

## Operating Instructions

### Top Loaders

Top ..., HO ..., F ...

M01.1089 ENGLISCH

Original instructions

■ Made  
■ in  
■ Germany

[www.nabertherm.com](http://www.nabertherm.com)

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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 a furnace which has been especially tailored to suit your manufacturing and production conditions.

This product is characterized by

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

Your Nabertherm Team



#### Note

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

#### Protective Rights

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



#### Note

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



#### Note

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

## 1.1 Product Description



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

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

Furnaces in the series **Top loader Top ...**, **Top loader HO ...** and **Fusing top loader F ...** are electrically heated furnaces for ceramics, glass fusing, glass and porcelain painting. These models always deliver very good firing results and are the right choice for hobby artists and workshops.

Top top loaders are ideal for working temperatures between 900 °C and 1230 °C. For intensive professional use, we recommend our rectangular HO top loaders or chamber furnaces with heating from five sides.

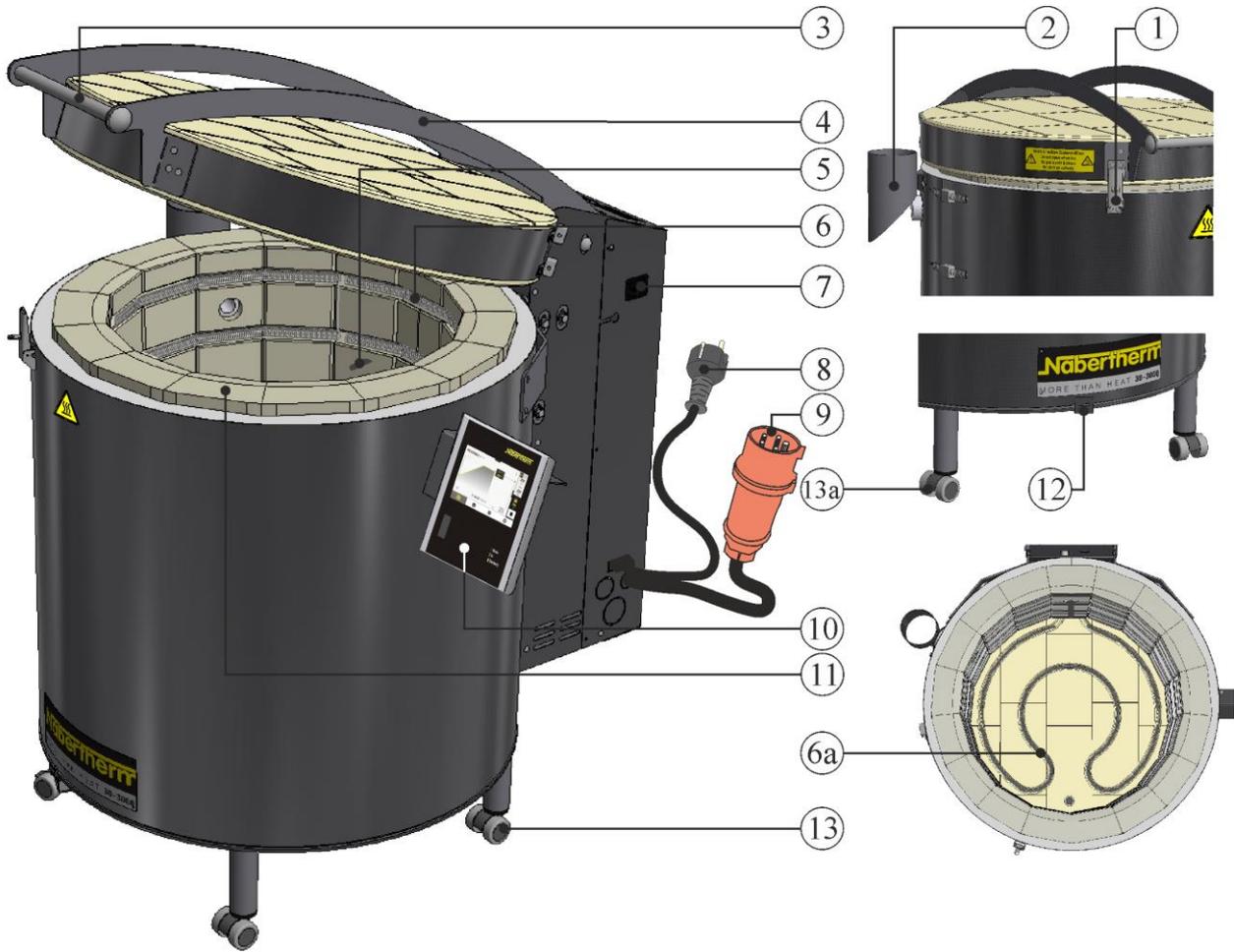
### Other Characteristics of this Product are:

- Model Top - heating elements protected in grooves, all-round heating
- Model F - heating elements from the top, with fusing furnaces F 75 – F 220 also all around the sides
- F 220 default with two-zone control (top and side)
- Model HO - heating elements on support tubes ensure uninterrupted heat radiation
- Lid with adjustable quick-release lock and padlock
- Controller with bracket on the right side of the furnace can be removed for convenient operation
- Solid state relays ensure low noise heater operation
- Type S thermocouple installed in the furnace wall for protection
- Lid interlock safety switch
- Two-layer refractory insulation and energy saving rear insulation
- Housing made from structured stainless steel
- Wear-free lid seal (brick on brick)
- Powerful gas struts support lid opening
- Infinitely adjustable air inlet in opening in the furnace floor for good ventilation and short cooling times
- Exhaust air outlet on furnace side with connection for 80 mm diameter pipe
- Sturdy, locking castors for easy movement of the furnace
- Top 16/R as tabletop model without castors
- Top loader F 30 as tabletop model without castors
- Exclusive use of insulation materials without categorization according to EC Regulation No 1272/2008 (CLP). This explicitly means that alumino silicate wool, also known as “refractory ceramic fiber” (RCF), which is classified and possibly carcinogenic, is not used.

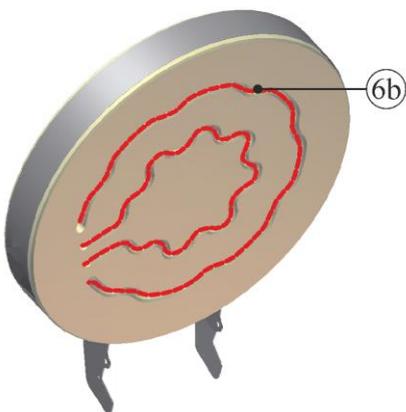
### Additional Equipment

- Floor heating for very good temperature uniformity from Top 80
- Two-zone heating controlled via controller
- Raised base for Top 45/ Top 60 and F 75/F 110

**1.2 Complete Overview of the Furnace**



Example: Top loader model Top 60



Example: Lid from the fusing top loader Model F 30



Example: Fusing top loader Model F 220

Fig. 1: Example: Top loader model Top ... and Fusing top loader Model F ... (similar to picture)



Fig. 2: Example: Top loader Model HO 100 (similar to picture)

No.	Name
1	Adjustable lid lock
2	Bypass connection (only Top + HO model)
3	Handle
4	Lid
5	Thermocouple
6	Heating elements protected in grooves
6a	Floor heating (additional equipment) for very good temperature uniformity from Top 80
6b	Heating elements from the top, with fusing furnaces F 75 – F 220

No.	Name
6c	Heating elements on support tubes (model HO)
7	Power switch (to switch the furnace on and off)
8	Power plug (up to 3600 watts)
9	Power plug (from 5500 watts)
10	Controller
11	Insulation
12	Fresh air inlet
13	Castor with locking brake
13a	Castor (with locking brake from model HO 70 + HO 100)
14	Lid heating (model fusing top loader F ...)
15	Base frame (model Top 220/fusing top loader from model F 75)

### 1.2.1 Key to the Model Names

Example	Explanation
Top 60/L	<b>Top</b> = Top loader, round/oval <b>F</b> = Fusing top loader <b>HO</b> = Top loader, rectangular
Top 60/L	<b>60</b> = Liters furnace chamber (volume in liters)
Top 60/L	<b>L</b> = low <b>LE</b> = low energy <b>R</b> = rapid

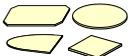


 <small>MORE THAN HEAT 30-3000 °C</small>		
<b>Nabertherm GmbH</b> Bahnhofstr. 20, 28865 Lilienthal/Bremen, Germany Tel +49 (04298) 922-0, Fax +49 (04298) 922-129 contact@nabertherm.de www.nabertherm.com		
Top 160	SN 123456	2021
TOP1603BN1	1320 °C	-
-	400 V 3/N/PE~	-
50/60 Hz	13,0/13,0/13,0 A	9,0 kW
		

Fig. 3: Example: Model name (type plate)

### 1.3 Scope of Delivery

The scope of delivery includes:

	Furnace components	Quantity	Comment
	-Furnace model Top ..., -Furnace model HO ... or -Furnace model F ...	1 x	Nabertherm GmbH
	Power cable <sup>1)</sup>	1 x	Nabertherm GmbH
	Bypass connection <sup>1)</sup> (for furnace models Top and HO)	1 x	Nabertherm GmbH
	Ceramic shelves (691600956 – 80x80x10 mm)	3 x	Nabertherm GmbH
	Castors	4 to 6x <sup>3)</sup>	Nabertherm GmbH
	Hex key <sup>1)</sup> (for furnace models Top and F)	1 x	Nabertherm GmbH
	<b>Accessories:</b>		
	Adjustable base <sup>1)</sup> (for furnace models Top 45/60 or F 75/F 110)	1 x	Nabertherm GmbH
	Shelve/s <sup>2)</sup> for furnace models Top, HO and F	4)	Nabertherm GmbH
	Props <sup>2)</sup>	4)	Nabertherm GmbH
	Other components, variable depending on the particular furnace	- - -	See the shipping documents
	<b>Document type</b>	<b>Quantity</b>	<b>Comment</b>
	Furnace operating manual	1 x	Nabertherm GmbH
	Controller operating manual	1 x	Nabertherm GmbH
	Other documents, variable depending on the particular furnace	- - -	

- 1) in delivery scope depending on the design/furnace model
- 2) in delivery scope as required, see shipping documents
- 3) quantity depends on furnace model
- 4) quantity as required, see shipping documents



**Note**

Store all documents carefully. All the functions of this furnace were tested during manufacturing and prior to shipping.



**Note**

The documents included do not always contain the electrical schematics and pneumatic diagrams.  
If you need the respective diagrams, they can be ordered from Nabertherm Service.

## 2 Specifications



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

### Furnace model Top

Model	Tmax °C	Inner dimensions in mm			Volume in l	Outer dimensions <sup>2</sup> in mm			Connected load kW	Electrical connection	Weight in kg
		w	d	h		W	D	H			
Top 16/R	1320	Ø 290	230	16	490	740	560	2.6	1-phase	32	
Top 45	1320	Ø 410	340	45	600	890	730	3.6	1-phase	62	
Top 45/L	1320	Ø 410	340	45	600	890	730	2.9	1-phase	62	
Top 45/R	1320	Ø 410	340	45	600	890	730	5.5	3-phase <sup>1</sup>	62	
Top 60	1320	Ø 410	460	60	600	890	850	3.6	1-phase	72	
Top 60/L	1200	Ø 410	460	60	600	890	850	2.9	1-phase	72	
Top 60/R	1320	Ø 410	460	60	600	890	850	5.5	3-phase <sup>1</sup>	72	
Top 80	1320	Ø 480	460	80	660	960	860	5.5	3-phase <sup>1</sup>	100	
Top 80/R	1320	Ø 480	460	80	660	960	860	7.0	3-phase <sup>1</sup>	100	
Top 100	1320	Ø 480	570	100	660	960	970	7.0	3-phase	102	
Top 100/R	1320	Ø 480	570	100	660	960	970	9.0	3-phase	102	
Top 130	1320	Ø 590	460	130	780	1080	880	9.0	3-phase	110	
Top 140	1320	Ø 550	570	140	750	1040	990	9.0	3-phase	124	
Top 140/R	1320	Ø 550	570	140	750	1040	990	11.0	3-phase	124	
Top 160	1320	Ø 590	570	160	780	1080	990	9.0	3-phase	130	
Top 190	1320	Ø 590	690	190	780	1080	1110	11.0	3-phase	146	
Top 190/R	1320	Ø 590	690	190	780	1080	1110	13.5	3-phase	146	
Top 220	1320	930	590	460	220	1120	1050	900	15.0	3-phase	150

<sup>1</sup>Heating only between two phases

<sup>2</sup>External dimensions vary when furnace is equipped with additional equipment

### Furnace model F

Model	Tmax °C	Inner dimensions in mm			Floor space in m <sup>2</sup>	Outer dimensions <sup>2</sup> in mm			Connected load kW	Electrical connection	Weight in kg
		w	d	h		W	D	H			
F 30	950	Ø 410			0.13	650	800	500	2.0	1-phase	50
F 75 L	950	750	520	230	0.33	950	880	680	3.6	1-phase	80
F 75	950	750	520	230	0.33	950	880	680	5.5	3-phase	80
F 110 LE	950	930	590	230	0.47	1120	950	680	6.0	1-phase <sup>1</sup>	95
F 110	950	930	590	230	0.47	1120	950	680	7.5	3-phase	115
F 220	950	930	590	460	0.47	1120	950	910	15.0	3-phase	175

<sup>1</sup>Fusing of 32 A if connected to 230 V

<sup>2</sup>External dimensions vary when furnace is equipped with additional equipment

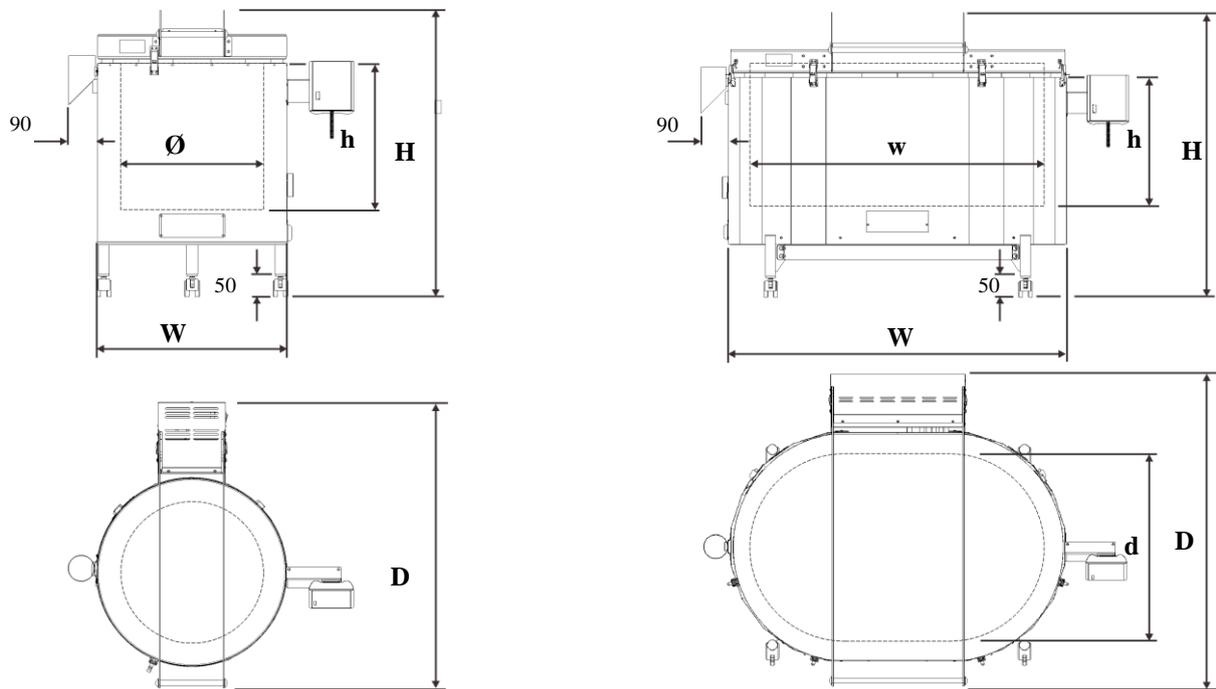


Fig. 4: Top 16 – 190 / F 30

Top 220 / F 75 – F 22

### Furnace model HO

Model	Tmax °C	Inner dimensions in mm			Volume in l	Outer dimensions <sup>2</sup> in mm			Connected load kW	Electrical connection	Weight in kg
		w	d	h		W	D	H			
HO 70/L	1200	440	380	420	70	785	830	830	3.6	1-phase	145
HO 70/R	1320	440	380	420	70	785	830	830	5.5	3-phase <sup>1</sup>	145
HO 100	1320	430	480	490	100	775	930	900	8.0	3-phase	160

<sup>1</sup>Heating only between two phases

<sup>2</sup>External dimensions vary when furnace is equipped with additional equipment

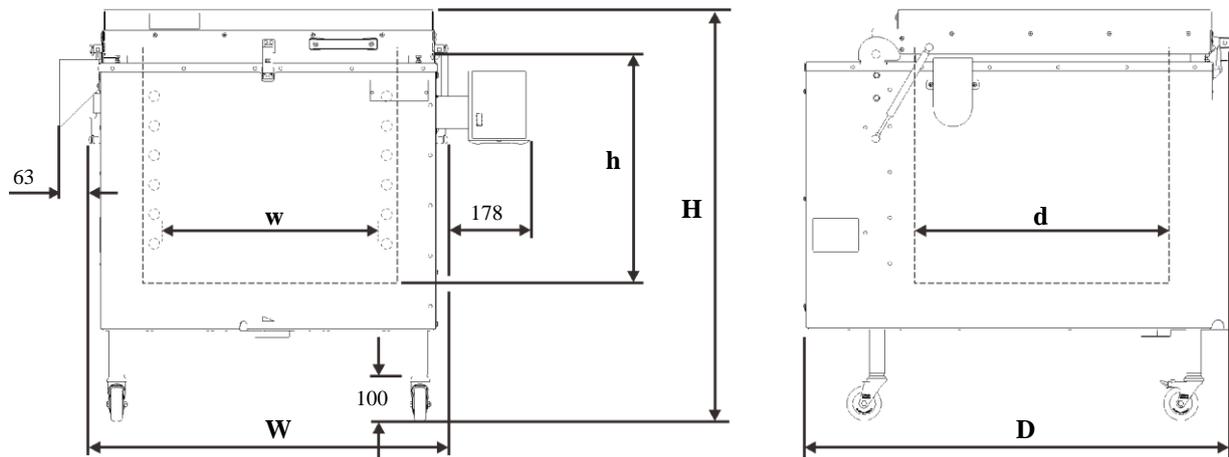


Fig. 5: Dimensions of model HO

Electrical connection	Voltage (V)	1-phase:	3-phase:	Special voltage:
Furnace model		See type plate on furnace		
	Frequency:	50 or 60 Hz		
Protection rating	Furnaces:	1		
Protection type		IP20		
Ambient conditions for electrical equipment	Temperature: Humidity:	+5 °C to +40 °C max. 80 % non condensing		
Weights	Furnace with accessories	Varies (see shipping documents)		
Emissions	Continuous sound pressure level	< 70 dB(A)		

## 2.1 Warranty and Liability



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

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

- All persons involved in operation, installation, maintenance, or repair of the furnace must have read and understood the operating instructions. No liability will be accepted for damage or disruption to operation resulting from non-compliance with the operating instructions.
- Not using the furnace as intended
- Improper installation, start-up, operation, or maintenance of the furnace,
- Operation of the furnace with defective safety equipment or improperly installed or non-functioning safety and protective equipment
- Not observing the information in the operating instructions with respect to transportation, storage, installation, start-up, operation, maintenance, or equipping the furnace
- Making unauthorized changes to the furnace
- Making unauthorized changes to the operating parameters
- Making unauthorized changes to the parameterization, the settings, or the program

- Nabertherm accepts absolutely no liability for damage caused by using parts that are not original Nabertherm parts. Original parts and accessories are designed especially for Nabertherm furnaces. Replace parts only with original Nabertherm parts. Otherwise the warranty will be void.
- Catastrophes due to third-party causes and force majeure

### 3 Safety

#### 3.1 Explanation of the Symbols and Warnings



##### Note

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

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

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

Graphic symbols correspond to **ISO 3864**. In accordance with the **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.

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

##### Structure of the Warning:

All Warnings are Structured as Follows

	 <sup>1</sup> <b>WARNING</b> <sup>2</sup>
4	<ul style="list-style-type: none"> <li>• <b>Type and source of the danger</b><sup>3</sup></li> <li>• <b>Consequences of non-compliance</b><sup>3</sup></li> <li>• <b>Action to prevent danger</b><sup>3</sup></li> </ul>

or

	 <sup>1</sup> <b>DANGER</b> <sup>2</sup>	
4	<ul style="list-style-type: none"> <li>• <b>Type and source of the danger</b><sup>3</sup></li> <li>• <b>Consequences of non-compliance</b><sup>3</sup></li> <li>• <b>Action to prevent danger</b><sup>3</sup></li> </ul>	5

Position	Description	Explanation
1	Hazard Symbol	Indicates the risk of injury
2	Signal Word	Classifies the danger
3	Reference Texts	<ul style="list-style-type: none"> <li>• Type and source of the danger</li> <li>• Possible consequences of non-compliance</li> <li>• Measures/prohibitions</li> </ul>
4	Graphical Symbols (optional) According to ISO 3864	Consequences, measures, and prohibitions
5	Graphical Symbols (optional) According to ISO 3864	Instructions or prohibitions

### Information Symbols in the Instructions:



#### Note

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



#### Rule - Rule Sign

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



#### Rule – Important Information for Operators

This symbol draws the operator's attention to important information and operating instructions that must be observed.



#### Rule – Important Information for Maintenance Personnel

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



#### Rule – Pull Out the Power Plug

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



#### Rule – Lift only with Several People

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



#### Warning – Hot Surface, Do Not Touch

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



### Warning – Danger of Electric Shock

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



### Warning – Danger if Heavy Loads are Lifted

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



### Warning – Fire Danger

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



### Prohibited – Important Information for Operators

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

### Warning Signs on the Furnace:



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

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



### Warning – Danger of Electric Shock!

Warning, dangerous electric voltage

 <b>DANGER</b>		
	<ul style="list-style-type: none"><li>• <b>Danger from electrocution</b></li><li>• <b>If there is no earth connection, or the earth connection is poorly connected, the result may be a deadly electrical shock.</b></li><li>• Do not insert any metallic objects such as thermocouples, sensors or tools into the furnace chamber without having previously ensured that the plant has been correctly earthed. Entrust the job of making a earth connection between the object and the furnace housing to a qualified electrical technician. Any objects inserted into the furnace must be inserted only through those openings intended for this purpose.</li></ul>	

## 3.2 Defined Application



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

Furnaces in the **Top** and **HO** series are electrically heated furnaces for firing ceramics, glass fusing, glass and porcelain painting. Furnaces in the **F** series are for glass fusing, glass and porcelain painting.

### Target group

The instructions are intended for operators and qualified specialists. Persons who work with the furnace system should pay special attention. Only people with the necessary training or who have received the necessary instructions may work with the furnace.

### In accordance with EN 60335-1, the following standards apply

This furnace may be used by children aged 8 years and above and by persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge, provided they are supervised or have received instructions in using the furnace safely and they understand the hazards involved. Children must not be allowed to play with the furnace.

### Improper furnace operation:

- Any other use, such as processing of products other than those for which the furnace was intended as well as handling hazardous materials or materials dangerous to health is deemed IMPROPER.
- The kiln is **not** suitable for drying. Insert only almost dry materials and aids.
- The furnace must **not** be used for heating food.
- The set-up instructions and safety regulations must be followed, otherwise the furnace will be considered improperly used, effectively cancelling any claims against Nabertherm GmbH. The EC Declaration of Conformity will cease to be valid if any modifications are made to the machine without our approval.
- The set-up instructions and safety regulations must be followed, otherwise the furnace will be considered improperly used, effectively cancelling any claims against Nabertherm GmbH.
- Operation with power sources, products, operating equipment, auxiliary materials, solvents, etc., which are listed as hazardous or which may in any way harm the health of the personnel operating the furnace is prohibited.

### The operator is liable for any resulting damages.

- The furnace may only be operated in the manner described in these operating instructions, i.e., the operating instructions must be completely read and understood.
- Under certain circumstances gases or materials may be released from the materials in the furnaces that settle on the insulation or the heating elements and destroy them. **If applicable, read the labels and instructions on the packaging of materials that you use.**
- The set-up instructions and safety regulations must be followed, otherwise the furnace will be considered improperly used, effectively cancelling any claims against Nabertherm GmbH.
- Opening the furnace while it is still hot, over 200 °C (392 °F), can lead to increased wear of the following components: insulation, door seal, heating elements and furnace housing. No liability shall be accepted for any damage to the goods or the furnace resulting from non-compliance with this warning.



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



#### Note

See safety instructions in the individual sections.



#### For all furnace systems

Operation with explosive gases or mixtures or explosive gases or mixtures formed during the process is prohibited.

#### These furnace systems have no safety technology for processes in which combustible mixtures can form (design does not meet the safety requirements of EN 1539)

The concentration of organic gases must at no time exceed 3% of the lower explosion limit (LEL) in the furnace. This requirement not only applies to normal operation, but also in particular to exceptional circumstances, such as process malfunctions (due to the breakdown of a unit, etc.).

Nabertherm offers a wide range of furnaces that have been especially developed for processes with combustible gases.



#### Note

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

### 3.3 Requirements for the Furnace Operator



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

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

#### The operator must ensure that

- When ceramics, clay, or glaze are fired, they can emit gases and vapors that are harmful to your health. It is therefore necessary to make sure that the "exhaust gases" emitted from the exhaust air opening are directed outdoors in a suitable manner (ventilate the working area). If adequate ventilation cannot be ensured at the working area, the "exhaust gases" must be removed via a pipe (see "venting exhaust fumes").
- Before placing materials in the furnace, check whether they could harm or destroy the insulation or the heating elements. Materials that could damage the insulation include: alkalis, alkaline earths, metal vapors, metal oxides, chlorine compounds, phosphorous compounds, and halogens. **If applicable, read the labels and instructions on the packaging of materials that you use.**
- The furnace is operated only in a perfect operating condition and, in particular, that the functions of the safety components are checked regularly.

- Necessary personal protective equipment is available. Example: protective gloves, suitable apron, etc.
- This instruction manual is to be kept beside the furnace. These instructions must be available at all times for anyone working with or on the furnace;
- All the safety and operating instruction signs on the furnace can be read properly. Damaged or unreadable signs must be replaced immediately,
- 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,
- If the furnace is used commercially:  
Observe the safety regulations applicable in your country. In Germany, the furnace must be checked by a qualified electrician at defined intervals in accordance with a regulation issued by the employers' accident insurance fund.

**Note**

Long-term operation at maximum temperature can lead to increased wear of the heating elements and insulation material. We recommend that you work **below maximum temperature** to approx. 70 °C.

**Note**

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

### 3.4 Protective Clothing



Wear heat-resistant gloves to protect your hands.

### 3.5 Basic Measures During Normal Operation

**Risks during normal operation**

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

Each time, before starting production check and ensure that all the safety equipment functions as intended (for example, that the contact safety switch switches the heating off when the lid is opened).

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

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

**At least once every day (see also Servicing and Maintenance) check the following:**

- Check the furnace for obvious external damage (visual check), for example insulation, heating elements, power cable, exhaust gas system, if applicable.
- Check that all safety equipment is functioning (for example, that the contact safety switch switches the heating off when the door is opened).

## 3.6 Basic Measures in Case of Emergency

### 3.6.1 What to Do in an Emergency



#### Note

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

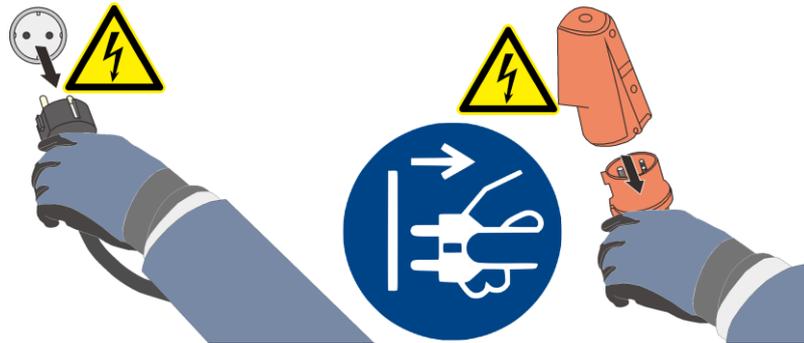


Fig. 6: Pull the power plug (similar to picture)



#### Risks during Normal Operation!

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

**In case of fire, keep lid closed.**

**Immediately remove the power plug.**

Keep doors and windows closed. This prevents smoke spreading.

Immediately notify the fire service, regardless of the extent of the fire. When you phone the fire service, remain calm and speak clearly.



	 <b>DANGER</b>	
	<ul style="list-style-type: none"> <li>• <b>Danger of electric shock.</b></li> <li>• <b>Risk of fatal injury.</b></li> <li>• Work on electrical equipment may be carried out only by qualified electricians or by trained personnel authorized by Nabertherm.</li> <li>• Before starting work, pull out the power plug</li> </ul>	

### 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 the furnace off at the power supply **and pull out the plug.**

The furnace must be completely empty.

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

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

- Check that loosened screw connections/tensioning straps have been re-tightened,
- Reinstall protective equipment, screens, and filters (if applicable),
- Remove all material, tools, and other equipment used for the maintenance or repair work from the working area of the furnace,
- Power cables may be replaced only with similar, approved cables.

### 3.8 General Risks with the Furnace



**Bypass connection/exhaust duct, lid and furnace housing are hot when the furnace is in operation.**

**Risk of burning.**

Bypass connection/exhaust duct, lid and housing must NOT be touched during operation.



**No objects should be inserted into openings in the furnace housing, exhaust holes or cooling slits of the switchgear or furnace.**

**Risk of electric shock.**

Do NOT insert any objects.



**Risk of electric shock.**

**Risk of fatal injury.**

The device must NOT become wet during operation or maintenance



**Warning – risk of burning**

Bypass connection / exhaust duct and lid must **NOT** be touched during operation.



**Risks during normal operation**

Do not place objects on top of the furnace. There is a risk of fire or explosion.

**Risk of explosion from materials placed in the furnace.**

**Risk of fatal injury.**

Do **NOT** place any explosive materials in the device that are flammable at working temperature.

Do **NOT** place any potentially explosive dusts or solvent mixtures inside the device.

Do not operate the device in areas where there is a risk of explosion.

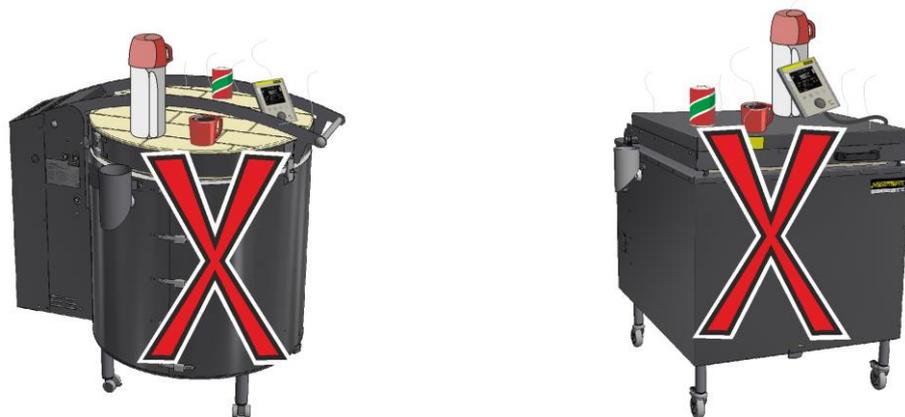
**NO** potentially explosive dusts or solvent mixtures in the surrounding area.

**Risk of fire if using an extension cable.**

**Risk of fatal injury.**

For all furnace models with a plug-in connection, ensure that the distance between the circuit breaker and the power socket that the furnace is connected to is as short as possible.

**NO** power board or extension cable is used between the power socket and the furnace.



	<b>CAUTION</b>	
<p><b>Do not open when hot</b></p> <p>Opening the furnace when it is hot <b>above 200 °C (392 °F)</b> can cause burns.</p> <p>No liability is assumed for damage to products or furnace.</p>		

## 4 Transportation, Installation and Initial Start-Up

### 4.1 Delivery

#### Check that everything is complete

Compare the delivered items with the delivery note and the purchase order documents.

**Immediately** notify the carrier and Nabertherm GmbH of any missing or damaged parts, as complaints at a later date cannot be acknowledged.

#### Danger of injury

When the furnace is being lifted, parts of the furnace or the furnace itself could topple over, slip, or fall. Before the furnace is lifted, make sure no one is in the working area.

Appropriate protective gloves must be worn.

#### Safety Instructions

- Industrial trucks (e.g.: crane/pallet truck) must be operated only by authorized personnel. The operator bears sole responsibility for safe operation and the load.
- Use only lifting equipment with sufficient load-bearing capacity.
- When the furnace is being lifted, make sure that the ends of the forks or the load do not catch on neighboring goods. Use a crane to move tall parts, such as control cabinets.
- 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.
- Attach transportation equipment only to positions intended for this purpose.



#### Note

Wear protective gloves when installing the furnace.



#### 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 furnaces are delivered ex works on wooden frames to facilitate unloading. Transport the furnace in its original packaging and with suitable equipment to prevent any damage. Remove the packaging only when the furnace is in its final location. When transporting the furnace, make sure it is secured against sliding, toppling over, and damage. The furnace should be transported and installed by at least two persons. **Do not store the furnace in damp rooms or outdoors.**
2. Push the pallet truck underneath the transportation frame. Make sure that the pallet truck is **completely** beneath the frame. Pay attention to neighboring goods.

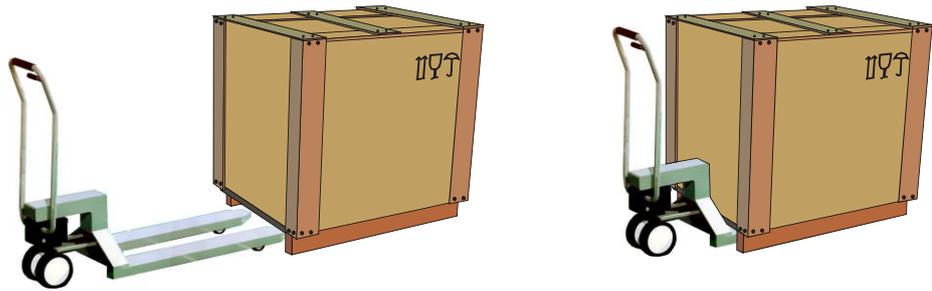


Fig. 7: Pallet truck is pushed **completely** beneath the transportation frame

3. Lift the furnace carefully and pay attention to its center of gravity. When the furnace 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 furnace is balanced safely; if not, attach securing equipment. Push the furnace carefully, slowly and with the pallet truck at its lowest position. Do not transport the furnace on inclines.
5. Carefully lower the furnace at its final position. Pay attention to neighboring goods. Try not to set it down too abruptly.

 	 <b>CAUTION</b>	
	<ul style="list-style-type: none"> <li>• <b>Device may slip or topple over.</b></li> <li>• <b>Damage to the device.</b></li> <li>• Risk of injury from lifting heavy loads.</li> <li>• Transport device only in original packaging.</li> <li>• Several people must carry the device.</li> </ul>	

## 4.2 Unpacking



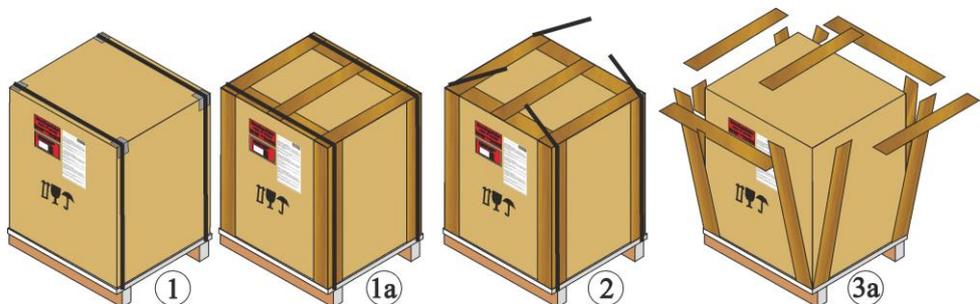
### Note

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

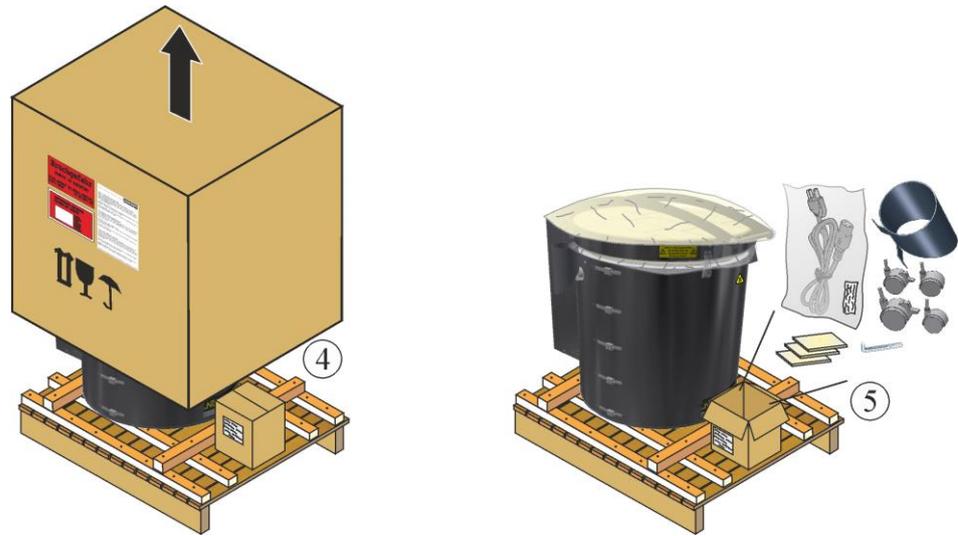
At least two people are needed to carry/transport the furnace, more for larger furnaces.



Wear protective gloves



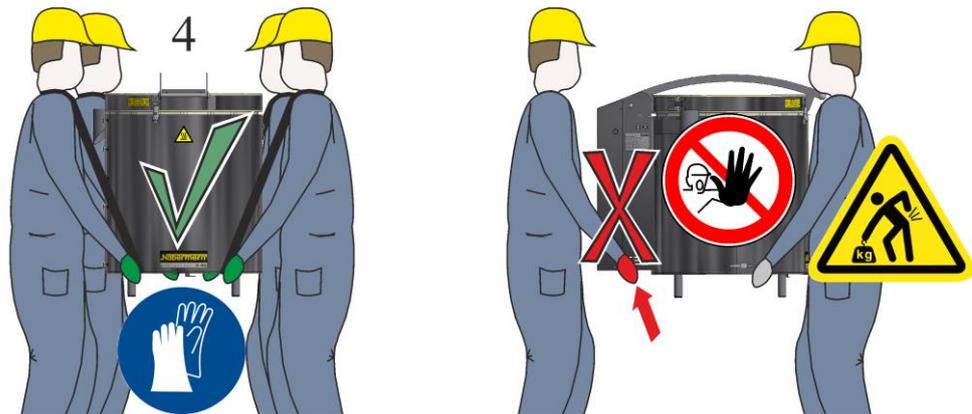
1. Check the transportation packaging for possible damage.
2. Remove tensioning straps from the transportation packaging.
3. Slacken screws and remove wooden casing from the covering box (if available 3a).



4. Carefully lift the cardboard box and remove it from the pallet. Compare the delivered items with the delivery note and the order documents, see "Delivery".
5. The pallet contains a packaging unit for accessories (example: power cable, bypass connection, ceramic shelves, and castors, depending on equipment).
6. Remove the top protective film (A) from the furnace.
7. Remove the protective film that protects the insulation between the furnace and the lid. (B) Make sure that you remove all the packaging material. Keep the packaging and transportation securing material (if applicable) in case it is needed for future transportation or storage of the furnace.



8. To carry the furnace, place your hands beneath the furnace on the side (near the feet) and make sure that you have a good grip. **Wear protective gloves when installing the furnace.** Keeping your back straight, lift the furnace from the pallet and carefully lower it at the point where it is to be installed. The furnace should be transported by at least 2 people.



	<b>⚠ CAUTION</b>	
	<ul style="list-style-type: none"> <li>• Device may slip or topple over.</li> <li>• Damage to the device.</li> <li>• Risk of injury from lifting heavy loads.</li> <li>• Transport device only in original packaging.</li> <li>• Several people must carry the device.</li> </ul>	

### 4.3 Transport Securing Device/Packaging



#### Note

No special transportation securing equipment is available for this furnace

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



#### Safety Information

Do not allow children to play with packaging parts. They are at risk of suffocation from folding boxes and plastic film.

## 4.4 Constructional and Connection Requirements

### 4.4.1 Installation (Furnace Location)

When the kiln is being installed, the following safety precautions must be observed:

- The kiln must be installed in a dry room in accordance with the safety precautions.
- The surface (floor or bench) where the kiln is to be installed must be level to enable the kiln to stand upright. The kiln must be placed on a **non-flammable** surface (fire safety class A DIN 4102 – Example: concrete, tiles, glass, aluminum or steel) so that any hot material falling from the kiln cannot ignite the surface.
- The load-bearing capacity of the bench (e.g., bench-top model Top 16/R) must be sufficient to take the weight of the kiln and accessories.



Non-flammable surface



Top 16/R Bench (additional equipment)

Fig. 8: Example: Non-flammable surface (similar to picture)

In spite of its good insulation, the kiln radiates heat from its outer surfaces. If necessary, this heat must be dissipated (**a ventilation technician may have to be consulted**). **Flammable materials must be kept at least 0.5 m from the sides and 1 m from the top of the kiln.** In some cases, the distance must be greater in order to correspond with local conditions. The minimum distance between the kiln and non-flammable materials may be reduced to 0.2 m at the sides. If the charge emits gases or vapors, ensure adequate ventilation at the installation site and/or a suitable exhaust gas venting system. If required, the customer must provide a suitable vent for combustion exhaust gases.

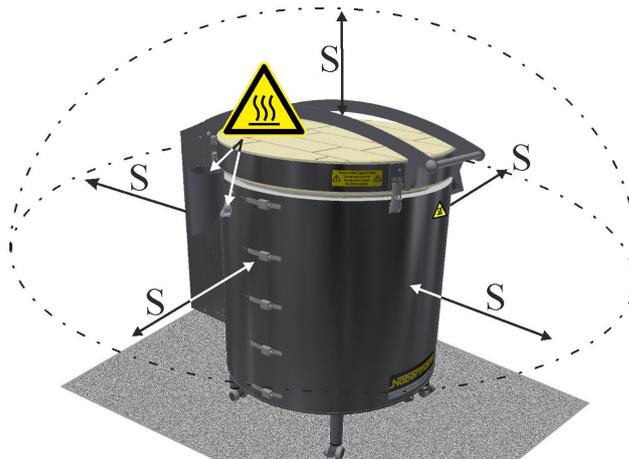


Fig. 9: Minimum safety gap to flammable materials (similar to picture)

	 <b>DANGER</b>
	<ul style="list-style-type: none"> <li>• Risk of fire, danger to health</li> <li>• Risk of fatal injury</li> <li>• Adequate ventilation must be ensured at the installation location to remove exhaust heat and exhaust gases</li> </ul>



**Note**

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

	 <b>DANGER</b>
	<ul style="list-style-type: none"> <li>• <b>Danger associated with the use of an automatic extinguishing system</b></li> <li>• <b>Danger to life from electrocution through wetness, suffocation caused by extinguishing gas, etc.</b></li> <li>• If automatic extinguishing systems are in place to fight fires and protect the building, e.g. sprinkler systems, care must be taken during their planning and installation that no additional hazards are created, for example by extinguishing a pilot light, mixing hardening oil and extinguishing water, shutdown of electrical equipment, etc.</li> </ul>

## 4.5 Assembly, Installation, and Connection

### 4.5.1 Assembling the Base Extension (Accessory)

#### Base Extension for Fusing Top Loader Model F ...

Remove the base from the packaging and compare the parts with the list below.

No.	Quantity	Name
1	2	Brace, long
2	2	Brace, short
3	4	Feet with castors, two with locking brake
4	8	Collar screw M8
5	1	Open-end wrench

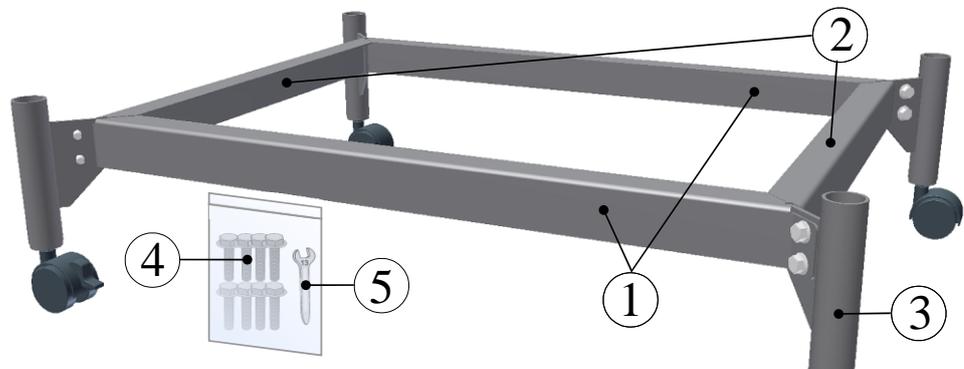


Fig. 10: Parts of the base (similar to picture)

- Assemble one foot (3) with two screws (4) (with one long (1) and one short (2) brace). Loosely tighten the screws with the supplied tool (5).
- Assemble the other feet and braces. When all the feet and braces are assembled, tighten the screws.
- Screw the castors that you removed on to the bottom of the feet (see “Assembling the Castors”).
- Carefully place the furnace on to the frame. Wear protective gloves and lift the furnace only by the base. At least two people are needed to lift the furnace, more for heavier furnaces.

### Base Extension Top Loader Model Top ...

Remove the base from the packaging and compare the parts with the list below.

No.	Quantity	Name
3	2	Base extension Top 45/Top 60

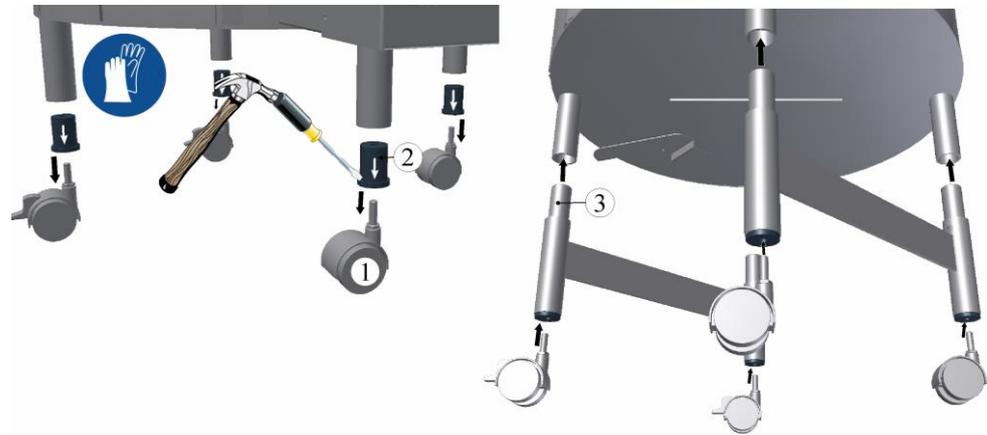


Fig. 11: Assembling the base extension (similar to picture)

- To remove the castors (1) pull them firmly downwards.
- Carefully loosen the sleeves (2) (on the furnace feet) with a wide screwdriver and hammer for example.
- Insert the two base extensions (3) on to the furnace feet. Make sure that the base extension sits firmly.
- Screw the castors that you removed on to the bottom of the feet (see “Assembling the Castors”).

### 4.5.2 Assembling the Castors

If required, the castors that are delivered can be attached to the furnace feet. We recommend that the castors with the locking brake are attached to the front of the furnace. The number of castors depends on the number of feet and varies depending on the furnace model. Furnace model Top 16/R (bench-top model) is delivered without castors. **Wear protective gloves when assembling the castors or when lifting the furnace.** Only lift the furnace from the base. **The furnace must NOT be placed on its side, as this will damage the insulation and heating elements and thus destroy the furnace.** Nabertherm accepts no liability for damage resulting from assembly of the castors.

- If required, the supplied castors can be inserted under the feet of the furnace.

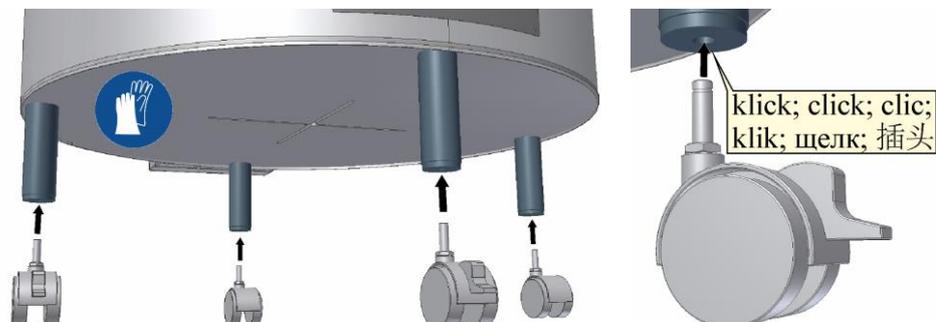


Fig. 12: Assembling the castors (similar to picture)

### Assembly recommendation

Compliance with our recommendations does not release users of our products from their personal responsibility in relation to local situations and conditions. However, several general recommendations should be considered:

- In the case of furnaces up to 60 kg we recommend that you tip the furnace carefully on its feet. Grip below the furnace (1) and carefully tip it to the side. Assemble the first castor and then carefully release your grip on the furnace. Repeat this process for all the castors. We recommend that a second person prevents the furnace from tipping too much, falling over or rolling away. (3)/(4).

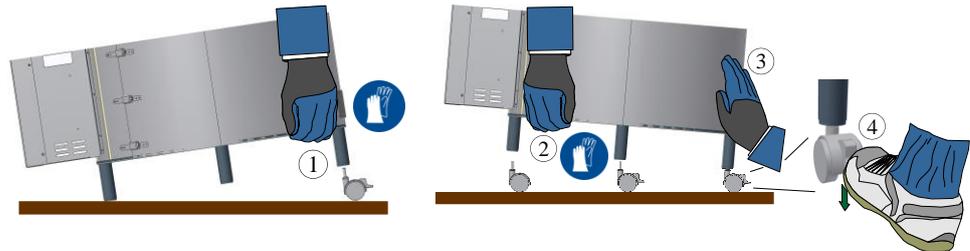
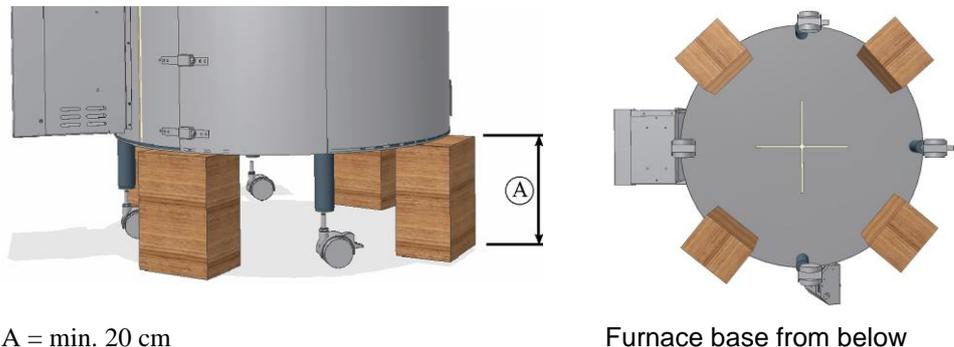


Fig. 13: Example: Assembling castors on furnaces up to 60 kg (similar to picture)

- Do NOT tip furnaces above 60 kg on their feet. There is a risk of the feet “breaking off” if you tip the furnace. To insert the castors, we recommend that you sit the furnace on four suitable wooden blocks. These blocks should be at least 20 cm high so that the castors can be screwed beneath the feet. At least two people are needed to lift the furnace, more for heavier furnaces.



A = min. 20 cm

Furnace base from below

Fig. 14: Example: Assembling castors on furnaces over 60 kg (similar to picture)

- When the furnace is in position, lock the brakes on the castors.

When the bypass connection has been attached to and aligned on the furnace, you can then assemble an exhaust gas system if this is required. See "Exhaust Gas System" for more information about exhaust gas.

### 4.5.3 Assembling the Controller (Depending on the Model)

Attach the supplied controller with holder (model-related) to the furnace.

At the controller position there are screws to attach the holder; these must be unscrewed beforehand.

Place the controller holder (2) with the screws loosened on to the correct position on the furnace and fasten it with suitable tools (3).

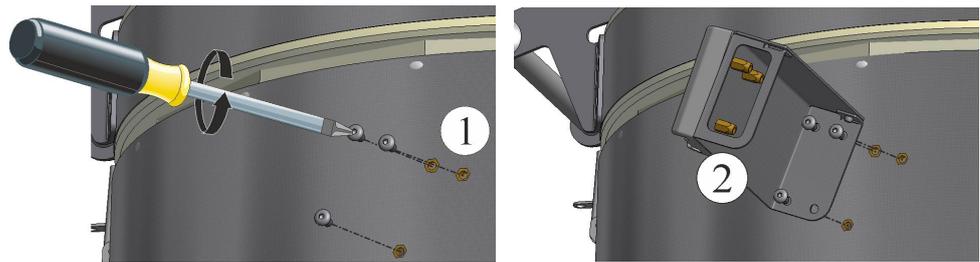


Fig. 15: Install the holder on the furnace housing (similar to picture)

Tighten the screws (3) of the holder and check that it sits properly (4).

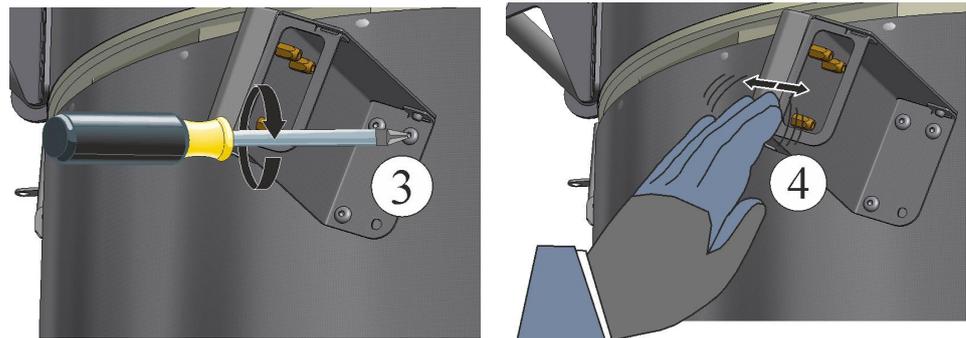


Fig. 16: Tighten the screws on the holder (similar to picture)

Place the controller in the holder on the furnace.

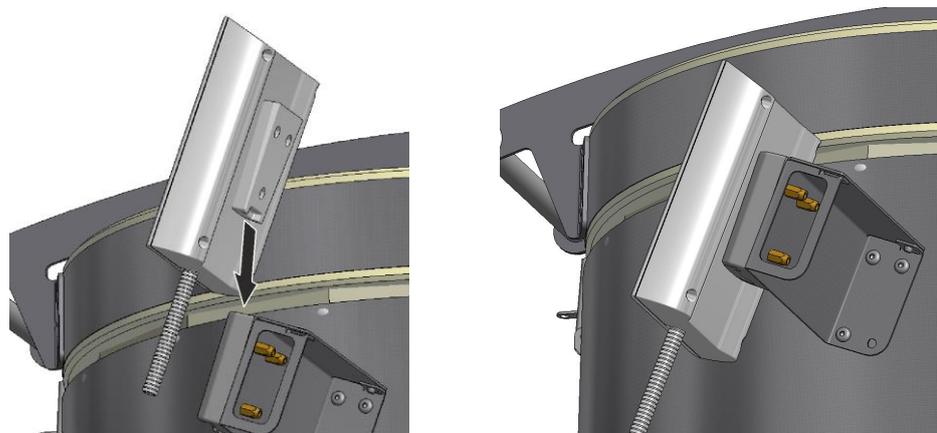


Fig. 17: Place the controller in the holder (similar to picture)

#### 4.5.4 Place the Controller in the Holder on the Furnace (model-related)

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



Fig. 18: Place the controller in the holder on the furnace (similar to the picture)

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

#### 4.5.5 Assembling the Bypass Connection

The bypass connection that is part of the delivery is fixed to the side of the furnace. Furnaces in the top loader F series... have no bypass connection. Furnace model Top 16/R is delivered without a bypass connection. This model is ventilated via a hole in the middle of the lid.

The bracket on the bypass connection can be adapted to suit the respective furnace model (housing circumference). The bracket can be bent carefully with a suitable tool (e.g. pliers) at slits (A) and (B) until the bracket fits the shape of the furnace housing.

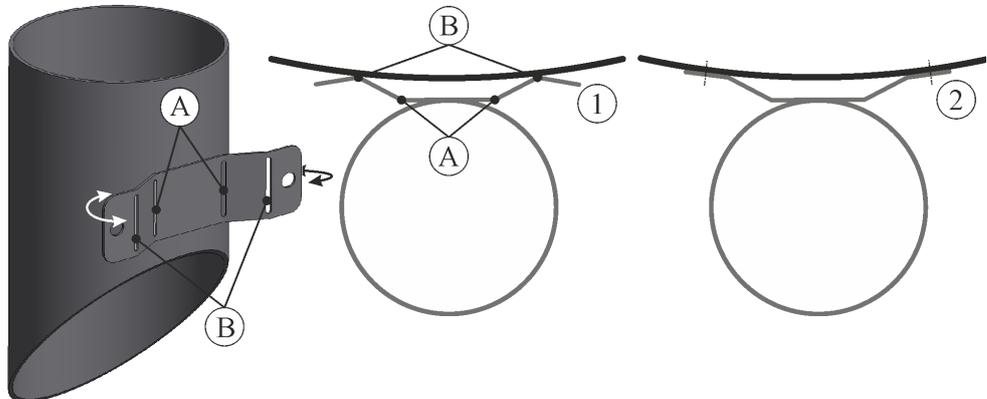


Fig. 19: Adjusting the bracket of the bypass connection (similar to picture)

At the position where the bypass connection is fixed are two screws (1) to assemble it; these must be removed beforehand.

Place the bypass connection (2) with the screws on to the correct position on the side of the furnace and fix it with suitable tools.

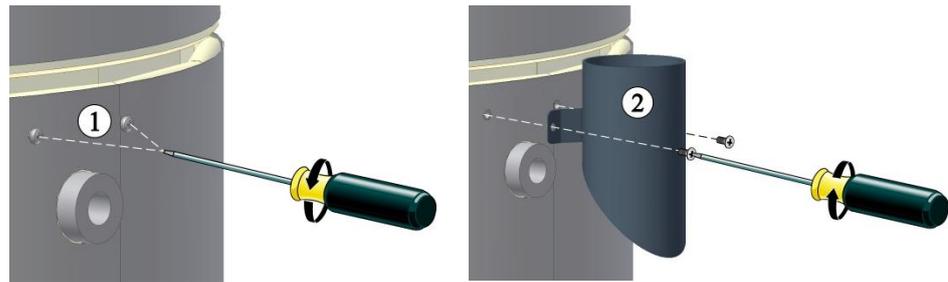
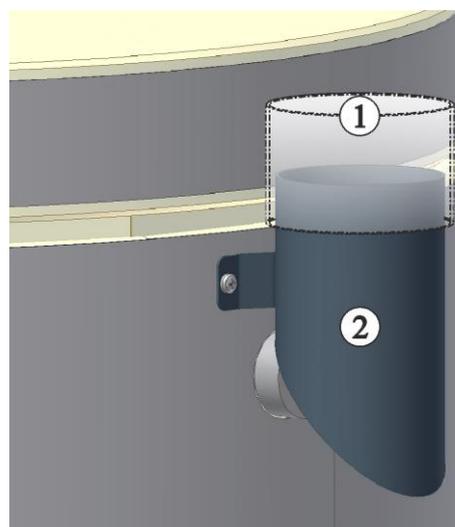


Fig. 20: Assembling the bypass connection (similar to picture)

When the bypass connection has been attached to and aligned on the furnace, you can then assemble an exhaust gas system if this is required. See "Exhaust Gas System" for more information about exhaust gas.



**1** Assembling the exhaust air piping: If required, see "Exhaust Gas System"

**2** Bypass connection

Fig. 21: Assembling the exhaust gas piping on the bypass connection (similar to picture)

#### 4.5.6 Venting Exhaust Fumes

When ceramics are fired, depending on the quality of the clay and/or glaze, they can emit gases and vapors that are harmful to your health. It is therefore necessary to make sure that the "exhaust gases" emitted from the exhaust air opening are directed outdoors in a suitable manner (ventilate the working area). If adequate ventilation cannot be ensured at the working area, the "exhaust gases" must be removed via a pipe. We recommend that you connect a pipe to the furnace to remove the exhaust gases.

A suitable metal exhaust gas pipe with NW80 can be used to vent the gases. Use only metal pipes (example: stainless steel). The pipe must be attached facing upwards and be fixed to the wall or ceiling. Adequate room ventilation is needed to achieve the bypass effect. Vapors may not be extracted through a fan.

Assume a maximum exhaust gas temperature of approx. 200 °C (392 °F) for the piping system. There is a risk of burning at the bypass connection and the piping. Make sure that the wall duct is made from (A) heatproof material.

If the furnace is installed in a "passive house" it must be ensured that the room has an adequate fresh air supply. Because of potential aggressive vapors, we do not recommend that it is connected to the house ventilation system. We recommend a separate furnace room that can be ventilated adequately.

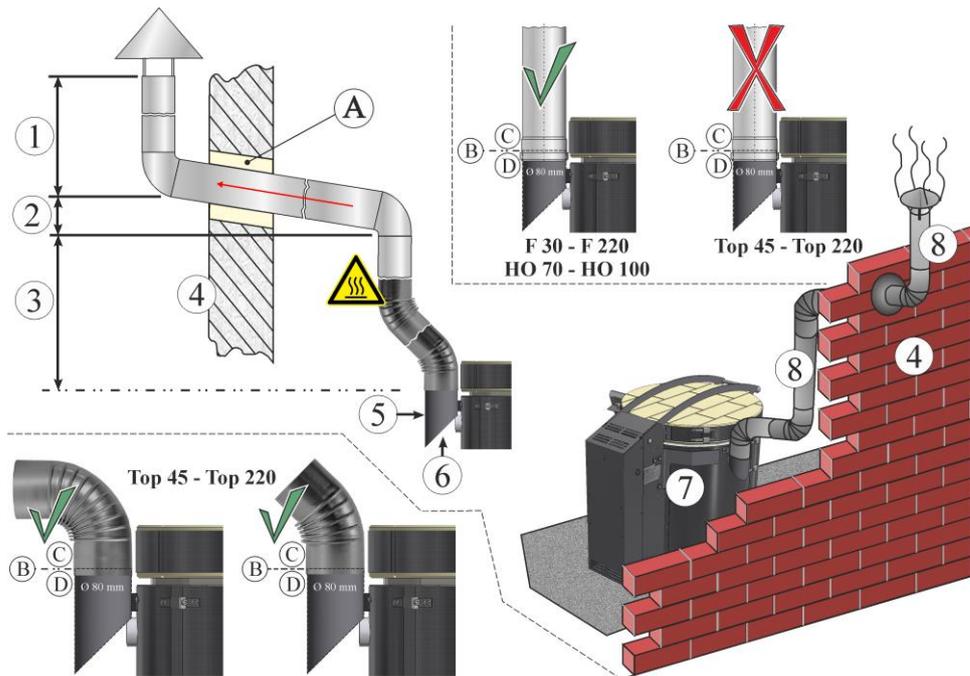


Fig. 22: Example: Assembling exhaust air piping (similar to picture)

1	min. 0.5 m	2	Install rising
3	min. 1 m	4	Outside wall
5	Bypass connection	6	Bypass effect
7	Kiln	8	Exhaust air piping
A	Wall duct	B	Supply limit
C	Customer	D	Nabertherm GmbH

**Recommendation:** Buy and install the exhaust air system only after the kiln is installed and aligned

#### Note

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

#### Volumetric Flow Quantities and Temperature Behavior

Use the exhaust air volumetric flow rates in the table below to calculate the exhaust air piping via the bypass connector. If the exhaust air piping is designed continuously rising with DN 80 according to our recommendations, it can be assumed that this value will be achieved if this volume of air can also be fed to the room from outdoors (ventilation opening with a minimum cross section of 50 cm<sup>2</sup>).

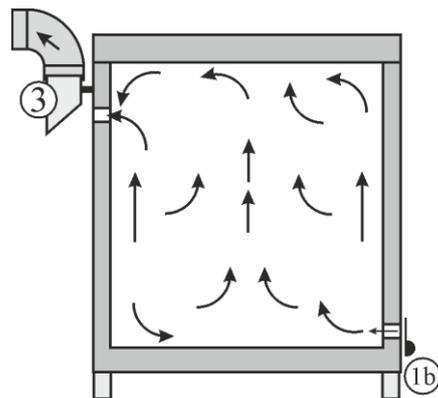
Furnace model	Maximum temperature inside the furnace in °C	Flow rate of bypass connector(3) <sup>1</sup> m <sup>3</sup> /h
Top 16 – Top 220	1320	approx. 25
F 30 – F 220	950	approx. 25
HO 70 – HO 100	1300	approx. 25
<sup>1</sup> if present (model-related)		

Fig. 23: Flow rates

The information described above and in the table relates exclusively to extraction of the gases from the furnace. The heat occurring in case of fire may make additional room ventilation necessary, depending on the size of the room. As the heat depends to a great extent on the firing program, it is not possible to provide precise data. 1/3 of the heating power of the respective furnace can be used as a guide for dimensioning room ventilation.

#### Warning:

Active ventilation of the installation room must not cause underpressure in the room, as otherwise extraction of the exhaust air from the furnace via the bypass connector will be affected.



Example: Furnace with air inlet opening (1b) and bypass connection (3)

## 4.5.7 Connecting the Furnace to the Power Supply

### Power Connection with Plug-In Power Line:

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

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

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

The customer must ensure that the floor has adequate load-bearing capacity and that the necessary energy (electricity) is provided.

- The furnace must be installed according to its intended use. The power connection must correspond to the values on the furnace type plate.

- The power socket must be close to the furnace and be easily accessible. The safety requirements are not met if the furnace is not connected to a socket with a protective ground contact.
- For all furnace models with a plug-in connection, ensure that the distance between the circuit breaker and the power socket that the furnace is connected to is as short as possible, NO power board or extension cable is used between the power socket and the furnace.
- The power cable must not be damaged. Do not place any objects on the power cable. Lay the cable in such a way that no one can stand on it or trip over it.
- Power cables may be replaced only with similar, approved cables.

**Note**

Before connecting the power, make sure that the power switch is set to "Off" or "0".

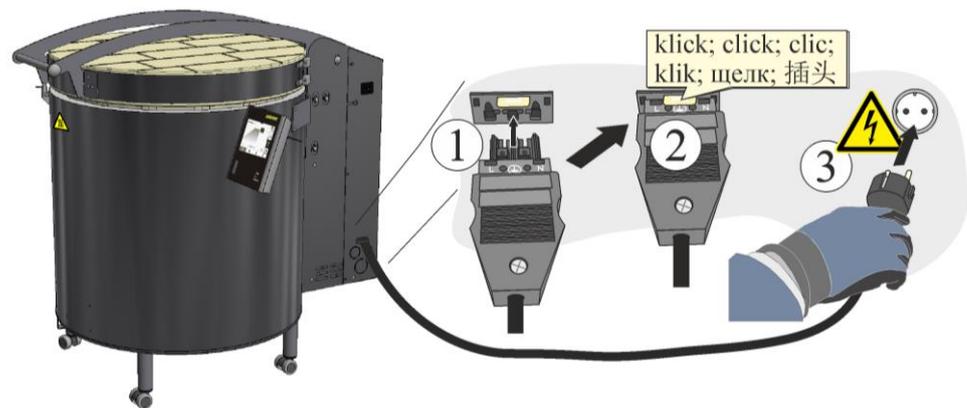


Fig. 24: Furnace up to 3600 kW (the power cable is supplied) (similar to picture)

1. Plug the supplied connection cable with snap-in coupling into the rear wall of the furnace.
2. Then connect the power cable to the power supply. Use only a grounded socket.



Fig. 25: Furnace from 5500 kW (CEE plug) (similar to picture)

1. Connect the power cable to the power supply. Use only a grounded socket. Grounding the furnace and the switchgear (acc. to VDE 0100, Part 410) is a requirement for the heating unit's leakage current protective circuit. Check the ground resistance (acc. to VDE 0100); see also accident prevention regulations. Electrical systems and equipment according to DGUV V3.

**Power Connection without Plug-In Power Line:**

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

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

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

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

Ensure that the protective conductor terminal is correct.

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

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

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

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



**Warning – Danger of Electric Shock!**

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

**Note**

The national regulations of the respective country of operation apply.

	<b>CAUTION</b>	
	<ul style="list-style-type: none"> <li><b>Danger from incorrect voltage</b></li> <li><b>Damage to the device</b></li> <li>Check voltage before connecting and starting the furnace</li> <li>Compare the voltage with the details on the type plate</li> </ul>	

## 4.7 Initial Start-Up

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

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

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

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

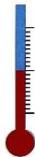
Before placing materials in the furnace, check whether they could harm or destroy the insulation or the heating elements. Materials that could damage the insulation include: alkalis, alkaline earths, metal vapors, metal oxides, chlorine compounds, phosphorous compounds, and halogens. **If applicable,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



### Note

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

## 4.8 Recommendations for Heating Up the Furnace for the First Time



Heat the kiln to dry out the insulation and to get a protective oxide coating on the heating elements. The life of the heating elements is dependent on obtaining a good oxide coating. There may be some unpleasant odors while the kiln is heating. This is due to binder being emitted from the insulation material. It is advisable to ventilate the room in which the kiln is located well during the first heating phase.

- Fully open the fresh-air valve (see "Operation")
- Close and lock the lid (see "Operation")
- Switch on the kiln/controller with the power switch (see "Operation")
- Use "Program 01" from the pre-set programs the first time you heat up the kiln.
- After the heating phase, allow the kiln to cool naturally.
- Read the controller instructions for how to enter temperatures and times.

The insulation materials and furniture have a natural residual moisture. During the first firings, condensation may accumulate and drip from the housing.



Fig. 26: Condensation accumulations during the first firings (similar to picture)

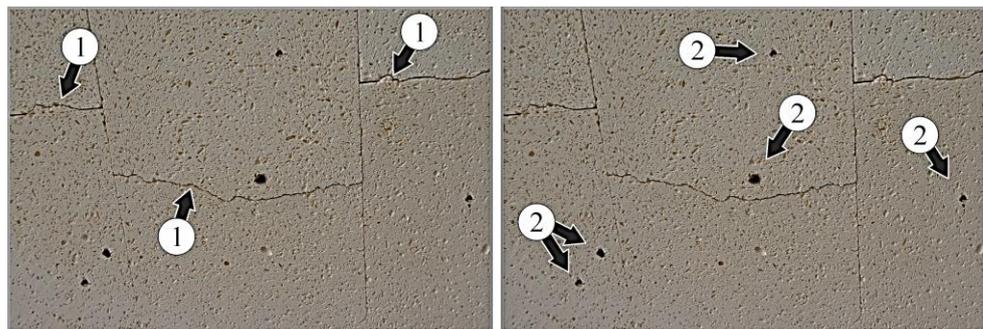
### Program 01

Program name: First firing ("FIRST FIRING")

Segment	Start	Target	Time	Fresh-air valve	Comments
1	0 °C	500 °C	360 min	The fresh-air valve must be completely open	
2	500 °C	950 °C	180 min		
3	950 °C	950 °C	240 min		
					Allow the kiln to cool naturally (keep the lid closed).

### Insulation

The furnace insulation is made from high-grade fireproof material. Due to thermal expansion, cracks in the insulation will occur after a few heating cycles. These have no influence on the function, safety or quality of the furnace. The refractory bricks (insulation) are of a particularly high quality. Due to the manufacturing process small holes or cavities may occur. These are quite normal and underline the quality features of the bricks. These holes or cavities are not a reason for complaint.



Cracks

Cavities

Fig. 27: Example: Cracks (1) and cavities (2) in the insulation after just a few heating cycles (similar to picture)



#### Note

Long-term operation at maximum temperature can lead to increased wear of the heating elements and insulation material. We recommend that you work **below maximum temperature** to approx. 70 °C.



#### Note

New furnace furniture (e.g. shelves and props) should be heated once to dry them out (as described above). When cold, heating elements are extremely brittle. Take great care when packing, emptying and cleaning the furnace.

The lid lock must be locked when during firing. To release emitted gases and vapors more quickly and to shorten the cooling phase after firing, the air inlet valve can be completely or partially opened.



#### Note

At high firing temperatures a slit may become visible along the edge of the lid. This is normal and does not compromise the furnace's function or safety.

## 5 Operation

### 5.1 Controller

#### B500/C540/P570



Fig. 28: Control field B500/C540/P570 (similar to picture)

No.	Description
1	Display
2	USB interface for a USB stick



#### Note

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

#### Read the tutorials on the Internet

To access the operating instruction quickly, scan the QR code with your smartphone or enter the Internet address in your browser:

[www.nabertherm.com/en/downloads/video-tutorials](http://www.nabertherm.com/en/downloads/video-tutorials)

Apps to scan QR codes can be downloaded from the corresponding sources (app stores).



### 5.1.1 Turning on the Controller/Furnace

Turning on the controller		
Procedure	Display	Comments
Turn on the power switch		Set power switch to "I". (Power switch type varies according to design/furnace model)
The furnace status is displayed. After a few seconds, the temperature is displayed.		When the temperature is shown on the controller, the controller is ready for operation.



**Note**

Long-term operation at maximum temperature can lead to increased wear of the heating elements and insulation material. We recommend that you work **below maximum temperature** to approx. 70 °C.

### 5.1.2 Turning off the Controller/Furnace

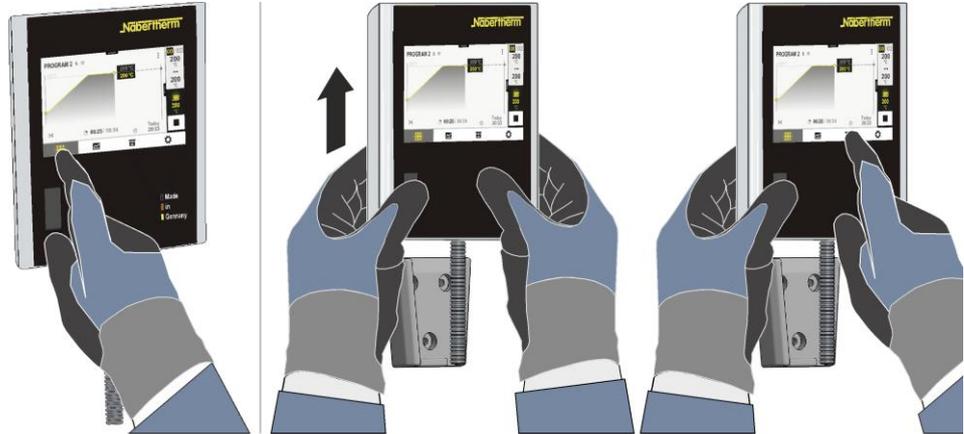
Turn off the controller		
Steps	Display	Comments
Turn off the power switch		Turn off the power switch by setting it to "0" (power switch type differs depending on features/furnace model)

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

### 5.1.3 Handling the Controller

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

After use, replace the controller in its holder.



Simple operation directly on the controller

Easy and ergonomic handling by removing the controller from its holder

Fig. 29: Handling the controller (similar to picture)

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

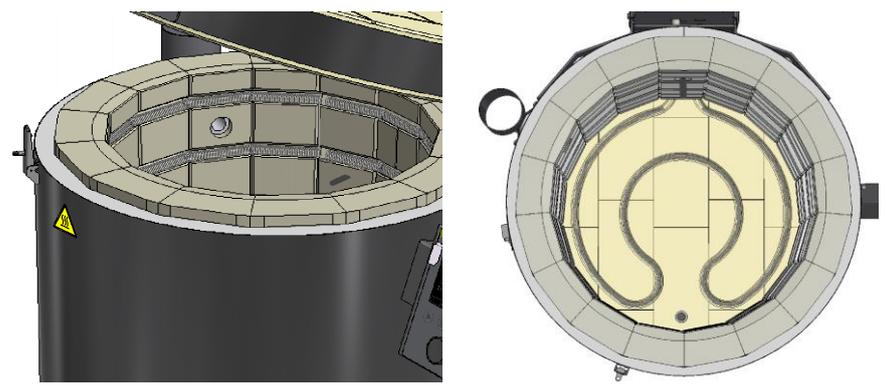


Fig. 30: Place the controller in the holder on the furnace (similar to the picture)

## 5.2 Operation of the Manual Zone Control from Model Top 80 Liters (Additional Equipment)

With the Nabertherm controller, you can control the floor heating as a second zone with Top furnaces from model series Top 80. Set your firing curve on the controller as usual. If you realize that the power ratio has to be changed from top to bottom, you simply adjust the ratio.

To adjust the zone control, refer to the controller instructions section “Manual Zone Control”.



Zone 1 (output A1) (furnace housing)

Additional equipment Zone 2 (output A2) (floor heating)

Fig. 31: Manual zone control (similar to picture)

### 5.3 Opening and Closing the Lid

#### Opening the Lid

Open the lid lock as shown in the figure below. Pull the handle lightly to open the lid slightly. It is advisable to open the lid completely to pack the furnace.

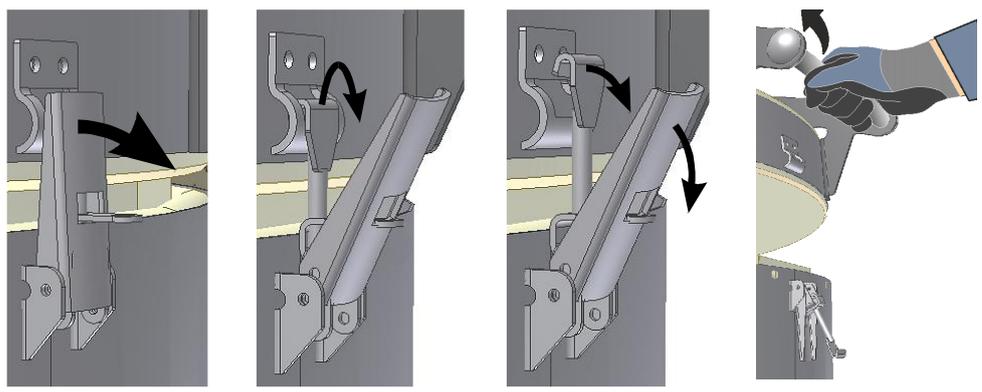


Fig. 32: Opening the lid lock (similar to picture)

	<p><b>⚠ CAUTION</b></p> <p><b>Do not open when hot</b></p> <p>Opening the furnace when it is hot <b>above 200 °C (392 °F)</b> can cause burns.</p> <p>No liability is assumed for damage to products or furnace.</p>	
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## Closing the Lid

Close the lid of the furnace carefully (don't slam it shut). Close the lid lock as shown in the figure below.

When the lid is closed, make sure that it is closed evenly all round. Check the lid fastener(s) and, if necessary, adjust the snap lock (A) by turning it so that the fastener can be closed without too much effort.

If the locking mechanism is too tight, it is possible that a piece of insulating brick can break off. This is not grounds for complaint.

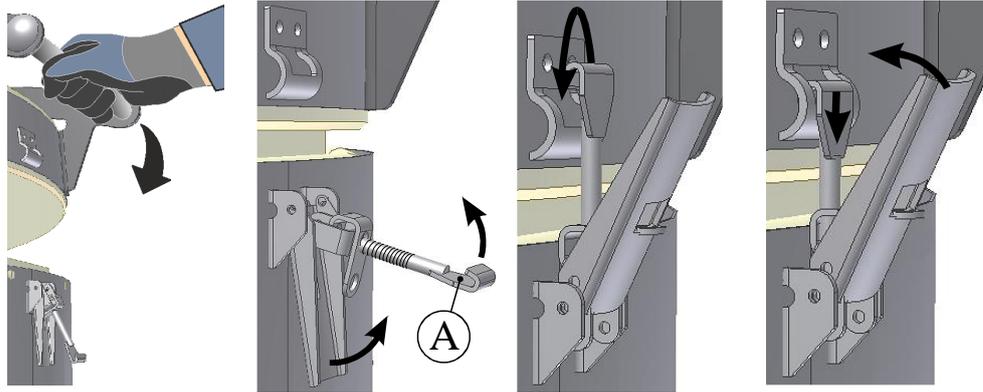


Fig. 33: Closing the lid lock (similar to picture)



### Warning – risk of burning

Bypass connection / exhaust duct and lid must **NOT** be touched during operation.



## 5.4 Fresh Air Valve

The volume of air fed to the furnace can be adjusted with the fresh air valve. The fresh air valve is located on the base of the furnace.

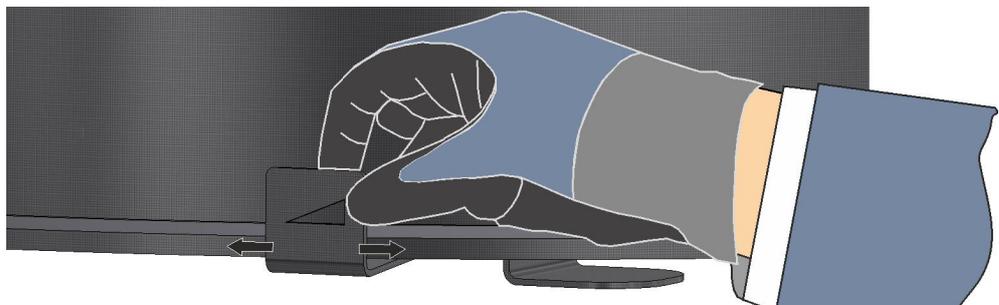


Fig. 34: Regulating the feed of fresh air (similar to picture)

Explanation of the symbol		
Symbol		
Fresh air inlet	closed	maximum open

Fig. 35: Regulating the feed of fresh air (symbol)

## 5.5 Loading/Charging

### Packing the Furnace

Three ceramic plates are included with the delivery (691600956) to stabilize the props and the shelves (C). We recommend that you use this three-point construction for good firing results.

### Arrangement of the Shelves and Props (Accessories)

First, place three props in a triangular design on top of the delivered ceramic plates (691600956). The ceramic plates must have been placed evenly on the floor of the furnace beforehand (A). The distance (B) between the props depends on the size of the shelves and should be as large as possible to ensure stability.

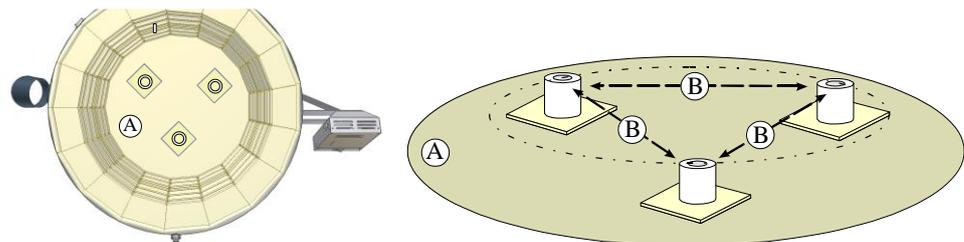


Fig. 36: Example: Even distribution of the props (accessory) (similar to picture)

Place the shelf (C) on top of the props. Now place the objects to be fired in the furnace and distribute them as evenly as possible. If a second layer is required, place props on the shelf to get the required distance between the shelves. These props should be situated exactly above each other if possible to ensure stability of the shelves.

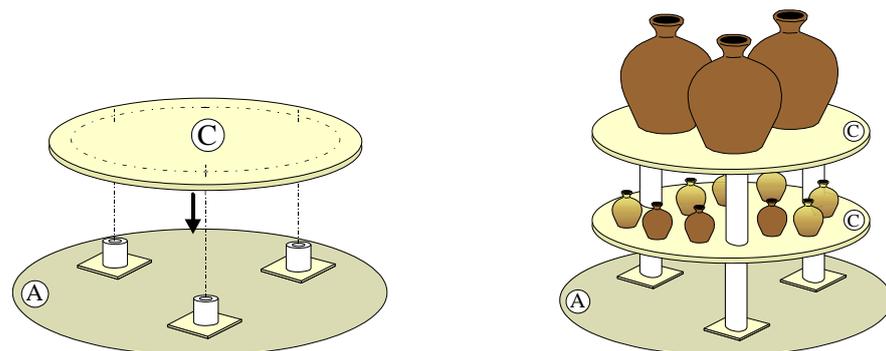


Fig. 37: Example: Several shelves (accessory) in the furnace (similar to picture)

### Note

The kiln is not suitable for drying wet clay. Material and aids must be completely dry before being placed in the kiln.

## 5.5.1 Tips for Potters



### Note

The temperature specifications given by clay and glaze producers must be observed. They will be happy to provide you with suitable firing curves for the products.

	 <b>CAUTION</b>	
	<p><b>Do not open when hot</b></p> <p>Opening the furnace when it is hot <b>above 200 °C (392 °F)</b> can cause burns.</p> <p>No liability is assumed for damage to products or furnace.</p>	

So that the pottery that you have made with a lot of effort and love is not destroyed, the following principles should be observed:

- Allow pottery to dry slowly – not in the kiln, a heated room or in the sun.
- Dry pottery away from drafts – drafts cause uneven drying and drying cracks.
- Loosely cover projecting parts (e.g., handles) with paper or plastic film, as they dry faster than the rest of the pot. If you don't do this, cracks may occur at the joints.
- Allow the pottery to dry for at least one week – longer in cool basements.
- Clay shrinks when it dries; in other words, the volume is reduced due to the loss of water. Objects that stick to a surface crack when they shrink – therefore, always place your pottery on fresh, clean surfaces.
- Turn your pottery often as the top dries quicker than the bottom.
- Handle dry pottery carefully with both hands and don't lift it by the edges. Pottery is very fragile in this state.

### 5.5.1.1 Preset Programs for Ceramic Applications

With Controllers B500/510, C540/550 and P570/580 the following programs are preset and can be started directly.



### Note

In all cases, observe the information and references from the producers of raw materials that may require preset programs to be changed or adjusted. There is no guarantee that preset programs will produce optimum results. The programs set in the factory may be overwritten for personal purposes.

### Note

The example programs for ceramic applications are stored in the factory in programs “P02 - P05”.



**Notice:** The programs set in the factory may be overwritten for your own purposes.

**The example shows the program on P02 (BISCUIT 950)**

#### Starting a program:

Call up the stored program from the overview by pressing the  icon.

Select the program with program number “P02”.

The program has now been loaded and can be started on the controller with the  button.  
Acknowledge the subsequent security prompt by clicking “Yes”.

### Program 02

Program name: Biscuit firing (“BISCUIT 950”)

Segment	Start	Target	Time	Fresh-air valve <sup>1</sup>	Comments
1	0 °C	600 °C	480 min	Open manually	
2	600 °C	950 °C	260 min	Close manually	
3	950 °C	950 °C	20 min	-	
4	900 °C	0 °C		-	

<sup>1</sup> Air inlet flap us opened and closed manually.

<sup>2</sup> The furnace is heated to the set temperature as quickly as possible.

### Program 03

Program name: Glaze firing, earthenware (“GLAZE FIRING 1050”)

Segment	Start	Target	Time	Fresh air flap <sup>1</sup>	Comments
1	0 °C	500 °C	180 min	Open manually	
2	500 °C	1050 °C	0 min <sup>2</sup>	Close manually	
3	1050 °C	1050 °C	20 min	-	
4	1050 °C	0 °C		-	

<sup>1</sup> Air inlet flap us opened and closed manually.

<sup>2</sup> The furnace is heated to the set temperature as quickly as possible.

### Program 04

Program name: Glaze firing, stoneware (“GLAZE FIRING 1150”)

Segment	Start	Target	Time	Fresh air flap <sup>1</sup>	Comments
1	0 °C	500 °C	180 min	Open manually	
2	500 °C	1150 °C	0 min <sup>2</sup>	Close manually	
3	1150 °C	1150 °C	20 min	-	
4	1150 °C	0 °C		-	

<sup>1</sup> Air inlet flap us opened and closed manually.

<sup>2</sup> The furnace is heated to the set temperature as quickly as possible.

### Program 05

Program name: Glaze firing, stoneware (“GLAZE FIRING 1250”)

Segment	Start	Target	Time	Fresh air flap <sup>1</sup>	Comments
1	0 °C	500 °C	180 min	Open manually	

Segment	Start	Target	Time	Fresh air flap <sup>1</sup>	Comments
2	500 °C	1250 °C	0 min <sup>2</sup>	Close manually	
3	1250 °C	1250 °C	20 min	-	
4	1250 °C	0 °C		-	

<sup>1</sup> Air inlet flap us opened and closed manually.

<sup>2</sup> The furnace is heated to the set temperature as quickly as possible.



**Note**

If one of the programs described above has a higher maximum temperature than that of your furnace, this program will not be preset.

## 5.5.2 Bisque Firing

When the greenware is completely dry, it is bisque fired; that is, it is fired in the furnace at between approx. 900 °C and 950 °C. The first firing – for unglazed pottery (terracotta) the only firing – changes the physical and chemical properties of the clay. It becomes "bisque ware" (like a clay brick) and is hard and cannot be dissolved in water.

During the bisque firing the pots in the furnace can touch each other. They can be stacked (also inside each other) as long as they are not too heavy or do not prevent each other from shrinking. Tiles or flat plates should be placed directly on the shelves to prevent distortion. It really depends on the size of the objects whether they are stacked on several shelves or if a few larger pieces fill the entire furnace. But the chamber should not be "overloaded" to ensure sufficient air circulation. For the firing it is important that you know what happens to the pottery. It loses a lot of water and shrinks. If the furnace temperature is raised too quickly, the steam does not have enough time to escape and objects can crack and damage the furnace. Therefore, the furnace should be heated slowly to about 650 °C at approx. 100 °C to 150 °C per hour. Chemically bound water escapes from the clay until about this temperature. From this time you can heat the furnace to the final temperature at full power. Nabetherm controllers handle this task fully automatically.

The controller instruction manual contains all the details.

Because of the large mass and the good insulation, it takes several hours for the furnace to cool; be patient. You should open the lid a little only when the furnace has reached about **100 °C**.

When the furnace is completely open, many people are amazed to find that there have been several changes to the pottery. The pieces are smaller, they are lighter in color, the clay has a different color, the bisque ware is hard and you can now lift a pot by its handle without fear of it breaking off.

## 5.5.3 Glaze Firing

Usually, the glaze firing is the highest temperature firing. The temperature range for earthenware (usually red or brown clay) is about 1020 °C to 1100 °C. For stoneware (usually white clay) the furnace has to reach at least 1250 °C. The glazes must be adapted to suit the temperature range.

The top of the shelves should be painted with a separating agent (batt wash) before a glaze firing. This coating should be renewed from time to time.

Check the areas where the pottery is to stand - they must be free of glaze. Pottery with a glazed base must be placed on stilts or triangular rods for the firing. Glazed pottery should be handled very carefully and should not be touched at the edges. The pots must not touch

in the furnace - the glaze would fuse together (there should be a few centimeters between the pots). There must also be a gap of at least 2 cm to the heating elements.

Always use only glazes in one melting range (e.g. 1050 °C) in a firing. Heat the furnace to about 500 °C at reduced power (approx. 180 °C per hour, see also controller instructions) (water escapes from the glaze), and then heat to the final temperature at full power. Hold this temperature for about 30 minutes so that the glaze melts evenly throughout the furnace.

Only open the lid or door when the temperature has dropped to **below 50 °C**. Many glaze cracks are the result of opening the lid too soon.

You can grind any glaze drops on the bottom of the pottery or the shelves with a grinding stone or an angle grinder - paying attention to all the safety regulations.

Do not use very runny glazes to avoid damaging the shelves, the furnace insulation or the heating elements and the furnace itself.

You can obtain firing and glazing accessories and specialist literature from a specialist dealer in your neighborhood. We will be happy to provide you with addresses.

### 5.5.4 Reduction Firing



In a reduction firing, oxygen in the furnace is consumed by means of a foreign substance. However, since oxygen is needed to maintain the protective oxide layer on the heating elements NO reduction firings should be carried out in an electrically heated furnace.

**Under certain circumstances, high concentrations of gases can settle in the insulation and destroy it.**

If it is unavoidable, after each reduction firing the furnace must be fired with a normal atmosphere to replace the protective oxide layer on the heating elements.

**No warranty claims will be accepted for damage caused by reduction firings.**

## 6 Servicing, Cleaning, and Maintenance

### 6.1 Shutting Down the Furnace for Servicing, Cleaning, and Maintenance



#### Risks during normal operation

- Repairs and 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.

**Operators may only rectify faults that are obviously due to malfunctions.**

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



- The furnace must be completely empty.
- Switch off the main switch **and pull out the power plug.**



#### Risks during normal operation

- Do not touch any objects without first checking how hot they are.



### Warning – Danger of Electric Shock

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

## 6.2 Furnace Insulation

The refractory bricks (insulation) are of a particularly high quality. Due to the manufacturing process small holes or cavities may occur. These are quite normal and underline the quality features of the bricks. These holes or cavities are not a reason for complaint.

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

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



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

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

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

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

Smoking, eating and drinking at the workplace is prohibited.

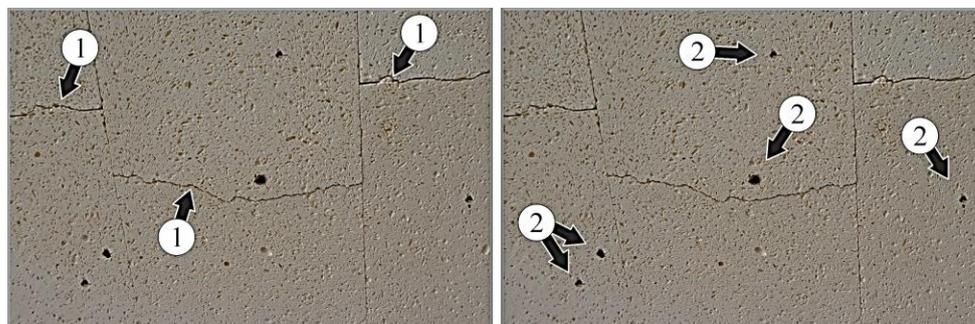
In Germany, during work involving insulation, the technical rules for hazardous substances must be applied. In particular: TRGS 500, TRGS 521, TRGS 558, TRGS 559, TRGS 900; <http://www.baua.de> (German).

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

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

### Insulation

The furnace insulation is made from high-grade fireproof material. Due to thermal expansion, cracks in the insulation will occur after a few heating cycles. These have no influence on the function, safety or quality of the furnace. The refractory bricks (insulation) are of a particularly high quality. Due to the manufacturing process small holes or cavities may occur. These are quite normal and underline the quality features of the bricks. These holes or cavities are not a reason for complaint.



Cracks

Cavities

Fig. 38: Example: Cracks (1) and cavities (2) in the insulation after just a few heating cycles (similar to picture)

## 6.3 Regular Maintenance of the Furnace

Warranty and liability claims for personal injury and material damage shall be excluded if regular maintenance work is not observed.

Component/ item/ function and action	Comment	A	B	C
<b>Safety test in accordance with DGUV V3 or corresponding national regulations</b> According to regulation	(If used commercially)			X2
<b>Contact safety switch (switches the heating off when the lid is opened)</b> Function check		3	Q	X2
<b>Furnace chamber, extraction holes and extraction tubes</b> Clean and inspect for damage, vacuum carefully			M	X1
<b>Heating elements</b> Visual inspection:		3	M	X2
<b>Thermocouple</b> Visual inspection		3	Q	X1
<b>Tensioning straps/lid tensioning ring</b> Check and adjust if necessary before every firing		3	D	X1
<b>Lid locks</b> Check setting and adjust if necessary		3	D	X1
<b>Lid fit (tight closure/fit of the lid)</b> Check setting and adjust if necessary			M	X1
<b>Contact safety switch (switches the heating off when the lid is opened)</b> Function check		3	Q	X2
<b>Furnace chamber, extraction holes and extraction tubes</b> Clean and inspect for damage, vacuum carefully			M	X1
<b>Key:</b> see "Maintenance Table Key"				



**Warning – Danger of Electric Shock!**

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



**Notice**

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

**6.4 Regular Maintenance Tasks – Documentation**

Component/ item/ function and action	Comment	A	B	C
<b>Type plate</b> Legible		-	Y	X1
<b>Operating instructions</b> Ensure they are kept near the furnace		3	Y	X1
<b>Component instructions</b> Ensure they are kept near the furnace		3	Y	X1
<b>Key:</b> see “Maintenance Table Key”				

**6.5 Maintenance Table Key**

Symbols:	
<b>A = Spare Part Stocks</b>	<b>1</b> = Stocks urgently recommended <b>2</b> = Stocks recommended / <b>3</b> = As required, not relevant
<b>B = Maintenance Interval</b> <b>Notice:</b> If ambient conditions are severe, the maintenance intervals must be shorter.	<b>D</b> = Daily, each time before the furnace is started <b>W</b> = Weekly <b>M</b> = Monthly / <b>Q</b> = Quarterly <b>Y</b> = Yearly /
<b>C = Performed by</b>	<b>X1</b> = Operating personnel <b>X2</b> = Specialist personnel

## 6.6 Adjusting the Lid

If the lid no longer rests on the hinge side when it is cold (can be seen by a gap between the lid and the collar insulation), undo the screws (2) on both sides of the switchgear cover and press the cover onto the collar insulation. Before you make the adjustment, make sure that the lid is closed using the front lock (1).

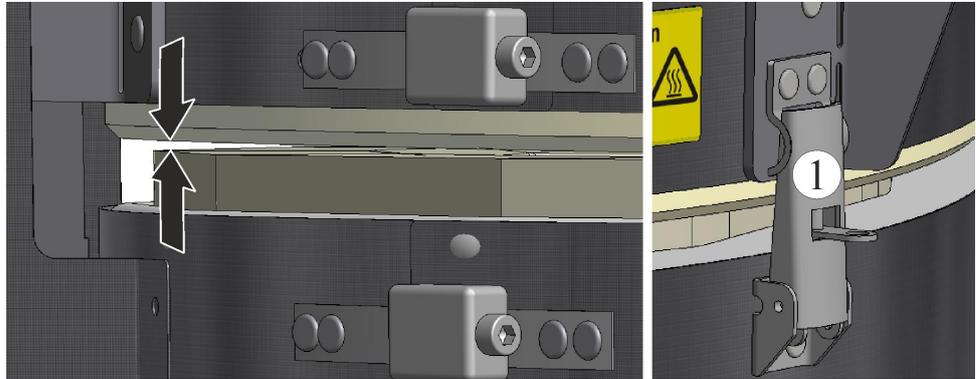


Fig. 39: Lock the lid (similar to picture)

We recommend that two people adjust the lid.

To adjust the lid, undo the screws (2) on both sides of the switchgear cover (see picture “Screws to adjust the lid”) with a suitable tool. Press the lid down on the hinge side until it sits evenly on the collar insulation.



Screws on both sides of the switchgear cover to adjust the lid

Fig. 40: Screws to adjust the lid (similar to picture)

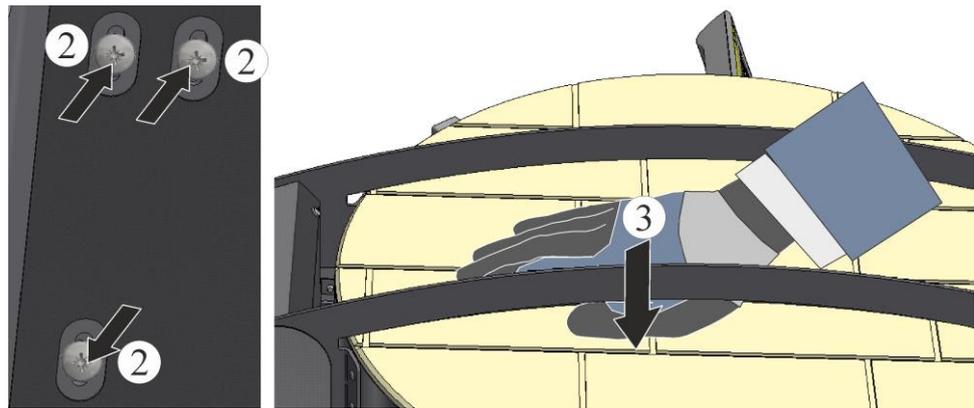


Fig. 41: Undoing the screws/pressing down the lid (similar to picture)

Have a second person hold the lid down. Tighten the screws (2) on both sides of the switchgear cover again. Make sure that the lid closes evenly all round; if not, realign the lid.

## 6.7 Adjusting the Tensioning Straps

Before each firing a check must be made to ensure that the furnace casing and the lid clamp ring retain their firm fit and that the furnace lid still closes snugly. If either the furnace casing or the lid clamp ring is loose, they must be retightened on the outer tensioning straps. Tightening the straps holds the insulation in the furnace lining and the lid in place. Tighten the screws of the furnace casing and/or lid clamp ring with the hex key that is supplied. Secure the tensioning connections against turning with pliers, for example.

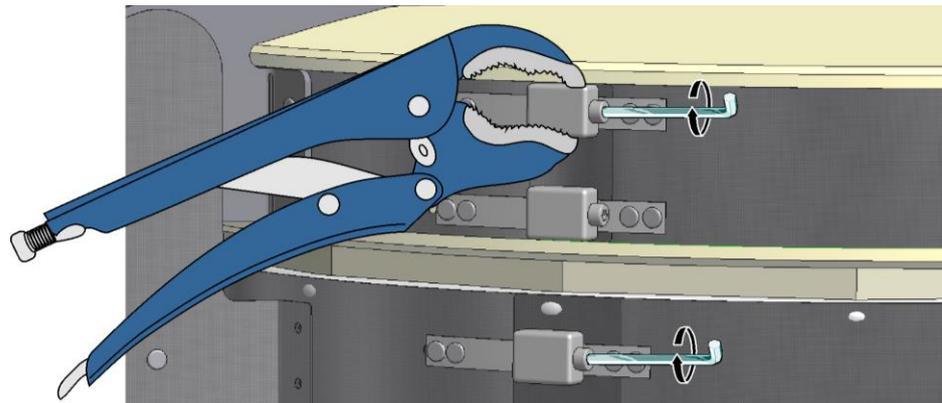


Fig. 42: Adjusting the tensioning straps (similar to picture)

## 6.8 Separate the Snap-In Coupling (Plug) from the Furnace Housing

With a small flat blade screwdriver carefully push the locking latch (2) upward while pulling the plug (3) out of the coupling (4).

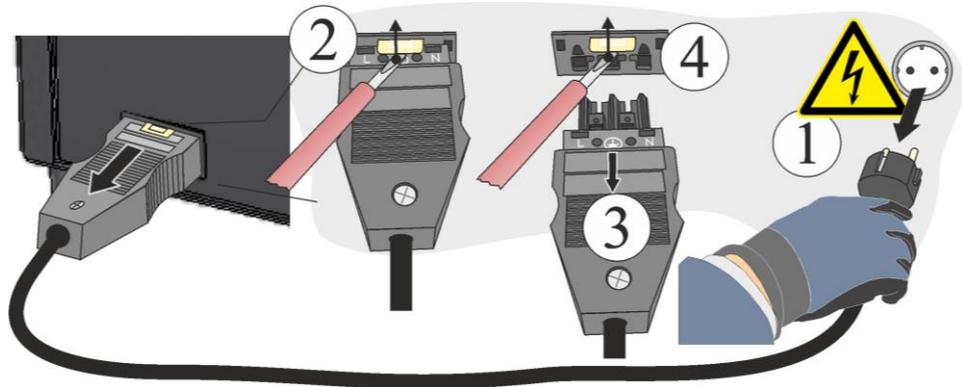


Fig. 43: Separate the snap-in coupling (plug) from the furnace housing (similar to picture)

## 6.9 Cleaning Products



Carry out the procedure to switch off the furnace (see "Operation") Then pull the power plug out of the socket. Allow the furnace to cool naturally.

**Pay attention to the labeling and information on the cleaning product packaging.** Wipe the surface with a damp, lint-free cloth. You may also use the following cleaning products.

### This List must be Completed by the Operator.

Component and Position	Cleaning Product
Metal surface	Stainless steel cleaner
Inside	Carefully clean with a vacuum cleaner (be careful with the heating elements)
Insulation brick (e.g. lid)	Carefully clean with a vacuum cleaner (be careful with the heating elements)
Instrument field on the controller	Wipe the surface with a damp, lint-free cloth (e.g. glass cleaner).

Fig. 44: Cleaning products

When you have finished cleaning, completely remove the cleaning product from the surfaces with a moist, lint-free cloth.

After cleaning, check all cables and connections, insulation, heating elements for damage and report faults immediately.



### Note

The furnace, furnace chamber, and connected parts may **NOT** be cleaned with a high-pressure cleaning device.

## 7 Malfunctions

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

Call your local electrician for malfunctions that you cannot localize.

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

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

In case of mechanical damage, send an email containing the above information and a digital photo of the damaged part and a photo of the complete furnace to the following address:

-> see "Nabertherm Service".

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

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

### 7.1 Error Messages of the Controller

The controller shows the error messages and warnings on the screen until they have been rectified and acknowledged. It may take up to one minute until these messages are transferred to the archive.

ID+ Sub-ID	Text	Logic	Remedy
<b>Communication error</b>			
01-01	Bus zone	Communication connection to a control module disrupted	Check that the control module is firmly attached LEDs on the control modules red? Check the cable between the control unit and the control module Plug of the connection cable not plugged correctly into the control unit
01-02	Bus communications module	Communication connection to the communications module (Ethernet/USB) disrupted	Check that the communications module is firmly attached Check the cable between the control unit and the communications module
<b>Sensor error</b>			
02-01	TC open		Check thermocouple, thermocouple terminals and cable Check contacts of the thermocouple cable in plug X1 on the control module (contacts 1+2)
02-02	TC Connection		Check the set thermocouple type Check poles of thermocouple connection
02-03	Compare point error		Control module defective
02-04	Compare point too hot		Temperature in the switchgear too high (approx. 70 °C) Control module defective

ID+ Sub-ID	Text	Logic	Remedy
02-05	Compare point too cold		Temperature in the switchgear too low (approx. -10 °C)
02-06	Encoder separated	Error at the 4-20 mA input of the controller (<2 mA)	Check 4-20 mA sensor Check the connection cable to the sensor
02-07	Sensor element defective	PT100 or PT1000 sensor defective	Check PT sensor Check connection cable to the sensor (cable break/short circuit)
<b>System error</b>			
03-01	System memory		Error after firmware updates <sup>1)</sup> Defective control unit <sup>1)</sup>
03-02	ADC error	Communication between AD converter and controller disrupted	Replace control module <sup>1)</sup>
03-03	File system defective	Communication between display and memory chip disrupted	Replace control unit
03-04	System monitoring	Program execution on the control unit defective (Watchdog)	Replace control unit USB flash drive removed too soon or defective Switch controller off and on again
03-05	Zone system monitoring	Program execution on a control module defective (Watchdog)	Replace control module <sup>1)</sup> Switch controller off and on again <sup>1)</sup>
03-06	Self-test error		Contact Nabertherm Service <sup>1)</sup>
<b>Monitoring</b>			
04-01	No heater power	No temperature increase in the ramps when heating output $\leq$ 100 % for 12 minutes and when the temperature setpoint is higher than the current furnace temperature	Acknowledge the error (if necessary, disconnect from the power supply) and check safety contactor, door switch, heating controls and controller. Check heating elements and heating element connections. Lower D value of the control parameters.
04-02	Excess temperature	The temperature of the control zone exceeds the max. program setpoint or the maximum furnace temperature by 50 Kelvin (from 200 °C) The equation for the switch off threshold is: Maximum program setpoint + zone offset of the master zone + charge control offset [Max] (if charge control active) + excess temperature switch-off threshold (P0268, e.g., 50 K)	Check solid state relay Check thermocouple Check controller  (from V1.51 with 3 minute delay)

ID+ Sub-ID	Text	Logic	Remedy
		A program was started at a furnace temperature higher than the maximum setpoint in the program	Do not start the program until the furnace temperature is lower. If this is not possible, insert a hold time as a start segment and then a ramp with the desired temperature (STEP=0 minutes duration for both segments) Example: 700 °C -> 700 °C, Time: 00:00 700 °C -> 300 °C, Time: 00:00 The normal program begins here From Version 1.14, the actual temperature is also considered at the start.  (from V1.51 with 3 minute delay)
04-03	Power failure	The set limit for restarting the furnace was exceeded	If possible, use an uninterruptible power supply
		The furnace was switched off at the main switch during the program	Stop the program on the controller before you switch off the main switch
04-04	Alarm	A configured alarm was triggered	
04-05	Auto-tune failed	The determined values are implausible	Do not carry out auto-tune at the lower temperature range of the furnace working range
	Battery weak	Time is not shown correctly. A power failure may no longer be handled properly.	Export all parameters to a USB flash drive Replace the battery (see “Specifications”)
<b>Other malfunctions</b>			
05-00	General malfunction	Malfunction in the control module or Ethernet module	Contact Nabertherm Service Provide the service export

## 7.2 Warnings of the Controller

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

No.	Text	Logic	Remedy
00	Gradient monitoring	The limit value of the configured gradient monitoring was exceeded	For troubleshooting, refer to “Gradient Monitoring” Gradient set too low
01	No control parameters	No “P” value was entered for the PID parameters	Enter at least one “P” value in the control parameters. It must not be “0”
02	Charge thermocouple defective	No charge thermocouple was determined with the current program and activated charge control	Plug in a charge thermocouple Disable charge control in the program Check the charge thermocouple and its cable for damage

No.	Text	Logic	Remedy
03	Cooling thermocouple defective	The cooling thermocouple is not plugged in or is defective	Plug in a cooling thermocouple Check the cooling thermocouple and its cable for damage If there is a malfunction in the cooling thermocouple during active controlled cooling, the system switches over to the thermocouple of the master zone.
04	Documentation thermocouple defective	Either no documentation thermocouple or a defective one was determined.	Plug in a documentation thermocouple Check the documentation thermocouple and its cable for damage
05	Power failure	A power failure was determined. There was no program interrupt	None
06	Alarm 1 - Band	The configured band alarm 1 was triggered	Optimize the control parameters Alarm set too narrowly
07	Alarm 1 - Min	The configured min. alarm 1 was triggered	Optimize the control parameters Alarm set too narrowly
08	Alarm 1 - Max	The configured max. alarm 1 was triggered	Optimize the control parameters Alarm set too narrowly
09	Alarm 2 - Band	The configured band alarm 2 was triggered	Optimize the control parameters Alarm set too narrowly
10	Alarm 2 - Min	The configured min. alarm 2 was triggered	Optimize the control parameters Alarm set too narrowly
11	Alarm 2 - Max	The configured max. alarm 2 was triggered	Optimize the control parameters Alarm set too narrowly
12	Alarm - External	The configured alarm 1 at input 1 was triggered	Check the source of the external alarm
13	Alarm - External	The configured alarm 1 at input 2 was triggered	Check the source of the external alarm
14	Alarm - External	The configured alarm 2 at input 1 was triggered	Check the source of the external alarm
15	Alarm - External	The configured alarm 2 at input 2 was triggered	Check the source of the external alarm
16	No USB flash drive inserted		When exporting data, insert a USB flash drive in the controller

No.	Text	Logic	Remedy
17	Import/export of data via the USB flash drive unsuccessful	The file was edited with a PC (text editor) and saved in the wrong format or the USB flash drive was not detected. You want to import data that is not in the import folder on the USB flash drive	Do not edit XML files with a text editor, only in the controller. Format the USB flash drive (format: FAT32). No quick formatting Use a different USB flash drive (to 2 TB/FAT32) When importing, all data must be in the import folder on the USB flash drive. The maximum storage capacity for USB flash drives is 2 TB/FAT32). If you experience problems with your USB flash drive, use a different USB flash drive with maximum 32 GB
	Programs are rejected during the import of programs	Temperature, time or rate are outside the limit values	Import only programs that are suitable for the furnace. The controllers differ as regards the number of programs and segments and the maximum furnace temperature.
	While programs are being imported, "Error occurred" is displayed	The complete parameter set (at least the configuration files) was not stored in the "Import" folder on the USB flash drive	If you deliberately left out files during import, ignore the message. Otherwise, check the completeness of the import files.
18	"Heating blocked"	This message is displayed if a door switch is connected to the controller and the door is open	Close the door Check the door switch
19	Open door	The furnace door was opened while a program was running	Close the door while a program is running.
20	Alarm 3	General message for this alarm number	Check the cause of this alarm message
21	Alarm 4	General message for this alarm number	Check the cause of this alarm message
22	Alarm 5	General message for this alarm number	Check the cause of this alarm message
23	Alarm 6	General message for this alarm number	Check the cause of this alarm message
24	Alarm 1	General message for this alarm number	Check the cause of this alarm message
25	Alarm 2	General message for this alarm number	Check the cause of this alarm message
26	Multi-zone holdback temperature exceeded	A thermocouple that was configured for multi-zone holdback has left the temperature band downward	Check whether the thermocouple is necessary for monitoring. Check the heating elements and their activation
27	Multi-zone holdback temperature undershot	A thermocouple that was configured for multi-zone holdback has left the temperature band upward	Check whether the thermocouple is necessary for monitoring. Check the heating elements and their activation

No.	Text	Logic	Remedy
28	Modbus connection interrupted	The connection to the superordinate system was interrupted.	Check if the Ethernet cables are damaged. Check the configuration of the communication connection

### 7.3 Malfunctions of the Switchgear

Error	Cause	Remedy
<b>Controller does not light up</b>	Controller is switched off	Switch the power switch to "I"
	No power available	Is the power cord plugged into the socket? Check the building fuses. Check the fuse of the controller (if present) and replace it if necessary.
	Check the fuse of the controller (if present) and replace it if necessary.	Switch the power switch on. If the error occurs again, contact Nabertherm Service
<b>Controller displays error</b>	See the separate instructions of the controller	See the separate instructions of the controller
<b>Furnace does not heat</b>	Door / cover is open	Close the door / cover
	The door contact switch is faulty (if present)	Check the door contact switch
	"Delayed Start" is displayed	The program is waiting for the programmed start time. Deselect delayed start above the start button.
	Error in entering the program	Check the heating program (see the separate instructions of the controller)
	Heating element defective	Have this checked by Nabertherm Service or a qualified electrician.
	<b>Very slow heating of the heating space</b>	The fuse(s) of the connection is/are defective.
<b>The program does not jump to the next segment</b>	In one TIME segment in the program input, the wait time is set to INFINITE If charge control is activated, the temperature of the charge is higher than the zone temperatures.	Do not set the wait time to INFINITE
	If charge control is activated, the temperature of the charge is higher than the zone temperatures.	The parameter [LOWER BLOCK] must be set to [NO].

Error	Cause	Remedy
<b>The controller module can not be registered on the operating unit</b>	Addressing error of the controller module	Perform a bus reset and re-address the controller module
<b>The controller is not heating in the optimization</b>	No optimization temperature has been set	The temperature to be optimized must be entered (see the separate instructions of the controller)

<b>The temperature rises faster than the controller setting allows</b>	<p>The switch element of the heating unit (semiconductor relay, thyristor or switch contactor) is defective.</p> <p>Individual defective components inside a furnace cannot be completely ruled out in advance. That is why the controllers and the switchgear units must be equipped with safety facilities. For example, the furnace shuts down the heating unit in response to error message 04 - 02 via an independent contact element.</p>	Have the switch element tested by a qualified electrician and replaced as necessary.
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## 7.4 Controller Check List

<b>Customer:</b>	
<b>Furnace model:</b>	
<b>Controller model:</b>	
<b>Controller version (see info menu):</b>	
<b>Controller serial number:</b>	
<b>Furnace serial number:</b>	
<b>Error code in display:</b>	
<b>The following malfunctions are dependent on external influences:</b>	02-05 ambient temperature too low: < -10 °C (14 °F) 02-04 ambient temperature too high: > 70 °C (158 °F)
<b>Exact description of fault:</b>	
<b>Export service information:</b>	Export all data to a USB flash drive. To do this, plug a USB flash drive into the controller and select "Service". Use the ZIP function (compression) integrated in Windows to make a ZIP file of the exported folder (see "Importing and Exporting Data and Parameters") and send this to your contact at Nabertherm Service.
<b>When does the malfunction occur?</b>	At certain points in the program or times of day:  At certain temperatures:

<b>When did the malfunction first occur?</b>	<input type="checkbox"/> The malfunction is new		
	<input type="checkbox"/> The malfunction has existed for some time		
	<input type="checkbox"/> Unknown		
<b>Malfunction frequency:</b>	<input type="checkbox"/> Malfunction occurs frequently		
	<input type="checkbox"/> Malfunction occurs regularly		
	<input type="checkbox"/> Malfunction occurs rarely		
	<input type="checkbox"/> Unknown		
<b>Replacement controller:</b>	Has a replacement controller been used?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	Is the malfunction still present when the replacement controller is used?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	Checked according to troubleshooting list (see Furnace Operating Manual)	<input type="checkbox"/> Yes	<input type="checkbox"/> No

Enter the following test program to heat the furnace at full power:

Point in program	Value
Segment 01- Start temperature	0 °C
Segment 01- Target temperature	500 °C
Segment 01- Time	5 minutes
Segment 01- Target temperature	500 °C

Close the door/lid and start the test program

Check the following:

- Is the furnace heating (temperature increase)?
- Does the display show the “heat” icon?

In the heating phase, open the info menu for more detailed information.

Date: \_\_\_\_\_ Name: \_\_\_\_\_ Signature: \_\_\_\_\_

## 8 Spare Parts/Wearing Parts



### Ordering spare parts:

Our Nabertherm Service team is available worldwide. Due to our high vertical range of manufacture, we deliver most spare parts from stock overnight or can produce them with short delivery times. You can order Nabertherm spare parts directly from the factory quickly and easily. Orders can be made by mail, phone, or e-mail -> see “Nabertherm Service”.

### Availability of spare parts and wearing parts:

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

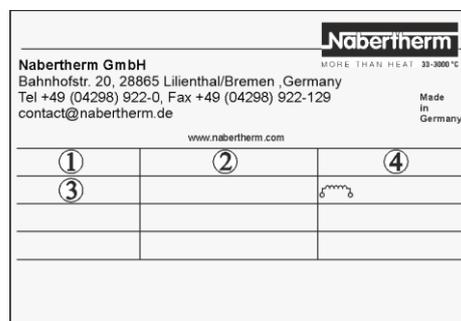
**Note**

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

**Note**

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

Provide the following details from the type plate:



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

Fig. 45: Example (type plate)

## 8.1 Removing and Installing Heating Elements

**Warning – Danger of Electric Shock**

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

**Warning – General Hazards!**

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

**Caution – Damage to components!**

Heating elements are extremely fragile. Avoid all stress or twisting of the heating elements. If this is not observed, the sensitive heating elements will be destroyed.

**Note**

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

**Tip:** Because of the many different furnace models, we recommend that you take several photos of the previously installed heating elements and the switchgear. This will simplify subsequent installation and wiring of new heating elements.

We recommend that two people replace heating elements.

### 8.1.1 Top Loader Model – Top and F

Unscrew all the screws of the panel with a suitable tool and keep them in a safe place for future use.

The number and position of the screws may differ from one furnace model to the next. The furnace may look different than the picture depending on the furnace model and features.

Carefully lean the switchgear cover (3) to the back. We recommend that you secure the switchgear cover with a wire (4) (length about 70 cm) so that cable connections between the switchgear and furnace housing are not damaged.



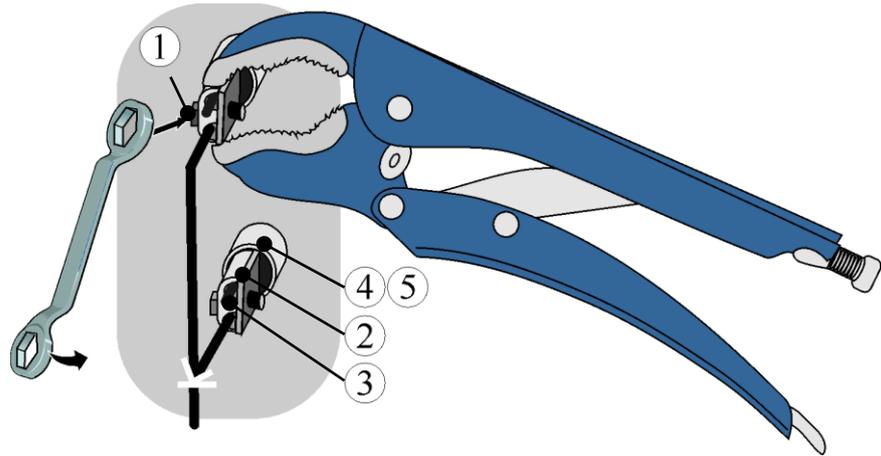
Fig. 46: Dismantle the cover of the switchgear from the back of the furnace (similar to picture)

To replace the heating elements, completely open the lid of the furnace (see "Opening and Closing the Lid").

#### Removing the heating elements

Unscrew the screws (1) of the connection terminals (2). Place the screws and the connection terminal in a safe place so that they can be reused. So as not to damage the connection terminal or the ceramic feedthrough tube we recommend the use of a suitable pipe wrench (example) as a brace when unscrewing the screws of the connection terminal (5).

**Warning:** The wire have pointed ends that can cause injuries.



1 Hexagonal screw / 2 Connectional terminal / 3 Heating element end  
 4 Ceramic feedthrough tube / 5 Fiber wadding

Fig. 47: Unscrew the screws on the ends of the heating elements (similar to picture)

Pull the ceramic feedthrough tube out and keep it in a safe place so that it can be used again (replace if included in the spare parts delivery).

Carefully pull out the ends of the heating elements (3) from inside the furnace.

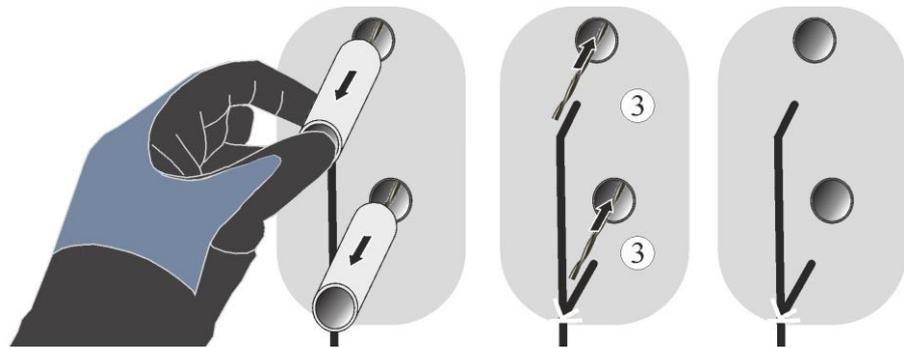


Fig. 48: Carefully remove the ceramic feedthrough tube (similar to picture)

Before you pull the heating element out from inside and/or carefully and slowly unwind it, remove all fasteners (1) with long-nose pliers (example). When unwinding the heating element, make sure that the insulation brick is not damaged. Caution: Heating elements that have been fired are very brittle.

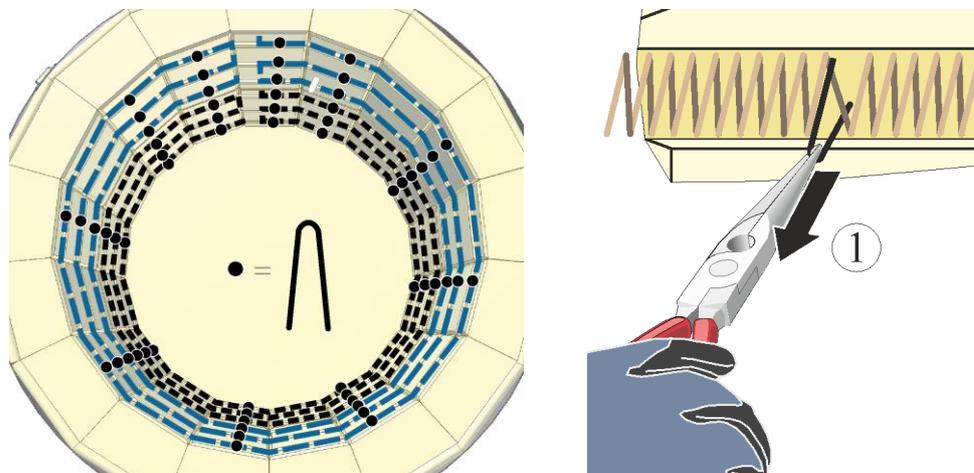


Fig. 49: Carefully remove the fasteners (similar to picture)

### Installing the Heating Elements

Before installing heating elements, we recommend that you clean the furnace chamber thoroughly, with a vacuum cleaner, for example.

The (twisted) ends of the heating elements have a loop as protection. Pinch off the loop with a suitable tool (pincers, for example) before installation.

**Warning:** The wire have pointed ends that can cause injuries.

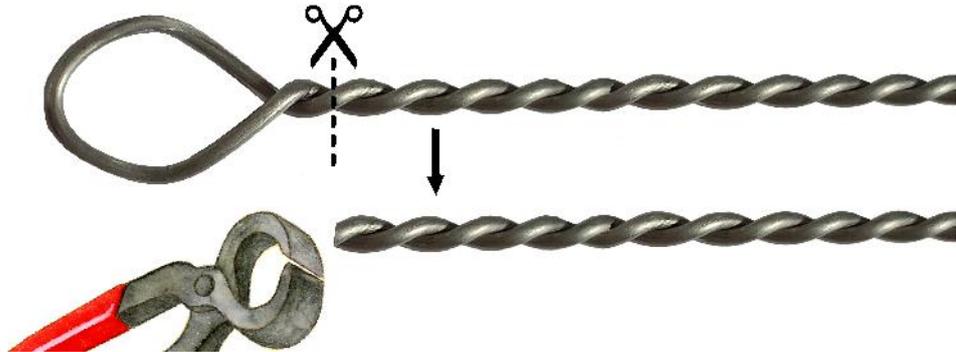


Fig. 50: Pinch off the loop on the end of the heating element (similar to picture)

Check the supplied heating elements for damage before installation.

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 received at a later date cannot be acknowledged.

Carefully place heating elements on a soft surface, as shown below, and, if possible, compare them with the dismantled heating elements. The length and coiling of some furnace models differ.

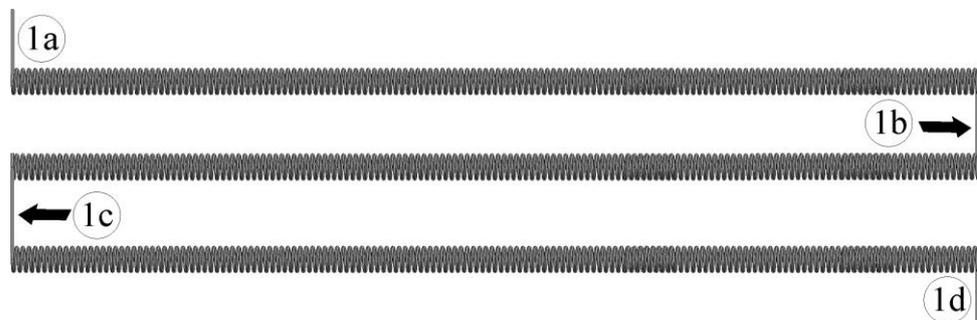


Fig. 51: Heating element (similar to picture)

#### Example:

First, insert the end of the heating element (1a) into the intended opening from inside (this is the opening that you pulled the previous heating element end out of).

Place the heating coil carefully into the intended groove/s. Carefully press the heating element connections (1b and 1c) into the intended slit. Insert the end of the heating element (1d) into the intended opening from inside to outside.

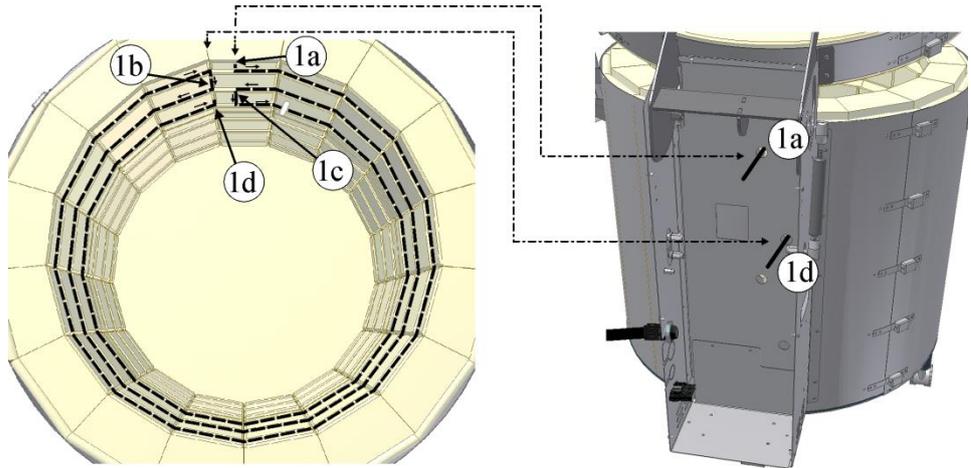


Fig. 52: Place the heating coil in the groove/s (similar to picture)

If available, assemble and place more heating elements in the intended grooves (depending on furnace model).

**Example:**

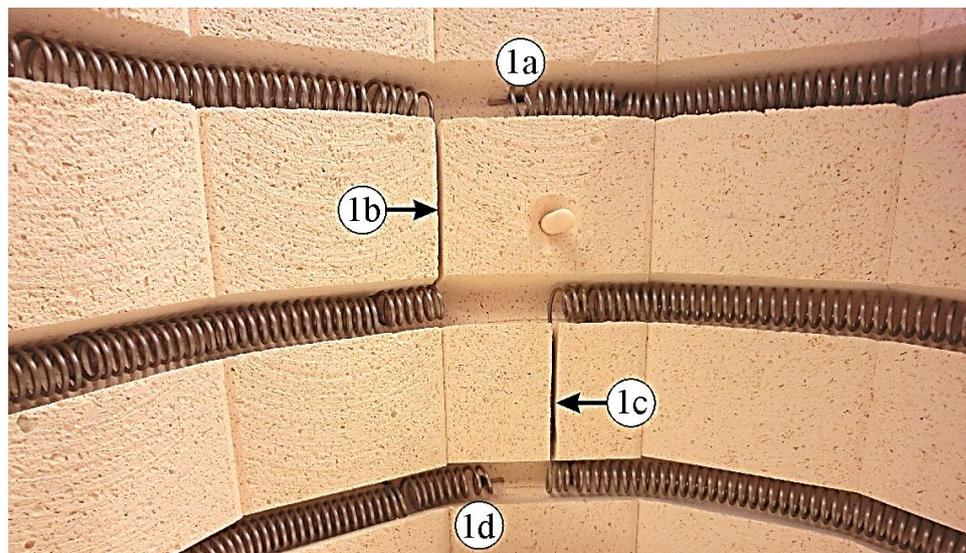


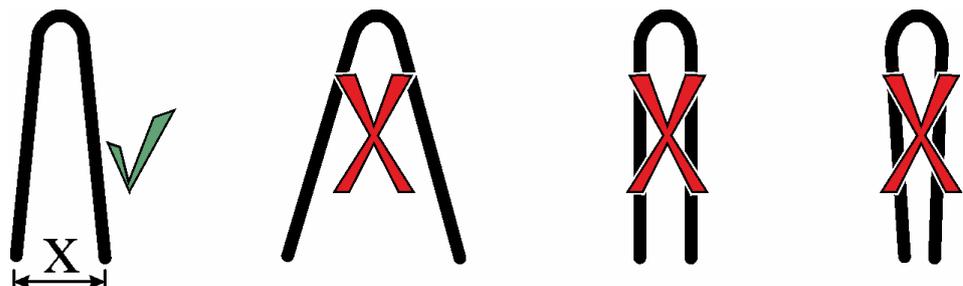
Fig. 53: Place the heating element in the groove/s (similar to picture)

Insert the supplied fasteners into the wall brickwork. They are needed to prevent the heating elements lifting out of the groove when they get hot.

**Notice:** Do not insert fasteners in holes of previous fasteners. We recommend that new fasteners are inserted 2 to 3 cm from existing holes.

**Note:** Distance X of the supplied fasteners must not be changed.

X ~ 14 mm



Expand the heating element a little (1) at the position where a cramp will be inserted using a suitable slot screwdriver.

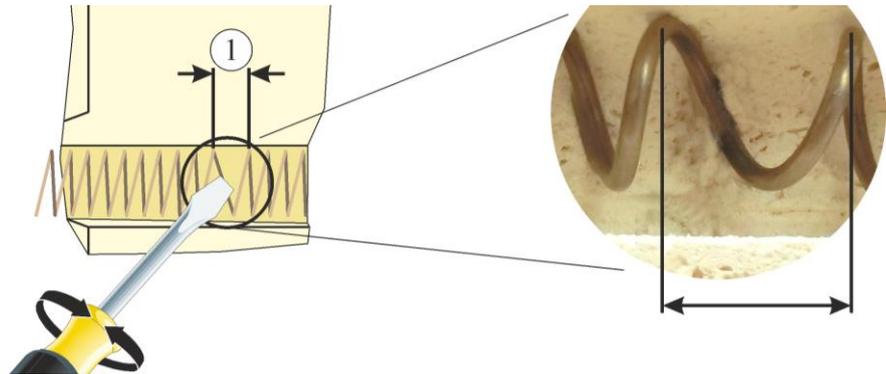


Fig. 54: Spread the heating coil a little (similar to picture)

Position the fasteners in the straight wall (3) of the groove to ensure that the heating element sits properly and functions as intended. After assembly, check that heating element and fastener are positioned correctly.

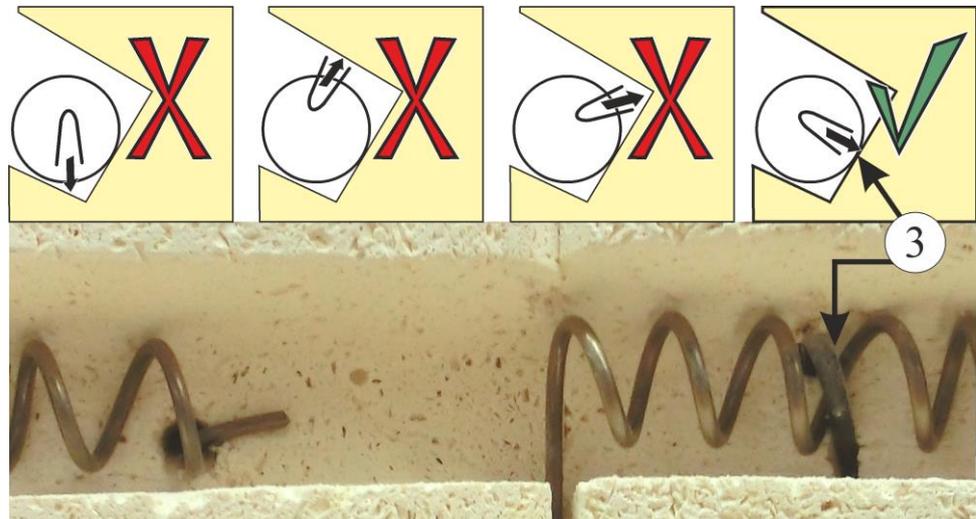


Fig. 55: Correct positioning of the fasteners (similar to picture)

Use a suitable tool to tap the supplied fasteners carefully into the insulating brick until the heating element sits completely on the brickwork. Make sure that the insulation brick is not damaged.

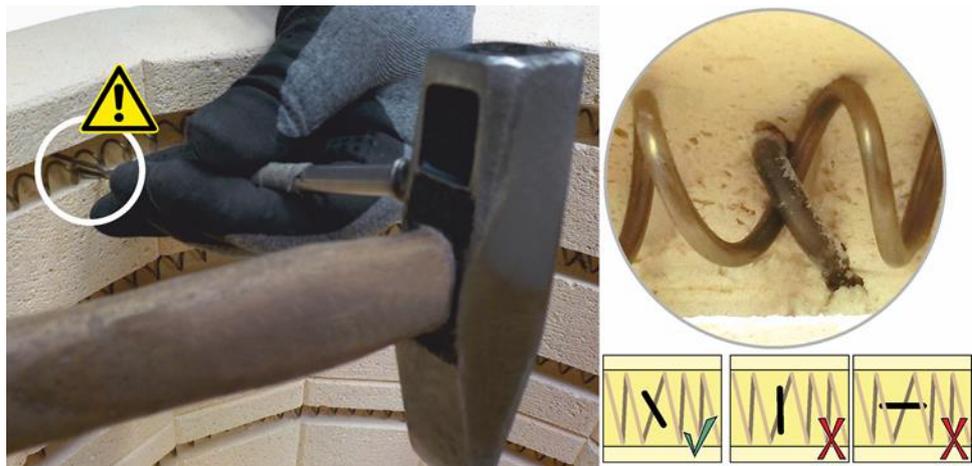


Fig. 56: Tapping the fasteners into the insulation bricks (similar to picture)

Seal the gaps in the ceramic feedthrough tube with a small amount of fiber wadding (included with delivery). To do this, spread the fiber wadding around the end of the heating element with a small screwdriver (1) and press this to the back of the small feedthrough hole. Do not use too much fiber wadding so that the ceramic feedthrough tube (2) can still be inserted until it engages.

Slide the ceramic feedthrough tube (2) on to the ends of the heating elements until they engage.

Slide the connection terminals (3) until they touch the ceramic feedthrough tube.

Use the terminals to create technically correct electrical connections (4).

Tighten the screws (5) of the connection terminals (the correct tightening torque can be found in the table below). So as not to damage the connection terminal or the ceramic feedthrough tube we recommend the use of a suitable pipe wrench (example) as a brace when tightening the screws of the connection terminal (5).

For the correct tightening torque, please refer to the table in these operating instructions in the section “Tightening Torque for Screws on the Heating Elements”.

Shorten the projecting twisted heating element ends with suitable pincers (6). We recommend that you leave approx. 0.5 cm between the edge and the connection terminal.

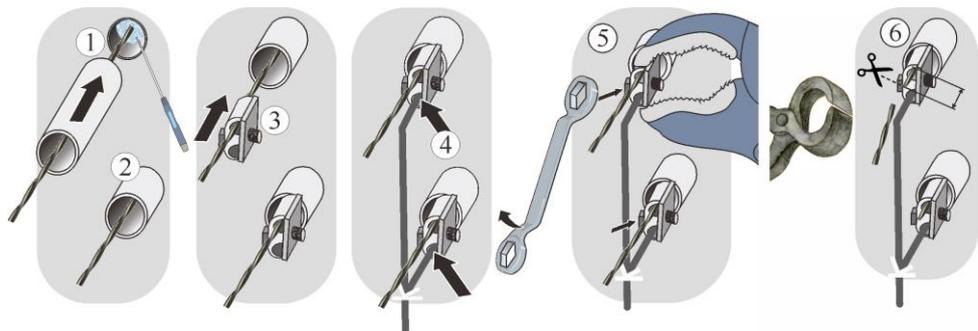


Fig. 57: Sliding on the ceramic ducts and connecting the electricity (similar to picture)

**Note:**

Tighten all screws on the connection terminals after one week of operation and then once each year. Avoid all stress or twisting of the heating element. If this advice is not followed, the heating elements may be damaged.



**Note**

Make sure that all screwed and plugged connections are in working order.

We recommend that you clean the switchgear and furnace chamber thoroughly, with a vacuum cleaner, for example.

The switchgear cover is assembled in the reverse order.



**Caution**

Make sure that no cables poke out or are caught. Beware of sharp edges.

**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").

**8.1.2 Top Loader Model – HO**

Use an appropriate tool to remove the screws all around the cover and keep them in a secure place for later use. The cover must be lowered onto a soft material (such as foam rubber). The number and position of the screws may differ from one furnace model to the next. The furnace may look different than the picture depending on the furnace model and additional equipment.

If present, pay attention to the protective ground cable of the back wall to the clamp. If necessary, disconnect the cable from the clamp.



Fig. 58: Dismantle the cover of the switchgear from the back of the furnace (similar to picture)

To replace the heating elements, completely open the lid of the furnace (see "Opening and Closing the Lid").

**Removing the heating elements**



**Note**

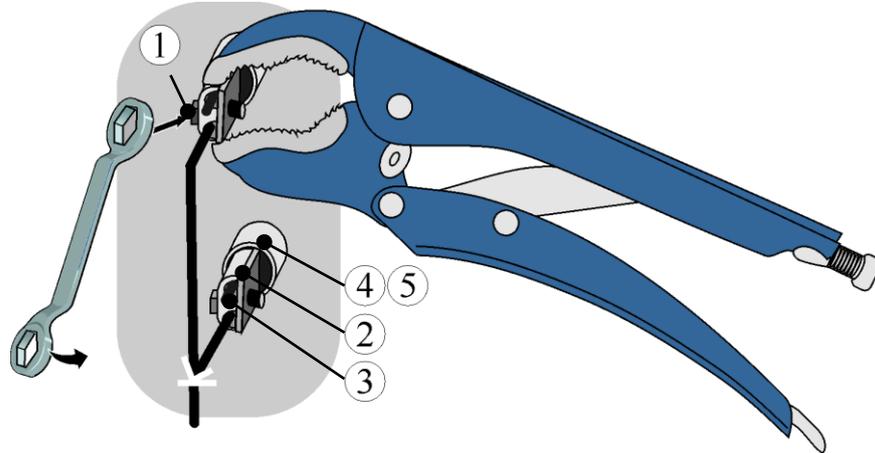
The pictures contained in the instruction manual may contain inaccuracies in terms of the function, design and furnace model.

**Tip:** Because of the many different furnace models, we recommend that you take several photos of the previously installed heating elements and the switchgear. This will simplify subsequent installation and wiring of new heating elements.

We recommend that two people replace heating elements.

Unscrew the screws (1) of the connection terminals (2). Place the screws and the connection terminal in a safe place so that they can be reused. So as not to damage the connection terminal or the ceramic feedthrough tube we recommend the use of a suitable pipe wrench (example) as a brace when unscrewing the screws of the connection terminal (5).

**Warning:** The wire have pointed ends that can cause injuries.



1 Hexagonal screw / 2 Connection terminal / 3 Heating element end  
4 Ceramic feedthrough tube / 5 Fiber wadding

Fig. 59: Unscrew the screws on the ends of the heating elements (similar to picture)

Pull the ceramic duct out and keep it in a safe place so that it can be used again (clean or replace where necessary, if included in the spare parts delivery).

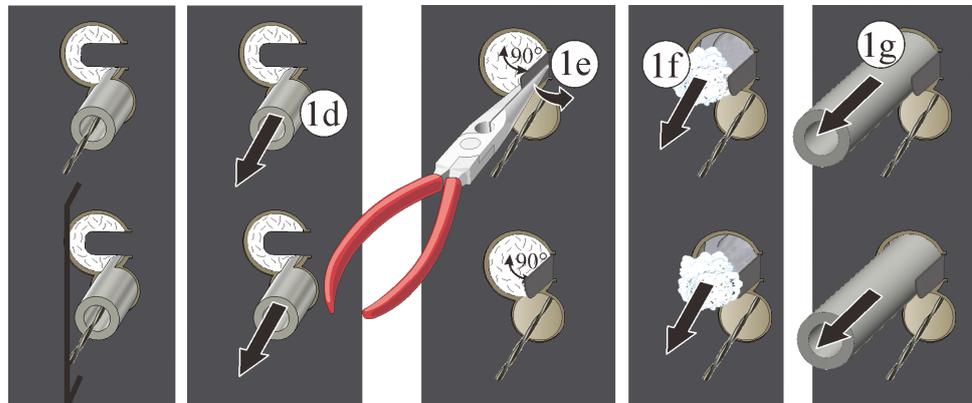


Fig. 60: Carefully remove the ceramic feedthrough tube (1d) (similar to picture)

To remove the support tubes of the heating elements, the protective metal sheets (1e) must first be bent upward by around 90° with suitable tools.

Remove the fiber wadding (1f) in front and keep it for reuse.

Pull the support tubes (1g) of the heating elements carefully and slowly out of the back wall as shown in the figure below (clean or replace where necessary, if included in the spare parts delivery).

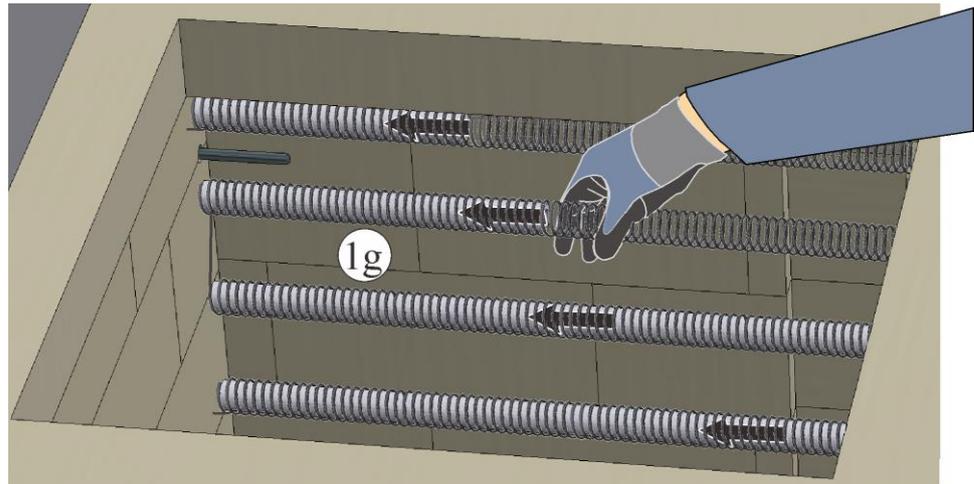


Fig. 61: Removing the support tubes (1g) (similar to picture)

Carefully lift the heating elements and remove them from the furnace. When removing them, make sure that the very brittle surrounding insulation is not damaged.

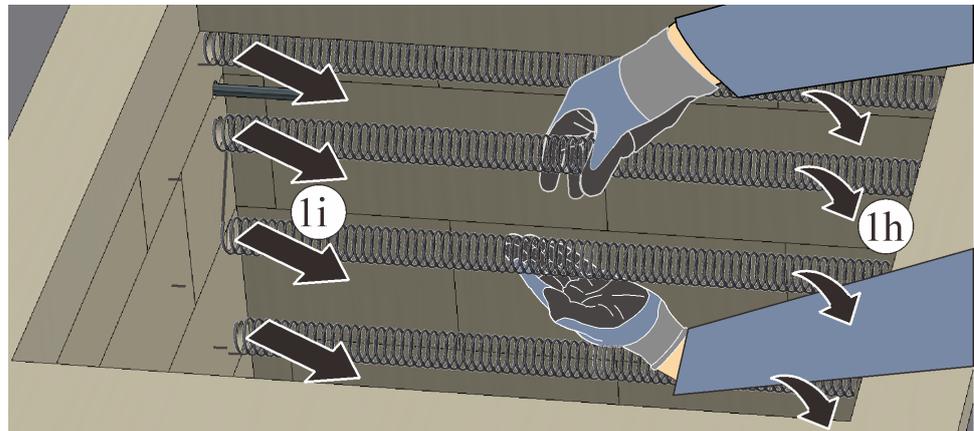


Fig. 62: Removing the heating elements from the furnace (similar to picture)

### Installing the Heating Elements

Before installing heating elements, we recommend that you clean the furnace chamber thoroughly, with a vacuum cleaner, for example.

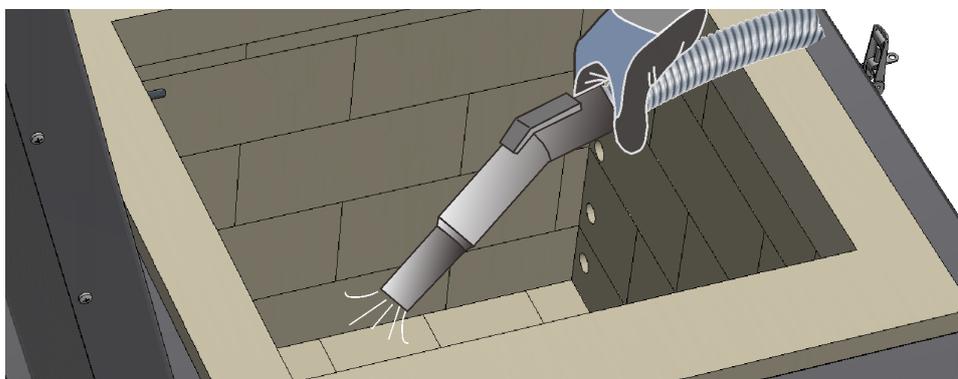


Fig. 63: Cleaning inside the furnace (similar to picture)

Check the supplied heating elements for damage before installation.

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 received at a later date cannot be acknowledged.

Clean the heating chamber, support tubes, clamps and ceramic ducts to remove firing residues.

Note: We recommend that you use new support tubes and ceramic ducts (dirty support tubes/ceramic ducts cause new heating elements to break down prematurely).

The (twisted) ends of the heating elements have a loop as protection. Pinch off the loop with a suitable tool (pincers, for example) before installation.

**Warning:** The wire have pointed ends that can cause injuries.

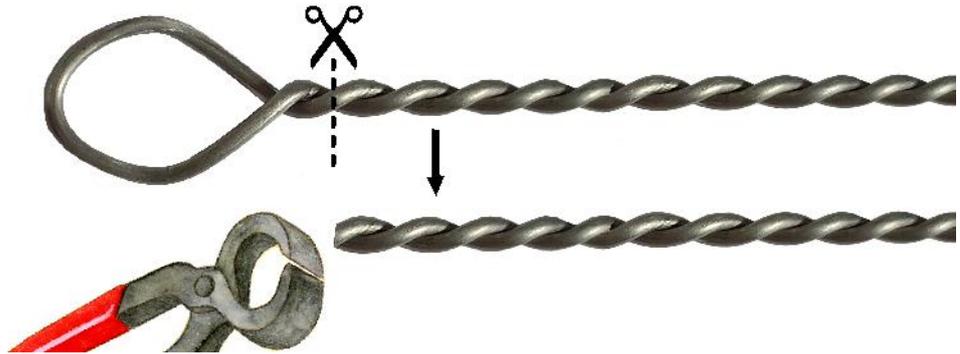


Fig. 64: Pinch off the loop on the end of the heating element (similar to picture)

Carefully insert the ends of the heating elements through the holes from inside. Then place the heating element carefully inside the furnace.

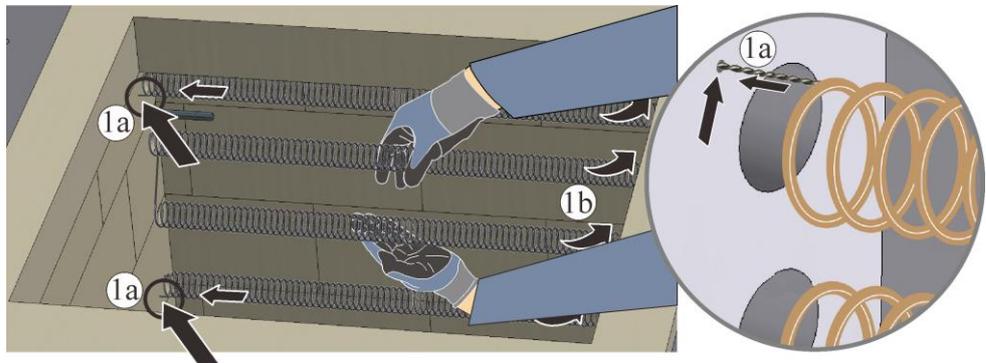


Fig. 65: Installing the heating elements (similar to picture)

Carefully insert the support tubes into the existing openings and through the individual heating elements.

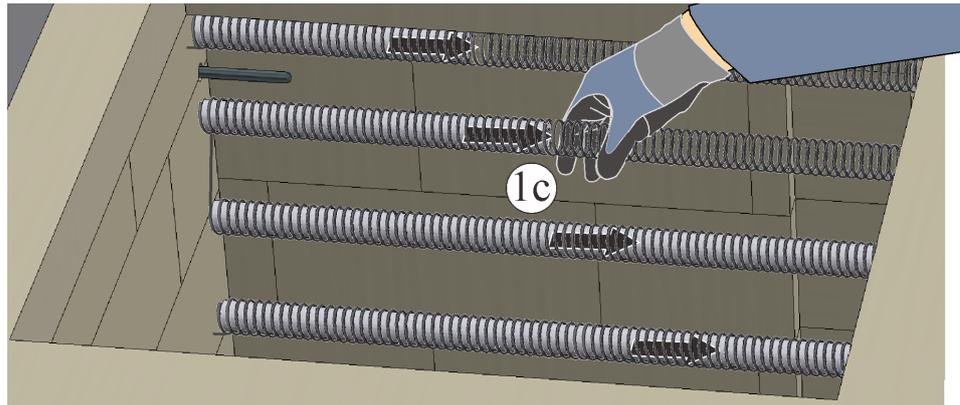


Fig. 66: Inserting the support tubes (similar to picture)

Fill the holes on the support tubes with sufficient fiber wadding (not the support tube itself).

Carefully bend the protective metal sheet back in place by hand (wear suitable protective gloves) or with a suitable tool.

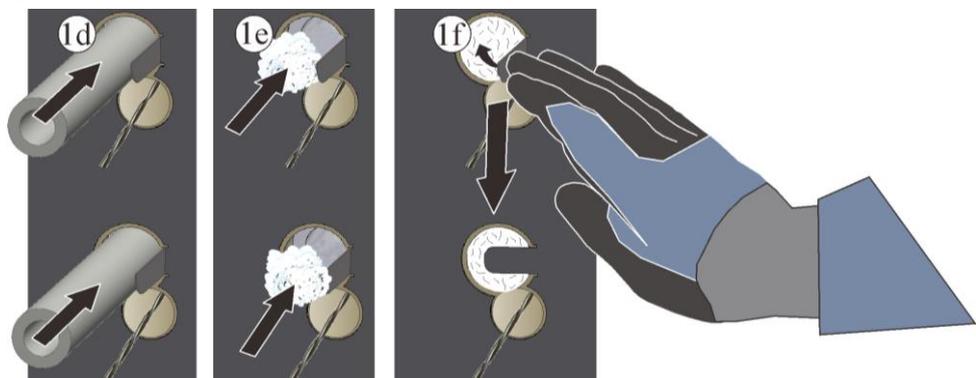


Fig. 67: Filling and closing the support tube holes (similar to picture)

Seal the gaps in the ceramic feedthrough tube with a small amount of fiber wadding (included with delivery). To do this, spread the fiber wadding around the end of the heating element with a small screwdriver (1) and press this to the back of the small feedthrough hole. Do not use too much fiber wadding so that the ceramic feedthrough tube (2) can still be inserted until it engages.

Slide the ceramic feedthrough tube (2) on to the ends of the heating elements until they engage.

Slide the connection terminals (3) until they touch the ceramic feedthrough tube.

Use the terminals to create technically correct electrical connections (4).

Tighten the screws (5) of the connection terminals (the correct tightening torque can be found in the table below). So as not to damage the connection terminal or the ceramic feedthrough tube we recommend the use of a suitable pipe wrench (example) as a brace when tightening the screws of the connection terminal (5).

For the correct tightening torque, please refer to the table in these operating instructions in the section “Tightening Torque for Screws on the Heating Elements”.

**Note:**

Tighten all screws on the connection terminals after one week of operation and then once each year. Avoid all stress or twisting of the heating element. If this advice is not followed, the heating elements may be damaged.

Shorten the projecting twisted heating element ends with suitable pincers (6). We recommend that you leave approx. 0.5 cm between the edge and the connection terminal.

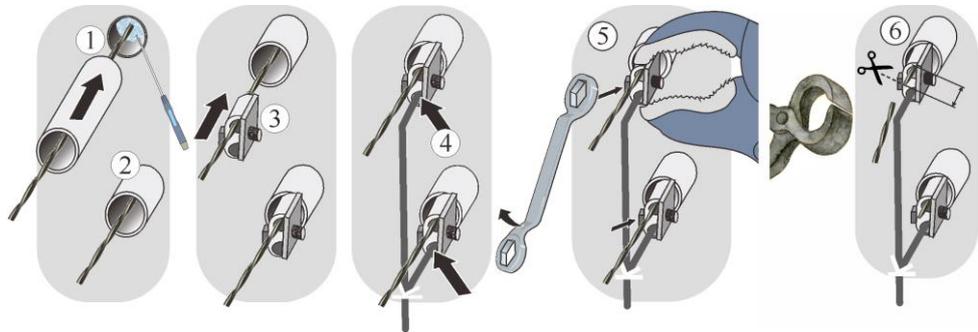


Fig. 68: Sliding on the ceramic ducts and connecting the electricity (similar to picture)



**Warning – General Hazards!**

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



**Note**

Make sure that all screwed and plugged connections are in working order.

The switchgear cover is assembled in the reverse order.



**Caution**

Make sure that no cables poke out or are caught. Beware of sharp edges.

**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").

### 8.1.2.1 Tightening Torque for Screw Connections on Heating Elements

Screw tightening torque			
Tighten screws on the heating elements with a defined torque. If this advice is not followed, the heating elements may be damaged.			
Figure	Screw/type of fixing	Thread diameter of metric thread	Torque (M) in Nm
	Fastening power cable clamp	M5	6 Nm
		M6	8 Nm
		M7	8 Nm
		M8	14 Nm
		M10	20 Nm

### 8.1.3 Replacing a Thermocouple



**Warning – Danger of Electric Shock**

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



**Warning – General Hazards!**

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



**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.



**Note**

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

A description of dismantling and installing the cover(s) and the associated safety instructions can be found in “Dismantling and Installing Heating Elements”.

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

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

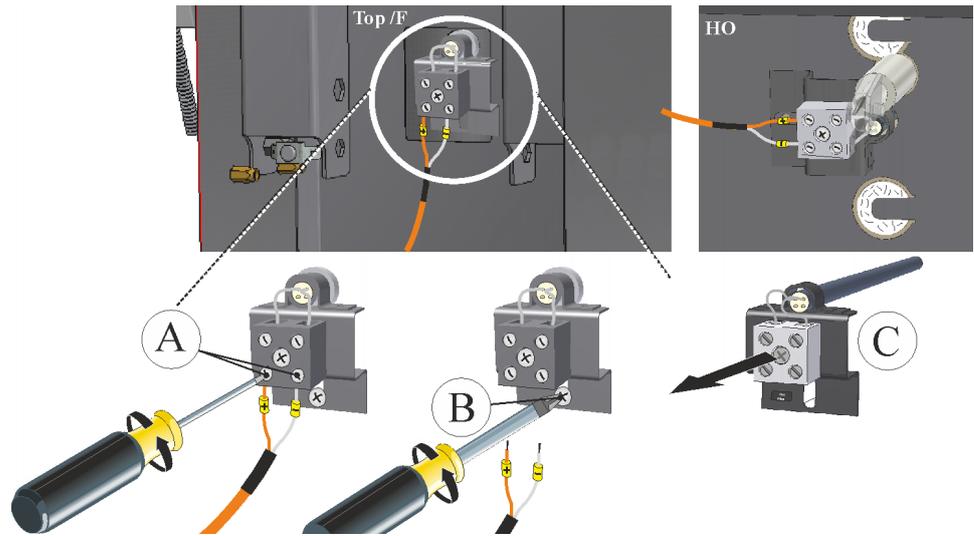


Fig. 69: Removing the thermocouple(s) (similar to picture)



**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  $\ominus$



**Note**

Make sure that all screwed and plugged connections are in working order.

The switchgear cover is assembled in the reverse order.



**Caution**

Make sure that no cables poke out or are caught. Beware of sharp edges.

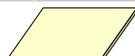
**Commissioning**

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").

**9 Accessories (Options)**

Furnace Furniture/Shelves			
Furnace model top loader Top	Dimensions in mm	Part number	Figure
Top 16/R	Ø225x10	691 600 954	
Top 45, Top 60	Ø350x10	691 600 397	
Top 80, Top 100	Ø420x12	691 600 440	
Top 140	Ø470x15	691 600 833	
Top 130, Top 160, Top 190	Ø520x15	691 600 834	
Top 220	550x440x18 (R275)	691 601 125	

Furnace Furniture/Shelves			
Furnace model fusing top loader F	Dimensions in mm	Part number	Figure
F 30	Ø350x10	691 600 397	
F 75	490x350x17 (R245)	691 601 372	
F 110, F 220	R275x440x18	691 601 125	

Furnace Furniture/Shelves			
Furnace model top loader HO	Dimensions in mm	Part number	Figure
HO 70	340x370x13	691 600 181	
HO 100	490x400x15	691 600 182	

Furnace Furniture/Props			
Furnace models Top, F and HO	Dimensions in mm	Part number	Figure
Prop	Ø40x50	691 600 185	
Prop	Ø40x100	691 600 951	

Base Extension			
Furnace model top loader Top	Dimensions in mm	Part number	Figure
Top 45	Height 132 (without castors)	600 0063 632	
Top 60			

Base Extension			
Furnace model fusing top loader F	Dimensions in mm	Part number	Figure
F 30	Height 132 (without castors)	401 010 088	
F 75		601 402 652	
F 100		601 402 501	

## 10 Electrical Connection (Circuit Diagram)



### Note

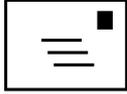
The documents included do not always contain the electrical schematics and pneumatic diagrams.

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

## 11 Nabertherm Service



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



### Mail

Nabertherm GmbH  
Bahnhofstrasse 20  
28865 Lilienthal/Germany



### Phone or fax

Phone: +49 (4298) 922-333  
Fax: +49 (4298) 922-129



### Web or e-mail

[www.nabertherm.com](http://www.nabertherm.com)  
[contact@nabertherm.de](mailto:contact@nabertherm.de)

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

Provide the following details from the type plate:

 <small>MORE THAN HEAT 30-3000°C</small>		
Nabertherm GmbH Bahnhofstr. 20, 28865 Lilienthal/Bremen, Germany Tel +49 (04298) 922-0, Fax +49 (04298) 922-129 contact@nabertherm.de <small>www.nabertherm.com</small>		
①	②	④
③		

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

Fig. 70: Example (type plate)

## 12 Shut-Down, Dismantling, and Storage

### 12.1 Environmental Regulations

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

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



#### **Safety information:**

When the furnace is being disposed of, the lid lock should be destroyed. This stops children being locked in and facing the risk of death.

Separate the power cable and dispose of this together with the plug.



#### **Note**

Observe the national regulations of the country in which the furnace will be used.

## 12.2 Transportation/Return Transportation



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

Otherwise:

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

+45°C  
-5 °C



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

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

Otherwise, in general:

“Fix” and “secure” (adhesive tape) all moving parts and cushion and protect any projecting parts against breakage.

Protect your electronic equipment against moisture and make sure that no loose packaging material can get inside it.

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

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

As a rule:

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

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

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



### Note

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



### Note

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

### 13 Declaration of Conformity



#### EC Declaration of Conformity

in accordance with EC directives 2014/35/EU,  
RoHS directives 2011/65/EU and  
EMC directive 2014/30/EU

Hereby

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**Nabertherm GmbH**  
**Bahnhofstr. 20, 28865 Lilienthal, Germany**

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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.

#### Top Loaders

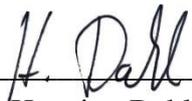
<b>Model</b>	Top 16/R	Top 45	Top 45/L	Top 45/R	Top 60
	Top 60/L	Top 60/R	Top 80	Top 80/R	Top 100
	Top 100/R	Top 130	Top 140	Top 140/R	Top 160
	Top 190	Top 190/R	Top 220	HO 70/L	HO 70/R
	HO 100	F 30	F 75 L	F 75	F 110
	F 110 LE	F 220			

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

The following harmonized standards were applied:

- DIN EN 60335-1 (08.2020)
- DIN EN 61000-6-1 (11.2019), DIN EN 61000-6-3 (09.2011)

Lilienthal, 03.01.2022

  
\_\_\_\_\_  
Dr. Henning Dahl  
Vice President R & D

  
\_\_\_\_\_  
Gernot Fäthke  
Department Manager R & D



MORE THAN HEAT 30-3000 °C

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