

Conversion Instructions

Replacing Heating Elements

Furnace model

L(T) 5-15

1300 °C and 1400 °C

M06.0013 ENGLISCH

■ Made
■ in
■ Germany

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1 Introduction

These instructions are intended for replacing heating elements.

These instructions contain all the information you need to replace the heating elements and start up the furnace.

These instructions are intended for laboratory furnaces in the L(T) series from 5 to 15 liters and a working temperature from 1300 °C (brick insulation) to 1400 °C (fiber insulation).

The following assembly instructions explain the handling of this system in a few steps. The figures show all the basic steps of assembly. Nevertheless, before starting the assembly you should read the entire assembly instructions. Follow the safety instructions in the assembly instructions and in the furnace operating instructions.






Note

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

2 Scope of Delivery

Spare parts package (heating element) for the respective furnace model

Quantity	Furnace model	Heating element / number	Bag of insulation fiber / number	Fastener / number	Comment
1	L, LT 5/13				6
1	L, LT 9/13				6
1	L, LT 15/13				6
1	L, LT 5/14				-
1	L, LT 9/14				-
1	L, LT 15/14				-

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

The documents included do not always contain the electrical schematics.

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

3 Safety



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.

DANGER		
	<ul style="list-style-type: none"> • 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 	

The safety advisories in the repair instructions and in the furnace operating instructions must be observed.

4 Personal Safety Equipment (PSA)



Wear protective clothing



Sharp edges – wear suitable gloves to prevent cuts on sharp edges.



Wear goggles to protect your eyes.



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

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 – Pull Out the Power Plug

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



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.

4.1 General Information for Servicing and Maintenance

- All maintenance work should be carried out in a clean environment.
- Note: Protect your eyes and hands while cleaning.
- Always handle the product with care.
- Do not use in environments where corrosive gases, chemicals, saltwater or vapors are present.
- In explosive environments, use only within the specified operating values.
- Do not use at locations that are subject to vibrations or impacts. Check the technical specifications of the product.
- Do not use the product at locations where it is subject to radiant heat.
- The surfaces to be cleaned may be cleaned with a soft, clean, lint-free cloth. Many household and industrial cleaning products contain abrasive substances and chemical concentrates and may not be used for cleaning.



Warning – General Hazards!

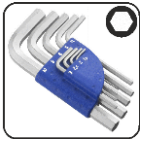
If installed improperly, functioning and safety of the system can no longer be guaranteed. The connection must be properly installed and put into operation by qualified personnel.



Caution

Nabertherm assumes no liability for damages caused by improper installation.

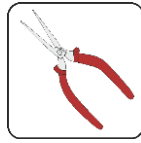
5 Tools Required for Assembly:



Allen keys in various sizes



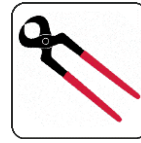
Open-end or ring wrench M5



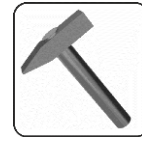
Small long-nose pliers



Small pipe wrench



Pincers



Small hammer for the fasteners (only model L(T) .../13)

Fig. 1: Tools

6 Turning off the Controller/Furnace

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

6.1 Disconnecting the Power Supply Cable from the Furnace

Before you perform any service work, disconnect the furnace from the power source. Disconnect the power plug from the power outlet.

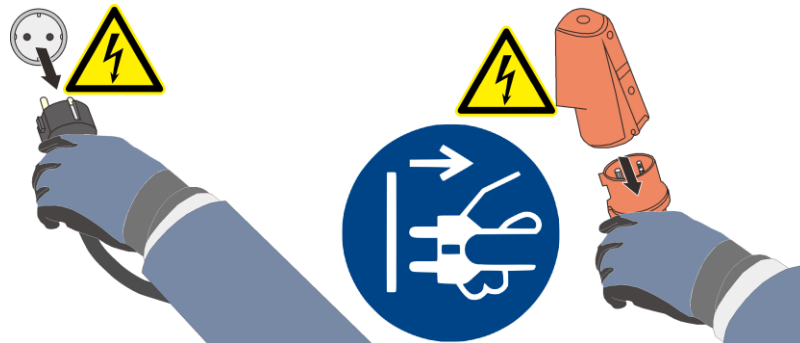


Fig. 2: Pull the power plug (similar to picture)

6.2 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).

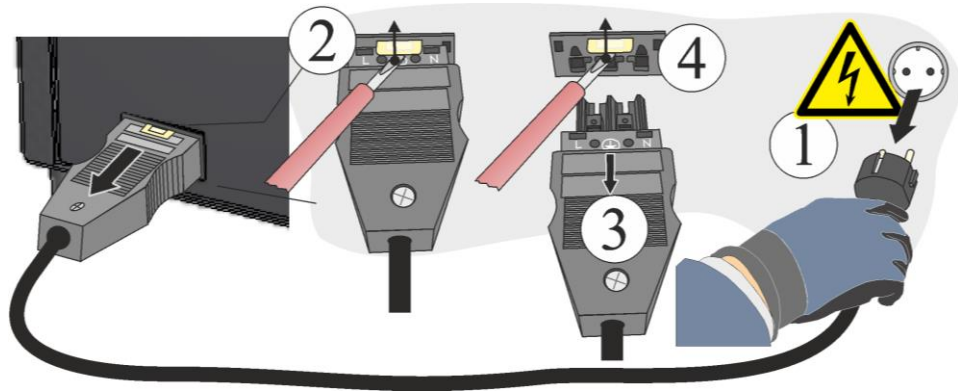


Fig. 3: Separate the snap-in coupling (plug) from the furnace housing (similar to picture)

7 Dismantling the Rear Panels on the Furnace

Applies to both furnace models L, LT .../13 and L; LT .../14

Note

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

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

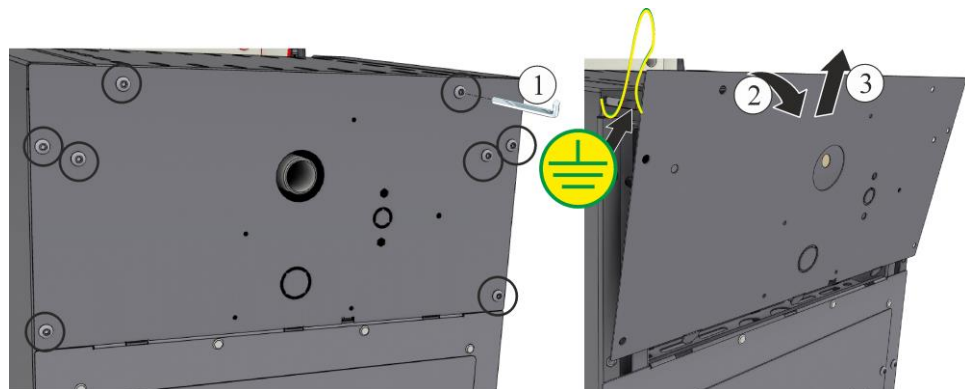


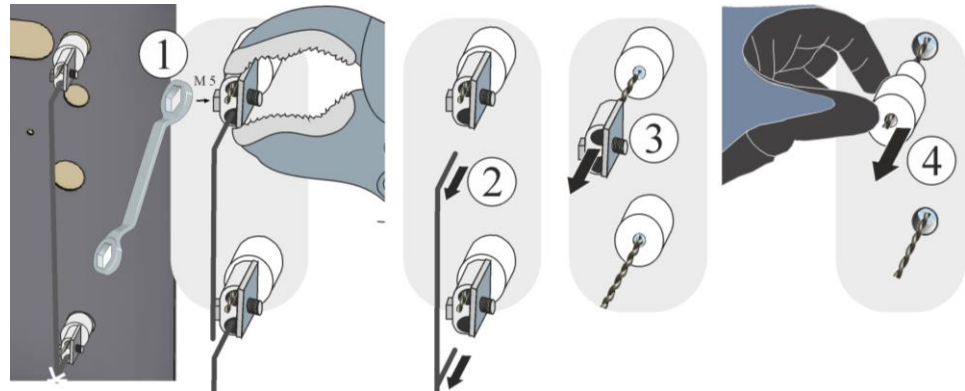
Fig. 4: Dismantling the rear panel (similar to picture)

8 Undoing the Electrical Connections

Unscrew the screws (1) of the connection terminals (3). Place the screws and the connection terminal in a safe place so that they can be reused. So as not to damage the connection terminal or the ceramic feedthrough tube we recommend the use of a suitable pipe wrench (example) as a brace when unscrewing the screws of the connection terminal.

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

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



1 Hexagonal screw / 2 Cable / 3 Connecting terminal
 4 Ceramic duct

Fig. 5: Undoing the electrical connections (similar to picture)

9 Removing the heating elements

Brick-insulated furnace models L, LT .../13

Remove the fiber wadding from the support tubes.

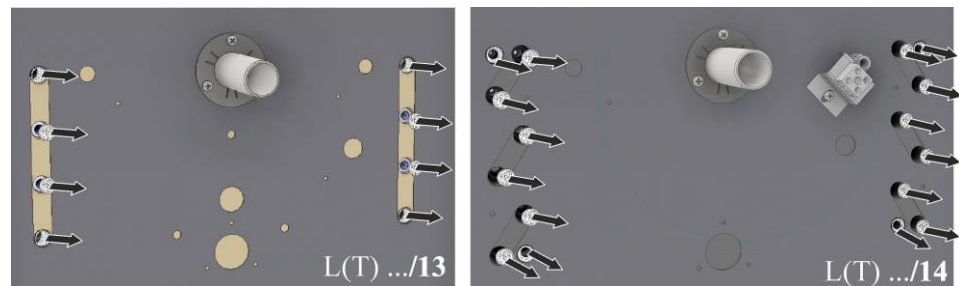


Fig. 6: Removing the fiber wadding (similar to picture)

Fiber-insulated furnace models L, LT .../14

Undo the screws of the cover plate with a suitable tool and keep them in a safe place for reuse.

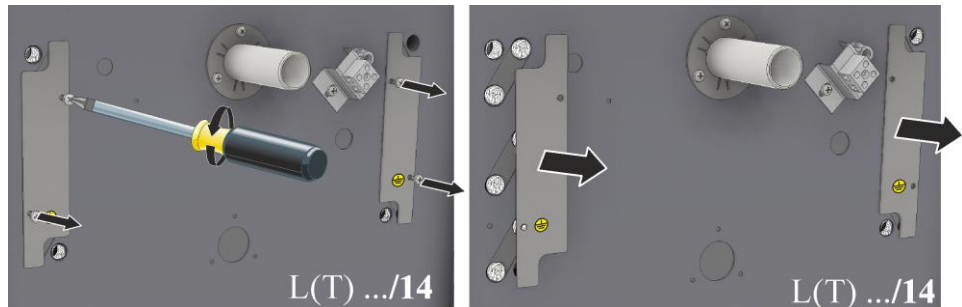


Fig. 7: Dismantling cover plates (only model L(T) .../14) (similar to picture)

Applies to both furnace models L, LT .../13 and L; LT .../14

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

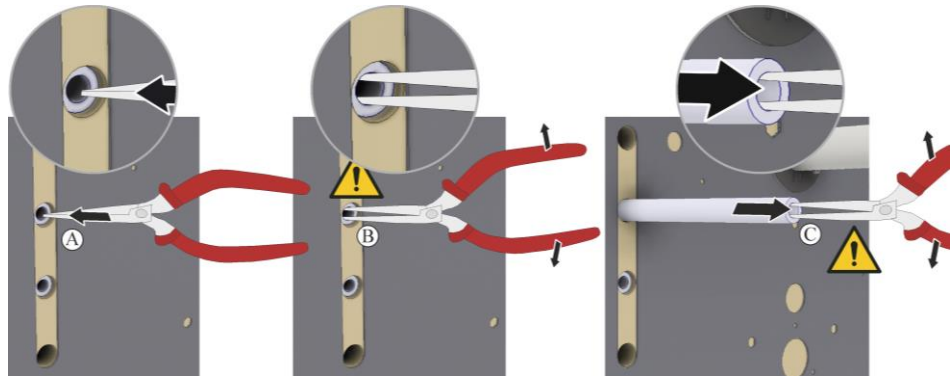


Fig. 8: Removing the support tubes (similar to picture)

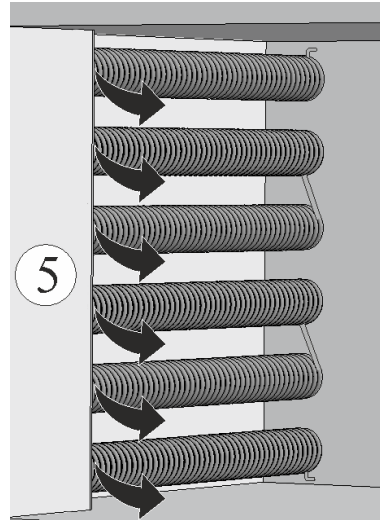
Brick-insulated furnace models L, LT .../13



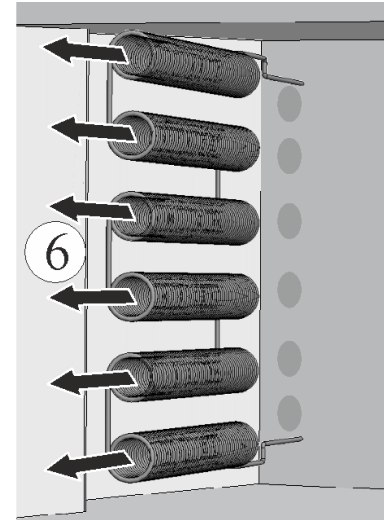
Remove fasteners used to fix the heating element from the side wall (only brick-insulated furnaces (L(T) .../13). Make sure that the brick insulation is not damaged. When installing a new heating element, always use new fasteners.

Applies to both furnace models L, LT .../13 and L; LT .../14

Press the heating elements carefully towards the middle of the furnace chamber (5) and, at the same time, pull them out of the furnace chamber (6). When you press the heating elements laterally be careful to avoid contact with the surrounding furnace collar (insulation) because it is extremely fragile.



Press the heating elements carefully towards the middle of the furnace chamber.



Pull the heating element carefully out of the furnace chamber.

Fig. 9: Pulling the heating elements out of the furnace chamber (similar to picture)

10 Installing the New Heating Elements

Applies to both furnace models L, LT .../13 and L; LT .../14

We recommend that two people replace heating elements.

Install the new heating elements in reverse order. During the installation into the furnace chamber pay attention to the "kink" on the upper and lower heating elements in place. These must be inserted with extreme care up to the edge of the insulation.

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

Check the supplied heating elements for damage before installation.

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

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

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

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

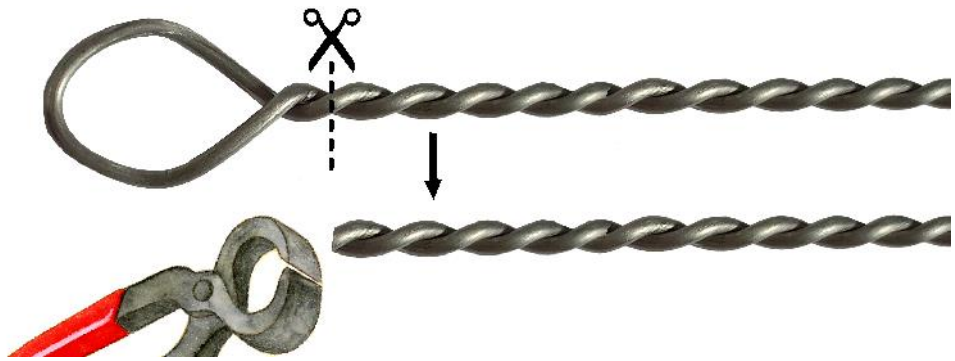


Fig. 10: Pinch off the loop on the end of the heating element (similar to picture)

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

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

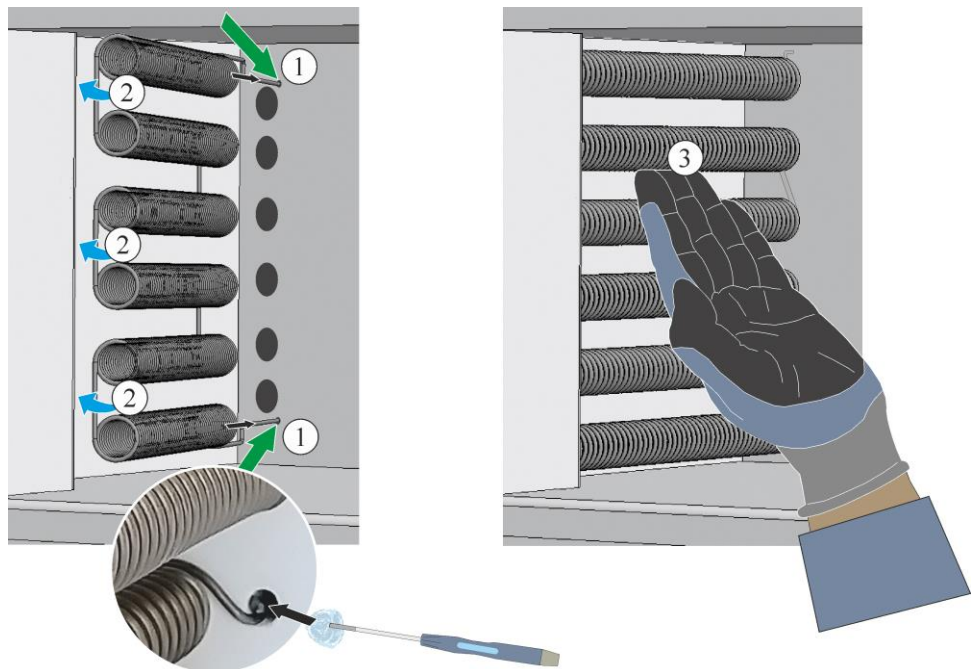


Fig. 11: Installing the new heating elements (similar to picture)

Carefully insert the heating elements from the side into the openings as far as they go.

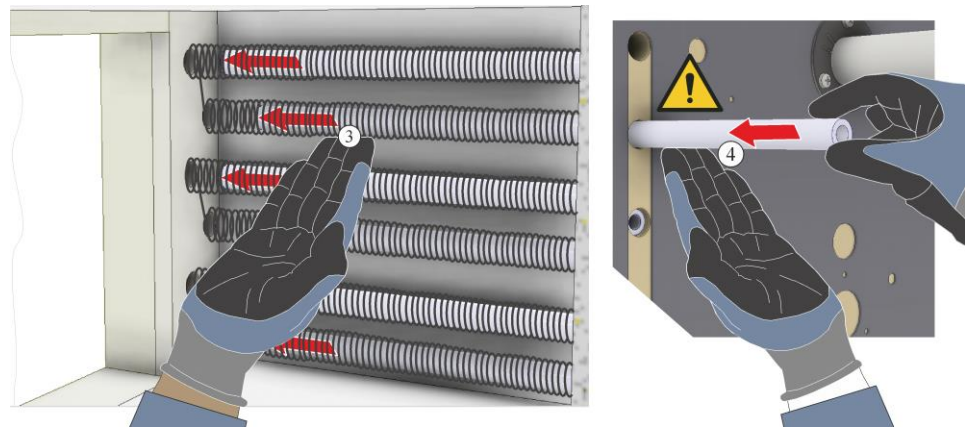


Fig. 12: Inserting the support tubes (similar to picture)

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

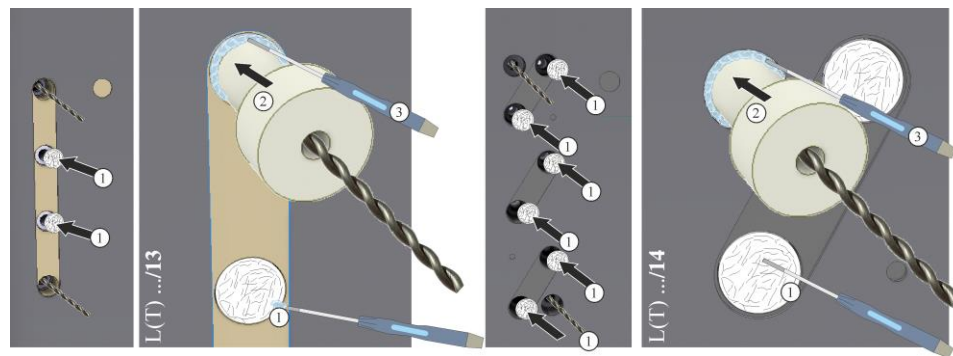


Fig. 13: Filling the holes around the support tubes with fiber wadding (similar to picture)

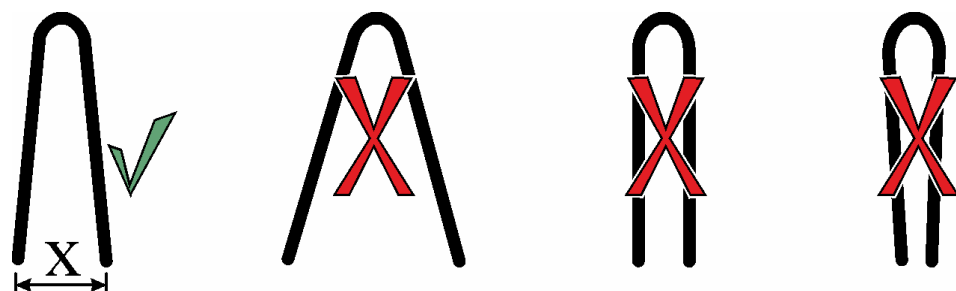
Brick-insulated furnace models L, LT .../13

This step applies only to brick-insulated furnaces (L(T) .../13). Use a suitable tool to tap the supplied fasteners carefully into the insulating brick on the sides, as illustrated, until the heating element sits completely on the brickwork. Make sure that the insulation brick is not damaged. The fasteners are required to prevent the heating elements from moving.

Do not insert the clamps into the holes of the previous clamps. We recommend moving the new clamps approx. 2 cm.

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

X ~ 14 mm



Minor cracks in the insulation brick are normal. Do not place fasteners in corner bricks, cracked areas or near the edge of the insulation bricks. Never use the old holes for new fasteners.

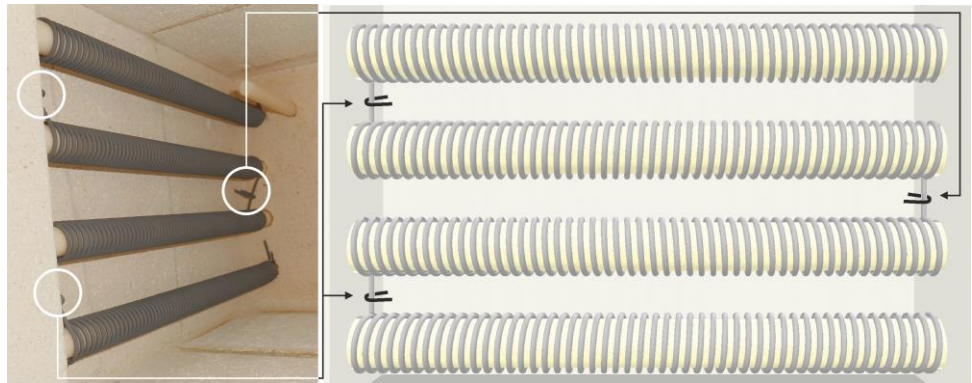


Fig. 14: Tapping the fasteners carefully into the side walls (only brick-insulated furnaces L(T) .../13) (similar to picture)

Fiber-insulated furnace models L, LT .../14

Close the holes in the support tube with the previously removed cover plates (only furnace model L(T) .../14).

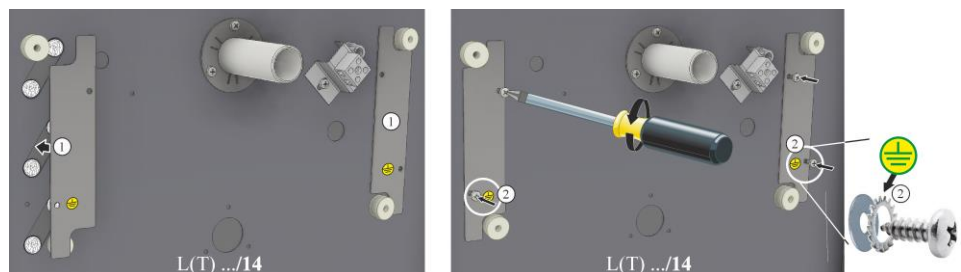


Fig. 15: Installing the cover plates (only model L(T) .../14) (similar to picture)

Applies to both furnace models L, LT .../13 and L; LT .../14

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

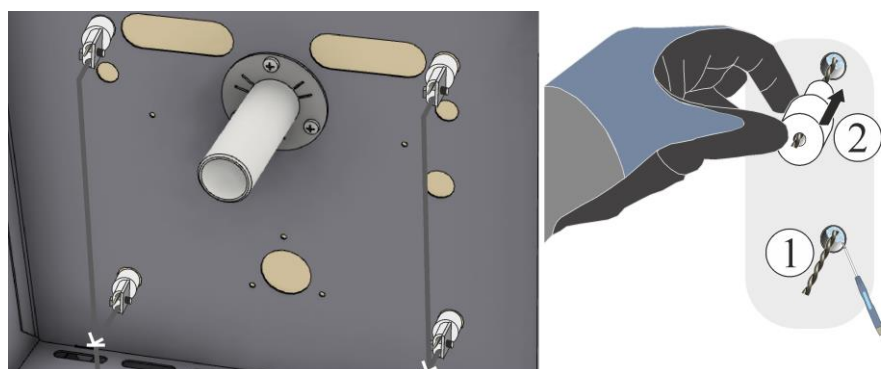


Fig. 16: Sliding on the ceramic ducts and connecting the electricity (similar to picture)

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

Slide the connection terminals (4) until they touch the ceramic feedthrough tube.

Tighten the screws (6) of the connection terminals (the correct tightening torque can be found in the table below). So as not to damage the connection terminal or the ceramic

feedthrough tube we recommend the use of a suitable pipe wrench (example) as a brace when tightening the screws of the connection terminal.

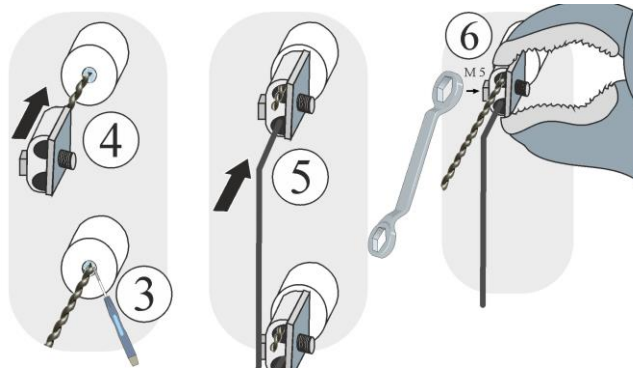


Fig. 17: Sliding on the ceramic ducts and connecting the electricity (similar to picture)

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



Warning – General Hazards!

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



Note:

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

Shorten the projecting twisted heating element ends with suitable pincers (7). We recommend that you leave approx. 0.5 cm between the edge and the connection terminal.

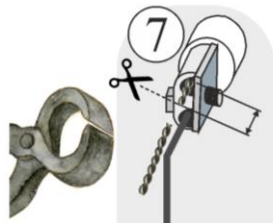


Fig. 18: Shortening twisted heating element ends (similar to picture)

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

The covers are replaced in reverse order. The previously disconnected grounding cable between the terminal and cover must be properly reconnected. The cables behind the cover must be routed freely and must not be laid over components that are subjected to heat or that come into contact with them.




Note

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

**Caution**

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


10.1 Tightening Torque for Screw Connections on Heating Elements

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

11 Operation

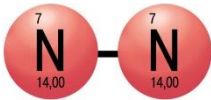
Insert the mains power connector, then switch on the power switch and check the function of the furnace.

11.1 Turning on the Controller/Furnace

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



Using protective gases



An oxide coating must form for the heating elements to function properly. To regenerate the heating elements, we recommend a **monthly** oxidation firing in an oxidizing atmosphere to create a protective oxide coating.

For the duration of the oxidation firing, please refer to “Recommendations for Heating the Furnace for the First Time”.

Carry out this procedure when using the furnace for the first time and repeat **every time** a heating element is replaced.

The oxidation firing is carried out with no furnace furniture or load. Non-flammable protective gases prevent oxidation. Gas supply equipment must be blocked during the oxidation firing.

<p>Oxidizing atmospheres (e.g. air or oxygen) help oxidize the heating elements.</p> <p>Non-flammable protective gases (reducing atmosphere, e.g. argon, helium) prevent oxidation.</p>	<p>Before</p>
<p>Uneven spacing is a natural process and no correction is required. However, if this is too pronounced, it may have an effect on temperature distribution.</p>	<p>After (uneven distribution)</p>



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.

11.2 Environmental Regulations

- The removal of electronic components and their disposal as electronic junk.
- Disposal of the metals that are neither hazardous to health nor the environment as recyclable metal.
- Please contact the responsible waste disposal company to have the above listed materials properly disposed of.



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

12 Nabertherm Service

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

Mail	Phone or fax	Web or e-mail
Nabertherm GmbH Bahnhofstrasse 20 28865 Lilienthal Germany	Phone: +49 (4298) 922-333 Fax: +49 (4298) 922-129	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:

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

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

Fig. 19: Example (type plate)

13 For Your Notes



MORE THAN HEAT 30-3000 °C

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