



OVEN-700-2000
User Manual



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Introduction

The Oven-700-2000 (hereinafter referred to as the oven) is a professional heating cabinet with vacuum supply inlets. Designed for curing composites including prepreg curing, as well as heat treatment of vacuum infusion parts, the oven can also be used to accelerate the curing of silicone and resin castings.

The oven has 2 ports equipped with gauges for connecting a vacuum tube 8/6 for vacuuming the product during resin curing. Compressed air can be supplied if required.

One of the key characteristics of the oven is the uniformity of temperature distribution throughout the internal volume, which is ensured by effective air recirculation by two fans and significantly reduces the time to reach the desired temperature inside its entire internal space.

The oven's high performance allows you to work at temperatures up to 200°C, have the maximum level of temperature stability, and relatively low energy consumption.

Loading products into the oven is done from above.



1. Safety Precautions

1.1 Only individuals who have completed industrial training, are familiar with this manual, and have received instruction on safe maintenance procedures are permitted to operate or perform maintenance on the oven.

1.2 Personnel endorsed to oven operation should have knowledge about the following topics:

- design and principle of oven operation;
- rules for safe operation and care of the oven;
- dangerous and harmful factors associated with the use of the oven;
- requirements for industrial sanitation, rules of personal hygiene;
- sanitary and hygienic requirements for the maintenance of the workplace;
- the procedure for actions in the event of a fire and the rules for the use of primary fire extinguishing means;
- methods of providing first aid in case of accidents.

1.3 The following hazards are associated with the oven operation:

- burns in case of contact with heating elements of products;
- burns of the face and upper respiratory tract by hot air when opening the oven's lid;
- electric shock in case of malfunction of electrical equipment, or lack of grounding of the oven body.

1.4 The workplace should be equipped with effective supply and exhaust ventilation, an earth leakage protective device, and an overcurrent protection device.

1.5 During work, protective clothing should be worn, including a suit designed to guard against contamination and mechanical stress, a polymeric apron with a bib, and polymeric sleeves.

When installing and operating the oven, it is necessary to adhere to applicable local health and safety regulations and guidelines governing labor protection and the safe operation of electrical installations.

To prevent electric shock or power supply system failures (such as circuit overloads, short circuits, etc.), the following requirements must be observed when preparing the oven for use:

- comply with the established procedure for turning electrical equipment and technical means on and off;



- in case of a power outage due to burnout of fuse links or an actuation of circuit breakers, re-switch only after checking and eliminating the causes that caused their burnout or shutdown. Troubleshooting should be carried out when the power supply is turned off.

The oven must be equipped with a protective and disconnecting device that meets local safety regulations and must ensure simultaneous disconnection of all phase wires and the neutral in the event of dangerous voltages (leakage currents) on the body. The protective and disconnecting device must operate reliably when the cabinet is supplied with electricity from an external source of electricity (electrical network) with a grounded or insulated neutral.

In the workshop where the oven is located, there must be places for fastening and installation of standard fire extinguishers, as well as standard fire extinguishers must be installed.

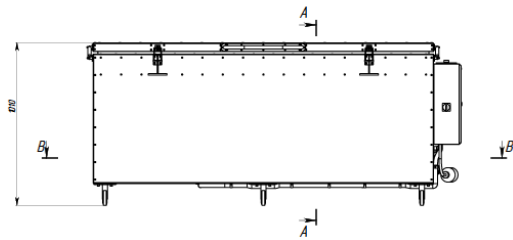
Installation, dismantling, and repair of the oven should be carried out with the power plug disconnected.

As the oven includes components powered by an AC network with a rated voltage of 380 V, its installation and connection must be performed by qualified specialists trained in safe handling of electrical installations up to 1000 V and holding the appropriate electrical safety certification. Replacement of complete cabinet components can be carried out on-site by qualified electrical personnel.

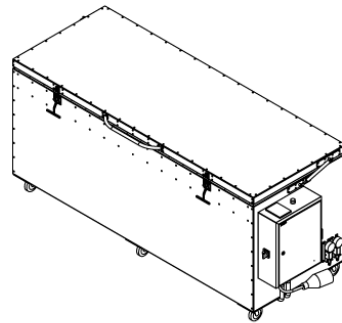
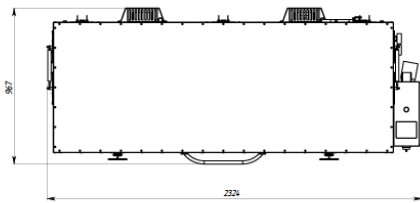
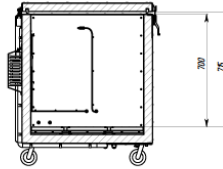
The oven is not intended for use in explosive, corrosive, or humid environments.

Before connecting the oven, make sure that the voltage and current characteristics in the power supply network correspond to the parameters of the equipment connected to it.

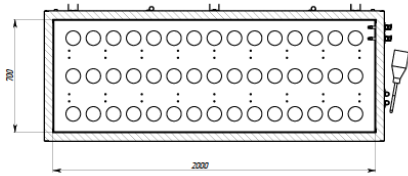
It is the customer's responsibility to adhere to all of the safety rules while operating the oven!



A-A



B-B



2. Specifications

2.1 OVEN-700-2000 Characteristics

Table 1

#	Name	Index
1	Material of the working area (inside)	08Kh18N12T 1.1,5
2	Exterior Cladding Material	AMc.N 1.2,0
3	Insulation (ceramic fiber)	50mm
4	Fans	S04C00AS
5	Internal volume, L	1000
6	Convection fan heating element, power, 2pcs	2.0 kW
7	Thermocouple	Gefran TC5N
8	Heat regulator	Delta DT320
9	Mains voltage	380 V
10	Power supply frequency	50 Hz
11	External Dimensions/ Internal dimensions, mm	2324x1010x967 / 2000x715x700
12	Operating temperature	from +15°C to +200°C
13	Minimum temperature	20°C
14	Maximum Temperature / Minimum heating time up to 200°C	200°C / 35 min
15	Product/Tooling Loading	above
16	Maximum power consumption, W	4400
17	Total weight, kg	280
18	Internal Dimensions, mm	2000x715x700 (WxHxD)
19	External Dimensions, mm	2324x1010x967 (WxHxD)

2.2 LCD-TFT Technical Specifications

Table 2

Supply voltage		24 VDC
Power consumption, max		0.4 A
Display Type		4"3 LCD TFT
Character size		
Interfaces	RS485 2W	Ethernet (Lan) support
	RTU, ASCII	
Software		EasyBuilder Pro
Processor Type		Cortex A8 600Mg 128Mb
Display Resolution		480x272
Chromaticity		16.7M
Storage conditions and operation	t operation, °C	From -10 to +50;
	t storage, °C	From -20 to +60
	Humidity, %	35...85% relative humidity; Storage: 35...85% relative humidity.

3 Oven design and operating principle

3.1 OVEN-700-2000 design

The oven structurally consists of a body with a lid, made of aluminum sheets on the outside and stainless-steel sheets on the inside. A heat-insulating material (a blanket made of ceramic fiber) is laid between the sheets of metal (Fig. 1). For the convenience of movement, swivel wheels are installed on the bottom side (item 4, fig. 2).

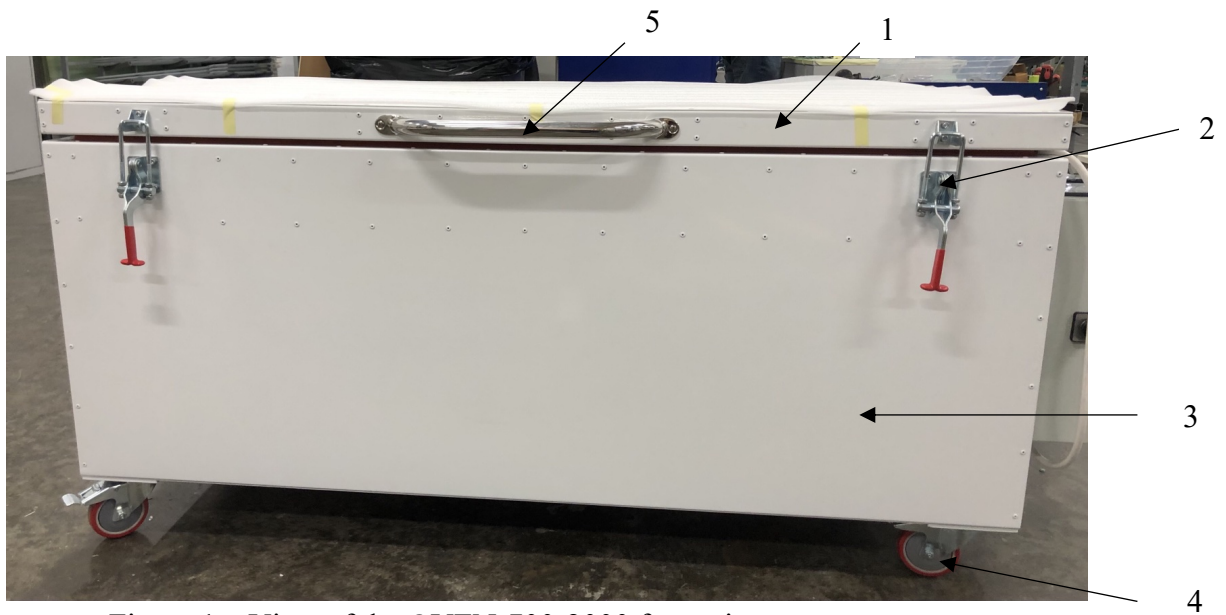


Figure 1 – View of the OVEN-700-2000 front view.

1 – cover, 2 – latches = 2 pcs., 3 – body, 4 – wheels = 4 pcs., 5 – handle.

A silicone seal is installed around the perimeter of the lid (Fig. 2, item 3) for a tight fit to the body. The lid is fastened with three curtains (Fig. 2, pos. 1) and attached with two latches to the body (Fig. 1, pos. 2).

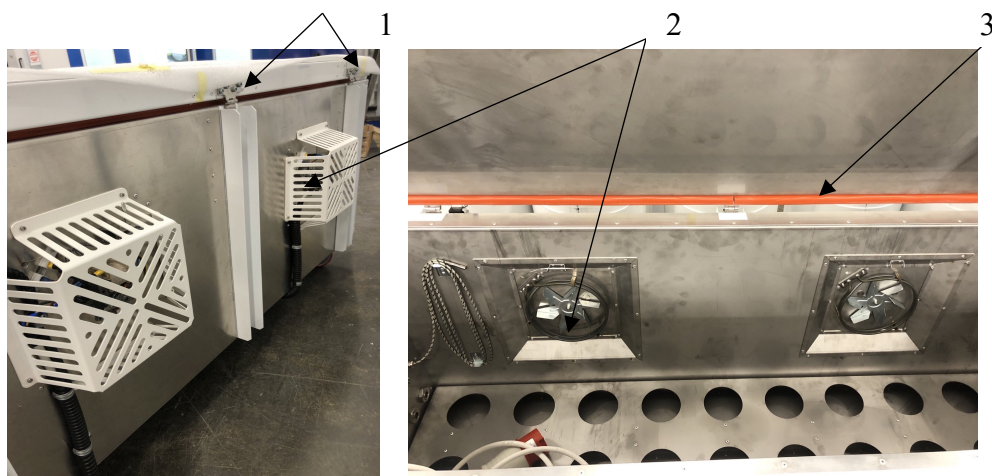


Figure – 2 view of the back and inside of the oven

1 – hinges = 3 pcs.; 2 – fan = 2 pcs., 3 – silicone seal.

For heating, the oven is equipped with two tubular electric heaters with fans (Fig. 3, pos. 2), which evenly distribute the hot air. Two thermocouples (Fig. 3, pos. 3) and a thermostat (Fig. 3, pos. 1). To connect the vacuum pump, two vacuum ports are placed inside and outside the oven (Fig. 3, pos. 4, 5). To supply power to the vacuum pump, there is a 220V socket, with the function of turning off the power supply at the end of the specified heating cycle.

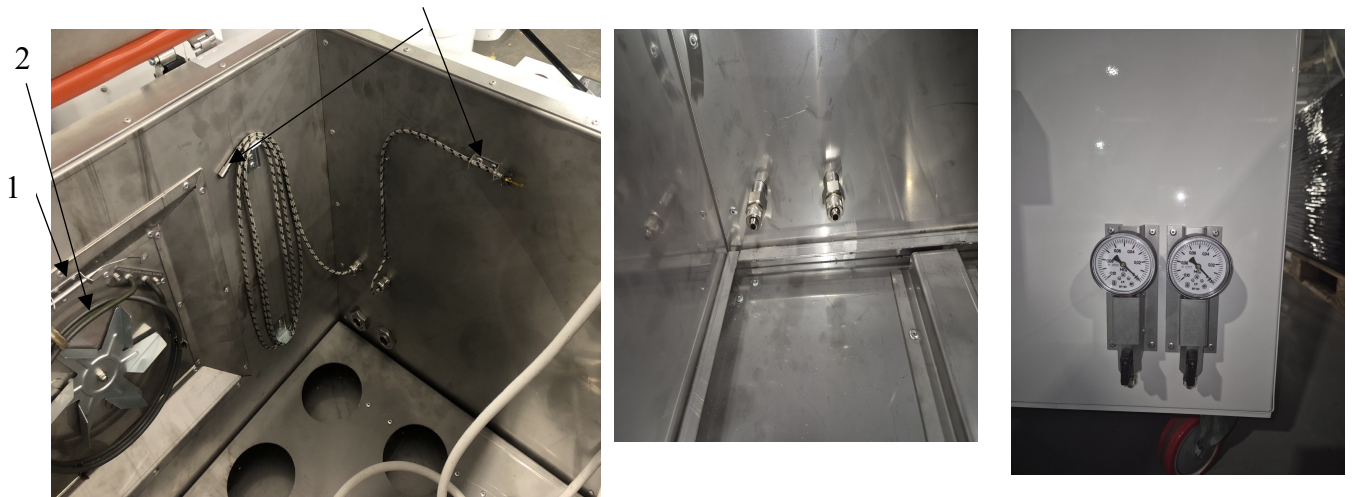


Figure 3 – view of the heating elements

1 – thermostat; 2 – heating element – 2 pcs; 3 – thermocouple – 2 pcs., 4 – internal ports – 2 pcs., 5 – external ports – 2 pcs.

An electrical panel is mounted on the outer side panel of the oven body. This panel includes a controller and a light and sound alarm on the top, as well as a toggle switch and a stylus on the side. (Fig. 4).

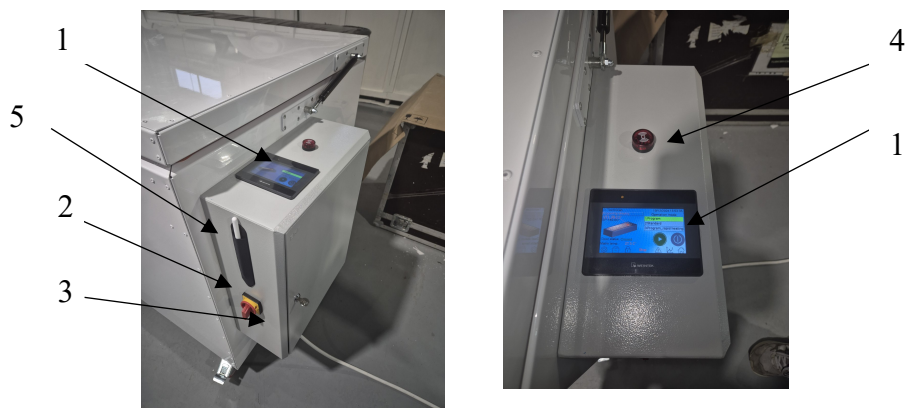


Figure 4 – A panel with a toggle switch and a controller.

1 – controller, 2 – toggle switch, 3 – switchboard, 4 – light and sound alarm, 5 – stylus.

3.2 Oven installation in the workshop

- 1 Prepare the workplace for the installation of the oven.
- 2 Release the oven from packaging. Make sure there is no damage.
- 3 Connect the oven power supply cable to the 380VAC mains.
- 4 Unfasten the latches of the oven lid, and open it.
- 5 Put the prepared parts in the oven.
- 6 Lower the lid of the oven and close it with the latches.
- 7 On the control panel (Fig. 4), set the toggle switch to position 1 (one).
- 9 Select the necessary program of work.
- 10 Start the thermal oven.

3.3 Enabling/Disabling and Setting the Program on the Controller

3.3.1 Turn on the OVEN-700-2000 by turning the toggle switch handle to the right to the "1" pointer. The operating screen on the controller is turned on (shown in Fig. 5).

Description of the controller screen.

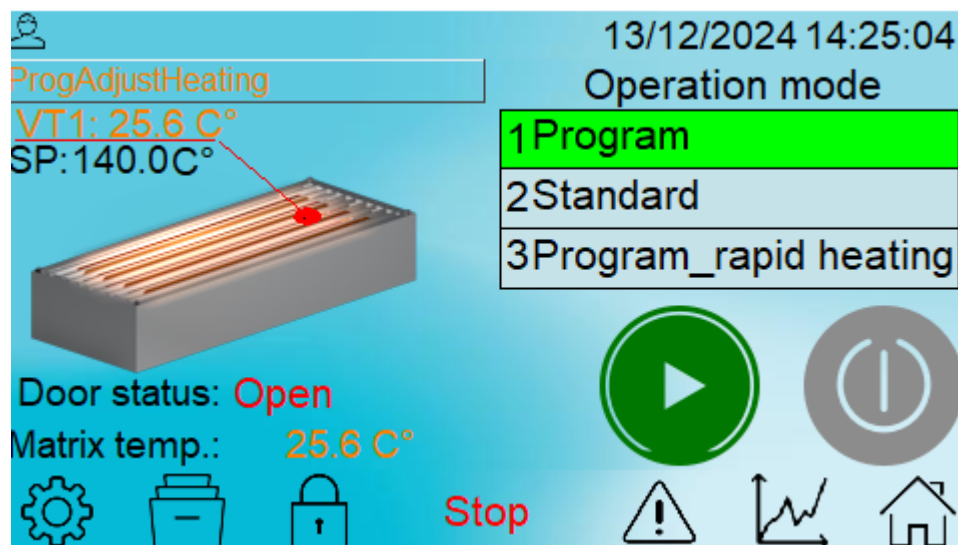









Figure 5 – Operating screen

The home screen displays the following:

- the current temperature in the oven VT1,
- mold temperature,
- selected operating mode ("Program", "Standard", "Program_rapid heating"),
- active program ("PrgAdjustHeating"),

- door status (open/closed)
- program execution status (stop/work)
- buttons to start and stop the program,
- the tabs "Settings" , "Programs",  page for entering passwords and user adjustments , errors , archive of graphs of executed programs , as well as a button to return to the home screen .

Configure users and passwords.

Pressing  Gets you to the menu for selecting a user and entering a password (Fig. 6).

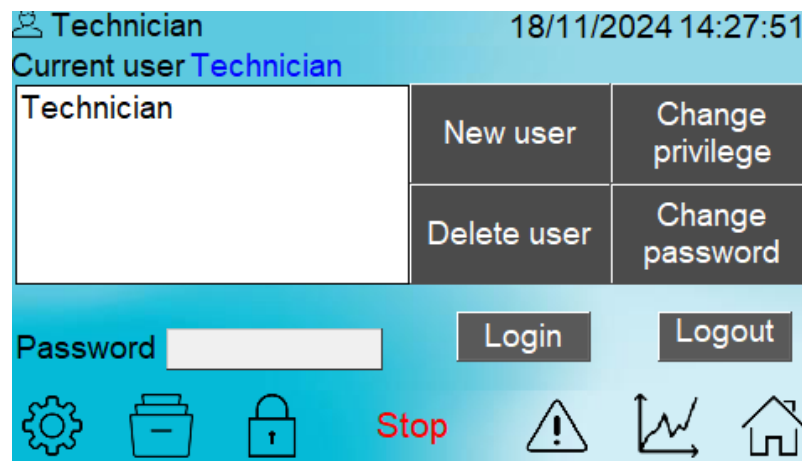


Figure 6 – screen for selecting/correcting users, entering a password

Select the necessary user, enter the password, and click the "login" button. For the "Technician" user, the standard password is 1111. By default, the "Technician" user is given the right to edit all program parameters, but it is possible to create other users with restricted/added capabilities.

To add a new user, you need to press "Create new user" (Fig. 7)

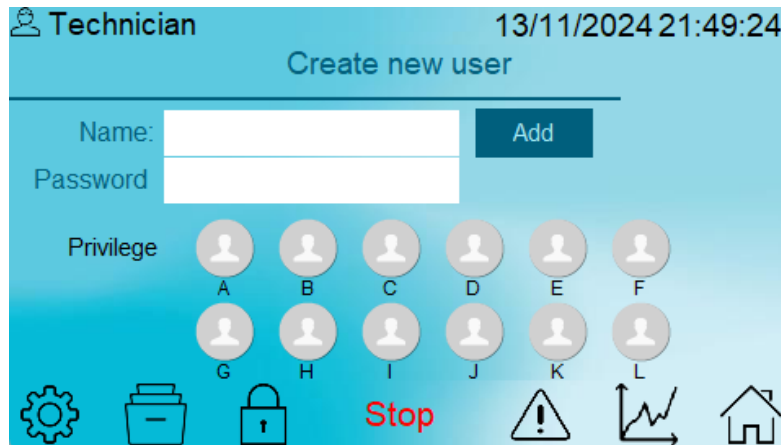


Figure 7 – New User Creation Screen

Next, enter your username and password, and also select the level. The selected values A, B, C open up the whole range of parameters for editing. Then click "Add", and the new user will be displayed in the user selection menu (Fig. 6).

To change the user's password, click the "Change password" button, after having selected the user (Fig. 6). Next, in the password change window (Fig. 8), enter a new password and click the "OK" button. The user password is changed successfully.

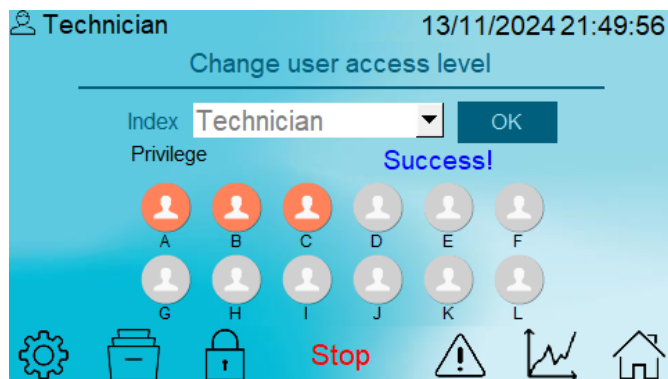



Figure 8 – User Password Change Screen

You can use the Delete User button (see Figure 6) to delete a user.

Description of the program settings.

To enter the settings menu, you need to enter the "Technician" user password and press the button  on the program's home screen.

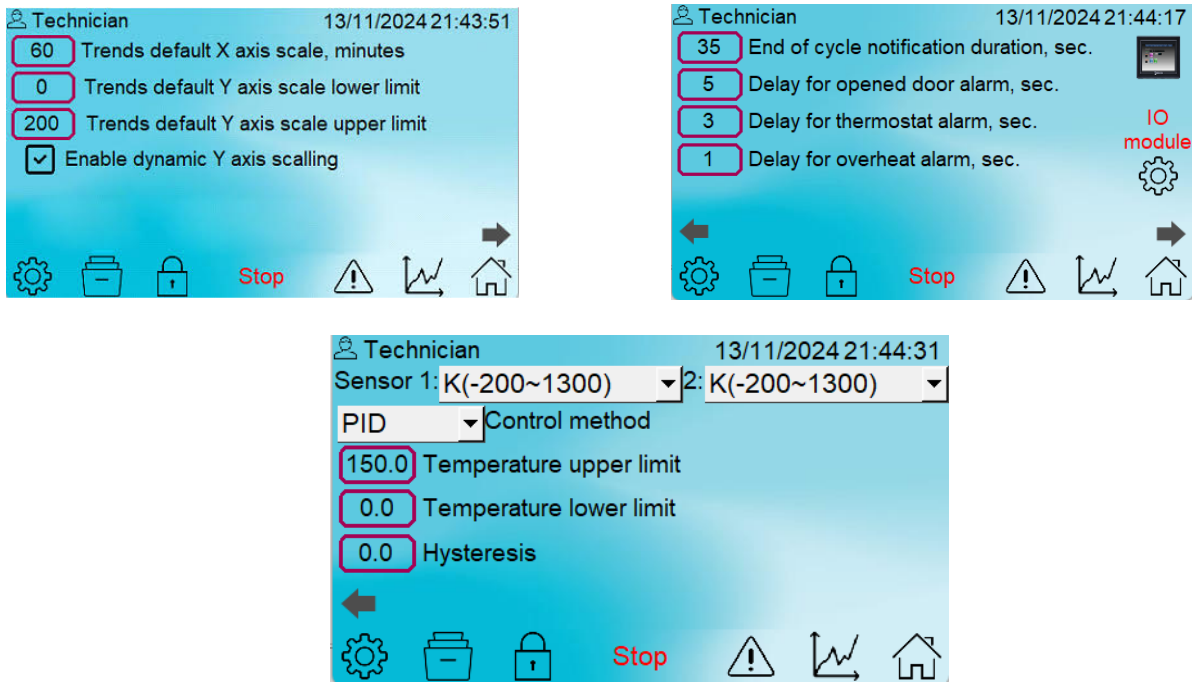



Figure 9 – Program Settings Pages

The parameters "X-axis scale on charts, in minutes", "Y-axis scale on charts, minimum", and "Y-axis scale on charts, maximum" are responsible for the graphical display of graphs in the tab . When the "Enable dynamic scaling" parameter is enabled, the program will automatically set the boundaries of the graphs for the correct visualization of the technological process.

The "Duration notified at the end of the cycle, sec" indicates the time during which the light and sound alarm will operate at the end of the cycle. Setting the parameter to "0" disables the sound accompaniment at the end of the program.

The "Open door error delay" parameter is responsible for the delay in the light and sound signal when the door is opened during the program execution. When an open-door alarm is triggered, the program continues to run.

The "Thermostat Error Delay" parameter is responsible for the delay in the supply of a light and sound signal when the protective thermostat is triggered by overheating. The program will continue to run after the temperature drops to the set point.

The "Overheating Error Delay" parameter is responsible for the delay in the supply of a light and sound signal when the "Maximum temperature" parameter is exceeded. The Minimum Temperature parameter restricts the ability to set a lower temperature specified in this program parameter.

The "Hysteresis" parameter is required to adjust the temperature difference for turning on the heating elements when the ON/OFF operating mode is selected.

In the settings, you can also select the type of temperature sensors.

3.3.2 Description of program modes

Program Mode

To select the mode, select Program in the right corner of the operating screen (Fig. 10).

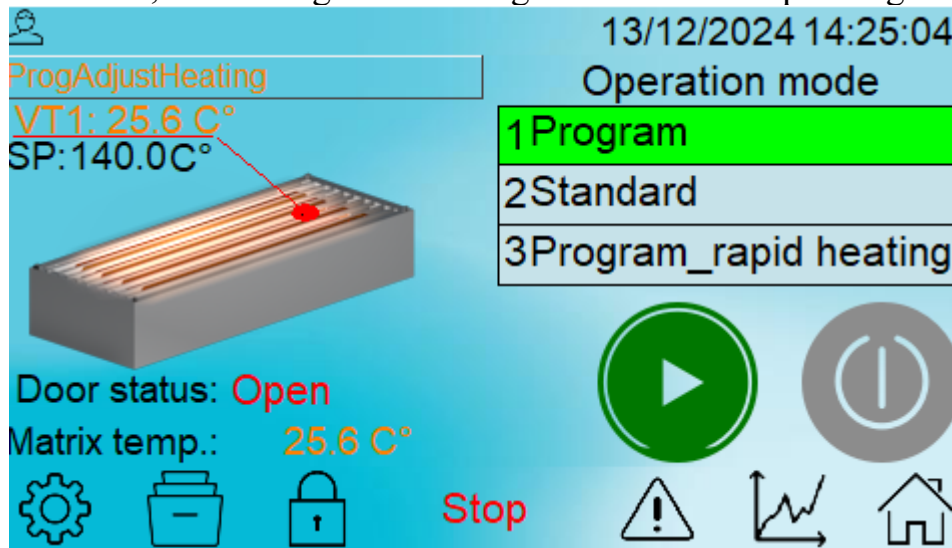


Figure 10 – Program mode selection on the home screen

This mode is due to a smooth rise in temperature with a gradual increase in temperature depending on the set parameters. The calculation of the number of degrees added per minute is carried out according to the formula:


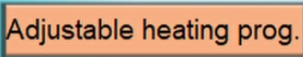
$$(t_1 - t_2) / T, \text{ where}$$

t_1 is the set treatment temperature,

t_2 the initial temperature in the oven at the beginning of treatment,

T treatment is the time of firing.

For example, the initial temperature in the stove is 20 degrees. According to the oven program, you need to reach 140 degrees in 60 minutes. Thus, the controller will add 2 degrees every minute to achieve the maximum smoothness of reaching a set temperature of 140 degrees in a time period equal to 60 minutes.

To edit the treatment recipe of the Program mode, go to the program selection page by pressing the button . Next, select the tab  (Fig. 11).

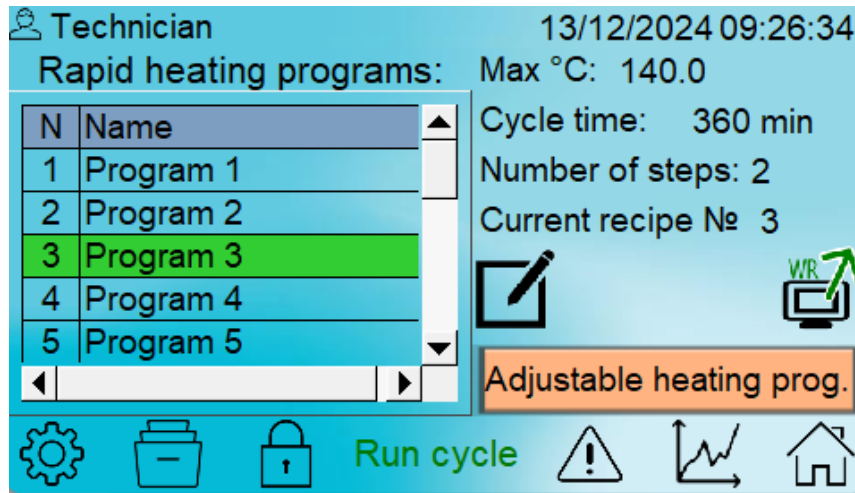


Figure 11 – Program selection page

In the treatment editing window that appears (Fig. 12), you can set up to eight heating stages with the ability to set the treatment temperature in each stage, as well as the duration of the stage in minutes.

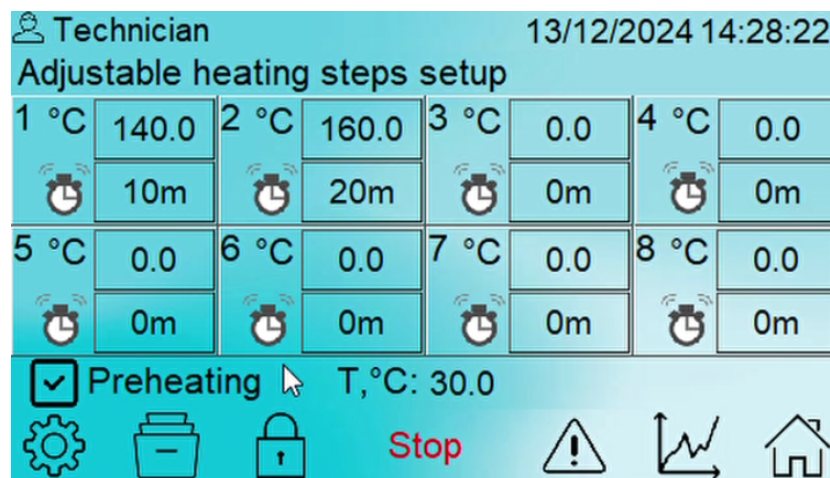


Figure 12 – Program recipe editing page

In this program (Fig. 12) two stages of treatment are set. In the first stage, the treatment temperature is 140 degrees, and the time to reach the specified temperature is 10 minutes. In the second stage, the treatment temperature is 160 degrees, and the time to reach the specified temperature is 20 minutes.

The algorithm provides for the possibility of starting the program to reach the temperature of the mold. This is because the air in the oven heats up faster than the mould on which the firing product is located, which can lead to a violation of the technological

process. To enable/disable the mould heating, you need to check the box (Fig. 12), as well as the temperature, after which the execution of the program stages will begin.

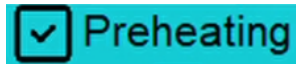





Figure 12 – Turning on the preheating of the die

After entering the parameters of the treatment stages, press the button  to exit the working screen. On the operating screen (Fig. 10) there are buttons for starting the program  and stopping it . After starting the program, the panel will display the remaining time for completing the step in minutes (Fig. 13).

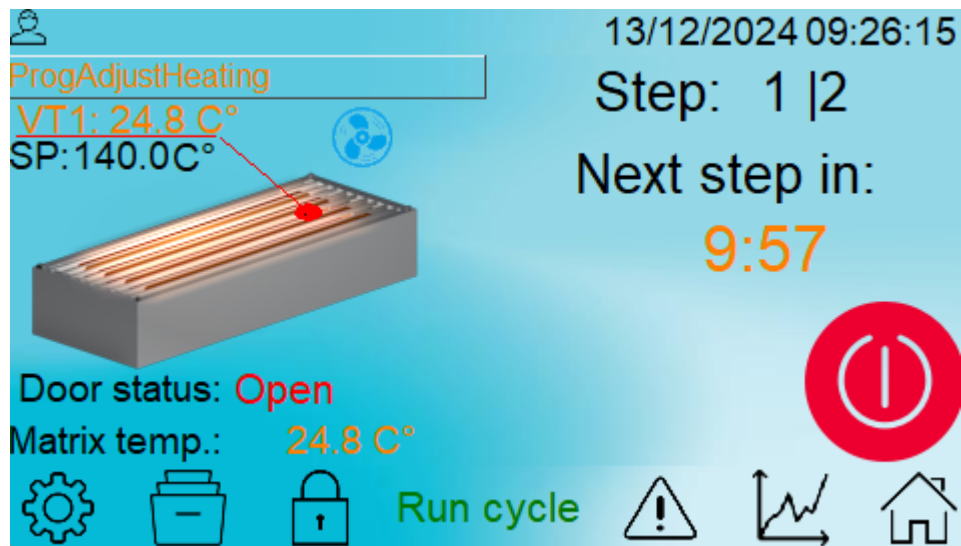


Figure 13 – Program Mode Execution

This mode should be used exclusively for hardening and is "self-adjusting". The accuracy and correctness of the oven operation in this mode are achieved after the temperature regulator has been trained (at least 20 treatment cycles). Control coefficients are recorded in the temperature controller, with the help of which the stability of the treatment process is achieved and the possibility of overregulation of the set parameters is excluded. In the process of training, it is possible to display the time of the end of the step in the form of "****" (Fig. 14)

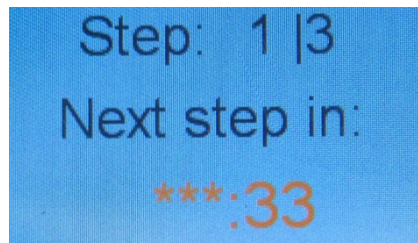


Figure 14 – Display of the step end time

The designation in the form of "***" means that in the process of performing the treatment stage, the temperature did not have time to reach the set value within the set time. The transition to the next step of the program will be performed when the set step temperature is reached and the remaining step time will be displayed correctly.

If the "Device no responding" message occurs during the program execution (Fig. 15), after the program is completed, it is necessary to reboot the power-off control module and restart the program for correct operation.

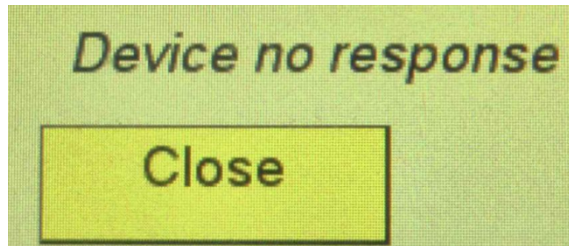



Figure 15 – Program execution error message

During the execution of the program, it is forbidden to edit the execution of the current recipe. It is not recommended to use this mode for standard heat treatment of products, which does not require a smooth rise in temperature according to the time established by the recipe.

Standard Mode

This mode of operation is simplified, it does not provide for heating stages. The temperature and treatment time are set. After the program is completed, the cycle ends.

To select the mode, select Standard in the right corner of the operating screen and press the program start button  (Fig. 16).

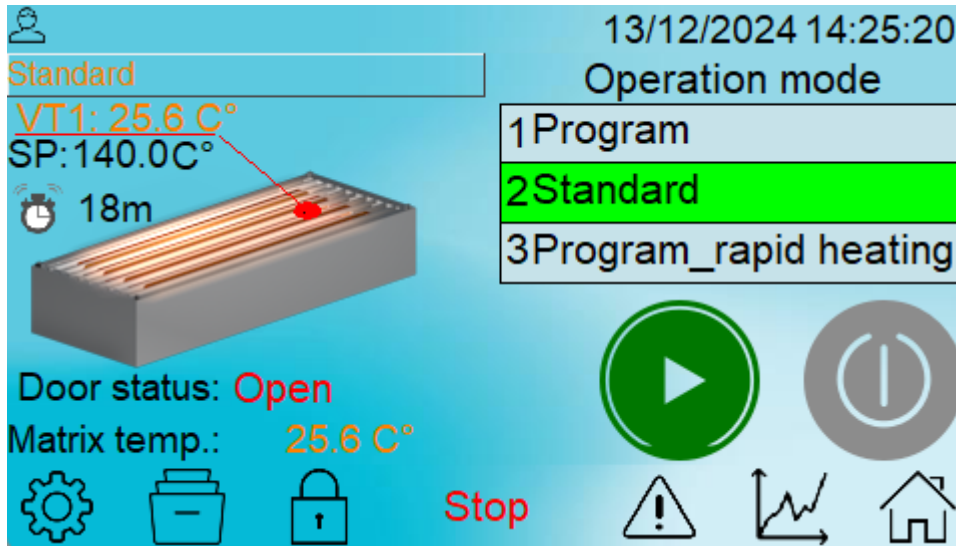



Figure 16 – Standard mode execution window

On the right side of the screen, the buttons are used to  adjust the firing time and temperature (fig. 17).

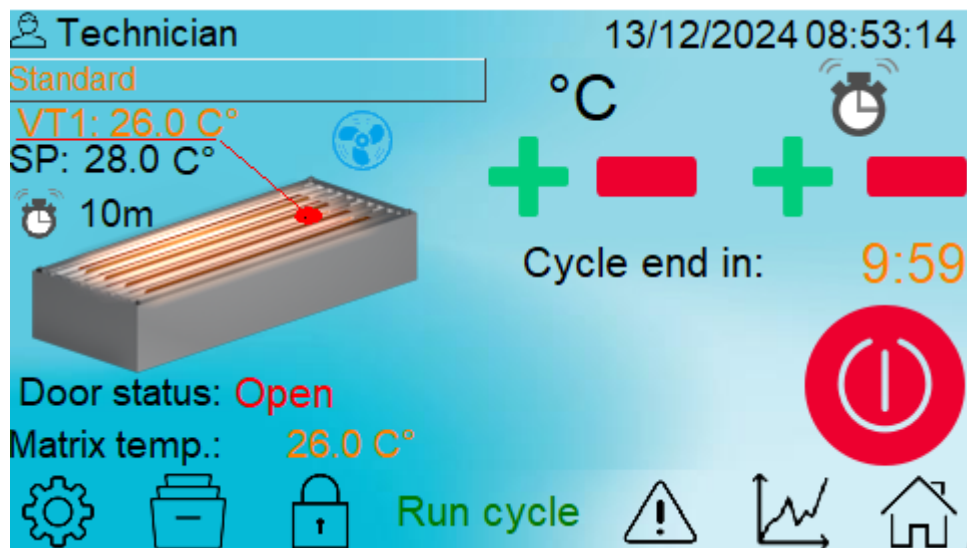



Figure 17 – Standard mode execution window

The mode is stopped prematurely by pressing the button . After the specified treatment time, the program will automatically end.

Program_rapid heating mode

This mode involves setting the set temperature and holding it in accordance with the specified time. The speed of reaching the set temperature is not regulated and is characterized by the power and number of installed heating elements in the oven.

To select the mode, select “Program_rapid heating” in the right corner of the operating screen (Fig. 18).

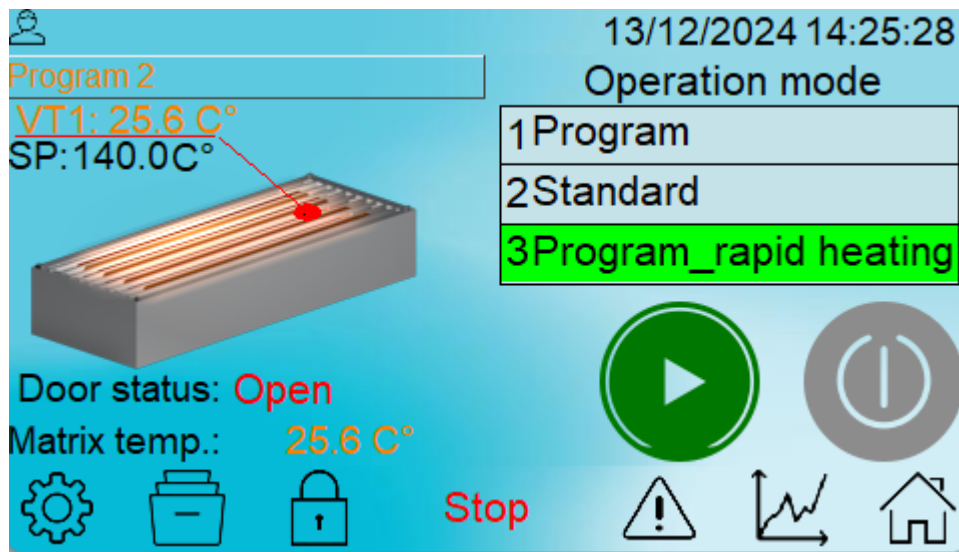



Figure 18 – Program_rapid heating mode selection window

To enter the program selection page, click the button . The program window is shown in Figure 19.

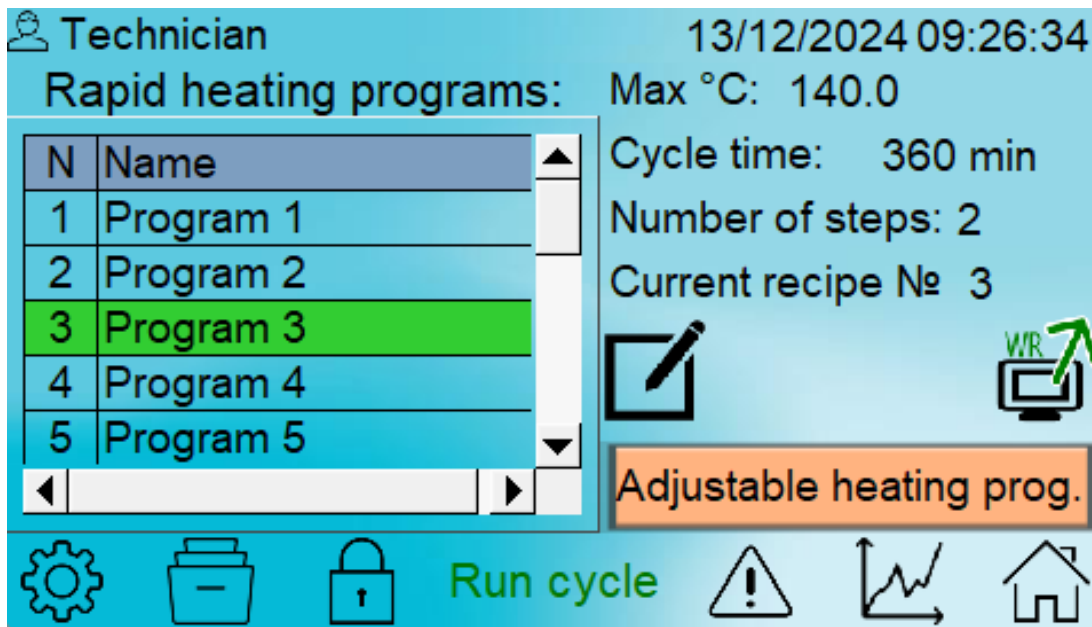


Figure 19 – Program Selection Page

The edit page displays the stored programs in memory, as well as the main parameters: cycle time, number of steps, and maximum temperature. The algorithm of the oven provides for the possibility of creating up to 19 programs.

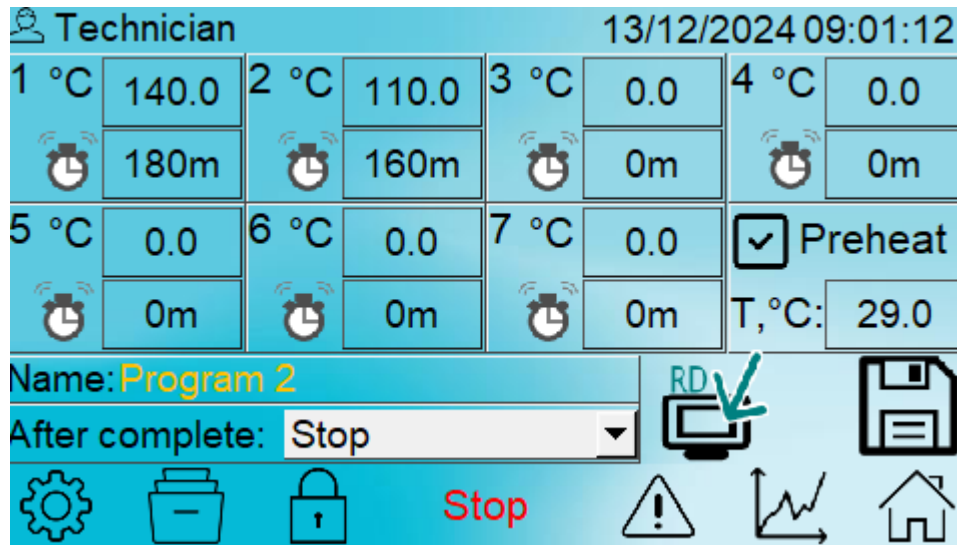



Figure 20 – Recipe editing window with an example Program 2

To change/create a treatment, select the required program and click the button . The program editing window will appear (Fig. 20). Each program can include up to seven heating stages, with the possibility of setting the firing temperature in each stage, as well as the duration of the stage in minutes.

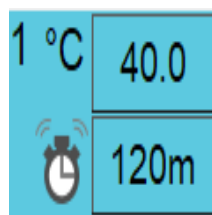




Figure 21 – First stage data entry

Figure 21 shows the data of the first stage of the program, the temperature is set to 40°, and the firing time is 120 minutes. To change the program parameters, select the required parameter (temperature or time), and use the keyboard to set the demanded value in the window that appears. After changing the program conditions, save it using the button  , and then transfer the new program conditions to the regulator .

The algorithm provides for the possibility of starting the program to reach the temperature of the mould. This is because the air in the oven heats up faster than the mould on which the treating product is located, which can lead to a violation of the technological process. To enable/disable the mould heating, you need to check the box (Fig. 22), as well as the temperature, after which the execution of the program stages will begin.

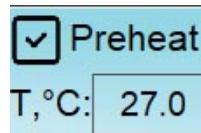


Figure 22 – Turning on the matrix heating and setting the temperature

Upon completion of the process, the possibility of further action of the program is provided (Fig. 23). You can stop the execution of a program or start another program.

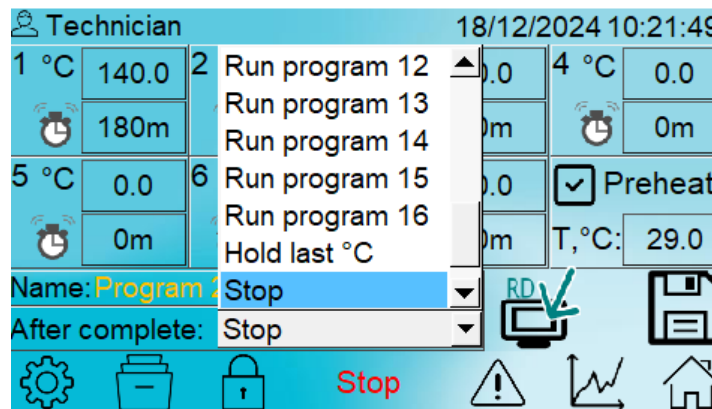






Figure 23 – Selecting an action at the end of the program

To exit the home screen from any menu, press the button . On the operating screen (Fig. 18) there are buttons for starting the program  and stopping it . After starting the program, the panel will display the remaining time for completing the step in minutes.

During the execution of the program, an event log is kept. A graphical display of the executed program can be viewed in the graphs menu by pressing the  button. The graph display menu is shown in Figure 24.

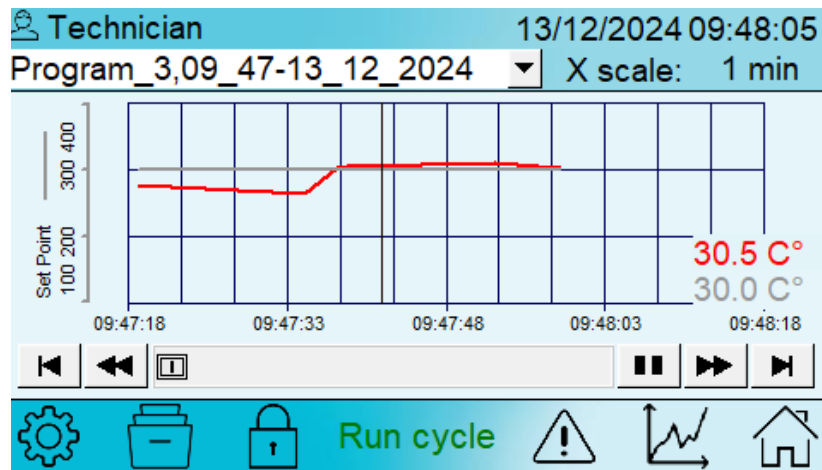


Figure 24 – Graph display page

The Y-axis in the graph has a temperature graduation. The X-axis displays the time interval.

Schedules of completed programs have a time and date in their name, which provides a convenient search.

4. Maintenance

Maintaining an operational oven involves performing multiple tasks to ensure its efficiency and ability to carry out its intended functions.

Regular maintenance is a crucial preventive measure that ensures reliable operation between scheduled repairs while minimizing the extent of necessary repair work.

During scheduled maintenance, the oven's performance is monitored and diagnosed, operational defects and safety violations are identified, and the scope of work required for current repairs is determined.

Any defects in components or parts that could affect the oven's functionality or compromise safety must be promptly addressed. These repairs should be carried out in accordance with warranty terms or under a separate maintenance agreement.

Performing routine maintenance on time and in full is a critical requirement for maintaining the manufacturer's warranty on the oven.

The warranty period of storage is 5 years from the date of manufacture.

The warranty period of operation is 1 year.

Resource – 10,000 hours.



5. Operational Limitations

The environment must be explosion-proof, free of conductive dust, corrosive gases, and vapors in concentrations that destroy insulation and metals, and disrupt the normal operation of the equipment installed in the oven.

6. Storage

Storage conditions of the oven before commissioning in terms of the impact of climatic factors on the environment:

- humidity not more than 85%;
- Storage temperature from +20 to +60°C.

During storage, it is forbidden to expose the oven to sudden shocks.

7. Transportation

Transportation of the oven must be carried out in the manufacturer packaging transport to any distance in accordance with the rules for the transportation of goods applicable to transport of this type.

During transportation, the package with the oven must be secured in any way that excludes its movement inside the transport. During transportation, it is forbidden to expose the oven to sudden shocks and blows, and it is not allowed to rub the oven against any objects.

After exposing the oven to negative temperatures, it is necessary to keep it in the specified operating conditions for at least 4 hours before turning the oven on.

8. Disposal

The oven does not contain harmful materials to humans and the environment. At the end of its service life, the oven must be disposed of in accordance with the local legislation.

