

ACCOMPANYING TECHNICAL DOCUMENTATION



M Series Electric Resistance Furnace

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1. Safety instructions

The electric resistance furnace is provided with various safety equipment to protect the operator and the machine from damage during its normal use. However, these precautions cannot cover all safety aspects and therefore the operator must read and understand the operating instructions before using the machine. This eliminates errors during machine installation and operation. Therefore, do not attempt to put the furnace into operation until you have read all of the instructions that came with the furnace and understand each function and procedure.

Important sections in the text which warn the operator of potential hazards are highlighted in the text of the documentation with the following symbols and signs:

1. Sign for the safety instruction of the HAZARD! category



NEGLECTING THIS SIGN MAY RESULT IN DEATH!

2. Sign for the safety instruction of the WARNING! category



NEGLECTING THIS SIGN MAY RESULT IN SERIOUS INJURY!

3. Sign for the safety instruction of the CAUTION! category

Safety instructions of this category are enclosed in a frame and highlighted with the white sign CAUTION on a black background.



NEGLECTING THIS WARNING MAY CAUSE DAMAGE TO THE FURNACE OR INJURY!

There are information and warning labels drawing attention to various hazards on the furnace structure. Always follow the safety instructions on the labels attached to the machine. Neither damage nor remove these labels. If any label is damaged or illegible, inform the manufacturing company. A list of labels and their illustrations is provided in the chapter "Labels".

The following safety instructions must be strictly observed in order to ensure safe operation.
Serious risks for health may occur if the instructions are disregarded

- Do not operate the unit without thoroughly familiarizing the operator with the instructions for its safe operation, control and maintenance.
- Before starting work, the operator is obliged to inspect the equipment, check its individual parts, especially the protective, starting and switching off devices.
- Any flammable materials may not be stored within a dangerous distance of 150 cm around the unit. If the storage of any flammable substances near the unit is necessary, they must be effectively protected from radiant heat.
- The unit must be positioned on a flat, non-combustible surface.
- Check for any objects present on the functional parts of the unit.
- Ensure that any foreign objects do not interfere with the path of moving parts of the unit.
- The unit may only be used only for the purposes for which it has intended. No other uses are permitted.
- When loading heavier charges weighing more than 20 kg, a lifting and handling device must be used.
- Do not open the protective covers on the unit while it is running, do not disable the protective devices; any actions intervening in the unit may be carried out only when the main switch is turned off.
- Adequate working and handling space must be provided and unauthorised persons must be prevented from entering.
- When the unit is in operation, its surface is hot. Do not block radiation of heat from the surface areas.
- Never insert any flammable materials into the unit.
- Before you start processing any material, check with your suppliers or in the safety data sheets that the materials you have selected are suitable for use. Inform yourself about processing temperatures, limit temperatures and possible formation of hazardous gases.
- When harmful gases are released, it is necessary to install effective exhaust hoods.

2. Technical description

2.1. Unit characteristics

Electric resistance circular furnace is designed for heat treatment of ceramics at temperatures up to T_{max} . The charge is loaded in a conditioning chamber in which the desired temperature is maintained. The temperature is controlled with a controller installed in a holder on the side of the furnace.

Technical specification:

Furnace type (*1)	Rated voltage U_{jm} [V] (*2)	Rated current I_{jm} [A] (*3)	Power input [kW] (*4)	Maximum temperature** T_{max} [°C] (*5)	Internal dimensions L x H [mm]	Ingress protection (*6)	Weight [kg] (*7)
M30/13	1/N/PE 230 V AC	15.2	3.5	1320	374 x 345	IP40	60
M45/13 (230V)	1/N/PE 230 V AC	15.2	3.5	1320	412 x 345	IP40	68
M45/13	3/N/PE 400/230 V AC	11.3 (16)	4.5	1320	412 x 345	IP40	68
M60/13 (230V)	1/N/PE 230 V AC	15.2 (16)	3.5	1320	412 x 458	IP40	71
M60/13	3/N/PE 400/230 V AC	13.7 (16)	5.5	1320	412 x 458	IP40	71
M100/13	3/N/PE 400/230 V AC	10.9 (16)	7.5	1320	550 x 458	IP40	100
M150/13	3/N/PE 400/230 V AC	12.3 (16)	8.5	1320	647 x 458	IP40	114
M160/13	3/N/PE 400/230 V AC	13.7 (16)	9.5	1320	550 x 690	IP40	122
M220/13	3/N/PE 400/230 V AC	15.9 (20)	11.0	1320	647 x 690	IP40	145

Note: THE RIGHT TO CHANGE THE TECHNICAL SPECIFICATION IS RESERVED.

** Prolonged operation at T_{max} can lead to rapid wear of the heating elements and insulation materials. It is recommended to use the unit at a temperature at least 70 °C below T_{max} .

THE TECHNICAL PARAMETERS MARKED *1 TO *9 ARE INDICATED ON THE TYPE LABEL AFFIXED TO THE FURNACE. FOR A SAMPLE TYPE LABEL, SEE THE CHAPTER "LABELS".

Serial number – *8; year of manufacture – *9

2.2. Description of the structure

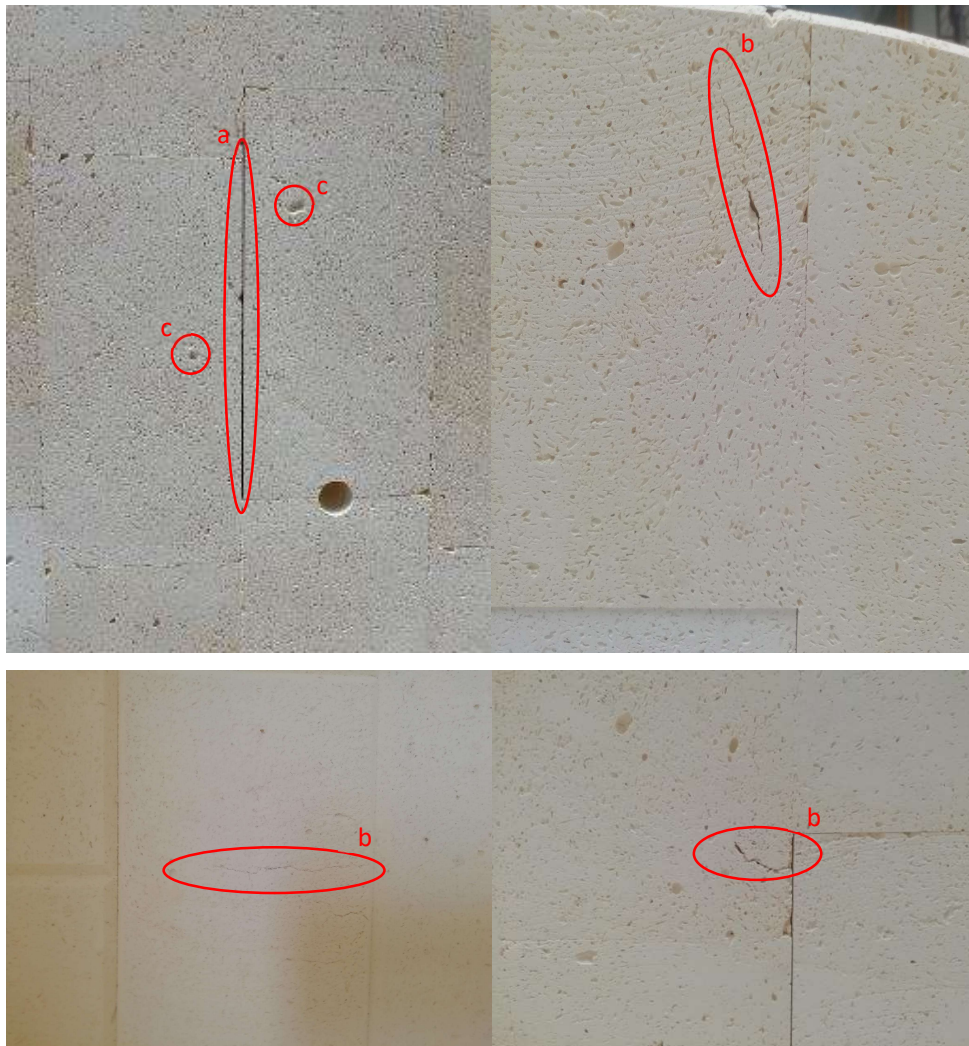
The furnace consists of two parts – the furnace module and the lid. The controller is positioned on the right-hand side of the furnace, while the electric installation is positioned under a cover at the back of the furnace.

The module casing is made of coiled ground stainless-steel sheet. A mineral fibre mat and a row of bricks creating the operating chamber wall are inserted into it. Along the periphery of the furnace upper edge, a refractory rope is inserted between the sheet and bricks, covering the upper edge of the mat. The bottom of the furnace is insulated with a layer of bricks. The complete casing is secured with screwed contracting tapes after installation. At the bottom of the furnace there is an opening with a slide valve for control of air intake. The casing may change its colour shade after heating, this is not a reason for complaint.

The lid consists of bricks encased in coiled ground stainless-steel sheet and secured with screw-tightening bands. There is a ventilation hole in the axis of the lid. The lid can be lifted up manually by means of a gas support, which is also used to lock the lid in the open position. The furnace lid is fitted with a safety limit switch. The heating system turns off when the furnace opens.

Heating is ensured with heating coils inserted in the horizontal grooves in the bricks of the furnace casing and fixed with clamps.

A small gap between the lid and the furnace module, small joints in the lid and bottom (a), as well as hairline cracks (b) and small cavities (c) in any part of insulation do not affect the functionality or energy consumption of the unit and are not grounds for a complaint.



2.3. Description of the electric installation

2.3.1. Control system

Temperature control is provided by a PID temperature controller (N1). The furnace is equipped with one of the following types of controllers:

- 1) The HT40AL controller regulates the temperature to a constant value set by the operator. In addition to maintaining the temperature at a constant value, a ramp function (program) can be set – including a controlled temperature rise to the desired value at a specified rate in °C/hour, holding the temperature for a set duration, another controlled temperature rise to a desired value at a specified rate in °C/hour, holding the temperature for a set duration, and finally switching off temperature control.
- 2) A programmable CERAMIC controller with built-in real-time clock and the ability to record the temperature profiles in the controller's internal memory. The CERAMIC temperature controller allows 20 control programs to be stored in the memory, with each program representing one temperature curve (i.e., temperature vs. time = firing). Using the real-time clock, the operator can start a selected program on the specified date and time. The program runs automatically without any operator intervention, and the furnace heating is switched off when the program is finished.
- 3) BENTRUP TC75 programmable controller. The controller allows for the storage of 6 programs, each with 4 segments See the controller manufacturer's instructions.
- 4) BENTRUP TC95 programmable controller. The controller allows for the storage of 20 programs, each with 20 segments. See the controller manufacturer's instructions.

The controller (N1) operates in PID mode, and controls the output of the heaters by alternately switching the power input on and off. The control output of the controller controls the power input of the heating coils by switching the power relay (KA1). The mean value of the output and thus the temperature in the heating area is given by the ratio of the switching on and off times of the heating elements. The higher the ratio, the larger the control deviation (the difference between the set point value and the measured temperature). The temperature in the operating area is detected with an S type (B1a) thermocouple. The alarm output of the controller switches off the power supply to the power relay (KA2) coil and disconnects the heating system power supply when the set maximum temperature limit is exceeded.

The limit temperature exceeding status is indicated on the front panel of the controller. When the set temperature limit is exceeded, the red AI indicator light on the front panel of the controller lights up

When the fault is corrected and the temperature drops below the limit, the controller trips the power supply to the protection relay coil and the signal light goes out.

The furnace is powered through a CEE cable with a plug with a current nominal value corresponding to the furnace power output.

The furnace can be turned on using the rocker switch (FS1), which simultaneously protects the furnace control circuits.

2.3.2. Heating system

The heating system consists of heating coils. The coils are housed in grooves in the furnace wall. Resistance wire is used to produce the heating coils. The heating performance for each type is given in the table of technical specification. The individual heating system branches are led to the electric control cabinet.

The heating system power supply is connected through a power relay controlled with an alarm output of the controller and the lid switch (SQ). When the furnace lid is opened, the heating system is disconnected from the power supply.

3. Operating instructions

3.1. Instructions for handling, installation, operation and maintenance

The furnace in its standard configuration does not require any special installation works. The furnace must be positioned on a flat surface made of non-flammable material.

The furnace can be connected to the mains using a cord with a plug. The sizing of the power supply line and the protection of the socket to which the furnace is connected must be in accordance with the technical specification of the furnace as indicated on the type label of the furnace.

The furnace can be operated in accordance with the operating instructions after power supply voltage is connected.



THE FURNACE MUST BE LOCATED AT A MINIMUM DISTANCE OF 150 cm FROM ANY FLAMMABLE MATERIALS. THE SPACE AROUND THE FURNACE MUST BE LARGE ENOUGH TO ALLOW SAFE HANDLING WHEN LOADING THE CHARGE AND OPERATING THE TEMPERATURE CONTROLLER. WHEN INSTALLING, MAKE SURE THAT THE POWER SUPPLY CORD IS IN A SUFFICIENT DISTANCE FROM THE FURNACE JACKET.



IT IS NECESSARY TO LEAVE THE UNIT FOR 24 HOURS IN THE PLACE WHERE THE FURNACE WILL BE OPERATED BEFORE TURNING ON.

NOTE:

The figures in this manual are intended for illustrative purposes only.

Before full operation of the equipment, it is necessary to carry out the first heating to dry the lining and form a protective layer on the heating coils.

Due to the release of the binder from the insulation materials, odours may occur. We therefore recommend that the workplace is ventilated at the first heating.

3.2. Handling

The electric resistance furnace is loaded on a wooden pallet for transport. The pallet can be handled using a fork-lift truck or a manual handling system.

The furnace must be handled using its red stand (wear gloves!). Before lifting the furnace, it is important to support it with beams (boards) in order to prevent damage to the furnace jacket during lifting. The handle on the lid should not be used for handling.



THE FURNACE MUST NOT BE OVERTURNED OR EXPOSED TO SHOCKS DURING HANDLING. SOME OF ITS COMPONENTS (IN PARTICULAR INSULATION) ARE OF A FRAGILE NATURE AND THE UNIT COULD BE SERIOUSLY DAMAGED OR EVEN DESTROYED

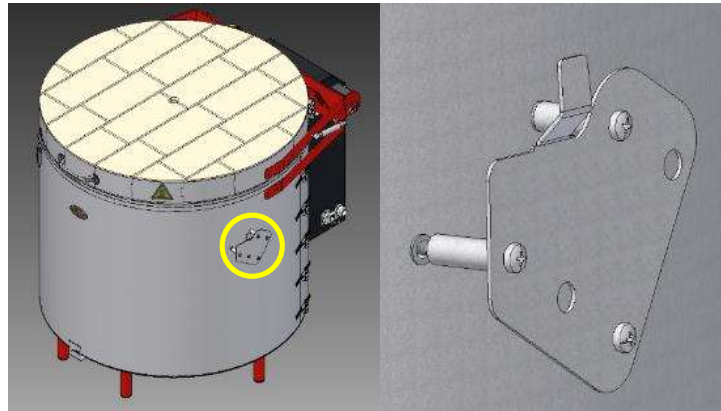


DURING HANDLING AND TRANSPORT, OBSERVE ALL RULES APPLICABLE TO HANDLING HEAVY LOADS. THE WEIGHT OF THE ENTIRE UNIT IS INDICATED ON THE PRODUCTION LABEL.

3.3. Installation

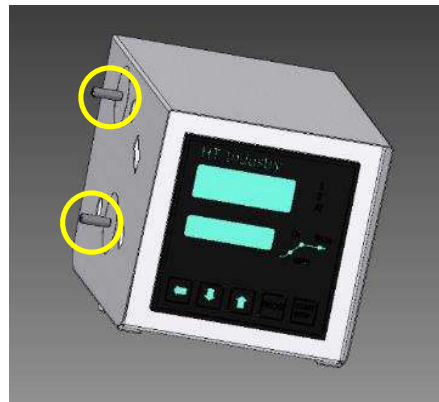
3.3.1. Installation of the controller

The furnace in its standard configuration is supplied without controllers on the right-hand side of the furnace. An attachment plate which is universal for all types of applicable controllers is prepared for installation of the controllers.



3.3.1.1. HT40AL/HTCERAMIC controller mounting

The controller is mounted in a stainless-steel casing, which has screws welded on its side for attaching it to the furnace.



1) Hook the controller box on the lug of the holder on the furnace (the lug must slide into the hole).

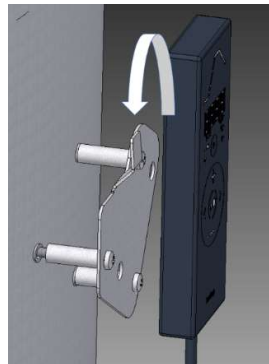


2) Attach the controller so that the driving in screws could pass through the holes in the holder and secure it with 2 pieces of wing nuts.

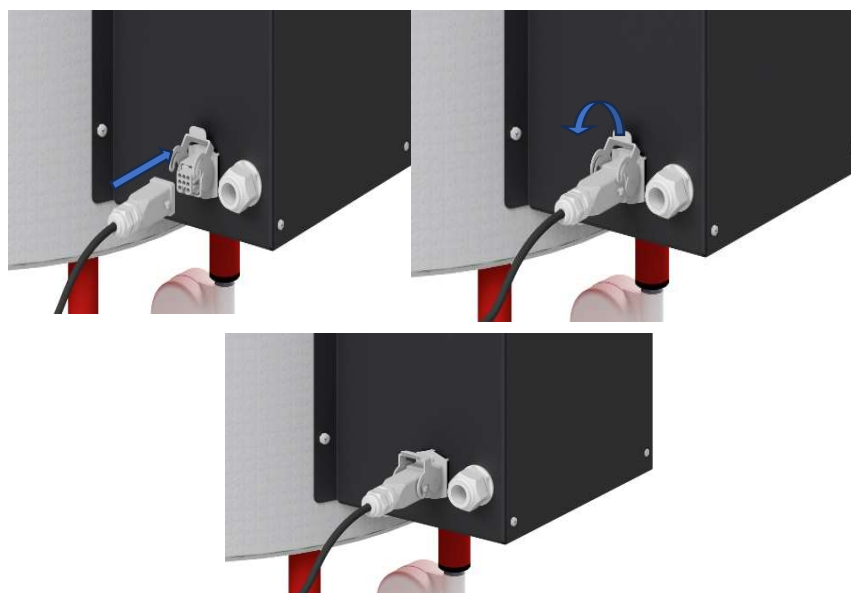


3.3.1.2. Bentrup TC75/TC95 controller mounting

1) Put the Bentrup controller on the lug of the holder on the furnace. The back side of the controller is provided with a hole for the lug.



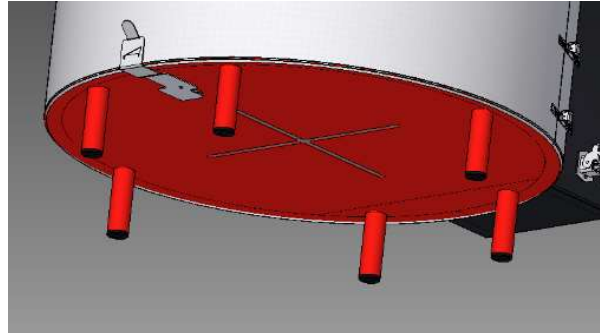
2) Then connect the controller to the furnace using a connector. After plugging in, the connector must be secured by turning the locking element. This instruction applies to all types of controllers.



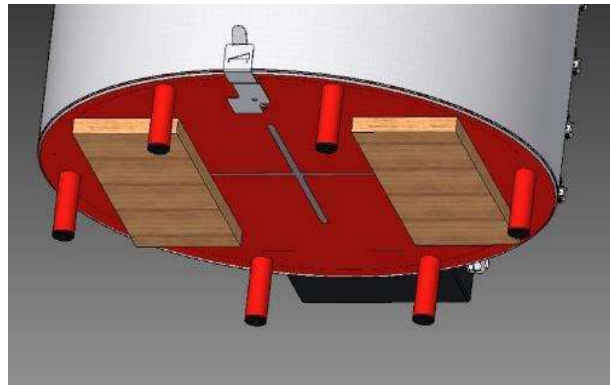
3.3.2. Installation of castors

!!!BE CAREFUL NOT TO TIP THE FURNACE!!!

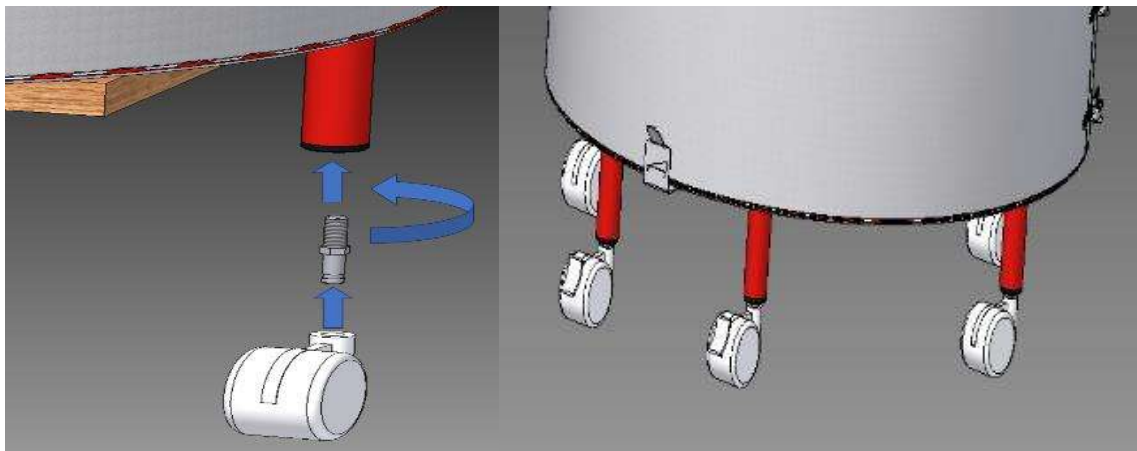
1) The furnace in its standard configuration is supplied without castors, only with bushings in the stand tubes. Castors are optional accessories, you can purchase them separately at any time.



2) Before lifting the furnace, it is important to support it with beams (boards) in order to prevent damage to the furnace jacket during lifting. Be careful not to damage the air inlet slide valve and the grounding of the stand with the jacket.



3) During the installation of the castors itself, screw the pins into the bushings in the stand tubes. Knock the castors onto the pins. The castors with brake are at the air inlet slide valve (in the front part of the furnace).



3.4. Operation

The electric circular resistance furnaces are the devices designed and made for heat treatment of ceramic items up to the temperature $T_{\max}$ of 1320 °C. The material to be processed is loaded in the heating chamber. It is necessary to allow furnace cooling down to 50 °C after firing completing and then to remove the processed charge from the furnace.

IF IT IS TECHNOLOGICALLY NECESSARY TO OPEN THE FURNACE OR REMOVE THE CHARGE AT TEMPERATURES HIGHER THAN 50 °C – THERE IS A RISK OF BURNING.

DURING OPERATION, SURFACE TEMPERATURES MAY BE ELEVATED ON SOME PARTS OF THE FURNACE, ESPECIALLY AROUND THE LID, DAMPERS AND OTHER INLET AND OUTLET OPENINGS – THERE IS A RISK OF BURNING.

IN THESE CASES, THE OPERATOR MUST WEAR HEAT RESISTANT PROTECTIVE EQUIPMENT PROTECTING AGAINST THE EFFECTS OF HIGH TEMPERATURES (FACE SHIELD, PROTECTIVE CLOTHING AND GLOVES).



The circular electric resistance furnace is controlled with a temperature controller installed in a holder on the side of the furnace. The other components of the control system are positioned in the electric installation control cabinet in the back part of the furnace. There is a rocker switch on the side of this cabinet.



THE UNIT MAY ONLY BE OPERATED BY A PERSON AUTHORISED TO DO SO.

BEFORE YOU BEGIN USING THE FURNACE, FAMILIARISE YOURSELF IN DETAIL WITH ITS OPERATION.

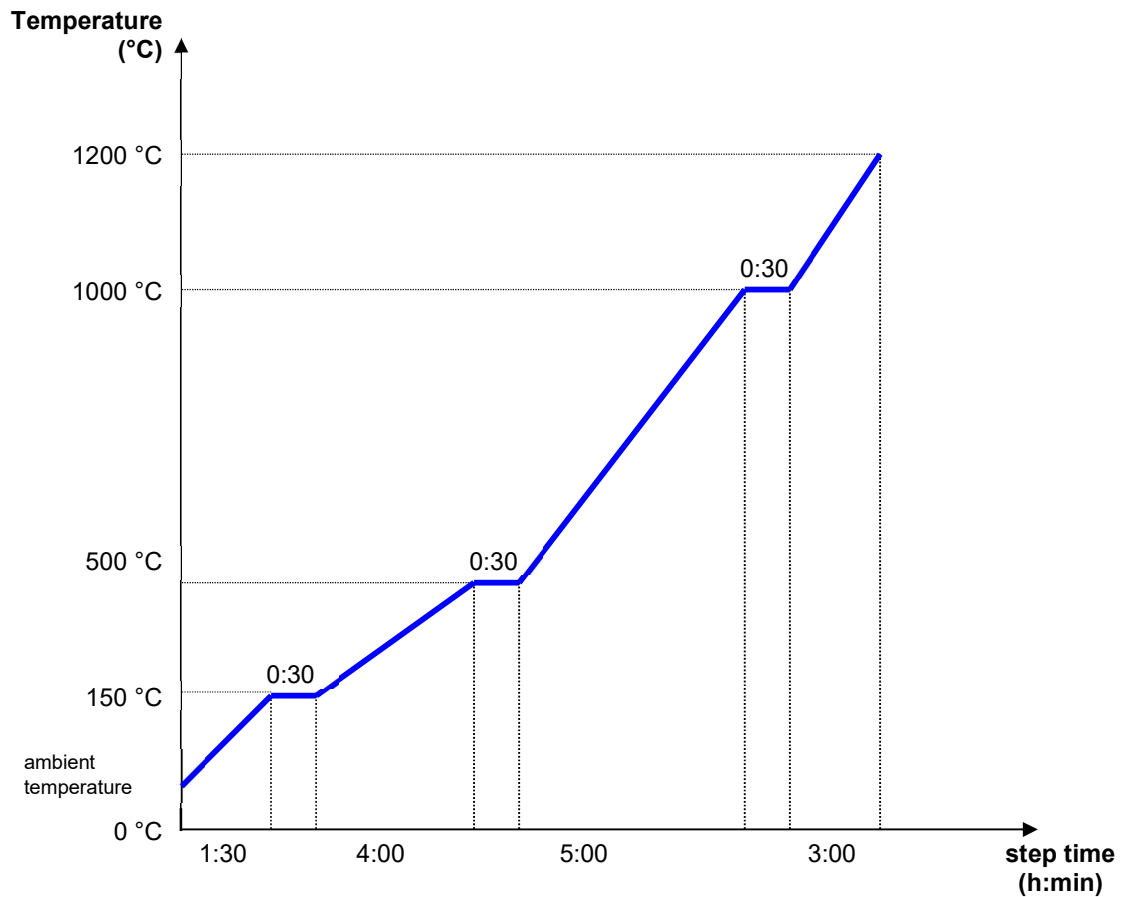
3.4.1. Commissioning



WHEN PUTTING THE FURNACE INTO OPERATION, IT IS NECESSARY TO DRY THE FURNACE AT FIRST.

The CERAMIC controller contains a preset drying program at the position No. 20. For the HT40AL and Bentrup TC75 controllers, the drying program must be set manually in several steps. For the Bentrup TC95 controller, the program is at the position No. 4. If the controller does not contain a preset program, it must be set manually.

1. Set the temperature to 150 °C, ramp time 1.5 hours, hold time 0.5 hours.
2. Set the temperature to 500 °C, ramp time 4 hours, hold time 0.5 hours.
3. Set the temperature to 1000 °C, ramp time 5 hours, hold time 0.5 hours.
4. Set the temperature to 1200 °C, ramp time 3 hours.
5. Set the end of the program.



3.4.2. Turning on



CHECK THE FOLLOWING BEFORE TURNING ON:

- ☐ **WHETHER THE POWER SUPPLY CORD IS NOT DAMAGED IN ORDER TO PREVENT INJURY (ELECTRIC SHOCK) IN THE EVENT OF ELECTRIC CURRENT LEAKAGE.**
- ☐ **WHETHER ELECTRIC INSTALLATION SAFETY COVERS ARE INSTALLED CORRECTLY AND ARE NOT DAMAGED REPLACE ANY DAMAGED COVERS BY NEW ONES IMMEDIATELY.**

NEVER START THE FURNACE IF ANY COVER IS REMOVED!

1) Connect the furnace to the mains and check whether the rocker switch is turned on – if this is not the case, turn it on. After power supply turning on, the controller display lights up after a while and the furnace is ready for operation. For the unit with the Bentrup controller, it is necessary to turn on also the rocker switch directly on the controller (in the lower right-hand part of the controller).



AFTER POWER SUPPLY TURNING ON, THE CONTROLLER SELF-TEST TAKES PLACE AND AFTER ITS COMPLETING (AFTER A FEW SECONDS), THE POWER RELAY IS SWITCHED ON, WHICH IS CONTROLLED WITH AN ALARM OUTPUT OF THE CONTROLLER. WHEN THE FURNACE LID IS OPEN, THE CONTACT OF THE LID SAFETY SWITCH IS OPEN. IT IS NECESSARY TO CHECK THE FUNCTIONALITY OF THE ALARM OUTPUT OF THE CONTROLLER AND THE LID SWITCH!

2) Before starting the temperature controller, the furnace lid must be closed (lid switch contact closed). Only when this condition is met, the correct operation of the unit is ensured.

3) Set the desired program or temperature on the temperature controller, or potentially set the ramping function and start firing.

HTCERAMIC controller

The user has the possibility to store totally 20 temperature control programs for different types of charges differing in material, weight and volume in the controller's memory. The actual creation of these programs and the method of running them is described in detail in the attached operating manual. The operator monitors the temperature in the furnace on the display of the controller. In the manual, you will find a description of the errors indicated on the controller display.



EACH PROGRAM MUST BE TERMINATED BY A STEP OF THE "END" TYPE. THIS ENSURES THAT THE HEATING SYSTEM IS TURNED OFF AFTER PROGRAM COMPLETING.

HT40AL controller

The operator sets the desired temperature value or starts a simple program (ramp function). The operation of the HT40AL controller is described in the enclosed operating instruction manual.

The operator monitors the temperature in the furnace on the display of the controller.

After start of firing, the temperature in the furnace begins to change according to the set requirement. If this is not the case, it is necessary to check once again whether the conditions necessary for successful start of the furnace have been fulfilled. If the conditions have been fulfilled and the furnace still does not operate correctly, ask the manufacturer's service department for assistance.

Bentrup TC95 controller

The Bentrup TC95 is equipped with the first up-to-date input interface for furnace controllers. The temperature profile is selectable, up to 25 segments can be entered (each consisting of a furnace ramping phase and a temperature holding phase).

25 temperature profiles are stored as a program. The actual creation of these programs and the method of running them is described in detail in the attached operating manual.

Bentrup TC75 controller

The TC75 controller can store up to 6 firing curves as programs that you can recall without having to re-enter them each time. You can edit these programs by yourself. The values will remain maintained even after the controller is turned off. The actual creation of these programs and the method of running them is described in detail in the attached operating manual.

NOTE:

The term "temperature in the furnace" refers to the temperature measured by the thermocouple in the furnace's heated space, not to the temperature of the processed charge. These two temperatures are identical only in a stabilised state; i.e., after expiration of the period necessary for the balancing of thermal losses, and for the transfer of heat to the charge. This period depends on the character of the fired charge (material, volume, area, etc.) and on the heat treatment mode.

3.4.3. Shutdown

HTCERAMIC, TC75, TC95 controller

The operator can terminate a running program manually or termination is a part of the program. After the end of the running program, the control output is turned off.

HT40AL controller

When controlling to a constant temperature value:

After reaching the desired temperature, the controller keeps it at a constant value until the operator intervenes. The operator can make the following interventions:

- a) Changes of the desired temperature value – the controller controls heating intensity so as to reach this new value and then keeps it constant.

- b) The operator sets the desired temperature value of 0 °C, the controller turns off heating after a while, the charge cools down, the operator can monitor the temperature in the furnace on the display of the controller.
- c) The operator turns the power supply to the furnace off. The charge is cooled down, the operator has no possibility to monitor the temperature in the furnace on the display of the controller. The next time the power supply is turned on, the controller will start to control the temperature to the value that was set before the power supply was turned off.

When the control is carried out according to a simple program:

After the end of the program, the controller controls the temperature to a constant temperature value according to the set requirement. If the desired temperature value is set to 0, temperature control is disabled.



IF YOU ARE NOT USING THE FURNACE, DISCONNECT IT FROM THE ELECTRICAL MAINS USING THE MAIN SWITCH.

Emergency stop

In the event of an emergency situation or a defect, pull the power supply plug out of the socket. This will disconnect the whole unit from the power supply.

Opening the lid

When the lid is opened, the lid safety switch, which switches the furnace heating power relay, is disconnected and the furnace heating is shut off. Opening of the power relay is accompanied by a slight click.

3.4.4. Loading the charge



ALWAYS TURN THE POWER SUPPLY TO THE FURNACE OFF USING THE ROCKER SWITCH WHEN LOADING THE CHARGE.

Load the charge into the furnace while maintaining free space between the charge and the coils; potential contact between the coils and the charge can damage or even destroy the coils. Too little space between the coils and the charge reduces the uniform transfer of heat into the material.



WHEN LOADING THE CHARGE, IT IS NECESSARY TO TAKE INTO CONSIDERATION THE FURNACE LINING; THE OPERATOR MUST NOT LEAN AGAINST THE LINING OR PUT THE PROCESSED MATERIAL ON IT DUE TO THE RISK OF ITS POTENTIAL DAMAGE.

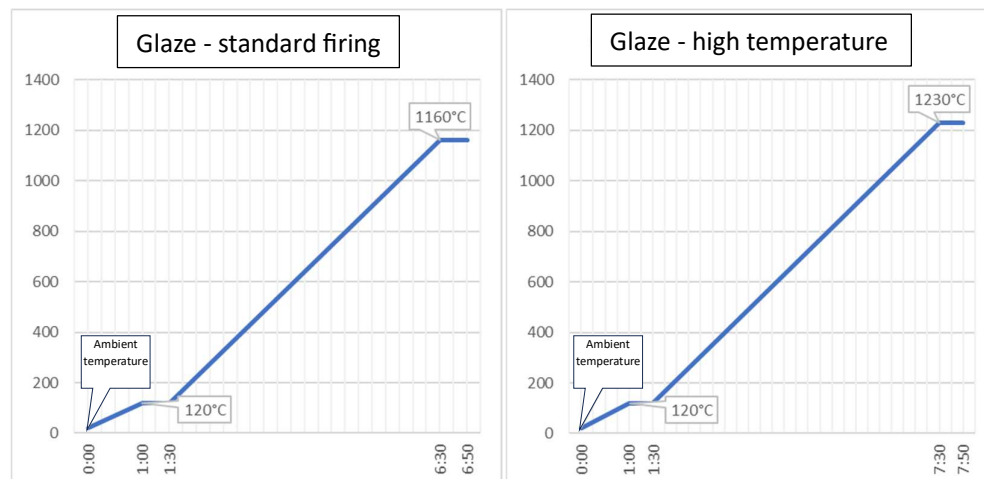
3.4.5. Preset programs

Applicable only to the HtCeramic and Bentrup TC95 controllers.

Program	Program number	
	HtCeramic	TC95
First firing	1	1
Glaze - standard firing	2	2
Glaze - high temperature firing	3	3
Drying program	20	4

NOTE:

The operator can modify the preset programs at any time. The instructions of the manufacturers of the raw materials to be processed must be followed. LAC does not guarantee optimum results when using preset programs.



NOTE:

They contain only newer versions of controllers, this is not any reason for complaint.

3.5. Maintenance



DISCONNECT THE FURNACE FROM THE MAINS BEFORE YOU START TO CARRY OUT ANY MAINTENANCE WORK.



MAINTENANCE AND REPAIRS OF THE ELECTRICAL CONTROL BOX AND HEATING SYSTEM MUST BE CARRIED OUT ONLY BY THE PERSONNEL WHO ARE AT LEAST KNOWLEDGEABLE. THE NATIONAL REGULATIONS FOR PROTECTIONS AGAINST INJURIES OF THE RESPECTIVE COUNTRY ALWAYS APPLY.

3.5.1. Cleaning

The furnace does not require any special maintenance. Lubricate the lid hinges occasionally as required (any lubricating grease can be used). The furnace must be kept clean and dry. After each firing (after the furnace has cooled down) check the heating compartment, any dirt should be removed, preferably blown out with compressed air (a vacuum cleaner can be used).

Do not use water when cleaning the furnace!

The electrical installation is protected under covers. During the warranty period, the covers may only be removed for periodic inspections or in order to replace any damaged parts. Any modification of the unit or change in the electrical wiring is not permitted; otherwise, any warranty claim will not be accepted.

3.5.2. Regular inspection intervals

Rotary parts without lubricators	Once a month*	Lubricate with any lubricating grease
Wiring screw joints	Once a half-year	Tightening of joints
Operation of safety features	Before every use	Check of operation
Cleanliness and function of the sensors	Once a week*	Visual inspection of the condition/cleaning if necessary
Condition of the heaters, coils	Once a month	Using a clamping ammeter
Verification of protection circuit continuity	Once a year	$R < 0.1 \text{ Ohm}$
Insulation resistance test	Once a year	$R > 1 \text{ Mohm}$
Leakage current measurement	Once a year	Max. 0.75 mA/kW or 5 mA
Test of protection against contact with dangerous parts	Once a year	According to IP
Inspection before thermal tests	Once a year	Visually
Inspection after thermal tests	Once a year	Visually

* or less frequently according to the conditions

The operation log must be properly filled in according to the regular inspections, lubrication and maintenance.

The piecewise verification protocol is available on request.

In the event of a malfunction caused by breaching the prescribed inspections, maintenance, lubrication and their intervals, no complaints will be taken into account.

3.5.3. Operating conditions

The unit is designed for operation in an environment which is defined by IEC 60364-5-51:2005:

Ambient temperature, relative humidity:	AB5 (from +5 °C to +40 °C, 5 to 85 %)
Altitude:	AC1 (≤ 2000 m)
Presence of water:	AD1 (negligible)
Presence of corrosive or polluting substances:	AF1 (negligible)
Mechanical stressing: Impact	AG1 (low severity)
Vibrations:	AH1 (low severity)
Contact of persons with the ground potential:	BC2 (occasional)
Competence of persons:	BA4 (instructed persons)



THE UNIT CAN BE USED ONLY FOR THE PURPOSE FOR WHICH IT HAS BEEN DESIGNED AND CONSTRUCTED; I.E., FOR THE HEAT TREATMENT OF CERAMIC ITEMS UP TO MAXIMUM TEMPERATURE VALUE OF T_{max} .

T_{max} IS THE MAXIMUM TEMPERATURE AT WHICH THE UNIT CANNOT BE OPERATED FOR PROLONGED PERIODS.

IT IS RECOMMENDED TO USE THE DEVICE AT A TEMPERATURE BY 70 °C LOWER THAN T_{max} .

3.5.4. Instructions for disposal

When disposing of the unit, observe the national regulations of the country of the operator.

Disposal of the furnace after the end of its technical life:

- Remove the furnace lining
- Remove the metal covering sections
- Cut the furnace structure into pieces
- Sort out all parts according to waste classes and hand them over to authorised entities for disposal.

Return collection of the discarded electrical equipment (applicable only to the Czech Republic)



When disposing of the discarded electrical equipment from LAC, s.r.o., use the instructions at www.lac.cz or contact directly the operator of the REMA collection system directly at www.rema.cloud to report that you have electrical equipment from LAC, s.r.o. Židlochovice.

4. Maintenance

Genuine parts are designed for LAC equipment. When replacing parts, use genuine LAC parts. LAC shall not be liable for any damage caused by the use of non-original parts and the equipment is void of warranty.



MAINTENANCE AND REPAIRS OF THE ELECTRICAL CONTROL BOX AND HEATING SYSTEM MUST BE CARRIED OUT ONLY BY THE PERSONNEL WHO ARE AT LEAST KNOWLEDGEABLE. THE NATIONAL REGULATIONS FOR PROTECTIONS AGAINST INJURIES OF THE RESPECTIVE COUNTRY ALWAYS APPLY.

DISCONNECT THE UNIT FROM THE MAINS BEFORE ANY SERVICING.

If necessary, contact the LAC Service Department.

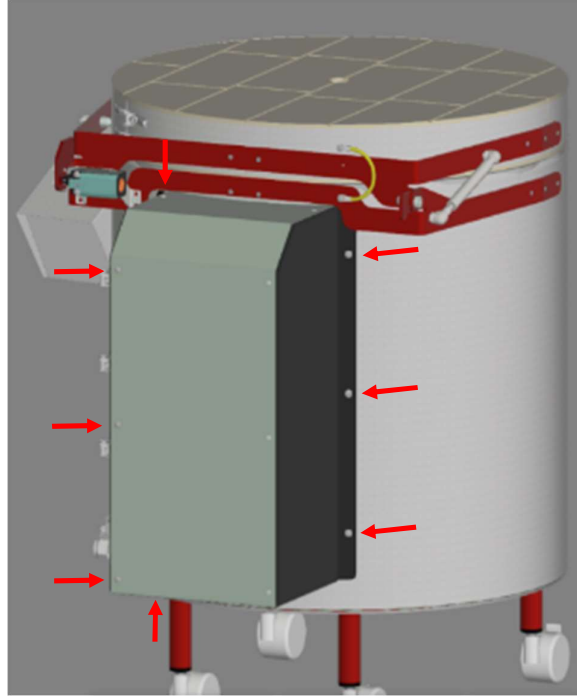
LAC s.r.o.
Topolová 933
667 01 Židlochovice
phone: +420 547 422 619
e-mail: servis@lac.cz

4.1. Spare Parts

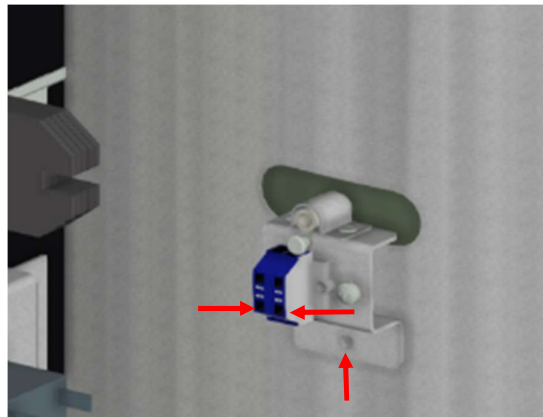
Part	Quantity in the furnace (pcs)	Ordering number
Thermocouple S 120 mm	1	250104
Limit switch	1	01120156
Rocker switch FS - Circuit breaker	1	01120147
HT40AL controller	1	01143393
HTCeramic controller	1	01143392
Bentrup TC75 controller	1	01143387
Bentrup TC95 controller	1	01143388
M30/13 heating coil	1	01131168
M45/13 heating coil (230 V)	1	01131172
M45/13 heating coil	1	01131558
M60/13 heating coil (230 V)	1	01120084
M60/13 heating coil	1	01121612
M100/13 heating coil	3	01131518
M150/13 heating coil	3	01131524
M160/13 heating coil	3	01131533
M220/13 heating coil	3	01131547
M30 castors set - M60	1	01143407
M100 castors set - M220	1	01143408
M30 - M60 gas spring 200 N	2	01142765
M100 - M220 gas spring 400 N	2	130783
M30 - M60 load relay	2	01120148
M100 - M220 load relay	3	01120148

4.2. Thermocouple replacement

1) Disconnect the unit from the mains, remove the screws holding the electric installation cover of the unit with a suitable tool and remove the cover.



2) Disconnect the thermocouple cables from the terminal block, loosen the screw holding the thermocouple in its position and remove the thermocouple.



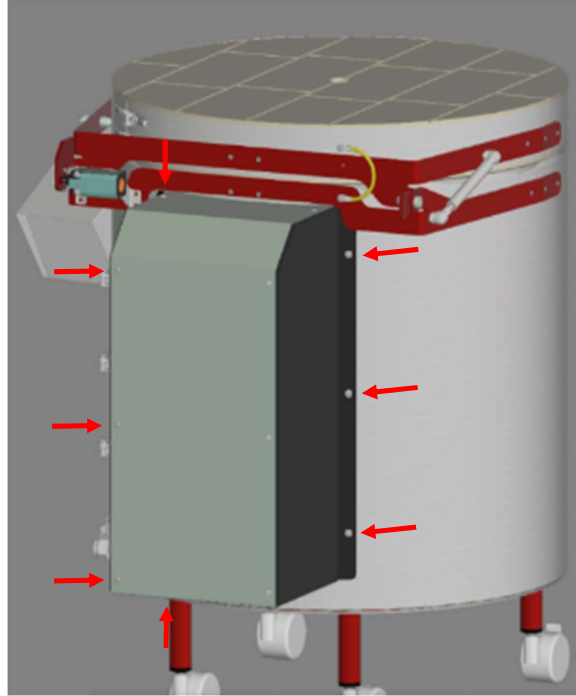
3) Insert a new thermocouple in its position and proceed using the same procedure in the reverse order.

NOTE:

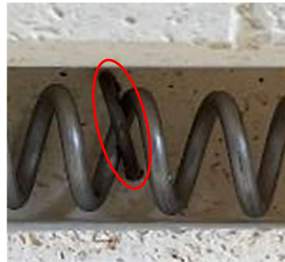
Handle the thermocouple with care, it is very fragile. Make sure that the thermocouple is installed with the correct polarity. All bolted and plug-in connections should be properly checked. Make sure that no cables are protruding or pinched. Pay attention to the parts with sharp edges.

4.3. Replacing the coils

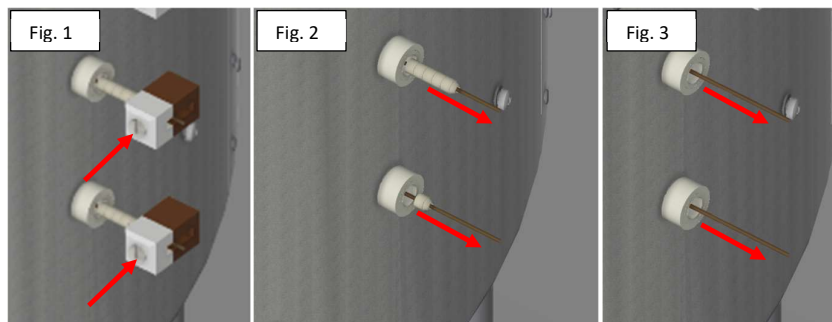
1) Disconnect the unit from the mains, remove the screws holding the electric installation cover of the unit with a suitable tool and remove it.



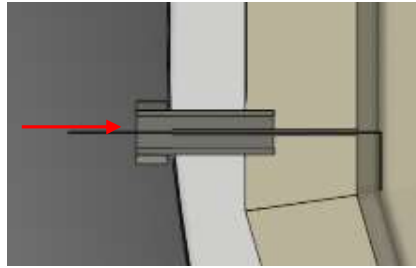
2) The heating coil is fixed in the grooves, all clamps holding the coil must be removed before its removal.



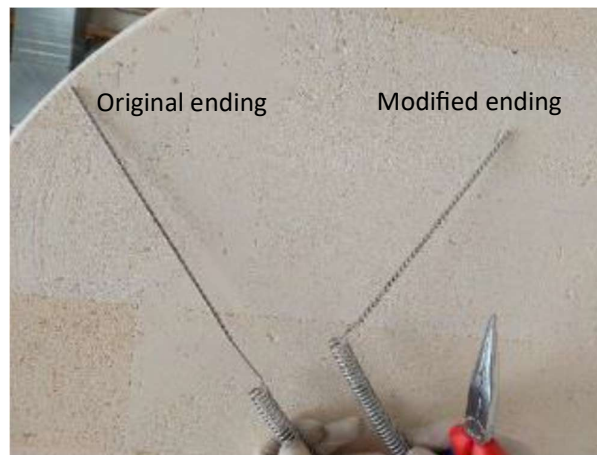
3) Disconnect the clamps from the outlets of the coils with a suitable tool (Fig. 1), remove the beads covering the outlets and remove the ceramic grommet (Fig. 3).



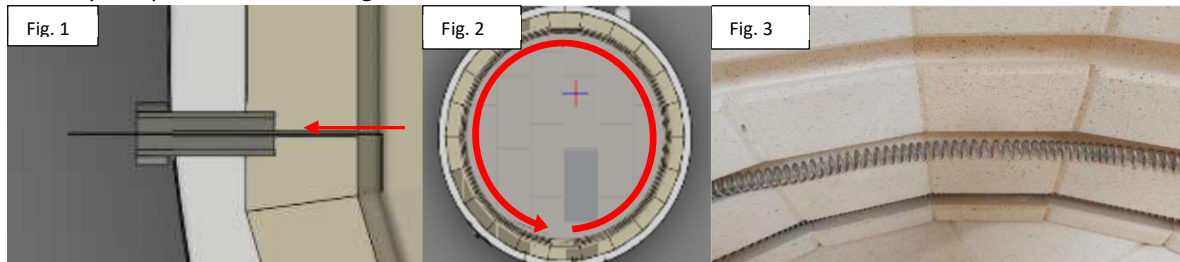
4) Pull the outlets of the coils into the inner space of the furnace and remove the coil from the groove.



5) Modify the twisted ends of the new coils – use pliers to bend the twisted end by 90°.

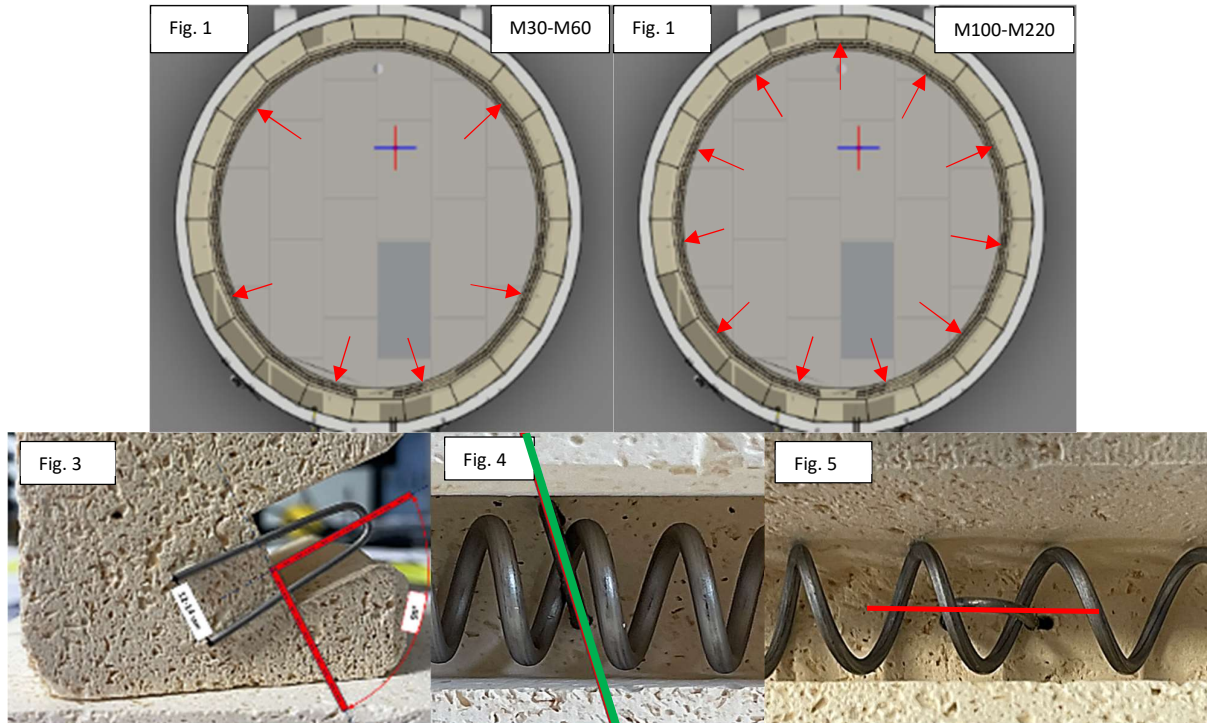


6) Pull the coil outlet from the inner space of the furnace into the electric installation space (Fig. 1). Guide the coil into the bottom of the groove around the entire circumference (Fig. 2). Pull the second coil outlet from the inner space of the furnace into the electric installation space (Fig. 1). The coil must lie freely in the groove. Pay attention to an incorrect fitting of the coil in the groove (Fig. 3), the coil may not protrude from the groove!

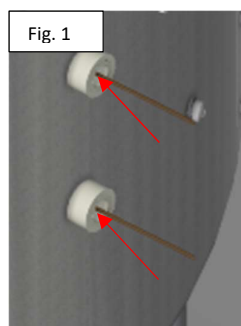


7) After inserting all heating coils, it is necessary to apply clamps to fix the coil in the groove (Fig. 1 a 2).

- The thread can be slightly expanded (e.g. with a flat head screwdriver) in the place of installation of the clamp to facilitate its installation.
- Position the clamp perpendicularly to the bottom of the groove (Fig. 3)
- Position the clamp between the coil threads diagonally (Fig. 4). If the clamp is not positioned correctly (Fig. 5), short circuit may occur!



8) Put the ceramic grommet on the outlets, and fill the space around the outlets with loose insulation fibres (Fig. 1), put the beads on the outlets and connect the coils through a terminal according to the wiring diagram (reverse procedure when compared with the step 3).



9) Replace the electric installation space cover and attach it back with the screws.

NOTE:

All bolted and plug-in connections should be properly checked. Make sure that no cables are protruding or pinched. Pay attention to the parts with sharp edges.

5. Residual risks

Heat radiation and hot surface

IF IT IS TECHNOLOGICALLY NECESSARY TO OPEN THE FURNACE OR REMOVE THE CHARGE AT TEMPERATURES HIGHER THAN 50 °C – THERE IS A RISK OF BURNING.

DURING OPERATION, SURFACE TEMPERATURES MAY BE ELEVATED ON SOME PARTS OF THE FURNACE, ESPECIALLY AROUND THE LID, DAMPERS AND OTHER INLET AND OUTLET OPENINGS – THERE IS A RISK OF BURNING.

IN THESE CASES, THE OPERATOR MUST WEAR HEAT RESISTANT PROTECTIVE EQUIPMENT PROTECTING AGAINST THE EFFECTS OF HIGH TEMPERATURES (FACE SHIELD, PROTECTIVE CLOTHING AND GLOVES).



Falling objects

WHEN HANDLING THE CHARGE, IT CAN FALL, WHICH CAN CAUSE INJURIES TO THE UPPER OR LOWER LIMBS. THEREFORE, THE OPERATOR MUST WEAR PROTECTIVE FOOTWEAR AND GLOVES.



POUŽIJ
OCHRANNOU
OBUV



POUŽIJ
OCHRANNÉ
RUKAVICE

Pinching body parts

WHEN CLOSING THE FURNACE LID, A PART OF THE BODY MAY BE PINCHED.



Electric shock injury

THE PARTS WHICH REMAIN ENERGIZED EVEN IF THE MAIN SWITCH IS TURNED OFF, ARE IDENTIFIED WITH A WARNING.



6. Labels

1. EXAMPLE OF A TYPE LABEL

 LAC, s.r.o. Topolová 933 667 01 Židlochovice Česká republika/Czech Republic www.lac.cz			
Typ	*1	Výrobní číslo Serial No.	*8
Jmenovité napětí Nominal voltage	*2		
Příkon Power Input	*4 kW	Jmenovitý proud Nominal Current	*3 A
Stupeň krytí IP - Rating	*6	Maximální teplota Maximum temperature	*5 °C
Hmotnost Weight	*7 kg	Rok výroby Year of manufacture	*9
Vyrobeno v České republice / Made in Czech Republic			

Parameters marked as *1 to *7 can be found on the type label and in the document “Technical Description of the Furnaces”. Parameters marked as *8 to *9 can be found on the type label. The type label with all parameters, serial number and year of manufacture of the furnace can be found attached to the furnace.

2. WARNING, ELECTRICITY! ENERGIZED EVEN IF THE MAIN SWITCH IS TURNED OFF!



3. DO NOT EXTINGUISH WITH WATER OR FOAM EXTINGUISHERS!



4. READ THE OPERATING INSTRUCTIONS BEFORE USE!



5. ATTENTION! HOT SURFACE



6. MAIN SWITCH



7. Support for downloading the accompanying technical documentation



Support for downloading technical documentation

Podpora ke stažení technické dokumentace

marketing@lac.cz



Download
the user manual
from the LAC website
www.lac.cz/support



Download the user manual and technical documentation for a product

Enter the type without numerical identification and the serial number of the product in the form.
This data is available on the type label.

Type	Serial number
Enter the type here	Enter the serial number
<button>Search for documentation</button>	

LAC, Ltd. Topolová 933 667 01 Židlochovice Czech Republic www.lac.cz		CE	
Type	VKK 3000/13	Serial number	2210010
Nominal voltage	3/N/PE 400/230V AC 50Hz		
Power input	205 kW	Nominal current	297 A
IP - Rating	IP 40	Maximum temperature	1340 °C
Weight	5000 kg	Year of manufacture	2022
Made in Czech Republic			

Návod k obsluze
získáte na www.lac.cz/podpora



Stažení návodu k obsluze a technické dokumentace produktu

Zadejte do formuláře typ bez číselného označení a výrobní číslo produktu.
Oba údaje naleznete na typovém štítku.

Typ	Výrobní číslo
Zde napište typ	Zadejte výrobní číslo
<button>Vyhledat dokumentaci</button>	

LAC, s.r.o. Topolová 933 667 01 Židlochovice Česká republika www.lac.cz		CE	
Typ	VKKC 000/09	Výrobní číslo	2110005
Jmenovité napětí	3/N/PE 400/230V AC 50Hz		
Příkon	85 kW	Jmenovitý proud	123 A
Stupeň krytí	IP 40	Maximální teplota	900 °C
Hmotnost	3500 kg	Rok výroby	2022
Vyrobeno v České republice			

Benutzerhandbuch
von der LAC-Website
herunterladen
www.lac.cz/unterstuetzung



Benutzerhandbuch und Technische Produktdokumentation herunterladen

Geben Sie in das Formular den Typ ohne numerische Bezeichnung und die Seriennummer des Produkts ein.
Beide Daten sind auf dem Typenschild zu finden.

Typ	Seriennummer
Geben Sie hier den Typ ein	Geben Sie die Seriennummer ein
<button>Dokumentation finden</button>	

LAC, GmbH Topolová 933 667 01 Židlochovice Tschechische Republik www.lac.cz		CE	
Typ	P1 300/11 MB.8	seriennummer	2210045
Nennspannung	3/N/PE 400/230V AC 50Hz		
Leistungsaufnahme	95 kW	Nennstrom	137,7 A
Schutzart	IP 40	Maximale Temperatur	1100 °C
Gewicht	1140 kg	Baujahr	2023
Hergestellt in Tschechien			

Pobierz instrukcję obsługi
ze strony internetowej
LAC
www.lac.cz/wsparcie



Pobranie instrukcji obsługi i dokumentacji technicznej produktu

Wpisz w formularzu typ bez oznaczenia numerycznego oraz numer seryjny produktu.
Wszystkie dane znajdziesz na tabliczce znamionowej.

Typ	Numer seryjny
Tutaj wpisz typ	Wpisz numer seryjny
<button>Wyszukaj dokumentację</button>	

LAC, Ltd. Topolová 933 667 01 Židlochovice Republika Česka www.lac.cz		CE	
Typ	PP 005	Numer seryjny	2210265
Napětí	3/N/PE 400/230V AC 50Hz		
Moc	8 kW	Nominální proud	18,4 A
Zabezpečení	IP 40	Maximální teplota	650 °C
Waga	186 kg	Rok produkce	2023
Wykonane w Republice Czeskiej			

Operational logbook

[illegible]