RN-111M

SINGLE PHASE VOLTAGE PROTECTION RELAY

OPERATING MANUAL

Quality control system on the development and production complies with requirements ISO 9001:2015

Dear customer,
Company NOVATEK-ELECTRO LTD. thanks you for purchasing our products.
You will be able to use properly the product after carefully studying the Operating Manual.
Keep the Operating Manual throughout the service life of the product.

Review the Operating manual before using the unit.

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

WARNING! – PRODUCT TERMINALS AND INTERNAL COMPONENTS ARE UNDER POTENTIALLY LETHAL VOLTAGE

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

- **TO CARRY OUT MOUNTING WORKS AND MAINTENANCE <u>WITHOUT DISCONNECTING THE PRODUCT FROM THE MAINS;</u>**
- TO OPEN AND REPAIR THE PRODUCT INDEPENDENTLY;
- TO OPERATE THE PRODUCT WITH MECHANICAL DAMAGES OF THE CASE.

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

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 when in Operation of Electrical Installations.

This operational manual is issued for description of the device, operational modes, design, procedure of operation and technical maintenance of Single phase voltage protection relay RN-111M (further in the text **RN-111M**).

Terms and abbreviations:
ARC – automatic reclosing of the output contacts (autoreclosing);
MS – magnetic starter;
Umax – actuation threshold by maximum voltage;
Umin – actuation threshold by minimum voltage.

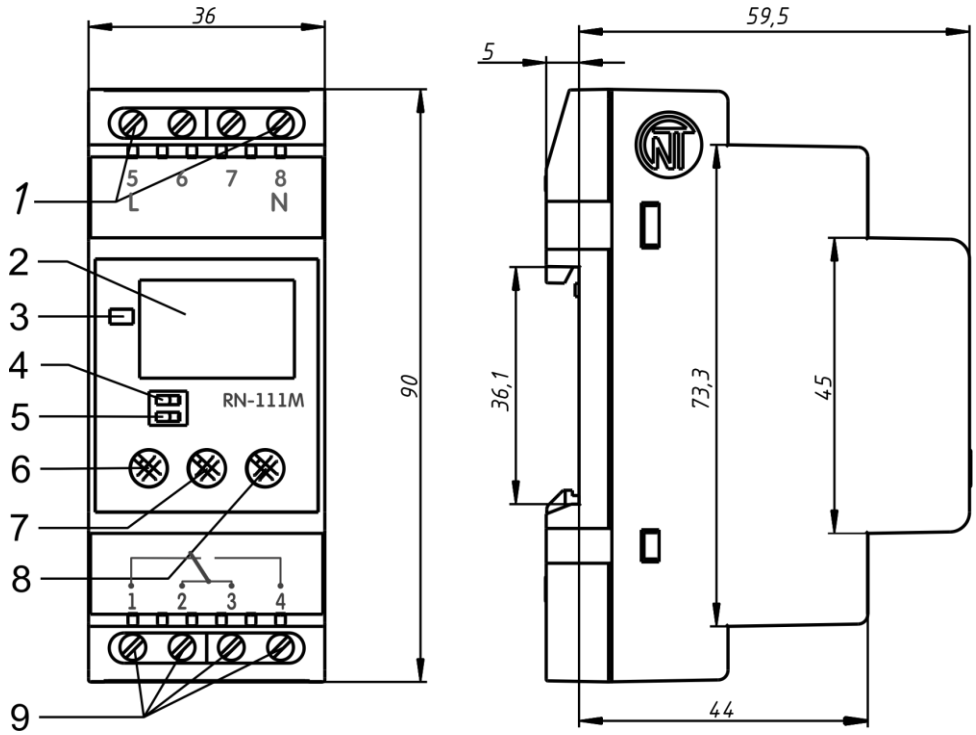
RN-111M complies with requirements:
EN 60947-1; EN 60947-6-2; EN 61000-4-2; EN 55011.
Harmful substances in quantities exceeding the maximum permissible concentrations are not available.

1. APPLICATION

1.1 Single phase (240V/50Hz) voltage protection relay RN-111M is designed to turn **OFF** home used consumer equipment or industrial power load in case of unallowable voltage fluctuations. And when the voltage parameters return back to normal values after fluctuation – it automatically turns **ON** the power load with the user adjusted time delay.

- If power load is less than 3.6 kW (16A) then RN-111M may operate with the power load directly using its own output terminals;
- If power load is more than 3.6 kW (16A) then it should be commutated using contactor of appropriate power rating. So RN-111M operates with the magnetic coil of the contactor and thus turn **ON**/**OFF** the power load when necessary. Kindly note that contactors of appropriate power rating should be chosen by User and not supplied along with RN-111M.

On the LED digital display RN-111M indicates the value of **acting voltage** level and the **Open**/**Close** (**ON**/**OFF**) state of the output contacts.



1 – Input terminals; 2 – Three digits seven segment LED display;
*3 – Green LED indicator showing **ON**/**OFF** state of the output contacts (power load);*
*4 – Toggle switch (**ON**/**OFF**): Maximal voltage tripping (**Umax**);*
*5 – Toggle switch (**ON**/**OFF**): Minimal voltage tripping (**Umin**);*
*6 – Autoreclosing time delay (**Ton**);*
*7 – Minimal voltage tripping threshold (**Umin**);*
*8 – Maximal voltage tripping threshold (**Umax**);*
9 – Output terminals for connecting load.

Figure 1 – Front panel controls description and dimensions diagram

1.2 Operational conditions

The device is intended for operation in the following conditions:

- Ambient temperature: from minus 35 to +45 °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.).

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).

2. TECHNICAL CHARACTERISTICS

2.1 General Information

The main technical specifications are provided in the Table 1.

Table 1

Item	Value
Purpose of device	Control and distribution equipment
Typical operation	Continued
Mounting	to standard 35 mm DIN-rail
Protection degree: - face panel - terminal block	 IP40 IP20
Index protection of electrical shock	II
Permissible degree of pollution	II
Overvoltage category	III
Nominal voltage of insulation, V	450
Rated impulse withstand voltage, kV	2.5
Connecting plugs cross section of conductors, mm^2	0.3 – 3.3
Maximum torque of terminal screws, Nm	0.4

2.2 Main Technical Specifications

Main Technical Specifications are provided in the Table 2

Table 2

Rated voltage, V	230/240
Rated voltage frequency, Hz	47 – 65
Harmonical configuration (nonsinusoidality) of power supply voltage	EN 50160
Adjustment ranges: - minimal voltage tripping range (**Umin**), V - maximal voltage tripping range (**Umax**), V - autoreclosing time delay (**Ton**), sec	 170 – 230 240 – 290 5 – 900
Fixed tripping time delay in case maximal voltage fault (**Umax**) detected, sec	1
Fixed tripping time delay in case minimal voltage fault (**Umin**) detected, sec	12
Fixed tripping time delay in case of voltage decrease more than 60V than the adjusted minimal voltage tripping threshold (**Umin**), sec	0.2
Fixed tripping time delay in case of voltage increase more than 30V than the adjusted maximal voltage tripping threshold (**Umax**), sec	0.12
Maximal commutation current (active power load), A	16
Tripping Voltage level accuracy, V	to 3
Minimal operation voltage level at which RN-111M will keep working, V	100
Maximal operation voltage level at which RN-111M will keep working, V	420
Voltage hysteresis, V	4 - 5
Rower consumption (when de-energization load), W	3
Commutation life of the output contacts: - under 16A power load, times (no less than) - under 5A power load, times (no less than)	 100 000 1 000 000
Outer dimensions, (2 S-modules),	Figure 1
Weight, kg, no less than	0.10
Casing material – self-extinguishing plastic	
The device preserves functionality in any position within the space	

2.3 Parameters of the integrated relay output terminals

The parameters of the integrated relay output terminals are shown in Table 3.

Table 3

	Maximal current at ~ 250V AC	Maximal commutation power	Maximal allowed AC/DC Voltage	Maximal current at 30V DC
Cos φ = 0.4 **Cos φ** = 1	5 A 16 A	4000 VA	380/150 V	5 A

3. START-UP PROCEDURE

3.1 Preparation for operation

3.1.1 Preparation for connection:

– Unpack and check the product for damage after transportation; in case of such damages detection, contact the supplier or manufacturer;

– Check for components (it.2), in case of detection of incomplete product, contacts the supplier or manufacturer;

– Carefully study the Operating Manual (**pay special attention to the connection diagram to power the product**);

– If you have any questions regarding the installation of the product, please contact the manufacturer by telephone number indicated at the end of this Operating Manual.

3.1.2 General instructions

ATTENTION! RN-111M IS NOT DESIGNED FOR LOAD COMMUTATION IN CASE OF SHORT CIRCUITS. THEREFORE THEY SHOULD BE PROTECTED BY AUTOMATIC CIRCUIT BREAKERS (FUSES) WITH TRIPPING CURRENT NOT EXCEEDING 16 A.

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

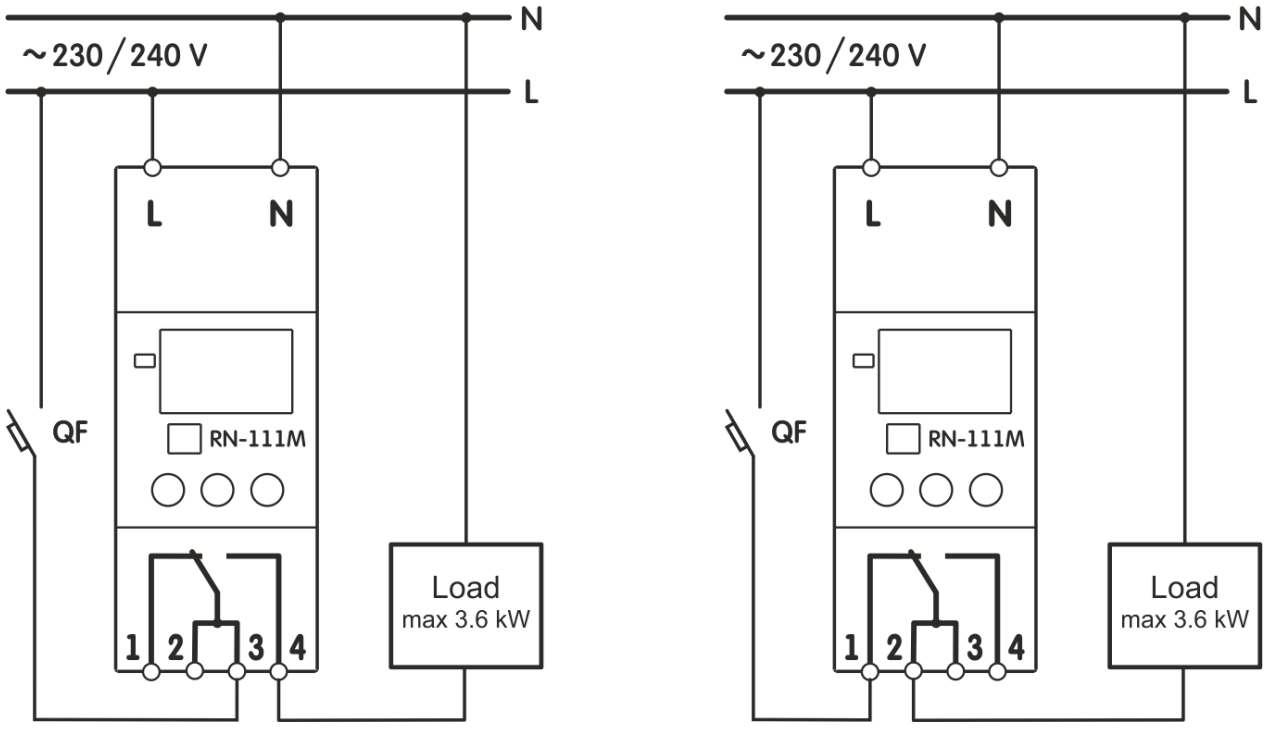
Error when performing the installation works may damage the product and connected devices.

To ensure the reliability of electrical connections you should use flexible (stranded) wires with insulation for voltage of not less than 450 V, the ends of which it is necessary to be striped of insulation for 5±0.5 mm and tightened with bootlaces. Recommended cable cross section for connection is 1 mm^2, not less, for current – 10 A. Wires fastening should exclude mechanical damage, twisting and insulation abrasion of wires.

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

For reliable contact it is necessary to perform tightening of screws of removable terminal block with the force specified in Table 1.

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



Version 1 **Version 2**

QF – automatic circuit breaker at current not exceeding 16 A.

Note – The relay contacts are shown in de-energized relay.

Figure 2 – Wiring Diagram

To improve operational properties of the product it is recommended to install the fuse (fuse element), or the equivalent for RN-111M current of 1A.

3.1.3 Using toggle switches on the front panel set necessary mode of operation.

3.1.4 In case of using RN-111M as Minimal/Maximal protection relay, Minimal protection relay or time relay connect wires according Figure 2, vers.a.

If RN-111M is being used as a maximal voltage protection relay power load should be connected according Figure 2, vers.b**.**

If power load is less than 3.6 kW (16 A) then it could be commutated directly by the output contacts of the RN-111M; if the power load is more than 16 A – then it should be commutated using contactor of appropriate rated parameters and the RN-111M should operate with the magnetic coil of the contactor.

3.1.5 By spinning the knobs on the front panel set the required Minimal and Maximal voltage tripping thresholds (**Umin** and **Umax**) and set necessary turn **ON** time delay (**Ton**).

ATTENTION! NOT TO BREAK OR TURN THE KNOBS, PLEASE, DON'T MAKE EXCESSIVE EFFORTS WHEN PERFORMING ADJUSTING OPERATIONS.

3.1.6 Connect RN-111M to the power circuit.

3.1.7 Give the power supply to RN-111M and by spinning the adjustment knobs set precisely the required values for the **Umin**, **Umax** and **Ton**. When spinning the knobs on the LED digital display it is shown the exact value of the adjusted parameter.

3.2 The device use

3.2.1 RN-111M can be in the following states:

– Normal operation (power load is ON, the load LED indicator lights, and three-digit indicator shows the value of the monitored voltage);

– Alarm (power load is OFF, the load LED indicator does not light, the three-digit indicator shows the value of the monitored voltage in the flashing mode);

– ARC time indication (power load is OFF, the load LED indicator does not light, the three-digit indicator shows the value of time in seconds, remaining until the end of ARC time delay and the dot lights in the low-order digit). After the end of ARC time, the device will return to the Normal operation condition if the input voltage is normal.

3.2.2 The device can operate in four independent modes:

– Minimum voltage relay (when Umin switch is ON and Umax switch is OFF): the device switches to the ALARM state when the input voltage drops below the minimum voltage threshold Umin;

– Maximum voltage relay (when Umax switch is ON and Umin switch is OFF): the device switches to the ALARM state when the input voltage rises above the threshold for the maximum voltage Umax;

– Voltage relay (when Umin and Umax switches are ON): the device switches to the ALARM state when the input voltage drops below the minimum voltage threshold or when the input voltage rises above the maximum voltage threshold;

– Turn on time delay relay (when Umin and Umax switches are OFF).

3.2.3 Features of first start-up

If the RN-111M has been de-energized, when the normal voltage is supplied to the input, the time to **prepare** for operation (0.3 - 0.4 sec) is added to the time of the re-closing set by the **Ton** (sec) knob, and the three-digit indicator briefly shows **"SEA".**

3.2.4 Automatic reclosing (ARC)

The reclosing time is set by the Ton (sec) knob.

If the RN-111M is on as the maximum voltage relay and has been de-energized, when the normal voltage is supplied to the input, the ARC time delay does not occur. In other operating modes of the device, the reclosing time starts from the moment when the power is applied.

In all modes of operation, the device will go to the Normal operation state before the reclosing time has finished. The countdown of the reclosing time starts from the moment of the fault occurrence.

During the countdown of the reclosing time the three-digit indicator displays the following:

– the actual value of the input voltage in flashing mode, if RN-111M is in the Alarm state;

– the time remaining until the end of the reclosing time, if the device is in the state of ARC time indication.

3.2.5 Minimum voltage relay mode

The power load is connected in series with contacts 2 (3), 4 (Fig. 2 version 1).

If the RN-111M was de-energized or in the **ALARM** condition, when the input voltage is applied to the input, the device changes to Normal operation: contacts 1, 2 (3) are opened and contacts 2 (3), 4 are closed, the load is connected.

When the input voltage drops below **Umin** for more than 12 seconds, the RN-111M goes to the **Alarm** state and contacts 1, 2 (3) become closed and contacts 2 (3), 4 open, the load is disconnected. If the voltage drops below 60 V from the set Umin, the device will go to the **Alarm** condition after 0.2 seconds.

When the input voltage becomes greater than **Umin** by a hysteresis value of 4 – 5 V, the device will return to **Normal operation** again.

3.2.6 Maximum voltage relay mode

ATTENTION! In the maximum voltage relay mode, the load of RN-111M must be connected in series with contacts 1, 2 (3) (Fig. 2 variant 2).

When the normal voltage is applied to the RN-111M input, the position of the RN-111M output contacts does not change: contacts 1, 2 (3) are closed and contacts 2 (3), 4 are open, the power load is connected.

If the input voltage rises above Umax for more than one second, or when the input voltage rises by 30 V higher than Umax for more than 0.2 seconds, the RN-111M switches to the ALARM state and contacts 1, 2 (3) are open and contacts 2 (3), 4 are closed, the power load is disconnected.

If the input voltage drops below Umax by a hysteresis value of 4 – 5 V, the device returns to **Normal operation**.

3.2.7 Voltage relay mode

The load is connected in series with contacts 2 (3), 4 (Fig. 2 version 1).

If the RN-111M was de-energized or in the ALARM condition, when the normal voltage is supplied to the input, the device switches to Normal operation and contacts 1, 2 (3) are opened and contacts 2 (3), 4 are closed, the power load is connected.

When the input voltage drops below Umin for more than 12 seconds, the RN-111M goes to the **ALARM state** and contacts 1, 2 (3) become closed and contacts 2 (3), 4 open, the power load is disconnected. When the voltage drops below 60 V from the set Umin, the device goes to the ALARM condition after 0.2 seconds.

When the input voltage becomes greater than Umin by a hysteresis value of 4 – 5 V, the device will return to Normal operation again.

If the input voltage rises above Umax for more than one second or when the input voltage is increased by 30 V higher than Umax for more than 0.2 seconds, the device goes to the **ALARM** condition and contacts 2 (3), 4 are opened, and contacts 1, 2 (3) are closed, the power load is disconnected.

When the input voltage drops below Umax by the hysteresis value of 4 -5 V, the device returns to the **Normal operation state.**

3.2.8 Turn on time delay relay

The power load is connected in series with contacts 2 (3), 4 (Fig.2 version 1).

When the voltage above 170 V is supplied to the RN-111M input, the device switches to the Normal operation after the reclosing time: contacts 1, 2 (3) are opened and contacts 2 (3), 4 are closed, the power load is connected.

If the voltage drops below 130 V, the device goes to the **ALARM** condition, contacts 2 (3), 4 are opened, and contact 1, 2 (3) are closed, the power load is disconnected.

4 MAINTENANCE

4.1. Safety precautions

THE TERMINALS AND THE PRODUCT INTERNAL ELEMENTS CONTAINS POTENTIALLY LETHAL VOLTAGE.
DURING MAINTENANCE IT IS NECESSARY TO DISABLE THE PRODUCT AND CONNECTED DEVICES FROM THE MAINS.

4.2. Maintenance of the product must be performed by qualified service personnel.

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 to remove the product from service and send for repair;

3) If necessary, wipe with cloth the front panel and the product housing.

Do not use abrasives and solvents for cleaning.

5 SERVICE LIFE AND MANUFACTURER WARRANTY

5.1. The lifetime of the product 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 product operation is 5 years from the date of sale.

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

ATTENTION! IF THE PRODUCT HAS BEEN OPERATED IN VIOLATION OF THE REQUIREMENTS OF THIS MANUAL, BUYER WILL FORFEIT THE RIGHT TO WARRANTY SERVICE.

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

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

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

Earnest request: indicate the reason for return in the notice of faults field at the return of the device or in case of submitting for warranty service or post-warranty service.

6. TRANSPORTATION AND STORAGE

The product 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

Single phase voltage protection relay RN-111M was produced and accepted in accordance with the requirements of effective technical documentation and was recognized as suitable for operation.

stamp Quality control department seal Production date

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9. DATA ON CLAIMS

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With questions and comments, please contact manufacturer at the following address:

"Novatek-Electro" Ltd.
59, Admiral Lazarev str.,
Odessa, Ukraine, 65007
Tel:**+38 048 738-00-28; +38 0482 37-48-27;**
Tel/fax: +38 0482 34-36-73
www.novatek-electro.com

Sale date_____

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