

Operating Instructions

High-temperature Tube Furnaces

RHTH for horizontal Operation and RHTV for vertical Operation

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Original instructions

■ Made
■ in
■ Germany

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1 Introduction

Dear Customer,

Thank you for choosing a quality product from Nabertherm GmbH.

You can be proud that you have chosen an oven 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 oven.

1.1 Product Description



These high-temperature tube 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.

High-Temperature Tube Furnace Models RHTH and RHTV

High-temperature tube furnaces, both the horizontal (**model RHTH**) and the vertical (**model RHTV**) are available. The very best insulation materials made of vacuum-molded fiberboards allow energy-saving operation and fast warm-up times thanks to low heat storage and thermal conductivity. The upgrades made available by various protective gas packages enable work to be done in a protective gas atmosphere, a vacuum or even in combustible gases. High-temperature tube furnaces in the model series RHTH and RHTV attain furnace chamber temperatures of max. 1600 °C (2912 °F), 1700 °C (3092 °F) or 1800 °C (3272 °F).

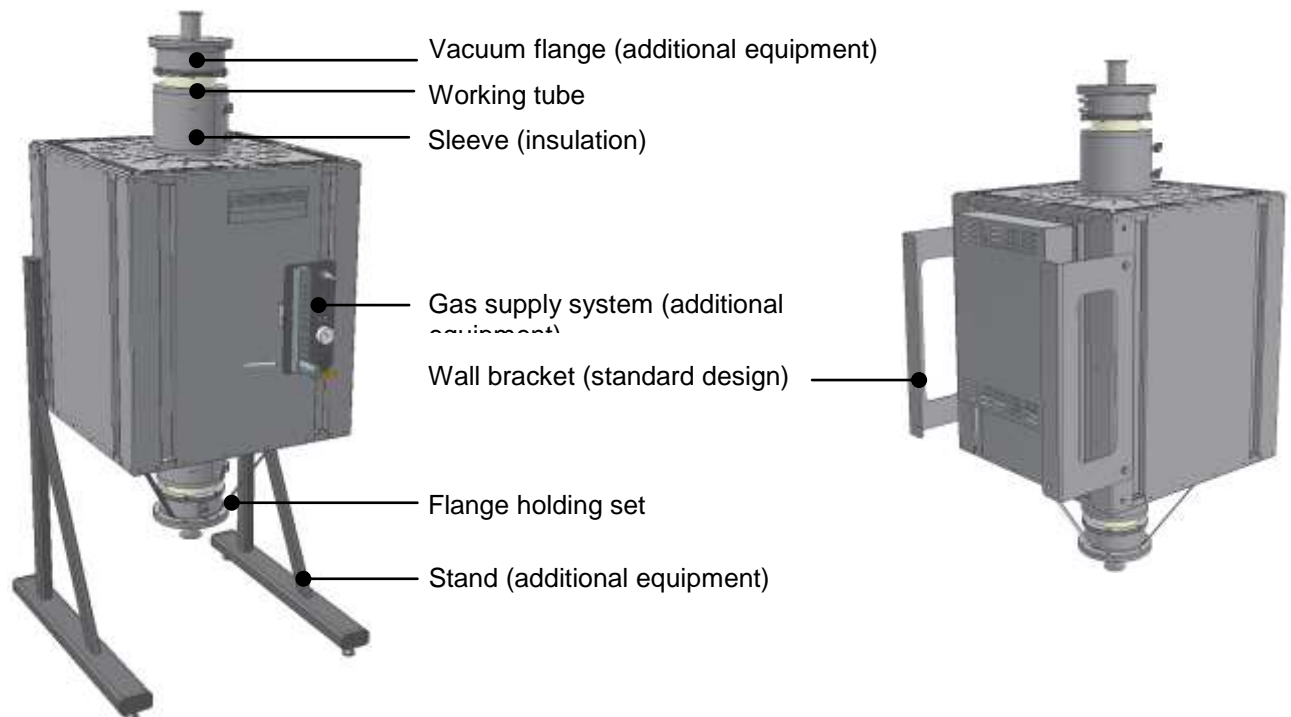
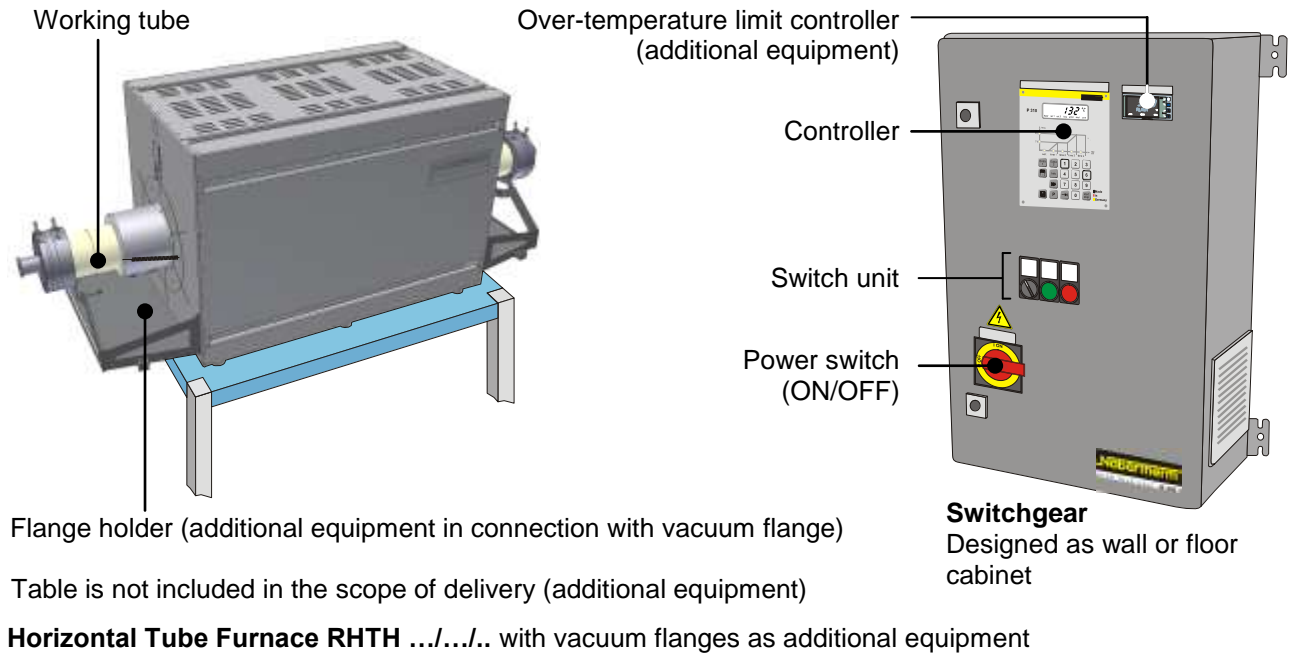
Other characteristics of this product are:

- MoSi₂ heating elements in a hanging arrangement and easy to replace
- Insulation made of vacuum-molded, ceramic fiberboards
- Rectangular outer housing with slots for convection cooling
- Housing made of textured stainless steel sheets
- Ceramic working tube made of C 799 incl. fiber plugs for operating in air included in the scope of delivery.
- Thermocouple type B
- Power unit with low-voltage transformer and thyristor
- Switchgear with controller separate from the furnace with separate wall or floor cabinet.
- Standard working tube as specified in table, see section "Accessories".
- Model RHTV with wall bracket

Additional equipment

- Over-temperature limit controller with adjustable shut-down temperature for thermal protective class 2 as specified in EN 60519-2 to protect the furnace and the charge against overheating.
- Charge control with temperature measurement in the working tube and in the furnace chamber behind the tube
- Working tube, designed for process requirements
- Display of the temperature in the working tube with additional thermocouple
- Gas-tight flange for protective gas and vacuum operation
- Manual or automatic protective gas system
- Three- or five-zone design for optimizing temperature uniformity
- Check valve at gas outlet prevents the penetration of entrained air
- Stand for vertical operation (model RHTV)
- Alternative working tube and accessories as specified in table, see section "Accessories"

1.2 Overview of the Complete Oven



Vertical Tube Furnace RHTH .../.../.. with vacuum flanges as additional equipment

Fig. 1: Example: Overview: High-temperature tube furnace models RHTH and RHTV

1.3 Key to the Model Names

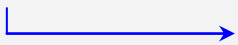
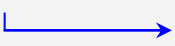
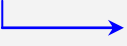

Example	Explanation
RHTH 120/150/16 	RHTH = High-temperature tube furnace horizontal design RHTV = High-temperature tube furnace vertical design
RHTH 120 /150/16 	120 = max. possible tube outer diameter in mm
RHTH 120/ 150 /16 	150 = heated tube length in mm 300 = heated tube length in mm 600 = heated tube length in mm
RHTH 120/150/ 16 	16 = Tmax 1600 °C 17 = Tmax 1700 °C 18 = Tmax 1800 °C



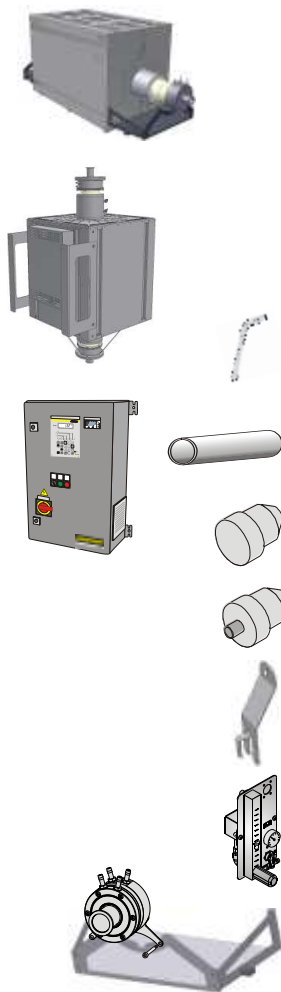
Fig. 2: Example: Model designation RHTH (type plate)



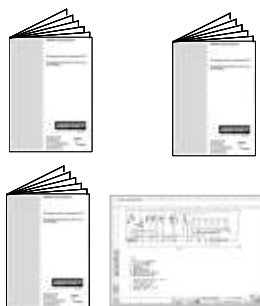
Fig. 3: Example: Model designation RHTV (type plate)

1.4 Scope of Delivery

The scope of delivery includes:



Furnace components	Quantity	Comment
High-temperature tube furnace Model RHTH .../.../.. or High-temperature tub furnace Model RHTV .../.../..	1 x	with wall bracket or stand *)
Control box	1 x	Designed as wall or floor cabinet *)
Allen key	1 x	- - -
Standard working tube Vacuum working tube *)	1 x	- - -
Fiber plugs *)	2 x	Fiber plug and fiber plug holder are only needed for the standard working tube)
Fiber plugs with protective gas connection *)	1 x	
Fiber plug holder	2 x	
Gas supply system *)	1 x	- - -
Flange/Flange holder *)	2 x	- - -
Other components, variable depending on the particular furnace	- - -	Consult the shipping papers



Document type	Quantity	Comment
Instruction Manual High-Temperature Tube Furnace	1 x	Nabertherm GmbH
Operating Instructions Controller	1 x	Nabertherm GmbH
Schematic Circuit)*	1 x	Nabertherm GmbH
Installation Instructions Vacuum Flange *)	1 x	- - -
- - -	- - -	- - -
Other documents, variable depending on the particular furnace	1 x	Consult the documentation binder

*) = in scope of delivery depending on the particular furnace



Caution

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

2 Specifications



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

High-Temperature Tube Furnace

Model	Tmax °C ⁴⁾	Outer dimensions in mm			Max. tube Ø outer/mm	Heated length mm	Length constant temperature ± 5 K	Tube length mm	Connected wattage/kW	Electrical connection	Weight in kg
		W ²⁾	D	H							
RHTH 120/150/ ..	1600	470	550	640	50	150	50	380	5.4	3-phase ¹⁾	70
RHTH 120/300/..	or 1700	620	550	640	80	300	100	530	9.0	3-phase ¹⁾	90
RHTH 120/600/..	or 1800	920	550	640	120	600	200	830	14.4	3-phase ¹⁾	110

Model	Tmax °C ⁴⁾	Outer dimensions in mm ³⁾			Max. tube Ø outer/mm	Heated length mm	Length constant temperature ± 5 K	Tube length mm	Connected wattage/kW	Electrical connection	Weight in kg
		W	D	H ²⁾							
RHTV 120/150/ ..	1600	570	650	510	50	150	30	480	5.4	3-phase ¹⁾	70
RHTV 120/300/..	or 1700	570	650	660	80	300	80	630	10.3	3-phase ¹⁾	90
RHTV 120/600/..	or 1800	570	650	960	120	600	170	880	19.0	3-phase ¹⁾	110

1) Heating only between two phases 2) Without tube 3) Without wall bracket or stand
4) Value Tmax outside the tube. Actually attainable working temperature in tube approx. 50 °C lower.

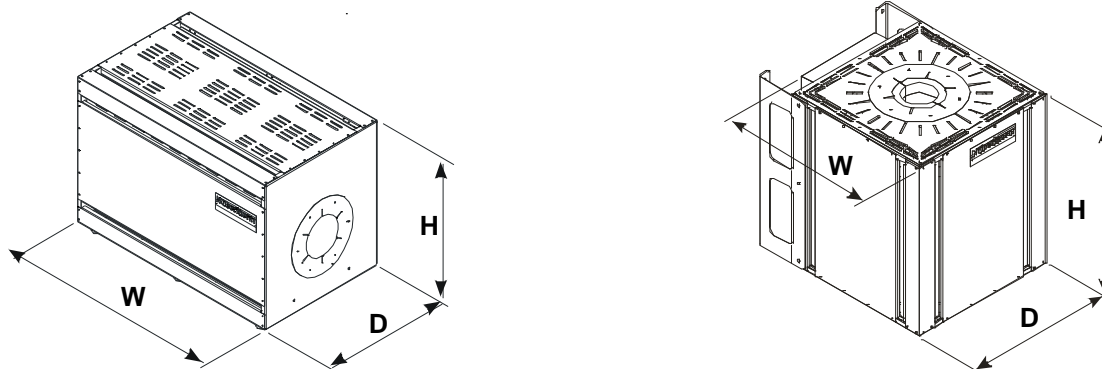


Fig. 4: Dimensions high-temperature tube furnace models RHTH and RHTV

Tmax	1600 °C (2912 °F), 1700 °C (3092 °F) or 1800 °C (3272 °F)	
	Voltage:	200 V – 240 V or 380 V – 480 V
	Frequency:	50 or 60 Hz
Thermal protection class	Furnaces:	as specified in DIN EN 60519-2 without safety controller: Class 0 with safety controller: Class 2
Protective type	Furnaces:	IP20
	Switchgear	IP43
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:

- Everyone involved in operation, installation, maintenance, or repair of the oven 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.
- Not using the oven as intended,
- Improper installation, start-up, operation, or maintenance of the oven,
- Operation of the oven with defective safety equipment or improperly installed or non-functioning safety and protective equipment,
- Not observing the references in the operating instructions to transportation, storage, installation, start-up, operation, maintenance, or equipping the oven,
- Making unauthorized changes to the oven,
- Making unauthorized changes to the operating parameters,
- Making unauthorized changes to the parameterization, the settings, or the program,
- Original parts and accessories are designed especially for Nabertherm ovens. 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.
- Catastrophes due to third-party causes and force majeure.

3 Safety

3.1 Intended Use



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 amount of safety.

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

Any other use 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 Nabertherm GmbH.

It must be established before placing materials in the furnace whether they could attack or destroy the insulation or the heating elements.

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

Changes to the furnace components require prior written approval of Nabertherm. The removal of protective components, avoiding their use, or deactivating them is prohibited.

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

If the furnace is opened when the temperature is greater than 100 °C (212 °F) (for example when charging) the following components can be damaged: Working tube (temperature shock), insulation materials and discoloring of the furnace housing.

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



- This furnace was designed for **commercial** use. The furnace is **not** designed for heating food, animals, wood, grain, etc.
- It is prohibited to use the furnace to heat food and drinks for consumption.
- 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 for metal working.
- Do not use the furnace as a clothes dryer.



Caution

Applicable safety instructions are contained in individual chapters.



Note

The oven 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.

This oven has **no** safety technology for processes in which ignitable mixtures could form, e.g. debinding.

If the oven is to be used for such processes, the concentration of organic gases must never

exceed 3% of the lower explosive limit (LEL) in the oven. This requirement not only applies to normal operation, but also especially to exceptions, such as process faults (e.g. due to the failure of a unit, etc.).

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



Note

This product does **not** comply with the ATEX Directive and may **not** be used in ignitable atmospheres. It must not be operated with explosive gases or mixtures or during processes where explosive gases or mixtures are produced.

3.2 Requirements for the Oven Operator



The set-up instructions and safety regulations must be followed, otherwise the oven will be deemed to have been used improperly, effectively cancelling any claims against Nabertherm GmbH.

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

The operator must ensure that

- all harmful gases are removed from the workplace, for example by an extraction system,
- the extraction system is switched on,
- the workplace is properly ventilated,
- the oven is operated only in a perfect operating condition and, in particular, that the functions of the safety components are checked regularly.
- the required personal protective equipment is available for and used by the operating, maintenance, and repair personnel.
- these operating instructions, including the supplier documentation, are kept near the oven. These instructions must be available at all times for anyone working with or on the oven;
- all the safety and operating instruction signs on the oven can be read properly. Damaged or unreadable signs must be replaced immediately,
- oven 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,
- a risk assessment is carried out (in Germany, covered by Section 5 of the Occupational Safety Act) to determine any other hazards that may result from the working conditions particular to the oven's location,
- all other instructions and safety guidelines that have been determined in a risk assessment for the workplace are compiled in an operation manual (in Germany, covered by Section 6 of the Ordinance Regulating the Use of Operating Equipment).
- operating personnel still in training initially perform their work at the oven under the supervision of an experienced person. Successful completion of the training period must be confirmed in writing.



Note

In Germany, the VBG and BGZ accident prevention regulations must be followed. The accident prevention regulations applicable in the country where the oven is installed must be followed.

3.3 Requirements for the Operating Personnel



The oven may be operated only by persons who are trained, instructed, and authorized to do so. These persons must know the operating instructions and act accordingly. The authorizations of the operating personnel must be clearly defined.

Only adequately qualified and authorized persons may operate, maintain, or repair the oven.

Operating personnel are instructed regularly in all aspects of occupational safety and environmental protection and are familiar with all the operating instructions, in particular, safety instructions.

Only trained personnel may operate the control and safety equipment.

The operator should complete these details:

- Operator _____
- The oven may only be transported by _____
- The oven may only be installed by _____
- The oven may only be commissioned by _____
- Initial instructions may only be given by _____
- Faults may only be rectified by _____
- The oven may only be maintained by _____
- The oven may only be cleaned by _____
- The oven may only be serviced by _____
- The oven may only be repaired by _____
- The oven may only be shut down by _____

3.4 Protective Clothing



Everywhere in the vicinity of the furnace, pouring pans, and similar components, wear protective clothing which is resistant to spatters of molten metal.



Protect your hands by wearing heat-proof gloves.



Wear a respirator (P2 or higher) to protect your respiratory tract e.g. when working on the fiber insulation.

3.5 Basic Measures During Normal Operation



Risks during Normal Operation!

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

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

Before starting production each time, check the oven 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 oven for obvious external damage,
- Check that all safety equipment is working as intended (e.g. emergency stop button),
- 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,

3.6 Basic Measures in Case of Emergency

3.6.1 What to do in an Emergency

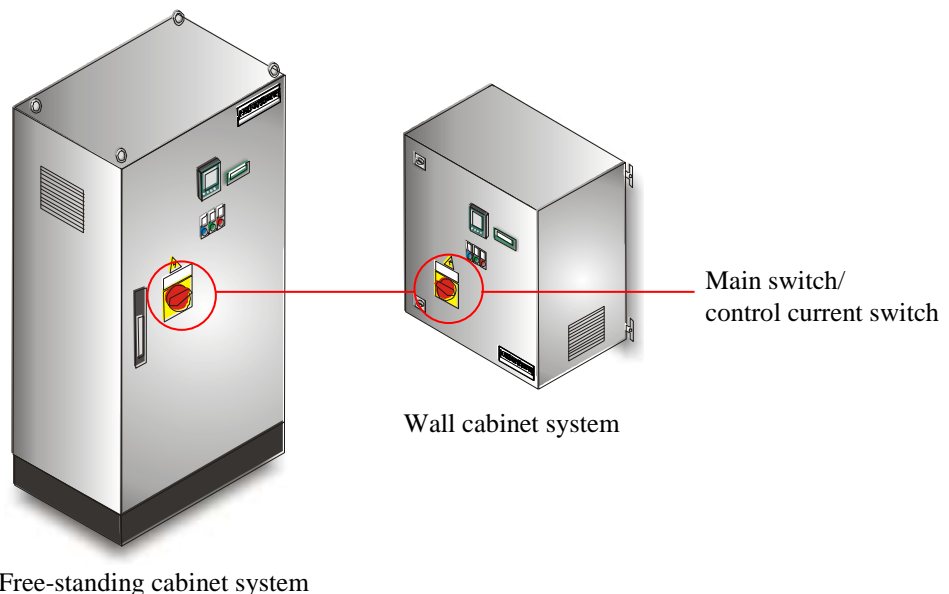
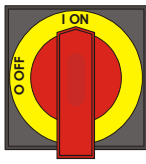


Fig. 5: Example: switchgear with main switch



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.



Note

Due to safety reasons, we also recommend disconnecting the mains power connector.



Warning - Danger of Electric Shock!

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

3.7 Basic Measures for Servicing and Maintenance



Maintenance work must be performed by authorized persons following the maintenance instructions and the accident prevention regulations. We recommend that the 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 oven 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 oven 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 equipment before carrying out maintenance or repair work (if applicable).

When cleaning ovens, 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 oven,
- 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 oven.

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 oven contains no substances that make a hazardous waste classification necessary. However, residues of process materials may accumulate in the oven 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.

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 oven is operating. These residual risks include dangers for humans/products/ the oven, 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.

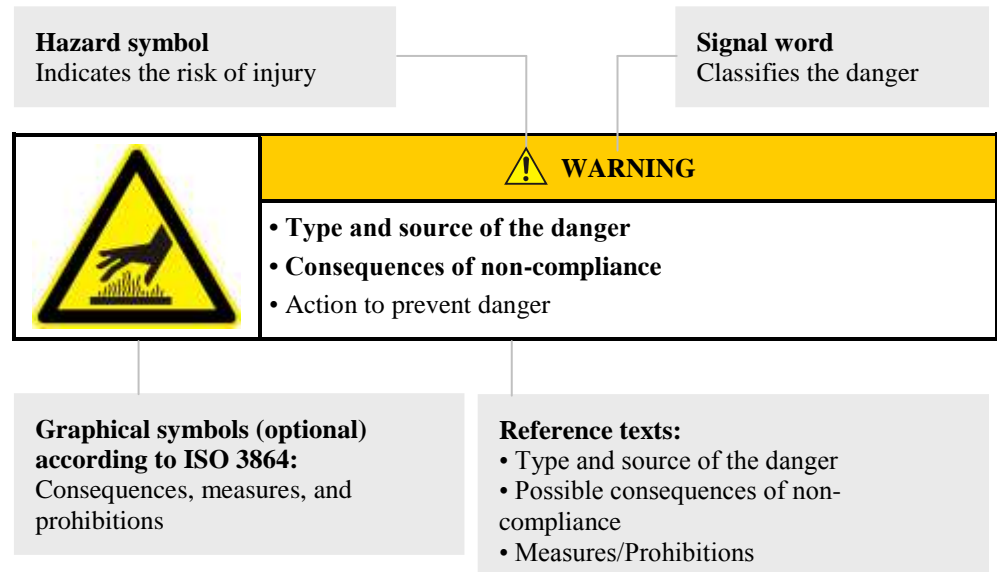
Graphic symbols correspond to **ISO 3864**. In accordance with the American National Standard Institute (ANSI) **Z535.6** the following warning information and words are used in this document:



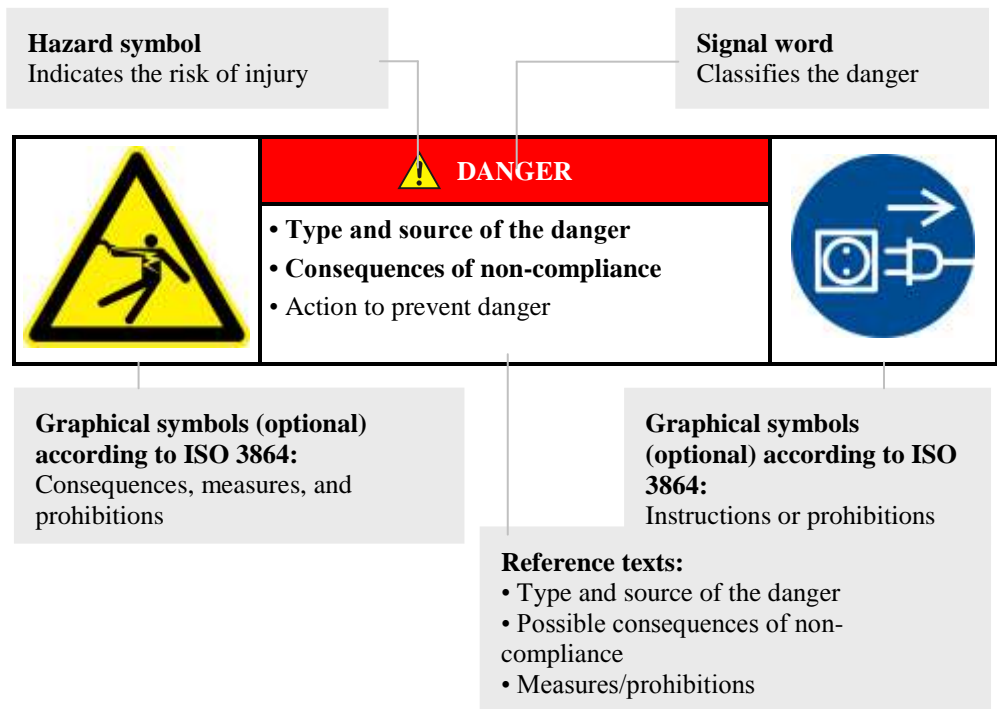
The general hazard symbol, in combination with the words **CAUTION**, **WARNING** and **DANGER** warns about the risk of serious injury. Observe the following information to prevent injury or death.

NOTICE	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



or



Information Symbols in the Instructions:

	<p>Note</p> <p>Below this symbol you will find instructions and particularly useful information.</p>
	<p>Rule - Rule Sign</p> <p>This symbol draws attention to important rules that must be followed. Rule signs protect people against injury and show what is to be done in certain situations.</p>
	<p>Rule - Important Information for Operators</p> <p>This symbol draws the operator's attention to important information and operating instructions that must be followed.</p>
	<p>Rule - Important Information for Maintenance Personnel</p> <p>This symbol draws the maintenance personnel's attention to important operating and maintenance instructions (service) that must be followed.</p>
	<p>Rule - Pull Out the Power Plug</p> <p>This symbol tells the operator to pull out the power plug.</p>
	<p>Rule - Lift only with Several People</p> <p>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.</p>
	<p>Warning - Hot Surface, Do Not Touch</p> <p>This symbol warns the operator that the surface is hot and should not be touched.</p>
	<p>Warning - Danger of Electric Shock</p> <p>This symbol warns the operator that there is a risk of an electric shock if the following warnings are not heeded.</p>
	<p>Warning - Risk of Device Toppling Over</p> <p>This symbol tells the operator that there is a risk of the device toppling over if the following warnings are not heeded.</p>
	<p>Warning - Suspended Load</p> <p>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.</p>
	<p>Warning - Danger if Heavy Loads Are Lifted</p> <p>This symbol warns the operator of the potential dangers of lifting heavy loads. Ignoring this can lead to injury.</p>
	<p>Warning - Risk to the Environment</p> <p>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.</p>
	<p>Warning - Fire Danger</p> <p>This symbol warns operators of the danger of fire if the following information is not followed.</p>



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 Oven:



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

You may not always realize that surfaces, such as oven components, oven 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 Oven



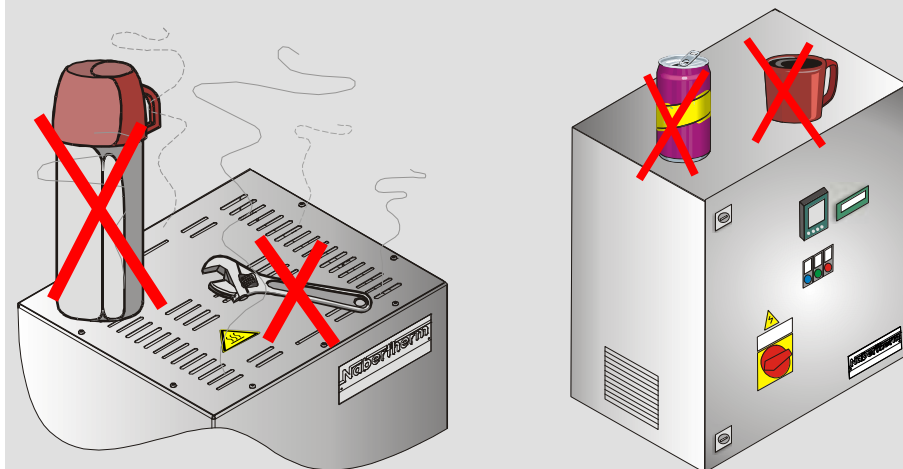
Warning! General hazards!

- Risk of burning on the furnace housing and on the tube
- The door handle/grip can become very hot during operation; wear gloves.
- Risk of crushing on moving parts (door hinge, rotary tube drive, lifting table, etc.)
- The switchgear cabinet (if present) and the terminal boxes on the system contain dangerous electrical voltages.
- Do not insert any objects into the openings on the furnace housing, exhaust air holes, or cooling slots on the switchgear or furnace (if present). This poses a risk of electric shock.



Warning! General hazards!

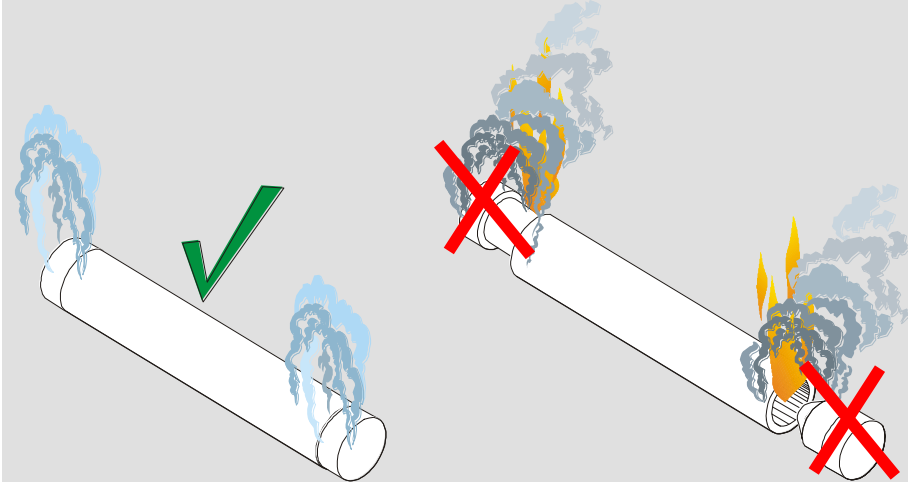
No objects may be placed or set down on the furnace or switchgear. Doing so creates a fire or explosion hazard.





Warning! General hazards!

In case of unexpected events in the furnace (e.g. severe smoking or annoying odor), fiber plugs at the working tube must **not** be opened or removed. Doing so creates a fire or explosion hazard. Wait until the furnace has naturally cooled down to room temperature.



Warning - General hazards!

If unusual processes are occurring in the furnace (e.g., emission of heavy smoke or strong odors), do **not** open or remove the flange at the working tube. Doing so creates a fire or explosion hazard. Wait until the furnace has naturally cooled down to room temperature.



4 Transportation, Installation, and Commissioning

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 oven is being lifted, parts of the oven or the oven itself could topple over, slip, or fall. Before the oven 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 oven 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 oven 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.

Transportation with a Pallet Truck

Observe the maximum permitted capacity of the pallet truck.

1. Our ovens are delivered ex works on wooden frames to facilitate unloading. Transport the oven in its original packaging and with suitable equipment to prevent any damage. Remove the packaging only when the oven is in its final location. When transporting the oven, make sure it is secured against sliding, toppling over, and damage. The oven should be transported and installed by at least two persons. Do not store the oven in damp rooms or outdoors.

2. Push the pallet truck underneath the transportation frame. Make sure that the pallet truck is **completely** beneath the frame. Pay attention to neighboring goods.

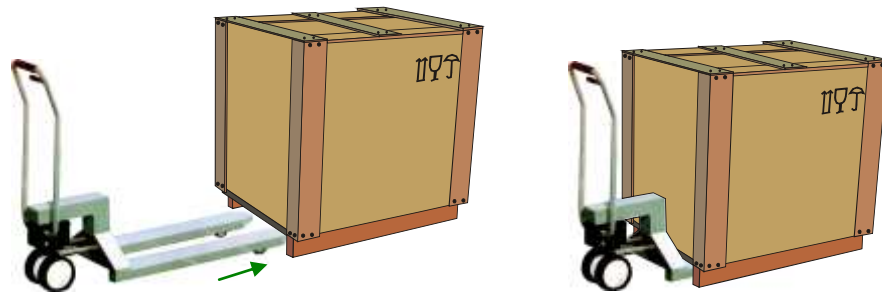


Fig. 6: Pallet truck is pushed **completely** beneath the transportation frame


3. Lift the oven carefully and pay attention to its center of gravity. When the oven is being lifted, make sure that the ends of the forks or the load do not catch on neighboring goods.
4. Make sure that the oven is balanced safely; if not, attach securing equipment. Push the oven carefully, slowly and with the pallet truck at its lowest position. Do not transport the oven on inclines.
5. Carefully lower the oven at its final position. Pay attention to neighboring goods. Try not to set it down too abruptly.

	<div style="background-color: yellow; text-align: center; padding: 5px;">⚠ CAUTION</div> <ul style="list-style-type: none"> 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. 	
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Symbols:

The international standard 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.
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.
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4.2 Unpacking

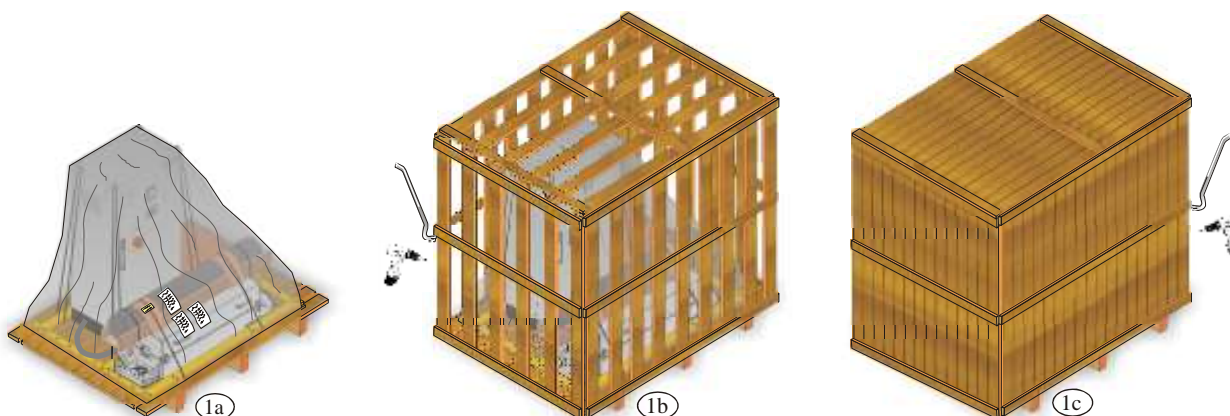


Fig. 7: Packaging unit of the furnace system as: 1a – subframe, 1b – wooden crate or as 1c – wooden box



Use
hand guards

1. Check the transportation packaging for possible damage. The packaging varies according to size, weight and destination, and accordingly comes in one of the following forms: on a pallet (subframe), as a wooden crate or as a wooden box (see figures 1a to 1c).

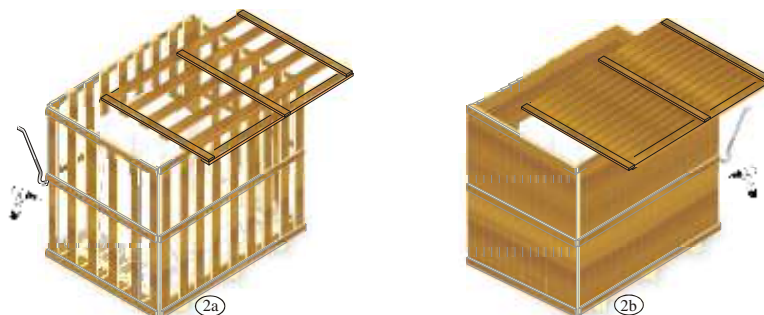


Fig. 8: Remove lid

- 2.. Loosen screws/cramps and then cautiously remove lid upwards.

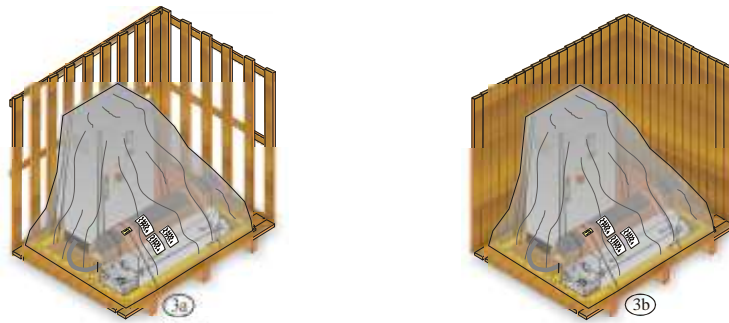


Fig. 9: Remove wooden crate

3. Loosen screws/cramps and then cautiously remove circumferential wooden crate from the subframe.

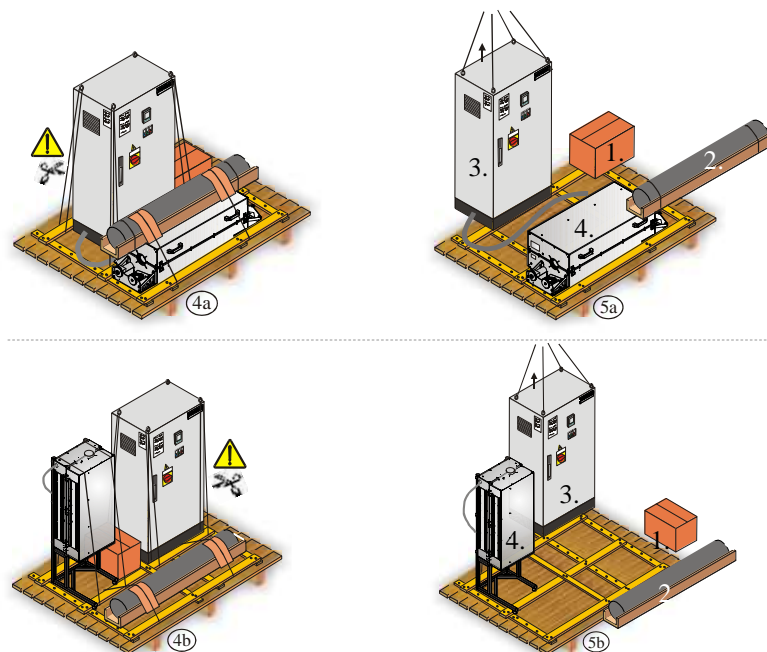


Fig. 10: Figures 4a-5a show tube furnace, model with horizontal operation
Figures 4b-5b show tube furnace, model with vertical operation

4. Remove foil, tensioning straps and other packaging material. When cutting the foil and tensioning straps (see Fig. 4a/b) be careful of cables and adjacent components. Unload small packaged units first, then the switchgear and furnace (see Fig. 5a/b). Compare the scope of delivery with the delivery note and the order documents; see section on "Delivery".

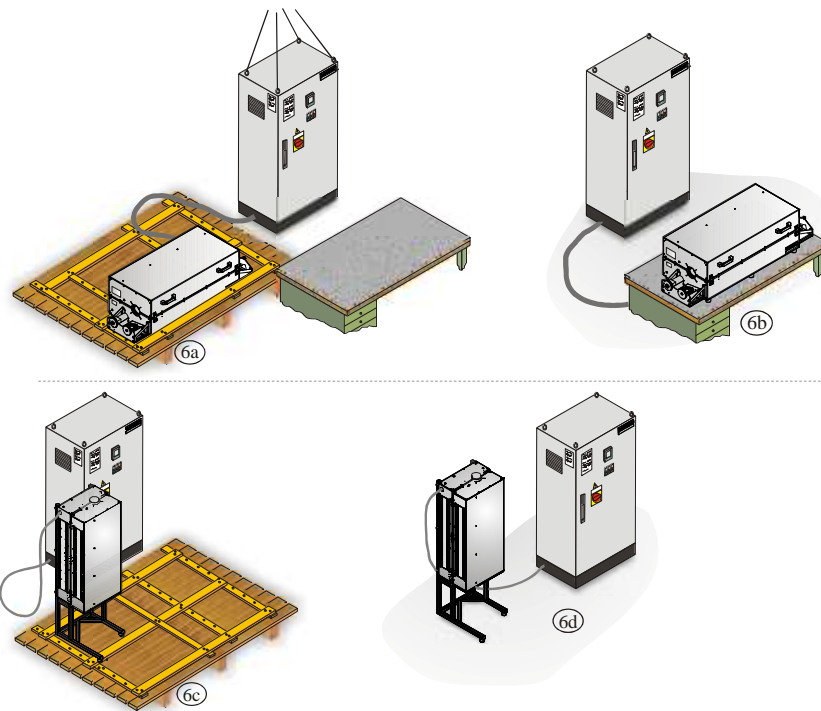


Fig. 11: Figures 6a-6b show tube furnace, model with horizontal operation
Figures 6c-6d show tube furnace, model with vertical operation

5. Lift first the switchgear to the installation location (6a/c), then the furnace (6b/d). Note the maximum cable length between the switchgear and the furnace. The cable must not be damaged. Lay cables so that nobody can step on or trip over them. A damaged cable must be replaced immediately.

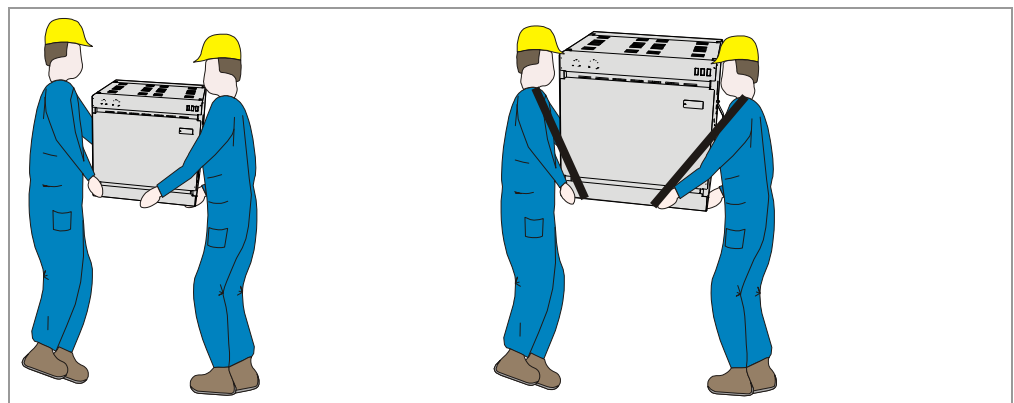


Fig. 12: Transportation RHTH (Example: putting down the palette)

6. Carry the furnace by holding it by the side from underneath.
7. For furnaces over 25 kg the transportation must be done by 2 people. If carrying straps are used they must be only be run from side to side (across). Make sure you have a good hold.

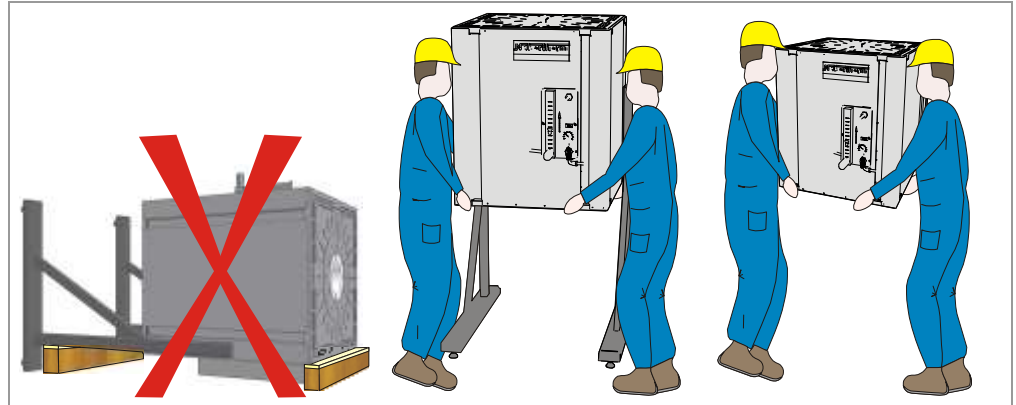
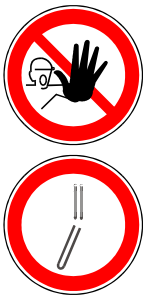


Fig. 13: Transportation RHTV (Example: putting down the palette)

Tube furnaces in the model series RHTV must **not** be transported or set down on their sides because this results in the destruction of the heating element.





Caution

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



Caution

Keep the transportation packaging in case it is needed for future transportation or storage.

	<div style="background-color: yellow; text-align: center; padding: 5px;">⚠ CAUTION</div> <ul style="list-style-type: none"> 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. 	
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4.3 Transportation Securing Equipment/Packaging



Note

No **special** transportation securing equipment is available for this oven

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



Caution - damage to components!

Ceramic tubes are extremely heat-resistant, but easily breakable – therefore handle with care.

4.4 Constructional and Connection Requirements

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

- The furnace must be installed in a dry room in accordance with the safety instructions.
- The table/supporting surface must be flat to enable the furnace to be installed straight. The furnace must be placed on a **noncombustible** base (stone, metal, etc.).
- The carrying capacity of the table must be designed to bear the weight of the furnace incl. accessories.
- The floor covering must consist of non-flammable material, so that hot material falling out of the furnace will not cause the floor covering to ignite.

Despite good insulation, the furnace radiates heat from its external surfaces. If necessary, this heat must be conducted away (**a ventilation engineer must be consulted if required**). In addition, the furnace must be positioned at a minimum safety distance of 0.5 m on each side and 1 m above the furnace away from combustible materials. In individual cases more space must be chosen in order to match the local conditions. The minimum distance away from **noncombustible materials** may be reduced to 0.2 m at the **sides**.

Should gases or vapors escape from the charge, then sufficient air supply and ventilation at the installation location or an appropriate exhaust gas line must be provided.

A suitable exhaust for the burner exhaust must be provided by the customer.

Free-standing cabinet system

The floor must be even and allow the switching system to be installed in a properly level manner.

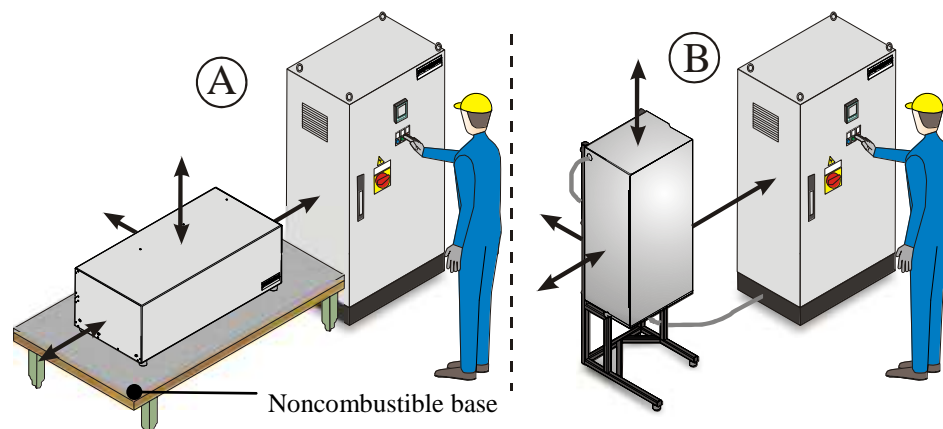


Fig. 14: Installation of a tube furnace with free-standing cabinet system

A = Tube furnace model with horizontal operation

B = Tube furnace model with vertical operation

Wall cabinet system

The wall must offer a secure fastening location. The top edge of the cabinet (C) box should have a maximum height of 2.00 m so that all controls can be reached easily.



Fig. 15: Example: Wall cabinet system

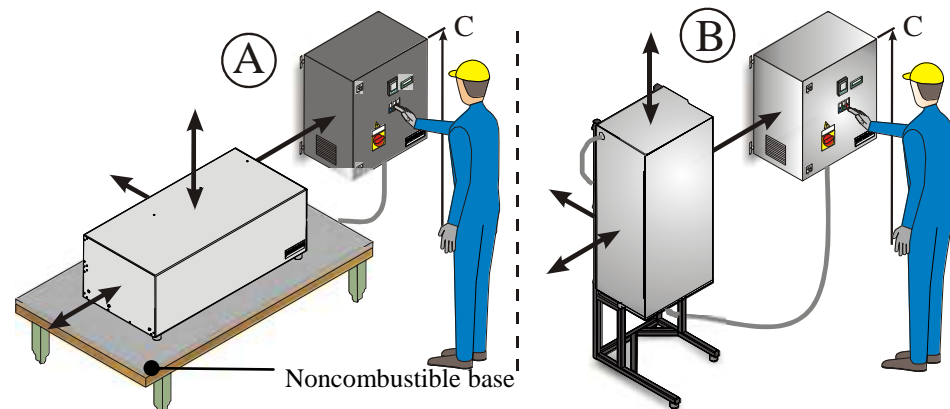


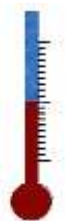
Fig. 16: Installation of a tube furnace with wall cabinet system

A = Tube furnace model with horizontal operation

B = Tube furnace model with vertical operation

Note

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



The installation location must have sufficient ventilation.

Environmental conditions such as temperature and humidity can be found in the chapter "Technical data". At higher ambient temperatures than specified, we recommend the use of the switch cabinet cooling unit.


The switching system must be easy to access.

Moreover, the switching system must be protected against heat, dust and moisture.



WARNING

- **Overheating**
- **Damage to the device**
- Do NOT install device in unventilated niches.
- Ensure sufficient ventilation for dissipating heat.

	! DANGER
	<ul style="list-style-type: none">• Fire- danger to health.• Risk of fatal injury.• Adequate ventilation must be ensured at the installation location to conduct waste heat and any exhaust gases away.

4.5 Assembly, Installation, and Connection

4.5.1 Waste Gas System

We recommend placing the furnace system underneath a suction system in order to discharge the exhaust gases accordingly.

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.

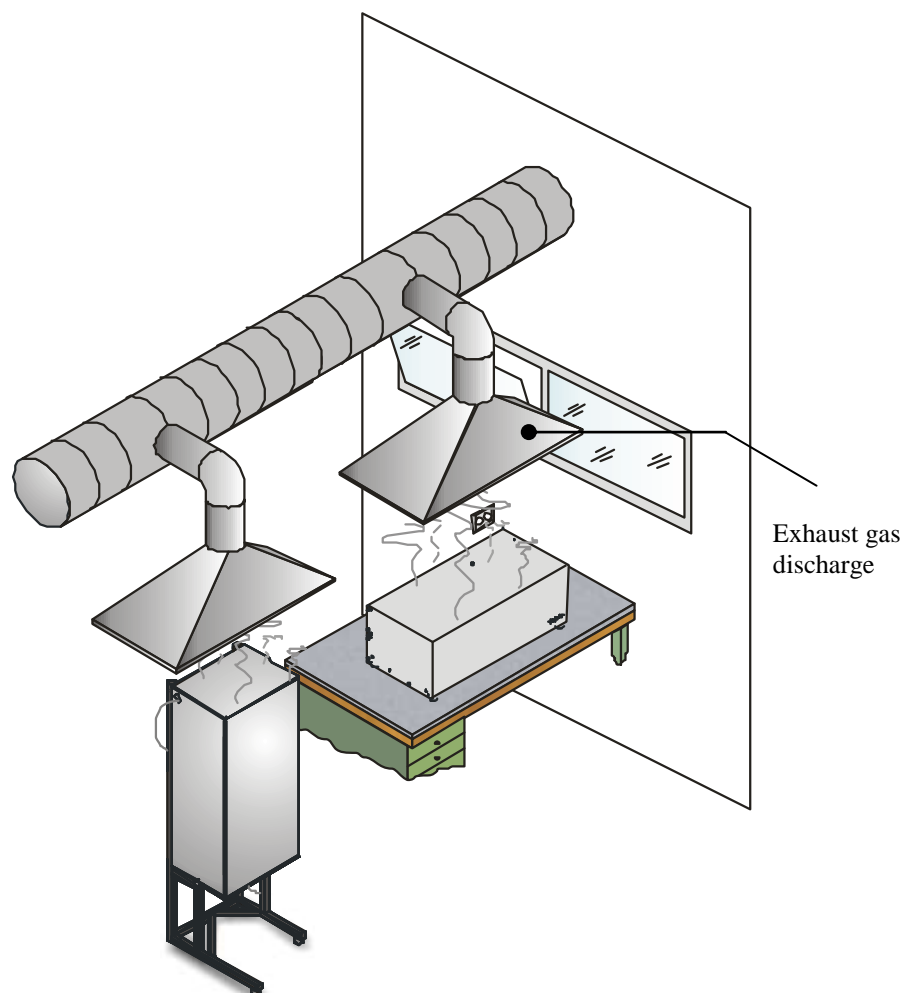


Fig. 17: Example: Assembly of a vent system



Note

The exhaust gases can only be discharged if the room is aerated via an appropriate supply air opening.



Note

Roof work and/or masonry by the customer is required for the exhaust gas discharge. The size and design of the exhaust gas discharge must be determined by a ventilation technician. The national regulations of the local country apply.

4.5.2 Connecting the Oven to the Power Supply

Requirements such as the load capacity of the installation surface, provision of power (electricity), etc. must be fulfilled on-site by the customer.

- Attend to sufficient dimensioning and fusing of the power line according to the furnace's characteristics.
- Ensure protected laying of the connection line from the furnace to the switching system.
- Grounding of the furnace and switching system (compliant with VDE 0100, part 410) is a prerequisite for the current-operated e.l.c.b. system of the heater.
- Test the ground resistance (in accordance with VDE 0100); see also accident prevention regulations.
- Electrical systems and equipment in accordance with BGV A3.

Connection to AC power with power cord:

Plug the power plug into a suitable outlet, taking into account the information on the rating plate for line voltage, line type, and maximum power requirement. The distance between the furnace and the outlet should be minimized; avoid using extension cords.

Connection to AC power without power cord:

The AC power connection is to be made via a permanent connection in the switchgear cabinet either on the prepared terminals or, for models without separate switchgears, directly on the main switch. Note the details on the rating plate regarding line voltage, line type and maximum power requirement.

The fuse protection and the cross section of the AC power connection to be provided depend on the environmental conditions, the length of the line, and the method of line placement. The manner hence should be determined by a qualified electrician at the installation location.

- The power cable must not be damaged. Do not place any objects on the power cable. Lay cables so that nobody can step on or trip over them.
- A power cord may be replaced only by an approved equivalent type of cord.
- Ensure that the furnace connection line is laid in a protected manner.

The design must correspond to the respective locally applicable standards and regulations. Ensure correct grounding conductor connection.

For multiple phases, they should be connected with a clockwise rotating field in the order L1, L2, L3.

Before turning the system on for the first time, ensure that a **clockwise rotating field** is ensured. This is the prerequisite of flawless system function.



Note

For wiring and electrical connections, see the attached circuit diagram. The electrical equipment of the machine can also be seen in the circuit diagram.



Note

The national regulations of the respective country of operation apply.



Warning! Electrical hazard!

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

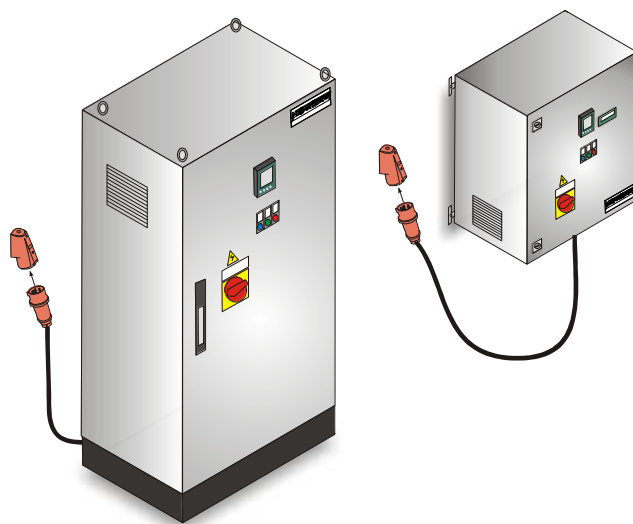


Fig. 18: Power connection **with** power cord

For wiring and electrical connections, see the attached wiring diagram. The electrical equipment of the machine can also be seen in the wiring diagram.

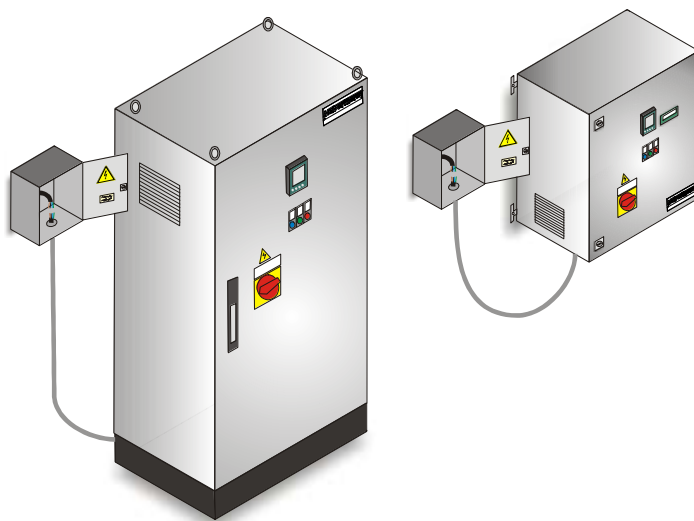




Fig. 19: Power connection **without** power cord

	NOTICE	
	<ul style="list-style-type: none"> • Danger from incorrect voltage • Damage to the oven. • Check voltage before connecting and commissioning the oven. • Compare the voltage with the details on the type plate. 	

4.5.3 Inserting/Introducing the Working Tube



Warning! Electrical hazard!

Before inserting or introducing the working tube, ensure that the power switch is set to the "Off" or "0" position.



Warning! Electrical hazard!

The furnace must not be put into operation without the working tube/protective caps. Otherwise there is a risk of electric shock.



Caution - damage to components!

Ceramic tubes are extremely heat-resistant, but easily breakable – therefore handle with care.



Note

If the furnace is supplied without the working tube at the customer's request, the openings must be secured by protective caps at the factory. Removal of these protective devices and operating the furnace without working tube voids the conformity.

4.6 Furnace Model RHTH

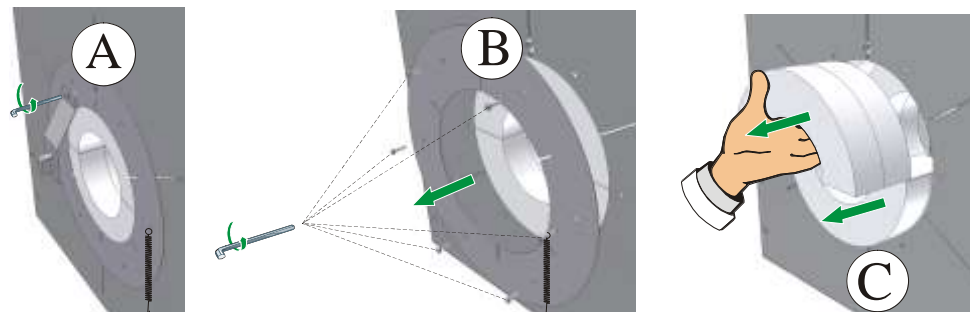


Fig. 20: Removing the fiber plug retainer/ring clamp/insulation half-liners

If included, remove the fiber plug retainer ① from the ring clamp using the Allen key (fiber plug and fiber plug retainer are only needed in connection with the standard working tube).

Remove screws all around the ring ② clamp.

Pull the upper insulation half-liner, then the lower insulation half-liner ③ carefully and slowly from the housing.

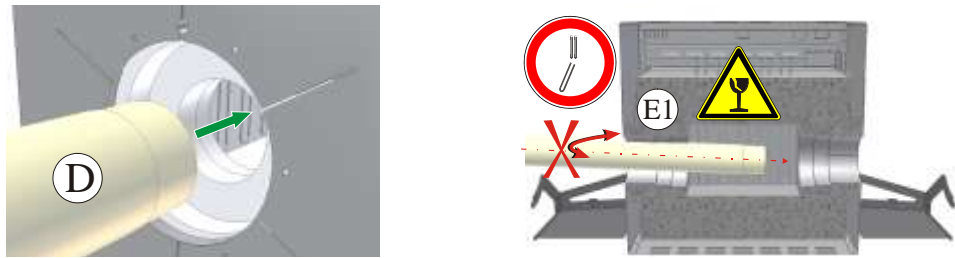


Fig. 21: Inserting the working tube

After the working tube (D) has been completely unpacked, slide it carefully into the opening meant for this purpose. Make sure that there is no packaging material in the working tube. Slide the working tube slowly and horizontally through the opening of the furnace. The heating elements (E1) must not be touched at any time because this can result in the destruction of the heating elements. We recommend getting help from a second person who is delegated the task of inserting the working tube at the opening (E2) on the opposing end.

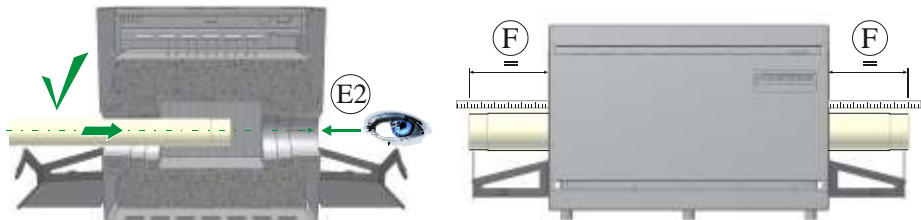


Fig. 22: Center the working tube.

It is important to center (F) the working tube to make installing the flange and the retaining plate easier (attachment between the flange retainer and the flange).

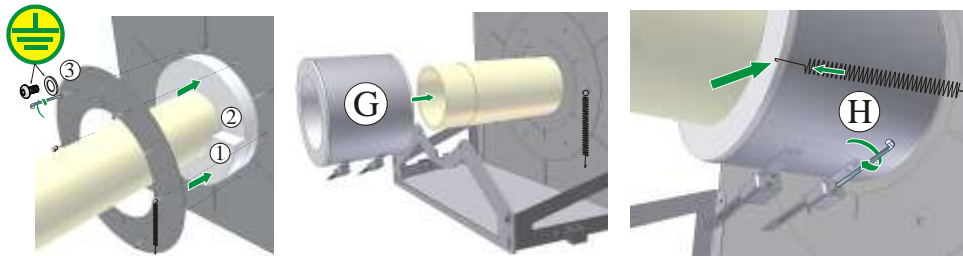


Fig. 23: Inserting the working tube

The insulation half-liners and the ring clamp are installed in the reverse sequence. Replace first the lower insulation half-liner (1) and then the upper insulation half-liner (2) carefully and slowly into the housing. Fasten the ring clamp with the previously removed screws. Make sure that there is a toothed lock washer between the screw and the lid. This position is marked by an earthing sticker (3) on the ring clamp.

Pull the insulation sleeve (G) onto the working tube. Tighten the screws of the insulation sleeve firmly with a suitable tool; this will press the insulation sleeve tightly up against the working tube. The insulation sleeve must also be secured by the tension springs (H) against any shifting of the working tube.

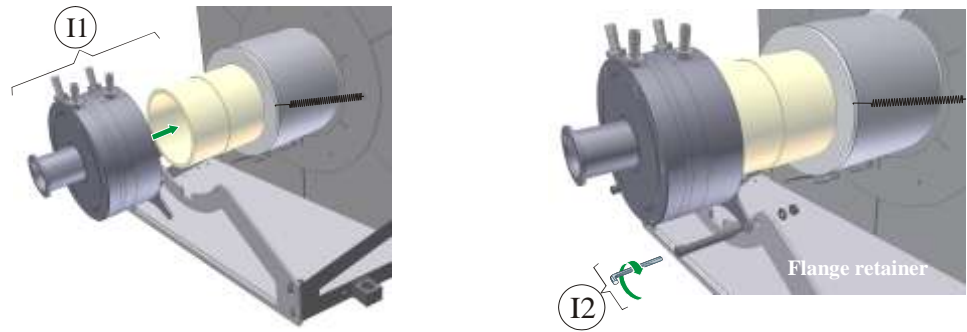


Fig. 24: Installing the flange

More information about installing/removing the flange ①, the flange retainer, retaining plate ② or the connection to the coolant water supply can be found in the separate flange instruction manual.

4.7 Furnace Model RHTV

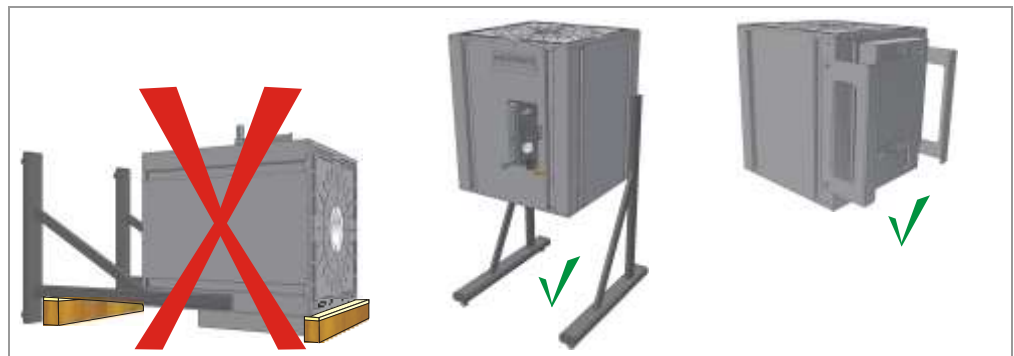
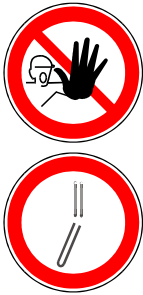


Fig. 25: Important notice

RHTV with stand

RHTV with wall bracket

For the purpose of installing/removing the working tube, furnaces in the model series RHTV must **not** be transported or set down on their sides because this results in the destruction of the heating elements. At least two people are necessary for installing the working tube.

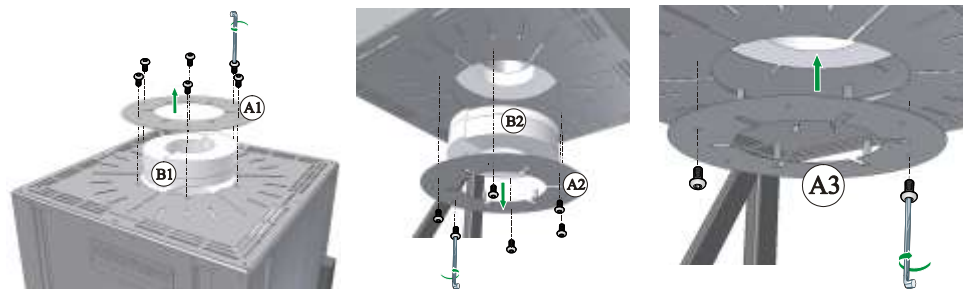


Fig. 26: Removing the ring clamp/insulation half-liners

Remove the screws around the ring clamp using the Allen key included in the scope of delivery. Remove the upper ① and lower ② ring clamp carefully from the housing.

Pull the upper ③ and lower ④ insulation half-liner carefully and slowly from the housing..

After the lower insulation half-liner has been pulled out of the housing, the lower ring clamp must be fastened with two screws to the housing ⑤. This will make the later installation of the lower insulation half-liners much easier.

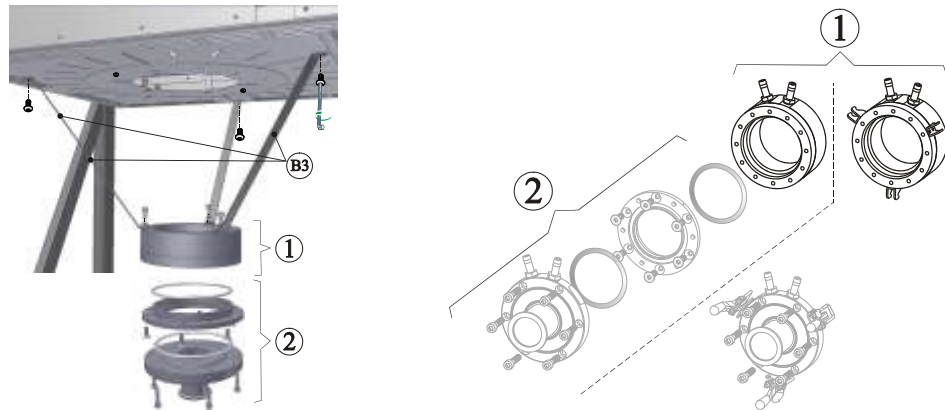


Fig. 27: Installation of the flange retention set

The flange retention set (B3) included in the scope of delivery must be fastened using the screws included in the scope of delivery at the lower housing floor into the installation holes intended for the purpose. The flange packaging must be completely removed. Make sure that there is no packaging material in the flange. It is necessary to completely disassemble the flange before it can be installed onto the working tube. More information about installing/removing the flange can be found in the separate flange instruction manual. After dismantling the flange, the jacket (1) must be fastened to the flange retention set. On the front of the jacket there are three threaded bores for fastening the flange retention set.



Fig. 28: Inserting the working tube

After the working tube (C) has been completely unpacked, slide it carefully into the opening meant for this purpose. Make sure that there is no packaging material in the working tube. Slide the working tube slowly and vertically through the opening of the furnace. The heating elements must not be touched at any time because this can result in the destructions of the heating elements. The working tube (D) must be guided by a second person carefully into the opening of the jacket until it contacts the working tube.

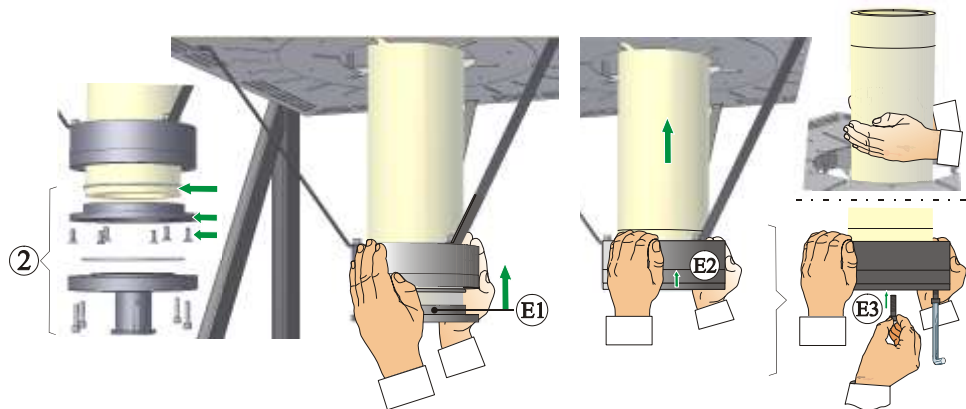


Fig. 29: Installation of the lower flange.

Apply a thin layer of silicon grease included in the scope of delivery to the O-ring and slide it onto the working tube. Slide the clamping lid (E1) carefully until it clearly makes contact

with the working tube. By pushing up the clamping lid **E2** and, thus, the working tube, the engagement of the jacket and clamping lid also presses the O-ring evenly into the inner housing of the jacket. Tighten the counter-sunk head screws **B3** with the 4 mm Allen key uniformly in a criss-cross pattern. All the screws should be equally firmly tightened to ensure a tight seal.

More information about installing the flange can be found in the separate flange instruction manual.

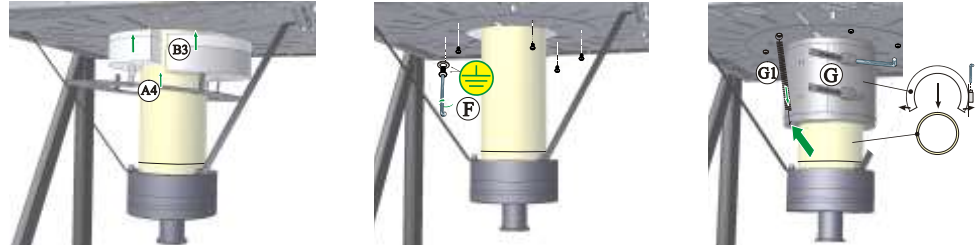


Fig. 30: Installation of the lower insulation half-liners.

The ring clamp **A4**, previously fastened by two screws, must be removed and left to rest diagonally across the flange retainer set. Insert the lower insulation half-liners **B3** carefully and slowly into the housing. Fasten the ring clamp with the previously removed screws. Make sure that there is a tooth lock washer between the screw and the lid. This position is labeled by an earthing sticker on the **F** ring clamp.

Wrap the insulation sleeve **G** around the working tube. Tighten the screws of the insulation sleeve firmly with a suitable tool; this will press the insulation sleeve tightly up against the working tube. The insulation sleeve must also be secured by the tension springs **G1** against any shifting caused by the working tube.

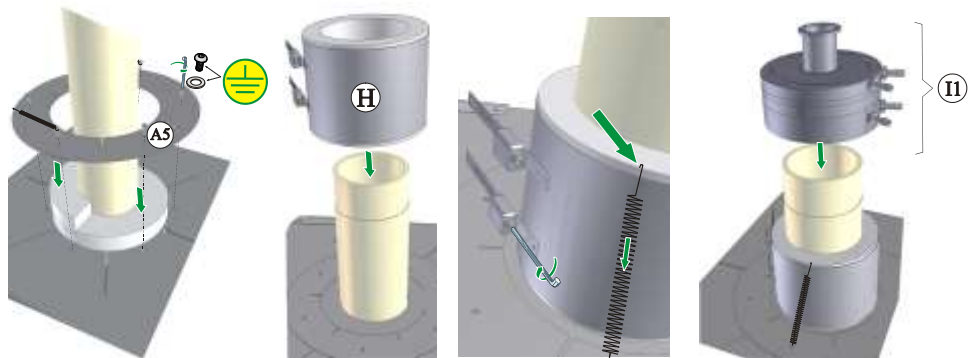


Fig. 31: Installation of the upper insulation half-liners and the flange

Insert the upper insulation half-liners carefully and slowly into the housing. Fasten the ring clamp with the previously removed screws **A5**. Make sure that there is a tooth lock washer between the screw and the lid. This position is labeled by an earthing sticker on the ring clamp. Pull the insulation sleeves **H** onto the working tube. Tighten the screws of the insulation sleeve firmly with a suitable tool; this will press the insulation sleeve tightly up against the working tube. The insulation sleeve must also be secured by the tension springs against any movement of the working tube.

More information about installing/removing the flange **II** or the connection to the coolant water supply can be found in the separate flange instruction manual.

4.8 Commissioning

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

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

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

The oven may be used only for its intended purpose.

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

Before starting the oven 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 oven 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 oven to start unexpectedly.

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

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

Before placing materials in the oven, 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.



Note

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



Note

The furnace must not be put into operation without the working tube/protective caps. Otherwise there is a risk of electric shock.

4.8.1 Molybdenum Disilicide Heating Elements

**Chemical resistance:**

Furnaces heated with molybdenum disilicide elements (MoSi_2) are available for max. furnace chamber temperatures of 1600, 1750 and 1800°C. The max. furnace chamber temperature refers to operation in air. At temperatures of over 800°C, a layer of silicon oxide occurs on the surface of the heating element, protecting it against further oxidation. Such a protective layer is not formed at low temperatures. If the surface of the element is not protected, molybdenum and silicon oxidation can take place at temperatures of around 550°C. This leads to the occurrence of a yellowish powder consisting primarily of molybdenum oxide (MoO_3). This chemical reaction has no disadvantageous effects on the performance of the heating element.

Resistance to metals and oxides:

The heating elements should never come into contact with solid materials, with the exception of ceramic substrate materials.

Metals:

In an oxidizing atmosphere, the majority of metals form scale on the surface (oxide formation occurs due to a thermal influence in an oxidizing atmosphere). This metal oxide may react with the silicon oxide of the heating element and shorten its service life. If the furnace is used to melt metals, it must be ensured that the furnace chamber is protected against metal splashes, soiling and vapors which occur during the melting process (particularly due to fluxing agents). Metal oxides also strongly corrode the insulation of the furnace.

Alkalines:

Alkaline compounds may corrode the heating elements. Alkaline compounds also lead to rapid destruction of the insulation.

Ceramic:

Ceramic may destroy the heating element on direct contact. Salts and oxides from the ceramic may additionally react with the silicon oxide of the heating element and shorten its service life.

Glass:

If glass is melted, the furnace atmosphere contains contaminants, the composition of which depends on the relevant glass product. These components usually act as a fluxing agent on the silicon oxide layer. As a result, its viscosity is reduced and the silicon oxide flows slowly down the heating element. However, new silicon oxide is immediately formed again, with the result that the service life is not noticeably shortened. The insulation may also be severely corroded depending on the type of glass.

4.9 Recommendations for Heating the Oven for the First Time



To achieve a protective oxide layer on the heating elements, the furnace must be heated to **100°C below the maximum temperature, depending on the employed working tube** and according to the **heating rates** given below. This temperature must be **maintained** for approx. **1 hour**. This process must be carried out on commissioning, after exchanging the heating elements or to regenerate the oxide layer. Odor pollution may occur during heating; this is due to the escape of binder from the insulating material. We recommend ventilating the furnace location well during the first heating phase.



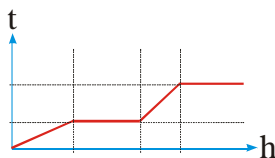
Dangers during normal operation!

When warming up the furnace the following warming-up rates, which vary depending on the working tube, must be observed unless explicitly otherwise stated.

Failing to observe these rates results in the destruction of the working tube and, possibly, of the heating elements.

Maximum permissible warming-up rates:

Depending on the application and temperature various working tubes are available. The technical specifications of the different working tubes can be found in the following table:



Material	Tube Outer Ø mm	Max. Warm-Up Rate K/h	Tmax Atmosphere * °C	Tmax in Vacuum °C	Gas-Tight
C 530 (Sillimantín)	< 120	unlimited	1300	not possible	no
	from 120	200			
C 610 (Pytagoras)	< 120	300	1400	1200	yes
	from 120	200			
C 799 (99.7 % Al ₂ O ₃)	< 120	300	1800	1400	yes
	from 120	200			
Quartz	all	unlimited	1100	950	yes
CrFeAl alloy	all	unlimited	1300	1100	yes

5 Operation

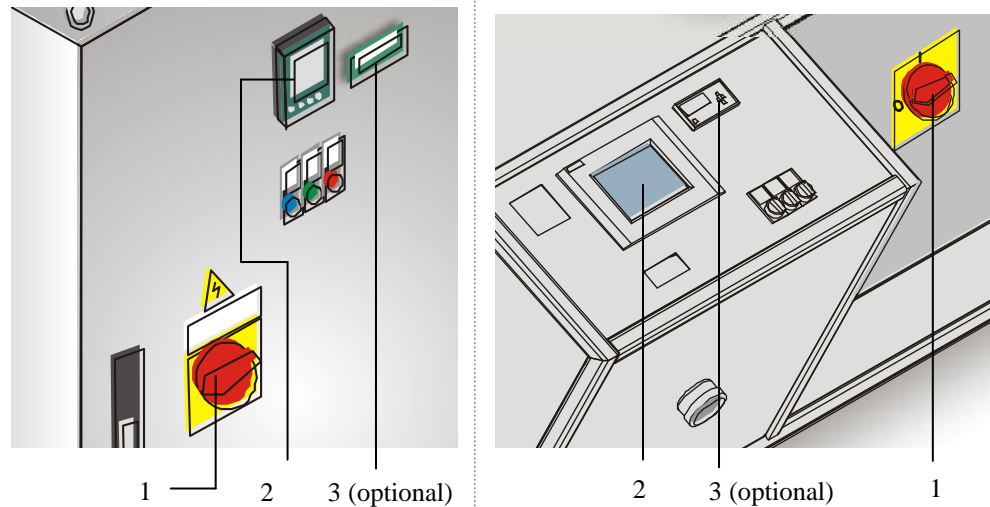
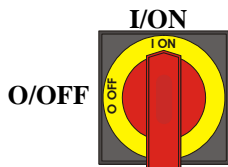


Fig. 32: Furnace system with controller



1. The power switch (1) is used to switch the control current on (**I/ON**) or off (**O/OFF**). When the control current is switched on, the heating chamber temperature is indicated in the LED display on the controller (2).
2. The desired heating and cooling program is set on the controller (2). See separate instructions for a description of the controller.
3. The temperature of the over-temperature limit controller (3) (optional) must be set 30°C higher than that of the controller. See separate operating instructions for a description of the over-temperature limit controller (TWB).

Note

Constant operation at maximum temperature may lead to increased wear on the heating elements and insulation. We recommend working at approx. **50°C below maximum temperature**.

Caution

Continuous operation at maximum temperature can lead to increased wear of the heating elements and the insulation material. We recommend operating at approx. **50 °C below the maximum temperature**.



NOTICE

- **Overheating**
- **Damage to the batch**
- If, as a result of excessive heat, a batch is likely to be damaged by the pre-set response temperature of the over-temperature limit controller with manual/automatic reset or if the batch itself becomes a source of danger for the oven or its surroundings, the temperature setting on the over-temperature limit controller with manual/automatic reset must be reduced to the maximum permissible value.

5.1 Loading/charging

Charging the Furnace

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

The furnace must also be charged when cold.

When charging the furnace make sure that the working tube is not damaged.

The charging must be in as small quantities as possible positioned in the center of the charge space of the working tube. This ensures uniform heating.

When a very large quantity of ware is loaded into the working tube the warm-up times can be substantially longer.

The removal of the fiber plugs, flanges and protective lid is prohibited when hot ($> 400\text{ }^{\circ}\text{C}$). The resulting thermal shock leads to the destruction of the working tube and, possibly, of the heating elements.

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

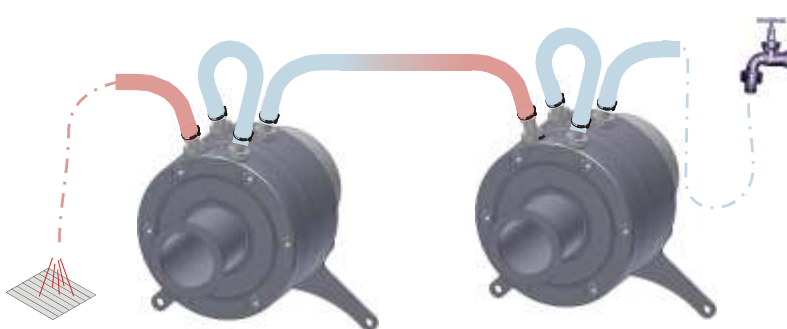
Please make sure that objects such as teapots and bottles are kept away from the furnace.



Warning - Danger of Electric Shock!

For the protection of the operator and the furnace the heating program must be stopped before the furnace is loaded. Ignoring this warning can result in electric shock.

- Vacuum tubes may be heated only with flanges pushed on.
- Open water supply connection before starting program.
- Ensure sufficient water supply ($>0.5\text{ l/min}$).
- The water temperature at the outlet must not exceed 50°C (122°F). Higher temperatures will damage the seals.
- The water supply connection must also remain open after the end of the program until the furnace has cooled down to $<300^{\circ}\text{C}$ ($<572^{\circ}\text{F}$).
- The cooling circuit must be operated depressurized and the water supply may be interrupted only in the supply flow line.
- Several terminal flanges can be connected parallel to the water supply.



- For fitting the working tube, open the vacuum flange at the Allen head screws on the face or at the quick-release fittings (optional).



Note

Vacuum must not be put into operation without a functioning cooling system, otherwise damage to or destruction of the O-ring seals will occur, causing leaks in the vacuum package.



Warning - General hazards! - Furnace opening temperature

Opening the furnace when hot ($>180\text{ °C}$ / $>356\text{ °F}$) is prohibited. The resulting thermal shock can destroy the working tube and possibly the heating elements as well.



Caution - damage to components!

Ceramic tubes are extremely heat-resistant, but easily breakable – therefore handle with care.

	WARNING
	<ul style="list-style-type: none"> • Working tube • Danger of burning. • Do NOT touch working tube, load, flange. Wait until the furnace has naturally cooled down to room temperature.

6 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 (BGV A3) 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 (BGV A3) 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 (BGV A3) 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.



This furnace contains ceramic fiber material in the insulation.

Active handling of these fibers (e.g., exchange of the insulation) in the Federal Republic of Germany is subject to the conditions of the Ordinance on Hazardous Substances, Annex V, No. 7 ("Artificial mineral fibers") of June 12, 1998. In the rest of the European Union, ceramic fibers are categorized as follows by Directive 97/69/EC of the Commission of December 5, 1997 CARC. Cat. 2; R 49; Xi R 38. Work with the fiber insulation must therefore be done in such a way that as little fiber dust as possible is released.



The following points must be noted when handling ceramic fiber:

- Dust development during processing should be minimized.
- Contact with skin and eyes should be avoided. The effects caused by fibers on the skin or in the eyes may cause mechanical irritation, as a result of which reddening and itching may occur.
- When processing large quantities of ceramic fibers, loose work clothing with long sleeves, gloves and safety glasses should be worn.
- When working with ceramic fiber insulation inside furnaces, a half/quarter mask with P2 filter should additionally be worn.

The furnace and its operating equipment must be regularly checked in accordance with the regulations of the employer's liability insurance association (BGV A3) or the corresponding national regulations in the relevant country of use!

6.1 Shutting the system down for 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.
- Notify operating personnel and specify a supervisor.
- Switch off the main switch and disconnect the mains power connector.
- Lock the main switch and secure against restoration of power using a padlock.
- Attach a warning sign on the main switch.
- Seal off a large area around the servicing area.
- Check for disconnection of power.
- Ground and short-circuit the working area.
- Cover any nearby parts still under power.



Warning! General hazards!

Do not touch any object without first checking its temperature.



Warning - Danger of Electric Shock!

Work on the electrical equipment may be done only by qualified, authorized electricians. During maintenance work it must be ensured that the oven and the switching equipment cannot be activated by mistake (pull out the power plug) and that all moving parts in the oven are secured. Observe BGV A3 or the corresponding national regulations in the country where the oven is installed. Wait until the oven and the connected parts have cooled to room temperature.



6.2 Regular Maintenance of the Oven

Position/ Maintenance center	Measure	Maintenance interval					Service	Speci alized
		Daily	Weekl y	Monthl y	Quarter ly	Annua lly	Personnel	
Safety inspection compliant with BGV A3 or the corresponding national regulations	Compliant with regulation	Compliant with regulation						X
EMERGENCY-OFF system (if included)	Press the pushbutton	●					X	
Safety and limit switch (if included)	Functional test					●		X
Furnace chamber, vent holes and vent pipes	Clean and check for damage, vacuum out carefully			●			X	
Seal surfaces: Door collar/furnace collar	Visual inspection	●					X	
Seals (if included)	Clean/replace		●				X	
Heating elements/retorts	Visual inspection	●					X	
Screws of the element holders see section entitled "Check Heating Element Screws" (if included)	Check and carefully tighten element holder screws.		● (first time)			● (subsequen t)		X
Verify uniform power consumption of the heating system	Functional test					●		X
Thermal element	Visual inspection (visual part of the thermocouple in the furnace chamber)	●					X	
Check setting value	Check as part of work plans	●					X	
Settings on the over-temperature limit controller	Every time the heat treatment program is changed	Every time the heat treatment program is changed check the trigger temperature (alarm value) on the over- temperature limit controller.					X	
Measurement and control precision	Calibration					●		X
Symbols:	■ = clean ● = test, replace x = Performed by							

Fig. 33: Maintenance Table



Warning - Danger of Electric Shock!

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



Note

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

6.3 Checking the Heating Element Screws



Warning - Danger of Electric Shock!

Work on the electrical equipment may be done only by qualified, authorized electricians. During maintenance work it must be ensured that the oven and the switching equipment cannot be activated by mistake (pull out the power plug) and that all moving parts in the oven are secured. Observe BGV A3 or the corresponding national regulations in the country where the oven is installed. Wait until the oven and the connected parts have cooled to room temperature.



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.

Dismantling the Furnace Lid

Remove the screws of the lid with the included Allen key.
Remove lid, see also section entitled "Replacing the Heating Elements"
Subsequent installation of the previously removed parts in the reverse sequence.

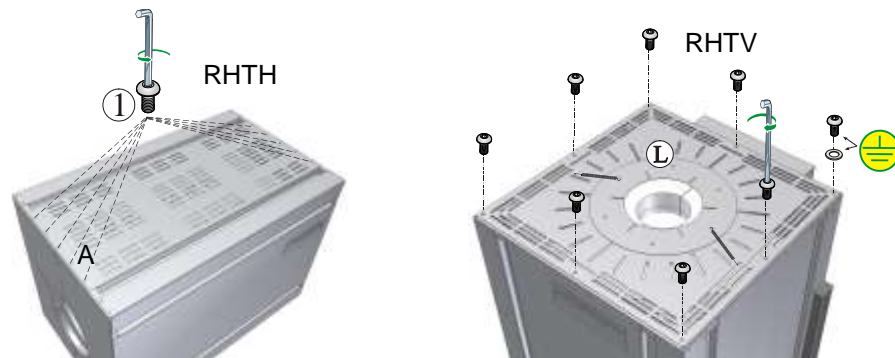


Fig. 34: Remove furnace lid

Checking the element holder screws and retightening if necessary

All screws must be carefully retightened after one week's operation and then once per year. Any strain on or rotation of the heating element must be avoided. The element must be secured with pliers to prevent rotation. Failure to observe this rule will lead to the immediate destruction of the sensitive heating elements.

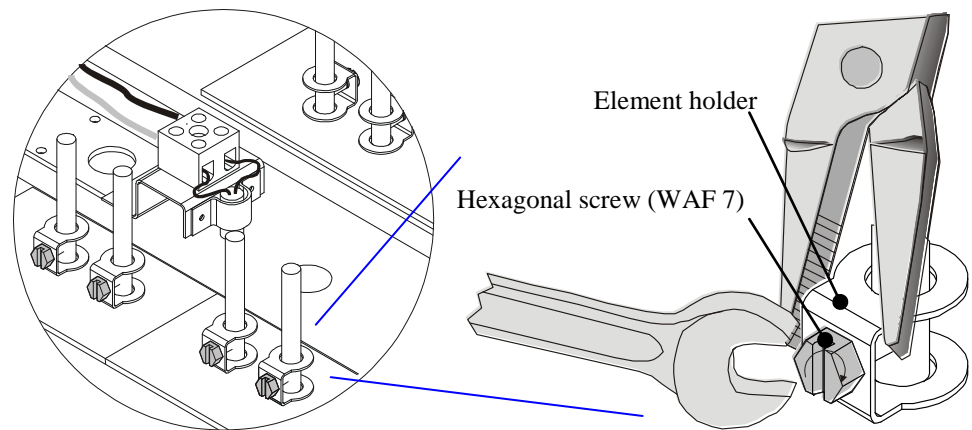


Fig. 35: Securing element holder screws.

6.4 Operating and Auxiliary Materials

6.5 Cleaning Products



Follow the procedure for shutting down the furnace system (in the "Operation" section). Then the power plug must be pulled out of the socket. Wait until the furnace cools down naturally.

Use commercially available detergent which is either water-based or non-combustible and free of any solvents to clean the housing of any deposits; use a vacuum cleaner for the interior.

Follow the labeling and the instructions on the packaging of the detergent.

Wipe the surface with a damp, lint-free cloth. The following detergents can also be used:

This list must be completed by the operator.	
Component and location	Detergent
Outer surfaces (frames *)	Use commercially available detergent which is either water- or non-combustible and free of any solvents for cleaning *)
Outer surface (stainless steel)	Stainless still cleaner
Interior	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 included)	Use commercially available detergent which is either water- or non-combustible and free of any solvents for cleaning
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 and, hence, environmentally safe paint (the clear should be tried first on an interior, normally unseen location).	

Fig. 36: Detergent

Do the cleaning from beginning to end without breaks to protect the surfaces. Remove the detergent completely from the surfaces by wiping them with a damp, lint-free cloth.



After cleaning all the supply lines, check all the connections for leaks, loose connections, abrasion and damage; report any shortcomings found immediately!

Please follow the section entitled "Environmental Protection Rules and Regulations"



Caution

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

	<div style="background-color: red; color: white; text-align: center; padding: 2px;">⚠ DANGER</div> <ul style="list-style-type: none"> • 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 oven to dry completely before operating it again 	
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7 Faults

Work on the electrical system may be done only by qualified, authorized electricians. Operators may only rectify faults that are obviously due to operating errors. Call the local electrician for faults that you cannot localize. If you have any questions, problems, or requirements, contact Nabertherm GmbH. By mail, phone, or e-mail → See "Nabertherm Service".

Type of errors	Possible causes	Correcting the error
Controller does not switch on.	-No voltage available. -Controller defective.	-Check connection fuse(s), renew if necessary. -Check controller fuses (if available), renew if necessary. -Check plug connector.
Controller indicates fault.	-See separate instructions for controller.	-See separate instructions for controller.
No heating chamber heating after starting program.	-Error in program input. -Connection fuse(s) defective. -Heating element defective	-Check heating program (see separate instructions for controller) -Check connection fuse(s), renew if necessary. Notify Nabertherm Service if the new fuse trips on screwing in. -Have checking carried out by Nabertherm Service.
Very slow heating of the heating chamber	-Connection fuse(s) defective.	-Check connection fuse(s), renew if necessary. Notify Nabertherm Service if the new fuse trips on screwing in.
Selected end temperature not reached.	-Lack of heater output due to undervoltage. -Heating element defective -Ends of the working tube not closed (fiber plugs, vacuum flanges)	-Have checking carried out by Nabertherm Service. -Close ends of the working tube (fiber plugs, vacuum flanges)

8 Spare Parts/Wearing Parts



Ordering Spare Parts:

Our Nabertherm Service team is available to you all around the world. Due to our considerable production depth we deliver most spare parts from the warehouse overnight or can make them ready for delivery within short deadlines. You can order Nabertherm spare parts easily and simply directly from the factory. If you cannot find the spare part you want we will be glad to help you. Spare parts can be ordered in writing, by phone or on the Internet -> see the section entitled "Nabertherm Service".

Availability of Spare Parts and Wearing Parts:

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



Note

Original parts are designed especially for Nabertherm ovens. 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 removing and installing replacement and wear parts. See section on "Nabertherm Service". Work on the electrical equipment may only be performed by qualified and authorized specialist electricians. This applies also to repairs not described below.

8.1 Replacing a Heating Element



Warning - Danger of Electric Shock!

Work on the electrical equipment may be done only by qualified, authorized electricians. During maintenance work it must be ensured that the oven and the switching equipment cannot be activated by mistake (pull out the power plug) and that all moving parts in the oven are secured. Observe BGV A3 or the corresponding national regulations in the country where the oven is installed. Wait until the oven and the connected parts have cooled to room temperature.

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.

Tools

To change the heating elements, you will need the following tools:



Tools

8.2 Furnace Model RHTH

Dismantling the Furnace Lid

Remove screws ① from the lid with the Allen key included in the scope of delivery. Pull the lid forwards as shown in the picture ② and remove by lifting it upwards ③.

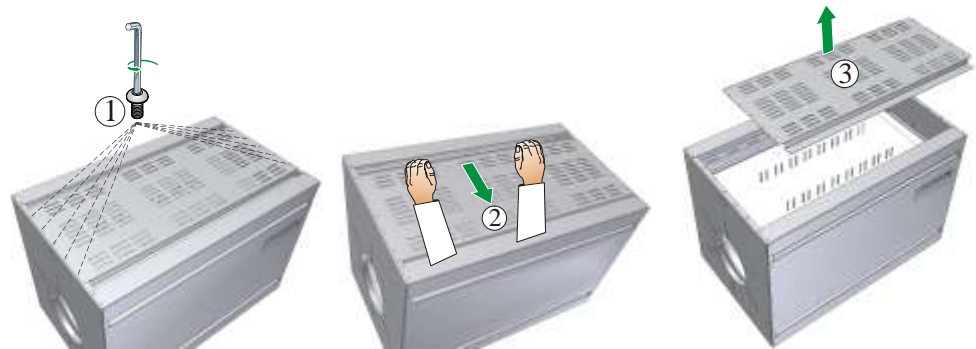


Fig. 38: Furnace lid

Clamps and connection contact/connection bridge

Carefully press the clamps open with the heating element pliers and pull upwards. Loosen the connection contact or connection bridge upwards from the heating element.

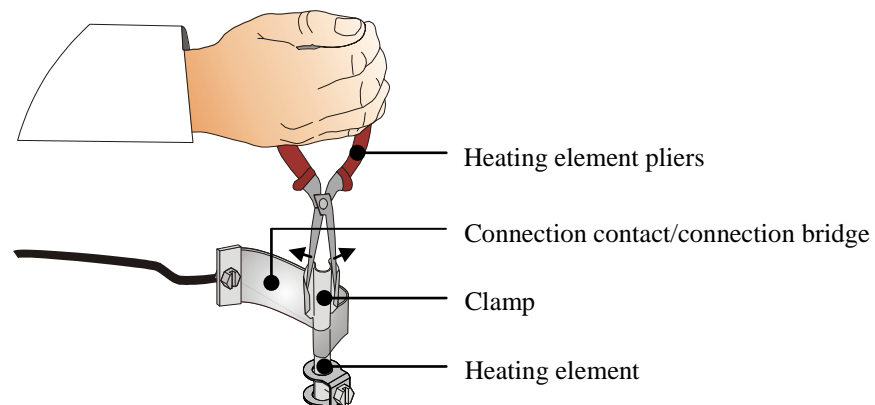


Fig. 39: Clamps and connection contact

Element holder and insulation

Loosen the screws from the element holder with an open-ended wrench. Pull the element holder from the heating element. Remove the underlying fiber paper and fiber wool from the slot between the legs of the heating elements.

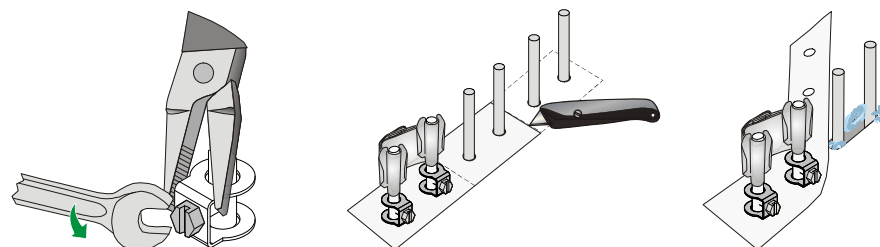


Fig. 40: Removing the element holder and insulation

Replacing heating elements

Carefully pull heating elements out upwards; do **not** press heating element legs together whilst doing so. Clean heating chamber and passage holes (vacuum out). Carefully insert new heating elements from above. Attention: Pay attention to the correct installation height! See sketch. An assembly support (e.g. foam) between the heating elements and the base of the furnace is helpful.

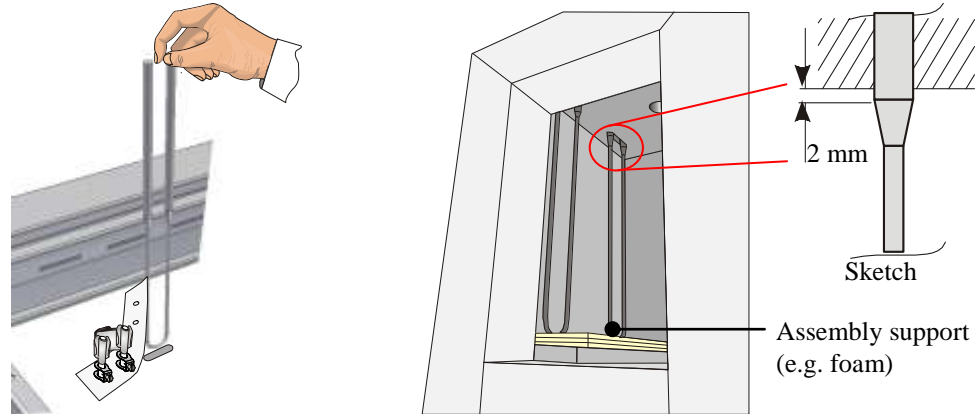


Fig. 41: Heating elements

Insulation

Fill the slots between the ends of the element connections with fiber wool *). Place 2 mm fiber paper *) on lightweight refractory bricks.

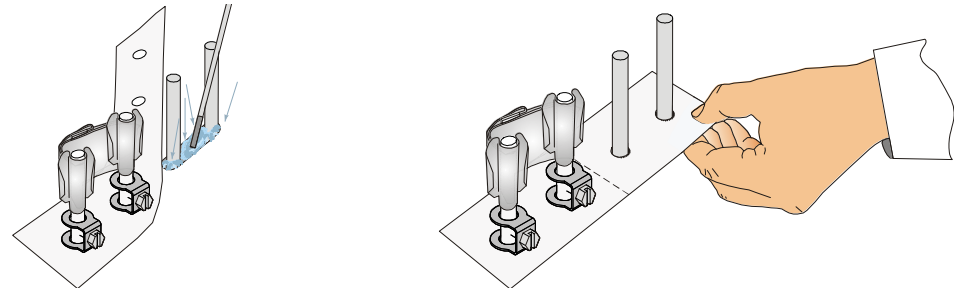


Fig. 42: Fiber wool

Fiber paper

Assembling the heating elements

Place element holder onto ends of heating element. **Carefully** tighten the hexagonal screws (WAF 7) of the element holders; the screw heads must point outwards. Any strain on or rotation of the heating element must be avoided. The element must be secured with pliers to prevent rotation. Position connection contact or connection bridge onto heating element ends and secure with new clamps, making sure these are positioned correctly to each other. Element holders, screws, spring clamps and cables must be properly checked.

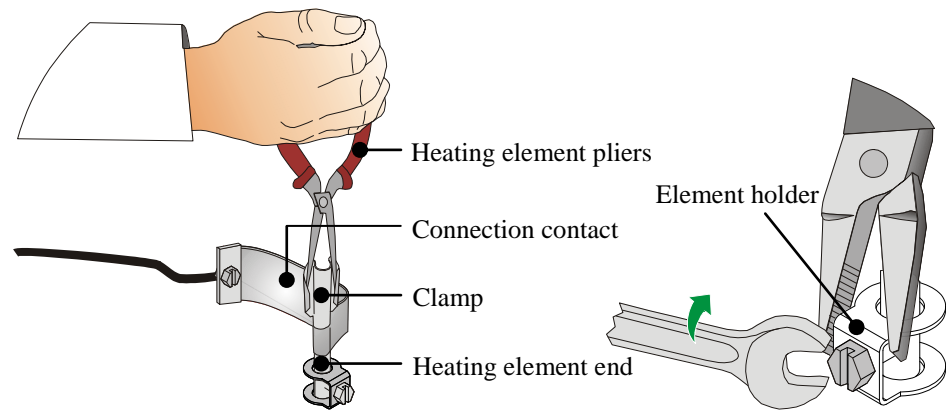


Fig. 43: Assembly

Additionally secure element holder with pliers

Installing the Furnace Lid

The furnace lid is installed in the reverse order. Place the furnace lid ① and center ② it. Fasten the furnace lid with the previously removed screws ③. Make sure that there is a tooth lock washer between the screw and the lid. This position is labeled by an earthing sticker on the housing/lid.



Fig. 44: Installing the Furnace Lid

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").

Note

Do not forget to remove the assembly support/assembly aid from the furnace chamber.

Note

*) = Enclosed with spare part delivery.

8.3 Furnace Model RHTV

For the purpose of installing/removing the heating elements the furnaces in the model series RHTV **must not** be transported or set down horizontally since this results in the destruction of the heating elements. See section "Inserting/Introducing the Vacuum Tube with Flange – RHTV". At least two people are necessary for installing/removing the working tube.

The flange, insulation sleeves, upper lid, lower ring clamp, insulation half-liners and the working tube must be removed before the heating elements can be replaced.

More information about installing/removing the flange (A) or the coolant water supply can be found in the separate flange instruction manual.

Remove the upper tension springs (B) and screws of the insulation sleeve. Pull the insulation sleeve (C) upwards from the working tube. Remove the tension springs (D) and screws of the lower insulation sleeve. Carefully fold back the lower insulation sleeve (E) and pull it from the working tube as shown in the figure below.

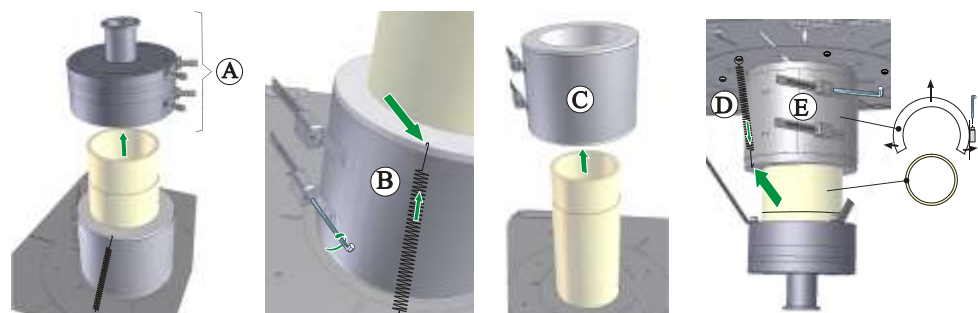


Fig. 45: Removal flange/insulation sleeve

Remove screws (F) or snap fasteners (depending on design) and the O-ring from the flange. Remove the screws (G) from the retaining lid. We recommend having a second person pressing the retaining lid together while the screws are being backed off to prevent a sudden drop of the working tube. A third person, for the sake of safety, should provide support by holding the working tube from above. When an unintended drop of the working tube occurs there is the risk that you will have your fingers crushed by the working tube's ledge or that the working tube will be damaged. We recommend pressing against the flange from below (H).

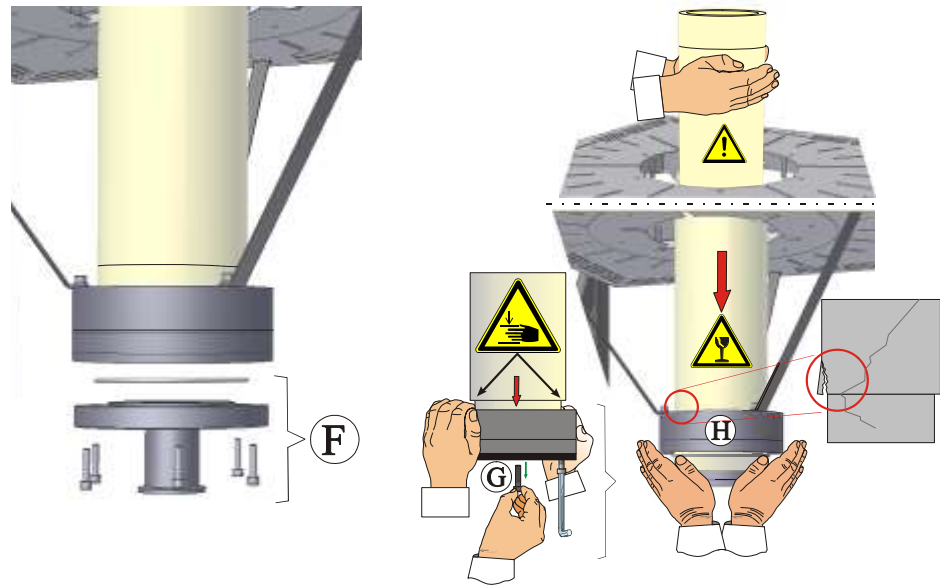


Fig. 46: Removal of the lower flange.

After removing the retaining lid, the working tube must be pulled upwards out of the furnace housing (I). We recommend that the working tube be held and guided by a second person. After removing the working tube, the lower ring clamp (J) must be removed and placed diagonally across the flange. Carefully and slowly pull the insulation half-liners (K) out of the housing. The heating elements must not be touched at any time because this can result in the destructions of the heating elements.

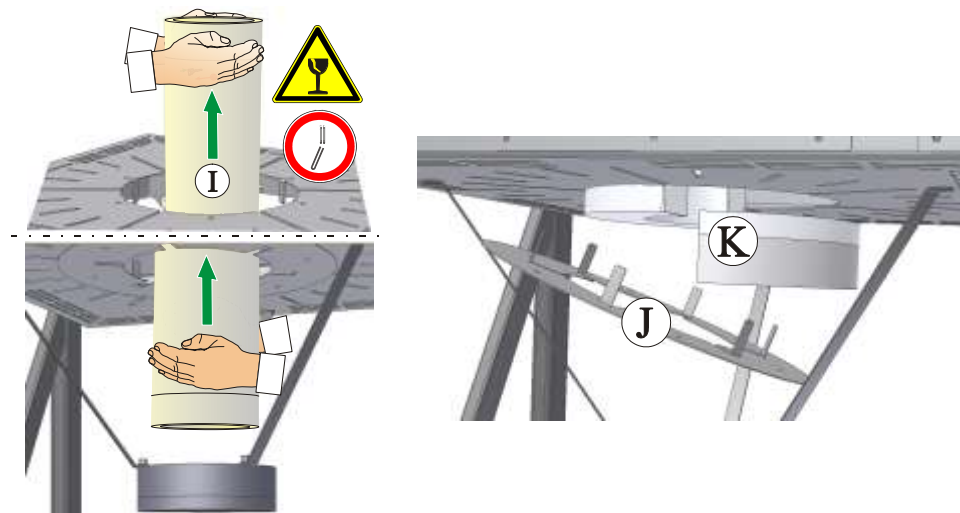


Fig. 47: Dismantling the working tube

Remove screws from all around the lid (L) with the Allen key included in the scope of delivery and remove the lid upwards. Remove the insulation half liners (M) from the furnace chamber.

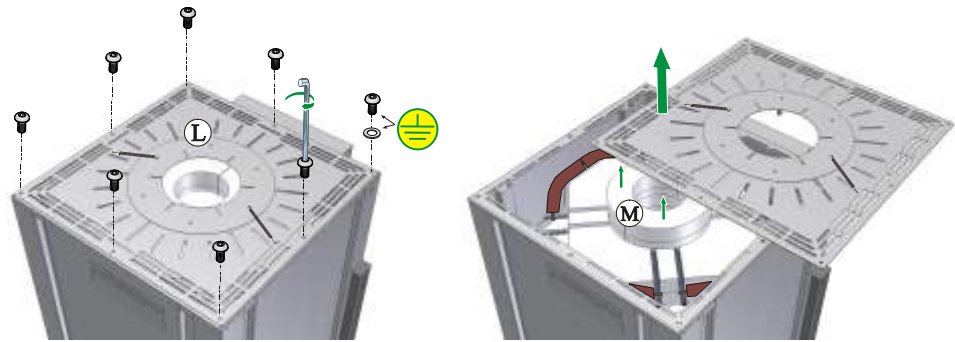


Fig. 48: Furnace lid

Replacing a singling heating element requires that the screws **(X)** on the connection clamp be loosened so that the connection contact can be stuck onto the heating element end.

If it is necessary to replace the connection contacts, the screw connections **(Y)** of the connection contacts must be removed and the protective hoses **(Z)** pulled from the respective connection contacts.

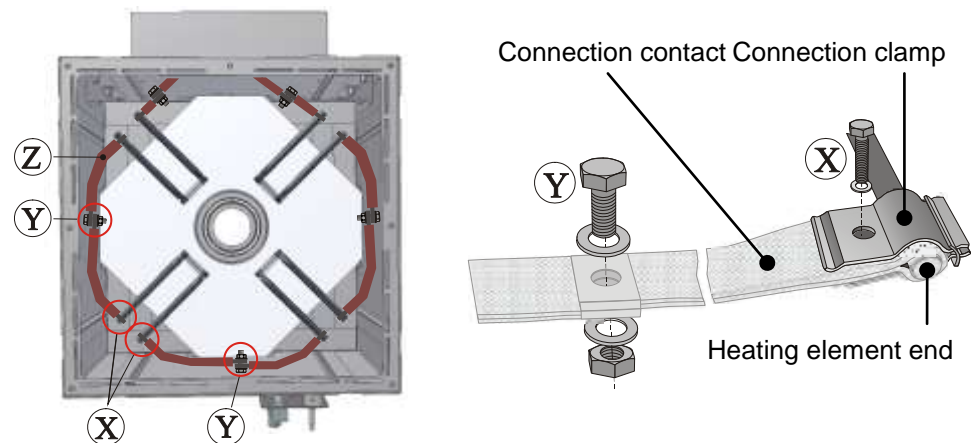


Fig. 49: Disconnect screwed connections

Pull the heating element carefully upwards and out, making sure that you **do not** squeeze together the legs of the heating element. Clean the heating chamber if necessary (vacuum). Carefully put the new heating element(s) in place from above. Slide the connection contact onto the heating element end and tighten screw **(X)** firmly with a suitable tool paying attention that they are positioned correctly in respect to each other.

We recommend that when a new connection contact (when necessary) is connected, the work should be done on a soft working surface so that no objects fall into the furnace chamber.

Soft working surface (for example: foam rubber)

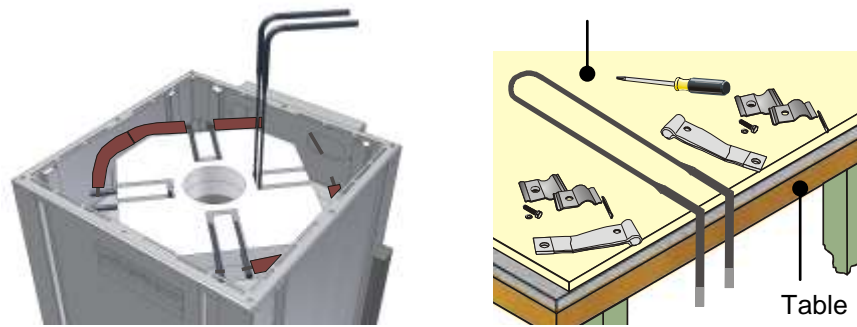


Fig. 50: Replacing the heating elements

In order to be able to screw the new connection contact to the connection clamp it is necessary to expand the connection contact at the position where the connection clamp is screwed to the connection contact.

Installation of the new connection clamp should be performed as shown in the figure below.

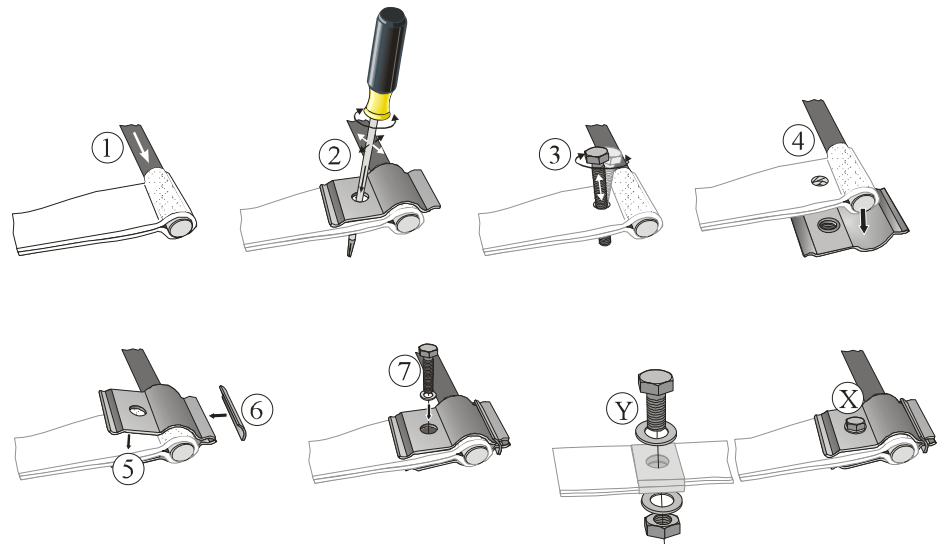


Fig. 51: Installation of a new connection contact

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").

8.4 Replacing a Thermocouple



Warning - Danger of Electric Shock!

Work on the electrical equipment may be done only by qualified, authorized electricians. During maintenance work it must be ensured that the oven and the switching equipment cannot be activated by mistake (pull out the power plug) and that all moving parts in the oven are secured. Observe BGV A3 or the corresponding national regulations in the country where the oven is installed. Wait until the oven and the connected parts have cooled to room temperature.



Caution - damage to components!

Thermocouples are extremely sensitive to breakage. Any strain on or rotation of the thermocouples must be avoided. Failure to observe this rule will lead to the immediate destruction of the sensitive thermocouples.

Tools

To change the thermocouple, you will need the following tools:



- 1 – Allen wrench
(supplied with furnace)
- 2 – Slotted screwdriver
- 3 – Phillips screwdriver

Fig. 52: Tools

Replacing the thermocouple

First slacken the two screws (A) from the thermocouple connection. Slacken screw (B) from thermocouple retaining plate and pull thermocouple out upwards. Push a new thermocouple carefully into the thermocouple channel (C) and assemble and connect in reverse order. Attention must be paid to the correct polarity of the electrical connections (D) *).

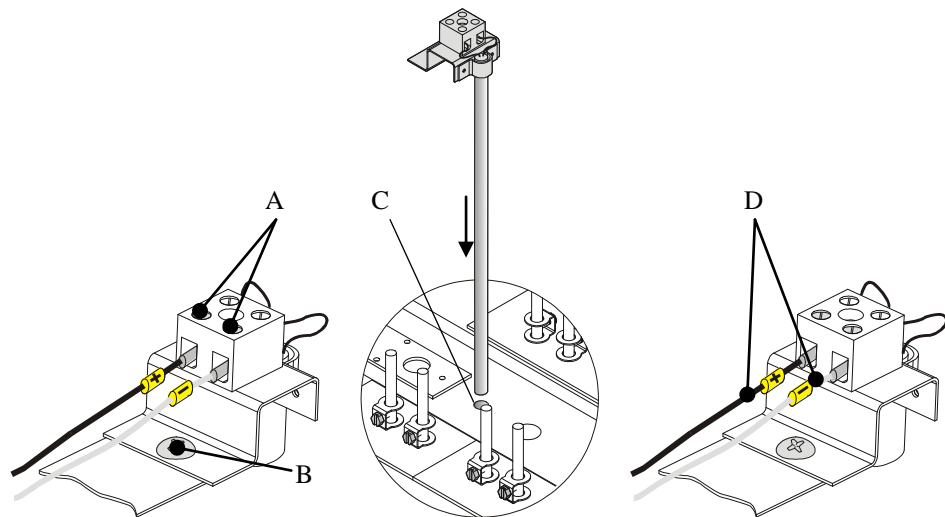


Fig. 53: Replacing the thermocouple



Note

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

\oplus to \oplus \ominus to \ominus

8.5 Repairing the Insulation

The insulation of the furnace consists of a very high-quality refractory material. Heat expansion may cause tears in the insulation even after a few heating cycles. However, these have no affect on the function or quality of the furnace. However, if entire "sections" of the insulation come loose, Nabertherm Service must be notified.

9 Accessories (Options)

9.1 Laboratory Gas Supply Station



Gas panel (individual panel)
for simple protective gas
applications.






Gas panel (double panel)
for operating with two non-combustible types
of gas.

Fig. 54: Laboratory gassing stations

Gassing station are conceived for commercial applications in laboratories. Nabertherm furnaces can be upgraded with various equipment packages for operation with non-combustible gases. The various equipment packages can be delivered together with the furnace, but also at a later time as well. You can select from gas panels which function just manually or both manually and automatically. We provide gas supply systems for non-combustible protective gas (argon Ar, nitrogen N_2 and inert gas N_2H_2 95/5) with shut-off valve, flowmeter and control valve.

9.2 Available Working Tubes

 Working Tube Outer Ø x Inner Ø x Length in mm	Order Number (Part number)	Model RHTH			Model RHTV		
		120-150	120-300	120-600	120-150	120-300	120-600
C 799							
50 x 40 x 380	692071664	●			●		
50 x 40 x 530	692071665		o			o	
50 x 40 x 830	692070163			o			o
80 x 70 x 830	692071670			o			o
80 x 70 x 530	692071669		●			●	
120 x 105 x 830	692071713			●			●
Vacuum tube ¹⁾ C 799							
50 x 40 x 990	692070149	o			o		
50 x 40 x 1140	692070176		o			o	
50 x 40 x 1440	692070177			o			o
80 x 70 x 1140	692070148		o			o	
80 x 70 x 1440	692070178			o			o
120 x 105 x 1440	692070147			o			o

Tube Diameter	Hose Set for Gas Supply for Fiber Plugs	Fiber plugs 		Fiber plugs with protective gas connection 	
		RHTH	RHTV	RHTH	RHTV
	Order Number				
50 x 40	601435841	691601199	691601722	691604154	691604067
80 x 70		691601200	691601723	691604155	691604068
120 x 100		691601201	691601724	691604156	691604069

*) Only working tubes with outside diameters as when the furnace was acquired may be used, since the insulation of the furnace was drilled to this dimension.



Symbols

- Standard working tube
- o Working tube available as option.
- 1) Including glued-on tube sleeves for use with water-cooled end flanges.

10 Electrical Connections (Circuit Diagram)



Note

See the Appendix for the wiring diagram for this system.

11 Nabertherm Service



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.



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.com

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



Fig. 55: Example: Type plate

12 Shut-Down, Dismantling, and Storage

To be Completed by the Operator

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

The oven 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 oven is dismantled for reuse 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 oven may be lifted only at the intended points.

Use only the stated lifting and securing equipment to lift the oven/parts.

Consider a total weight of _____kg when choosing suitable lifting equipment.

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



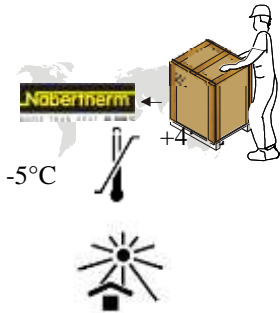
Before transporting the oven, attach the following securing equipment:



Note

Read the sections on "Safety" and "Transportation"

12.1 Transportation/Return Transportation



If you still have the original packaging, this is the safest way to send an oven.

Otherwise:

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

- **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 oven 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 oven on a level floor to prevent distortion.**
- **Packaging and transportation may be carried out only by qualified and authorized persons**

If your oven has transportation securing equipment (see "Transportation Securing Equipment"), 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 oven is sent without accessories, unless the technician expressly requests them.

Enclose a detailed description of the fault along with the oven – 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.

13 Declaration of Conformity



EC Declaration of Conformity

in accordance with EC directives 2006/95/EEC and
EMC directive 2004/108/EEC

Hereby

Nabertherm GmbH
Bahnhofstr. 20, 28865 Lilienthal, Germany

declares that the product specified below conforms to the relevant fundamental safety and health requirements of the appropriate EU Directive both in its basic design and construction as well as in the version marketed by us. The declaration will cease to be valid if any modifications are made to the machine without our approval.

electrically heated tube furnace

Model	RHTH .../.../1600	RHTH .../.../1700	RHTH .../.../1800
	RHTV .../.../1600	RHTV .../.../1700	RHTV .../.../1800

For all Furnaces: With switchgear 200 – 480 V and Nominal frequency 50/60 Hz.

The following harmonized standards were applied:

- DIN EN 61010-1 (08.2002)
- DIN EN 60335-1 (11.2010)
- DIN EN 61000-6-1 (10.2007) , DIN EN 61000-6-3 (09.2007)

Lilienthal, 29.05.2007

Thomas Adamek
Quality Management

Wolfgang Bartilla
Research and Development

14 For Your Notes

[illegible]

