



ELPRO s.r.o., Napajadla 19, 040 12 Kosice, Slovakia

SOLDERING AND ASSEMBLY TECHNOLOGY

Tel.:+421-55-623 1093, www.elpro-ke.sk, email:elpro@elpro-ke.sk

HR-30

Benchtop Drawer Reflow Oven

(60 cm chamber with N2 and exhaust)



User Manual

v.1.21

Dear Customer,

thank you for your trust and for purchasing the HR-30 table reflow oven. This user manual is part of the product. It contains important instructions for putting the product into operation. If you give the product to someone else, make sure that you also give them this manual.

Keep the manual so you can read it again if needed!

Last update 09/23/2022. The text has not undergone language editing. The content is the intellectual property of Elpro, s.r.o. and is protected in accordance with the Copyright Act no. 383/1997 Coll. as amended and by the applicable legal regulations of the Slovak Republic.

CONTENT:

1. Safety Instructions.....	5
2. Package contents and Installation	6
3. Technical Data.....	7
4. Description of control and display devices	8
5. After switching on – First heating cycle	12
6. Description of screens - Main menu	14
6.1. PROFILES	14
6.1.1 Editing - Saddle profile.....	15
6.1.2 Editing - Linear profile	18
6.1.3 Editing - Drying profile	20
6.2. HEAT UP START	21
6.3. SETTINGS	25
7. PC PROGRAM – HR30WIN.....	26
8. ERRORS	34
Appendix A – Declaration of Conformity.....	36

1. Safety Instructions



Use the device exclusively for the purposes specified by the manufacturer, in accordance with the operating instructions and the warranty card. Read the instructions carefully, the manufacturer is not responsible for damages and injuries caused by improper use. The device must be placed on a non-flammable, flat surface, on a safe, immovable structure. Connected to the electricity supply separately and without the use of power strips and extension cables.

Remove all packaging material. If you find damage caused by the carrier, do not use the device and contact the seller. Before turning on the device and starting heating, remove easily flammable or explosive substances (liquids and gases) from its vicinity. In no case, these substances must not be in the vicinity of the oven and the oven door.

During normal operation of the device, some of its parts can heat up to 300 °C. It is therefore prohibited:

- **put your hands in the space of the temperature chamber during work, and immediately after it ends**
- **touch the heating coil and halogen lamps**
- **touching the rack and hot PCBs after reflowing, or material that has undergone a drying program, immediately after opening the door. It is necessary to wait until they are cooled by fans, the operator is prompted acoustically and by information on the LCD display to replace the boards**

When intervention is necessary in the chamber (service), it is necessary to turn off the oven with the main switch and disconnect the power supply. Leave the door open and wait at least 30 minutes for the oven to cool down.

Attach the external thermocouple to the rack when the oven has cooled down - should the thermocouple be inserted while operating the device, there is danger of burns from the metal parts of the oven.

It is forbidden to insert hands or fingers into the door area when they are in the process of closing. Risk of injury!

Do not look directly into the halogen lamps if they are in the reflow phase. There is danger of eye damage. Soldering pastes containing lead are toxic, which is why it is strictly forbidden to eat, drink, or smoke while operating the device. Always wash your hands carefully after working with lead-containing pastes.

Please abide by the national and international regulations pertaining to health and safety at work.

2. Package contents and Installation

Delivery includes

- Oven HR-30
- Suction hose fi 57mm – length 2m
- Power cable (5x2.5) length 3 m with CEE 16 A terminal, 5 pin
- Connecting USB cable type A to B
- USB stick with the installation of the HR30WIN program for PC
- User manual . on a USB stick
- Touch pen – stylus for easier touch screen control
- 4 pcs of K-type thermocouples for external measurement of temperature profiles
- Wooden box with a pallet - necessary for returning goods or repairs
- Movable table 1000x600 mm as a stand under the oven (only on order)

Remove the oven from the wooden box and cardboard packaging and place it on a flat, non-flammable mat or mobile table.. Keep in mind that the front door extends up to 60 cm forwards and you must leave enough handling space.

Plug the device into a separate 3x400V/50 Hz mains socket with a 16 A circuit breaker. Do not connect any other devices to this circuit breaker. During the operation of the device, never cover the upper suction holes of the fans, which serve to cool the melting chamber and ensure an air flow of up to 360 l/min. Also, make sure that there are no small and light objects in the space under the rack when the door is open, which could be drawn in by the cooling fans. (Figure in Chapter 4).

Connect the suction hose to the outlet on the back of the top cover. Connect the other end to a filter device or external suction system. (Figure in Chapter 4).

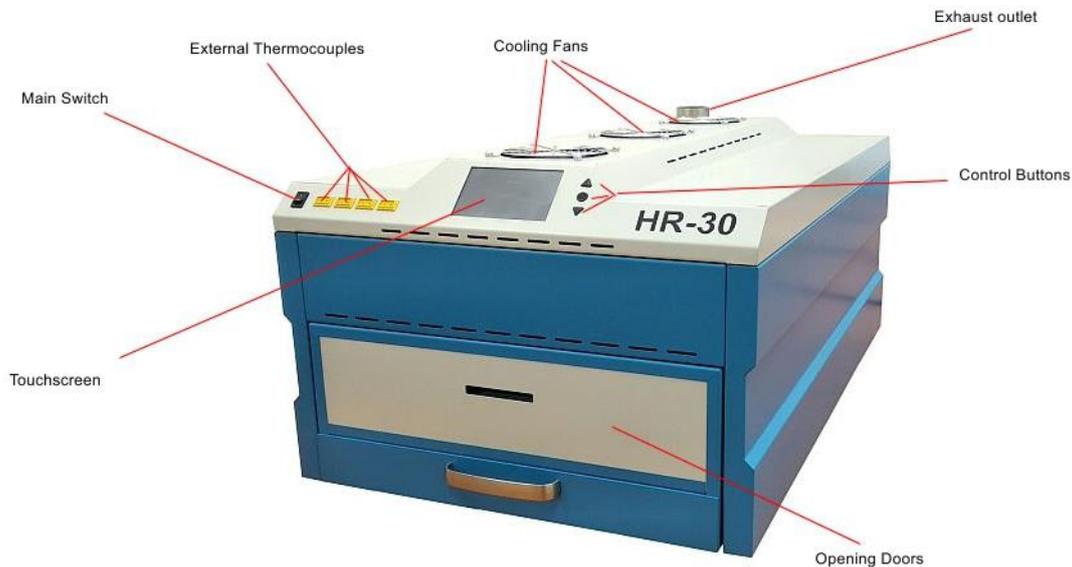
After this, the oven is ready for the first switch-on.

3. Technical Data

HR-30

Power supply	3x400 V, 50 Hz
Electric energy consumption	average 3500 W, max. 7000 W
Electric current supply breaker	3x16A type B
Heating units	8 x linear lamp 1000 W 2 x heating unit 2000 W
The number of reflow / drying profiles	100
Number of zones for a linear profile	6 heating + 1 cooling
Optional gradient (linear profile)	4 levels (0,5 – 1,0 – 1,5-2,0 °C/s)
Max. idle time (linear profile)	100 s
Max. reflow temperature	260 °C
Maximum preheating and reflow time (saddle profile)	600 s + 300 s
Max. drying temperature	150 °C
Drying time	1 - 999 min = 16 hours
Heating the oven to operating mode	< 5 min
Cycle length with basic parameters	an average of 5 minutes
Stabilization time in between cycles	< 3 min
Nitrogen consumption (N2)	560 l/hour average, 1200 l/hour max.
Working pressure of N2	2 – 6 bar
Cooling	4 fans under the rack, adjustable speed
Exhaust 1	Above the closed door while the program is running
Exhaust 2	1500 l/min from inside the chamber after opening the door
Work surface dimensions	600 x 410 mm
Rack dimensions	610 x 420 mm
Max. height for components on PCB	55 mm top side and 30 mm bottom side
Oven dimensions (length/width/ height)	896 x 545 x 420 mm
Weight	48 kg
IP Code	IP 30

4. Description of control and display devices



Front view of the oven HR-30

Main switch - connects mains voltage 3x400V/16A

Connectors for external thermocouples – yellow connectors are located from the top of the oven on the left side.

If necessary, it allows the connection of external thermocouples of the "K" type, with which it is possible to measure the temperature of critical places on the printed circuit board inside the oven (near large circuits, etc.). We recommend fixing this thermocouple mechanically to the board, as well as to the support grid for the boards circuit boards. The measured temperature is displayed on the graph and stored in the memory. You can view them in the HR30WIN program on PC.

LCD touch screen – the main control and display element of the oven. It displays information about the entered profiles, temperatures and times, changes in the parameters of individual profiles, displays the air temperature inside the chamber, the temperature of external thermocouples and other process data.

Using the displayed buttons and keyboards, the user selects and sets the parameters of the profiles and the settings of the entire oven.

Control buttons - serve to control the movement of the door and simultaneously start and end programs.



"CLOSE/START" button - Button to start the motor that closes the door.

When the door is completely closed, the set or last used program starts.

The door can also be closed manually.

"STOP/STANDBY" button - Pressing the button stops the movement of the door during opening or closing.

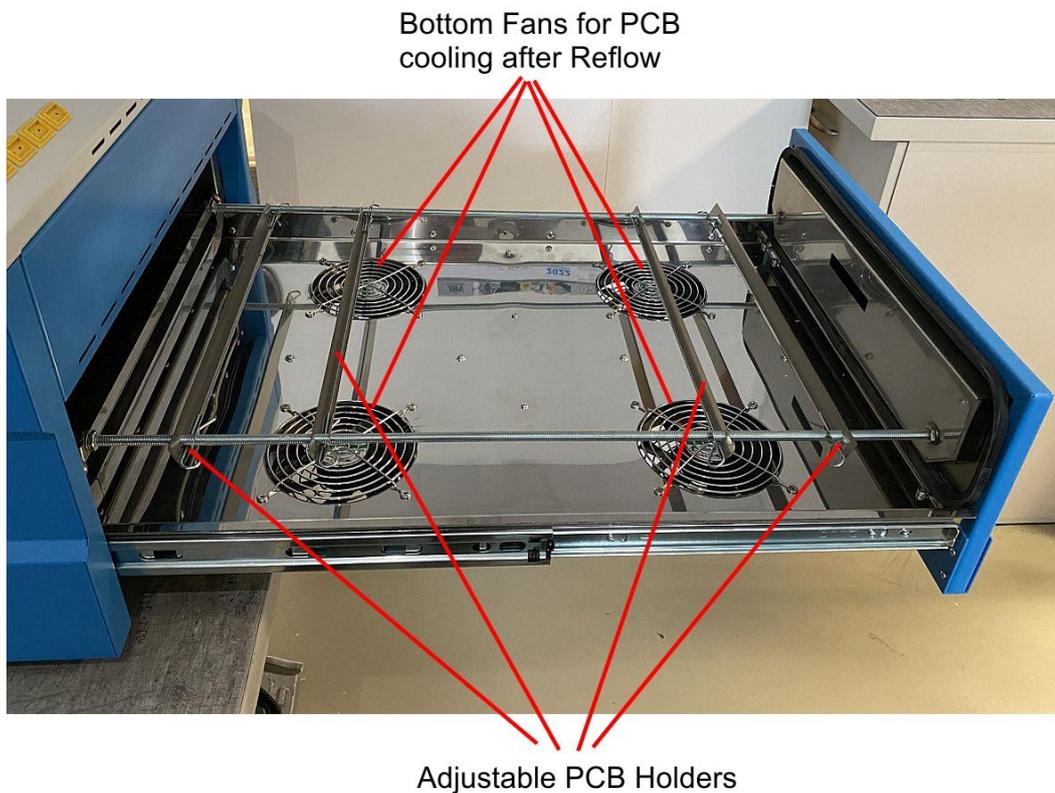
By pressing the button, during one of the running programs, the oven will enter the STANDBY state - Tempering. This means that a stable temperature of 100°C will be maintained in the oven.

We only get to the tempering state if the temperature in the oven when the button is pressed is < 150°C. The tempering process is finished by pressing the "OPEN" button and opening the door.

"OPEN/CANCEL" button - Used to open the door.

Pressing while the program is running will end it. It is necessary to open the door for cooling and then start a new cycle.

Rack PCB Brackets – Adjust to PCB width by pulling out the clip on each side of the bracket and moving it to a new position. PCBs can be stored in several rows in a row.

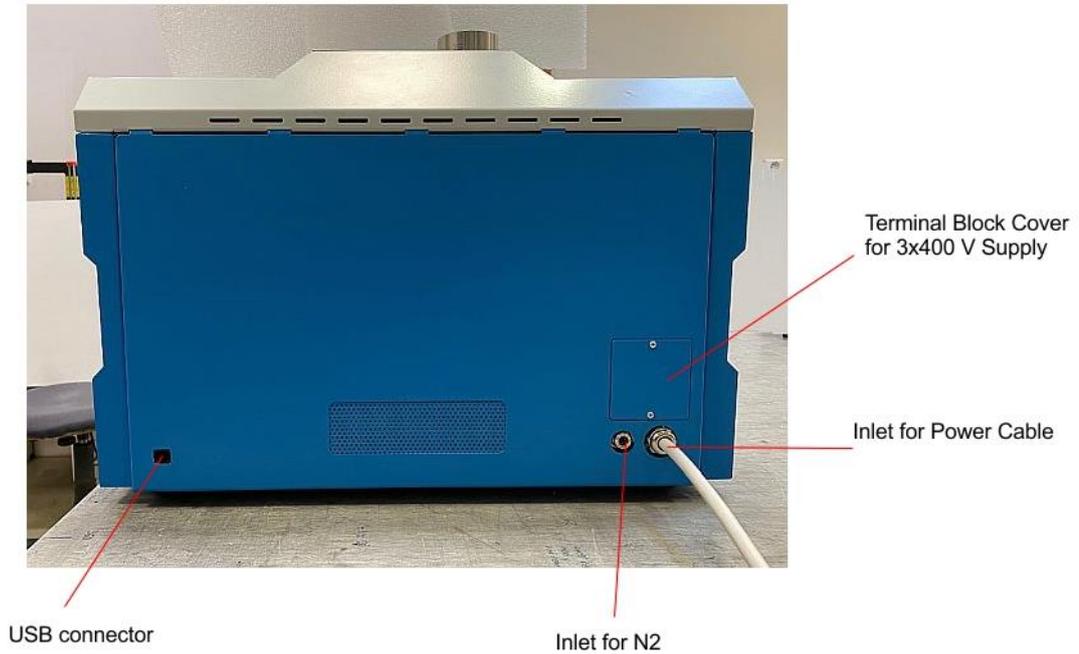


Extraction of soldering fumes – The oven actively extracts soldering fumes from the door tops during the entire soldering cycle. After the remelting is finished, the main extraction of vapors from inside the chamber starts. For the most effective result, this process is divided into 3 phases:

- Starting the extraction fan at maximum speed 5 seconds before the end of remelting. This value can be changed in the HR30WIN program.
- Opening the door to 2 cm gap after remelting to allow clean air to enter, but the smoking PCB still remains in the chamber. The size of the half-open door gap can be adjusted in the HR30WIN program
- After 10 seconds, the door opens to its maximum (or default) length and starts the PCB cooling cycle with the bottom fans. This value can be changed in the HR30WIN program.

Setting of these parameters you could find in chapter 7.

On the back of the oven, in the lower left corner, there is a USB type B connector for connecting to a PC and transferring data to the HRWIN program.



On the right side there is a connector for connecting a hose with nitrogen. Next to it is a passage for the power cable. Above the cable is the cover of the terminal block to which you connect the 3x400V, 50 Hz power supply.

5. After switching on – First heating cycle

After turning on the oven with the mains switch, the initial screen appears before us
 With the left button "PROFILES" we can select or edit profiles, see chapter 6.1.



Pressing the "HEAT UP START" button will start the first heating cycle and the oven will ask us to open the door fully (100%) to calibrate the limit switch. We open by pressing the "OPEN" hardware button.



Immediately after that, the oven prompts us to close the door with the HW button "CLOSE" and after closing, the first heating cycle begins. The oven starts to heat up to a temperature of 200°C and when this temperature is reached the door opens automatically and the oven cools down to an initial temperature of about 100°C.

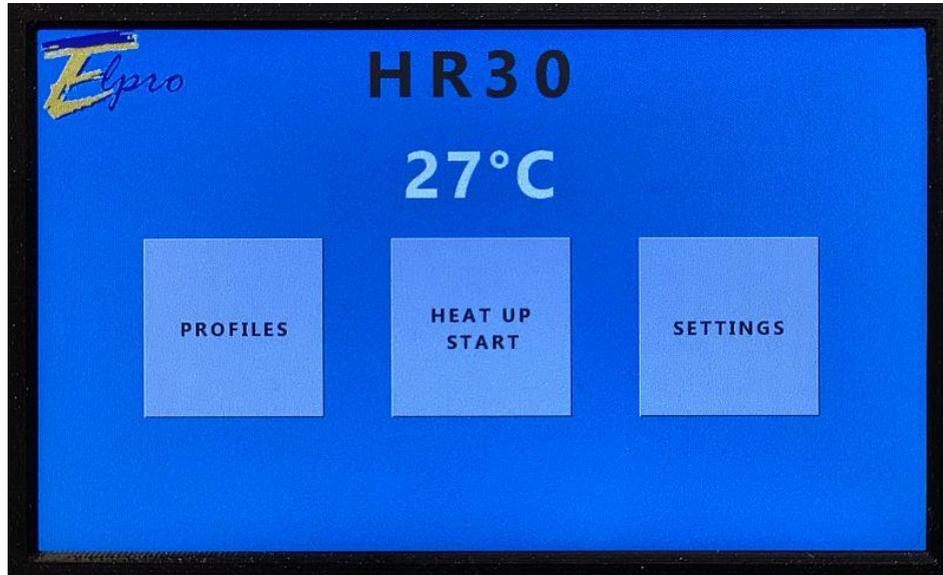
This first heating cycle is necessary to check individual parts of the oven, but it also creates the same conditions for all PCBs that will be remelted. They will always be placed into a chamber that is heated to 100 °C.



After the end of cooling, the oven prompts us to insert the PCB and the normal cycle begins according to selected or edited profile as described in chapter 6.1

6. Description of screens - Main menu

This screen appears as soon as the oven is turned on and has the following Buttons and information:



- **PROFILES** – Button for selecting temperature profiles and editing them
- **HEAT UP START** – Button for starting the selected profile. Immediately after turning on the oven, the last used profile is selected
- **SETTINGS** – Setting oven parameters and service menu.

6.1. PROFILES

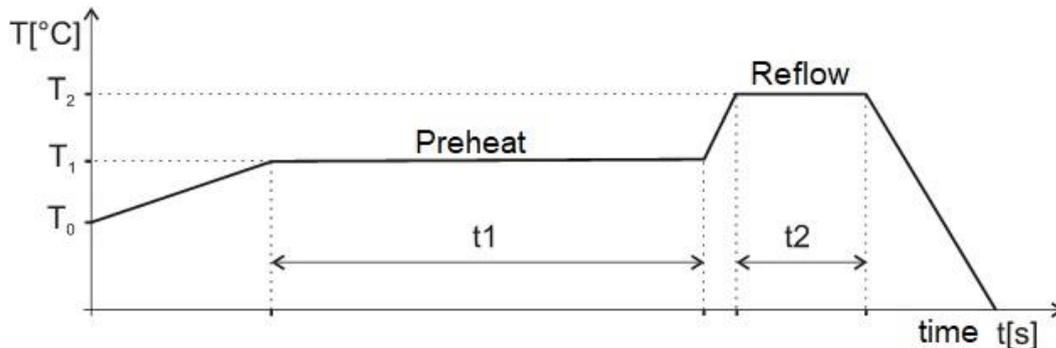
On this screen, we can select one of the saved profiles and set it as the current one by pressing the "Set" button.

We can also edit saved profiles or return to the main menu.

The memory contains 100 profiles, which are displayed 5 on each page.

6.1.1 Editing - Saddle profile

We set to some profile, which is highlighted in yellow, and then press the EDIT button. We get to the profile settings menu. From the factory, all profiles are set as saddle with the same values of temperatures and times. All factory settings are intended for remelting lead-free SnAgCu type



solder paste. When you use paste containing lead SnPb type, you can reduce the temperature values and save energy and the components will be under less thermal stress.

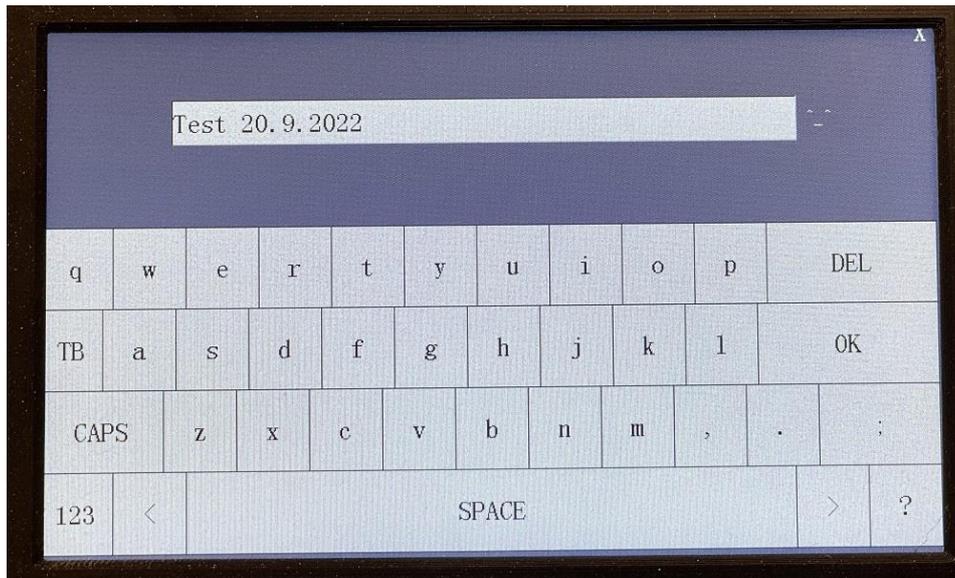
In the first line, we can choose **Type of the profile** - saddle, linear or drying.

We will choose a saddle.

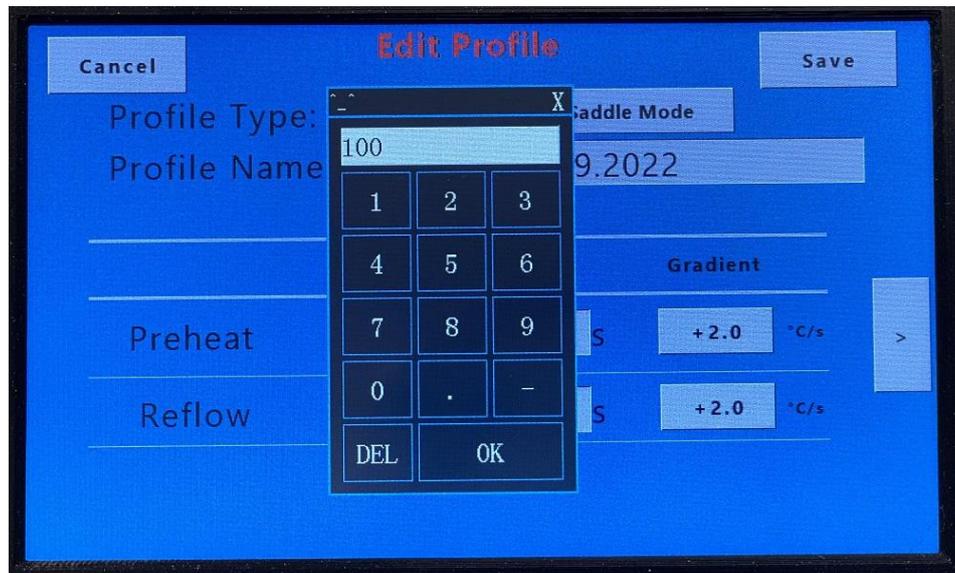
The screenshot shows the 'Edit Profile' interface. At the top, there are 'Cancel' and 'Save' buttons. The 'Profile Type' is set to '08 Saddle Mode'. The 'Profile Name' is 'Default Profile No8'. Below this is a table with columns for 'Temp.', 'Time', and 'Gradient'. The 'Preheat' stage is set to 170 °C, 130 s, and +2.0 °C/s. The 'Reflow' stage is set to 230 °C, 30 s, and +2.0 °C/s. A right arrow button is visible on the right side of the table.

	Temp.	Time	Gradient
Preheat	170 °C	130 s	+2.0 °C/s
Reflow	230 °C	30 s	+2.0 °C/s

In the second line is the **Name of the profile** - when we press this button, an alphanumeric keyboard appears for a text description.



In the next two lines, we set **Time, Temperature and Gradient** for preheating and reflow on the numeric keypad.



The preheating temperature must be lower than the reflow and the temperature can be set to a maximum of 260°C.

With the arrow to the right, we get to the second page of the settings of this same profile

Edit Profile

Profile Type: 08 Reflow Profile
 Profile Name: Default Profile No8

	Point	Delay Time
N2 On	Start Of Profile	5 s
N2 Off	End of Profile	0 s
Cooling Speed	60 %	
Door Opening Distance	75%	

N2 On/N2 Off The user who connects the nitrogen to the oven sets the time when the valve opens and the nitrogen begins to fill in. He can choose the start, end of preheat or reflow or some more seconds from that point. The same way closing of the valve is set - switching off N2. This shutdown must be further in time than the valve opening.

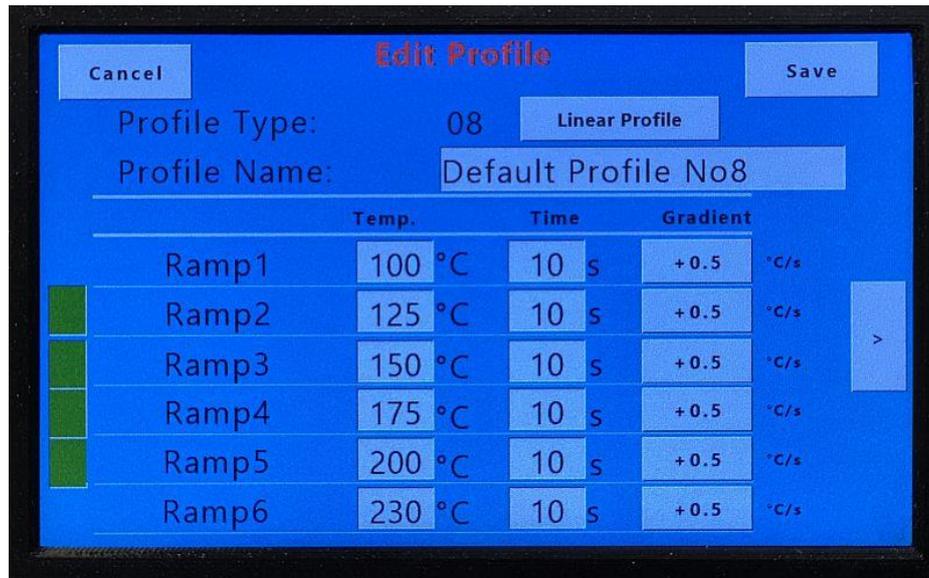
Cooling speed - Adjusts the speed of the PCB cooling fans after reflow and opening the door. The speed can be adjusted in the range of 45-100%.

Door Opening Distance – After reflow, doors can open to 50, 75, or 100% of maximum. The maximum distance is 600 mm.

Press the "Save" button to save the set values and return to the previous screen.

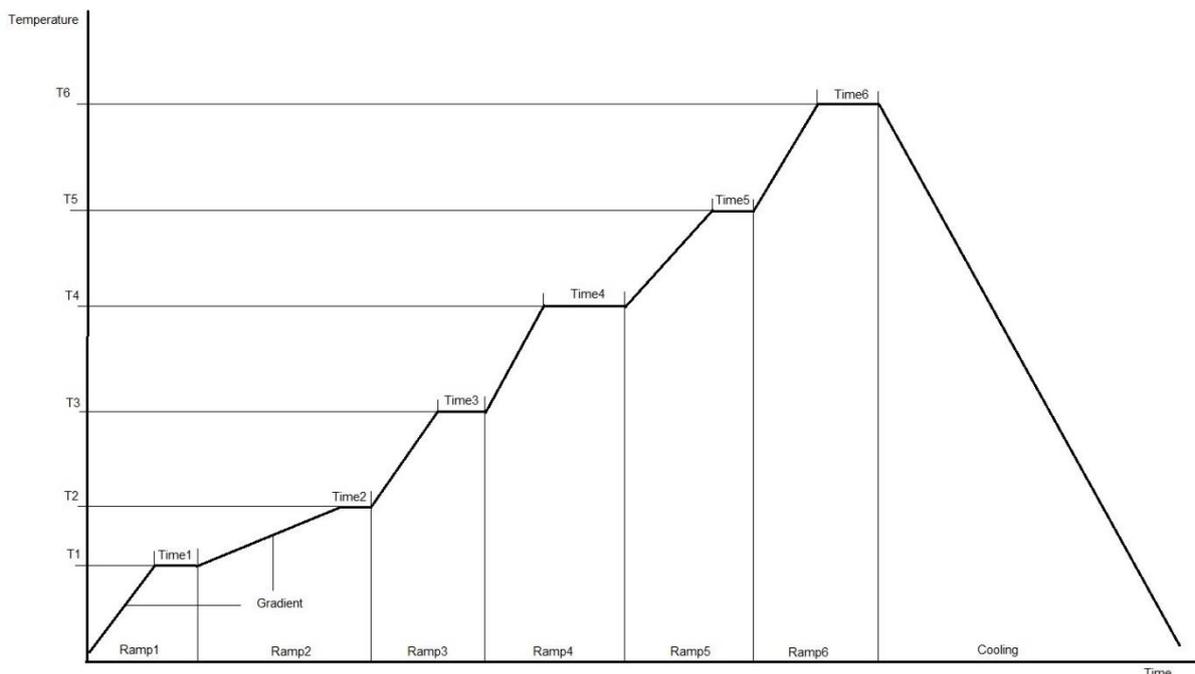
6.1.2 Editing - Linear profile

In the first line, we choose as Profile type - **Linear profile** and we get this screen.



We first edit the **Name** of the profile program.

Then we set the **Temperature, Time and Gradient** for each of the 6 sections of the profile. If all sections are unnecessary, we mark them on the left edge with a red cross.



The temperature T1 of the first section must be at least 100 °C or more. Each subsequent section must have a higher temperature. The time can be set from 0 seconds to 100 seconds. After reaching the temperature Ramp6 and the set time elapses, the door opens and automatic cooling occurs. We influence the steepness of the cooling curve by setting the cooling speed.

The next screen (right arrow) again adjusts nitrogen control, cooling speed and door opening.

Edit Profile

Profile Type: 08 Reflow Profile
Profile Name: Default Profile No8

	Point	Delay Time
N2 On	Start Of Profile	5 s
N2 Off	End of Profile	0 s
Cooling Speed	60 %	
Door Opening Distance	75%	

Press the "Save" button to save the set values and return to the previous screen.

6.1.3 Editing - Drying profile

In the first line, we choose as Type of profile - **Drying profile** and we get this screen.

The screenshot shows a blue screen titled "Edit Profile" with a "Cancel" button on the top left and a "Save" button on the top right. The screen displays the following parameters:

- Profile Type: 08 (with a "Dry Profil" button next to it)
- Profile Name: Default Profile No8
- Initial Temperature: 50 °C
- Dry Temp: 120 °C
- Dry Time: 100 min
- Cooling speed: 0 %

We first edit the **Name of the profile**.

Then we set the **Initial temperature** - at least 50 °C. The chamber will be cooled to this temperature after finishing the profile for the repeatability of the drying conditions.

We also set the **Drying temperature**, with the maximum temperature being 150°C.

Next, the **Drying time** is set, which is set in minutes and the maximum value is 999 minutes, which is approximately 16 hours.

Finally, we set the **Cooling speed** after the drying process is finished. Allowed values are 0% and then range 45-100%. At a setting of 0%, the cooling fans do not spin at all and the material cools down slowly to room temperature.

With this type of profile, the N2 and door opening parameters are not set.

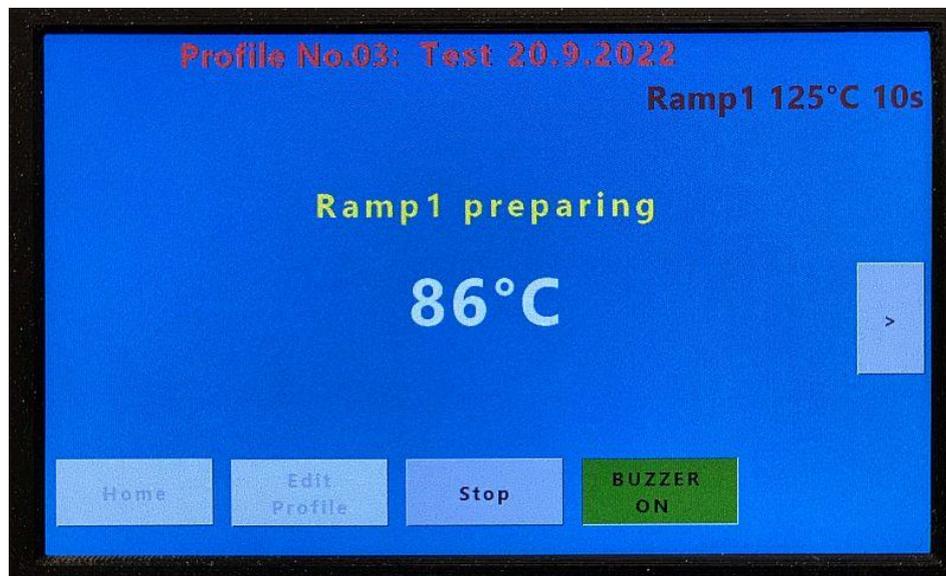
By pressing the Save button - we save the set values and return to the previous screen.

6.2. HEAT UP START

After pressing the "HEAT UP START" button, the following screen will appear on which there is a request to open the door, insert the PCB and close the door.



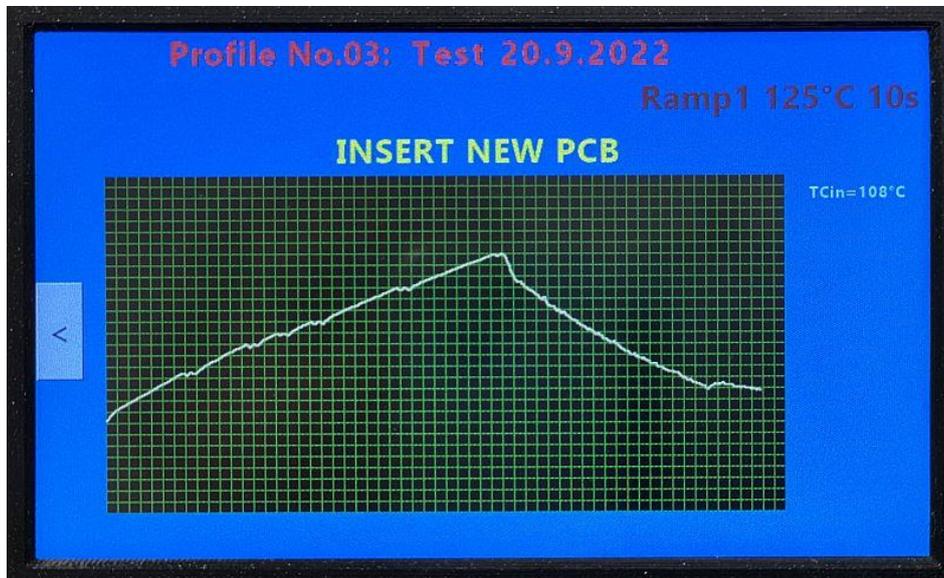
As described in chapter 4, the currently selected or last used profile is activated after the door is closed. Immediately after turning on the oven, the last profile used before turning off the oven is set.



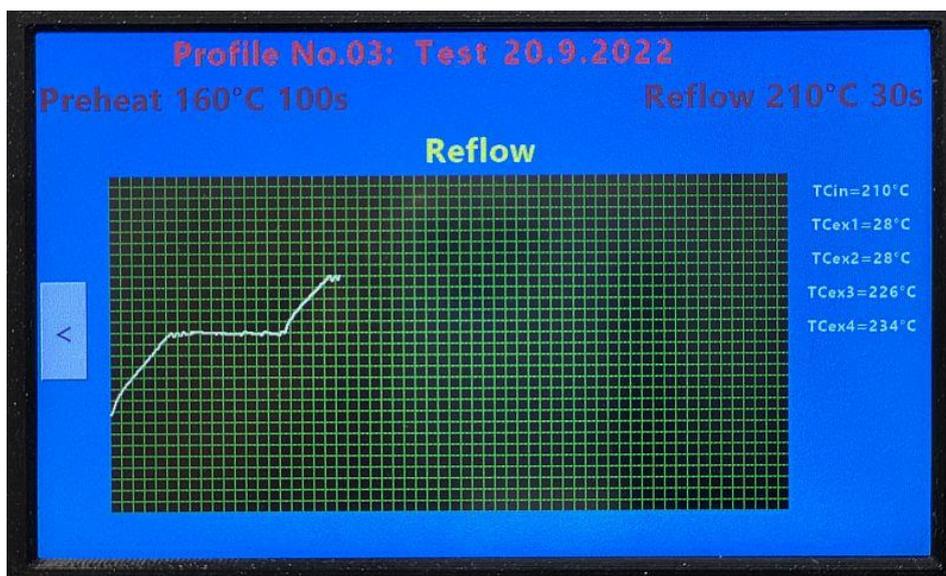
Next, we just watch the progress of the temperature in the chamber on the screen and notices about the state of the profile we are currently in. When the selected temperature is reached, we can also watch the countdown of the set time.

By pressing the arrow on the right, we get to the graph of the temperature up to the current moment.

This graph is automatically refreshed. The current temperature of the internal thermocouple is displayed to the right of the graph first from the top.



When we have external thermocouples connected, we can also monitor their progress in different colors. As described in chapter 4, this graph is only informative, and we can view the exact values only after transferring the measured profile to the PC. The oven has a memory for only one profile, so only the last measured one is always transferred.



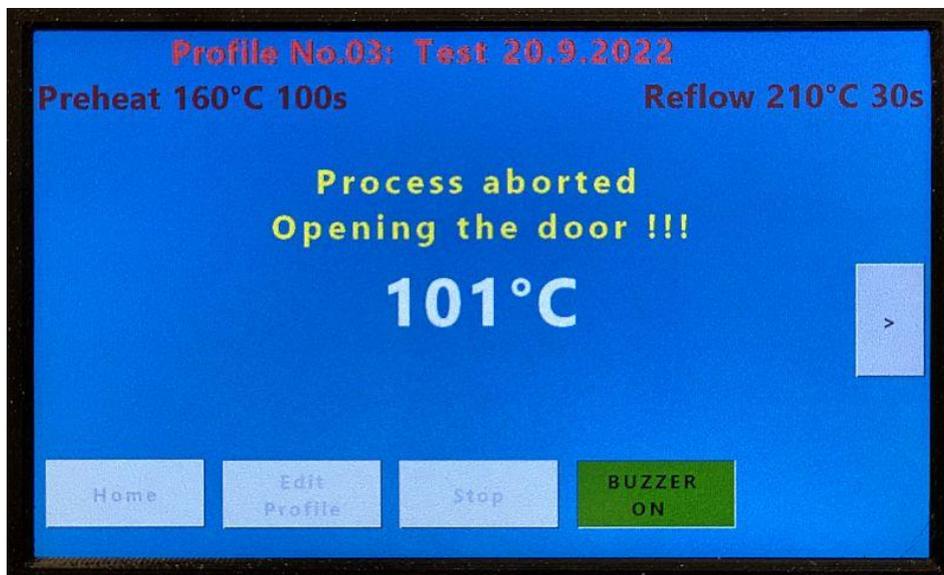
The grid on the graph has the following parameters

- Horizontal axis – 1 square represents 10 seconds
- Vertical axis – 1 square represents 10 °C

After the profile is finished, the door opens and the bottom fans cool the extended PCB. At the same time, the extraction of soldering fumes from the inside of the chamber is switched on. This also cools the oven chamber to the initial temperature, which the following screen informs us about.



You can end the running program at any time by pressing the "Stop" button. We also end the program by pressing the "OPEN/CANCEL" control button. see chapter 4.

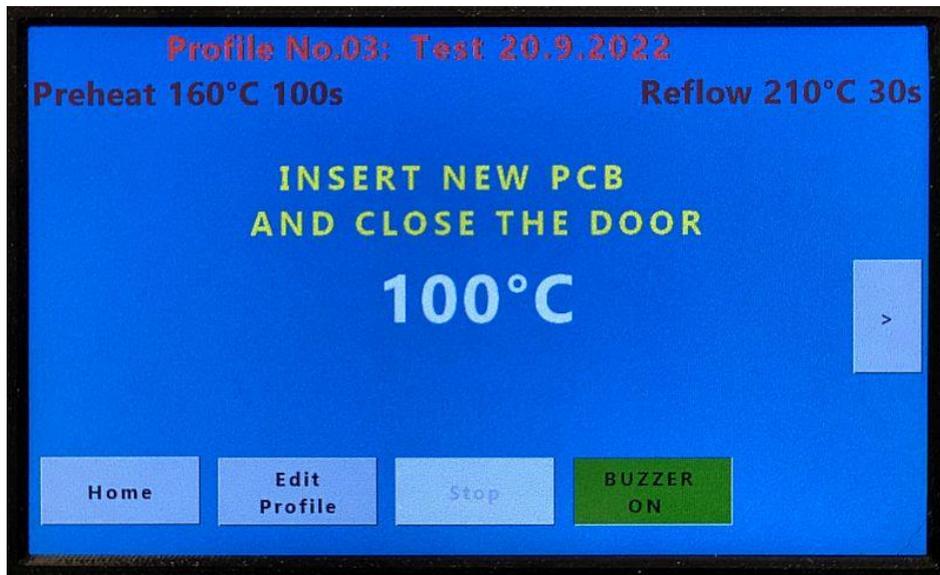


The door opens and cooling begins.

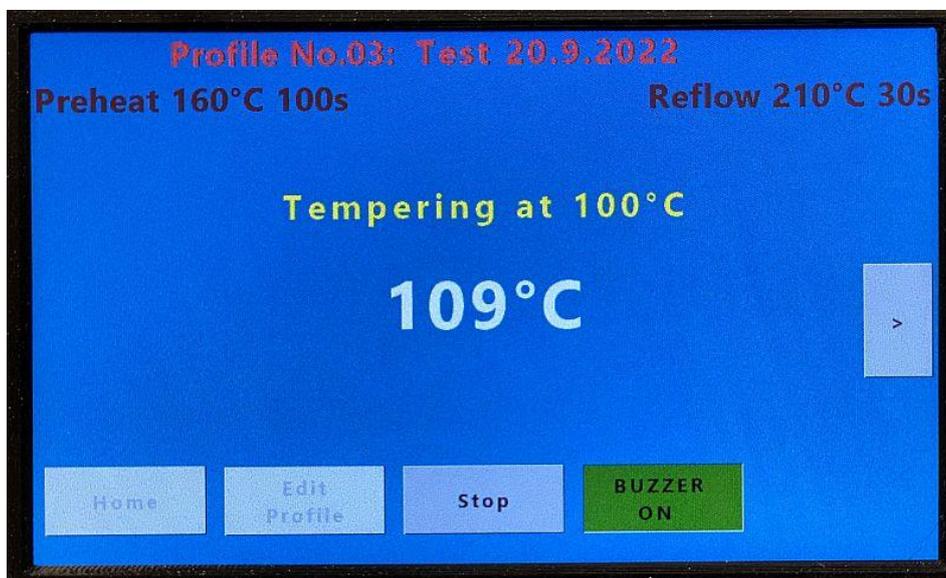
Cooling continues until the temperature of the chamber cover reaches the initial temperature, which corresponds to approximately 100°C measured by the thermometer inside the chamber, and this temperature is showed on the display.

The "BUZZER ON / OFF" button turns on and off the acoustic signaling of the oven status.

After the end of cooling, the oven prompts us to insert another PCB and by closing the door we start another cycle. Then the "Edit Profile" button is also accessible, where we can change the current profile as needed for further use.



At this moment, the oven can be turned off with the main switch or, after closing the door, keep it in Standby mode by pressing the "STOP/STANDBY" button - see chapter 4.



The tempering state is canceled by opening the door and starting a new cycle.

6.3. SETTINGS

In this section, the basic parameters of the oven are set, but it is accessible only to the manufacturer or an authorized service.

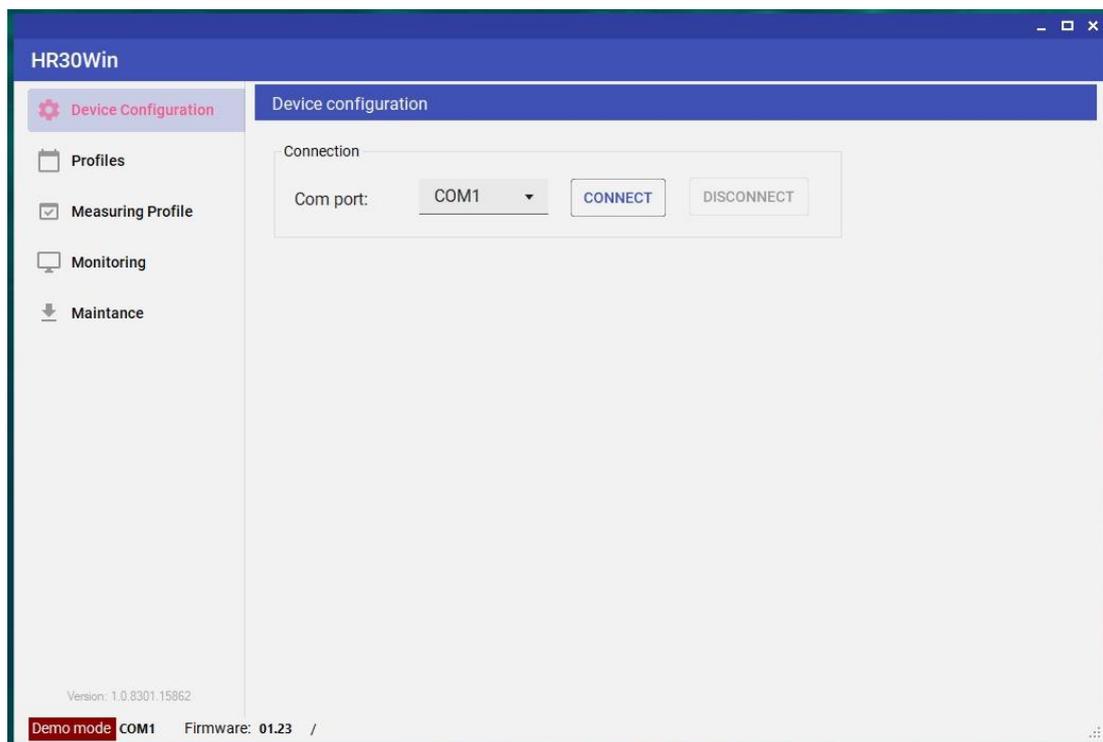
7. PC PROGRAM – HR30WIN

The PC program HR30WIN was created to improve the quality of work with the oven. It allows data to be downloaded from the oven, displayed, analyzed and backed up for further use. It also offers a more convenient way to set up profiles and also serves to set up and modify the manufacturer or an authorized service.

The basic parameters of the HR30WIN program are:

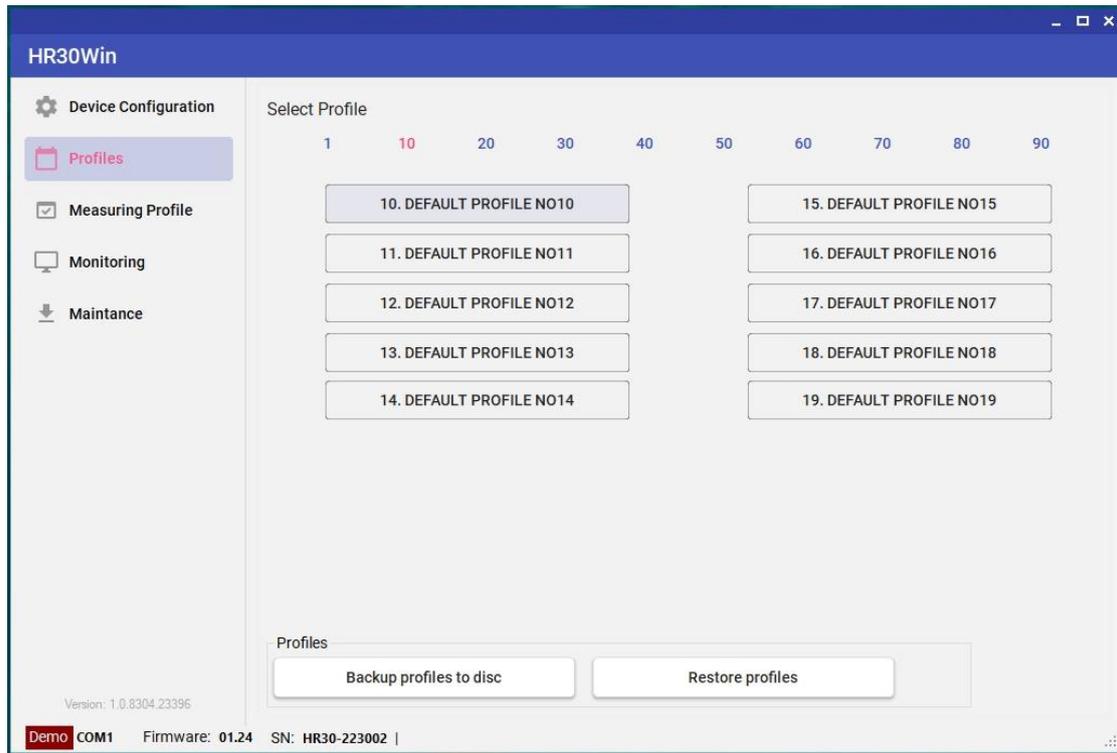
- Runs under Windows 10 operating system or higher
- To connect to the oven, it uses a cable connection via a USB port
- It is supplied on a USB stick in the form of a self-installation program of the .exe type.
- Uses your PC's Internet connection to search for the latest update, which is available

After installing the program, the HR30WIN icon will appear on the Desktop. We turn on the HR-30 oven and connect it to the PC using the supplied USB cable type A to B. We start the program and the Device configuration screen appears for us:



The COM port to which the HR-30 oven is connected is set here. We select the port and press the "CONNECT" button to start data transfer from the oven, which is informed by the text on the bottom bar of the window.

After loading the current data from the oven, we can view the set profiles in the following window and we can also edit them.



There are also buttons on this screen to archive the settings of all 100 profiles to your computer's disk. We can also upload and view all saved profiles.

Here is the screen for setting the saddle profile in the same way as it is done on the stove. See chapter 6.1 – Editing the saddle profile.



Pressing the SET DEFAULT VALUES button will set the original default values for this profile.

We send the program to the oven by pressing the SAVE button. The oven must be inactive and showing the Home screen at the time - see chapter 6.

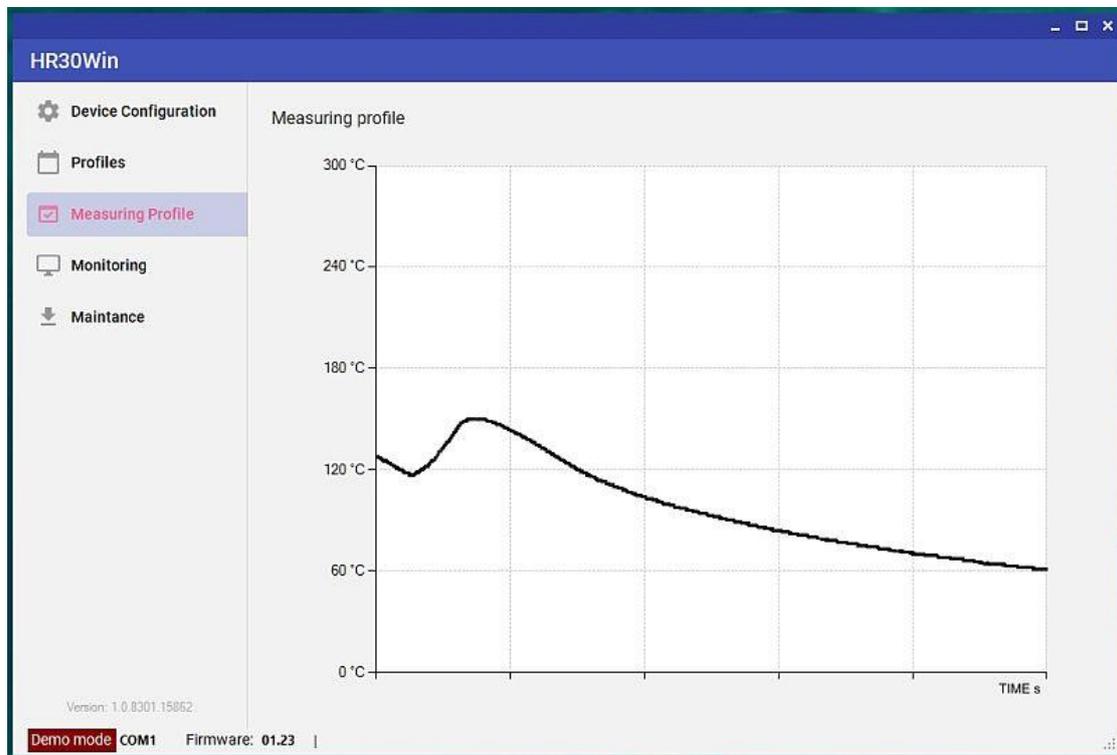


We also set the linear and drying profile in the same way.



Press the CANCEL button to return to the display screen of all profiles.

In the next window, we can view the graph of the last measured temperature profile in the oven. The measurement curve from the internal thermocouple located in the chamber above the PCB is displayed.



If external thermocouples were also connected, their curves are also displayed.

After placing the cursor on a point of the curve, its temperature and time since the beginning of the measurement will be displayed in the window. From this data, we can calculate the duration of sections or the maximum and minimum temperature on a section, or the steepness, etc.

For a more detailed analysis with a report and the ability to measure up to 8 channels at once, we recommend purchasing a special Datalogger device, for example the MTP-05 from the manufacturer ELPRO.

The measured data can also be exported in *.csv *.xls and *.txt format. These can then be viewed and analyzed in other PC programs.

In the next "Monitoring" window, the current internal data of the oven is displayed.

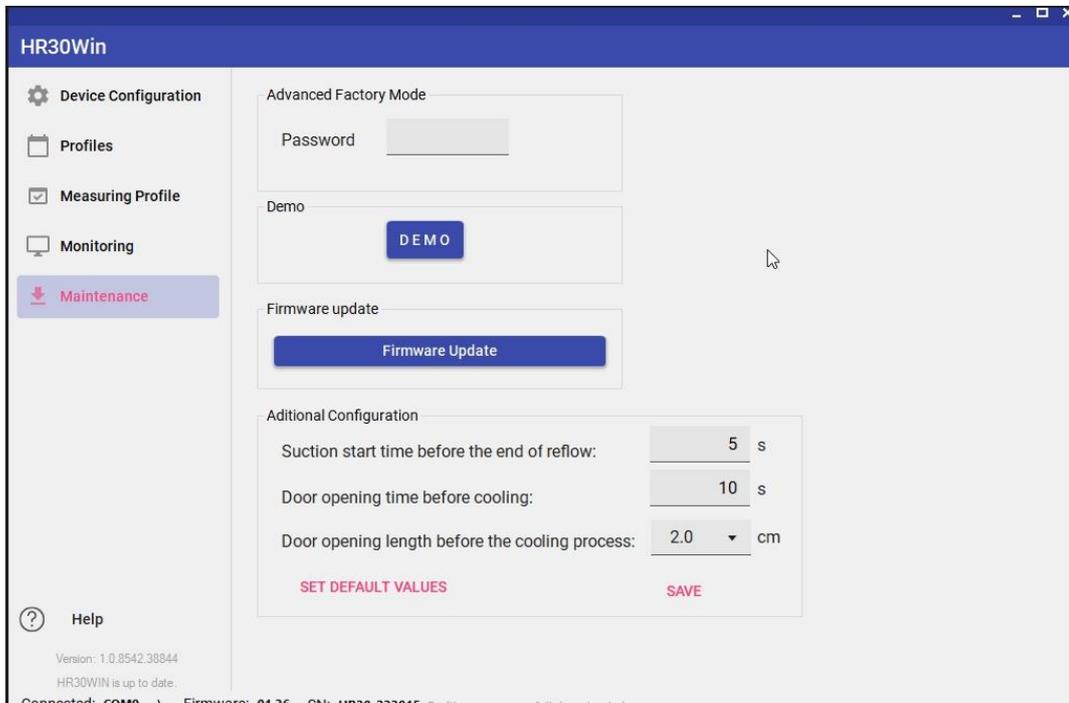
The screenshot shows the HR30Win software interface. On the left is a navigation menu with options: Device Configuration, Profiles, Measuring Profile, Monitoring (highlighted), and Maintenance. The main area displays two data tables. The first table, titled 'Temperature', lists internal and external sensor readings in degrees Celsius. The second table, titled 'Power', lists power line frequencies in Hz. At the bottom left, it shows 'Version: 1.0.8301.15862' and 'Demo mode COM1 Firmware: 01.23 /'.

Temperature	
Internal air temperature 1	58,2 °C
Internal air temperature 2	57,0 °C
External sensor 1	61,0 °C
External sensor 2	26,8 °C
External sensor 3	- °C
External sensor 4	- °C
External sensor 5	- °C

Power	
	Frequency
Power line 1	70,4 Hz
Power line 2	12,7 Hz
Power line 3	87,7 Hz

Version: 1.0.8301.15862
Demo mode COM1 Firmware: 01.23 /

The last "Maintenance" window is used to start the Demo mode, Firmware Update and to save the downloaded data from the oven to disk and upload them back to the HR30WIN program. Some options are only for the manufacturer or authorized service when working with the oven and are only accessible after entering a password



To upgrade the firmware in the oven to a higher version, the user must have an upgrade file in the form of "xyz.hr30" provided by the manufacturer or reseller. You can find a more precise description of the firmware upgrade process in the help file of the most current version of the HR30WIN program.

For ovens that already contain firmware in version 1.26 or higher, the parameters for extracting soldering fumes from the oven appear in the lower part of the window, which the user can change. These are the following data:

Suction start time before the end of reflow – This period of time is set so that the suction fan starts increasing its speed up to the maximum before the door is opened after the end of reflow. According to the manufacturer's tests, 5 seconds is enough to reach maximum speed. The user can change it.

Door opening time before cooling – This is the time after remelting that the door remains ajar to the default gap. During this time, most of the smoke will be drawn from the remelting chamber and then the door will be opened fully and the cooling process will begin. According to

the manufacturer's tests, 10 seconds are enough for this. The user can change this value. Too long a time without cooling can lead to the formation of a coarse-grained structure in the soldered joint and increases the risk of later cracks in the joint. Follow the paste manufacturer's recommendations.

Door opening length before the cooling process – The size of the gap required for the intake of cold air after the end of remelting. To write the set parameters to the oven, it must be inactive and show the Home screen as described in chapter 6.

Other options are only for the manufacturer or authorized service when working with the oven and are only accessible after entering a password.

8. ERRORS

During program execution or during diagnostics, the control system can detect hardware errors. These are the follow

Power failure on phase X. - there has probably been a disconnection or interruption of voltage on one of the 3 phases. Check the connection or circuit breakers - always turn off the oven with the main switch first.

Temperature measurement error. the control system does not receive information from all internal thermocouples. In the event of this error, contact your dealer or the manufacturer of the table reflow oven HR-30, for example via email elpro@elpro-ke.sk

If a halogen lamp burns out, it can be replaced immediately on the spot with the same type, or the same size and performance. The manufacturer recommends replacement radiators (PHILIPS Plusline Pro, type: 494344 XX, 1000 W, base R7s), which will be supplied by your dealer or the manufacturer of the table reflow oven HR-30 together with replacement instructions.

The HR-30 oven is equipped with its own diagnostics, and in the event of any error on the display, contact your dealer or the manufacturer of the HR-30 oven, for example via email elpro@elpro-ke.sk.

Of course, we will also be pleased with the feedback from the users of the application, it will contribute to its improvement. You can also send your other comments and suggestions, for which we thank you in advance.



Please see other ovens from our production.



Appendix A – Declaration of Conformity

CE Declaration of Conformity

Issuer's name and address: **ELPRO, s.r.o.**
Napájadlá 19
040 12 Košice
Slovakia

Product: **Batch Reflow Oven**

Type designation: **HR-30**

Declare under our sole responsibility that above designated products are in conformity with the following EC directives:

2014/35/EC – (Low-Voltage Directive)

2014/30/EC – (EMC Directive)

2006/42/EC – (Machine Directive)

Full compliance with the standards listed below proves conformity of the designated products with the provisions of the above-mentioned EC Directives:

Electrical safety: STN EN 60335-1+A11:2002, STN EN 60335-2-45:1997,
STN EN 60335-1+A1+A12+A13+A14:1999,
STN EN 60204-1:2019-02

EMC: STN EN 55011:2016/A1:2017,
STN EN 61000-3-2:2014,
STN EN 61000-3-3:2013

Mechanical safety: STN ISO 12100:2011-06

Košice, 23.09.2022

.....
Place, Date


.....
Ing. Pavel Bratko – CEO

ELPRO, s.r.o.
Napájadlá 19
04012 Košice

Tel.: +421 55 623 10 93
Fax.: +421 55 577 19 57
www.esdshop.sk

VAT no.: SK2020482134
Company ID: 2020482134
Trade reg. no: 31718604