Nabertherm
MORE THAN HEAT 30-3000 °C

Operating Instructions

Oven

TR 60 - TR 1050

->11.2015 M01.0063 ENGLISCH

Original instructions

Made
in
Germany

www.nabertherm.com

Reg: M01.0063 ENGLISCH
Rev: 2017-04

1 Introduction

Dear Customer,

Thank you for choosing a quality product from Nabertherm GmbH.

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

This product is characterized by

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

Your Nabertherm Team

Note

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

Protective Rights

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

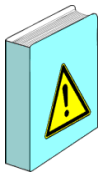
Note

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

Note

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

1.1 Product Description



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

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

With their maximum working temperature of up to 300 °C (572 °F) and forced air circulation, the ovens achieve a perfect temperature uniformity which is much better than in ovens of most competitors. They can be used for various applications such as e.g. drying, sterilizing or warm storing. Ample warehousing of standard models provides for short delivery times.

Other Characteristics of this Product are:

- Tmax 300 °C
- Working temperature range: + 5 °C above room temperature up to 300 °C
- Models TR 60 – TR 240 designed as tabletop models
- Models TR 450 – TR 1050 designed as floor-standing models
- Horizontal, forced air circulation results in temperature uniformity better than +/- 5 °C
- Stainless steel chamber, alloy 304 (AISI)/(DIN material no. 1.4301), rust-resistant and easy to clean
- Large handle to open and close the door
- Charging in multiple layers possible using removable grids (number of removable grids included, see "Specifications")
- Large, wide-opening swing door, hinged on the right with quick release for models TR 60 – TR 450
- Double swing door with quick release for TR 1050
- TR 1050 equipped transport rollers
- Infinitely adjustable exhaust at the rear wall with operation from the front
- PID microprocessor control with self-diagnosis system
- Solid state relays provide for lownoise heater operation

Additional Equipment

- Over-temperature limiter with manual cut-off temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the oven and load
- Infinitely adjustable fan speed of the air circulation fan
- Window for charge observing
- Further removeable grids with rails
- Side inlet
- Stainless steel collecting pan to protect the furnace chamber
- Safety technology according to EN 1539 for charges containing liquid solvents (TRS) up to model TRS 240, achievable temperature uniformity +/- 8 °C
- Transport costors for model TR 450
- Various modifications available for individual needs
- Upgrading available to meet the quality requirements of AMS 2750 E or FDA
- Process control and documentation via VCD software package for monitoring

1.2 Overview of the Complete Furnace

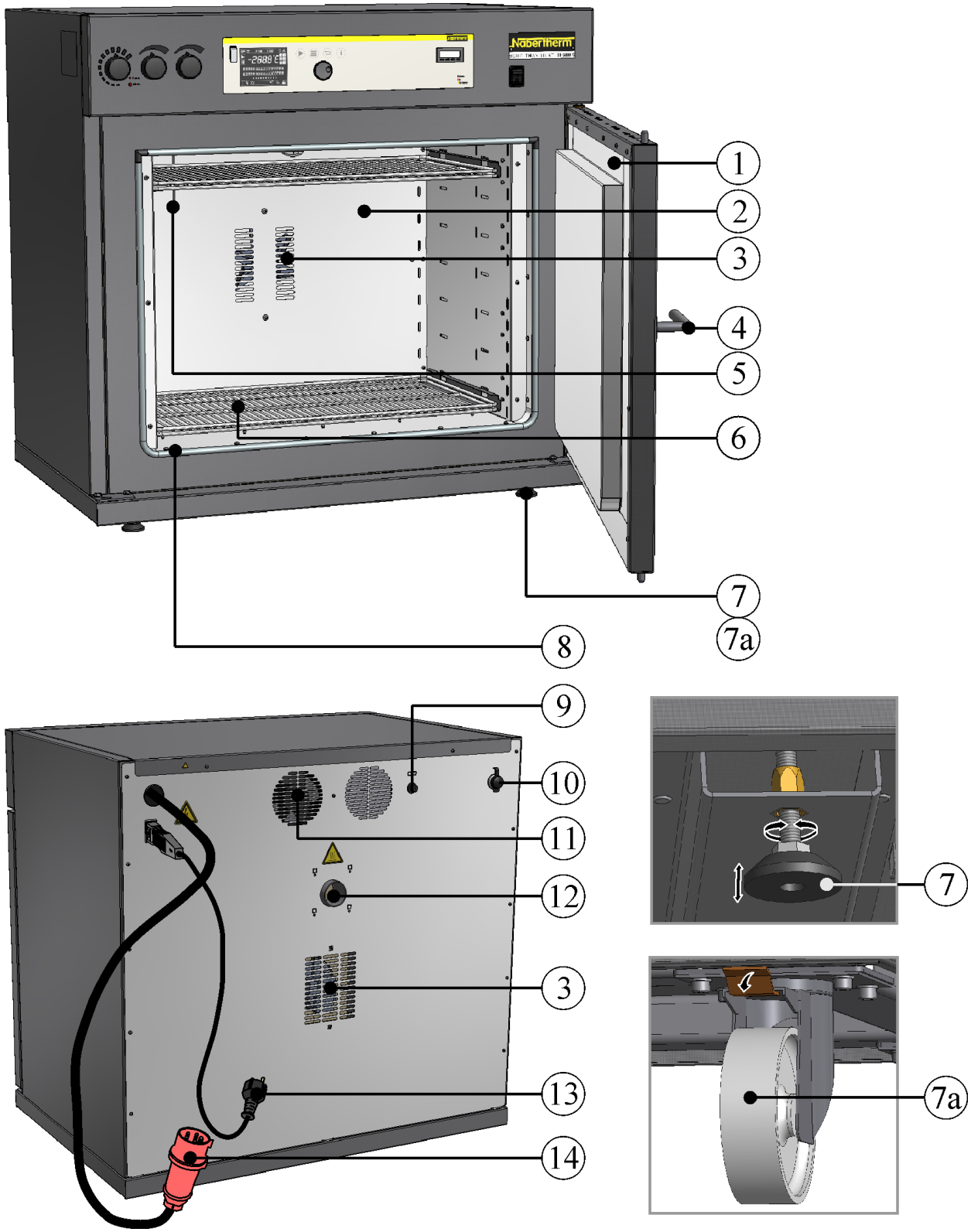


Fig. 1: Overview: The model shown here is the TR 120 drying oven with accessories (similar to picture)

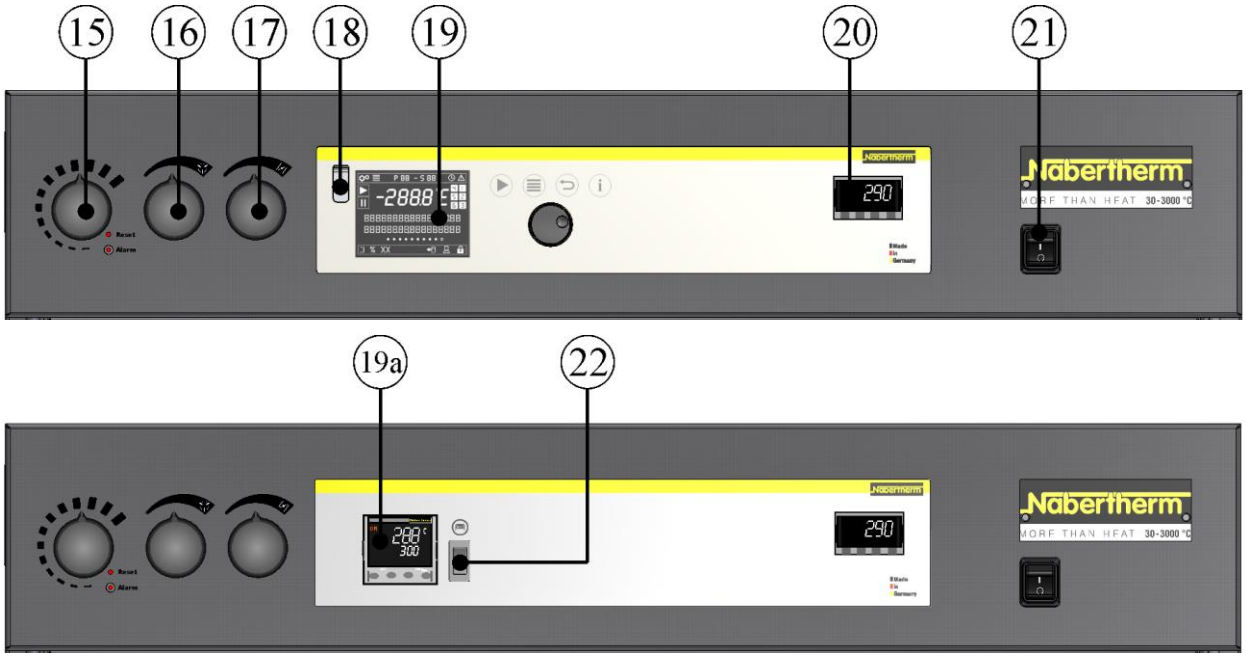


Fig. 2: Operating elements - front view (similar to picture)

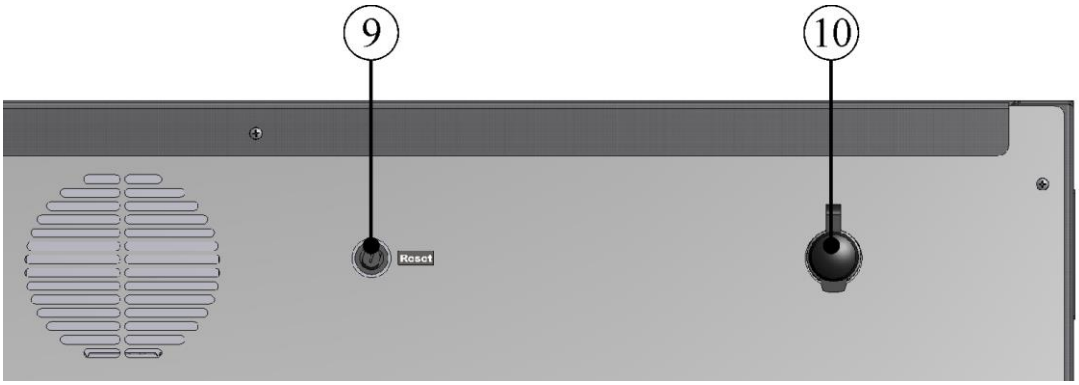
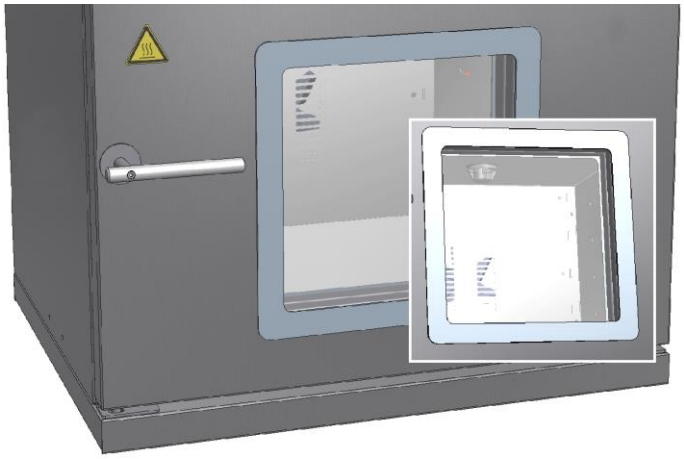


Fig. 3: Operating elements - rear view (similar to picture)

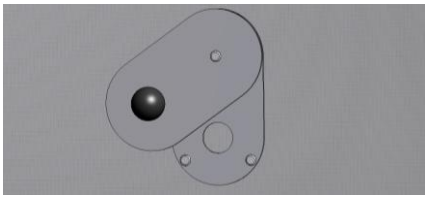
No.	Designation
1	Swing door (with viewing panel and inside lighting as accessories). Double swing door on Model TR 1050
2	Oven chamber
3	Air circulation motor
4	Handle
5	Thermocouple
6	Grids for charging on several levels
7	Balancing screws to level the feet.
7a	Model TR 1050 with transport rollers (transport rollers available as an accessory for Model TR 450)
8	Allround seal

No.		Designation
9		Reset button for over-temperature limiter
10		Interface RJ45 Ethernet socket
11		Switchgear fan
12		Exhaust channel with butterfly valve
13		Power plug (to 3600 watts) with snap-in coupling
14		CEE power plug (from 16 A)
15		Mechanical over-temperature limiter (accessory)
16		Infinitely adjustable air-circulation speed (accessory)
17		Infinitely adjustable exhaust system via a butterfly valve in the rear wall
18		USB interface
19		Controller B410, C450 or P480 (depending on model)
19a		Controller R7 (depending on model).
20		Over-temperature limiter with manual cut-off temperature for thermal protection class 2 in accordance with EN 60519-2 as a temperature limiter to protect the oven and the load (accessory)
21		Power switch with integrated fuse (switching oven on/off)
22		Heating (ON/OFF)

Additional Equipment



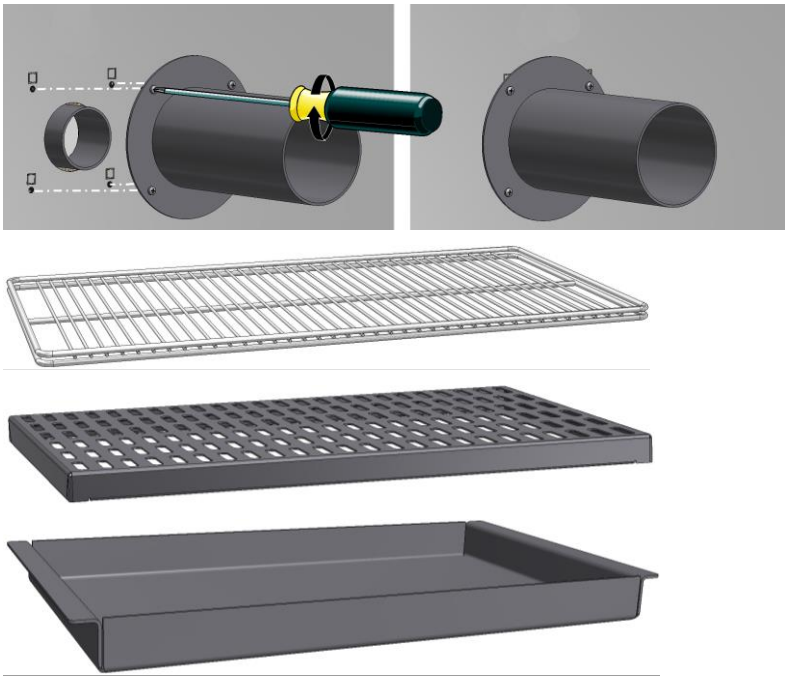
Viewing window to observe the charge with inside lighting



Side inlet

Fig. 4: Example: Accessories (similar to picture)

Accessories



Option to connect an exhaust air nozzle on the rear of the oven for connecting an exhaust air system

Removable grids to load the oven on different levels

Removable trays to load the oven on different levels

Stainless steel collection pan to protect the inside of the oven

Fig. 5: Example: Accessories (similar to picture)

1.3 Safeguarding against Dangers from Excess Temperatures

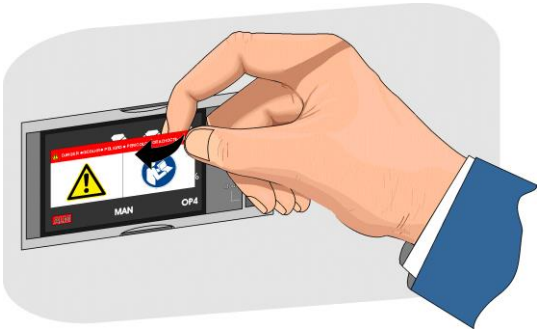
Over-temperature limiters and over-temperature limiters with automatic reset to protect against over-temperature in the furnace are available for Nabertherm GmbH furnaces either as a standard feature (depending on the model series) or as additional equipment (customized design).

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

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

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

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



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

Fig. 6: Removing the sticker (similar to picture)

1.3.1 Key to the Model Names

Example	Explanation
TR 240 →	**TR** = Drying oven
TR **240** →	**60** = 60 liter oven chamber (volume in L) **120** = 120 liter oven chamber (volume in L) **240** = 240 liter oven chamber (volume in L) **450** = 450 liter oven chamber (volume in L) **1050** = 1050 liter oven chamber (volume in L)

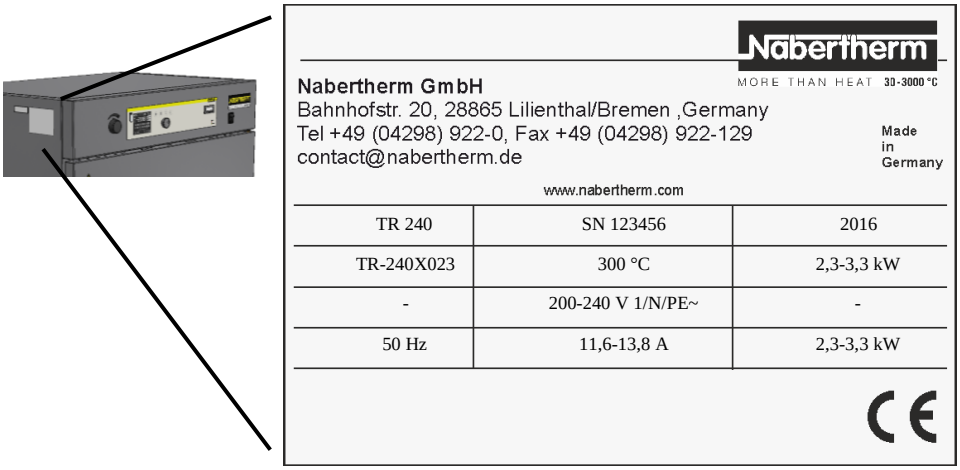


Fig. 7: Example of model name (type plate)

1.4 Scope of Delivery

The Scope of Delivery Includes:

Oven Components	Quantity	Comment
Drying oven[1)]	1 x	Nabertherm GmbH
Power cable[2)]	1 x	Nabertherm GmbH
Removable grids[4)]	[3)]	Nabertherm GmbH
Other components, variable depending on the particular oven	- - -	See shipping papers

Document Type	Quantity	Comment
Drying oven operating instructions	1 x	Nabertherm GmbH
Operating instructions for Controller[1)]	1 x	
Operating Instructions VCD software package[1)]		
Other documents, variable depending on the particular oven	1 x	

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

Note

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

Note

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

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

2 Specifications

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

Model	Tmax	Inner dimensions in mm			Outer dimensions in mm			Volume	Weight
	°C	w	d	h	W	D[1]	H	in l	in kg
TR 60	300	450	390	350	700	610	710	60	90
TR 120	300	650	390	500	900	610	860	120	120
TR 240	300	750	550	600	1000	780	970	240	165
TR 450	300	750	550	1100	1000	780	1470	450	235
TR 1050	300	1200	670	1400	1470	940	1920	1050	450

Model	Heating power in kW[2]	Grids included	Grids max.	Max. total load in kg[3]
TR 60	3	1	4	120
TR 120	3	2	7	150
TR 240	3	2	8	150
TR 450	6	3	15	180
TR 1050	9	4	14	250

[1] Dimensions include door handle and supply/exhaust air ducts
[2] Depending on furnace design connected load might be higher
[3] Max load per layer 30 kg

Note: Drying ovens up to TR 240 can be stacked

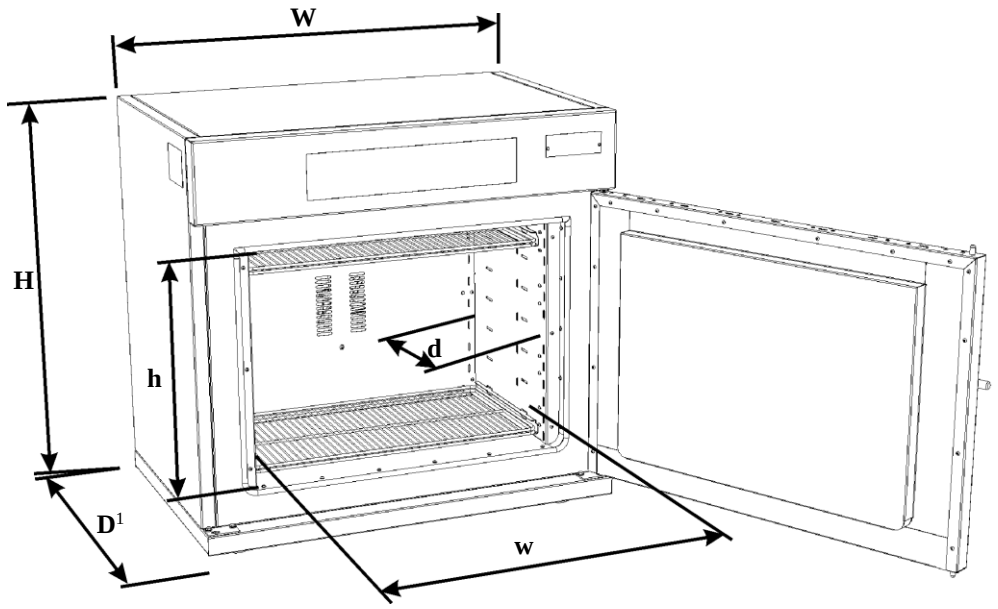


Fig. 8: Dimensions (similar to picture)

Electrical Connection		**1-phase:**			**3-phase:**	
	Voltage:	200 V – 240 V			200 V – 240 V or 380 V – 400 V	
	Frequency:	50 or 60 Hz			50 or 60 Hz	
	Rated power:	TR 60	TR 120	TR 240	TR 450	TR 1050
		3 kW	3 kW	3 kW	6 kW	9 kW
	Power plug	TR 60 – TR 240			TR 450 – TR 1050	
		Grounded plug (with snap-in socket)			CEE plug	
Thermal Protection Class	Ovens:	**according to DIN EN 60519-2** without safety controller: Class 0 with safety controller: Class 2				
Protection Type	Ovens:	IP20				
Ambient Conditions for Electrical Equipment	Temperature: Humidity:	+5 °C to +40 °C max. 80 % non condensing				
Weights	Oven with accessories	Varies (see shipping papers)				
Emissions	Continuous sound pressure level:	< 80 dB(A)				

2.1 Warranty and Liability

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

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

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

3 Safety

3.1 Defined Application

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

- Only materials whose characteristics and melting temperatures are known may be heated. Consult any available safety 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.
- TR-series drying ovens are suitable for drying and heat-treating solid materials, powders, and bulk materials. Solvents used in the materials must not be explosive or ignitable. The components of the charge must NOT form explosive mixtures in combination with air. The interior temperature must remain below the flash point or sublimation point of the charge.
- Any other use, such as processing of products other than those for which the furnace was intended as well as handling hazardous materials or materials dangerous to health is deemed IMPROPER and such uses must be approved in writing by Nabertherm.

- 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.**
- Furnaces with over-temperature limit controllers must have their shut-down temperatures set to prevent any overheating of the material.
- The set-up instructions and safety regulations must be followed, otherwise the furnace will be considered improperly used, effectively cancelling any claims against Nabertherm GmbH. The EC Declaration of Conformity will cease to be valid if any modifications are made to the machine without our approval.
- The set-up instructions and safety regulations must be followed, otherwise the furnace will be considered improperly used, effectively cancelling any claims against Nabertherm GmbH.
- Opening the furnace while it is still hot, over 200 °C (392 °F), can lead to increased wear of the following components: insulation, door seal, heating elements and furnace housing. No liability shall be accepted for any damage to the goods or the furnace resulting from non-compliance with this warning.
- Operation with power sources, products, operating equipment, auxiliary materials, solvents, etc., which are listed as hazardous or which may in any way harm the health of the personnel operating the furnace is prohibited.
- Operation with explosive gases or mixtures, i.e., including any explosive gases or mixtures created as a result of heating/drying, is prohibited.

Note

Due to the special requirements of the German Medical Devices Law (MPG), these ovens are NOT suitable for sterilizing medical products in terms of European Directive 93/42/EEC.

Note

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

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

Note

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

3.2 Requirements for the Furnace Operator

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

Note

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

3.3 Requirements for the Operating Personnel

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

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

Only trained personnel may operate the control and safety equipment.

The Operator Should Complete these Details:

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

⚠ DANGER

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

3.4 Protective Clothing

Wear heat-resistant gloves to protect your hands.

3.5 Basic Measures During Normal Operation

Risks during Normal Operation!

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

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)

- Check seal(s) for damage

3.6 Basic Measures in Case of Emergency

3.6.1 What to Do in an Emergency

Note

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

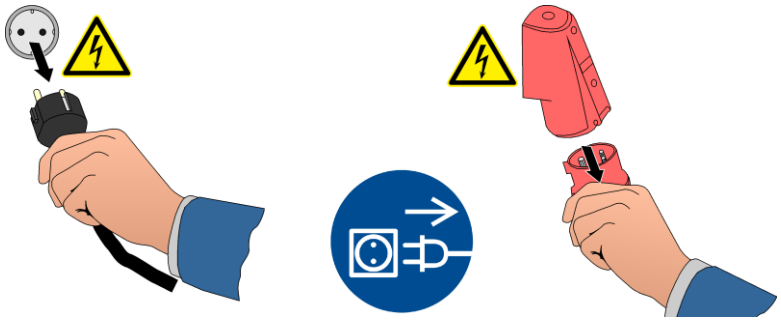


Fig. 9: Pull the power plug (similar to picture)

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.

DANGER

- **Danger of electric shock.**
- **Risk of fatal injury.**
- Work on electrical equipment may be carried out only by qualified electricians or by trained personnel authorized by Nabertherm.
- Before starting work, pull out the power plug

Warning - Danger of Electric Shock!

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

3.7 Basic Measures for Servicing and Maintenance

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

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

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

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

When maintenance or repair work has been completed, before recommencing production

ensure the following:

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

3.8 Environmental Regulations

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

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

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

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

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

Note

The operator must ensure that national environmental regulations are observed.

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

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

3.9 Explanation of the Symbols and Warnings

Note

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

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

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

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

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

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

Structure of the Warning: All Warnings are Structured as Follows

Hazard Symbol
Indicates the risk of injury

Signal Word
Classifies the danger

⚠ WARNING

- **Type and source of the danger**
- **Consequences of non-compliance**
- Action to prevent danger

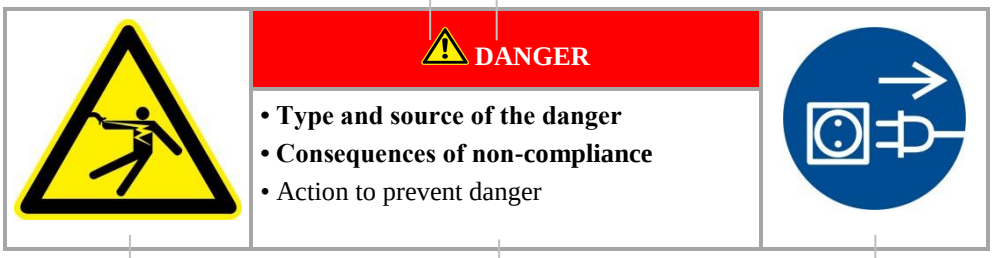
Graphical Symbols (optional) According to ISO 3864:
Consequences, measures, and prohibitions

Reference Texts:
- Type and source of the danger
- Possible consequences of non-compliance
- Measures/Prohibitions

or

Hazard Symbol
Indicates the risk of injury

Signal Word
Classifies the danger



Graphical Symbols (optional) According to ISO 3864:
Consequences, measures, and prohibitions

Graphical Symbols (optional) According to ISO 3864:
Instructions or prohibitions

Reference Texts:
• Type and source of the danger
• Possible consequences of non-compliance
• Measures/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.

Caution – Danger of Falling

Ignoring this can lead to fatal injury. Danger of falling exists at a height less than 1.00 m above the ground or another sufficiently broad bearing surface (for example, on elevated operating positions and workplaces, working platforms, galleries, platforms, footbridges, flying bridges, ramps and stairways).

Openings and recesses through which people can fall (for example in floors, platforms, installation openings, hatchways and pits, non-bearing roofs).

Warning – Danger if Heavy Loads are Lifted

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

Warning – Risk to the Environment

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

Warning - Fire Danger

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

Warning – Risk of Explosive Substances or Explosive Atmosphere

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

Prohibited - Important Information for Operators

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

Warning Signs on the Furnace:

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

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

Warning - Danger of Electric Shock!

Warning, dangerous electric voltage

3.10 General Risks with the Furnace

⚠ CAUTION

- **During operation, the exhaust air pipe on the rear side of the housing becomes hot.**
- **Danger of burning.**
- Do NOT touch the exhaust air pipe during oven operation.

⚠ CAUTION

- **Interior chamber, charge, exhaust air supports, window (option).**
- **Danger of burning.**
- Do NOT touch the inside surface of the oven, the charge, the exhaust air supports during operation.
- Wait until the oven has cooled naturally to room temperature.

⚠ DANGER

- **Do not insert any objects into the openings on the oven housing, the exhaust air or supply ducts, the air circulation motor, or the cooling slits of the switchgear or the oven.**
- **Danger of electric shock.**
- Do NOT insert any objects.

DANGER

- **Danger of electric shock**
- **Risk of fatal injury**
- The oven must NOT become wet during operation or maintenance

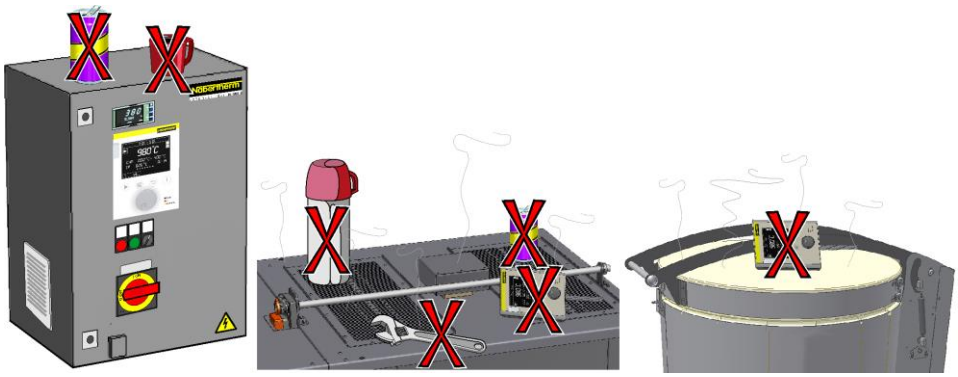
DANGER

- **Risk of explosion**
- **Risk of fatal injury**
- Do NOT insert explosive substances into the oven when it has reached its operating temperature.
- NO explosive dusts or solvent-air mixtures inside the oven.
- Do NOT operate the oven in areas where there is a risk of explosion.

- NO explosive dusts or solvent-air mixtures in the surrounding area.

Warning – General Hazards

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



DANGER

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

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

4 Transportation, Installation and Initial Start-Up

4.1 Delivery

Check that Everything is Complete

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

Danger of Injury

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

Safety Instructions

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

Risks during Normal Operation!

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

Note

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

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.

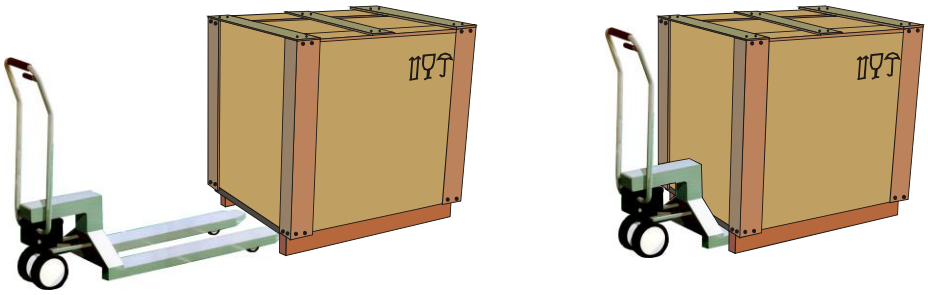


Fig. 10: Pallet truck is pushed **completely** beneath the transportation frame

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.

⚠ CAUTION

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

Symbols:

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

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

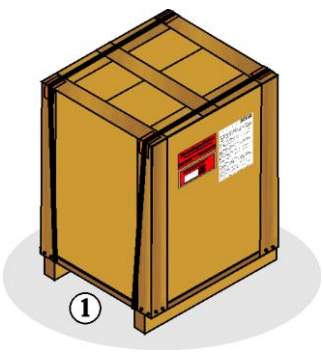
4.2 Unpacking

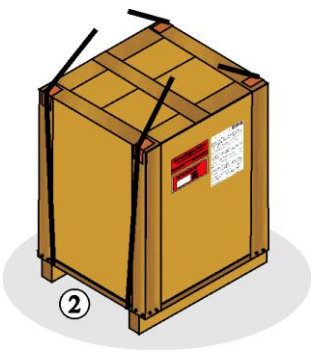
Note

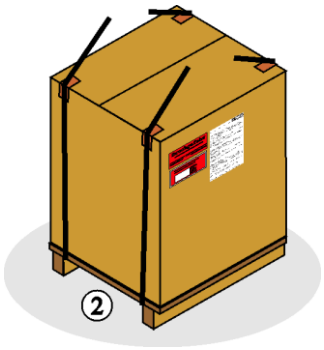
The furnace packaging prevents damage during transportation. Make sure that you remove all packaging material (also inside the Furnace Chamber). Keep the packaging and transportation securing equipment in case it is needed for future transportation or storage.

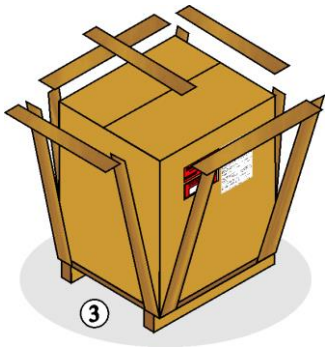
At least two people are needed to carry/transport the furnace, more for larger furnaces.

Wear protective gloves

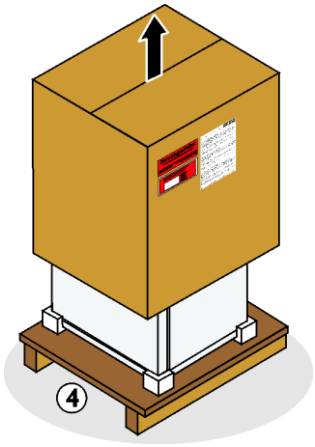


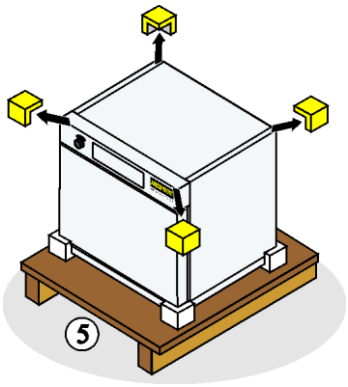




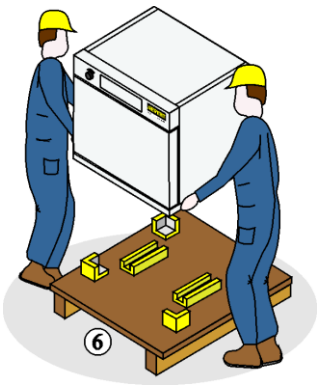


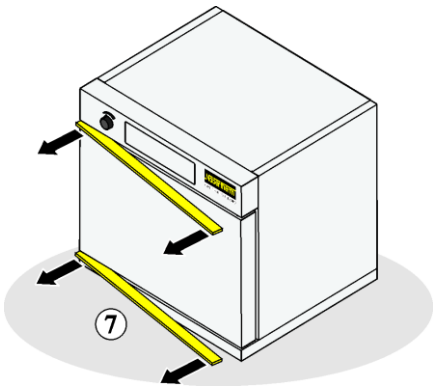
1. Check the transportation packaging for any signs of damage.
2. Remove straps from the transportation packaging.
3. Loosen the screws and remove the wooden frame from the cardboard box (if applicable)





4. Carefully lift the cardboard box and remove it from the pallet.
5. Remove the top transportation protection material from the drying oven. Compare the delivered items with the delivery note and the order documents, see "Delivery". Remove the protective film and packaging material from the drying oven.

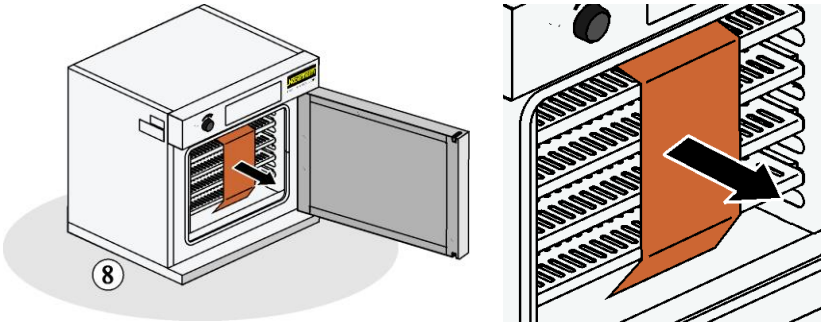




6. To carry the oven, place your hands beneath the oven on the side (near the feet) and make sure that you have a good grip. Keeping your back straight, lift the drying oven from the pallet and carefully lower it at the point where it is to be installed. Have another person remove the bottom transportation material before you lower the

oven. Two people are needed to lift drying ovens in series TR 60 – TR 120 from the pallet, and four are needed for drying ovens in series TR 240 – TR 1050, one at each foot

7. Remove the transportation securing material at the top and bottom of the door.



8. Use the handle to open the swing door. The removable grids inside the oven are protected during transportation, remove this protection material. Make sure that you remove all the packaging material. Keep the packaging and transportation securing material in case it is needed for future transportation or storage of the oven.

⚠ CAUTION

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

4.3 Transport Securing Device/Packaging

Note

No special transportation securing equipment is available for this furnace

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

Safety Information

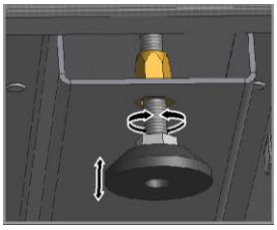
Do not allow children to play with packaging parts. They are at risk of suffocation from folding boxes and plastic film.

4.4 Constructional and Connection Requirements

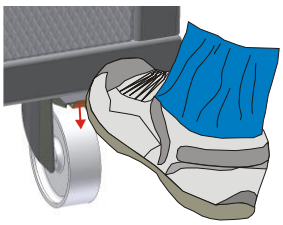
4.4.1 Installation (Furnace Location)

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

- The furnace must be positioned in a dry room as stated in the safety instructions.
- The supporting surface must be level to permit the furnace to stand upright. The furnace must be installed on a non-combustible support surface, free of any vibrations (stone, metal or an equivalent material).
- The load-bearing capacity of the table (model series TR 60 – TR 240) must match the weight of the furnace plus accessories.
- The floor covering must not be made of flammable material so that this floor covering does not ignite if hot material falls out of the furnace.
- The furnace must be oriented with the help of a water-level. The leg lengths can be adjusted using the tilt compensation screws.
- The furnace must be oriented with the help of a water-level. Leg lengths can be adjusted using the tilt compensation screws (models TR 60 – TR 450). For model TR 1050, which contains transport rollers, the appropriate height adjustment sheets (not included in the scope of delivery) or equivalent materials must be used. After orienting the furnace, the brakes on the fron guide rollers must be locked.



TR 60 – TR 450

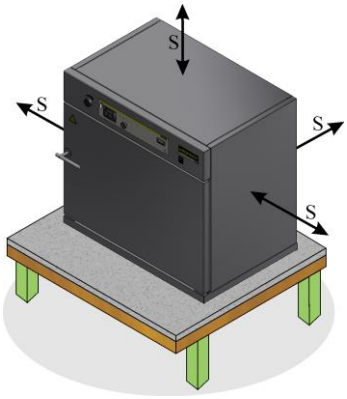


TR 1050

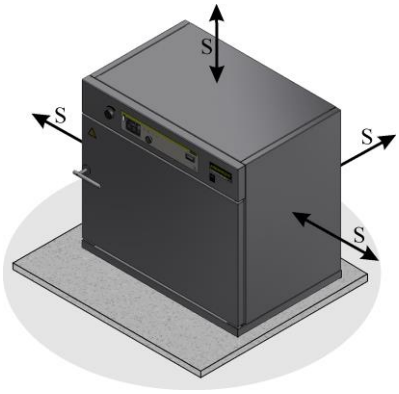
Fig. 11: Setting up (similar to picture)

Despite good insulation, the outer surfaces of the furnace radiate heat. If necessary, this heat must be vented (the assistance of a ventilation expert may be necessary). Besides, an all-around minimum safety clearance (S) of 0.5 m and, in the rear, 1 m, from any combustible materials must observed. In some cases the distance must be greater in response to specific local conditions. The side minimum clearance from non-combustible materials can be as low as 0.2 m.

If the 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.



TR 60 – TR 240 table-top models



TR 450 – TR 1050 floor models

Fig. 12: Example: Setting up (similar to picture)

Caution

Permissible ambient temperatures during operations are +18 °C to +40 °C. When room temperatures are high temperature fluctuations may result.

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.

Note

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

DANGER

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

4.4.2 Ovens May Be Stacked

Fig. 13: Example: Drying ovens up to TR 240 can be stacked (similar to picture)

Two ovens up to series TR 240 may be stacked. Use anti-slip rubber padding beneath all the feet on the top oven.

	***CAUTION***
	• **Top furnace may slip or topple over.** • **Damage to the furnace.** • If stacking furnaces, use anti-slip rubber padding beneath all four feet of the top furnace.

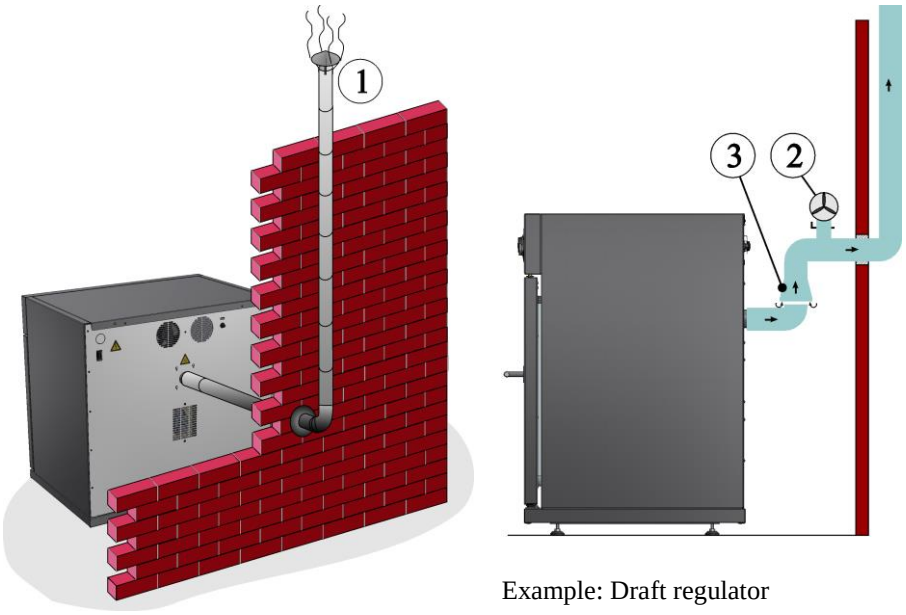
4.5 Assembly, Installation, and Connection

4.5.1 Venting Exhaust Fumes

We recommend that you connect a pipe to the oven to remove the exhaust gases.

A conventional metal exhaust pipe NW50 to NW80 and a maximum length of 5 meters is suitable. It must be attached facing upwards and be fixed to the wall or ceiling.

If larger exhaust pipes or piping with waste gas fans are used, install a draft regulator. Assume a maximum exhaust gas temperature of approx. 300 °C for the piping system.



Example: Draft regulator

1 Exhaust pipe / **2** Exhaust fan / **3** Draft regulator

Fig. 14: Example: Installing an exhaust pipe (figure similaire)

Note

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

Note

The customer is responsible for the masonry and roofing work necessary for venting the exhaust gases. The size and design of the exhaust system must be defined by a ventilation engineer. The accident prevention regulations applicable in the country where the oven is installed must be followed.

4.5.2 Connecting the Furnace to the Power Supply

On the building side, the required services must be provided, i.e. the carrying capacity of the installation surface, provision of power (electricity), etc.

- The furnace must be installed in accordance with its intended use. The power connection values must correspond to the values on the furnace type plate.
- The power socket must be located close to the furnace and must be easily accessible. The safety requirements are not met if the furnace is not connected to a socket with grounding contact.
- On use of an extension cable or a multipoint socket, the maximum electrical rating must not be exceeded. Do not use the furnace with an extension cable if you are uncertain whether grounding is guaranteed.
- The power cable must not be damaged. Do not place any objects on the power cable. Route the cable so that nobody can tread on or stumble over it.
- A damaged power cable must be replaced immediately.
- Ensure that the furnace's connection cable is routed so that it is protected.

- The connection cable must not be installed on the exhaust air duct as high temperatures can be expected here (see “Venting Exhaust Fumes”).

Note

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

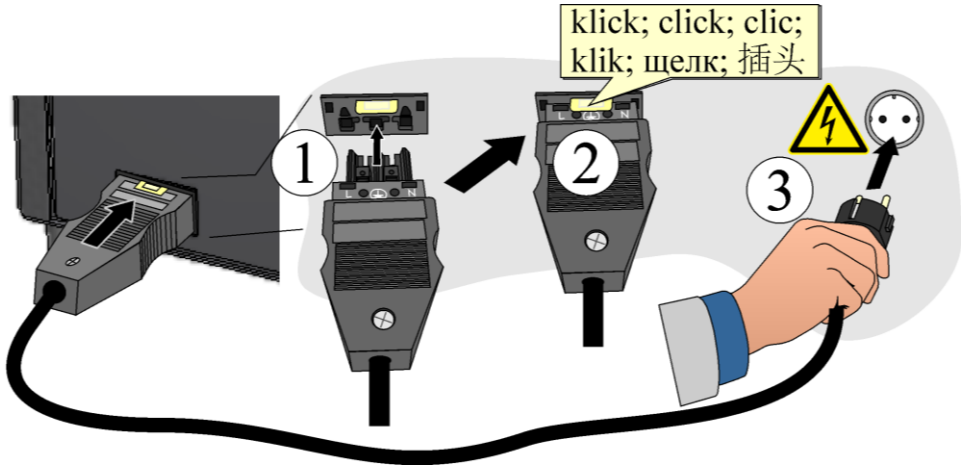


Fig. 15: Furnace up to 3600 kW (the power cable is supplied) (similar to picture)

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

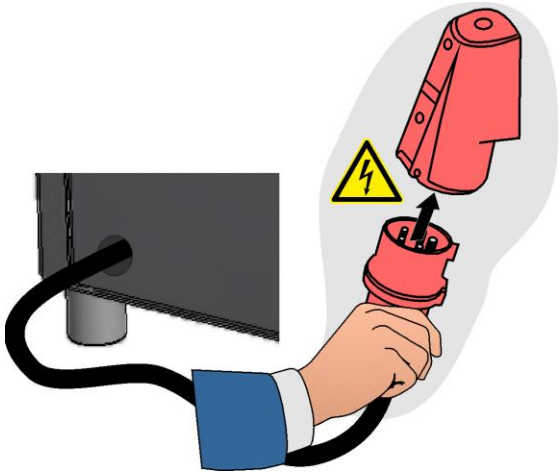


Fig. 16: Furnace from 3.600 W (CEE plug) (similar to picture)

1. Connect the power cable to the power supply. Use only a grounded socket.

Check the ground resistance (acc. to VDE 0100); see also accident prevention regulations. Electrical systems and equipment according to DGUV V3.

Note
The national regulations of the respective country of operation apply.

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

CAUTION

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

DANGER

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

4.6 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

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

4.7 Recommendations for Heating Up the Furnace for the First Time

The oven should be heated to **100°C below max. temperature** in approx. **2 hours**. Hold this temperature for about 1 hour. This process should be carried out during commissioning and after heating elements have been replaced. While the oven is heating up, you may notice a smell; this is due to binder being emitted from the insulation material. It is advisable to ventilate the room in which the oven is located well during the first heating phase.

5 Operation

5.1 Controller

B410/C450/P480

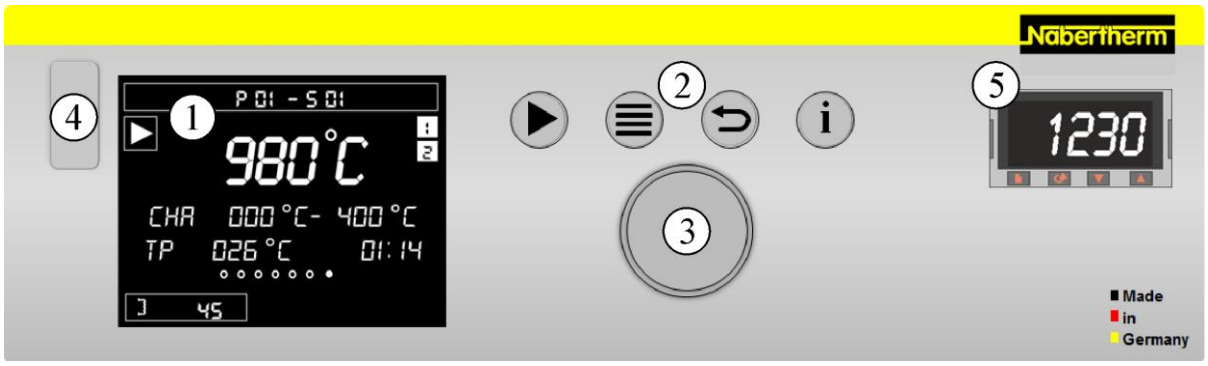


Fig. 17: Control field B410/C450/P480 (similar to picture)

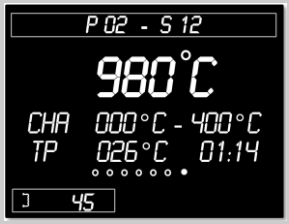
No.	Description
1	Display
2	Control keys for "Start/Hold/Stop", "Menu" selection, "Back" function and information menu selection
3	Jog dial
4	USB interface for a USB stick
5	Over-temperature limiter with manual reset (optional)

Note

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

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

6.1 Turning on the Controller/Furnace

Switching on the Controller		
Steps	**Display**	**Comments**
Turn on the power switch		Turn on the power switch by setting it to "**I**" (power switch type differs depending on features/furnace model)
The overview screen appears. After a couple of seconds, the temperature is displayed.		If the temperature is displayed at the controller, the controller is ready to operate.

6.2 Turning off the Controller/Furnace

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

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

▶ **Note**
See additional operating instructions for description and function

6.3 Operating Controller R7

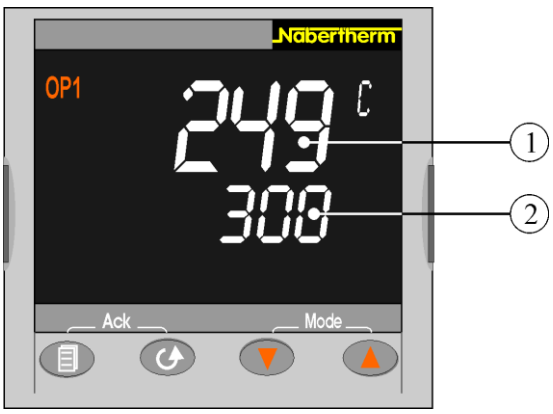


Fig. 18: Controller R7 (similar to picture)

Two temperatures are shown in the display.

At the top is the actual value (1). **249 °C**

Beneath this is the specified target temperature (2). **300**

Setting the Setpoint:

Button	Description	Display
	From the main display: Use to increase or decrease the setpoint. The device applies the new setpoint as soon as the button is released. A brief flash indicates that the value is now current.	**300 °C** **249 °C**
Note	When delivered, this controller is set as a fixed setpoint controller. But for several processes it is important that the temperature is raised slowly for the first firing. A ramp function can be set on Controller R 7 for this purpose.	

Setting a Temperature Ramp:

Button	Description	Display
	Press until "**SP.RAT**" appears in the display.	**OFF** **SP.RAT**
	Use to set the required heating ramp in °C/min (Example 2 °C/min) Increase the value with (OFF … 1,9; 2) Decrease the value with (2 … 0,1; OFF) Wait 2 seconds until the setting is applied automatically (display flashes 1x).	**2** **OFF** **SP.RAT**
	Press to go to the main display.	**249 °C** **300**
	Use to change a setpoint to the required value. The set rate is used only when the setpoint has been changed. The rate can be used for heating or cooling. The starting temperature of the rate is always the actual temperature. If the target temperature is set below the actual temperature, it is a cooling rate. When a rate has started, "**RUN**" is shown in the display. Increase the value with Decrease the value with	**249 °C** **300** **RUN**
Note	If the ramp mode is no longer needed, set the parameter "**SP.RAT**" to **OFF** again.	

Automatic Adjustment of the Control Parameters to the Process Characteristic:

Button	Description	Display
	Press for >5 seconds until "**Lev1**" appears in the display.	**LEv1** **GOTO**
	Press 1x until "**LEv2**" appears in the display and wait for 2 seconds - the display changes to "**0**"	**LEv2** **0**
	Press 2x until code "**2**" is displayed and wait 2 seconds. (The display returns to the main display)	**2** **550 °C**
	Press until "**A.TUNE**" appears in the display.	**OFF** **A.TUNE**

Button	Description	Display
	Use to set OFF or ON. Change with (ON) Change with (OFF) Wait 2 seconds until the setting is applied automatically (display flashes 1x).	**ON** **OFF** **A.TUNE**
	Press until you return to the main display.	**249 °C** **300**
	Use to set the required temperature in °C (Example 100 °C). (During optimization, TUNE flashes in the display). When optimization is finished, the determined control parameters are applied automatically.	**100 °C** **0 °C**
	Press for >5 seconds until "**Lev2**" appears in the display.	**LEv2** **GOTO**
	Press 1x until "**LEv1**" appears in the display and wait 2 seconds. Input finished.	

Manual Adjustment of the Control Parameters to the Process Characteristic:

Button	Description	Display
	Press for >5 seconds until "**Lev1**" appears in the display.	**LEv1** **GOTO**
	Press 1x until "**LEv2**" appears in the display and wait for 2 seconds - the display changes to "**0**"	**LEv2** **0**
	Press 2x until code "**2**" is displayed and wait 2 seconds. (The display returns to the main display)	**2** **550 °C**
	Press until "**PB**", "**TI**", "**TD**" appear in the display PB: Proportional Band TI: Integral Time TD: Differential Time	**5** **PB**
	Set the required parameters with (Example 10) Increase the value with (OFF/1 … 9; 10) Decrease the value with (10… 2; 1/OFF) Wait 2 seconds until the setting is applied automatically (display flashes 1x).	**10** **5** **PB**

Caution

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

Note

We recommend that you do not switch off the furnace as soon as the program has ended but to wait until it naturally cools down in forced-air circulation.

6.4 Operation of Over-Temperature Limiter

The over-temperature limiter monitors the temperature in the oven chamber and protects the oven. Over-temperature limiters separate the heating element from the power supply as soon as the temperature in the oven chamber exceeds the maximum oven temperature by approx. 10 %. After the oven has cooled naturally to its operating temperature, the over-temperature limiter (located on the back of the oven) can be reset, which reconnects the heating element to the power supply.

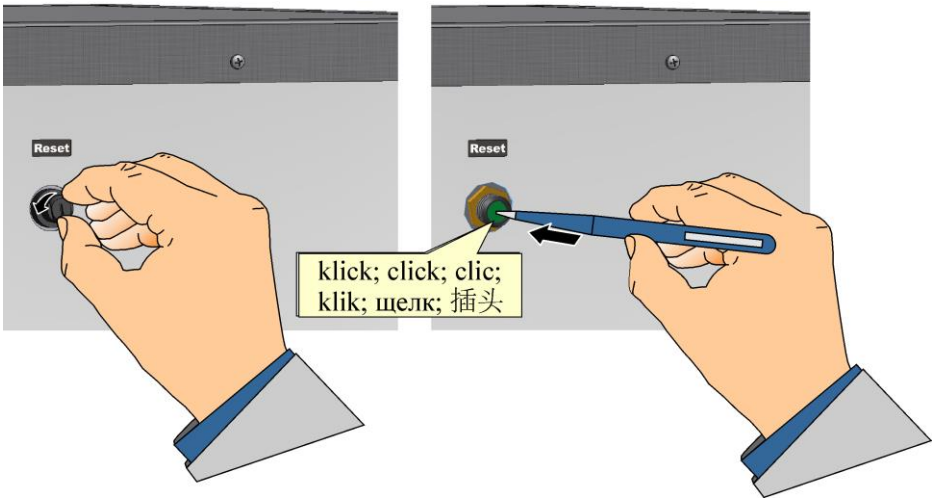


Fig. 19: Over-temperature limiter (similar to picture)

- The over-temperature limiter is located on the back side of the oven and has a corresponding sticker Reset.
- Before resetting, remove the cap by hand or with a flat blade screwdriver.
- Activate the green reset button with a suitable tool (e.g. a ballpoint pen).

The over-temperature limiter is generally triggered by a malfunction in the oven. This malfunction must be rectified before the reset button is activated. It is recommended that you contact the Nabertherm Service Department (see "Nabertherm Service").

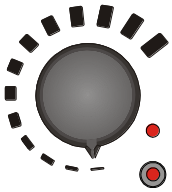
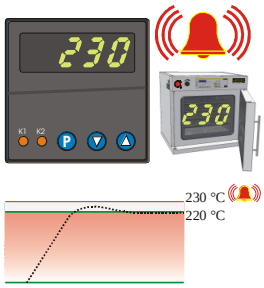
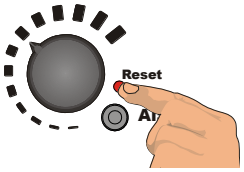
You cannot see whether the over-temperature limiter has been triggered. You notice it audibly with a "click" when the green reset button is pressed.

Note

The over-temperature limiter does not apply if you choose the mechanical over-temperature limiter with manual reset.

6.5 Over-temperature Limiter with Manual Reset

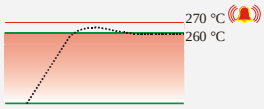
6.5.1 Mechanical Over-Temperature Limiter with Manual Reset

Figure	Description
	The over-temperature limiter with manual reset monitors the temperature in the oven chamber. If the temperature in the oven chamber exceeds the trigger temperature, the heating is switched off to protect the oven and the load. This can be seen on the over-temperature limiter when an "Alarm" lamp illuminates. **Adjust the trigger temperature:**
	Switch on the oven (see "Operating the Controller"). Turn the temperature selection knob to the right as far as it goes.
	**Example:** The temperature in the oven chamber is to be **220°C**. The trigger temperature for the over-temperature limiter (alarm value) to protect the oven or the load should be **230°C**. Enter the required trigger temperature of **230°C** on the controller. Switch on the heating. (see "Operating the Controller"). **Note:** Premature triggering of the over-temperature limiter can be avoided if the difference between the temperature in the oven chamber and the trigger temperature is not below 10°C.
	When the required trigger temperature of **230°C** is reached, hold this for at least 30 minutes (dwell time).
	After the dwell time, turn the knob on the over-temperature limiter very slowly to the left until the lamp Alarm on the over-temperature limiter illuminates. The trigger temperature (alarm value) of **230°C** is now set on the over-temperature limiter and the heating is switched off to protect the oven or the load.
	Enter the oven chamber temperature (**220°C**) on the controller (reset the trigger temperature to the temperature in the oven chamber).
	Wait until the oven has cooled naturally to room temperature. For further operation you must press the Reset button to release the heating. When you have pressed the Reset button, the Alarm lamp extinguishes.
	Entry finished.

The operator must ensure that the trigger temperature (alarm value) on the over-temperature limiter CANNOT be adjusted. Adjusting the trigger temperature can damage the oven or the load. Nabertherm does not accept liability for lost profits, interruption to operations, or damage to the oven or the load.

6.5.2 Electrical Over-Temperature Limiter with Manual Reset

Fig. 20: Over-temperature limiter with manual reset 2132i (similar to picture)

Key	Description	Display
	The over-temperature limiter with manual reset monitors the temperature in the furnace chamber. The display shows the last trigger temperature that was set. If the temperature in the furnace chamber exceeds the set trigger temperature, the heating is switched off to protect the furnace and the load. "FSH" alarm flashes on the over-temperature limiter.	**260 °C** **FSH**
	When the temperature in the furnace chamber **falls below the value set on the over-temperature limiter** , the following buttons have to be pressed to release the heating so that the furnace can continue to operate:	
	Release heating:	
[▯] [↺]	Press [▯] and [↺] simultaneously. The alarm on the over-temperature limiter is reset and this releases the heating.	
	Adjust the trigger temperature:	
[▼] [▲]	Set the required trigger temperature with the [▼] [▲] button (Example 270 °C) Increase the value with [▲] (260 … 269, 270) Reduce the value with [▼] (270 … 261, 260) To change the value quickly: hold the [▼] [▲] button depressed for longer. Wait 2 seconds until the new trigger temperature is integrated automatically (display flashes 1x).  **Note:** Premature triggering of the over-temperature limiter can be avoided if the difference between the adjustable temperature in the furnace chamber and the trigger temperature is not below 10 °C.	**270** **260**
	The display jumps back to the start screen showing the trigger temperature. The current trigger temperature is displayed.	**270 °C**
	Entry finished.	
	For more information about operation, see the separate instructions for the Eurotherm 2132i	

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

6.6 Controlling the Exhaust Air

Series TR … ovens have an infinitely adjustable butterfly valve on the rear of the oven. The exhaust air can be controlled by a knob on the front side of the oven This is used to conduct process-related exhaust gases out of the oven via this valve.

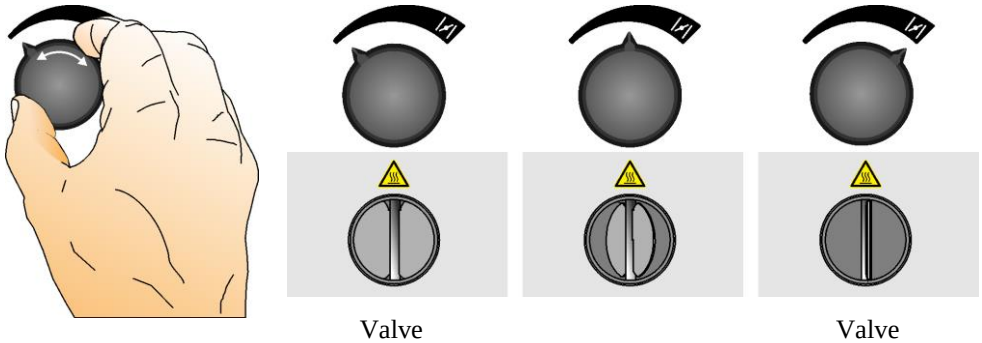


Fig. 21: Infinite adjustment of the exhaust air (similar to picture)

Note

Operating the oven with the valve open can change the temperature conditions in the oven chamber. If the batch is sensitive to temperature fluctuations, it may be advisable to run a test for temperature uniformity to optimize the process.

6.7 Controlling the Air Circulation (Accessory)

A manual, infinitely adjustable speed control for the air circulation motor is available as an accessory for ovens in the TR … series. The speed of the air circulation motor can be controlled by a knob on the front side of the oven This is used to optimize air circulation for the specific process.

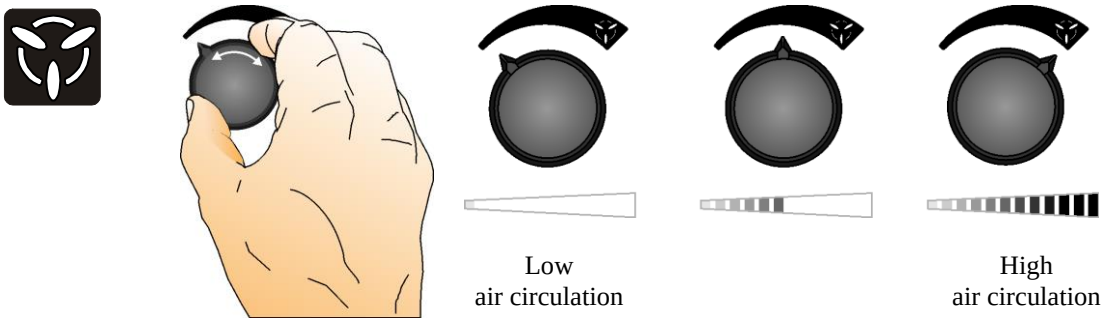
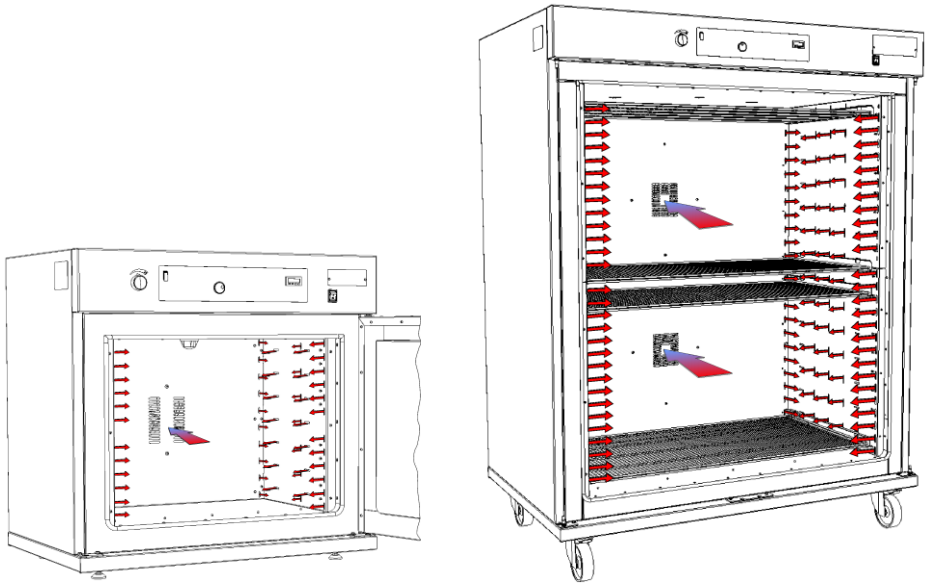


Fig. 22: Infinite adjustment of the air circulation (similar to picture)



TR 60 – TR 240 TR 450 - 1050

Fig. 23: Principle of air flow (similar to picture)

Note

Operating the oven with adjustable air circulation can change the temperature conditions in the oven chamber. If the batch is sensitive to temperature fluctuations, it may be advisable to run a test for temperature uniformity to optimize the process.

6.8 Adjusting the Baffles

The individual baffles (located inside the furnace system) are set or positioned at the factory (empty useful space) to optimize the temperature uniformity. Temperature uniformity is influence by a large number of factors including the material used, size, quantity, and position of the charge.

Depending on the process and the charge, the baffles can be re-positioned to provide optimum temperature uniformity. We recommend that you document the baffle positions set at the factory for your furnace model (such as noting the step setting of the baffles).

In order to adjust the individual baffles the screws on the baffles must be loosened a little with the help of a suitable screwdriver. Number, position and quantity of baffles may differ from one furnace model to another. The baffles can now be re-adjusted for optimum temperature uniformity. Inspect carefully both the baffles and the insulation for possible

signs of damage. Your supervisor or Nabertherm Service must be informed immediately of any damages.

Loosen the screws (1) wires to adjust the baffles

Fig. 24: Adjusting the individual baffles (similar to picture)

6.9 Opening and Closing the Door

Furnace door bolted Furnace door unbolted (door can be opened)

Fig. 25: Bolting/unbolting the furnace door (similar to picture)

Opening the Door

The swinging door can be easily opened by pulling. We recommend opening the swinging door completely to enable easier charging.

Closing the Door

Close the furnace door carefully (do not slam). Slamming the swinging door shut may result in harmful shocks. Fragile material must be treated carefully.

Before the first start-up, when you close or lock the door, make sure that the furnace door is uniformly closed all around the edge (the seal of the furnace door is pressed against the furnace collar when it is locked. Make sure that the furnace door opens and closes easily (the door must not be forced shut).

When the furnace door is not correctly closed result is increased wear of the heating eleents and a high degree of discoloring of the furnace housing. If the furnace chamber temperature is not reached (due to an incorrectly closed door) no liability shall be accepted in case of damage to the furnace or the charge.

6.10 Adjusting the Removable Grids

The removable grids can be inserted at various heights. Several removable grids allow charging on several levels (see "Accessories and Spare Parts").

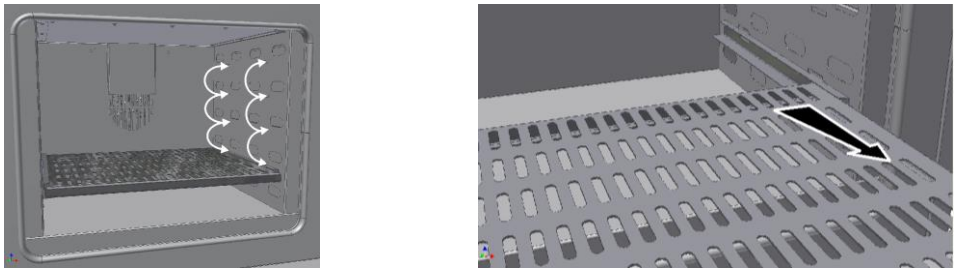


Fig. 26: Pull the removable grids out of the rails and place on a soft clean surface (similar to picture)

Fig. 27: Tilt the removable rails upwards and pull them out of the side walls (similar to picture)

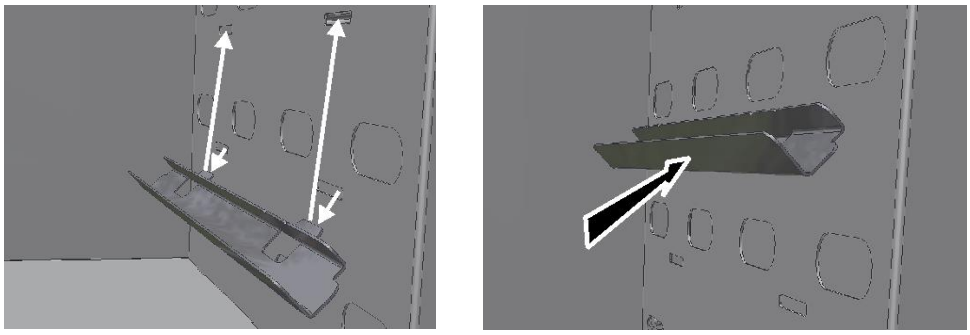


Fig. 28: Push the rails into the rectangular holes at an angle (similar to picture)

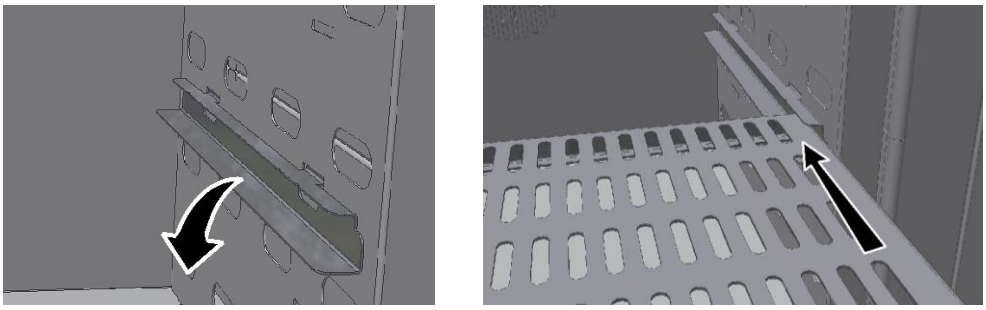


Fig. 29: Fold the rail down and slide the grids that you removed previously on again carefully as far as it goes (similar to picture)

7 Servicing, Cleaning, and Maintenance

Risks during Normal Operation!

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

Warning - Danger of Electric Shock!

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

During maintenance work, the oven and/or switchgear must be disconnected from the power supply and safeguards must be taken to ensure that they cannot be switched on again inadvertently. For safety reasons, pull out the power plug.

Operators may only rectify malfunction that are obviously due to operating errors.

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

Check the oven for obvious damage regularly. Also, clean the inside of the oven as required (e.g. with a vacuum cleaner).

While work is being carried out on the oven, the oven and the room in which it is installed should be ventilated with fresh air.

Protective equipment that was removed during maintenance work must be replaced when the work is finished.

Warning about suspended loads at the workplace (e.g. cranes). Working beneath a suspended load (e.g. the oven or switchgear) is prohibited.

Safety switches and limit switches must be checked regularly (BGV A3) or according to the corresponding national regulations in the country where the oven is installed.

To ensure perfect temperature control of the oven, the thermocouple should be checked for damage before every process.

Tighten the element holder screws (see "Replacing the Heating Element") if necessary. Before doing this, disconnect the oven and/or the switchgear from the power supply (pull out the power plug). Observe BGV A3 or the corresponding national regulations in the country where the oven is installed.

Caution – Danger of Falling

Ignoring this can lead to fatal injury. Danger of falling exists at a height less than 1.00 m above the ground or another sufficiently broad bearing surface (for example, on elevated operating positions and workplaces, working platforms, galleries, platforms, footbridges, flying bridges, ramps and stairways).

Openings and recesses through which people can fall (for example in floors, platforms, installation openings, hatchways and pits, non-bearing roofs).

7.1 Furnace Insulation

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

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

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

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

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

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

Smoking, eating and drinking at the workplace is prohibited.

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

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

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

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

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

Risks during Normal Operation!
Cleaning, lubrication, and maintenance work must be performed by authorized personnel following the maintenance instructions and the accident prevention regulations. We recommend that maintenance and repair work is carried out by the service team of Nabertherm GmbH. Non-compliance may cause injuries, death, or considerable damage to property.

Wait until the Furnace and the Connected Parts have Cooled to Room Temperature.

- The furnace must be completely empty.
- Inform operating personnel, name a supervisor.
- Switch off the main switch and pull out the power plug.
- Attach a warning sign to the furnace (example: Caution! Maintenance Work)
- Clear an adequate area around the furnace to facilitate the repair work.
- Make sure that the furnace is voltage free.
- Ground and short circuit the working area.
- Cover neighboring live parts.

Risks during Normal Operation!
Do not touch any objects without first checking how hot they are.

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

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

7.3 Regular Maintenance of the Furnace

Item/ Maintenance Point	Measure	Maintenance Interval					Operator	Expert
		Daily	Weekly	Monthly	Quarterly	Annually	Personnel	
Safety inspection in conformance with DGUV V3 or the corresponding national regulations	Compliant with regulation	Compliant with regulation						x
Air circulation motor	Function check. Maintenance acc. to manufacturer's instructions.	●					x	
Safety and limit switch (if applicable)	Function check				●			x
Oven chamber, vent holes and vent pipes	Clean and check for damage, vacuum out carefully			●			x	
Door seal	Visual inspection	●					x	
Door seal	Clean/replace		■				x	
Heating elements	Visual inspection			●				x
Incoming air filter (option)	Clean/replace							x
Check for uniform power consumption of the heating system	Function check					●		x
Thermocouple	Visual inspection of display				●		x	
Check set value	Check according to work schedules	●					x	
Settings of the over-temperature limit controller with manual reset	Whenever the heat treatment program is changed	●					x	
Door closes tightly	Visual inspection	●					x	
Symbols:	■ = clean	● = check, replace			x = Performed by			

Fig. 30: Maintenance table

Warning - Danger of Electric Shock!

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

Notice

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

Note

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

7.4 Operating and Auxiliary Materials

7.5 Cleaning Products

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

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

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

Component and position	Cleaning product
Outer surfaces	Normal cleaning product without acid or halogenides. Alcohol solutions.
Inside	Normal cleaning product without acid or halogenides. Alcohol solutions.
Removable grids	Normal cleaning product without acid or halogenides. Alcohol solutions.
Door seal	Normal cleaning product without acid or halogenides.
Instrument panel	Normal cleaning product without acid or halogenides.

Fig. 31: Suggested cleaning products

Clean quickly to protect the surfaces.
When you have finished cleaning, completely remove the cleaning product from the surfaces with a moist, lint-free cloth.
When you have finished cleaning, check all connections for leaks, check the door seal, check for loose connections, scuffed areas, and damage.
Read the section on "Environmental Protection Regulations"

Note

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

7.6 Cleaning Inside the Oven

Warning – Danger of Electric Shock

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

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

Warning – General Hazards!

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

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.

Undo the screws on the rear of the oven with a suitable tool and keep them in a safe place for future use.

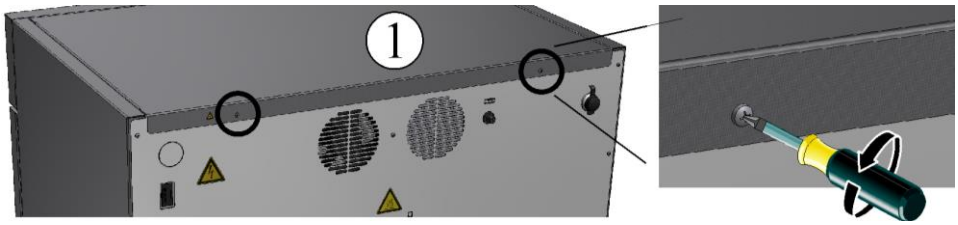


Fig. 32: Undoing the screws from the top (similar to picture)

Pull the top towards you until you feel it catching.

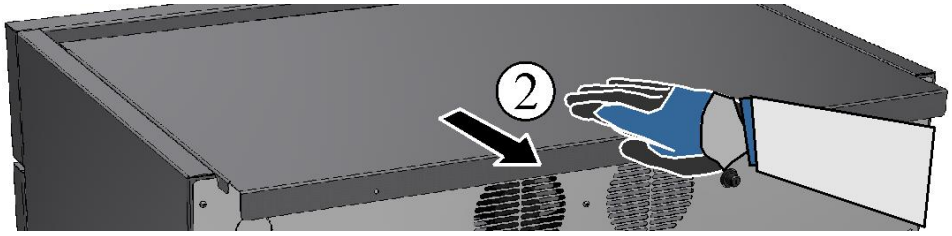


Fig. 33: Pulling the top (similar to picture)

Lift the top and place it beside the oven. Place some soft padding under the top to protect it.

If present, pay attention to the protective ground cable from the panel to the terminal; if necessary, dismantle the cable from the terminal.

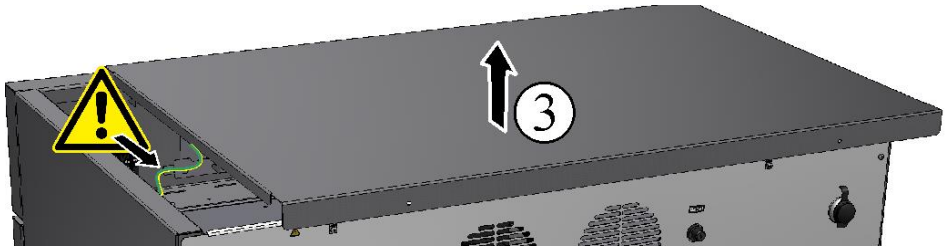


Fig. 34: Lifting and removing the top (similar to picture)

Completely empty the oven. Remove the grids and trays (see "Adjusting the Removable Grids").

Fig. 35: Completely empty the oven (similar to picture).

To remove the metal sheets on the side, the screws on the side walls must be completely unscrewed. This requires a 2.5 mm Allen key.

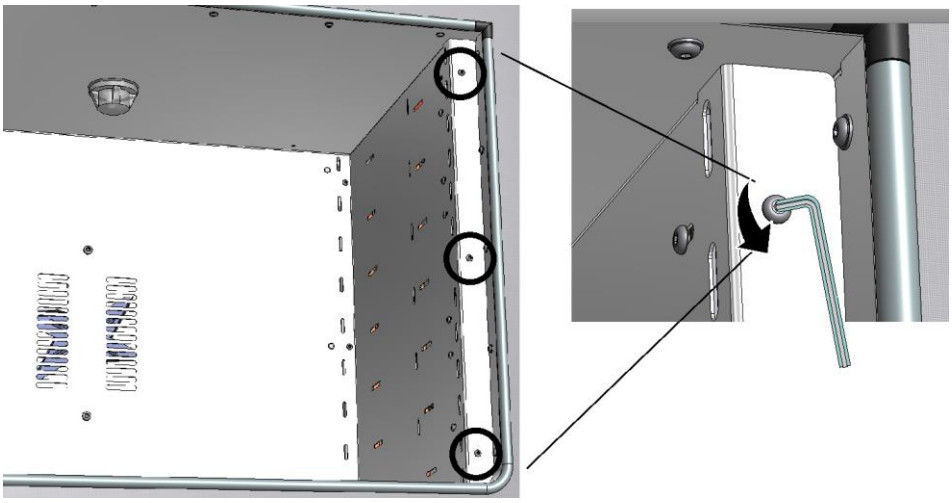


Fig. 36: Unscrewing the screws on the side walls (similar to picture)

Turn the side walls inwards. Carefully pull the side walls towards the front of the oven and remove them.

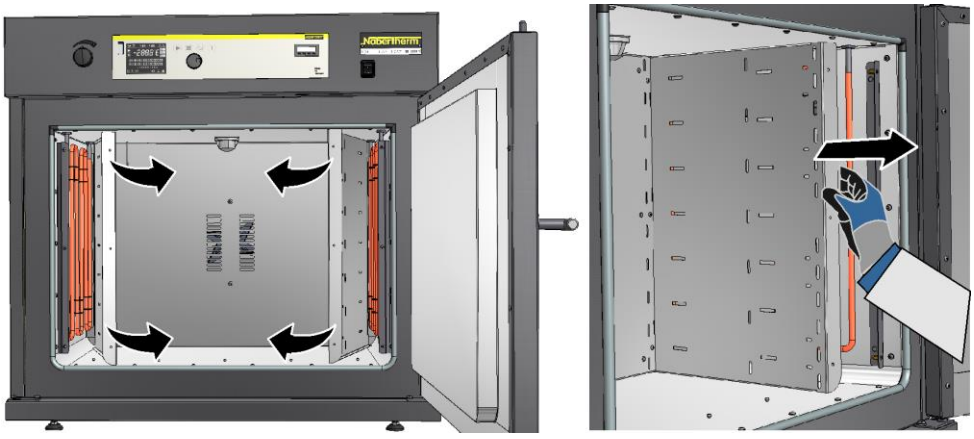


Fig. 37: Removing the side walls from the oven (similar to picture)

Undo the screws on the inside back wall with a suitable tool. The number and position of the screws may differ depending on the oven model. This requires a 4 mm Allen key. Keep the screws to reuse them later.

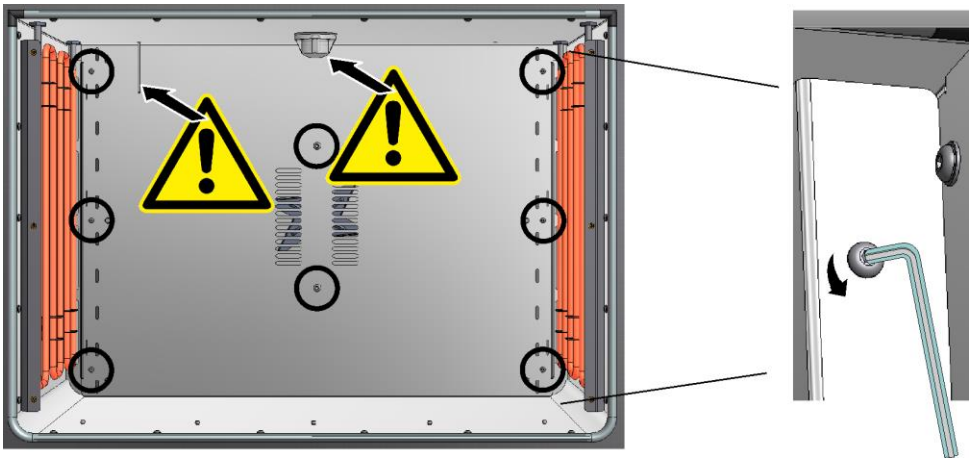


Fig. 38: Undoing the screws on the inside back wall (similar to picture)

To remove the back wall, the thermocouple must be dismantled (see “Replacing a Thermocouple”) and also the inside lighting if installed. Undo the glass shield and the lamp (if installed) by turning them in an anticlockwise direction and put them in a safe place.

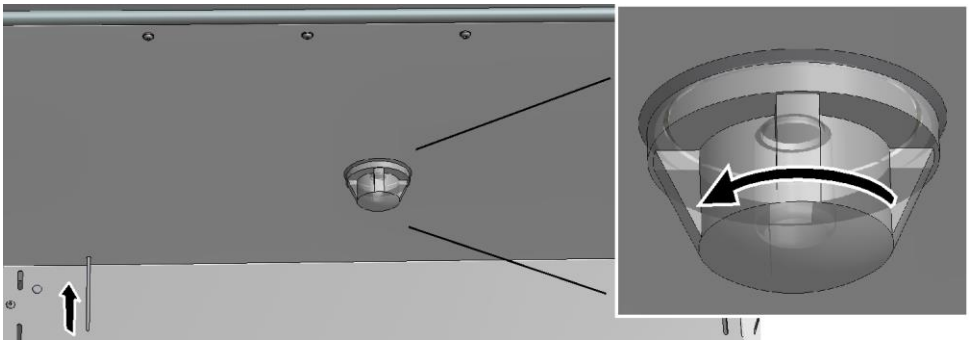


Fig. 39: Dismantling the thermocouple and inside lighting (similar to picture)

Carefully turn the back wall (1) while carefully removing it through the front of the oven (2).

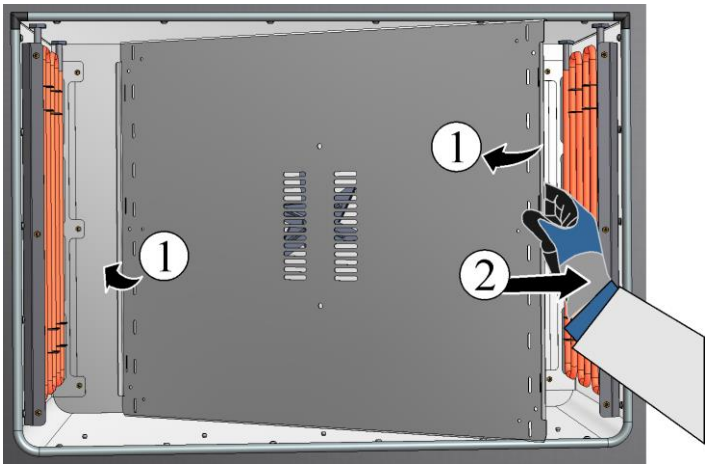


Fig. 40: Removing the back wall carefully (similar to picture)

Undo the hex nut (wrench size 13) from the fan wheel in a clockwise direction with suitable tools, holding the wheel with one hand.

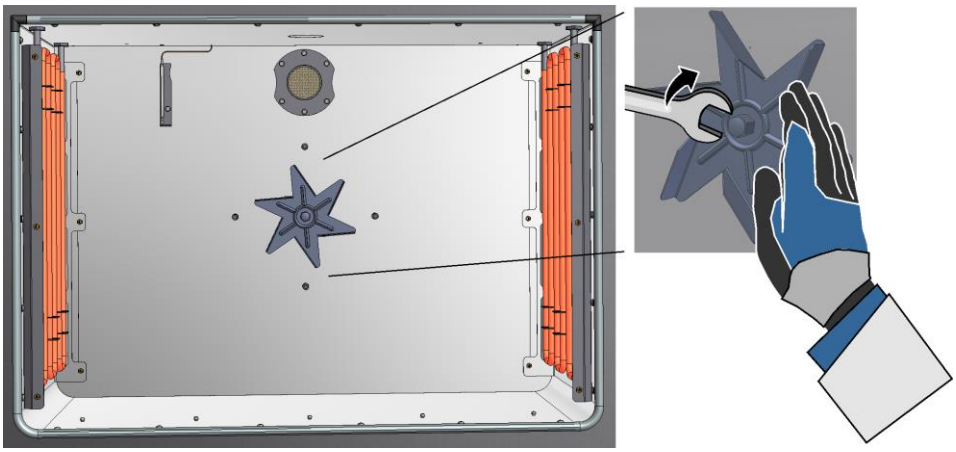


Fig. 41: Dismantling the fan wheel (similar to picture)

Thoroughly clean the inside of the oven and the dismantled parts. Do not pour water or cleaning product over the inside or outside surfaces. See "Cleaning Products".

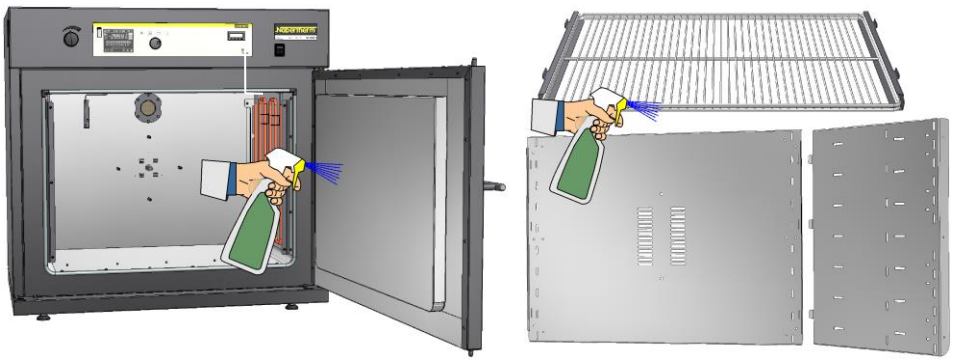


Fig. 42: Cleaning the inside of the oven and the components thoroughly (similar to picture)

Note

Assemble the loosened parts in the reverse sequence.

Note

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

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").

DANGER

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

8 Malfunctions

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

Call your local electrician for malfunctions that you cannot localize.

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

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

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

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

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

8.1 Error Messages of the Controller

ID+ Sub-ID	Text	Logic	Remedy
Communication error			
01-01	Bus zone	Communication connection to a control module disrupted	Check that the control module is firmly attached LEDs on the control modules red? Check the cable between the operating unit and the control module. Plug of the connection cable not plugged correctly into the operating unit.
01-02	Bus communication module	Communication connection to the communication module (Ethernet/USB) disrupted	Check that the communication module is firmly attached Check the cable between the operating unit and the communication module.
Sensor error			
02-01	TC open		Check thermocouple, thermocouple terminals and cable Check contacts of the thermocouple cable in plug X1 on the control module (contacts 1+2)
02-02	Outside TC measurement range		Check set thermocouple type Check poles of thermocouple connection
02-03	Compare point error		Control module defective
02-04	Compare point too hot		Temperature in the switchgear too high (approx. 70 °C) Control module defective
02-05	Compare point too cold		Temperature in the switchgear too low (approx. -10 °C)
02-06	Encoder separated	Error at the 4-20 mA input of the controller (<2 mA)	Check 4-20 mA sensor Check the connection cable to the sensor
02-07	Sensor element defective	PT100 or PT1000 sensor defective	Check PT sensor Check connection cable to the sensor (cable break/short circuit)
System error			

ID+ Sub-ID	Text	Logic	Remedy
03-01	System memory		Error after firmware updates[1)] Defective operating unit[1)]
03-02	ADC error	Communication between AD converter and controller disrupted	Replace control module[1)]
03-03	File system defective	Communication between display and memory chip disrupted	Replace operating unit
03-04	System monitoring	Program execution on the operating unit defective (Watchdog)	Replace operating unit USB flash drive removed too soon or defective Switch controller off and on again
03-05	Zone system monitoring	Program execution on a control module defective (Watchdog)	Replace control module[1)] Switch controller off and on[1)]
03-06	Self-test error		Contact Nabertherm Service[1)]
Monitoring			
04-01	No heating power	No temperature increase in the ramps when heating output <> 100 % for 12 minutes and when the temperature setpoint is higher than the current furnace temperature	Acknowledge the error (if necessary disconnect from the power supply) and check safety contactor, door switch, heating controls and controller. Lower D value of the control parameters.
04-02	Excess temperature	The temperature of the control zone exceeds the max. program setpoint or the maximum furnace temperature by 50 Kelvin (from 200 °C) The equation for the switch off threshold is: Maximum program setpoint + zone offset of the master zone + charge control offset [Max] (if charge control active) + excess temperature switch-off threshold (P0268, e.g. 50 K)	Check solid state relay Check thermocouple Check controller
		A program was started at a furnace temperature higher than the maximum setpoint in the program	Do not start the program until the furnace temperature is lower. If this is not possible, insert a hold time as a start segment and then a ramp with the desired temperature (STEP=0 minutes duration for both segments) Example: 700 °C -> 700 °C, Time: 00:00 700 °C -> 300 °C, Time: 00:00 The normal program begins here From Version 1.14, the actual temperature is considered at the start.

ID+ Sub-ID	Text	Logic	Remedy
04-03	Power failure	The set limit for restarting the furnace was exceeded	If possible, use an uninterruptible power supply
04-04	Alarm	A configured alarm was triggered	
04-05	Self optimization failed	The determined values are implausible	Do not carry out self optimization at the lower temperature range of the furnace working range
	Battery weak	Time is not shown correctly. A power failure may not have been handled properly	Export all parameters to a USB flash drive Replace the battery (see “Specifications”)

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

8.2 Warnings of the Controller

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

No.	Text	Logic	Remedy
00	Gradient monitoring	The limit value of the configured gradient monitoring was exceeded	For troubleshooting, refer to “Gradient Monitoring” Gradient set too low
01	No control parameters	No “P” value was entered for the PID parameters	Enter at least one “P” value in the control parameters. It must not be “0”
02	Charge thermocouple defective	No charge thermocouple was determined with the current program and activated charge control	Plug in a charge thermocouple Disable charge control in the program Check the charge thermocouple and its cable for damage
03	Cooling thermocouple defective	The cooling thermocouple is not plugged in or is defective	Plug in a cooling thermocouple Check the cooling thermocouple and its cable for damage If there is a malfunction in the cooling thermocouple during active controlled cooling, the system switches over to the thermocouple of the master zone.
04	Documentation thermocouple defective	Either no documentation thermocouple or a defective one was determined.	Plug in a documentation thermocouple Check the documentation thermocouple and its cable for damage
05	Power failure	A power failure was determined. There was no program interrupt	None

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

8.3 Malfunctions of the Switchgear

Error	Cause	Remedy
Controller does not light up	Controller is switched off	Switch the power switch to "**I**"
	No power available	Is the power cord plugged into the socket? Check the building fuses. Check the fuse of the controller (if present) and replace it if necessary.
	Check the fuse of the controller (if present) and replace it if necessary.	Switch the power switch on. If the error occurs again, contact Nabertherm Service
Controller displays error	See the separate instructions of the controller	See the separate instructions of the controller
Furnace does not heat	Door / cover is open	Close the door / cover
	The door contact switch is faulty (if present)	Check the door contact switch
	The "wait" or clock icon (product line 400 controllers) lights up	The program is waiting for the programmed start time. Set the wait time to 00:00 or disable it
	Error in entering the program	Check the heating program (see the separate instructions of the controller)
	Heating element defective	Have this checked by Nabertherm Service or a qualified electrician.
Very slow heating of the heating space	The fuse(s) of the connection is/are defective.	Check the fuse(s) of the connection and replace if necessary. Notify Nabertherm service if the new fuse fails again immediately.
The program does not jump to the next segment	In one TIME segment in the program input, the wait time is set to INFINITE (product line 400 controllers). If charge control is activated, the temperature of the charge is higher than the zone temperatures.	Do not set the wait time to INFINITE
	If charge control is activated, the temperature of the charge is higher than the zone temperatures.	The parameter [LOWER BLOCK] must be set to [NO].
The controller module can not be registered on the operating unit	Addressing error (product line 400 controllers)	Perform a bus reset
The controller is not heating in the optimization	No optimization temperature has been set	The temperature to be optimized must be entered (see the separate instructions of the controller)

The temperature rises faster than the controller setting allows	The switch element of the heating unit (semiconductor relay, thyristor or switch contactor) is defective. Individual defective components inside a furnace cannot be completely ruled out in advance. That is why the controllers and the switchgear units must be equipped with safety facilities. For example, the furnace shuts down the heating unit in response to error message 04 - 02 via an independent contact element.	Have the switch element tested by a qualified electrician and replaced as necessary.
The selected end temperature was not reached.	Extraction system	Reduce air flow of the extraction system (valve)  Reduce exhaust air with the knob on the front of the oven.

8.4 Controller Check List

Customer:	
Furnace model:	
Controller model:	
Controller version (see information menu ⓘ):	
Controller serial number	
Furnace serial number	
Error code in the display:	
The following errors are dependent on external influences:	02-05 Ambient temperature too low: < -10 °C (14 °F) 02-04 Ambient temperature too high: > 70 °C (158 °F)
Detailed error description:	
Export of the service information:	Please export all the data to a USB stick using the function [EXPORT COMPLETELY] Generate a zip file using the ZIP function integrated in Windows (compression) of the exported folder (see the section "Importing and Exporting Data and Parameters") and send them to your contact at Nabertherm Service.
When does this error occur?	At specific point in the program or at certain times of day:

	At specific temperatures:		
How long has the error existed?	☐ Error is new		
	☐ Error has existed for a long time		
	☐ Unknown		
Error frequency	☐ Error occurs frequently		
	☐ Error occurs regularly		
	☐ Error occurs rarely		
	☐ Unknown		
Substitute controller:	Has a substitute controller already been used?	☐ yes	☐ no
	Did the error continue with the substitute controller?	☐ yes	☐ no
	Checked according to the error search list (see the furnace operating instructions)	☐ yes	☐ no

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

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

Close door/lid and start the example program

Please check the following items:

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

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

Date: _____ **Name:** _____ **Signature:** _____

9 Spare Parts/Wearing Parts

Ordering Spare Parts:

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

Availability of Spare Parts and Wearing Parts:

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

Note

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

Note

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

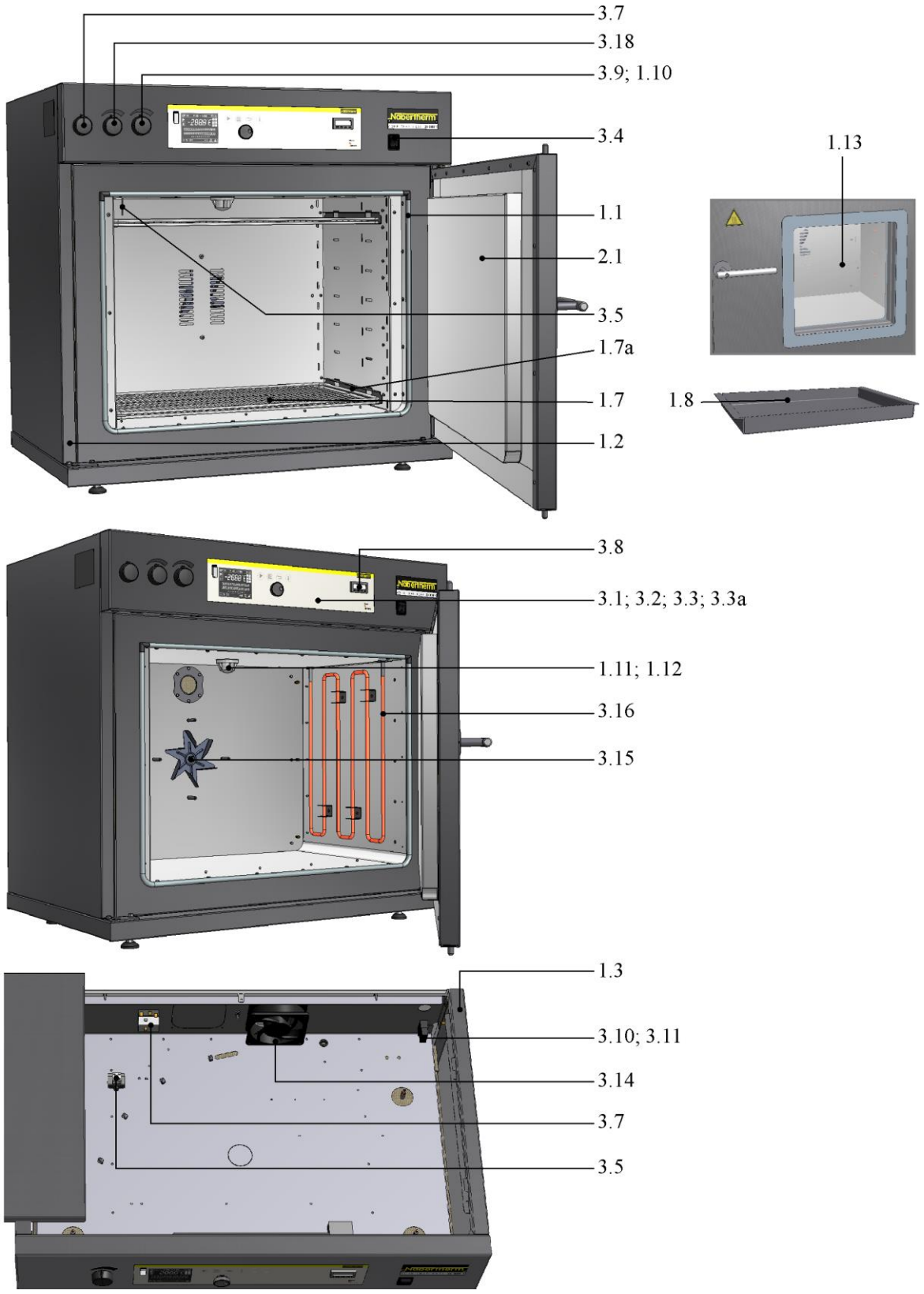


Fig. 43: Spare/wearing parts (similar to picture)

Model	TR 60	TR 120	TR 240	TR 450	TR 1050
No. Name	Part number ▶	Part number ▶	Part number ▶	Part number ▶	Part number ▶

Model		TR 60		TR 120		TR 240		TR 450		TR 1050	
1	**Housing**										
1.1	Door seal	601405663	●	601405664	●	601405665	●	601405733	●	601405767	●
	Viton door seal	1)	●	1)	●	1)	●	1)	●	1)	●
1.2	Left side wall	601405623	●	601405625	●	601405627	●	601405726	●	601405746	●
1.3	Right side wall	601405624	●	601405626	●	601405628	●	601405727	●	601405747	●
1.7	Removable grids	691404375	●	691404376	●	691404377	●	691404377	●	691404378	●
1.7a	Removable rail	621495008	●	621495008	●	621495009	●	621495009	●	621495217	●
1.8	Collecting pan	621495505	●	621495506	●	621495507	●	621495507	●	621495508	●
1.9	Butterfly valve, complete	601404285	❍	601404305	❍	601404267	❍	601404267	❍	601404410	❍
1.10	Butterfly valve knob	691404251	●	691404251	●	691404251	●	691404251	●	691404251	●
1.11	Inside lighting	541600096	❍	541600096	❍	541600096	❍	541600096	❍	541600096	❍
1.12	Bulbs for inside lighting	1)	●	1)	●	1)	●	1)	●	1)	●
1.13	Pane	691400813	●	691400813	●	691400813	●	691400530	●	691400653	●
2	**Door**										
2.1	Door, complete	601405590	●	601405593	●	601405596	●	601405728	●	601405757 (left)	●
										601405758 (right)	●
3	**Electrical/controllers**										
3.1	Controller B410	801000091	❍	801000091	❍	801000091	❍	801000091	❍	801000091	❍
3.2	Controller C450	801000096	❍	801000096	❍	801000096	❍	801000096	❍	801000096	❍
3.3	Controller P480	801000097	❍	801000097	❍	801000097	❍	801000097	❍	801000097	❍
3.3a	Controller R 7	540200719	❍	540200719	❍	540200719	❍	540200719	❍	540200719	❍
3.4	Rocker switch	541800259	❍	541800259	❍	541800259	❍	541800259	❍	541800259	❍
3.5	Type K thermocouple	540300061	❍	540300061	❍	540300061	❍	540300061	❍	540300061	❍
3.7	Mechanical over-temperature limiter with manual reset	601404361	❍	601404361	❍	601404361	❍	601404361	❍	601404361	❍
3.8	Electrical over-temperature limiter with manual reset	540200566	❍	540200566	❍	540200566	❍	540200566	❍	540200566	❍
3.10	Power cable (state country where it will be used)	V0013xx	●	V0013xx	●	V0013xx	●	1)	●	1)	●
3.11	Euro power plug	540900258	❍	540900258	❍	540900258	❍	-	❍	-	❍
3.14	Switchgear fan	522800031	❍	522800031	❍	522800031	❍	522800031	❍	522800031	❍
3.15	Circulation motor	542400473	❍	542400473	❍	542400473	❍	542400473	❍	542400178	❍
3.16	Pipe heating elements	692270489	❍	692270479	❍	692270491	❍	692270494	❍	692270497	❍
3.18	Adjustable fan speed	635001457	❍	635001457	❍	635001457	❍	635001457	❍	635001458	❍
1) on request											

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

9.1 Replacing a Heating Element

Warning – Danger of Electric Shock

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

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

Warning – General Hazards!

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

Caution – Damage to Components!

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

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.

Undo the screws on the rear of the oven with a suitable tool and keep them in a safe place for future use.

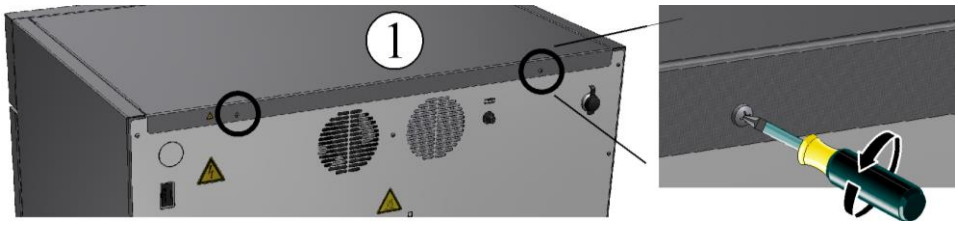


Fig. 44: Undoing the screws from the top (similar to picture)

Pull the top towards you until you feel it catching.

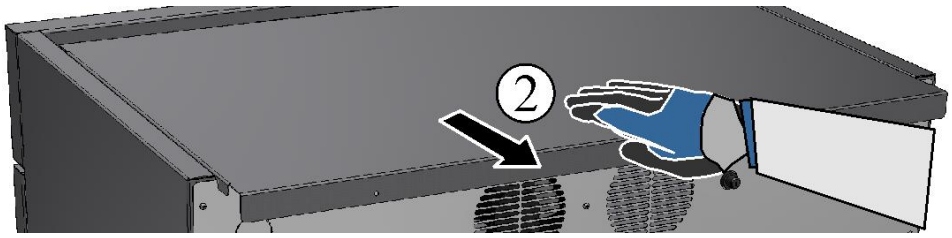


Fig. 45: Pulling the top (similar to picture)

Lift the top and place it beside the oven. Place some soft padding under the top to protect it.

If present, pay attention to the protective ground cable from the panel to the terminal; if necessary, dismantle the cable from the terminal.

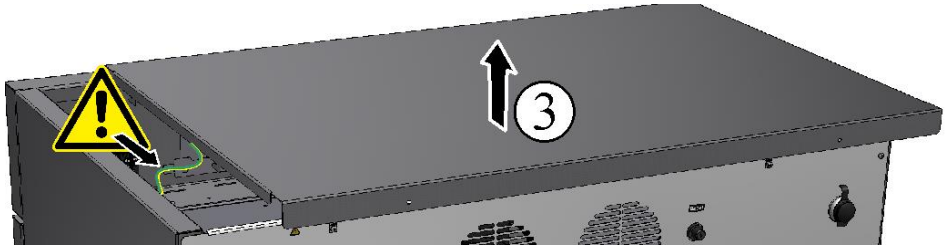


Fig. 46: Lifting and removing the top (similar to picture)

Completely empty the oven. Remove the grids and trays (see "Adjusting the Removable Grids").

Fig. 47: Completely empty the oven (similar to picture).

To remove the metal sheets on the side, the screws on the side walls must be completely unscrewed. This requires a 2.5 mm Allen key.

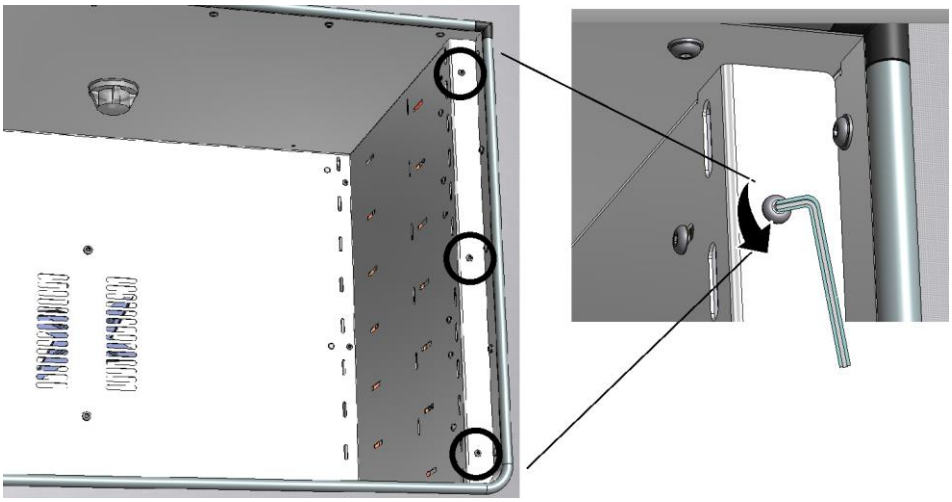


Fig. 48: Unscrewing the screws on the side walls (similar to picture)

Turn the side walls inwards. Carefully pull the side walls towards the front of the oven and remove them.

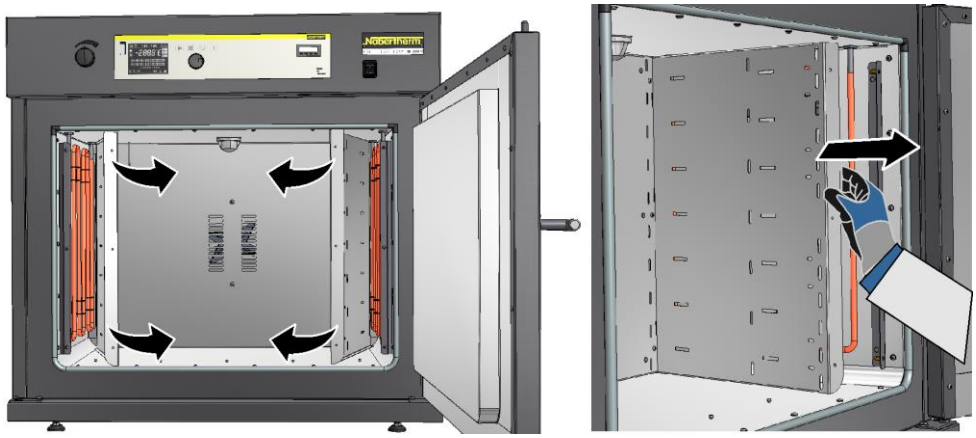


Fig. 49: Removing the side walls from the oven (similar to picture)

The screw connections on the heating elements must be dismantled before the heating elements can be removed from inside the oven. The screw connections of the heating elements are located in the switchgear of the top that was removed previously.

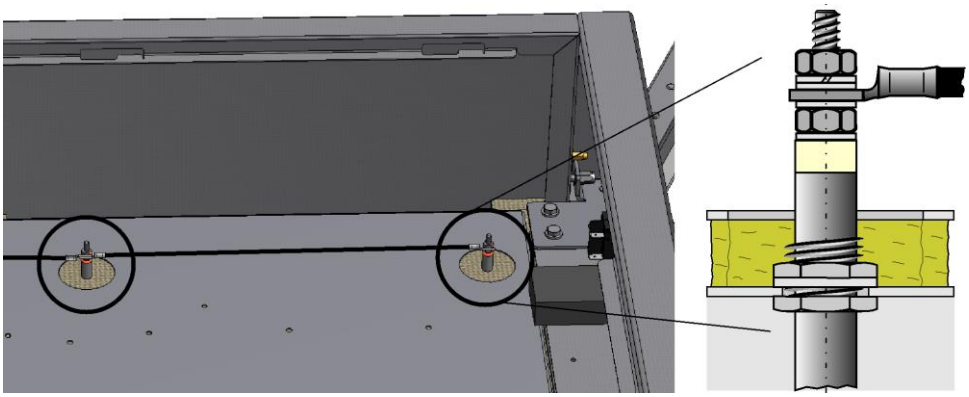


Fig. 50: Screw connections of the heating elements (similar to picture)

First, undo the top screw connection (1) with a suitable tool in order to release the cable connection to the heating element. To remove the heating element through the oven, the screw connection (3) of the heating elements must be completely unscrewed with a suitable tool (hex nut M14 wrench size 19). Before doing this, carefully remove the insulation (2) as this will be reused later.

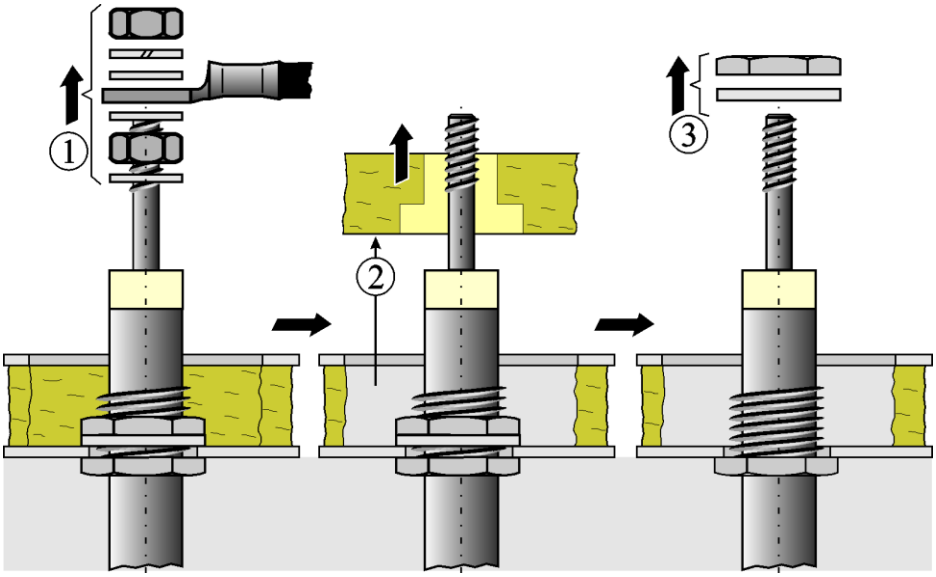


Fig. 51: Undoing the screw connections of the heating element (similar to picture)

Remove the heating element(s) carefully at a downward angle. Replace damaged heating elements with similar ones. The oven must not be operated with damaged heating elements.

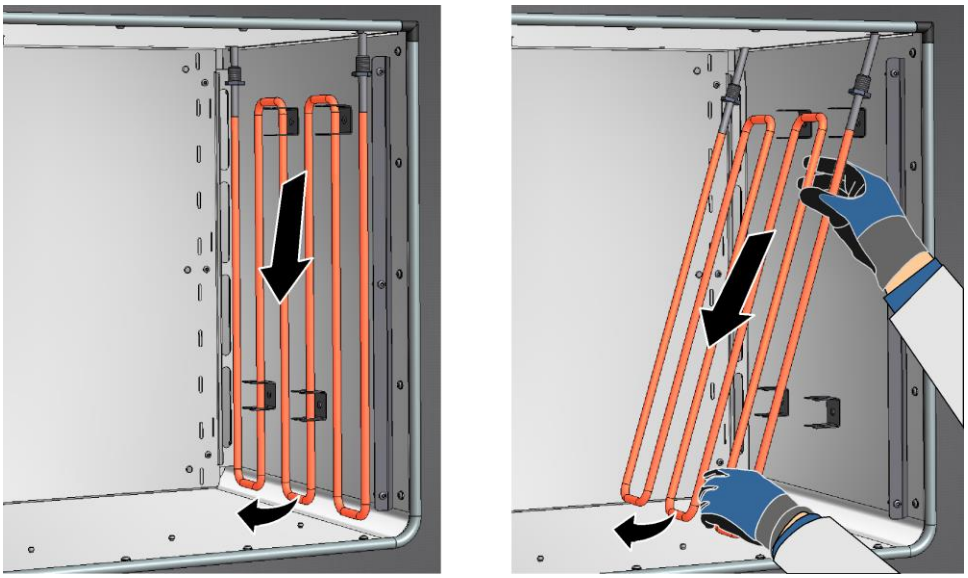


Fig. 52: Removing a heating element (similar to picture)

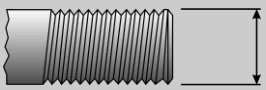
Check the supplied heating elements for damage before installation.

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

Install the new heating elements and the dismantled/detached components in the reverse order.

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

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

Screw tightening torque	
Tighten power cable clamps and screws on the **heating elements** with a defined torque. If this advice is not followed, the heating elements may be damaged.	
Thread diameter Metric thread (M) 	Torque in Nm 
M 4	2.0
M 5	6.0
M 6	8.0
M 7	14.0

Screw tightening torque	
M 8	20.0
M 10	39.0

Commissioning

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

9.2 Replacing a Thermocouple

Warning – Danger of Electric Shock

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

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

Warning – General Hazards!

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

Caution - damage to components!

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

Completely empty the oven. Remove the grids and trays (see "Adjusting the Removable Grids").

Undo the screws on the rear of the oven with a suitable tool and keep them in a safe place for future use.

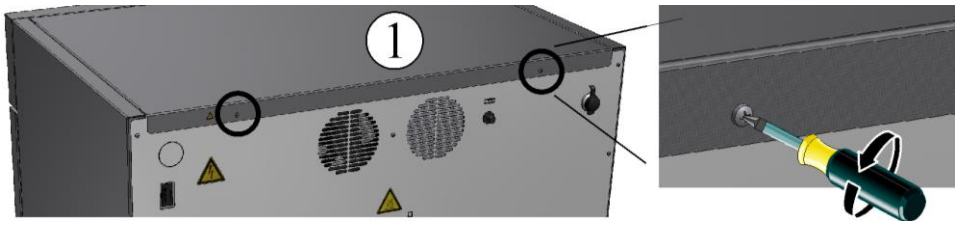


Fig. 53: Undoing the screws from the top (similar to picture)

Pull the top towards you until you feel it catching.

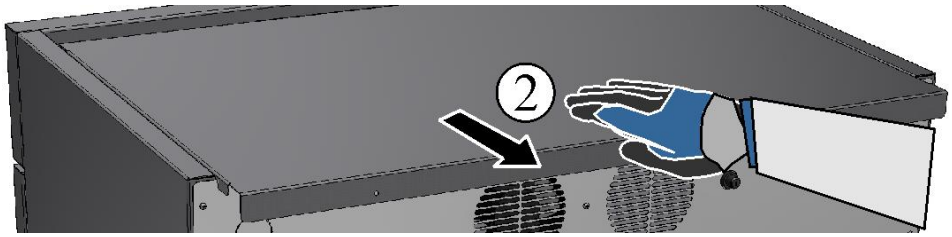


Fig. 54: Pulling the top (similar to picture)

Lift the top and place it beside the oven. Place some soft padding under the top to protect it.

If present, pay attention to the protective ground cable from the panel to the terminal; if necessary, dismantle the cable from the terminal.

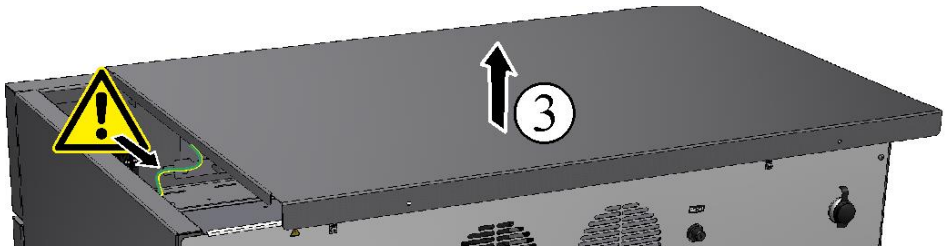


Fig. 55: Lifting and removing the top (similar to picture)

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

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

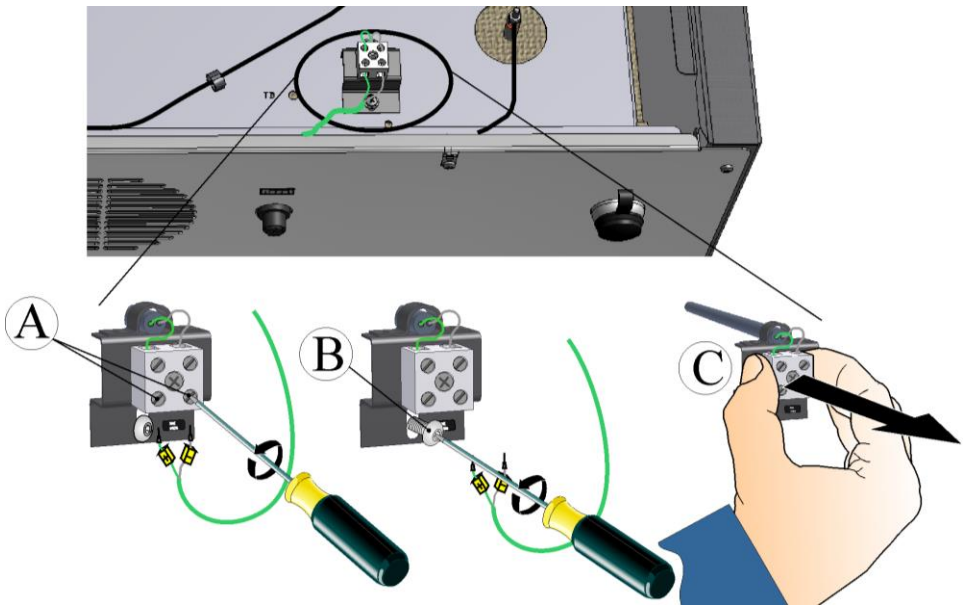


Fig. 56: Dismantling the thermocouple(s) (similar to picture)

Note

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

⊕ to ⊕ ⊖ to ⊖

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

Note

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

The panels are assembled in the reverse order. If necessary, connect the ground cable between the terminal and the panel again properly. Cables behind the panels must be installed freely and must not be installed over or come into contact with the exhaust air tube or other hot components.

Commissioning

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

9.3 Replacing Door Seals

Warning – Danger of Electric Shock

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

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

Warning – General Hazards!

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

To replace the door seal, we recommend that you open the swing door completely.

Completely empty the oven. Remove the grids and trays (see "Adjusting the Removable Grids").

Undo all the screws around the inside of the oven (**do not completely unscrew them**). The number of screws may differ depending on the oven model.

Remove the old door seal and replace it with a new one.

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

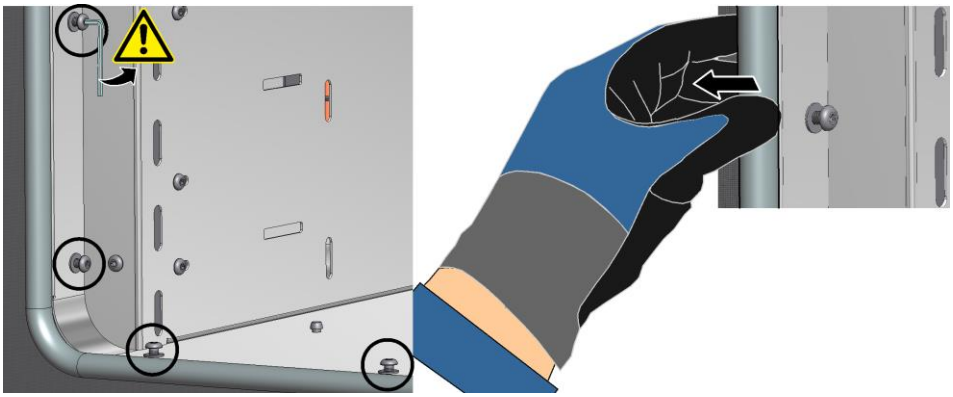


Fig. 57: Undoing the screws around the oven (similar to picture)

Install the door seal (1) all around the door. Start by inserting the door seal in the middle of the side with the hinge. Make sure that the "barb" of the door seal (2) faces inside the oven. When you have positioned the door seal, **carefully** tighten the screws (3). The sheet metal inside the oven must not be "dented".

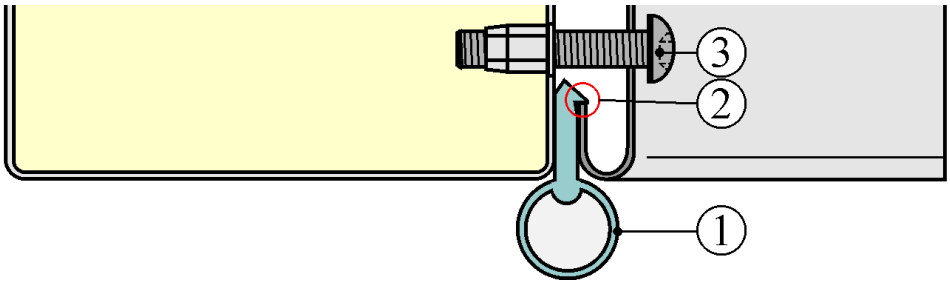


Fig. 58: Inserting the door seal correctly (similar to picture)

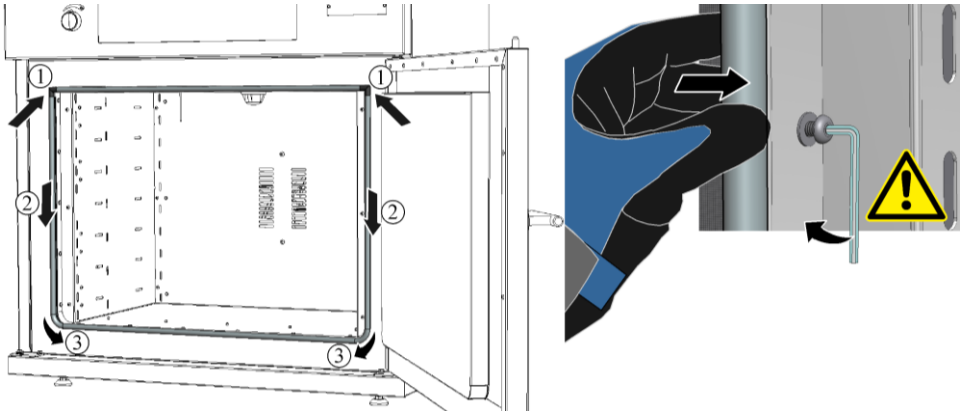


Fig. 59: Inserting the door seal all around the door (similar to picture)

The inside of the swing door should close against the seal evenly all the way around.

When the door seal has been installed, adjust the swing door if necessary (see "Door Adjustment").

Note

Assemble the loosened parts in the reverse sequence.

Commissioning

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

9.4 Door Adjustment

Warning – Danger of Electric Shock

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

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

Warning – General Hazards!

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

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.

Undo the screws on the rear of the oven with a suitable tool and keep them in a safe place for future use.

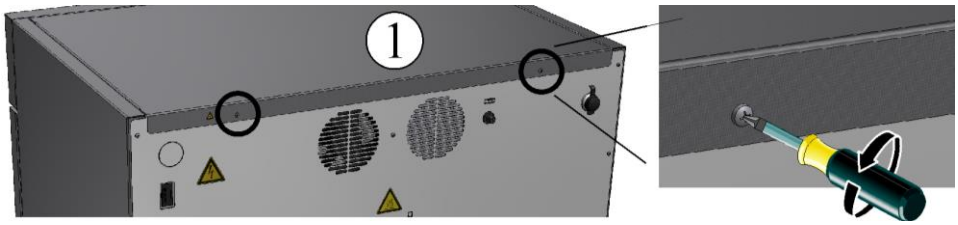


Fig. 60: Undoing the screws from the top (similar to picture)

Pull the top towards you until you feel it catching.

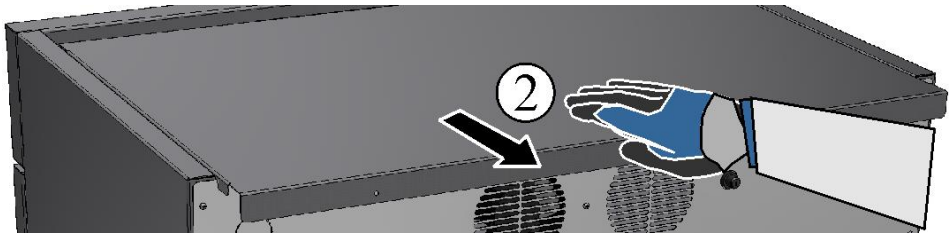


Fig. 61: Pulling the top (similar to picture)

Lift the top and place it beside the oven. Place some soft padding under the top to protect it.

If present, pay attention to the protective ground cable from the panel to the terminal; if necessary, dismantle the cable from the terminal.

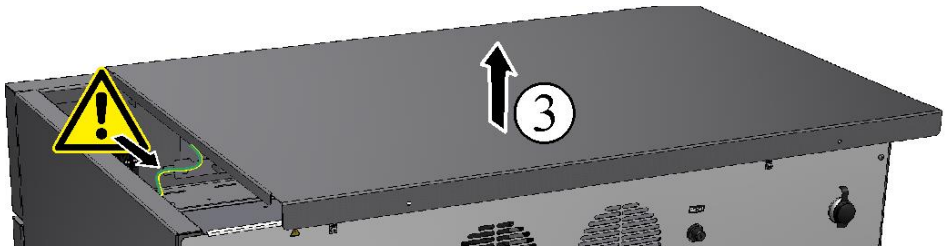


Fig. 62: Lifting and removing the top (similar to picture)

Completely empty the oven. Remove the grids and trays (see "Adjusting the Removable Grids").

When a door hinge or a door seal is replaced, it is important that the swing door opens and closes easily. The inside of the swing door should close against the seal evenly all the way around. Adjustable hinges to adjust the swing door are located in the switchgear and at the bottom of the door.

Undo the screws on the side of the door lock (A) and on the hinge (C) using a suitable tool (e.g. Size 10 ring wrench). Adjust the door hinge to the required position.

Fine adjustment of the top sheets (3) by adjusting the screws (2) can allow the door to be adjusted at the top, for example.

At the bottom of the door adjust the screws of the door lock (B) and the hinge (D) in the same manner.

With the door closed, loosen the top or bottom hex nut. While tightening the hex nut again, press the swing door firmly against the door seal. For precise alignment of the swing door we recommend that you place an approx. 7 - 8 mm thick, sufficiently long strip of cardboard underneath the door in the middle.

Once the swing door is adjusted, remove the strip of cardboard.

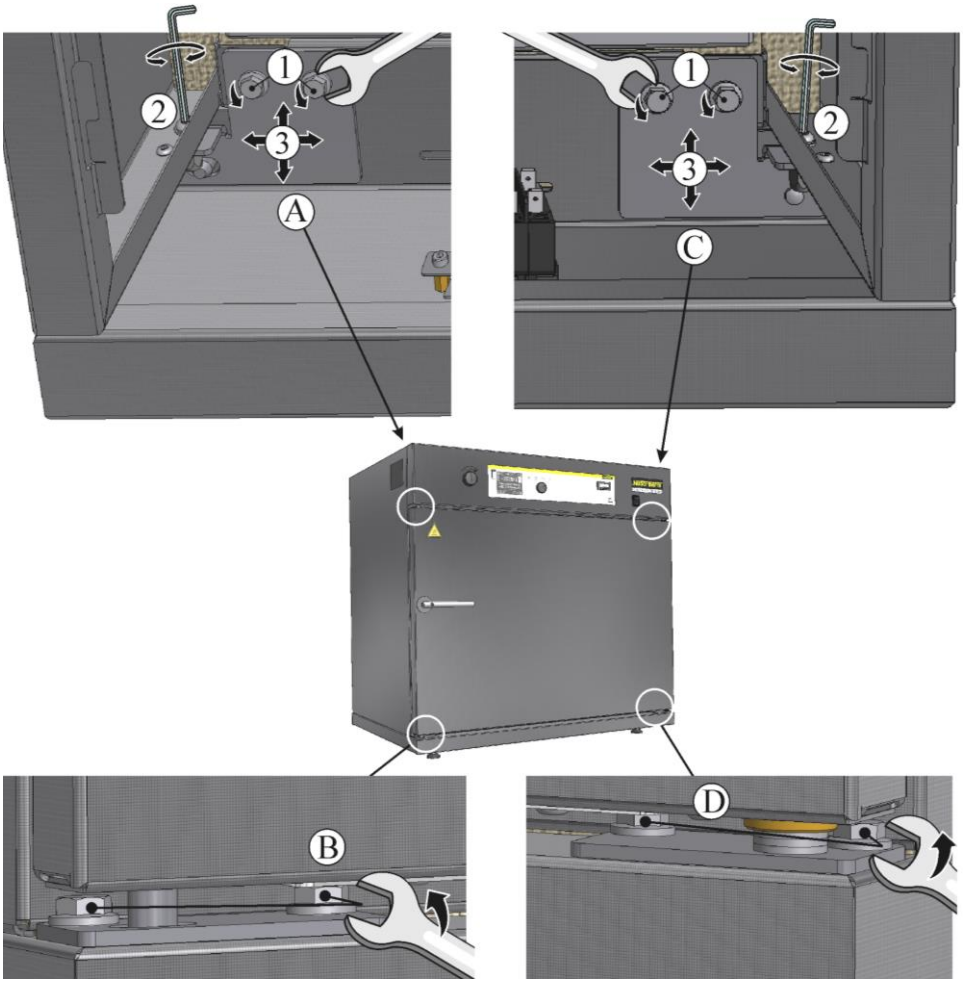


Fig. 63: Options for adjusting the swing door (similar to picture)

Commissioning

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

9.5 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.

9.6 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).

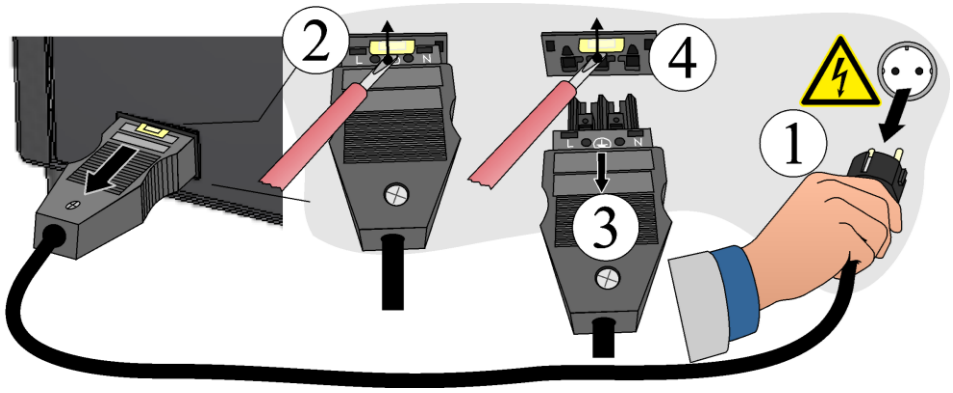
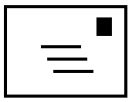


Fig. 64: Separate the snap-in coupling (plug) from the furnace housing (similar to picture)

10 Nabertherm Service

The Nabertherm Service team is available at all times for furnace maintenance and repair.

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



Mail
Nabertherm GmbH
Bahnhofstrasse 20
28865 Lilienthal/Germany

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

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

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

Provide the following details from the type plate:

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

Fig. 65: Example (type plate)

11 Shut-Down, Dismantling, and Storage

To be Completed by the Operator

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

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

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

_____

_____

_____

_____

Oils and other substances that are hazardous to water must be completely removed before the furnace is dismantled for recycling or scrap.
Ensure that operating materials, lubricants, and consumables are disposed of in an environmentally compliant manner. Regulations relating to proper waste recycling and disposal must be observed.
The furnace may be lifted only at the intended points.
Use only the specified lifting and securing equipment to lift the furnace/parts.

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

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

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

_____

_____

_____

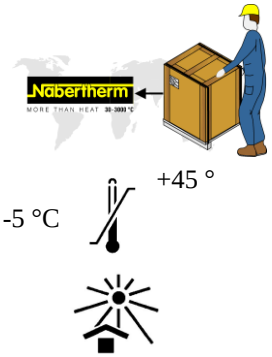
_____

▶

Note

See “Safety” and “Transportation”.

11.1 Transportation/Return Transportation



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

Otherwise:

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

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

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

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

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

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

As a rule:

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

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

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

Note

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

Note

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

12 Declaration of Conformity

EC Declaration of Conformity

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

We,

Nabertherm GmbH

Bahnhofstr. 20, 28865 Lilienthal, Germany

hereby declare that the following product:

Electrically heated oven

for commercial applications

Model	TR 60	TR 120	TR 240
	TR 450	TR 1050	

for all furnaces with switchgear and rated frequency of 50/60 Hz

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

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

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

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

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

The following harmonized standards were applied:

- DIN EN 61010-1 (07.2011)
- DIN EN 61000-6-1 (10.2007), DIN EN 61000-6-3 (09.2011)

Lilienthal, 03.04.2017

Michael Oberschmidt
Vice President R & D

Thomas Adamek
Head of Quality Management

13 For Your Notes

For Your Notes

For Your Notes