

VOLTAGE RELAY PH-260t



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 devices.
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 device

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 WITHOUT DISCONNECTING THE DEVICE FROM THE MAINS;
- TO OPEN AND REPAIR THE DEVICE INDEPENDENTLY;
- TO OPERATE THE DEVICE WITH MECHANICAL DAMAGES OF THE CASE.

ATTENTION! THE DEVICE IS NOT INTENDED FOR LOAD COMMUTATION AT SHORT CIRCUITS. THEREFORE, THE DEVICE SHOULD BE USED IN AN ELECTRICAL NETWORK PROTECTED BY AN AUTOMATIC CIRCUIT BREAKER WITH A CUTOFF CURRENT OF MORE THAN 63 A, CLASS B.

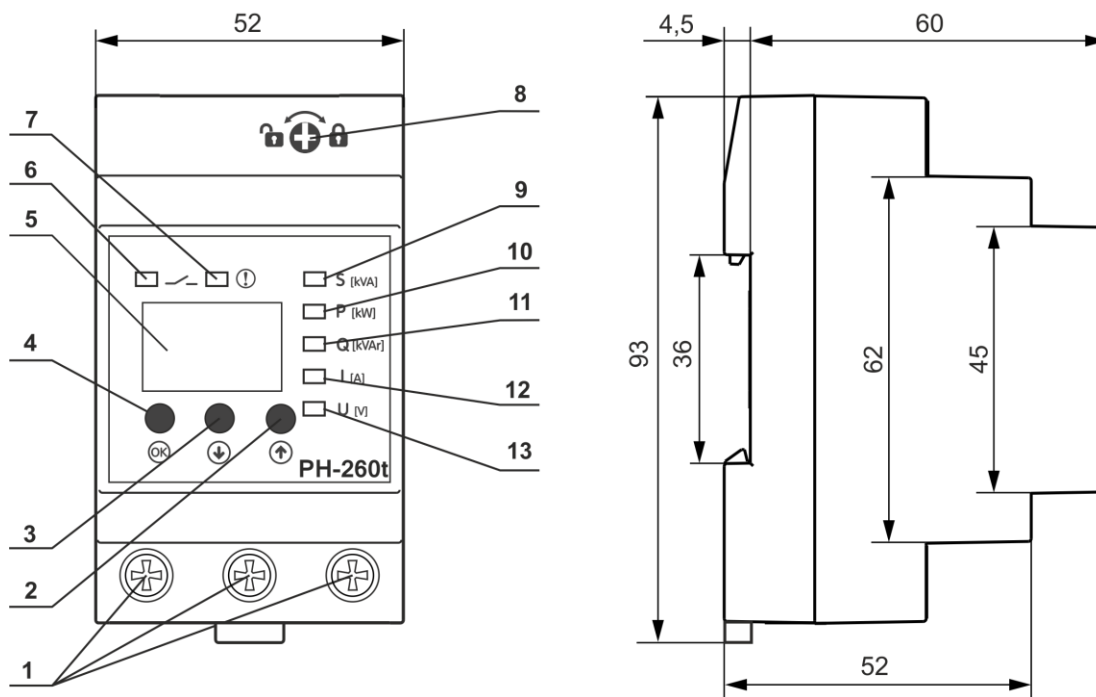
IT IS NOT ALLOWED WATER PENETRATION ON TERMINALS AND INTERNAL ELEMENTS OF THE DEVICE.

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.

Installation, adjustment and maintenance of the device must be performed by qualified personnel having studied this Operating Manual.

In compliance with the requirements of this Operating Manual and regulations the device is safe for use.



- 1 – terminals for device connection;
- 2 – button (UP) serves for navigation in the menu;
- 3 – button (DOWN) serves for navigation in the menu;
- 4 – button serves for entry to the menu;
- 5 – a display;
- 6 – a green indicator of load switching on (hereinafter in the text **Load**) is on, when the load is connected, it goes down, when the load is off; it flashes when counting down the delay time of load disconnection;
- 7 – a red indicator (hereinafter in the text – **Fault**) lights up when the load is off, it flashes when counting down the delay time of load disconnection;
- 8 – switch «Protection against recording»;
- 9 – green indicator **S [kVA]** lights up when a total power value is displayed;
- 10 – green indicator **P [kW]** lights up when an active power value is displayed;
- 11 – green indicator **Q [kVAr]** lights up when a reactive power value is displayed;
- 12 – green indicator **I [A]** lights up when a load current value is displayed;
- 13 – green indicator **U [V]** lights up when a mains voltage value is displayed.

Figure 1 – Controls and overall dimensions of PH-260t

This Operation Manual is intended to let you know about the device, safety requirements, operation and maintenance procedures for the voltage-response relay PH-260t (hereinafter in the text: the device, PH-260t).

The device meets the requirements of the following:

- EN 60947-1;
- EN 60947-6-2;
- EN 55011;
- EN 61000-4-2.

Harmful substances, in more than allowed concentration, are not available.

Terms and abbreviations:

- **Controlled parameter** – mains voltage and a parameter (variable) selected by the User (total power, active power, reactive power, load current), with exceeding of which the device opens contacts 1-3 (Fig. 1);
- **AR** – delay of automatic re-closure which is counted down after opening of contacts 1-3 (Fig. 1);
- **Display** – a three-digit seven-segment indicator.

1 DESIGNATION

1.1. Designation of the device

The voltage relay PH-260t is designed to protect household and industrial electrical equipment (refrigerators, air conditioners, washing machines, television, video and audio equipment, etc.) against unacceptable voltage fluctuations in the mains and the effects of a neutral (zero) conductor breakage.

PH-260t indicates the actual value of the voltage in the mains and the state of the output contacts (the state of the load).

PH-260t has protection against overheating due to exceeding of the rated current of the load.

PH-260t measures and displays current consumed by the load, active and reactive power and it trips off the load in case of exceeding of the thresholds set for current and power.

The ranges of the parameters to be measured and controlled are shown in Table 1.

Table 1 – Ranges of the parameters to be measured and controlled

Name	Controlled range	Measured range
Total power, kVA	1 – 14	0 – 14
Active power, kW	1 – 14	0 – 14
Reactive power, kVA _r	1 – 14	0 – 14
Load current, A	1 – 63	0.5 – 63
Input voltage, V	160 – 280	120 – 350

PH-260t may be used as: a voltage-response relay; a consumed power limiting relay; a digital multimeter (indication of the mains voltage, total, active and reactive power and current consumed).

PH-260t is supplied from the circuit that supplied the load.

1.2 Controls and overall dimensions of the PH-260t:

Controls and overall dimensions are shown in Fig. 1.

1.3 Operation conditions

The device is designed for operation in the following conditions:

- Ambient temperature: from minus 35 to +55°C;
- Atmospheric pressure: from 84 to 106.7 kPa;
- Relative air humidity (at temperature of +25°C): 30 ... 80%.

If the temperature of the device after transportation or storage differs from the environment temperature at which it is expected to operate, then before connection to electric mains keep the device under the operating conditions within two hours (because the device elements may have moisture condensation).

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 SPECIFICATIONS

The main technical specifications of the device are shown in Table 2.

Characteristics of the output contacts of the device are shown in Table 3.

The defined parameters are given in Table 4.

Table 2 - The main technical specifications

Description	Value
Rated AC one-phase supply voltage, V	230/240
Mains frequency, Hz	47 – 65
Harmonic composition (unsinusoidality) of the supply voltage	EN 50160
Rated insulation voltage, V	450

Rated impulse withstand voltage, kV	2.5
Accuracy of total power measurement, %, not more	5
Accuracy of active power measurement, %, not more	5
Accuracy of reactive power measurement, %, not more	5
Accuracy of current measurement, %, not more	2,5
Accuracy of voltage measurement within the range of 120 – 350 V, % not more	2
Automatic re-closure time, min.	1 – 580
Cutoff delay, s	1 – 300
Automatic re-closure time by voltage, s	1 – 900
Readiness time, s, not more	0.8
Maximal switching current at active load, A	63
Consumed power at unconnected load, W, not more	3
Maximal voltage at which operability is retained (acting value), V	450
Minimal voltage at which operability is retained (acting value), V	120
Fixed delay of cutoff by U_{max} , s	1
Fixed delay of cutoff by U_{min} , s	12
Fixed response time at voltage exceeding 430 V and pulse duration of more than 1.5 ms, s, not more	0.05
Fixed response time (voltage protection is on) at voltage decrease below 60 V from the set value in U_{min} or at voltage decrease below 145 V, s	0.12
Fixed response time (voltage protection is off) at voltage decrease below 120 V, s	0.12
Fixed response time at voltage increase by more than 30 V from the set value in U_{max} or at voltage exceeding 285 V, s	0.12
Accuracy of determining operation threshold by voltage, V	3
Voltage hysteresis, V	5
Rated mode of operation	long
Degree of device protection	IP 10
Electric shock protection class	II
Climatic version	NF 3.1
Permissible pollution	II
Overvoltage category	II
Wire cross section for connecting to terminals, mm ²	0.5 – 16.0
The moment of tightening the screws of terminals, N*m	2±0.2
Mass, kg, not more	0.2
Overall dimensions, HxBxL, mm	93x52x64.5
Installation (wiring) of the article - standard 35 mm DIN rail	
The article retains its operability in any position in the space	
Material of the body frame - self-extinguishing plastic	

<i>At the mains voltage below 120 V and more than 350 V the value of voltage measured by the device is not correct</i>	

Table 3 – Characteristics of PH-260t output contacts

Description	Value
Maximal current at voltage of ~230 V ($\cos \varphi = 1$), A	63
Maximal power at closed contacts, kVA	14
Maximal switched power ($\cos \varphi = 0.4$), kVA	1.4
Maximal permissible alternative current voltage, V	275
Service life: – mechanical, times, at least – electrical, times, at least	500 th. 10 th.

Table 4 – Defined parameters of PH-260t

Items of menu and their designation on the display	Parameter to adjust and the range of values	Default settings
$P_r \square$ Controlled parameter	«5» – total power; «9» – reactive power; «P» – active power; «E» – load current	E
P_{ou} Power	from 1 to 14 kW (kVA, kVAr)	14
$\square U_r$ Current	from 1 to 63 A	63
d_{oF} Delay time of load cutoff	from 1 to 300 s	5
d_{on} AR time by the controlled parameter	from 1 to 580 min. If the value if more than 580 min – AR is prohibited «oFF»	oFF
U_{Pr} Voltage protection	«on» – protection is on; «oFF» – protection is off	on
U_{rL} Minimal voltage threshold	from 160 to 220 V	195

<i>UrH</i>	Maximal voltage threshold	from 230 to 280 V	255
<i>Udo</i>	AR time by voltage	from 1 to 900 s	5
<i>dS</i>	Displayed parameter by default	« <i>dS</i> » – total power; « <i>dP</i> » – active power; « <i>dQ</i> » – reactive power;	dU
<i>dId</i>	Parameter indication mode	« <i>Eno</i> » – parameter value is displayed continuously; « <i>d10</i> » – parameter value is displayed for 15 seconds (then a default parameter will be displayed); « <i>LYL</i> » – a continuous cyclic parameter displaying.	Eno
<i>PAS</i>	Password setting	allowable values from 000 to 999	000

3 THE INTENDED USE

3.1 Preparation for operation

3.1.1 Preparation for connection:

- unpack and check the device for damage absence after transportation; in case of such damages detection, contact the supplier or the manufacturer;
- carefully study the Operation Manual;
- 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 Connection

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.

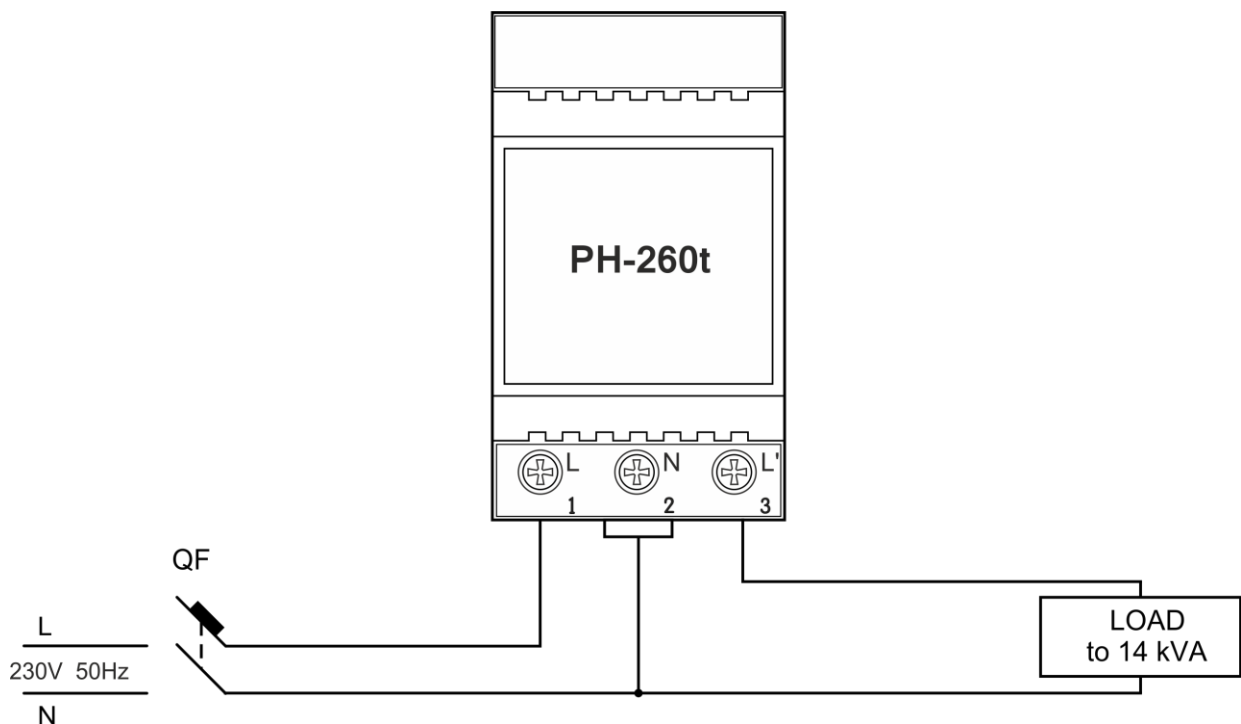
To ensure reliability of electrical connections, flexible (multi-wire) conductors with voltage insulation for at least 450 V should be used. The wire cross section for connecting protected equipment depends on the load current (power), and should be: for current of 40 A (9 kW) – at least 6 mm²; for current of 63 A (14 kW) - at least 10 mm². The ends of the wires must be stripped of insulation for 5 ± 0.5 mm and crimped with bushings. Fastening of the wires should exclude mechanical damage, twisting and abrasion of wire insulation.

If necessary, it is allowed to use a wire with cross-section of 0.5 - 1 mm² for connection of supply to the device (terminal 2, Fig. 1).

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

For a reliable contact, tighten the terminal screws with the force indicated in Table 2.

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



QF – a circuit breaker.

Figure 2 – Device connection diagram

3.1.2.1 Switch off the power supply with a circuit breaker.

3.1.2.2 Connect the device according to the circuit shown in Fig. 2.

ATTENTION! If it is foreseen to change factory settings, it is recommended to switch off the load beforehand.

3.1.2.3 Open the circuit breaker to supply voltage to PH-260t.

After connecting the device to the mains, the display will indicate "5tA" (Load indicator does not light up, "Fault" indicator lights up) then automatic re-closure time countdown by voltage will be displayed.








After the countdown of the automatic re-closure time, if the value of the mains voltage is within the specified limits, the device will connect the load, the Load indicator will light (the Fault indicator will go out).

The display shows the measured parameter that was selected in settings («d,5», Table 4) and the corresponding indicator will light up (pos. 9 - 13, Fig. 1)*.

* **Note** – with the first connection the mains voltage value (parameter «dU») is displayed and U[V] indicator lights up.












3.1.3 If necessary, you can change the factory settings of the PH-260t.

Before changing the parameters, it is necessary:


- to set the «Write Protect» switch (pos. 8, Fig. 1) to the «» position (after completing the settings, set the "Write Protect" switch to the «» position);
- press and hold button  for 3 seconds to enter the main menu;
- release button , the display will show the password entry field (the inscription «000») with a blinking high digit;
- by means of buttons  or  set the value of the highest digit of the password and briefly press the button  to go to the next digit. Enter the middle and lower digits of the password in the same way. If the password is entered correctly, the display will show the first menu item (parameter «P-L», Table 4); if the password was entered incorrectly, the device will go into the «Normal operation» state.

By default password «000 » is set.


In order to change any parameter, it is necessary:



- to move to the required parameter by means of buttons  or  and choose it by pressing button . The device will move to the state «Setting of parameters» (items of the menu are described in Table 4);
- to change the value of the selected parameter by means of buttons  or . When editing the parameter by pressing the buttons for a short period of time:  – the value of the parameter will be increased by 1 unit,  – the value of the parameter will be decreased by 1 unit. When changing the numerical parameters, with holding buttons  or  for a long time, values will be changing every 0.5 s:
 - within the range from 1 to 60 – with a step of one;
 - within the range from 60 to 100 – with a step of five;
 - within the range from 100 to more – with a step of twenty.
- for saving the parameter value, press button , for a short time, thereby the device will move to the main menu;
- for moving from the main menu to the "Normal operation" mode, press and hold button  for 3 seconds.

In order to change the password, it is necessary:

- to move to «PAS» in the menu;
 - to set the required value of the high order digit of the password and to press button  for a short time. To set the middle and lower order digits of the password in the similar way. After entering the value to the lower-order digit of the password, the device will save the password and it will move to the main menu.
- If no buttons are pressed within 30 seconds, the device will go into the "Normal operation" mode automatically, but the next time you enter the menu, the device will go back to the parameter that was active before exiting.

Notes:

- if the password value is «000», the password will not be requested when entering the menu;
- the password is requested regardless of the position in which the "Write protection" switch is set
- if switch "Write Protect" is set to position «», it is impossible to change parameters, only reading is possible. The exception is for «d,5» and «d,d» parameters, which are available for change at any position of the "Write Protect" switch.

3.1.4 To reset the parameters to the factory settings, it is necessary to set "Write Protect" switch to the «», to disconnect the device from the mains and, by holding the button , turn on the device (the password will be set to «000»).

3.2 Use of the device

3.2.1 Modes of operation

The device may be in the following modes of operation:

- «Normal operation»;
- «Setting of parameters»;
- «Fault».

The device will be in the «Normal operation» mode, if:

- The controlled parameter does not exceed the value, set by the User;
- The countdown of the automatic re-closure time is over.

In the «Setting of parameters» mode a change of parameter values takes place (Table 4).

In the «Fault» mode the load is off and indicator **Fault** lights up (the **Load** indicator does not light).

3.2.2 Operation of the device

3.2.2.1 Voltage control

If the mains voltage exceeds the thresholds set by the User (parameter « U_{rL} » or « U_{rH} », Table 4), the countdown of the load disconnection delay starts (fixed cutoff delay, Table 2). The **Load** and **Fault** indicators are blinking. After the completion of the countdown of the trip delay time and, if up to this point, the voltage has not taken an acceptable value:

- the device will enter the «Fault» state;
- the display alternately displays the rest of the re-closure time by voltage in seconds and the current value of the mains voltage. During the display of the rest of the re-closure time, the dot in the lowest digit of the display lights up and the **U [V]** indicator does not light (pos. 13, Fig. 1), and when the voltage value is displayed, the **U [V]** indicator lights up.

After the completion of the countdown of the automatic re-closure time according to the voltage and if the mains voltage assumes an acceptable value, the device will connect the load and the **Load** indicator will light (the **Fault** indicator will go out).

If the voltage protection responded to the upper voltage threshold, the device will connect the load when the voltage drops to the U_{rH} value minus the hysteresis value. If the voltage protection tripped by the lower voltage threshold, the device will connect the load, when the voltage rises to U_{rL} value plus the hysteresis value. The device will enter the «Normal operation» state.

If the voltage protection (parameter UP_r , Table 4) is disabled, then when the mains voltage is lower than 120 V or if the voltage is higher than 285 V, the device will go into the «Fault» state. After the countdown of the re-closure time by voltage, the device will move to the «Normal operation» state, if the mains voltage is between 165 V and 275 V.

3.2.2.2 Power and current control

If the value of the controlled parameter is exceeded (menu item « PrL », Table 4), and the **Load** and **Fault** indicators flash.

After completion of the countdown of the trip delay time and, if up to this point, the controlled parameter has not accepted an allowable value:

- the device will enter the «Fault» state;
- the display will show the rest of the automatic re-closure time in minutes and one of the indicators (pos. 9-12, Fig. 1), corresponding to the parameter beyond which the protection has tripped, will flash.

If a voltage fault occurs while counting the AR time by power or current, the display will show the voltage value, periodically replaced by the remaining AR time by voltage (when AR by voltage is displayed a point in the least significant digit is lit on the display). Also, instead of one of the indicators (pos. 9-12, Figure 1), the **U [V]** indicator will blink.

If the voltage failure is gone, but the current or power failure remains, then the display will show the AR value (by current or power) again, and instead of the **U [V]** indicator (pos. 13, figure 1) one of the indicators will blink again (pos. 9-12, Figure 1), corresponding to the parameter when exceeded the protection was activated.

If the countdown of automatic re-closure time by power or current is prohibited (parameter « don », value « OFF », Table 4), the device will not turn on the load, the display will show « OFF ». To turn on the load, you must turn off the power of the PH-260t and turn it on again, or set the automatic re-closure time (parameter « don », Table 4) for 580 min. or less.

Note: when selecting a controlled parameter (menu item « PrL », Table 4), the rest parameters of this item are not controlled.

3.2.2.3 Contact group overheating control

If the overheating protection of the contact group is activated (temperature above 85 °C), the device will disconnect the load and further operation of the PH-260t will be blocked. The display will show « ErP », all other indicators will go out. To resume operation of the device, you must disconnect the device from the mains, then turn it back on.

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 Recommended frequency of maintenance is **every six months**.

4.3 Maintenance Procedure:

- 1) Check the connection reliability of the wires, if necessary, clamp with the force specified in Table 2;
- 2) Visually check the integrity of the housing, in case of detection of cracks and damages take the device out of service and send for repair;
- 3) If necessary, wipe the front panel and the housing of the device with cloth.

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 WITH THE VIOLATION OF THE REQUIREMENTS OF THIS USER MANUAL, THE USER WILL LOSE THE RIGHT TO WARRANTY MAINTENANCE.

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.

You are kindly requested, in case of the device return and transfer it to the warranty (post-warranty) service please indicate detailed reason for the return in the field of the claims data.

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 ACCEPTANCE CERTIFICATE

PH-260t has been manufactured and accepted in accordance with the requirements of valid technical documentation and classified as fit for operation.

Head of QCD

Date of manufacture

Seal

8 CLAIMS DATA

For all questions, please contact the manufacturer:

NOVATEK-ELECTRO Ltd,
 59, Admiral Lazarev Str.,
 Odessa, 65007, Ukraine.
 Tel.: +38 (048)738-00-28,
 Tel./fax: +38 (0482) 34-36-73.
 www.novatek-electro.com

Date of sale: _____