

# PEF-301

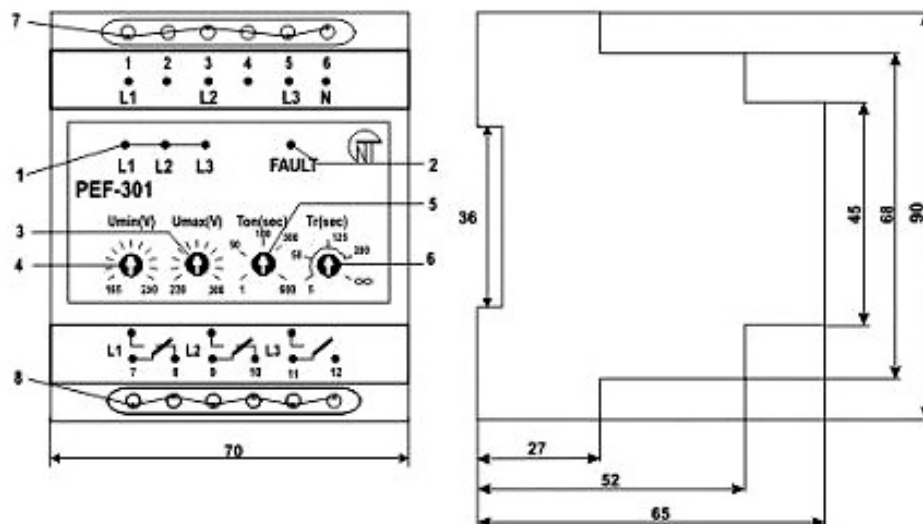
## *ELECTRONIC HEALTHY*

## *PHASE SELECTOR (UNIVERSAL AUTOMATIC ELECTRONIC PHASE SWITCH)*



## USERS MANUAL

### CONTROLS DESCRIPTION AND DIMENSIONS DIAGRAM



1. green LEDs indicating the phase the load is energized from;
2. red LED indicating fault;
3. control knob for Umax threshold setting, Umax;
4. control knob for Umin threshold setting, Umin;
5. control for autoreclosing time delay, Ton;
6. control for time delay to return to the priority phase, Tr;
7. connection terminals;
8. connection terminals.

## 1 APPLICATIONS

The PEF-301 universal automatic electronic phase switch is designed to supply an industrial/ appliance single-phase 220V/50Hz load from three-phase four-wire mains 3x380+N in order to maintain uninterrupted power supply of essential single-phase loads and protect them against unallowable voltage variations in the mains. To this end a single phase load is connected into the three-phase mains with the interposition of the PEF-301. According to voltage presence and voltage quality on phases the PEF-301 will automatically select the optimum phase and switch the single phase load supply to this phase.

Any power load is energized with the interposition of the PEF-301:

- if power is less than 3,5 kW (16A), the load is energized from the PEF-301 directly;
- if power is more than 3,5 kW (16A), the PEF-301 controls magnetic starter single phase coils of the corresponding power.

Reset delay to the priority phase, the maximum voltage threshold and the minimum voltage threshold are set by user.

## 2 TECHNICAL BRIEF

Nominal Phase Voltage, V	220
Mains frequency, Hz	45-55
Trip threshold for Umin, V	160-210
Trip threshold for Umax, V	230-280
Adjustable reset delay, Ton, s	1-600
Return delay range to the priority phase, Tr, (5—200), s	present
Return delay range to the priority phase, Tr, (200 -- ∞), s	absent
Fixed switch (de-energization) delay for Umin, s	12
Switch delay to reserve phases, s, not more than	0.2
Voltage hysteresis, V	5-7
Accuracy, V	±3
Maximum switched current of output contacts, A, no less than	16
Operating phase voltage, V	400
Transient withstand, V	450
Power consumption (under load), V, not more than	1.0
Life of output contacts: <ul style="list-style-type: none"> <li>• under load 16 A , operations, no less than</li> <li>• under load 5 A , operations, not more than</li> </ul>	100 000 1 mln.
Protection degree: <ul style="list-style-type: none"> <li>• apparatus</li> <li>• terminal block</li> </ul>	IP40 IP20
Operating temperature, °C	from -35 to +55
Storage temperature, °C	from -45 to +70
Weight, no more than, kg	0.200
Case dimension, mm	52*88*65
Mounting 35 mm DIN-rail	
Mounting position arbitrary	

## 3 OPERATION

The PEF -301 is a digital microprocessor - based device. User sets trip thresholds of the PEF-301, i. e. the minimum and the maximum voltage thresholds on reaching of which the device trips and de-energizes a load (switches the load to a reserve phase). The PEF-301 is connected to the three-phase four-wire mains through the 1(L1), 3(L2), 5(L3), 6(N) input terminals.

The phase L1 is the priority one, i. e. the load will always be energized from the L1 phase if voltage on this phase is present & within user-preset thresholds. The device performs monitoring of voltage presence & values on each phase and if the voltage value on the L1 goes outside the trip threshold range the PEF-301 effects the high speed (a switch delay is not more than 0.2 s) switching of the load to the phase where voltage value is within trip thresholds. If the voltages on both reserve phases are outside the preset trip voltage thresholds the load will be de-energized.

Switching is performed successively from L1 to L2, from L2 to L3 (the corresponding LED indicator glows).

### Switching to the phase with unallowable parameters is not performed.

After the load had been switched to reserve phases the monitoring of voltage presence & voltage value on the priority phase is going on and when the voltage parameters on this phase regenerated the load will be

switched to the priority phase after user-preset reset delay  $T_r$  (5-200 s) has expired. If  $T_r$  is in « $\infty$ » position (the priority is excluded) the return to the priority phase is not performed.

If voltage drops below the minimum trip voltage threshold, the load will be switched (de-energized) after the fixed time delay for starting transient drops ignoring (12 sec) has expired.

If voltage exceeds the maximum trip voltage threshold the load will be switched (de-energized) at once.

If the load had been de-energized from all the three phases because of unallowable voltage level on each phase the PEF-301 goes on voltage monitoring on all phases. When voltage parameters regenerate at least on one phase the load will be energized after the reset delay  $T_{on}$  has expired.

#### 4 PRELIMINARY STARTING PROCEDURE AND OPERATING PROCEDURE

The PEF-301 produced is ready for service and needs no special pre-starting procedure measures. Due to the application of digital technology all the settings in the PEF-301 are calibrated quite accurate, so one needs no monitoring devices to adjust the settings. Application of the switch according to specifications above and the present service manual, continuous work included, relieves of preventive maintenance during service life.

Before the PEF -301 is plugged - in one needs to set trip threshold values on the front panel by the contact knobs of potentiometers :

trip threshold for **U<sub>min</sub>**: 160 – 210V;

trip threshold for **U<sub>max</sub>**: 230 – 280V;

Reset delay after the load had been completely de-energized and then voltage parameters regenerated at least on one phase; also this is the initial load energization delay when voltage is applied to the device, **T<sub>on</sub>**: 1—600 sec;

Return delay to the priority phase, **T<sub>r</sub>**: it's adjusted in the 5 – 200 sec range; in the position « $\infty$ » the phase priority is excluded.

*For refrigerators, conditioners and other compressor equipment  $T_{on}$  is recommended to set within 3-4 min, for other devices  $T_{on}$  is set according to their operating instructions.*

The PEF-301 must be connected subject to the safety regulations. To set settings is recommended in « OFF » state. To set settings alive is permitted following to the safety regulations.

Three green LEDs **L1**, **L2**, **L3** on the front panel indicate the phase that energizes the load. The **red «fault» LED** indicator glows when the load is de-energized from all three phases.

#### NOTES AND RECOMENDATIONS:

to bring-in the phase priority when the PEF-301 backs up the load of considerable value. In this case after the load had been switched to reserve phases and the voltage on the priority phase regenerated the load will return to the priority phase and thus sustained overload of the reserve phase will be excluded;

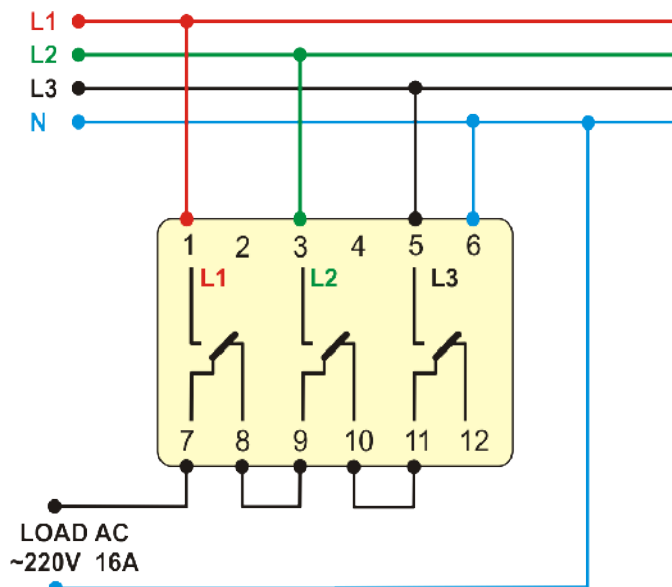
not to bring-in (to exclude) the phase priority if the PEF-301 backs up the essential load of inconsiderable value because the switching of this load to reserve phase will not virtually produce an effect on phase loading;

to select different priority phases for different single-phase loads in order to avoid phase overloads when several devices are energized from the one and the same mains.

Internal blocking for sticking of output built-in relay contacts is provided in the PEF-301. Also the PEF-301 performs the monitoring of the magnetic starter power contact position in external circuit and is blocking the power contacts for their sticking (the 12 terminal is used, see WIRING DIAGRAM №2).

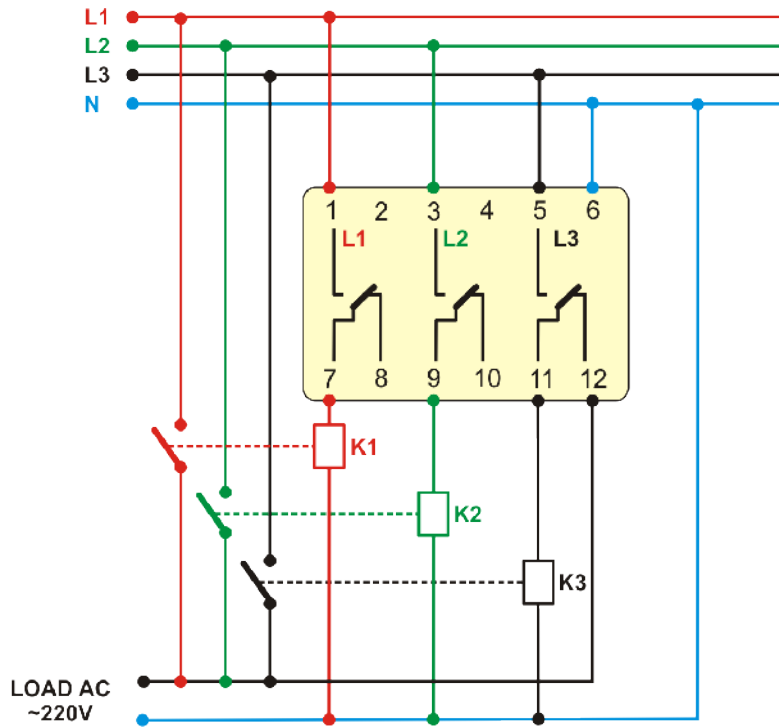
#### Wiring diagram №1

Connection when load is no more than 16A (apply jumper straps between the 8-9 and 10-11 terminals)



### Wiring diagram №2

Magnetic starters-assisted connection under load more than 16A (remove jumper straps between the 8-9 and 10-11)



K1, K2 , K3 – magnetic starters

**NOTE: If the voltage is applied to the 12 terminal the switching is not performed.**

### 5 STORAGE AND SHIPPING CONDITIONS

The switch in manufacturer package should be stored in enclosed rooms at -45° to +70 °C and exposed to no more than 80% of relative humidity when there are no fumes in the air that exert a deleterious effect on package and the switch material. The Buyer must provide the protection of the switch against mechanical damages in transit.