

THERMOREGULATOR TP-12



OPERATING MANUAL

*Development and production quality control system meets the requirements of
ISO 9001:2015*

Dear customer!

"Novatek-Electro" Company thanks you for our production purchasing.
By thoroughly studied this manual, one can be able to use the DEVICE properly. Keep this manual
throughout the whole life of the product.

ATTENTION! ALL REQUIREMENTS IN THIS MANUAL ARE OBLIGATORY FOR IMPLEMENTATION!



CAUTION – THE SOCKET WITH PLUG AND INTERNAL ELEMENTS OF DEVICE POSSESS VOLTAGE DANGEROUS FOR LIFE.

TO ENSURE SAFE USE OF THE DEVICE IT IS STRICTLY PROHIBITED TO:

– PERFORM INSTALLATION WORKS AND MAINTENANCE **UNLESS THE DEVICE IS CONNECTED TO THE SOCKET:**

- OPEN AND REPAIR THE DEVICE INDEPENDENTLY;
- OPERATE THE DEVICE WITH MECHANICALLY DAMAGED CASING.

NO WATER PENETRATION ALLOWED TO THE INTERNAL ELEMENTS OF THE DEVICE, SOCKET OR PLUG.

NO DIGITAL SENSOR IS ALLOWED TO USE FOR MEASURING LIQUID TEMPERATURE.

WARNING!

1) THE DEVICE IS NOT DESIGNED FOR LOAD SWITCHING WHILE SHORT CIRCUITS. THEREFORE, THE DEVICE SHOULD BE OPERATED WITHIN ELECTRICAL NETWORK, PROTECTED BY CIRCUIT BREAKER WITH **BREAKING CURRENT MORE THAN 16 A.**

2) CAPACITY LOAD MORE THAN 3.6 kW SHOULD NOT BE CONNECTED TO TP-12.

3) LOAD CURRENT SHOULD NOT EXCEED THE MAXIMUM CURRENT OF SOCKET, TO WHICH TP-12 IS CONNECTED.

To improve performance, it is recommended to use the device while load currents, not exceeding 70% of maximum value.

When operating and maintaining one should meet the requirements of regulations:

- «Rules for technical operation of electrical installations»,
- «Safety rules when operating electrical installations»,
- «Labor safety when operating electrical installations».

Connection, adjustment and maintenance of the device should be performed by Users, who have already studied this Manual.

Meeting all the operation rules makes the device safe for use.

This manual is designed for learning the device, safety requirements, operation and maintenance sequence for TP-12 Thermoregulator (hereinafter referred to as TP-12).

The device complies with the following requirements:

- IEC 60947-1; -IEC 60947-6-2;
- CISPR 11; - IEC 61000-4-2.

No harmful substances, exceeding the maximum allowable concentrations, available.

Definitions and abbreviations:

Load – heating or cooling device.

Hysteresis by temperature – difference between device start and shutdown temperature.

U_{max} – actuation threshold by maximum voltage.

U_{min} – actuation threshold by minimum voltage.

1 PURPOSE

1.1 Purpose of the product

TP-12 is used where it is necessary to maintain the air temperature at a given level: in residential areas, greenhouses, vegetable storage facilities, incubators etc.

The product measures the air temperature via digital temperature sensor (hereinafter referred to as sensor) and operates the cooling and heating device. Depending on the wire length and sensor location in the lower or upper casing part, the device has several versions, given in the Table 1. The temperature is controlled in the place where the sensor is located.

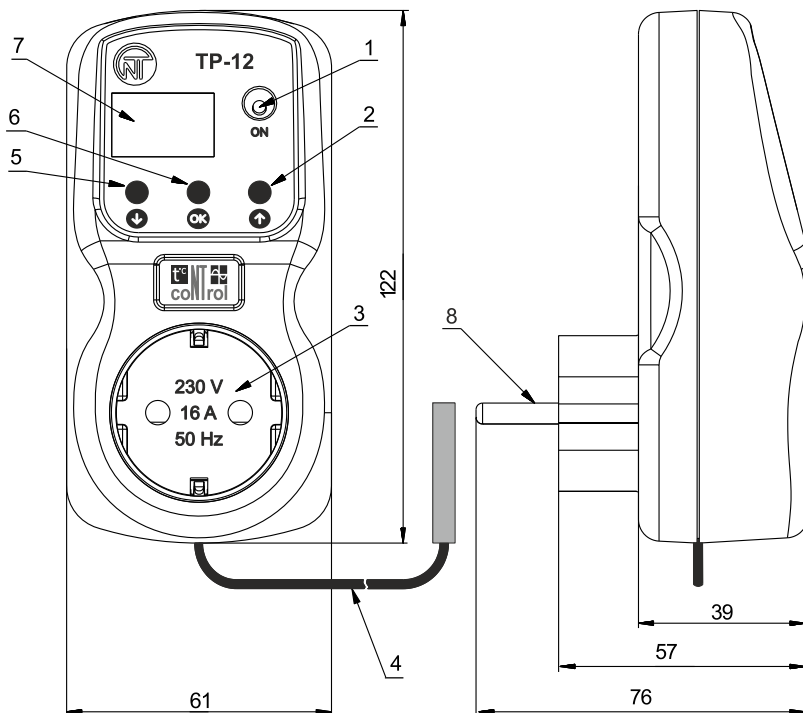
Additionally TP-12 possesses functions of voltage relay, protecting the load inappropriate voltage levels.

Table 1 – The device versions

Version	Sensor Location	Sensor Wire Length
TP-12-1	Lower part of casing	10 cm
TP-12-2		1.8 m
TP-12-3	Upper part of casing	10 cm

Note – the device version is indicated on the package

1.2 TP-12 Controls and Dimensions



- 1 – ON led illuminates if there is voltage in the socket of TP-12;
- 2 – ↑ - pushbutton for value increase when setting up parameters and changing the display mode;
- 3 – socket for load connection;
- 4 – digital temperature sensor;
- 5 – ↓ - pushbutton for value decrease when setting up parameters and changing the display mode;
- 6 – OK – pushbutton for entering (exiting) to (from) settings menu and their saving when changed;
- 7 – seven-segment three-digit display (hereinafter referred to as display);
- 8 – power plug.

Figure 1 –TP-12 controls and dimensions

1.3 Operating conditions

The device is designed for operation in the following conditions:

- Ambient temperature from 10 to +45°C;
- Atmospheric pressure from 84 to 106.7 kPa;
- Relative humidity (at the temperature of +25 °C) 30 ... 80%.

If the device temperature after transportation or storage differs from the air temperature, intended for the operation, before connecting to electrical network the device should be operated during two hours (because of the probable moisture on the device elements).

ATTENTION! The device **is not designed** to operate in the following conditions:

- Significant vibration and shocks;

- High humidity;
- Aggressive environment containing acids, alkalis etc, as well as strong contaminations (such as fat, oil, dust and others).

2 SPECIFICATIONS

General specifications of TP-12 are given in the Table 2.

Basic data on TP-12 is given in the Table 3.

Table 2 – General specifications

Name	Value
AC single-phase nominal voltage, V	230/240
Network frequency, Hz	45 – 65
Temperature measurement error, °C	2
Harmonics (non-sinusoidal) of power voltage	EN 50160
Temperature control range (it isn't recommended to establish temperature higher than +60°C), °C	from -10 to +90
Hysteresis by temperature, °C	0.1 ...30
Actuation threshold control range: –by minimum voltage, V – by maximum voltage, V	120 – 210 230 – 290
Fixed operating time by U _{max} , seconds	0.5
Fixed off-delay by U _{min} , seconds	7
Fixed operating time when voltage decrease lower than 120 V, seconds	0.12
Fixed operating time when pulse voltage increase more than 450 V while pulse duration more than 1 ms, seconds, not more than	0.02
Actuation threshold determination error by voltage, not more than, V	3
Return hysteresis by voltage, V	5
Minimum voltage, preserving functionality (RMS value), V	120
Maximum switching current when active load, A	16
Maximum voltage, preserving functionality (RMS value), V	320
Output contacts switching resource: – Under the load of 16 A, one time, not less than – Under the load of 5 A, one time, not less than	100 thous. 1 mio.
Power consumption when non-connected load, W, not more than	1.3
Connected load power, kW, not more than	3.6
Weight, kg, not more than	0.16
Dimensions (fig.1), HxBxL, mm	122x61x76
The device preserves functionality in any position within the space	
Casing material – self-extinguishing plastic	

Table 3 – Basic Data

Name	Value
Purpose of the device	Distribution and control equipment
Nominal operation mode	Continuous
Degree of device protection	IP30
Class of protection or against electric shock	I
Climatic version	CN3.1
Allowable degree of contamination	II
Overvoltage category	II
Insulation nominal voltage, V	450
Rated pulse withstand voltage, kV	2.5

3 DEVICE OPERATION DESCRIPTION

3.1 Device Factory Settings

Load operation mode	hDŁ (Heat)
Temperature, supported by the device, when controlling the load	30°C
Hysteresis by temperature	3°C
Actuation threshold by maximum voltage	250 V
Actuation threshold by minimum voltage	190 V
Temperature calibration	0°C
Minimum load on/off time (protection from frequent actuations)	0 minutes*

* - the load of the device is on/off in 5 seconds

3.2 Normal Device Operation



Normal device operation – TP-12 maintains the set temperature by enabling (disabling) the load, thus the display shows the value of the temperature, measured by sensor.



When normal device operation the network voltage is in the set thresholds.

By using the heating device, in case factory settings fit, connect the load to the device and do not set anything, thus the heating device heats the premise up to 30°C and shuts down. After cool down up to 3°C (factory setting of hysteresis by temperature), that is up to 27°C, TP-12 enables the heating device once more and the cycle is repeated. If it is necessary to maintain the temperature lower than 30°C (i.e., 25°C), adjust the temperature to 25 °C. In this case the heating device heats the premise up to 25°C and shuts down. After cool down up to 3 °C (up to 22°C) the device enables the heating device once more and the cycle is repeated.

When using the cooling device one should change the operating mode of the device to «Cooling» (how to change is described in section «Complete parameters setting»), set the temperature value, supported by TP-12. For instance, for maintaining within the premise 8 °C the cooling device cools the premise up to 8°C and shuts down, after increasing the temperature for 3 °C (factory setting of hysteresis by temperature), that is up to 11°C, the device enables the cooling device once more and the cycle is repeated.

3.3 Viewing the Network Voltage

When normal device operation one can change the value displaying of measured temperature to network voltage value. Simultaneously push the keys  and , thus the display instead of temperature value, measured by sensor, shows the network voltage value.

To return to the temperature value display simultaneously push the keys  and  or the return is made automatically in 15 seconds. When network voltage indication the point on the display is not lit.

3.4 «Failure» Status

If the network voltage value exceeds the set threshold, TP-12 enters «Voltage failure» status.

From the moment of failure occurrence:

- the load turn off;
- the display periodically shows the "ErU" code;
- **ON** led is not lit.

After restoring voltage parameters, the "ErU" code stops to flash and the device returns to its normal operation.

Besides the voltage failure there also can be other failures, thus the display alternately shows the measured temperature values and failure code. In the below table there are failure types and troubleshooting.

Failure Types		Troubleshooting
ErD	No signal from sensor	Disconnect TP-12 from power outlet and load, contact customer service for device repair
ErC	Device contacts fritting	Disconnect TP-12 from power outlet, than re-enable. If the code continues to be shown on the display or systematically appears, the device should be removed from operation and one should contact the customer service
ErE	EEPROM error	Reset the settings to factory, and than re-configure (see the item «Complete parameters setting»)
ErU	Voltage error	Check, if the input voltage value is in the given threshold
ErP	Casing overheat	Check reliability of TP-12 socket and plug connection with power outlet and load, as well as absence of deposit. Ensure, that the load does not exceed 3.6 kW

3.5 TP-12 Protection Against Overheat

TP-12 provides for «Device protection against overheat». If the temperature inside the device casing rises above 85 °C, the display shows the "ErP" code, **ON** led turns off and the load is disabled. To disable protection one should disconnect the device from power outlet, cool it down, than re-connect.

At frequent emergence on the display "ErP" code should contact the customer service or manufacturer .

4 INTENDED USE

4.1 Preparing for Connection:

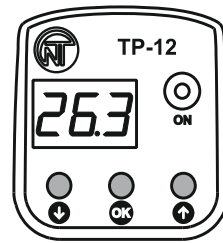
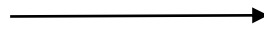
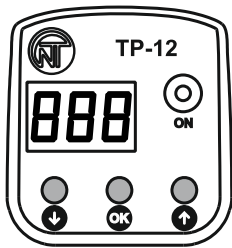
- unpack the device (to preserve the original packing for the entire warranty period of the device is recommended);
- check the device for damages after transportation, in case of such contact the supplier or manufacturer;
- carefully read the user manual;
- in case of issues on device installation, please, contact the manufacturer by phone specified in the end on the user manual.

4.2 Connecting the Device



WHEN TP-12 CONNECTED THE SOCKET CONTACTS AND INTERNAL DEVICE ELEMENTS POSSESS THE VOLTAGE DANGEROUS FOR LIFE

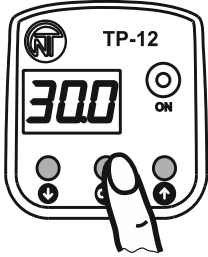
4.2.1 Connect TP-12 to power socket



The display shows the value «888» 3 seconds

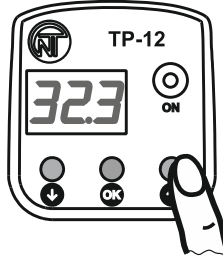
After 3 seconds the display shows temperature value, measured by sensor

4.2.2 When connected to TP-12 of heating device, in order to change factory temperature setting perform the following actions:



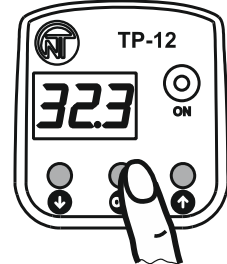
Step.1 Entering Settings

Press **OK** pushbutton to enter temperature settings, thus the display shows factory temperature setting in flashing mode



Step.2 Changing Parameters

Via **↓** or **↑** pushbuttons change the flashing temperature value within the range of -10 to +90°C with increment size of 0.1°C



Step.3 Saving Parameters

Press **OK** pushbutton to save changes and exit settings menu. In case of holding **OK** pushbutton for 3 seconds, one exits temperature settings without saving

When the setting during 30 seconds none of pushbuttons are switched, the device does not save changes and exits the setting mode, thus the display shows the temperature value, measured by sensor.

In order to connect to TP-12 the cooling device (change the device operating mode) and change parameter settings to different from factory ones, see the «Complete parameters setting» section

4.2.3 Connect the load to TP-12 socket

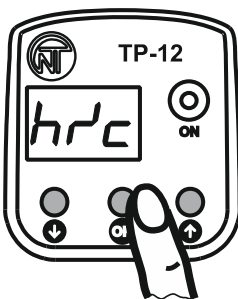
4.3 Complete Parameters Setting

All device parameters are represented by the menu.

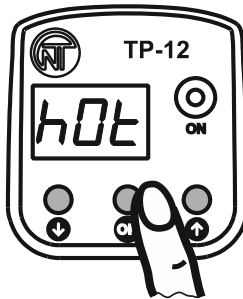
When the setting during 30 seconds none of pushbuttons are switched, the device does not save changes and exits the setting menu, thus the display shows the temperature value, measured by sensor.

To exit the menu hold **OK** pushbutton pressed for 3 seconds

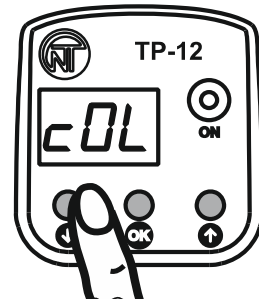
Selecting Heating/Cooling (h/c) load mode



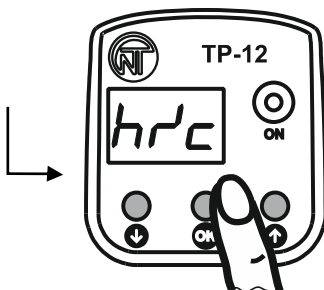
Hold **OK** pushbutton for 3 seconds until the display shows «hrc» menu parameter



Press **OK** pushbutton to enter the parameter, thus the display shows the factory parameters setting in («hot») flashing mode

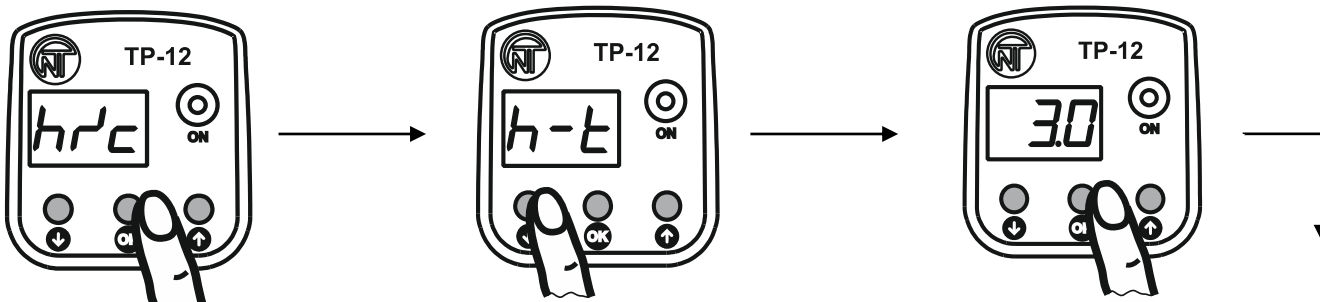


Via **↓** or **↑** pushbutton change the load mode value: «hot» - Heating, «col» - Cooling



Press **OK** pushbutton to save changes, thus the display shows «hrc» menu parameter (in case of holding **OK** pushbutton for 3 seconds, one exits the setting menu without saving and the device will operate in normal mode).

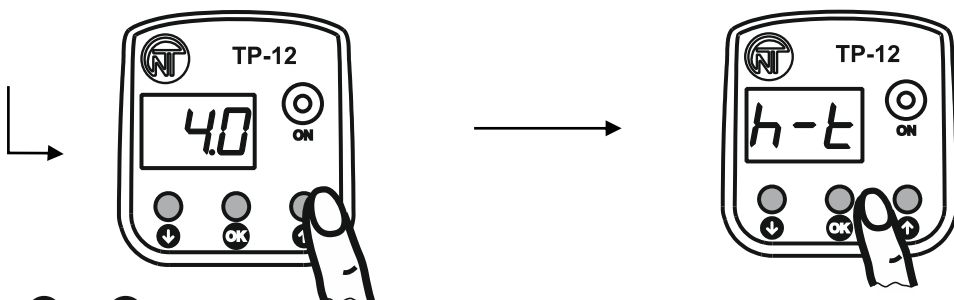
Hysteresis by Temperature (h-t)



Hold **OK** pushbutton pressed for 3 seconds until the display shows «hrc» menu parameter

Via **↓** or **↑** pushbutton select «h-t» menu parameter

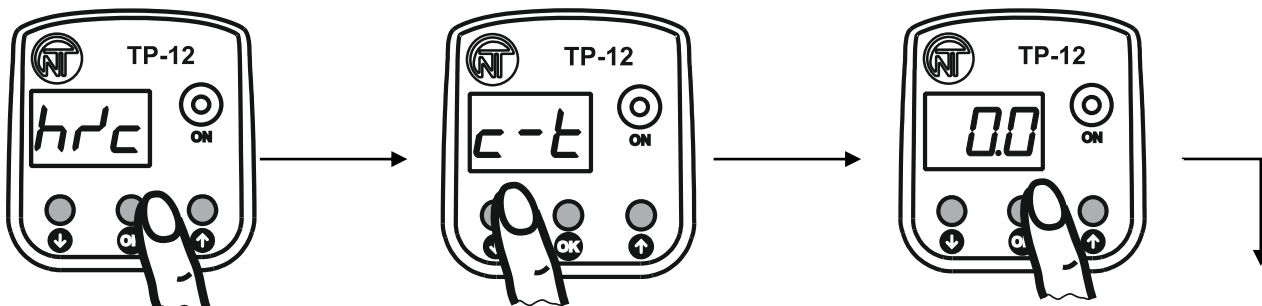
Press **OK** pushbutton to enter parameter, thus the display shows the factory parameters setting in (3.0) flashing mode



Via **↓** or **↑** pushbutton change parameter value within 0.1 to 30 °C with increment size of 0.1 °C

Press **OK** pushbutton to save changes, thus the display shows «h-t» menu parameter (in case of holding **OK** pushbutton pressed for 3 seconds, one exits settings menu without saving and the device operates in its normal mode).

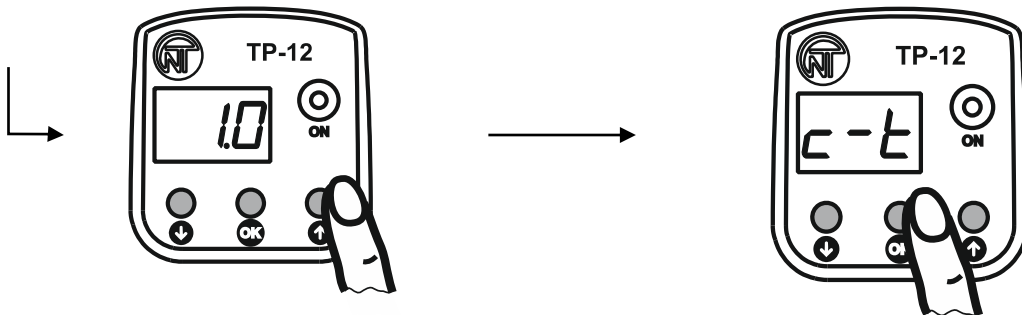
Temperature Calibration (c-t)



Hold **OK** pushbutton pressed for 3 seconds until the display shows «hrc» menu parameter

Via **↓** or **↑** pushbuttons select «c-t» menu parameter

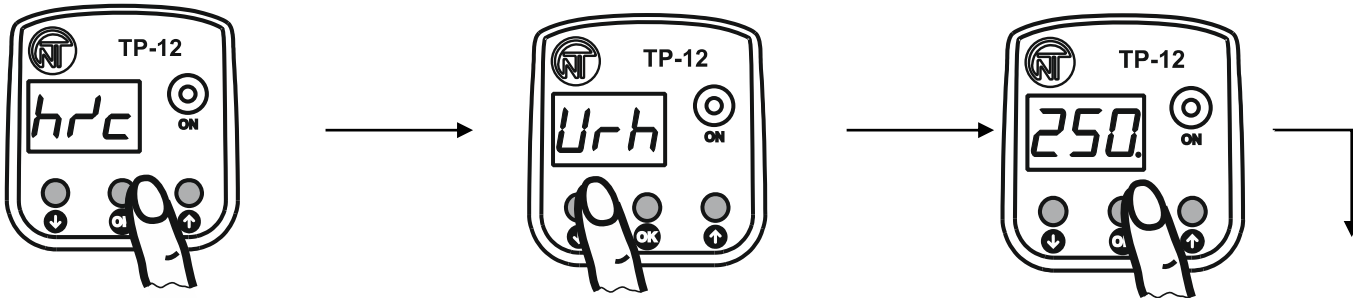
Press **OK** pushbutton to enter parameter, thus the display shows factory parameter setting in (0.0) flashing mode



Via **↓** or **↑** pushbutton change parameter value within -5.0 to +5.0 °C with increment size of 0.1 °C

Press **OK** pushbutton to save changes, thus the display shows «c-t» menu parameter (in case of holding **OK** pushbutton pressed for 3 seconds, one exits from settings menu without saving and the device will operate in normal mode).

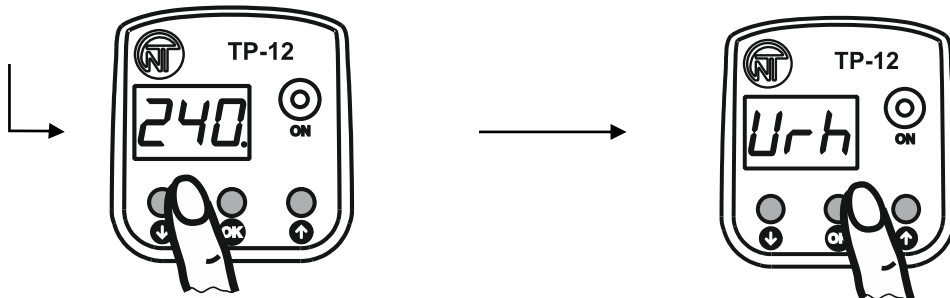
Actuation Threshold by Maximum Voltage (Ur_h)



Hold **OK** pushbutton pressed for 3 seconds until the display shows «hrc» menu parameter

Via **↓** or **↑** pushbutton select «Ur_h» menu parameter

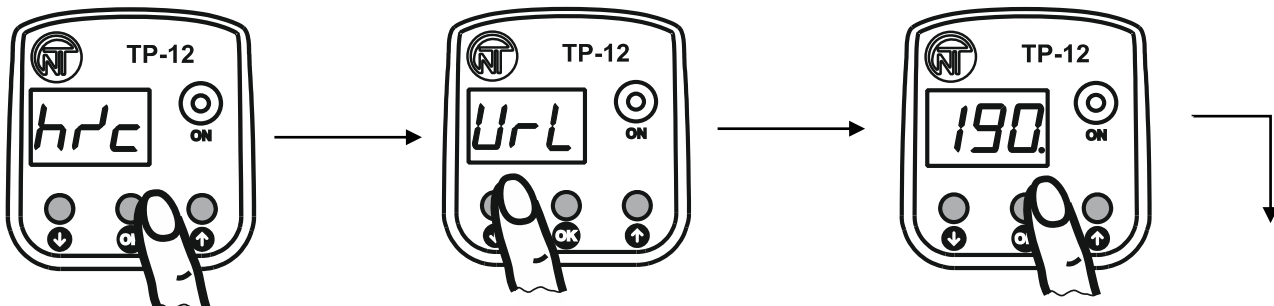
Press **OK** pushbutton to enter parameter, thus the display shows factory parameter setting in (250.) flashing mode



Via **↓** or **↑** pushbutton change parameter value within 230 to 290 V with increment size of 5 V

Press **OK** pushbutton to save changes, thus the display shows «Ur_h» menu parameter (in case of holding **OK** pushbutton pressed for 3 seconds, one exits settings menu without saving and the device will operate in normal mode). To exit menu hold **OK** pushbutton pressed for 3 seconds

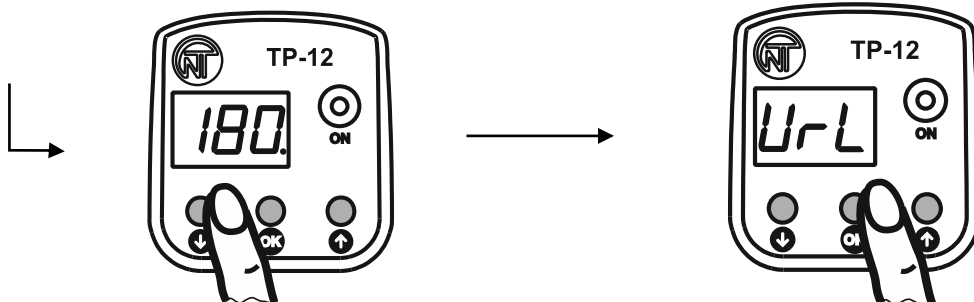
Actuation Threshold by Minimum Voltage (Ur_L)



Hold **OK** pushbutton pressed for 3 seconds until the display shows «hrc» menu parameter

Via **↓** or **↑** pushbutton select «Ur_L» menu parameter

Press **OK** pushbutton to enter parameter, thus the display shows factory parameter setting in (190.) flashing mode

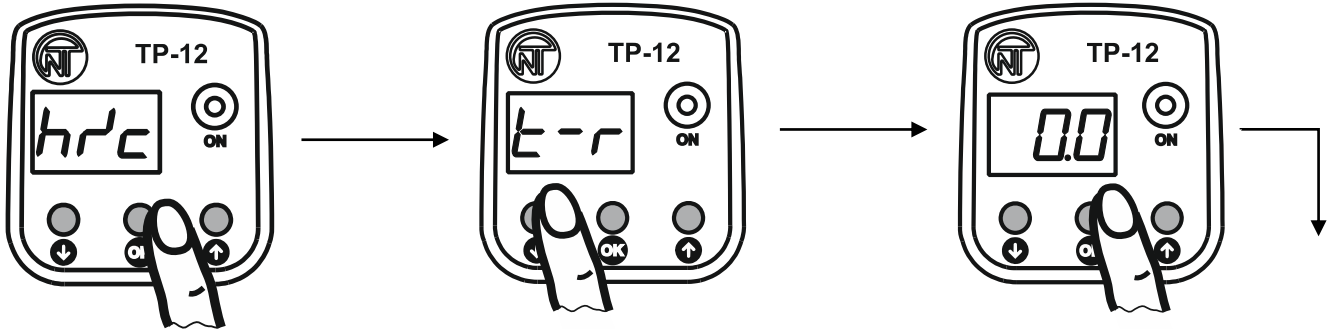


Via **↓** or **↑** pushbutton change parameter value within 120 to 210 V with increment size 5 V

Press **OK** pushbutton to save changes, thus the display shows «Ur_L» menu parameter (in case of holding **OK** pushbutton pressed for 3 seconds, one exits settings menu without saving and the device will operate in normal mode).

Minimal Time of Load ON/OFF (Protection against After Switching-On) (t-r)

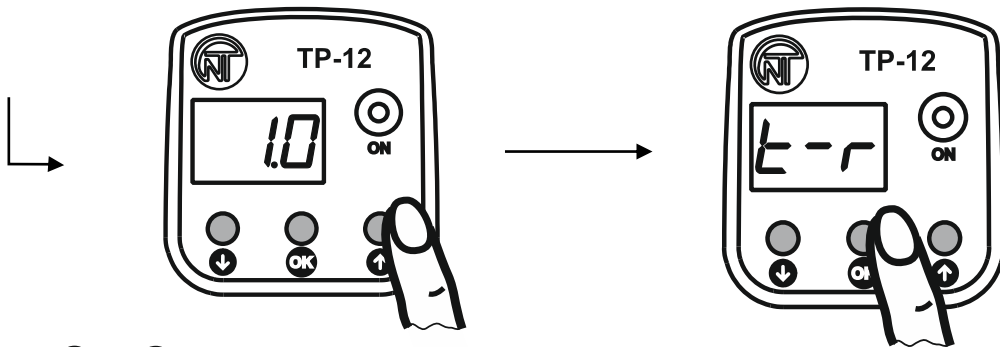
It is recommended to set parameter value not less than 5 minutes when operating cooling equipment, as well as while frequent enabling of TP-12 to increase the life of the device.



Hold **OK** pushbutton pressed for 3 seconds until the display shows «hrc» menu parameter

Via **↓** or **↑** pushbutton select «t-r» menu parameter

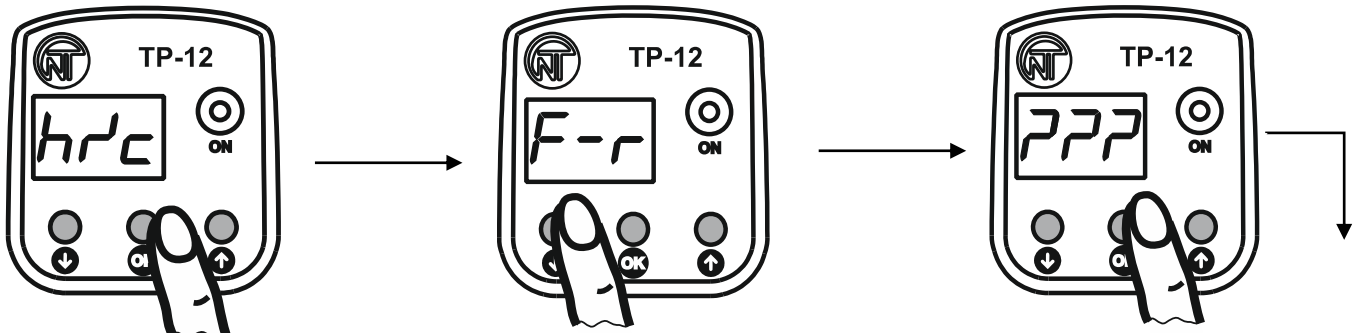
Press **OK** pushbutton to enter parameter, thus the display shows factory parameter setting in (0.0) flashing mode



Via **↓** or **↑** pushbutton change parameter value within 0 to 10 minutes with increment size of 1 minute. When setting 1 minute the device turns on / off the load in 1 minute.

Press **OK** pushbutton to save changes, thus the display shows «t-r» menu parameter (in case of holding **OK** pushbutton pressed for 3 seconds, one exits settings menu without saving and the device will operate in normal mode).

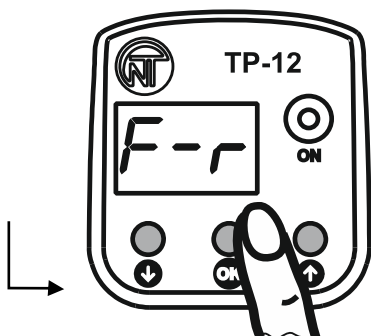
Reset to factory settings (F-r)



Hold **OK** pushbutton pressed for 3 seconds until the display shows «hrc» menu parameter

Via **↓** or **↑** pushbutton select «F-r» menu parameter

Press **OK** pushbutton to enter parameter, thus the display shows three question marks in flashing mode



Press **OK** pushbutton to reset all configurable parameters to factory settings, thus the display shows «F-r» menu parameter (in case of holding **OK** pushbutton pressed for 3 seconds, one exits reset settings menu to factory settings and the device will operate in normal mode).

5 MAINTENANCE

5.1 Safety Measures

WHEN MAINTAINING IT IS NECESSARY TO DISCONNECT THE DEVICE AND APPLIANCES CONNECTED FROM THE MAINS.

5.2 Recommended maintenance intervals – each six months.

5.3 Maintenance procedure:

- 1) visually inspect the device plug for soot, in case of such remove the soot;
- 2) visually inspect the casing for integrity, in case of cracks and chips remove the device from operation and send to repair;
- 3) wipe the casing of the device with rug if necessary.

No abrasive materials and solvents should be used when cleaning.

6 OPERATING LIFE AND MANUFACTURER'S WARRANTY

6.1 Operating life of the device is 10 years. At the end of its life contact the manufacturer.

6.2 Storage life is 3 years.

6.3 The warranty period of the device is 5 years from the date of sale.

During the warranty period (in case of failure of the device) the manufacturer performs the device repair for free.

ATTENTION! IN CASE THE DEVICE WAS OPERATED IN VIOLATION OF REQUIREMENTS OF OF THIS USER MANUAL, THE MANUFACTURER RESERVES THE RIGHT TO REFUSE WARRANTY BY THE SERVICE.

6.4 Warranty service is performed at the place of purchase or by the product's manufacturer.

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

6.6 Prior to sending for repair, the device should be packed in its original or other packaging, preventing it from mechanical damages.

Strong request: when returning the device or transferring it to warranty (post-warranty) service, state the reason for return in details in the claims data line.

7 TRANSPORTATION AND STORAGE

The device in the manufacturer's packaging is allowed to be transported and stored at temperature from minus 45 to +60 °C and relative humidity not more than 80%.

8 ACCEPTANCE CERTIFICATE

TP-12 manufactured and accepted in accordance with the requirements of valid technical documentation and is fit for use.

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