

RN-111M

SINGLE PHASE VOLTAGE PROTECTION RELAY



OPERATING MANUAL

Review the Operating manual before using the unit.

Store the unit in the operating environment for 2 hours before switching to the mains.
Do not use abrasives or organic compounds for cleaning (spirit, gasoline, solvents, etc.).



NEVER ATTEMPT TO REMOVE AND REPAIR THE UNIT.

Some of the unit components may be live.



NEVER ATTEMPT TO OPEN AND REPAIR THE PROTECTED EQUIPMENT, IF SWITCHED TO THE UNIT SOCKET.



The electrical contact between the plug and the socket remains even in case of deactivated unit

NEVER ATTEMPT TO OPERATE THE UNIT WITH THE MECHANICAL DAMAGE OF THE HOUSING.



NEVER ATTEMPT TO OPERATE THE UNIT UNDER CONDITIONS OF HIGH HUMIDITY.

Do not let water into the unit.

WARNING! THE UNIT SHOULD BE OPERATED IN THE ELECTRIC MAINS PROTECTED WITH AUTOMATIC CIRCUIT BREAKER WITH THE BREAKING CURRENT OF 32 A, NO MORE.

1. APPLICATION

Single phase (240V/50Hz) voltage protection relay RN-111M (hereinafter **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.

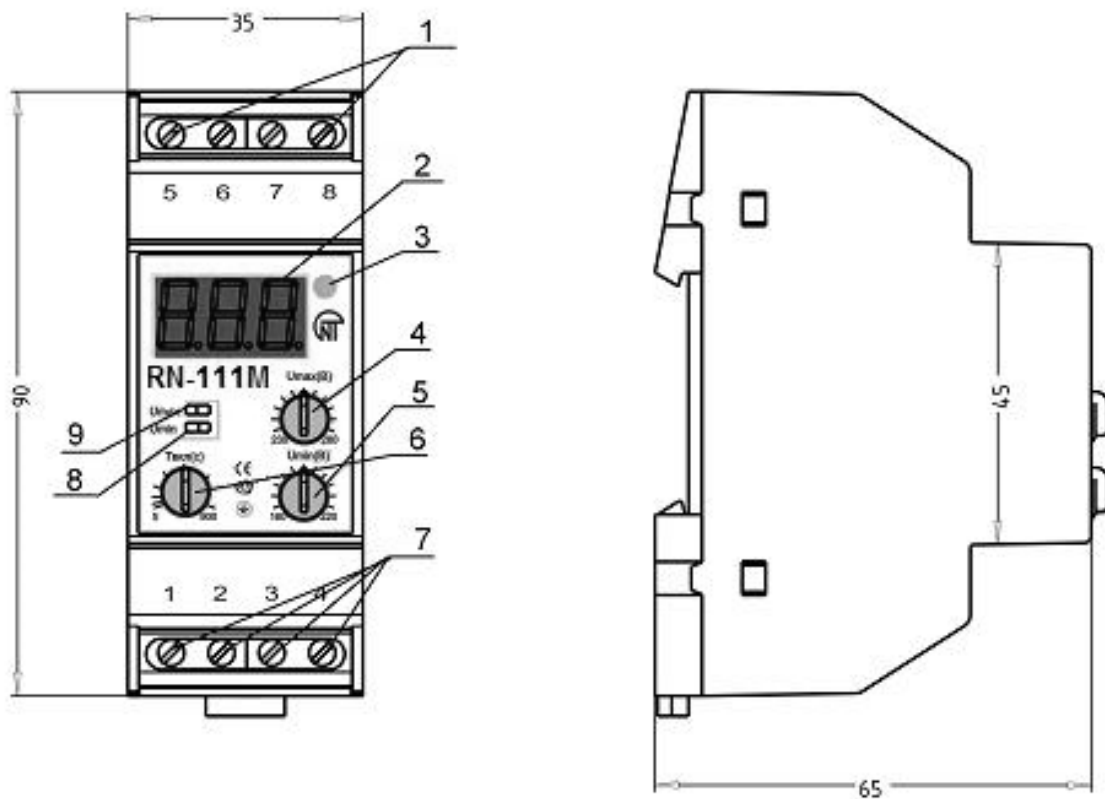
- If power load is less than 3,5 kW (16A) then RN-111M may operate with the power load directly using its own output terminals;

- If power load is more than 3,5 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.

RN-111M has four independent modes of operation:

1. **Minimal/Maximal** voltage protection relay;
2. **Minimal** voltage protection relay;
3. **Maximal** voltage protection relay;
4. Turn **ON** time delay relay.

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 – Maximal voltage tripping threshold (**U_{max}**);
5 – Minimal voltage tripping threshold (**U_{min}**);
6 – Autoreclosing time delay (**T_{on}**);
7 – Output terminals;
8 – Toggle switch (**ON/OFF**): Minimal voltage tripping (**U_{min}**);
9 – Toggle switch (**ON/OFF**): Maximal voltage tripping (**U_{max}**);

Figure 1- Front panel controls description and dimensions diagram

1. TECHNICAL CHARACTERISTICS

2.1 GENERAL INFORMATION

RN-111M complies with requirements:

IEC 60947-1; IEC 60947-6-2; IEC 61000-4-2; CISPR 11:2004, IDT.

Harmful substances in quantities exceeding the maximum permissible concentrations are not available.

The main technical specifications are provided in the Table 1.

Table 1

Item	Unit	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
Operational temperature range	°C	from -35 to + 55
Storage temperature	°C	from -45 to + 70
Permissible degree of pollution	-	II
Overvoltage category	-	III
Nominal voltage of insulation	V	450
Rated impulse withstand voltage,	kV	4
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 61000-3-2 (IEC 1000-3-2)
Adjustment ranges: - minimal voltage tripping range (U_{min}), V - maximal voltage tripping range (U_{max}), V - autoreclosing time delay (T_{on}), sec	170 – 230 240 – 290 5 – 900
Fixed tripping time delay in case maximal voltage fault (U_{max}) detected, sec	1
Fixed tripping time delay in case minimal voltage fault (U_{min}) detected, sec	12
Fixed tripping time delay in case of voltage decrease more than 60V than the adjusted minimal voltage tripping threshold (U_{min}), sec	0,2
Fixed tripping time delay in case of voltage increase more than 30V than the adjusted maximal voltage tripping threshold (U_{max}), sec	0,12
Maximal commutation current (active power load), A (no less than)	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 (no less than)	4
Total power consumption, mA	to 15
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

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 power when contacts are closed	Maximal commutation power	Maximal allowed AC/DC Voltage	Maximal current at 30V DC
Cos φ = 0,4	5 A	5000 VA	4000 VA	380/150 V	5 A
Cos φ = 1	16A				

3. START-UP PROCEDURE AND CONNECTION

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

3.2. 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 16A (3,5 kW) then it could be commutated directly by the output contacts of the RN-111M; if the power load is more than 16A – then it should be commutated using contactor of appropriate rated parameters and the RN-111M should operate with the magnetic coil of the contactor.

3.3. Connect RN-111M (contacts **5, 8**) to the power circuit.

3.4. 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**). Please pay attention that the **Ton** time should be adjusted taking into consideration the technical documentation and requirements of the protected power load – for example – air-conditioners, refrigerators and other compressor containing equipment usually need 3-4 minutes pause before turn **ON** again after they were disconnected.

3.5. 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.

4. GENERAL DESCRIPTION AND OPERATION

4.1. RN-111M has several functional states:

– **Normal operation mode:** Power load is **ON**, Green LED indicator – **ON**. Digital LED display shows measured voltage value;

– **Alarm mode:** Power load is **OFF**, Green LED indicator – **OFF**. Digital LED display shows blinking value of the measured voltage;

– **Indication of the remaining time to turn ON the power load (Ton):** Power load is **OFF**, Green LED indicator – **OFF**. Digital LED display shows the remaining time to turn **ON** the power load (in seconds) and dot is being displayed in the lower digit. After the **Ton** time elapse RN-111M will return to **Normal operation mode** if voltage parameters on the input terminals are within the permitted range adjusted by the user.

4.2. MINIMAL/MAXIMAL VOLTAGE PROTECTION RELAY

Power load (contactor coil) should be connected to the output terminals 2(3), 4 (Figure2).

If RN-111M was initially deenergized or the power load was **OFF** due to the wrong voltage parameters – then after correct voltage appear on the input terminals and after the time delay **Ton** contacts **1, 2(3)** will open and contacts 2(3), 4 will close.

If input voltage get lower than minimal voltage threshold for more than 12 seconds RN-111M becomes to **Alarm mode** – contacts **1, 2(3)** close and contacts 2(3), 4 open.

If input voltage gets 60V lower than the minimal voltage tripping threshold – RN-111M comes to Alarm mode in 0,2 sec. After the recovery of the voltage parameters to the value of hysteresis (4-5V) – cycle is repeated relays.

If input voltage gets higher than the maximal tripping voltage threshold for more than 1 sec. or the voltage is 30V higher than the maximal tripping threshold during a period exceeding – then the RN-111M comes to **Alarm mode** – contacts 2(3), 4 open and contacts **1, 2(3)** close. When voltage level decrease lower than the maximal tripping voltage threshold to the hysteresis value (4-5V) – RN-111M turns **ON** the power load with the user adjusted time delay **Ton**.

4.3. MINIMAL VOLTAGE PROTECTION RELAY

Power load should be connected to the output terminals 2(3), 4 (Figure2).

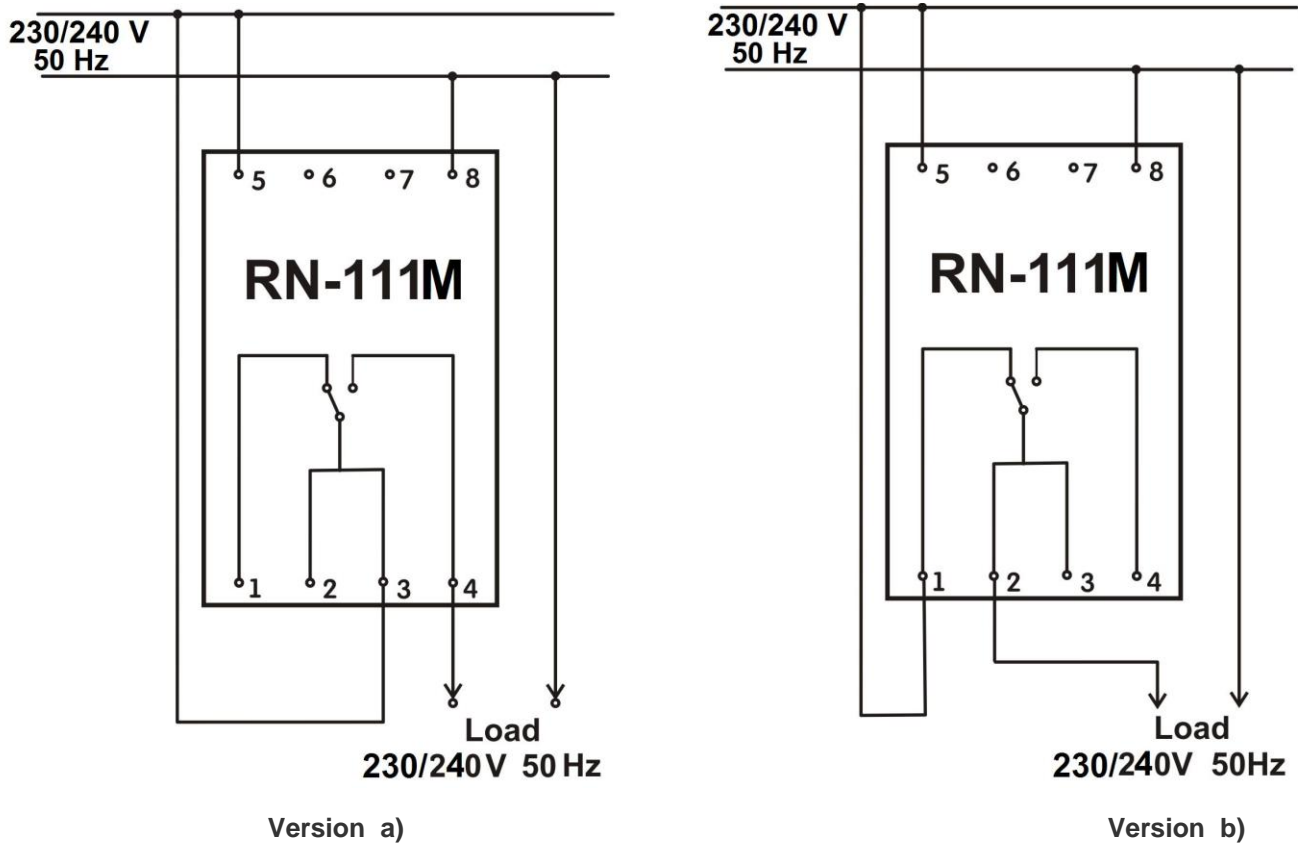
If RN-111M was initially deenergized or the power load was **OFF** due to the wrong voltage parameters – then after correct voltage appear on the input terminals and after the time delay **Ton** contacts **1, 2(3)** will open and contacts 2(3), 4 will close.

If input voltage get lower than minimal voltage threshold for more than 12 seconds RN-111M becomes to

Alarm mode – contacts 1, 2(3) close and contacts 2(3), 4 open .

When the voltage drops below 60 V on the set threshold, the relay goes into Alarm mode with a 0.2 s (introduced rapid acceleration $T_{usk} = 0.2$ s).

When you restore a level of controlled voltage above the minimum threshold on the magnitude of hysteresis is 4-5 in the cycle of the relay is repeated.



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

Figure 2 – Wiring Diagramm

4.4. MAXIMAL VOLTAGE PROTECTION RELAY

Power load should be connected to the output terminals 1, 2(3).

When normal voltage applied to the input terminals of RN-111M – the state of the output relay doesn't change so the RN-111M stay in the "cold" state: contacts 1, 2(3) are closed and contacts 2(3), 4 are opened.

If input voltage gets higher than the maximal tripping voltage threshold for more than 1 second or accelerated tripping time of 0,2 second is applied if the voltage is 30V higher than the maximal tripping threshold – then the RN-111M comes to **Alarm mode** – contacts 1, 2(3) open and contacts 2(3), 4 close. When voltage level decrease lower than the maximal tripping voltage threshold to the hysteresis value (4-5V) – RN-111M returns to normal .

4.5. TURN ON TIME DELAY RELAY

Power load (contactor coil) should be connected to the output terminals 2(3), 4 (Figure2).

If the input voltage is more than 170V RN-111M will turn **ON** through time delay T_{on} and contacts 1, 2(3) open and contacts 2(3), 4 close. If the voltage will get lower than 130V RN-111M will go to **Alarm mode** – contacts 2, 3(4) open and contacts 1(2), 3 close.

4.6 FEATURES OF FIRST START-UP

At first start-up or after the RN-111M was completely deenergized additional time delay of 0,3-0,4 second is required for self testing. During this time LED display indicates "StA" and then start showing the remaining time to turn **ON** the power load.

Thus turn **ON** time will be 0,3 s + T_{on} time.

Position of the output contacts are shown as if RN-111M is no voltage on input terminals ("cold" state).

5. STORAGE AND TRANSPORTATION CONDITIONS

RN-111M should be stored in a factory package in enclosed rooms with ambient temperature from - 45° to +75° C and exposed to not more than 80% of relative humidity. It should be no fumes in the air that may exert a deleterious effect on package and the RN-111M components.

The Buyer must provide the protection of the relay against possible mechanical damages in transit.

6. MAINTENANCE AND SAFETY PRECAUTIONS

6.1 SAFETY PRECAUTIONS

Power plug-in motor must not exceed specified herein as this can cause overheating of the contact group and fire hazard in product.

ATTENTION: IN THE RN-111M USES A LIFE THREATENING STRESS. WHEN TROUBLESHOOTING, MAINTENANCE, ASSEMBLY WORK, YOU MUST DISABLE THE DEVICE (SWITCH OFF COMPLETELY) FROM POWER CONNECTION

It is not intended for use in bumps and knocks

Not allowed ingress of moisture to the input terminals terminal blocks and internal element device.

Do not use the device in harsh environments with content of acids, alkalis, oils, etc. in the atmosphere.

Connection, adjustment and maintenance of the unit must be performed only by qualified specialists, having learned this operation manual.

6.2 MAINTENANCE PROCEDURE

The recommended frequency of maintenance is every six months.

The maintenance procedure consists of visual inspection, during which one should check the reliability of wires connection, the absence of breaks and cracks of the unit's housing.

7. WARRANTY AND CLAIMS CONDITIONS

Service life is 10 years. Refer to the manufacturer upon the expire of the service life.

Warranty period is 36 month upon the day of sale.

The manufacturer shall repair the unit, in the compliance with the operating manual by the user, within the warranty period.

RN-111M is not subject to the warranty service in the following cases:

- expiry of the warranty period;
- availability of mechanical damages;
- attempts to open and repair ;
- traces of moisture attack or in the presence of foreign items inside the unit;
- damage caused by an electric current or voltage values which exceed the nameplate, improper or careless handling of the product is not subject to the instructions for installation and use;
- damage is caused by electric current or voltage in excess to the permissible values as indicated in the Operating manual.

Warranty service is provided in the place of purchase.

Post-warranty service shall be provided by the manufacturer.

The manufacturer's warranty does not cover compensation for direct or indirect losses associated with the unit transportation to the place of purchase or manufacturer's plant.

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.

8. 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.