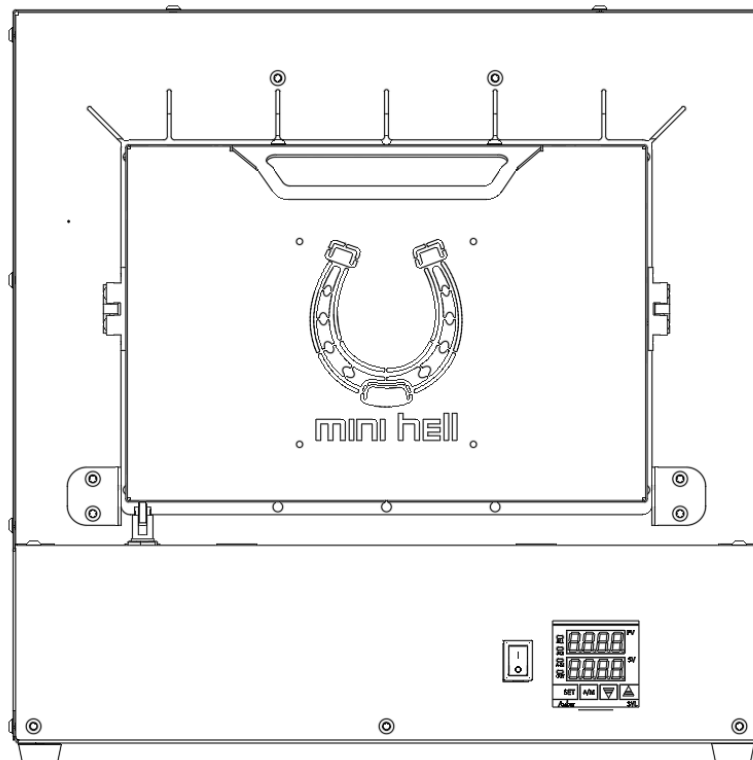


Operating manual

HEAT-TREATMENT FURNACE FOR METALS

MINIHELL

Type – MH250-F



Baltazar Pawłowski knives & ovens

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Translation of the original instructions

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1. BASIC INFORMATION

1.1 Introductory information

This operating manual has been prepared on the basis of the Regulation of the Minister of Economy of 21 October 2008 on essential requirements for machinery (Journal of Laws No. 199, item 228).

This operating manual applies to a device intended for the heat treatment of metals. The device meets the requirements of Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery and bears the CE marking.

The contents of this operating manual are intended to facilitate familiarisation with the device and its intended use. The manual contains important instructions that enable reliable, safe, correct and efficient operation of the device. Compliance with this manual will help prevent hazards, reduce downtime and repair costs, and maintain the reliability and service life of the device.

This manual must be read by all persons who perform any activities involving the device, including operation, auxiliary work and other activities related to keeping the device in good technical condition and fully operational (maintenance, inspections, repairs or overhauls).

Before starting work on or with the device, every person must read this manual in order to become familiar with the furnace design, operating principle, adjustment, use, all servicing activities and occupational safety. To ensure full utilisation of the device, extend its service life and minimise operating costs, keep it clean, carry out regular maintenance and inspections, and immediately rectify even minor faults and damage that are noticed.

Before switching on the device, please read the operating manual carefully and strictly observe all applicable regulations and occupational health and safety rules during operation.

The manufacturer continuously strives to improve its products and therefore reserves the right to make design, technological or equipment changes without prior notice.

1.2 Definitions

User - a person, institution or organisation entitled to use a product (machine, device, service, technology or tool).

Operator - a person directly responsible for operating the device in order to carry out production activities. Specific interventions (e.g. settings, adjustments and minor maintenance activities) may be carried out by the operator only if the operator has been specifically trained for this purpose.

Maintenance technician - a qualified person authorised by the user to keep the machinery in proper technical condition and possessing adequate, verified knowledge enabling specific servicing activities to be performed on the machine / device.

Operating personnel – the operator, maintenance personnel and any other person authorised by the user to work with or on the device.

Operation / servicing activities – any type of work with or on the device throughout its entire life cycle (including normal operation, setting, transport, installation, maintenance, servicing, repairs, inspections, overhauls, disassembly/assembly, scrapping and disposal).

1.3 Information concerning the manual

The operating manual is an integral part of the supplied device and should be kept at the workstation (or with the device when it is stored) in a condition that ensures all information remains legible. The manual must therefore be kept in an easily accessible place known to the operating personnel, used as an authoritative source of information and consulted whenever doubts arise. This manual may be used only for the owner's own purposes and must be presented upon request to an authorised technical service centre.

The manual provides information enabling correct and safe work with the device. Everyone working with the device is obliged to comply with the regulations, laws, safety rules and accident-prevention principles applicable at the place of use, and the user must take all steps necessary to ensure safe operating conditions for the personnel. The information on safety, operation, transport, assembly, installation, maintenance and repair contained in the manual enables correct and safe work with the device; failure to follow it may endanger life or health, damage the device or its surroundings and/or invalidate the warranty.

If this manual is lost, damaged, incomplete or if additional documentation is required, please contact the device supplier.

This documentation is confidential and the information contained herein may not be reproduced, used for purposes other than intended or disclosed to third parties without the consent of the manufacturer / supplier.

This manual does not exempt the user from applying and observing general regulations concerning accident prevention and environmental protection.

2. GENERAL SAFETY REQUIREMENTS

2.1 Description of safety symbols used in the manual

Safety instructions are marked with a warning symbol and a signal word. The signal word (DANGER, WARNING) describes the severity of the hazard and has the following meaning:



DANGER

Indicates an immediate hazard with a high risk of death or serious bodily injury (loss of a body part or long-term damage) if it is not prevented.

Failure to follow this instruction may result in death or serious / permanent bodily injury.



WARNING

Indicates a possible hazard with a moderate level of risk which, if not prevented, may cause minor or moderate bodily injury or property damage.

Failure to follow this instruction may result in temporary bodily injury.

Important information, instructions, recommendations and notes are marked with an information symbol and a signal word, the meaning of which is shown below:



NOTICE

Indicates information and instructions important for keeping the device in good technical condition or facilitating correct use, optimisation of operation or storage.

Failure to follow this instruction may prevent full use of the device or may result in process disruption, damage to the device or its surroundings.

2.2 Safety regulations

To avoid accidents and ensure long and trouble-free operation of the device, personnel must be familiar with the construction and operation of the furnace, the hazards it presents, applicable occupational health and safety and fire-protection regulations, and the correct safety measures. Following these regulations and the recommendations described in this manual will reduce the risk of injury or damage to the furnace.

1) Before starting work with the furnace:

- carefully read the operating manual and follow the information it contains; become familiar with the construction of the device, its operating principle, control system, protective devices and the hazards it presents,
- use the required personal protective equipment – clothing, safety glasses, face protection and protective gloves,
- check the device for externally visible defects and damage – do not use the furnace if any part is not operating correctly, has been damaged or is defective,
- check that the furnace and its safety devices are functioning correctly,
- make sure that no one will be endangered by the operating device.

2) When operating the device, follow the instructions below:

- operate the furnace only when it is fully functional and only when all protective devices required for safety (safety switches, limit switches, operating-status indicators or other devices installed on the equipment) are correctly installed, connected and operational,
- if faults occur in the operation of the furnace, any of its components, accessories or safety devices, immediately disconnect the device from the power supply and have the faults repaired; operating the furnace before the faults have been rectified is prohibited,
- do not overload the furnace beyond its permissible operating parameters,
- carry out all repairs, maintenance and cleaning of furnace components only when the device is switched off and secured against unexpected start-up,
- personnel operating equipment with moving parts must not wear clothing with loose or hanging elements, such as loose sleeves, ties or scarves, and long hair must be covered,
- control elements must be dry and free from traces of oil and grease,
- never place hands near moving parts,
- talking and leaving the device unattended during operation are prohibited,
- never leave the device operating unattended; if it is necessary to leave the workstation, switch the machine off,
- do not use any working method that creates a safety hazard,
- ensure adequate lighting at the workstation.

	NOTICE This operating manual is an integral part of the device.
	NOTICE Before starting any work, carefully read the operating manual. All persons operating the device are required to follow the instructions and recommendations, in particular the safety rules contained in this manual.
	WARNING Using the furnace in a manner that differs from that described in the manual is prohibited because it may create hazards to persons and property and is regarded as improper use.
	WARNING Operating personnel are prohibited from making modifications to safety devices, mechanical parts and assemblies or electrical installations that are not provided for in this documentation and that could reduce operational safety.
	DANGER The device contains danger zones that present a risk of serious injury or death.

2.3 Warning and information signs

For safe handling of the device, pictograms / warning and information signs have been installed. Their meaning and installation location are given in Table 1.

Table 1

No.	Pictogram	Meaning	Location
1		Read the operating manual	On the device structure or at the workstation
2		Mandatory eye protection sign	On the device structure or at the workstation
		Mandatory face protection sign (e.g. face shield, protective mask)	On the device structure or at the workstation
		Mandatory protective clothing sign (e.g. leather apron, coveralls)	On the device structure or at the workstation
3		Warning sign – risk of electric shock	On the control panel and/or near the power cable
4		Warning sign – moving / rotating parts	Near the fan
5		Warning sign – hot surface	Near the door

2.4 Electrical safety

Precautions during installation and operation of the furnace:

1. Work on the furnace electrical installation and electrical equipment may only be carried out by a qualified electrician. If in doubt, contact the manufacturer of the device.
2. The furnace must be connected to an electrical installation suitable for its power rating and protected by appropriate fuses. Furnace parameters are given in section 3.2.
3. The furnace must be connected to an installation equipped with a protective earth conductor (PE).
4. Any modification of the electrical installation of the device is prohibited. Such modification will immediately invalidate the warranty and may result in electric shock.
5. Disconnect the furnace from the power supply before carrying out any service work inside the chamber, such as cleaning or vacuuming.
6. Never use an extension cord with a conductor cross-section other than that required for the power rating of the device. This may damage the furnace or cause the extension cord to melt.

	DANGER Any modification of the device electrical installation is prohibited – electric-shock hazard.
	DANGER Do not touch, adjust or replace the furnace heating elements while the furnace is connected to the power supply. Electric shock may cause serious injury or death!
	NOTICE Incorrect connection may damage the electrical components of the furnace.

7. Do not switch on the device until you have made sure that no unauthorised persons are in the vicinity.
8. Before starting the device, make sure it is operational, undamaged and ready for use, and that the switches are in the “O” / OFF position.
9. The furnace electrical installation and electrical equipment must be inspected regularly; any faults, such as loose connections or damaged cable insulation, must be rectified immediately.
10. Use insulated tools only.
11. Use only protective devices rated for the correct current. Using fuses with too high a current rating may damage the electrical installation and may also endanger health and life.
12. The electrical installation to which the furnace is connected must also be inspected regularly.
13. When the furnace is not in use, remove the plug from the socket.

3. CONSTRUCTION AND TECHNICAL DATA

3.1 Identification and intended use of the device

Name: Electric crucible furnace

Type: MH250-F

Intended use: Minihell furnaces are intended for heating metal objects placed in the heating chamber at temperatures up to 1100°C and holding them for the time required for internal structural transformations in a normal atmosphere.

This documentation contains a description of the furnace construction and operating principle as well as information and recommendations concerning operation, possible operating modes, methods of setting and adjusting operating parameters, maintenance, inspections, repairs and overhauls.

3.2 Technical data

The basic data and parameters of the furnaces are provided in Table 2.

Table 2

No.	Furnace model	Power [kW]	Chamber dimensions L x W x H [cm]	Overall dimensions L x W x H [cm]	Voltage [V]	Weight [kg]	Other
1	MH250-F	3,4	225x225x130	400x400x400	230	16	
2							
3							
4							
5							
6							



NOTICE

The size of the heating chamber determines the maximum dimensions of objects intended for heat treatment.



NOTICE

Take particular care when placing components in the furnace so as not to damage the internal lining, door or other furnace components.

3.3 Furnace construction

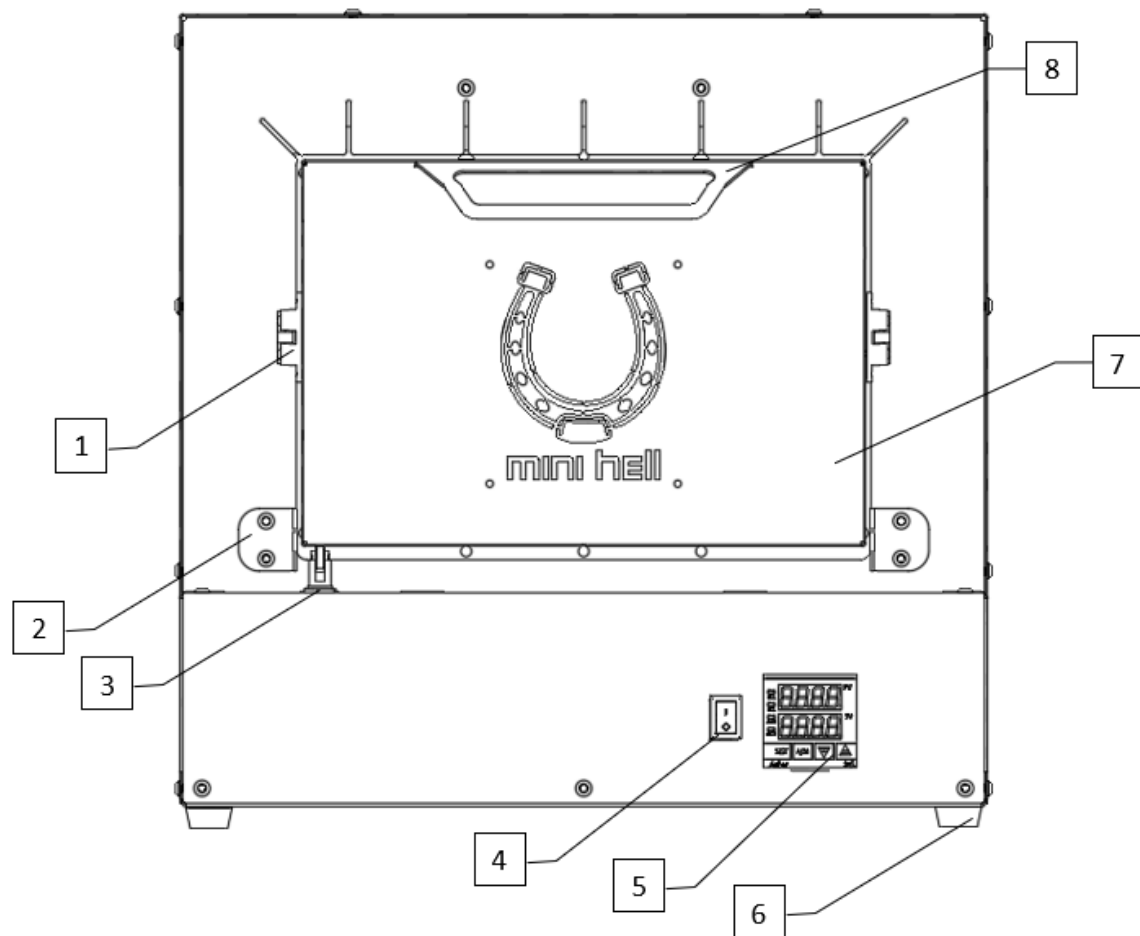
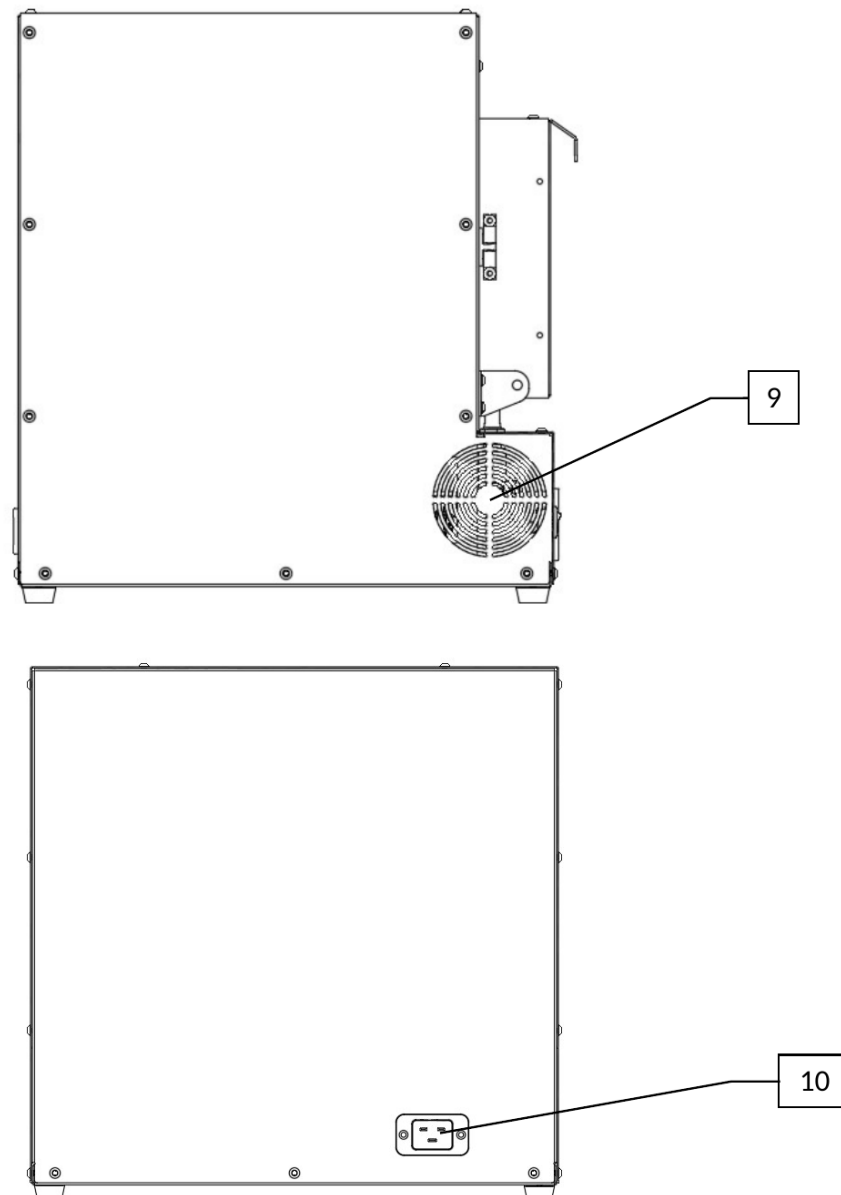


Fig. 1 MH250-F furnace – front view

Main components of Minihell furnaces:

1. door latch
2. door hinge
3. limit switch
4. main switch
5. temperature controller
6. foot
7. door
8. door handle



9. Fan guard | 10. Power inlet

Control-panel components and sensors

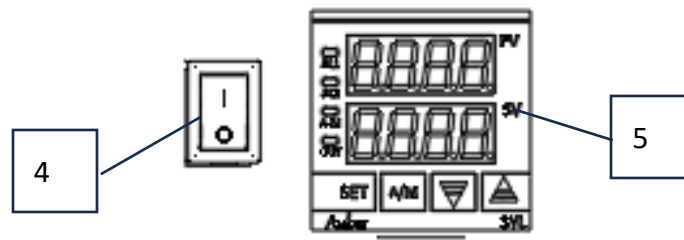


Fig. 3 – Control panel view

The furnace is controlled using the components located on the control panel. The furnace is switched on and off using switch 4. The required temperature is set on controller 5 (a detailed controller operating manual is attached to this manual). The fuse protecting the furnace electrical installation is located inside the control system. The temperature sensor is located inside the furnace chamber and is visible only after the device door has been opened.



NOTICE

When placing objects in the heating chamber, take care not to damage the sensor / thermocouple.



DANGER

Touching live heating elements may create an electric-shock hazard.

Safety devices

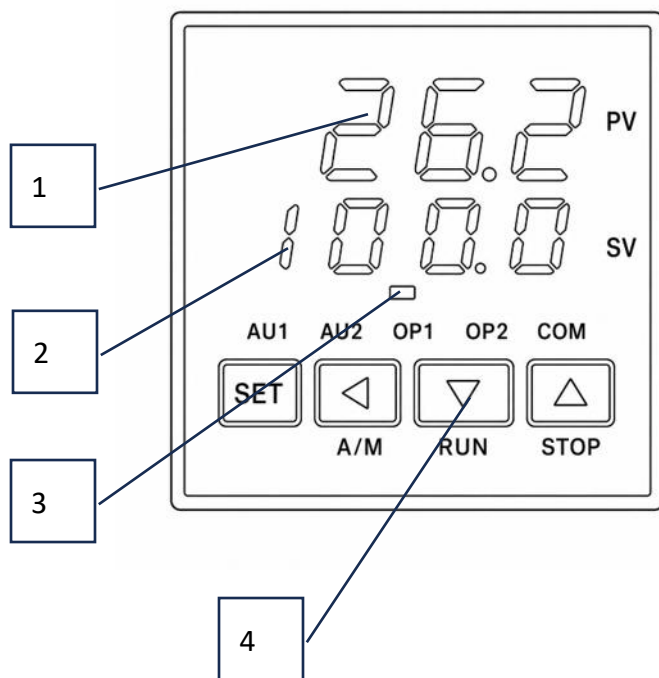
The furnace is equipped with several safety devices:

- 3) 0.5 A fuse in the control circuit
- 4) Overtemperature alarm in the control system, which disconnects power to the heating elements when the temperature exceeds the setpoint on the controller by 50 degrees

Although the heating elements are switched off when the furnace door is opened, it is recommended to switch off the device power supply when inserting and removing the load from the furnace chamber, and to disconnect the plug during any service work and inspections.

It is recommended to keep a fire extinguisher suitable for extinguishing electrical equipment and smoke detectors within easy reach.

Temperature control



1. Current chamber temperature
2. Set temperature
3. The indicator light shows that the controller is in operating mode and all control outputs are active. If the user changes the "RUN" parameter to "no", the controller will enter sleep mode and the furnace will not heat up.
4. The arrow buttons are used to set the required temperature.

3.4 Danger zones / hazards

Remember that residual electrical and thermal energy is present in the device and its immediate surroundings and that hazards from other sources may also exist. The device has been designed to eliminate situations dangerous to health and life. Nevertheless, situations may arise in which the operator or bystanders are exposed to hazards.

The furnace must be switched off immediately if there is a hazard to the operator, bystanders or the device itself, and it must not be restarted until the fault or hazard has been eliminated.

The device uses electrical energy to drive the fan and heat the heating chamber. For this reason, it has several hazardous zones.

- 1) Fan (moving parts) – a mechanical hazard may arise if the fan guard is damaged.
- 2) Electrical cable, heating coils – an electric-shock hazard may arise if the electrical insulation is damaged or melted.



DANGER

Do not touch, adjust or replace the furnace heating elements while the furnace is connected to the power supply. Electric shock may cause serious injury or death!

- 3) Hot housing surfaces – the risk of burns during normal furnace operation is low (temperature below 85°C). Figure 6 below shows the hottest areas of the housing during furnace operation, mainly near the door. The outside door cover also becomes hot.

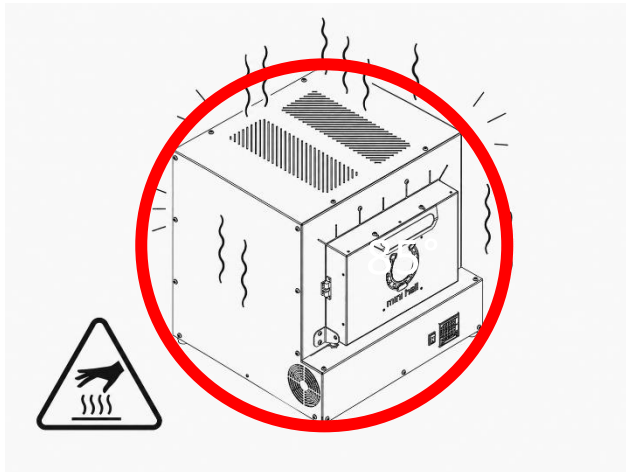


*Fig. 6 – Approximate temperature distribution
on the housing*

- 4) Hot chamber interior and thermal radiation – high risk of burns.

The chamber contains hot air which escapes rapidly when the door is opened. There is a high risk of burns. Always open the furnace chamber door carefully and wear suitable non-flammable protective clothing (e.g. an apron), eye protection providing protection against infrared and ultraviolet radiation, protective gloves suitable for work at very high temperatures, and face protection against hot air and splashes.

The thermal inertia of the chamber lining is relatively high; therefore, complete cooling of the chamber is a slow process. There remains a risk of burns or electric shock if the heating

elements are touched.

	DANGER Touching live heating elements may create an electric-shock hazard.
	WARNING After heating has been switched off and the door opened, there is a high risk of burns. The furnace housing also becomes hot and presents a burn hazard.
	WARNING Use personal protective equipment, especially when opening the furnace and removing the load.

Other types of hazards:

1) Noise and vibration

The furnace is not a source of significant noise or vibration. The noise level does not exceed 70 dB(A).

2) Liquids, oils, chemicals

- when carrying out work involving quenching fluids, cleaning agents or other chemical substances, use personal protective equipment and comply with the safety regulations applicable to each fluid (in accordance with the relevant safety data sheets) and to the processes in which they are used.
- do not allow these substances to enter the natural environment.
- When vacuuming the chamber, use a vacuum cleaner fitted with a HEPA filter. Inhalation of dust from JM26 ceramic bricks and fibre-ceramic shapes may be harmful.

4. WORKSTATION

The furnace may be operated by one operator at a time. The workstation should provide a view of the working area of the entire device and access to all mechanisms requiring operation during normal use. The workplace must be well lit by natural or artificial light to ensure good visibility.

The space around the device must allow convenient and safe cleaning and adjustment work. During operation, only persons authorised to operate the device may be present in the immediate work area.

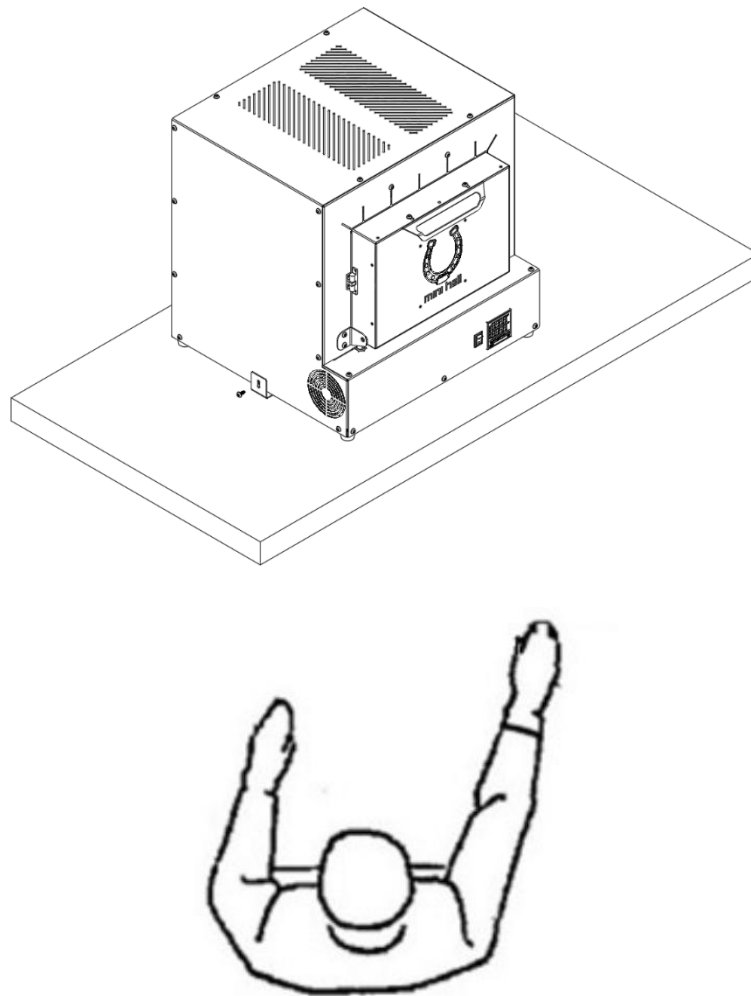


Fig. 5 – Workstation



DANGER

During operation, various components of the device are electrically energised. Incorrect operation may result in serious injury or damage to components of the device.



WARNING

Operating personnel are responsible for becoming familiar with the device, its construction and operation, the contents of this manual and all appendices, possible hazards (including hazards not covered here that may occur in the furnace working environment), applicable accident-prevention regulations and all local regulations relevant to owning and operating the supplied device.

5. TRANSPORT, INSTALLATION AND COMMISSIONING

5.1 Transport

	NOTICE Before starting transport work, read this operating manual.
	NOTICE During transport and installation work, observe generally applicable safety measures and exercise due care.
	NOTICE At every stage of transport, positioning and installation of the device, use appropriate hand and mechanical tools as well as personal protective equipment (safety footwear, protective clothing, safety glasses).

During transport, place the device on a pallet and secure it against movement and tipping; remove components that are susceptible to damage. Use forklifts, hand pallet trucks or other lifting equipment with sufficient capacity, operated by trained and authorised personnel, for lifting and transporting the load.

When lifting and handling the device, ensure the load is correctly balanced. Never subject it to strong impacts, as this may damage the furnace or control components.

Move / transport the device to its destination carefully, protecting all components against damage. After positioning the furnace at its destination, check whether any damage has occurred. Particular attention should be paid to the panels with heating elements, the temperature sensor and the furnace control and power-supply components.

If the device is taken out of service, store it in a dry place protected from weather conditions, on a stable surface, disconnected from the power supply and secured against unauthorised start-up.

	DANGER During handling, transport, lifting and reloading of the device, no one may remain beneath a suspended load.
	NOTICE Do not lift the device by openings in the housing, control components, power cables or the door.

5.2 Furnace installation

After unpacking the furnace, thoroughly inspect its overall condition (e.g. against the delivery note or separate documentation), as well as the condition and presence of accessories. Before installing the furnace at the selected location, clean the device thoroughly and remove any protective film / paper.

Install all accessories and components that were removed from the furnace (e.g. for transport). Provide sufficient free space around the furnace for daily operation as well as possible servicing, cleaning and replacement of components and parts. The furnace surroundings must not cause any interference that could adversely affect the operator or operation of the device.

	DANGER The device should be connected to an electrical installation protected by a residual-current device (RCD).
	DANGER Carry out all installation and repair work with the electrical power supply disconnected. The electrical enclosure may be opened and repairs carried out only by qualified personnel with appropriate authorisation.
	NOTICE Before starting assembly and installation of the device, read this operating manual and all appendices.
	WARNING It is strictly prohibited to start the furnace if any safety system is not functioning correctly.

5.3 Safe positioning and furnace operating conditions

- 1) Place the furnace on a table, supporting frame, base or other structure standing securely on the floor. The base on which the furnace is placed must be strong enough to support the weight of the furnace together with the load inside its chamber.
- 2) Neither the surface on which the furnace is placed nor objects located near the furnace may be readily flammable.
- 3) Do not obstruct the ventilation openings in the housing or the fan guard located on the rear wall of the furnace.
- 4) The furnace must be positioned at least 15 cm away from walls and other machines or surfaces.
- 5) The minimum distance from the ceiling is 90 cm.
- 6) The furnace must be located in a well-ventilated room. If any combustion process takes place inside the furnace, the workstation must be equipped with a fume extraction system above the furnace.
- 7) The room in which the furnace is installed must be large enough to allow heat from the device to dissipate freely.

- 8) Under no circumstances should the furnace be used when airborne dust is present, for example during grinding operations.
- 9) It is the user's responsibility to check that the load placed in the furnace does not generate harmful fumes or compounds and to ensure safe removal from the room of gases produced while the load is being heated.
- 10) Do not store any flammable objects or substances in the room in which the furnace is installed.
- 11) The space around the furnace should be free of objects that could compromise safe operation of the device.
- 12) The temperature in the room in which the furnace operates should be between +5 and +40°C.
- 13) Optimum relative humidity is 40–60%.
- 14) Avoid damp and heavily dusty rooms.
- 15) The furnace must not be exposed to rain, wind or other weather conditions.
- 16) When the furnace is not in operation, the device door should be closed and the plug removed from the socket.

5.4 Electrical connection

Check that the electrical connection data on the rating plate (supply voltage and mains frequency – also specified in the “Technical data” section) correspond to the available supply. Make sure that the device is properly earthed.

- 1) The electrical diagram should be available during furnace installation.
- 2) The initial connection of the furnace to the electrical installation should be carried out by a person with appropriate knowledge and qualifications.
- 3) The electrical installation to which the device is connected should be inspected by a qualified electrician, must have suitable parameters and current satisfactory electrical test results.
- 4) The installation must be equipped with a residual-current device (RCD) and must be suitable for the current drawn by the device.

5.5 Putting into service

Before start-up, become familiar with the full description and operation of the furnace and once again check the technical condition and correct operation of all components, shut-off devices and safety systems.

Before starting the device, qualified operating personnel should perform the following activities:

- 1) place the supplied operating manual at the workstation,
- 2) check the condition of mechanical fastenings and furnace positioning,
- 3) check the technical condition of the device, its components and heating elements,
- 4) remove all unnecessary tools and objects from the device and its immediate surroundings,
- 5) check that all safety systems and guards have been installed and are operating correctly,
- 6) check that no unauthorised persons are present within the device area,
- 7) after completing the above activities, carry out initial operation (see section 5.6 Initial start-up),

- 8) throughout the initial operation period, monitor the condition and operation of the heating elements and moving parts,
- 9) pay attention to unusual noises, e.g. from the fan, excessive smoke and other abnormalities,
- 10) if there are any concerns, stop operation and have the furnace inspected by specialised personnel,
- 11) if the tests are satisfactory, normal operation of the furnace may begin.

5.6 Initial start-up

- 1) The first start-up of the furnace should be carried out with an empty chamber. This allows a protective layer to form on the heating elements and enables the user to become familiar with operation of the device.
- 2) Set the furnace to 800°C and allow it to heat freely at this temperature until water vapour and smoke caused by combustion of the organic binders that bind the ceramic fibres stop coming out of the furnace chamber. The device may then be switched off or the set temperature changed and further operation begun.
- 3) Once smoke from the chamber has stopped, it is recommended – while wearing protective clothing against high temperatures and suitable eye, face and hand protection – to switch off the power supply and open the furnace chamber so that the operator can become familiar with the blast of hot air that accompanies opening the chamber.

6. USER RESPONSIBILITIES



WARNING

Knowledge of basic safety instructions and occupational health and safety regulations, and compliance with them, are prerequisites for safe and trouble-free operation of the device.

The user is obliged to:

- 1) keep all warning signs on the device / workstation legible,
- 2) replace damaged warning signs, guards and protective devices,
- 3) allow only personnel who meet the following requirements to work with the device:
 - are familiar with basic occupational health and safety regulations and accident-prevention regulations,
 - have been trained in working with the device (workstation training),
 - have read and understood this operating manual and other manuals supplied with the device,
 - are fit to perform their duties,
 - are at least 18 years old.
- 4) use materials suitable for heat treatment; if the user is unsure, contact the material supplier to clarify any doubts,
- 5) carry out the heat-treatment procedure in accordance with the guidelines of the manufacturer of the material concerned (temperatures, heating time, type of quenching liquid / oil, etc.).



WARNING

Incorrect selection of the process for the material being treated may lead to an accident or damage to the furnace.

- 6) regularly supervise personnel with regard to hazard awareness and safe working practices, taking into account the information contained in the manual and the applicable regulations.

Operating personnel are obliged to:

- 1) comply with occupational health and safety regulations and accident-prevention regulations,
- 2) follow the recommendations and instructions contained in this manual and other attached documentation,
- 3) maintain the device in proper technical condition and keep the workstation tidy,
- 4) use the protective equipment and safeguards required at the workstation,
- 5) switch off the furnace by removing the plug from the socket when the furnace is not in use or during repair, maintenance or overhaul,
- 6) use the device in accordance with its intended purpose.

7. INTENDED USE

The furnace is intended for heating metal objects placed in the heating chamber at temperatures up to 1100°C and holding them for the time required for internal structural transformations in a normal atmosphere.

Intended use also includes:

- tempering processes after hardening,
- normalising processes,
- compliance with all guidelines contained in this manual,
- timely and correct performance of inspections, repairs and maintenance work by qualified and authorised persons,
- performance of work aimed at improving operational safety.



WARNING

Faults in furnace operation, especially removal of guards, protective devices or safety devices, may lead to situations that endanger health. Any such deficiencies must be rectified immediately.

Failure by the user to follow the recommendations and instructions contained in this manual and use of the device for purposes other than those described above will be regarded as improper use.

8. IMPROPER USE

The device is NOT intended for heating objects other than metal / steel objects, especially combustible objects, metal objects exceeding the dimensions of the heating chamber, or for processing any materials harmful to health.



DANGER

Operating the device in potentially explosive atmospheres is prohibited. Appropriate measures must be taken to ensure that materials and auxiliary substances processed using the device do not create an explosion or fire hazard.

The following work and activities are also prohibited:

- 1) using the device in potentially explosive atmospheres,
- 2) switching on the device while inserting or removing a load from the chamber,
- 3) switching on / operating the furnace when it has visible damage or faults or is in an improper technical condition,
- 4) operating the device without authorisation, in inappropriate clothing or without appropriate personal protective equipment,
- 5) working with guards or safety devices removed or damaged, or with the door open,
- 6) deactivating / bypassing / removing safety systems and limit switches,
- 7) exceeding the permissible furnace operating parameters and using materials of unsuitable dimensions, in particular heating the furnace above the maximum temperature specified on the rating plate,
- 8) placing hands in areas of the device where there is a risk of amputation, crushing, fracture, burns or electric shock,
- 9) allowing persons who are intoxicated or under the influence of medication or psychoactive substances to work with the device,
- 10) using the furnace for food preparation, defrosting, space heating, drying or similar purposes,
- 11) using operating methods other than those specified in this manual,
- 12) repairing or cleaning the furnace or carrying out maintenance work while the power supply is switched on – disconnect the plug first,
- 13) modifying the furnace or its installation for a use other than that specified in this manual,
- 14) placing objects on the furnace or leaning them against its housing,
- 15) under no circumstances heat cyanides in the furnace – vapours generated when these substances are heated are TOXIC,
- 16) never leave the operating device unattended – there is a risk of fire,
- 17) never use the furnace with the chamber door open,
- 18) never allow the power cable to touch the device housing – this may damage the cable and cause electric shock.



DANGER

Do not work on a furnace with a damaged electrical installation, uninsulated wires or defective safety devices.



DANGER

The manufacturer accepts no responsibility for risks arising from use that is improper / not provided for in this manual.



NOTICE

Incorrect connection may damage the electrical components of the furnace.

9. RESIDUAL RISK

9.1 Identification of residual risk

The device has been designed and manufactured in accordance with applicable regulations and the best available technical knowledge. Nevertheless, certain parts of the device may present hazards:

- 1) electrical installation,
- 2) rotating fan components,
- 3) hot surfaces of the device,
- 4) hot surfaces of the load material,
- 5) thermal radiation / hot air.

Residual risk results from improper operation of the device by personnel, both during normal use and during repairs, maintenance, inspections or overhauls, and may occur when the following prohibited activities are performed:

- 1) allowing an untrained person to work with the device,
- 2) operating the device by persons under the influence of alcohol or other psychoactive substances,
- 3) opening or removing guards and reaching inside the device while it is switched on,
- 4) working with the door open or damaged,
- 5) working or reaching within the area of moving parts,
- 6) working or reaching within the area of high-temperature components,
- 7) checking the technical condition or carrying out maintenance, repairs or inspections while the furnace is operating,
- 8) contact with live parts.

Residual risk may also arise in the following situations:

- foreseeable incorrect behaviour resulting from ordinary inattention,
- failure by an employee to use protective equipment,
- disregarding a hazard,
- being surprised by an unexpected event, e.g. a blast of hot air after opening the door,
- choosing the easiest course of action rather than the safest one,
- performing activities without eliminating the hazard,
- lack of concentration or distraction by bystanders;
- device failure,
- loss of control of the device by the operator.

9.2 Methods of reducing residual risk and its acceptability

To eliminate or minimise the above-mentioned hazards / residual risks, the following rules must be observed:

- 1) the device must have an operating manual and the manual must be available to operating personnel,
- 2) read the manual carefully, follow the rules stated in it and strictly observe all requirements, instructions, warnings and prohibitions in order to prevent accidents,
- 3) only persons who have acquired appropriate knowledge and experience in operation, fault recognition, identification of irregularities in device operation and operational safety may be authorised to operate the device,
- 4) the device, protective devices, accessories, tools and instruments used must be correctly installed, serviceable and functioning properly,
- 5) maintenance, repairs and inspections may be carried out only by persons familiar with the operating manual and having appropriate qualifications,
- 6) use appropriate personal protective equipment,
- 7) secure the device / workstation against access by unauthorised persons.

Following the recommendations presented in this manual will significantly reduce residual risk and enable the device to be used without creating a hazard to people or the environment.

When the above rules are observed, the identified residual-risk hazards are assessed as negligible – very unlikely. The residual risk remaining after protective measures have been applied, all safety functions have been implemented and the above rules are followed is at an acceptable safety level.

The above recommendations do not exhaust all possible methods of avoiding hazards and do not relieve the user of the obligation to take additional measures aimed at further increasing the safety of device operation.



WARNING

An apparent interruption in device operation may be misleading – automatic restart may occur at any time, e.g. after a power failure and restoration of the power supply.

10. FURNACE OPERATION

10.1 Conditions of use

- 1) Do not use the furnace in a potentially explosive atmosphere; immediately disconnect the power supply if such a hazard is suspected.
- 2) The furnace may only be used indoors.
- 3) Do not thermally overload the furnace beyond the permissible parameters.
- 4) Avoid installing / using the device in an environment containing dangerous or corrosive substances, as they may endanger the health of operating personnel and may cause corrosion or permanent damage to the furnace structure or its components.

10.2 Preparatory activities

Before starting work on the device, the operator should:

- 1) prepare the workstation appropriately:
 - check that the floor around the device is not slippery or obstructed,
 - remove unnecessary objects and obstacles,
 - prepare the necessary tools and workpieces as well as the required personal protective equipment (clothing, safety glasses, face protection, work gloves, etc.),



WARNING

All personal protective equipment must be selected for the current working conditions, be serviceable, undamaged and used correctly. Incorrectly selected, improperly used or absent personal protective equipment may provide insufficient protection for the operator.

- 2) switch on the furnace power supply – insert the plug into the socket,
- 3) select temperatures appropriate for the material being processed,
- 4) check the condition and correct operation of the furnace:
 - guards, control devices and protective devices (condition of switches),
 - lighting,
 - correct setting of operating parameters,
- 5) make sure that starting work will not create hazards for persons at the workstation or in its immediate vicinity,
- 6) carry out a trial start of the furnace and check that it operates correctly,
- 7) use the personal protective equipment required in the workplace and for the particular workstation.

10.3 Operator responsibilities during operation

While working with the furnace, the operator should:

- 1) perform assigned tasks carefully and in accordance with occupational health and safety rules and regulations,
- 2) perform all activities in such a way that they do not create hazards for the operator, co-workers or bystanders,
- 3) concentrate on the activities being performed,

- 4) immediately report every workplace accident to the immediate supervisor and leave the accident site unchanged until the accident investigation team arrives,
- 5) if there is any doubt as to whether a task can be performed safely, stop the activity and inform the supervisor.

10.4 Furnace operation and work cycle

- 1) The furnace is intended for heat treatment of metals (hardening, tempering, normalising and melting). The maximum continuous operating time in one heating cycle is 5 hours. The device has one operating mode (heating to the set temperature).
- 2) The furnace operator should be trained in metal heat treatment and be able to read correct values from steel data sheets, such as austenitising temperature and time, tempering temperature, normalising temperature and melting temperature for the selected steel.
- 3) The temperature is set by pressing the up/down arrow buttons on the controller.
- 4) After switching on the power supply, set the required temperature. Once the furnace has completed the heating process, the load may be placed in the chamber. The load may also be heated in the chamber from the start together with the furnace if the hardening, tempering, normalising or melting procedure requires this.
- 5) The furnace is started using the black ON-OFF switch. During operation, the set temperature on the PID controller may be changed as required. Emergency stop is performed by removing the power plug from the socket or setting the switch to OFF. Restarting is performed by restoring the power supply (inserting the plug into the socket or setting the switch to ON); after this operation the furnace is ready for further use. The device is reset by disconnecting and then restoring the power supply using the two-position ON-OFF switch.
- 6) Scale formed as a result of heating steel may be removed with a vacuum cleaner after the device has cooled down.

10.5 Loading the chamber

- 1) Before opening the furnace door, switch off its power supply using the switch on the device panel.
- 2) Do not place a load in the chamber while the power supply is switched on, as this creates an electric-shock hazard that may result in death or permanent injury.
- 3) When inserting a crucible into the chamber, avoid striking the furnace walls or the thermocouple.
- 4) The load in the furnace must be stable and must not be able to move inside the furnace chamber.
- 5) Once the load has been positioned correctly in the chamber, close the furnace door and switch the device power supply back on.
- 6) The load may be inserted into either a warm or a cold chamber. In both cases, all of the above rules for safe use of the device must be followed.

10.6 Removing the load from the chamber

- 1) The load must be removed from the chamber while wearing protective clothing, eye and face protection, and protective gloves meeting the requirements specified earlier in this manual. Before opening the door, switch off the furnace power supply using the switch on the device control panel. Only then may the furnace door be opened.

- 2) When removing the crucible from the chamber, take particular care not to strike furnace components, as this may damage them.
- 3) Once the material has been removed, immediately close the chamber door.

10.7 Activities after finishing work

After finishing work, the operator should:

- 1) switch off the furnace using the O/I switch and remove the plug from the socket,
- 2) close the furnace door and, if necessary, wait for the furnace to cool down,
- 3) clean the furnace and the area around it and remove any production residues,
- 4) secure the device so that it cannot be started by unauthorised persons and so that the furnace does not present a hazard,
- 5) tidy the workstation and return equipment and tools used for the work to their proper places,
- 6) clean personal protective equipment and return it to its designated storage location.
- 7) Use a vacuum cleaner fitted with a HEPA filter to vacuum the chamber. Inhalation of dust from JM26 ceramic bricks and fibre-ceramic shapes may be harmful.

11. INSPECTIONS, MAINTENANCE AND OVERHAULS

11.1 Safety during repair work

- 1) All repair, cleaning, lubrication or maintenance activities must be carried out with the device disconnected from all power sources and secured against unexpected start-up.
- 2) Personnel assigned to this work must wear appropriate protective clothing so that the work can be carried out safely and in accordance with current standards and occupational health and safety regulations. Personal protective equipment must be adapted to the prevailing conditions and to the preparations and cleaning agents used, in accordance with their safety data sheets. Maintenance work must be carried out in designated areas.
- 3) Before carrying out maintenance work, carefully read all labels, warning pictograms and instructions relating to this work. Begin maintenance / repair by switching off the furnace (remove the plug from the socket) and cleaning away all contamination. Do not use aggressive cleaning agents.
- 4) Before cleaning the device with liquid preparations, cover or seal all openings into which liquid must not enter for safety reasons. Electrical components are particularly vulnerable, including cables, connectors, the fan, operator panels and electrical switches. After cleaning, completely remove all covers or seals.
- 5) Warning, information and mandatory signs must be checked at regular intervals and renewed or replaced when necessary.
- 6) If several persons are working on the device during repairs or other work and it is necessary to start the furnace, warn everyone present before each start-up and energise the device only for the time necessary to perform the required activity.

	DANGER Maintenance, repairs and overhauls may only be carried out with the electrical power supply switched off – disconnect the power plug.
	WARNING Operating personnel must be informed before any maintenance, inspection or repair work begins and, if necessary, the work area must be marked and cordoned off.
	NOTICE Maintenance and repairs may be carried out only by trained and qualified specialist personnel using suitable, serviceable tools and equipment.

11.2 Maintenance and repairs

The device should be kept clean and provided with appropriate supervision and maintenance. Regular inspections and maintenance can ensure long and trouble-free operation. Safety-relevant faults must be rectified immediately or reported for repair.



NOTICE

Carry out the recommended inspections, adjustment, maintenance and overhaul work on time.



NOTICE

Do not use a pressure washer. Washing the furnace with pressurised water may damage it.

If the device operates under severe conditions, maintenance may need to be performed more frequently than recommended. The intervals specified in the recommendations are the absolute minimum; therefore, the frequency of maintenance work should be adapted to the conditions prevailing at the facility. Planned maintenance and repair work must be carried out in accordance with the operating and maintenance instructions.

11.3 Technical inspections

A technical inspection is a set of activities including, among other things, maintenance (cleaning, lubrication), adjustment, diagnostics and preventive measures. The purpose of a technical inspection is to detect and eliminate malfunctions and damage by adjustment, simple basic repair or replacement of parts, e.g. wear parts.

Technical inspections should be performed under the following maintenance regimes:

- 1) Daily – performed before the start and after the end of the work shift:
 - a) check the cleanliness of the workplace and make sure there are no items nearby that could interfere with operation,
 - b) after start-up, check the device for unusual noises, smoke, impacts, etc.,
 - c) check the general technical condition and correct operation of shut-off and safety devices,
 - d) check the condition of the door, guards and their fastenings,
 - e) check the condition of electrical equipment, cables and plugs.
- 2) Periodic – performed according to a previously established schedule; as part of this inspection, check the operation of and, if necessary, repair or replace:
 - a) heating elements, thermocouple, switches and fuses,
 - b) internal furnace components, in particular the heating-chamber lining,
 - c) furnace housing and components,
 - d) components – inspect.



NOTICE

A repaired device should be returned to service by persons responsible for its condition and operational readiness.

- 3) Protective (maintenance) – intended to ensure correct and safe furnace operation and resistance to possible environmental influences (corrosion protection).
- 4) Control / special – performed when exceptional circumstances have occurred that may have adversely affected the safety condition of the device, such as major damage, involvement in collisions or accidents, natural forces, or an extended period of downtime.

Only serviceable tools may be used for the above activities.

	DANGER When carrying out repairs, maintenance, adjustments or overhauls, the furnace must be disconnected from the power supply and marked with a sign, e.g. "Repair – do not switch on" or "Overhaul". All electrical connections and disconnections not associated with daily operation may only be carried out by a qualified electrician.
	NOTICE Each of the activities described is equally important for ensuring continuity of production, maintaining the good technical condition and durability of the device, and protecting the furnace surroundings from damage.

Records of inspections, repairs and overhauls must be maintained. This makes it possible to verify inspection dates, the degree of part wear and the service life of components during operation.

Maintenance and inspection activities required by law must be carried out independently of activities intended to maintain device functionality, because their purpose is to ensure the safety of personnel assigned to work on the device and to prevent possible property damage. Relevant documentation must be retained and, when required, made available to service personnel or maintenance departments.

11.4 Equipment overhaul

The user should include overhauls in annual or multi-year plans. An overhaul covers simultaneous repair of all components and mechanisms or replacement of those that require it and could not be repaired previously.

When determining overhaul dates and scope, take into account:

- 1) the operating time and operating conditions of the device at the user's facility,
- 2) the possibility of excessive wear of certain parts,
- 3) the provisions and instructions contained in this operating manual.

When carrying out any overhaul work, follow the instructions and recommendations in this operating manual, the documentation of component manufacturers and current industry and occupational health and safety regulations.

	WARNING The work area must be cordoned off with red-and-white tape or chain and marked with a warning sign.
	WARNING Use of devices for which the next required inspection date has passed or for which maintenance activities have not been performed is prohibited.

Inspections and overhauls should be entrusted to specialised technical personnel or the manufacturer's service department. Overhauls should be carried out according to the following cycle:

Periodic inspection – performed monthly

During periodic inspections, visually inspect the furnace and check the condition of the electrical installation and heating chamber. Assess correct operation of the temperature controller and thermocouple. If any part has been damaged, it must be replaced. Also check operation of the safety devices (switches, limit switches).

Intermediate overhaul – performed every 6 months

During intermediate overhauls, inspect the condition of the device without dismantling its components. Assess the overall technical condition of the furnace, components, electrical installation (correct cable connections, temperatures reached) and sensors. Replace worn parts if necessary.

Major overhaul – performed every 1–2 years

During a major overhaul, completely dismantle the device and carefully inspect all individual parts. Repair and/or replace damaged components. Thoroughly inspect all electrical connections, heating elements and all switches, and replace damaged or defective parts. After a major overhaul, the device should meet the assessment criteria for a new device in terms of performance and operation.

12. MALFUNCTIONS, FAULTS

If the device is damaged, fails or operates incorrectly, the possible causes may be checked using Table 3. If the cause of the malfunction cannot be identified and eliminated, contact the manufacturer or an authorised service centre.

Table 3

Fault	Possible cause	Corrective action
The panel switch does not switch on the power supply	No power supply	- check whether there is a power outage, - check the plug and connection to the socket, - defective fuse – replace,
	Damaged power cable	- have the cable / electrical installation repaired by a qualified person
The switch turns on the power supply, but the heating elements do not heat	Defective fuse	- replace
	Open circuit in the installation	- check the cables and connections and repair,
	- defective SSR relay or contactor	- replace
Excessive heating of the heating elements	Defective temperature sensor	- check cables and connections; replace if necessary
	Defective SSR relay	- replace
Excessive heating of the housing	Defective fan	- replace

13. FAILURES

13.1 Procedure in emergency situations

- 1) In the event of a furnace failure:
 - immediately switch off the device (e.g. using the switch or by disconnecting the plug),
 - secure it against accidental start-up by other persons,
 - inform the supervisor immediately.
- 2) Restarting the device before the fault has been rectified is prohibited.
- 3) A defective, damaged device or a device undergoing repair should be taken out of service and marked with appropriate information signs.
- 4) After the failure has been rectified:
 - switch on the power supply,
 - check / set the appropriate operating mode / temperature,
 - the device is ready to be restarted.
- 5) In the event of an accident involving the device:
 - immediately switch off the device (e.g. using the switch or by disconnecting the plug),
 - secure it against accidental start-up by other persons,
 - immediately provide first aid to the injured person and, if necessary, call for medical assistance,
 - leave the accident site unchanged until the accident investigation team arrives,
 - notify the supervisors.
- 6) In the event of a fire:
 - warn persons located within the danger area,
 - disconnect the building's electrical power supply and shut off the gas supply (if present),
 - alert the fire brigade,
 - begin evacuation of people,
 - inform supervisors about the fire,
 - if possible, begin firefighting using suitable portable firefighting equipment.



WARNING

Fires involving live machinery and electrical control systems must be extinguished with dry-powder or CO₂ fire extinguishers.

14. DISASSEMBLY, SCRAPPING AND DISPOSAL

The device is made of the following materials:

- structural steel,
- aluminium,
- electrical components,
- electronic components,
- rubber and plastics.

Worn, defective or damaged furnace parts must be repaired or replaced with original parts or suitable equivalents.

Do not dispose of damaged device components with household waste. Worn parts must be replaced with new ones; if the furnace or any part of it is destroyed or scrapped, first disassemble the components, sort them and deliver them to appropriate disposal or recycling facilities.

Before dismantling the furnace, empty the heating chamber and clean it of process residues, remaining liquids and other chemical substances. Do not allow these substances to enter the natural environment. Used and unused preparations must be delivered to appropriate disposal facilities.

When carrying out this work, use personal protective equipment and comply with the safety regulations applicable to each of these liquids (in accordance with their safety data sheets).



NOTICE

Exercise appropriate care and safety precautions when dismantling the device and its individual parts.



NOTICE

At every stage of disassembly and disposal, use appropriate hand and mechanical tools as well as personal protective equipment.

15. APPENDICES

- 1) Declaration of conformity
- 2) Warranty terms
- 3) MAU90 controller manual

DECLARATION OF CONFORMITY, No. 160

MANUFACTURER	
Name:	Baltazar Pawłowski knives&ovens
Address:	ul. Wichrowa 4, 60-449 Poznań
Phone:	+48 664 858 527
E-mail:	baltzar@minihell.pl

Based on the conformity assessment process carried out by Teknomatik s.c. T. Markuzel, R. Peruń and the issued Certificate of Conformity No. [CZ] S2246, declares that:

PRODUCT	
Name:	Heat treating kiln
Function:	Heat treatment of metals
Machine Series of Types:	MH250-F
Serial number:	0160
Production date:	2026

meets the requirements of the following European directive:

- **Directive 2006/42/EC of the European Parliament and of the Council, of 17 May 2006**

meets the requirements of the following harmonized standards

- PN-EN ISO 12100:2012 Safety of machinery - General principles for design - Risk assessment and risk reduction
- PN-EN 60204-1:2018-12 Safety of machinery - Electrical equipment of machines - Part 1: General requirements
- PN-EN ISO 14118:2018-05 Safety of machinery - Prevention of unexpected start-up
- PN-EN ISO 14120:2016-03 Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards
- PN-EN ISO 13849-1:2016-02 Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design

and the standards:

- PN-EN ISO 7010:2020-07 Graphical symbols - Safety colours and safety signs - Registered safety signs

The manufacturer accepts no liability for any damage to persons or property resulting from the use of the device in a manner inconsistent with its intended purpose. This EU Declaration of Conformity becomes invalid if the device is modified or rebuilt without the manufacturer's consent.

Poznań 22.08.2026

Place and date

Baltazar Pawłowski, wichrowa 4, 60-449 Poznań
Poland

Name, surname and address of the person
authorized to prepare the technical documentation

Manufacturer / Manufacturer's representative:

Baltazar Pawłowski

Signature of a person
authorized to issue the declaration