Operating Instructions

Laboratory Furnaces (Muffle Furnaces)

L .../...
LE .../...
LT .../...
LV .../...
LVT .../...
-SKM -SW -HA

-> 10.2005

Original instructions
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 laboratory 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.

Laboratory Furnaces are attractive thanks to their many advantages. These furnaces are all-rounders for research and laboratory applications. They are made from expertly finished, high-quality materials and are easy to operate. These furnaces are optimally designed for incinerating and heat treatment. The very best insulation materials permit energy-saving operation and fast heating times thanks to low heat storage and thermal conductivity. Laboratory furnaces attain furnace chamber temperatures of max. 1100 °C (2012 °F), 1200 °C (2192 °F) or 1300 °C (2372 °F).

Other Characteristics of this Product are:

- All the models have a high-quality, multi-layered and energy-saving thermal insulation
- Double-wall housing means low outer temperatures and solid stability. All furnaces have housings made of textured stainless steel sheet.
- Good temperature uniformity provided by special air supply and exhaust system for models LV/LVT .../... and LT .../...HA. For models LV/LVT .../... the system delivers more than 6 air changes a minute. The incoming air is pre-heated, so that a good temperature uniformity is ensured.
- There are furnaces with drop-down doors or lift doors
- Ceramic heating plates with integrated heating wire, protected against splattering and exhaust-air for models L/LT .../... and LV/LVT .../...
- Model L/LT .../.../SW with scale and software (Controltherm MV) for annealing loss specifications
- All the models are equipped with a controller which provides considerable safety against operator mistakes. The furnace chamber temperature is measured and regulated by a long-life thermocouple (NiCr-Ni Tmax < 1100 °C or PtRh-Pt Tmax > 1100 °C).

Additional Equipment

- Vent, vent with fan or catalytic converter.
- Over-temperature limiter with adjustable shut-down temperature for thermal protective class 2 as specified in EN 60519-2 to protect the furnace and the ware against overheating.
- Manual or automatic protective gas system Protective gas connection on the back side of the furnace
- Digital interface RS 422, for example, for process control and documentation provided by Controltherm MV software package.
- Base plates and catch basins to protect of the furnace and to enable easy charging
- Rectangular container, stackable for charging on several levels
1.2 Overview of the Complete Furnace

- Furnace door
- Handle
- Air for the regulation of fresh air
- Furnace chamber
- Display
- Controller
- Power switch (ON/OFF)
- Exhaust-air system
- Display
- Controller
- Power switch (ON/OFF)
- Heating (ON/OFF)
Backup power connection (lock for backup power connection) for example, for vent with fan or gas supply system (additional equipment)

Fig. 1: Example: Complete overview of various laboratory furnaces
1.3 Safeguarding against Dangers Posed by Over-Temperature

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

The over-temperature limiter with manual reset/with automatic reset monitors the furnace chamber temperature. The display shows the most recently set cut-off temperature. If the furnace chamber temperature rises about the pre-set cut-off temperature the heating is shut down to protect the furnace, the charge and/or the operating equipment.

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

We recommend setting the maximum setpoint temperature of the heating program in the limiter between 5 °C and 30 °C, depending on the physical characteristics of the furnace, below the trigger temperature of the over-temperature limiter with manual reset/with automatic reset. This prevents an unwanted triggering of the over-temperature limiter with manual reset/with automatic reset.

Description and function, see the Operating Instructions of the over-temperature limit controller/guard

Fig. 2: Removing the sticker
### 1.3.1 Key to the Model Names

<table>
<thead>
<tr>
<th>Example</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT 9/11SKM</td>
<td>L = Laboratory furnace with drop-down door</td>
</tr>
<tr>
<td></td>
<td>LE = Laboratory furnace economy series</td>
</tr>
<tr>
<td></td>
<td>LT = Laboratory furnace with lift door</td>
</tr>
<tr>
<td></td>
<td>LV = Laboratory incinerator with drop-down door</td>
</tr>
<tr>
<td></td>
<td>LVT = Laboratory incinerator with lift door</td>
</tr>
<tr>
<td>LT 9/11SKM</td>
<td>1 = 1-liter furnace chamber (volume in L)</td>
</tr>
<tr>
<td></td>
<td>2 = 2-liter furnace chamber (volume in L)</td>
</tr>
<tr>
<td></td>
<td>3 = 3-liter furnace chamber (volume in L)</td>
</tr>
<tr>
<td></td>
<td>4 = 4-liter furnace chamber (volume in L)</td>
</tr>
<tr>
<td></td>
<td>5 = 5-liter furnace chamber (volume in L)</td>
</tr>
<tr>
<td></td>
<td>6 = 6-liter furnace chamber (volume in L)</td>
</tr>
<tr>
<td></td>
<td>9 = 9-liter furnace chamber (volume in L)</td>
</tr>
<tr>
<td></td>
<td>14 = 14-liter furnace chamber (volume in L)</td>
</tr>
<tr>
<td></td>
<td>15 = 15-liter furnace chamber (volume in L)</td>
</tr>
<tr>
<td></td>
<td>24 = 24-liter furnace chamber (volume in L)</td>
</tr>
<tr>
<td></td>
<td>40 = 40-liter furnace chamber (volume in L)</td>
</tr>
<tr>
<td>LT 9/11SKM</td>
<td>11 = Tmax 1100 °C (2012 °F)</td>
</tr>
<tr>
<td></td>
<td>12 = Tmax 1200 °C (2192 °F)</td>
</tr>
<tr>
<td></td>
<td>13 = Tmax 1300 °C (2372 °F)</td>
</tr>
<tr>
<td>LT 9/11SKM</td>
<td>HA = Laboratory furnace with recirculating air fan in the back wall</td>
</tr>
<tr>
<td></td>
<td>SKM = Furnace chamber made of ceramic muffle</td>
</tr>
<tr>
<td></td>
<td>SW = Scale furnace with support frame and scale</td>
</tr>
</tbody>
</table>

Fig. 3: Example: Model designation (type plate)
1.4 Scope of Delivery

The scope of delivery includes:

<table>
<thead>
<tr>
<th>Furnace components</th>
<th>Quantity</th>
<th>Comment</th>
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</thead>
<tbody>
<tr>
<td>Laboratory furnace 1)</td>
<td>1 x</td>
<td>Nabertherm GmbH</td>
</tr>
<tr>
<td>Power cable 1)</td>
<td>1 x</td>
<td>Nabertherm GmbH</td>
</tr>
<tr>
<td>Vent 1)</td>
<td>1 x</td>
<td></td>
</tr>
<tr>
<td>Vent with fan 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catalytic converter 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ceramic ribbed plate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ceramic ceramic catch basin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel catch basin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base Plate 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas supply system 2)</td>
<td>1 x</td>
<td>Nabertherm GmbH</td>
</tr>
<tr>
<td>Scale 2)</td>
<td>1 x</td>
<td>Nabertherm GmbH</td>
</tr>
<tr>
<td>Process documentation</td>
<td>1 x</td>
<td>Nabertherm GmbH</td>
</tr>
<tr>
<td>Controltherm MV software package 1)</td>
<td>1 x</td>
<td>Nabertherm GmbH</td>
</tr>
<tr>
<td>Other components, variable depending on the particular furnace</td>
<td>- - -</td>
<td>Consult the shipping papers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Document type</th>
<th>Quantity</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruction Manual Laboratory Furnace 1)</td>
<td>1 x</td>
<td>Nabertherm GmbH</td>
</tr>
<tr>
<td>Operating Instructions for Controller 1)</td>
<td>1 x</td>
<td>Nabertherm GmbH</td>
</tr>
<tr>
<td>Operating Instructions gas supply system 1)</td>
<td>1 x</td>
<td>Nabertherm GmbH</td>
</tr>
<tr>
<td>Operating Instructions Controltherm MV software package 1)</td>
<td>1 x</td>
<td>Nabertherm GmbH</td>
</tr>
<tr>
<td>Other documents, variable depending on the particular furnace</td>
<td>- - -</td>
<td></td>
</tr>
</tbody>
</table>

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

Caution

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

Note

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

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

## Muffle Furnace

<table>
<thead>
<tr>
<th>Model Drop-Down Door</th>
<th>Tmax °C</th>
<th>Dimensions Interior in mm</th>
<th>Dimensions Outer in mm</th>
<th>Volume in l</th>
<th>Heating power in kW*</th>
<th>Weight kg</th>
<th>Minutes to Tmax¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>L 3/11</td>
<td>1100</td>
<td>160 140 100</td>
<td>380 370 420</td>
<td>3</td>
<td>1.2</td>
<td>20</td>
<td>60</td>
</tr>
<tr>
<td>L 5/11</td>
<td>1100</td>
<td>200 170 130</td>
<td>440 470 520</td>
<td>5</td>
<td>2.4</td>
<td>35</td>
<td>60</td>
</tr>
<tr>
<td>L 9/11</td>
<td>1100</td>
<td>230 240 170</td>
<td>480 550 570</td>
<td>9</td>
<td>3.0</td>
<td>45</td>
<td>75</td>
</tr>
<tr>
<td>L 15/11</td>
<td>1100</td>
<td>280 340 250</td>
<td>560 660 650</td>
<td>15</td>
<td>3.6</td>
<td>55</td>
<td>90</td>
</tr>
<tr>
<td>L 24/11</td>
<td>1100</td>
<td>320 490 250</td>
<td>600 790 650</td>
<td>24</td>
<td>4.5</td>
<td>75</td>
<td>95</td>
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<tr>
<td>L 40/11</td>
<td>1100</td>
<td></td>
<td></td>
<td>40</td>
<td>6.0</td>
<td>95</td>
<td>95</td>
</tr>
</tbody>
</table>

¹ for connection to 230 V 1/N/PE or 400 V 3/N/PE
*Depending on furnace design connected load might be higher

## Muffle Furnace

<table>
<thead>
<tr>
<th>Model Lift Door</th>
<th>Tmax °C</th>
<th>Dimensions Interior in mm</th>
<th>Dimensions Outer in mm</th>
<th>Volume in l</th>
<th>Heating power in kW*</th>
<th>Weight kg</th>
<th>Minutes to Tmax¹</th>
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<tbody>
<tr>
<td>LT 3/11</td>
<td>1100</td>
<td>160 140 100</td>
<td>380 370 420+165</td>
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<td>1.2</td>
<td>20</td>
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<tr>
<td>LT 5/11</td>
<td>1100</td>
<td>200 170 130</td>
<td>440 470 520+220</td>
<td>5</td>
<td>2.4</td>
<td>35</td>
<td>60</td>
</tr>
<tr>
<td>LT 9/11</td>
<td>1100</td>
<td>230 240 170</td>
<td>480 550 570+290</td>
<td>9</td>
<td>3.0</td>
<td>45</td>
<td>75</td>
</tr>
<tr>
<td>LT 15/11</td>
<td>1100</td>
<td>280 340 250</td>
<td>560 660 650+335</td>
<td>15</td>
<td>3.6</td>
<td>55</td>
<td>90</td>
</tr>
<tr>
<td>LT 24/11</td>
<td>1100</td>
<td>320 490 250</td>
<td>600 790 650+335</td>
<td>24</td>
<td>4.5</td>
<td>75</td>
<td>95</td>
</tr>
<tr>
<td>LT 40/11</td>
<td>1100</td>
<td></td>
<td></td>
<td>40</td>
<td>6.0</td>
<td>95</td>
<td>95</td>
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</tbody>
</table>

¹ for connection to 230 V 1/N/PE or 400 V 3/N/PE
² incl. opened lift door
*Depending on furnace design connected load might be higher
### Muffle Furnace

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Dimensions Interior in mm</th>
<th>Dimensions Outer in mm</th>
<th>Volume in l</th>
<th>Heating power in kW*</th>
<th>Weight kg</th>
<th>Minutes to Tmax 1</th>
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<tbody>
<tr>
<td>L 5/13</td>
<td>1300</td>
<td>200 170 130</td>
<td>440 470 520</td>
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<td>2.4</td>
<td>45</td>
<td>45</td>
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<tr>
<td>L 9/13</td>
<td>1300</td>
<td>230 240 170</td>
<td>480 550 570</td>
<td>9</td>
<td>3.0</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>L 15/13</td>
<td>1300</td>
<td>230 340 170</td>
<td>480 650 570</td>
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<td>3.6</td>
<td>60</td>
<td>60</td>
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</table>

1 for connection to 230 V 1/N/PE or 400 V 3/N/PE
*Depending on furnace design connected load might be higher

### Muffle Furnace

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Dimensions Interior in mm</th>
<th>Dimensions Outer in mm</th>
<th>Volume in l</th>
<th>Heating power in kW*</th>
<th>Weight kg</th>
<th>Minutes to Tmax 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT 5/13</td>
<td>1300</td>
<td>200 170 130</td>
<td>440 470 520</td>
<td>5</td>
<td>2.4</td>
<td>42</td>
<td>45</td>
</tr>
<tr>
<td>LT 9/13</td>
<td>1300</td>
<td>230 240 170</td>
<td>480 550 570</td>
<td>9</td>
<td>3.0</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>LT 15/13</td>
<td>1300</td>
<td>230 340 170</td>
<td>480 650 570</td>
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<td>3.6</td>
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</table>

1 for connection to 230 V 1/N/PE or 400 V 3/N/PE
2 incl. opened lift door
*Depending on furnace design connected load might be higher

### Compact Muffle Furnace

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Dimensions Interior in mm</th>
<th>Dimensions Outer in mm</th>
<th>Volume in l</th>
<th>Heating power in kW*</th>
<th>Weight kg</th>
<th>Minutes to Tmax 1</th>
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</thead>
<tbody>
<tr>
<td>LE 1/11</td>
<td>1100</td>
<td>90 115 110</td>
<td>250 265 340</td>
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<td>1.5</td>
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<td>10</td>
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<tr>
<td>LE 2/11</td>
<td>1100</td>
<td>110 180 110</td>
<td>275 380 350</td>
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<td>1.8</td>
<td>10</td>
<td>25</td>
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<tr>
<td>LE 4/11</td>
<td>1100</td>
<td>170 200 170</td>
<td>335 400 410</td>
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<td>LE 6/11</td>
<td>1100</td>
<td>170 200 170</td>
<td>510 400 320</td>
<td>6</td>
<td>1.8</td>
<td>18</td>
<td>35</td>
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<td>LE 14/11</td>
<td>1100</td>
<td>220 300 220</td>
<td>555 500 370</td>
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<td>2.9</td>
<td>25</td>
<td>40</td>
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</tbody>
</table>

1 for connection to 230 V 1/N/PE or 400 V 3/N/PE
*Depending on furnace design connected load might be higher

### Incinerator

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Dimensions Interior in mm</th>
<th>Dimensions Outer in mm</th>
<th>Volume in l</th>
<th>Heating power in kW*</th>
<th>Weight kg</th>
<th>Minutes to Tmax 1</th>
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</thead>
<tbody>
<tr>
<td>LV 3/11</td>
<td>1100</td>
<td>160 140 100</td>
<td>380 370 750</td>
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<td>1.2</td>
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<tr>
<td>LV 5/11</td>
<td>1100</td>
<td>200 170 130</td>
<td>440 470 850</td>
<td>5</td>
<td>2.4</td>
<td>35</td>
<td>120</td>
</tr>
<tr>
<td>LV 9/11</td>
<td>1100</td>
<td>230 240 170</td>
<td>480 550 900</td>
<td>9</td>
<td>3.0</td>
<td>45</td>
<td>120</td>
</tr>
<tr>
<td>LV 15/11</td>
<td>1100</td>
<td>230 340 170</td>
<td>480 650 900</td>
<td>15</td>
<td>3.6</td>
<td>55</td>
<td>120</td>
</tr>
</tbody>
</table>

1 for connection to 230 V 1/N/PE or 400 V 3/N/PE
2 incl. exhaust air pipe (Ø 80 mm)
*Depending on furnace design connected load might be higher
### Incinerator

<table>
<thead>
<tr>
<th>Model Lift Door</th>
<th>Tmax °C</th>
<th>Dimensions Interior in mm</th>
<th>Dimensions Outer in mm</th>
<th>Volume in l</th>
<th>Heating power in kW*</th>
<th>Weight kg</th>
<th>Minutes to Tmax¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVT 3/11</td>
<td>1100</td>
<td>160 140 100</td>
<td>380 370 750</td>
<td>3</td>
<td>1.2</td>
<td>20</td>
<td>120</td>
</tr>
<tr>
<td>LVT 5/11</td>
<td>1100</td>
<td>200 170 130</td>
<td>440 470 850</td>
<td>5</td>
<td>2.4</td>
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<td>120</td>
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<tr>
<td>LVT 9/11</td>
<td>1100</td>
<td>230 240 170</td>
<td>480 550 900</td>
<td>9</td>
<td>3.0</td>
<td>45</td>
<td>120</td>
</tr>
<tr>
<td>LVT 15/11</td>
<td>1100</td>
<td>230 340 170</td>
<td>480 650 900</td>
<td>15</td>
<td>3.6</td>
<td>55</td>
<td>120</td>
</tr>
</tbody>
</table>

¹ for connection to 230 V 1/N/PE or 400 V 3/N/PE
² incl. exhaust air pipe (Ø 80 mm)
*Depending on furnace design connected load might be higher

### Muffle Furnace

<table>
<thead>
<tr>
<th>Model Drop-Down Door/ Lift Door</th>
<th>Tmax °C</th>
<th>Dimensions Interior in mm</th>
<th>Dimensions Outer in mm</th>
<th>Volume in l</th>
<th>Heating power in kW*</th>
<th>Weight kg</th>
<th>Minutes to Tmax¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>L 9/11/SKM</td>
<td>1100</td>
<td>230 240 170</td>
<td>480 550 570</td>
<td>9</td>
<td>3.0</td>
<td>50</td>
<td>90</td>
</tr>
<tr>
<td>LT 9/11/SKM</td>
<td>1100</td>
<td>230 240 170</td>
<td>480 550 570+290</td>
<td>9</td>
<td>3.0</td>
<td>50</td>
<td>90</td>
</tr>
</tbody>
</table>

¹ for connection to 230 V 1/N/PE or 400 V 3/N/PE
² incl. opened lift door
*Depending on furnace design connected load might be higher

### Muffle Furnace

<table>
<thead>
<tr>
<th>Model Drop-Down Door</th>
<th>Tmax °C</th>
<th>Dimensions Interior in mm</th>
<th>Dimensions Outer in mm</th>
<th>Volume in l</th>
<th>Heating power in kW*</th>
<th>Weight kg</th>
<th>Minutes to Tmax¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>L 9/11/SW</td>
<td>1100</td>
<td>230 240 170</td>
<td>480 550 800</td>
<td>9</td>
<td>3.0</td>
<td>55</td>
<td>75</td>
</tr>
<tr>
<td>L 9/12/SW</td>
<td>1200</td>
<td>230 240 170</td>
<td>480 550 800+290</td>
<td>9</td>
<td>3.0</td>
<td>55</td>
<td>90</td>
</tr>
</tbody>
</table>

¹ for connection to 230 V 1/N/PE or 400 V 3/N/PE
*Depending on furnace design connected load might be higher

### Muffle Furnace

<table>
<thead>
<tr>
<th>Model Drop-Down Door</th>
<th>Tmax °C</th>
<th>Dimensions Interior in mm</th>
<th>Dimensions Outer in mm</th>
<th>Volume in l</th>
<th>Heating power in kW*</th>
<th>Weight kg</th>
<th>Minutes to Tmax¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT 9/11/SW</td>
<td>1100</td>
<td>230 240 170</td>
<td>480 550 800+290</td>
<td>9</td>
<td>3.0</td>
<td>55</td>
<td>75</td>
</tr>
<tr>
<td>LT 9/12/SW</td>
<td>1200</td>
<td>230 240 170</td>
<td>480 550 800+290</td>
<td>9</td>
<td>3.0</td>
<td>55</td>
<td>90</td>
</tr>
</tbody>
</table>

¹ for connection to 230 V 1/N/PE or 400 V 3/N/PE
² incl. opened lift door
*Depending on furnace design connected load might be higher

### Scale

<table>
<thead>
<tr>
<th>Type</th>
<th>Readability in g</th>
<th>Weight Range in g</th>
<th>Stamp Weight in g</th>
<th>Calibration Value in g</th>
<th>Minimum Load in g</th>
</tr>
</thead>
<tbody>
<tr>
<td>EW-2200</td>
<td>0.01</td>
<td>incl. stamp</td>
<td>850</td>
<td>0.1</td>
<td>0.5</td>
</tr>
<tr>
<td>EW-4200</td>
<td>0.01</td>
<td>incl. stamp</td>
<td>850</td>
<td>0.1</td>
<td>0.5</td>
</tr>
<tr>
<td>EW-6200</td>
<td>0.10</td>
<td>incl. stamp</td>
<td>850</td>
<td>1.0</td>
<td>5.0</td>
</tr>
</tbody>
</table>
Muffle Furnace

<table>
<thead>
<tr>
<th>Model Lift Door</th>
<th>Tmax °C</th>
<th>Dimensions Interior in mm</th>
<th>Dimensions Outer in mm</th>
<th>Volume in l</th>
<th>Heating power in kW*</th>
<th>Weight kg</th>
<th>Minutes to Tmax¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT 5/11HA</td>
<td>1100</td>
<td>200 w 160 d 130 h</td>
<td>440 W 470 D 520+220 H</td>
<td>5</td>
<td>2.4</td>
<td>36</td>
<td>60</td>
</tr>
<tr>
<td>LT 9/11HA</td>
<td>1100</td>
<td>230 w 230 d 170 h</td>
<td>480 W 550 D 570+290 H</td>
<td>9</td>
<td>3.0</td>
<td>46</td>
<td>60</td>
</tr>
<tr>
<td>LT 15/11HA</td>
<td>1100</td>
<td>230 w 330 d 170 h</td>
<td>480 W 650 D 570+290 H</td>
<td>15</td>
<td>3.6</td>
<td>56</td>
<td>75</td>
</tr>
</tbody>
</table>

¹ for connection to 230 V 1/N/PE or 400 V 3/N/PE
² incl. opened lift door

*Depending on furnace design connected load might be higher

Electrical connection

<table>
<thead>
<tr>
<th></th>
<th>1-phase: (1 N/PE)</th>
<th>3-phase: (3 N/PE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model:</td>
<td>to 3.6 kW</td>
<td>from 4.5 kW</td>
</tr>
<tr>
<td>Power plug</td>
<td>Protective contact plug (with snap-in socket)</td>
<td>CEE plug</td>
</tr>
<tr>
<td>Voltage:</td>
<td>110 V – 240 V</td>
<td>380 V – 480 V</td>
</tr>
<tr>
<td>Frequency:</td>
<td>50 or 60 Hz</td>
<td></td>
</tr>
<tr>
<td>Heating output in kW:</td>
<td>see section &quot;Specifications&quot; or type plate on the furnace</td>
<td></td>
</tr>
<tr>
<td>Thermal protection class</td>
<td>Furnaces: as specified in DIN EN 60519-2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>without safety controller Class 0</td>
<td></td>
</tr>
<tr>
<td>Protective type</td>
<td>Furnaces: IP20</td>
<td></td>
</tr>
<tr>
<td>Ambient conditions for electrical equipment</td>
<td>Temperature: Humidity: +5 °C to + 40 °C max. 80 % not condensing</td>
<td></td>
</tr>
<tr>
<td>Emissions</td>
<td>Continuous sound pressure level: &lt; 80 dB(A)</td>
<td></td>
</tr>
</tbody>
</table>
2.1 Warranty and Liability

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

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

- Everyone involved in operation, installation, maintenance, or repair of the 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.
- 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 references in the operating instructions 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,
- 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.
- Catastrophes due to third-party causes and force majeure.
3 Safety

3.1 Intended Use

This Nabertherm system was designed and manufactured after careful selection of the harmonized standards to be observed as well as other technical specifications. It therefore corresponds to the state of the art, ensuring the highest possible degree of safety. Only materials with known characteristics and melting temperatures may be used. Check the material safety data sheets if necessary.

Use of the furnace for any other purpose whatsoever such as processing products other than those intended or handling hazardous substances or substances posing a health hazard constitutes improper use and must be agreed upon with Nabertherm in writing.

Whether or not the materials used in the furnace can potentially corrode or destroy the insulation or heating elements must be ascertained.

For furnaces with over-temperature limiters, the cutoff temperature must be set to prevent overheating of the material.

Modifications to system equipment must be agreed upon with Nabertherm in writing. It is not permitted to remove, bypass, or shut down safety devices.

The installation instructions and safety guidelines must be observed. Otherwise, the furnace will not be considered as being used as designated, and all claims against Nabertherm GmbH will be void.

Opening the furnace when hot (temperature greater than 200/392 °C/°F) can lead to accelerated wear of the following components: insulation, heating elements, and furnace housing.

Operating with power sources, products, operating equipment, additives, etc. that are subject to the Ordinance on Hazardous Substances or cause risks to the health of operating personnel in any way is not permitted.

- This furnace is designed for commercial use. The furnace must **not** be used for heating food, animals, wood, grain, etc.
- The furnace must not be used as a workplace heater.
- Do not use the furnace to melt ice or similar materials.
- Do not use the furnace as a clothes dryer.

**Note**

See safety instructions in the individual sections.

**Caution**

Operating the furnace with explosive gases or mixtures, including explosive gases or mixtures created as a result of heating/drying, is prohibited.

This furnace features **no** safety technology for processes which produce combustible mixtures, for example debinding.

If the furnace is still used for such processes despite this fact, the concentration of organic gas mixtures in the furnace must never exceed 3% of the lower explosion limit (LEL). This pre-requisite applies not only to normal operation but, in particular, to exceptional situations such as process disruptions (caused, for example, by the failure of a power unit). You must ensure that the furnace is adequately ventilated and vented.

Nabertherm offers a broad range of furnaces which were especially developed for processes
involving the use of combustible gas mixtures.

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

### 3.2 Requirements for the 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 by Section 5 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 by Section 6 of the Ordinance Regulating the Use of Operating Equipment).
- operating personnel still in training initially perform their work at the furnace under the supervision of an experienced person. Successful completion of the training period must be confirmed in writing.

**Note**
In Germany, the general accident protection guidelines of VBG or BGZ must be observed. The national accident prevention regulations of the country of operation apply.
3.3 Requirements for the Operating Personnel

The furnace may be operated only by persons who are trained, instructed, and authorized to do so. These persons must know the operating instructions and act accordingly. The authorizations of the operating personnel must be clearly defined. Only adequately qualified and authorized persons may operate, maintain, or repair the furnace.

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

Only trained personnel may operate the control and safety equipment.

The operator should complete these details:

- Operator

- The 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 with manual reset/ over-temperature limiter with automatic reset.

- Mortal danger
  - If, as a result of over-temperature from the charge and/or the operating equipment, a charge is likely to be damaged at this preset cut-off temperature of the over-temperature limiter with manual reset/over-temperature limiter with automatic reset, or if the charge itself becomes a source of danger for the furnace or its surroundings, the cut-off temperature must be reduced at the over-temperature limiter with manual reset/automatic reset to the maximum permissible value.
3.4 Protective Clothing

Wear protective clothing

Wear heat-resistant gloves to protect your hands.

Wear protective goggles.

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 that all safety equipment is working as intended (e.g. emergency stop button),
- Check all hydraulic or pneumatic hoses, make sure that they are not leaking and that they are connected properly (if applicable),
- Check all gas and oil lines, make sure that they are not leaking and that they are connected properly (if applicable),
- Check that the fan works properly (if applicable)
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.

![Pull the power plug](image)

Fig. 5: 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 of electric shock](image)
3.7 Basic Measures for Servicing and Maintenance

Maintenance work must be performed by authorized persons following the maintenance instructions and the accident prevention regulations. We recommend that the maintenance and repair work be carried out by the service team of Nabertherm GmbH. Non-compliance may cause injuries, death, or considerable damage to property. Switch off the furnace 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 furnace to facilitate the repair work. Suspended loads are dangerous. Working beneath a suspended load is prohibited. There is a risk of fatal injury.

Relieve the pressure on hydraulic equipment before carrying out maintenance or repair work (if applicable). When cleaning 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 furnace,
- 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.
### 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 American National Standard Institute (ANSI) Z535.6 the following warning information and words are used in this document:

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

<table>
<thead>
<tr>
<th>NOTICE</th>
<th>Refers to a hazard that could damage or destroy the equipment.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAUTION</td>
<td>Refers to a hazard with a minor or medium risk of injury.</td>
</tr>
<tr>
<td>WARNING</td>
<td>Refers to a hazard that could cause death, serious or irreversible injury.</td>
</tr>
<tr>
<td>DANGER</td>
<td>Refers to a hazard that could directly cause death, serious or irreversible injury.</td>
</tr>
</tbody>
</table>

#### Structure of the Warning: All Warnings are Structured as Follows

- **Signal word**
  - Classifies the danger

- **Hazard symbol**
  - Indicates the risk of injury

- **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

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

**Rule - Important Information for Maintenance Personnel**
This symbol draws the maintenance personnel's attention to important operating and maintenance instructions (service) that must be followed.

**Rule - Pull Out the Power Plug**
This symbol tells the operator to pull out the power plug.

**Rule - Lift only with Several People**
This symbol draws the personnel's attention to the fact that this device may only be lifted and moved to its final destination by several people.
### Warning - Hot Surface, Do Not Touch
This symbol warns the operator that the surface is hot and should not be touched.

### Warning - Danger of Electric Shock
This symbol warns the operator that there is a risk of an electric shock if the following warnings are not heeded.

### Warning – Risk of Device Toppling Over
This symbol tells the operator that there is a risk of the device toppling over if the following warnings are not heeded.

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

### Warning – Danger if Heavy Loads Are Lifted
This symbol warns the operator of the potential dangers of lifting heavy loads. Ignoring this can lead to injury.

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

### Warning - Fire Danger
This symbol warns operators of the danger of fire if the following information is not followed.

### Warning – 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

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

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

**DANGER**
- Danger caused by incorrectly entered cut-off temperature at the over-temperature limiter with manual reset/over-temperature limiter with automatic reset.
- Mortal danger
  - If, as a result of over-temperature from the charge and/or the operating equipment, a charge is likely to be damaged at this preset cut-off temperature of the over-temperature limiter with manual reset/over-temperature limiter with automatic reset, or if the charge itself becomes a source of danger for the furnace or its surroundings, the cut-off temperature must be reduced at the over-temperature limiter with manual reset/automatic reset to the maximum permissible value.
4 Transportation, Installation, and Commissioning

4.1 Delivery

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

Danger of Injury
When the 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. 6: Pallet truck is pushed completely beneath the transportation frame](image)

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.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Device may slip or topple over.</td>
</tr>
<tr>
<td>• Damage to the device.</td>
</tr>
<tr>
<td>• Risk of injury from lifting heavy loads.</td>
</tr>
<tr>
<td>• Transport device only in original packaging.</td>
</tr>
<tr>
<td>• Several people must carry the device.</td>
</tr>
</tbody>
</table>
Symbols:
The international standard symbols for handling packaging are defined in ISO R/780 (International Organization for Standardization) and in DIN 55 402 (German Institute for Standardization).

<table>
<thead>
<tr>
<th>Description</th>
<th>Symbol</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fragile</td>
<td><img src="image" alt="Fragile Symbol" /></td>
<td>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.</td>
</tr>
<tr>
<td>This side up</td>
<td><img src="image" alt="This side up Symbol" /></td>
<td>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.</td>
</tr>
<tr>
<td>Keep dry</td>
<td><img src="image" alt="Keep dry Symbol" /></td>
<td>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.</td>
</tr>
<tr>
<td>Sling here</td>
<td><img src="image" alt="Sling here Symbol" /></td>
<td>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.</td>
</tr>
</tbody>
</table>

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.

1. Check the transportation packaging for possible damage.
2. Remove tensioning straps from the transportation packaging.
3. Slacken screws and remove wooden casing from the covering box (if available 3a).
4. Carefully lift the cardboard box and remove it from the pallet.
5. Remove the foam insert in the box. The box contains a packaging unit for accessories (Example: exhaust air tube, insert plate, power cable). Compare the delivered items with the delivery note and the order documents, see "Delivery".
6. Carefully lift the furnace out of the packaging unit.

7. To carry, grip furnace from below at the sides and make sure you have a firm grip.
8. For furnaces weighing more than 25 kg, transport work must be carried out by at least 2 people. If transport straps are used, they must be attached crosswise only. Ensure that they are secure.

**Note**
In Germany, the general accident protection guidelines of VBG or BGZ must be observed. The national accident prevention regulations of the country of operation apply.

**Note**
Save the packaging for possible shipping or for storing the furnace.
4.3 Transportation Securing Equipment/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.

4.4 Constructional and Connection Requirements

4.4.1 Installation (Furnace Location)

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

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

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

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

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

![Fig. 7: Installation (Furnace Location)]
4.5 Assembly, Installation, and Connection

4.6 Assembly of a Vent

Which vents are supplied vary depending on the application/order (does not apply to protective gas connection):

**Vent (not for LV Models)**

- Vent which exhausts the escaping gases and vapors through the exhaust air connecting piece and releases them overhead. Exhaust air cross section: 40 x 30 mm
- Install by slipping the vent onto the connecting piece on the back wall of the furnace and fasten it with the screws included in the scope of delivery.

**Vent with fan (not for LV Models)**

- Supports the venting of gases and vapors from the furnace chamber. Exhaust air cross section: 85 x 60 mm
- Install by slipping the vent onto the connecting piece on the back wall of the furnace and fasten it with the screws included in the scope of delivery. Plug the connecting plug into the socket on the back of the switchgear (optional) or in an external socket.
Vent with Fan and Catalytic Converter (not for LV Models)

- Heats the gases and vapors from the furnace chamber to approx. 600 °C and feeds it through the catalytic converter honeycomb. The converter incinerates most of the organic substances, i.e. breaks them down into carbon dioxide and steam. This largely eliminates any annoying odors (for example, during dewaxing).
- Warning! Inorganic substances such as heavy metals halogens, silicones and particulates (even in small quantities) will destroy the catalytic converter!
- The temperature of the catalytic converter must be checked; from the start of the program the converter must be operating at approx. 600 °C. A statement cannot be made regarding residues which may be released into the environment. This is largely dependent on the individual materials/embedding masses used and their compositions. Exhaust air cross section: 120 x 120 mm
- Installation: Fasten the U-shaped brackets to the back wall of the furnace using the screws included in the scope of delivery, slide the included section of pipe onto the connecting piece of the furnace and screw the vent (with CAT) firmly to the bracket. Plug the power plug into the socket on the back side (optional) of the switchgear or into an external socket.

Installation of an Exhaust Gas Pipe on LV(T) …/… Models

- These models come with a special exhaust gas pipe.
- Begin the installation by fastening the rectangular pipe to the inner housing of the furnace with the screws included in the scope of delivery, then by fastening the rounds section to the outer housing. The screws included in the scope of delivery are for this purpose.
- Operating the furnace without this pipe results in a reduced air flow which is insufficient for an incinerating process.
Caution
The installation of a catalytic converter or vent with fan is not possible on these models.

4.6.1 Venting Exhaust Fumes

We recommend connecting an exhaust air pipe to the furnace to remove the exhaust gases. For this purpose you can use a commercially available, metal exhaust gas pipe with NW80 to NW120. It must be installed continuously rising and fastened to the wall or ceiling. Center the pipe over the furnace vent (for models with vent fan or catalytic converter, NW 120 is necessary.

The exhaust gas pipe must not be installed with a tight fit to the furnace vent pipe since this would prevent any bypass effect. This is necessary so that not too much fresh air is sucked in by the furnace. (An exception are the LV furnaces: Here the exhaust gas pipe NW80 can be slid directly onto the furnace vent pipe.)

Vent A: Position the exhaust air piping approx. 50 mm over the vent.

Exhaust air (model LV/LVT) or vent with fan B: Exhaust air piping can be slid directly onto the exhaust air pipe or vent.

Furnaces without exhaust air pipe or with catalytic converter C: We recommend feeding the exhaust air through a flue.

Fig. 11: Example: Various ways of removing the exhaust air

Caution
The exhaust gases can only be vented if the workspace is ventilated with an adequate fresh-air opening.

Caution
The customer is responsible for providing the masonry and roofing work necessary for venting the exhaust. The size and design of the exhaust air system must be decided by a ventilation expert. The accident prevention regulations applicable in the country where the furnace is installed must be followed.
4.6.2 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.

Note
Before connecting the voltage supply, make sure that the power switch is in the "Off" or
"0" position.

Fig. 12: Illustrated power cable enclosed in the scope of delivery

1. First connect the enclosed power cable to the intended mains power connector on the
furnace.

2. Now connect the enclosed power cable to the power connection. Only use a socket
with grounding contact to supply power.
1. Connect the power cable to the power connection. Only use a socket with grounding contact to supply power.

Grounding of the furnace and switching system (compliant with VDE 0100, part 410) is a prerequisite for the current-operated e.l.c.b. system of the heater.

Test the ground resistance (compliant with VDE 0100); see also accident prevention guidelines.

Electrical systems and equipment compliant with BGV A3.

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

**Warning - danger due to electrical current!**
Work on the electrical equipment may only be performed by qualified, authorized electricians.

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

**Note**
For wiring and electrical connections, see the attached circuit diagram. The electrical equipment of the machine can also be seen in the circuit diagram.
4.6.3 Insertion of the Base Plate

Carefully place the insert plate(s) *) (number of insert plates depends on the furnace model), distributed across the floor of the furnace, starting from the middle. When placing the insert plate(s) make sure that neither the door collar nor the heating elements are damaged. Absolutely avoid touching the heating elements when inserting the heating plate(s). Contacting the heating elements can result in their immediate destruction. The furnace floor is made of high-quality refractory material but this material is highly sensitive to impact or pressure.

Some models are supplied with one insert plate as a standard in order to prevent the soft furnace floor from being damaged. Nabertherm accepts no liability for damage (e.g. depressions) in the furnace floor resulting from not using these insert plates. *) Damaged insert plate(s) must be immediately replaced with new ones (see the section "Spare Parts/Wearing Parts").

The charge must be positioned in the furnace chamber, on the floor, as centered as possible. This ensures uniform heating.

After charging, the furnace door must be closed carefully.

*) in scope of delivery depending on the design/furnace model

Note

It must be ensured that the load on the furnace base does not exceed 2 kg/dm².
In scope of delivery depends on design/furnace model

Fig. 14: Inserting the ceramic insert plate

**Installing the Scale on the L(T)../../SW Model**

- Insert the ceramic stamp ① included in the scope of delivery from below into the hole in the floor of the furnace.
- Place the scale ② in the frame under the furnace. At the same time raise the pipe carefully and place it on the supporting surface of the scale.
- To hold the pipe in place the support die ③ must be slide into the space between the pipe and the supporting surface of the scale. This is done by carefully raising the pipe.
- In the furnace chamber, slide the ceramic plate ④ with its guide onto the pipe and orient it precisely. The pipe must be free-standing on the scale and must not have any contact with the furnace insulation to avoid falsifying the measurement results.
- Connect the scale with the power plug.
- The function of the scale: This information can be found in the instructions enclosed with the scale.
- Separate instruction manual for MV software (optional)
4.7 Commissioning

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.
4.8 Recommendations for Heating the Furnace for the First Time

The furnace must first be heated up to dry out the masonry and generate a protective oxidated layer on the heating elements.

During the heating up the furnace may give off unpleasant odors, which is due to the release of binding agents from the insulation material. We recommend that the furnace location be well ventilated during the first warm-up phase.

- Warm up the empty furnace over a period of roughly 6 hours\(^1\) to 1050 °C (1922 °F).
  Hold this temperature for roughly 1 hour.
- Warm up LE .../... models to 1000 °C (1832 °F) (without the warm-up ramp).
- After the first warm-up phase, let the furnace cool down naturally to room temperature.
- The furnace is now ready to operate

1) Warm-up ramp

**Caution**

This procedure must be performed at the time the furnace is commissioned, following the replacement of heating elements or to regenerate the oxidated layer.

4.9 Loading/Charging

**Charging the Furnace**

The insulation is made of high-quality refractory material but is highly sensitive to impact. Avoid contact when charging to prevent any damage.

To obtain a temperature distribution which is as uniform as possible it is advantageous to leave space between the pieces and between the pieces and the side walls. Nabertherm supplies insert plates (base plate) and the like to help you make use of the furnace chamber. Loading a very large quantity of ware into the furnace chamber can substantially lengthen the heating-up time.

The furnace heating system is interrupted if the door is opened. After the door is reclosed, it is automatically switched on again (not applicable to LE .../... models).

If it can be at all avoided, do not open the furnace when it is hot. When it is necessary to open the furnace at a high temperature, the time should be kept to an absolute minimum.

Make sure that operators wear the appropriate protective clothing and that the workspace is adequately ventilated.

Always make sure that the door is completely closed.

Stainless steel sheet can discolor (especially if the furnace is opened while hot). This does not impair functionality in any way. This is no reason for a complaint.

**Caution LE .../... Models:**

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

**Caution for LT .../HA Models:**

The recirculating air motor starts when the program begins and cuts out again automatically when the program ends and the furnace chamber temperature has dropped to below 80 °C.
(176 °F). Above this temperature the furnace must not be switched off or disconnected from its power source. If this caution is not observed the recirculating air motor may be damaged.

**Warning - Danger of Electric Shock!**

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

**Cracks in the Insulation**

The insulation of the furnace and/or the side heating plates in the furnace (depending on the furnace model) are made of very high-quality refractory material. Thermal expansion causes cracks in the insulation even after only a few warm-up cycles and, in some circumstances, in the side heating plates as well. But these have no impact on the function or quality of the furnace. This is no reason for a complaint.

![Fig. 16: Example: Cracks in the insulation after a few warm-up cycles.](image)

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**Notice for the Use of Catalytic Converters and Exhaust Vent Fan:**

The air feed lever must always be set to because the exhaust gases cannot be adequately vented from the furnace chamber.

**Information for LV/LVT …/… Models:**

These models have an independent, air feed system which cannot be regulated. The fresh air is fed through holes in the back wall into the upper heating plate where it is pre-heated and comes back out in front, above the furnace chamber. In the setting of the air feed lever fresh air is also fed in which is not pre-heated. For complete feed air pre-heating select the setting. During protective gas connection/operation the lever must be set to .
5 Operation

5.1 Operating Controller B 180/P 330

Fig. 17: Example: Controller

1. The control power is switched on and off with the power switch (1). When the control voltage is switched on the heating space temperature is displayed by the controller (2) in the LED.

2. The desired heating and cooling program is set at the controller (2). The description of the controller is in a separate instruction manual.

3. Temperature value of the over-temperature limiter (3) (optional) must be set 30 °C higher than the setting on the controller. Description of the over-temperature limiter (OTL) is contained in the instruction manual of the controller B 180/P 330.

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

Caution
Description of the controller B 180/P 330 is contained in a separate instruction manual.
### 5.2 Operating Controller R 6

![Controller R 6](image)

#### Key

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="OFF/ON" /></td>
<td>Switch on furnace <strong>I</strong>&lt;br&gt;The furnace is switched on and off with the power switch &quot;<strong>I</strong>&quot;. When the power is switched on, the current furnace temperature (actual temperature) is shown on the controller display (Example: <strong>20 °C</strong>).&lt;br&gt;When the <strong>K1</strong> lamp &quot;<strong>I</strong>&quot; remains on, this means that the controller is ready. **</td>
<td>**</td>
</tr>
<tr>
<td><img src="image" alt="Press" /> <strong>P</strong></td>
<td>To adjust the required furnace temperature (temperature set point), press the &quot;<strong>P</strong>&quot; button once. The display alternates between &quot;<strong>SP</strong>&quot; and the last temperature set point in the entry level (Example: <strong>0 °C</strong>)&lt;br&gt;&lt;br&gt;Use the &quot;<strong>&lt;</strong>&quot; and &quot;<strong>&gt;</strong>&quot; buttons to set the required furnace temperature (temperature set point) between <strong>0 °C</strong> and <strong>300 °C</strong> (Example: <strong>230 °C</strong>)&lt;br&gt;&lt;br&gt;Increase the value with <strong>△</strong> (225, 229, 230)&lt;br&gt;Reduce the value with <strong>▽</strong> (230, 226, 225)&lt;br&gt;&lt;br&gt;Wait 2 seconds until the new temperature set point is integrated automatically (display flashes 1x)&lt;br&gt;(For the required temperature set point you can choose a temperature range from 5°C above room temperature to 300°C).</td>
<td><strong>SP</strong> 0</td>
</tr>
<tr>
<td><img src="image" alt="Press" /> <strong>P</strong></td>
<td>The display changes automatically after 15 seconds or if you press the &quot;<strong>P</strong>&quot; button again&lt;br&gt;(The current furnace temperature is displayed. Example <strong>20 °C</strong>). **</td>
<td>20</td>
</tr>
<tr>
<td><img src="image" alt="OFF/ON" /></td>
<td>Switch on heating <strong>I</strong> → The heating process is started.&lt;br&gt;Use the &quot;** Initialise &quot; switch to switch the heating on and off.&lt;br&gt;When the <strong>K2</strong> lamp &quot;<strong>I</strong>&quot; flashes, this means that the heating is ready.</td>
<td><strong>I</strong></td>
</tr>
<tr>
<td><img src="image" alt="Press" /> <strong>P</strong></td>
<td>You can check the temperature set point at any time with the &quot;<strong>P</strong>&quot; button.</td>
<td><strong>I</strong></td>
</tr>
</tbody>
</table>

* = Set point
5.3 Over-Temperature Limiter with Manual Reset and Adjustable Cut-Off Temperature

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.

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.

The display jumps back to the start screen showing the trigger temperature. The current trigger temperature is displayed.

Entry finished.

For more information about operation, see the separate instructions for the Eurotherm 2132i.
5.4 Air Inflow Lever

The volume of air fed to the furnace can be adjusted with the fresh air lever. The fresh air lever is located at the side of the door at the bottom. The position is explained by the symbols beside and on the lever.

![Fresh air lever (figure similar)](image)

Fig. 1: Fresh air lever (figure similar)

![Regulating the feed of fresh air (symbols)](image)

Fig. 21: Regulating the feed of fresh air (symbols)

Notice for the Use of Catalytic Converters and Exhaust Vent Fan:
The air feed lever must always be set to because the exhaust gases cannot be adequately vented from the furnace chamber.

Information for LV/LVT …/… Models:
These models have an independent, air feed system which cannot be regulated. The fresh
air is fed through holes in the back wall into the upper heating plate where it is pre-heated and comes back out in front, above the furnace chamber. In the setting of the air feed lever fresh air is also fed in which is not pre-heated. For complete feed air pre-heating select the setting. During protective gas connection/operation the lever must be set to .

Note
If the fresh air lever is open, under certain circumstances this may affect temperature uniformity in the furnace chamber.

6 Servicing, Cleaning, and Maintenance

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

Warning - Danger due to Electrical Current!
Work on the electrical equipment may only be performed by qualified, authorized electricians!

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

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

Safety systems removed during maintenance tasks must be replaced after the work. Warning of swinging loads in the workshop (e.g. crane systems). Work under a lifted load (e.g. a lifted furnace or switching system) is not permitted. Safety switches and any limit switches present must be checked for function periodically (BGV A3) or according to the national guidelines of the country of operation. To ensure proper temperature regulation of the furnace, the thermocouple must be checked for damage before every process. If necessary, retighten the element holders (see chapter "Replacing the Heating Element"). Before carrying out this work, the voltage supply to the furnace and/or switching system must be switched off (disconnect mains power connector). The regulations (BGV A3) or corresponding national regulations in the relevant country of operation must be observed. There are one or more contactors in the control system. The contacts of these circuit breakers are wearing parts and must therefore be serviced and/or replaced regularly (BGV A3) or according to the national guidelines of the country of operation. The switching system cabinet (if available) contains vent grilles with integrated filter mats. These must be cleaned and/or replaced at regular intervals in order to ensure sufficient
intake and outflow of air from the switching system. During melting operation, the switching cabinet door must always be firmly closed.

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

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

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

6.1 Shutting the System Down for Maintenance

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

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

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

Warning - Dangers During Normal Operation!
Do not touch any object without first having checked its temperature.
6.2 Regular Maintenance of the Furnace

<table>
<thead>
<tr>
<th>Position/Maintenance Point</th>
<th>Measure</th>
<th>Maintenance Interval</th>
<th>Operating Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety test in accordance with BGV A3 or corresponding national regulations</td>
<td>According to regulations</td>
<td>According to regulations</td>
<td>x</td>
</tr>
<tr>
<td>Safety and limit switches (if available)</td>
<td>Function test</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Furnace chamber, flue outlets and flue</td>
<td>Clean and check for damage, vacuum out carefully</td>
<td>■</td>
<td>x</td>
</tr>
<tr>
<td>Seal surfaces: door lining/furnace lining</td>
<td>Visual check</td>
<td>●</td>
<td>x</td>
</tr>
<tr>
<td>Heating elements</td>
<td>Visual check (visible part of the heating element in the furnace chamber)</td>
<td>●</td>
<td>x</td>
</tr>
<tr>
<td>Check for even power consumption of heating</td>
<td>Function test</td>
<td>●</td>
<td>x</td>
</tr>
<tr>
<td>Thermocouple</td>
<td>Visual check (visible part of the thermocouple in the furnace chamber)</td>
<td>●</td>
<td>x</td>
</tr>
<tr>
<td>Set setpoint</td>
<td>Test according to work schedules</td>
<td>●</td>
<td>x</td>
</tr>
</tbody>
</table>

Key: ■ = clean    ● = check, replace    x = performance by

Fig. 22: Maintenance table

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 BGV A3 or the corresponding national regulations in the country where the furnace is installed. Wait until the furnace and the connected parts have cooled to room temperature.

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

6.4 Cleaning Products

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

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

Follow the labeling and the instructions on the packaging of the detergent. Wipe the surface with a damp, lint-free cloth. The following detergents can also be used:

<table>
<thead>
<tr>
<th>Component and location</th>
<th>Detergent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer surfaces (frames *)</td>
<td>Use commercially available detergent which is either water-or non-combustible and free of any solvents for cleaning *)</td>
</tr>
<tr>
<td>Outer surface (stainless steel)</td>
<td>Stainless still cleaner</td>
</tr>
<tr>
<td>Interior</td>
<td>Carefully clean with a vacuum cleaner (avoid the heating elements)</td>
</tr>
<tr>
<td>Insulation materials</td>
<td>Carefully clean with a vacuum cleaner (avoid the heating elements)</td>
</tr>
<tr>
<td>Door seal (if included)</td>
<td>Use commercially available detergent which is either water-or non-combustible and free of any solvents for cleaning</td>
</tr>
<tr>
<td>Instrument panel</td>
<td>Wipe the surface with a damp, lint-free cloth. (e.g. glass cleaner)</td>
</tr>
</tbody>
</table>

*) You must be sure that the cleaner does not damage the water-soluble and, hence, environmentally safe paint (the clear should be tried first on an interior, normally unseen location).

Fig. 23: Detergent

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

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

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

Caution

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

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

<table>
<thead>
<tr>
<th>Type of malfunction</th>
<th>Possible causes</th>
<th>Malfunction rectification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller does not switch on.</td>
<td>-No voltage available.</td>
<td>-Check connection fuse(s), renew if necessary.</td>
</tr>
<tr>
<td></td>
<td>-Controller defective.</td>
<td>-Check controller fuses (if available), renew if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Check plug connector.</td>
</tr>
<tr>
<td>Controller indicates malfunction.</td>
<td>-See separate instructions for controller.</td>
<td>-See separate instructions for controller.</td>
</tr>
<tr>
<td>No heating chamber heating after starting program.</td>
<td>-Error in program input.</td>
<td>-Check heating program (see separate instructions for controller)</td>
</tr>
<tr>
<td></td>
<td>-Connection fuse(s) defective.</td>
<td>-Check connection fuse(s), renew if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Notify Nabertherm Service if the new fuse trips on screwing in.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Have checking carried out by Nabertherm Service.</td>
</tr>
<tr>
<td>Very slow heating chamber heating.</td>
<td>-Connection fuse(s) defective.</td>
<td>-Check connection fuse(s), renew if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Notify Nabertherm Service if the new fuse trips on screwing in.</td>
</tr>
<tr>
<td>Selected end temperature is not reached.</td>
<td>-Lack of heater output due to undervoltage.</td>
<td>-Have checking carried out by Nabertherm Service.</td>
</tr>
<tr>
<td></td>
<td>-Heating element defective</td>
<td></td>
</tr>
</tbody>
</table>
7.1 Replacing a Fuse

7.1.1 Fuse Located Outside the Switchgear

A fuse is located on the back of the furnace beside the power cable connection. The fuse is an important component of the power supply system and protects the furnace and its components against damage and fire. When you insert a new fuse, make sure that the fuse rating is suitable for the voltage used by your furnace.

---

**NOTICE**

- Damage to the furnace and its components
- Use of a fuse that is NOT suitable for the respective voltage may damage the furnace and its components and is a fire hazard.
- Use only a suitable fuse type. Check that the fuse type has the correct nominal current value.

---

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

---

![Fuse holder](image)

Fig. 24: The fuse is located in the back wall of the furnace.

- Insert a suitable flat blade screwdriver into the slot of the fuse holder. To remove the fuse holder, press it in and turn it anti-clockwise. After a few turns, pull the fuse holder out carefully with your fingertips.

---

![Fuse holder](image)

Fig. 25: Release and pull out the fuse holder

- Remove the fuse from the fuse holder.
- Replace the defective fuse with a similar fuse.
- Before you replace the fuse, make sure that it has the correct nominal current. For the correct fuse (fuse link), see "Spare/Wearing Parts".
Note
The nominal current is engraved into the metal cap of the fuse or can be found imprinted directly on the fuse.

- Insert the new fuse into the fuse holder. Make sure that the fuse is pushed fully into the holder.
- Replace the fuse holder slowly and carefully. To fix the fuse holder, insert the flat blade screwdriver into the slot and turn it in a clockwise direction with some pressure.

Check that the power cable is not damaged. The power cable must not be damaged. Power cables may be replaced only with similar, approved cables.
- Reconnect the power cable (see "Connecting the Furnace to the Power Supply")
- Switch on the furnace's power switch (see "Operation")
7.1.2 Fuse Located Inside the Switchgear

A Fuse is located inside the switchgear cabinet. The fuse is an important component of the power supply system and protects the furnace and its components against damage and fire. When you insert a new fuse, make sure that the fuse rating is suitable for the voltage used by your furnace.

**NOTICE**

- Damage to the furnace and its components
- Use of a fuse that is NOT suitable for the respective voltage may damage the furnace and its components and is a fire hazard.
- Use only a suitable fuse type. Check that the fuse type has the correct nominal current value.

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

**Removing the switchgear cover**

The number and position of the screws may differ from one furnace model to the next.

Fig. 28: Remove rear wall (figure similar)
Remove the screws from the rear wall and keep them in a secure place for later use.
Remove the fuse from the fuse holder.
Replace the defective fuse with a similar fuse.
Before you replace the fuse, make sure that it has the correct nominal current.

Insert the new fuse into the fuse holder. Make sure that the fuse is pushed fully into the holder.
Check that the power cable is not damaged. The power cable must not be damaged. Power cables may be replaced only with similar, approved cables.

Assemble the loosened parts in the reverse sequence.
7.2 Separate the Snap-In Coupling (Plug) from the Furnace Housing

With a small flat blade screwdriver carefully push the locking latch ① upward while pulling the plug ② out of the coupling ③.

Fig. 31: Separate the snap-in coupling (plug) from the furnace housing
8 Spare Parts/Wearing Parts

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

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

<table>
<thead>
<tr>
<th>Model</th>
<th>Designation</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Furnace</td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>Fiber wool</td>
<td>691600518 *)</td>
</tr>
<tr>
<td>2</td>
<td>Electrical/controllers</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Controller P 330</td>
<td>520100258</td>
</tr>
<tr>
<td>2.2</td>
<td>Controller P 180</td>
<td>520100257</td>
</tr>
<tr>
<td>2.3</td>
<td>Controller R 6</td>
<td>635001141</td>
</tr>
<tr>
<td>2.4</td>
<td>Rocker switch</td>
<td>541700200</td>
</tr>
<tr>
<td>2.5</td>
<td>G back-up set 2 A</td>
<td>541500182</td>
</tr>
<tr>
<td>2.6</td>
<td>G back-up set 10 A</td>
<td>541500215</td>
</tr>
<tr>
<td>2.7</td>
<td>G back-up set 16 A</td>
<td>541500303</td>
</tr>
<tr>
<td>2.8</td>
<td>Power cable</td>
<td>V0013xx</td>
</tr>
<tr>
<td>3</td>
<td>Tools</td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*) = Quantity depending on need

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

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

8.1 Electrical Schematics/Pneumatic Schematics

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

Contact Nabertherm Service at any time for maintenance and repair. If you have any questions, problems, or requirements, contact Nabertherm GmbH. By mail, phone or e-mail.

Mail
Nabertherm GmbH
Bahnhofstrasse 20
28865 Lilienthal/Germany

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

Web or E-mail
www.nabertherm.com
contact@nabertherm.com

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

Provide the following details from the type plate:

Fig. 32: Example (type plate)
10 Shut-Down, Dismantling, and Storage

10.1 Environmental Regulations

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

- Dismantle the electronic components and dispose of them as electric scrap.
- Remove the insulation and dispose of it as hazardous waste (See Servicing, Cleaning, and Maintenance with Ceramic Fiber Material)
- Dispose of the housing as scrap metal.

Note

Observe the national regulations of the country in which the furnace will be used.
10.2 Transportation/Return Transportation

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

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

- 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 °C (-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 Equipment"), use this.
Otherwise, in general:
"Fix" and "secure" (adhesive tape) all moving parts and cushion and protect any projecting parts against breakage.

Protect your electronic equipment against moisture and make sure that no loose packaging material can get inside it.
Fill gaps in your packaging with soft but adequately firm material (e.g. foam mats) and make sure that the equipment cannot slide around in the packaging.

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

As a rule:
The 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.
11 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:

<table>
<thead>
<tr>
<th>Product</th>
<th>Laboratory Furnaces (Muffle Furnaces)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>L .../...LE .../...LT .../...LV .../...LVT .../-SKM-SW-HA</td>
</tr>
</tbody>
</table>

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:

- Directive 2006/95/EC for electrical equipment designed for use within certain voltage limits
- Directive 2004/108/EC on electromagnetic compatibility

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.

- DIN EN 746-1 (02.2010)
- DIN EN 60204-1 (06.2007)
- DIN EN 60519-1 (10.2011), DIN EN 60519-2 (05.2007)
- DIN EN 61000-6-2 (03.2006), DIN EN 61000-6-4 (09.2011)

The following harmonized standards were applied:

Lilienthal, 12.01.2011

________________________    _______________________
Thomas Adamek      Wolfgang Bartilla
Quality Management     Research and Development