Nabertherm
MORE THAN HEAT 30-3000 °C

Operating Instructions

Electrically Heated Forced Convection Furnace

NA 30/45 - NA 675/65

-> 05.2016 M01.0070 ENGLISCH

Original instructions

Made
in
Germany

www.nabertherm.com

Reg: M01.0070 ENGLISCH
Rev: 2017-04

1 Introduction

Dear Customer,

Thank you for choosing a quality product from Nabertherm GmbH.

You can be proud that you have chosen a furnace which has been especially tailored to suit your manufacturing and production conditions.

This product is characterized by

- professional workmanship
- high performance due to its high efficiency
- high-quality insulation
- low power consumption
- low noise level
- simple installation
- easy to maintain
- high availability of spare parts

Your Nabertherm Team

Note

These documents are intended only for buyers of our products and may not be copied or disclosed to third parties without our written consent. (Law governing copyright and associated protective rights, German Copyright Law from Sept. 9, 1965)

Protective Rights

Nabertherm GmbH owns all rights to drawings, other documents and authorizations, also in case of applications for protective rights.

Note

All the figures in the instructions have a descriptive character; in other words, they do not represent the exact details of the furnace.

Note

The pictures contained in the instruction manual may contain inaccuracies in terms of the function, design and furnace model.

1.1 Product Description

These electrically heated furnaces are a high-quality product which will give you many years of reliable service if they are properly cared for and maintained. One basic prerequisite is that the furnace is used the way it was designed to be used.

During development and production a high priority was placed on safety, functionality and economy.

The very good temperature uniformity of these chamber furnaces with air circulation provides for ideal process conditiones for annealing, curing, solution annealing, artificialageing, preheating, or soft annealing and brazing. The furnaces are equipped with a suitable annealing box for soft annealing of copper or tempering of titanium, and also for annealing of steel under non-flammable protective or reaction gases. The modular furnace design allows for adaptation to specific process requirements with appropriate accessories.

Other Characteristics of this Product are:

- Tmax 450 °C or 650 °C
- Stainless steel air-baffles in the furnace for optimum air circulation
- Swing door hinged on the right side
- Base frame included in the delivery
- Horizontal air circulation
- Temperature uniformity up to +/- 4 °C according to DIN 17052-1
- Optimum air distribution enabled by high flow speeds
- One removable tray and rails for two additional trays included in the scope of delivery
- NTLog for Nabertherm Controller: Recording of process data with USB-flash drive

Additional Equipment

- Optimization of the temperature uniformity up to +/- 3 °C according to DIN 17052-1
- AMS 2750 E/CQI-9
- Fan cooling to accelerate the cooling process
- Motorized exhaust vents
- Manual lift door (up to model NA 250/..)
- Pneumatic lift door
- Adjustable air circulation for sensitive components
- Additional removable trays
- Roller conveyor in furnace chamber for heavy charges
- Debinding packages with safety concept starting from 120 liters volume
- Process control and documentation via VCD software package or Nabertherm Control Center (NCC) for monitoring, documentation and control

Accessories

- Charging rack
- Charging stacker
- Various slide-in shelves for the charging frame
- Protective-gas boxes
- Roller conveyor in furnace chamber for heavy charges

1.2 Overview of the Complete Furnace

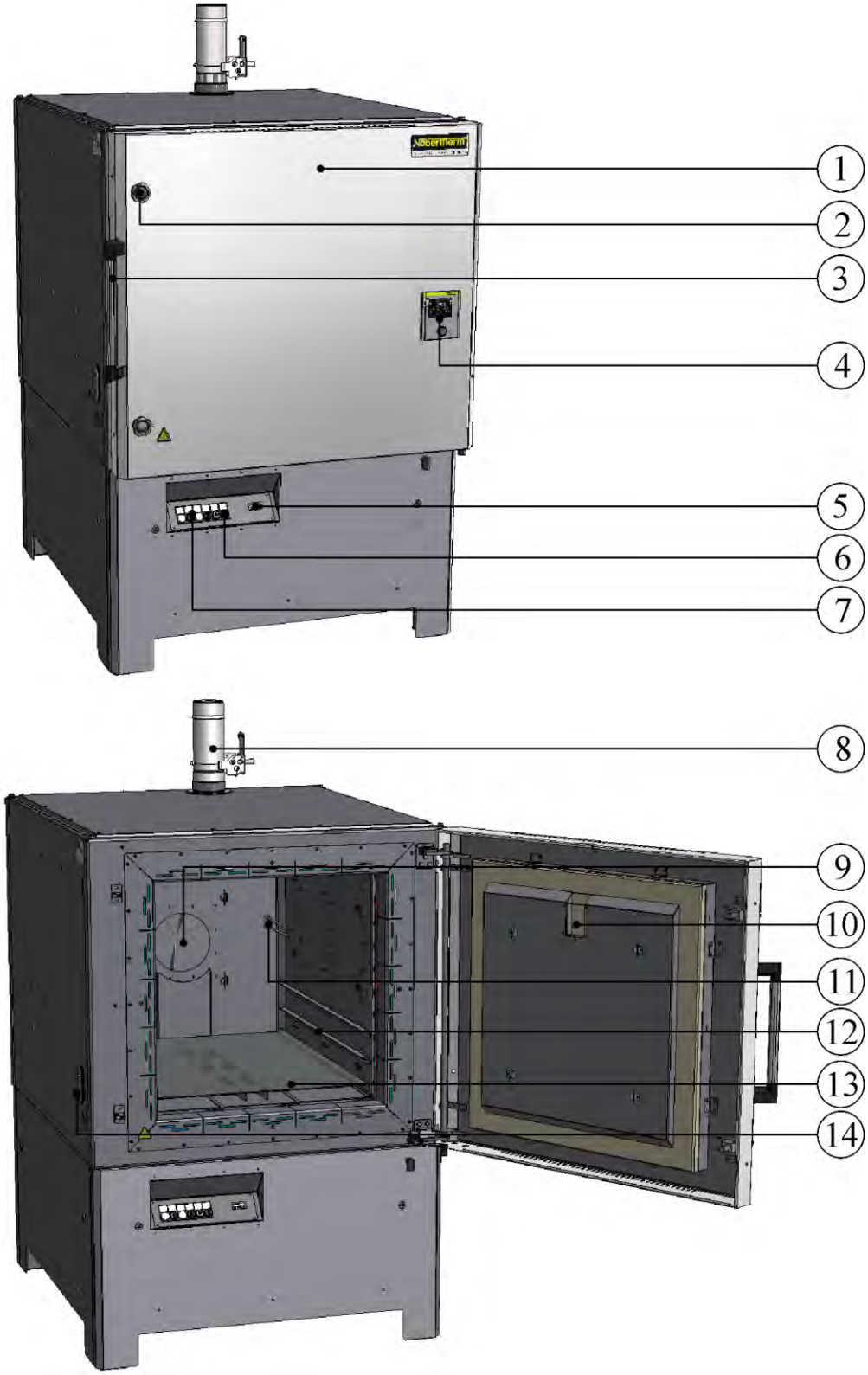


Fig. 1: Overview: The example shows a forced convection oven **with swing door** and accessories (similar to picture)

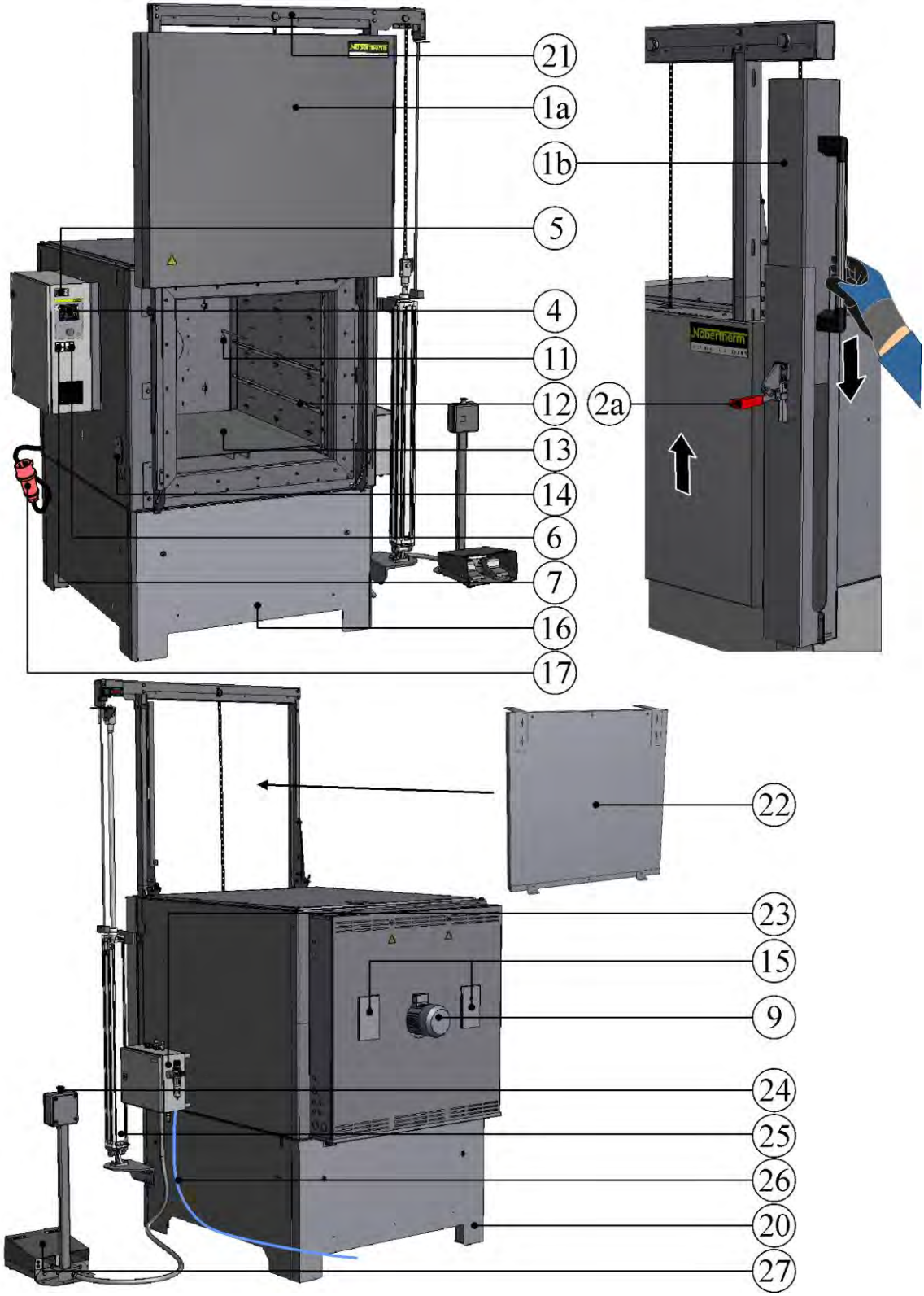


Fig. 2: Overview: The example shows a forced convection oven with accessories, manual lifting device using a chain block (to NA 250/45) or a pneumatic lift door (similar to picture)

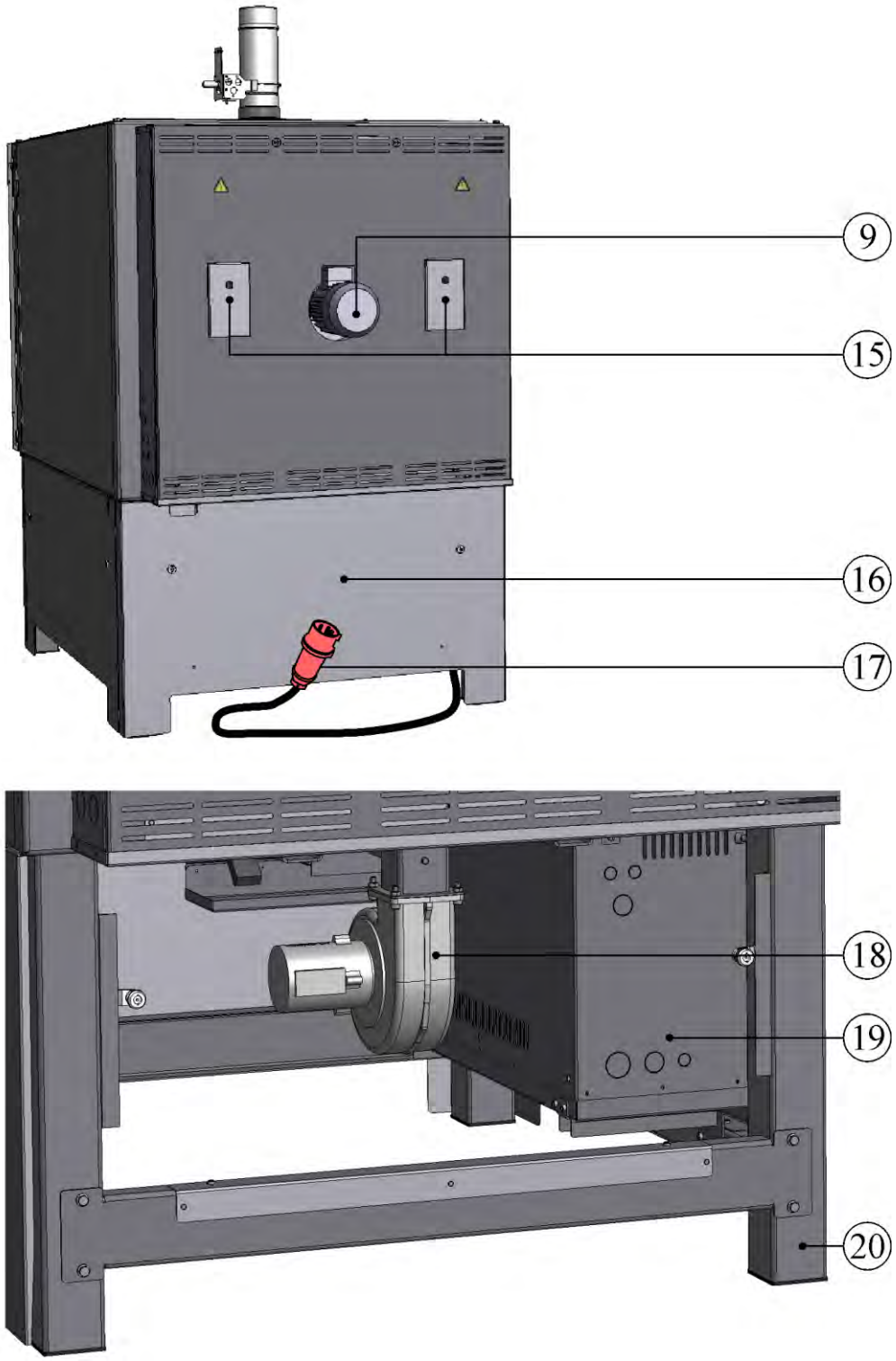
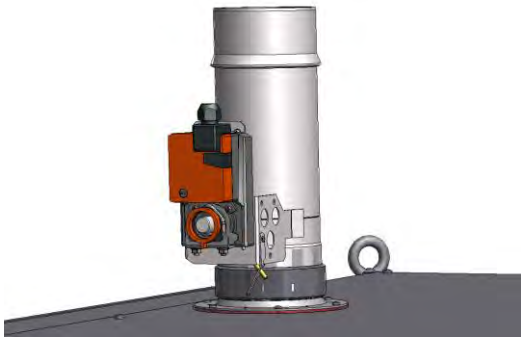


Fig. 3: Forced convection oven, rear view with accessories (similar to picture)

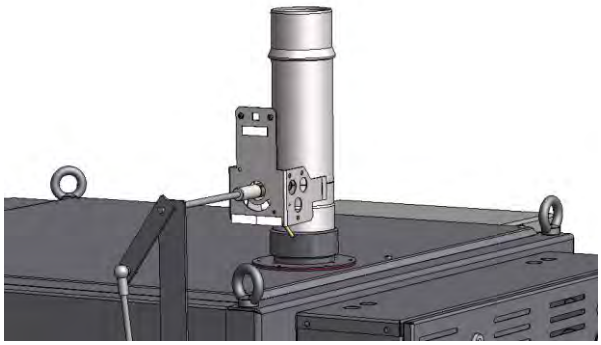
No.	Name
1	Swing door
1a	Lift door (accessory)
1b	Manual lifting device using chain block (to NA 120/45)

No.	Name
2	Lock (to lock/unlock the swing door)
2a	Lever to lock/unlock the lift door with manual lifting device
3	Handle
4	Controller B400/C440/P470 (depending on model) incl. USB interface
5	Over-temperature limiter with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the oven and the load
6	Power switch (to switch the oven on and off)
7	Operating, display and switching elements (depending on model)
8	Manual or motor-driven exhaust air flap (accessory)
9	Air circulator (air circulation motor)
10	Opening for a gas supply system (remove perforation and insulation)
11	Thermocouple
12	Removable rail
13	Removable tray
14 	Side inlet (example: for a thermocouple). Notice: Do not insert metallic objects, such as thermocouples, sensors or tools into the oven without grounding them properly beforehand. Ignoring this warning can result in a life-threatening electric shock.
15	Thermocouples behind the cover plates
16	All-round cover plate
17	CEE power plug
18	Regulated or unregulated cooling system with frequency-controlled cooling fan (accessory)
19	Switchgear (depending on the model, on the left of the oven or integrated)
20	Base
21	Guillotine with chain
22	Heat protection shield (accessory)
23	Compressed air maintenance unit
24	EMERGENCY STOP button (stops the lift door movement)
25	Pneumatic cylinder
26	Compressed air connection, quick-action coupling with 3/8" hose nozzle
27	Foot switch to open and close the lift door

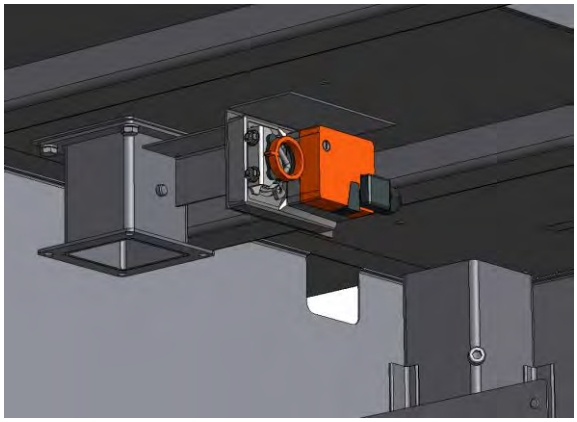
Additional Equipment



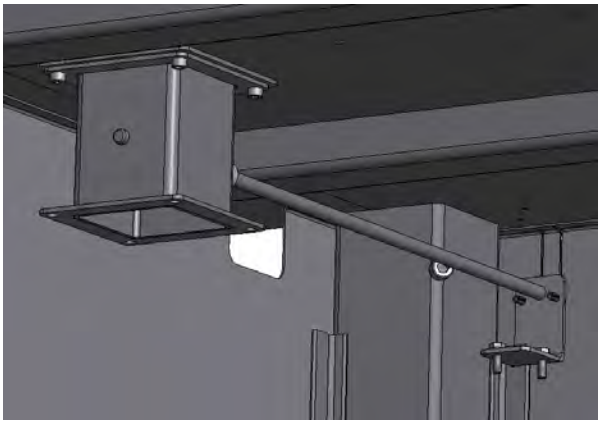
Motorized exhaust-air flap (similar to picture)



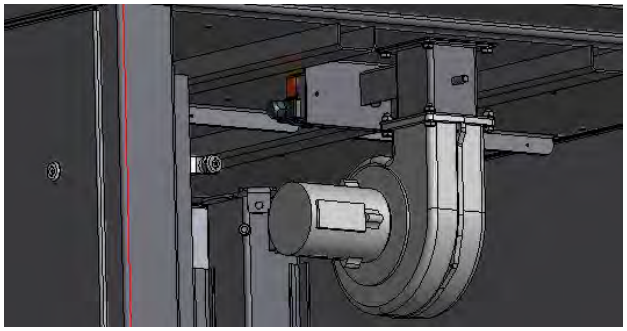
Manual exhaust-air flap (similar to picture)



Motorized fresh-air flap (similar to picture)



Manual fresh-air flap (similar to picture)



Controlled or uncontrolled cooling system with frequency-controlled cooling blower (similar to picture)

Accessories

Roller conveyor in furnace chamber for heavy charges (similar to picture)

1.3 Safeguarding against Dangers from Excess Temperatures

Over-temperature limiters and over-temperature limiters with automatic reset to protect against over-temperature in the furnace are available for Nabertherm GmbH furnaces either as a standard feature (depending on the model series) or as additional equipment (customized design).

Over-temperature limiters and over-temperature limiters with automatic reset monitor the furnace temperature. The display shows the most recently set cut-off temperature. If the furnace temperature rises above the pre-set cut-off temperature, the heating is shut down to protect the furnace, the charge and/or the operating equipment.

DANGER

- **Danger caused by incorrectly entered cut-off temperature at the over-temperature limiter/over-temperature limiter with motor driven reset**
- **Risk of fatal injury**
- If, as a result of over-temperature from the charge and/or the operating equipment, a charge is likely to be damaged at this pre-set cut-off temperature of the over-temperature limiter/over-temperature limiter with motor driven reset, or if the charge itself becomes a source of danger for the furnace or its surroundings, the cut-off temperature must be reduced on the over-temperature limiter/over-temperature limiter with motor driven reset to the maximum permissible value.

Read the operating instructions of the over-temperature limiter/over-temperature limiter with automatic reset before starting the furnace. The safety sticker must be removed from the over-temperature limiter/over-temperature limiter with automatic reset. When a change is made in the heat treatment program, the maximum permissible cut-off temperature (alarm trigger temperature) on the over-temperature limiter/over-temperature limiter with automatic reset must be checked or re-entered.

Depending on the physical characteristics of the furnace, we recommend that you set the maximum target temperature of the heating program in the controller between 5 °C and 30 °C below the trigger temperature of the over-temperature limiter/over-temperature limiter with automatic reset. This prevents unwanted triggering of the over-temperature limiter/over-temperature limiter with automatic reset.

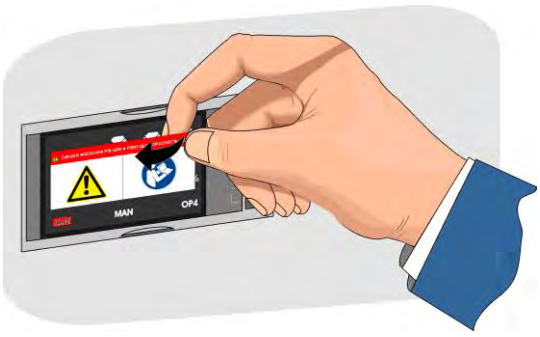


Fig. 4: Removing the sticker (similar to picture)

Description and function, see the Operating Instructions of the over-temperature limiter/over-temperature limiter with automatic reset.

1.3.1 Key to the Model Names

Example	Example
NA 500/45	**N** = Forced convection oven
N**A** 500/45	**A** = Forced Convection (Air circulation operation)
NA **500**/45	**30** = 30-liter furnace chamber (volume in L) ↓ **675** = 675-liter furnace chamber (volume in L)
NA 500/**45**	**45** = Tmax 450 °C (842 °F) **65** = Tmax 650 °C (1202 °F) **85** = Tmax 850 °C (1562 °F)

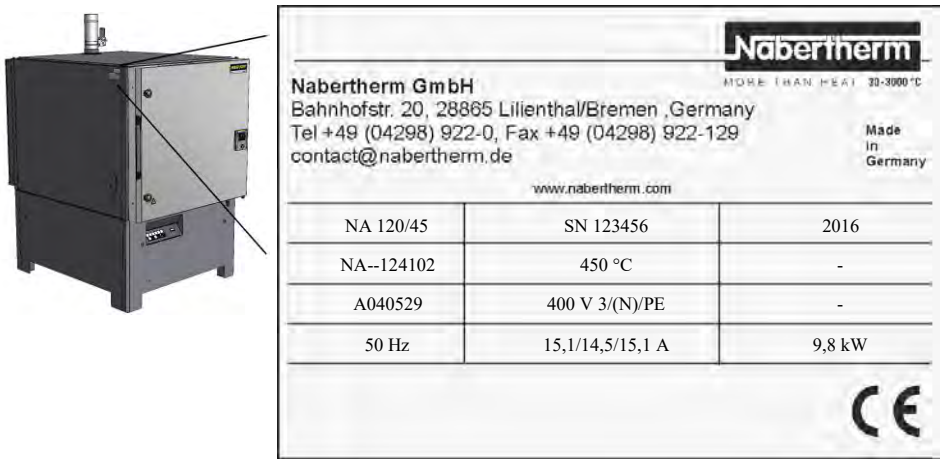


Fig. 5: Example model designation (type plate)

1.4 Scope of Delivery

The scope of delivery includes:

Furnace components	Quantity	Comment
Forced convectio oven	1 x	Nabertherm GmbH
Switch cabinet key	1 x	Nabertherm GmbH
Additional removable trays[2)]	[4)]	Nabertherm GmbH
Gas supply system[2)]	1 x	Nabertherm GmbH
Process documentation VCD software package[2)]	1 x	Nabertherm GmbH
Other components, variable depending on the particular furnace	- - -	Consult the shipping papers

Type of document	Quantity	Comment
Operating instructions, forced convection oven	1 x	Nabertherm GmbH
Operating instructions, controller	1 x	Nabertherm GmbH
Operating instructions, over-temperature limit controller[1)]	1 x	Nabertherm GmbH
Operating instructions for gas injection pane[2)]	1 x	Nabertherm GmbH
Operating Instructions VCD software package[2)]	1 x	Nabertherm GmbH
Other documents depending on variant	1 x	

1) = in scope of delivery depends on design/furnace model
2) = in scope of delivery depend on need, see shipping papers
3) = quantity depends on furnace model
4) = quantity depends on on need, see shipping papers

Note

Make sure that all documents are carefully stored. All the functions of this furnace were tested during manufacturing and prior to shipping.

Note

The documents included do not always contain the electrical schematics and pneumatic diagrams.

If you need the respective diagrams, they can be ordered from Nabertherm Service.

2 Specifications

Electrical specifications are on the type plate located on the side of the furnace.

Model	Tmax	Inner Dimensions in mm			Volume	Outer Dimensions[2] in mm			Heating power	Weight
	°C	w	d	h	in l	W	D	H	in kW[3]	in kg
NA 30/45	450	290	420	260	30	1040	1290	1385	3.0	195
NA 60/45	450	350	500	350	60	1100	1370	1475	6.0	240
NA 120/45	450	450	600	450	120	1200	1470	1575	9.0	310
NA 250/45	450	600	750	600	250	1350	1650	1725	12.0	610
NA 500/45	450	750	1000	750	500	1500	1850	1800	18.0	1030
NA 675/45	450	750	1200	750	675	1500	2050	1800	24.0	1350
NA 30/65	650	290	420	260	30	870	1290	1385	5.0	195
NA 60/65	650	350	500	350	60	910	1390	1475	9.0	240
NA 120/65	650	450	600	450	120	990	1470	1550	12.0	310
NA 250/65	650	600	750	600	250	1170	1650	1860	20.0	610

Model	Tmax	Inner Dimensions in mm			Volume	Outer Dimensions[2] in mm			Heating power	Weight
	°C	w	d	h	in l	W	D	H	in kW[3]	in kg
NA 500/65	650	750	1000	750	500	1290	1890	1825	27.0	1030
NA 675/65	650	750	1200	750	675	1290	2100	1825	27.0	1350

[1]Table-top model
[2]Outer dimensions with attachments (deviations possible with additional equipment)
[3]Depending on furnace design connected load might be higher

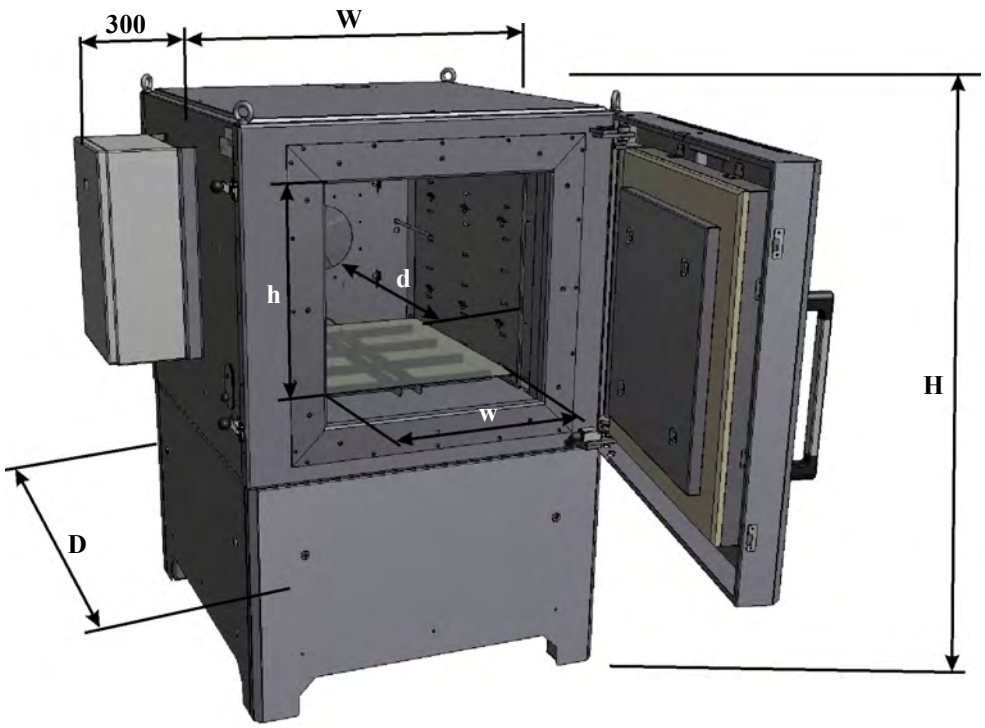


Fig. 6: Example: Dimensions (similar to picture)

Model	Work space dimensions in mm			Removable floor tray	Max. number of removable trays	Max. load per tray	Max. floor load
	w1	d1	h1	(Scope of delivery)	(Accessories)	in kg	in kg
NA 30/45	230	335	210	1	2	60	60
NA 60/45	280	400	280	1	3	60	60
NA 120/45	360	480	360	1	5	60	120
NA 250/45	480	600	480	1	5	125	250
NA 500/45	600	800	600	1	7	125	500
NA 675/45	600	1000	600	1	7	125	500
NA 30/65	230	335	210	1	2	60	60

Model	Work space dimensions in mm			Removable floor tray	Max. number of removable trays	Max. load per tray	Max. floor load
	w1	d1	h1	(Scope of delivery)	(Accessories)	in kg	in kg
NA 60/65	280	400	280	1	3	60	60
NA 120/65	360	480	360	1	5	60	120
NA 250/65	480	600	480	1	5	125	250
NA 500/65	600	800	600	1	7	125	500
NA 675/65	600	1000	600	1	7	125	500

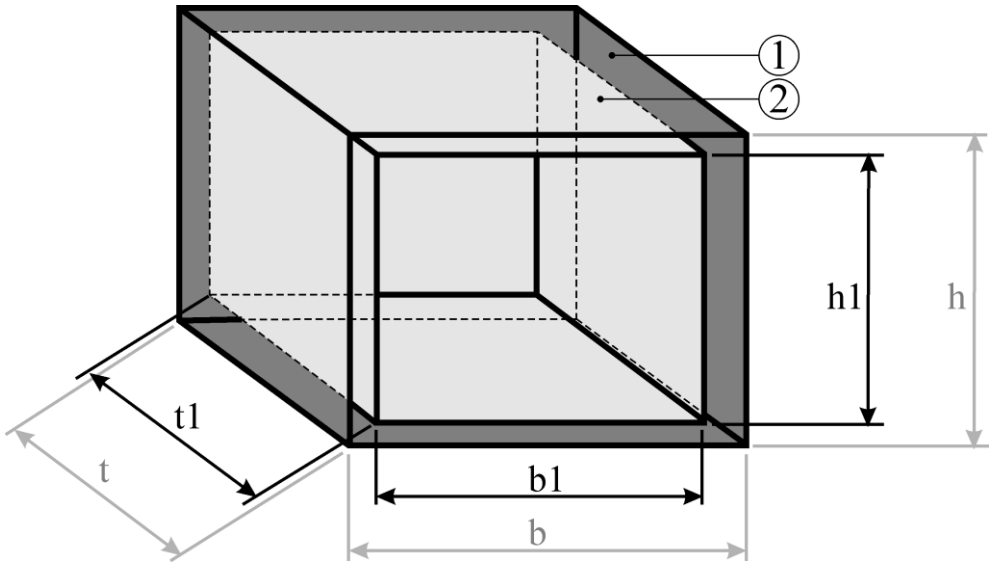


Fig. 7: Schematic representation of furnace chamber (1) and work space (2)

Electrical Connection		**1-phase**	**3-phase**
		NA 30/45	NA 60/45 – NA 675/45 NA 30/65 – NA 675/65 NA 30/85 – NA 675/85
	Voltage:	Consult type plate	
	Frequency:	Consult type plate	
Thermal Protection Class	Furnaces:	**as specified in DIN EN 60519-2** with safety controller: Class 2	
Protective Type	Furnaces:	IP20	
	Switch cabinet	IP40	
Ambient Conditions for Electrical Equipment	Temperature: Humidity:	+5 °C to + 40 °C max. 80 % not condensing	
Weights	Furnace with accessories	Varies (consult the shipping papers)	

Emissions	Continuous sound pressure level:	< 80 dB(A)

2.1 Warranty and Liability

§

As regards warranty and liability, the normal Nabertherm warranty terms apply, unless individual terms and conditions have been agreed. However, the following conditions also apply:

Warranty and liability claims for personal injury or damage to property shall be excluded if they are attributable to one or more of the following causes:

- All persons involved in operation, installation, maintenance, or repair of the furnace must have read and understood the operating instructions. No liability will be accepted for damage or disruption to operation resulting from non-compliance with the operating instructions.
- Not using the furnace as intended
- Improper installation, start-up, operation, or maintenance of the furnace,
- Operation of the furnace with defective safety equipment or improperly installed or non-functioning safety and protective equipment
- Not observing the information in the operating instructions with respect to transportation, storage, installation, start-up, operation, maintenance, or equipping the furnace
- Making unauthorized changes to the furnace
- Making unauthorized changes to the operating parameters
- Making unauthorized changes to the parameterization, the settings, or the program
- Nabertherm accepts absolutely no liability for damage caused by using parts that are not original Nabertherm parts. Original parts and accessories are designed especially for Nabertherm furnaces. Replace parts only with original Nabertherm parts. Otherwise the warranty will be void.
- Catastrophes due to third-party causes and force majeure

3 Safety

3.1 Defined Application

The Nabertherm furnace was designed and built in conformance with a careful selection of the applicable harmonized standards and other technical specifications. Hence, it corresponds to the state of the art and assures the greatest degree of safety.

Only materials whose characteristics and melting temperatures are known may be heated. Consult any available safety-related material data sheets.

- The furnace is universally useable for heat treatment/drying.
- Heat treatment of workpieces or metals
- For use in business in conformance with EN 60335-1

  Design in conformance with EN 60204 available as an additional feature
- The furnace is designed for continuous operation
- The furnace was designed to be charged and unloaded under maximum temperature.
- Manual charging horizontal with forklift or manipulator

- Working temperature range of 150 °C (302 °F) to Tmax

  A lower temperature of 150 °C (302 °F) can be achieved with the accessory “exhaust air flap controller” or the frequency-controlled speed of the air circulation.

- Any other use, such as processing of products other than those for which the furnace was intended as well as handling hazardous materials or materials dangerous to health is deemed IMPROPER and such uses must be approved in writing by Nabertherm.

Operation with explosive gases or mixtures, i.e., including any explosive gases or mixtures created as a result of heating/drying, is prohibited.

The operator is liable for any resulting damages.

- **This furnace is NOT used by certain persons (including children) with restricted physical, sensorial or mental capabilities or who have insufficient experience and/or insufficient knowledge, unless they are supervised by a person who is responsible for their safety or are instructed in how to use the furnace. Children should be supervised to make sure that they do not play with the furnace.**

- The furnace may only be operated in the manner described in these operating instructions, i.e., the operating instructions must be completely read and understood.

- Furnaces with over-temperature limit controllers must have their shut-down temperatures set to prevent any overheating of the material.

- If as a result of excessive heat the batch is likely to be damaged by the pre-set cut-out temperature of the over-temperature limit controller or that the batch itself becomes a source of danger for the furnace or its surroundings, the temperature setting on the over-temperature limit controller must be reduced to the **maximum permissible value**.

- Only materials whose characteristics and melting temperatures are known may be heated. Consult any available safety data sheets of the materials. Any other use beyond this is improper, including the processing of products other than those for which the furnace was intended as well as handling hazardous materials or materials dangerous to health, and must be approved in writing by the manufacturer Nabertherm GmbH.

- The set-up instructions and safety regulations must be followed, otherwise the furnace will be considered improperly used, effectively cancelling any claims against Nabertherm GmbH. The EC Declaration of Conformity will cease to be valid if any modifications are made to the machine without our approval.

- The maximum charge weight (see section "Technical Data") must **not** be exceeded.

- The set-up instructions and safety regulations must be followed, otherwise the furnace will be considered improperly used, effectively cancelling any claims against Nabertherm GmbH.

- Before placing materials in the furnace, check whether they could harm or destroy the insulation or the heating elements. Materials that could damage the insulation include: alkalis, alkaline earths, metal vapors, metal oxides, chlorine compounds, phosphorous compounds, and halogens. **If applicable, read the labels and instructions on the packaging of materials that you use.**

- Operation with power sources, products, operating equipment, auxiliary materials, solvents, etc., which are listed as hazardous or which may in any way harm the health of the personnel operating the furnace is prohibited.

To protect against thermal destruction the air recirculation motors must continue to operate as long as the furnace chamber temperature is **greater than 80 °C** (176 °F). The furnace must not be switched off until the furnace chamber temperature is **below 80 °C** (176 °F).

- This furnace was designed for **commercial** use. The furnace is **not** designed for heating food, animals, wood, grain, etc.
- The furnace must not be used to heat the workplace.
- Do not use the furnace to melt ice or for similar purposes.
- Do not use the furnace as a clothes dryer.

Caution

Applicable safety instructions are contained in individual chapters.

Note

The furnace must not be operated with explosive gases or mixtures or with explosive gases or mixtures that form during the process.
This furnace has **no** safety technology for processes in which combustible mixtures can form, such as debinding.
If the furnace is to be used for such processes, the concentration of organic gases must never exceed 3 % of the lower explosive limit (LEL) in the furnace. This requirement not only applies to normal operation, but also especially to exceptions, such as process malfunctions (e.g. due to the breakdown of a unit, etc.). Ensure adequate extraction and ventilation of the furnace.

Nabertherm offers a wide range of furnaces that were especially developed for processes with flammable gases.

Note

This product does not comply with the ATEX Directive and may not be used in ignitable atmospheres. The system must not be operated with explosive gases or mixtures and it must be ensured that explosive gases or mixtures do not form during the process.

3.2 Requirements for the Furnace Operator

The set-up instructions and safety regulations must be followed; otherwise the furnace will be considered improperly used, effectively cancelling any claims against Nabertherm GmbH.

This level of safety when operating the furnace can only be achieved if all the necessary measures have been taken. It depends on the furnace operator's due diligence in planning these measures and controlling how they are carried out.

If the process causes the release of hazardous vapors or gases, the operator must vent the exhaust gases from the outlet flap through a suitable exhaust air purification system out of the building and ensure sufficient fresh air for the fresh-air inlet flap.

In this case, operation of the furnace without a suitable exhaust-purification system and ductwork carrying exhaust out of the building is not permissible.

- Hot air emitted from the furnace's outlet flap must not be hazardous to people, things or the building.

The operator must ensure that

- all harmful gases must be removed from the workplace, for example by a extraction system,
- extraction equipment is switched on,
- the workplace is properly ventilated,
- the furnace is only operated in perfect running condition and, in particular, that the working order of the safety components is checked at regular intervals.
- required protective clothing and devices are available for and used by the operating, maintenance and repair personnel.
- these operating instructions, including the supplier documentation, are kept near the furnace. These instructions must be available at all times for anyone doing any work at the furnace;
- all the safety and operating instruction signs on the furnace are in good condition and easy to read. Damaged or unreadable signs must be replaced immediately,
- furnace personnel are informed at regular intervals about all pertinent questions involving occupational safety and environmental protection and are familiar with all the operating instructions, especially those involving safety,
- a potential hazard assessment is performed (in Germany covered of the Occupational Safety Act) to determine any other sources of danger which may result from the working conditions particular to the site of the furnace,
- all other instructions and safety guidelines are compiled in an operating instruction manual (in Germany covered of the Ordinance Regulating the Use of Operating Equipment) which reflects the findings of a hazard assessment of the jobs performed at the furnace.
- Only sufficiently qualified and authorized personnel may operate, maintain and repair the system. This personnel must be trained in how to operate the furnace and must confirm their participation in the training with a personal signature. The training program must be documented in detail. In case an operator is replaced, additional training must also take place. The additional training may only be performed by authorized, trained individuals familiar with the system. The additional training must be painstakingly documented and participation must be evidenced by the names and signatures of the participating employeess..

Operating the Furnace

- Operating the furnace with explosive gases or mixtures, i.e., including any explosive gases or mixtures created as a result of heating/drying, is prohibited.
- A furnace opened while still hot radiates enormous heat energy, which can cause burns.
- Working with the furnace, for example opening the furnace door, etc., is only permissible when the whole space needed for the door to swing out, the danger zone, is visible to the operator.
- When working at the furnace with high temperatures, the appropriate protective clothing and protective goggles must be worn.
- Danger! Risk of burns:
- Several spots on the housing and components of the control box can become hot enough during normal operation to cause skin burns.
- When the vent supports are hot, touching them will lead to burns.
- To protect against thermal destruction, the air recirculation motors must operate continuously as long as the furnace chamber temperature is greater than 80 °C (176 °F).

- Impermissibly shutting down of the control voltage or the main switch when the furnace chamber temperature is greater than 80 °C (176 °F) will destroy the recirculating fan motors.

Requirements related to the Ambient Conditions of the Control Box

- The furnace's electrical equipment is designed to operate in temperatures from +5 °C to 40 °C (104 °F). At a temperature of 40 °C (104 °F) the humidity must not exceed 50 %. At lower temperatures the humidity can be higher (max. 80 %), but there must be no condensation.
- At higher temperatures, switch-cabinet coolers must be used. In case of higher humdity and very low temperatures, heaters must be used.
- The switch box must be protected against heat, dust and moisture.
- The location must be sufficiently ventilated.

Connecting the Switch Box

- When the switch box is connected to the power source and, as necessary, to the furnace, a clockwise rotating field must be executed.
- Connections must be made by specialized electricians. All applicable rules and legal regulations must be followed.
- Before connecting the furnace, the available supply voltage and frequency must be checked against the values stated on the type plate to ensure that they are identical.
- Check the protective conductor
- Select the cross sections of the feed line as specified in the schematic circuit.

Caution

In Germany the accident prevention regulations contained in must be followed. The accident prevention regulations applicable in the country where the furnace is installed must be followed.

3.3 Requirements for the Operating Personnel

All persons involved in operation, installation, maintenance, or repair of the furnace must have read and understood the operating instructions. No liability will be accepted for damage or disruptions to operation resulting from non-compliance with the operating instructions.

Only adequately qualified and authorized persons may operate, maintain, and repair the system.
These personnel are informed regularly about all issues involving occupational safety and environmental protection and are familiar with all the operating instructions, especially those involving safety,

Only trained personnel may operate the control and safety equipment.

The Operator Should Complete these Details:

- Operator _____
- The furnace may only be transported by _____
- The furnace may only be installed by _____
- The furnace may only be commissioned by _____

- Initial instructions may only be given by
  _____
- Malfunctions may only be rectified by
  _____
- The furnace may only be maintained by
  _____
- The furnace may only be cleaned by
  _____
- The furnace may only be serviced by
  _____
- The furnace may only be repaired by
  _____
- The furnace may only be shut down by
  _____

⚠ DANGER

- **Danger caused by incorrectly entered cut-off temperature at the over-temperature limiter/over-temperature limiter with motor driven reset**
- **Risk of fatal injury**
- If, as a result of over-temperature from the charge and/or the operating equipment, a charge is likely to be damaged at this pre-set cut-off temperature of the over-temperature limiter/over-temperature limiter with motor driven reset, or if the charge itself becomes a source of danger for the furnace or its surroundings, the cut-off temperature must be reduced on the over-temperature limiter/over-temperature limiter with motor driven reset to the maximum permissible value.

3.4 Protective Clothing

Wear goggles to protect your eyes.

Wear protective clothing

Wear heat-resistant gloves to protect your hands.

Wear safety boots to protect your feet.

3.5 Basic Measures During Normal Operation

Risks during Normal Operation!

Before switching the furnace on, check and ensure that only authorized persons are in the working area of the furnace and that no one can be injured as a result of operating the furnace.

Before starting production each time, check and ensure that all the safety equipment works properly.

Before starting production each time, check the furnace for obvious damage and ensure that it is operated only in a perfect condition. Report any defects to a supervisor immediately.

Before starting production each time, remove all materials and objects that are not needed for production from the working area.

At Least once every Day (see also Servicing and Maintenance) Check the Following:

- Check the furnace for obvious external damage,
- Check all hydraulic or pneumatic hoses, make sure that they are not leaking and that they are connected properly (if applicable),
- Check all gas and oil lines, make sure that they are not leaking and that they are connected properly (if applicable),
- Check that the fan works properly (if applicable)

3.6 Basic Measures in Case of Emergency

3.6.1 What to Do in an Emergency

Furnaces with Power Plug

Note

In an emergency, **immediately** switch off the voltage supply to the furnace at the **power switch** (position "**O**"). Wait until the furnace chamber and attaching parts have cooled to room temperature.

Note

The power plug is to be pulled out to stop the furnace in case of an emergency. Therefore, the power plug must be accessible at all times when the furnace is operating so that it can be pulled out quickly in case of an emergency.

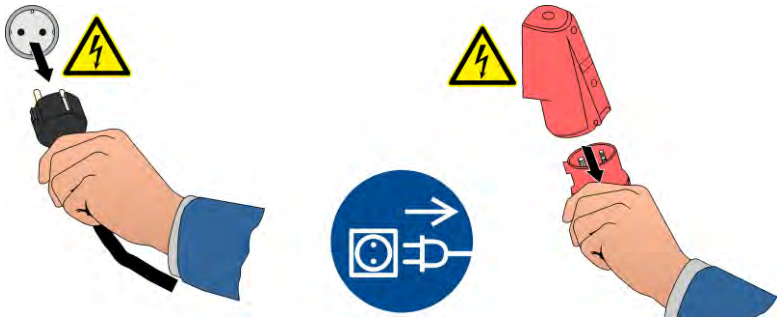
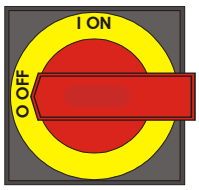


Fig. 8: Pull the power plug (similar to picture)

Furnaces with main switch (additional equipment) (for fürnaces > 32 A standard



Note

In an emergency, **immediately** switch off the voltage supply to the furnace at the **main switch** (position "**O/OFF**"). Wait until the furnace chamber and attaching parts have cooled to room temperature.

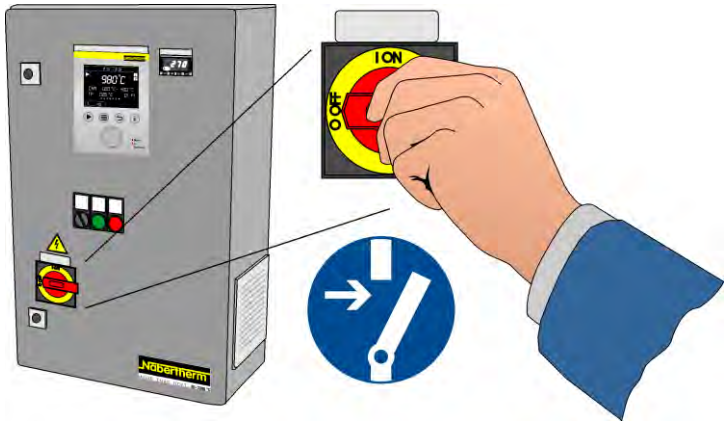
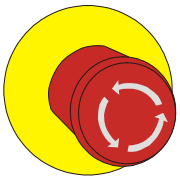


Fig. 9: Disconnect power to the system using the main switch (similar to picture)

EMERGENCY-STOP KEY (additional equipment)

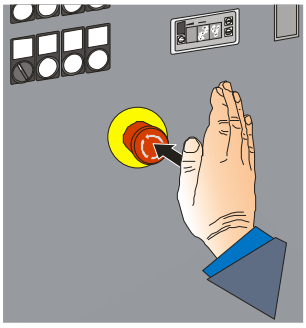


Note

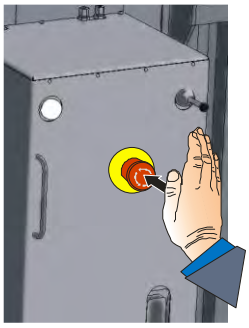
The EMERGENCY-STOP key is only intended for emergencies and not for shutting off the furnace during normal operation! After it has been used, the "EMERGENCY-STOP" key must be unlocked by hand, by turning the knob (optionally with key) before the furnace can be re-started.

In case of emergency, the lift movemet must be stopped immediately with the EMERGENCY-STOP key.

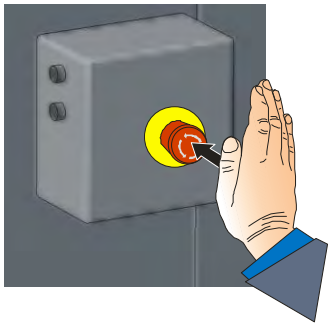
Note: The EMERGENCY-STOP key does not turn off the system's heating unit. Turn off the heating by pulling the system power plug or, if included, by switching the main switch to off.



Example:
Switchgear

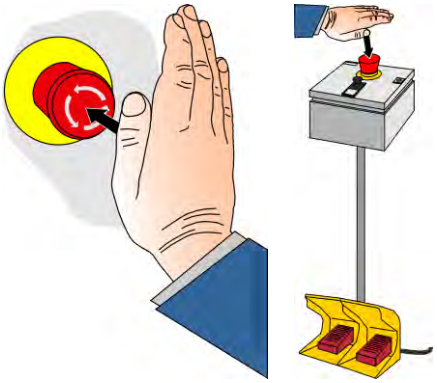


Example:
Hydraulic system



Example:
Control unit

Fig. 10: Shutdown of the machine in an emergency with one or several EMERGENCY-STOP command devices (similar to picture)



similar to picture

EMERGENCY STOP button

EMERGENCY STOP buttons are electromechanical switching devices designed to protect people at or near machines. They are used to switch off/stop machines and systems to prevent or reduce imminent or existing risks for people or damage to the machine or the charge.

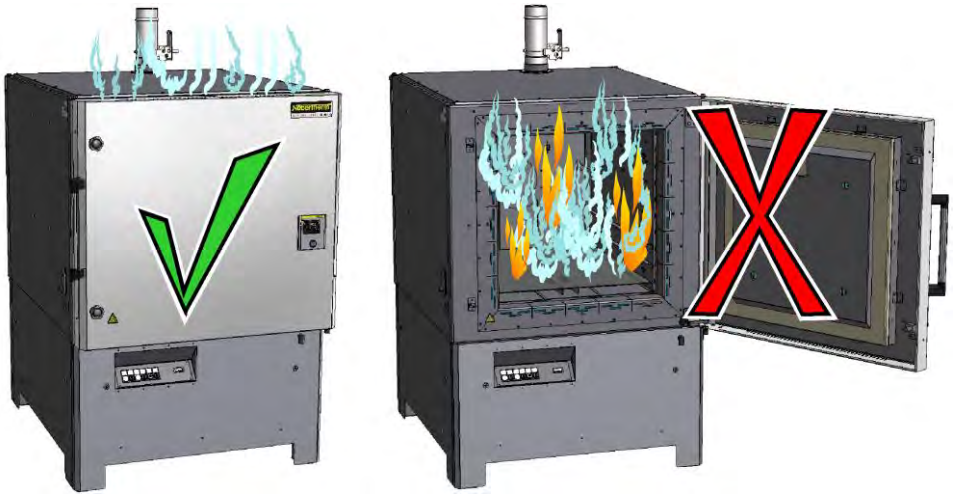
In an emergency this safety device must be pressed immediately.

Risks during Normal Operation!

Switch the furnace off immediately in case of unexpected occurrences in the furnace (e.g. a lot of smoke or unusual smells). Wait until the furnace has cooled naturally to room temperature.

In case of fire, keep door and the exhaust-air flap closed. This will allow you to prevent the spread of smoke and keep out a supply of oxygen. The exhaust-air flaps must remain closed.

The exhaust-air flap must remain closed.



	**DANGER** **• Danger of electric shock.** **• Risk of fatal injury.** • Work on the electrical equipment may be performed only by qualified electricians or by technicians authorized by Nabertherm • Switch off the furnace	

3.7 Basic Measures for Servicing and Maintenance

Maintenance work must be performed only by authorized persons, observing the maintenance instructions and the accident prevention regulations. We recommend that maintenance and repair work be carried out by the service team of Nabertherm GmbH. Non-compliance may cause injuries, death, or considerable damage to property.

Switch off the system and make sure it cannot be switched on again inadvertently (lock the main switch and secure it with a padlock), or pull out the power plug.

Clear an adequate area around the system to facilitate the repair work.
Suspended loads are dangerous. Working beneath a suspended load is prohibited. There is a risk of fatal injury.
Relieve the pressure on hydraulic and pneumatic equipment before carrying out maintenance or repair work. (if applicable).

When cleaning furnaces, control cabinets, or electrical equipment housings, never spray them with water.

When maintenance or repair work has been completed, before recommencing production ensure the following:

- Check that loosened screw connections have been re-tightened,
- Reinstall protective equipment, screens, and filters,
- Remove all material, tools, and other equipment used for the maintenance or repair work from the working area of the system,
- Remove any liquids that have leaked,
- Check that all safety functions (e.g. EMERGENCY STOP button) work properly,
- Power cables may be replaced only with similar, approved cables,

3.8 Environmental Regulations

All statutory duties regarding waste avoidance, proper recycling, and disposal must be observed when work is carried out on and with the furnace.

Problem materials that are no longer needed, such as lubricants or batteries, must not be placed in normal waste disposal systems or allowed to enter the sewage system.

During installation, repair, and maintenance work, substances that are hazardous to water, such as

- lubricating grease and oils
- hydraulic oils
- refrigerants
- solvent-based cleaning fluids must not be allowed to contaminate the soil or enter the sewage system.

These substances must be stored, transported, collected, and disposed of in suitable containers.

Note
The operator must ensure that national environmental regulations are observed.

When it is delivered, this furnace contains no substances that make a hazardous waste classification necessary. However, residues of process materials may accumulate in the furnace insulation during operation. These may be hazardous to health and/or the environment.

- Dismantle the electronic components and dispose of them as electric scrap.
- Remove the insulation and dispose of it as hazardous waste (see “Servicing, Cleaning, and Maintenance with Ceramic Fiber Material”).
- Dispose of the housing as scrap metal.
- Contact the responsible disposal company to dispose of the materials listed above.

3.9 Explanation of the Symbols and Warnings

Note
In the following operating instructions, specific warnings are given to draw attention to residual risks that cannot be avoided when the furnace is operating. These residual risks include dangers for humans/products/ the furnace, and the environment.

The symbols used in the operating instructions are especially intended to draw attention to safety information.

The symbols used cannot replace the text of the safety information. Therefore, always read the entire text.

Graphic symbols correspond to **ISO 3864**. In accordance with the **A**merican **N**ational **S**tandard **I**nstitute (ANSI) **Z535.6** the following warning information and words are used in this document:

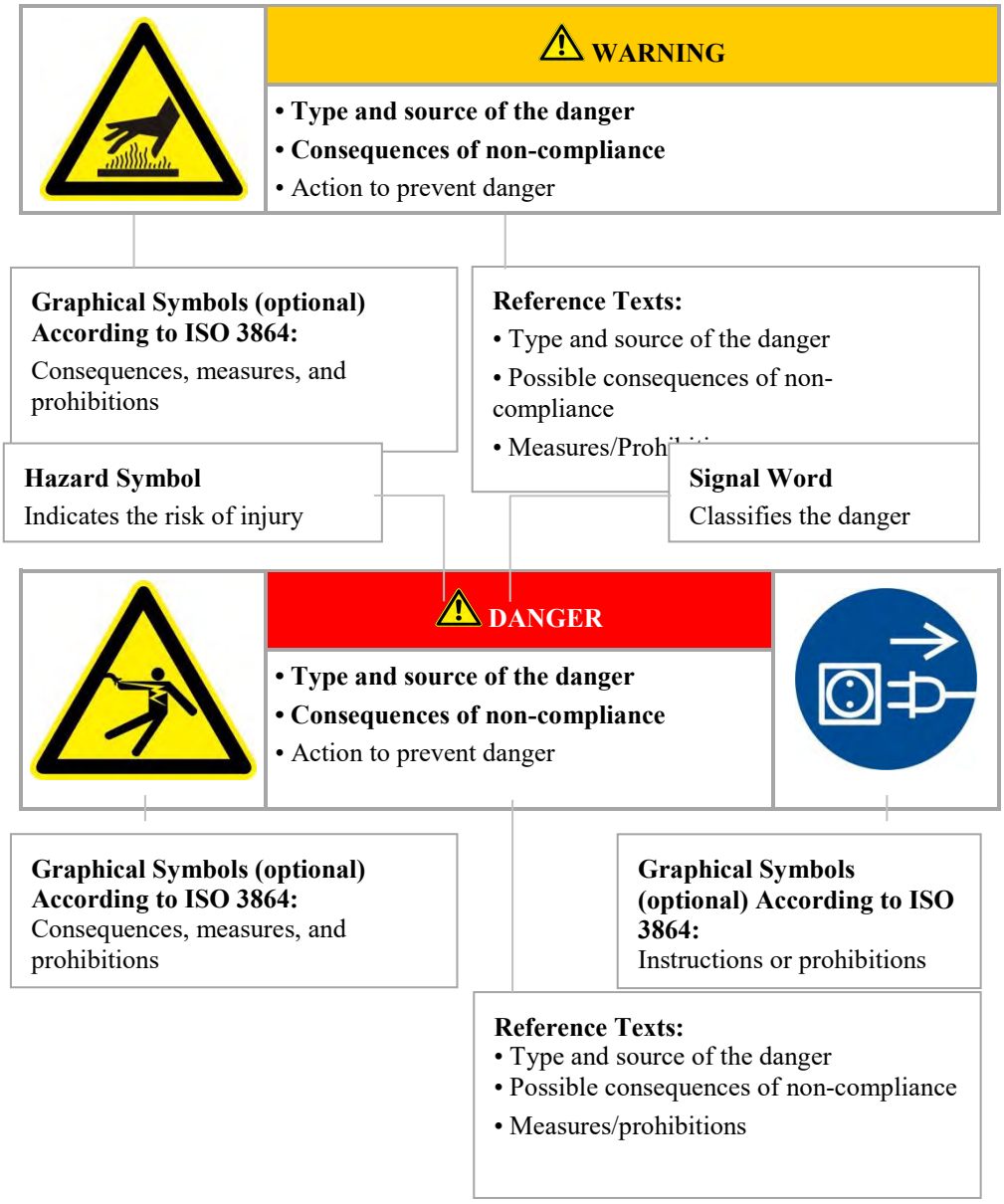
The general hazard symbol, in combination with the words **CAUTION**, **WARNING** and **DANGER** warns about the risk of serious injury. Observe the following information to prevent injury or death.

NOTE	Refers to a hazard that could damage or destroy the equipment.
CAUTION	Refers to a hazard with a minor or medium risk of injury.
WARNING	Refers to a hazard that could cause death, serious or irreversible injury.
DANGER	Refers to a hazard that could directly cause death, serious or irreversible injury.

Structure of the Warning: All Warnings are Structured as Follows

Hazard Symbol
Indicates the risk of injury

Signal Word
Classifies the danger



Information Symbols in the Instructions:

Note
Below this symbol you will find instructions and particularly useful information.

Rule - Rule Sign
This symbol draws attention to important rules that must be observed. Rule signs protect people against injury and show what is to be done in certain situations.

Rule – Important Information for Operators
This symbol draws the operator's attention to important information and operating instructions that must be observed.

Rule – Important Information for Maintenance Personnel

This symbol draws the maintenance personnel's attention to important operating and maintenance instructions (service) that must be observed.

Rule – Pull Out the Power Plug

This symbol tells the operator to pull out the power plug.

Rule – Disconnect the Furnace

This symbol informs the operator that before beginning any work the furnace must be disconnected from the power supply and the applicable safety rules and accident prevention regulations must be observed.

Rule – Lift only with Several People

This symbol draws the personnel's attention to the fact that this device may only be lifted and moved to its final destination by several people.

Caution – Fingers or Hands May Be Crushed

This symbol warns the operator of the potential for fingers or hands to be crushed. Ignoring this can lead to injury.

Warning – Hot Surface, Do Not Touch

This symbol warns the operator that the surface is hot and should not be touched.

Warning – Danger of Electric Shock

This symbol warns the operator that there is a risk of an electric shock if the following warnings are not heeded.

Warning – Risk of Device Toppling Over

This symbol tells the operator that there is a risk of the device toppling over if the following warnings are not heeded.

Warning – Suspended Load

This symbol warns the operator of potential dangers of suspended loads. Working below a suspended load is strictly forbidden. Ignoring this can lead to fatal injury.

Caution – Danger of Falling

Ignoring this can lead to fatal injury. Danger of falling exists at a height less than 1.00 m above the ground or another sufficiently broad bearing surface (for example, on elevated operating positions and workplaces, working platforms, galleries, platforms, footbridges, flying bridges, ramps and stairways), openings and recesses through which people can fall (for example in floors, platforms, installation openings, hatchways and pits, non-bearing roofs).

Warning – Danger if Heavy Loads are Lifted

This symbol warns the operator of the potential dangers of lifting heavy loads. Ignoring this can lead to injury.

Warning – Risk to the Environment

This symbol warns the operator of the risk to the environment if the following information is not heeded. The operator must ensure that national environmental regulations are observed.

Warning – Fire Danger

This symbol warns operators of the danger of fire if the following information is not followed.

Warning – Suffocation from Lack of Oxygen

This symbol warns the operator of the possibility of suffocating from lack of oxygen. Ignoring this can lead to **suffocation**

Warning – Risk of Explosive Substances or Explosive Atmosphere

These symbols warn the operator of explosive substances or an explosive atmosphere

Prohibited – Important Information for Operators

This symbol warns the operator that water or cleaning products must NOT be poured over the objects. A high-pressure cleaning device must also not be used.

Warning Signs on the Furnace:

Warning – Hot Surface, Danger of Burning – Do Not Touch

You may not always realize that surfaces, such as furnace components, furnace walls, doors and materials, and even liquids are hot. Do not touch the surface.

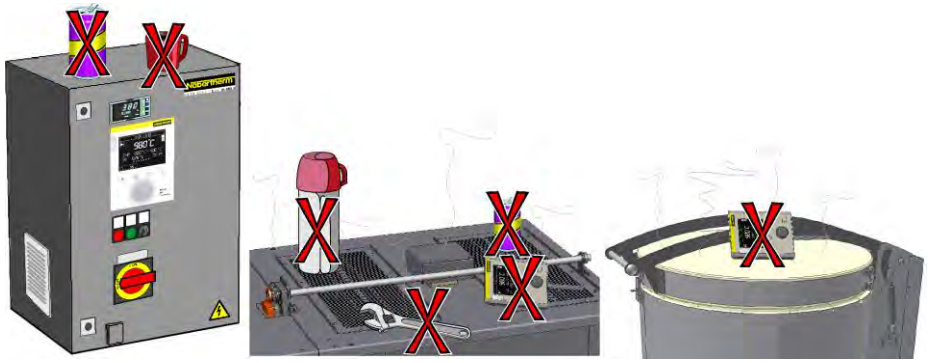
Warning – Danger of Electric Shock!

Warning, dangerous electric voltage

3.10 General Risks with the Furnace

Warning – General Hazards

No objects may be placed or set down on the furnace or switchgear. There is a risk of fire or explosion.



DANGER

- **Danger from electrocution**
- **If there is no earth connection, or the earth connection is poorly connected, the result may be a deadly electrical shock.**
- Do not insert any metallic objects such as thermocouples, sensors or tools into the furnace chamber without having previously ensured that the plant has been correctly earthed. Entrust the job of making a earth connection between the object and the furnace housing to a qualified electrical technician. Any objects inserted into the furnace must be inserted only through those openings intended for this purpose.

DANGER

- **Danger caused by incorrectly entered cut-off temperature at the over-temperature limiter/over-temperature limiter with motor driven reset**
- **Risk of fatal injury**
- If, as a result of over-temperature from the charge and/or the operating equipment, a charge is likely to be damaged at this pre-set cut-off temperature of the over-temperature limiter/over-temperature limiter with motor driven reset, or if the charge itself becomes a source of danger for the furnace or its surroundings, the cut-off temperature must be reduced on the over-temperature limiter/over-temperature limiter with motor driven reset to the maximum permissible value.

Risks during Normal Operation!

Switch the furnace off immediately in case of unexpected occurrences in the furnace (e.g. a lot of smoke or unusual smells). Wait until the furnace has cooled naturally to room temperature.

4 Transportation, Installation and Initial Start-Up

4.1 Delivery

Check that Everything is Complete

Compare the delivered items with the delivery note and the purchase order documents. **Immediately** notify the carrier and Nabertherm GmbH of any missing or damaged parts, as complaints at a later date cannot be acknowledged.

Danger of Injury

When the furnace is being lifted, parts of the furnace or the furnace itself could topple over, slip, or fall. Before the furnace is lifted, make sure no one is in the working area. Wear safety footwear and a hard hat.

Safety Instructions

- Forklifts must be operated only by authorized personnel. The operator bears sole responsibility for safe operation and the load
- When the furnace is being lifted, make sure that the ends of the forks or the load do not catch on neighboring goods. Use a crane to move tall parts, such as control cabinets.
- Use only lifting equipment with sufficient load-bearing capacity
- Lifting gear must be attached only to positions that have been designated for this purpose
- Attachments, piping, or cable conduits must never be used to affix lifting gear
- Unpackaged parts should only be lifted with ropes or straps
- Attach transportation equipment only to positions intended for this purpose.
- Lifting and securing equipment must conform to the provisions contained in accident prevention regulations
- Consider the weight of the furnace when choosing lifting and securing equipment. (see Specifications)
- Stainless steel parts (including mounting elements) must always be kept separate from unalloyed steel parts
- Do not remove corrosion protection until immediately prior to assembly

Risks during Normal Operation!

Suspended loads are dangerous. Working beneath a suspended load is prohibited. There is a risk of fatal injury.

Note

Safety and accident prevention guidelines applicable for forklift trucks must be followed.

Transporting with a Forklift

Observe the maximum permitted capacity of the forklift.

1. For unloading purposes, our furnaces are delivered on a wooden transport frame. Transport the furnace in its original packaging and with suitable equipment to prevent any damage. Remove the packaging only when the furnace is at its final location. When transporting the furnace, make sure it is secured against sliding, toppling over, and damage. The furnace should be transported and installed by at least two persons. **Do not store the furnace in damp rooms or outdoors.**
2. Drive the forklift forks under the transport frame of the furnace, being careful of sensitive parts such as the attachments and cables and removing them if necessary. Ensure that the forks of the forklift are **completely** beneath the frame. Pay attention to adjacent materials.

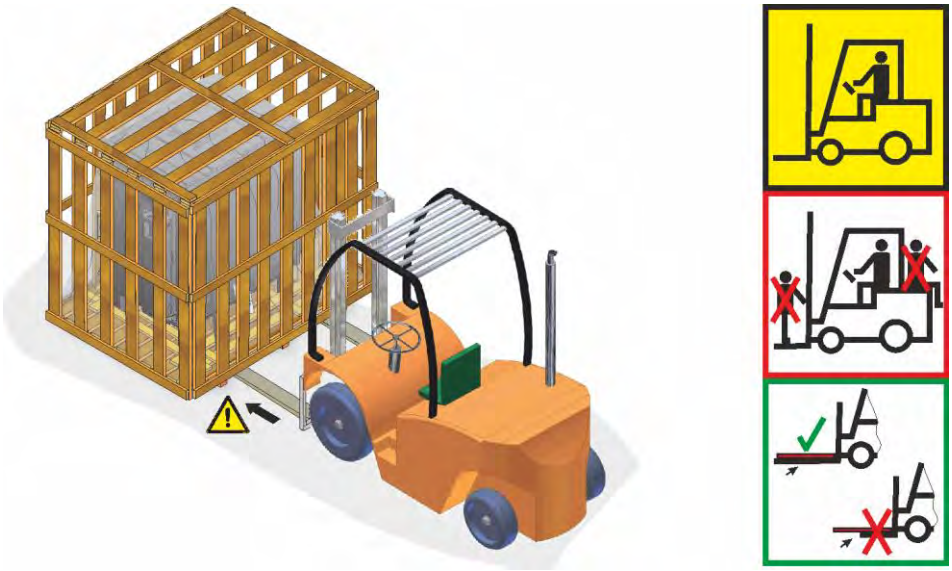


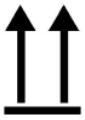
Fig. 11: Forks are **completely** beneath the transport frame

3. Carefully lift the furnace, paying attention to the center of gravity. When the furnace is being lifted, make sure that the ends of the forks and the load do not catch on neighboring goods.
4. Check that the furnace is stable and use securing devices if necessary. Drive carefully, slowly and with the forks at their lowest position. Do not drive on inclines.
5. Carefully set the furnace down at the installation location. Pay attention to adjacent materials. Try not to set it down too abruptly.

Symbols:

The symbols for handling packaging are defined in ISO R/780 (International Organization for Standardization) and in DIN 55 402 (German Institute for Standardization).

Description	Symbol	Explanation
Fragile		This symbol is to be attached to fragile goods. Goods marked like this are to be handled carefully and must not be thrown or tied up.

Description	Symbol	Explanation
This side up		The freight must be transported, transshipped, and stored in such a way that the arrows point upward. The freight must not be rolled, folded, or stored on edge. However, the package does not have to be packed on top of other freight.
Keep dry		Products with this symbol must be protected against high air moisture, hence, they must be stored under cover. If particularly heavy or bulky packages cannot be stored in halls or sheds, they must be covered carefully with a tarpaulin or similar.
Sling here		The symbol shows only where the sling should be attached, not the method of slinging. If the symbols are at an equal distance from the middle or center of gravity of the package, the package hangs straight if the slings are the same length. If this is not the case, the sling on one side has to be shortened.

⚠ CAUTION

- **Device may slip or topple over.**
- **Damage to the device.**
- Risk of injury from lifting heavy loads.
- Transport device only in original packaging.
- Several people must carry the device.

4.2 Unpacking

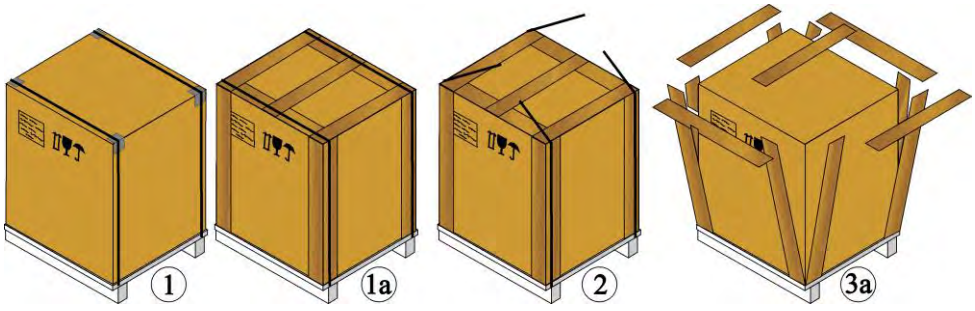
Note

The furnace packaging prevents damage during transportation. Make sure that you remove all packaging material (also inside the Furnace Chamber). Keep the packaging and transportation securing equipment in case it is needed for future transportation or storage.

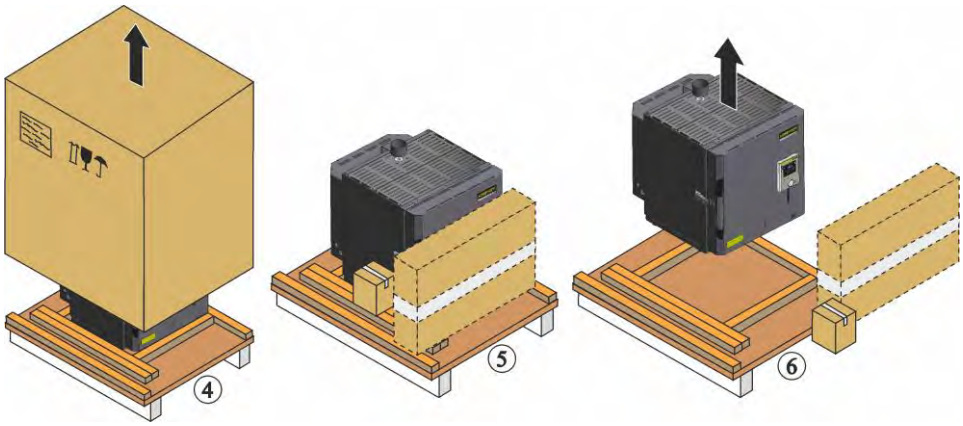
At least two people are needed to carry/transport the furnace, more for larger furnaces.

4.3 Unpacking (NA 30/…)

Wear protective gloves



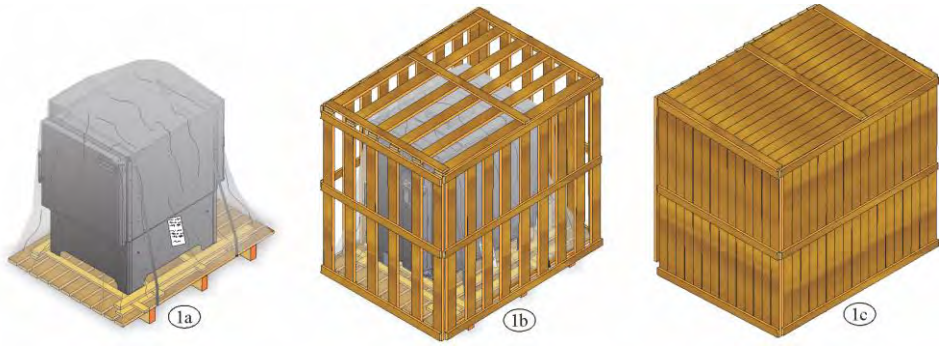
1. Check the transportation packaging for possible damage.
2. Remove tensioning straps from the transportation packaging.
3. Slacken screws and remove wooden casing from the covering box (if available 3a).



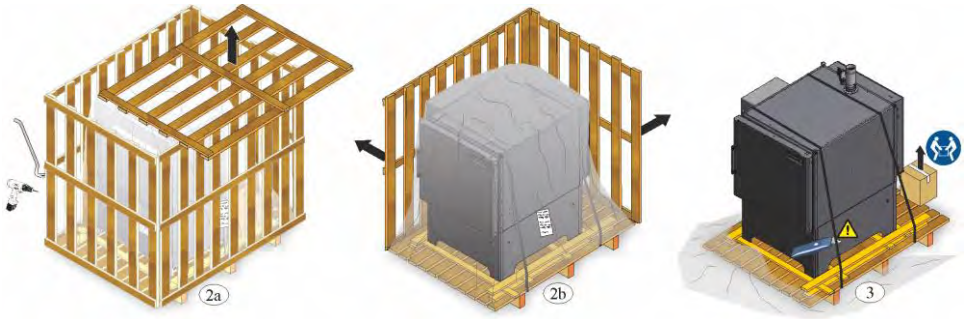
4. Carefully raise the covering box and remove from the pallet.
5. Remove foil and packaging material. Compare the scope of delivery with the delivery note and the order documents, see section on "Delivery".
6. Carefully lift furnace upwards.

4.4 Unpacking (NA 60/.. - NA 675/..)

Wear protective gloves

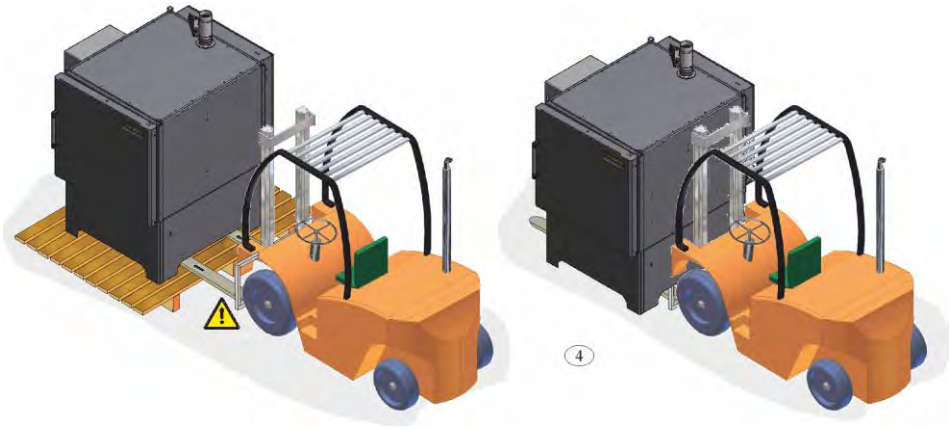


1. Check the transport packaging for any signs of damage. The packaging differs depending on size, weight or installation site and, based on this, is provided in one of the following ways. On a pallet, in a wooden cage or in a wooden box (shown in figures 1a to 1c).



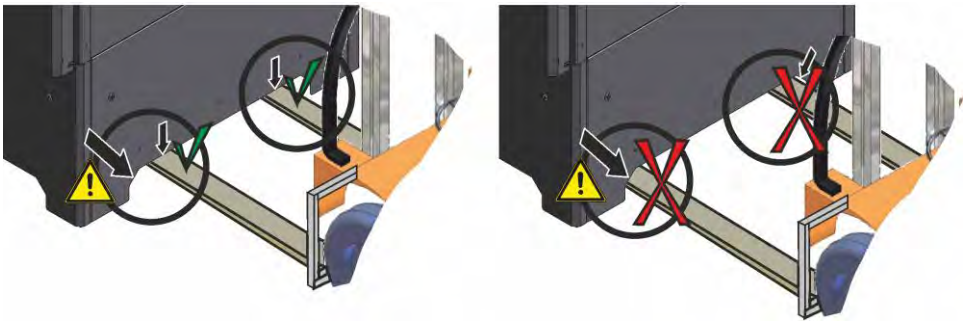
2. Remove screws/staples and then carefully remove the wooden siding from around the base. Remove any plastic transportation sheeting.
3. Remove any transportation sheets, straps and packaging materials.

Transportation with suitable forklift truck



4. The furnace frame is made of thick steel sections. Drive the forklift forks under the furnace watching out for fragile parts such as attachments and cables. Remove as necessary. Make sure that the forks of the forklift are **completely** under the frame. Mind the nearby transported goods.

   Carefully lift the furnace from below minding the center of gravity. When lifting make sure that the fork tips or the load itself do not get caught on nearby stacked goods. Drive carefully, slowly and **in the lowest** position. Do not drive over any steep surfaces. When the installation site is reached, lower the base carefully on the wheels. Avoid any sudden drops.



When moving the furnace with the help of appropriate forklifts remember:

This model series features sheet metal paneling all around the furnace. Insert the forklift forks completely under the furnace frame and make sure that they are not positioned against the bevel of the panels (see the figure above).

When this instruction is ignored the side panels will be damaged when the furnace is lifted.

Caution

We recommend that the system be moved to the installation site over longer distances or over bumpy surfaces using a forklift or a pallet lift.

Note

In Germany, the general accident protection guidelines must be observed. The accident prevention regulations applicable in the country where the furnace is installed must be observed.

Note

Please keep the packaging for possible shipping or storing of the furnace.

Lifting the System with a Crane

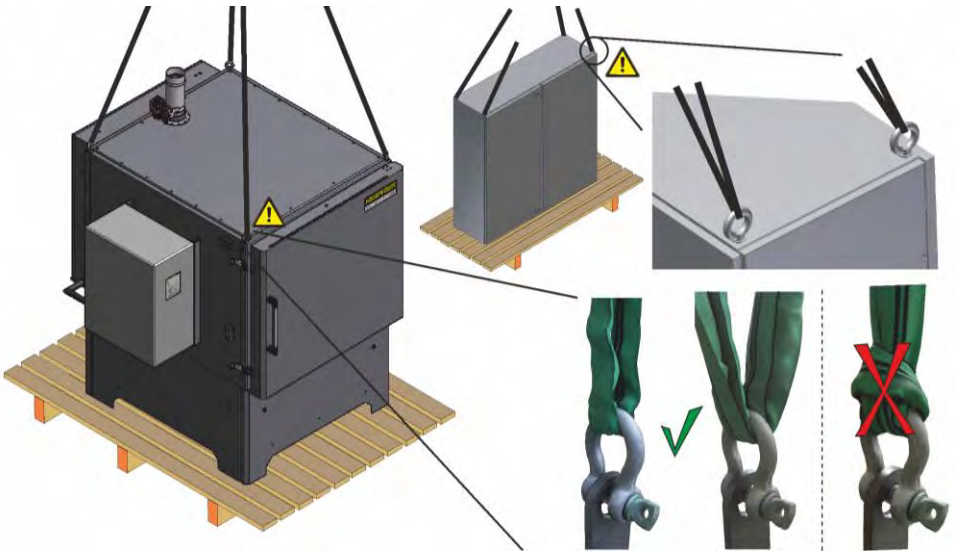


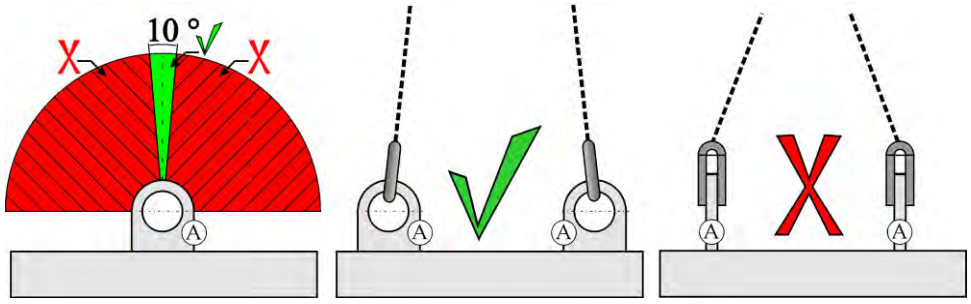
Fig. 12: Example: Transportation of the system by crane (similar to system)

The furnace must not be lifted by its attachments, pipes or cable conduits. Ropes, chains, straps and belt must not be knotted together.

Lift the furnace gently, avoiding any sudden movements. Working beneath a suspended load is prohibited. The risk of death is imminent. Lift and lower the furnace carefully.

Depending on the design, load lifting devices are available for fastening the lifting means to the furnace.

Lateral forces on the load lifting devices are prohibited. Ring bolts must be completely screwed in.



We recommend using a suitable lifting beam (B). Use only suitable lifting equipment.

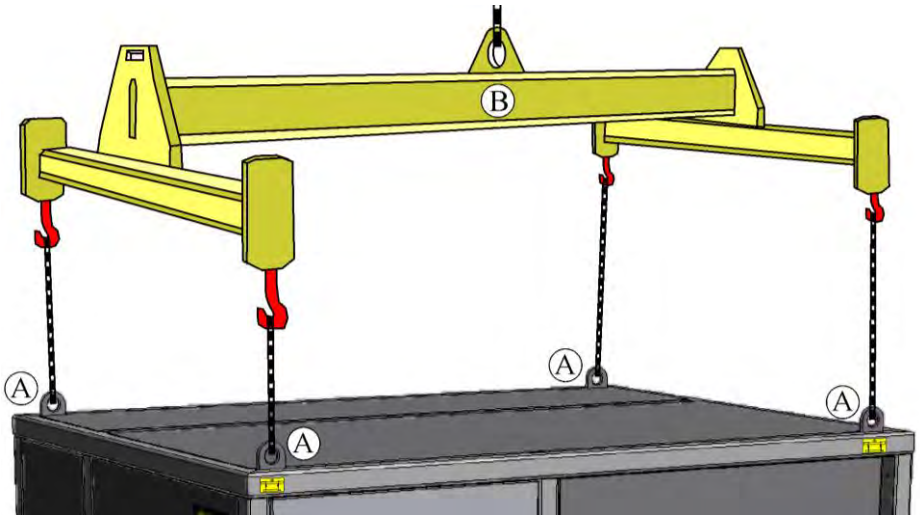


Fig. 13: Example: Transporting the system with a suitable lifting beam (similar to picture)

Note

In Germany, the general accident protection guidelines must be observed. The accident prevention regulations applicable in the country where the furnace is installed must be observed.

4.5 Transport Securing Device/Packaging

Note

No special transportation securing equipment is available for this furnace

The furnace packaging prevents damage during transportation. Make sure that you remove all packaging material (also inside the Furnace Chamber). All packaging material can be recycled. The packaging was designed so that no special description is necessary.

Note

Please keep the packaging for possible shipping or storing of the furnace.

4.6 Constructional and Connection Requirements

4.6.1 Installation (Furnace Location)

When setting up the furnace, these safety instructions must be followed:

Floor Characteristics

- The furnace must be positioned in a dry room as stated in the safety instructions.
- The floor must be level to permit the furnace to stand upright.
- The load-bearing capacity of the floor must be rated to take the weight of the furnace plus the operating personnel.

- Place the furnace on a **non flammable** surface (fire safety class A DIN 4102 – Example: concrete, tiles, glass, aluminum or steel) so that any hot material falling from the furnace cannot ignite the surface.

Installation Location

- The operator is responsible for adequate ventilation by installing the appropriate systems to supply fresh air and to vent exhaust air. If a batch emits gases or vapors, adequate ventilation of the installation site must be provided as well as a suitable exhaust air venting system.
- Make sure that the heat radiated by the furnace is vented (consult a ventilation expert, if necessary)
- Although the furnace is well-insulated, the exterior surfaces of the furnace radiate heat. If necessary, this heat must be dissipated (**a ventilation technician may need to be consulted**). In addition, a minimum clearance (**S**) of 0.5 m on all sides and 1 m above the furnace must be maintained to flammable materials. In individual cases, more space must be chosen in order to match the local conditions. For **nonflammable materials**, the minimum **side** clearance can be reduced to 0.2 m.
- The furnace must be protected against weather and caustic atmospheres. Nabertherm accepts no liability or warranty claim for any corrosion damage as a result of installation in damp surroundings or for similar reasons.
- The furnace and switchgear are not designed to be operated outdoors.

Requirements related to the ambient conditions of the switchgear

- The switchgear x must be readily accessible.
- The floor must be level to permit the switchgear to stand upright.
- The furnace's electrical equipment is designed to operate in temperatures from + 5 °C to 40 °C (104 °F). At a temperature of 40 °C (104 °F) the humidity must not exceed 50 %. At lower temperatures the humidity can be higher (max. 80 %), but there must be no condensation.
- At higher temperatures the switch-cabinet coolers must be used. In case of higher humidity and very low temperatures, heaters must be used.
- The switchgear must be protected against heat, dust and moisture.
- The location must be sufficiently ventilated.

Connecting the switchgear

- When the switchgear is connected to the power source and, as necessary, to the furnace, a **clockwise rotating** field must be executed.
- Both connections must be made by specialized electricians. All applicable rules and legal regulations must be followed.
- Before connecting the furnace, the available supply voltage and frequency must be checked against the values stated on the type plate to ensure that they are identical.
- Check the protective conductor
- Select the cross sections of the feed line as specified in the schematic circuit.

Note

Before starting the furnace for the first time, allow it to acclimatize at its installation location for 24 hours.

DANGER

- **Danger associated with the use of an automatic extinguishing system**
- **Danger to life from electrocution through wetness, suffocation caused by extinguishing gas, etc.**
- If automatic extinguishing systems are in place to fight fires and protect the building, e.g. sprinkler systems, care must be taken during their planning and installation that no additional hazards are created, for example by extinguishing a pilot light, mixing hardening oil and extinguishing water, shutdown of electrical equipment, etc.

Installation of a Wall Cabinet System (in scope of delivery depending on design/furnace model)

The wall must provide a safe and secure mounting surface. The top of the box should not be higher than 2.00 m so that all the operating elements are easy to reach. (Hardware for the attachment is not included in the scope of delivery).

1) Wall-attachment bracket

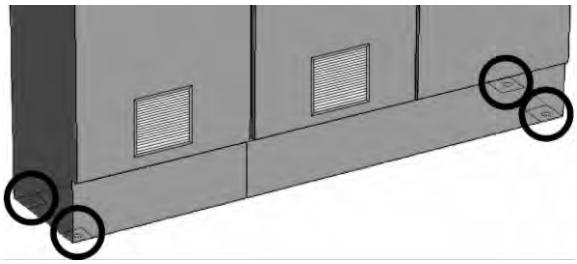
Fig. 14: Wall cabinet system (similar to picture)

Note

Make sure you know where the power and water lines are located before you drill any holes. Nabertherm does not assume any liability for possible damage or injuries.

Installation of a Free-Standing System (in scope of delivery depending on design/furnace model)

- Secure the switchgear using the screws included in the delivery (The quantity of materials included in the scope of delivery can vary from one model to another).
- The number and position of the screws may differ from one furnace model to the next



Scope of delivery:

-Height adjustment disks
-Threaded anchors

Fig. 15: Installing the switchgear (similar to picture)

Note

To ensure that the floor switchgear cabinets are safely and securely installed we recommend that they be bolted to the floor. The switchgear cabinets supplied by Nabertherm are provided with bores in the base for this purpose.

DANGER

- **Risk of fire, danger to health**
- **Risk of fatal injury**
- Adequate ventilation must be ensured at the installation location to remove exhaust heat and exhaust gases

4.7 Assembly, Installation, and Connection

4.7.1 Assembly of Base for Chamber Furnaces

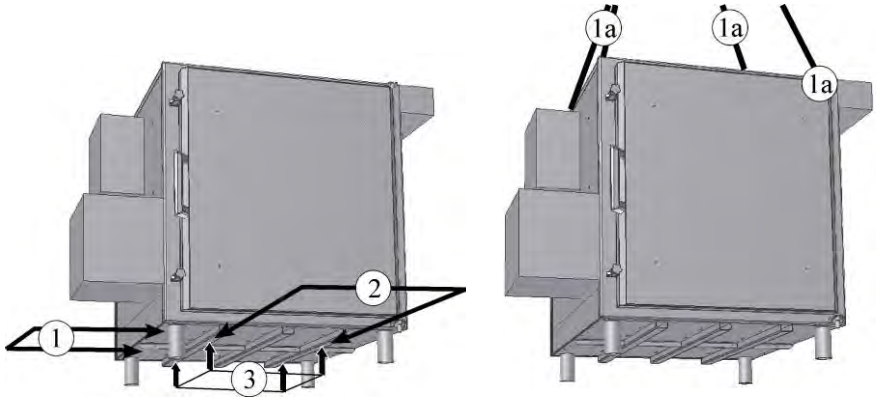


Fig. 16: Lifting the furnace with an industrial truck or crane (similar to picture)

Lifting the Furnace with a Suitable Industrial Truck

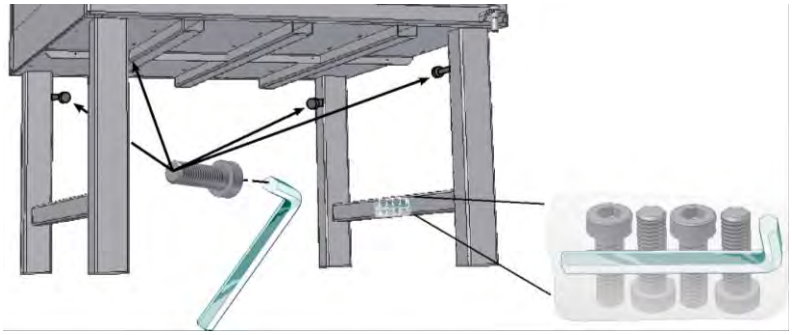
The forks of the industrial truck should be completely inserted under the furnace floor either from the side (1) or from the front (2). Only the floor profiles (3) of the furnace floor may rest on the forks of the industrial truck. Make sure the forks are clear of attachments, pipework or cable conduits. Lift the furnace gently; avoid any sudden movements.

Lifting the Furnace with a Suitable Crane

There are 4 lifting rings (1a) on the furnace for attaching shackles. The inner diameter of the lifting rings is roughly 35 mm. Attach an appropriate shackle to each of the 4 lifting rings. The lifting belts attached to the shackles must be adequate for the task (see the illustration "Lifting the furnace" in the section entitled "Unpacking"). The furnace must not be lifted by its attachments, pipes or cable conduits. Lifting belts must not be tied together. Lift the furnace gently; avoid any sudden movements.

Fig. 17: Lowering onto the base frame (similar to picture)

Lower the furnace carefully onto the base frame and make sure that it rests securely in place.



Scope of delivery: 4x screws M10x30 mm / 1x Allen key 8 mm

Secure the base frame by attaching the screws included in the scope of delivery.

Fig. 18: Secure attachment of the base frame (similar to picture)

4.7.1.1 Installation/Disassembly of the Side/Surrounding Cover Panels

The locks on the cover panel must be unlocked with a suitable key. Tilt the cover panel slightly and lift it up and out. The panel must be set down on a soft material (such as foam rubber). Depending on the furnace model and features, the position of the locks and appearance may differ. Install in the reverse order.

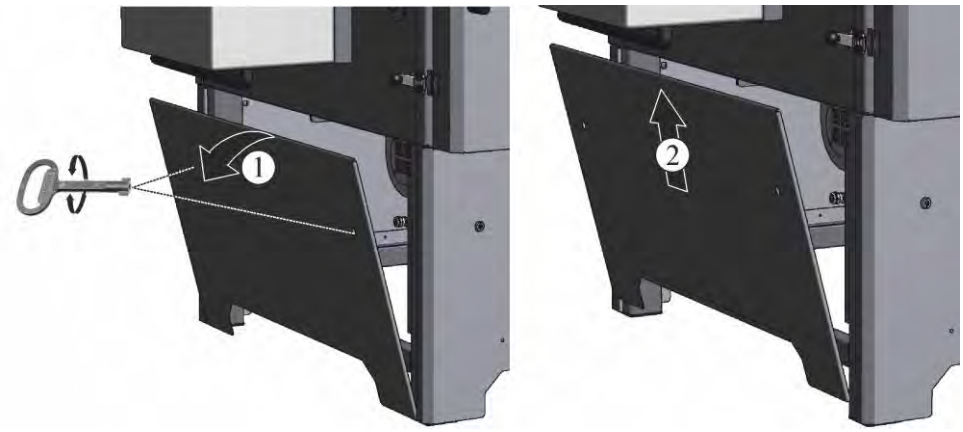


Fig. 19: Disassembly of the cover panels (similar to picture)

4.7.2 Installation and Mounting of the Lift-Gate Guide Tracks

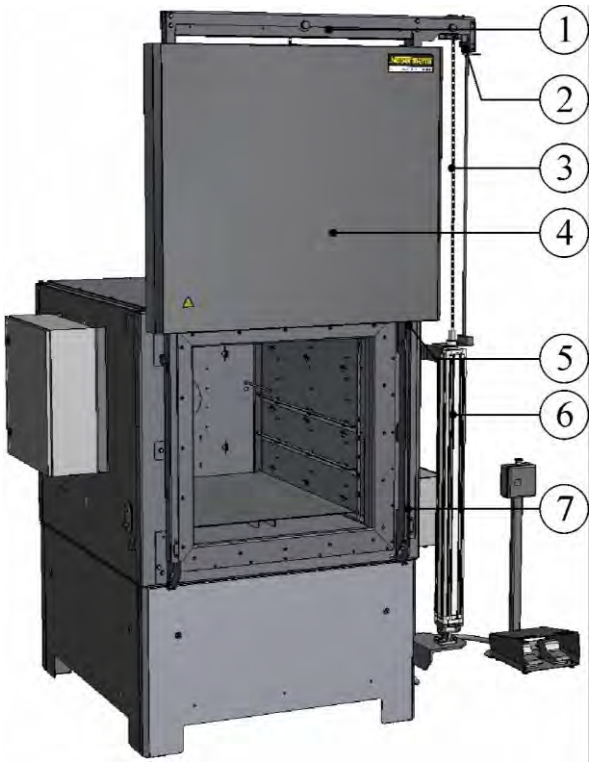
Set-Up and Assembly of Lift-Gate and Guillotine Guide Tracks

Danger of Injury

When lifting the furnace, parts of the guillotine or the guillotine itself could fall over or drop. Before assembly work begins, anyone not involved with this task must leave the work area. Safety shoes and hardhats must be worn.

Safety Instructions

- Only authorized personnel may operate industrial trucks. The operator bears sole responsibility for safe operation and the load.
- Only use lifting equipment with sufficient load-bearing capacity
- Suitable lifting straps must be attached only to those positions which have been designated for this purpose
- At no time should attachments, pipework or cable conduits be used for attaching the lifting equipment
- Unpackaged parts should only be lifted using hoisting or belt slings
- Lifting and slinging equipment must conform to the provisions contained in accident-prevention regulations
- Parts made of special steel (including hardware elements) must always be kept separate from those made of unalloyed steel
- Do not remove corrosion protection until immediately prior to assembly



1) Guillotine
2) Door contact switch
3) Chain
4) Lift door
5) Roller guide
6) Pneumatic cylinder
7) Lift-door track

Fig. 20: Lift-door guide track and guillotine (similar to picture)

Warning - Dangers During Normal Operation!
Swinging or suspended loads are dangerous. Working beneath a suspended load is prohibited. This explosion can be deadly.

Note
Safety and accident prevention guidelines applicable for forklift trucks must be followed.

Warning – Danger of Electric Shock!
Work on the electrical equipment may be done only by qualified, authorized electricians.

Removing the lining of the lift door

Before you align the lift door guide, remove the lining of the lift door by undoing the screws around the door with a suitable tool.

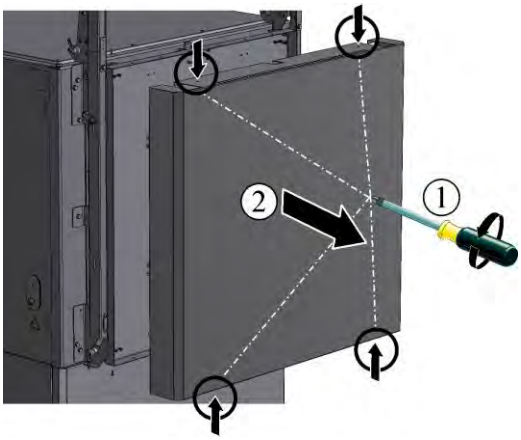
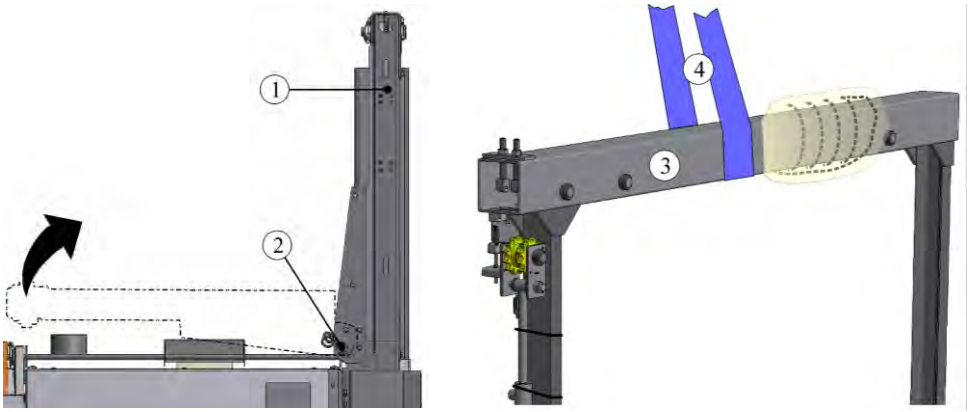


Fig. 21: Dismantling the lift door lining (similar to figure)

Erecting the Guillotine

Remove all packaging material (We recommend leaving the packaged chain on the guillotine until it has been erected.). Remove the requisite hexagon bolts and washers at the joint of the lift door guide track with a suitable tool and keep them for installing the lift-door guide track later. Raise the lift door guide track slowly and carefully on the guillotine using a suitable transportation strap. The furnace must not be lifted by its attachments, pipes or cable conduits. Avoid any sudden upward jerks. For safety reasons the transportation strap must **not** be removed after the lift door track has been raised.



1) Lift-door track 2) Joint 3) Guillotine 4) Transportation strap

Fig. 22: Erecting the guillotine (similar to picture)

Installing the Lift Door Track

Fasten the lift-door track with the previously removed hexagon bolts incl. washers with suitable tool to the furnace frame, turning clockwise, ensure that they are firmly secured and tighten as necessarily.

After a check, the transport strap can be removed from the guillotine

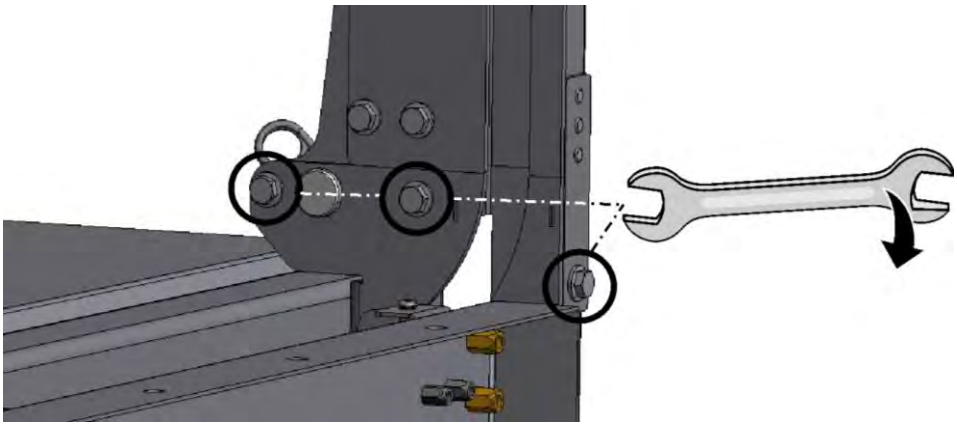


Fig. 23: Installing the Lift Door Track (similar to picture)

When the lift door guide is installed, replace the lining of the lift door with the screws that were previously removed.

Remove Fastening Material

Carefully remove any fastening material attached to the lift door track and the guillotine. These are generally on the chain or the pneumatic cylinder.

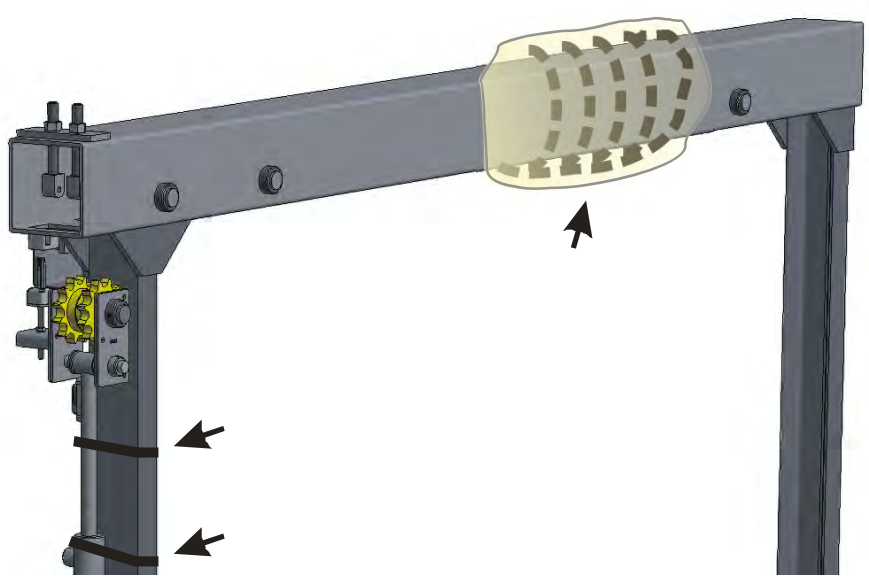


Fig. 24: Removing the Fastening Material (similar to picture)

Installing the door contact switch

Attach the door contact switch to the lift door track with a suitable tool. When connecting the door contact switch check for any signs of damage. A damaged door contact switch must **not** be used. It must be replaced with an equivalent. Ensure that the cable to the door contact switch is run correctly and safely.

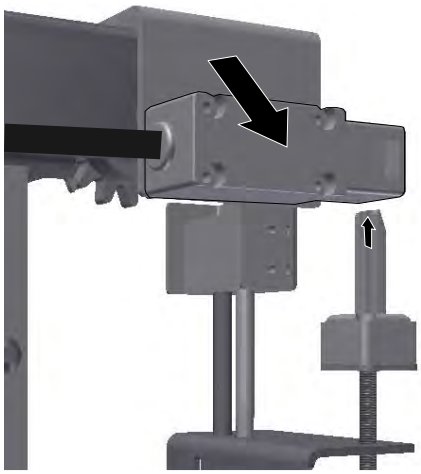


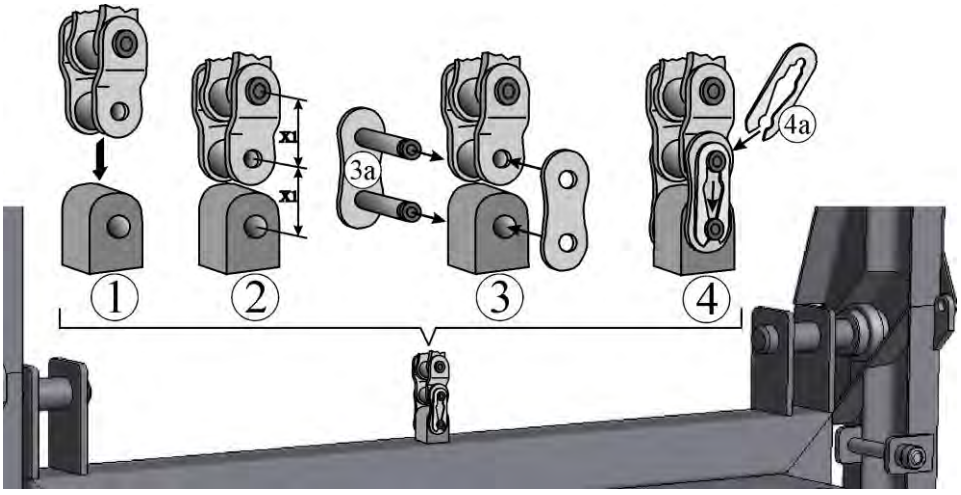
Fig. 25: Example: Installing the door contact switch (similar to picture)

Installing the Chain to the Lift Door

Connect the chain to the chain suspension unit of the lift door and secure it with the chain lock. The chain lock must be slid into the appropriate ring groove of the lock member rivet bolts to secure the chain.

Ensure that the chain lock is securely connected.

The chain is installed in the sequence of steps shown in the figure below.

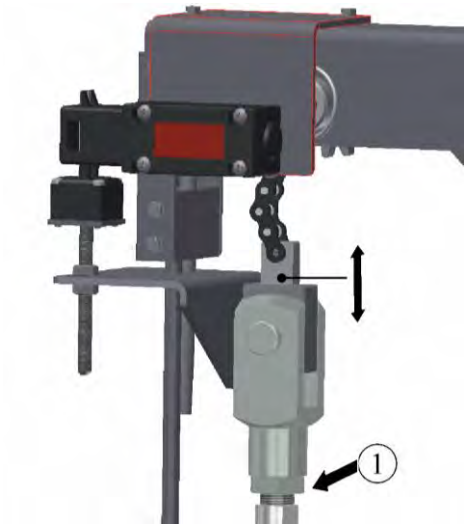


3a) Lock member rivet bolts 4a) Chain lock

Fig. 26: Installing the chain (similar to picture)

Adjusting the Chain Tension

The chain tension can be adjusted using the screw on the fork-head of the cylinder with an appropriate tool.

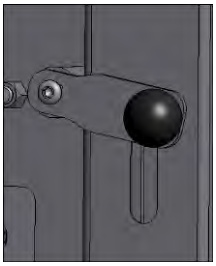


1) Clevis

Fig. 27: Readjusting (tension) the chain (similar to picture)

Removing the Transportation Fittings (furnace model with safety latch)

The door collar and lift-door insulation are extremely vulnerable to breakage when exposed to mechanical stress during transportation. To prevent the insulation from "abrading" on the door collar during transportation there are small wood blocks where the guide rollers are located. After the furnace system has been connected to the power source and is ready to operate. Drive the lift door to the upper position until the lift has been secured by the furnace door block (see section "Operating the Lift Door").

	**⚠ WARNING** • **Danger of crushing in the guide rollers of the lift door** • **Fingers/hands exposed to crushing** • Only after the lift door has been secured using the furnace door lock on the lift door track can the transportation fittings be removed.	

Note

In Germany, the general accident protection guidelines must be observed. The accident prevention regulations applicable in the country where the furnace is installed must be observed.

4.7.3 Connection to Compressed Air Supply

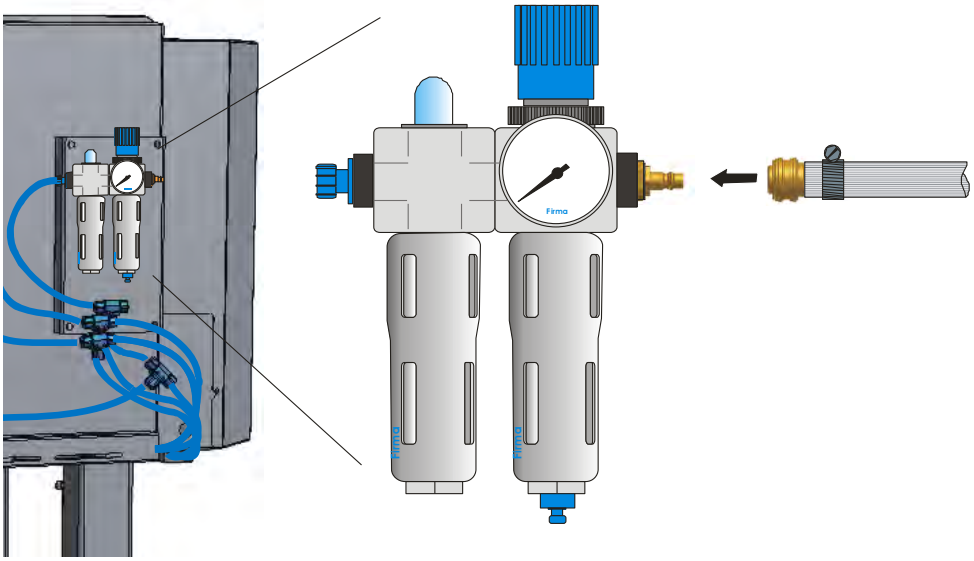


Fig. 28: Connection for the compressed air supply (similar to picture)

Connect the Coupling Socket to the Quick Coupling

Connect the coupling socket (1) (not included with delivery) with a suitable hose (2) and a hose clamp. Tighten the hose clamp with a suitable tool (3). Make sure that the connection between the coupling socket and the hose is tight.

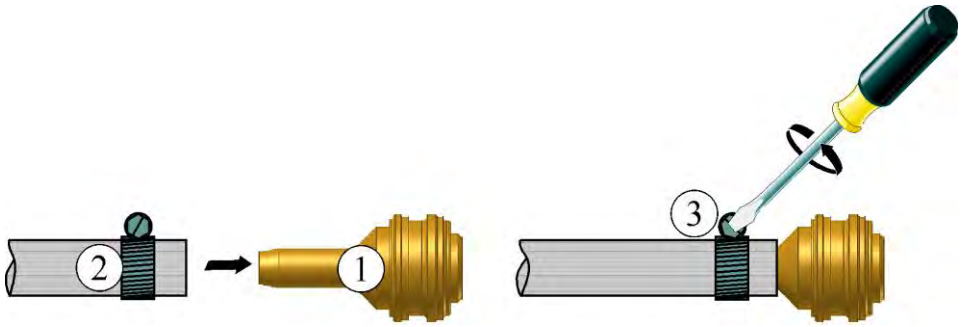


Fig. 29: Connection between coupling socket and hose (similar to picture)

Place the hose with the connected coupling socket on to the quick-action coupling (4).

Fig. 30: Connection between coupling socket and quick-action coupling (similar to picture)

When you hear a "click" you know that the coupling socket and the quick-action coupling are connected properly.

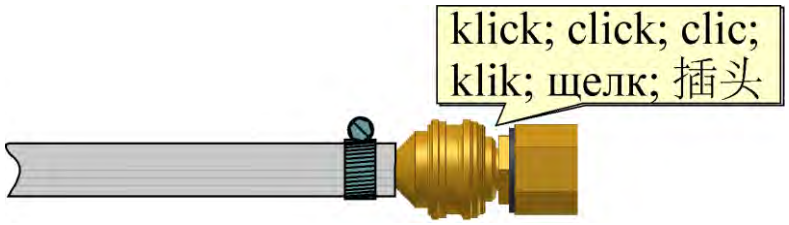


Fig. 31: Connection between coupling socket and quick-action coupling (similar to picture)

Disconnect the Connection at the Coupling Socket and the Quick Coupling

Close the valve of the compressed air supply or the gas supply system and pull out the coupling socket (1) on the line.

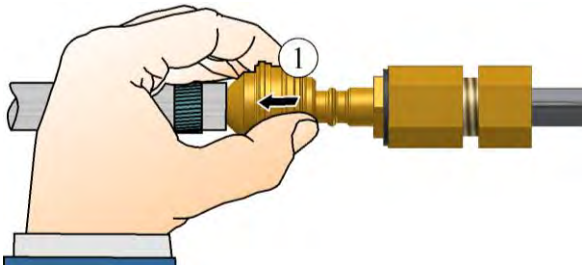


Fig. 32: Disconnect the coupling socket from the quick coupling (similar to picture)

Medium:	**Air**
Primary Pressure:	max. 8 bar (at 40 °C ambient temperature)
Oil content:	- - -
Solid content:	- - -
Water content:	- - -
Connection:	Quick coupling with 3/8" hose fitting

4.7.4 Setting the Traveling Distance for the Pneumatic Door Opener

After connecting the compressed air supply (1) the door can be opened or closed by pressing the foot pedal (see section "Operating the Pneumatic Door Opener with the Foot Pedal"). **Maximum operating pressure** (2) approx. **8 bar** (dependent on ambient temperature) for filtered (40 µm) compressed air (and oiled as well).

The **optimum operating pressure** was set at the factory on the maintenance unit (3) at approx. **6 bar** and should not be changed. During operation there must be permanent pressure on the maintenance unit. However, any potentially necessary correction may only be made if these instructions are followed:

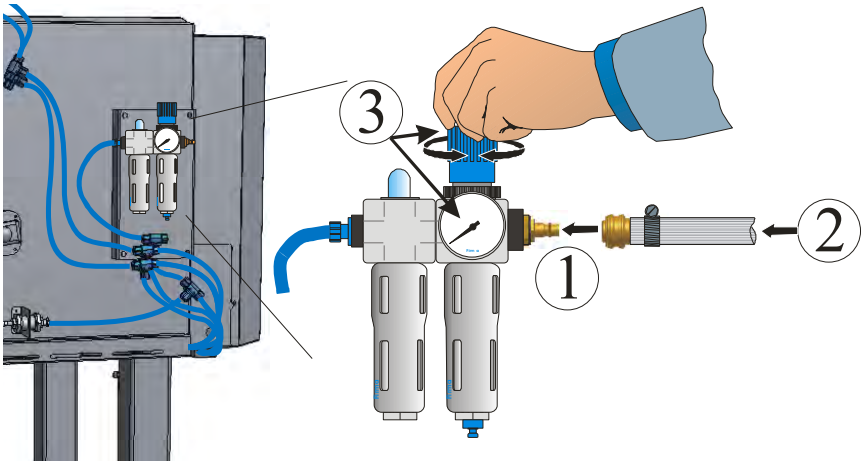


Fig. 33: Operating pressure (similar to picture)

The **closing and opening speed of the door** can be changed with the help of the pneumatic schematic (the pneumatic schematic for this system is in the appended Annex) by adjusting the setting screw at the throttle (at the top and bottom) of the pneumatic cylinder.

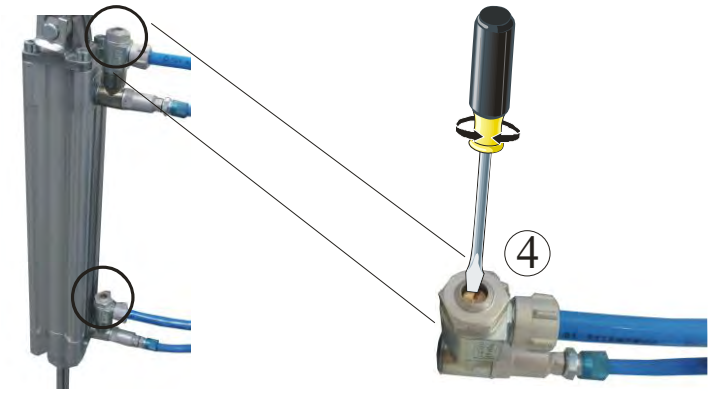


Fig. 34: Closing and opening speed of the door (similar to picture)

The **cushioned stop position** can be changed using a setting screw on the pneumatic cylinder (top and bottom).

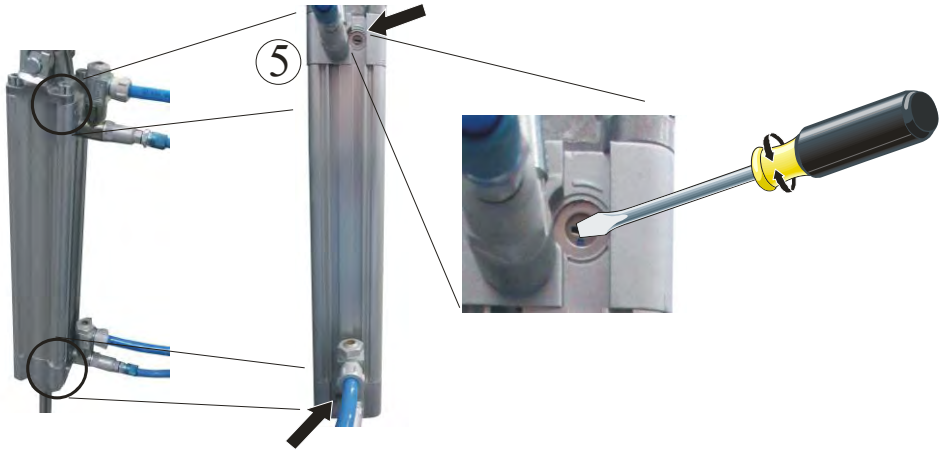


Fig. 35: Set the cushioned stop position (similar to picture)

4.7.5 Positioning the Foot Pedal for Lifting and Lowering the Furnace's Swinging Door

The foot pedal for lifting and lowering the swinging door of the furnace must be positioned at a **minimum distance** of **1 m** from the furnace on the floor. The space required for the furnace door to open and close must be visible to the operator. Any other positioning of the foot pedal than what is shown in the figure below is prohibited.

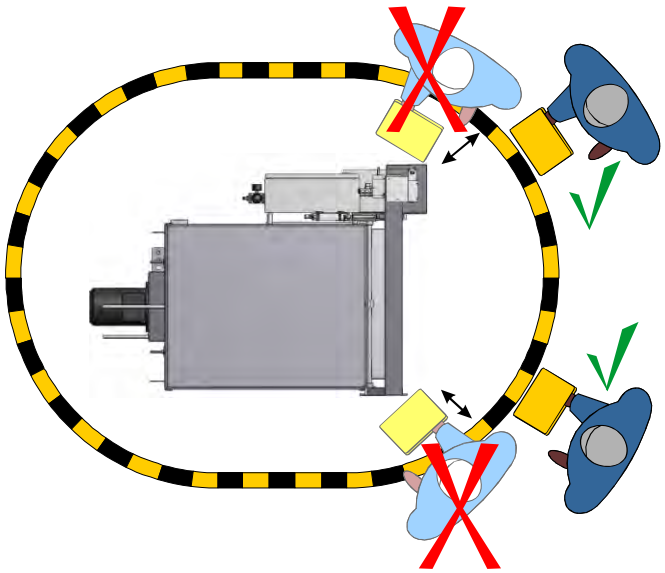


Fig. 36: Positioning the foot pedal

4.7.6 Exhaust Gas Line (additional equipment)

If the process causes the release of hazardous vapors or gases, the operator must vent the exhaust gases **through the exhaust-air flaps to a suitable exhaust air purification system out of the building and supply sufficient fresh-air for the inlet flap.**

In this case the operation of the furnace is not permissible without a suitable exhaust air purification system and exhaust air pipework to carry the exhaust out of the building.

You must ensure that the hot air emitted by the furnace does not endanger people, property or the building.

When starting up, you must ensure that enough fresh air (room ventilation) comes into the room (for example: by opening windows).

If no exhaust top hat is included in the scope of delivery, an equivalent construction must be provided.

Large heat loads released into the working environment during cooling may have to be drawn off by a structure built for that purpose. This also applies if the room housing the furnace is small. Even when the exhaust-air flaps are closed enormous heat loads can be produced.

The exhaust can be removed passively by the natural draw of the extended piping or actively by a suction unit provided by the customer.

A passive or active suction system must be able to draw off the air flows and temperatures produced by the furnace. Any bottleneck or backing up in the direction of the furnace is not permissible.

Note

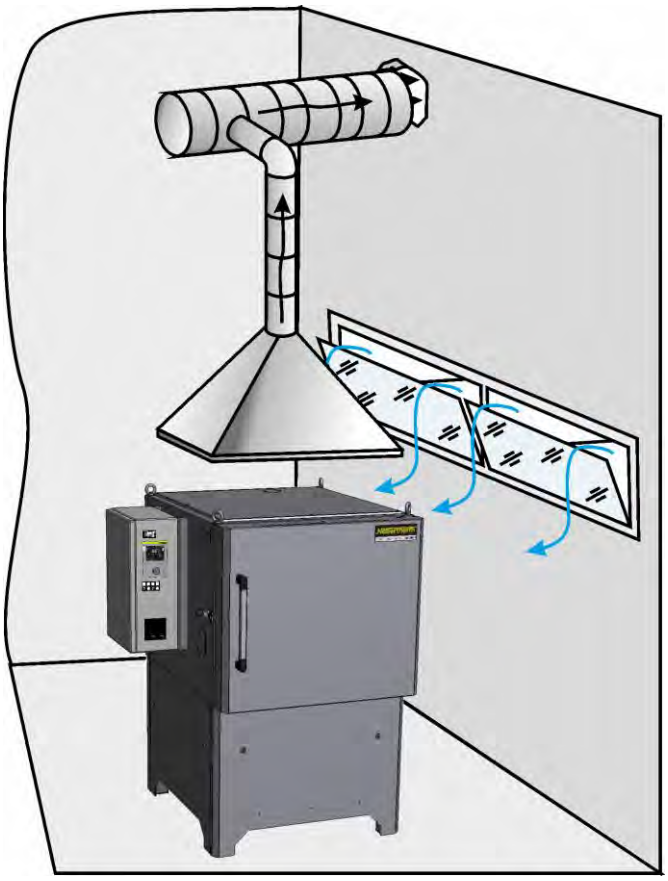
The exhaust can only be vented if the workspace is ventilated with a corresponding fresh-air opening (for example: by opening windows).

We recommend that an exhaust air pipe be connected to the furnace to discharge the exhaust gas.

A commercially available metal exhaust gas pipe may be used as the discharge pipe. It must be laid so that it always slopes upwards and must be fastened to the wall or ceiling.

The exhaust gas discharge must be centered above the furnaces.

The size and design of the exhaust gas discharge must be determined by a ventilation technician.



Steps must be taken to ensure that the flow of hot air emitted through the **exhaust air piping** does not pose a hazard to persons, property or the building.

Fig. 37: Example: Installing an exhaust hood above the exhaust air piping (similar to picture)

Note

Roof work and/or masonry by the customer is required for the exhaust gas extraction. The size and design of the exhaust gas system must be defined by a ventilation engineer. The accident prevention regulations applicable in the country where the furnace is installed must be observed.

4.7.7 Connecting the Furnace to the Power Supply

The customer must supply the necessary preconditions such as the load-bearing capacity of the bearing surface and a source of electric power.

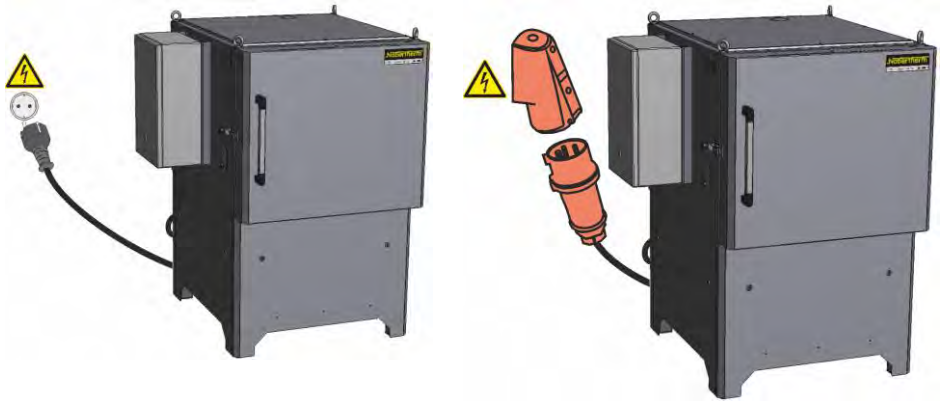
- Make sure that the power lines are adequately dimensioned and secured corresponding to the furnace's parameters.
- Ensure that the connection line to the furnace/switchgear is protected.
- **A residual current circuit breaker (RCCB) cannot be used with the following components:**
- Testing of the earth resistance (compliant with VDE 0100); see also the accident prevent regulations.
- Electric facilities and operating equipment compliant with DGUV V3.

Power Connection with Plug-In Power Line:

When you plug the power plug into an appropriate socket check the type plate for specifications related to mains voltage, mains type and max. power requirement. The distance between the furnace and the socket should be as short as possible. Extensions must be avoided.

The power plug (furnace with feeder) enables the furnace and control box to be connected and disconnected from the power grid.

The power plug must be easy to reach while the furnace is in operation to be able to pull it quickly in case of emergency (see section entitled "What to do in an emergency").



Power connection **with** power line

Power Connection without Plug-In Power Line:

The power line must have a fixed connection in the switchgear cabinet, either at the available terminals or, in models without a separate switchgear, to the main switch. When carrying out this work pay attention to the specs on the type plate: network voltage and type, and maximum power consumption.

The fuse protection and the cross-section of the required power connection depend on the surrounding conditions, the length of the line and how it is installed. For this reason, the type of protection and how it should be installed must be decided by a qualified electrician.

- The power cable must not be damaged. Do not place any objects on the power cable. Lay the cable so that nobody can step on it or trip over it.
- The power line may only be replaced by an approved, equivalent line
- Ensure that the connection line of the furnace is protected

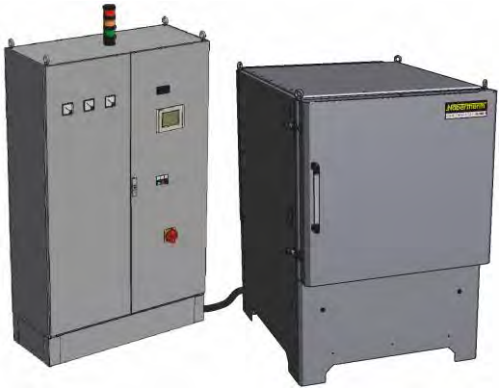
This protection must be compliant with locally applicable standards and regulations.

Ensure that the protective conductor terminal is correct.

When several phases are involved, they must be connected with a clockwise rotating field in the sequence L1, L2, L3.

Before you switch on the furnace for the first time make sure that **a clockwise rotating field is in place**. This is a prerequisite for the smooth functioning of the furnace.

Power connection **without** power line



You can provide the wiring and electrical connections using the enclosed wiring schematic. The electrical equipment of the machine is shown in the schematic.

Warning – Danger of Electric Shock!

Work on the electrical equipment may be done only by qualified, authorized electricians.

CAUTION

- **Danger from incorrect voltage**
- **Damage to the device**
- Check voltage before connecting and starting the furnace
- Compare the voltage with the details on the type plate

4.8 Initial Start-Up

The furnace may be put into operation only by qualified persons and in compliance with the safety instructions.

Read the section on "Safety". When the furnace is put into operation, the following safety information must also be observed to prevent serious injury, damage to the furnace, and damage to other property.

Make sure that the instructions and information in the controller instructions are observed and followed.

The furnace may be used only for its intended purpose.

Ensure that only authorized persons remain in the working area of the furnace and that no other persons are put at risk when the furnace is put into operation.

Before starting the furnace for the first time, make sure that all tools, foreign parts, and transportation securing equipment have been removed.

Activate all safety equipment (power switch, emergency stop button if applicable) before putting the furnace into operation.

Incorrectly wired connections may destroy electric/electronic components.

Observe the special protective measures (e.g. grounding, …) for components that are at risk.

Faulty connections can cause the furnace to start unexpectedly.

Before you switch on the furnace, make sure that you know what to do in case of faults or emergencies.

Before starting the furnace for the first time, check the electrical connections and control displays.

Before placing materials in the furnace, check whether they could harm or destroy the insulation or the heating elements. Materials that could damage the insulation include: alkalis, alkaline earths, metal vapors, metal oxides, chlorine compounds, phosphorous compounds, and halogens.

Caution

Before you switch on the furnace for the first time, make sure that the **motor achieves a clockwise rotating field**. This is a prerequisite for the smooth functioning of the furnace.

Note

Before starting the furnace for the first time, allow it to acclimatize at its installation location for 24 hours.

4.9 Loading/Charging

Only materials whose characteristics are known may be heated. Consult any available safety data sheets for the materials.

Loading a very large quantity of material into the furnace chamber can substantially lengthen the heating-up time.

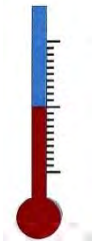
If it can be at all avoided, do **not** open the furnace when it is hot. When it is necessary to open the furnace at a high temperature, the time should be kept to an absolute minimum. Personnel must wear the appropriate protective clothing, and the workspace must be adequately ventilated as stated in the section entitled “Safety”.

Stainless steel sheet can discolor (especially if the furnace is opened while hot), but this does not impair the functionality of the furnace.

Additional Precautionary Measures

Please make sure that objects such as teapots and bottles are kept away from the furnace.

4.10 Recommendations for Heating Up the Furnace for the First Time



To dry the insulation, the furnace must be heated once with the flaps **open**.

This may smell unpleasant, but as long as an adequate exhaust vent system is in place and there is sufficient ventilation, it does not constitute a health hazard.

How to proceed: Heat up the empty furnace over a period of 5 hours auf (450 °C (842 °F) 600 °C (1112 °F); maintain this temperature for 0.5 hours.

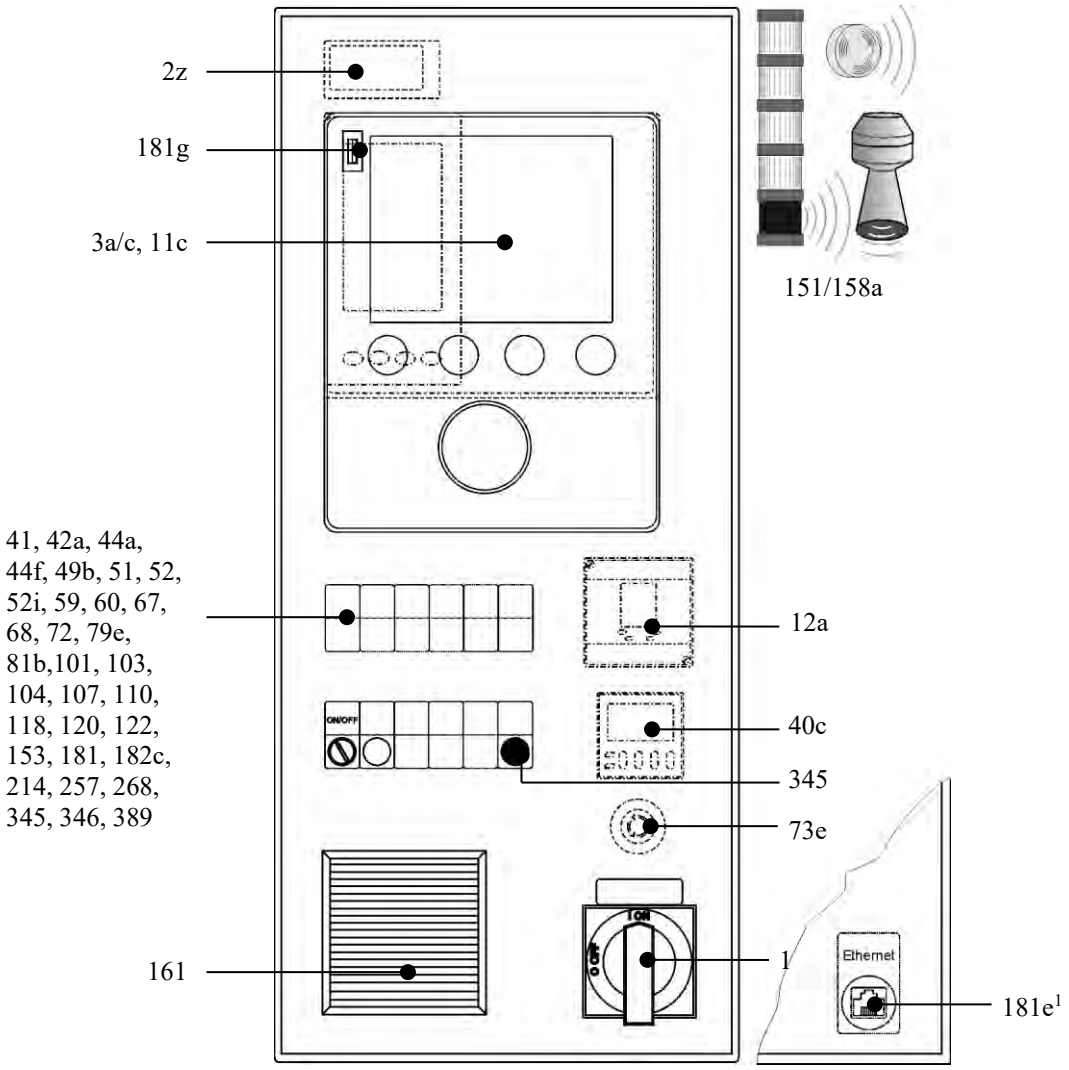
- Ventilate the furnace chamber during the initial heating up. If included, open the exhaust-air flap/s. For furnaces without exhaust-air flap/s, alternatively, the door can be opened during heating up a few cm for 30 seconds at a time. This procedure must be repeated several times during the heating up phase.
- Operate without the cooling blower function
- Heat the furnace without a charge
- Closing the door
- Switch on the furnace/controller (see section "Operation")
- The furnace insulation is made of very high-quality refractory material. Thermal expansion causes the formation of cracks in the insulation after only a few heating-up cycles. But these have no impact on the function, safety or quality of the furnace. The lightweight refractory bricks (insulation) used are especially high-grade. The manufacturing process may cause small holes or cavities to form here and there. These should be seen as normal and underscore the quality characteristics of the brick. This provides no grounds for a complaint.

Hinweis

Wear parts such as muffles, insert boxes, roller conveyors, charging plates or sheet metal linings are subject to increased wear depending on the respective use. In addition to the process and the type of application, the service life also depends on the frequency of use. There may be distortion of these components. A slight deformation is normal and requires no further measures. However, if larger distortions occur, rework or replacement of the component is recommended. A regular check of the functionality by the customer is recommended.

5 Operation

5.1 Operating, Display, and Switching Elements



[1]Positioned on the back side of the switchgear or on the external free-standing cabinet

Note

The pictures contained in the instruction manual may contain inaccuracies in terms of the function, design and furnace model.

Note

See the separate operating instructions for a description of how to enter temperatures and times and to “start” the furnace.

Note

Pay attention only to the operating and display elements that are available on your switchgear. If you have received a schematic diagram you can find on it the exact layout of your furnace.

1	=	Main switch (depending on model)
2z	=	Over-temperature limit controller with manual reset for thermal protection
3a/c,11c	=	Controller/Touch panel
8	=	Ammeter (option, position depends on switchgear design)
12a	=	Pre-set clock (in connection with the Eurotherm controller 3c)
40c	=	Timer clock dwell time (in connection with the alarm signal 158a)
41	=	Switch, control voltage OFF/ON (O/I)
42a	=	Exhaust-air flap - Automatic/Close/Open
42b	=	Exhaust air / fresh air flap - Automatic / Close / Open
44a	=	Fresh-air fan - Automatic/OFF/ON (O/I)
44f	=	Selection switch for fresh air Automatic/OFF/ON (O/I)
49b	=	Operating mode pre-selection clock (option)
51	=	Switch furnace O/I (only for Eurotherm controller)
52	=	Potentiometer fresh-air fan
52i	=	Potentiometer for fresh air volume
58	=	Switch, general fault RESET
59	=	Malfunction - air recirculation motor reset
60	=	Fresh-air fan reset
72	=	Lamp test
73e	=	EMERGENCY-STOP key (option)
79e	=	Selection switch for process gas Ar (Argon) Automatic/OFF/ON (O/I)
81b	=	Switch to STOP acoustic alarm
101	=	Indicator lamp, control current
103	=	Exhaust-air flap open
104	=	Fresh-air fan I
107	=	Control lamp - malfunction fresh-air fan
110	=	Control lamp disruption air recirculating motor.
118	=	Malfunction indicator lamp (general)
120	=	Indicator light, furnace ON (option)
151	=	acoustic alarm air recirculation
153	=	acoustic alarm (MALFUNCTION)
158a	=	Acoustic alarm signal dwell time end
161	=	Switching cabinet fan (filter)
181e	=	Plug-in device for Ethernet (option)

181g	=	USB plug Type A (additional equipment)
182c	=	Plug-in device – thermocouple charge
214	=	Fresh-air flap open
268	=	Fresh-air flap - Automatic/Close/Open
345	=	Start the timer clock dwell time 40
346	=	Acknowledge acoustic alarm dwell time end
389	=	Selection switch/key switch dwell time - manual/automatic

5.2 Controller

B400/C440/P470

Fig. 38: Control field B400/C440/P470 (similar to picture)

No.	Description
1	Display
2	Control keys for "Start/Hold/Stop", "Menu" selection, "Back" function and information menu selection
3	Jog dial
4	USB interface for a USB stick

All the necessary settings for perfect functions have already been made at the factory.

Note

See the separate operating instructions for a description of how to enter temperatures and times and to “start” the furnace.

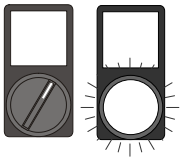
6 Operation, Display and Switch Elements (depending on design)

6.1 Turning on the Controller/Furnace

Plug the **power plug** into the socket.

Turn on main switch **[1] → I/ON**

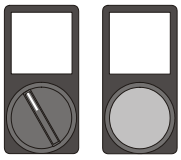
The furnace and switching system are connected to the power supply using the main power switch.



Switch the **Control Voltage Switch** [**41**] to → **ON**. When the control voltage is on, the furnace is ready to operate.

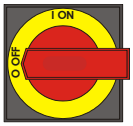
When the **Control Voltage** is on, the lamp glows [**101**]. The control lamp indicates that the system is ready to operate.

6.2 Turning off the Controller/Furnace



Switch the control voltage switch [**41**] to → **OFF**

When the **Control Voltage** is off, the control lamp [**101**] is extinguished.



Turn off main switch **[1] → O/OFF**

The furnace and switching system are disconnected from the power supply and de-energized using the main power switch .

Pull the **power plug** out of the socket

Note:

Trigger an **emergency stop** by **pulling the power plug**. The power plug must therefore be easy to reach at all times during operation so it can be pulled out of the socket in emergencies.

To protect against thermal destruction the air recirculation motors must operate continuously as long as the furnace chamber temperature is greater than 80 °C. Control voltage and main switch must never be switched off at furnace chamber temperatures above 80 °C.

▶

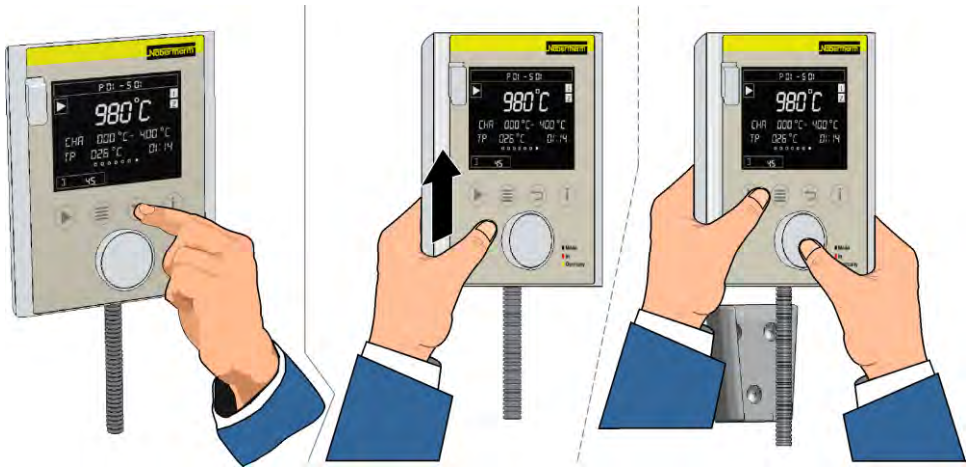
Note

Make sure that the doors of the control box are always locked and bolted. Otherwise dirt can be expected to shorten the useful life of the installed electrical switching components.

6.2.1 Handling the Controller

The controller can simply be removed from the holder for especially ergonomic handling and more comfortable operation.

After use, replace the controller in its holder.



Simple operation directly on the controller	Easy and ergonomic handling by removing the controller from its holder

Fig. 39: Handling the controller (similar to picture)

Make sure that the controller is placed correctly in the holder. If this is ignored, the controller may be damaged or destroyed. Nabertherm accepts no liability if the controller is not handled properly.

Fig. 40: Place the controller in the holder on the furnace (similar to the picture)

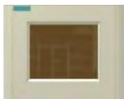
6.2.2 Explanation of the Control, Display and Switch Elements

Turn on main switch **[1]** → **I/ON**

The furnace and switching system are connected to the power supply using the main power switch.

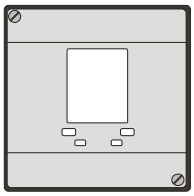
The **overtemperature limit controller monitors [2z]** the furnace chamber temperature. The display shows the last triggering temperature set. When the furnace chamber temperature exceeds the set triggering temperature, the heating is switched off to protect the furnace or charge.

Once the furnace is ready to operate, the process can be programmed with the **controller/touch panel** [**3a/c, 11c**] (see the separate controller instruction manual of the controller/touch panel).



8 = Ammeter

The ammeter [**8**] shows the current of the individual phase(s) for each of the furnace(s).



Use the **Pre-set Clock [12a]** (additional equipment, only in connection with the Eurotherm controller) to switch on the furnace heating unit at a specified, previously set time. In addition, you can have the two controller-setpoints automatically re-switched automatically (for example for a night-time temperature drop).

Channel 1	ON = furnace heating on OFF = furnace heating off
Channel 2	ON = setpoint 2 (night-time temperature drop) OFF = setpoint 1 (operating temperature)

The setpoint can only be changed if the furnace heating unit is switched on, for example using the pre-set clock. (see the separate operating manual)**.**

Operating the Dwell Time Timer Clock with Program Controller

With the **Timer Clock Dwell Time 40c**, a signal can be set by the operator independent of the controller. This requires that the dwell time be set longer in the controller than the time of the dwell time clock.

(🕮 see also the separate operating instructions of the controller and the dwell time relay).

Use the **Selection Switch/Key Switch [389] Dwell Time Manual/Automatic** to select the operating mode of the dwell time timer clock:

<u>Operating Mode of the Dwell Time = Manual</u>

In the **Manual** operating mode, in order to start the dwell time clock, the furnace door must be closed and the **Key [345] Start Dwell Time** must be pressed. The actual temperature in the furnace has no influence on the dwell time clock.

If the dwell time is over and the program has not yet ended, the heating unit remains on, the **Signal Column [401] Dwell Time End** glows and the **Acoustic Alarm** [**158a]** sounds. The acoustic alarm can be acknowledged with the **[346] Acoustic Alarm Signal Dwell Time End key**.

Open and close the door and restart (as long as the program has not come to an end) by pressing the [**345] Start Dwell Time Key** to switch off the signal column and restart the clock.

This procedure can be repeated until the program time on the controller has come to an end.

Operating Mode of the Dwell Time = Automatic

In the operating mode **Dwell Time Automatic**, you must close the furnace door to start the dwell time clock. In this operating mode, the dwell time relay always starts when the furnace door is closed.

The actual temperature in the furnace has no influence on the dwell time clock.

If the dwell time is over and the program has not yet ended, the heating unit remains on, the **Signal Column [401] Dwell Time End** glows and the **Acoustic Alarm** [**158a]** sounds. The acoustic alarm can be acknowledged with the **[346] Acoustic Alarm Signal Dwell Time End key** .

When you open and close the door the signal column is switched off and the clock is restarted.

This procedure can be repeated until the program time on the controller has come to an end.

Caution: If no program was started in the controller, the timer clock dwell time has no function either. If the time in the controller is over before the time on the timer clock is over, the program segment is properly brought to an end and the remaining time on the dwell time clock is ignored.

That is why you should always ensure that the program duration in the controller is longer than the time set on the dwell time clock.

Operating the Dwell Time Timer Clock with Set Value Controller

With the **Timer Clock Dwell Time 40c**, a signal can be set by the operator independent of the controller.

(📖 see also the separate operating instructions of the controller and the dwell time clock).

At the controller a setpoint is set without a dwell time. In addition to this setpoint, an under-pressure band alarm is set.

Use the **Selection Switch/Key Switch [389] Dwell Time Manual/Automatic** to select the operating mode of the dwell time timer clock:

Operating Mode of the Dwell Time = Manual

For the operating mode **Dwell Time Manual**, in order to start the dwell time timer, the furnace door must be closed and the **Key [345] Start Dwell Time** must be pressed. If an under-pressure band alarm is programed, the dwell time does not start until the temperature also rises above this limit.

Note: Use this band alarm to ensure that in the furnace chamber, in addition to the set time, the corresponding temperature was also active. This band alarm must be adapted by the operator to the process.

(🕮 see also the separate operating instructions of the controller).

After the set time has run out the heating unit remains switched on, the **Signal Column [401] Dwell Time End** glows and the **Acoustic Alarm [158a]** sounds. The acoustic alarm can be acknowledged with the **[346] Acoustic Alarm Signal Dwell Time End** key.

When you open and close the door and restart by pressing the **[345] Start Dwell Time Key** and, as applicable, after achieving the temperature limit, the signal column is switched off and the clock is restarted.

Operating Mode of the Dwell Time = Automatic

In the operating mode **Dwell Time Automatic**, you must close the furnace door to start the dwell time clock. If an under-pressure band alarm is programed, the dwell time does not start until the temperature also rises above this limit.

Note: Use this band alarm to ensure that in the furnace chamber, in addition to the set time, the corresponding temperature was also active. This band alarm must be adapted by the operator to the process.

(🕮 see also the separate operating instructions of the controller).

After the set time has run out the heating unit remains switched on, the **Signal Column [401] Dwell Time End** glows and the **Acoustic Alarm [158a]** sounds. The acoustic alarm can be acknowledged with the **[346] Acoustic Alarm Signal Dwell Time End** key.

When you open and close the door and, as applicable, after achieving the temperature limit, the signal column is switched off and the dwell time is restarted.

The **Dwell time clock 40c** is used to monitor a preset heat treatment time.

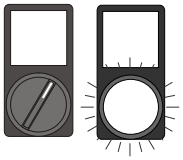
Fig. 41: Dwell time clock

Item	Description	Comment
1	Signalization point	Dwell time active (blinks)
2	OP	Dwell time has run out
3	RST	Reset dwell time
4	LOCK	Key lock is active

Item	Description	Comment
5	Reset-key	resets the actual value back to the setpoint and the outlets
6	Lock key	locks/unlocks entries to prevent an accidental entry
7	Elapsed time	run time remain
8	Setpoint dwell time	set time
9	Time unit	h - hour, m - minute, s - second,
10	Arrow up key	increases the setpoint for each digit
11	Arrow down key	decreases the setpoint for each digit

Key	Description	Display
	Start Screen	0 : 0 0 0 : 0 0 **LOCK h m**
	To set the dwell time (8), the key lock must be deactivated. Press the  key (6) once briefly until the "LOCK" symbol (4) is deleted.	0 : 0 0 0 : 0 0 **h m**
	The dwell time (8) can now be set using the  keys (10/11).	0 : 0 0 1 : 2 3 **h m**
	The pre-set dwell time (8) is entered by briefly pressing the  key (5). The "RST" symbol (3) glows briefly.	1 : 2 3 **RST** 1 : 2 3 **h m**
	After setting the dwell time (8) the key lock is activated using the  key (6).	1 : 2 3 1 : 2 3 **LOCK h m**
Caution	Depending the furnace design, one of the following options is set is set by Nabertherm the dwell time clock. The option pertinent to your order can be found in the order documentation.	
	Start after closing the door: After the dwell time (8) has ended and the charge has been removed, the door contact switch of the furnace starts the dwell time again when the door is closed.	**OP** 0 : 5 9 1 : 2 3 **LOCK h m**
	Start after reaching the temperature set on the controller: After the dwell time (8) has elapsed and the charge has been removed, the dwell time clock starts from the beginning, after the setpoint set on the furnace controller has been reached.	

Key	Description	Display
	**Manual operation:** During manual operation, the dwell time is started manually using the "**Key 345**" Start Dwell Time	
	**Resetting the clock while the dwell time runs:** The time can be reset by briefly pressing the  key (5). The "RST" symbol (3) glows briefly. Start the dwell time again by entering a new start command.	0 : 0 0 1 : 2 3 **LOCK h m** ⇩ 1 : 2 3 1 : 2 3 **LOCK h m**
	You can find more operating information in the separate Installation and Operation Handbook Panasonic LT4H	



Switch the **Control Voltage Switch** [**41**] to → **ON**. When the control voltage is on, the furnace is ready to operate.

When the **Control Voltage** is on, the lamp glows [**101**]. The control lamp indicates that the system is ready to operate.

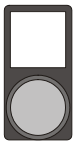
Use the **Selection Switch [49b] Furnace Clock/O/I** to switch on the furnace as follows.

In the **Clock** setting the heating unit is switch on via the pre-set clock **[12a]** .

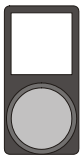
In the **On** setting the heating unit is switched on directly.

In the **Off** setting the heating unit is switched off.

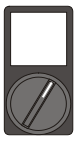
To operate the furnace and enable the heating unit switch the **Switch [51] Furnace O/I** to **I** (On). Only for Eurotherm controllers



A fault can be reset with the **button** [**58**] Fault Reset; if there are no more faults listed, the system is ready to operate.



The control of the **Control Lamps** is performed with the **Key 72 Lamp Test**. When the key is pressed, all the control lamps, independent of the system status, must glow.

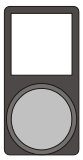


A gas system can be activated with the **selection switch [79e] process gas Ar (Argon) Automatic/O/I**.

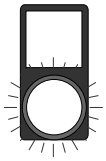
In the Auto position, gassing is activated via the extra relay (see extra relay/control tracks).

In position **O** gassing is switched off.

In position **I** gassing is switched on manually.

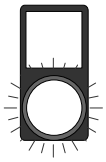


The **acoustic alarm** be acknowledged with the key **[81b] Acoustic Alarm Sensor Stop**.



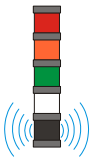
Malfunction indicator lamp (general, red)

The malfunction (general) indicator lamp [**118**] flashes if a malfunction is currently present or was not acknowledged after correction.

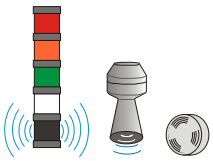


Control Lamp [120] Furnace ON (option) (Example: Eurotherm controller)

If the control lamp glows **[120]** Furnace ON (only for Eurotherm controllers), the controller was switched on and, hence, the heating as well.



The **Malfunction alarm** [**153**] acoustically signals a malfunction.



The **Alarm Signal Malfunction** [**158a**] is an **acoustic** signal indicating that the dwell time is over.

Use the **346 Acknowledge Alarm Dwell Time End** key to switch off the acoustic signal.

(not in connection with Nabertherm or external controllers). Acoustic alarm signal comes only with the dwell time relay or touchpanel (H 700/H 1700/HiProSystem)

Signal lamp: green = Process has started, yellow/orange = Program has ended, red = Malfunction (option for controller 11c)

The **filters [161]** for the control cabinet ventilation must be cleaned at regular intervals in order to ensure good air circulation. Depending on the type and variant of the ventilation system, 2 or 3 filters may be present in other areas in the switching cabinet.

The air can be vented either through a raised roof (not for wall cabinets) or air outlet filters.

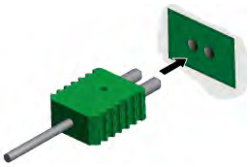
The **Ethernet plug-in device [181e]** is intended for the additional function „process control and documentation via the VCD software package“.

The control data (temperatures) are transferred to the PC via this interface.

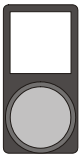
Note

Optional: Data (temperatures) is transferred to the PC via the Ethernet interface on the back of the oven.

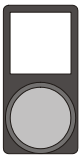
For the additional option "archiving" the **USB plug [181g]** is provided.



The charge thermocouple is connected to the **plug-in device [182c] thermocouple**.



Use **Key [345]** to start the timer clock dwell time [40c]. The previously set dwell time begins to run down.

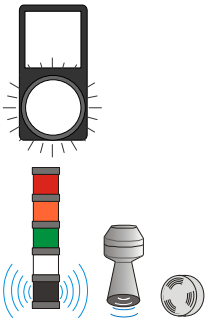


Use the **Key [346] Acknowledge Alarm Dwell Time End** to switch off the acoustic alarm signal.

Use the **Selection Switch/Key Switch [389] Dwell Time** to select whether the timer clock for the dwell time os started by closing the door (position "AUTO") or by manually pressing a key [345] (position "MANUAL").

The **Emergency Stop Key [73e]** switches off all electrical drives. The system cannot be restarted until the key has been unlocked by turning the knob (or, if a lock is included, using the key).

6.2.2.1 Air circulation motor



The **air recirculation motor starts with the program start** and, independent of the program status, only stops when the temperature drops below 80 °C.

If the furnace door is opened the fan is switched off for 2 minutes. (Option)

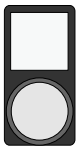
The fan restarts without any prior warning.

The **Control Lamp [110] Malfunction Air Recirculation Motor** glows if there is a malfunction in the electric drive of the air recirculation motor.

The furnace heating unit is switched off, but the fan continues to run to prevent overheating from destroying the motor.

An acoustic warning of a malfunction of the air recirculation system is provided by the **Acoustic Alarm Signal [151] Air Recirculation**.

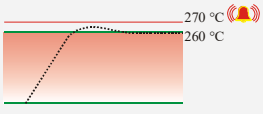
The furnace heating unit is then switch off to avoid exposing the fan to additional heat.



After a malfunction in the air recirculation motor or the frequency converter is fixed, it is acknowledged with **Key 59 Malfunction Air Recirculation Motor Reset** ; if no other malfunction exists, the system is again fully operational.

6.3 Over-temperature Limiter with Manual Reset

Fig. 42: Over-temperature limiter with manual reset 2132i (similar to picture)

Key	Description	Display
	The over-temperature limiter with manual reset monitors the temperature in the furnace chamber. The display shows the last trigger temperature that was set. If the temperature in the furnace chamber exceeds the set trigger temperature, the heating is switched off to protect the furnace and the load. "FSH" alarm flashes on the over-temperature limiter.	**260 °C** **FSH**
	When the temperature in the furnace chamber **falls below the value set on the over-temperature limiter** , the following buttons have to be pressed to release the heating so that the furnace can continue to operate:	
	Release heating:	
[▯] [↺]	Press [▯] and [↺] simultaneously. The alarm on the over-temperature limiter is reset and this releases the heating.	
	Adjust the trigger temperature:	
[▼] [▲]	Set the required trigger temperature with the [▼] [▲] button (Example 270 °C) Increase the value with [▲] (260 … 269, 270) Reduce the value with [▼] (270 … 261, 260) To change the value quickly: hold the [▼] [▲] button depressed for longer. Wait 2 seconds until the new trigger temperature is integrated automatically (display flashes 1x).	**270** **260**
	**Note:** Premature triggering of the over-temperature limiter can be avoided if the difference between the adjustable temperature in the furnace chamber and the trigger temperature is not below 10 °C.	

Key	Description	Display
	The display jumps back to the start screen showing the trigger temperature. The current trigger temperature is displayed.	**270 °C**
	Entry finished.	
	For more information about operation, see the separate instructions for the Eurotherm 2132i	

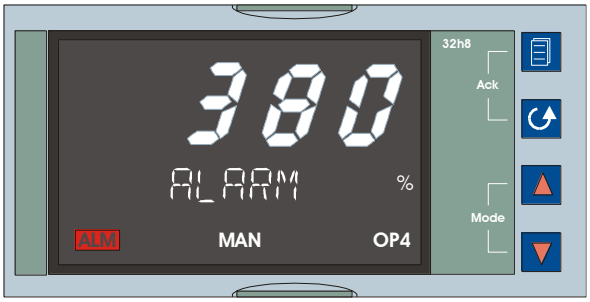


Fig. 43: Over-temperature limiter with manual reset 32h8i (similar to picture)

Key	Description	Display
	The over-temperature limiter with manual reset monitors the temperature in the furnace chamber. The display shows the last trigger temperature that was set. If the temperature in the furnace chamber exceeds the set trigger temperature, the heating is switched off to protect the furnace and the load. An alarm text appears at the over-temperature limiter. When the temperature in the furnace chamber **falls below the value set on the over-temperature limiter** , the following buttons have to be pressed to release the heating so that the furnace can continue to operate:	**330 °C** **ALARM** **…**
	Enable heating:	
	Simultaneously press and . The alarm message of the over-temperature limiter is reset and the heating thereby enabled.	
	Setting the triggering temperature:	
	Press 1x until "**A1 H1**" appears in the display	**330** **A1 HI**
	Using the buttons , set the desired triggering temperature (example 380 °C) Increase the value with (330 … 379, 380) Decrease the value with (380 … 331, 330) Wait 2 seconds until the set triggering temperature is automatically applied (display flashes 1x).	**380** **330** **A1 HI**
	In input mode, if no entry or change is made within approx. 30 seconds, the mode is exited automatically.	
	Input ended.	
	For further information on operation, see separate Eurotherm 32h8i operating instructions	

DANGER

- **Danger caused by incorrectly entered cut-off temperature at the over-temperature limiter/over-temperature limiter with motor driven reset**
- **Risk of fatal injury**
- If, as a result of over-temperature from the charge and/or the operating equipment, a charge is likely to be damaged at this pre-set cut-off temperature of the over-temperature limiter/over-temperature limiter with motor driven reset, or if the charge itself becomes a source of danger for the furnace or its surroundings, the cut-off temperature must be reduced on the over-temperature limiter/over-temperature limiter with motor driven reset to the maximum permissible value.

Note

The default setting of the over-temperature limiter with manual reset/over-temperature limiter with automatic reset is a maximum furnace chamber temperature of + 30 °C.

General Cautions and Safety Advisories

Note

Make sure that the doors of the control box are always locked and bolted. Otherwise dirt can be expected to shorten the useful life of the installed electrical switching components.

Note

When the furnace is being loaded, be sure to avoid concentrated loads on the floor plate. Danger! Risk of burns: The furnace can be opened while still hot to remove the load. When it is necessary to open the furnace at a high temperature, the time should be kept to an absolute minimum. When working at the furnace with high temperatures, the operator must wear the appropriate protective clothing and protective goggles. We recommend leaving the load in the furnace until it has completely cooled off. An impermissibleshut-down of the control power or the main switch when the furnace chamber temperature is **greater than 80 °C** (176 °F) **will destroy the recirculating fan motors.**

Note

It is possible that working temperatures of less than 100 °C (212 °F) can only be reached when flaps are partially open. The high recirculation rate creates in the furnace air friction which, despite the furnace heating being shut off, can result in temperatures approx. as high as 100 °C (212 °F). So the flaps should not be closed.

Note

The temperature curve must be adapted by the user so that the load, furnace and surroundings are not damaged. Nabertherm GmbH provides no guarantee for the process.

Note

The electrical equipment of the system is designed for operation at air temperatures of +5 °C to 40 °C. Air humidity at 40 °C must not exceed 50 %. At lower temperatures, the air

humidity may be higher (up to 80 %) but must be noncondensing. Climate control units must be used for the switchgear cabinets at higher temperatures. Heating units must be used for very low temperatures and high humidity.

6.4 Forced Cooling Operation Modes (Accessories)

If the natural cooling of the oven when it is closed is not sufficient, Nabertherm offers various options for forced cooling.

An oven can be cooled in different ways. Cooling can be controlled or uncontrolled.

Uncontrolled cooling takes place with an almost fixed volumetric flow of fresh air.

Controlled cooling also processes the temperature of the oven and can adjust the correct cooling ramp at all times via a variable volumetric flow of fresh air.

Controlled cooling is necessary if the oven has to use a linear cooling ramp that is faster than the natural cooling of the oven.

The maximum cooling rate is dependent on the properties of the oven.

Controller: Types of cooling

Uncontrolled cooling with manual flaps

Uncontrolled cooling with motor-driven flaps that can be adjusted for different segments

Uncontrolled cooling, fresh air volume adjusted beforehand with a potentiometer	Uncontrolled cooling, fresh air volume can be activated and adjusted **for different segments**

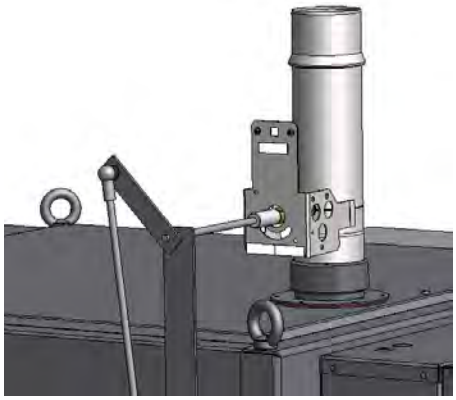
Controlled cooling

6.4.1 Manual Fresh and Exhaust Air Flaps (Accessory)

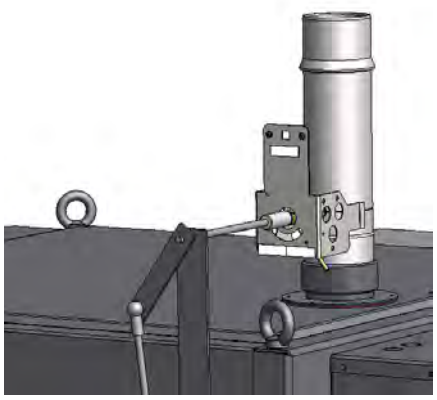
Manual Exhaust-Air Flap/s

This furnace has exhaust-air flap/s which can be manually operated at the lever. Exhaust-air flaps ensure the safe removal of the furnace's process exhaust. The furnace is supplied with additional fresh air through a fresh air blower (additional equipment).

If it is only necessary to vent the gases in the furnace, and no recirculation is wanted, you only need to open the exhaust-air flap.



Exhaust-air flap closed

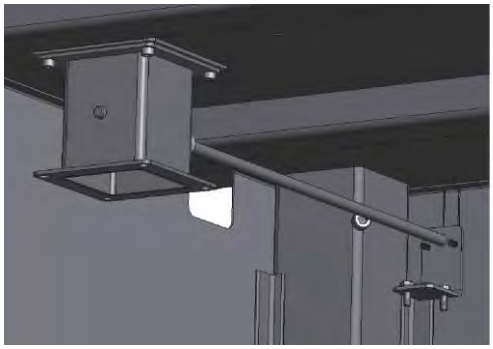


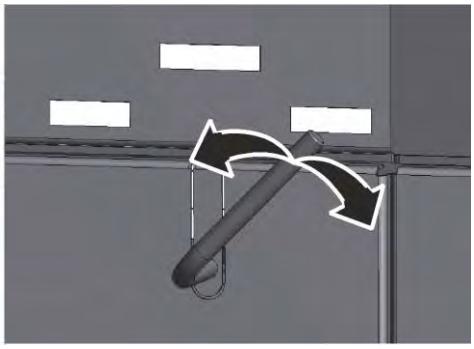
Exhaust-air flap open

Opening and closing is labeled by a plate.

Manually Operated Fresh-Air Flap

The quantity of the supplied air can be set using the adjustable fresh air flap. The adjustable fresh air flap is at the bottom of the furnace.





Opening and closing is labeled by a plate.

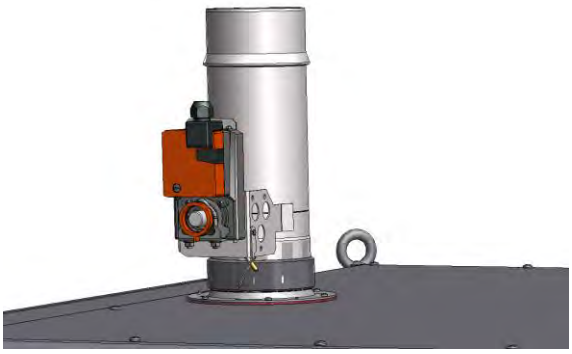
Caution

Operating the furnace with the flaps open can change the temperature conditions in the furnace chamber. If the batch is sensitive to temperature fluctuations it may be advisable to run a test for temperature homogeneity to optimize the process.

6.4.2 Motor-Driven Fresh and Exhaust Air Flaps (Accessory)

Motor-driven exhaust air flap(s)

This oven has the option of a motor-driven adjustable exhaust air flap. Exhaust air flaps are used to extract exhaust air caused by the process safely from the oven.



Motor-driven exhaust air flap

The fresh-air flap (accessory) is operated via a motor-driven actuator. If the flap is open, cooling is faster due to the volumetric flow of fresh air.

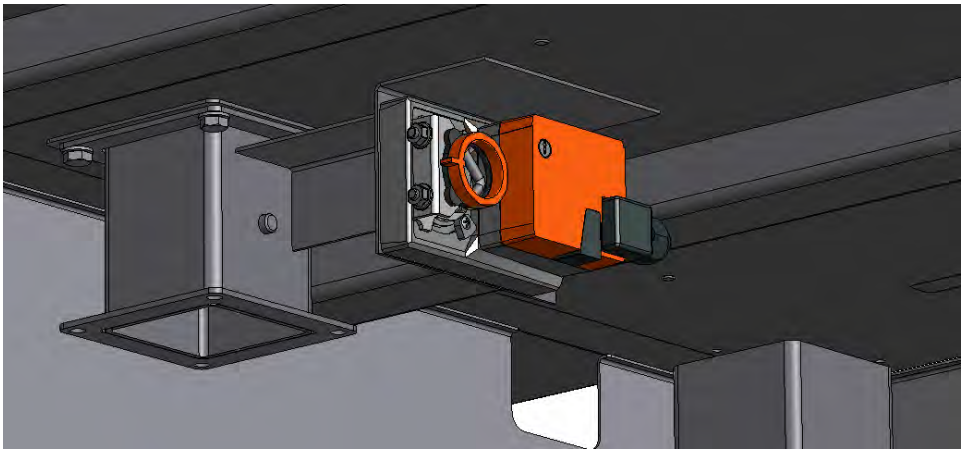
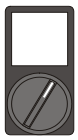


Fig. 44: Example: Motorized fresh-air flap

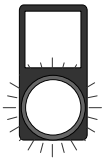
Caution

Operating the furnace with the flaps open can change the temperature conditions in the furnace chamber. If the batch is sensitive to temperature fluctuations it may be advisable to run a test for temperature homogeneity to optimize the process.

Fresh-air flap control



The fresh-air flap can be activated manually with the **selection switch [268] fresh-air flap automatic/close/open**.

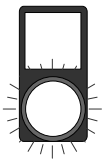


The **control lamp [214] fresh-air flap open** indicates the position of the fresh-air flap.

Exhaust air flap control

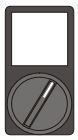
Operating the exhaust air flap with **switch [42a]** exhaust air flap auto/close/open:

In the Auto position, the flap is activated via the extra relay (see extra relay/control tracks). When the switch is in the positions Open and Close, the flap is operated manually.



The **control lamp [103] exhaust air flap open** indicates the position of the exhaust air flap.

Exhaust air / fresh air flap control



Operation of the exhaust air / fresh air flap with **switch [42b]**
Exhaust air / fresh air flap - Auto / Close / Open:

In the Auto position, the flap is activated using the extra relay (see Extra relay / Control tracks). The flap is operated in manual mode using the Open and Close switch positions.

Programming the extra relay

During a heat treatment program, special functions can be called up via the programming of the extra relay. Depending on the required function (see table), the extra relays are set in the corresponding segment during programming and are activated automatically while the program is running:

Extra 1	Extra 2	Function
x	-	Open exhaust air flap and fresh-air flap

On the touch panel (options like AUTOMATIC, OFF, or ON) the motor driven flaps are opened or closed depending on the program.

Note

Control/Regulation of motorized actuator, see the corresponding section in the included instructions or, as necessary, in a separate operating instruction manual for the switchgear.

6.4.3 Controlled Cooling with Fresh Air Fan (Accessory)

Cooling can be accelerated by switching on the cooling fan and opening the exhaust air flaps.

- The properties of the charge must be considered before forced cooling is switched on.
- High cooling rates resulting from opening the exhaust air flaps or switching on the fresh air fans at high temperatures cause increased wear of the insulation and the oven furniture.

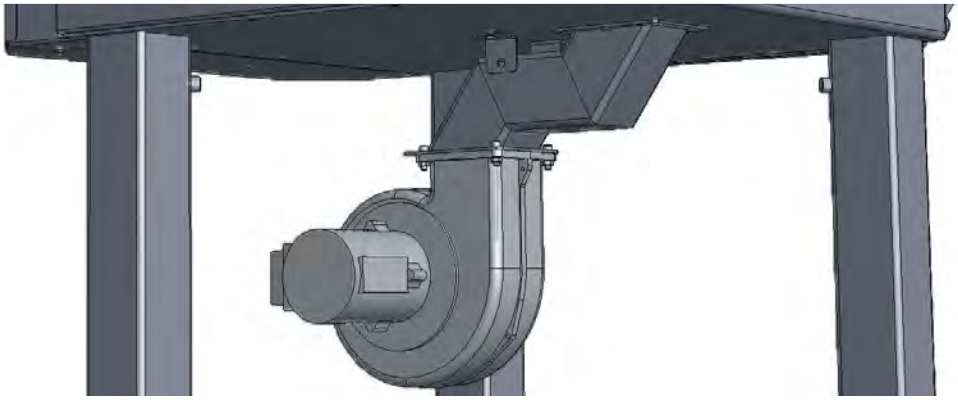
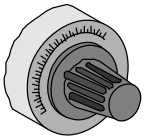


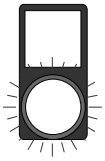
Fig. 45: Fresh air fan (similar to picture)

Forced cooling with controller P470

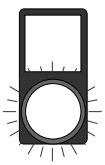
Operating the fresh air fan with **switch [44f]** fresh air automatic/on/off:
In the Auto position, the fresh air feed is switched on as soon as a program is started in the controller and extra relay 3 is set.



The **fresh air volume can be changed** and adjusted to the process **with the potentiometer [52i].**
Turn to the left to reduce the volume of fresh air and to the right to increase it.
When the switch is in positions On and Off, the fresh air feed is operated manually.
Note: The fresh air fan is switched on only when the exhaust air flaps are open.



When the fresh air fan is running, the **control lamp [104] fresh air fan** is lit.



The **control lamp [107] malfunction fresh air fan** is lit if there is a malfunction in the electrical drive or on the fresh air fan.

Note

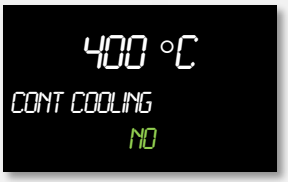
For a description and functions of other controller variants, see separate operating instructions.

Controlled cooling with controller P470

The cooling rate is set by adjusting the fresh-air flap while the speed of the fresh air fan remains constant.

The maximum cooling rate is dependent on the properties of the oven.

This controller is suitable for controlled cooling such as this. In a heating program, controlled cooling can be switched on or off for each segment.

Drain	Operation	Display	Comments
Select the cooling function			Depending on the oven equipment.

Note

For detailed operation of controlled cooling, see P470 Controller instructions

We recommend that cooling be activated only in a cooling ramp (decreasing setpoint).

With active controlled cooling with a separate cooling thermocouple, the display in the main overview is switched to the temperature of the cooling thermocouple.

In the process documentation, the cooling temperature (with or without a separate cooling thermocouple) is always recorded parallel to the control thermocouple and the cooling output.

6.5 Opening and Closing the Door

6.5.1 Furnace with Quick Release

Opening and Closing the Swinging Door

Open the quick-release fastener as shown in the figure below.

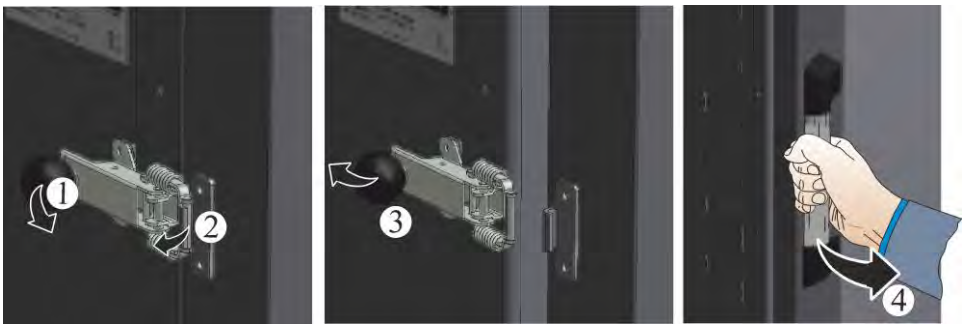


Fig. 46: Opening the door (similar to picture)

Pull the door handle to open the swinging door. The swinging door must be fully open to charge the furnace. The door is closed in the reverse sequence. Press the swinging door carefully against the furnace collar (do not let it swing shut). The weight of the swinging door can cause damage to the furnace or the door collar.

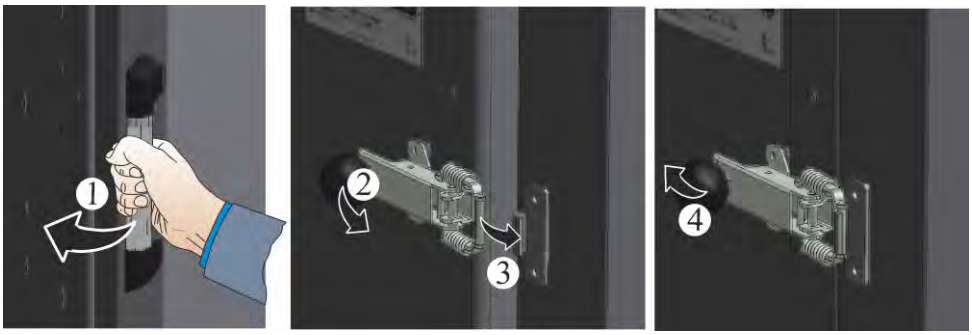


Fig. 47: Closing the door (similar to picture)

After closing the door make sure that the door is uniformly closed all around the door (visual check).

6.5.2 Oven with Turn Lock

Opening and Closing the Swinging Door

Loosen the locks (1) on the swing door in an anticlockwise direction and swing them towards the furnace door hinges (2).

Pull the door handle (3) to open the swinging door. The swinging door must be fully open to charge the furnace. The door is closed in the reverse sequence. Press the swinging door carefully against the furnace collar (**do not let it swing shut**). The weight of the swinging door can cause damage to the furnace or the door collar.

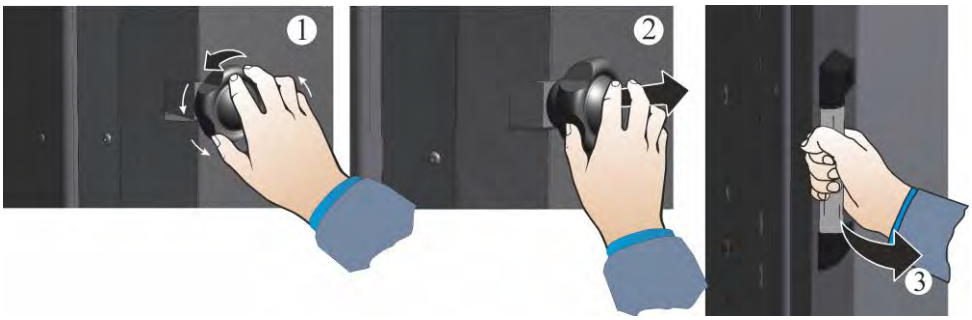


Fig. 48: Opening the swinging door

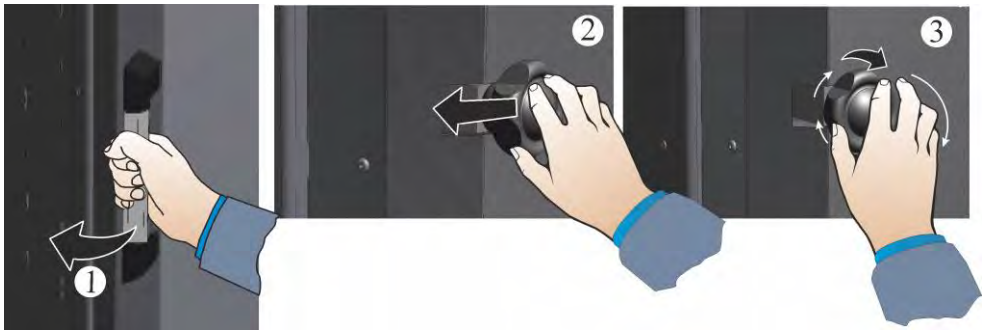


Fig. 49: Closing the swinging door

6.6 Operating the Pneumatic Lift Gate

The operator must observe the lifting or lowering movements and make sure that no persons or objects are at risk from the movement.

Depress the **left foot pedal** to **open the door**. Release the foot pedal to interrupt the door's movement.

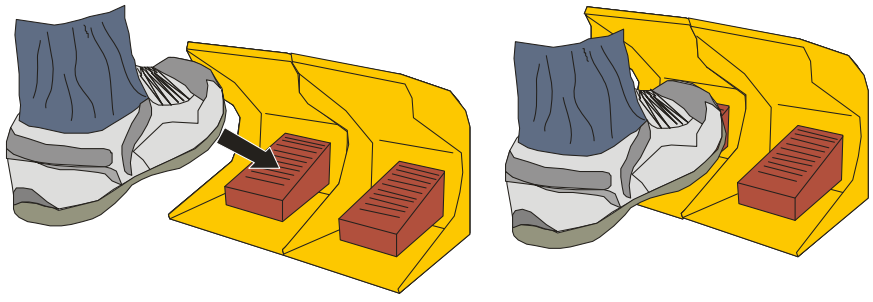
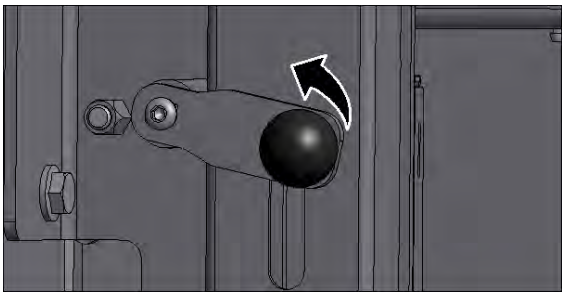


Fig. 50: Opening the door

6.6.1 Manual Release of the Furnace-Door Block

Before closing the lift gate the block must be manually released.



The lever handle must first be adjusted upward and forwards to be able to lower the lift gate.

The lever handle is automatically returned to the initial position when the gate is lowered.

Fig. 51: Manual release of the furnace-door block

Depress the **right foot pedal** to **close the door**. Release the foot pedal to interrupt the door's movement.

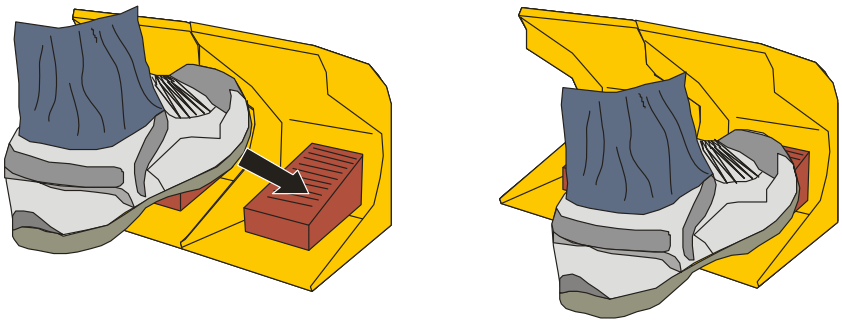


Fig. 52: Closing the door

The operator must observe the lifting or lowering movements and make sure that no persons or objects are at risk from the movement.

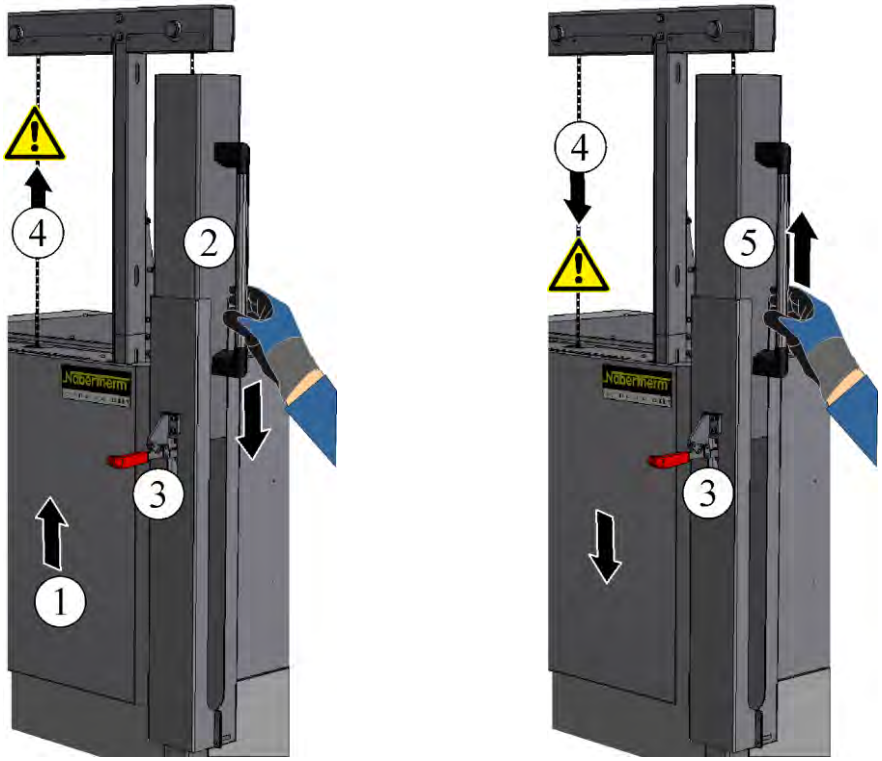
Warning - Dangers During Normal Operation!

When opening and closing the furnace door you must make sure that it can safely and freely move and can be observed at all times. You must ensure that there is nobody in the vicinity of the door to exclude the possibility of personal injury near the furnace door.

6.7 Operating the Manual Lift Door (Accessory)

To open the lift door (1), the counterweight (2) must be pulled down as far as it goes. Beforehand, push the lever (3) upwards to unlock the door. The operator must ensure an even speed. The speed must be reduced before the door reaches its end position (4) so that it is not mechanically overloaded. Press the lever (3) down to prevent the lift door being closed inadvertently.

The lift door is closed in the reverse order; i.e, the counterweight must be raised (5). When the door is closed, press the lever (3) down to lock the door.

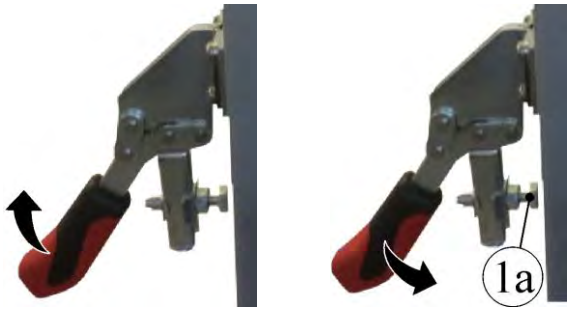


Opening the lift door

Closing the lift door

Fig. 53: Opening and closing a lift door manually (similar to picture)

The operator must observe the lifting or lowering movements and make sure that no persons or objects are at risk from the movement.



Raise the lever to unlock the lift door

Lower the lever to lock the lift door

The clamping bolt (1a) can be adjusted with the nut-washer in the clamping arm

Fig. 54: Lever to lock/unlock the lift door with manual lifting device

6.8 Side Inlet

Bushing for the installation of a component such as a mantle thermocouple. These bushings can be used for corresponding thermocouples, charge control, temperature monitoring or measuring units.

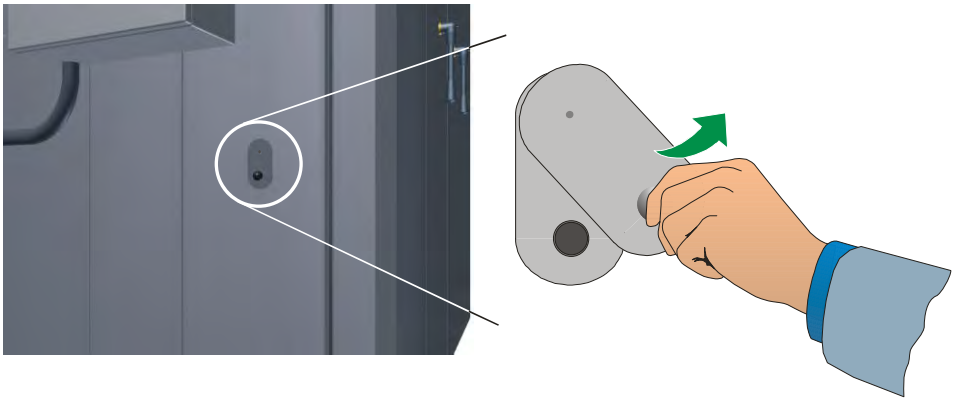


Fig. 55: Bushing

Avoid heat loss by filling the bushing with fiber wool.

	**⚠ DANGER** Do not insert metallic objects, such as thermocouples, sensors or tools into the oven without grounding them properly beforehand. If not available, have an electrician create a ground connection between the object and the oven housing. Ignoring this warning can result in a life-threatening electric shock.	

	**⚠ CAUTION** • **The surface of the bushing is hot** • **Danger of serious skin burns** • Heat-resistant gloves must be worn	

6.9 Protective Gas Operation (additional equipment)

Warning – Danger of Suffocation

There is a danger of suffocation when process/purge or exhaust gases escape, e.g. as a result of leaks (e.g. at doors, pipes, valves, etc.).

Due to their specific weight gases can displace oxygen. This poses a danger of suffocation.

Measures: Switch on the extraction system.

Note

When working with protective gases always make sure that the room is adequately ventilated. Country-specific safety regulations must also be observed.

Note

Connections, operation and safety recommendations for **protective gas and carburizing systems** see separate operating manual **M04.0001**

Remove the slide-in shelves

- With furnaces from Models N(A) 30/.. to N(A) 120/.. the removable tray remains in the furnace. The annealing box is placed or slid directly on to the removable tray. The removable tray ensures good air circulation.
- With furnaces from Models N(A) 250/.. to N(A) 500/..HA the tray must be removed from the furnace. With these furnace models the tray must **not** remain in the furnace. Annealing boxes for this furnace series have 70 cm high fork-lift attachments for charging carts for better air circulation in the annealing box.

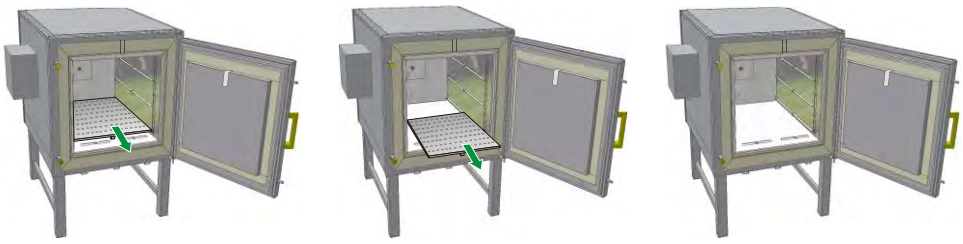


Fig. 56: Remove the tray (Models N(A) 250/.. to N(A) 500/..)

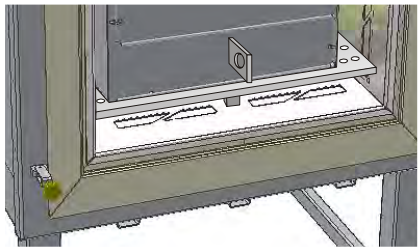
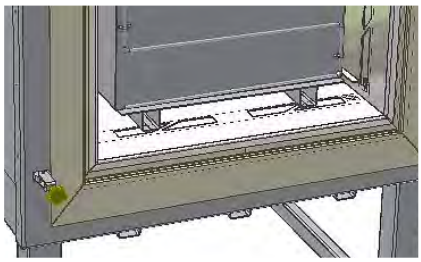


Fig. 57: Furnace models to N(A) 120/.. with removable tray



Furnace models from N(A) 250/.. without removable tray

Charging the Furnace

To charge the annealing box from furnace model N(A) 250/.. a suitable charging fork-lift truck should be used. Carefully slide the forks (A) of the charging fork-lift beneath the annealing box, paying attention to the center of gravity of the box. When the annealing box is being lifted, make sure that the forks and the annealing box do not catch on neighboring parts. Carefully and slowly place the annealing box in the furnace. In the case of furnaces with a lift door, pay attention to the gas connection at the bottom. Try not to set it down too abruptly. Push the annealing box into the furnace until the protective gas pipes touch the furnace collar (see figure "Pay attention to the furnace collar and the protective gas pipes").

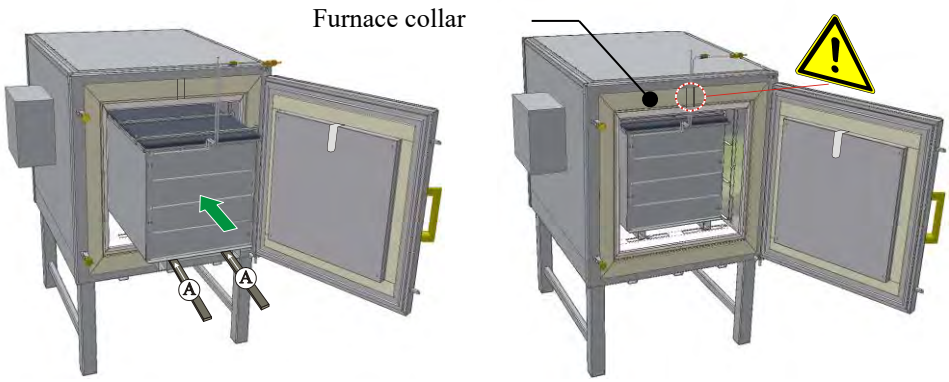


Fig. 58: Example: Charging the annealing box into the furnace (from Model N(A) 250../)

Annealing boxes for furnace models to N(A) 120/.. can be easily charged with the help of a draw hook using the ring at the bottom of the box. The draw hook is used to push the annealing box into or pull it out of the furnace. Push the annealing box into the furnace until the protective gas pipes touch the furnace collar (see figure "Pay attention to the furnace collar and the protective gas pipes").

For easy charging of the heat treatment box we recommend the use of a charging cart. Press the bridge of the charging cart carefully against the edge of the removable tray. The removable tray and the bridge of the charging cart must form one plane for the heat treatment box to be charged easily. Screws to adjust the height of the charging cart to the charging height are located on the bottom frame (see "Charging Cart With and Without Cooling Fan"). Prevent the cart moving by engaging the locking brake on the castors or via a foot-operated latch.

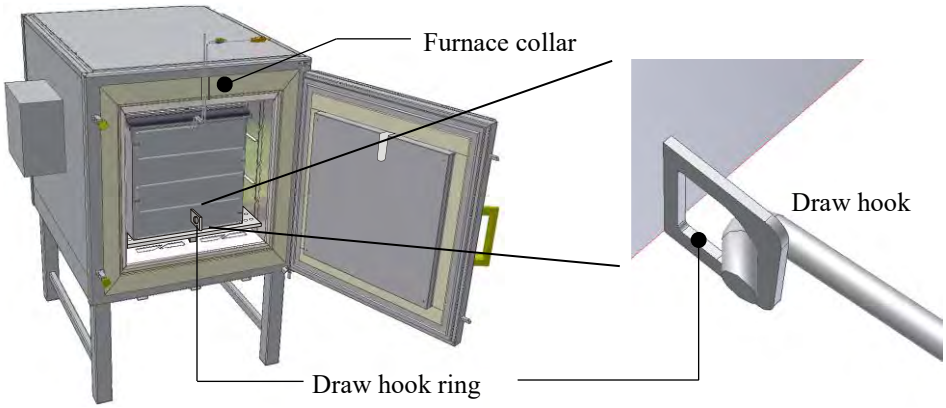


Fig. 59: Example: Charging the annealing box into the furnace (Models to N(A) 120../)

If a protective gas box is used, make sure that it is placed carefully into the furnace and the protective gas pipes touch the furnace collar.

If the protective gas box was purchased later as an accessory, before it is used, the door cladding and insulation have to be prepared for using a gas supply system.

Firstly, use a suitable tool to remove the metal sheets marked in the picture (1 and 2) at the perforation. The door insulation (3) must be ground carefully so that the protective gas pipes (4) fit exactly. When closing the door, make sure that the insulation presses against the furnace collar all around.

If the gas supply system is no longer used, the previously removed piece of insulation must be filled with suitable insulation material (e.g. AES fiber wadding). If this is not done, heat losses can occur with the associated temperature unevenness inside the furnace and higher energy consumption.

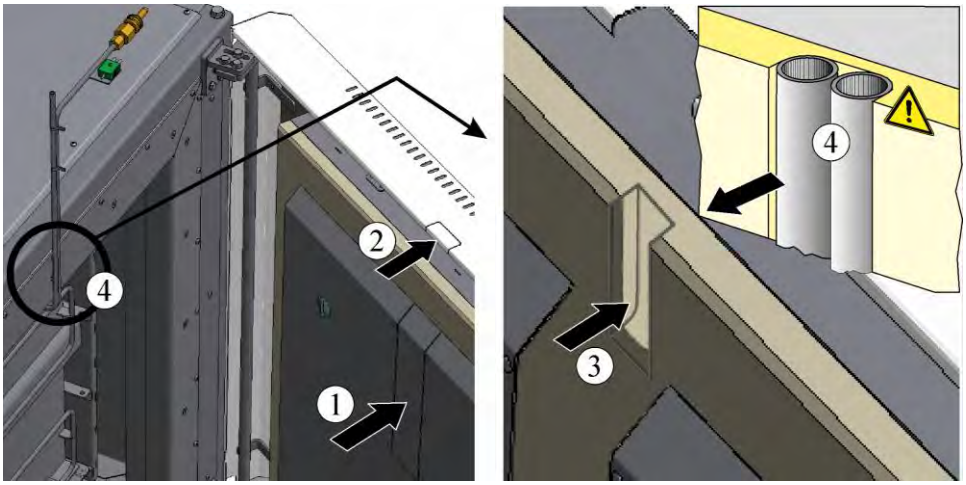


Fig. 60: Pay attention to the furnace collar and protective gas pipes (similar to picture)

6.10 Operation of Compressed Gas Containers

Pressurized gas tanks may be operated only by persons familiar with their handling. Before commencing work, employees must be instructed

in the operation of pressurized gas tanks,

about the special hazards of handling pressurized gas tanks, and

- what to do in case of accidents or malfunctions. These instructions must be repeated at appropriate intervals.

Pressurized gas cylinders may be placed in work rooms only in the absolutely necessary quantities and in the smallest possible sizes, and only for immediate use.
Pressurized gas cylinders must not be stored in work rooms.

If possible, gas cylinders should be kept in gas cylinder cabinets with an extraction system.

When no gas is being withdrawn, always keep the main valve on the gas cylinder closed. Gas cylinders without attached pressure regulators must not be used without protective caps. Gas hoses must be checked regularly for brittle or porous areas and, if necessary, be replaced immediately.

Safety measures and appropriate conduct

- Secure pressurized gas tanks against toppling over, impact and heating (e.g. from heater or furnace system).
- At the workplace only have the number of pressurized gas cylinders required to continue working.
- Transport only with cylinder transport trolleys and with protective caps firmly screwed on.
- Wear suitable gloves and if necessary goggles.
- When changing cylinders, always check for leaks at the valves of full and empty cylinders.
- Refilling cylinders is prohibited.
- Do not use force to open valves.

- Sufficiently ventilate areas.
- Smoking and open flames are prohibited.
- Keep fire extinguisher ready.

The operator must prepare operating instructions specifying the hazards occurring in the work room for people and the environment and also specifying the generally required protective measures and codes of conduct. The operating instructions must be written in an understandable form and be available in the work room. The operating instructions must also contain instructions on what to do in case of danger and about first-aid measures.

Note

When working with protective gases always make sure that the room is adequately ventilated. Country-specific safety regulations must also be observed.

Warning – General Hazards!

If installed improperly, functioning and safety of the system can no longer be guaranteed. The connection must be properly installed and put into operation by qualified personnel.

7 Servicing, Cleaning, and Maintenance

Warning - General Hazards!

Cleaning, lubrication, and maintenance tasks may only be performed by authorized experts following the maintenance instructions and accident protection guidelines. We recommend that maintenance and repair be performed by Nabertherm GmbH Service. Failure to comply runs the risk of bodily injury, death, or significant property damage!

Warning - Danger due to Electrical Current!

Work on the electrical equipment may only be performed by qualified, authorized electricians!

During maintenance work, the voltage supply to the furnace and/or switching system must be switched off to prevent unintentional commissioning. Disconnect the mains power connector due to reasons of safety.

Operators may only correct malfunctions which are obviously due to operational error!

Wait until the furnace chamber and attaching parts have cooled to room temperature.

The furnace must be visually inspected at regular intervals for damage. The interior of the furnace must also be cleaned as required (e.g. vacuuming out) **Attention:** Do not bang against the heating elements to avoid breaking them.

While work is being performed on the furnace, the furnace and work room must additionally be ventilated with fresh air.

Safety systems removed during maintenance tasks must be replaced after the work.

Warning of swinging loads in the workshop (e.g. crane systems). Work under a lifted load (e.g. a lifted furnace or switching system) is not permitted.

Safety switches and any limit switches present must be checked for function periodically (DGUV V3) or according to the national guidelines of the country of operation.

To ensure proper temperature regulation of the furnace, the thermocouple must be checked for damage before every process.

If necessary, retighten the element holders (see chapter "Replacing the Heating Element"). Before carrying out this work, the voltage supply to the furnace and/or switching system must be switched off (disconnect mains power connector). The regulations (DGUV V3) or corresponding national regulations in the relevant country of operation must be observed.

There are one or more contactors in the control system. The contacts of these circuit breakers are wearing parts and must therefore be serviced and/or replaced regularly (DGUV V3) or according to the national guidelines of the country of operation.

The switching system cabinet (if available) contains vent grilles with integrated filter mats. These must be cleaned and/or replaced at regular intervals in order to ensure sufficient intake and outflow of air from the switching system. During melting operation, the switching cabinet door must always be firmly closed.

Caution – Danger of Falling

Ignoring this can lead to fatal injury. Danger of falling exists at a height less than 1.00 m above the ground or another sufficiently broad bearing surface (for example, on elevated operating positions and workplaces, working platforms, galleries, platforms, footbridges, flying bridges, ramps and stairways), openings and recesses through which people can fall (for example in floors, platforms, installation openings, hatchways and pits, non-bearing roofs).

7.1 Furnace Insulation - Handling Fiber Materials

Repairs to the insulation or the replacement of components in the heating chamber may only be performed by persons who are trained about possible hazards and protective measures and can apply this knowledge without supervision.

During the work on the insulation or the replacement of components in the furnace chamber, the following points must be observed:

When repairs are made or demolition work is performed, silicon dust may be released. Depending heat-treated materials contained in the furnace, further contaminants may be contained in the insulation. To exclude possible health risks, dust concentrations must be kept to a minimum during any work performed at or near the insulation. In many countries there are specific occupational safety limits. You can acquire more relevant information by investigating the relevant legal specifications in your country.

Dust concentrations should be kept as low as possible. Dust must be removed using a suction device or a vacuum cleaner with a high-performance filter (HEPA – category H). Strong air currents such as drafts, for example, must be prevented. Pressurized air or brush must not be used for cleaning. Piles of dust must be sprinkled.

During work on the insulation a respirator mask with an FFP2 filter or an FFP3 filter must be used. The work clothing must be loose and cover the body completely. Gloves and goggles must be worn. Soiled clothing should be cleaned before it is removed with a vacuum cleaner equipped with a HEPA filter.

Contact with skin and eyes should be avoided. The impact of fibers on skin or eyes can lead to mechanical irritation which, in turn, causes reddening and itchiness. After completing the work, or after direct contact, the skin must be washed with soap and water. If there is contact with the eyes, they must be washed out carefully for several minutes. If necessary, an eye doctor should be consulted.

Smoking, eating and drinking at the workplace is prohibited.

In Germany, during work involving insulation, the technical rules for hazardous substances must be applied. In particular: TRGS 500, TRGS 521, TRGS 558, TRGS 559, TRGS 900; http://www.baua.de (German).

Additional information regarding how to handle fibrous materials can be found at http://www.ecfia.eu (English).

When the materials are discarded, national and regional guidelines must be observed. The possible presence of hazardous contaminants generated by the furnace process must be taken into account.

Note
Data sheets and safety data sheets can be requested from Nabertherm GmbH as required.

7.2 Shutting Down the Furnace for Servicing, Cleaning, and Maintenance

Warning! General Hazards!
Cleaning, lubrication, and maintenance tasks may only be performed by authorized experts following the maintenance instructions and accident protection guidelines. We recommend that maintenance and repair be performed by Nabertherm GmbH Service. Failure to comply runs the risk of bodily injury, death, or significant property damage!

Wait until the furnace chamber and attached parts have cooled to room temperature.

- The furnace must be completely emptied
- Inform operating personnel and name supervisors
- Switch off main switch and/or disconnect the power cord.
- Lock the main switch (if available) and secure against restoration of power using a padlock.
- Attach a warning sign on the main switch
- Clean up the maintenance area as far as possible.
- Check for disconnection of power.
- Ground and short-circuit the working area.
- Cover any nearby parts still under power.

Warning - Dangers During Normal Operation!
Do not touch any object without first having checked its temperature.

Warning – Danger of Electric Shock
Work on the electrical equipment may be done only by qualified, authorized electricians. During work it must be ensured that the furnace and the switching equipment cannot be activated by mistake (pull out the power plug) and that all moving parts in the furnace are secured. Observe DGUV V3 or the corresponding national regulations in the country where the furnace is installed.
Wait until the furnace and the connected parts have cooled to room temperature.

Caution – Danger of Falling

Ignoring this can lead to fatal injury. Danger of falling exists at a height less than 1.00 m above the ground or another sufficiently broad bearing surface (for example, on elevated operating positions and workplaces, working platforms, galleries, platforms, footbridges, flying bridges, ramps and stairways), openings and recesses through which people can fall (for example in floors, platforms, installation openings, hatchways and pits, non-bearing roofs).

7.3 Regular Maintenance Tasks for the Complete System

A	B	C			D					E		F
		1	2	3	T	W	M	Q	J	X 1	X 2	
Drives and third-party subassemblies	Maintenance according to manufacturer instructions										●	
Safety test in accordance with DGUV V3 or corresponding national regulations	According to regulation										●	
EMERGENCY STOP systems	Press the "EMERGENCY OFF" button, power switch or main switch							●		●		

Symbols:	
A = Component / Position / Function / **B** = Measure / **C** = Spare Part Stocks / **D** = Maintenance Interval / **E** = Performed by / **F** = Comment	
Spare part stocks:	**1** = Stocks urgently recommended **2** = Stocks recommended / **3** = As required, not relevant
Maintenance Interval **Notice:** If ambient conditions are severe, the maintenance intervals must be shorter.	**D** = Daily, each time before the furnace is started **W** = Weekly **M** = Monthly / **Q** = Quarterly **Y** = Yearly / ● = Check, replace
Performed by:	**X1** = Operating personnel **X2** = Specialist personnel

Notice

Maintenance work must be performed only by authorized persons, observing the maintenance instructions and the accident prevention regulations. We recommend that maintenance and repair work be carried out by the service team of Nabertherm GmbH.

7.4 Regular Maintenance of the Furnace

A	B	C			D					E		F
		1	2	3	T	W	M	Q	J	X 1	X 2	
Connect the heating elements	Check the wiring to the connection ends, the screws of the heating element brackets, tighten as necessary			•					•		•	
Power heating elements	Functional test: check the uniform load bearing pressure of the heating group								•		•	
Door/Lid seal (silicon / FKM / fiber)	Visual check: check for tightness, damage and loose parts Functional check: Uniform pressure on the seal			•		•				•		
Collar (metal / fiber)	Visual check: check for unevenness, crack formation, loose segments			•		•				•		
Air deflectors	Visual check: check setting, tightness			•			•			•		Setting may be process dependent, if the setting is changed, check tightness
Penetrations through furnace housing (if included)	Functional test: tightness of the lock			•			•			•		
Fresh-air and exhaust-air piping	Visual check: check for damage and blockage; clean			•				•		•		
Motorized fresh-air and exhaust-air flaps (if included)	Functional test: check opening, closing, end positions (if included) Visual check: check for damage and blockage; clean			•				•		•		
Safety switches: "Door/Lid contact"	Functional test: correct switching point			•			•				•	
Safety switches: door/lid bolting hardware (if included)	Functional test			•			•				•	
Furnace top / furnace back wall	Visual check: cables, motors, thermocouples for thermal influence								•		•	

A	B	C			D					E		F
		1	2	3	T	W	M	Q	J	X 1	X 2	
Furnace housing: surface and external attachments (if included)	Visual check: of thermal influence, burns								●	●		
Position switch (if included)	Adjust the stop position if necessary			●					●		●	
Drives and aggregates made by other companies	Check according to manufacturer's maintenance instructions											
Door/Lid hinges	Functional test: free and easy movement, tightness, readjust as necessary			●				●		●		
Bearing of the lift door (if included)	Functional test: easy and free movement, visual check for damage			●					●	●		
Door/Lid lock / lock bearing	Functional test: free and easy movement, tightness, readjust as necessary			●				●		●		
Thermocouple controller	Visual check: protective pipe, check position and terminal							●				Stock of spare parts, depending on process
Thermocouple TWB	Visual check: protective pipe, check position and terminal							●				Stock of spare parts, depending on process
Bearing parts: chains, ropes, etc. (if included)	Visual check: for damage, Functional check			●				●		●		
Moving parts, possibly from additional equipment (if included)	Visual check: for damage, functional check			●				●		●		
Filters: fresh air filter / recirculation filter (if included)	Visual check: for deposits/dirt (see description of additional equipment, filter), clean or replace filter element as necessary		●				●				●	
Inspection glass in the door (if included)	Visual check: for damage, clean if necessary			●			●			●		

A	B	C			D					E		F
		1	2	3	T	W	M	Q	J	X 1	X 2	
Furnace chamber lighting (if included)	Visual check: for damage, clean if necessary functional check			●			●			●		
EMERGENCY STOP system	Functional test: press the "EMERGENCY-OFF" key, power switch			●	●					●		

Symbols:	
A = Component / Position / Function / **B** = Measure / **C** = Spare Part Stocks / **D** = Maintenance Interval / **E** = Performed by / **F** = Comment	
Spare part stocks:	**1** = Stocks urgently recommended **2** = Stocks recommended / **3** = As required, not relevant
Maintenance Interval **Notice:** If ambient conditions are severe, the maintenance intervals must be shorter.	**D** = Daily, each time before the furnace is started **W** = Weekly **M** = Monthly / **Q** = Quarterly **Y** = Yearly / ● = Check, replace
Performed by:	**X1** = Operating personnel **X2** = Specialist personnel

Warning – Danger of Electric Shock!

Work on the electrical equipment may be done only by qualified, authorized electricians.

Notice

Maintenance work must be performed only by authorized persons, observing the maintenance instructions and the accident prevention regulations. We recommend that maintenance and repair work be carried out by the service team of Nabertherm GmbH.

Note

If used, over-temperature limiters with automatic reset and over-temperature limiters (see “Overview of the Complete Furnace”) must be checked regularly to ensure that they function as intended. To check whether the over-temperature limiters with automatic reset and over-temperature limiters respond, start the furnace and set the required setpoint on the temperature control unit below the setpoint of the controller. For more information, see the operating instructions for over-temperature limiters with automatic reset and over-temperature limiters.

7.5 Regular Maintenance Tasks – Switchgear

A	B	C			D					E		F
		1	2	3	T	W	M	Q	J	X 1	X 2	
Air suction filter	Clean or replace filter mat		●			●				●		Ignoring this can lead to the failure of electronic devices. We accept no liability in case of a production stoppage.
Contactors	Check for scorching			●				●			●	
Contactors	Replacement	●							●		●	
USV battery	Replacement		●								●	
Control box	Vacuum out										●	
Switch cabinet cooling unit	Follows the manufacturer's maintenance instructions										●	
Check functionality of over-temperature protection	Set the shut-down value under the actual value and have it shut down.							●		●		
Check the precision of the over-temperature protection (calibrate)	The pre-set shut-down temperature is checked with a certified temperature transmitter.								●		●	
Check the temperature display (calibrate)	The pre-set shut-down temperature is checked with a certified temperature transmitter.								●		●	
Check the firmness of all screwed terminal positions.	Contactors, terminals, etc.								●		●	
Check all connections for smoke residues									●		●	
Switchgear: Lamps and signals	Check functionality			●				●			●	
Fuses	Replace after blow	●								●		
Semi-conductor fuses	Replace after blow	●								●		

Symbols:	
A = Component / Position / Function / **B** = Measure / **C** = Spare Part Stocks / **D** = Maintenance Interval / **E** = Performed by / **F** = Comment	
Spare part stocks:	**1** = Stocks urgently recommended **2** = Stocks recommended / **3** = As required, not relevant
Maintenance Interval **Notice:** If ambient conditions are severe, the maintenance intervals must be shorter.	**D** = Daily, each time before the furnace is started **W** = Weekly **M** = Monthly / **Q** = Quarterly **Y** = Yearly / ● = Check, replace
Performed by:	**X1** = Operating personnel **X2** = Specialist personnel

7.6 Regular Maintenance Tasks – Pneumatic System (if applicable)

A	B	C			D					E		F
		1	2	3	D	W	M	Q	J	X 1	X 2	
Maintenance unit	Empty condensation			●		●				●		
Maintenance unit	Check primary pressure settings						●			●		
Hose connections	Check for damage and correct fit			●			●				●	
Cylinder	Check piston rod and seal / clean						●			●		
Function	Check manually for jerk-free drive						●			●		
Throttle valves	Check movement speed			●			●			●		Movements that are too fast can damage the insulation at the stop position or expose the user to danger
Two-hand operation, emergency stop	Check functionality						●			●		

Symbols:	
A = Component / Position / Function / **B** = Measure / **C** = Spare Part Stocks / **D** = Maintenance Interval / **E** = Performed by / **F** = Comment	
Spare part stocks:	**1** = Stocks urgently recommended **2** = Stocks recommended / **3** = As required, not relevant
Maintenance Interval **Notice:** If ambient conditions are severe, the maintenance intervals must be shorter.	**D** = Daily, each time before the furnace is started **W** = Weekly **M** = Monthly / **Q** = Quarterly **Y** = Yearly / ● = Check, replace

Performed by:	**X1** = Operating personnel **X2** = Specialist personnel

7.7 Regular Maintenance Tasks – Documentation

A	B	C			D					E		F
		1	2	3	T	W	M	Q	J	X 1	X 2	
Type plate	Legible								●	●		
Operating instructions	Ensure they are kept near the furnace			●					●	●		
Component instructions	Ensure they are kept near the furnace			●					●	●		

Symbols:	
A = Component / Position / Function / **B** = Measure / **C** = Spare Part Stocks / **D** = Maintenance Interval / **E** = Performed by / **F** = Comment	
Spare part stocks:	**1** = Stocks urgently recommended **2** = Stocks recommended / **3** = As required, not relevant
Maintenance Interval **Notice:** If ambient conditions are severe, the maintenance intervals must be shorter.	**D** = Daily, each time before the furnace is started **W** = Weekly **M** = Monthly / **Q** = Quarterly **Y** = Yearly / ● = Check, replace
Performed by:	**X1** = Operating personnel **X2** = Specialist personnel

7.8 Regular Maintenance Tasks – Electrical Testing

A	B	C			D					E		F
		1	2	3	T	W	M	Q	J	X 1	X 2	
Insulation resistance check									●		●	
High-voltage check	If possible								●		●	
Protective conductor	Correct fit of protective conductor at the connections between the system parts and covers								●		●	
Check function	All electrical components								●		●	

Symbols:	
A = Component / Position / Function / **B** = Measure / **C** = Spare Part Stocks / **D** = Maintenance Interval / **E** = Performed by / **F** = Comment	
Spare part stocks:	**1** = Stocks urgently recommended **2** = Stocks recommended / **3** = As required, not relevant
Maintenance Interval **Notice:** If ambient conditions are severe, the maintenance intervals must be shorter.	**D** = Daily, each time before the furnace is started **W** = Weekly **M** = Monthly / **Q** = Quarterly **Y** = Yearly / ● = Check, replace
Performed by:	**X1** = Operating personnel **X2** = Specialist personnel

Warning – Danger of Electric Shock!

Work on the electrical equipment may be done only by qualified, authorized electricians.

Notice

Maintenance work must be performed only by authorized persons, observing the maintenance instructions and the accident prevention regulations. We recommend that maintenance and repair work be carried out by the service team of Nabertherm GmbH.

Note

The switchgear must be serviced at regular intervals by an electrician. **Contactors are wearing parts and must be checked regularly, depending on ambient conditions and frequency of use, and be replaced after no more than a year**.

Note

Operating furnaces with heating transformers can trigger an upstream fault-current circuit breaker due to the EMC filter circuitry. For this reason, fault-current circuit breakers should not be used as protection switchgear.

Note

The filters for the control cabinet ventilation must be cleaned at regular intervals in order to ensure good air circulation. Depending on the type and design of the ventilation system there may be 2 or 3 filters, also at other locations on the control cabinet. The door of the switchgear must be kept closed and locked (otherwise the lifetime of the electronic devices will be shortened by contamination).

Note

If the furnace has an interruptible power supply (UPS), you must be sure that the rechargeable battery has an operating life of roughly 2 years when operating in an ambient temperature up to +40 °C. Higher ambient temperatures or long downtimes (furnace is shut down) shorten the life of the battery. The rechargeable battery is a wearing part and, depending on the ambient conditions, must be replaced every 1 to 2 years.

7.9 Cleaning Products

Observe the procedure for shutting down the furnace (see “Operation”). Then remove the power plug from the socket. Allow the furnace to cool naturally.

Use commercial cleaning products that are either water-based or non-flammable and free of any solvents to clean the housing of any deposits; use a vacuum cleaner for the interior.
Pay attention to the labeling and information on the cleaning product packaging.
Wipe the surface with a damp, lint-free cloth. You may also use the following cleaning products:

This List must be Completed by the Operator.	
Component and Position	**Cleaning Product**
Outer surfaces (frames *)	Use commercial cleaning products that are either water-based or non-flammable and free of any solvent *)
Outer surface (stainless steel)	Stainless steel cleaner
Inside	Carefully clean with a vacuum cleaner (avoid the heating elements)
Insulation materials	Carefully clean with a vacuum cleaner (avoid the heating elements)
Door seal (if applicable)	Use commercial cleaning products that are either water-based or non-flammable and free of any solvent
Instrument panel	Wipe the surface with a damp, lint-free cloth. (e.g. glass cleaner)
*) You must be sure that the cleaner does not damage the water-soluble, environmentally safe paint (test the product on an interior, hidden area).	

Fig. 61: Cleaning products

Clean quickly to protect the surfaces.
Remove the cleaning product completely from the surfaces by wiping them with a damp, lint-free cloth.
After cleaning, check all supply lines and connections for leaks, loose connections, abrasion and damage; report any defects immediately!
See “Environmental Protection Regulations”.

Note

The furnace, the furnace chamber and attached components must **NOT** be cleaned with a high-pressure cleaner.

DANGER

- **Danger of electric shock.**
- **Risk of fatal injury**
- Before cleaning, pull out the power plug.
- Do NOT pour water or cleaning products over the inside or outside surfaces
- Allow furnace to dry completely before operating it again

8 Malfunctions

Work on the electrical system may be done only by qualified, authorized electricians. Operators may only rectify malfunctions that are obviously due to operating errors.

Call your local electrician for malfunctions that you cannot localize.

If you have any questions, problems, or requirements, contact Nabertherm GmbH. By mail, phone, or e-mail -> See "Nabertherm Service".

Phone advice is free and non-binding for our customers – all you pay is the phone costs.

In case of mechanical damage, send an email containing the above information and a digital photo of the damaged part and a photo of the complete furnace to the following address: -> see "Nabertherm Service".

If a malfunction cannot be rectified with the described solutions, contact our service hotline directly.

Have the following information at hand when you phone. This makes it easier for our customer service to answer your questions.

8.1 Error Messages of the Controller

ID+ Sub-ID	Text	Logic	Remedy
Communication error			
01-01	Bus zone	Communication connection to a control module disrupted	Check that the control module is firmly attached LEDs on the control modules red? Check the cable between the operating unit and the control module. Plug of the connection cable not plugged correctly into the operating unit.
01-02	Bus communication module	Communication connection to the communication module (Ethernet/USB) disrupted	Check that the communication module is firmly attached Check the cable between the operating unit and the communication module.

ID+ Sub-ID	Text	Logic	Remedy
Sensor error			
02-01	TC open		Check thermocouple, thermocouple terminals and cable Check contacts of the thermocouple cable in plug X1 on the control module (contacts 1+2)
02-02	Outside TC measurement range		Check set thermocouple type Check poles of thermocouple connection
02-03	Compare point error		Control module defective
02-04	Compare point too hot		Temperature in the switchgear too high (approx. 70 °C) Control module defective
02-05	Compare point too cold		Temperature in the switchgear too low (approx. -10 °C)
02-06	Encoder separated	Error at the 4-20 mA input of the controller (<2 mA)	Check 4-20 mA sensor Check the connection cable to the sensor
02-07	Sensor element defective	PT100 or PT1000 sensor defective	Check PT sensor Check connection cable to the sensor (cable break/short circuit)
System error			
03-01	System memory		Error after firmware updates[1)] Defective operating unit[1)]
03-02	ADC error	Communication between AD converter and controller disrupted	Replace control module[1)]
03-03	File system defective	Communication between display and memory chip disrupted	Replace operating unit
03-04	System monitoring	Program execution on the operating unit defective (Watchdog)	Replace operating unit USB flash drive removed too soon or defective Switch controller off and on again
03-05	Zone system monitoring	Program execution on a control module defective (Watchdog)	Replace control module[1)] Switch controller off and on[1)]
03-06	Self-test error		Contact Nabertherm Service[1)]

ID+ Sub-ID	Text	Logic	Remedy
Monitoring			
04-01	No heating power	No temperature increase in the ramps when heating output <> 100 % for 12 minutes and when the temperature setpoint is higher than the current furnace temperature	Acknowledge the error (if necessary disconnect from the power supply) and check safety contactor, door switch, heating controls and controller. Lower D value of the control parameters.
04-02	Excess temperature	The temperature of the control zone exceeds the max. program setpoint or the maximum furnace temperature by 50 Kelvin (from 200 °C) The equation for the switch off threshold is: Maximum program setpoint + zone offset of the master zone + charge control offset [Max] (if charge control active) + excess temperature switch-off threshold (P0268, e.g. 50 K)	Check solid state relay Check thermocouple Check controller
		A program was started at a furnace temperature higher than the maximum setpoint in the program	Do not start the program until the furnace temperature is lower. If this is not possible, insert a hold time as a start segment and then a ramp with the desired temperature (STEP=0 minutes duration for both segments) Example: 700 °C -> 700 °C, Time: 00:00 700 °C -> 300 °C, Time: 00:00 The normal program begins here From Version 1.14, the actual temperature is considered at the start.
04-03	Power failure	The set limit for restarting the furnace was exceeded	If possible, use an uninterruptible power supply
04-04	Alarm	A configured alarm was triggered	
04-05	Self optimization failed	The determined values are implausible	Do not carry out self optimization at the lower temperature range of the furnace working range
	Battery weak	Time is not shown correctly. A power failure may not have been handled properly	Export all parameters to a USB flash drive Replace the battery (see “Specifications”)

Error messages can be reset by pressing **twice** the jog dial  . If there is another error message, contact Nabertherm Service. Recirculation motors (if included) also remain switched on in case of an error until the temperature falls below the set cut-off temperature.

8.2 Warnings of the Controller

Warnings are not displayed in the error archive. They are only displayed on the display and in the file of the parameter export. Warning do not generally lead to a program crash.

No.	Text	Logic	Remedy
00	Gradient monitoring	The limit value of the configured gradient monitoring was exceeded	For troubleshooting, refer to “Gradient Monitoring” Gradient set too low
01	No control parameters	No “P” value was entered for the PID parameters	Enter at least one “P” value in the control parameters. It must not be “0”
02	Charge thermocouple defective	No charge thermocouple was determined with the current program and activated charge control	Plug in a charge thermocouple Disable charge control in the program Check the charge thermocouple and its cable for damage
03	Cooling thermocouple defective	The cooling thermocouple is not plugged in or is defective	Plug in a cooling thermocouple Check the cooling thermocouple and its cable for damage If there is a malfunction in the cooling thermocouple during active controlled cooling, the system switches over to the thermocouple of the master zone.
04	Documentation thermocouple defective	Either no documentation thermocouple or a defective one was determined.	Plug in a documentation thermocouple Check the documentation thermocouple and its cable for damage
05	Power failure	A power failure was determined. There was no program interrupt	None
06	Alarm 1 - Band	The configured band alarm 1 was triggered	Optimize the control parameters Alarm set to narrowly
07	Alarm 1 - Min	The configured min. alarm 1 was triggered	Optimize the control parameters Alarm set to narrowly
08	Alarm 1 - Max	The configured max. alarm 1 was triggered	Optimize the control parameters Alarm set to narrowly
09	Alarm 2 - Band	The configured band alarm 2 was triggered	Optimize the control parameters Alarm set to narrowly
10	Alarm 2 - Min	The configured min. alarm 2 was triggered	Optimize the control parameters Alarm set to narrowly
11	Alarm 2 - Max	The configured max. alarm 2 was triggered	Optimize the control parameters Alarm set to narrowly
12	Alarm - External	The configured alarm 1 at input 1 was triggered	Check the source of the external alarm
13	Alarm - External	The configured alarm 1 at input 2 was triggered	Check the source of the external alarm

No.	Text	Logic	Remedy
14	Alarm - External	The configured alarm 2 at input 1 was triggered	Check the source of the external alarm
15	Alarm - External	The configured alarm 2 at input 2 was triggered	Check the source of the external alarm
16	No USB flash drive inserted		When exporting data, insert a USB flash drive in the controller
17	Import/export of data via the USB flash drive unsuccessful	The file was edited with a PC (text editor) and saved in the wrong format or the USB flash drive was not detected. You want to import data that is not in the import folder on the USB flash drive	Do not edit XML files with a text editor, only in the controller. Format the USB flash drive (format: FAT32). No quick formatting Use a different USB flash drive (1-8GB) When importing, all data must be in the import folder on the USB flash drive. It is best to use USB flash drives up to 8GB.
	Programs are rejected during the import of programs	Temperature, time or rate is outside the limit values	Import only programs that are suitable for the furnace. The controllers differ as regards the number of programs and segments and the maximum furnace temperature.
	While programs are being imported, "Error occurred" is displayed	The complete parameter set (at least the configuration files) was not stored in the "Import" folder on the USB flash drive	If you deliberately left out files during import, ignore the message. Otherwise, check the completeness of the import files.
18	“Heating blocked”	This message is displayed if a door switch is connected to the controller and the door is open	Close the door Check the door switch

8.3 Malfunctions of the Switchgear

Error	Cause	Remedy
Controller does not light up	Controller is switched off	Switch the power switch to “**I**”
	No power available	Is the power cord plugged into the socket? Check the building fuses. Check the fuse of the controller (if present) and replace it if necessary.
	Check the fuse of the controller (if present) and replace it if necessary.	Switch the power switch on. If the error occurs again, contact Nabertherm Service
Controller displays error	See the separate instructions of the controller	See the separate instructions of the controller
Furnace does not heat	Door / cover is open	Close the door / cover
	The door contact switch is faulty (if present)	Check the door contact switch

Error	Cause	Remedy
	The “wait” or clock icon (product line 400 controllers) lights up	The program is waiting for the programmed start time. Set the wait time to 00:00 or disable it
	Error in entering the program	Check the heating program (see the separate instructions of the controller)
	Heating element defective	Have this checked by Nabertherm Service or a qualified electrician.
Very slow heating of the heating space	The fuse(s) of the connection is/are defective.	Check the fuse(s) of the connection and replace if necessary. Notify Nabertherm service if the new fuse fails again immediately.
The program does not jump to the next segment	In one TIME segment in the program input, the wait time is set to INFINITE (product line 400 controllers). If charge control is activated, the temperature of the charge is higher than the zone temperatures.	Do not set the wait time to INFINITE
	If charge control is activated, the temperature of the charge is higher than the zone temperatures.	The parameter [LOWER BLOCK] must be set to [NO].
The controller module can not be registered on the operating unit	Addressing error (product line 400 controllers)	Perform a bus reset
The controller is not heating in the optimization	No optimization temperature has been set	The temperature to be optimized must be entered (see the separate instructions of the controller)
The temperature rises faster than the controller setting allows	The switch element of the heating unit (semiconductor relay, thyristor or switch contactor) is defective. Individual defective components inside a furnace cannot be completely ruled out in advance. That is why the controllers and the switchgear units must be equipped with safety facilities. For example, the furnace shuts down the heating unit in response to error message 04 - 02 via an independent contact element.	Have the switch element tested by a qualified electrician and replaced as necessary.
Glass Bubbles on the Surface of the Heating Element	At temperatures above 1550 °C (2822 °F) fine glass bubbles can settle on the surface of the heating elements due to residual silicon during the production process.	Before heating the furnace again remove the glass bubbles carefully (with a paintbrush or brush).

8.4 Controller Check List

Customer:	
Furnace model:	

Controller model:			
Controller version (see information menu ⓘ):			
Controller serial number			
Furnace serial number			
Error code in the display:			
The following errors are dependent on external influences:	02-05 Ambient temperature too low: < -10 °C (14 °F) 02-04 Ambient temperature too high: > 70 °C (158 °F)		
Detailed error description:			
Export of the service information:	Please export all the data to a USB stick using the function [EXPORT COMPLETELY] Generate a zip file using the ZIP function integrated in Windows (compression) of the exported folder (see the section "Importing and Exporting Data and Parameters") and send them to your contact at Nabertherm Service.		
When does this error occur?	At specific point in the program or at certain times of day:		
	At specific temperatures:		
How long has the error existed?	☐ Error is new		
	☐ Error has existed for a long time		
	☐ Unknown		
Error frequency	☐ Error occurs frequently		
	☐ Error occurs regularly		
	☐ Error occurs rarely		
	☐ Unknown		
Substitute controller:	Has a substitute controller already been used?	☐ yes	☐ no
	Did the error continue with the substitute controller?	☐ yes	☐ no
	Checked according to the error search list (see the furnace operating instructions)	☐ yes	☐ no

Please enter the following test program so that the furnace heats up at full power:

Program point	Value
Segment 01- Start Temperature	0 °C
Segment 01- Target Temperature	500 °C
Segment 01- Time	30 minutes
Segment 01- Target Temperature	500 °C

Close door/lid and start the example program

Please check the following items:

- Does the furnace heat (temperature rise)?
- Is the "Heating" symbol displayed?

Please call up the information menu in the heating up phase for further details.

Date: _____ Name: _____ Signature: _____

9 Spare Parts/Wearing Parts

Ordering Spare Parts:

Our Nabertherm Service team is available worldwide. Due to our high vertical range of manufacture, we deliver most spare parts from stock overnight or can produce them with short delivery times. You can order Nabertherm spare parts directly from the factory quickly and easily. If you do not find the spare part you are looking for in the spare parts list or in the separate spare parts list, we would be happy to help you. Spare parts can be ordered in writing, by phone or on the Internet -> see “Nabertherm Service”.

Availability of Spare Parts and Wearing Parts:

Although Nabertherm has many spare parts and wearing parts in stock, we cannot guarantee the short-term availability of all of them. We recommend that certain parts be ordered in good time. If you need any assistance when selecting spare parts and wearing parts, the staff at Nabertherm will be glad to help you.

Note

Original parts and Accessories are designed especially for Nabertherm furnaces. Replace parts only with original Nabertherm parts. Otherwise the warranty will be void. Nabertherm accepts absolutely no liability for damage caused by using parts that are not original Nabertherm parts.

Note

Contact our Nabertherm Service for dismantling and installing wearing/spare parts. See “Nabertherm Service”. Work on the electrical equipment may be done only by qualified, authorized electricians. This applies also to repairs that are not described here.

Hinweis

Wear parts such as muffles, insert boxes, roller conveyors, charging plates or sheet metal linings are subject to increased wear depending on the respective use. In addition to the process and the type of application, the service life also depends on the frequency of use. There may be distortion of these components. A slight deformation is normal and requires no further measures. However, if larger distortions occur, rework or replacement of the component is recommended. A regular check of the functionality by the customer is recommended.

Model		NA 30/45 – NA 675/65		
No.	**Name**	**Part number**		**Comment**
1	**Oven**			
	Air baffle box	2)		
	Air circulation fan	up to 120 liters 691401674	from 250 liters 691401675	
2	**Electrical/controllers**			
2.1	Controller	1) 2)		
2.2	Over-temperature limiter	1) 2)		
2.3	Thermocouple Type K	1) 2)		
2.4	Heating element	1) 2)		
2.5	Door contact switch for swing door	541700182		
2.6	Door contact switch for lift door	1) 2)		
2.7	Air circulation motor depending on connection voltage			
2.7.1	3~motor, 0.55 kW 230/400 V	542400188		
2.7.2	3~motor, 0.55 kW220/ 380 V	542400468		
2.7.3	1~motor, 0.55 kW 230 V	142400752		
2.7.4	Special voltage and UL	2)		

1) see circuit diagram
2) on request

Note

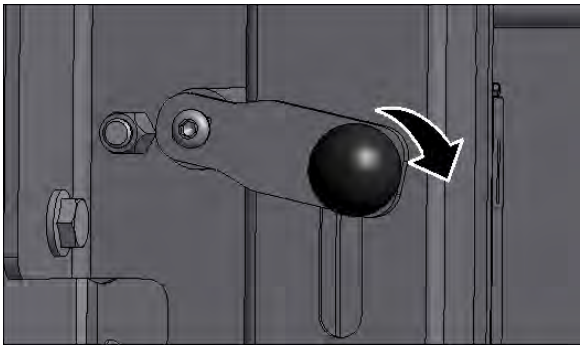
The documents included do not always contain the electrical schematics and pneumatic diagrams.

If you need the respective diagrams, they can be ordered from Nabertherm Service.

9.1 Safe Procedure for Eliminating Blockages

- Switch off the main switch (position "O/OFF") → Switchgear
- Secure the main switch against inadvertent start-up with a padlock (if available) or remove the power plug.
- Enter the oven only when the safety catch or bolt on the lift door guide has been engaged or pushed in.

- Before working on the system, secure a suitably large zone around the working area (chains with warning signs in front of the lift door).
- Immediately report any damage or faults on the system to the responsible employee/supervisor. Interrupt production until the damage has been rectified. Defects in the system must be rectified without delay.
- Wait until the oven and the connected parts have cooled to room temperature.



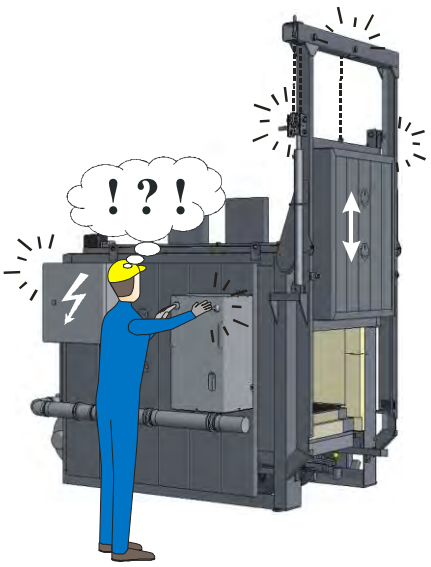
Caution
The furnace door must be completely opened.

Fig. 62: Furnace-door block

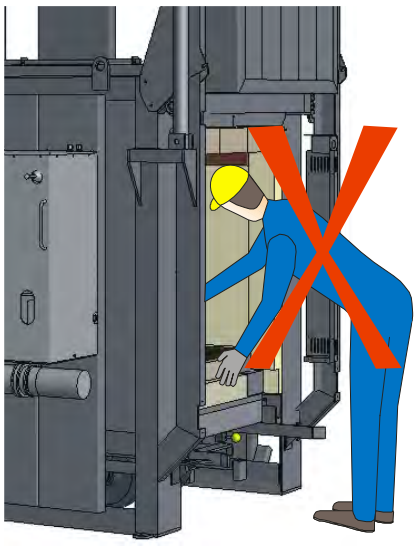
Slowly and carefully raise the lift door with the forks of a suitable forklift truck. No one may stand or work below the lift door. There is also a risk of crushing hands or fingers on the lift door guide and the guide rollers. Slowly and carefully raise the lift door to its top position with the ends of the forks. Then slowly and carefully have the forklift place the lift door on to the oven door safety device (safety lever).

Contact Nabertherm Service at any time for maintenance and repair.

If you have any questions, problems, or requirements, contact Nabertherm GmbH. By mail, phone or e-mail.



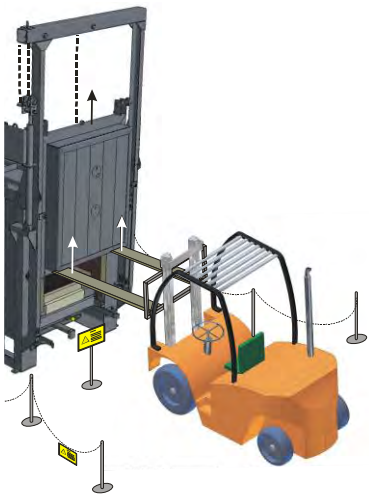
The upwards and downwards movement of the lift door is unexpectedly blocked.



Entering the space under the lift door or performing any work there is prohibited.

Fig. 63: The upwards and downwards movement of the lift door is unexpectedly blocked (similar to picture)

Before the lift gate is opened for the first time, the lever handle must be moved into the initial position, towards the back and down.Push the lift door into the top position. Then lower the lift door carefully and slowly onto the furnace-door block.



Use the tips of a suitable forklift to raise the lift door slowly and carefully.

Fig. 64: Securing the lift door (similar to picture)

9.2 Replacing a Heating Element

Warning – Danger of Electric Shock

Work on the electrical equipment may be done only by qualified, authorized electricians. During work it must be ensured that the furnace and the switching equipment cannot be activated by mistake (pull out the power plug) and that all moving parts in the furnace are secured. Observe DGUV V3 or the corresponding national regulations in the country where the furnace is installed.

Wait until the furnace and the connected parts have cooled to room temperature.

Warning – General Hazards!

If installed improperly, functioning and safety of the system can no longer be guaranteed. The connection must be properly installed and put into operation by qualified personnel.

Note

In Germany, the general accident protection guidelines must be observed. The accident prevention regulations applicable in the country where the furnace is installed must be observed.

Caution – Damage to Components!

Heating elements are extremely sensitive to breaking. Any strain on or rotation of the heating elements must be avoided. Failure to observe this rule will lead to the immediate destruction of the sensitive heating elements.

Note

See the enclosed circuit diagram for the wiring and electrical connections. The machine's electrical equipment is shown in the circuit diagram.

Note

The pictures contained in the instruction manual may contain inaccuracies in terms of the function, design and furnace model.

We refuse to accept any responsibility for any and all direct and indirect damages resulting from faulty installation. This also applies to all cases in which generally required installation steps are not described. The replacement of the heating elements requires the cover/s (protective paneling) on the furnace (furnace, depending on model). Use an appropriate tool to remove the screws around the sides of the cover and keep them in a safe place for later use. The number and position of the screws may differ from one furnace model to the next.

Removing Cover/s

The locks on the cover panel must be unlocked with a suitable key. Tilt the cover panel slightly and lift it up and out. The panel must be set down on a soft material (such as foam rubber). Depending on the furnace model and features, the position of the locks and appearance may differ. Install in the reverse order.

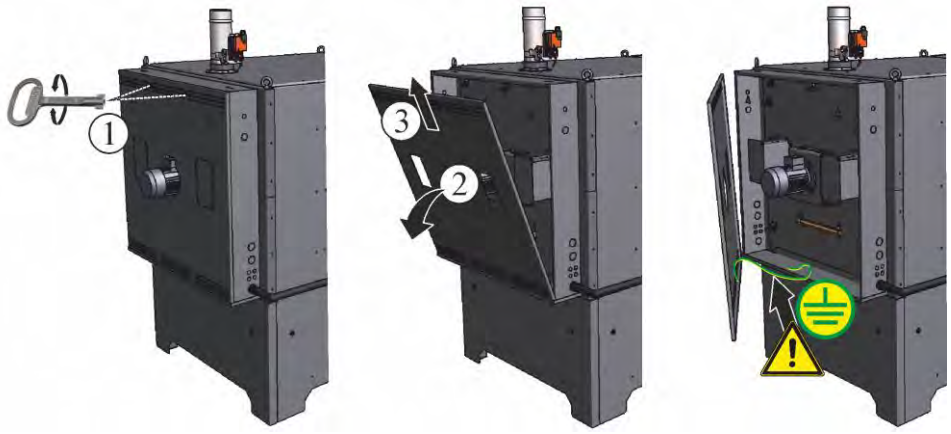


Fig. 65: Example: Removing Cover/s (similar to picture)

Hold the nut (B1) with a suitable tool and tighten the nut (B2) from the end of the heating element. Remove nuts, washers and terminal lug from the heating element.

Unfasten the holding plate (6) with an appropriate tool (do not remove) to be able to pull out the heating element.

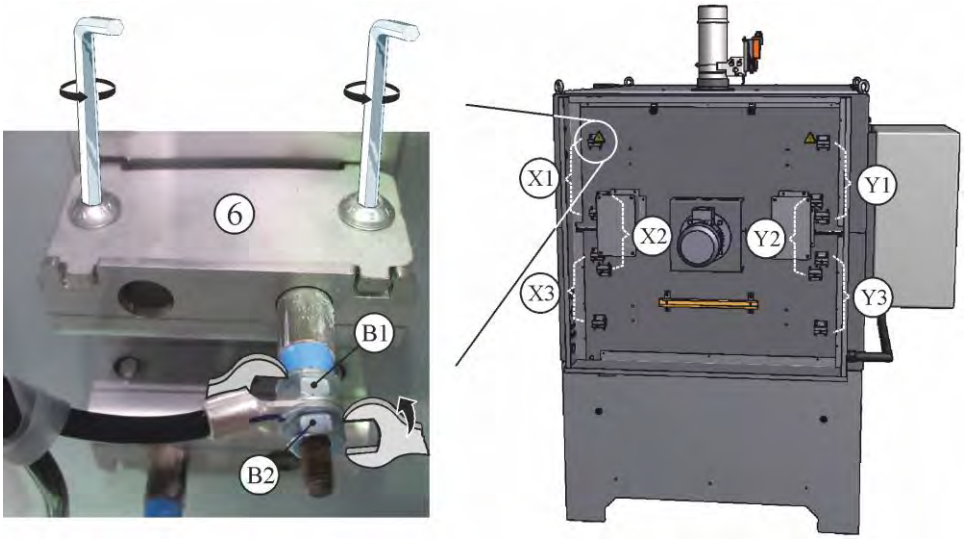


Fig. 66: Removing the heating element

Air baffles (located inside the furnace system) must be removed as shown in the figure below. First, the securing plates must be removed and kept in a safe place for later use. The number and position of the securing plates may differ from one furnace model to the next. Inspect carefully both the baffles and the furnace inner wall for possible damage.

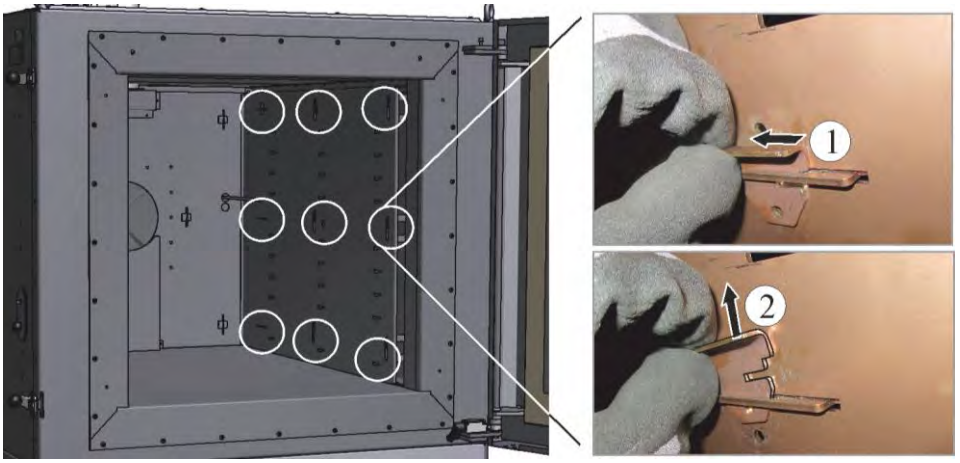


Fig. 67: Disassembly of an air baffle (similar to picture)

Pull the heating elements carefully and slowly out of the interior of the furnace. The defective heating element (tube radiator) must be replaced by a new equivalent element.

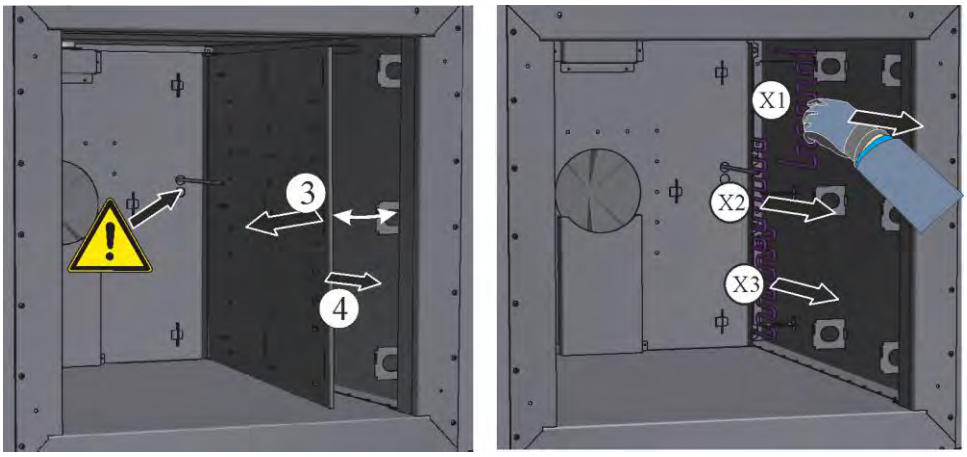


Fig. 68: Disassembly of the air baffles and the heating elements (similar to picture)

Slide the new heating element carefully from the inside of the furnace through the opening in the back wall of the furnace. The heating element is installed in the reverse order.

Fasten the holding plate (6) again using a suitable tool.

When a tube radiator is connected, the installation sequence (washers, nuts, etc.) as shown below in the tables must be followed. Details regarding screw connections can be found in the respective schematics.

Hold the nut (B1) with a suitable tool and tighten the nut (B2) from the end of the heating element. The nuts must be tightened to a defined torque (see table).

Make sure that the ceramic isolator (E) is **not** damaged in the process. The heating element must **not** be operated with a damaged isolator.

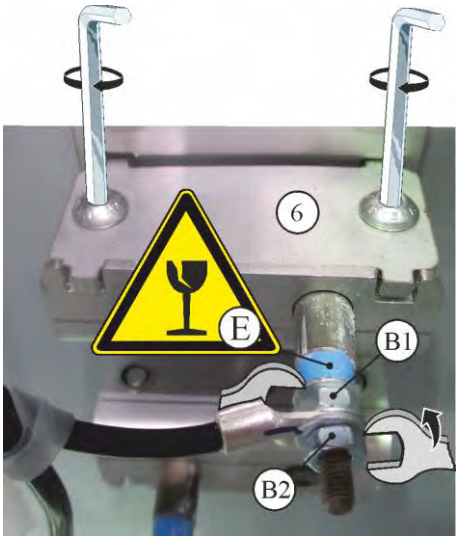


Fig. 69: Installing the heating element

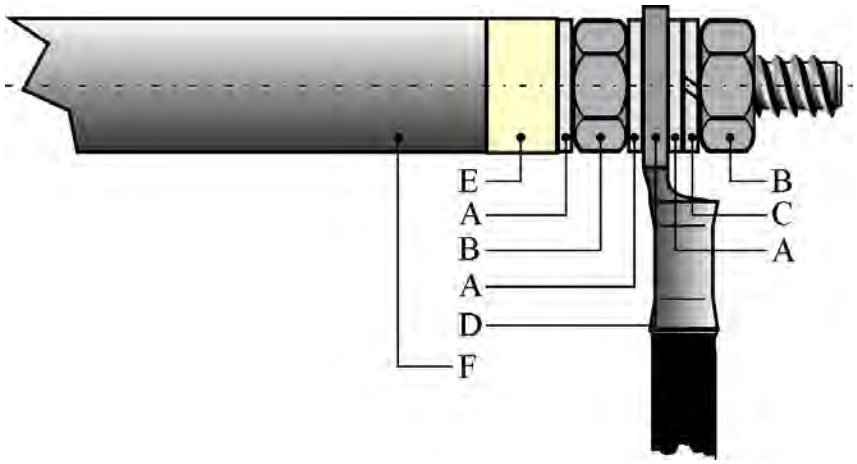


Fig. 70: Simple connection (tube radiator) (similar to picture)

Simple connection (tube radiator)			
Item	**Quantity**	**Designation**	**Tightening torque**
A	3	Washer	
B	2	Nut **M4**	2 Nm
C	1	Spring washer	
D	1	Terminal lug	
E	1	Ceramic isolator	
F	1	Heating elements	

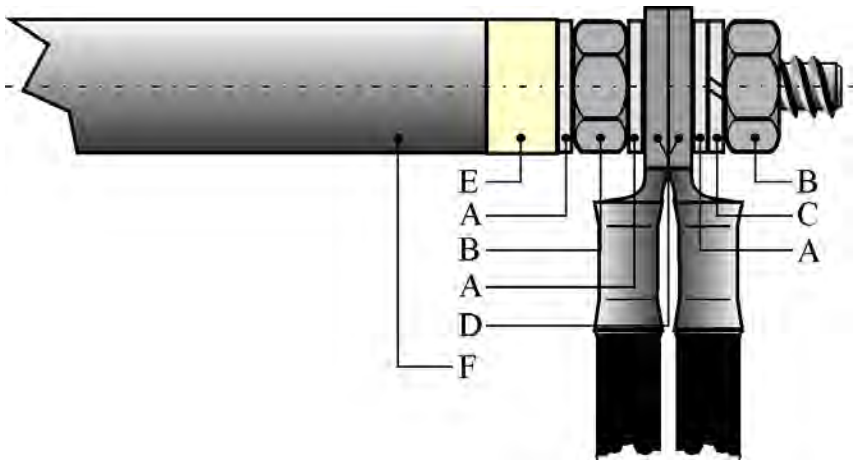


Fig. 71: Connection bridge circuit (tube radiator) (similar to picture)

Connection bridge circuit (tube radiator)			
Item	**Quantity**	**Designation**	**Tightening torque**
A	3	Washer	
B	2	Nut **M4**	2 Nm

Connection bridge circuit (tube radiator)			
Item	**Quantity**	**Designation**	**Tightening torque**
C	1	Spring washer	
D	2	Terminal lug	
E	1	Ceramic isolator	
F	1	Heating elements	

9.3 Replacing a Thermocouple

Warning – Danger of Electric Shock

Work on the electrical equipment may be done only by qualified, authorized electricians. During work it must be ensured that the furnace and the switching equipment cannot be activated by mistake (pull out the power plug) and that all moving parts in the furnace are secured. Observe DGUV V3 or the corresponding national regulations in the country where the furnace is installed.

Wait until the furnace and the connected parts have cooled to room temperature.

Note

The pictures contained in the instruction manual may contain inaccuracies in terms of the function, design and furnace model.

Remove the cover panel/s of the thermocouple/s on the back wall of the furnace.

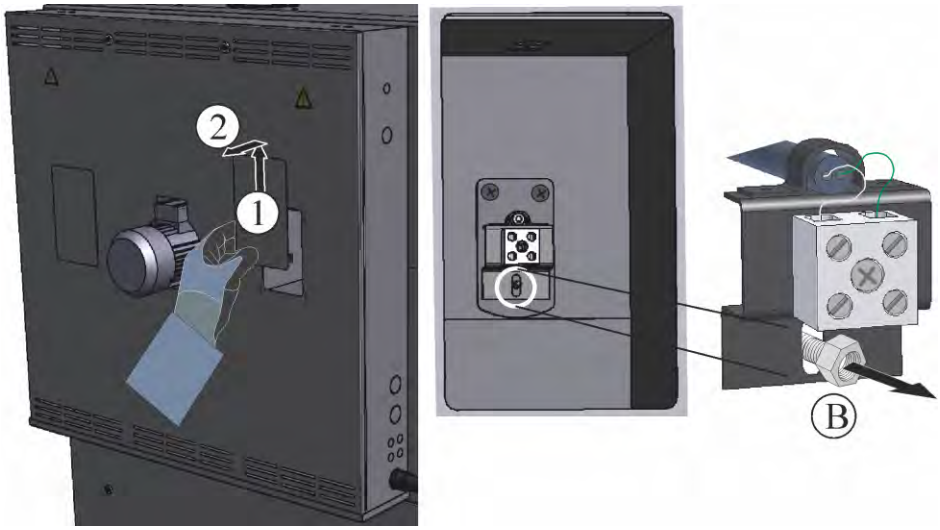


Fig. 72: Removing the cover panel (similar to picture)

You can find the position and labeling of built-in thermocouples in the schematic contained in the appendix.

First remove the two screws (A) from the thermocouple connection. Remove screw (B) and pull out the thermocouple (C).

Insert the new thermocouple carefully into the thermal channel (C), install and connect in reverse order. Make sure that the polarity of the electrical connections (D) is correct*).

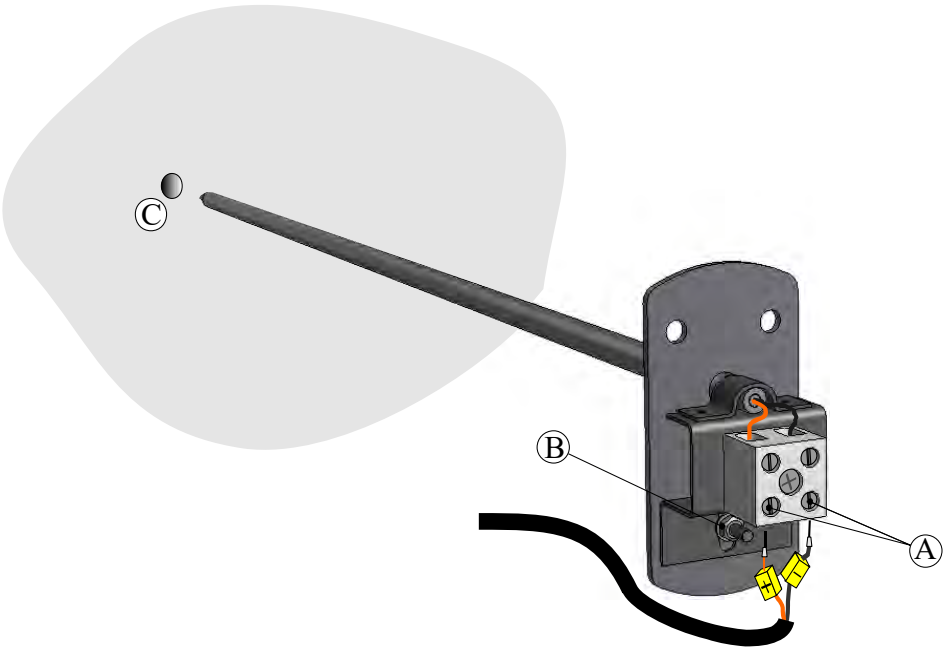


Fig. 73: Removing the thermocouple/s (Similar to this)

Note

*) The connections of the connecting lines from the thermocouple to the controller are labeled with ⊕ and ⊖. It is absolutely essential to observe the correct polarity.

⊕ to ⊕ ⊖ to ⊖

Commissioning

Insert the mains power connector (see chapter "Connection to the Mains Electricity"), then switch on the power switch and check the function of the furnace (see chapter "Operation").

Start-Up

Switch on the power switch and check if the furnace is working (see section "Operation").

9.4 Electrical Schematics/Pneumatic Schematics

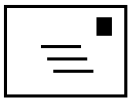
Note

The documents included do not always contain the electrical schematics and pneumatic diagrams.

If you need the respective diagrams, they can be ordered from Nabertherm Service.

10 Nabertherm Service

The Nabertherm Service team is available at all times for furnace maintenance and repair.
If you have any questions, problems, or requirements, contact Nabertherm GmbH. By mail, phone, or the Internet.



Mail
Nabertherm GmbH
Bahnhofstrasse 20
28865 Lilienthal/Germany

Phone or fax
Phone: +49 (4298) 922-0
Fax: +49 (4298) 922-129

Web or e-mail
www.nabertherm.com
contact@nabertherm.de

When you contact us, please have the type plate details of the furnace or controller at hand.

Provide the following details from the type plate:

① Furnace model
② Serial number
③ Article number
④ Year of construction

Fig. 74: Example (type plate)

11 Shut-Down, Dismantling, and Storage

To be Completed by the Operator

When the furnace is shut down, the following safety information must be observed to prevent serious injury, damage to property, and damage to the environment.

The furnace may only be shut down by authorized, trained personnel.

▶ The following operating materials/parts are to be disposed of by:

_____

_____

_____

_____

Oils and other substances that are hazardous to water must be completely removed before the furnace is dismantled for recycling or scrap.
Ensure that operating materials, lubricants, and consumables are disposed of in an environmentally compliant manner. Regulations relating to proper waste recycling and disposal must be observed.

The furnace may be lifted only at the intended points.
Use only the specified lifting and securing equipment to lift the furnace/parts.

Consider a total weight of kg when choosing
_____suitable lifting equipment.

For transportation, consider a permitted floor weight of at least _____kg/m².

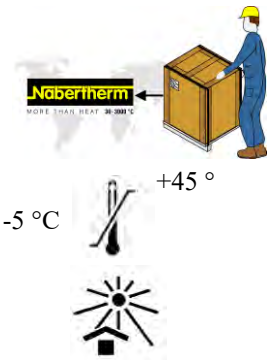
▶ Before transporting the furnace, attach the following securing equipment:

_____
_____
_____
_____

▶

Note
See “Safety” and “Transportation”.

11.1 Transportation/Return Transportation



If you still have the original packaging, this is the safest way to send a furnace.

Otherwise:

Choose suitable, adequately sturdy packaging. During transportation, packages are often stacked, bumped, or dropped; the packaging acts as external protection for your furnace.

- **Drain all piping and containers before transportation/return transportation (e.g. cooling water). Pump off operating materials and dispose of properly.**
- **Do not subject the furnace to extreme cold or hot temperatures (direct sunlight)**
- **Storage temperature -5 °C to 45 ° (23 °F to 113 °F)**
- **Humidity 5 % to 80 %, non-condensing**
- **Place the furnace on a level floor to prevent distortion**
- **Packaging and transportation may be carried out only by qualified and authorized persons**

If your furnace has transportation securing equipment (see "Transportation Securing"), use this.
Otherwise, in general:

“Fix” and “secure” (adhesive tape) all moving parts and cushion and protect any projecting parts against breakage.
Protect your electronic equipment against moisture and make sure that no loose packaging material can get inside it.

Fill gaps in your packaging with soft but adequately firm material (e.g. foam mats) and make sure that the equipment cannot slide around in the packaging.

If the goods are damaged during return transportation due to inadequate packaging or some other breach of duty, the costs will be borne by the customer.

As a rule:

The furnace is sent without accessories, unless the technician expressly requests them.

Enclose a detailed description of the malfunction along with the furnace – this saves the technician time and costs.

Don't forget to enclose the name and phone number of a contact in case there are any questions.

Note

Return transportation may only be carried out according to the information given on the packaging or in the transportation documents.

Note

Transportation and return transportation **not** covered by a warranty claim are paid for by the customer.

12 Declaration of Conformity

EC Declaration of Conformity

Compliant with EC Directive 2006/42/EC on machinery, Annex II A

We,

Nabertherm GmbH
Bahnhofstr. 20, 28865 Lilienthal, Germany

hereby declare that the following product:

Electrically Heated Forced Convection Oven

Model	NA 30/45	NA 60/45	NA 120/45
	NA 250/45	NA 500/45	NA 675/45
	NA 30/65	NA 60/65	NA 120/65
	NA 250/65	NA 500/65	NA 675/65

For all furnaces with switchgear 110 – 480 V and nominal frequency 50/60 Hz.

fulfills all the pertinent provisions contained in Directive 2006/42/EC.

The product named is also compliant with all the provisions of the following directives:

- 2014/35/EU (LVD)
- 2014/30/EU (EMC)
- 2011/65/EU (RoHS)

The signatories are authorized to compile the relevant technical documents. The address is the stated manufacturer's address.

Any change in the product not approved by the manufacturer invalidates this declaration.

The following harmonized standards were applied:

- DIN EN 60335-1 (10.2012)
- DIN EN 61000-6-1 (10.2007), DIN EN 61000-6-3 (09.2011)

Lilienthal, 13.04.2017

Thomas Adamek
Head of Quality Management

Matthias Ritter
Department Manager R & D