

## Operating Instructions

### Vacuum Firing and Pressing Furnaces with Lift Bottom

**VL 01/12 LB**

**VL 01/12 LB Press**

M01.1101 ENGLISCH

Original instructions

■ Made  
■ in  
■ Germany

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

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## 1 Introduction

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)

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

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

## 2 Key to the Symbols and Warning Terminology Used in Warning Messages



### Note

The following operating instructions set forth specific warnings to highlight the residual risks that cannot be avoided when operating the equipment. These residual risks include hazards to personnel/product/equipment and the environment.

The symbols used in the operating instructions are primarily intended to draw attention to the safety instructions!

The respective symbols cannot replace the text contained in the safety instructions. The text must therefore always be read in full!

Graphic symbols correspond to **ISO 3864**. According to the **American National Standards Institute (ANSI) Z535.6** standard, the following warning messages and terminology are used in this document:



The general hazard symbol, in conjunction with the warning words **CAUTION**, **WARNING** and **DANGER**, warns of the risk of serious injury.

The textual explanations associated with the general hazard symbol, particularly if this appears on the device, must always be observed in order to obtain instructions on how to avoid hazards and prevent injury or death.

### NOTICE

Indicates a hazardous situation leading to damage to or destruction of the equipment.

### CAUTION

Indicates a hazardous situation that could result in minor or moderate injury.

### WARNING

Indicates a hazardous situation that could result in death or serious or irreversible injury.

### DANGER

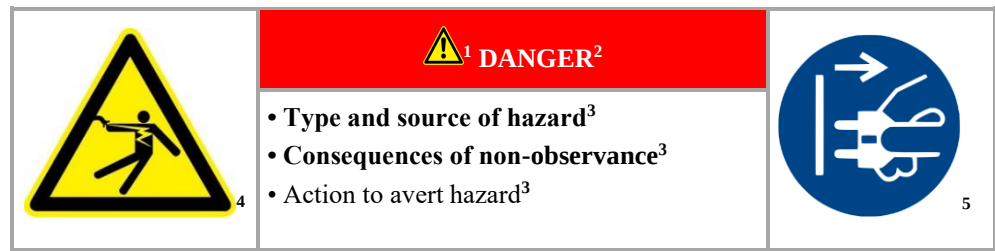
Indicates a hazardous situation that will result in immediate death or serious injury.

### Warning Message Structure:

All warning messages are structured as follows

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <div>  <sup>1</sup> <b>WARNING</b><sup>2</sup> </div> <ul style="list-style-type: none"> <li>• <b>Type and source of hazard</b><sup>3</sup></li> <li>• <b>Consequences of non-observance</b><sup>3</sup></li> <li>• <b>Action to avert hazard</b><sup>3</sup></li> </ul> |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

or



| Item | Name                                                | Explanation                                                                                                                                                      |
|------|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Safety alert symbol                                 | Indicates risk of injury                                                                                                                                         |
| 2    | Signal word                                         | Classifies the hazard                                                                                                                                            |
| 3    | Safety messages                                     | <ul style="list-style-type: none"> <li>• Type and source of hazard</li> <li>• Potential consequences if not observed</li> <li>• Measures/prohibitions</li> </ul> |
| 4    | Graphical symbols (optional) according to ISO 3864: | Consequences, measures or prohibitions                                                                                                                           |
| 5    | Graphical symbols (optional) according to ISO 3864: | Rules 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 – Risk of Device Toppling Over**

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



**Warning – Suspended Load**

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



**Warning – Danger if Heavy Loads are Lifted**

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



**Warning – Risk to the Environment**

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



**Warning – Fire Danger**

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



**Warning – Suffocation from Lack of Oxygen**

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



**Warning – Risk of Explosive Substances or Explosive Atmosphere**

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

**Prohibited – Important Information for Operators**

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

**Warning Signs on the Furnace:****Warning – Hot Surface, Danger of Burning – Do Not Touch**

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

**Warning – Electrical voltage!**

Warning of dangerous electric voltage.



### 3 Product Description



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

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

The motorized lift bottom simplifies charging of the high-temperature furnaces VL 01/12 LB (Press) considerably. The all-round heating of the furnace chamber ensures optimum temperature uniformity.

Due to generously dimensioned heating capacity and low storage heat, short process times are possible. These vacuum firing and pressing furnaces are intended for dental processes and reach a maximum temperature of 1200 °C (2192 °F).

#### **Furnace Model VL 01/12 LB (Press)**

These models are ideally suited for firing dental ceramics in a vacuum or normal atmosphere. The VL 01/12 LB Press model is also suitable for pressing dental ceramics in a vacuum.

#### **Product properties:**

- Tmax 1200 °C (2192 °F).
- High-quality heating elements freely radiating in a quartz glass muffle
- Very good temperature uniformity inside the furnace
- Precise, motorized tooth belt drive of the lift bottom with button controls; the furnace can be opened and closed automatically in programmed operation
- Type S thermocouples
- Controller D580 (up to 50 materials with max. 32 programs for each material)
- 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.
- Dual shell housing made of textured stainless steel sheets with additional fan cooling for low surface temperature
- Only fiber materials are used which are not classified as carcinogenic according to TRGS 905, class 1 or 2
- NTLog Basic for Nabertherm controller: recording of process data with USB-flash drive

3.1 Overview of the Complete System

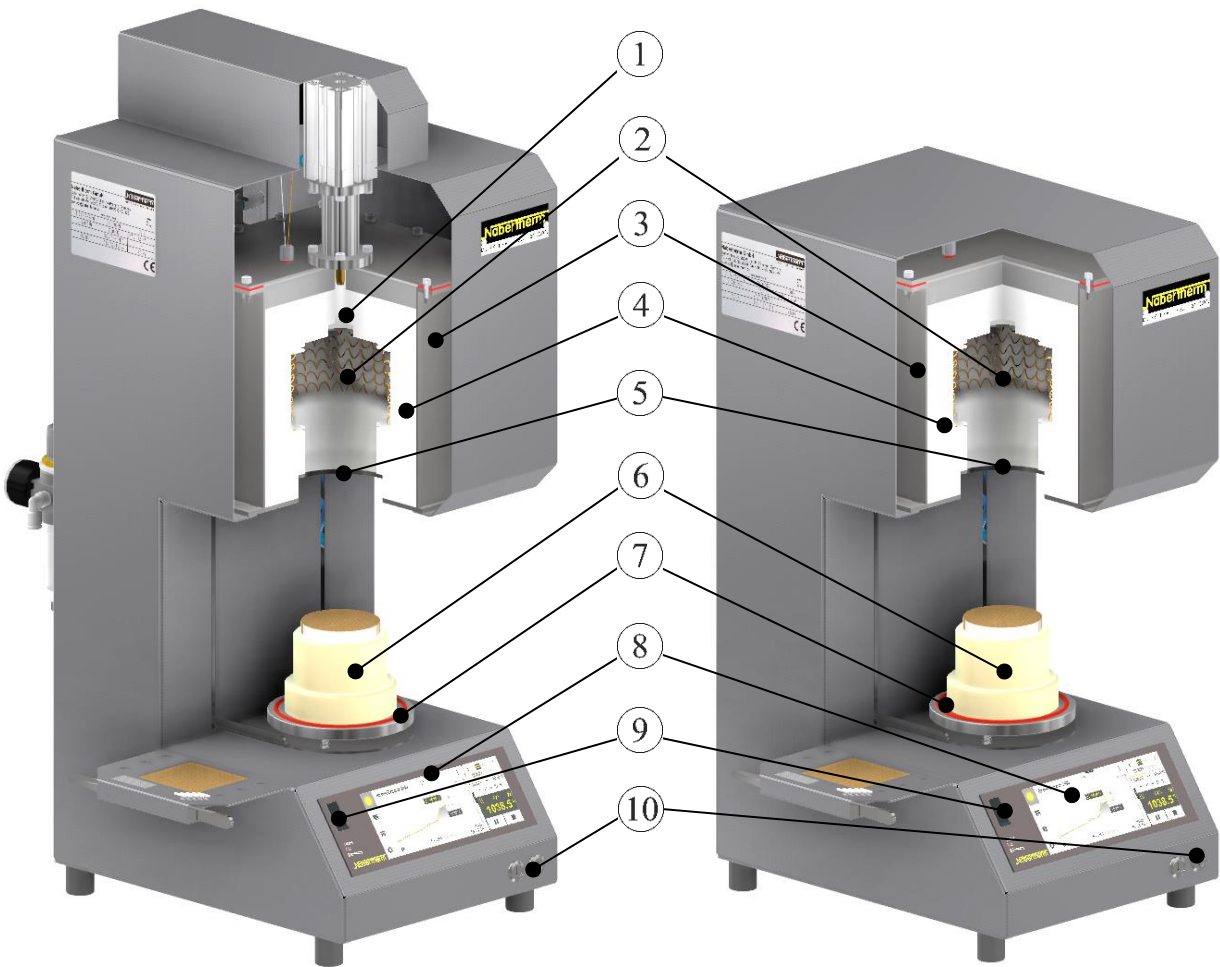


Fig. 1: Complete view: VL 01/12 LB Press (left), VL 01/12 LB (right) (similar to picture)

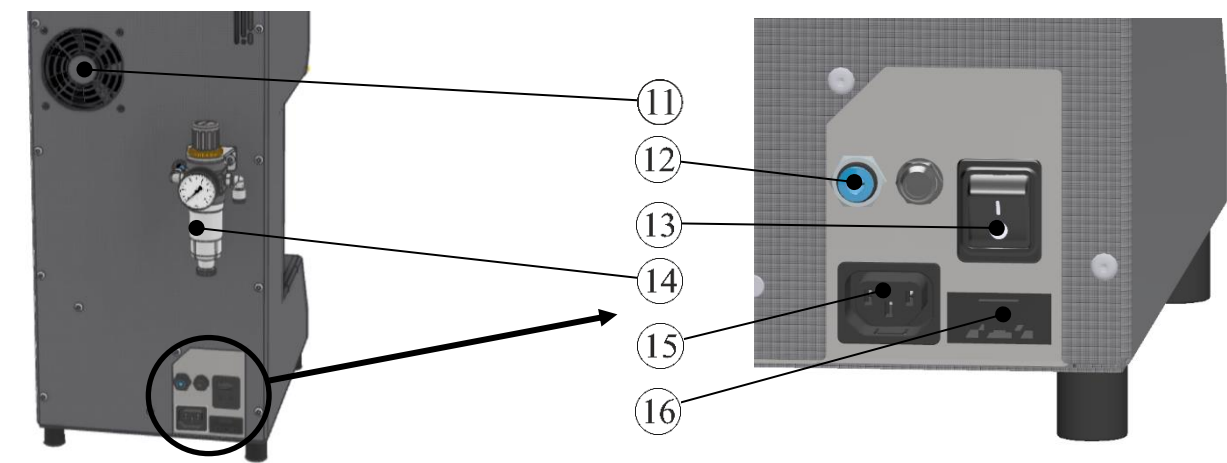


Fig. 2: Back view of the furnace (similar to picture)

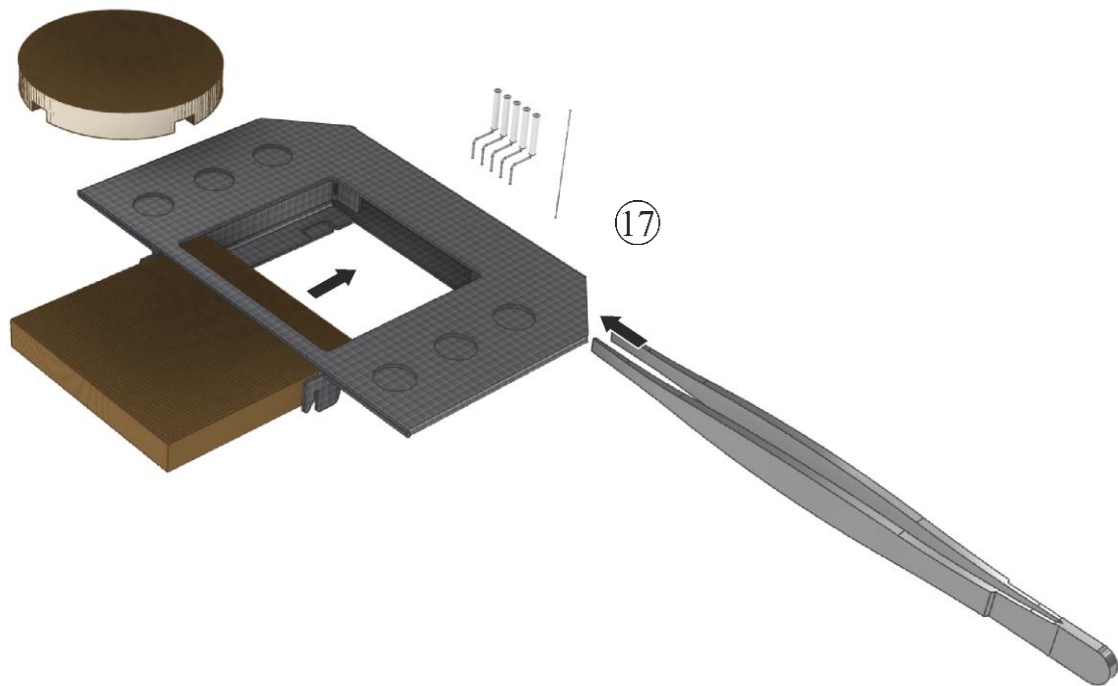


Fig. 3: Starter kit (similar to picture)

| No. | Name                                                                                                                            |
|-----|---------------------------------------------------------------------------------------------------------------------------------|
| 1   | Plunger (only model VL 01/12 LB Press)                                                                                          |
| 2   | Quartz glass heating muffle                                                                                                     |
| 3   | Vacuum chamber                                                                                                                  |
| 4   | Chamber insulation                                                                                                              |
| 5   | Collar insulation                                                                                                               |
| 6   | Lift bottom with floor insulation                                                                                               |
| 7   | Lift bottom seal                                                                                                                |
| 8   | Controller D580                                                                                                                 |
| 9   | USB interface                                                                                                                   |
| 10  | Button to control the lift bottom                                                                                               |
| 11  | Housing fans                                                                                                                    |
| 12  | Vacuum pump connection, plug-in connection for externally calibrated hoses Ø 6 mm                                               |
| 13  | Power switch (ON/OFF)                                                                                                           |
| 14  | Connection for compressed air 4-6 bar, plug-in connection for externally calibrated hoses Ø 6 mm (only model VL 01/12 LB Press) |
| 15  | Electric connection of the vacuum pump                                                                                          |
| 16  | Power plug with snap-in coupling                                                                                                |
| 17  | Starter set                                                                                                                     |

### 3.2 Safeguarding against Dangers from Excess Temperatures

The design, with consideration of DIN EN 61010-1, ensures that no inadmissible temperatures occur on the outer housing of the furnace.

In case of malfunctions that cause the furnace to overheat, the dimensioning of the heating element and the calculation of the insulation provide adequate assurance that there is no risk of excess temperature. In this case, the heating element would malfunction before the insulation.

The surfaces of the housing that are affected by heat have a warning sign (see “Hot Surface, Danger of Burning”).

### 3.3 Key to the Model Names

| Example                  | Explanation                                               |
|--------------------------|-----------------------------------------------------------|
| VL 01/12 LB              | VL = Vacuum Dental-Laboratory furnace                     |
| VL <b>01</b> /12 LB      | <b>01</b> = approx. 1-liter furnace chamber (volume in L) |
| VL 01/ <b>12</b> LB      | <b>12</b> = Tmax 1200 °C (2192 °F)                        |
| VL 01/12 <b>LB</b>       | <b>LB</b> = Lift Bottom                                   |
| VL 01/12 LB <b>Press</b> | <b>Press</b> = model with pneumatic pressing function     |

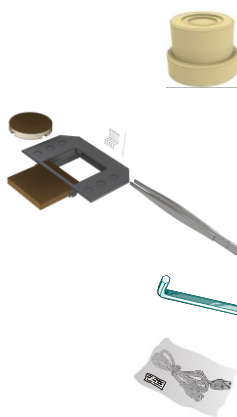


| <div><div><b>Nabertherm</b></div><div>MORE THAN HEAT 30-3000 °C</div></div>                                                                                                                                                                    |                   |                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------------------------------------------------------------------------------------|
| <b>Nabertherm GmbH</b><br>Bahnhofstr. 20, 28865 Lilienthal/Bremen, Germany<br>Tel +49 (04298) 922-0, Fax +49 (04298) 922-129<br>contact@nabertherm.de<br><a href="http://www.nabertherm.com">www.nabertherm.com</a> <div>Made in Germany</div> |                   |                                                                                                   |
| VL 01/12 LB                                                                                                                                                                                                                                    | SN 123456         | 2021                                                                                              |
| RR1211X017                                                                                                                                                                                                                                     | 1200 °C           |  max. 1,8 kW |
| M045307                                                                                                                                                                                                                                        | 220-240 V 3/N/PE~ | —                                                                                                 |
| 50/60 Hz                                                                                                                                                                                                                                       | 7,5 A             | max. 1,8 kW                                                                                       |
|                                                                                                                                                           |                   |                                                                                                   |

Fig. 4: Example of model name (type plate similar)

### 3.4 Scope of Delivery

The scope of delivery includes:



| System components                       | Quantity | Comment                |
|-----------------------------------------|----------|------------------------|
| Furnace                                 | 1 x      |                        |
| Furnace lift bottom insulation          | 1 x      |                        |
| Starter kit                             | 1 x      |                        |
| Hex key                                 | 1 x      |                        |
| Power cable <sup>1)</sup>               | 1 x      |                        |
| Other components depending on the model | - - -    | See shipping documents |



| Document type                                                | Quantity | Comment |
|--------------------------------------------------------------|----------|---------|
| Operating instructions for vacuum dental furnace             | 1 x      |         |
| Operating instructions for controller                        | 1 x      |         |
| Other documents, variable depending on the particular design | 1 x      |         |

<sup>1)</sup> Included in delivery depending on the version/furnace model



#### Note

Keep all documents for future reference. All functions of this furnace system 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.

## 4 Specifications



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

| Model             | Tmax | Outer dimensions in mm |     |     | Work space in mm |    |
|-------------------|------|------------------------|-----|-----|------------------|----|
|                   | °C   | W                      | D   | H   | Ød               | h1 |
| VL 01/12 LB       | 1200 | 260                    | 360 | 605 | 70               | 70 |
| VL 01/12 LB Press | 1200 | 260                    | 450 | 745 | 70               | 70 |

| Model             | Volume      | Weight | Time to Tmax | Area of lift bottom | Maximum charge weight |
|-------------------|-------------|--------|--------------|---------------------|-----------------------|
|                   | in L        | in kg  | in min       | ØD                  | in kg                 |
| VL 01/12 LB       | approx. 0.4 | 22     | 10           | 75                  | 0.5                   |
| VL 01/12 LB Press | approx. 0.4 | 27     | 10           | 75                  | 0.5                   |

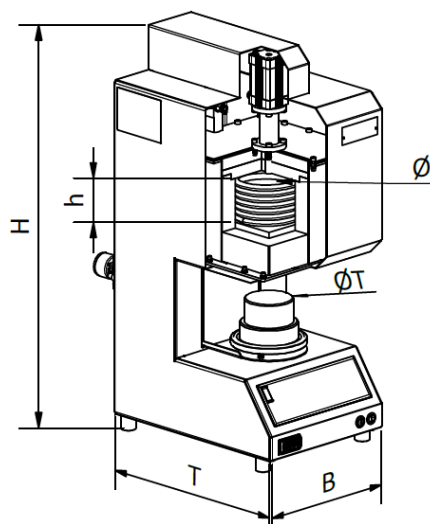


Fig. 5: Dimensions

| Model             | Electrical connection | Voltage   | Amperage | Connected load | Frequency |
|-------------------|-----------------------|-----------|----------|----------------|-----------|
|                   |                       | in V      | in A     | in kW          | in Hz     |
| VL 01/12 LB       | 1/N/PE, 2PE           | 220 - 240 | 7.5      | 1.8            | 50/60     |
| VL 01/12 LB Press | 1/N/PE, 2PE           | 220 - 240 | 7.5      | 1.8            | 50/60     |

|                                             |                           |                                           |
|---------------------------------------------|---------------------------|-------------------------------------------|
| Thermal protection class                    | Furnaces:                 | DIN EN IEC 60519-1                        |
| Protection type                             | Furnaces:                 | IP20                                      |
| Ambient conditions for electrical equipment | Temperature:<br>Humidity: | +5 °C to 40 °C<br>max. 80% non-condensing |

|                  |                                 |                                              |
|------------------|---------------------------------|----------------------------------------------|
| <b>Weights</b>   | Oven with accessories           | Depending on design (see shipping documents) |
| <b>Battery</b>   | Controller:                     | 3 V/285 mA Lithium Model: CR2430             |
| <b>Emissions</b> | Continuous sound pressure level | < 70 dB(A)                                   |

## 5 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

## 6 Safety

### 6.1 Defined Application



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

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

**Furnaces in this range are suitable for firing and pressing dental ceramics in a vacuum or normal atmosphere. The charge is placed on a lift bottom and moved into the furnace.**



#### 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.).

#### 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.
- 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.



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

The furnace must not be filled with materials or substances that release explosive gases or vapors. Only materials and substances whose properties are known may be used.



#### Note

Continuous operation at maximum temperature can lead to increased wear of heating elements, insulation materials and metallic components. We recommend working at approx. **50 °C below maximum temperature.**



This furnace was designed for **commercial** use. The furnace is **NOT** designed for heating food, animals, wood, grain, etc.

The furnace must not be used to heat the workplace.

Do not use the furnace to melt ice or for similar purposes.

Do not use the furnace as a clothes dryer.

#### 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.
- 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.



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



#### Note

Depending on use, wearing parts, such as heating elements and insulation material, can be subject to increased wear. High temperatures on the stainless steel (especially if the furnace is opened when hot) can cause discoloration; however, this in no way affects the function of the furnace.



#### 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.**

## 6.2 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 when operating the furnace 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

- all harmful gases are removed from the workplace, for example by an extraction system,
- the extraction system is switched on,
- the workplace is properly ventilated,
- the furnace is operated only in a perfect operating condition and, in particular, that the functions of the safety components are checked regularly.
- the required personal protective equipment is available for and used by the operating, maintenance, and repair personnel.
- these operating instructions, including the supplier documentation, are kept near the 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,
- furnace personnel are informed regularly about all issues involving occupational safety and environmental protection and are familiar with all the operating instructions, especially those involving safety,
- a risk assessment is carried out (in Germany, covered of the Occupational Safety Act) to determine any other hazards that may result from the working conditions particular to the furnace's location,
- all other instructions and safety guidelines that have been determined in a risk assessment for the workplace are compiled in an operation manual (in Germany, covered of the Ordinance Regulating the Use of Operating Equipment).

- Only sufficiently qualified and authorized personnel may operate, maintain and repair the system. This personnel must be trained in how to operate the furnace and must confirm their participation in the training with a personal signature. The training program must be documented in detail. In case an operator is replaced, additional training must also take place. The additional training may only be performed by authorized, trained individuals familiar with the system. The additional training must be painstakingly documented and participation must be evidenced by the names and signatures of the participating employees.

The use of paint solvents can lead to accelerated wear of the heating elements. If solvents are used, good pre-drying is necessary to minimize their impact on the heating elements.



#### 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.

### 6.3 Requirements for the Operating Personnel



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

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

These personnel are informed regularly about all issues involving occupational safety and environmental protection and are familiar with all the operating instructions, especially those involving safety,

Only trained personnel may operate the control and safety equipment.



**DANGER**

- **Danger of electric shock**
- **Risk of fatal injury**
- Do not insert any metal objects, such as thermocouples, sensors or tools into the firing chamber.

### 6.4 Protective Clothing



Wear protective clothing



Wear a full face protection visor that is resistant to heat or splattering



Wear heat-resistant gloves to protect your hands.



Wear safety boots to protect your feet.

## 6.5 Basic Measures During Normal Operation



### **Risks during Normal Operation!**

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

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

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

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

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

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

## 6.6 Basic Measures in Case of Emergency

### 6.6.1 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.

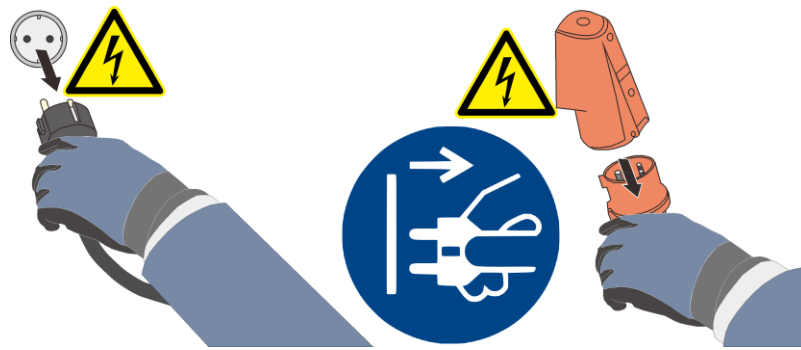


Fig. 6: Pull the power plug (similar to picture)



#### 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.



#### Warning - General hazards!

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

In case of fire, keep the lift bottom closed. This prevents smoke spreading and oxygen entering the furnace. Immediately disconnect the power plug.



#### Warning – Danger of Electric Shock!

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

## 6.7 Basic Measures for Servicing and Maintenance



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

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

Clear an adequate area around the system to facilitate the repair work.

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

Relieve the pressure on hydraulic and pneumatic equipment before carrying out maintenance or repair work. (if applicable).

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

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

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

## 6.8 Environmental Regulations

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

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

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

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

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



### Note

The operator must ensure that national environmental regulations are observed.

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

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

## 6.9 General Risks with the Furnace



### **Warning – General hazards!**

Risk of burning on the furnace housing.

Risk of crushing from moving parts (lift bottom).

Live parts contain dangerous electrical voltages.

Operate the furnace only with fully installed and closed cover panels.

Do not reach into the firing chamber.

Do not insert any metal objects, such as thermocouples, sensors or tools into the firing chamber.

Use insulated tools.

Do not insert objects into openings in the furnace housing, exhaust tubes, the firing chamber or cooling slits of the switchgear or furnace. Ignoring this warning can result in electric shock.

### **Risk of fire if using an extension cable:**

If an extension cable is used, its maximum electrical load must not be exceeded. Do not use power strips. Do not operate the furnace with an extension cable if you are not sure if grounding is guaranteed.

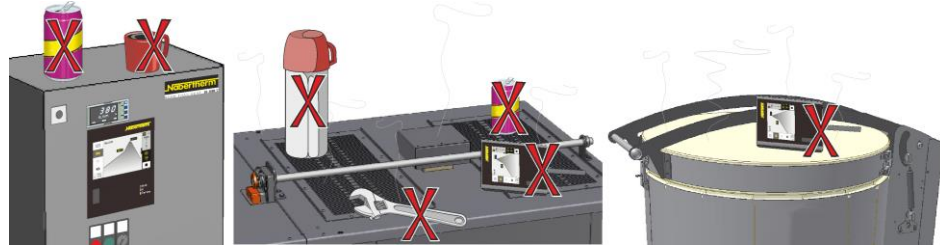


Risk of crushing when the lift bottom is being lowered



### Warning – General Hazards

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



### Warning – Influence on Implants from Electromagnetic Fields

It can be assumed that there is no risk from **electromagnetic fields**. Deviating from this, there may be a risk for people with active implants (such as a pacemaker, insulin pump) and passive implants, as the function of the implant may be affected also with a field strength below the permissible threshold. Proper function must be ensured on the basis of the technical specifications of the implant through an individual assessment by a suitable expert (for example, an occupational physician).



**! DANGER**

- Danger of electric shock
- Risk of fatal injury
- Do not insert any metal objects, such as thermocouples, sensors or tools into the firing chamber.



**! DANGER**

- Danger of electric shock
- If the system is not or not properly grounded, there is a risk of fatal electric shock.
- Do not insert any metal objects, such as thermocouples, sensors or tools into the furnace chamber.



## 7 Transport und Montage

### 7.1 Delivery

#### Check that Everything is Complete

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

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

#### Danger of Injury

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

## Safety Instructions

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



### Risks during Normal Operation!

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



### Note

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

## 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.

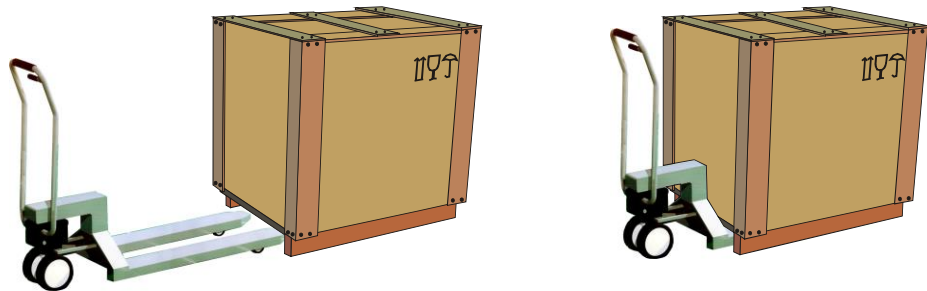


Fig. 7: Pallet truck is pushed **completely** beneath the transportation frame

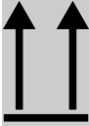
3. Lift the furnace carefully and pay attention to its center of gravity. When the furnace is being lifted, make sure that the ends of the forks or the load do not catch on



- 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.

#### Symbols:

The symbols for handling packaging are defined in ISO R/780 (International Organization for Standardization) and in DIN 55402 (German Institute for Standardization).

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

## 7.2 Unpacking



#### Note

Keep the packaging unit and transportation protection in case you have to return the furnace. Install the transportation protection in the reverse order, as shown in "Transportation Protection/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.

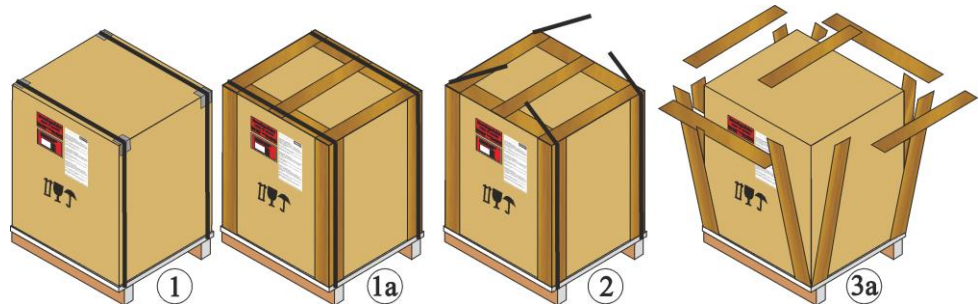
Because we use several different packaging units, we recommend that you take a few photos of the furnace in its original packaging.

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                     |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  | <div style="background-color: yellow; text-align: center; padding: 5px;"><b>⚠ CAUTION</b></div> <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> |  |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|

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



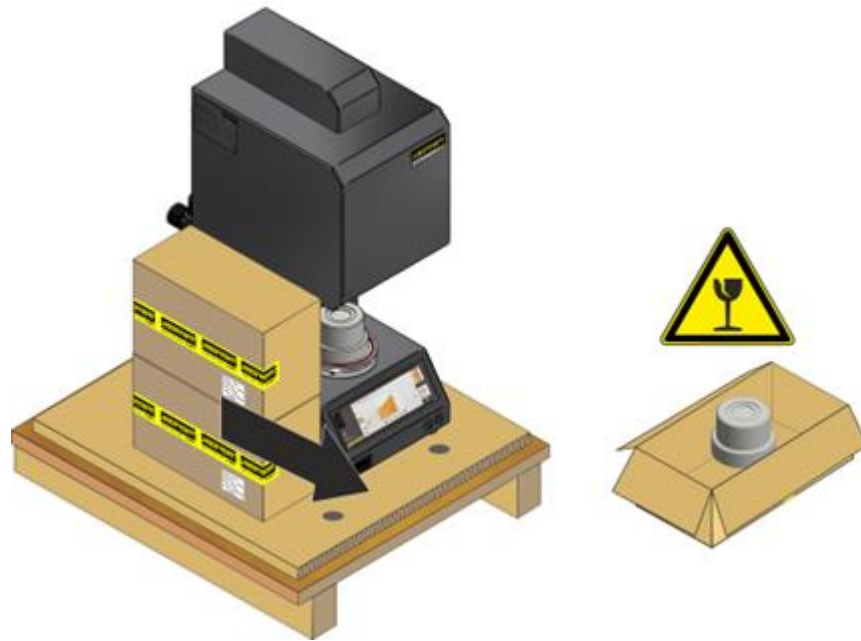
Wear protective gloves



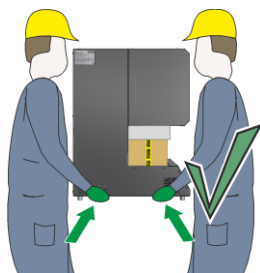
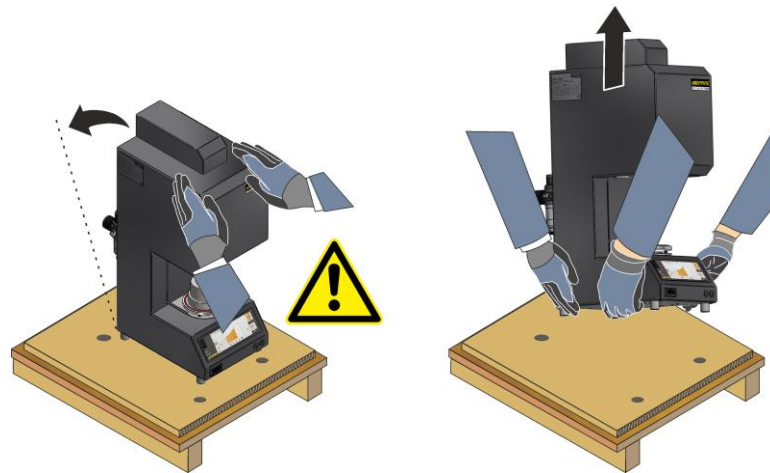
1. Check the transportation packaging for possible damage.
2. Remove tensioning straps from the transportation packaging.
3. Slacken screws and remove wooden casing from the covering box (if available 3a).
4. Carefully raise the covering box and remove from the pallet.



5. At the side of the furnace are packaging units containing the lift bottom insulation and the starter kit. Remove the packaging units only at the installation site and keep them together with the transport protection (foam) in a safe place.



6. Grip the furnace from below (wear suitable gloves), lift it carefully out of the packing unit and carry it to its installation location. Do not grip underneath the heating module to carry the furnace.



7. To carry the furnace, grip at the sides beneath it and make sure that you have a firm grip.
8. Transport furnaces heavier than 25 kg with at least two people. If carrying straps are used, place them only on the sides (across). Make sure that you have a firm grip.

**Note**

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

**Note**

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

|                                                                                                                                                                                                          | <table border="1"><tr><th> <b>CAUTION</b></th></tr><tr><td><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></td></tr></table> |  <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> |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  <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> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                  |                                                                                                                                                                                                                                                                                           |                                                                                     |

## 7.3 Constructional and Connection Requirements

### 7.3.1 Location of the Furnace

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

- The furnace must be installed in a dry room in accordance with the safety instructions.
- The table/supporting surface must be flat to enable the furnace to be installed straight. Place the furnace on a **non-flammable** surface (fire safety class A DIN 4102 – Example: concrete, tiles, glass, aluminum or steel) so that any hot material falling from the furnace cannot ignite the surface.
- The carrying capacity of the table must be designed to bear the weight of the furnace incl. accessories.
- The floor covering must be made of non-flammable material so that hot material falling out of the furnace will not cause the floor covering to ignite.



Fig. 8: Pay attention to the load-bearing capacity of the table (tabletop model) (similar to picture)

#### Installation Location

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

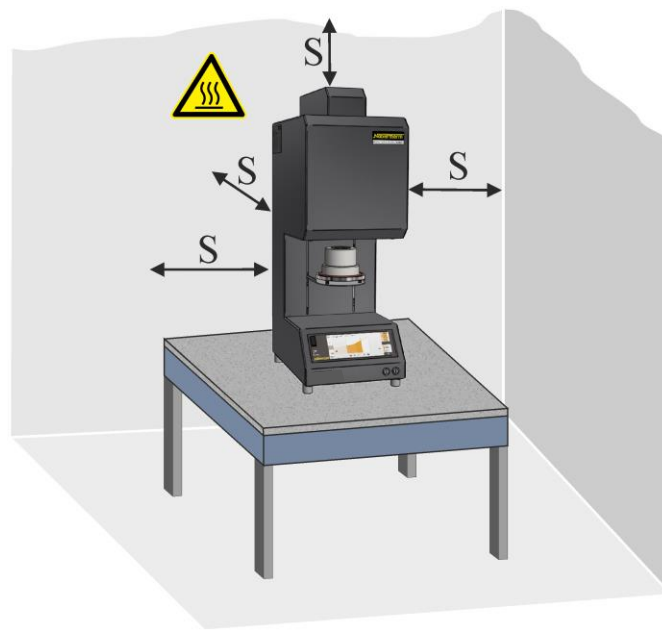


Fig. 9: Minimum safety gap to flammable materials (tabletop model) (similar to picture)

**Note**

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



**⚠ DANGER**

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



**⚠ DANGER**

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

## 7.4 Assembly, Installation, and Connection

### 7.4.1 Venting Exhaust Fumes

We recommend that you connect an exhaust air pipe to the furnace or place it beneath an extractor to remove the exhaust air.

A suitable metal exhaust gas pipe with NW80 to NW120 can be used to vent the gases. It must be attached facing upwards and be fixed to the wall or ceiling.

We recommend that you remove the exhaust air with a flue.

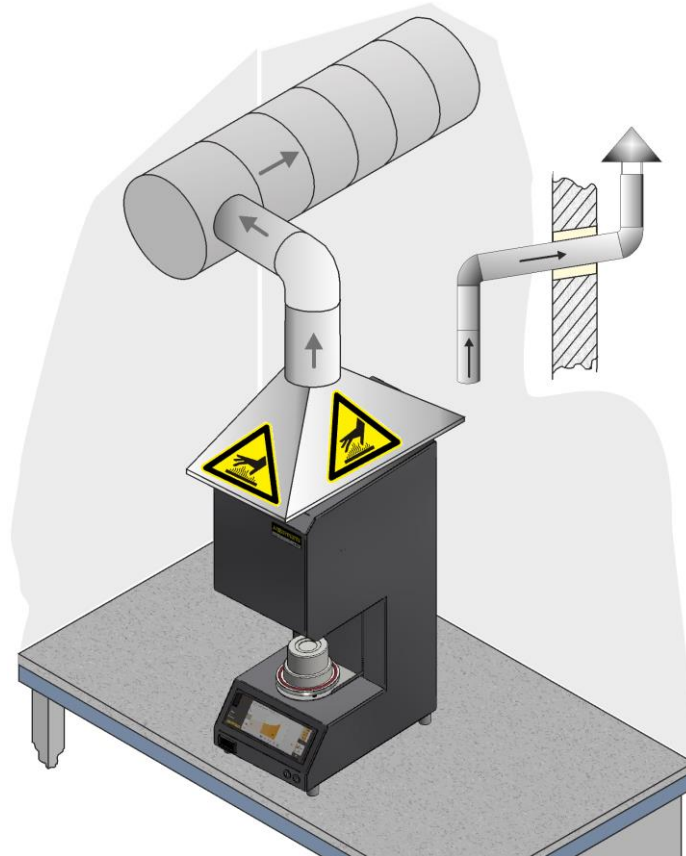


Fig. 10: Example: Installing an exhaust extraction system (similar to picture)



#### Caution

Steps must be taken to ensure that the flow of hot air emitted from the furnace's exhaust outlet flap is not hazardous to people, property or the building.



#### Note

Exhaust gases can be vented only if the room is ventilated with a corresponding fresh air inlet.



#### 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.

### 7.4.2 Compressed Air Connection (VL 01/12 LB Press)

Connect the compressed air system (1) (compressed air cylinder, compressor) to the maintenance unit of the furnace (2), using a suitable compressed air hose (see figure).

Make sure that the connections between the compressed air system and the maintenance unit are tight.

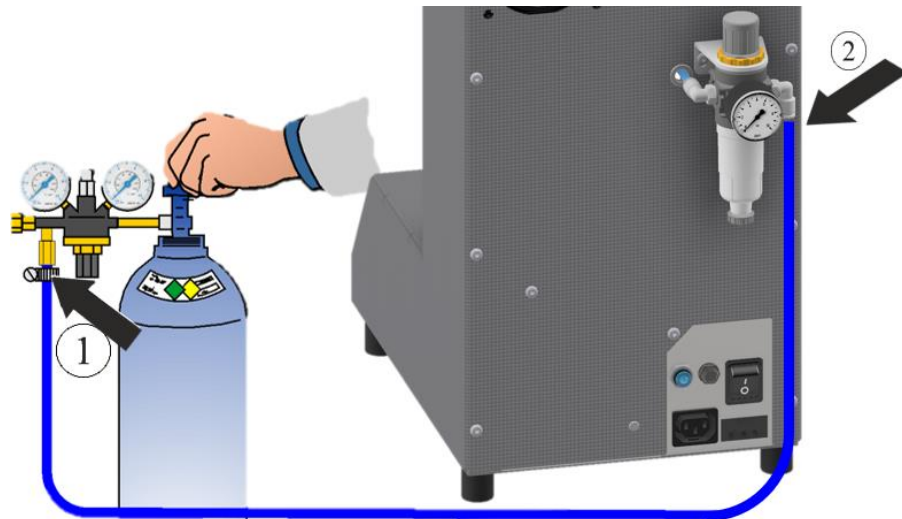


Fig. 11: Connection to the compressed air system (similar to picture)

Supply connections must be clearly labeled XXXXX

|                                     |                                                              |
|-------------------------------------|--------------------------------------------------------------|
| <b>Medium:</b>                      | <b>Air</b>                                                   |
| <b>Standard:</b>                    | - - -                                                        |
| <b>Pre-pressure:</b>                | max. 6 bar/87 psi                                            |
| <b>Working pressure:</b>            | Depends on the material 1 - 6 bar                            |
| <b>Compressed air requirements:</b> | approx. 0.1 L per press operation                            |
| <b>Contaminants:</b>                | Class 3                                                      |
| <b>Oil content:</b>                 | Class 2; max. oil content 0.1 mg/m <sup>3</sup>              |
| <b>Solids content:</b>              | 5 µm for solids                                              |
| <b>Water content:</b>               | Class 4; max. pressure dew point +3 °C                       |
| <b>Connection:</b>                  | Plug-in connection for externally calibrated hoses<br>Ø 6 mm |



#### Warning – General Hazards!

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



### 7.4.2.1 Adjusting the Pressing Pressure



Fig. 12: Adjusting the pressure at the compressed air-maintenance unit (similar to picture)

Adjust the material-related pressing force of the pressing cylinder by adjusting the pressing force at the maintenance unit.

The required pressure can be calculated from the pressing force:

$$p = \frac{F_p}{80 \frac{N}{bar}}$$

Where

$p$  : is the pressure to be adjusted in *bar*

$F_p$ : is the tabulated pressing force in *N*.

### 7.4.3 Connecting the Furnace to the Power Supply

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.
- If an extension cable is used, its maximum electrical load must not be exceeded. Do **not** use a power strip. The furnace must not be used with an extension cable if grounding cannot be ensured.
- The power cable must not be damaged. Do not place objects on top of the power cable. Lay the cable so that no one can stand on it or trip over it.
- Power cables may be replaced only with similar, approved cables.
- Ensure that the connection cable of the furnace is fused.
- Connect the power cable to the power supply. The power supply must be equipped with a residual current device with a rated residual current no greater than 30 mA.
- Grounding the furnace and the switchgear (acc. to VDE 0100, Part 410) is a requirement for the heating unit's residual current switching.
- The ground resistance must be checked in accordance with VDE 0100, see also Accident Prevention Regulations.
- Electrical systems and operating equipment compliant with DGUV V3.

### Note

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

### 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").

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.

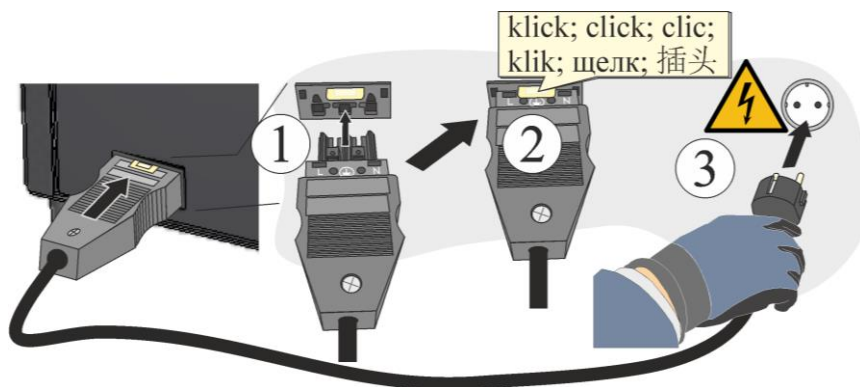


Fig. 13: Depending on model – supplied power cable included in scope of delivery (illustration similar)

### 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.



### CAUTION

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

|                                                  |  |
|--------------------------------------------------|--|
| <b>Nabertherm GmbH</b>                           |  |
| Bahnhofstr. 20, 28665 Lilienthal/Bremen, Germany |  |
| Tel. +49 (0)4208 922-0, Fax +49 (0)4208 922-129  |  |
| contact@nabertherm.de                            |  |
| www.nabertherm.com                               |  |
| Name                                             |  |
| Surname                                          |  |
| CE                                               |  |

#### 7.4.4 Connecting a Vacuum Pump

- Install the vacuum pump in accordance with its operating instructions. The power connection must correspond to the values on the furnace type plate.
- The connection cable must not be damaged. Do not place objects on top of the cable. Lay the cable so that no one can stand on it or trip over it.
- The connection cable must be suitable for the maximum electric power at a supply voltage according to the type plate.
- Grounding the furnace and the switchgear (acc. to VDE 0100, Part 410) is a requirement for the residual current switching of the connected electrical accessories.
- The ground resistance must be checked in accordance with VDE 0100, see also Accident Prevention Regulations.
- Electrical systems and operating equipment compliant with DGUV V3.



##### Note

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



##### Note

To achieve optimum firing and pressing results, we recommend that you use a vacuum pump from Nabertherm, which is ideally suited to the furnace (see "Accessories").

Permissible data for third-party vacuum pumps:

Maximum power: 250 W

Final vacuum: < 50 mbar

Use a suitable pressure hose to connect the vacuum pump with the furnace connector (see figure).

Plug the connection cable of the vacuum pump into the marked socket on the furnace. Pay attention to the information on the type plate as regards voltage, supply type and max. power consumption. The distance between the furnace and the socket should be as short as possible; therefore avoid using extension cables.

The vacuum pump is connected to and disconnected from the power supply via the furnace. The power plug must be easy to reach while the furnace is in operation so that it can be removed quickly in case of an emergency (see "What to do in an Emergency").

Make sure that the vacuum pump and the furnace are connected properly. Set the switch on the vacuum pumps to **ON/I**. The furnace switches the vacuum pump on and off in relation to the segment.

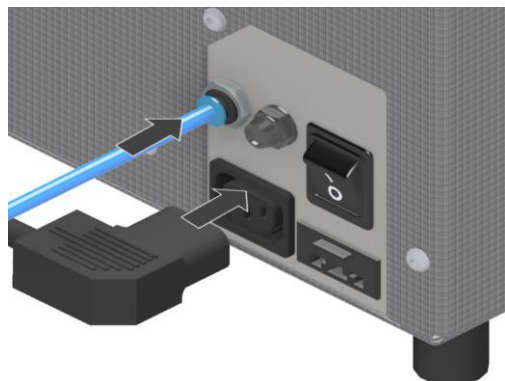


Fig. 14: Vacuum pump connection, dependent on the model (power cable supplied with the vacuum pump) (similar to picture)

Supply connections must be clearly labeled XXXXX

|                               |                                                                                             |
|-------------------------------|---------------------------------------------------------------------------------------------|
| <b>Medium:</b>                | <b>Vacuum</b>                                                                               |
| <b>Standard:</b>              | - - -                                                                                       |
| <b>Final pressure:</b>        | < 50 mbar                                                                                   |
| <b>Electrical connection:</b> | IEC plug-in connector C14<br>Supply voltage, see the label of the connection on the furnace |
| <b>Connection:</b>            | Plug-in connection for externally calibrated hoses<br>Ø 6 mm                                |

|                                                                                   |                                                                                                                                                                                                                                                                       |                                                                                     |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  | <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> |                                                                                     |

## 8 Commissioning

### 8.1 Placing the Insulation in the Base Shell of the Lift Bottom

The furnace must not be operated without insulation.

To make it easier to place the insulation into the base shell of the lift bottom, we recommend that you use the “Lower/raise lift table” button (see “Lower Lift Table Button”) to lower the lift bottom to about 1 cm above the controller unit.

The insulation is sensitive and must be handled with great care.

Remove the insulation from the packaging unit and place it in the center of the lift bottom.



Fig. 15: Placing the insulation on the lift bottom (similar to picture)

## 8.2 Installing the Side Shelf

Bend the four lugs on the bottom of the shelf about 1.5 mm inwards. Then slide the square ceramic honeycombed support into the guide as far as it goes.

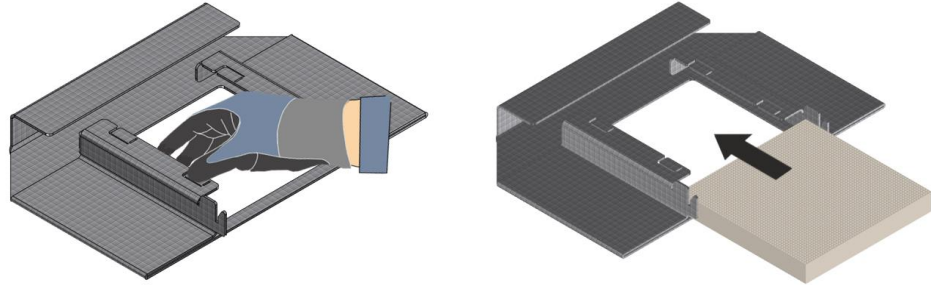


Fig. 16: Inserting the ceramic honeycombed support (similar to picture)

Insert the side shelf into the slot on the left or right side of the furnace. Press the shelf down until it engages.

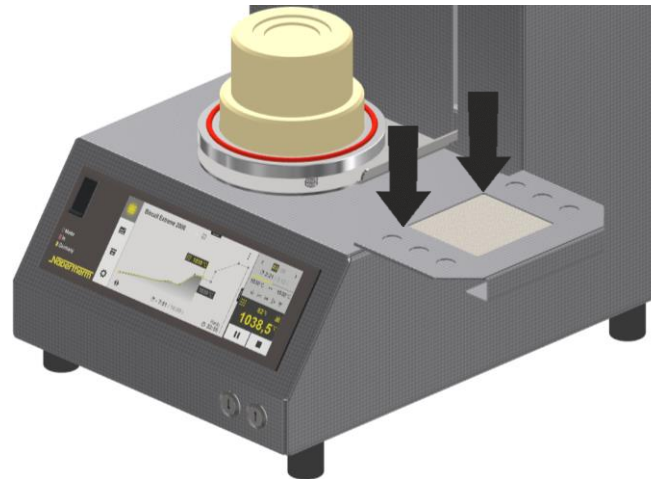


Fig. 17: Installing the side shelf (similar to picture)

## 9 Initial Start-Up

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

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

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

The furnace may be used only for its intended purpose.

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

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

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

Incorrectly wired connections may destroy electric/electronic components.

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

Faulty connections can cause the furnace to start unexpectedly.

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

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

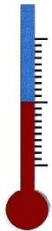
Before placing materials in the furnace, check whether they could harm or destroy the insulation or the heating elements. Materials that could damage the insulation include: alkalis, alkaline earths, metal vapors, metal oxides, chlorine compounds, phosphorous compounds, and halogens.



#### Note

When you switch on the furnace, check that the housing fan is working (it makes a slight humming noise).

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



To achieve optimum firing results, we recommend that you run the “dehumidification program” before you use the furnace for the first time. You will find this in the firing programs under the manufacturer “Nabertherm” and the material family “Maintenance” (see also “Maintenance Programs”).

When the furnace is being heated for the first time, there may be a smell caused by binder being emitted from the insulation material. It is advisable to ventilate the room in which the furnace is located well during the first heating phase. Allow the furnace to cool naturally to room temperature.

### Tears in the insulation

The insulation of the furnace consists of a very high-quality refractory material. Heat expansion may cause tears in the insulation even after a few heating cycles. However, these have no affect on the function or quality of the furnace.

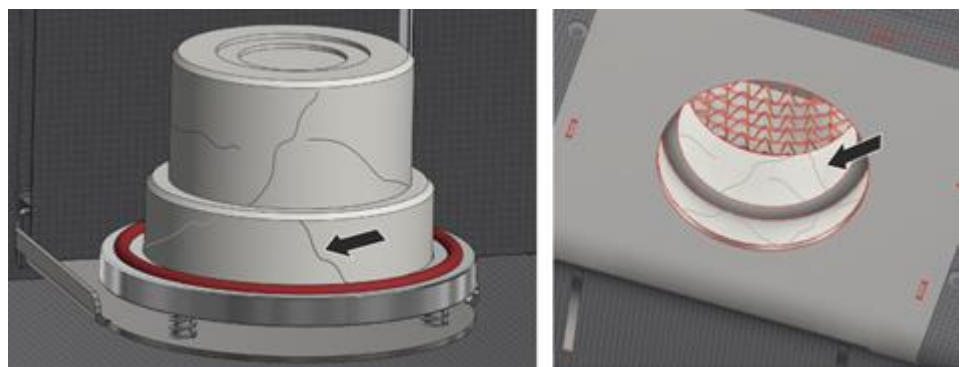


Fig. 18: Cracks in the insulation (similar to picture)



#### Note

Continuous operation at maximum temperature can lead to increased wear of heating elements, insulation materials and metallic components. We recommend working at approx. **50 °C below maximum temperature**.

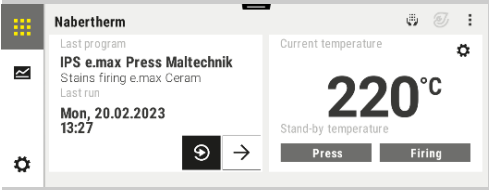


#### Note

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

## 10 Operation

### 10.1 Turning on the Controller/Furnace

| Switch on the controller                                                                                                                                              |                                                                                   |                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Procedure                                                                                                                                                             | Display                                                                           | Comments                                                                                |
| Switch on the power switch                                                                                                                                            |  | Set power switch to “I”.                                                                |
| The furnace status is displayed.<br>After a few seconds, the temperature is displayed and the self-test starts. If you selected the set-up wizard, this is displayed. |  | When the temperature is shown on the controller, the controller is ready for operation. |

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

If required, material programs can also be imported by loading a material onto a USB flash drive.

### 10.2 Turning off the Controller/Furnace

| Switch the controller off   |                                                                                     |                                             |
|-----------------------------|-------------------------------------------------------------------------------------|---------------------------------------------|
| Procedure                   | Display                                                                             | Comments                                    |
| Switch off the power switch |  | Switch the power switch to the “O” position |



#### Note

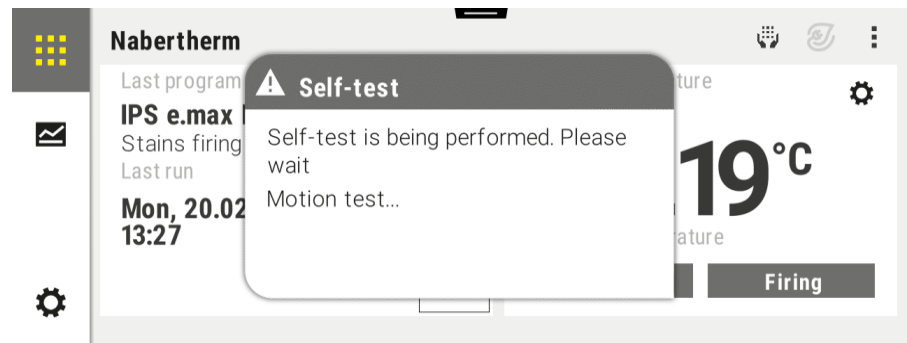
Stop running heating programs before turning the furnace off at the main switch, since the controller will otherwise generate a fault message when it is turned back on.  
See Faults/fault messages

### 10.3 Self-Test

When you switch on the controller or finish the set-up wizard, the device automatically carries out a self test. This test takes about 1 minute and tests the following furnace functions:

- Closing and opening the furnace
- Heating
- Evacuation

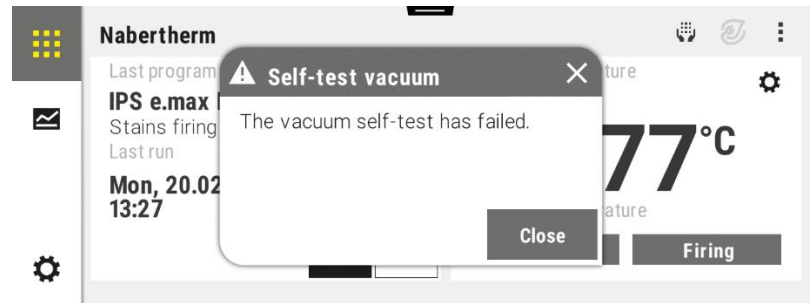
A window opens.



After a successful self test, the overview screen is displayed.

If the test fails, an error message is shown.

Example: “Evacuation test failed”



Check the table position. Is the vacuum pump switched on? Check the hose connection.

A detailed description of faults and how to remedy them can be found in Section **Fehler!**  
**Verweisquelle konnte nicht gefunden werden..**

## 10.4 Set-Up Wizard

Once the self-test has been completed, the **set-up wizard** is displayed. Here, you can set functions, such as language, Wi-Fi connection for the app and the temperature display unit. Once the wizard is finished, you can decide whether to use it again the next time you switch on the system.

| Execute the set-up wizard                                 |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                               |                                          |                                |                                |                               |                               |                             |                                  |                              |                                 |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|------------------------------------------|--------------------------------|--------------------------------|-------------------------------|-------------------------------|-----------------------------|----------------------------------|------------------------------|---------------------------------|
| Procedure                                                 | Operation                                                                           | Display                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                               |                                          |                                |                                |                               |                               |                             |                                  |                              |                                 |
| When you switch on the furnace, a set-up wizard is opened |                                                                                     | The wizard procedure can be repeated if necessary.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                               |                                          |                                |                                |                               |                               |                             |                                  |                              |                                 |
| Select and confirm language                               |  | <div>Please select your desired language</div> <table><tr><td><input type="radio"/> English</td><td><input checked="" type="radio"/> Deutsch</td></tr><tr><td><input type="radio"/> Français</td><td><input type="radio"/> Italiano</td></tr><tr><td><input type="radio"/> Español</td><td><input type="radio"/> Русский</td></tr><tr><td><input type="radio"/> Dansk</td><td><input type="radio"/> Nederlands</td></tr><tr><td><input type="radio"/> Polski</td><td><input type="radio"/> Português</td></tr></table> | <input type="radio"/> English | <input checked="" type="radio"/> Deutsch | <input type="radio"/> Français | <input type="radio"/> Italiano | <input type="radio"/> Español | <input type="radio"/> Русский | <input type="radio"/> Dansk | <input type="radio"/> Nederlands | <input type="radio"/> Polski | <input type="radio"/> Português |
| <input type="radio"/> English                             | <input checked="" type="radio"/> Deutsch                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                               |                                          |                                |                                |                               |                               |                             |                                  |                              |                                 |
| <input type="radio"/> Français                            | <input type="radio"/> Italiano                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                               |                                          |                                |                                |                               |                               |                             |                                  |                              |                                 |
| <input type="radio"/> Español                             | <input type="radio"/> Русский                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                               |                                          |                                |                                |                               |                               |                             |                                  |                              |                                 |
| <input type="radio"/> Dansk                               | <input type="radio"/> Nederlands                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                               |                                          |                                |                                |                               |                               |                             |                                  |                              |                                 |
| <input type="radio"/> Polski                              | <input type="radio"/> Português                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                               |                                          |                                |                                |                               |                               |                             |                                  |                              |                                 |



### Execute the set-up wizard

| Procedure                                                                                        | Operation  | Display                                                                            |
|--------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------|
| Set up the Wi-Fi connection.<br>- Select the correct Wi-Fi network<br>- Enter the Wi-Fi password |            |  |
| Set up the temperature format                                                                    | "Finished" |  |

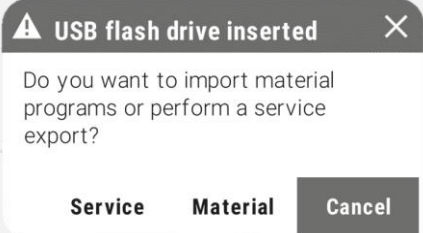
## 10.5 Importing Materials

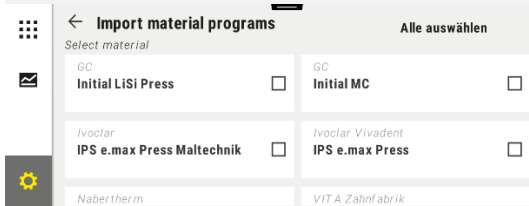
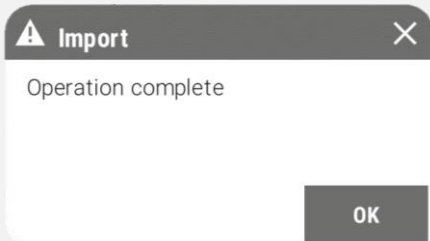
Materials and the associated programs can be imported in two ways:

- Window when a USB flash drive is inserted
- Menu SETTINGS\IMPORT/EXPORT\ (user -> Admin)

Common materials and their programs can be downloaded from the Nabertherm website <https://nabertherm.com/en/downloads/firing-and-pressing-programs> via the Nabertherm portal in the download area.

### Import material

| Procedure                                                                                                                                                                                                                                                                                                                                                                 | Operation                                                                           | Display                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Download the material program from the Nabertherm portal:<br><a href="https://nabertherm.com/en/downloads/firing-and-pressing-programs">https://nabertherm.com/en/downloads/firing-and-pressing-programs</a><br><br>Copy material programs onto a USB flash drive in the following folder:<br>[USB drive]:\Import\<br><br>Insert the USB flash drive into the controller. |                                                                                     |  |
| Select the window with the USB flash drive inserted                                                                                                                                                                                                                                                                                                                       |  |  |

| Import material                                                                                                                                                                                                                                                                                                                                                                      |                                                                                     |                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Procedure                                                                                                                                                                                                                                                                                                                                                                            | Operation                                                                           | Display                                                                              |
| <p>Download the material program from the Nabertherm portal:<br/> <a href="https://nabertherm.com/en/downloads/firing-and-pressing-programs">https://nabertherm.com/en/downloads/firing-and-pressing-programs</a></p> <p>Copy material programs onto a USB flash drive in the following folder:<br/> [USB drive]:\Import\</p> <p>Insert the USB flash drive into the controller.</p> |                                                                                     |    |
| <p>Select the materials<br/> (max. 50 materials are displayed and can be imported)</p>                                                                                                                                                                                                                                                                                               |                                                                                     |    |
| Transfer the selected materials.                                                                                                                                                                                                                                                                                                                                                     |   |                                                                                      |
| <p>Window after successful import.</p> <p>Click OK to finish the import</p>                                                                                                                                                                                                                                                                                                          |  |  |

## 10.6 Lower Lift Bottom Button

Press the lower **lift bottom button** to lower the bottom in manual mode.

Press the button once and the lift bottom will be lowered to its end position. If one of the buttons **Raise lift bottom** or **Lower lift bottom** is pressed while the unit is in motion, movement is stopped. Press the button again to restart the movement.

If, after 20 seconds, the lift bottom has not reached an end position, the movement is stopped to protect the operator and the furnace and will start again only with a renewed command.

**Caution!** The action “Lower lift bottom” will be carried out only when the vacuum is switched off. If no vacuum was active in the previous segment, the lift bottom is lowered with no delay. If a vacuum was active, the lift bottom waits in the top end position for a ventilation time of 15 seconds before moving downward.



Fig. 19: Lower lift bottom button (similar to picture)

## 10.7 Raise Lift Bottom Button

Press the **Raise lift bottom** button to raise the bottom in manual mode.

Press the button once and the lift bottom will be raised to its end position. If one of the buttons **Raise lift bottom** or **Lower lift bottom** is pressed while the unit is in motion, movement is stopped. Press the button again to restart the movement.

If, after 20 seconds, the lift bottom has not reached an end position, the movement is stopped to protect the furnace and will start again only with a renewed command.

**Caution! When a program is started, the lift bottom may start moving automatically.**



Fig. 20: Raise lift bottom button (similar to picture)

## 10.8 Vacuum Plug and Socket Device

The **184c vacuum plug and socket device** is intended for the electrical connection of the vacuum pump.

The plug and socket device has an external fuse **55F1** (T2A 250V, 5x20 mm).

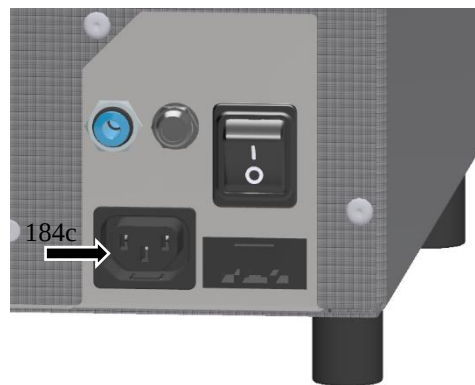


Fig. 21: Vacuum connection plug and socket device (similar to picture)

## 10.9 Loading/Charging

### Loading the furnace

Lower the lift bottom to its bottom position.

Use only materials whose properties and melting temperatures are known. Read the relevant material safety data sheets if applicable.

When loading the furnace, make sure that the door collar and the heating elements are not damaged when the door is being closed.

Once the furnace has been filled, start the program or close the lift bottom. Place the charge in the middle; it must not project over the edge. This ensures even heating. Observe the maximum loading height. If this is not complied with, the top insulation and/or the charge may be damaged. Make sure that the lift bottom is moved to the top position again.

Large quantities of material in the furnace can substantially lengthen the heating-up time. Stainless steel sheet can discolor (especially if the furnace is opened while hot), but this does not impair the functionality of the furnace.

### Additional precautionary measures

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

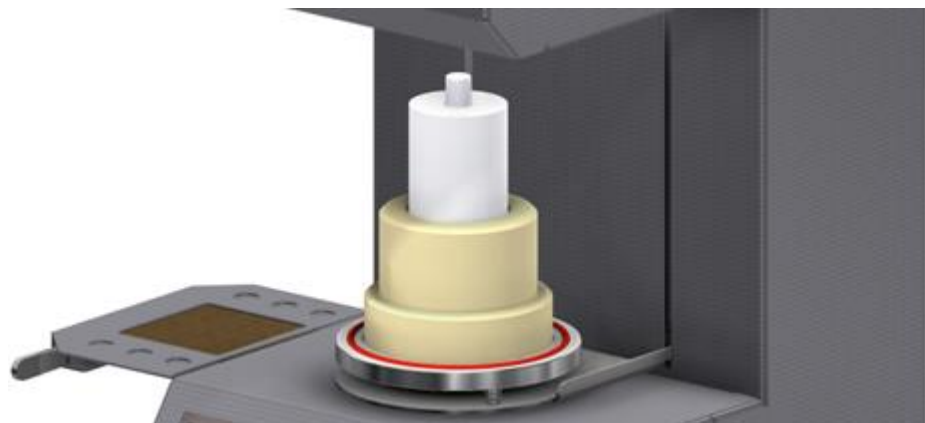


Fig. 22: Pressing program (similar to picture)

- Start the pressing program; the furnace heats up and opens with a signal once the start temperature has been reached
- Prepare the muffle according to the manufacturer's instructions
- Place the muffle in the center of the recess in the lift bottom.
- To continue with the pressing process, the furnace will tell you to close it with the "Close" button.

- At the end of the pressing process, the furnace opens (with an acoustic signal)
- Remove the pressed muffle
- Press “Open” to open the furnace
- Start the intended pressing program as described in “Display and Start Programs”

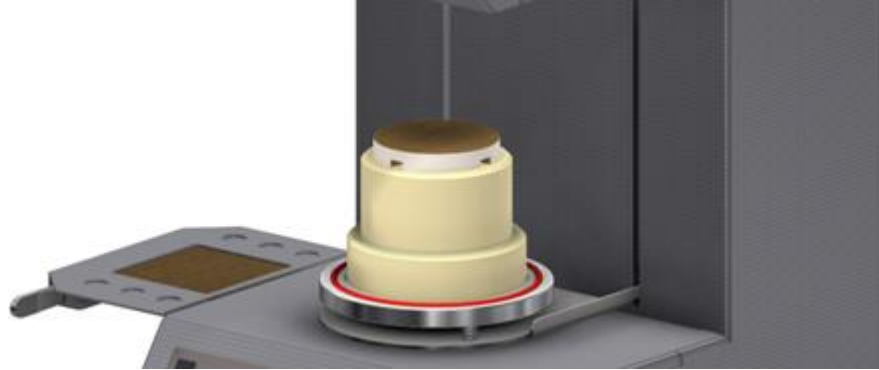


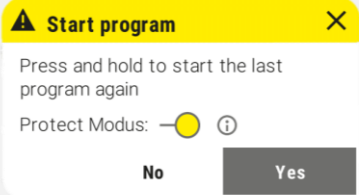
Fig. 23: Firing program (similar to picture)

- Press “Open” to open the furnace
- Place the charge with the carrier in the middle of the furnace table
- Start the intended firing program as described in “Display and Start Programs”

## 10.10 Display and Start Programs

Saved programs can be viewed without accidentally changing the program. To do this, take the following steps:

| Display and start program                               |           |                 |
|---------------------------------------------------------|-----------|-----------------|
| Procedure                                               | Operation | Display/Comment |
| Select the [Material overview] menu and select material |           |                 |
| Select and display a program from the list              |           |                 |

| Display and start program      |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Procedure                      | Operation                                                                         | Display/Comment                                                                                                                                                                                                                                                                                                                                                                                                 |
| Start the program              |  | Press the button until the progress bar is completed. <b>This can take about 2-3 seconds.</b> If you press the button by mistake, release it again. The program will then not be started.                                                                                                                                                                                                                       |
| Confirm the security challenge | Confirm<br>[Yes]/[No]                                                             |  <p>Program option: You can decide whether to activate protect mode at the end of the program (switch off stand-by temperature and close the furnace below 100 °C). This mode protects the furnace and charge against moisture. You will find more detailed information about protect mode in the controller instructions.</p> |
|                                |                                                                                   | The controller opens the program overview in graph format with the small segment player.                                                                                                                                                                                                                                                                                                                        |

## 10.11 Connecting to the MyNabertherm App

Series 500 controllers can be connected to an app for Android and iOS. One or more furnaces can be linked via the app. See the controller instructions in “Connecting to the MyNabertherm App” to discover how to connect the app with the furnace.

## 11 Servicing, Cleaning, and Maintenance



### Warning - General Hazards!

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



### Warning - Danger due to Electrical Current!

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



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

Operators may only correct malfunctions which are obviously due to operational error! Wait until the furnace chamber and attaching parts have cooled to room temperature. The furnace must be visually inspected at regular intervals for damage. The interior of the furnace must also be cleaned as required (e.g. vacuuming out) **Attention:** Do not bang against the heating elements to avoid breaking them.

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

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

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

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

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

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

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



#### Note

If hazardous substances have been spilled on or inside the equipment, proper decontamination must be performed.

## 11.1 Furnace Insulation

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.

When working on insulation, the Technical Regulations for Hazardous Materials must be applied in Germany. <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.

## 11.2 Shutting the System down for Maintenance Work on the Open Furnace

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

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



### **Warning - Dangers During Normal Operation!**

Do not touch any object without first having checked its temperature.



### **Warning – Danger of Electric Shock**

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

## 11.3 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).



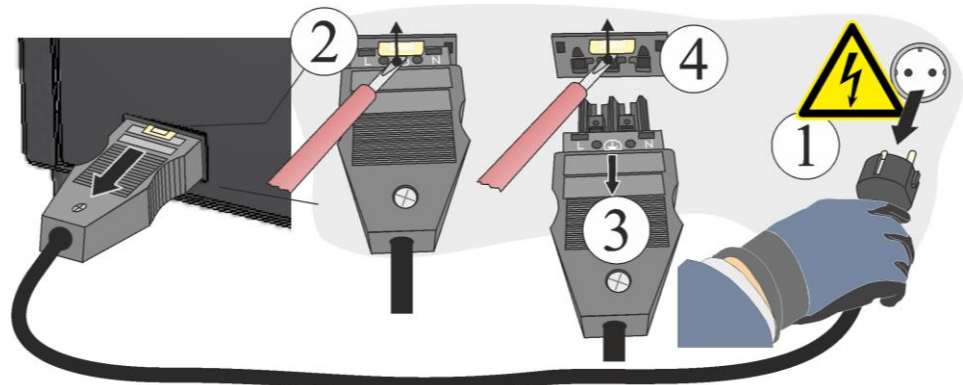


Fig. 24: Separate the snap-in coupling (plug) from the furnace housing (similar to picture)

## 11.4 Regular Maintenance of the Furnace

| Component/ item/ function<br>and action                                                                               | Comment                                              | A | B                                | C  |
|-----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|---|----------------------------------|----|
| <b>Safety test in accordance with DGUV V3 or equivalent national regulations</b><br>According to regulation           | According to regulation                              | - | -                                | X2 |
| <b>Safety and limit switch (if present)</b><br>Function check                                                         |                                                      | - | Y                                | X2 |
| <b>Furnace chamber, extraction holes and extraction tubes</b><br>Clean and check for damage, vacuum out carefully     |                                                      | - | M                                | X1 |
| <b>Sealing surfaces: Door collar/furnace collar/lift bottom seal</b><br>Visual inspection                             |                                                      | - | D                                | X1 |
| <b>Seals</b><br>Clean/replace                                                                                         |                                                      | 1 | W                                | X1 |
| <b>Leak check</b>                                                                                                     | Automatic with self-test                             | - | D                                | X1 |
| <b>Heating elements</b><br>Visual inspection                                                                          |                                                      | 2 | D                                | X1 |
| <b>Check the screws of the power cable clamps</b><br>Check and carefully tighten the screws of the power cable clamps | <sup>1</sup> first time<br><sup>2</sup> subsequently | - | W <sup>1</sup><br>Y <sup>2</sup> | X2 |
| <b>Thermocouple</b><br>Visual inspection (visible part of the thermocouple inside the furnace)                        |                                                      | 2 | D                                | X1 |
| <b>Lift bottom setting</b><br>Check that the lift bottom closes completely and moves freely                           |                                                      | 2 | D                                | X1 |
| <b>Measurement and control accuracy</b><br>Calibration (see Maintenance Programs)                                     |                                                      | - | Y                                | X1 |
| <b>Switchgear fan</b><br>Function check                                                                               | At each initial start-up                             | - | D                                | X1 |

**Key:** see "Maintenance Table Key"

## 11.5 Regular Maintenance Tasks – Electrical Testing

| Component/ item/ function and action                                                                            | Comment | A | B | C  |
|-----------------------------------------------------------------------------------------------------------------|---------|---|---|----|
| <b>Insulation resistance test</b>                                                                               |         | - | Y | X2 |
| <b>High-voltage test</b><br>If possible                                                                         |         | - | Y | X2 |
| <b>Ground wire</b><br>Correct position of ground wire on the connection between the system parts and the covers |         | - | Y | X2 |
| <b>Function check</b><br>All electrical components                                                              |         | - | Y | X2 |

**Key:** see “Maintenance Table Key”



### Warning – Danger of Electric Shock!

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

## 11.6 Regular Maintenance Tasks – Documentation

| Component/ item/ function and action                                   | Comment | A | B | C  |
|------------------------------------------------------------------------|---------|---|---|----|
| <b>Type plate</b><br>Legible                                           |         | - | Y | X1 |
| <b>Operating instructions</b><br>Ensure they are kept near the furnace |         | 3 | Y | X1 |
| <b>Component instructions</b><br>Ensure they are kept near the furnace |         | 3 | Y | X1 |

**Key:** see “Maintenance Table Key”

## 11.7 Maintenance Table Key

| Symbols:                                                                                                                       |                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A = Spare Part Stocks</b>                                                                                                   | <b>1</b> = Stocks urgently recommended<br><b>2</b> = Stocks recommended /<br><b>3</b> = As required, not relevant                                     |
| <b>B = Maintenance Interval</b><br><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<br><b>W</b> = Weekly<br><b>M</b> = Monthly /<br><b>Q</b> = Quarterly<br><b>Y</b> = Yearly / |
| <b>C = Performed by</b>                                                                                                        | <b>X1</b> = Operating personnel<br><b>X2</b> = Specialist personnel                                                                                   |

## 11.8 Cleaning Products



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

Use commercial cleaning products that are either water-based or non-flammable and free of any solvents to clean the housing of any deposits; use a vacuum cleaner for the interior.

**Pay attention to the labeling and information on the cleaning product packaging.**

Wipe the surface with a damp, lint-free cloth. You may also use the following cleaning products:

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

| Component and Position          | Cleaning Product                                                                                       |
|---------------------------------|--------------------------------------------------------------------------------------------------------|
| Outer surfaces (frames)*        | Use commercial cleaning products that are either water-based or non-flammable and free of any solvent* |
| Outer surface (stainless steel) | Stainless steel cleaner                                                                                |
| Inside                          | Carefully clean with a vacuum cleaner (avoid the heating elements)                                     |
| Insulation materials            | Carefully clean with a vacuum cleaner (avoid the heating elements)                                     |
| Door seal (if applicable)       | Use commercial cleaning products that are either water-based or non-flammable and free of any solvent  |
| Instrument panel                | Wipe the surface with a damp, lint-free cloth. (e.g. glass cleaner)                                    |

\*You must be sure that the cleaner does not damage the water-soluble, environmentally safe paint (test the product on an interior, hidden area).

Fig. 25: Cleaning products

Clean quickly to protect the surfaces.

Remove the cleaning product completely from the surfaces by wiping them with a damp, lint-free cloth.

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

**See “Environmental Protection Regulations”.**



### Note

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



### Note

If hazardous substances have been spilled on or inside the equipment, proper decontamination must be performed.

## 11.9 Maintenance Programs

The maintenance programs are located in the firing programs area. They can be found under the manufacturer “Nabertherm” and the material family “Maintenance”.

The following programs can be found under “Maintenance”:



|  | Material                              | Pressen | Brennen                               |   |
|--|---------------------------------------|---------|---------------------------------------|---|
|  | GC<br>Initial MC                      | ☆       | Ivoclar<br>IPS e.max Press Maltechnik | ☆ |
|  | Ivoclar<br>IPS e.max Press Maltechnik | ☆       | Nabertherm<br>Wartung                 | ☆ |
|  | VITA Zahnfabrik<br>VITA AKZENT Plus   | ☆       | VITA Zahnfabrik<br>VITA AKZENT Plus   | ☆ |

Fig. 26: Maintenance programs (similar to picture)

### Cleaning firing

To clean the furnace chamber, the charge carrier and the charge holding pins.

#### Note

Make sure that the accessories to be cleaned are suitable for a cleaning temperature of 1200 °C (2192 °F).

### Leak test

To check the furnace for leaks.

#### Note

A message is given only if a leak is discovered during the test.

### Temperature calibration

For optimum processes, the furnace was calibrated in the factory. If temperature deviations are discovered, the furnace can be calibrated with the supplied silver wire test kit (PN 6000129071).

For calibration, set the “firing” stand-by temperature to 600 °C and heat the furnace **and charge carriers** for at least 30 minutes. Use the supplied round charge carrier.

Press the “Open” button to open the furnace and place a silver wire vertically in the middle of the charge carrier. The tip of the silver wire should be about 25 mm above the charge carrier.

Select “Programs” -> “Firing” -> “Maintenance” -> “Temperature Calibration”.

Start the calibration program with the start button and answer the security challenge. For a detailed description of the process, see the controller instructions under “Starting and Stopping Programs”.

At the end of the program, a query is displayed to enable you to adjust the temperature:

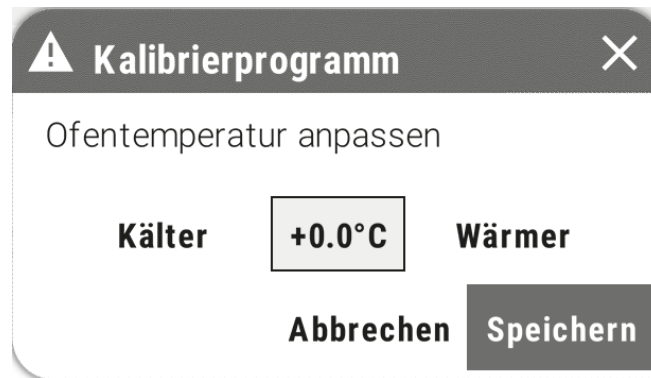


Fig. 27: Calibration program (similar to picture)

For this, you have to evaluate the appearance of the silver wire:

| Appearance                                                                           | Description                                                                                                  | Result               | Action                                                                                                                                                                             |
|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | The silver wire is unchanged. The surface is smooth, the edges are sharp.                                    | Temperature too low  | Increase the calibration value in max. 2 °C increments by pressing the "hotter" button. Press "Save" to save the new calibration value. Repeat the calibration with the same wire. |
|   | The silver wire is slightly melted. The surface has very small beads of molten material, the tip is rounded. | Temperature correct  | Leave the calibration value unchanged and press "Save" to complete the calibration. Your furnace is now calibrated.                                                                |
|  | The silver wire is highly melted. A large bead of molten material has formed, the tip has melted.            | Temperature too high | Reduce the calibration value in max. 2 °C increments by pressing the "colder" button. Press "Save" to save the new calibration value. Repeat the calibration with a new wire.      |

### Dehumidification program

Carry out this program if the furnace has not been used for some time or at initial start-up to dehumidify the furnace chamber.

## 12 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.

### 12.1 Error Messages of the Controller

| 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<br>LEDs on the control modules red?<br>Check the cable between the control unit and the control module<br>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<br>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<br>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<br>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)<br>Control module defective                                                                                                                                                  |
| 02-05                      | Compare point too cold    |                                                                                | Temperature in the switchgear too low (approx. - 10 °C)                                                                                                                                                                             |
| 02-06                      | Encoder separated         | Error at the 4-20 mA input of the controller (<2 mA)                           | Check 4-20 mA sensor<br>Check the connection cable to the sensor                                                                                                                                                                    |

| ID+ Sub-ID          | Text                     | Logic                                                                                                                                                                                                                                                                                                                                                                            | Remedy                                                                                                                                                                                                                                                  |
|---------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 02-07               | Sensor element defective | PT100 or PT1000 sensor defective                                                                                                                                                                                                                                                                                                                                                 | Check PT sensor<br>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><br>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<br>USB flash drive removed too soon or defective<br>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><br>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 <> 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.<br>Check heating elements and heating element connections.<br>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)<br><br>The equation for the switch off threshold is:<br><br>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<br>Check thermocouple<br>Check controller<br><br>(with 3 minute delay)                                                                                                                                                          |
|                     |                          | 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.                                                                                                                                                                                        |
| 04-03               | Power failure            | The set limit for restarting the furnace was exceeded                                                                                                                                                                                                                                                                                                                            | If possible, use an uninterruptible power supply                                                                                                                                                                                                        |

| ID+ Sub-ID                | Text                          | Logic                                                                           | Remedy                                                                                                                                                                                                                                                                                       |
|---------------------------|-------------------------------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                           |                               | 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<br>Replace the battery (see “Specifications”)                                                                                                                                                                                                     |
| <b>Other malfunctions</b> |                               |                                                                                 |                                                                                                                                                                                                                                                                                              |
| 05-00                     | General malfunction           | Malfunction in the control module or Ethernet module                            | Contact Nabertherm Service<br>Provide the service export                                                                                                                                                                                                                                     |
| 05-01                     | Self-test lower limit switch  | Self-test unsuccessful.                                                         | Please turn the furnace off and on again to repeat the self-test. If the problem is not resolved, contact Nabertherm Service                                                                                                                                                                 |
| 05-02                     | Self-test upper limit switch  | Self-test unsuccessful.                                                         | Please turn the furnace off and on again to repeat the self-test. If the problem is not resolved, contact Nabertherm Service                                                                                                                                                                 |
| 05-03                     | Self-test heating             | Self-test unsuccessful.                                                         | Please turn the furnace off and on again to repeat the self-test. If the problem is not resolved, contact Nabertherm Service                                                                                                                                                                 |
| 05-04                     | Vacuum pump / pressure switch | Evacuation was not successful.                                                  | Check whether the vacuum pump is switched on.<br>Check the connection between the furnace and the vacuum pump.<br>Check the seal on the furnace table. Dirt and correct closure<br>Check and, if necessary, replace faulty seals. If the problem is not resolved, contact Nabertherm Service |

<sup>1)</sup> The error can only be acknowledged by switching off the controller.

Once the cause of a malfunction has been remedied, press the “acknowledge” button on the screen to acknowledge error messages. Contact Nabertherm service if an error message appears again. Recirculation motors (if present) also remain switched on in case of an error until the temperature falls below the set cut-off temperature.

## 12.2 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”<br>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”  |



| No. | Text                                 | Logic                                                                                       | Remedy                                                                                                                                                                                                                                                |
|-----|--------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 02  | Charge thermocouple defective        | No charge thermocouple was determined with the current program and activated charge control | Plug in a charge thermocouple<br>Disable charge control in the program<br>Check the charge thermocouple and its cable for damage                                                                                                                      |
| 03  | Cooling thermocouple defective       | The cooling thermocouple is not plugged in or is defective                                  | Plug in a cooling thermocouple<br>Check the cooling thermocouple and its cable for damage<br>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<br>Check the documentation thermocouple and its cable for damage                                                                                                                                                 |
| 05  | Power failure                        | A power failure was determined.<br>There was no program interrupt                           | None                                                                                                                                                                                                                                                  |
| 06  | Alarm 1 - Band                       | The configured band alarm 1 was triggered                                                   | Optimize the control parameters<br>Alarm set too narrowly                                                                                                                                                                                             |
| 07  | Alarm 1 - Min                        | The configured min. alarm 1 was triggered                                                   | Optimize the control parameters<br>Alarm set too narrowly                                                                                                                                                                                             |
| 08  | Alarm 1 - Max                        | The configured max. alarm 1 was triggered                                                   | Optimize the control parameters<br>Alarm set too narrowly                                                                                                                                                                                             |
| 09  | Alarm 2 - Band                       | The configured band alarm 2 was triggered                                                   | Optimize the control parameters<br>Alarm set too narrowly                                                                                                                                                                                             |
| 10  | Alarm 2 - Min                        | The configured min. alarm 2 was triggered                                                   | Optimize the control parameters<br>Alarm set too narrowly                                                                                                                                                                                             |
| 11  | Alarm 2 - Max                        | The configured max. alarm 2 was triggered                                                   | Optimize the control parameters<br>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       | <p>The file was edited with a PC (text editor) and saved in the wrong format or the USB flash drive was not detected.</p> <p>You want to import data that is not in the import folder on the USB flash drive</p> | <p>Do not edit XML files with a text editor, only in the controller.</p> <p>Format the USB flash drive (format: FAT32). No quick formatting</p> <p>When importing, all data must be in the import folder on the USB flash drive.</p> <p>The maximum storage capacity for USB flash drives is 2TB/FAT32. If you experience problems with your USB flash drive, use a different USB flash drive with maximum 32 GB</p> <p>Option: USB flash drive, Nabertherm part number 524500024</p> |
|     | 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                                                                                                                   | <p>Close the door</p> <p>Check the door switch</p>                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| No. | Text                                                             | Logic                                                                                                                                                                                                            | Remedy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 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                                                                                                                | <p>Check whether the thermocouple is necessary for monitoring.</p> <p>Check the heating elements and their activation</p>                                                                                                                                                                                                                                                                                                                                                             |

| No. | Text                                      | Logic                                                                                           | Remedy                                                                                                         |
|-----|-------------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| 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.<br>Check the heating elements and their activation |
| 28  | Modbus connection interrupted             | The connection to the superordinate system was interrupted.                                     | Check if the Ethernet cables are damaged.<br>Check the configuration of the communication connection           |

### 12.3 Malfunctions of the Switchgear

| Error                                                                   | Cause                                                                      | Action                                                                                                                                               |
|-------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>No light on controller</b>                                           | Controller switched off                                                    | Power switch to “I”                                                                                                                                  |
|                                                                         | No power available                                                         | Is the power cord plugged into the socket?<br>Check the building fuses<br>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 it is triggered again, contact Nabertherm Service                                                                     |
| <b>Controller displays error</b>                                        | See controller error messages                                              | See controller error messages                                                                                                                        |
| <b>Furnace does not heat</b>                                            | Stand-by temperature not activated                                         | Activate stand-by temperature                                                                                                                        |
|                                                                         | Stand-by temperature set too low                                           | Set stand-by temperature according to material specifications                                                                                        |
|                                                                         | Energy saving mode or protect mode activated                               | Deactivate energy saving mode or protect mode                                                                                                        |
|                                                                         | The controller is in “Wait” status (Series 500 controllers).               | The program is waiting for the programmed start time.<br>Set waiting time to “00:00” or disable                                                      |
|                                                                         | Error in program entry, e.g., temperature too low                          | Check the heating program (see separate instructions for the controller)                                                                             |
|                                                                         | Heating element faulty.                                                    | Have this checked by Nabertherm Service or a qualified electrician.                                                                                  |
| <b>Very slow heating of the heating chamber</b>                         | The fuse(s) of the connection is/are defective.                            | Check the fuse(s) of the connection and replace if necessary.<br>Notify Nabertherm Service if the new fuse fails again straightaway.                 |
| <b>Program does not go to next process step</b>                         | Temperature remains stuck a few °C before the target value is reached.     | Check the control parameters and controller damping in ramps.                                                                                        |
|                                                                         | No temperature increase                                                    | See “Furnace does not heat”.                                                                                                                         |
| <b>The controller module cannot be registered on the operating unit</b> | Controller module addressing error                                         | Perform a bus reset and re-address the controller module                                                                                             |

| Error                                                           | Cause                                                                                                                                                                                                                                                                                                                                                                                                                                    | Action                                                                                                                                                                         |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The controller is not heating in the optimization               | No optimization temperature has been set                                                                                                                                                                                                                                                                                                                                                                                                 | The temperature to be optimized must be entered (see the separate instructions of the controller)                                                                              |
| The temperature rises faster than the controller setting allows | The switch element of the heating unit (semiconductor relay, thyristor or switch contactor) is defective.<br><br>Individual defective components inside a furnace cannot be completely ruled out in advance. That is why the controllers and the switchgear units must be equipped with safety facilities. For example, the furnace shuts down the heating unit in response to error message 04 - 02 via an independent contact element. | Have the switch element tested by a qualified electrician and replaced as necessary.                                                                                           |
| Lifting table cannot be lowered.                                | Fuse (fuses) on the connector is (are) defective.<br><br>Electrical drive is damaged.                                                                                                                                                                                                                                                                                                                                                    | Inspect fuse(s) on the connector and replace if necessary.<br><br>Lower the lift unit via the emergency hole (see section entitled "Lowering the Lift Unit – Emergency Hole"). |

## 12.4 Controller Check List

|                                                                  |                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Customer:                                                        |                                                                                                                                                                                                                                                                                                                                |
| Kiln model:                                                      |                                                                                                                                                                                                                                                                                                                                |
| Controller model:                                                |                                                                                                                                                                                                                                                                                                                                |
| Controller version (see info menu):                              |                                                                                                                                                                                                                                                                                                                                |
| Controller serial number:                                        |                                                                                                                                                                                                                                                                                                                                |
| Furnace serial number:                                           |                                                                                                                                                                                                                                                                                                                                |
| Error code in display:                                           |                                                                                                                                                                                                                                                                                                                                |
| The following malfunctions are dependent on external influences: | 02-05 ambient temperature too low: < -10 °C (14 °F)<br>02-04 ambient temperature too high: > 70 °C (158 °F)                                                                                                                                                                                                                    |
| Exact description of fault:                                      |                                                                                                                                                                                                                                                                                                                                |
| Export service information:                                      | 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. |
| When does the malfunction occur?                                 | At certain points in the program or times of day:<br><br>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 in one of the materials to heat the furnace at full power:

| Point in program        | Value                             |
|-------------------------|-----------------------------------|
| Process step "Close"    | 00:10 min                         |
| Process step "Firing 1" | 800 °C<br>250 °C/min<br>05:00 min |

Close the table 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: \_\_\_\_\_

## 12.5 Lowering the Lift Unit - Emergency Hole



### 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.

If the electric drive is damaged or in case of a power outage, the lifting unit can be lowered manually.

### Dismantling the back wall

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.

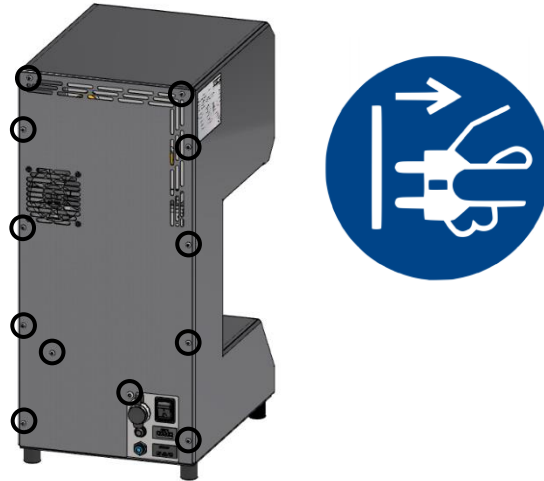


Fig. 28: Back of furnace/ground cable (similar to picture)

Use a hex key to turn the hex screw (A) of the belt tensioner anti-clockwise approx. 5 times. Lowering the belt tensioner (B) loosens the belt, which will cause the lift bottom to lower slowly.



Fig. 29: Undoing the belt tensioner (similar to picture)

The lift bottom must be lowered to the lowest position in order to tension the belt again correctly with the belt tensioner. If the lift bottom does not go to the bottom position on its own, slowly and carefully press the carriage (4) of the lift until the lowest position is reached.



#### Note

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



**Caution**

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



**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.

## 13 Spare Parts/Wearing Parts



**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.



**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:**

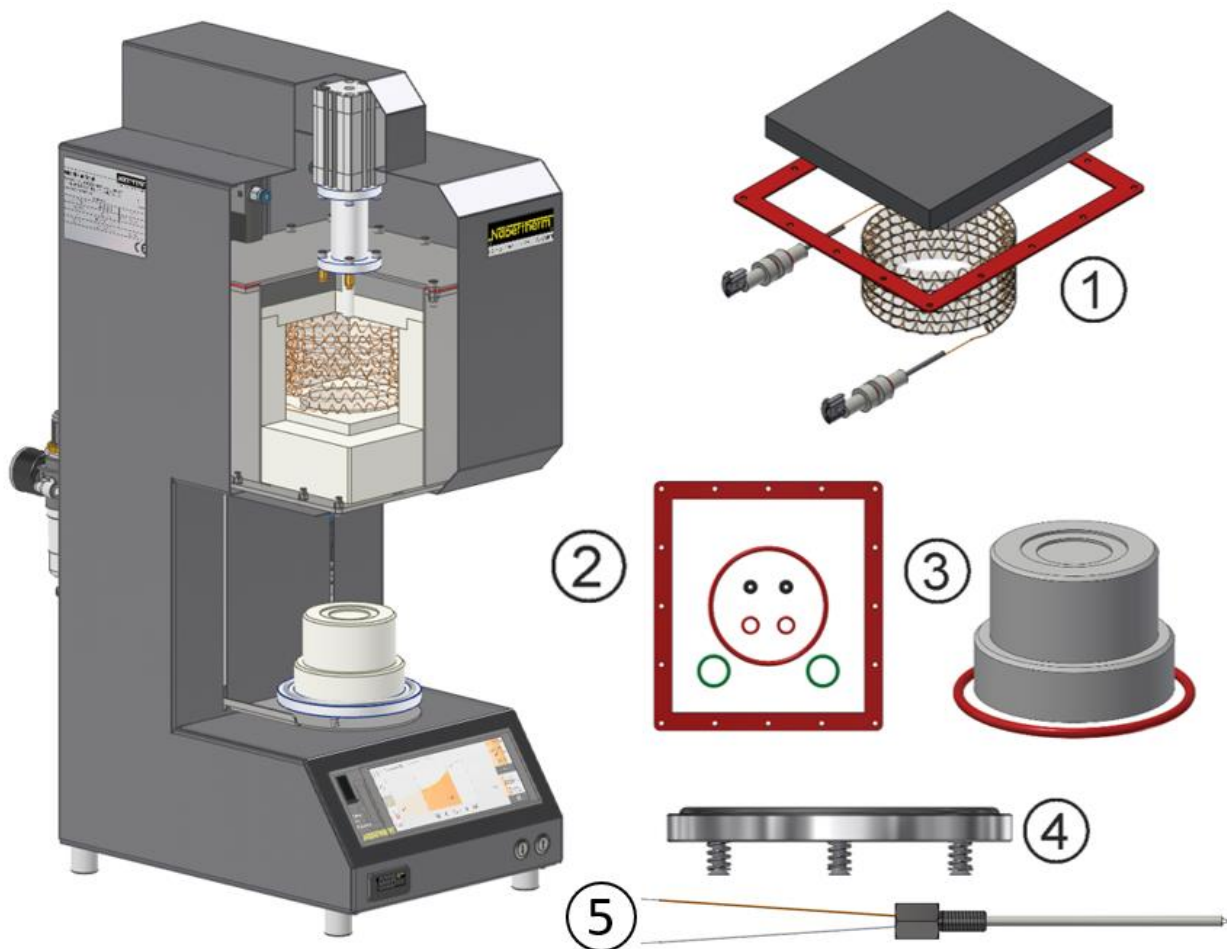
Although Nabertherm has many spare parts and wearing parts in stock, we cannot guarantee the short-term availability of all of them. We recommend that certain parts be ordered in good time. If you need any assistance when selecting spare parts and wearing parts, the staff at Nabertherm will be glad to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

The complete list of spare parts can be requested from Nabertherm Service.



**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.



| Item | Name                                                                |   |
|------|---------------------------------------------------------------------|---|
| 1    | Heating unit VL 01/12 LB including seal and top insulation          | ○ |
| 2    | Set of seals VL 01/12 LB for lid, lift bottom, heating unit bushing | ● |
| 3    | Lift bottom insulation, including seal                              | ● |
| 4    | Lift bottom carrier, spring loaded, including seal                  | ● |
| 5    | Thermocouple type S 0.3 mm x 80 mm                                  | ○ |



#### Symbols

- Can be replaced by the customer with tools and instructions.
- Can be replaced by trained personnel with tools and instructions.
- NT Nabertherm Service required



### 13.1 Electrical Schematics/Pneumatic Schematics



#### Note

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

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

### 13.2 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.



#### Note

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



#### Note

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

Nabertherm expressly does not accept any responsibility for direct or indirect damage caused by incorrect assembly. This also applies in all cases where general installation steps are not described.

The furnace must be completely emptied prior to installation or removal.

We recommend that two people replace heating elements.

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

#### Dismantling the Furnace Lid

Undo the screws of the lid with a suitable tool, remove the lid towards the front and upward.



Fig. 30: Furnace lid (similar to picture)

The cover must be lowered onto a soft material (such as foam rubber).

### Dismantling the back wall

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.

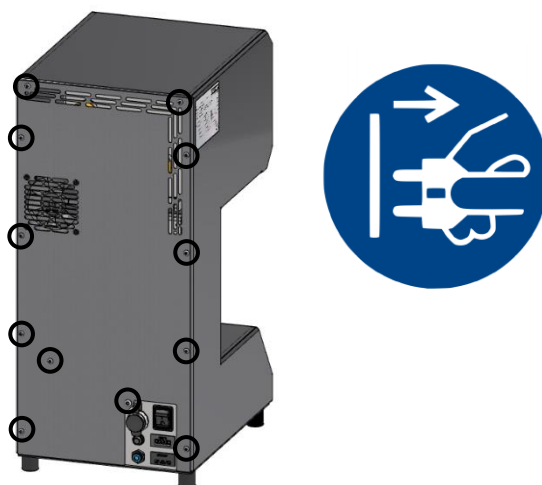


Fig. 31: Back of furnace/ground cable (similar to picture)

### Dismantling the retort lid

To dismantle the pneumatic hoses, press the ring on the screw while pulling the hose. The valve plug is screwed with a knurled-head screw and can be removed upward once it has been undone. The pneumatic cylinder and the solenoid valve (only VL 01/12 LB Press) can remain in place.

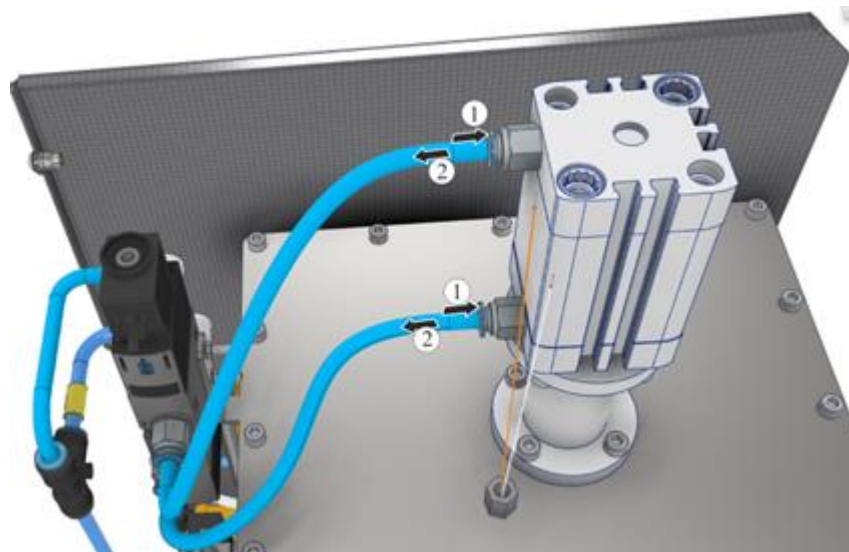


Fig. 32: Dismantling the pneumatic hose and valve plug (only model VL 01/12 LB Press)

Dismantle the thermocouple as described in “Replacing a Thermocouple”.

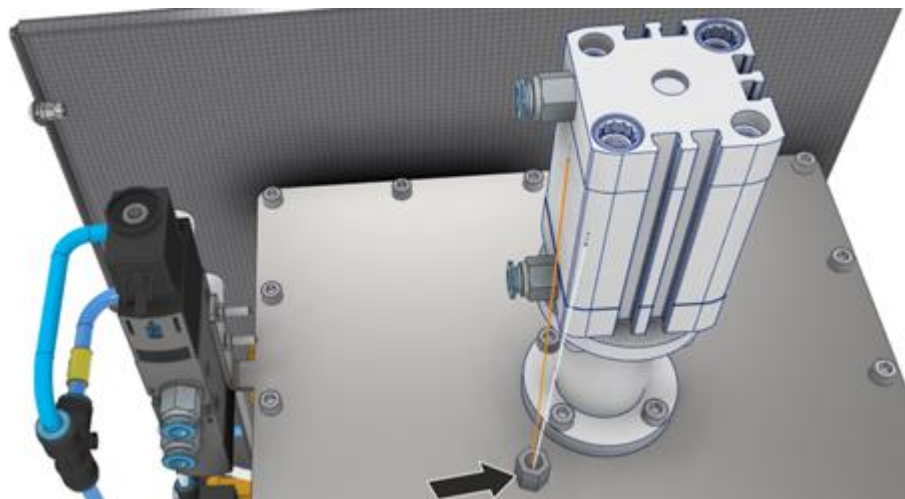


Fig. 33: Dismantling the thermocouple (similar to picture)

Undo the screws on the retort cover and keep them in a safe place to be used again. Remove the retort cover upward.

Place the cover on a soft surface (such as foam rubber). Remove the seal.

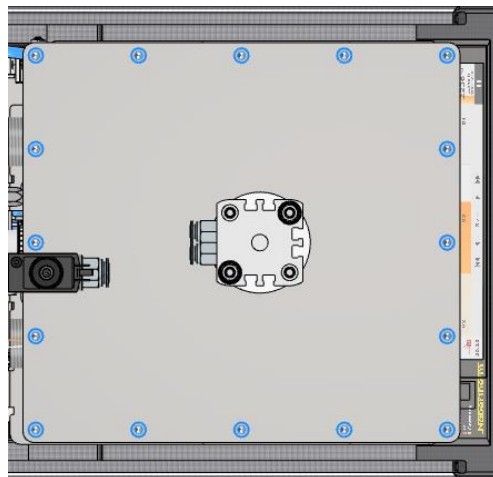


Fig. 34: Removing the retort cover (similar to picture)

### Removing the top insulation

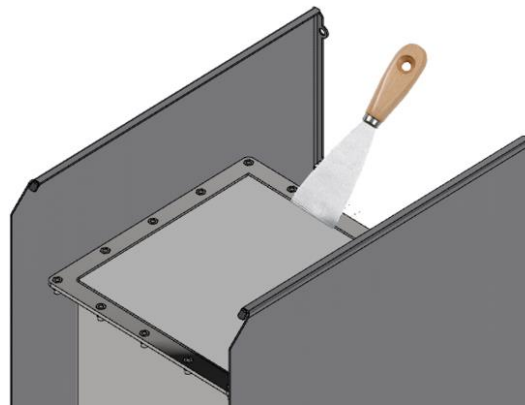


Fig. 35: Removing the top insulation (similar to picture)

Use a scraper to lift the three layers of insulation from the retort. Make sure that the surrounding insulation is not damaged. Remove the top strip of fiber paper.

### Removing the 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).

Undo the retainer nuts with a suitable open-end wrench (SW 30) and keep them in a safe place for reuse.

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

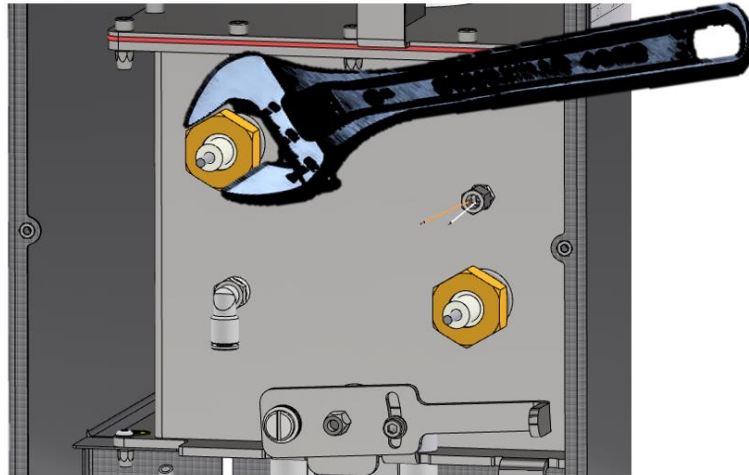


Fig. 36: Dismantling the retainer nuts (similar to picture)

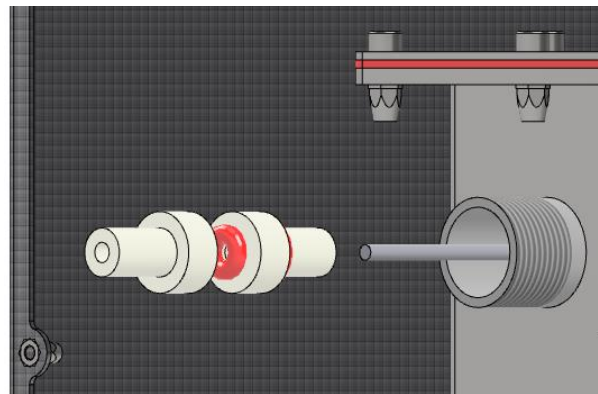


Fig. 37: Carefully remove the ceramic feedthrough tube and seals (similar to picture)

Slide the connection ends of the heating wire into the furnace far enough so that the QG heating unit can be removed upward. Install the new QG heating unit in the reverse order. Use the new seal and insulation that is supplied.

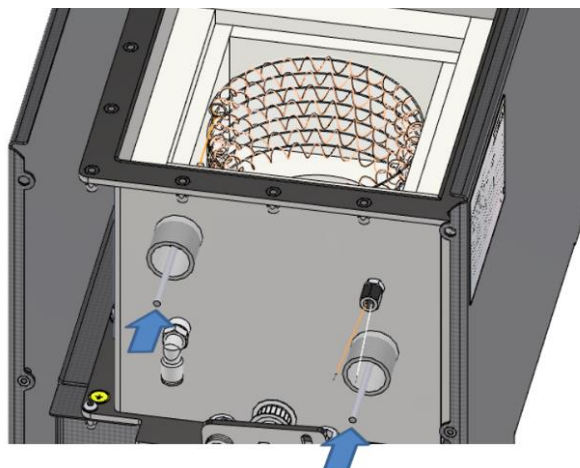


Fig. 38: Sliding the connection ends into the furnace (similar to picture)



**Note**

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

**Caution**

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

**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.

**Commissioning**

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

**Note**

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

**Note**

\*) = Enclosed with spare part delivery.

### 13.3 Removing and Installing the Plunger (only VL 01/12 LB Press)

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

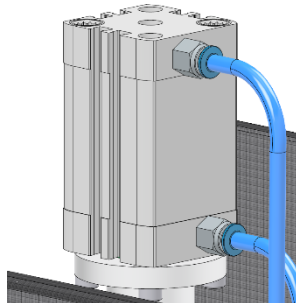
**Dismantling the pressing unit**

Fig. 39: Dismantling the pneumatic hose (similar to picture)

To dismantle the pneumatic hoses, press the ring on the screw while pulling the hose. The valve plug is screwed with a knurled-head screw and can be removed upward once it has been undone. The pneumatic cylinder and the solenoid valve (only VL 01/12 LB Press) can remain in place.

### Dismantling the pneumatic cylinder

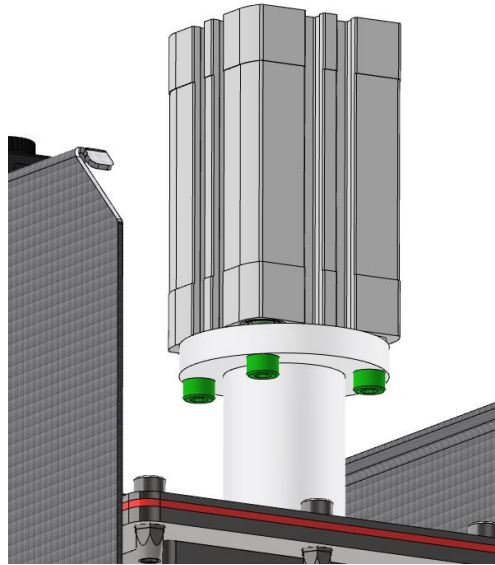


Fig. 40: Dismantling the pneumatic cylinder (similar to picture)

Undo the screws on the pneumatic cylinder. Remove the cylinder upwards and put it in a safe place so that it can be reused.

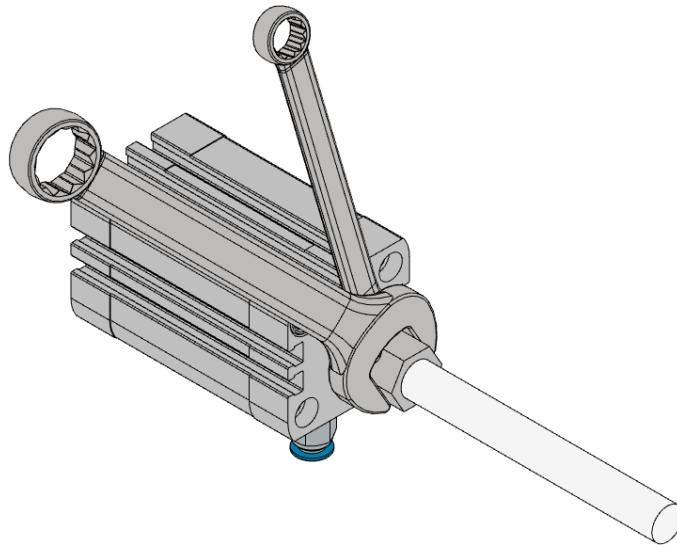


Fig. 41: Dismantling the plunger (similar to picture)

Dismantle the plunger with the aid of two open-end wrenches (SW 10 & SW 17).

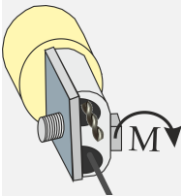
Install the unit in reverse order.



**Note**

Re-install in reverse sequence.

## 13.4 Tightening Torque for Screw Connections on Heating Elements

| Screw tightening torques                                                                                                           |                             |                                  |                  |
|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|----------------------------------|------------------|
| Tighten screws on the heating elements with a defined torque. If this advice is not followed, the heating elements may be damaged. |                             |                                  |                  |
| Illustration                                                                                                                       | 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            |

## 13.5 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 DGVV V3 or the corresponding national regulations in the country where the furnace is installed. Wait until the furnace and the connected parts have cooled to room temperature.



### Caution - 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.



### 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.

### Commissioning

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



### Note

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

## 13.6 Dismantling the Furnace Lid and the Back Wall

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



## 13.7 Dismantling the Thermocouple

First, undo the two screws (A) from the thermocouple connection and then the screw on the thermocouple itself to remove the thermocouple.

Insert the new thermocouple carefully into the channel, then assemble and connect in the reverse order. Ensure correct polarity of the electrical connections.



Fig. 42: Dismantling the thermocouple (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 cover is assembled in the reverse order.

### Caution

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



### 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.



### Warning! General hazards!

Work on the equipment may only be performed by qualified, authorized specialists. During work, the voltage supply to the furnace/switching system must be switched off to prevent unintentional commissioning (disconnect mains power connector) and all moving parts of the furnace must be secured. Observe DGUV V3 or corresponding national guidelines of the country of use. Wait until the furnace chamber and attaching parts have cooled to room temperature.



### 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.

## 14 Repairing the Insulation

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

## 15 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                                                                | Phone or fax                                         | Web or e-mail                               |
|---------------------------------------------------------------------|------------------------------------------------------|---------------------------------------------|
| Nabertherm GmbH<br>Bahnhofstrasse 20<br>28865 Lilienthal<br>Germany | Phone: +49 (4298) 922-333<br>Fax: +49 (4298) 922-129 | www.nabertherm.com<br>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:

|                                                                                                                                                                             |   |   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|
|                                                                                          |   |   |
| <b>Nabertherm GmbH</b><br>Bahnhofstr. 20, 28865 Lilienthal/Bremen, Germany<br>Tel +49 (04298) 922-0, Fax +49 (04298) 922-129<br>contact@nabertherm.de<br>www.nabertherm.com |   |   |
| ①                                                                                                                                                                           | ② | ④ |
| ③                                                                                                                                                                           |   |   |
|                                                                                                                                                                             |   |   |
|                                                                                                                                                                             |   |   |

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

Fig. 43: Example (type plate)

## 16 Shut-Down, Dismantling, and Storage

### To be Completed by the Operator

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

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



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

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Oils and other substances that are hazardous to water must be completely removed before the furnace is dismantled for recycling or scrap.

Ensure that operating materials, lubricants, and consumables are disposed of in an environmentally compliant manner. Regulations relating to proper waste recycling and disposal must be observed.

The furnace may be lifted only at the intended points.

Use only the specified lifting and securing equipment to lift the furnace/parts.

Consider a total weight of \_\_\_\_\_ kg when choosing  
\_\_\_\_\_ suitable lifting equipment.

For transportation, consider a permitted floor weight of at least \_\_\_\_\_ kg/m<sup>2</sup>.

Before transporting the furnace, attach the following securing equipment:

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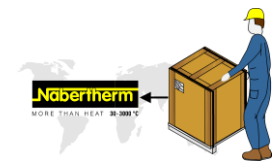
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#### Note

See "Safety" and "Transportation".

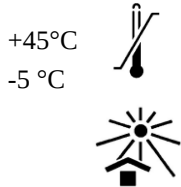
## 16.1 Transportation/Return Transportation



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

Otherwise:

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



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

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

Otherwise, in general:

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

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

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

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

As a rule:

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

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

---

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



**Note**

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



**Note**

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

## 17 Declaration of Conformity



### EU Declaration of Conformity

#### Vacuum firing and pressing furnaces with lift bottom

|              |             |                   |
|--------------|-------------|-------------------|
| <b>Model</b> | VL 01/12 LB | VL 01/12 LB Press |
|--------------|-------------|-------------------|

Name and address of the manufacturer

Nabertherm GmbH  
Bahnhofstr. 20  
28865 Lilienthal, Germany

The above product fulfills the following harmonization regulations of the EU:

- 2006/42/EC (Machinery Directive)
- 2014/30/EU (EMC):
- 2011/65/EU (RoHS)

The following harmonized standards were applied:

- DIN EN 61010-1 (03.2020)
- DIN EN IEC 61000-6-1 (11.2019), DIN EN IEC 61000-6-3 (06.2022)

The manufacturer has sole responsibility for issuing this declaration of conformity. The signatories of the declaration are authorized to compile the relevant technical documents. The address corresponds to the specified address of the manufacturer.

Lilienthal, 23.02.2023

Dr. Henning Dahl  
Vice President R & D

Malte Pirngruber-Spanier  
Department Manager R & D

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**18 For Your Notes**



