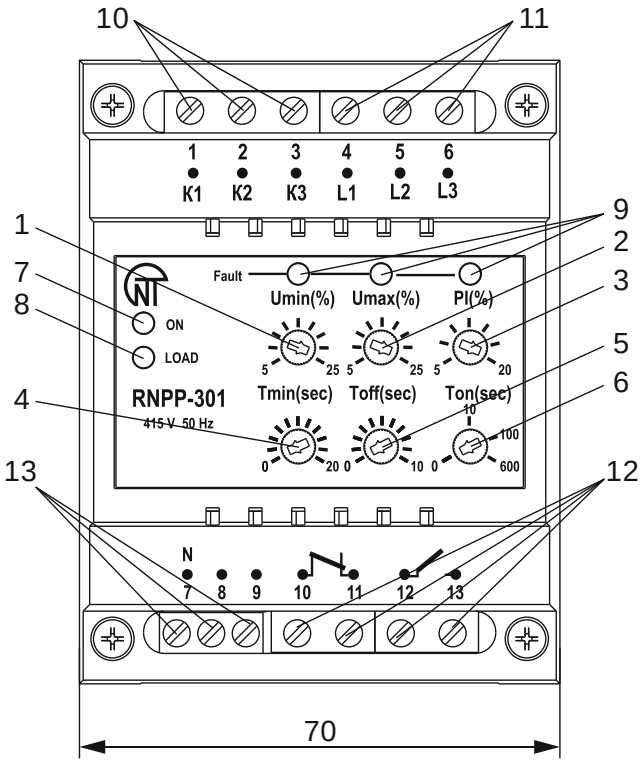
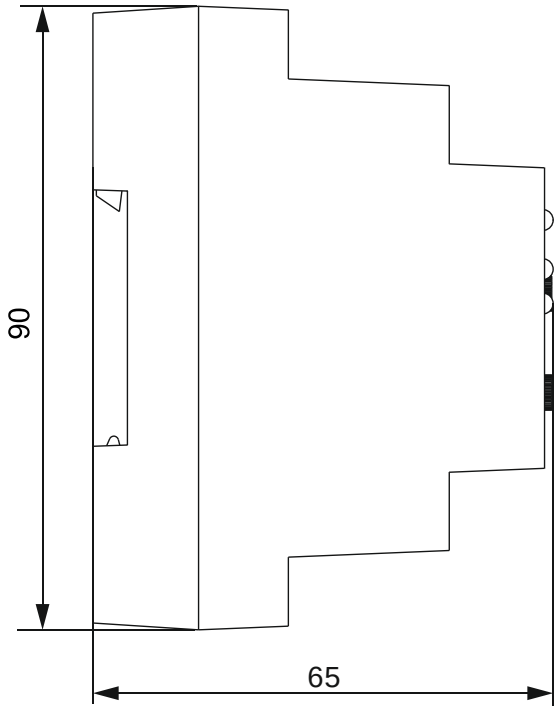
THREE PHASE VOLTAGE AND PHASE MONITORING RELAY

RNPP-301





Controls description and dimensions diagram

1. control for minimum voltage threshold, Umin (%);
2. control for maximum voltage threshold, Umax (%);
3. control for peak phase imbalance threshold, PI (%);

4. control of trip delay setting for Umin, Tmin (sec);
5. control of trip delay setting for the mains voltage faults, Toff (sec);
6. control for automatic reset delay setting, Ton (sec);
7. green LED signal that the mains voltage is present, ON;
8. green LED signal that load is energized, Load;
9. red LEDs signal for the mains voltage fault/ magnetic starter (MS) power contacts monitoring, Fault;
10. MS power contacts monitoring terminals;
11. input contacts;
12. output contacts;
13. terminals for the mode selection: line/phase voltage monitoring.

A RNPP-301 voltage control relay is designed for:

1. monitoring of the tolerable **RMS** phase/line voltage level (at the option of user) with independent setting adjustments for the minimum and maximum voltage thresholds;
2. monitoring of the correct phase sequence and phase "non-coincidence" (the phases are supposed to be coinciding when a load is energized not from two different phases but instead from one and the same phase);
3. monitoring of three phase lines for voltage presence and the mains voltage symmetry with adjustable phase imbalance or asymmetry setting;
4. monitoring of the magnetic contactor power contacts status at no-load and under load;
5. load (415V/50Hz) de-energization with user-set trip delay (**Toff**) through the opening the magnetic contactor coil power circuit (AC and DC electric circuit switching) when fault conditions occur;
6. mains voltage quality monitoring after the relay had tripped and did reset automatically with the user-set reset delay (**Ton**) upon the voltage parameters regeneration;
7. all fault conditions (full phase switching of the magnetic contactor power contacts is included) are displayed by special LEDs indicating the specific cause of the occurring voltage fault in the mains.

TECHNICAL BRIEF

Rated phase/line voltage, V	240/415
Mains frequency, Hz	45-55
Harmonical configuration (nonsinusoidality) of power supply voltage	EN 61000-3-2(IEC 1000-3-2)
Adjustable range for Umin, % of nominal value	5-25
Adjustable range for Umax, % of nominal value	5-25
Adjustable range for phase imbalance/asymmetry, %	5-20
Adjustable range for Tmin, sec	0-20
Adjustable range for Toff, sec	0-10
Adjustable range for Ton, sec	0-600
Minimum trip delay when threshold settings are reached, sec	0.1
Reset/energization delay when the relay energizes, sec, not more than	0.2
Voltage hysteresis, V	5-6
Accuracy of trip threshold for voltage, V, not more than	3
Phase imbalance accuracy, %, not more than	1.5
Safe operating voltage, % of rated value	30-110
Power required (under load), VA, not more than	3.0
Maximum switched current of output contacts, A	5
Output contacts life:	
• under load 5A, no less than, operations	100 000
• under load 1A, no less than, operations	1 mln.
Protection degree of:	
• apparatus	IP40
• terminal block	IP20
Permissible contamination level	II
Overvoltage category	III
Nominal voltage of isolation, V	450
Rated impulse withstand voltage, kV	4
Cross-section area of connection terminals, mm²	0.5-2
Maximum torque of terminal fixing, N*m	0.4
Operating temperature range, °C	from -35 to +55
Weight, no more than, kg	0.200
Case dimensions 4 modules of S-type	
Mounting 35 mm DIN-rail	
Mounting position as desired	

RNPP-301 complies with requirements:
IEC 60947-1:2004, IDT; IEC 60947-6-2:1992, IDT; CISPR 11:2004, IDT; IEC 61000-4-2:2001, IDT

The RNPP-301 relay (hereafter "the relay") is a digital microprocessor based device that provides a high degree of reliability and accuracy. The relay doesn't require any auxiliary power supply because it is self-powered by the three-phase voltage to be monitored. This permits the relay to keep operation capability even when only one phase is present (in the three-phase systems with neutral). Two modes of the mains voltage monitoring can be selected at the user's option:

The phase voltage monitoring mode

To enable phase voltage monitoring mode, it's necessary to remove jumper in between terminals 8-9 and connect neutral wire to terminal 7. This mode of operation is recommended for the situations when for the machinery the neutral shift is very critical (within the range of user preset values) and when phase imbalance is a matter of a great concern.

The line voltage monitoring mode

To go into this mode of operation one needs to apply the jumper strap between terminals ***8-9***; in this case to connect the neutral is not necessary. This mode of operation is recommended when the neutral drift value and phase voltage imbalance is not important as well as for isolated neutral three-phase systems. The relay will trip when line voltage imbalance/asymmetry between phases occurs.

Controls

The relay has six independent controls for basic parameters. For user's convenience screwdriver slots of adjusting potentiometers are brought out to the relay front panel.

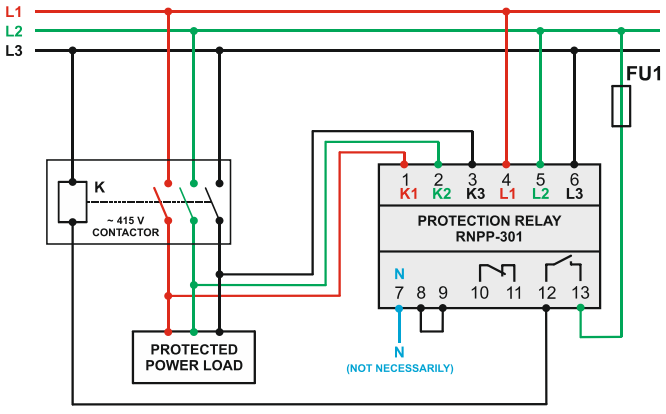
- **Umin** — trip threshold for the minimum allowable voltage, % of rated voltage;
- **Umax** — trip threshold for the maximum allowable voltage, % of rated voltage;
- **PI** — phase/line voltage imbalance threshold (according to selected monitoring mode), difference between RMS phase/line voltages, % of a lesser value;
- **Tmin** — trip delay for the minimum voltage that allows to ignore transient and/or starting voltage drops; it's recommended to set Tmin no less than 10 sec.
- **Toff** — trip delay covering all types of the mains voltage faults, under voltage excluded. It's recommended to set Toff no less than 1-1,5 sec to prevent the excessive relay tripping due to switching perturbations in the mains;
- **Ton** — automatic reset delay after the relay tripped and the mains voltage parameters have regenerated; this is also the energization time delay after the normal voltage was applied to the relay.

WIRING DIAGRAM

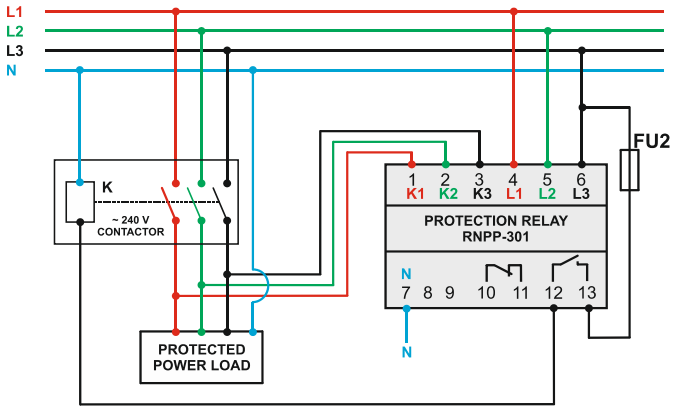
The relay should be connected in parallel to load according to the diagrams shown below.

The RNPP-301 wiring diagram with selectable mode of operation;

SCHEME A. LINE VOLTAGE (PHASE-TO-PHASE) MONITORING MODE



SCHEME B. PHASE VOLTAGE (LINE-TO GROUND) MONITORING MODE



FU1, FU2 – *fuse 6.3 A (circuit breaker)*