



DIGITAL BOTTOM PRE-HEATING AND SOLDERING SYSTEMS  
FOR PRINTED CIRCUIT BOARDS

**MANUAL FOR SAFETY AND USE**

English Edition 1.2E

**Moscow 2017**

## **TABLE OF CONTENT**

|   |    |
|---|----|
| 1. Introduction.....  | 3  |
| 1.1. Documents take into account at production and in documentation.....  | 3  |
| 1.2. Briefly about the Manufacturer.....  | 3  |
| 2. Safety measures working with System.....   | 3  |
| 2.1. Precautions and safety while the equipment operating.....  | 4  |
| 3. The device description.....  | 5  |
| 3.1. Technical characteristics of NP Series pre-heating systems.....  | 5  |
| 3.2. Digital Bottom Pre-Heating and Soldering System of NP Series delivery specification and its application..... | 6  |
| Technical Characteristics of TP Series Temperature Controllers.....   | 8  |
| 4.1. Before working start.....  | 9  |
| 4.2. First Switch On.....   | 9  |
| 4.2.1. Power supply connection.....   | 9  |
| 5. Equipment operation.....   | 10 |
| 5.1 Equipment and Operation.....  | 10 |
| 5.2 Systems work (autonomous).....  | 13 |
| 5.2.1. Selection of heating channel on Controller TP2-10AB.....   | 13 |
| 5.2.2. Measure of the temperature of stabilization.....   | 14 |
| 5.2.3. Heater turn ON and OFF.....  | 15 |
| 5.2.4. Work with memory.....  | 15 |
| 5.2.5. Change of temperature setting limits.....  | 15 |
| 5.3. The Sytem work under PC control.....   | 15 |
| 5.3.1. ThermoGraph read out (for Controllers TP X-XKD Pro).....   | 16 |
| 5.3.2. Thermo-profile work out (for Controllers TPX-XKD Pro).....   | 16 |
| 5.3.3. The procedure of system setting for soldering by thermo-profile.....                                       | 16 |
| 6. Maintanece.....  | 18 |
| 7. Storage and transportation requirements.....   | 20 |
| 8. Terms of Warranty limitation.....  | 20 |
| 8. Disposal.....  | 22 |

## 1. Introduction

We are grateful for your decision to purchase Digital Bottom Pre-Heating and Soldering System of NP Series for circuit boards.

It was fabricated by us especially for you in accordance with the highest quality standards, and tested by our experts on compliance with EU directives shown in the section "**Documents taken into account in production and documentation**" before to shipping the Equipment to You.

Despite the fact that the equipment is simple enough to use, we strongly recommend You to read the Manual before starting work, paying close attention to the **Safety Instructions**.

Digital Bottom Pre-Heating and Soldering System is designed for preheating of printed electronic modules with components for assembly and/or repair by solder reflow and/or reballing (recovery contacts BGA balls on components). The system is designed both for a Lead-Free and a Traditional technology, with working thermo-profile out on the heaters and the printed circuit board.

The System can operate both as a separate unit and as integrated part (Module) of Reworking Soldering Complex.

### 1.1. Documents taken into account at production and in documentation

**For EU Countries only:**

OOO NTF "Techno Alliance Electronics" being the responsible Manufacturer declares that Digital Bottom Pre-Heating and Soldering System of NP Series with Characteristics presented in Section 3.1 is a serial product and meets following EU Directives:

- Directive 2006/95/ECs relating to electrical equipment designed for use within certain voltage limits.
- Directive 89/336/EC related to electro-magnetic compatibility of 3<sup>rd</sup> May 1989;
- Machinery Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery and amending Directive 95/16/EC.

Technical documentation for EU Authority Use is kept by European official Representative of the Manufacturer:

***K&K Kauppa ja Konsultointi Oy:  
Fredrikinkatu 33B,  
00120 Helsinki  
Finland***

### 1.2. Briefly about the Manufacturer

The NTF "Techno Alliance Electronics" Company was founded in 1993 in Moscow, Russia. Since that time hundreds of enterprises in dozens High-Tech industries appreciated the quality and service of "TERMOPRO" Brand. We have thousands customers among modern Service Centers and Manufacturing Companies which use modern methods of soldering for BGA and other SMD components. For contact information of OOO NTF "Techno Alliance Electronics" Sales Office and Manufacturing Facilities please see page #23 of this Manual.

## 2. Safety measures working with System



**WARNING!** Read all instructions and safety recommendations. Failure to fill the instructions and recommendations may lead to electric shock, burns, fire and / or serious injury.

**Keep these instructions with recommendations for future use.**

Digital Bottom Pre-Heating and Soldering System of NP Series is designed for installation and remove of electronic components. Other use of its devices individually or in a IK-650 Reworking Complex will be considered by the manufacturer as executed by the User at his (User)own responsibility and risk.

## 2.1. Precautions and safety while the equipment operating.



Do not touch the heaters and adjacent hot parts. This will result in burns. Any potentially dangerous objects, in particular those which can cause a fire, must be removed from a working area.



**ATTENTION! The Heaters stay HOT for a long time after power turn off!**



In case of operation fault do not open device yourself (this can cause even more damage), contact a experienced service personal.

General safety measures are to be taken working with electrical installations and heating devices. Premises, where the Center operates, must be equipped with fire extinguishing agents and exhaust ventilation.



All inter-unit connections must be made before connecting to the power line. All connectors must be secured with cap nuts (where applicable). Before switching on, make sure that grounding outlet or a separate ground terminals are in order.



A fuse replacement should be carried out only when the device is switched off (the power cord must be disconnected from Power line socket).



During the working process the temperature of the heater's housing and adjacent metal parts can exceed 100 ° C, therefore a care should be taken in all manipulations of pre-heater unit. Adjoining components and Modules can be heated as well, therefore very careful operation have to be carried.



**NEVER!**

- Connect power line plug to a line without ground line connected. In the absence of a reliable grounding the proper functioning of the installation can not be guaranteed;
- Turn the unit on if ground line is not checked;
- Leave working equipment unattended;
- Put foreign flammable objects on hot surface;
- Measure a temperature of liquids and aggressive media by unprotected sensor deep in these;
- Turn the heater on nearby flammable liquids and any other easy light on materials;
- Carry out maintenance without shutting down the product the unit and disconnecting it of power supply line.



**ATTENTION!** Digital temperature controllers contains following build in safety functions:

- Turn the controllers on does not turn the heater on as well;
- Automatic turn off any heaters channel in case of short cut or brake a feedback line. Indication of mistake reason will be displayed;
- Galvanic isolation of low-power circuits from high power ones;
- Galvanic insulation of controller circuits from managing PC (for controllers with RS-232C communication channels);
- For reduction of disturbances in power line the SSR is used for heaters communication.



**WARNING:** DO NOT let comfort or experience in device operation (gained from repeated use) dominate strict adherence to safety rules for handling this device. Improper use of tools or failure to follow the safety rules stated in this Manual may cause serious personal injury.

### 3. The device description

#### 3.1. Technical characteristics of NP Series pre-heating systems

| PARAMETERS  | NP17-12 Pro  | NP24-17 Pro | NP34-24 Pro |
|---|--------------|-------------|-------------|
| Power Voltage [V]   | ~220V – 50Hz |             |             |
| Fuse [A]  | 10           |             |             |
| Number of independent heating zones   | 1            | 1           | 2           |
| Max Wattage [W]   | 700          | 1400        | 2x1400      |
| Power to surface Ratio [W/dm <sup>2</sup> ]   | 343          |             |             |
| Max working temperature   | +300°C       |             |             |
| Max possible temperature difference between 2 any point on working surface, excluding corners (not more then) | 8°C          |             |             |
| Dimensions LxWxH [mm]   | 250x175x50   | 300x250x50  | 420x300x50  |
| Working surface size LxW[mm]  | 170x120      | 240x170     | 340x240     |

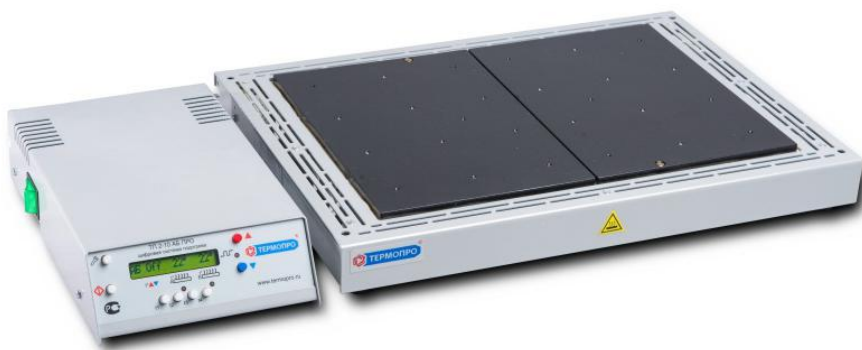
|                         |   |                |   |
|-------------------------|---|----------------|---|
| Weight (not more ) [kg] | 1,9                                       | 2,9            | 6 |
| Working mode            | Continuous                                |                |   |
| Working conditions      | Ambient temperature                       | +10°C ÷ +35°C  |   |
|                         | Rel. Humidity at 25°C<br>(w/o condensate) | до 80%         |   |
|                         | Atmos. Pressure                           | 84 ÷ 106,7 kPa |   |

### 3.2. Digital Bottom Pre-Heating and Soldering System of NP Series delivery specification and its application

The NP Series of equipment includes following heating plates: NP10-6Pro, NP17-12Pro, NP24-17Pro, NP34-24Pro. And following configuration of Temperature Cocontrollers:

| Configuration                     | TP1-10KD Pro | TP1-10KD | TP1-10 | TP2-10AB | TP1-10KD/0.5 |
|-----------------------------------|--------------|----------|--------|----------|--------------|
| Digital Temperature Controller    | +            | +        | +      | +        | +            |
| Temperature control Sensor        | +            | +        | -      | -        | +            |
| USB DATA cable                    | +            | -        | -      | -        | -            |
| “ThermoPro-Center” software on CD | +            | -        | -      | -        | -            |
| Manual for Safety and USE         | +            | +        | +      | +        | +            |

System Modifications differ with Wattage and sizes of working plates. NP17-12Pro, NP24-17Pro devices are controlled by device TP1-10KD Pro. 2- heating zone unit NP34-24Pro is recommended for big size PCB processing. Half power rate TP1-10KD/0.5 controller is specified from NP10-6 heating plate.



Pic. 1. Digital Bottom Pre-Heating and Soldering System appearance (NP34-24Pro with TP2-10AB Pro Controller shown)

The delivery specification of the system includes digital controller and heating plate. Recommended combinations are presented in the table below.

|                   | TP1-10KD Pro | TP1-10KD | TP1-10 | TP2-10AB | TP1-10KD Pro/0.5 |
|-------------------|--------------|----------|--------|----------|------------------|
| <b>NP17-12Pro</b> | +            | +        | +      | +        | -                |
|                   |              |          |        | +        | -                |

|                   |   |   |   |   |   |
|-------------------|---|---|---|---|---|
| <b>NP24-17Pro</b> | + | + | + | + | - |
|                   |   |   |   | + | - |
| <b>NP34-24Pro</b> | - | - | - | + | - |
| <b>NP10-6 Pro</b> | - | - | - | - | + |

The line of Temperature Controllers of TP-Series was developed to meet different industries requirements. Thermo-plates with different dimensions of working surface were developed for processing wider possible spectr boards dimensions.

ThermoPro Bottom Preheating Systems were designed for realization the following technical functions:

- Soldering SMD-components on PCB by thermo-profile;
- Pre-heating of PCB's during soldering of SMD-components by different technique;
- Pre-heating of PCB's during a process of components replacement on PCB (repair operations);
- Temperature parameters Control during pre-heating and soldering;
- Silicon wafers Pre-heating in solar battery production process;
- Ceramic components Pre-heating before soldering process to avoid microcracking;
- Chemicals thermo-polymerization. For example - components fixing compound;
- BGA components re-balling;
- Preliminary heating of metal parts (joints) before its soldering or welding;
- PCB utilization by mass components de-soldering;
- Other Lab needs where the temperature control in small zone is required.

TP Series Controllers are used for working surfaces of NP-Series pre-heaters heating plates temperature control and management. TP Controllers with NP pre-heaters can work as individual unit or can be integrated into Reworking Center. Some models of Controllers have an extra thermo-sensor terminal, what can be used as an additional temperature read-out channel.

Temperature Controller TP1-10KD Pro has a RS-232C port what allows to connecting Controller with PC and run "Thermopro-Center" Software.

Temperature Controller TP1-10KDPro allows to realize Thermo-profile at heating plate of NP Preheater because has a thermo sensor for process temperature read-out. The "ThermoPro-Center" Program has to be used for profile creating, tuning and control.

A precise tracing of Thermo-profile, as well as exact process repeatability is guaranteed.

Temperature Controller TP2-10AB has two independent channels (A&B) for independent temperature regulation. These can operate NP17-12, NP24-17 or NP34-24. In last case Controller can work with one of 2 plates or both simultaneously, for what it has virtual channel "AB" mode.

Below table gives brief reference for fast selection of the controller.

| <b>Model of Controller</b> | <b>Application</b>   |
|----------------------------|--|
| <b>TP1-10KD Pro</b>        | Soldering by profile with digital and graphic temperature control and read out. Digital and graphic controlled heating up. |
| <b>TP1-10KD</b>            | Digital Controlled heating up (the device is equipped with additional temperature measurement channel)                     |
| <b>TP1-10</b>              | Manual Pre-set heating up  |
| <b>TP2-10AB</b>            | Manual Pre-set heating up on 2 channels, separately or together  |

**Digital Temperature Controllers Features:**

- Heating turn on/off;
- Quick temperature of stabilization settings;
- Quick selection and store of temperature settings from a memory;
- Simultaneous display of temperature settings and real running temperature, as well as control sensor temperature;

- Light and sound indication of heater's working process;
- Light indication of data exchange process between controller and PC;
- Memory storage for temperature of stabilization settings and its current value when the device is off;
- Ability to restore "The Factory Settings" in a case of faults in a work.

### Technical Characteristics of TP Series Temperature Controllers

| PARAMETERS  | TP1-10KD Pro   | TP1-10KD       | TP1-10        | TP2-10AB       |
|---|--|----------------|---------------|----------------|
| Consumed power voltage  | ~220[V] / 50Hz   |                |               |                |
| Number of independent control channels for heaters                                      | 1  |                |               | 2              |
| Max Wattage of connected device(s) [W]  | 1800   |                |               | 2 x 1800       |
| Regulated Range of Temperature of Stabilization   | 50°C ÷ 350°C*  |                |               |                |
| Temperature measurement resolution  | 1°C  |                |               |                |
| Frequency of temperature read-out   | 15Hz/2channels   | 15Hz/2channels | 30Hz/1channel | 15Hz/2channels |
| Regulation accuracy for Temperature of stabilization                                    | ± 2°C**<br>(at 300°C)  |                |               |                |
| Memory for temperature of stabilization (number of values can be saved)                 | 4/6 cells  |                |               | 2 x 4/6 sells  |
| Working surface temperature (T) correction referring to read-out sensor temperature (t) | Fixed<br>T= t - t/16 for NP17-12Pro<br>T= t - t/32 for NP24-17 Pro & NP34-24 Pro   |                |               |                |
| Additional channel for temperature control read-out                                     | Available  |                | Not available | ***            |
| Temperature measure range   | -70°C...+500°C   |                | -             | -              |
| Temperature measurement error for T range - 40°C ÷ 350°C                                | max ±2°C**   |                | -             | -              |
| Sensor dimensions [mm]  | 4 x 2 x 0,5  |                | -             | -              |
| Thermo Profile working out ability  | Yes****  | No             |               |                |
| Controller dimensions L xWx H [mm]  | 250 x 155 x 58   |                |               |                |
| Weight (max) [kg]   | 1.6  |                |               |                |
| Working Mode  | Continuous   |                |               |                |
| Working Environment conditions  | Ambient Temperature +10°C ÷ +35°C<br>Relative Humidity Under the Temperature 25°C (with no condensation) upto 80%<br>Atmospheric pressure 84 ÷ 106,7 KPa |                |               |                |

\* regulated temperature range can be changed for less by customer order request. For Controller TP1-10KD Pro the range can be change from the Program (Read Manual for Use of the "ThermoPro-Center" Program).

\*\* typical variation ± 1°C

\*\*\* available by customer reques. At read out Mode the temperature correction applied by Controller has to be taken into account.



\*\*\*\* Thermo-profiling and Thermo Graphic read out are realized by connection of the Controllers of “Pro” version to PC through USB interface. Mentioned functions are realized by the “ThermoPro-Center” Program. **All types of cControllers are available in “Pro” version.**

## 4. Operation Start Up

### 4.1. Before working start

Check the equipment appearance and a delivery completeness:

- Thermo-plate;
- Digital Temperature Controller;
- Power Cord;
- Thermo-sensor;
- USB Data cable (for Pro-version)
- Software “ThermoPro-Center “on CD (for Pro-version);
- Manual for Safety and Use in original;

**If any of above components missed or damaged please address this fact to your Supplier.**

### 4.2. First Switch On

First of all read the Present Manual in full. Then the consequence of actions is the following:

- Unpack the device and assure in absence of any visible damages. If damages take place immediately contact your Supplier;
- Install devices on flat and firm working desktop surface.
- Place devices in a way for maximum convenience for Operator and guaranteed avoid power cable appearance in working zone.



**ATTENTION! NP-Series plates have to operate ONLY under control of TP-Series Controller. Connection of NP series devices directly to Power with 220V supply line is prohibited, in opposite overheat and destruction of costly heaters is guaranteed.**

#### 4.2.1. Power supply connection

- Check Power Supply line Voltage for matching parameters written on a device back label.
- Before pre-heater connection assure that power switch is in OFF (switch position (0)).
- Turn the power on by switch. The initiation process starts. Inscriptions “Techo Alliance” and model # appear one after other on display. After that device turns into autonomic mode and heating is on.
- Connect Temperature Controller cords to Pre-heater;
- While the Controller runs under the “ThermoPro-Center” program it has to be loaded and opened on your PC prior a controller turned on. This consequence caused by the fact that the Program makes a search of devices connected to Computer before its start. If Zones 7&8 of display (See Section 5.3.4.) shows “S.C.” or “O.C.” it means that the Program “ThermoPro-Center” cannot find temperature Controllers.

- If it is needed connect thermo-sensor.

#### 4.2.2. Switching On

- Switch the Controller On
- After checking a working heating plate the device is ready for the work, what will be deployed;
- After switching the device off it is recommended to turn it on again not earlier than in 10 seconds.

### 5. Equipment operation

#### 5.1 Equipment and Operation

Control of heating and soldering process is made by Digital Temperature Controller.

All devices have a metal housing case, and its appearance is shown on Pic.2. The front panel has buttons and LC display. On a back panel are terminals for external connections.



Pic.22. Digital Temperature Controller of “ThermoPro” Series (NP2-10ABPro shown)

Power ON/OFF button is placed on left side of the device.

Back panel can have (depending on model) power cord, rack of fuses, terminal for pre-heater NP-series connection, terminal for thermo-sensor connection, USB port.

Devices are to be powered on through grounded sockets designed for 12 Amp current, and device TP2-10AB to sockets designed for 16 amp. Fuses are to be used only as per working current level stipulated on the back panel of the device..



Pic.2.1. Back panel of device TP1-10KD Pro

- 1- Power Cord
- 2- Rack of fuses
- 3- Terminal for NP-preheater connection
- 4- Terminal for control thermo-sensor connection
- 5- USB interface



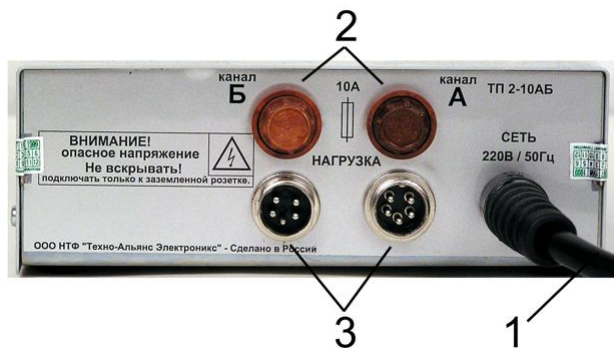
Pic.2.2. Back panel of Connector TP1-10KD

- 1- Power Cord
- 2- Rack of fuses
- 3- Terminal for NP-preheater connection
- 4- Terminal for control thermo-sensor connection



Pic.2.3. Back panel of device TP1-10

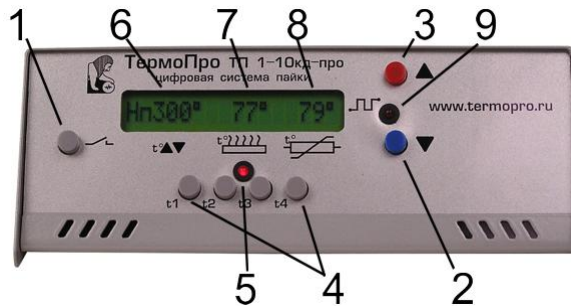
- 1- Power Cord
- 2- Rack of fuses
- 3- Terminal for NP-preheater connection



Pic.2.4. Back panel of device TP2-10AB

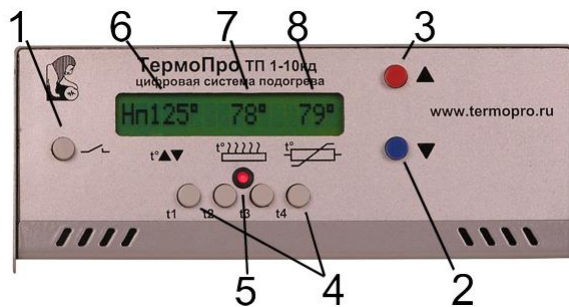
- 1- Power Cord
- 2- Rack of fuses
- 3- Terminals for NP-preheater connection

Front panel of the Controller contains elements of control and indication.



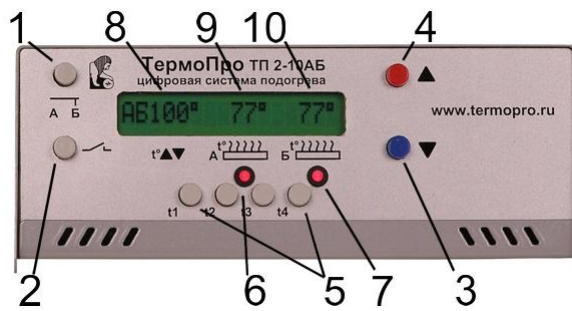
Pic2.5. Control panel of Controller TP1-10KD Pro

- 1- Switch Pre-heater plate ON/OFF;
- 2- Button for reducing temperature of stabilization;
- 3- Button for increasing temperature of stabilization;
- 4- Memory cells buttons
- 5- Heater ON Power indicator
- 6- Channel name and temperature of stabilization setting zone of display. If the heater is OFF the "Off" symbol will be displayed instead of temperature value;
- 7- Heating plate ranning temperture read out zone of display;
- 8- Control Sensor read out zone of display;
- 9- Light indicator for data exchange through USP (not available on some models)



Pic.2.7. Control Panel of TP1-10KD, TP1-10

- 1- Switch Pre-heater plate ON/OFF;
- 2- Button for reducing temperature of stabilization;
- 3- Button for increasing temperature of stabilization;
- 4- Memory cells buttons;
- 5- Heater ON Power indicator
- 6- Channel name and temperature of stabilization setting zone of display. If the heater is OFF the "Off" symbol will be displayed instead of temperature value;
- 7- Heating plate ranning temperture read out zone of display;
- 8- Control Sensor read out zone of display;



Pic.2.8. Control Panel of TP1-10AB

- 1- Button of read out channel selection;
- 2- Switch Pre-heater plate ON/OFF;
- 3- Button for reducing temperature of stabilization;
- 4- Button for increasing temperature of stabilization;
- 5- Memory cells buttons;
- 6- Light indicator of "ON" status for channel "A"
- 7- Light indicator of "ON" status for channel "B"
- 8- Channel name and temperature of stabilization setting zone of display. If the heater is OFF the "Off" symbol will be displayed instead of temperature value;
- 9- Heating plate running temperature read out zone of display;
- 10- Control Sensor read out zone of display;

Delivery set of some Controller models includes Control thermo-sensor for temperature control at different objects surfaces. **Control thermo-sensor is a sensitive element made of fragile ceramic and demands very careful manipulating. It is not recommended to touch sensor with fingers, contact its signal wire to other data transfer cables or bent these.** Working temperature range for this sensor is from -70°C up to +500°C. **Signal transfer wire and insulating tubes allow heating up to 300°C and staying at this temperature a long time, and up to 350°C for a period not longer than 5 minutes (silicon tubes can get dark).**

High accuracy platinum thermistor of DIN EN60751 class B serves as a thermo-sensor.

## 5.2 Systems work (autonomous)

Upon turn on the Temperature Controller work in autonomous mode (not under PC "Termoprocenter" software control), and a heater (heaters) is off. The display refer zones (see. Pic. 2.6-2.8) show: set temperature at heating channel, heating plate running temperature and Control Sensor temperature read-out (for "KD" version Controllers). Temperature read-out information is updated with 1.5 seconds interval.

In autonomous mode the system provides access to following features:

- \TP2-10AB\ a heater channel selection for set and change of temperature settings;
- up and down temperature of stabilization on channels;
- Heating on/off;
- Fast selection of temperature settings from memory cells;
- Memory store of current temperature settings;
- Visual and sound control of current temperature value.

### 5.2.1. Selection of heating channel on Controller TP2-10AB

The controller TP2-10AB has two independent channels of temperature control - A and B, which can be connected either to two pre-heaters NP17-12 Pro, NP24-17 Pro or to NP34-24Pro having two independent

heating plates (zones). After selection of channel an operator can change temperature of stabilization at channel and turn on /off the heating at the channel. Thus, the channel "A" has its own the temperature of stabilization and can be turned on or off, and the channel "B" is implemented the same way. To provide simultaneous control of two heaters by one temperature of stabilization a virtual channel "AB" has to be selected.

Selecting of channel is managed by button 1 (Pic.2.8.). Consequence of channels display is looped: "A" - "B" - "AB" - "A"...

When you select a channel "AB" an audio signal sounds after about 3 seconds, and the value of the temperature stabilization of the channel "B" is set upon channel "A". Now, channels are managed together, i.e., buttons 3 and 4 can simultaneously set the temperature of both channels, and the button 2 simultaneously turn on and off the heaters. A setting temperature of stabilization using the memory buttons can be done as well. The virtual channel "AB" uses a memory of channel "A".

Switch over to the channel "A" or "B" can be selected when it is needed. The temperatures of stabilization at channels "A" and "B" stays identical last "AB" settings.

### 5.2.2. Measure of the temperature of stabilization



**ATTENTION! At the first turn on or after prolonged storage the temperature of stabilization at 75 ° C should be set and the unit has to be left for about an hour to remove any accumulated moisture.**

Change the temperature of stabilization - increase or decrease the setting by pressing button up or button down. The current temperature of stabilization value can be seen in the refer display zone. Each press of the button change the temperature on 1 ° C in one or another direction. If to hold a button continuously the temperature to stabilize varies continuously until the button is released or it reaches the upper (lower) limit of the temperature change range.

After changing the temperature of stabilization setting for the channel the Controller automatically compensates a differences between a new temperature setting and a current temperature of the heater. If the new temperature stabilization more than the previous one then indicator on the controller panel will continuously lit. And if it is less then indicator is off. When the Controller reaches the temperature of stabilization the temperature of heating plate surface becomes equal to the temperature of stabilization LED indicator turn on periodically. Changing the actual temperature of the heater can be monitored by changes in the relevant indication zone displaying actual temperature.

When the heater is turned off «Off» symbol appears on display at zone of temperature stabilization. To see a temperature of stabilization click the button to increase or decrease the temperature. The «Off» inscription on a display area will be replaced with the current value of the temperature of stabilization. 2-3 seconds after the button release the temperature value will again be replaced by the word «Off». The temperature change procedure while heater off is the same as when it on.

Approximately in 8 seconds after increase or decrease temperature buttons released a new temperature of stabilization setting is automatic recorded into internal flash memory. Later it will be used for restoration of settings in controller turn on process. If the device is turned off at the moment when recording of settings processed these are not restored at next turn on. Such operation can cause errors in limits of the temperature change and inscriptions "O.C." and "S.C." can appear in the temperature of stabilization display zone. For system recovery turn off the power for 20 seconds, then press and hold a button the temperature stabilization increase and turn a controller on. After the display lit-on release the button. After this operation both upper and lower limits of the temperature of stabilization change will be restore and the temperature of stabilization of each channel will be set up at lower limit.

### 5.2.3. Heater turn ON and OFF

Turning the heater on is made by pressing a "On/Off" button on a Controller front panel. Off is made by another the same button one more time. If inscriptions "O.C." or "S.C." are displayed in the corresponding display zone for actual temperature value then the heater is blocked. The appearance of such inscriptions indicates an open or short circuit in the heating-plate feedback sensor circuit. Further operation of the system with such a malfunction is prohibited.

### 5.2.4. Work with memory

Four / six memory cells are available for operator to store most often used temperature of stabilization settings. For two-channel controller TP2-10AB four/six cells are available per each channel.

Current temperature of stabilization record to memory is made by pressing and holding one of the four memory cell buttons for 3 seconds (until long "beep" signal sounds). For a dual-channel memory controller it acts for each of channels. If "AB" channel is selected the channel "A" memory is used. Selection of temperature of stabilization from memory cells is performed by short press refer memory button. The current value of the temperature of stabilization will be replaced by a value stored before in selected memory cell.

### 5.2.5. Change of temperature setting limits

A temperature change limitation can be set up. Instead of the range of 50 - 300 ° C it can have different values of upper and lower limits within "the factory settings". To the temperature Controller of "Pro" version a new range can be set up using the program "TERMOPRO CENTER" instruments (see the Program Manual for details). For other models of Controller these requirements should specify upon ordering.

## 5.3. The System work under PC control

A system supposed for soldering use should have a configuration including a temperature controller TPx-xx KDPro and pre-heater NPxx-xxPro, what gives an ability to operate under PC ("TERMOPRO - CENTER") control. Such system acquires a number of new features:

- An ability to control the temperature of a heater in accordance with the thermo-profile specified by the operator;
- The program graphically displays a temperature versus time curve for each control channel or feedback sensor in real time format;
- Received ThermoGraphs are stored on HD for further research, analysis and print out;
- The program can simultaneously operate with up to four "TERMOPRO" devices in any combination;
- The program allows to program the internal parameters for each control channel, such as: temperature of stabilization, upper and lower limits of temperature change and provides a choice of service tools.

Thus, the operator can create thermo-profiles required for different soldering processes in a graphic interface. Thermo-profiles can be modified and stored in a library. In the soldering process, the operator can observe the temperature change on a surface of heating plate and/or on PCB in real time (in numeric or graphical format).

Before Software set up please read a documentation and License Agreement supplied on CD with the Program.



### 5.3.1. ThermoGraph read out (for Controllers TP X-XKD Pro)

A control sensor for temperature measurement is to be installed on a processed object prior a process run. The value of a running temperature on sensor will be presented on a Controllers display, as well as on Virtual Panel of Devices in a "ThermoPro-Center" Program interface.



**ATTENTION! Do not install the sensor on the radio elements and other objects that are energized without additional isolation. Do not use an open sensor for measuring the temperature of liquids and vapors. For these measurements it is necessary to place the temperature sensor in a sealed capsule with a good thermal conductivity.**

It is not recommended to fix a cold sensor on objects with a temperature above 100 ° C. Fix the sensor first on the cold surface of the object and then heat them up together. Make sure that the sensor is not heated up to a temperatures more than + 500 ° C. At any manipulation take a good care of the sensor leads and try to avoid these heavy bending.

Although the temperature of any object can be measured, but initially sensors are designed to measure the temperature of the PCB surface. Fixing a sensor to a board is recommended by means of a heat-resistant adhesive tape or Rack Sensor Holder RD-400.

Thermograph read out is made under the control of "TERMOPRO CENTER" Program (detailed description of the work with the program is available on Program Manual). Once the program has "found" a controller connected to one of PC COM-ports and displays it at virtual panel, receiving ThermoGraphs can be immediately started. The obtained data are stored on PC hard disk. The data recorded on the disc can then be analyzed by the "TERMOPRO CENTER" program tools.

### 5.3.2. Thermo-profile work out (for Controllers TPX-XKD Pro)

Under the control of "TERMOPRO CENTER" Program a Controller can perform user-defined thermal profile on a pre-heater heating surface. Process of setting up devices for a Thermo-Profile realization is closely considered in the program "TERMOPRO CENTER" Manual. Below is presented a general description of the procedure.

The "TERMOPRO CENTER" let assign a user-defined Thermal profile to a channel of Temperature Controller. Creating a thermo-profile avoid setting up a high heating up ramp. If necessary the program may simultaneously perform thermo-profile on several (up to 4) Controllers connected.

In the process of thermo-profile realization the program displays an individual temperature curves in real time both for heating and measuring channels where control sensors are connected to. Thus, it is possible visually monitor the work of equipments and the results of a process on a board. Also working thermo-profile adjustments can be done even in a running process. The data obtained in the process are saved to HD.

### 5.3.3. The procedure of system setting for soldering by thermo-profile

- Preparation of the Controller and bottom pre-heater to a work;
- Setting up of main "ThermoPro-Center" program parameters;
- Creation of working Thermo-Profile;
- Channel linking to thermo-profile;
- PCB installation to a working surface of pre-heater plate;
- Control sensor fixing at PCB;
- Test soldering run;
- Obtained control results for working thermo-profile corrections;
- Second test soldering run;
- Another thermo-profile correction if needed or realization of soldering process by proven thermo-profile.



A thermo-profile can be also worked out on a board automatically with feed-back link help. In this case an Operator get an ability to make a soldering almost with not thermo-profile tuning. The program corrects the temperature automatically in a way to match profile as closer as possible.

The full methodic for Program setting for soldering by profile is presented in the "ThermoPro-Center" Manual.

#### 5.3.4. Soldering by thermo-profile



Pic.3. Hardware in a working process

For process of Soldering by thermo-profile the equipment set shown in Pic.3. is used. These include:

- NP-series bottom Pre-heater;
- Digital Thermo Controller TP X-XKD Pro;
- Air Cooler FC-500 (not presented at picture);
- Thermo-sensor clamp PDS-300;
- "ThermoPro-Center" Software;
- Computer (not presented at picture)

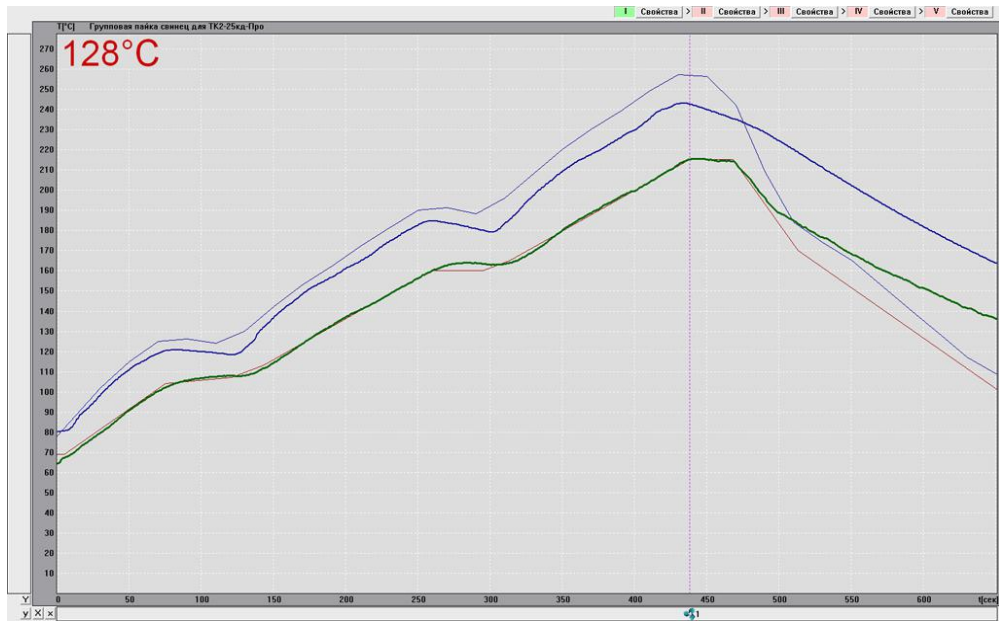
Printed circuit boards has be made of high quality glass-cloth laminate, otherwise darkening or delaminating of glass on board (if it contains moisture) under the influence of temperature is possible .

Before soldering a paste is applied to PCB pads and electronic components are placed. Cooling zone can be formed automatically using an Air Cooler FC-500 if required.

A Controller connected to the computer runs the "Termopro-Center" Program download thermo-profile from PC database. Subsequently, the program performs the preparatory operations automatically and controlled by the operator. Detailed instructions for creating and configuring thermo-profiles see the "TERMOPRO - CENTER" Program Manual.

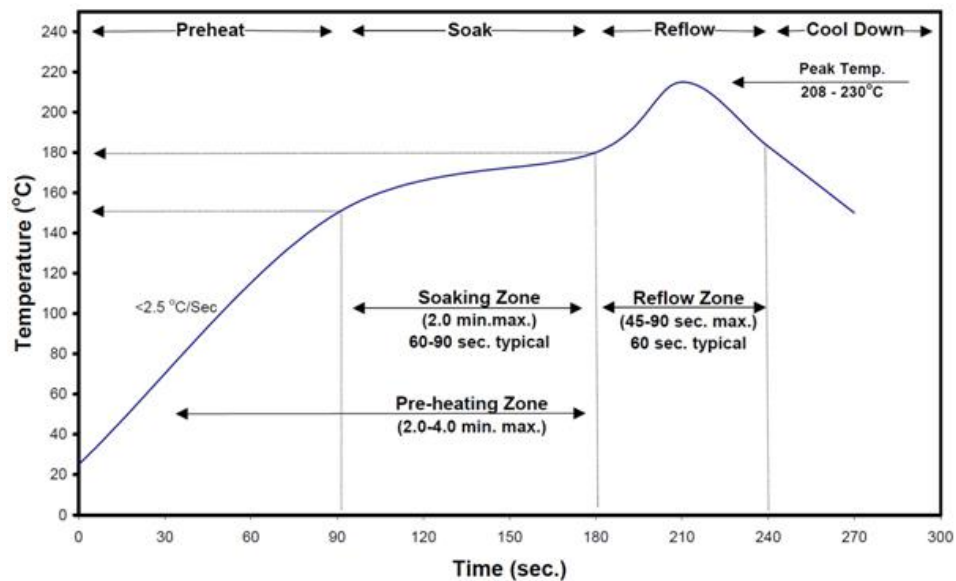
The printed circuit board placed on working surface preliminary preheated to 50 ° C and a control sensor is fixed on it with PDS-300 help. When serial soldering is run by well-tuned thermo-profile it is not necessary to fix a sensor on each processed board, because the process repeatability is provided automatically.

Run the automatic soldering by thermal-profile Program. The process can be visually monitored in real time on the computer monitor. Sample of results of soldering process is presented in Picture 4. Bold Green and blue lines show programmed thermo-profile temperature and thin red and violet ones real process temperature on a board and heater plate respectively.



Pic.4.

At the point of solder reflow completion the AirCooler automatically switches on (pink vertical line), and a PCB cooling zone is formed. The cooling rate is defined by thermo- profile. After the board surface is cooled to a temperature 130-140 ° C, the product can be taken away from the heating-plate.



Pic. 5 Common parameters and zones of Reflow Thermo-profile

## 6. Maintenance

To prolong the life of equipment we highly recommend to carry out a preventive maintenance. The maintenance should be carried out as needed, depending on the intensity of use, but not less than once every six months. First of all accumulated dust should be carefully remove with cotton fabric from all outter surfaces of the device.

***During the maintenance follow the safety measures given in Section 2.***

Controller maintenance have to include following:

- Visual inspection of unit and checking for a presence of wire damages, connectors, and power plug;
- Checking a grounding in power socket;
- Checking a grounding within a system "temperature controller - pre-heater plate";
- Cleaning the housing and display of the Controller with a soft cloth. Solvents or alcohol-containing liquids are NOT recommended for cleaning;
- Cleaning a heating-plate surface off residues of soldering products;
- Degreasing connector pins if needed;
- Checking the integrity of a temperature sensor body (if available);
- Degreasing of temperature sensor contacts wires;
- Degreasing bare metal surfaces of the temperature sensor

***Periodic functional test of device protective grounding should be carried out as follows:***

- do this, without disconnecting heating-plate off a temperature controller;
- remove the power plug from a socket;
- measure the resistance between the thermo-plate housing and the ground terminal the power plug. Resistance should be less than 0.5 ohm.

During operation deposition of soldering products residues to a surface the heating-plate is possible. Surface cleaning can be done with a soft cloth moistened with water or 95% solution of industrial grade alcohol. Do not allow water and liquid solvents to get inside the unit.

**Digital Temperature Controller of "Termopro" series does not need a periodic calibration.**

**Typical troubles, its symptoms and ways of these fixing**

| <b>The name of a fault and its symptoms</b>   | <b>Possible reasons of a fault</b>   | <b>Fault repair recommendation</b>   |
|---|--|--|
| 1. There is no indication on the display after controller turns on                          | 1. Power fuse is burned off.<br>2. Power cord and/or socket can be damaged   | 1. Replace the fuse in a device housing for new one with with same parameters.<br>2. Check the cord and socket and replace is needed. If it does not help send a device for repair (Contact your local dealer) |
| 2. "S.C." or "O.C." displays instead of temperature at regulating channel during a process. | 1. Pre-heated cable is not connected properly or damaged<br>2. Brake or short-cut in Heating equipment circuits takes place. | 1. Check all cables for a pesence of damaged and/or connect properly to correct terminals.<br>2. Sent Equipment for repair (contact your local dealer)   |
| 3. "O.C." displays instead of temperature at regulating channel during the process          | 1. Sensor is not connected<br>2. Sensor cord is damaged<br>3. Sensor is damaged<br>4. Sensor is not needed                   | 1. Check the sensor connection<br>2. If possible to restore a wire<br>3. Replace sensor<br>4. Connect a fixed resistor with nominal 1KOhm - 1,1 KOhm instead of sensor   |
| 4. "S.C." displays instead of temperature at regulating channel during the process          | 1. Damage or short-cut in sensor , its wires or its terminals  | 1. Check a wire fasten to terminal and its connection correctness.<br>2. Remove short cut on wire or   |

|   |  |   |
|---|--|---|
|   |  | terminals   |
| 5. Working under the Program control PC can not find a controller or a notification about losing connection appears.  | USB Cable is damaged or disconnected   | Check a cable fastening in terminal.<br>Replace cable if needed.  |
| 6. "S.C." displays instead of temperature setting or "O.C.", or displayed temperature value is obviously outside of working limits. The same problem takes place upon temperature recall from memory. | At turning on the failure took place at reading memory parameters of the Controller. Or the same failure took place in a process of recording. | Turn the Controller off and turn on again after 10 seconds holding a button of temperature setting increase pressed.<br>Check a voltage in Power supply line, take measure for protection from power line interferences, and voltage jump changes. Check grounding. |
| 7. Data disappears from display from time to time or unreadable symbols appear  | Display module is broken   | Sent Equipment to repair (contact your local dealer)  |

## 7. Storage and transportation requirements

Components of the equipment are allowed to be kept in facilities with ambient temperature range  $-10^{\circ}\text{C}$  up to  $+40^{\circ}\text{C}$  and humidity up to 80%. Components are to be kept in heated storage facilities in a case of prolonged storage and are to be packed in a manufacturer package or its analogue.

Keep system and its components from impact of:

- Shock;
- Vibration;
- Atmospheric precipitations;
- Direct sun light;
- Heating device;
- Aggressive liquids and vapors;
- Sources of strong radio waves and magnetic fields

The equipment should be transported in original Manufacturer package or its analogue. Transportation has to be arranged in closed vehicles. In a case of transportation by water the measures for insulation are to be taken.

In a winter period the components of the system are to be kept at ambient temperature within 2-3 hours prior unpacking and operation start up.

## 8. Terms of Warranty limitation

The Manufacturer reserves the right to introduce any changes into design, working scheme, internal program of the Controller and software, supplied with equipment, any time and without preliminary notification. The present Manual also can be changed any time without preliminary notification.

The manufacturer is committed to the toll-free repair or replacement of hardware components **within 12 months**, subject to the user's manual of recommendations set forth herein. Possibility of warranty repair service is determined by an authorized local service company or by the manufacturer after the examination (inspection) equipment.

For repairs contact the organization at the place of purchase of your system. Repair after warranty period is over possible for an extra fee. The cost of repair is determined by an authorized local service company or the manufacturer after an examination of faults.

The Manufacturer does not provide Warranty services either obvious or undermine if these are not presented and listed into the Clause. Any undermine warranties are limited by the present warranty by Law.

**Within Warranty period:**

The Manufacturer provides free repair or replacement of the defective product (products) with similar product without defects within a limited warranty period. If the product is no longer available it will be replaced with a similar type one. If a defect in material or workmanship is found within the limited warranty period these will be replaced with the same but with no defects.

The warranty period starts from the date of first customer purchase. Evidence of the date of purchase is a waybill or transport company consignment note with date delivery to the first customer. Also, the reference period of the guarantee may start from the date specified in the warranty card Manufacturer provides with a product serial number, signature and seal of the trading organization on the card.

If a Buyer can not submit an above mentioned documents the warranty period begins on the date of product acceptance by Manufacturer Quality control department. Date of acceptance is determined by the serial number of the product. This limited warranty is not extend for any product with no serial number. Warranty repairs are carried out on a Manufacturer territory, and any transport costs borne by the Buyer. The warranty period is extended for a period of the product repair. Extending the guarantee does not apply to a time of return shipment of the product to a place of repair.

The Buyer has to cover the costs of materials and repair job if a warranty service work is carried out when warranty period is over.

*Manufacturer warranty within the warranty period in applied at:*

- Materials used for manufacturing;
- Quality and precision of mechanical parts and its work;
- Assembly correctness and calibration of equipment.
- Stability in time of declared technical characteristics and functions.

*Manufacturer Warranty does not cover following:*

- Natural wear out and/or loss of materials and its parts.
- Gradual loss of electrical contacts due to high temperatures exposure in combination with corrosive vapors of materials used, and other external factors.
- Destruction of paint & electroplating due to corrosion, high temperatures exposure and corrosive vapors used in Buyer working process as well as other external factors.
- Violations of the present manual recommendations by User during equipment operation.
- Mechanical or other damages to the product due to User's negligence.
- Unauthorized changes of design or electrical schematic carried by User.
- Attempts of unauthorized repair.
- Improper and untimely maintenance.
- Damage to products due to improper transportation.
- Any damage caused by natural disasters, earthquakes, lightning, abnormal voltage or environmental influences.

All costs the Manufacturer carries for non-warranty repair and/or replacement are on a Buyer's side.

*The Manufacturer does not hold warranty for the following materials and products:*

- Perishable parts
- Lubricants
- Packing materials and manual itself
- Cables, connectors of other Manufacturers supplied in a set with equipment (these are covered by its Manufacturer Warranty).

## 8. Disposal

Disposal of old and replaced parts, spare parts and/or other equipment components as well as a whole devices should be carried out by the Buyer or an End User in accordance with the laws of a Country where it is supposed to be carried.

Design and production of all “ThermoPro” devices, “ThermoPro-Center” Software and all rights to this brand owner is OOO NTF “Techno-Alliance Electronics”

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Edition 1.2E от 18.05.2017

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