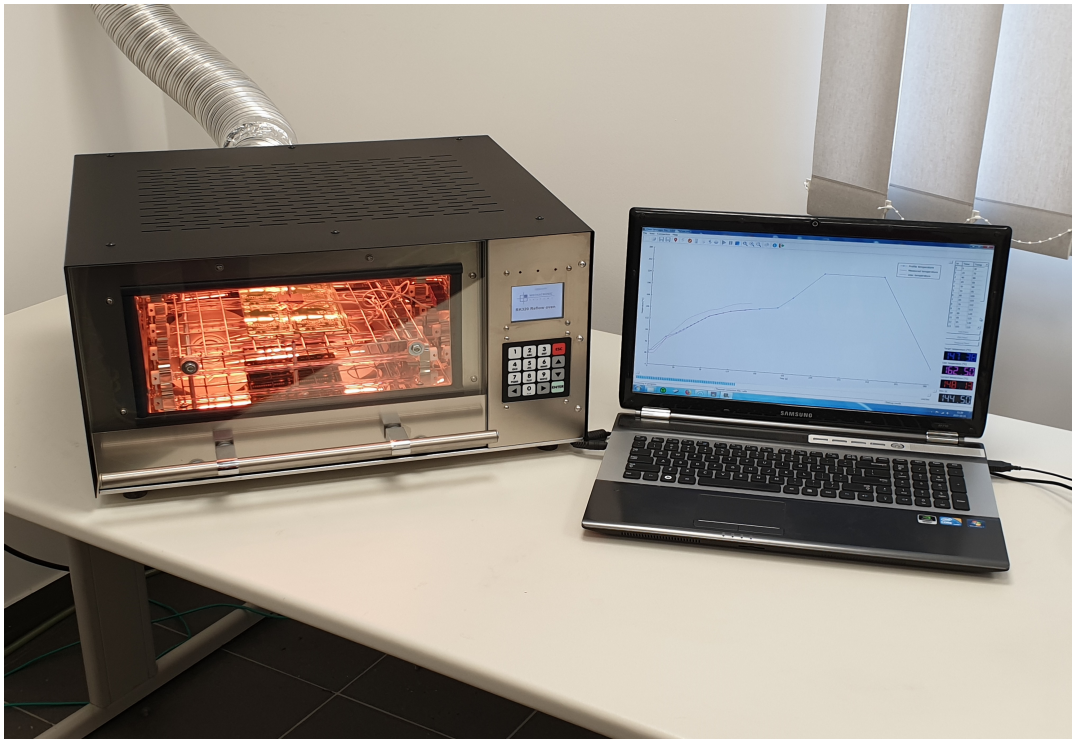
OPERATING INSTRUCTIONS

REFLOW OVENS RK320, RK360, RK460

OvenManagerPro 3.5.2



Types of reflow ovens

Types	Heating area (mm)	Rated power (W)	Power requirements (VAC/ Hz)
RK320	320 x 220	max. 3500	220 /50-60
RK360	460 x 410	max. 3500	220/50- 60
RK460	460 x 410	max. 4800	380/50-60

General information

This document contains all information for the intended use of the system/product delivered. This document is intended for persons with basic knowledge of installation and operation of software-controlled systems. General knowledge of operational safety as well as basic knowledge of using PCs running Microsoft Windows® are required.

- Read this document and possibly associated safety data sheets carefully before first start-up and usage of the components.

- Observe the safety regulations as well as the regulations on operational health and safety and protection of the environment.

- Use the system/product only in a technically perfect condition.

- Observe all labels and safety signs on the system/product.

- Never remove the safety signs and replace or clean them if not readable anymore.

- Persons who install, operate, uninstall, or maintain our systems/products must not be under the influence of alcohol, other drugs, or medication that impairs the ability to react.

- Use only approved spare parts and accessories in order to prevent injuries due to unsuitable spare parts and accessories.

-Observe the technical data and ambient conditions specified in this document.
Validity

This document is part of the system/product and corresponds to the technical state at the time of publication. This document has always to be present at the system/product and has to be available to the operating personnel without restrictions, in a complete and legible form and at all times. If the operator changes, this document has to be handed over together with the system/product. The operator has to ensure that all safety measures specified in this document are observed.

The operating personnel must have read and understood this document before performing any task. A basic requirement for safe work is observance of all safety notes and steps. This document contains important information about the system/product that has to be observed when installing, first starting up, or maintaining the system/product. Its structure allows trained personnel to perform all tasks.

Mechatronic Engineering Sp z.o.o reserves the right to make changes in respect to the content of this document. The figures in this document serve as basic understanding and can differ from the actual state of the system.

Structure of warning messages and safety notes

The safety notes and warning messages in this document identify hazards and risks and they are created in accordance with ANSI Z535.6-2011 and the standards series ISO 3864.
The warning messages are structured as follows:

-Warning sign (only for injuries)

-Signal word indicating the hazard class

-Type and source of the hazard

-Consequences of non-observance

-Measures to avoid the hazard

Warning messages can also be embedded in the format of the surrounding text in order to avoid a visual disruption in a sequence. In this case, they are distinguished as follows:

Type and source of the hazard!
Consequences of non-observance.
Measure(s) to avoid the hazard.
Warning messages are classified in hazard classes represented by the signal word. In the following, the warning messages are described in accordance to their hazard classes:

Limited liabilit

All data, notes and instructions in this document have been prepared with consideration to the statutory standards and regulations, the present state of technology, as well as our many years of knowledge and experience.

Mechatronic Engineering accepts no liability for damage due to:
non-observance of this document

-improper use of the system/product

-employment of personnel that is not sufficiently qualified

-unauthorized modificatio

-technical changes

-unauthorized manipulation of the safety devices

-use of spare parts that are not approved by producer

The actual scope of delivery can deviate from the explanations and presentations given here, due to custom designs, the utilization of additional order options, or due to the most recent technical changes.

We reserve the right for technical modifications of the product for reasons of improved usability and future development.

The responsibilities agreed in the delivery contract, the General Terms and Conditions as well as the delivery conditions of the manufacturer and the statutory regulations valid at the time of the conclusion of the contract are effective.

Warranty

Please note that the warranty is subject to the current regulations in combination with the current General Terms and Conditions.

All information and instructions in this document have been compiled in observance of current regulations and the current state of the art. Before working with the system/product, this document has to be read carefully. The manufacturer assumes no liability for damage and faults due to non-observance of this document.

Mechatronic Engineering sp z.o.o provides a 12-months warranty if the following conditions are met:

The warranty starts on delivery.

The warranty covers defects in material or manufacture. During the warranty period, such defects are remedied without cost by replacement or rework of the defective parts. This service is provided by the Mechatronic Enginnering Service.

The operating conditions described in this document have been complied with.

The maintenance work described in this document has been executed and documented at the specified maintenance intervals.

For further information on wear parts refer to the chapter scope of delivery.

Customer service for technical information contact our Service:
Address:

10191 SW Avery Street
Tualatin, OR 97062
United States

support@pcbunlimited.com

1. Safety

This chapter provides an overview of all important safety aspects for protecting persons as well as for a safe and fault-free operation of the system/product. There are further warning messages in the sections of the individual lifecycle stages.

1.1 Intended use

RK series oven RK320, RK360, RK460 are infrared and hot air circulatio. Their main application is reflow soldering of PCBs but they can be used for the applications listed below

RK series ovens RK320, RK360, RK460 have following applications:

-Lead-free reflow soldering

-Curing adhesives

-Curing through-hole plating pastes

-Curing solder masks

-Drying components

If in doubt, contact Mechatronic Engineering Service for alternative materials or processes.

Any other kind of use is considered as not intended use. The manufacturer is not liable for any resulting damage; the operator alone bears the risk. Part of the intended use is also to follow the instructions for safety in this user manual with regard to operation and maintenance of the system.

Foreseeable misuse

Do not use the system for processing easily flammable materials (e.g. paper, wood etc.).

1.2 Residual risks

No residual risks have currently been identified, if the intended use as well as all safety regulations are observed. Any identified residual risks and their avoidance are listed in the form of safety instructions starting in chapter 1.3. Non-observance can cause personal injuries and property damage.

1.3 Responsibility of the operator

Operator

The operator is the person/company who operates the system/product themselves for industrial or commercial purposes, or makes it available to a third party for use and has the product responsibility for the safety of the system operator/user, the personnel in general, and other persons present.

Operator's obligations

The system/product is used in the industrial sector. The operator of the system/product is thus subject to the statutory obligations for occupational health and safety.
In addition to the safety instructions in this document, the safety, accident prevention, and environmental protection regulations must also be observed at the system's/product's place of operation.

The following applies in particular:

The operator must inform himself about the effective industrial safety regulations and determine additional hazards in a risk assessment that result from the special working conditions at the system's/product's place of operation. The operator has to implement these in the form of operating procedures for the operation of the system/product.

During the total operating life of the system/product, the operator has to check and ensure that the established operating procedures comply with the current state of the rules and standards and adapt them, if necessary.

The operator has to define clear-cut responsibilities for installation, operation, trouble-shooting, maintenance, and cleaning.

The operator has to make sure that all persons who are working with the system/product have read and understood this document. Furthermore, the personnel has to be trained and informed about the dangers on a regular basis.

The operator has to provide the required personal protective equipment and instruct the personnel to wear it.

The operator has to instruct the personnel to maintain a clean and tidy workplace. Eating and drinking at the workplace and especially while operating the system/product must not be permitted.

The operator is also responsible to keep the system/product in good working order. Thus, the following applies:
The operator has to ensure that the maintenance intervals stated in this document are observed.
The operator has to check all safety devices for proper function and completeness on a regular basis.

1.4 Personnel requirements

The various tasks described in this document require different qualifications of the persons who are to perform these tasks.

If no personnel qualifications are listed in the individual chapters of this document, the operating personnel are intended to perform the tasks.

Only persons who can be expected to perform the tasks reliably are authorized to perform the tasks.

Persons whose ability to react is impaired, e.g. through drugs, alcohol, or medication are not approved as personnel.

This document uses the following qualifications for persons for the different tasks.

Qualified electrician

A qualified electrician is able to perform work on electrical systems and to detect and avoid possible dangers on his/her own based on his/her professional training, know- how and experience as well as knowledge of the applicable standards and regulations.
The qualified electrician has been trained for the special field where he/she works and knows the relevant standards and regulations.

Maintenance personnel of the operator

Maintenance personnel are those persons who are designated by the operator to perform simple maintenance tasks (e.g. cleaning the system/product, removing parts from the system/product). The operator has to ensure that the personnel is suited for performing the work.
The maintenance personnel are able to perform their work and to detect and avoid possible dangers on their own based on their professional training, know-how and experience as well as knowledge of the applicable standards and regulations.
The maintenance personnel have been trained for the special field where they work and know the relevant standards and regulations.

Service personnel

Service personnel are persons who are authorized by the supplier Mechatronic Engineering for servicing the system/product. These tasks may only be performed by the LPKF Service.Operating personnel.

Operating personnel trained by the operator are able to perform their work and to detect and avoid possible dangers on their own based on the training performed by the operator, their professional training, and their know-how and experience.
The operating personnel have been trained for the special field where they work and know the relevant standards and regulations.

1.5 Personal protective equipment

Personal protective equipment protects against health or safety risks when working with the system. The individual sections of this manual each point out the personal protective equipment (PPE) that has to be worn during the different tasks of working on the system.

2.Technical data

The following tables contain the technical data of the system:

2.1 Technical data RK 320

Mechanical data

Data	Value	Unit
Dimensions (width × height × depth)	540 × 300 × 480(~21.3 × 11.8 × 18.9)	mm (inch)
Weight	30 (~66.1)	kg (lbs.)

Electrical data

Data	Value	Unit
Power supply	220 to 240	V AC
Frequency	50	Hz
Power	3500	W

Climatic conditions

Data	Value	Unit
Temperature range (operation)	15 to 30 (59 to 86)	°C (°F)
Max. humidity, non-condensing	50 - 70	%

Process data

Data	Value	Unit
Heating area (top and bottom)	320 × 220 (~12.6 × 8.7)	mm (inch)
Temperature range	30 to 290 (86 to 554)	°C (°F)
Process duration per cycle for PCB size 300 × 200 mm (~11.8 × 7.9 inch)	4 to 5	min
Min. PCB size	40 × 50 (~1.6 × 2.0)	mm (inch)
Max. PCB size*	300 × 200 (~11.8 × 7.9)	mm (inch)
Max. PCB thickness	10 (~0.4)	mm (inch)

*It is advisable not to exceed the PCB size specified in the manual, inserting a PCB exceeding the dimensions specified in the manual may result in failure to heat the PCB and prevent air circulation inside the heating chamber.

Emissions

Data	Value	Unit
Sound pressure level LpA (EN ISO 3744)	< 70	dB (A)
Sound power level LwA (EN ISO 3744)	< 70	dB (A)
EMC limit class		–

2.2 Technical data RK 360

Mechanical data

Data	Value	Unit
Dimensions (width × height × depth)	630 × 300 × 675 (~23.8 × 11.8 × 26.6)	mm (inch)
Weight	55 (~121.3)	kg (lbs.)

Electrical data

Data	Value	Unit
Power supply	220 to 240	V AC
Frequency	50	Hz
Power	3500	W

Climatic conditions

Data	Value	Unit
Temperature range (operation)	15 to 30 (59 to 86)	°C (°F)
Max. humidity, non-condensing	50 - 70	%

Process data

Data	Value	Unit
Heating area (top and bottom)	460 × 410 (~18.1 × 16.1)	mm (inch)
Temperature range	30 to 300 (86 to 572)	°C (°F)
Process duration per cycle (for PCB size 300 × 200 mm (~11.8 × 7.9 inch)	4 to 5	min
Min. PCB size	40 × 50 (~1.6 × 2.0)	mm (inch)
Max. PCB size*	440 × 390 (~17.3 × 15.4)	mm (inch)
Max. PCB thickness	10 (~0.4)	mm (inch)

*It is advisable not to exceed the PCB size specified in the manual, inserting a PCB exceeding the dimensions specified in the manual may result in failure to heat the PCB and prevent air circulation inside the heating chamber.

Emissions

Data	Value	Unit
Sound pressure level LpA (EN ISO 3744)	< 70	dB (A)
Sound power level LwA (EN ISO 3744)	< 70	dB (A)
EMC limit class		–

2.3 Technical data RK 460

Mechanical data

Data	Value	Unit
Dimensions (width × height × depth)	630 × 300 × 675(~24.8 × 11.8 × 26.6)	mm (inch)
Weight	55 (~121.3)	kg (lbs.)

Electrical data

Data	Value	Unit
Power supply	380	V AC
Frequency	50	Hz
Power	4800	W

Climatic conditions

Data	Value	Unit
Temperature range (operation)	15 to 30 (59 to 86)	°C (°F)
Max. humidity, non-condensing	50 - 70	%

Process data

Data	Value	Unit
Heating area (top and bottom)	460 × 410 (~18.1 × 16.1)	mm (inch)
Temperature range	30 to 300 (86 to 554)	°C (°F)
Process duration per cycle (for PCB size 300 × 200 mm (~11.8 × 7.9 inch)	4 to 5	min
Min. PCB size	40 × 50 (~1.6 × 2.0)	mm (inch)
Max. PCB size*	440 × 390 (~17.3 × 15.4)	mm (inch)
Max. PCB thickness	10 (~0.4)	mm (inch)

*It is advisable not to exceed the PCB size specified in the manual, inserting a PCB exceeding the dimensions specified in the manual may result in failure to heat the PCB and prevent air circulation inside the heating chamber.

Emissions

Data	Value	Unit
Sound pressure level LpA (EN ISO 3744)	< 70	dB (A)
Sound power level LwA (EN ISO 3744)	< 70	dB (A)
EMC limit class		–

3. Structure and function

This chapter describes the technical structure and the functions of the system.

3.1 Brief description

Soldering furnace from series RKxxx is a high-performance convection oven for lead-free reflow soldering All profile parameters, such as temperature and process duration, can be individually programmed for the individual pre-heating and reflow phases. It is possible to process single or multiple PCBs with a maximum area of 300 × 200 mm (~11.8 × 7.9 inche) in the RK320 oven and 440 × 390 mm (~17.3 × 15.4 inche) in the RK360 and RK460 oven.
The processor control in combination with four sensors and four separate heating circuits ensures an even distribution of heat across the entire area of the PCBs. Several freely programmable steps between pre-heating and final reflow enable the processing of almost all reflow profiles up to 290 °C.

3.2 Scope of delivery

This section provides an overview of the scope of delivery of all reflow oven RK series.

Scope of delivery of RK320

Scope of delivery	number of pc
1. Reflow oven RK320	1 pc
2. Power cable	1 pc
3. Eternet cable	1 pc
4. Heat-reststance protecive gloves	1 pc
5. Fuse T 16 A / 250 V AC	1 pc
6. Flexble temperature sensor	1 pc

Scope of delivery of RK360

Scope of delivery	number of pc
1. Reflow oven RK360	1 pc
2. Power cable	1 pc
3. Eternet cable	1 pc
4. Heat-reststance protecive gloves	1 pc
5. Fuse T 16 A / 250 V AC	1 pc
6. Flexble temperature sensor	1 pc

Scope of delivery of RK460

Scope of delivery	Scope of delivery
1. Reflow oven RK460	1 pc
*	-
3. Eternet cable	1 pc
4. Heat-reststance protecive gloves	1 pc
**	-
6. Flexble temperature sensor	1 pc

*- The power cable is permanently attached to reflow oven
**- It is not possible for the user to replace the fuse himself, see point 3.4.1

3.3 Type label of RK320

The type label is located at the housing of the system. For information on identifying the system and the relevant equipment, specify the system model and the serial number on the type label when you contact Mechatronic Enginnering Service.

Name	Description
Manufacturer	Address of the manufacturer
Type	Reflow oven RK320
Power	max. 3500 W / 220-240 V / 50 Hz
Serial no.	Serial number
Place of manufacture	Poland
CE mark	CE mark

3.4 System components

This chapter describes the components of the system. First of all, make yourself familiar with the individual components of the system before starting the operation.

3.4.1. interface on back side of reflow oven

Interface back side of reflow oven RK320

Interface back side of reflow oven RK360

Inteface back side of reflow oven RK460

In reflow oven RK460 the user doesn't have the option of replacing the fuse. For replacements, contact the service department.

3.5 Drawer

The drawer is opened with the handle and contains a metal grille on which the PCB to be processed can be inserted.

Two fans are installed in the interior. The transparent drawer front allows you to continuously observe the process.

Drawer is closed

Drawer is opened

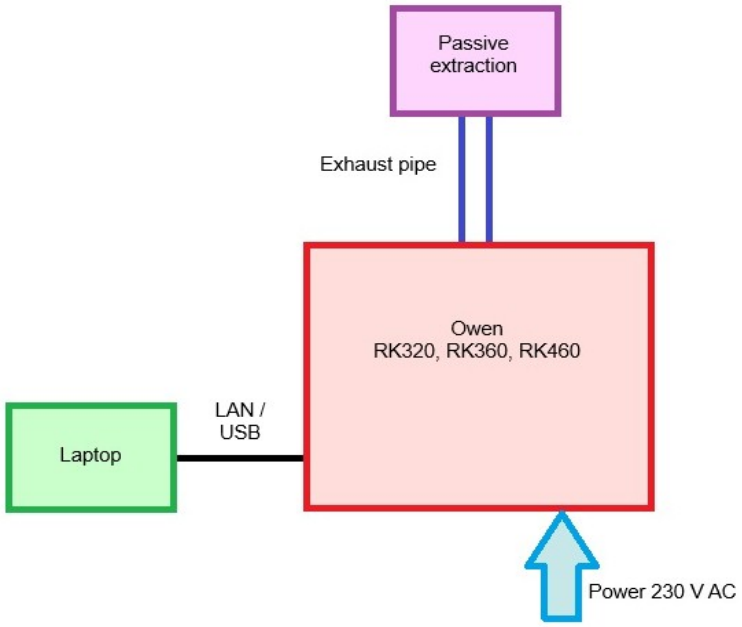
3.6 Exhaustion

Purpose of the system used

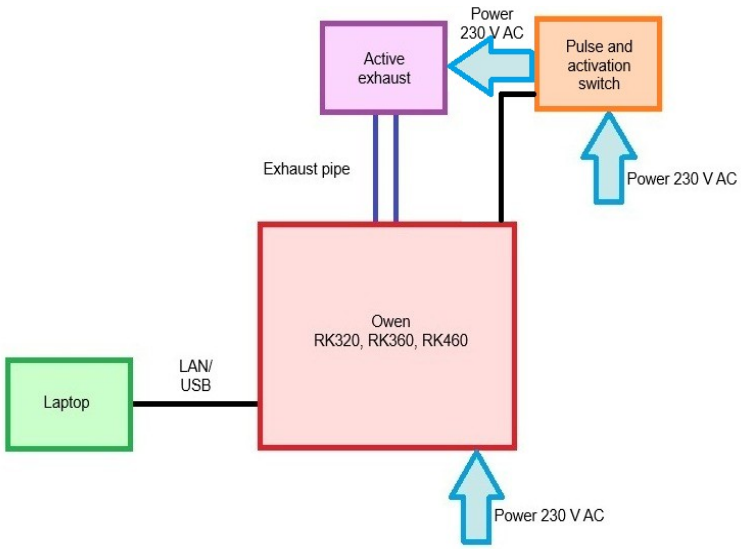
A fume extraction system has been used because the reflow soldering process generates toxic fumes that can damage the health of the user.

The system can be implemented by means of 3 solutions, which are described below:

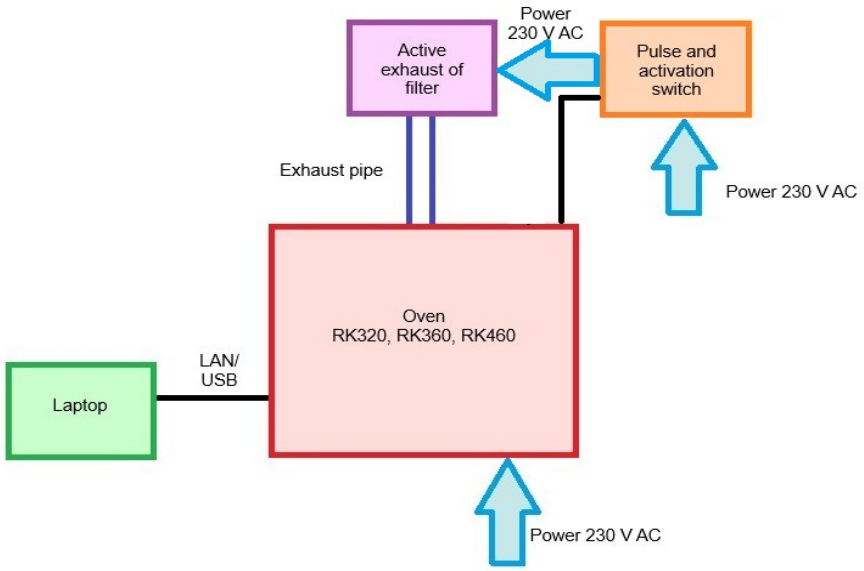
1.Passive extraction of flue gases from outside the room by means of a ventilation system



2.Active extraction of exhaust fumes from the room via a mechanical ventilation system



3.Active exhaust system from oven to the filter unit

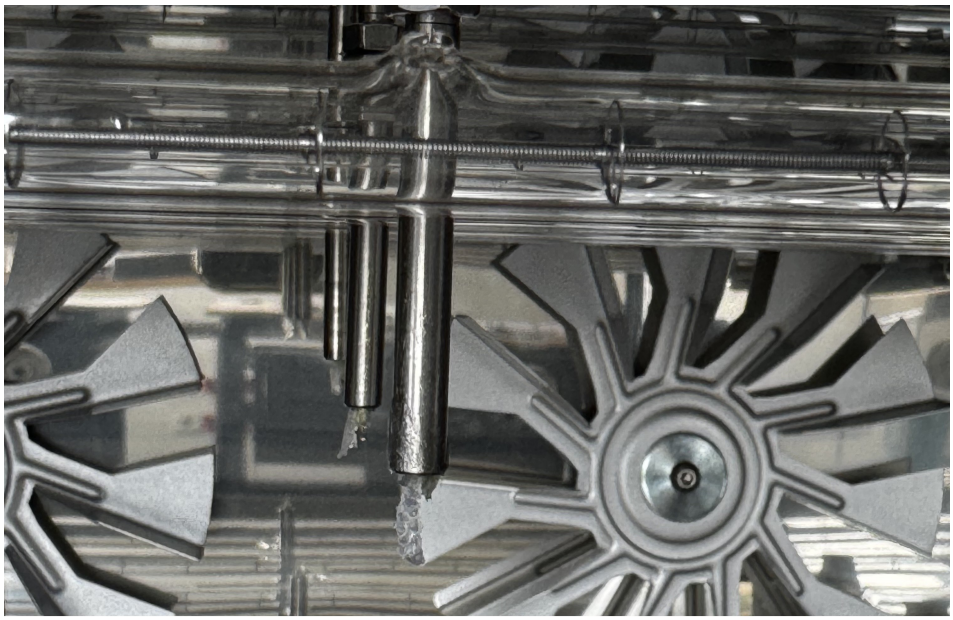


3.7 Heating chamber

Reflow oven RK320 heating chamber is equipped with 8 heaters with a total output of 3500W.
Reflow oven RK360 heating chamber is equipped with 12 heaters with a total output of 3500W.
Reflow oven RK460 heating chamber is equipped with 12 heaters with a total output of 4800W

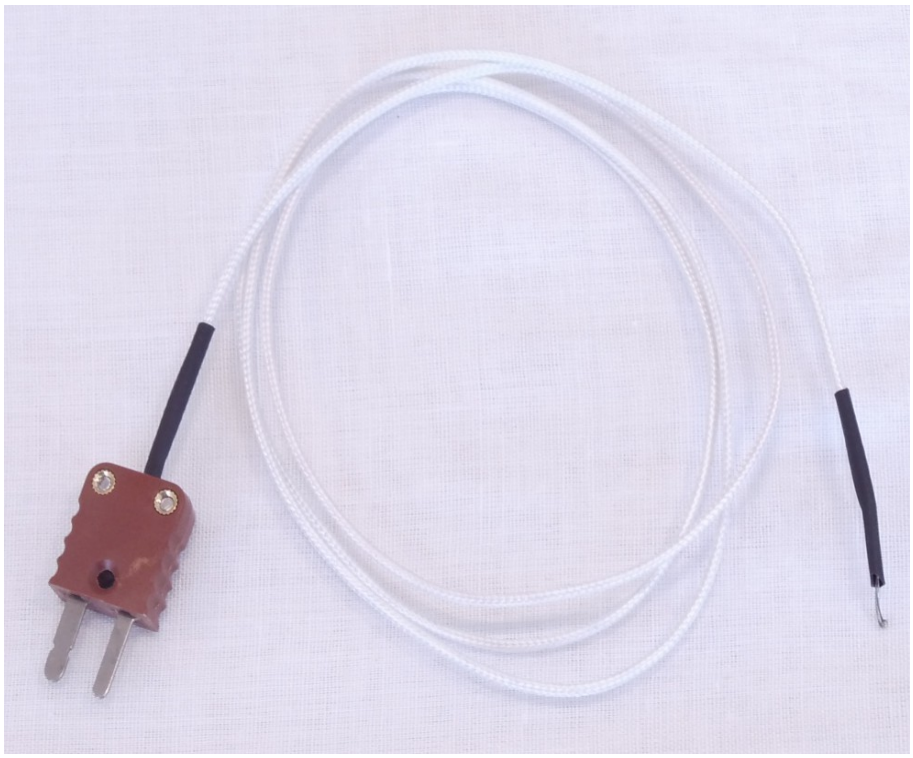
3.8 Temperature sensors

The four integrated temperature sensors ensure an optimization of the reflow process and enable monitoring of the process. The temperature sensors are installed in the heating chamber.



Flexible temperature sensor

Using this additional flexible temperature sensor, you can measure the temperature of any area on your PCB.



3.9 Information LEDs

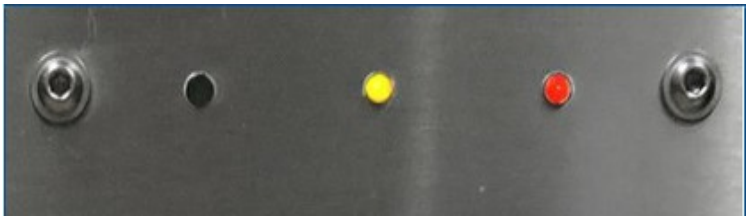
This chapter describes the displays and control elements of the system. First of all, make yourself familiar with the individual components of the system before starting the operation.
The system has three status lights that indicate the different stages of the process. The colors have the following meaning:

Red: Heating phase is active. This lamp lights up until the desired maximum heating temperature in the process is reached.

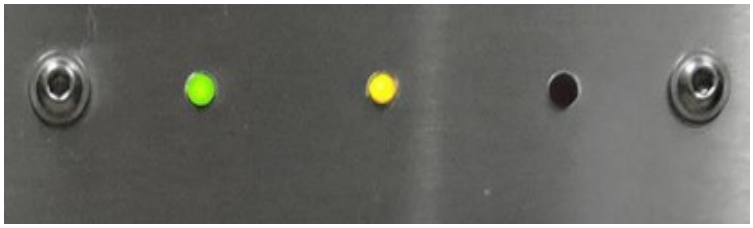
Yellow: The process is being executed. The progress bar in the software is still active.

Green: Cooling phase is active. This lamp lights up until the desired cool-down temperature is reached.

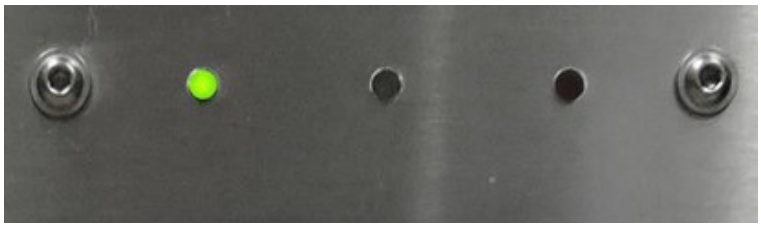
Only when all three status lights have gone out, the drawer may be opened and the PCB may be removed!



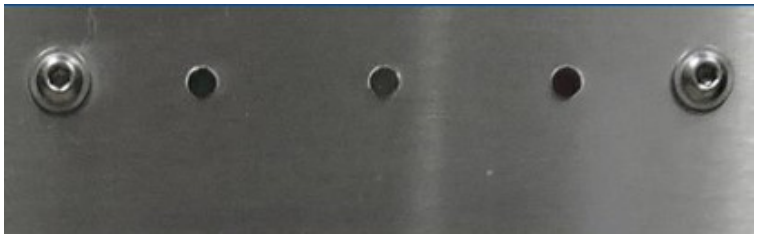
Active programme | Heating phase active*



Active programme | Cooling phase active**



Programme finished | Cooling phase active***



Programme finished | Cooling phase finished

- * Heating phase of solder paste is active, part of heating profile

- ** Cooling phase after solder paste heating is active, part of heating profile

- *** Cooling phase of the chamber after heating of the solder paste, not part of the heating profile, the furnace must be cooled down to the temperature set in the settings after heating (see chapter 8.2 Thermal protection)

4. Transport and storage

This chapter contains important information on transport, packaging and storage of the system.

4.1 Transport inspection

Check the delivered goods immediately upon receipt for completeness and for transport damage. If transport damage is evident or a ShockWatch® indicator or a TiltWatch® indicator has been activated, proceed as follows:
-Do not accept the delivery or only with reservations.
-Record the extent of damage on the transport documentation or on the delivery note of the transport company.
- Use photographs to document the damage.
- Initiate a complaint.

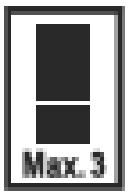
4.2 Packaging

The packaging is chosen according to the transport conditions.
The packaging is to protect the system from transport damage, corrosion, and other kinds of damage until installation.
- Keep the packaging in its original form.
- Only remove the packaging just before installation.
- Handling packaging material
- Dispose of the packaging material according to the current laws and local regulations.

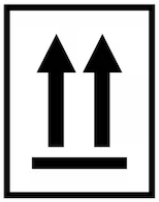
5. Symbols on the packaging

Observe the following symbols on the packaging when transporting the system:

Stacking limit
A maximum of 3 identical packages that may be stacked.



Top
The arrowheads of the symbol indicate the top side of the package. These always have to point upwards, otherwise, the contents could be damaged.



Fragile
Identifies packages with fragile or sensitive contents. Handle the package with care, do not drop, and do not subject it to shocks.

Keep dry
Protect packages against moisture and keep them dry.

6. Unpacking and packing oven

This chapter describes how to unpack the system.

Ensure that the following prerequisites are fulfilled before performing the described tasks:

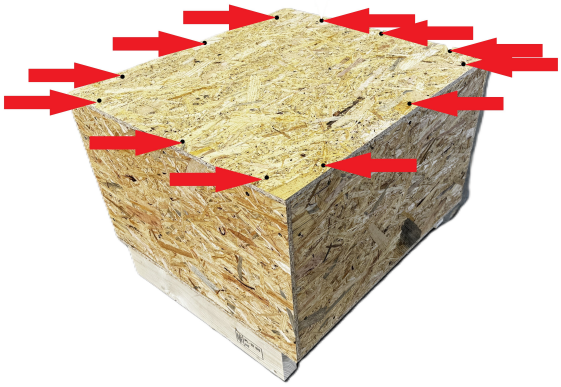
Prerequisites Spare parts and auxiliaries

1.Wear protective gloves
2.Wear safety shoes
3.Work in a team of two

4.Phillips screwdriver

6.1 Unpacking oven

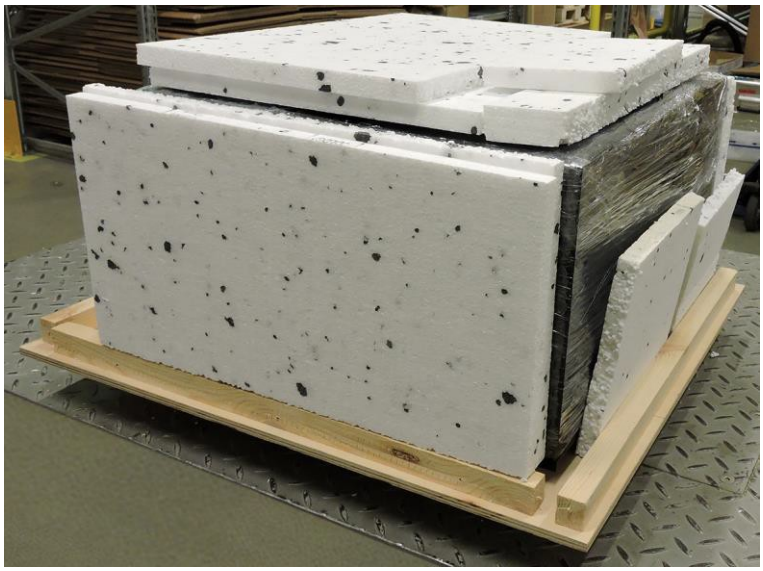
1.Remove the screws from the top of the wooden box and remove the top lid of the wooden box



2.Remove the screws on the right side of the wooden box and remove the right-hand wall of the wooden box.

3.Remove the screws at the left of the wooden box and remove the left wall of the wooden box .

4. Before pulling out the oven, pull out the accessories attached to the oven
There is no need to unscrew all the walls of the wooden box to pull out the oven



5.Remove the filling material (Styrofoam).

WARNING! Risk of injury by heavy load!
The system is heavy and bulky and must not be lifted by only one person. Incorrect lifting can cause serious injuries e.g. crushing injuries or spinal injuries.
- Always lift the system with ***two people***.
- Always wear the recommended safety shoes and protective gloves.

6. Lift the system with two people.

7.Remove the stretch film

8.The system has been unpacke

6.2 Storage

- Store the system in its original packaging according to the symbols on the packaging.
- Store the packages under the following conditions:
Do not store outdoors.
Store dry and dust-free.
Do not expose to aggressive substances.
Protect against sunlight.
Storage temperature: 15 °C - 35 °C (59 °F - 95 °F)
Relative air humidity: 60 % max, non-condensing.
If storing for more than 3 months, check the general condition of all components and the packaging on a regular basis.

6.3 Paking oven

In the event of a claim/service*, pack the cooker according to the following instructions.
 - * after contacting the service technician and agreeing that the cooker should be sent back for servicing

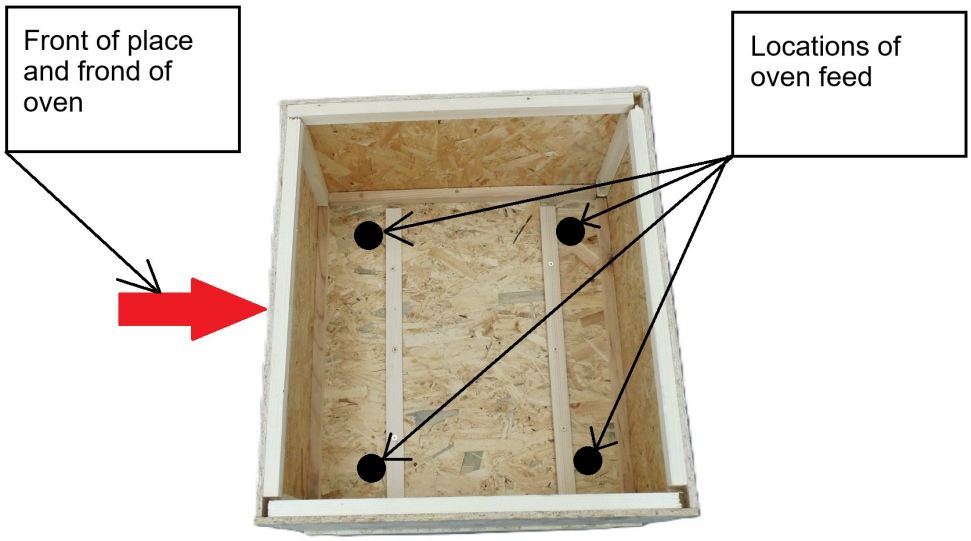
1. Before packing, the cooker should be protected with a stretch film for transport safety.

2.Remove the screws from the top of the wooden box and remove the top lid of the wooden box

3.Remove the screws on the right side of the wooden box and remove the right-hand wall of the wooden box.

4.Remove the screws at the left of the wooden box and remove the left wall of the wooden box .

5. The cooker should be placed in the wooden box with the front of the cooker slightly tilted down so that the handle does not touch the front of the wooden box.



red arrow - red arrow indicates front of pack and place of front oven

black spots - black spots are the locations of oven feet

6. On the side where the cooling fans are located, insert a double layer of polystyrene foam and screw down the packing wall.

7. On the side where I don't have cooling fans, insert a single layer of polystyrene foam and screw on the packaging hay.

8. Place a large piece of polystyrene on top of the cooker and place two smaller pieces of polystyrene in the middle.

9. Screw on the top cover of the wooden frame.

10. !!! Do not leave any items in the heating chamber !!!

7. First startup

This chapter contains important information on first startup of the system.

7.1 Safety

Observe the following safety instructions for the first startup of the system:

7.2 Requirements of the place of installation

Before installing the system, the following requirements of the place of installation have to be ensured.
Minimum required space

Dimension of the RK320

Width	Depth	Height
540 mm (~21.3 in)	480 mm (~18.9 in)	Height 300 mm (~11.8 in)

Dimension of the RK360

Width	Depth	Height
675 mm (~26.6 in)	630 mm (~24.8 in)	300 mm (~11.8 in)

Dimension of the RK460

Width	Depth	Height
675 mm (~26.6 in)	630 mm (~24.8 in)	300 mm (~11.8 in)

Climatic conditions
The following climatic conditions have to be ensured for operating the system:

Climatic conditions

Data	Value	Unit
Temperature range (operation)	15 to 30 (59 to 86)	°C (°F)
Max. humidity, non-condensing	50 - 70	%

7.3 Connecting the system

The following steps are performed to connect the system:

-Connecting the system
-Connecting the system to the in-house extraction system
-Detecting the IP address of the system

Starting the software and connecting it to the system

Connecting the system

Place the system on a level surface at the place of installation.
Plug in the supplied mains cable:

Plug in the supplied mains cable:

Connect the plug to a wall socket.Insert the supplied Ethernet cable into the appropriate port:

Connect the other end of the Ethernet cable to the PC on which you will install the associated software.

The system has been connected.

Connecting the system to the in-house extraction system:

- Connect the hose of the extraction system with the extraction fitting.

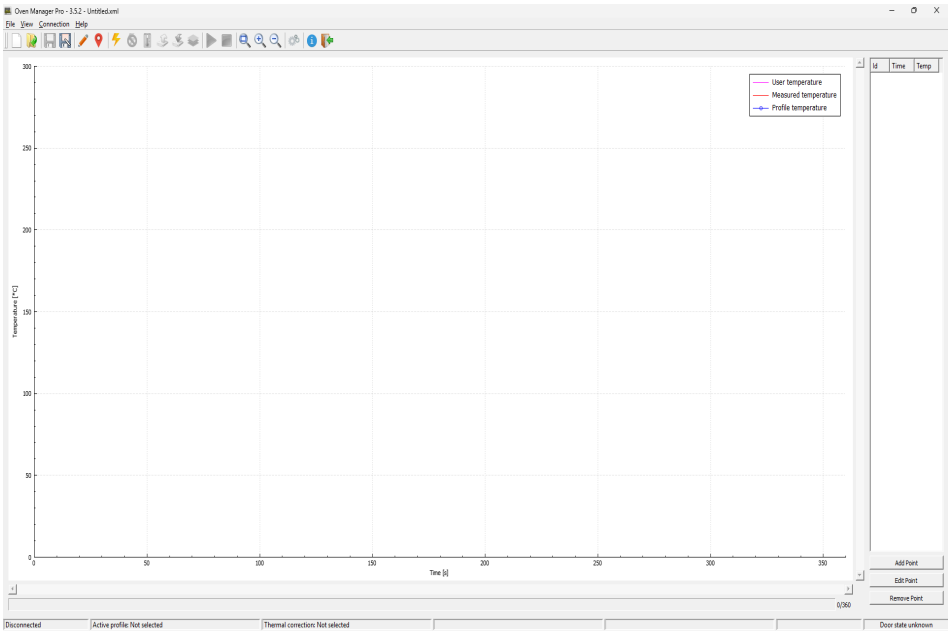
The system has been connected to the in-house extraction system.

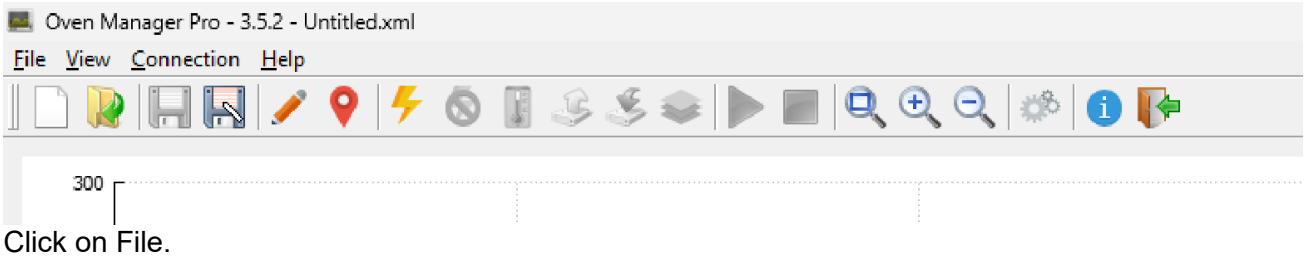
To connect your system to the software, it is necessary to detect the IP address of the system. To detect the IP address, you need the software Oven Menager Pro- 3.5.2. The software should be downloaded from the manufacturer's website after consulting with the manufacturer of the device as to the software version.

Detecting the IP address of the system
Turn on your system with the main switch at the rear of the system:

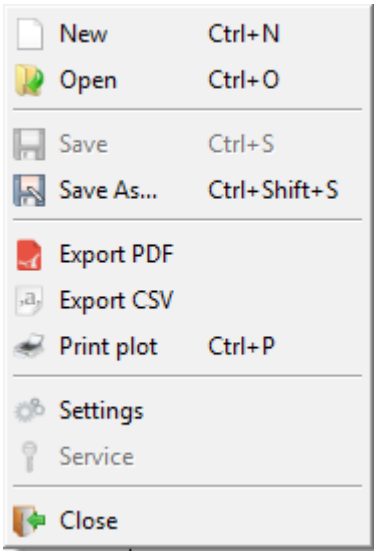
The system is ready for operation.

Starting the software and connecting it to the system
Double-click on the file OvenManagerPro.exe.
The following dialog is displayed:

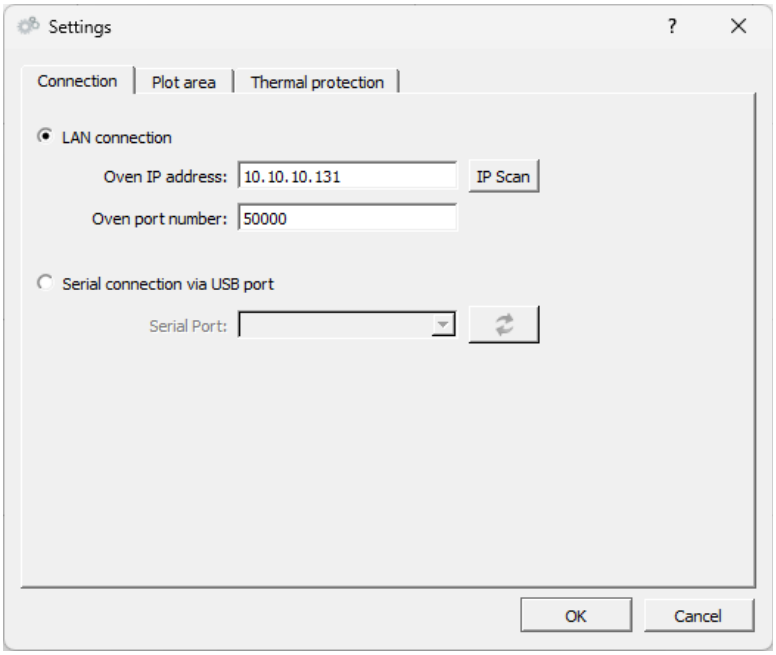




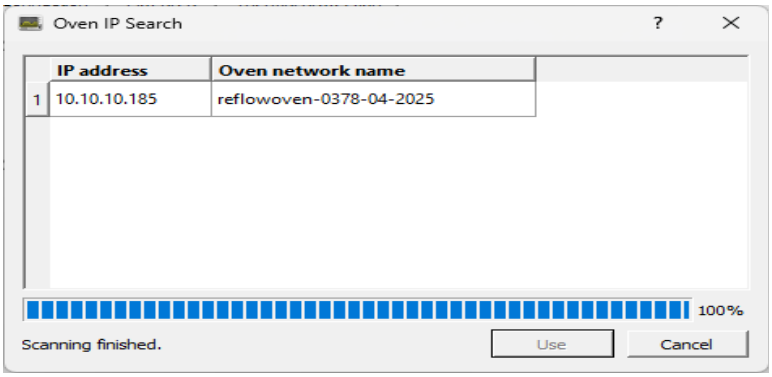
Click on File.



Click on Settings

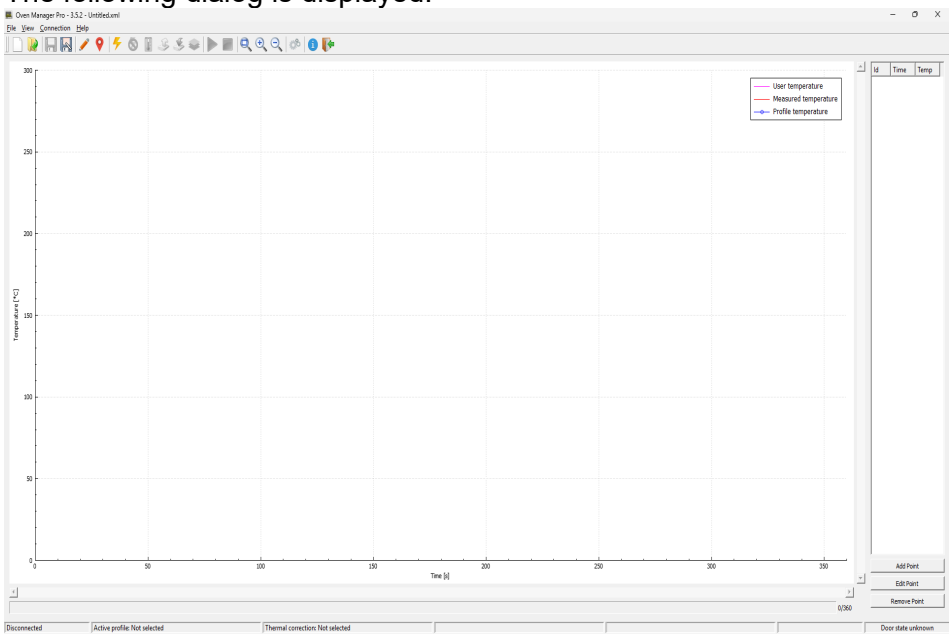


In the Connection tab, select how your PC communicates with Oven. For LAN connection, press IP scan button. Depending on how fast the network is, the IP address of the system is detected. In some cases, this may take several hours!

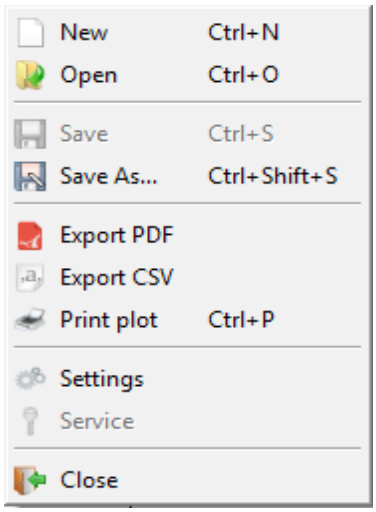


After scanning the network, select the furnace and accept the selection by pressing Use.

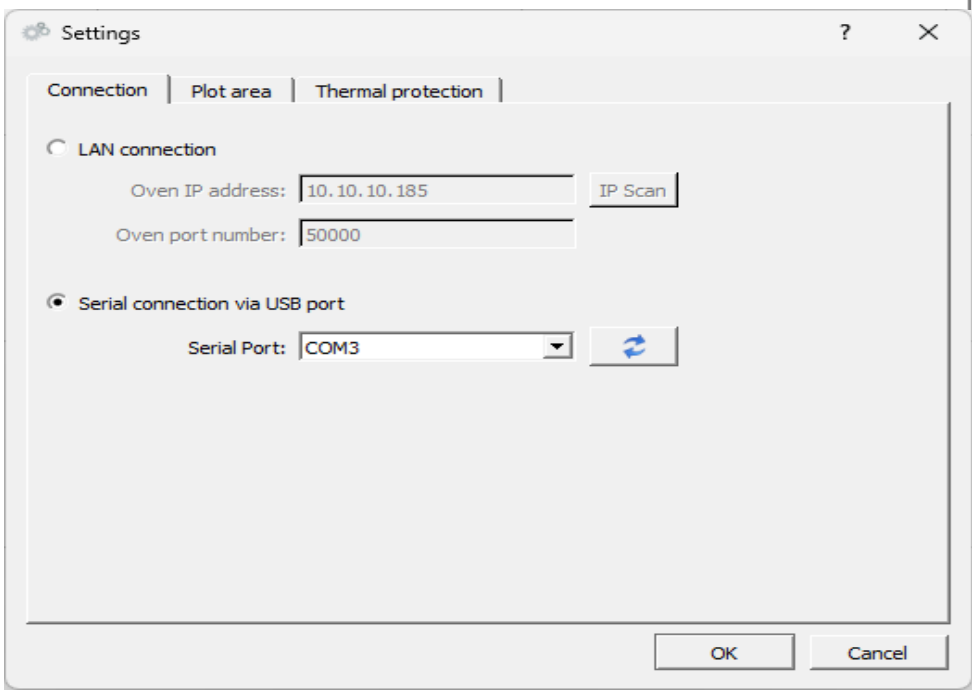
To use the system via the USB port, you need:
Starting the software and connecting it to the system
Double-click on the file OvenManagerPro.exe.
The following dialog is displayed:



Click on File > Settings:

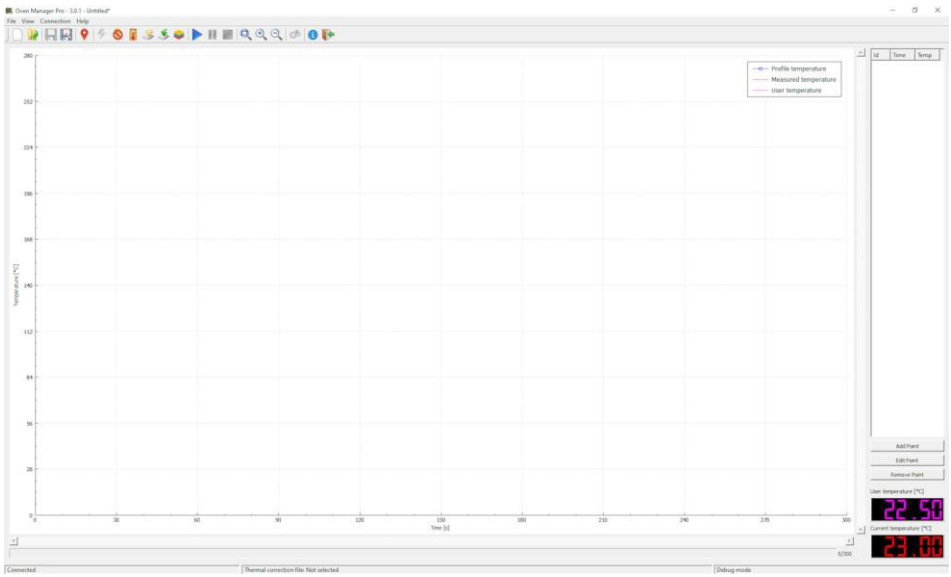


The dialog Settings displayed.
To communicate with Oven, select the appropriate communication method and choose the USB port to which Owen is connected.



Click on [OK].
Regardless of the chosen method of communication with Oven, in order to connect to the PC software you need to:
Click on the following icon: .
Once the connection to the system has been established, the current operating temperature is displayed in the lower right.

The view changes as follows:



The software has been started and connected to the system.

8. Operating the system

The manual is compatible with OvenManagerPro software version 3.5.2 and next
Oven software version:

- OvenViewer 1.3 and next
- OvenCore 2.5 and next
- MCU 3.7 and next

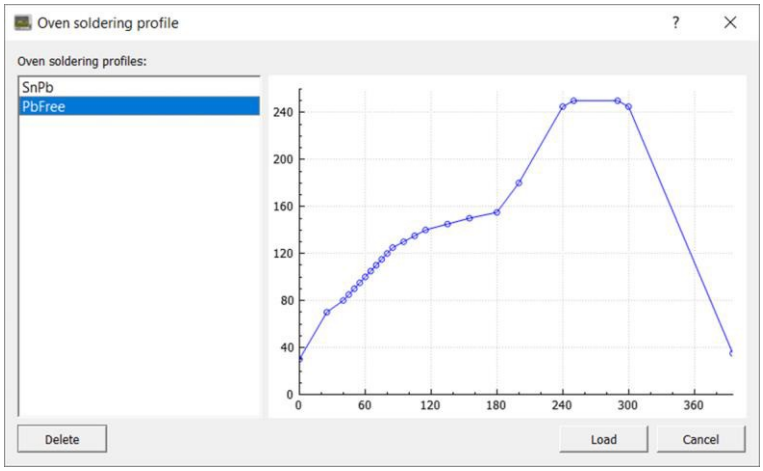
8.1 Operating the oven reflow via the OvenManagerPro application

Processing the PCB in the reflow oven

The system has two predefined profiles:
SnPb – used for lead soldering
PbFree – used for lead-free soldering

1. Click on Connection > Download process data or on  .

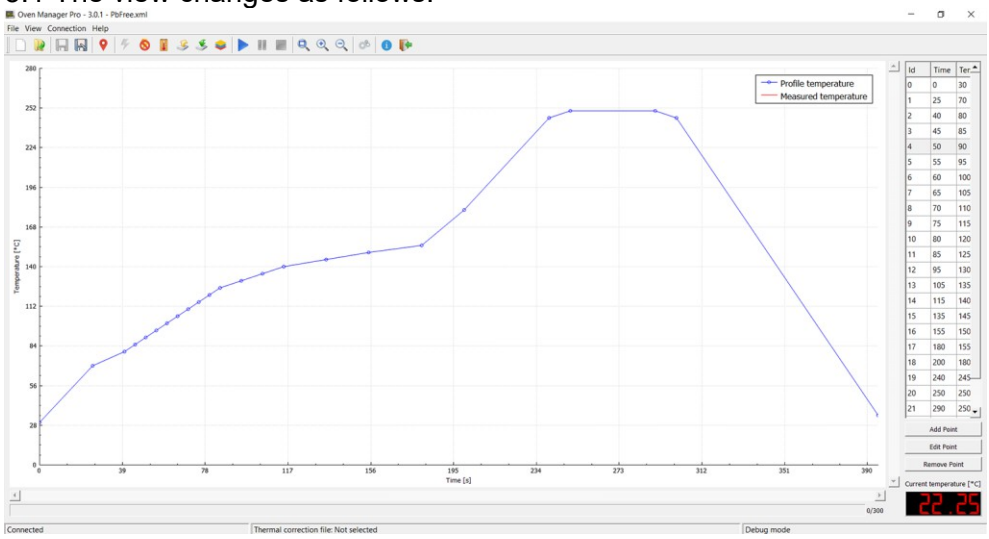
The following dialog is displayed:



2.Select one of the profiles. In this example the predefined profile PbFree is used.

3. Click on [Load].

3.1 The view changes as follows:



You can also import your own profiles. Click on File > Open and select your desired heating profile and click on [Open].

The files SnPb and PbFree are sample profiles with a heating and a cooling phase. You can adjust the temperature curve and the time to suit your requirements. To do this, add more points to the temperature curve using the
[Add point] function. You can use the [Edit point] function to change existing points (temperature/time). All temperature/time values are displayed in the table on the right.

4.Adjust the temperature curve and the time.

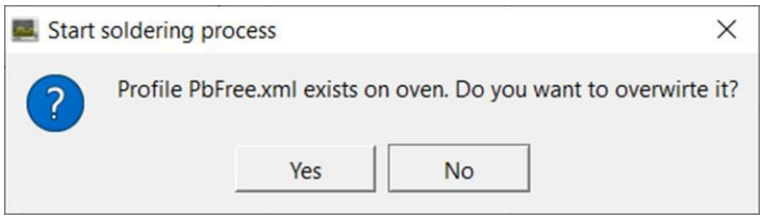
5.Open the drawer, insert the PCB to be processed, and close the drawer.

6.Click on Connection > Start process or click on the following icon: .

6.1The dialog Save profile is displayed.

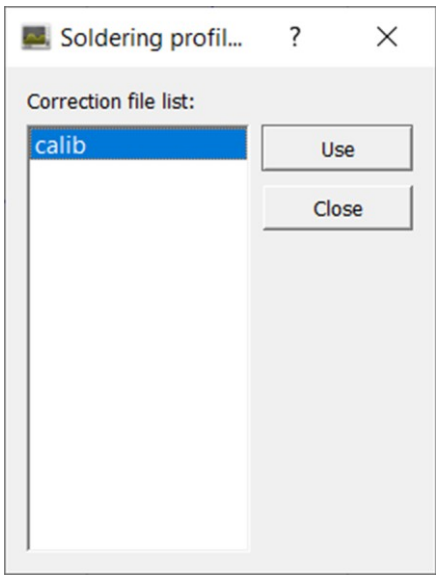
7.Navigate to the folder for saving the file and click on [Save].

7.1The following dialog is displayed:



8.Click on [Yes].

8.1The following dialog is displayed:



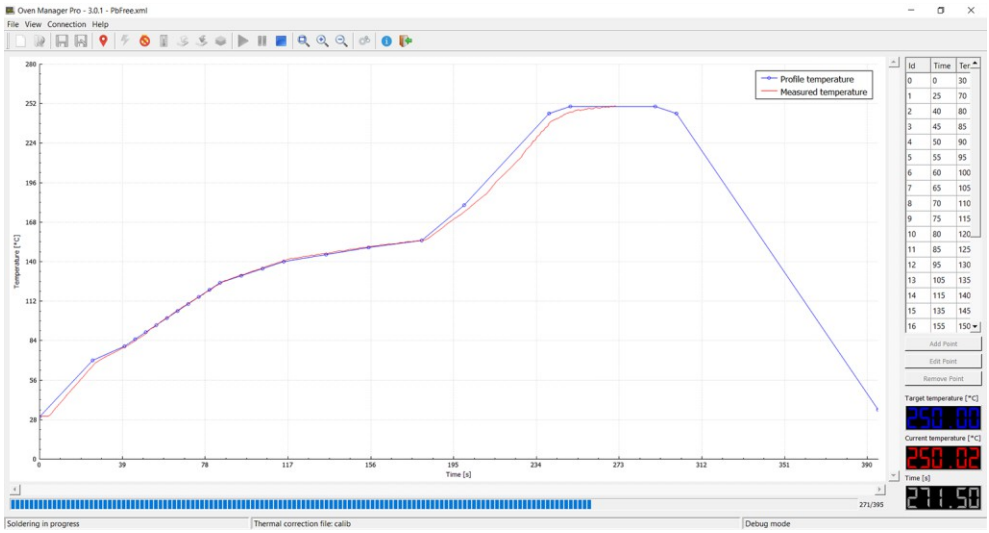
The correction profile compensates for the temperature difference between the installed temperature sensors and the temperature on the PCB surface. The system has a predefined correction profile *calib* that must be selected.

9.Select the entry *calib*.

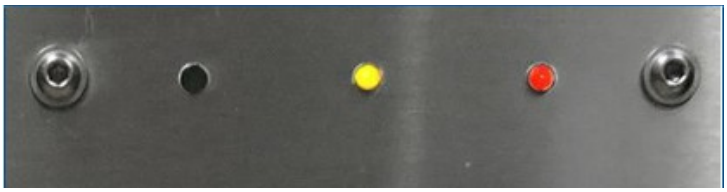
9.1Click on [Use].

Burn hazard by hot surfaces!

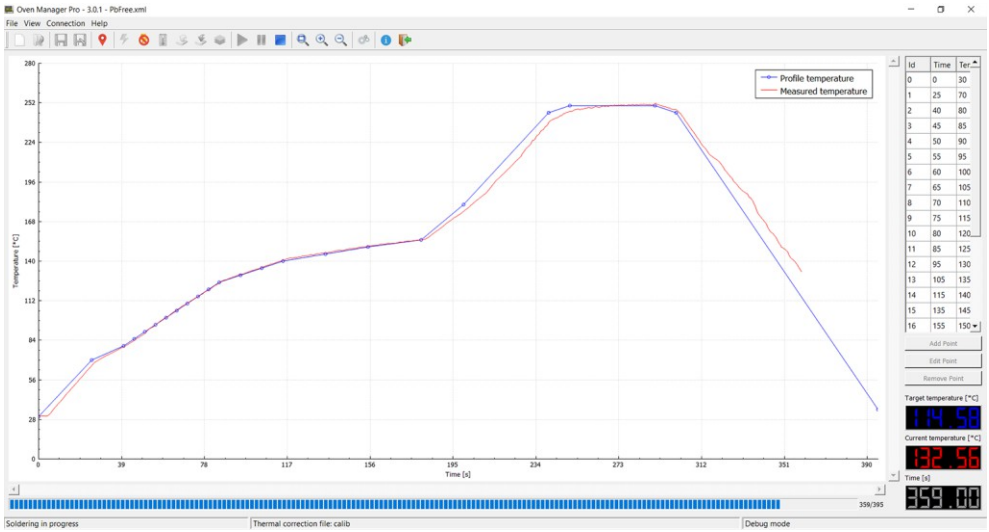
Skin contact with heated PCBs or with the heated convection oven can cause skin burns.
-Wear personal protective equipment while working.
-Avoid skin contact with heated PCBs and the convection oven.
The temperature curve is displayed in the software:



The system status lights change to the following state and the heating phase starts:

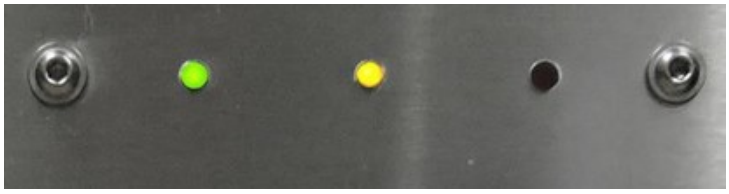


The cooling phase is displayed in the software:



As soon as the progress bar has completed, the program is ended and a beep sounds. The status of the status lights changes as follows:

Once the time for the heating phase has elapsed, the status lights of the system change to the following state:



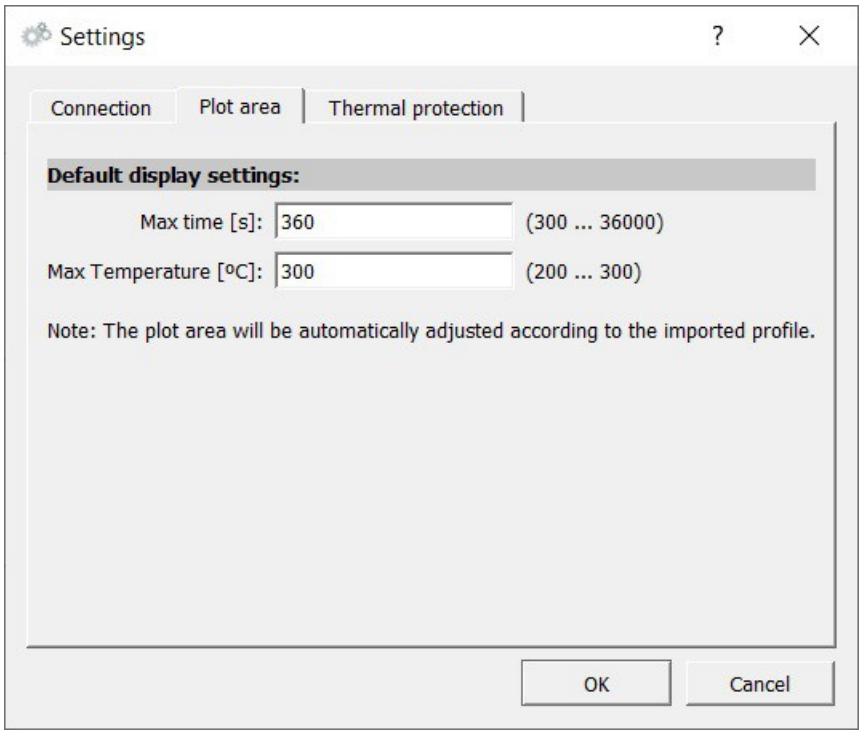
8.2Thermal protection

The new thermal protection features of the furnace make it possible, for example, to anneal the wafer at low temperatures for a long period of time. They also provide additional protection during normal use.

Heating chamber parameters

In Oven Manager Pro, select: File > Settings > Plot area.

In this tab, we find two options:
- Max time - maximum duration of the process
- Max Temperature - maximum temperature

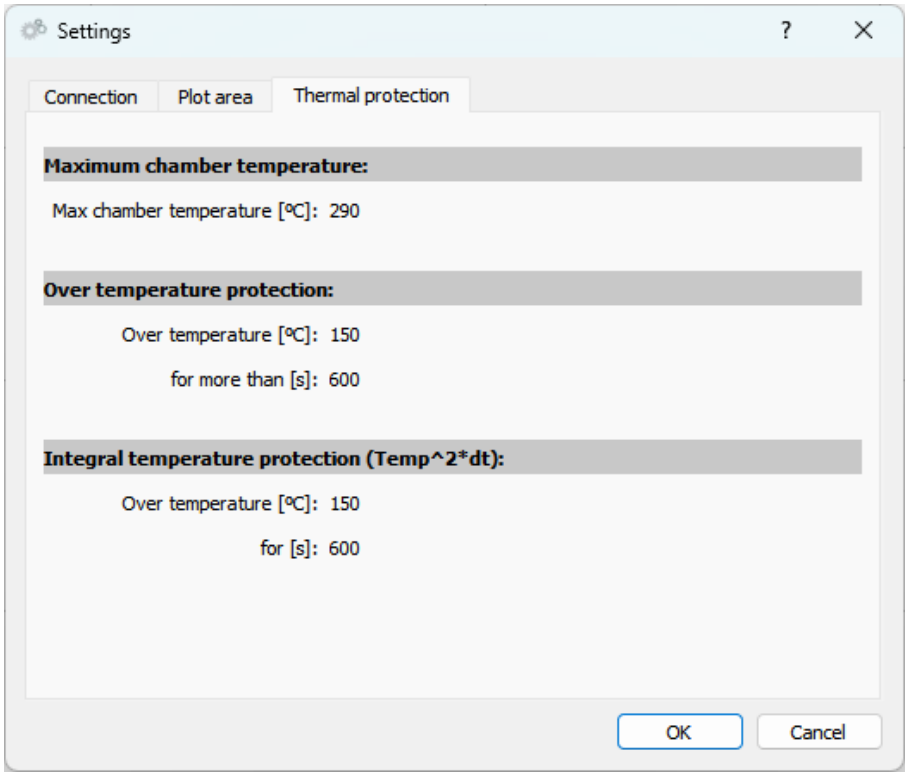


These parameters must be set manually before modelling the solder profile.
Once the profile is loaded, the above parameters update automatically.

Types of thermal protection

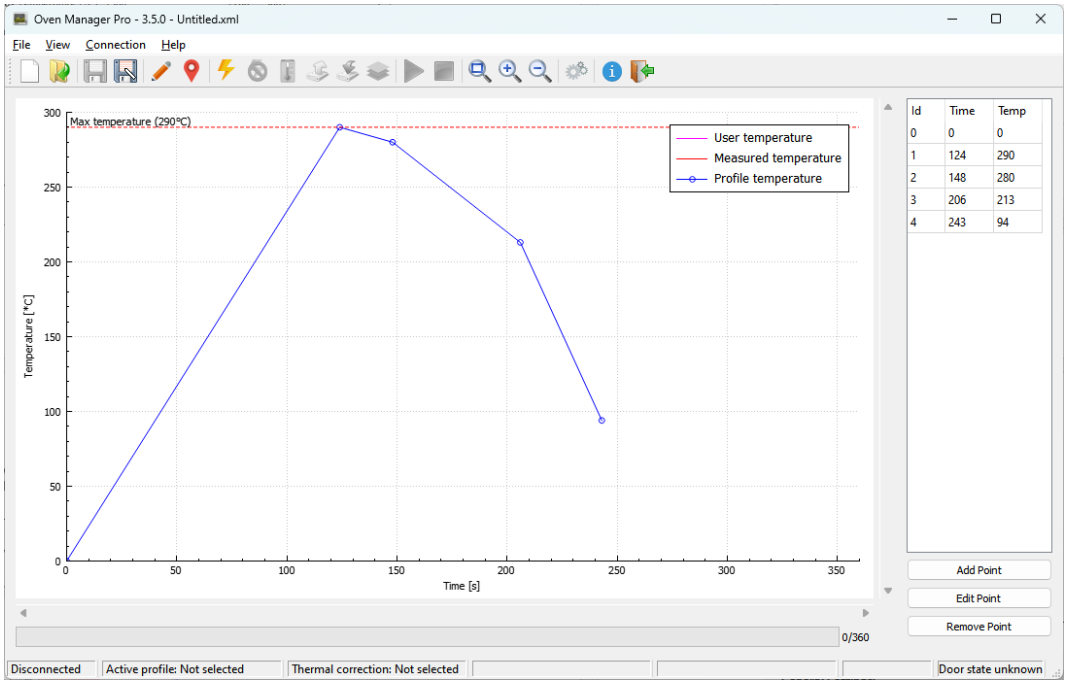
Three types of thermal protection have been introduced in the new software version:
-Maximum chamber temperature – maximum chamber temperature.
-Over temperature protection – temperature protection over time.
-Integral temperature protection – temperature protection based on a calculation of the surface area T^2*dt.

The values of the above protection parameters can be checked by selecting the tab:
File > Settings > Thermal protection.



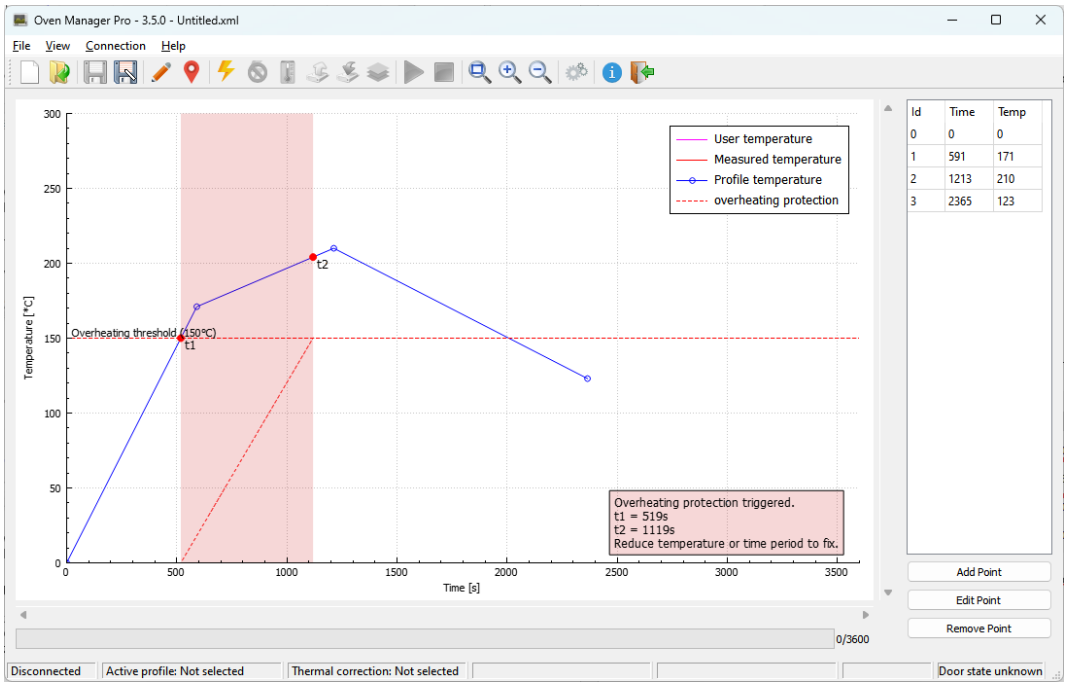
Maximum chamber temperature

This is the maximum permissible temperature in the furnace chamber. If too high a temperature is set when creating a profile, the program will not allow such a profile to run.



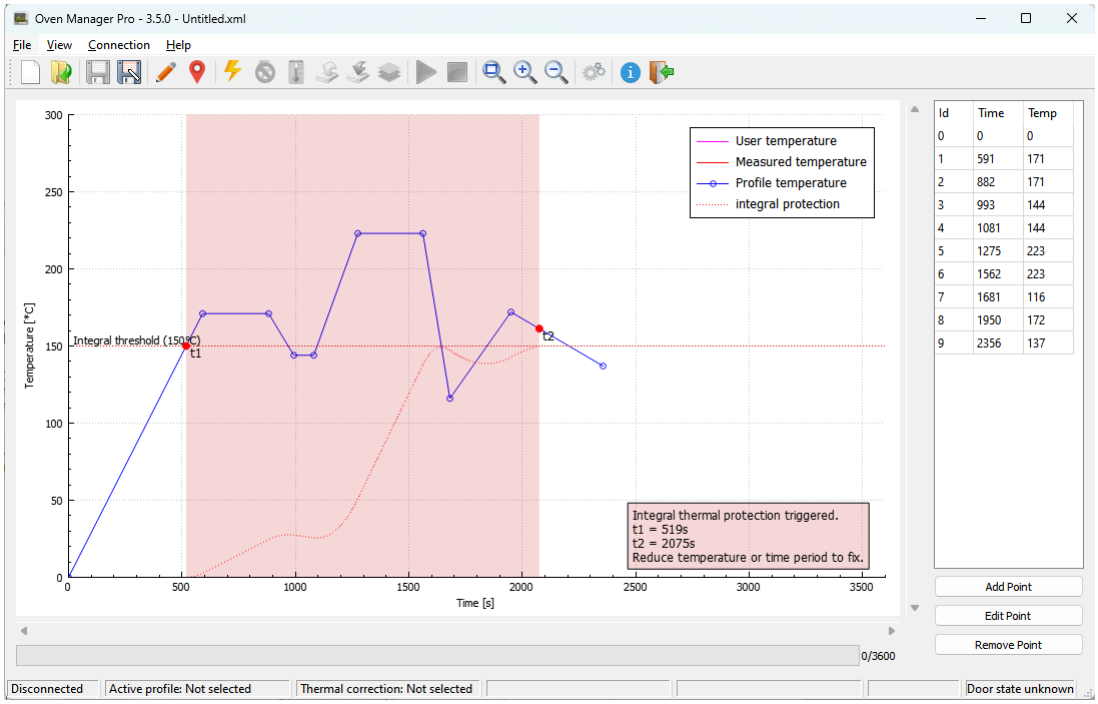
Overheating protection

This is a safety feature that will trip if the temperature in the chamber remains above 150 degrees Celsius for more than 600s.



Integral thermal protection

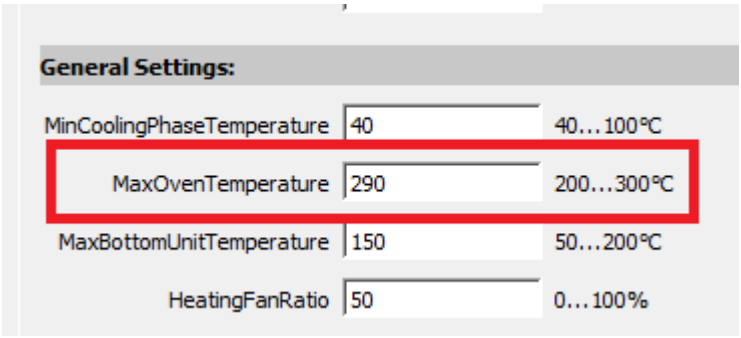
This is a safety feature that will trip if the temperature in the chamber after summing up all measuring points is higher than 150 degrees Celsius for more than 600 seconds. This protection makes it possible to detect a situation in which a single exceedance of the critical temperature lasts for less than a defined time, but the total time for such areas exceeds the defined criterion.



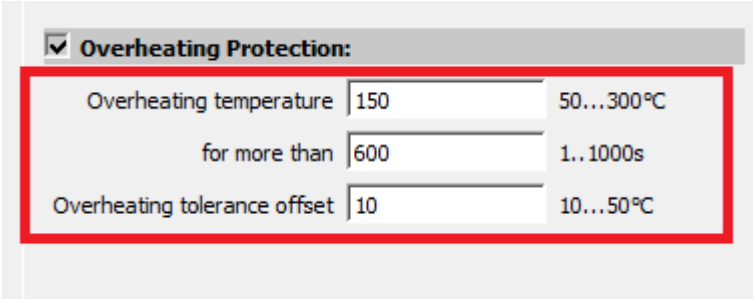
Settings of all parameters in owen settings

The parameters for all security features can be changed in service mode under common settings.

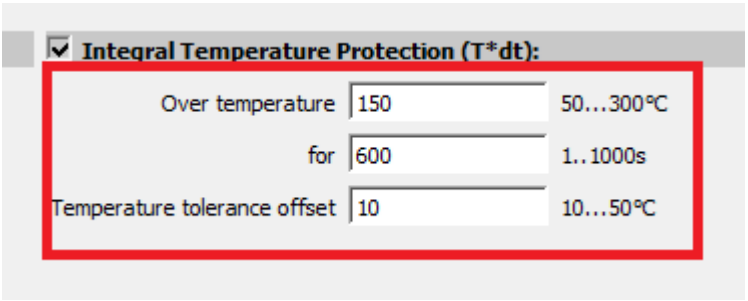
The values for the maximum chamber temperature parameter can be changed in the General Settings section and is a parameter called MaxOverTemperature:



The overheating protection parameters can be changed in the section as below:

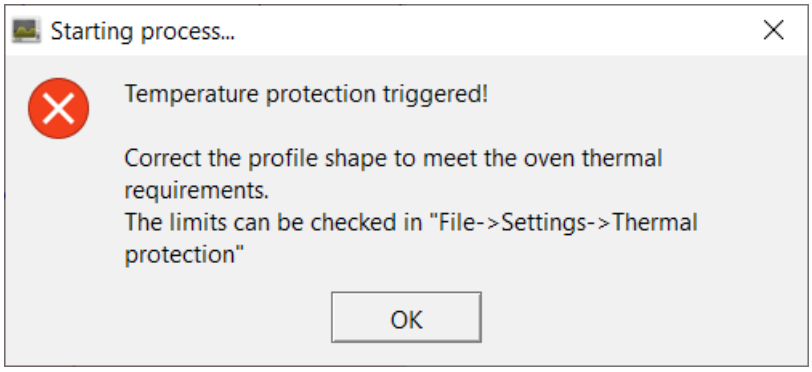


The integral temperature protection parameters can be changed in the section as below:



However, modification of these parameters is not advisable as it may damage or destroy owen. Modification may only be carried out by the supplier of the appliance

Communications



This message is displayed on the screen if temperature limits are violated. The soldering proce will not be started

8.3Furnace chamber opening sensor

Purpose of introducing the function

The chamber opening sensor function was introduced for the safety of the soldering process and its stability.

Opening the chamber during the process disrupts the stability of the process temperature curve.

Operation modes of the chamber opening sensor

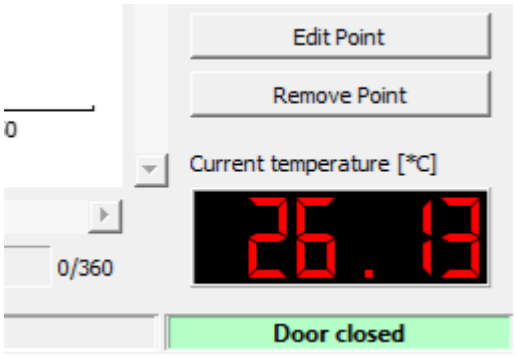
The furnace chamber opening sensor is optional and has two modes of operation. It can operate in a mode that only informs the user that the chamber is open and allows the process to continue or start the brazing process when the chamber is open.

The second mode not only informs the user of the status of the furnace chamber opening, but also prevents the process from starting when the chamber is open and interrupts the process if the chamber opening occurs during the process.

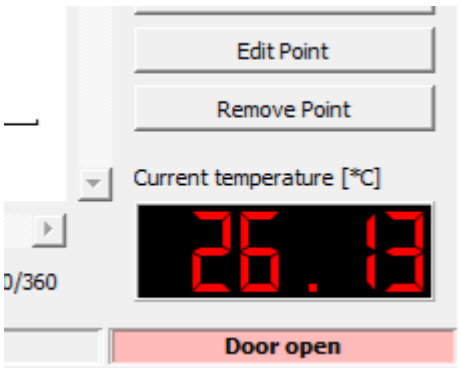
By default, the second mode of the chamber opening sensor is set in each furnace, but it can be changed at the customer's express request.

Chamber opening sensor messages

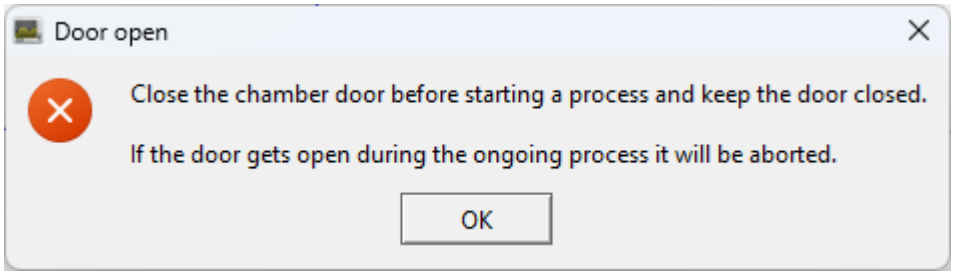
This is what the user information looks like when the chamber is closed:



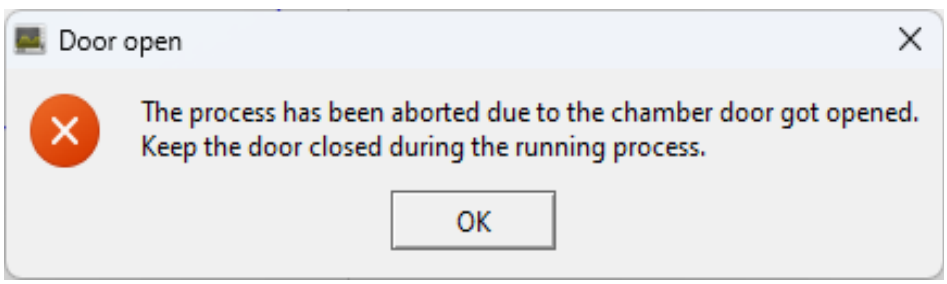
This is what the user information looks like when it is open:



A message that displays when the chamber is open and an attempt has been made to start the process:



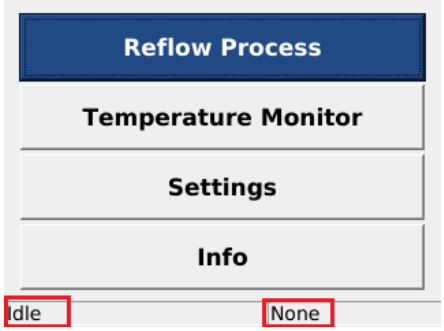
A message that displays when the oven chamber is opened during the process:



The mode of operation of this function can be changed in the service tab, which is not accessible to the user.
To change the mode of operation of the sensor, contact the supplier of the device or, when ordering the device, indicate that the sensor is to have an information-only function.

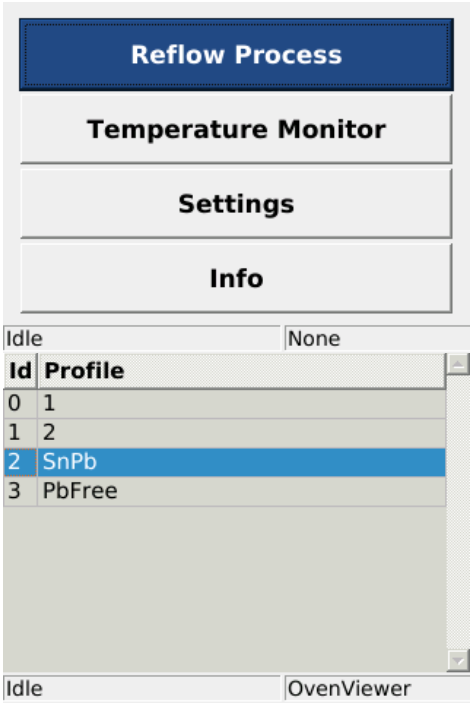
8.4Operating the oven reflow via displays

In the standalone mode the oven is controlled by the keypad:
Enter button is used to select an option.
Esc button is used to abort an operation.
The arrow keys are used to move through fields.
The numeric keys are used to enter parameters and settings.



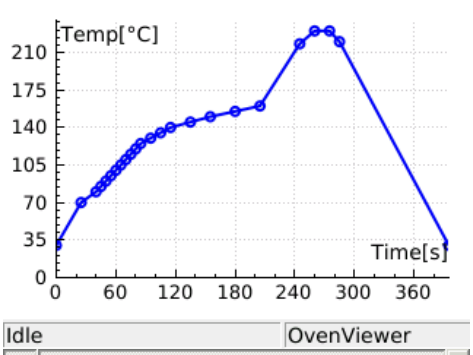
The bottom status bar of the display shows:
The oven state (on the left). It can be either Idle or In progress or Cooling.
The indication of a user who controls the oven (on the right). It can be:
None – the oven is not controlled.
OvenViewer – the oven is in standalone mode.
OvenManager – the oven is controlled by the Oven Manager application.

Running a reflow process

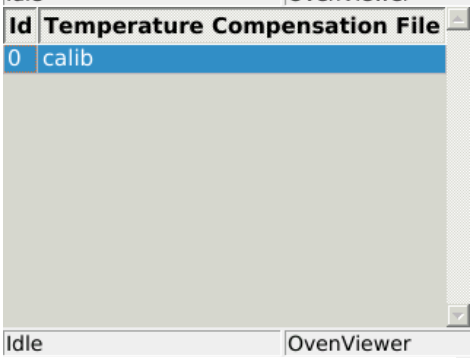


In order to run a predefined profile select the Reflow Process option from the main menu and press Enter.

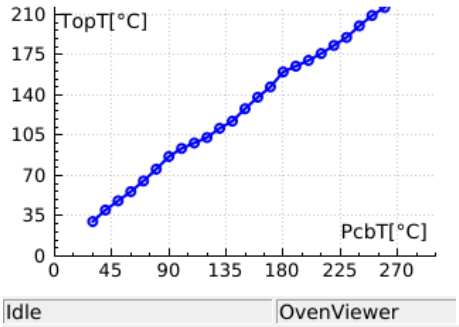
Then select the profile of your choice and press Enter.



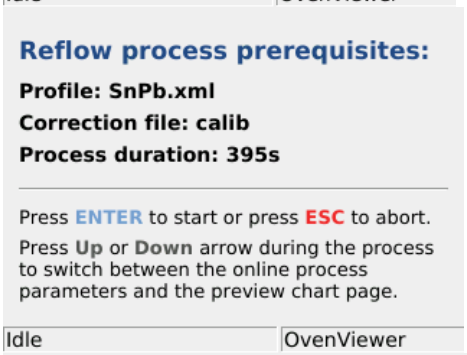
A preview of the selected profile will be displayed. Press Enter to continue or press Esc to go back to the previous menu.



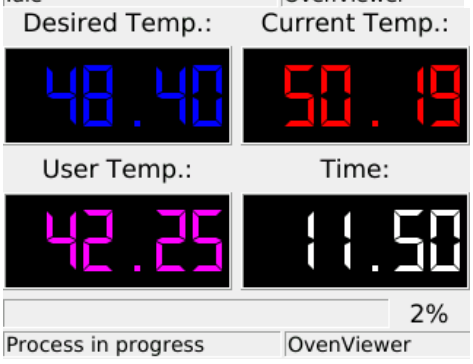
Select the temperature compensation file and press Enter.



A preview of the selected compensation file will be displayed. Press Enter to continue or press Esc to go back to the previous menu.



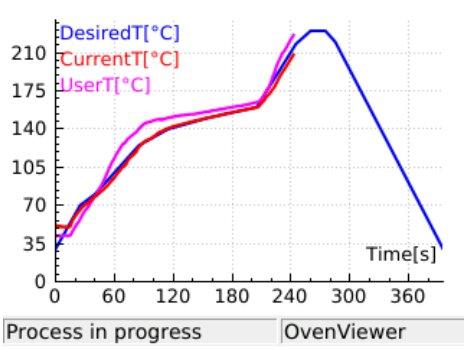
A summary of the process will be displayed. Press Enter to start the soldering process over. Or press Esc to abort the operation.



The soldering process will begin.
The temperature and time parameters will be displayed and update every 0.5s.

In order to see the graphical view press ▼.

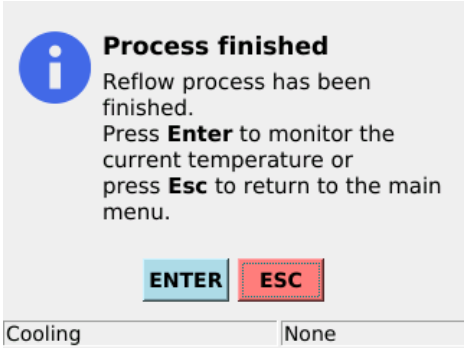
In order to stop the process press Esc.



The graphical view shows the ongoing process. The blue curve shows the predefined process profile. The red curve represents the current chamber temperature.
If the user thermocouple is installed an additional pink curve will be drawn as well showing a local temperature.

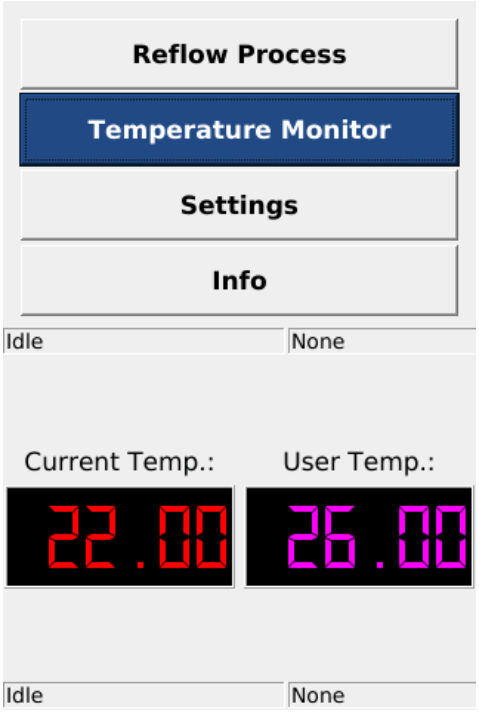
In order to see the numeric view press ▲.

In order to stop the process press Esc.
When the process is over the message will be displayed.



Pressing Enter switches to temperature monitor mode.
Pressing Esc returns to the main menu.

Temperature monitor



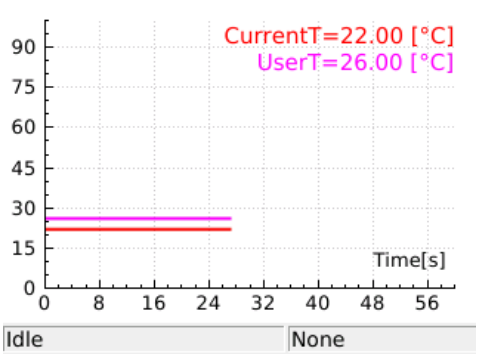
In order to monitor the current temperature of the oven chamber and the temperature of a selected object (by means of an external thermocouple) there is a Temperature Monitor option available.

Select the Temperature Monitor option from the main menu and press Enter.

The digital display shows the current temperature of the oven chamber and (if the external thermocouple is connected) the user selected object temperature.

In order to see the graphical view press ▼.

In order to return to the main menu press Esc.

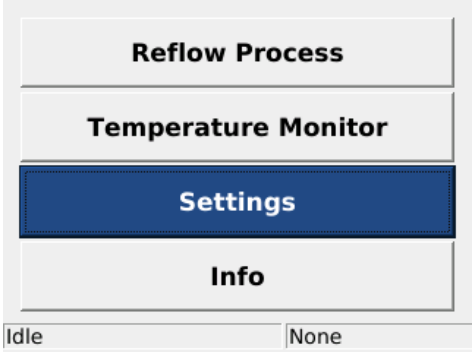


The graphical view shows the current temperature curve(s).

In order to see the numeric view press ▲.

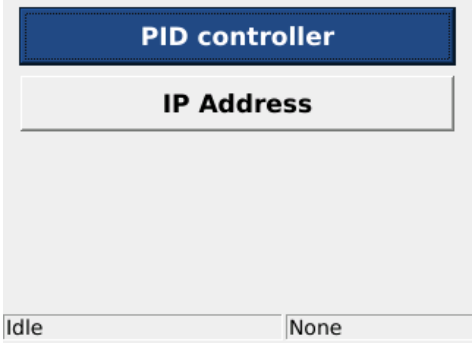
In order to return to the main menu press Esc.

Oven controller settings



In order to change the oven PID controller settings select the Settings option and press Enter.

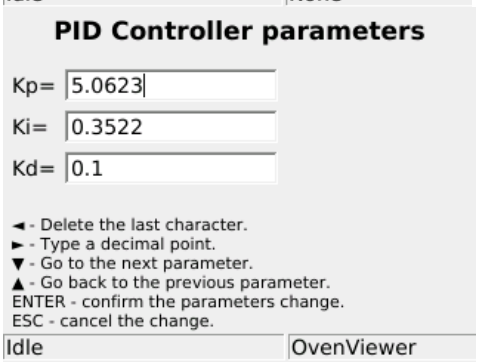
Please note that the every oven is calibrated in factory and changing that settings should not be needed and requires a service access.



Then select the PID controller option and press Enter.

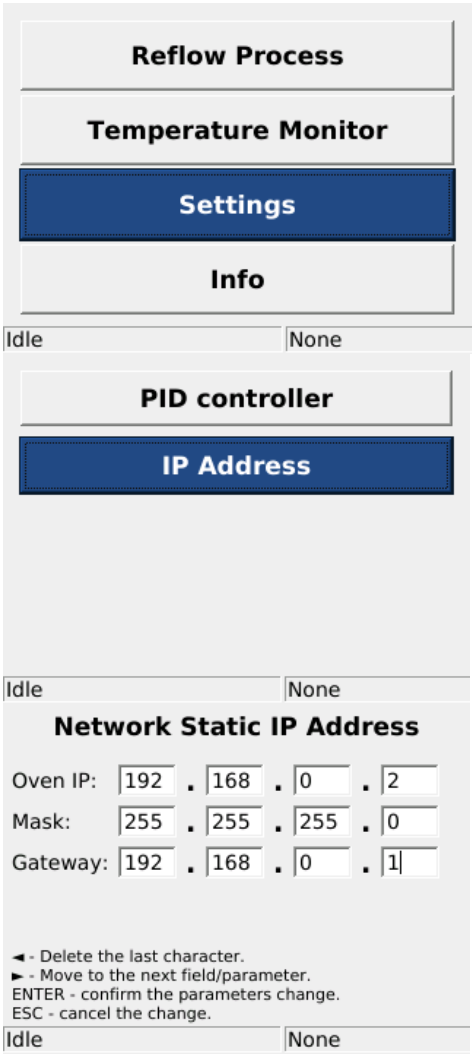
You will be asked to enter the service code first.

Then press Enter to continue.



The current PID controller parameters will displayed. Set the new settings and press Enter to save them. Otherwise press Esc to abort.

Static address settings



It is possible to direct connect the oven to a PC/laptop via a LAN cable. In order to establish a connection it is needed to set up a static network settings first.

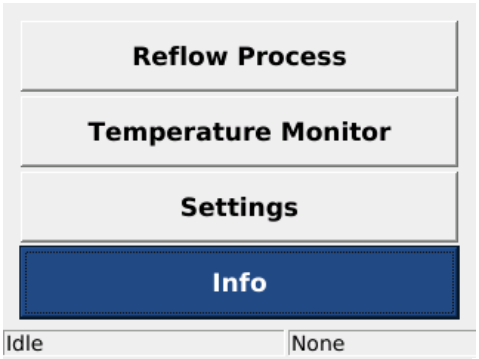
Select the Settings option from the main menu and press Enter to continue.

Then select the IP Address option and press Enter.

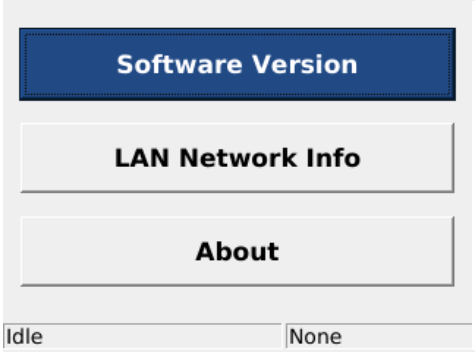
Enter the static IP address of the oven of your wish. Then set the network mask and set the gateway IP address (the static IP address of your PC/laptop).

Press Enter to save the settings or press Esc to abort.

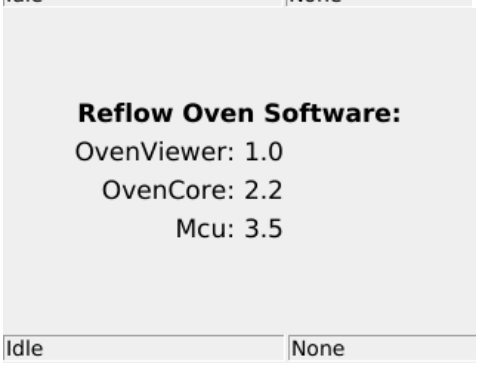
Software version info



In order to check the software version select the Info option in the main menu and press Enter.



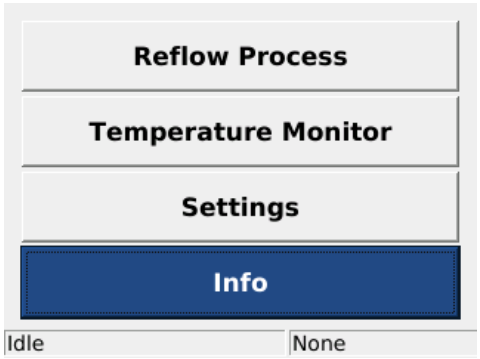
In order to check the software version select the Software Version option in the main menu and press Enter.



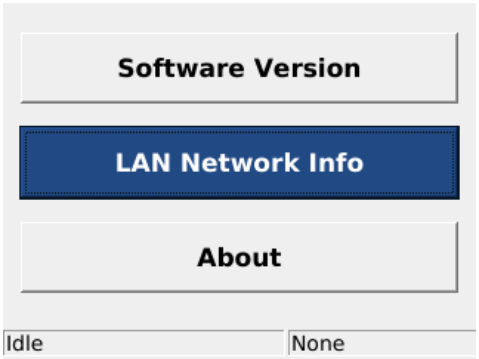
The software components version will be displayed.

Press Esc to return to the main menu.

LAN network info



In order to check the LAN network dynamic IP address select the Info option in the main menu and press Enter.

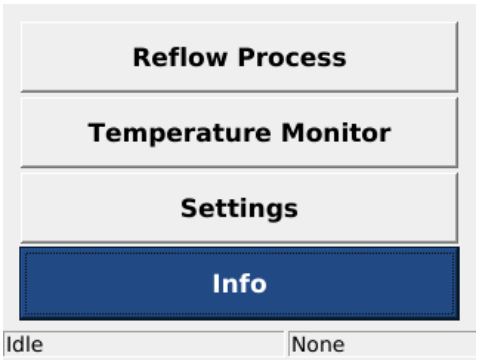


Then select the LAN network Info option and press Enter.

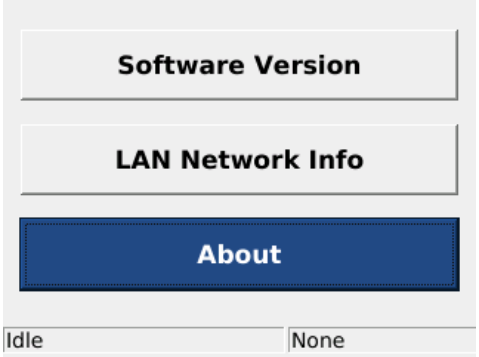
The oven IP address will be displayed.

Press Esc to return to the main menu.

Oven about message



In order to see the about message select the Info option in the main menu and press Enter.



Then select the About option and press Enter.

The about message is displayed with the support email information.

Press Esc to return to the main menu.

9. Maintenance

9.1 Maintenance schedule

The following table lists the maintenance tasks that are to be performed by personnel trained for these tasks.

Component/Assembly group	Interval	Task to be performed
System	Every week or if necessary	Clean
Fuse	If necessary	Replace

9.2 Maintenance tasks

This chapter describes in detail the individual maintenance tasks that the maintenance personnel of the operating company may perform:
-Cleaning the system
-Prerequisites
-Spare parts and auxiliaries
-The system is switched off.
-Chemical-resistant gloves
-Soft cloth
-Mild detergent

- Clean the surface of the system with a soft cloth soaked in mild detergent.
The system has been cleaned.

Replacing the fuse (only for RK320 and RK360)

Ensure that the following requirements are met before performing the steps below:
Turn off the system at the main switch, remove the Ethernet cable and disconnect the mains cable from the power supply.
Push and turn the fuse holder to remove it.

The fuse has been removed:

Replace the fuse.

Reinsert the fuse holder containing the new fuse.

Tighten the fuse holder.

Insert the Ethernet cable.

Reconnect the mains cable to the power supply and turn on the system.

The fuse has been replaced.

9.3 EC Declaration of conformity

EC Declaration of conformity according to machinery directive 2006/42/EC Annex IIA

The manufacturer:

Mechatronic Engineering Sp. z o.o.
Kostrzynska 28
66-400 Gorzow Wielkopolski
Poland
Tel. +49 91 8854801

www.mechatronic-systems.com
info@mechatronic-systems.com

hereby declares that the following products:
Product designation: RK320 , RK360 and RK460
Product type: reflow oven

conforms to the requirements of the directive stated above – including the amendments in force at the time of the declaration.

This declaration is only valid for the state of the product at the time of delivery . Any parts added by the user or other later modifications are excluded. The declaration becomes invalid if the product is modified after delivery.

The following harmonized standards were applied:

EN ISO 12100:2010	-	Safety of machinery – general principles for design risk assessment and risk reduction
EN 61010-1:2010+A1:2019	-	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1 : general requirements
EN 61000-6-1:2016	-	Electromagnetic compatibility (EMC) - Part 6-1
	-	Generic standards: Immunity for residential, commercial and light-industrial environments
EN 61000-6-3:2007/ A1:2011/AC:2012-08	-	Electromagnetic compatibility (EMC) – Part 6-3
	-	Generic standards: emission standard for residential, commercial and light-industrial environments

The following additional EC directives were applied:

- EMC directive 2014/30/EU
- Low voltage directive 2014/35/EU

CEO : Aleksander Kotowicz
Gardno 01.01.2021

10. Automatic calibration

10.1 Automatic calibration

The reason why it is necessary to calibrate the soldering process.

As standard, the soldering furnace has a common calibration profile (calib) that allows the correct soldering of 2-4 layer boards based on epoxy-glass laminate with a thickness of 1..2mm.

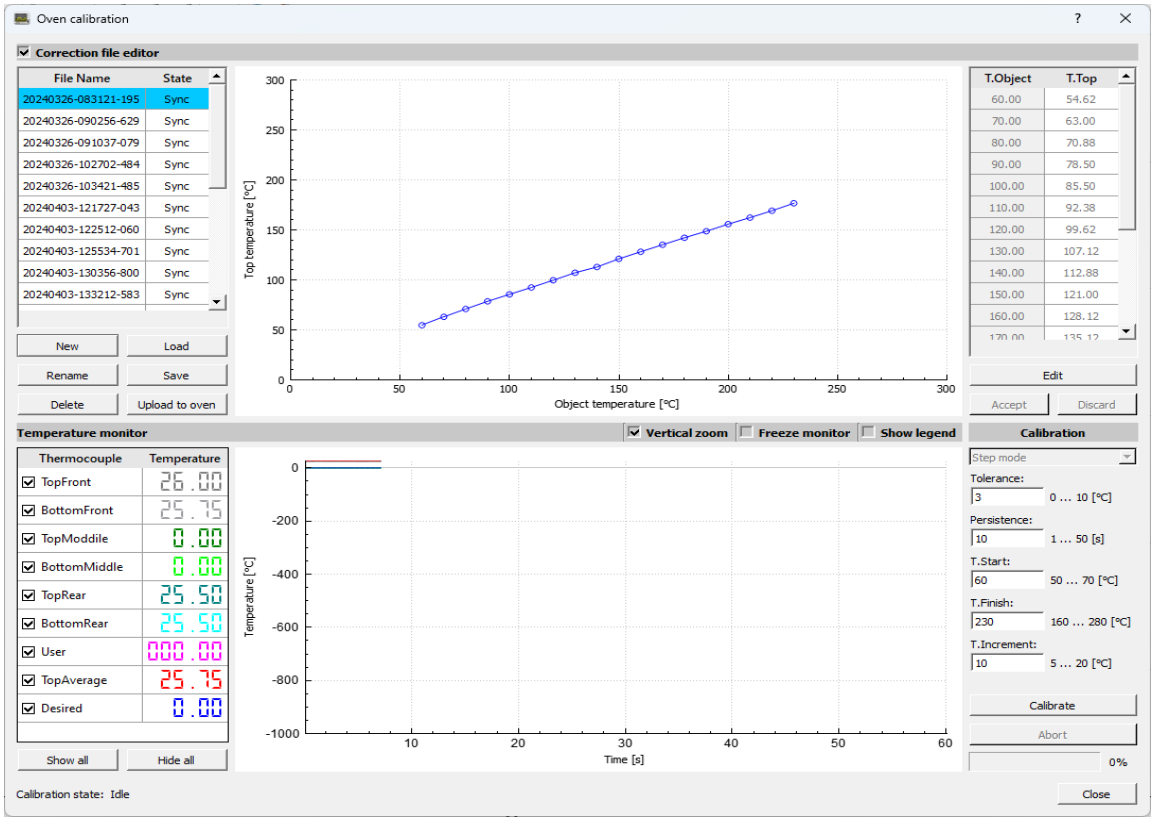
However, due to the wide variety of materials used, number of layers, soldermask types, board thickness and size, and solder packing density, it may be necessary to prepare dedicated calibration files. To this end, an automatic calibration mode has been introduced.

Note: the automatic calibration mode requires training and is not available to end users.

Description and breakdown of the automatic calibration editor.

To activate the calibration mode, press Ctrl+Alt+C.

The following dialogue box will then appear on the screen:



In addition, a new icon appears on the top bar, which allows the calibration mode to be called up directly:

The calibration window is divided into three sections:

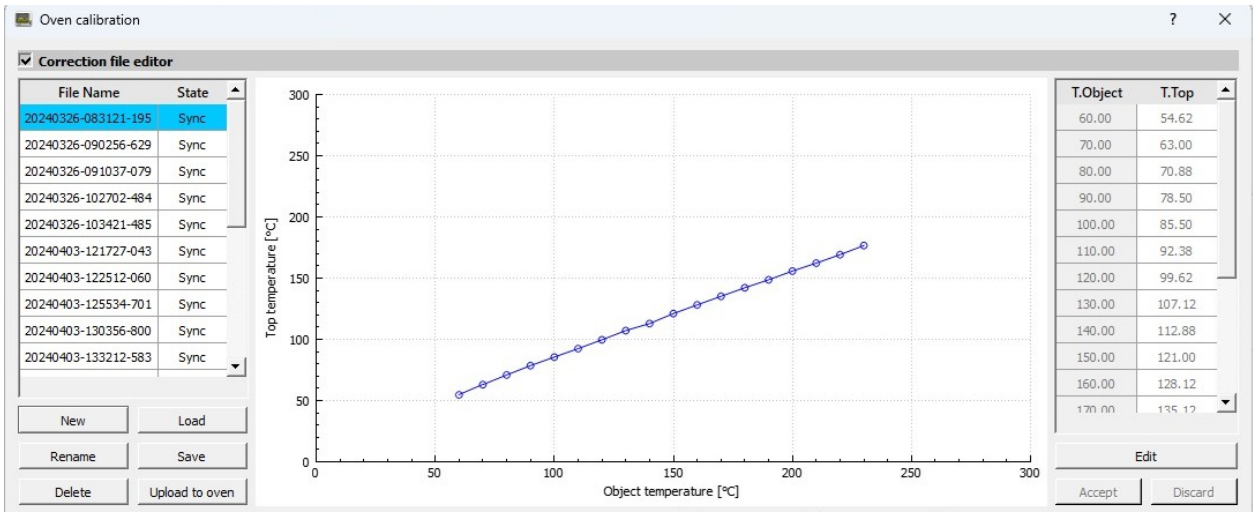
-Calibration profile editor.

-Temperature monitor.

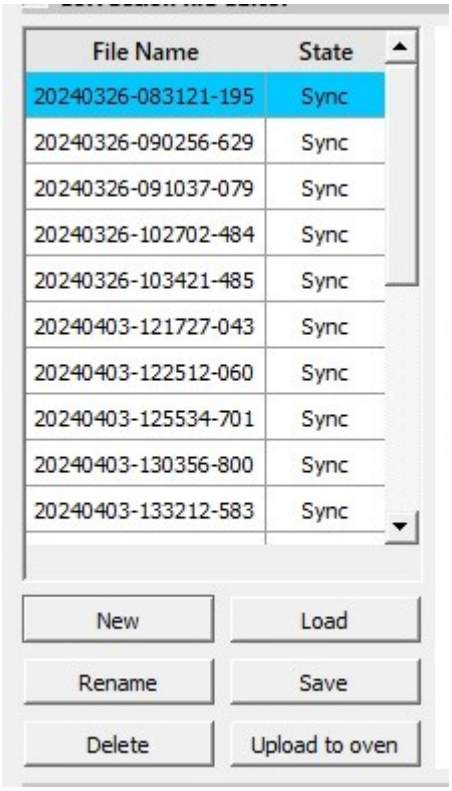
-Calibration module.

Calibration file editor

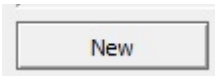
In this section, it is possible to manually edit the calibration files stored on the furnace:



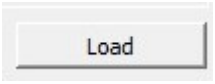
On the left-hand side of the chart, there is a section for creating, saving, deleting, reading and modifying individual calibration files.



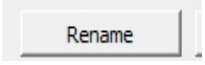
New – creation of a new file based on a predefined calibration file:



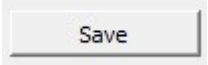
Load – uploading a file that has already been created but is on the computer's disk or other data carrier:



Rename – possibility of changing the name of a particular file:

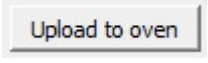


Save – saving the file in question:

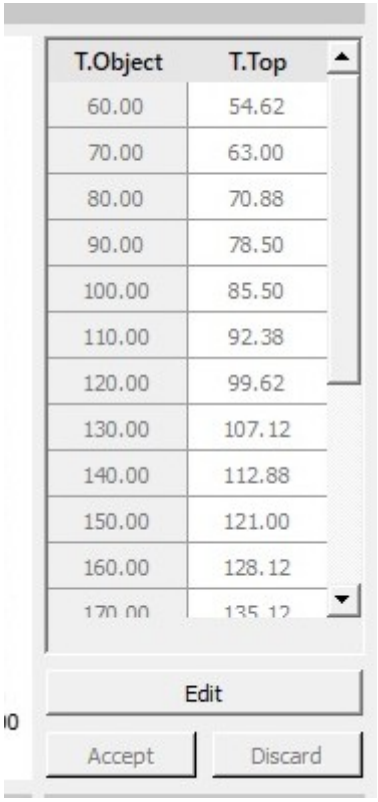


Delete – possibility of deleting a particular file:

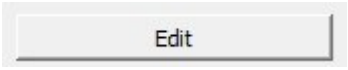
Upload to oven – copying calibration file to furnace memory:



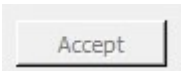
To right of chart is a section dedicated to manually changing parameters of calibration files:



Edit – mode of manual editing of individual points in a given calibration file:

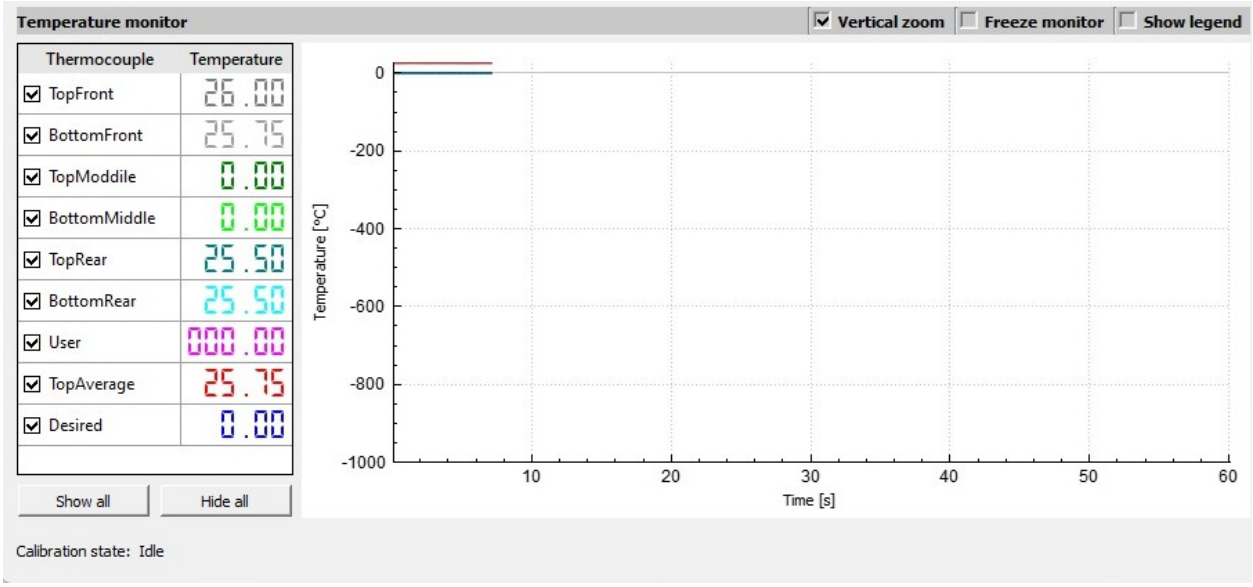


Accept – approve changes to file in question:

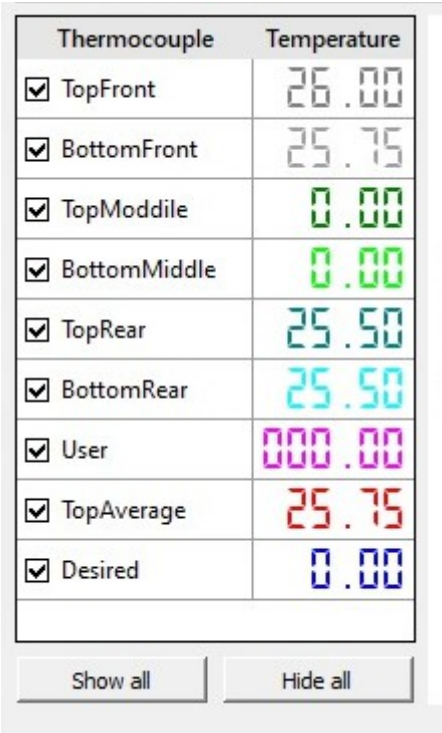


Discard – rejecting changes to file in question:

Temperature monitor



This part of the automatic calibration section is dedicated to real-time temperature monitoring using thermocouples.



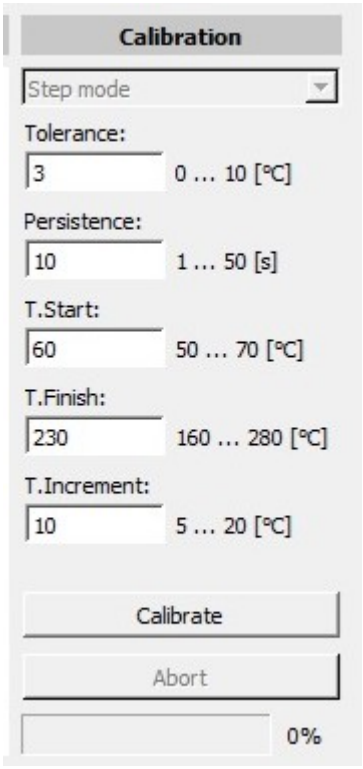
All thermocouples are individually colour-coded to reflect the curves on the temperature graph. It is possible to switch individual thermocouple monitoring on and off.

Vertical zoom – option, which allows the graph to be zoomed in vertically.

Freeze monitor – freezing the temperature chart.

Show legend – display a legend on the side of the chart.

Calibration module



Parameters:
Calibration operating mode:
Step mode – step calibration.
Profile based – calibration based on a preselected profile in the main application window (recommended mode).

Tolerance – tolerance to temperature fluctuations during automatic calibration.

Persistence – Expected temperature stability.

T. Start – minimum start temperature for the automatic calibration process.

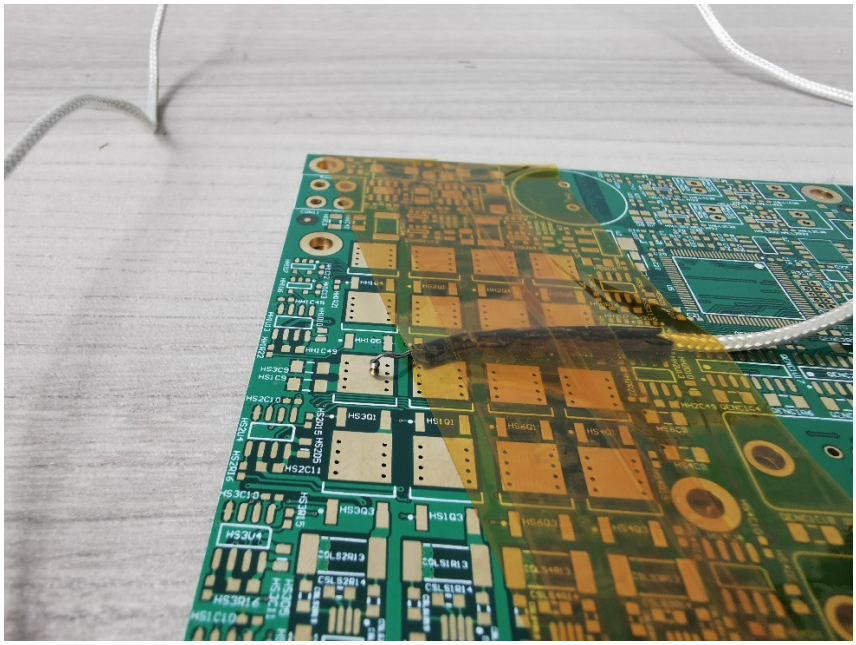
T. Finish – maximum completion temperature of the automatic calibration process.

T. Increment – temperature increment in automatic calibration mode.

Calibration can be started by pressing Calibrate.
Stopping / interrupting the calibration process is possible by pressing the Abort button.

Preparation of the furnace for automatic calibration.

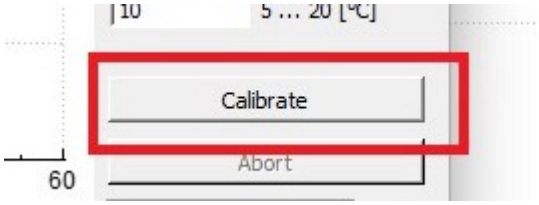
To start the calibration process:
A user thermocouple should be mounted to the board you intend to solder, as shown in the photo:



Then plug the user's thermocouple into the socket intended for this thermocouple inside owen.

Then connect to the oven in the Oven Manager Pro application and activate the calibration mode. If the calibration is to be carried out in Profile-based mode, the required profile must first be loaded.

The next step is to activate the automatic calibration of the furnace by pressing the Calibrate button:



Example of automatic calibration
The automatic calibration consists of three stages:

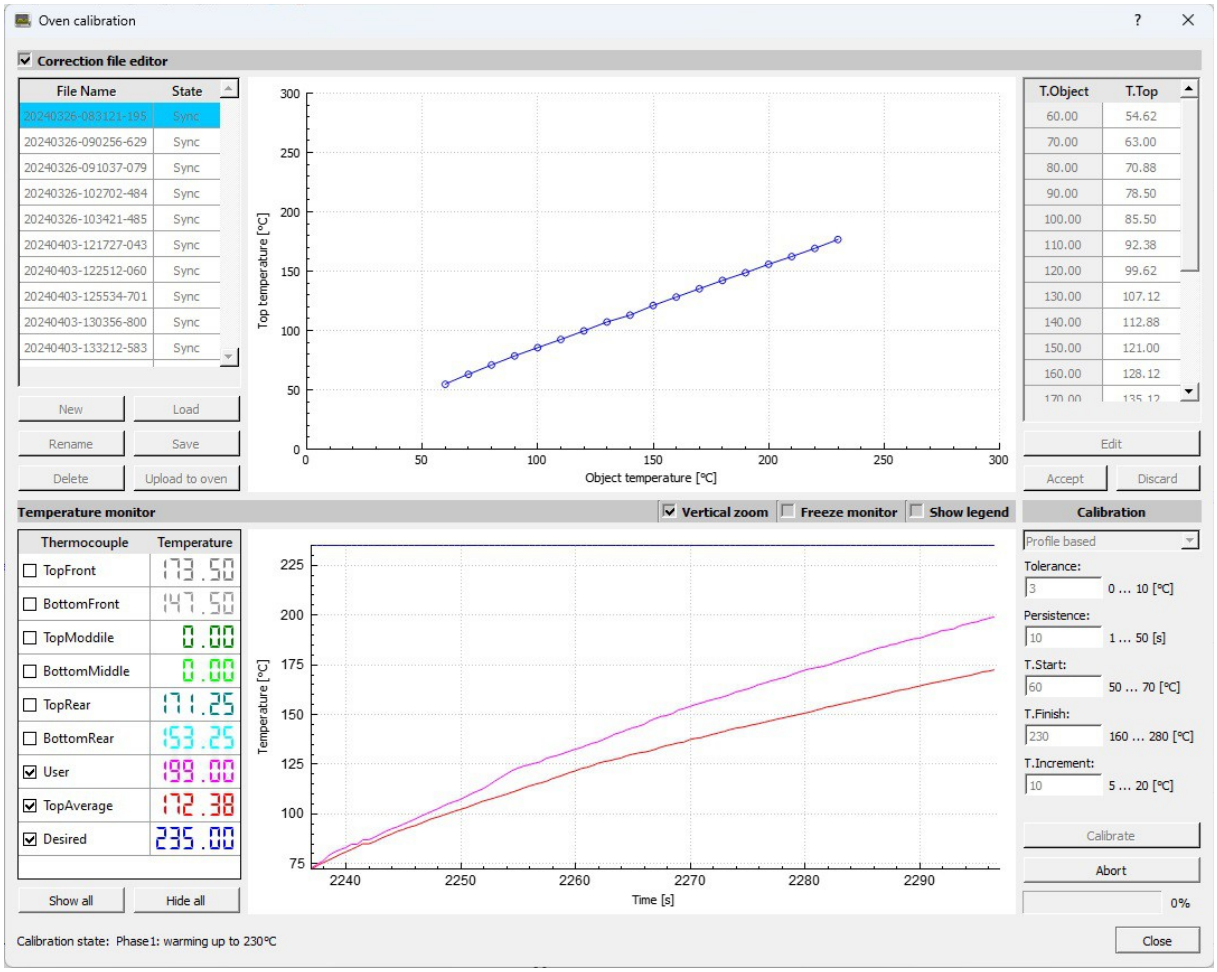
-Heating up the furnace chamber.

-Calibration based on the temperature read from the thermocouple mounted on the test board.

-Calibration curve correction based on furnace chamber thermocouples.

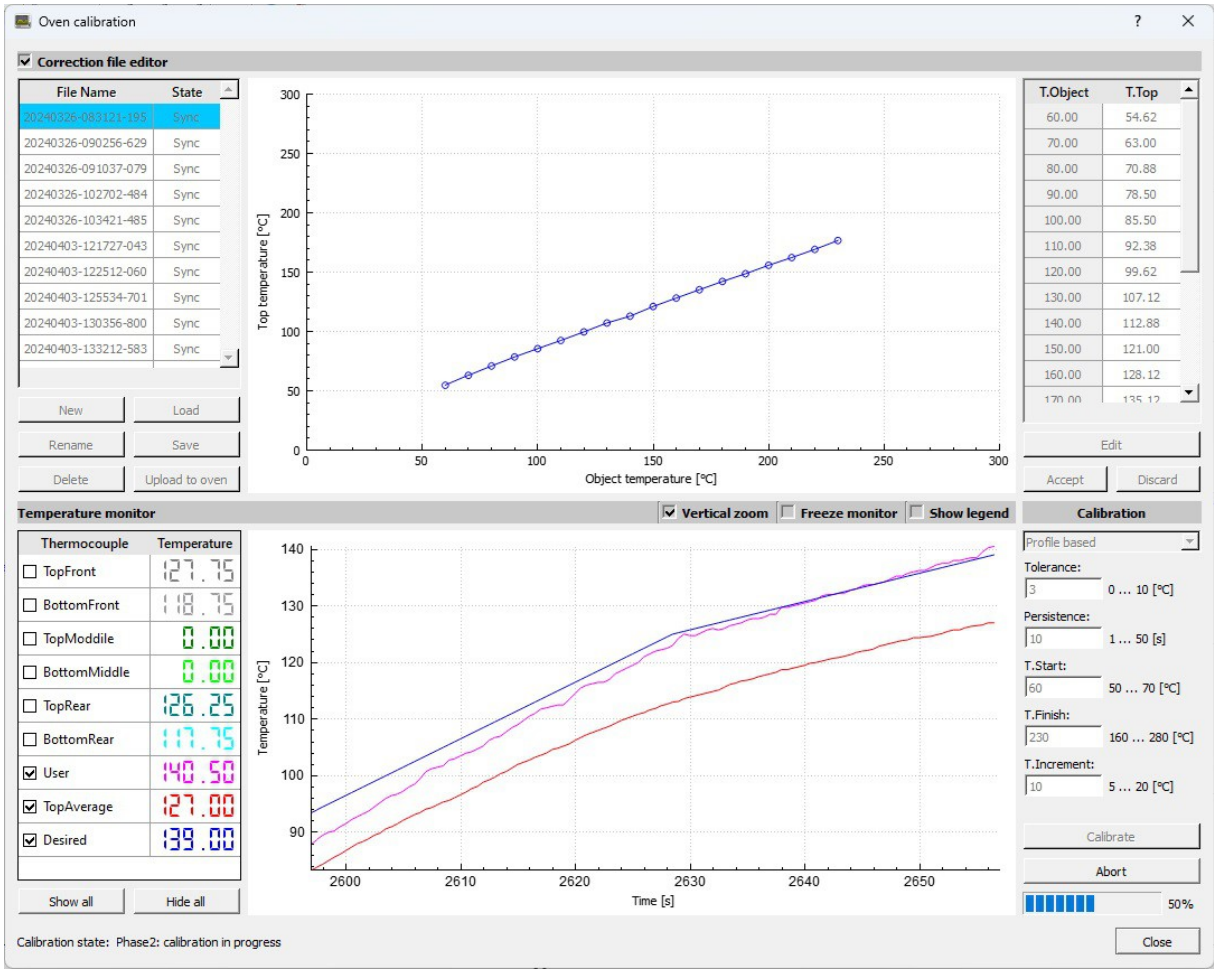
Warm-up phase.

The annealing process is necessary to obtain true results during the calibration and final correction phase.



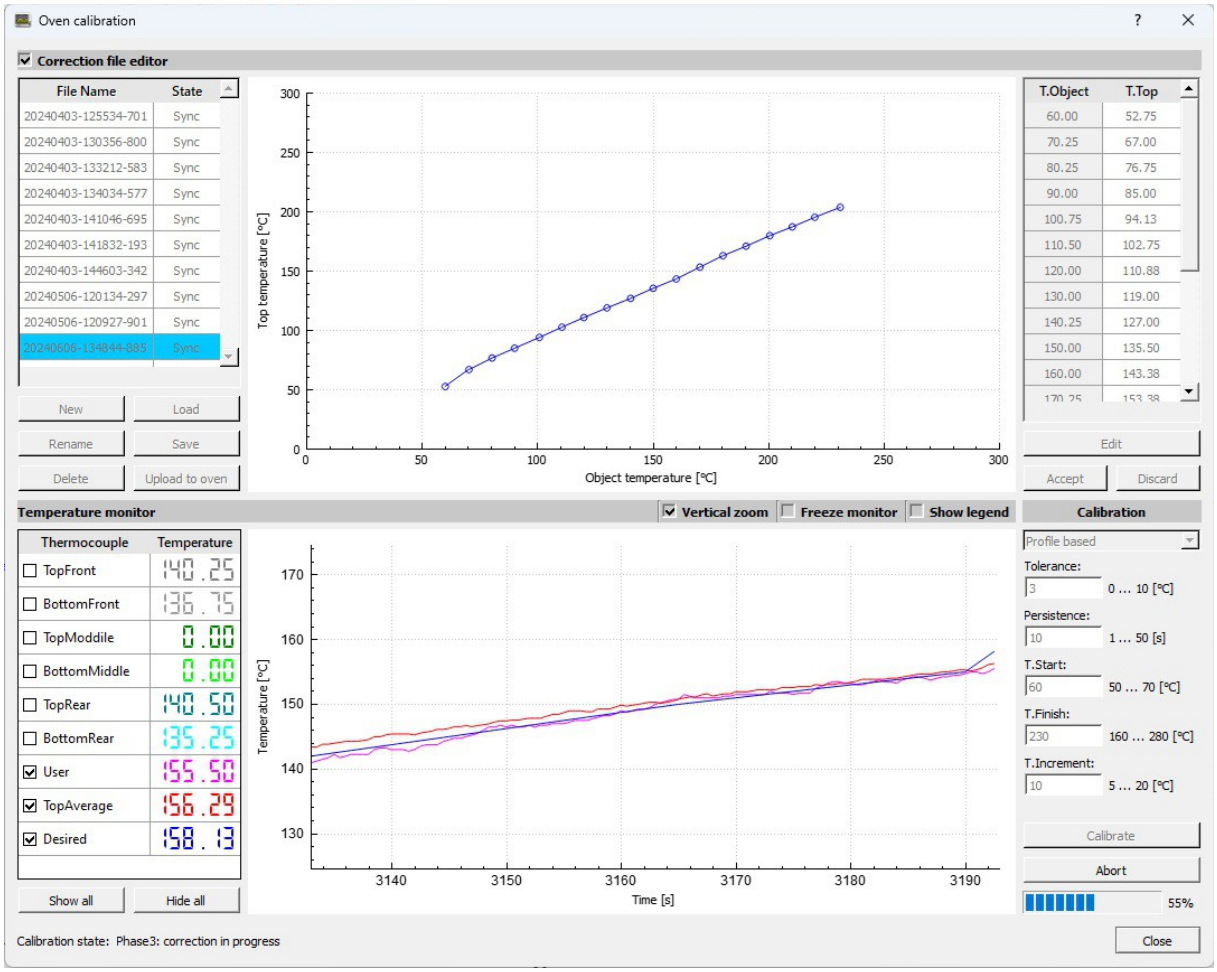
Calibration phase.

The process corrects the temperature in the furnace chamber based on the user thermocouple according to the selected operating mode. When the Profile-based mode is selected, the furnace executes the process according to the selected profile.



Correction phase

In this phase, the calibration process is performed again. This time based on the temperatures from the furnace chamber and a correction of the calibration curve is performed.



Once the calibration process is complete, two calibration files are created:
The first contains the calibration curve before correction.
The second contains the corrected calibration curve - this file must be selected during the soldering process for the type of board.