PH-1100

VOLTAGE 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 device after carefully studying the Operating Manual.
Keep the Operating Manual throughout the service life of the device.

Review the Operating manual before using the unit.

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



WARNING! – 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 MOUNTING WORKS AND MAINTENANCE <u>WITHOUT DISCONNECTING THE DEVICE FROM THE MAINS;</u>**
- TO OPEN AND REPAIR THE DEVICE INDEPENDENTLY;
- TO OPERATE THE DEVICE WITH MECHANICAL DAMAGES OF THE CASE.

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 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 Voltage relay PH-1100 (further in the text PH-1100 or device).

Terms and abbreviations:
The term "**Normal voltage**" means that the input voltage corresponds to all the parameters set by the user.
AR – automatic reclosing of the output contacts (autoreclosing);
Umax – actuation threshold by maximum voltage;
Umin – actuation threshold by minimum voltage.

PH-1100 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.

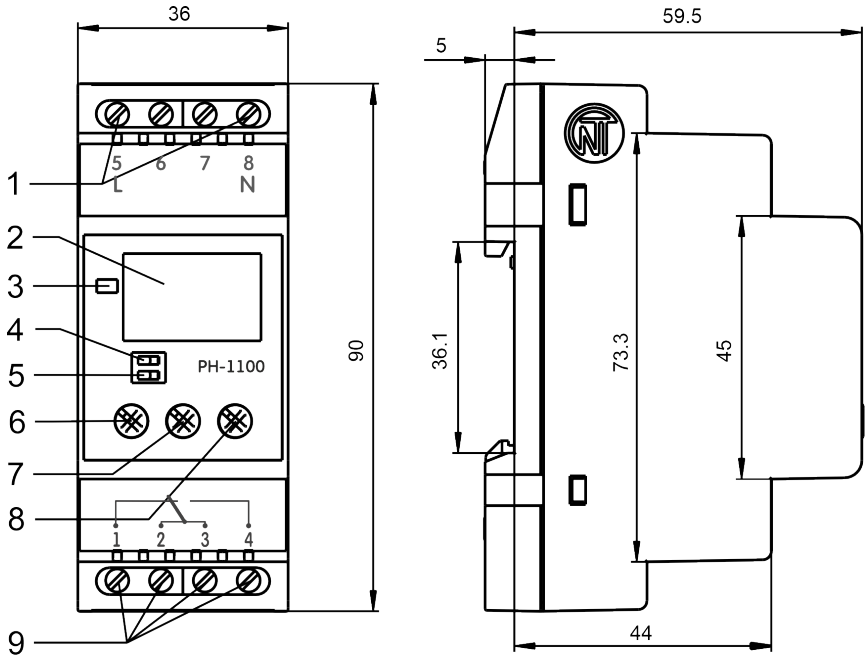
1. PURPOSE

1.1 The device's purpose

The PH-1100 Voltage Relay is designed to monitor the validity and presence of voltage with nominal parameters of 100 V, 50 Hz, and to switch electrical circuits in protection and automation systems of electrical installations above 1000 V.

The device displays the root-mean-square (RMS) value of the input voltage and the status of the output relay.

1.2 Controls, overall and mounting dimensions of the device are shown in Fig. 1.



1 – input terminals;
2 – three digits seven segment LED display (further in the text display);
3 – indicator showing ON/OFF state of the output contacts (power load) **On**;
4 – toggle switch (ON/OFF): Maximal voltage tripping (**Umax**);
5 – toggle switch (ON/OFF): Minimal voltage tripping (**Umin**);
6 – emergency Shut-off Timer Knob (**Toff(sec)**);
7 – minimum voltage threshold adjustment knob (**Umin(V)**);
8 – maximal voltage threshold adjustment knob (**Umax(V)**);
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 +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 CHARACTERISTICS

General data are listed in Table 1. Main technical specifications are listed in Table 2. Technical characteristics of the PH-1100 output contacts are listed in Table 3.

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
Climatic design version	NF 3.1
Index protection of electrical shock	II
Permissible degree of pollution	II
Overvoltage category	II
Nominal voltage of insulation	450 V
Rated impulse withstand voltage	2.5 kV
Connecting plugs cross section of conductors	0.3 – 3.3 mm^2
Maximum torque of terminal screws	0.4 N*m

Table 2

Rated voltage	100 V
Rated voltage frequency	47 – 65 Hz
Harmonical configuration (nonsinusoidality) of power supply voltage	EN 50160
Control range for Umin	50 – 95 V
Control range for Umax	105 – 150 V
Control range for Toff	0.1; 0.2; 0.3; 0.5; 1.0; 2.0; 3.0; 5.0; 10.0 s
Autoreclosing time delay (AR)	1 s
Fixed tripping time delay in case of voltage decrease more than 40 V	0.2 s
Fixed tripping time delay in case of voltage increase more than 160 V	0.12 s
Maximal commutation current (active power load)	16 A
Tripping Voltage level accuracy	to 2 V
Minimal operation voltage level at which PH-1100 will keep working	30 V
Maximal operation voltage level at which PH-1100 will keep working	170 V
Voltage hysteresis	4 V
Rower consumption (when de-energization load)	3 W
Commutation life of the output contacts: - under 16 A power load - under 5 A power load	 ≥ 100 000 times ≥ 1 000 000 times
Outer dimensions, (2 S-modules), HxBxL	90x36x64.5 mm
Weight	≤ 0.10 kg
Casing material – self-extinguishing plastic	
The device preserves functionality in any position within the space	

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 device for damage after transportation; in case of such damage's detection, contact the supplier or manufacturer;

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

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

3.1.2 General instructions

ATTENTION! PH-1100 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 device and connected devices.

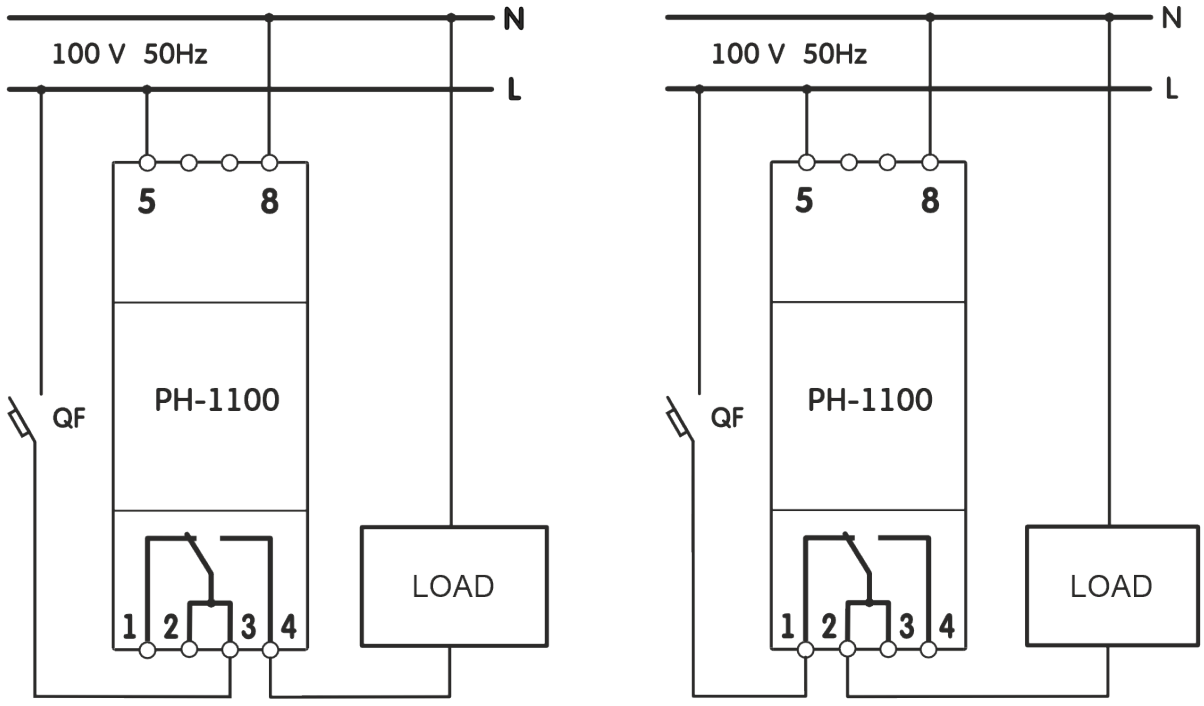
To ensure the reliability of electrical connections you should use flexible (stranded) wires with insulation for voltage of not less than 450 V, the ends of which it is necessary to be striped of insulation for 5±0.5 mm and tightened with bootlaces. Recommended cable cross section for connection is 1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

To improve operational properties of the device it is recommended to install the fuse (fuse element), or the equivalent for PH-1100 current of 1A.



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

3.1.3 Using toggle switches (it. 4, 5 fig.1) on the front panel set necessary mode of operation (see p. 3.2.2).

3.1.4 In case of using PH-1100 as Protection relay, Minimal protection relay or time relay connect wires according Figure 2, vers.1.

If PH-1100 is being used as a maximal voltage protection relay power load should be connected according Figure 2, vers. 2.

3.1.5 By spinning the knobs on the front panel set the required **Umin(V)**, **Umax(V)** and **Toff(sec)**.

ATTENTION! **Don't make excessive efforts when performing adjusting operations**.

3.1.6 Connect PH-1100 (contacts 5, 8 fig.2) to the power circuit.

3.1.7 Give the power supply to PH-1100 and by spinning the adjustment knobs set precisely the required values for the **Umin(V)**, **Umax(V)** and **Toff(sec)**.

When spinning the knobs on the display it is shown the exact value of the adjusted parameter.

3.2 The device use

3.2.1 PH-1100 can be in the following states:

– **Normal operation** (power load is ON, the load indicator lights, and display shows the value of the monitored voltage);

– **Alarm** (power load is OFF, the load indicator does not light, the display shows the value of the monitored voltage in the flashing mode).

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 PH-1100 was de-energized, then when normal voltage is applied to the input, the initialization time (0.3 – 0.4 s) is added to the AR time (1 second), and the text "StA" is briefly displayed on the display.

3.2.4 Automatic reclosing (AR)

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.

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 PH-1100 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 time Toff, the PH-1100 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 40 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 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 PH-1100 must be connected in series with contacts 1, 2 (3) (Fig. 2 variant 2).

When the normal voltage is applied to the PH-1100 input, the position of the PH-1100 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 time Toff, or when the input voltage rises by 160 V higher than Umax for more than 0.2 seconds, the PH-1100 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 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 PH-1100 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 time Toff, the PH-1100 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 40 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 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 160 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 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 70 V is supplied to the PH-1100 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 40 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 DEVICE INTERNAL ELEMENTS CONTAINS POTENTIALLY LETHAL VOLTAGE.
DURING MAINTENANCE IT IS NECESSARY TO DISABLE THE DEVICE AND CONNECTED DEVICES FROM THE MAINS.

4.2. Maintenance of the device 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 device from service and send for repair;

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

Do not use abrasives and solvents for cleaning.

5 SERVICE LIFE AND MANUFACTURER WARRANTY

5.1. The lifetime of the device 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 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 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 device.

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

5.6. Before sending for repair, the device 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 device 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. DATA ON CLAIMS

8. ACCEPTANCE CERTIFICATE

Voltage relay PH-1100 was produced and accepted in accordance with the requirements of effective technical documentation and was recognized as suitable for operation.

Quality control department seal _____

Production date _____

stamp

The Company is grateful to you for the information about the quality of the device and suggestions for its operation.

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

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Sale date_____

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