
Hysteresis of overvoltage release, V	4 – 5
Power consumption (when load is not connected), max., W	2
Commutation life of output contacts: – under load of 16 A, min., time – under load of 5 A, min., time	100 thousand 1 million
Overall dimensions (S-type module) – height * width * length, mm	90 x 65 x 18
Weight, max., kg	0.10
The device remains operational capability in any position in space	
Housing material - self-extinguishing plastic	

**Table 3 – Output Contacts Specifications**

Operation mode	Max. current at U~250 V, A	Max. switching power, kVA	Max. continuous permissible AC / DC voltage, V	Max. current at U <sub>cont</sub> =30 V, A
cos φ=1	10 (RN-118) 16 (RN-119)	2.3 (RN-118) 3.6 (RN-119)	250	5
cos φ=0.4	5	1.1		

**Table 4** –Variables Controlled by RN-118/RN-119

Parameters	Code on indicator	Factory setting	Min. value	Max. value
Min. voltage, V	5U <sub>-</sub>	190	160	220
Max. voltage, V	5U <sub>+</sub>	250	230	290
AR interval, s	t0n	5	1	900
Relay type	tYP	r <sub>---</sub>		
r t - On-delay relay (relay will turn on after the time t0n after the voltage supply); r <sub>---</sub> - Under-voltage relay (failure - if the voltage is less than Umin (parameter 5U <sub>-</sub> ); r <sub>---</sub> - Overvoltage relay (failure - if the voltage is more than Umax (parameter 5U <sub>+</sub> ); r <sub>---</sub> - Voltage relay (failure - if voltage is less than Umin (parameter 5U <sub>-</sub> ) or voltage is more than Umax (parameter 5U <sub>+</sub> ).				

### 3. THE INTENDED USE

#### 3.1. Preparation for operation

##### 3.1.1. Preparation for connection:

- Unpack the device (we recommend to keep the original packing for the entire warranty period of the device operation);
- Check the device for damage absence after transportation; in case of such damages detection, contact the supplier or the manufacturer;
- Carefully study the Operating Manual (**pay special attention to the diagram of the device connection to power**);
- If you have any questions regarding the installation of the device, please contact the manufacturer by telephone number indicated at the end of this Operating Manual.

##### 3.1.2. General

*If the temperature of the device after transportation or storage differs from the ambient temperature at which it is supposed to be operated, then before connecting to the mains keep the device under the operating conditions within two hours (because of condensation may be on the device elements).*

**ATTENTION! THE DEVICE IS NOT INTENDED FOR THE LOAD COMMUTATION IN CASE OF SHORT CIRCUIT. SO THE POWER SUPPLY LOAD CIRCUIT SHOULD HAVE INSTALLED AUTOMATIC CIRCUIT BREAKER FOR CURRENT NO MORE THAN 10 A FOR RN-118 (16 A FOR RN-119).**

**ATTENTION! ALL CONNECTIONS MUST BE PERFORMED WHEN THE DEVICE IS DE-ENERGIZED.**

To ensure the reliability of electrical connections, the flexible (stranded) wires with insulation for voltage of at least 450 V should be used, the ends of which it is necessary to be striped of insulation for 5±0.5 mm and tightened with bootlaces. The cross-section of the wire for connecting the protected equipment depends on the current (power) of the load. For example, for current of 10 A it should be no less than 1 mm<sup>2</sup>. Wires fastening should exclude mechanical damage, twisting and abrasion of the wire insulation.

**IT IS NOT ALLOWED TO LEAVE EXPOSED PORTIONS OF WIRE PROTRUDING BEYOND THE TERMINAL BLOCK.**

For a reliable contact, tighten the terminal screws with the force indicated in Table 1.

When reducing the tightening torque, the junction point is heated, the terminal block may be melted and wire can burn. If you increase the tightening torque, it is possible to have thread failure of the terminal block screws or the compression of the connected wire.

**To improve the performance of the device, it is recommended to install the fuse (fuse element) or its equivalent in the RN-118/RN-119 supply circuit for current of 1 A.**

**Error when performing the installation works may damage the device and connected devices.**

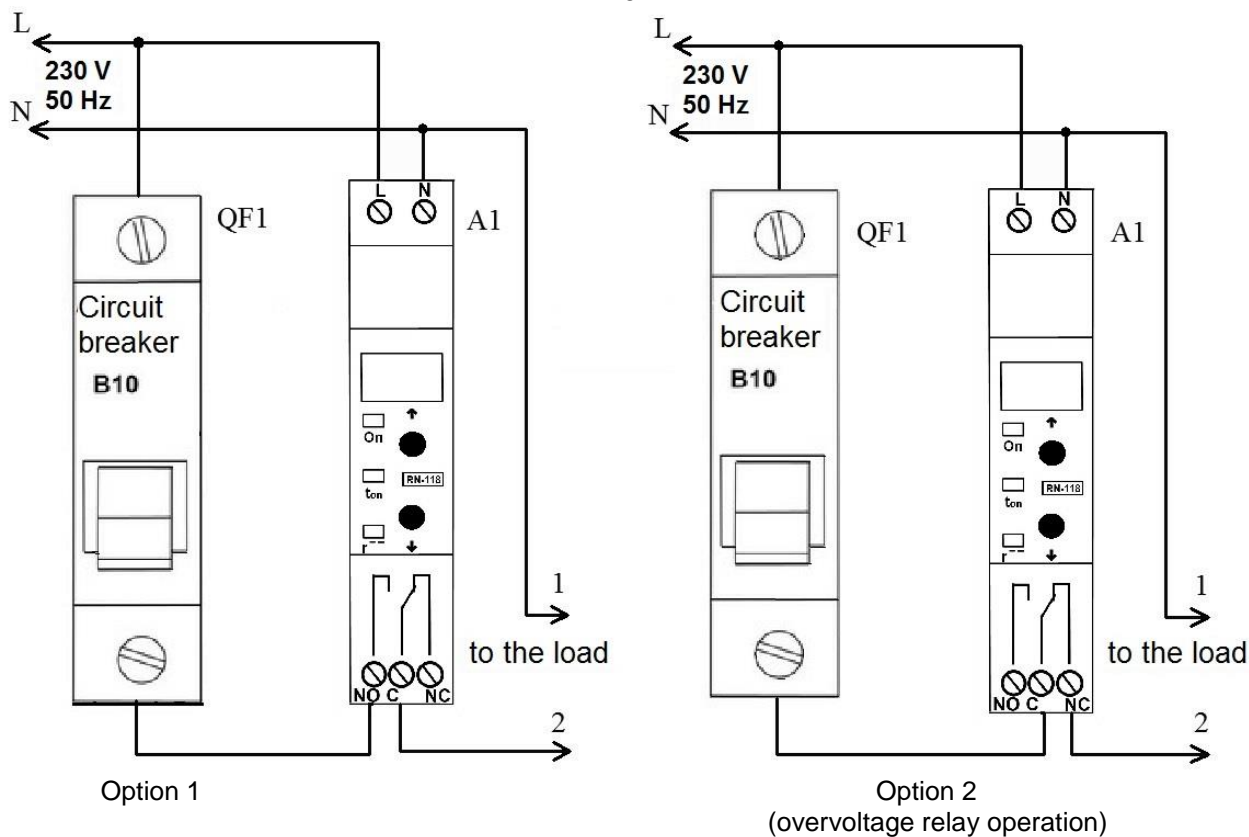
**3.1.3.** When using the device in the modes of **Voltage relay**, **Under-voltage relay** or **Time relay**, connect the load in accordance with Fig. 2 (Option 1).

When using RN-118/RN-119 in the mode of the **Overvoltage relay**, connect the load in accordance with Fig. 2 (Option 2).

In case of load power of up to 2.3 kW (current is up to 10 A) for RN-118 or load power of up to 3.6 kW (current is up to 16 A) for RN-119, the load is switched on in accordance with Fig. 2. In case of higher power, connect the MS coil to terminals 1, 2 (Fig. 2), and connect the load through the power contacts of the MS.

**ATTENTION! IF THE MS IS USED, THEN WHEN INSTALLING THE UNDERVOLTAGE THRESHOLD AT WHICH RN-118/RN-119 SHOULD OPERATE, YOU SHOULD CONSIDER THE VOLTAGE OF MS OPERATION AND RELEASE.**

**3.1.4.** Connect the device to the mains (Fig. 2).



A1 – RN-118/RN-119

QF1– Automatic circuit breaker for current not exceeding 10 A for RN-118 (16 A for RN-119)

Note - the graphic representation of the relay contacts is given for the convenience of reading the circuit diagram.

**Fig. 2 – RN-118/RN-119 Connection Diagram**

**3.1.5.** Apply the supply voltage.

**3.1.6.** If it is necessary to change the factory settings, make the adjustment of the device in accordance with it. 3.2.

**3.2. The device setting**

Regardless of the initial state of the RN-118/RN-119 (**Normal operation, Failure, AR indication**), to change parameters of RN-118/RN-119 it is required to do the following:

- On the front panel of the device, simultaneously press UP and DOWN buttons briefly, the display will show the first parameter of the main menu ("5U\_");
- Use UP (DOWN) buttons to select the required parameter;
- Press simultaneously UP and DOWN buttons briefly (the value of the selected parameter will blink on the display);
- Use UP (DOWN) buttons to change the value of the parameter;
- To record the parameter value, press simultaneously UP and DOWN buttons briefly. RN-118 / RN-119 will go back to the menu.

If you press long simultaneously UP and DOWN buttons (for more than 3 s), or if you do not press any button for 25 s, RN-118/RN-119 will return to its original state.

**ATTENTION!** After changing the Relay type parameter ("LYP"), the device will automatically restart.

**3.3. Using the device**

**3.3.1.** RN-118/RN-119 can be in the following states:

- **Normal operation** (load is switched on, load indicator lights, and the display shows the value of the monitored voltage);
- **Failure** (load is disconnected, the load indicator is off, the value of the monitored voltage is displayed in the flashing mode);
- **AR interval indication** (load is disconnected, the load indicator does not light, the display shows the time in seconds remaining before the end of AR time and ton indicator lights). After the end of AR time, the device will go to the **Normal operation** condition if the input voltage is normal.

**3.3.2.** The device can be operated in four independent modes:

- **Voltage relay** (parameter LYP is set in "r--"): the device goes into the **Failure** state when the input voltage drops below Umin or when the input voltage rises above Umax;
- **Under-voltage relay** (parameter LYP is set in "r--"): the device goes into the **Failure** state when the input voltage drops below Umin;
- **Overvoltage relay** (parameter LYP is set in "r--"): the device goes into the **Failure** state when the input

voltage rises above **U<sub>max</sub>**;

- **On-delay relay** (parameter **t<sub>YP</sub>** is set in **rE i ')**).

### 3.3.3. Features of the first turning on

If RN-118/RN-119 has been de-energized, then when the normal voltage is applied to the input, AR time is added to the time of preparation for operation (0.3-0.4 s), and the display shows briefly "**5LR**".

### 3.3.4. Viewing the maximum and minimum voltage values

RN-118/RN-119 detects the maximum and minimum voltage values from the moment the power supply voltage is applied to the device or since the last time the stored values were viewed.

NOTE - After applying the supply voltage to the device, the minimum voltage value is zero.

Regardless of the initial state of RN-118/RN-119 (**Normal operation, Failure, AR indication**) press UP button briefly to view the maximum and minimum voltage values.

The display will show consequently:

- code "**U<sub>~</sub>**" (within one second);
- the maximum voltage value from the moment the device was switched on or from the last time the stored values were viewed (within two seconds);
- code "**U<sub>-</sub>**" (within one second);
- the minimum voltage value from the moment the device was switched on or from the last time the stored values were viewed (within two seconds).

After viewing, the old values are deleted, and as the initial value of the maximum and minimum voltage will be the current value of the voltage at the input of the device.

### 3.3.5. Automatic reclosing (AR)

The AR time is set by the value of the parameter **t<sub>On</sub>**.

If the RN-118/RN-119 is turned on as the **Overvoltage relay** and has been de-energized, then when the normal voltage is applied to the input there is no AR time delay. In other operating modes of the device, the AR time countdown starts from the moment the power is applied.

In all modes of operation, the device will go to the **Normal operation** state not before the reclosing time has finished. The AR time countdown starts from the moment of the occurrence of the failure.

During the countdown, the display shows:

- the actual value of the input voltage in the blinking mode, if the RN-118/RN-119 is in the **Failure** condition;
- the time remaining until the end of the AR time, if the device is in the state of **AR time indication** ("**t<sub>On</sub>**" indicator simultaneously lights up).

### 3.3.6. Voltage relay mode

The load is connected in series with the contacts of "C", "NO" (Fig. 2, Option 1).

If the RN-118 RN-119 was de-energized or in the **Failure** condition, then when normal voltage is applied to input, the device will go to the **Normal operation** state and contacts "C" and "NC" are opened, and the contacts "C", "NO" are closed, are the load is connected.

When the input voltage drops below **U<sub>min</sub>** for more than 7 seconds, the RN-118/RN-119 goes into the **Failure** condition and "C", "NC" contacts are closed, and "C", "NO" contacts are opened, and the load is disconnected. When the voltage drops below 145 V, the device goes into the **Failure** condition after 0.15 seconds.

When the input voltage becomes more than **U<sub>min</sub>** by hysteresis value of 4 – 5 V, the device will return to the **Normal operation** condition.

When the input voltage rises above **U<sub>max</sub>** for more than 0.5 seconds or when the voltage spike rises more than 420 V at pulse duration of more than 1.5 ms, the RN-118/RN-119 goes into the **Failure** condition and "C", "NO" contacts are opened, and "C", "NC" contacts are closed, and the load is disconnected.

When the input voltage drops below **U<sub>max</sub>** by hysteresis value of 4 – 5 V, the device returns to the **Normal operation** condition.

### 3.3.7. Under-voltage relay mode

The load is connected in series with "C", "NO" contacts (Fig. 2, Option 1).

If the RN-118 RN-119 was de-energized or in the **Failure** condition, then when normal voltage is applied to input, the device will go to the **Normal operation** state and contacts "C" and "NC" are opened, and "C", "NO" contacts are closed, are the load is connected.

When the input voltage drops below **U<sub>min</sub>** for more than 7 seconds, the RN-118/RN-119 goes into the **Failure** condition and "C", "NC" contacts are closed, and "C", "NO" contacts are opened, and the load is disconnected. When the voltage drops below 145 V, the device goes into the **Failure** condition after 0.15 seconds.

When the input voltage becomes more than **U<sub>min</sub>** by hysteresis value of 4 – 5 V, the device will return to the **Normal operation** condition.

### 3.3.8. Overvoltage relay mode

**ATTENTION! In the Overvoltage relay mode, the load of RN-118/RN-119 should be connected in series with the "C", "NC" contacts (Fig. 2, Option 2).**



In the **Overvoltage relay mode**, the indicator  $\overline{\overline{\text{C}}}$  lights up.

When the normal voltage is applied to the RN-118/RN-119 input, the position of the output contacts RN-118/RN-119 does not change: "C", "NC" contacts are closed, and "C", "NO" contacts are opened, the load is connected.

When the input voltage rises above **U<sub>max</sub>** for more than 0.5 seconds or when the voltage spike rises more than 420 V at pulse duration of more than 1.5 ms, the RN-118/RN-119 goes into the **Failure** condition and "C", "NC" contacts are opened, and "C", "NO" contacts are closed, and the load is disconnected.

When the input voltage drops below **U<sub>max</sub>** by hysteresis value of 4 – 5 V, the device returns to the **Normal operation** condition.

### 3.3.9. On-delay relay

The load is connected in series with "C", "NO" contacts (Fig. 2, Option 1).

When the voltage above 164 V is applied to the RN-118/RN-119 input, the device changes to the **Normal operation** condition after the AR time: "C", "NC" contacts are opened and "C", "NO" contacts are closed, the load is connected.

If the voltage drops below 145 V, the device goes to the Failure condition, "C", "NO" contacts are opened, and "C", "NC" contacts are closed, and the load is disconnected.

## 4. MAINTENANCE

### 4.1. Safety precautions



**THE DEVICE TERMINALS AND INTERNAL COMPONENTS ARE UNDER POTENTIALLY LETHAL VOLTAGE.**

**DURING MAINTENANCE IT IS NECESSARY TO DISABLE THE DEVICE AND CONNECTED DEVICES FROM THE MAINS.**

4.2. Maintenance of the device must be performed by the skilled professionals.

4.3. Recommended frequency of maintenance **is every six months.**

#### 4.4. Maintenance Procedure:

- 1) Check the connection reliability of the wires, if necessary, clamp with the force specified in Table 1;
- 2) Visually check the integrity of the housing, in case of detection of cracks and damages take the device out of service and send for repair;
- 3) If necessary, wipe the front panel and the housing of the device with cloth.

**Do not use abrasives and solvents for cleaning.**

## 5. SERVICE LIFE AND MANUFACTURER WARRANTY

5.1. The lifetime of the device is 10 years. Upon expiration of the service life, contact the manufacturer.

5.2. Shelf life is 3 years.

5.3. Warranty period of the device operation is 5 years from the date of sale.

During the warranty period of operation (in the case of failure of the device) the manufacturer is responsible for free repair of the device.

**ATTENTION! IF THE DEVICE HAS BEEN OPERATED IN VIOLATION OF THE REQUIREMENTS OF THIS OPERATION MANUAL, THE MANUFACTURER HAS THE RIGHT TO REFUSE IN WARRANTY SERVICE.**

5.4. Warranty service is performed at the place of purchase or by the manufacturer of the device.

5.5. Post-warranty service of the device is performed by the manufacturer at current rates.

5.6. Before sending for repair, the device should be packed in the original or other packing excluding mechanical damage.

## 6. TRANSPORTATION AND STORAGE

The device in the original package is permitted to be transported and stored at the temperature from minus 45 to +60 °C and relative humidity of no more than 80 %.

## 7. ACCEPTANCE CERTIFICATE

RN-118/RN-119 has been manufactured and accepted in accordance with the requirements of current technical documentation and classified as fit for operation.