

**VOLTAGE,
PHASE IMBALANCE
AND SEQUENCE RELAY**

RNPP-311.1



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 Operating Manual.

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

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.

This Operation Manual is intended to familiarize you with the design, the requirements for safety, operation and maintenance procedures of the voltage, phase imbalance and sequence relay RNPP-311.1 (hereinafter referred to as the "device", RNPP-311.1).

Terms and abbreviations:

ARS – Automatic reclosing;

MS – Magnetic starter.

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

1. SERVICE

1.1. Device service

The voltage, phase imbalance and sequence relay RNPP-311.1 is designed to disconnect the load of 400 V 50 Hz in case of:

- unacceptable voltage fluctuations in the mains with duration of at least 0.02 s;
- violation of the amplitude symmetry of the mains voltage (phase imbalance);
- failure, incorrect sequence and sticking of phases.

1.2. Controls, overall and mounting dimensions of RNPP-311.1

Controls, overall and mounting dimensions of RNPP-311.1 are shown in Fig. 1.

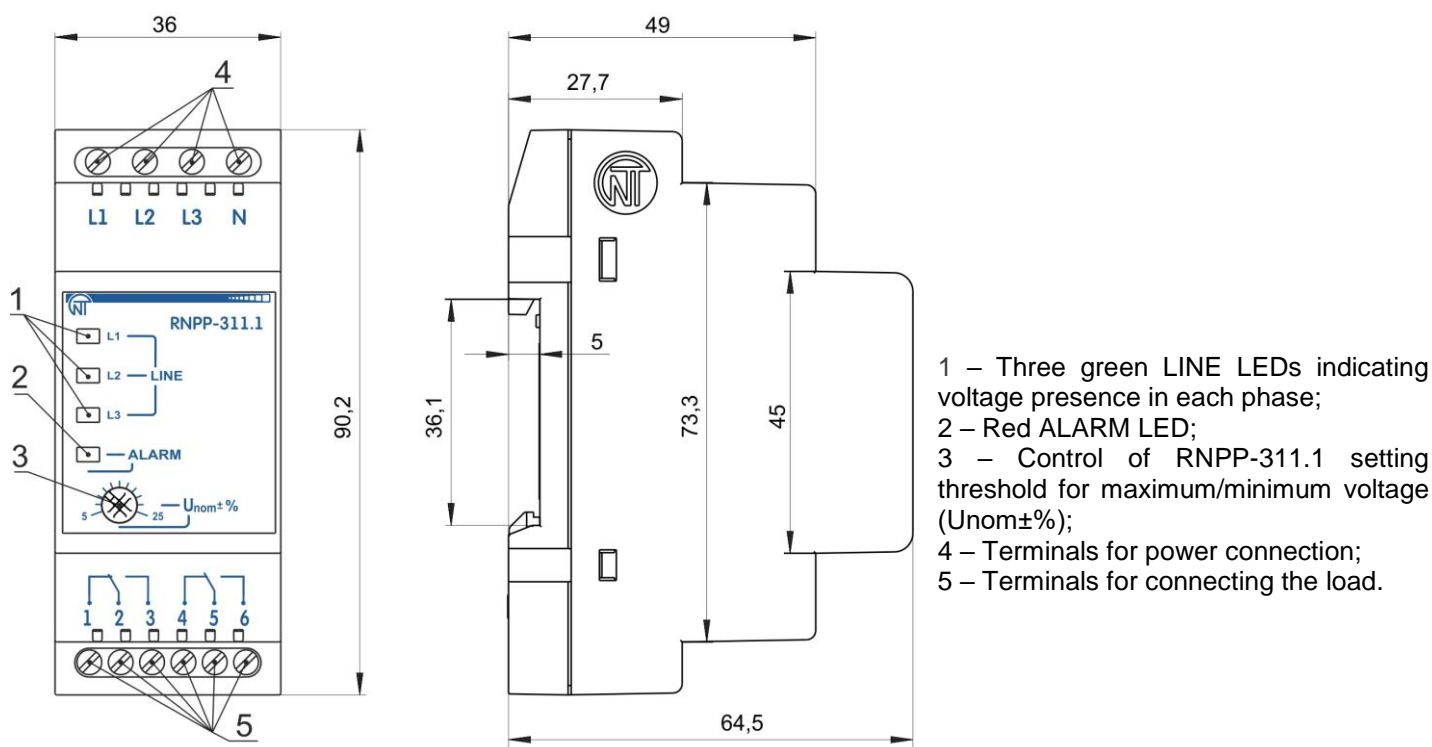


Fig. 1 – Controls, overall and mounting dimensions of RNPP-311.1

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 %.

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 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

The basic technical specifications are given in Table 1.

1-2-3, 4-5-6 terminals specifications are given in Table 2.

Table 1 – The Basic Technical Specifications

Description	Value
Rated phase / line supply voltage, V	230/400
Mains frequency, Hz	45 – 55
Harmonic composition (unsinusoidality) of supply voltage	EN 50160
Control range of response for U _{max} /U _{min} , as a percentage of nominal	5 – 25
Fixed delay of response due to U _{min} , s	12
Fixed voltage of response due to phase imbalance, V	60
Fixed time of response due to U _{max} , s	1.5 (0.1– as option)
Fixed time of response in case of loss of one phase, s	1.5 (0.1– as option)
AR time after voltage parameters restoring*, s	5
Hysteresis of voltage, V	5-6
Accuracy of determination of the voltage operation threshold, max., V	3
The supply voltage when the operability is maintained, V	95 – 450
Power consumption (when load is not connected), max., W	3.0
Climatic design version	NC 3.1
Protection class rating of the front panel	IP40
Protection class rating of the terminal block	IP20
Commutation life under load of 5 A, min., time	100000
Permissible contamination level	II
Overvoltage category	III
Rated voltage of insulation, V	450
Rated impulse withstand voltage, kV	4
Conductor cross-section for connecting to terminals, mm ²	0.5 – 2
Tightening torque of the terminal screws, N*m	0.4
Overall dimensions (Fig. 1), H*B*L, mm	90.2*36*64.5
Weight, kg, maximum	0.100
Installation (mounting) of the device is on standard 35 mm DIN-rail	
The device remains operational capability in any position in space	
Housing material - self-extinguishing plastic	
* - According to the order of the Buyer, the AR time can be changed to the following values – 0, 10, 60, 100, 150, 200, 250 seconds	

Table 2 –1-2-3, 4-5-6 Terminals Specifications

	Max. current at U~250 V, A	Max. switching power, kVA	Max. continuous permissible AC voltage at current of 2 A	Max. current at U _{cont} =30 V, A
cos φ = 1,0	5	1.25	440 V	1.5
cos φ = 0,4	2	0.5	–	–

3. DEVICE OPERATION

RNPP-311.1 constantly monitors the values of the voltages in the three-phase mains, comparing them with the values set by the user using regulator U_{nom}±%.

The device will disconnect the load if the voltage value exceeds the limits set by the user.

RNPP-311.1 1 has one combined adjustable maximum / minimum voltage set point. For example: in the 10% position, the device will operate when the voltage is increased / decreased by 10% of the nominal value.

The device can be in the following states: normal operation; voltage failure; AR time delay.

Normal operation condition:

- the mains voltage is within the limits set by the user when setting the device;
- AR time has finished;
- the protected equipment is connected to the mains;
- ALARM indicator does not light up;
- LINE indicators are on.

Voltage alarm condition:

- the mains voltage has exceeded the limits set by the user when setting the device, for time longer than indicated in the technical specifications (see Table 1);

- the protected equipment is disconnected from the mains, the ALARM indicator is on;
- **when the phase is broken, the corresponding LINE indicator does not light up.**

AR time delay condition:

The AR time countdown starts from the moment the power is applied or the failure occurs.

After completion of the AR time, the device will go to the **Normal operation** condition, if the mains voltage parameters are restored after the failure.

4. THE INTENDED USE

4.1. General

ATTENTION! THE POWER SUPPLY LOAD CIRCUIT SHOULD HAVE INSTALLED AUTOMATIC CIRCUIT BREAKER (FUSE) OR ITS ANALOGUE FOR CURRENT NO MORE THAN 6.3 A OF CLASS B.

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

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

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. It is recommended to use the wire with cross-section of at least 1 mm². 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.

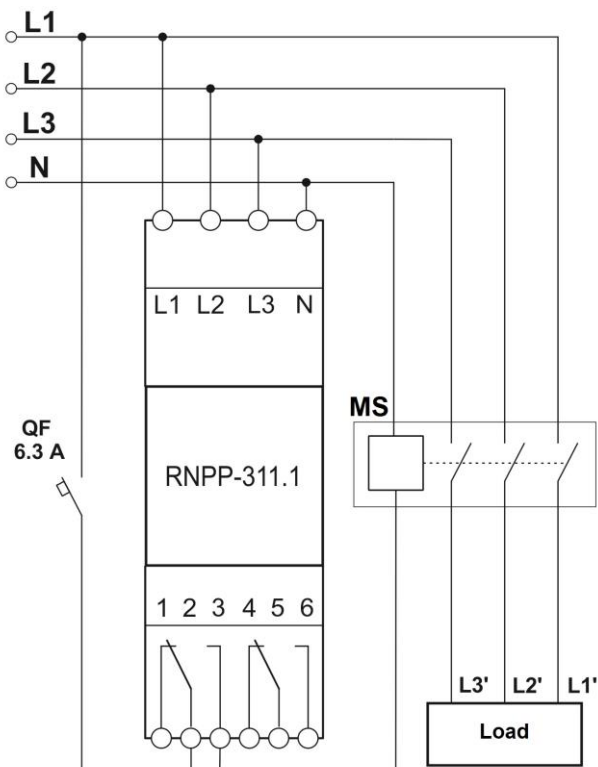
To improve the performance of the device, it is recommended to install the fuse (fuse element) for current of 1 A in RNPP-311.1 (L1, L2, L3) supply circuits.

4.2. 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 Operation 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 Operation Manual.

4.3. Device connection

4.3.1. Connect the device as per Fig. 2.



MS – magnetic starter (the coil voltage is 230 V);
QF– automatic circuit breaker for current not exceeding 6.3 A

Fig. 2 – Connection Diagram of RNPP-311.1

4.3.2. Set the required thresholds for the maximum / minimum voltage.

4.3.3. Supply power to terminals **L1, L2, L3, N**. At normal voltage, the indicators **L1, L2, L3** will light up and the AR time countdown starts, while the ALARM indicator lights up. After the AR time countdown has finished, the device goes to the **Normal operation** condition.

Note: If the device does not turn on (the ALARM indicator is on, there are no other inhibiting factors: unacceptable voltage fluctuations in the mains, incorrect amplitude symmetry (phase imbalance, sticking and failure), the wires connected to terminals **L2** and **L3** should be interchanged.

The range of the actuation set points and their fixed values can be changed at the request of the Buyer.

5. MAINTENANCE

5.1. Safety precautions



THE TERMINALS AND THE DEVICE INTERNAL ELEMENTS CONTAINS POTENTIALLY LETHAL VOLTAGE.

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

5.2. Maintenance of the device must be performed by the **skilled professionals**.

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

5.4. 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.

6. SERVICE LIFE AND MANUFACTURER WARRANTY

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

6.2. Shelf life is 3 years.

6.3. 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.

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

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

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

7. TRANSPORTATION AND STORAGE

The device in the original package should be stored in closed rooms at temperature from minus 45 to plus 60 °C and relative humidity of no more than 80 %, in the absence of vapors in the air, harmful to the package and the device materials.

8. ACCEPTANCE CERTIFICATE

RNPP-311.1 has been manufactured and accepted in accordance with the requirements of current technical documentation and classified as fit for operation.