Laboratory

Muffle Furnaces
Preheating Furnaces
Ashing Furnaces
Tube Furnaces
Ovens
Air Circulation Furnaces
Chamber Furnaces
Melting Furnaces
High-Temperature Furnaces
Sintering Furnaces of Zirconia
Vacuum Furnaces
Dental Furnaces

www.nabertherm.com
Made in Germany
Nabertherm with a staff of more than 300 employees worldwide, have developed and produced furnaces and ovens for laboratory and industrial applications for more than 60 years. 150,000 satisfied customers in 100 countries document our success. Subsidiaries and partners, established for years in all the significant countries of the world guarantee one-on-one customer service and advice on site. Complete fabrication of our furnaces takes place exclusively at facilities in Lilienthal/Bremen. Nabertherm will continue to concentrate its full production in Germany in the future.

Benchmarks in Quality and Reliability
Our product line ranges from standard muffle furnaces to technically demanding high-temperature and vacuum furnaces. A variety of accessories is available to adapt standard furnaces to your particular needs. The innovative Nabertherm regulation and automation technology enables precise control, as well as monitoring and documentation of processes.

The depth of our product range guarantees the application flexibility of our furnaces. Applications like ashing and burn-off, heat treatment, drying, or the manufacture of bioceramics are just a few examples of the many uses for our furnaces.

Technical details like the double-wall stainless steel housings on most of our furnaces mean both energy-efficiency and a long service life, ensuring your decisive competitive advantage.

Time is Money
We know you need your laboratory furnaces fast in order to be able to perform your experiments or production. And we won’t let you down in this important point. That’s why many models are warehoused ready to deliver. Even for complex laboratory furnaces, we promise you quick delivery.

Customer Service and Replacement Parts
The experts on our customer service team are ready to answer any of your questions. Whether on site, by telephone, or by email, our service technicians will solve your problem. We are particularly proud of our replacement parts service. We send you most replacement parts anywhere in the world in the shortest possible time – and at fair prices, no matter how old your furnace is.

Experience in many Applications
Besides furnaces for the laboratory, Nabertherm also provides a range of standard furnaces for a variety of other application areas. Many laboratory furnaces are also available in larger versions for your production facilities. Our experienced engineering team views customer-specific solutions as a challenge. We are also happy to provide consulting on custom system solutions.
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Professional Furnaces: L 3/11 - LT 40/12 with Folding Door or Lift Door

L 3/11 - LT 40/12
Our L 3/11 - LT 40/12 series is the right choice for daily laboratory use. These models stand out for their excellent workmanship, advanced and attractive design, and high level of reliability. The furnaces come equipped with either a folding door or lift door at no extra charge.

- Tmax 1100 °C or 1200 °C
- Ceramic heating plates with integral heating element which is safeguarded against fumes and splashing, and easy to replace
- Highly durable cured vacuum fibre module lining
- Casing made of sheets of textured stainless steel (non-rusting design)
- Double-walled casing for low external temperatures and high stability
- Optional fold-down door (L) which can be used as work platform or lift door (LT) with hot surface facing away from the operator
- Adjustable air inlet integrated in door (see illustration)
- Exhaust air outlet in rear wall of furnace
- Silent solid-state power control relay
- Please see page 48 for a description of various controllers

Additional Equipment
- Vent, vent with fan or catalytic converter
- Over-temperature limit controller with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the oven and load
- Protective gas connection on the rear wall of furnace
- Manual or automatic gas supply system
- Please see page 13 for more optional equipment
Infinetely variable working air inlet sliding valve

<table>
<thead>
<tr>
<th>Model</th>
<th>Lift door</th>
<th>Max. temperature</th>
<th>Inner dimensions in mm</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection*</th>
<th>Weight in kg</th>
<th>Minutes to Tmax</th>
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</thead>
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<tr>
<td>LT 3/1</td>
<td>L 100</td>
<td>160 140 100</td>
<td>3</td>
<td>380 370 420</td>
<td>1,2 single-phase</td>
<td>20</td>
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<td></td>
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<td>LT 5/1</td>
<td>L 200</td>
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<td>440 470 520</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>LT 9/1</td>
<td>L 200</td>
<td>170 120</td>
<td>9</td>
<td>480 550 570</td>
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<td></td>
<td></td>
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<td>600 790 650</td>
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<td>95</td>
<td>95</td>
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</tbody>
</table>

¹Including opened lift door *Please see page 48 for more information about mains voltage
Compact Muffle Furnaces LE 2/11 - LE 14/11

With their unbeatable price/performance ratio, these compact muffle furnaces are perfect for many applications in the laboratory. Quality features like the double-walled furnace casing of rust-free stainless steel, their compact, lightweight constructions, or the heating elements encased in quartz glass tubes make these models reliable partners for your application.

- Tmax 1100 °C, working temperature 1050 °C
- Heating from two sides from heating elements in quartz glass tubes
- Maintenance-friendly replacement of heating elements and insulation
- Multilayered insulation with fibre plates in the furnace chamber
- Casing made of sheets of textured stainless steel (non-rusting design)
- Double-walled casing for low external temperatures and high stability
- Folding door which can also be used as a work platform
- Exhaust air outlet in rear wall
- Silent solid state relay
- Compact dimensions and light weight
- Controller mounted in side space (under the door on the LE /1 1 and LE 4/1 1 to save space)
- Please see page 48 for a description of various controllers

Additional Equipment
- Vent, vent with fan or catalytic converter
- Over-temperature limit controller with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the oven and load
- Protective gas connection on the rear wall of furnace
- Manual gas supply system
- Please see page 13 for more optional equipment

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Inner dimensions in mm</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection</th>
<th>Weight in kg</th>
<th>Minutes to Tmax</th>
</tr>
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<tbody>
<tr>
<td>LE 2/11</td>
<td>1100</td>
<td>110 x 180 x 110</td>
<td>2</td>
<td>275 x 380 x 350</td>
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<tr>
<td>LE 4/11</td>
<td>1100</td>
<td>170 x 200 x 170</td>
<td>4</td>
<td>335 x 400 x 410</td>
<td>1,8</td>
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<td>35</td>
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<tr>
<td>LE 6/11</td>
<td>1100</td>
<td>170 x 200 x 170</td>
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<td>510 x 400 x 320</td>
<td>1,8</td>
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<td>35</td>
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<td>LE 14/11</td>
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<td>220 x 300 x 220</td>
<td>14</td>
<td>555 x 500 x 370</td>
<td>2,9</td>
<td>single-phase</td>
<td>25</td>
<td>40</td>
</tr>
</tbody>
</table>

*Please see page 48 for more information about mains voltage
Muffle Furnaces L 3/13 - LT 15/13 with Brick Insulation and Flap Door or Lift Door

L 3/13 - LT 15/13
Heating elements embedded in grooves radiating freely into the furnace chamber give these models particularly short heating times. Thanks to their robust lightweight refractory brick insulation, they can reach a maximum working temperature of 1300 °C. These models thus represent an interesting alternative to the familiar L(T) 3/11 models, when you need particularly short heating times or a higher application temperature.

- Tmax 1300 °C
- Heating elements freely radiating, embedded in grooves for high heating speeds
- Multilayer insulation with robust lightweight refractory bricks in the furnace chamber
- Casing made of sheets of textured stainless steel (non-rusting design)
- Double-walled casing for low external temperatures and stability
- Optional fold-down door (L) which can be used as work platform or lift door (LT) with hot surface facing away from the operator
- Adjustable air inlet in the furnace door
- Exhaust air outlet in rear wall of furnace
- Silent solid-state power control relay
- Please see page 48 for a description of various controllers

Additional Equipment
- Vent, vent with fan or catalytic converter
- Over-temperature limit controller with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the oven and load
- Protective gas connection on the rear wall of furnace
- Manual or automatic gas supply system
- Please see page 13 for more optional equipment

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Inner dimensions in mm</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection</th>
<th>Weight in kg</th>
<th>Minutes to Tmax</th>
</tr>
</thead>
<tbody>
<tr>
<td>L     3/13</td>
<td>1300</td>
<td>160 140 100</td>
<td>3 380 370 420</td>
<td>1.6</td>
<td>single-phase</td>
<td>25 45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L     5/13</td>
<td>1300</td>
<td>200 170 130</td>
<td>5 440 470 520</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>L     9/13</td>
<td>1300</td>
<td>230 240 170</td>
<td>9 480 550 570</td>
<td>3.0</td>
<td>single-phase</td>
<td>60 50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L 15/13</td>
<td>1300</td>
<td>230 340 170</td>
<td>15 480 650 570</td>
<td>3.6</td>
<td>single-phase</td>
<td>70 60</td>
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<table>
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<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Inner dimensions in mm</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection</th>
<th>Weight in kg</th>
<th>Minutes to Tmax</th>
</tr>
</thead>
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<td>LT    3/13</td>
<td>1300</td>
<td>160 140 100</td>
<td>3 380 370 420+165</td>
<td>1.6</td>
<td>single-phase</td>
<td>25 45</td>
<td></td>
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</tr>
<tr>
<td>LT    5/13</td>
<td>1300</td>
<td>200 170 130</td>
<td>5 440 470 520+220</td>
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<td>single-phase</td>
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<td>LT    9/13</td>
<td>1300</td>
<td>230 240 170</td>
<td>9 480 550 570+290</td>
<td>3.0</td>
<td>single-phase</td>
<td>60 50</td>
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</tr>
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<td>15 480 650 570+290</td>
<td>3.6</td>
<td>single-phase</td>
<td>70 60</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹Including opened lift door

*Please see page 48 for more information about mains voltage
Ashing Furnaces LV 3/11 - LVT 15/11 with Flap Door or Lift Door

The models LV 3/11 - LVT 15/11 are especially designed for ashing in the laboratory. A special air intake and exhaust system allows air exchange of more than 6 times per minute. Incoming air is preheated to ensure a good temperature uniformity.

- $T_{\text{max}}$ 100 °C
- Ceramic heating plates with integral heating element which is safeguarded against fumes and splashing, and easy to replace
- Highly durable, high-performance cured vacuum fibre module lining
- Casing made of sheets of textured stainless steel (non-rusting design)
- Double-walled casing for low external temperatures and stability
- Optional fold-down door (L) which can be used as work platform or lift door (LT) with hot surface facing away from the operator
- Silent solid-state power control relay
- Air exchanged more than 6 times per minute
- Good temperature uniformity due to preheating of incoming air
- Please see page 48 for a description of the different controllers
Additional Equipment

- Over-temperature limit controller with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the oven and load
- Please see page 13 for more optional equipment

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax</th>
<th>Inner dimensions in mm</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection*</th>
<th>Weight in kg</th>
<th>Minutes to Tmax</th>
</tr>
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<tbody>
<tr>
<td>LV 3/11</td>
<td>1100</td>
<td>160 x 140 x 100</td>
<td>3</td>
<td>380 x 370 x 750</td>
<td>1.2</td>
<td>single-phase</td>
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<td>120</td>
</tr>
<tr>
<td>LV 5/11</td>
<td>1100</td>
<td>200 x 170 x 130</td>
<td>5</td>
<td>440 x 470 x 850</td>
<td>2.4</td>
<td>single-phase</td>
<td>35</td>
<td>120</td>
</tr>
<tr>
<td>LV 9/11</td>
<td>1100</td>
<td>230 x 240 x 170</td>
<td>9</td>
<td>480 x 550 x 900</td>
<td>3.0</td>
<td>single-phase</td>
<td>45</td>
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<td>LV 15/11</td>
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<td>480 x 650 x 900</td>
<td>3.6</td>
<td>single-phase</td>
<td>55</td>
<td>120</td>
</tr>
</tbody>
</table>

*Including exhaust tube (Ø 80 mm)

*Please see page 48 for more information on mains voltage
Muffle Furnaces L, LT 9/11/SKM with embedded Heating Elements in the Ceramic Muffle

We particularly recommend the L 9/11/SKM model if your application involves aggressive substances. The furnace has a ceramic muffle with embedded heating from four sides. The furnace thus combines a very good temperature uniformity with excellent protection of the heating elements from aggressive atmospheres. Another aspect is the smooth, nearly dust-free muffle (furnace door made of fibre insulation), an important quality feature for some ashing processes.

- **Tmax 1100 °C**
- Muffle heated from four sides
- Furnace chamber with embedded ceramic muffle, high resistance to aggressive gasses and vapours
- Casing made of sheets of textured stainless steel (non-rusting design)
- Optional fold-down door (L) which can be used as work platform or lift door (LT) with hot surface facing away from the operator
- Adjustable working air inlet in the door
- Exhaust air outlet in rear wall of furnace
- Silent solid-state power control relay
- Please see page 48 for a description of the different controllers

### Additional Equipment

- Vent, vent with fan or catalytic converter
- Over-temperature limit controller with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the oven and load
- Protective gas connection on the rear wall of furnace
- Manual or automation gas supply system
- Please see page 13 for more optional equipment

### Model Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Inner dimensions in mm</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection*</th>
<th>Weight in kg</th>
<th>Minutes to Tmax</th>
</tr>
</thead>
<tbody>
<tr>
<td>L 9/11/SKM</td>
<td>1100</td>
<td>230 240 170</td>
<td>9</td>
<td>480 550 570</td>
<td>3,0</td>
<td>single-phase</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>LT 9/11/SKM</td>
<td>1100</td>
<td>230 240 170</td>
<td>9</td>
<td>480 550 570+90¹</td>
<td>3,0</td>
<td>single-phase</td>
<td>50</td>
<td>90</td>
</tr>
</tbody>
</table>

¹Including opened lift door

*Please see page 48 for more information about mains voltage
Furnace Systems with Scale and Software for Determination of Combustion Loss

L 9/11/SW - LT 9/12/SW
This complete system, with an furnace, integrated precision scale, and software, was designed especially for combustion loss determination in the laboratory. The determination of combustion loss is necessary, for instance, when analyzing sludges and household garbage, and is also used in a variety of technical processes for the evaluation of results. The difference between the initial total mass and the combustion residue is the combustion loss. During the process, the software included records both the temperature and the weight loss.

- Tmax 1100 °C or 1200 °C
- Ceramic heating plates with integral heating element which is safeguarded against fumes and splashing, and easy to replace
- Highly durable cured vacuum fibre module lining
- Casing made of sheets of structured stainless steel (non-rusting design)
- Optional fold-down door (L) which can be used as work platform or lift door (LT) with hot surface facing away from the operator
- Adjustable working air inlet in the door
- Exhaust air outlet in rear wall of furnace
- Silent solid-state power control relay
- Delivery includes base, ceramic plunger with base plate in the furnace interior, precision scale and software package
- 3 scales available for different maximum weights and scaling ranges
- Software for documentation of the temperature curve and combustion loss using a PC
- Please see page 48 for a description of the different controllers

Additional Equipment
- Vent, vent with fan or catalytic converter
- Over-temperature limit controller with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the oven and load
- Please see page 13 for more optional equipment

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Inner dimensions in mm</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection*</th>
<th>Weight in kg</th>
<th>Minutes to Tmax</th>
</tr>
</thead>
<tbody>
<tr>
<td>L 9/11/SW</td>
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<td>240</td>
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<td>9</td>
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<td>880</td>
<td>550</td>
</tr>
<tr>
<td>L 9/12/SW</td>
<td>1200</td>
<td>230</td>
<td>240</td>
<td>170</td>
<td>9</td>
<td>480</td>
<td>880</td>
<td>550</td>
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</tbody>
</table>

*Including opened lift door

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Inner dimensions in mm</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection*</th>
<th>Weight in kg</th>
<th>Minutes to Tmax</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT 9/11/SW</td>
<td>1100</td>
<td>230</td>
<td>240</td>
<td>170</td>
<td>9</td>
<td>480</td>
<td>550</td>
<td>550</td>
</tr>
<tr>
<td>LT 9/12/SW</td>
<td>1200</td>
<td>230</td>
<td>240</td>
<td>170</td>
<td>9</td>
<td>480</td>
<td>550</td>
<td>550</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Inner dimensions in mm</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection*</th>
<th>Weight in kg</th>
<th>Minutes to Tmax</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT 9/11/SW</td>
<td>1100</td>
<td>230</td>
<td>240</td>
<td>170</td>
<td>9</td>
<td>480</td>
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<td>550</td>
</tr>
<tr>
<td>LT 9/12/SW</td>
<td>1200</td>
<td>230</td>
<td>240</td>
<td>170</td>
<td>9</td>
<td>480</td>
<td>550</td>
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</table>

*Please see page 48 for more information about mains voltage

<table>
<thead>
<tr>
<th>Scale type</th>
<th>Readability in g</th>
<th>Weight range in g</th>
<th>Weight of plunger in g</th>
<th>Calibration value in g</th>
<th>Minimum load in g</th>
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<tbody>
<tr>
<td>EW-1500</td>
<td>0,01</td>
<td>1500 incl. plunger</td>
<td>850</td>
<td>0,1</td>
<td>0,5</td>
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<tr>
<td>EW-3000</td>
<td>0,01</td>
<td>3000 incl. plunger</td>
<td>850</td>
<td>0,1</td>
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<tr>
<td>EW-6000</td>
<td>0,10</td>
<td>6000 incl. plunger</td>
<td>850</td>
<td>1,0</td>
<td>5,0</td>
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</tbody>
</table>

Software for documentation of the temperature curve and combustion loss using a PC
Muffle Furnaces LT 5/11 HA - LT 15/11 HA with integrated Air Circulation

LT 5/11 HA - LT 15/11 HA

The LT 5/11 HA - LT 15/11 HA muffle ovens with integrated air circulation provide an optimum temperature uniformity in the furnace chamber and heat transmission to your batch. This advantageous effect not only increases the precision of the results of your work, it is also a true quality factor, particularly when you need good uniformity in the lower temperature range.

- Tmax 1100 °C
- Ceramic heating plates with integral heating element which is safeguarded against splashing, and easy to replace
- Highly durable cured vacuum fibre module lining
- Casing made of sheets of textured stainless steel (non-rusting design)
- Double-walled casing for low external temperatures and stability
- With lift door (LT), whereby the hot side is away from the operator
- Exhaust air outlet in rear wall of furnace
- Silent solid-state power control relay
- Circulation fans for better heat transmission and distribution, particularly during heating and cooling
- Please see page 48 for a description of the different controllers

Additional Equipment
- Vent, vent with fan or catalytic converter
- Over-temperature limit controller with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the oven and load
- Please see page 13 for more optional equipment

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax  °C</th>
<th>Inner dimensions in mm</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection</th>
<th>Weight in kg</th>
<th>Minutes to Tmax</th>
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<tr>
<td>LT 5/11HA</td>
<td>1100</td>
<td>200 160 130</td>
<td>5</td>
<td>440 470 520+220</td>
<td>2.4</td>
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<tr>
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<td>1100</td>
<td>230 230 170</td>
<td>9</td>
<td>480 550 570+290</td>
<td>3.0</td>
<td>single-phase</td>
<td>46</td>
<td>60</td>
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<td>480 650 570+290</td>
<td>3.6</td>
<td>single-phase</td>
<td>56</td>
<td>75</td>
</tr>
</tbody>
</table>

*Including opened lift door

*Please see page 48 for more information about mains voltage
Muffle Furnace Accessories

Vent for connection to an exhaust pipe.

Vent with fan, to remove exhaust gas from the furnace better. The P 320 controller can be used to control the vent automatically.

Catalytic converter with fan for removal of organic components from the exhaust air. Organic components are catalytically oxidized at about 600 °C, broken into carbon dioxide and water vapour. Irritating odors are thus largely eliminated. The P 320 controller can be used to switch the catalytic converter automatically.

Stackable charge saggar

Select between different base plates and collecting pans for protection of the furnace and easy loading (for models L, LT, LE, LV and LVT on pages 4 - 12).

Ceramic ribbed plate

<table>
<thead>
<tr>
<th>for models</th>
<th>Article No.</th>
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</thead>
<tbody>
<tr>
<td>LE 2</td>
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</tr>
<tr>
<td>L 3, LT 3, LV, LVT 3</td>
<td>691600507</td>
</tr>
<tr>
<td>LE 4, LE 6, L 5, LT 5, LVT 5</td>
<td>691600508</td>
</tr>
<tr>
<td>L 9, LT 9, LV 9, LVT 9</td>
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<tr>
<td>LE 14</td>
<td>691601098</td>
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<tr>
<td>L 15, LT 15, LV 15, LVT 15</td>
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<td>L 24, LT 24</td>
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<td>L 40, LT 40</td>
<td>691600875</td>
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Ceramic collecting pan

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<tbody>
<tr>
<td>LE 2</td>
<td>691601099</td>
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<tr>
<td>L 3, LT 3, LV 3, LVT 3</td>
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</tr>
<tr>
<td>LE 4, LE 6, L 5, LT 5, LVT 5</td>
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<tr>
<td>L 9, LT 9, LV 9, LVT 9</td>
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</table>

Steel collecting pan

<table>
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<th>Article No.</th>
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<tr>
<td>LE 2</td>
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<tr>
<td>L 3, LT 3, LV 3, LVT 3</td>
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<tr>
<td>L 9, LT 9, LV 9, LVT 9</td>
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<td>LE 14</td>
<td>691402097</td>
</tr>
<tr>
<td>L 15, LT 15, LV 15, LVT 15</td>
<td>691400149</td>
</tr>
<tr>
<td>L 24, LT 24</td>
<td>691400626</td>
</tr>
<tr>
<td>L 40, LT 40</td>
<td>691400627</td>
</tr>
</tbody>
</table>

Heat-resistant gloves for protection of the operator when loading or removing hot materials, resistant to 600 °C or 900 °C.

Gloves, Tmax 650 °C

Gloves, Tmax 900 °C

Various tongs for easy loading and unloading of the furnace
Annealing and Hardening Furnaces N 7/H - N 61/H

To withstand harsh use in the laboratory, e.g. when heat-treating metals, robust insulation with light refractory bricks is necessary. The N 7/H - N 61/H models are a perfect fit to solve this problem. The furnaces can be extended with a variety of accessories, like annealing boxes for operation under protective gas, roller guides, or a cooling station with a quenching bath. Even high-performance applications like the annealing of titanium in medical applications can be implemented without the use of expensive and complicated annealing systems.

- Tmax 1280 °C
- Three-sided heating from both sides and the floor
- High-quality, free-radiating heating elements mounted on support tubes for longest service life
- Floor heating protected by heat-resistant SiC plate
- Multilayer insulation with high-quality lightweight refractory bricks in the furnace chamber
- Exhaust opening in the side of the furnace, or on back wall of furnace in the N 31/H models and higher
- Models N 7/H - N 17/HR are designed as tabletop models
- Stand included with model N 31/H and up
- Parallel swinging door which opens downward, or upward upon request
- Manual or automatic gassing system

Please see page 48 for a description of various controllers

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>w</th>
<th>d</th>
<th>h</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection*</th>
<th>Weight in kg</th>
<th>Minutes to Tmax</th>
</tr>
</thead>
<tbody>
<tr>
<td>N 7/H</td>
<td>1280</td>
<td>7</td>
<td>120</td>
<td></td>
<td>7</td>
<td>720 640 510</td>
<td>3.0</td>
<td>single-phase</td>
<td>60</td>
<td>180</td>
</tr>
<tr>
<td>N 11/H</td>
<td>1280</td>
<td>11</td>
<td>140</td>
<td></td>
<td>11</td>
<td>720 740 510</td>
<td>3.6</td>
<td>single-phase</td>
<td>70</td>
<td>150</td>
</tr>
<tr>
<td>N 11/HR</td>
<td>1280</td>
<td>11</td>
<td>140</td>
<td></td>
<td>11</td>
<td>720 740 510</td>
<td>5.5</td>
<td>3-phase¹</td>
<td>70</td>
<td>120</td>
</tr>
<tr>
<td>N 17/HR</td>
<td>1280</td>
<td>17</td>
<td>250</td>
<td></td>
<td>250</td>
<td>840 1010 1220</td>
<td>6.4</td>
<td>90</td>
<td>90</td>
<td>105</td>
</tr>
<tr>
<td>N 31/H</td>
<td>1280</td>
<td>31</td>
<td>350</td>
<td></td>
<td>350</td>
<td>840 1010 1220</td>
<td>15.0</td>
<td>3-phase¹</td>
<td>210</td>
<td>105</td>
</tr>
<tr>
<td>N 41/H</td>
<td>1280</td>
<td>41</td>
<td>500</td>
<td></td>
<td>500</td>
<td>840 1160 1320</td>
<td>15.0</td>
<td>3-phase</td>
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<td>120</td>
</tr>
<tr>
<td>N 61/H</td>
<td>1280</td>
<td>61</td>
<td>750</td>
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<td>750</td>
<td>840 1410 1320</td>
<td>20.0</td>
<td>3-phase</td>
<td>400</td>
<td>200</td>
</tr>
</tbody>
</table>

¹Heating only between two phases
*Please see page 48 for information on mains voltage
Hardening Accessories

Our wide selection of annealing and hardening furnaces can be extended with a variety of hardening accessories to suit your application. The accessories shown below represent only a small fraction of the products available. For further details, please see our separate catalogues for heat-treatment furnaces and hardening accessories.

Hardening and Annealing Boxes
- Hardening and annealing boxes with or without protective gas connectors, up to 1100 °C, also in a tailor-made variant for cold evacuation, for instance for the annealing of small parts and bulk goods

Annealing Tray with Holder
- Annealing tram with alloy bag and holder with protective gas connection for models N 7/H to N 61/H for annealing and hardening under protective gas and quenching in air

Hearth Plates
- Hearth plates for up to 1100 °C for protection of the furnace floor for models N 7/H to N 61/H, edged on three sides

Hardening Tongs
- Hardening tongs in various sizes and forms for use in annealing and hardening

Heat Treating Foil
- Heat treating foil for wrapping of samples for oxidation-free annealing and hardening of steels up to 1200 °C

Gloves
- Heat-resistant gloves to 600 °C or 900 °C for protection of operator during loading (see page 13)

Please ask for our separate catalogues for hardening furnaces and hardening accessories!
Compact Tube Furnaces R

These compact tabletop tube furnaces with integrated control systems can be used universally for many processes. Equipped with a standard working tube of C 530 ceramic and two fibre plugs, these furnaces have an unbeatable price/performance ratio.

- Tmax 1200 °C or 1300 °C
- Casing made of textured stainless steel sheets (non-rusting design)
- Outer tube diameter of 50 to 120 mm, heated length from 250 to 1000 mm
- Working tube of C 530 ceramic including two fibre plugs as standard equipment
- Type S thermocouple
- Silent solid-state power control relays
- Standard working tube see chart on page 9
- Please see page 48 for a description of various controllers

Additional Equipment
- Over-temperature limit controller with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the oven and load
- Cascade controller for temperature measurement in the working tube and behind the tube, please see page 28
- Working tubes designed for process requirements
- Three-zoned design with HiProSystem control (heated length from 750 mm, for 1300 °C models)
- Alternative working tubes see chart on page 28
- Please see page 24 for optional equipment

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Outer dimensions in mm</th>
<th>Outer tube Ø /mm</th>
<th>Heated length mm</th>
<th>Length constant temperature ΔT 10K</th>
<th>Tube length in mm</th>
<th>Power kW</th>
<th>Electrical connection*</th>
<th>Weight in kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>R 50/250/12</td>
<td>1200</td>
<td>400 240 490</td>
<td>50</td>
<td>250</td>
<td>80</td>
<td>450</td>
<td>1,2</td>
<td>single-phase</td>
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</tr>
<tr>
<td>R 50/500/12</td>
<td>1200</td>
<td>650 240 490</td>
<td>50</td>
<td>500</td>
<td>170</td>
<td>700</td>
<td>1,8</td>
<td>single-phase</td>
<td>25</td>
</tr>
<tr>
<td>R 100/750/12</td>
<td>1200</td>
<td>1000 360 640</td>
<td>90</td>
<td>750</td>
<td>250</td>
<td>1070</td>
<td>3,6</td>
<td>single-phase</td>
<td>80</td>
</tr>
<tr>
<td>R 100/1000/12</td>
<td>1200</td>
<td>1300 420 730</td>
<td>120</td>
<td>1000</td>
<td>330</td>
<td>1400</td>
<td>6,0</td>
<td>3-phase²</td>
<td>170</td>
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<td>50</td>
<td>250</td>
<td>80</td>
<td>450</td>
<td>1,3</td>
<td>single-phase</td>
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<tr>
<td>R 50/500/13</td>
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<td>50</td>
<td>500</td>
<td>170</td>
<td>700</td>
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<td>120</td>
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<tr>
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<td>1300 420 730</td>
<td>120</td>
<td>1000</td>
<td>330</td>
<td>1400</td>
<td>6,5</td>
<td>3-phase²</td>
<td>230</td>
</tr>
</tbody>
</table>

¹These models also available with three-zones
²Heating only between two phases
⁴Tmax is reached outside the tube. Realistic working temperature inside the tube is approx. 50 °C lower.
Universal Tube Furnaces RT with Stand for horizontal or vertical Operation

RT 50/250/11 - RT 30-200/15

These compact tube furnaces are used when laboratory experiments must be performed horizontally, vertically, or at specific angles. The ability to configure the angle of tilt and the working height, and their compact design, also make these furnaces suitable for integration into existing process systems.

- Tmax 1100 °C, 1300 °C, or 1500 °C
- Compact design
- Vertical or horizontal operation freely adjustable
- Working height freely adjustable
- Working tube made of C 530 ceramic
- Type S thermocouple
- Operation also possible separate from stand if safety guidelines are observed
- Control system integrated in furnace base
- Please see page 24 for optional equipment
- Please see page 48 for a description of various controllers

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Outer dimensions in mm</th>
<th>Inner tube Ø/length mm</th>
<th>Heated length mm</th>
<th>Length constant temperature ΔT 10K</th>
<th>Tube length in mm</th>
<th>Power kW</th>
<th>Electrical connection*</th>
<th>Weight in kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT 50-250/11</td>
<td>1100</td>
<td>350  380  740</td>
<td>250  80  360</td>
<td>1,8</td>
<td>single-phase</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RT 50-250/13</td>
<td>1300</td>
<td>350  380  740</td>
<td>250  80  360</td>
<td>1,8</td>
<td>single-phase</td>
<td>25</td>
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</tr>
</tbody>
</table>

*Please see page 48 for more information about mains voltage
Hinged Tube Furnaces RS for horizontal or vertical Operation up to 1300 °C, Gas Atmosphere or Vacuum

The RS tube furnaces can be used for either horizontal or vertical operation. Using a variety of accessories, these professional tube furnaces can be optimally laid out for your process. By using different available gas supply packages, operations can be performed under a protective gas atmosphere, vacuum, or even with flammable gases.

- Tmax 1100 °C or 1300 °C
- Casing made of sheets of textured stainless steel (non-rusting design)
- Tmax 1100 °C: Type K thermocouple
- Tmax 1300 °C: Type S thermocouple
- Available in horizontal or vertical designs
- Hinged design for simple insertion of the working tube
- Working tube made of ceramic C 530 for operation in air included in scope of delivery
- Switchgear and control unit separate from furnace in own wall or standing cabinet
- Standard working tube see chart on page 29
- Please see page 48 for a description of various controllers

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax</th>
<th>Exterior dimensions³ in mm</th>
<th>Max. outer tube Ø /mm</th>
<th>Heated length mm</th>
<th>Length constant ΔT 10K</th>
<th>Tube length in mm</th>
<th>Power kW</th>
<th>Electrical connection</th>
<th>Weight in kg</th>
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<tbody>
<tr>
<td>RS 80/300/11</td>
<td>1100</td>
<td>555 475 390</td>
<td>80</td>
<td>300</td>
<td>100</td>
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<td>150</td>
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<td>100</td>
<td>650</td>
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<td>single-phase</td>
<td>80</td>
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<tr>
<td>RS 80/500/13</td>
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<td>755 475 390</td>
<td>80</td>
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<td>850</td>
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<td>3-phase¹</td>
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<tr>
<td>RS 80/750/13</td>
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<td>250</td>
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<tr>
<td>RS 10/500/13</td>
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<td>RS 10/1000/13</td>
<td>1300</td>
<td>1255 525 440</td>
<td>120</td>
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<td>12,6</td>
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<tr>
<td>RS 170/750/13</td>
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<td>250</td>
<td>1100</td>
<td>12,6</td>
<td>3-phase¹</td>
<td>150</td>
</tr>
</tbody>
</table>

¹Heating only between two phases
²Without tube
³Exterior dimensions for vertical operation upon request
⁴Tmax is reached outside the tube. Realistic working temperature inside the tube is approx. 50 °C lower.
*Please see page 48 for more information about mains voltage.
The RS tube furnace line can be custom-fit to your needs with a variety of extras. Starting with various working tubes of different materials to protective gas or vacuum operation. For optimum temperature uniformity, all RS furnaces are also available as three-zone tube furnaces with modern PLC controls. The heat loss at the ends of the tube is compensated using this three-zoned control, and a longer uniform zone is the result. An overview of the complete line of accessories can be found starting on page 24.

Additional Equipment

- Cascade controller with temperature measurement in the working tube and in the oven chamber behind the tube, please see page 28
- Working tubes designed for process requirements
- Different gas supply packages (starting on page 24) for protective gas and vacuum operation
- Three-zone control for optimization of temperature uniformity
- Burst protector for heating elements and/or as support surface for the load
- Stand for vertical operation
- Base frame with integrated switchgear and controller
- Alternative working tubes see chart on page 29
- Please see page 24 for more optional equipment
When the retention of the granular characteristics of the material is important, e.g. when drying or calcining, this rotary tube furnace is the optimum solution. The continuous rotary operation of the furnace tube and the option of operating it under protective gas lead to excellent results.

- Design like RS models, see page 18
- T<sub>m</sub> 1100 °C
- Type K thermocouple
- Compact unit, designed as tabletop model
- Optionally supplied with quartz glass process reactor or quartz glass tube
- Easy working tube or process reactor removal through beltless drive and hinged casing
- Infinitely variable drive (approx. 1-20 rpm)
- Good flooding of load with process gas due to inlet on one side and outlet on other side of tube
- For a description of various controllers, see page 48

**Additional Equipment**

- Gas-tight rotary feedthrough for connection to gas supply systems (suitable for operation in rough vacuum)
- Tilting device
- Gas supply systems with gas cooler at the outlet
- Three-zone control
- Tube adaptor for alternative operation either with glass reactor or ceramic tube

**RSR 80-500/11 - RSR 120-750/11**

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Outer dimensions in mm</th>
<th>Length constant Temperature ΔT 10K</th>
<th>Tube dimensions in mm</th>
<th>Supply power/kW</th>
<th>Electrical connection*</th>
<th>Weight in kg</th>
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<tr>
<td>RSR 80-500/11</td>
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<td>1075 475 390</td>
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<td>1100</td>
<td>1325 525 440</td>
<td>250 1390</td>
<td>750 106 34</td>
<td>6.3 3-phase</td>
<td>120</td>
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</tbody>
</table>

*Please see page 48 for information on mains voltage

1 Heating only between two phases
2 Without tube
3 Tmax. is reached outside the tube. Realistic working temperature inside the tube is approx. 50 °C lower.
Universal High-Temperature Tube Furnaces RHTC with Silicon Carbide Rod Heating, Gas Atmosphere or Vacuum

These compact tube furnaces with SiC rod heating and integrated switchgear and controller can be used universally for many processes. With an easy to replace working tube as well as additional standard equipment options, these furnaces are flexible and can be used for a wide range of applications. The high-quality fiber insulation ensures fast heating and cooling times. The SiC heating rods installed parallel to the working tube ensure excellent temperature uniformity. The price-performance ratio for this temperature range is unbeatable.

- Tmax 1500 °C
- Textured stainless steel sheet casing (non-rusting)
- High-quality fiber insulation
- Active cooling of casing for low surface temperatures
- Type S thermocouple
- Silent semiconductor relay
- Prepared for assembly of working tubes with water-cooled flanges
- Ceramic tube, C 799 quality
- Standard working tube see chart on page 29
- For a description of various controllers, see page 48

Additional Equipment

- Over-temperature limit controller with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect furnace and load
- Cascade controller with temperature measurement in the working tube and in the oven chamber behind the tube, please see page 28
- Fiber plugs
- Working tubes for operation with water-cooled flanges
- Alternative gas supply systems for protective gas or vacuum operation, starting on page 24
- Alternative working tubes see chart on page 29

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C¹</th>
<th>Outer dimensions in mm</th>
<th>Outer tube Ø /mm</th>
<th>Heated length/mm</th>
<th>Length constant temperature ΔT 10K</th>
<th>Tube length in mm</th>
<th>Supply power/kW</th>
<th>Electrical connection*</th>
<th>Weight in kg</th>
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<td>450</td>
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<td>710</td>
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<td>1070</td>
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</tbody>
</table>

¹Heating only between two phases
²Heating only on one phase
*See page 48 for information on supply voltage
³Tmax. is reached outside the tube. Realistic working temperature inside the tube is approx. 50 °C lower.
High-temperature Tube Furnaces RHTH for horizontal Operation and RHTV for vertical Operation up to 1800 °C, Gas Atmosphere or Vacuum

The high-temperature tube furnaces are available in either horizontal (type RHTH) or vertical (type RHTV) designs. High-quality insulation materials made of vacuum-formed fibre plates enable energy-saving operation and a fast heating time due to low heat storage and heat conductivity. By using different gas supply systems, operations can be performed under a protective gas atmosphere, vacuum, or even with flammable gasses.

- Tmax 1600 °C, 1700 °C, or 1800 °C
- MoSi₂ heating elements, mounted vertically for easy replacement
- Insulation with vacuum-formed ceramic fibre plates
- Rectangular outer casing with slots for convection cooling
- Models RHTV with hinges for wall mounting
- Casing made of sheets of textured stainless steel (non-rusting design)
- Ceramic working tube made of material C 799 incl. fibre plugs operation under air
- Type B thermocouple
- Power unit with low-voltage transformer and thyristor controller
- Switchgear and control unit separate from furnace in separate floor standing cabinet
- Standard working tube see chart on page 29
- Please see page 48 for a description of various controllers

Additional Equipment
- Over-temperature limit controller with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the oven and load
- Cascade controller with temperature measurement in the working tube and in the oven chamber behind the tube, please see page 28
- Working tubes designed for process requirements
- Gas-tight flanges for protective gas and vacuum operation
- Manual or automatic gas supply system
- Three- or five-zone control for optimization of temperature uniformity
- Stand for vertical operation
- Alternative working tubes see chart on page 29
- Please see page 24 for more optional equipment

Horizontal tube furnace RHTH 120/300/16 with vacuum flanges as optional equipment

RHTH 120/150/… - RHTH 120/600/…, RHTV 120/150/… - RHTV 120/600/…

Gas supply panel for nonflammable protective gas with shutoff valve and flow meter with regulator valve, piped and ready to connect

Over-temperature limit controller

Please see page 48 for a description of various controllers

Please see page 24 for more optional equipment
RHTV 10-300/17 vertical tube furnace with stand as optional equipment

Vacuum pump stand for operation up to $10^{-5}$ mbar (see pages 5 and following)

Choice of various working tubes

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax</th>
<th>Outer dimensions in mm</th>
<th>Max. outer tube Ø /mm</th>
<th>Heated length mm</th>
<th>Length constant temperature $\Delta T$ 10K in mm</th>
<th>Tube length in mm</th>
<th>Power kW</th>
<th>Electrical connection*</th>
<th>Weight in kg</th>
</tr>
</thead>
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<td>Horizontal design</td>
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<tr>
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<tr>
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<td>620 550 640</td>
<td>120</td>
<td>300</td>
<td>100</td>
<td>620</td>
<td>9.0</td>
<td>3-phase¹</td>
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<th>Heated length mm</th>
<th>Length constant temperature $\Delta T$ 10K in mm</th>
<th>Tube length in mm</th>
<th>Power kW</th>
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<tr>
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<td>150</td>
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<td>3-phase¹</td>
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<td>120</td>
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<td>630</td>
<td>10.3</td>
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<tr>
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<td>170</td>
<td>880</td>
<td>19.0</td>
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</tbody>
</table>

¹Heating only between two phases
²Without tube
³Tmax. is reached outside the tube. Realistic working temperature inside the tube is approx. 50 °C lower.

¹Please see page 48 for information on mains voltage
Gas Supply Systems / Vacuum Operation for Tube Furnaces R, RS, RHTC, RHTH and RHTV

When equipped with various equipment packages, the tube furnace series RS, RHTC, RHTH, and RHTV can be adapted for operation with nonflammable or flammable gases or for vacuum operation. The different equipment packages can be delivered together with the furnace, or later as needed.

Gas Supply System 1 for simple protective gas applications (no vacuum operation)
This package represents a basic version sufficient for many applications, for operation with nonflammable protective gases. The standard working tube made of ceramic C 530 delivered with the furnace can still be used.

- Standard working tube can be used
- 2 plugs of ceramic fibre with protective gas connections
- Gas supply system for nonflammable protective gas (Ar, N₂, forming gas) with shutoff valve and flow meter with control valve (volume 50-500 l/hr), piped and ready to connect (gas intake pressure at 300 mbar to be provided by customer)

Additional Equipment
- Extension of gas supply system with a second or third nonflammable type of gas
- Bottle pressure regulator for use with bottled gas
- Automatically controlled gas supply with solenoid valves on the gas supply panel, which can be switched on and off through a controller with programmable extra functions (e.g. P 320)

Gas Supply System 2 for protective gas applications with nonflammable gases/vacuum operation
For increased atmospheric purity requirements in the working tube, we recommend this gas supply system. The standard working tube is replaced by a dense working tube of ceramic C 610 or C 799 in a gas-tight design. Besides the longer working tube, the scope of delivery also includes gas-tight flanges and a corresponding bracket system in the furnace. The system can also be equipped for vacuum operation.

- Longer, gas-tight working tube of ceramic C 610 for furnaces to 1300 °C or of C 799 for temperatures above 1300 °C
- 2 vacuum-tight, water-cooled stainless steel flanges with fittings on the outlet side (cooling water supply with NW9 hose connector to be provided by the customer)
- Mounting system on furnace for the flanges
- Gas supply system for nonflammable protective gas (Ar, N₂, forming gas) with shutoff valve and flow meter with control valve (volume 50-500 l/hr), gas outlet valve, piped and ready to connect (gas intake pressure at 300 mbar to be provided by customer)

Additional Equipment
- Extension of gas supply system with a second or third nonflammable type of gas
- Bottle pressure regulator for use with bottled gas
- Automatically controlled gas supply with solenoid valves on the gas supply panel, which can be switched on and off through a controller with programmable extra functions (e.g. P 320)
- Water-cooled end flange with quick connectors
- Cooling unit for closed loop water circuit
- Window for charge observation in combination with gastight flanges

Vacuum Operation
- Vacuum package for evacuation of the working tube, consisting of connector for the gas outlet, 1 ball valve, manometer, 1-stage manually operated rotary vane vacuum pump with corrugated stainless steel hose connected to the gas outlet, max. attainable end pressure in working tube about 10⁻² mbar
- Alternative pumps for max. final pressure of up to 10⁻⁵ mbar on request (see page 25)
Gas Supply System 3 for hydrogen applications, manual operation in supervised mode

Adding gas supply system 3 to the tube furnace allows operation under a hydrogen atmosphere. During hydrogen operation, a safety pressure of approx. 30 mbar is ensured in the working tube. Surplus hydrogen is burnt off in an exhaust gas torch. The operator manually takes care of inerting the working chamber before process start, after process end, and in case of default.

- Safety system for operation with flammable gases including torch function and tube breakage monitoring (checking overpressure)
- Longer, gas-tight working tube of ceramic C 610 for furnaces to 1300 °C or of C 799 for temperatures above 1300 °C
- 2 vacuum-tight, water-cooled stainless steel flanges (cooling water supply to be provided by customer via hose connector)
- Exhaust gas torch
- Pressure switch for monitoring the safety pressure
- Gas supply system for H₂ and N₂. Volume adjustment is carried out by hand (the customer provides an H₂ supply at 300 mbar and an N₂ supply at 10 bar)

Gas Supply System 4 for hydrogen applications, semiautomatic operation in unattended mode

With extended safety logic and an integrated nitrogen purge container, the system can be used for unattended operation. Process preparation is carried out manually and operation is carried out automatically. In case of default, the tube is immediately purged with nitrogen and the system is automatically switched to a safe status.

Equipment in Addition to System 3

- Extended safety control system with emergency tube purging in case of default
- Emergency purge container

Gas Supply System 5 for hydrogen applications, fully-automatic, unattended operation

Equipped with a PLC control system, pre-purging, hydrogen inlet, operation, fault monitoring and purging at the end of the process are carried out automatically.

Equipment in Addition to System 4

- Furnace PLC control system
- Gas supply technology with safety concept

Additional Equipment for Systems 3 - 5

- Gas supply system extension for additional nonflammable gas types
- Bottle pressure reducer for use with bottled gas
- Cooling unit for closed loop water circuit
- Vacuum packages (with hydrogen operation, this package can only be used for pre-evacuation)
- PLC control system (as standard with gas supply system 5)
- Gas supply via program-dependent, controllable mass flow controllers (with PLC control system only)

Vacuum Pumps

With respect to the final pressure different pumps are available (see also page 44):

- Single-step rotary piston pump for a max. final pressure of approx. 20 mbar.
- Two-step rotary piston pump for a max. final pressure of approx. 10⁻² mbar.
- Pump system PT70 Dry (rotary vane pump with following turbomolecular pump for a max. final pressure of 10⁻⁵ mbar.

Information:

For protection of the vacuum pump only cold stage evacuation is allowed. The reduction of working tube strengthness limits the max. possible working temperature under vacuum (see page 28).
Tube Furnaces for Integration into Customized Systems

With their high level of flexibility and innovation, Nabertherm offers the optimal solution for customer-specific applications.

Based on our standard models, we develop individual solutions for integration in overriding process systems. The solutions shown on this page are just a few examples of what is feasible. From working under vacuum or protective gas via innovative control and automation technology for a wide selection of temperatures, sizes, lengths and other properties of tube furnace systems – we will find the appropriate solution for a suitable process optimization.
Customized Tube Furnaces

Besides our extensive selection of standard tube furnaces, we can also provide you with a tube furnace custom-designed for your application. Some examples of tube furnace systems we have supplied to other customers are listed below. From modified standard furnaces to fully-customized tube furnace systems – we will find a solution for your needs!

- **RS 100/1500/13S tube furnace for integration in the customer’s production plant**
  - Operates horizontally, vertically, or at a defined angle
  - Tmax 1300 °C
  - Heated length: 1500 mm
  - Tube interior diameter: 100 mm
  - Three-zoned control system for optimization of temperature uniformity

- **R 100/1000/11S tube furnace for vacuum operation for annealing of metals under vacuum or protective gas atmospheres**
  - Working tube closed on one side made of highly heat-resistant 1.4841 (314) alloy
  - Load carrier made of 1.4841 (314) alloy
  - 1-stage rotary vane pump for vacuum down to 10⁻¹ mbar
  - Tmax 1100 °C
  - Heated length: 1000 mm
  - Tube interior diameter: 100 mm

- **Dual tube ceramic furnace system with 2 RS 50/300/13 furnaces for working with different temperatures in one working tube**
  - Furnaces hinged for simple insertion of the working tube
  - Each furnace has its own controller
  - Gas-tight flanges, water-cooled for working under protective gas
  - Tmax 1300 °C
  - Overall tube length: 800 mm
  - Heated length: 2 x 300 mm
  - Tube interior diameter: 50 mm

- **RS 200/2500/13S production tube furnace with hinged lid**
  - Simple insertion of working tube from above by opening the furnace lid
  - Lid to be opened using a crane
  - Tmax 1300 °C
  - Heated length: 2500 mm
  - Tube interior diameter: 200 mm

- **RS 100/1000/11 hinged tube furnace for debinding under protective gas atmospheres**
  - Gas-tight flanges, water-cooled for working under protective gas
  - Binder cold trap with condensate separator on the right side of the tube
  - Tmax 1100 °C
  - Heated length: 1000 mm
  - Tube interior diameter: 100 mm
Control Alternatives and Working Tubes

Control Alternatives for Tube Furnaces

Furnace Chamber Control
with temperature measurement in furnace chamber outside the working tube.
- Advantages: Thermocouple protected against damage and aggressive load, very even control, attractive price
- Disadvantage: Process-dependent temperature difference between displayed temperature on the controller and inside the tube

Charge Control
with temperature measurement of load in the working tube.
- Advantages: Precise control inside of tube without temperature deviation
- Disadvantages: Slow control with danger of temperature overshoot, control parameters must eventually be adjusted to correspond to the process. At high application temperatures, the over-temperature limit controller can activate to protect the heating elements.

Cascade Control
with temperature measurement both in the furnace chamber outside the working tube as well as in the working tube.
- Advantages: Very precise and rapid control adjustment
- Disadvantage: Costs

Furnace Chamber vs. Cascade Controller Comparison

Furnace Chamber Control
Only the furnace chamber temperature is measured and controlled. Regulation is carried out slowly to avoid out-of-range values. Because the charge temperature is not measured during this process, the furnace chamber temperature deviates from the charge temperature by several degrees.

Cascade Control
If the cascade is switched on, both the charge temperature and furnace chamber temperature are measured. By setting different parameters the heat-up and cooling processes can be individually adapted. This results in a more precise temperature control at the charge.

Working Tubes

There are various working tubes available, depending on application and temperatures. The technical specifications of the different working tubes are presented in the following table:

<table>
<thead>
<tr>
<th>Material</th>
<th>Tmax in air* °C</th>
<th>Tmax in vacuum operation °C</th>
<th>Gas-tight</th>
</tr>
</thead>
<tbody>
<tr>
<td>C 530 (Sillimanite)</td>
<td>1300</td>
<td>not possible</td>
<td>no</td>
</tr>
<tr>
<td>C 610 (Pythagoras)</td>
<td>1400</td>
<td>1200</td>
<td>yes</td>
</tr>
<tr>
<td>C 799 (99.7 % Al₂O₃)</td>
<td>1800</td>
<td>1400</td>
<td>yes</td>
</tr>
<tr>
<td>Quartz glass</td>
<td>1100</td>
<td>950</td>
<td>yes</td>
</tr>
<tr>
<td>CrFeAl-Alloy</td>
<td>1300</td>
<td>1100</td>
<td>yes</td>
</tr>
</tbody>
</table>

*the max. allowed temperature might be reduced operating under aggressive atmospheres
### Available Working Tubes: Standard (✓) and Options (●)

<table>
<thead>
<tr>
<th>Working tube</th>
<th>Article No.</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>outer Ø x inner Ø x length</td>
<td>R</td>
<td>RS</td>
</tr>
<tr>
<td>40 x 30 x 450 mm</td>
<td>692070274</td>
<td>✓</td>
</tr>
<tr>
<td>40 x 30 x 700 mm</td>
<td>692070276</td>
<td>✓</td>
</tr>
<tr>
<td>50 x 40 x 450 mm</td>
<td>692070275</td>
<td>✓</td>
</tr>
<tr>
<td>50 x 40 x 700 mm</td>
<td>692070277</td>
<td>✓</td>
</tr>
<tr>
<td>60 x 50 x 650 mm</td>
<td>692070106</td>
<td>●</td>
</tr>
<tr>
<td>60 x 50 x 850 mm</td>
<td>692070305</td>
<td>●</td>
</tr>
<tr>
<td>70 x 60 x 1070 mm</td>
<td>692070048</td>
<td>●</td>
</tr>
<tr>
<td>80 x 70 x 650 mm</td>
<td>692070036</td>
<td>●</td>
</tr>
<tr>
<td>80 x 70 x 850 mm</td>
<td>692070036</td>
<td>●</td>
</tr>
<tr>
<td>95 x 80 x 1070 mm</td>
<td>692070049</td>
<td>●</td>
</tr>
<tr>
<td>120 x 100 x 850 mm</td>
<td>692070110</td>
<td>●</td>
</tr>
<tr>
<td>120 x 100 x 1100 mm</td>
<td>692070111</td>
<td>●</td>
</tr>
<tr>
<td>120 x 100 x 1350 mm</td>
<td>692070135</td>
<td>●</td>
</tr>
<tr>
<td>120 x 100 x 1400 mm</td>
<td>692070279</td>
<td>●</td>
</tr>
<tr>
<td>170 x 150 x 1100 mm</td>
<td>692071659</td>
<td>●</td>
</tr>
<tr>
<td>170 x 150 x 1350 mm</td>
<td>692071660</td>
<td>●</td>
</tr>
<tr>
<td><strong>Vacuum tube¹ C 610</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 x 50 x 1030 mm</td>
<td>601435137</td>
<td>●</td>
</tr>
<tr>
<td>60 x 50 x 1230 mm</td>
<td>601435138</td>
<td>●</td>
</tr>
<tr>
<td>60 x 50 x 1480 mm</td>
<td>601435139</td>
<td>●</td>
</tr>
<tr>
<td>80 x 70 x 1230 mm</td>
<td>601435111</td>
<td>●</td>
</tr>
<tr>
<td>80 x 70 x 1480 mm</td>
<td>601435112</td>
<td>●</td>
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<tr>
<td>120 x 100 x 1230 mm</td>
<td>601435114</td>
<td>●</td>
</tr>
<tr>
<td>120 x 100 x 1480 mm</td>
<td>601435113</td>
<td>●</td>
</tr>
<tr>
<td>120 x 100 x 1730 mm</td>
<td>601435140</td>
<td>●</td>
</tr>
<tr>
<td>170 x 150 x 1480 mm</td>
<td>601435192</td>
<td>●</td>
</tr>
<tr>
<td>170 x 150 x 1730 mm</td>
<td>601435193</td>
<td>●</td>
</tr>
<tr>
<td><strong>Vacuum tube¹ C 799</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 x 40 x 380 mm</td>
<td>692071664</td>
<td>●</td>
</tr>
<tr>
<td>50 x 40 x 530 mm</td>
<td>692071665</td>
<td>●</td>
</tr>
<tr>
<td>50 x 40 x 830 mm</td>
<td>692070163</td>
<td>●</td>
</tr>
<tr>
<td>80 x 70 x 600 mm</td>
<td>692070600</td>
<td>●</td>
</tr>
<tr>
<td>80 x 70 x 830 mm</td>
<td>692071670</td>
<td>●</td>
</tr>
<tr>
<td>80 x 70 x 1080 mm</td>
<td>692071667</td>
<td>●</td>
</tr>
<tr>
<td>120 x 100 x 830 mm</td>
<td>692071688</td>
<td>●</td>
</tr>
<tr>
<td><strong>Vacuum tube¹ APM</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 x 66 x 1090 mm</td>
<td>69140564</td>
<td>●</td>
</tr>
<tr>
<td>75 x 66 x 1290 mm</td>
<td>69140565</td>
<td>●</td>
</tr>
<tr>
<td>75 x 66 x 1540 mm</td>
<td>691400835</td>
<td>●</td>
</tr>
<tr>
<td>115 x 104 x 1290 mm</td>
<td>691402566</td>
<td>●</td>
</tr>
<tr>
<td>115 x 104 x 1540 mm</td>
<td>691402567</td>
<td>●</td>
</tr>
<tr>
<td>115 x 104 x 1790 mm</td>
<td>691402568</td>
<td>●</td>
</tr>
<tr>
<td>164 x 152 x 1540 mm</td>
<td>691402569</td>
<td>●</td>
</tr>
<tr>
<td>164 x 152 x 1790 mm</td>
<td>691402570</td>
<td>●</td>
</tr>
<tr>
<td><strong>Quartz glass tube³</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>76 x 70 x 1140 mm</td>
<td>601402750</td>
<td>●</td>
</tr>
<tr>
<td>76 x 70 x 1390 mm</td>
<td>601402751</td>
<td>●</td>
</tr>
<tr>
<td>76 x 70 x 1440 mm</td>
<td>601402636</td>
<td>●</td>
</tr>
<tr>
<td>106 x 100 x 1140 mm</td>
<td>601402752</td>
<td>●</td>
</tr>
<tr>
<td>106 x 100 x 1390 mm</td>
<td>601402753</td>
<td>●</td>
</tr>
<tr>
<td>106 x 100 x 1440 mm</td>
<td>601402637</td>
<td>●</td>
</tr>
<tr>
<td><strong>Quartz glass tube³</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>76 x 70 x 1140 mm</td>
<td>601402746</td>
<td>●</td>
</tr>
<tr>
<td>76 x 70 x 1390 mm</td>
<td>601402747</td>
<td>●</td>
</tr>
<tr>
<td>76 x 70 x 1440 mm</td>
<td>601402748</td>
<td>●</td>
</tr>
<tr>
<td>106 x 100 x 1140 mm</td>
<td>601402749</td>
<td>●</td>
</tr>
<tr>
<td>106 x 100 x 1390 mm</td>
<td>601402638</td>
<td>●</td>
</tr>
</tbody>
</table>

¹With sealing rings for the use with water-cooled flanges
²With attached holder for gas tight flange
³Tubes/reactors incl. mounted sleeves for connection to the rotary drive. Spare tubes come without sleeves.

---

**Legend:**
- **Standard working tube:** ✓
- **Working tube available as an option:** ●
Professional Chamber Furnaces with Brick Insulation LH or Fibre Insulation LF

The LH 15/12 - LF 120/14 laboratory furnaces have been trusted for many years as professional chamber furnaces for the laboratory. These furnaces are available with either a robust insulation of light refractory bricks (LH models) or with a combination insulation of refractory bricks in the corners and low heat storage, quickly cooling fibre material (LF models). With a wide variety of optional equipment, these models can be optimally adapted to your processes.

- Tmax 1200 °C, 1300 °C, or 1400 °C
- 5-sided heating for very good temperature uniformity
- Heating elements on support tubes ensure free heat radiation and a long service life
- Protection of floor heating and flat stacking surface provided by embedded SiC plate in the floor
- LH models: multilayered, fibre-free insulation of light refractory bricks and special backup insulation
- LF models: high-quality fibre insulation with corner bricks for shorter heating and cooling times
- Door with brick-on-brick seal, hand fitted
- Short heating times due to high installed power
- Side vent with bypass connection for exhaust pipe
- Self-supporting arch for high stability and greatest possible protection against dust
- Quick lock on door
- Freely adjustable air slide intake in furnace floor
- Stand included

Please see page 48 for a description of the different controllers
### Additional Equipment
- Parallel swinging door, pivots away from operator, for opening when hot
- Separate wall-mounting or floor standing cabinet for switchgear
- Automatic vent flap
- Cooling fan for shorter cycle times
- Protective gas connector, sealed casing
- Retort made of quartz glass for very clean atmosphere, quartz glass covered door with lid function
- Manual or automatic gas supply system
- Scale to measure weight reduction during annealing

### Model Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Inner dimensions in mm</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection</th>
<th>Weight in kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>LF 15/13</td>
<td>1300</td>
<td>250 250 250 250</td>
<td>15</td>
<td>570 790 1170</td>
<td>5,0</td>
<td>3-phase¹</td>
<td>150</td>
</tr>
<tr>
<td>LF 30/13</td>
<td>1300</td>
<td>250 250 250 250</td>
<td>15</td>
<td>570 790 1170</td>
<td>7,0</td>
<td>3-phase¹</td>
<td>170</td>
</tr>
<tr>
<td>LF 60/13</td>
<td>1300</td>
<td>250 250 250 250</td>
<td>15</td>
<td>570 790 1170</td>
<td>8,0</td>
<td>3-phase¹</td>
<td>230</td>
</tr>
<tr>
<td>LF 120/13</td>
<td>1300</td>
<td>250 250 250 250</td>
<td>15</td>
<td>570 790 1170</td>
<td>12,0</td>
<td>3-phase¹</td>
<td>340</td>
</tr>
</tbody>
</table>

¹ Heating only between two phases

*Please see page 48 for information on mains voltage

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**LF 120/12S with fibre insulation**

### LF 120/12S with quartz glass retort

**Parallel swinging door for opening when hot**

**Gas panel**

---

**LH 120/12S with quartz glass retort**
Fast-Firing Kilns LS 12/13 and LS 25/13

LS 12/13 and LS 25/13
These models are ideal for simulation of typical fast-firing processes up to a maximum firing temperature of 1300 °C. The combination of high performance, low thermal mass and powerful cooling fans provides for cycle times from cold to cold of under 35 minutes.

- Tmax 1300 °C
- Very compact design
- Ceramic grid tubes as charge support
- Floor and lid heating
- Two-zone control, bottom and lid
- Integrated cooling fans, automatically programmable to speed up charge cooling including housing cooling
- Programmable lid opening of approximately 20 mm for faster cooling without activating the fan
- Thermocouple PtRh-Pt, type S for top and bottom zone
- Castors for easy furnace moving

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>w</th>
<th>d</th>
<th>h</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection*</th>
<th>Weight in kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS 12/13</td>
<td>1300</td>
<td>350</td>
<td>550</td>
<td>40</td>
<td>12</td>
<td>600  800  985</td>
<td>15</td>
<td>3-phase</td>
<td>130</td>
</tr>
<tr>
<td>LS 25/13</td>
<td>1300</td>
<td>500</td>
<td>500</td>
<td>100</td>
<td>25</td>
<td>750  985  1150</td>
<td>22</td>
<td>3-phase</td>
<td>160</td>
</tr>
</tbody>
</table>

Firing curves LS 12/13 and LS 25/13

Gradient Kilns GR 1300/13

GR 1300/13
The kiln chamber is divided into six equal control sections over its heated length of 1300 mm. Each of these zones is individually controlled. For temperatures up to 1300 °C a gradient of up to 400 °C can be achieved.

- Tmax 1300 °C
- Heated length: 1300 mm
- Heating elements on support tubes providing for free heat radiation in the kiln chamber
- Charging from the top or through the right side door
- Gas damper suspension of the lid
- 6-zone control
- Separate control of heating zones (each 160 mm long)
- Temperature gradient of 400 °C over the entire length of the kiln chamber, each zone can individually be controlled
- Fibre blocks to separate the individual chambers as additional equipment

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>w</th>
<th>d</th>
<th>h</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection*</th>
<th>Weight in kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>GR 1300/13</td>
<td>1300</td>
<td>1300</td>
<td>100</td>
<td>60</td>
<td>1660  740  1345</td>
<td>18</td>
<td>3-phase</td>
<td>300</td>
</tr>
</tbody>
</table>

*Please see page 48 for more information about mains voltage
The N 110/HS furnace is especially used for the assay of precious metals where the insulation and heating must be protected from emerging gasses and vapours. The furnace chamber forms a ceramic muffle which can easily be replaced. In the standard design, the muffle is closed with a firebrick plug. A lift door can be installed instead upon request.

- Tmax 1300 °C
- Muffle heated from four sides
- Heating elements and insulation protected by ceramic muffle
- Simple replacement of muffle
- Manual lift door
- Tool holder on furnace
- Stainless steel exhaust chimney above the door opening for connection of an exhaust system
- Work platform with embedded ceramic plate in front of the muffle opening to place load
- Front side with large service door for easy access to the furnace chamber behind the muffle
- Switchgear and control unit separate from furnace
- Please see page 48 for a description of the different controllers

Additional Equipment
- Lift door, manually operated with counterweight or electrically operated, for easy opening and closing
- Electrical lift door drive with 2-hand button operation
- Second work platform with embedded ceramic plate below the standard platform
- Double-walled casing with fan cooling to reduce exterior temperatures

### N 110/HS

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Interior dimensions in mm</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection</th>
<th>Weight in kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>N 110/HS</td>
<td>1300</td>
<td>w 260 d 340 h 95</td>
<td>8</td>
<td>W 760 D 790 H 1435</td>
<td>22</td>
<td>3-phase</td>
<td>510</td>
</tr>
<tr>
<td>S 73/HS</td>
<td>1200</td>
<td>w 530 d 380 h 380</td>
<td>73</td>
<td>W 1050 D 1530 H 900</td>
<td>26</td>
<td>3-phase</td>
<td>890</td>
</tr>
</tbody>
</table>

*Please see page 48 for more information about mains voltage
Ovens TR 60 - TR 1050 up to 300 °C

TR 60 - TR 1050
With their maximum working temperature of 300 °C and forced air circulation, the TR series ovens achieve very good temperature uniformity. They can be used for various applications such as e.g. drying, sterilizing or warm storing. The stainless steel interior chamber is easy to clean and resistant to rust.

- Tmax 300 °C
- Operating range, room temperature + 5 °C to 300 °C
- Models TR 60 - TR 240 designed as tabletop models
- Models TR 420 and TR 1050 designed as floor standing models
- Horizontal, forced air circulation results in temperature distribution better than ΔT 8 K
- Stainless steel chamber, material 1.4301, rust-resistant and easy to clean
Charging in multiple layers possible using removeable trays (number of removeable trays included, see table below)

- Large, wide-opening swing door, hinged on the right with quick release for models TR 60 - TR 420
- Double swing door with quick release for TR 1050
- Exhaust vent in the rear wall
- PID microprocessor control with self-diagnosis system
- Silent solid-state power control relays
- Please see page 48 for a description of various controllers

Additional Equipment
- Over-temperature limit controller with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the furnace and load
- Window for charge observing
- Further removeable trays with rails

---

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Inner dimensions in mm</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection*</th>
<th>Weight in kg</th>
<th>Trays included</th>
<th>Trays max.</th>
<th>Max. total load*</th>
</tr>
</thead>
<tbody>
<tr>
<td>TR 60</td>
<td>300</td>
<td>490 w 360 d 340 h</td>
<td>60 w 650 d 550 h</td>
<td>60 w 650 d 550 h</td>
<td>2,1</td>
<td>single-phase</td>
<td>45</td>
<td>1</td>
<td>4</td>
<td>120</td>
</tr>
<tr>
<td>TR 120</td>
<td>300</td>
<td>600 w 360 d 480 h</td>
<td>105 w 750 d 550 h</td>
<td>60 w 650 d 550 h</td>
<td>2,1</td>
<td>single-phase</td>
<td>70</td>
<td>2</td>
<td>7</td>
<td>150</td>
</tr>
<tr>
<td>TR 240</td>
<td>300</td>
<td>700 w 360 d 640 h</td>
<td>240 w 860 d 730 h</td>
<td>60 w 650 d 550 h</td>
<td>3,1</td>
<td>single-phase</td>
<td>100</td>
<td>2</td>
<td>9</td>
<td>150</td>
</tr>
<tr>
<td>TR 420</td>
<td>300</td>
<td>710 w 550 d 1080 h</td>
<td>420 w 860 d 830 h</td>
<td>60 w 650 d 550 h</td>
<td>4,0</td>
<td>3-phase</td>
<td>120</td>
<td>3</td>
<td>17</td>
<td>150</td>
</tr>
<tr>
<td>TR 1050</td>
<td>300</td>
<td>1240 w 570 d 1510 h</td>
<td>1050 w 1430 d 860 h</td>
<td>60 w 650 d 550 h</td>
<td>9,3</td>
<td>3-phase</td>
<td>380</td>
<td>4</td>
<td>22</td>
<td>170</td>
</tr>
</tbody>
</table>

¹Max load per layer 30 kg

*Please see page 48 for information on mains voltage
### High-Temperature Ovens, Air Circulation Furnaces up to 850 °C

If very good temperature uniformity is necessary for your heat treatment, our air circulation furnaces with horizontal air circulation are the right solution for you. Due to their solid industrial design, they can be used for many processes, like ageing, preheating, drying, hardening, tempering and annealing.

- Tmax 450 °C, 650 °C, or 850 °C
- Furnace plenum made of stainless steel (N 15/65HA without plenum)
- Model with 15 liters designed as tabletop model, other models freestanding with stand
- Solid industrial design
- Optimum temperature uniformity per DIN 17052-1 to ΔT 6K in useable space
- Loading of multiple layers possible using removeable trays. For models N 30/.. - N 560/.. one tray is included in scope of delivery
- Please see page 48 for a description of various controllers

### Model Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax (°C)</th>
<th>Inner dimensions in mm</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power (kW)</th>
<th>Electrical connection</th>
<th>Weight (in kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N 15/65HA</td>
<td>650</td>
<td>340 x 260 x 95</td>
<td>15</td>
<td>470 x 875 x 460</td>
<td>2,7</td>
<td>single-phase</td>
<td>55</td>
</tr>
<tr>
<td>N 30/45HA</td>
<td>450</td>
<td>295 x 420 x 170</td>
<td>15</td>
<td>307 x 1175 x 1315</td>
<td>3,6</td>
<td>single-phase</td>
<td>195</td>
</tr>
<tr>
<td>N 60/45HA</td>
<td>650</td>
<td>350 x 350 x 170</td>
<td>15</td>
<td>667 x 1250 x 1400</td>
<td>6,6</td>
<td>3-phase</td>
<td>240</td>
</tr>
<tr>
<td>N 120/45HA</td>
<td>650</td>
<td>450 x 600 x 170</td>
<td>15</td>
<td>767 x 1350 x 1500</td>
<td>9,6</td>
<td>3-phase</td>
<td>310</td>
</tr>
<tr>
<td>N 250/45HA</td>
<td>650</td>
<td>600 x 600 x 170</td>
<td>15</td>
<td>1002 x 1636 x 1860</td>
<td>19,0</td>
<td>3-phase</td>
<td>610</td>
</tr>
<tr>
<td>N 500/45HA</td>
<td>650</td>
<td>750 x 1000 x 75</td>
<td>560</td>
<td>1190 x 1800 x 1190</td>
<td>28,0</td>
<td>3-phase</td>
<td>730</td>
</tr>
<tr>
<td>N 560/45HA</td>
<td>750</td>
<td>500 x 1000 x 175</td>
<td>500</td>
<td>1152 x 1886 x 2010</td>
<td>31,0</td>
<td>3-phase</td>
<td>1030</td>
</tr>
<tr>
<td>N 15/85HA</td>
<td>850</td>
<td>340 x 260 x 95</td>
<td>15</td>
<td>470 x 875 x 460</td>
<td>2,7</td>
<td>single-phase</td>
<td>55</td>
</tr>
<tr>
<td>N 30/85HA</td>
<td>850</td>
<td>295 x 420 x 170</td>
<td>15</td>
<td>307 x 1175 x 1315</td>
<td>3,6</td>
<td>single-phase</td>
<td>195</td>
</tr>
<tr>
<td>N 60/85HA</td>
<td>850</td>
<td>350 x 350 x 170</td>
<td>15</td>
<td>667 x 1250 x 1400</td>
<td>6,6</td>
<td>3-phase</td>
<td>240</td>
</tr>
<tr>
<td>N 120/85HA</td>
<td>850</td>
<td>450 x 600 x 170</td>
<td>15</td>
<td>767 x 1350 x 1500</td>
<td>9,6</td>
<td>3-phase</td>
<td>310</td>
</tr>
<tr>
<td>N 250/85HA</td>
<td>850</td>
<td>600 x 600 x 170</td>
<td>15</td>
<td>1002 x 1636 x 1860</td>
<td>19,0</td>
<td>3-phase</td>
<td>610</td>
</tr>
<tr>
<td>N 500/85HA</td>
<td>850</td>
<td>750 x 1000 x 75</td>
<td>560</td>
<td>1190 x 1800 x 1190</td>
<td>28,0</td>
<td>3-phase</td>
<td>730</td>
</tr>
</tbody>
</table>

¹Tabletop model
²Heating only between two phases
*Please see page 48 for more information on mains voltage
High-Temperature Furnaces HTC with SiC Rod Heating as Table-Top Model

HTC 03/14 - HTC 08/16

These powerful laboratory muffle furnaces are available for temperatures up to 1400 °C, 1500 °C, or 1600 °C. The durability of the SiC rods in periodic use, in combination with their high heating speed, make these furnaces to all-rounders in the laboratory. Heating times of 40 minutes to 1400 °C can be achieved, depending on the furnace model and the conditions of use.

- Tmax 1400 °C, 1500 °C, or 1600 °C
- Easy replacement of heating rods
- High-quality fibre material, selected for the working temperature
- Casing made of sheets of textured stainless steel (non-rusting design)
- Double-walled casing for low external temperatures and high stability
- Optional fold-down door which can be used as work platform or lift door with hot surface facing away from the operator
- Adjustable air intake opening in the furnace door, exhaust air opening in the back wall
- Switching system with semiconductor relay, power tuned to the SiC rods
- Please see page 48 for a description of the different controllers

Additional Equipment

- Over-temperature limit controller with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the oven and load
- Stackable charge saggar for charging in multiple layers

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Inner dimensions in mm</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection*</th>
<th>Weight in kg</th>
<th>Minutes to Tmax</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTC 03/14</td>
<td>1400</td>
<td>120 210 120</td>
<td>3 400 535</td>
<td>13,0 3-phase¹</td>
<td>30</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HTC 08/14</td>
<td>1400</td>
<td>170 290 170</td>
<td>8 450 620</td>
<td>13,0 3-phase¹</td>
<td>40</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HTC 03/15</td>
<td>1500</td>
<td>120 210 120</td>
<td>3 400 535</td>
<td>9,0 3-phase¹</td>
<td>30</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HTC 08/15</td>
<td>1500</td>
<td>170 290 170</td>
<td>8 450 620</td>
<td>13,0 3-phase¹</td>
<td>40</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HTC 03/16</td>
<td>1600</td>
<td>120 210 120</td>
<td>3 400 535</td>
<td>9,0 3-phase¹</td>
<td>30</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HTC 08/16</td>
<td>1600</td>
<td>170 290 170</td>
<td>8 450 620</td>
<td>13,0 3-phase¹</td>
<td>40</td>
<td>60</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹Heating only between two phases

*Please see page 48 for more information about mains voltage
High-Temperature Furnaces LHT with MoSi₂ Heating Elements as Table-Top Model

LHT 02/16 - LHT 08/18

Designed as tabletop models, these compact high-temperature furnaces have a variety of advantages. The first-class workmanship using high-quality materials, combined with ease of operation, make these furnaces all-rounders in research and the laboratory. These furnaces are also perfectly suited for the sintering of technical ceramics, such as zirconium oxide dental bridges.

- Tmax 1600 °C, 1750 °C, or 1800 °C
- High-quality molybdenum disilicide heating elements
- Furnace chamber lined with first-class, durable fibre material
- Casing made of sheets of textured stainless steel (non-rusting design)
- Double-walled casing with additional cooling using fans, for low exterior temperature
- Furnace sizes of 2, 4, or 8 liters
- With lift door, whereby the hot side is away from the operator
- Adjustable air inlet integrated in door
- Exhaust air opening in the roof
- Type B thermocouple
- Switching system with phase-angle firing thyristors (SCRs)
- Please see page 48 for a description of the different controllers

Additional Equipment

- Over-temperature limit controller with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the oven and load
- Stackable charge saggar for charging in multiple layers
- Protective gas connector in rear wall of furnace
- Manual or automatic gas supply system

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Inner dimensions in mm</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection</th>
<th>Weight in kg</th>
<th>Minutes to Tmax</th>
</tr>
</thead>
<tbody>
<tr>
<td>LHT 02/16</td>
<td>1600</td>
<td>90 150 150</td>
<td>2</td>
<td>470 700 750-350</td>
<td>3.0</td>
<td>single-phase</td>
<td>75</td>
<td>30</td>
</tr>
<tr>
<td>LHT 04/16</td>
<td>1600</td>
<td>150 150 150</td>
<td>4</td>
<td>470 700 750-350</td>
<td>5.2</td>
<td>3-phase¹</td>
<td>85</td>
<td>25</td>
</tr>
<tr>
<td>LHT 08/16</td>
<td>1600</td>
<td>150 300 150</td>
<td>8</td>
<td>470 850 750-350</td>
<td>8.0</td>
<td>3-phase¹</td>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td>LHT 02/17</td>
<td>1750</td>
<td>90 150 150</td>
<td>2</td>
<td>470 700 750-350</td>
<td>3.0</td>
<td>single-phase</td>
<td>75</td>
<td>60</td>
</tr>
<tr>
<td>LHT 04/17</td>
<td>1750</td>
<td>150 150 150</td>
<td>4</td>
<td>470 700 750-350</td>
<td>5.2</td>
<td>3-phase¹</td>
<td>85</td>
<td>40</td>
</tr>
<tr>
<td>LHT 08/17</td>
<td>1750</td>
<td>150 300 150</td>
<td>8</td>
<td>470 850 750-350</td>
<td>8.0</td>
<td>3-phase¹</td>
<td>100</td>
<td>40</td>
</tr>
<tr>
<td>LHT 02/18</td>
<td>1800</td>
<td>90 150 150</td>
<td>2</td>
<td>470 700 750-350</td>
<td>3.6</td>
<td>single-phase</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>LHT 04/18</td>
<td>1800</td>
<td>150 150 150</td>
<td>4</td>
<td>470 700 750-350</td>
<td>5.2</td>
<td>3-phase¹</td>
<td>85</td>
<td>60</td>
</tr>
<tr>
<td>LHT 08/18</td>
<td>1800</td>
<td>150 300 150</td>
<td>8</td>
<td>470 850 750-350</td>
<td>9.0</td>
<td>3-phase¹</td>
<td>100</td>
<td>60</td>
</tr>
</tbody>
</table>

¹Heating only between two phases
*Please see page 48 for more information about mains voltage

Over-temperature limit controller

Stackable charge saggar

Additional text: Over-temperature limit controller with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the oven and load.

Stackable charge saggar for charging in multiple layers.

Protective gas connector in rear wall of furnace.

Manual or automatic gas supply system.
High-temperature Elevator Furnace LHT/LB without and LHT/LBR with Retort

LHT/LB and LHT/LBR
Due to the electrically driven lift bottom, the LHT/LB series high-temperature furnaces can be charged very handily. With their all-round heating, these furnaces achieve outstanding temperature uniformity. In the LHT 02/16 LBR model, the furnace chamber is separated from the heating elements due to the use of a tubular plasma ceramic retort placed vertically in the furnace. This design prevents a certain degree of contamination of both the load and the heating elements. It is also recommended for gassing processes.

- Tmax 1600 °C or 1700 °C
- High-quality molybdenum disilicide heating elements
- Furnace chamber lined with first-class, durable fiber materials
- Outstanding temperature uniformity due to all-round furnace chamber heating
- Tubular plasma ceramic retort for the LBR version to prevent a certain level of contamination and to improve temperature uniformity
- Furnace chamber with a volume of 2 liters, table with large footprint
- Precise, electric spindle drive with push button operation
- Casing made of textured stainless steel sheets
- Adjustable air inlet through the floor
- Exhaust air vent in the roof
- Type B thermocouple
- Switchgear with SCR control

Additional Equipment
- Over-temperature limit controller with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the furnace and load
- Stackable charge saggar for charging in multiple layers
- Protective gas connection
- Manual or automatic gas supply system, particularly effective in the LBR version

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Inner dimensions in mm</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection</th>
<th>Weight in kg</th>
<th>Minutes to Tmax</th>
</tr>
</thead>
<tbody>
<tr>
<td>LHT 02/16 LB</td>
<td>1600</td>
<td>Ø 120</td>
<td>h 130</td>
<td>2</td>
<td>540</td>
<td>610</td>
<td>740</td>
<td>3.0</td>
</tr>
<tr>
<td>LHT 02/16 LBR</td>
<td>1600</td>
<td>Ø 120</td>
<td>h 130</td>
<td>2</td>
<td>540</td>
<td>610</td>
<td>740</td>
<td>3.0</td>
</tr>
<tr>
<td>LHT 02/17 LB</td>
<td>1700</td>
<td>Ø 120</td>
<td>h 130</td>
<td>2</td>
<td>540</td>
<td>610</td>
<td>740</td>
<td>3.0</td>
</tr>
</tbody>
</table>

*Please see page 48 for more information about mains voltage
High-Temperature Furnaces HT with MoSi$_2$ Heating Elements as Floor Models

HT 04/16 - HT 16/18

Due to their solid construction and compact stand-alone design, these high-temperature furnaces are perfect for processes in the laboratory where the highest precision is needed. Outstanding temperature uniformity and practical details set unbeatable quality benchmarks. For configuration for your processes, these furnaces can be extended with extras from our extensive option list.

- Tmax 1600 °C, 1750 °C, or 1800 °C
- High-quality molybdenum disilicide (MoSi$_2$) heating elements
- Furnace chamber lined with first-class, durable fibre material
- Parallel swinging doors, chain-guided, allowing safe opening and closing without destruction of the fibre insulation. Positive closing of the door with a cam latch
- Type B thermocouple
- Furnace sizes from 4 to 450 liters, special sizes on request
- Over-temperature limit controller as standard equipment for protection of material
- Please see page 48 for a description of the different controllers

Additional Equipment

- Floor reinforcement for support of heavy loads
- Exhaust air flap controlled manually or automatically for better ventilation of furnace chamber
- Fan for better ventilation of combustion chamber and for fast cooling of the furnace
- Protective gas connector and seal of furnace casing to allow flushing of furnace with protective gasses
- Manual or automatic gas supply system

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Inner dimensions in mm</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection</th>
<th>Weight in kg</th>
<th>Minutes to Tmax</th>
</tr>
</thead>
<tbody>
<tr>
<td>HT 04/16</td>
<td>1600</td>
<td>150 x 150 x 150</td>
<td>4</td>
<td>610 x 610 x 1400</td>
<td>5.2</td>
<td>3-phase²</td>
<td>150</td>
<td>25</td>
</tr>
<tr>
<td>HT 08/16</td>
<td>1600</td>
<td>200 x 300 x 260</td>
<td>16</td>
<td>710 x 650 x 1500</td>
<td>8.0</td>
<td>3-phase²</td>
<td>200</td>
<td>25</td>
</tr>
<tr>
<td>HT 16/16</td>
<td>1600</td>
<td>300 x 300 x 60</td>
<td>16</td>
<td>710 x 650 x 1500</td>
<td>12.0</td>
<td>3-phase²</td>
<td>270</td>
<td>25</td>
</tr>
<tr>
<td>HT 04/17</td>
<td>1750</td>
<td>150 x 150 x 150</td>
<td>4</td>
<td>610 x 610 x 1400</td>
<td>5.2</td>
<td>3-phase²</td>
<td>150</td>
<td>40</td>
</tr>
<tr>
<td>HT 08/17</td>
<td>1750</td>
<td>300 x 300 x 260</td>
<td>16</td>
<td>710 x 650 x 1500</td>
<td>8.0</td>
<td>3-phase²</td>
<td>200</td>
<td>40</td>
</tr>
<tr>
<td>HT 16/17</td>
<td>1750</td>
<td>300 x 300 x 60</td>
<td>16</td>
<td>710 x 650 x 1500</td>
<td>12.0</td>
<td>3-phase²</td>
<td>270</td>
<td>40</td>
</tr>
<tr>
<td>HT 04/18</td>
<td>1800</td>
<td>150 x 150 x 150</td>
<td>4</td>
<td>610 x 610 x 1400</td>
<td>5.2</td>
<td>3-phase²</td>
<td>150</td>
<td>40</td>
</tr>
<tr>
<td>HT 08/18</td>
<td>1800</td>
<td>200 x 300 x 260</td>
<td>16</td>
<td>710 x 650 x 1500</td>
<td>9.0</td>
<td>3-phase²</td>
<td>200</td>
<td>40</td>
</tr>
<tr>
<td>HT 16/18</td>
<td>1800</td>
<td>200 x 300 x 60</td>
<td>16</td>
<td>710 x 650 x 1500</td>
<td>12.0</td>
<td>3-phase²</td>
<td>270</td>
<td>40</td>
</tr>
</tbody>
</table>

¹Heating only between two phases
²Please see page 48 for more information about mains voltage

Ask for our “Ceramics” catalog for more information on our high-temperature furnaces!
High-Temperature Furnaces HFL as floor Models with Brick Insulation for Melting Experiments

HFL 16/16 - HFL 160/17

The HFL 16/16 - HFL 160/17 series is particularly characterized by their special cladding with light refractory bricks. This insulation is necessary when aggressive gasses (such as vapourized glass) or acids may be produced in the process.

- Tmax 1600 °C or 1700 °C
- High-quality molybdenum disilicide (MoSi$_2$) heating elements
- Insulation with light refractory bricks and special backup insulation
- Type B thermocouple
- Furnace sizes of 16 to 160 liters
- For the release of vapours, a 30 mm large exhaust hole is integrated into the roof of the furnace
- Over-temperature limit controller for protection of material
- Please see page 48 for a description of the different controllers

Additional Equipment

- Exhaust air flap controlled manually or automatically for better ventilation of furnace chamber
- Fan for better ventilation of combustion chamber and for fast cooling of the furnace
- Protective gas connector and seal of furnace casing to allow flushing of furnace with protective gasses
- Manual or automatic gas supply system

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Inner dimensions in mm</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Power kW</th>
<th>Electrical connection*</th>
<th>Weight in kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>HFL 16/16</td>
<td>1600</td>
<td>300 300 260 16</td>
<td>720 900 1520 12</td>
<td>3-phase¹</td>
<td>500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HFL 40/16</td>
<td>1600</td>
<td>300 350 350 40</td>
<td>820 950 1620 12</td>
<td>3-phase</td>
<td>660</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HFL 64/16</td>
<td>1600</td>
<td>400 400 400 64</td>
<td>920 1000 1670 18</td>
<td>3-phase</td>
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<td></td>
</tr>
<tr>
<td>HFL 160/16</td>
<td>1600</td>
<td>500 550 550 160</td>
<td>1020 1150 1820 21</td>
<td>3-phase</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>HFL 16/17</td>
<td>1700</td>
<td>200 300 260 16</td>
<td>720 900 1520 12</td>
<td>3-phase¹</td>
<td>530</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HFL 40/17</td>
<td>1700</td>
<td>300 350 350 40</td>
<td>820 950 1620 12</td>
<td>3-phase</td>
<td>690</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HFL 64/17</td>
<td>1700</td>
<td>400 400 400 64</td>
<td>920 1000 1670 18</td>
<td>3-phase</td>
<td>920</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HFL 160/17</td>
<td>1700</td>
<td>500 550 550 160</td>
<td>1020 1150 1820 21</td>
<td>3-phase</td>
<td>1190</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹Heating only between two phases  *Please see page 48 for more information about mains voltage
The compact furnaces of the VHT line are available as electrically heated chamber furnaces with graphite, molybdenum or MoSi$_2$ heating. A wide variety of heating designs as well as a complete range of accessories allow optimal furnace configuration for technically demanding customer processes.

The vacuum-tight retort enables heat treatment processes either in protective and reaction gas atmospheres or in a vacuum, depending on the application, all the way to $10^{-5}$ mbar.

With the appropriate safety technology, the furnaces are also suitable for operation with hydrogen.

**Heating Concepts**

**Graphite – VHT ./.GR**
- Suitable for processes under protective and reaction gases or under vacuum
- Tmax 1800 °C and 2200 °C
- Graphite felt insulation
- Temperature measurement using type B thermocouple (version to 1800 °C)
- Temperature measurement using optical pyrometer (version to 2200 °C)

**Molybdenum – VHT ./.MO**
- Suitable for processes under highly pure protective and reaction gases or under a high vacuum up as much as $10^{-5}$ mbar
- Tmax 1600°C
- Insulation made of Molybdenum steel sheets

**MoSi$_2$ – VHT ./.KE**
- Suitable for processes under protective and reaction gases, under vacuum or in air
- Tmax 1800°C
- Insulation made of high purity aluminum oxide fiber
Basic Version VHT (All Heating Concepts)

- Standard furnace sizes 8, 40 and 100 liters
- A water-cooled stainless steel process reactor sealed with temperature-resistant o-rings
- Frame made of stable steel profiles, powder-coated and easy to service due to removable stainless steel panels
- Casing of the VHT 8 model on castors for easy repositioning of furnace
- Cooling water manifold with manual stopcocks in supply and return lines, automatic flowmeter monitoring, open-loop cooling water system
- Adjustable cooling water circuits with flowmeter and temperature indicator and overtemperature fuses
- Switchgear and controller integrated in furnace housing
- H 700 PLC control with clearly laid out 5.7" touchpanel control for program entry and display, 10 programs each with 20 segments
- Over-temperature limit controller with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2
- Manual operation of the process gas and vacuum functions
- Manual gas supply for one process gas (N₂ or Ar) with adjustable flow
- Bypass with manual valve for rapid filling or flooding of furnace chamber
- Manual gas outlet with overflow valve (20 mbar)
- Single-stage rotary vane pump with ball valve for pre-evacuating and heat treatment in a rough vacuum to 20 mbar
- Pressure gauge for visual pressure monitoring

Additional Equipment

- Optionally separable frame for passing through narrow door openings
- Manual gas supply for second process gas (N₂ or Ar) with adjustable flow and bypass
- Molybdenum or carbon-fiber-carbon retort with direct gas supply for clean atmosphere and improved temperature uniformity in the furnace chamber
- Charge thermocouple with display
- Two-stage rotary vane pump with ball valve for pre-evacuating and heat-treating in a vacuum to 10⁻² mbar
- Cooling unit with closed-loop cooling water circuit

<table>
<thead>
<tr>
<th>Inert gas</th>
<th>VHT ...-18/GR</th>
<th>VHT ...-16/MO</th>
<th>VHT ...-18/KE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>to 500 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrogen</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Rough vacuum and fine vacuum (&gt;10⁻² mbar)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>High vacuum (&lt;10⁻⁵ mbar)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

![Graphite heating chamber](image)
![Molybdenum heating chamber](image)
![Chamber made of ceramic fiber](image)

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Inner dimensions in mm</th>
<th>Volume in l</th>
<th>Outer dimensions in mm</th>
<th>Supply power/kW</th>
<th>Electrical connection*</th>
<th>Weight in kg</th>
<th>Material heater/insulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>VHT 8/18-GR</td>
<td>1800</td>
<td>170 240</td>
<td>200 8</td>
<td>1250 (800)¹</td>
<td>1100 2000 2300 27,0</td>
<td>three-phase</td>
<td>1200</td>
<td>Graphite/graphite felt</td>
</tr>
<tr>
<td>VHT 40/18-GR</td>
<td>1800</td>
<td>300 450</td>
<td>300 40</td>
<td>1500 2000 2300 83,0</td>
<td>on request</td>
<td>three-phase</td>
<td>2000</td>
<td>Graphite/graphite felt</td>
</tr>
<tr>
<td>VHT 100/18-GR</td>
<td>1800</td>
<td>450 550</td>
<td>450 100</td>
<td>1750 2200 2600</td>
<td>-</td>
<td>three-phase</td>
<td>800</td>
<td>Graphite/graphite felt</td>
</tr>
<tr>
<td>VHT 8/22-GR</td>
<td>1800</td>
<td>170 240</td>
<td>200 8</td>
<td>1250 (800)¹</td>
<td>1100 2000 2300 27,0</td>
<td>three-phase</td>
<td>1200</td>
<td>Graphite/graphite felt</td>
</tr>
<tr>
<td>VHT 40/22-GR</td>
<td>1800</td>
<td>300 450</td>
<td>300 40</td>
<td>1500 2000 2300 83,0</td>
<td>on request</td>
<td>three-phase</td>
<td>2000</td>
<td>Graphite/graphite felt</td>
</tr>
<tr>
<td>VHT 100/22-GR</td>
<td>1800</td>
<td>450 550</td>
<td>450 100</td>
<td>1750 2200 2600</td>
<td>-</td>
<td>three-phase</td>
<td>800</td>
<td>Graphite/graphite felt</td>
</tr>
<tr>
<td>VHT 8/16-MO</td>
<td>1800</td>
<td>170 240</td>
<td>200 8</td>
<td>1250 (800)¹</td>
<td>1100 2000 2300 34,0</td>
<td>three-phase</td>
<td>1200</td>
<td>Molybdenum</td>
</tr>
<tr>
<td>VHT 40/16-MO</td>
<td>1800</td>
<td>300 450</td>
<td>300 40</td>
<td>1500 2000 2300 122,0</td>
<td>on request</td>
<td>three-phase</td>
<td>2000</td>
<td>Molybdenum</td>
</tr>
<tr>
<td>VHT 100/16-MO</td>
<td>1800</td>
<td>450 550</td>
<td>450 100</td>
<td>1750 2200 2600</td>
<td>-</td>
<td>three-phase</td>
<td>800</td>
<td>Molybdenum</td>
</tr>
<tr>
<td>VHT 8/18-KE</td>
<td>1800</td>
<td>170 240</td>
<td>200 8</td>
<td>1250 (800)¹</td>
<td>1100 2000 2300 12,5</td>
<td>three-phase</td>
<td>1200</td>
<td>MoSi₂/ceramic fiber</td>
</tr>
<tr>
<td>VHT 40/18-KE</td>
<td>1800</td>
<td>300 450</td>
<td>300 40</td>
<td>1500 2000 2300 45,0</td>
<td>on request</td>
<td>three-phase</td>
<td>2000</td>
<td>MoSi₂/ceramic fiber</td>
</tr>
<tr>
<td>VHT 100/18-KE</td>
<td>1800</td>
<td>450 550</td>
<td>450 100</td>
<td>1750 2200 2600</td>
<td>-</td>
<td>three-phase</td>
<td>800</td>
<td>MoSi₂/ceramic fiber</td>
</tr>
</tbody>
</table>

¹With the switching system unit removed
*See page 48 for information about supply voltage.
The use of automatic valves for process gas or exhaust air management and the powerful H3700 controller allow the entire heat treatment process to be run fully automatically. The entry of all process data (temperatures, ramps, gas supply and vacuum) is easily controllable from a large, 12" graphic control panel. System status with all process-related data are clearly shown on a process control diagram. All valves and the vacuum pump can also be operated manually from here as well.

The system has an automatic pre-program and post-program for purging the furnace chamber and also features automated leak testing.

**Automatic Version VHT without Hydrogen Operation**

- Features the same as basic version of VHT, plus:
- Automatic gas supply for one process gas (N₂ or Ar) with adjustable flow
- Bypass for rapid filling or flooding of furnace chamber
- Automatic gas outlet with check valve and pressure relief valve (20 mbar)
- Single-stage rotary vane pump with check valve for pre-evacuating and heat treatment in a rough vacuum to 20 mbar
- Transducer for absolute and relative pressure measurements
- H3700 controller (10 programs with 20 segments each)
- Operation with 12" graphical control panel (touchpanel)

**Additional Equipment**

- Mass flow controller for varying flow volumes and generating gas mixtures (with second process gas)
- Furnace pressure control with position-controlled exhaust valve (partial pressure control)
- Electric or gas-heated exhaust gas torch for process gas post-combustion
- Water-cooled exhaust gas cooler
- Condensate traps for separation of large amounts of binder
- Two-stage rotary vane pump with check valve for pre-evacuating and heat treatment in a vacuum to 10⁻² mbar
- Pump stand with turbo-molecular pump and slide valve for pre-evacuating and for heat treatment in a vacuum to 10⁻³ mbar (only for molybdenum model) including electric pressure transducer and booster pump
- PC control via NCC with enhanced optional documentation and possible connection to customer LAN
Extension Package – Hydrogen in VHT-MO
When hydrogen is used as a process gas, our systems come equipped with additional safety technology. Only certified and industry proven safety sensors are used. The furnaces are always controlled using a fail-safe controller (S7-300F/safety controller). The controller and documentation are carried out using Nabertherm Control Center NCC (see page 49).

Two Temperature-Dependent Concepts Available for Safe Operation with Hydrogen:
- Partial pressure operation: H₂ infeed under controlled negative pressure (partial pressure) in the process reactor starting from 750 °C furnace chamber temperature
- Atmospheric operation: H₂ overpressure infeed in process reactor starting from room temperature

Automatic Version VHT for Operation with Hydrogen
- Features as found with automatic version of the VHT without hydrogen operation, plus
- Redundant process gas valves for hydrogen
- Monitored pre-pressures of all process gases
- Bypass for safe flushing of furnace chamber with inert gas
- Pressure-monitored emergency flooding with automated solenoid valve opening
- Electric or gas-heated exhaust gas torch for H₂ post-combustion

Extension Package – Debinding and Sintering
The “Debinding and Sintering” extension package allows VHT furnaces with molybdenum heating to be used for processes causing process-related contamination during heat treatment. The furnace is equipped with an additional retort with direct gas inlet and outlet and exhaust gas torch. Special gas plumbing prevents contamination of the furnace insulation and the heater due to the thermal process. The furnace can also optionally be equipped with a heated gas exhaust, a partial pressure debinding system, and a binding agent trap. The control system corresponds to that of the “Automatic” extension package.

Automatic Version VHT-MO for Debinding/Sintering
- Features such as the automatic version of the VHT without hydrogen, plus:
  - Additional molybdenum retorts in the furnace chamber with direct gas inlet and outlet for protecting the furnace insulation
  - Exhaust gas torch for post-combustion of gases produced by process
  - Exhaust gas cooler

Additional Equipment
- Heated gas outlet
- Binding agent trap with condensate separation for processes with a large proportion of binding agents
- Cooling unit for closed-loop water circuit
Melting Furnaces K 1/10 - K 4/13, KC Models

K 1/10 - K 4/13, KC 1/15 + KC 2/15

These compact melting furnaces for the melting of non-ferrous metals and alloys are one of a kind and have a number of technical advantages. Designed as tabletop models, they can be used for many laboratory applications. The practical counter balanced hinge with shock absorbers and the spout (not for KC) on the front of the furnace make exact dosing easy when pouring the melt. The furnaces are available for furnace chamber temperatures of 1000, 1300, or 1500 °C. This corresponds to melt temperatures of about 80-110 °C lower.

- Tmax 1000 °C, 1300 °C, or 1500 °C, with melt temperature about 80 - 110 °C lower
- Crucible sizes of 1, 2, or 4 liters
- Crucible with integrated pouring spout of iso-graphite included with delivery
- Spout (not for KC), mounted at the furnace for exact pouring
- Compact bench-top design, simple emptying of crucible by tilting system with gas damper
- Crucible for heating of furnace insulated with a hinged lid, lid opened when pouring
- Please see page 48 for a description of the different controllers

### Additional Equipment

- Other crucible types available, e.g. steel or SiC
- Over-temperature limiter with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the oven and melt. The furnace shuts off upon overtemperature and switches back on when the temperature falls below the critical level.
- Observation hole for the melt

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Crucible</th>
<th>Volume in L</th>
<th>Outer dimensions in mm</th>
<th>Supply power/kW</th>
<th>Electrical connection*</th>
<th>Weight in kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>K 1/10</td>
<td>1000</td>
<td>A 6</td>
<td>1,0</td>
<td>520</td>
<td>680</td>
<td>660</td>
<td>3,0</td>
</tr>
<tr>
<td>K 2/10</td>
<td>1000</td>
<td>A10</td>
<td>2,0</td>
<td>520</td>
<td>680</td>
<td>660</td>
<td>3,0</td>
</tr>
<tr>
<td>K 4/10</td>
<td>1000</td>
<td>A25</td>
<td>4,0</td>
<td>570</td>
<td>755</td>
<td>705</td>
<td>3,6</td>
</tr>
<tr>
<td>K 1/13³</td>
<td>1300</td>
<td>A 6</td>
<td>1,0</td>
<td>520</td>
<td>680</td>
<td>660</td>
<td>3,0</td>
</tr>
<tr>
<td>K 2/13³</td>
<td>1300</td>
<td>A10</td>
<td>2,0</td>
<td>520</td>
<td>680</td>
<td>660</td>
<td>3,0</td>
</tr>
<tr>
<td>K 4/13³</td>
<td>1300</td>
<td>A25</td>
<td>4,0</td>
<td>570</td>
<td>755</td>
<td>705</td>
<td>5,5</td>
</tr>
<tr>
<td>K 1/15³</td>
<td>1500</td>
<td>A 6</td>
<td>1,0</td>
<td>580</td>
<td>630</td>
<td>580</td>
<td>10,5</td>
</tr>
<tr>
<td>KC 2/15³</td>
<td>1500</td>
<td>A10</td>
<td>2,0</td>
<td>580</td>
<td>630</td>
<td>580</td>
<td>10,5</td>
</tr>
</tbody>
</table>

¹Heating only between two phases
²Please see page 48 for information on mains voltage
³External dimensions of furnace, transformer in separate housing (500 x 570 x 300 mm)
⁴Switchgear and controller mounted in a floor standing cabinet
Crucible Furnaces T 10/11 - T 80/13 for Melting and Holding

**T 10/11 - T 80/13**

The electrically heated T series crucible furnaces are suitable for melting nonferrous metals at melt temperatures up to 1200 °C. The first-class insulation in combination with all-round heating results in extremely good temperature uniformity, in turn ensuring good melt quality.

- **T ..../11** with maximum furnace chamber temperature of 1100 °C for aluminum (melt temperature up to max. 980 °C)
- **T ..../12** with maximum furnace chamber temperature of 1200 °C, also suitable for brass (melt temperature up to max. 1100 °C)
- **T ..../13** with maximum furnace chamber temperature of 1300 °C, also suitable for bronze alloys (melt temperature up to max. 1200 °C)
- Suitable for clay-graphite or SiC crucibles
- Crucible available as additional equipment
- Four side heating with heating elements radiating freely into the furnace chamber
- Heating of furnaces up to 24 kW power rating controlled using long-lasting, noiseless thyristors
- High melting performance with good temperature distribution in the melt
- Insulation constructed in multiple layers with lightweight refractory bricks on the hot face
- Emergency outlet for safe draining of the melt in case of crucible breakage
- No exhaust gas discharge needed
- Temperature limit controller in furnace chamber for protection against overheating
- Furnace chamber control with temperature measurement behind the crucible

**Additional Equipment**

- Clay-graphite or SiC crucible
- Crucible breakage monitor with optical and audible signal
- Bath control with thermocouples in the furnace chamber and in the melt. Control takes place via the actual temperature in the molten bath.

### Table: Model Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Tmax °C</th>
<th>Crucible Capacity</th>
<th>Exterior dimensions in mm</th>
<th>Power in kW</th>
<th>Weight kg</th>
<th>Melting performance³ kg/hr Al</th>
<th>Holding lid closed/open kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>T 10/11</td>
<td>1100</td>
<td>A 70</td>
<td>860 x 860 x 790</td>
<td>16</td>
<td>400</td>
<td>32³</td>
<td>3/5³</td>
</tr>
<tr>
<td>T 20/12</td>
<td>1200</td>
<td>A 150</td>
<td>940 x 940 x 790</td>
<td>20</td>
<td>460</td>
<td>42³</td>
<td>3/6³</td>
</tr>
<tr>
<td>T 40/13</td>
<td>1300</td>
<td>A 300</td>
<td>1010 x 1010 x 880</td>
<td>26</td>
<td>580</td>
<td>58³</td>
<td>3/7³</td>
</tr>
<tr>
<td>T 80/13</td>
<td>1300</td>
<td>BU 200</td>
<td>1110 x 1110 x 940</td>
<td>50</td>
<td>650</td>
<td>126³</td>
<td>4/9³</td>
</tr>
</tbody>
</table>

³The specified melting performances are maximum values. In practice, approx. 80 % are achieved.

---

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Measurement and Control Systems

Nabertherm has many years of experience in the design and construction of both standard and custom control system. All controls are remarkable for their ease of use and even in the basic version have a wide variety of functions.

Standard Controller

Our extensive line of standard controllers satisfies most customer requirements. Based on the specific furnace model, the controller regulates the furnace temperature reliably. The standard controllers are developed and fabricated within the Nabertherm group. When developing controllers, our focus is on ease of use. From a technical standpoint, these devices are custom-fit for each furnace model or the associated application. From the simple controller with an adjustable temperature to the control unit with freely configurable control parameters, stored programs, PID microprocessor control with self-diagnosis system and a computer interface, we have a solution to meet your requirements.

Assignment of Standard Controllers to Furnace Families

| Controller | L 3-13.40 | LE 2101-1.4 | LE 5511-1.4 | LL 1/1 | LL 1/19 | N 7/H | N 8/H | N 7/H | N 8/H | R | R 1 | R 15 | R 15 | R 15 | R 15 | R 15 | R 15 | R 15 | R 15 | R 15 | R 15 | H 40/60 | H 40/60 | H 40/60 | H 40/60 | H 40/60 | H 40/60 | H 40/60 | H 40/60 | H 40/60 | H 40/60 |
|------------|-----------|-------------|-------------|---------|---------|-------|-------|-------|-------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| B 170      | ✓         | ✓           | ✓           | ✓       | ✓       | ✓     | ✓     | ✓     | ✓     | ✓ | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| P 320      | ✓         | ✓           | ✓           | ✓       | ✓       | ✓     | ✓     | ✓     | ✓     | ✓ | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| R 6        | ✓         | ✓           | ✓           | ✓       | ✓       | ✓     | ✓     | ✓     | ✓     | ✓ | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| C 6        | ✓         | ✓           | ✓           | ✓       | ✓       | ✓     | ✓     | ✓     | ✓     | ✓ | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| C 290      | ✓         | ✓           | ✓           | ✓       | ✓       | ✓     | ✓     | ✓     | ✓     | ✓ | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| C 295      | ✓         | ✓           | ✓           | ✓       | ✓       | ✓     | ✓     | ✓     | ✓     | ✓ | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| C 40/42    | ✓         | ✓           | ✓           | ✓       | ✓       | ✓     | ✓     | ✓     | ✓     | ✓ | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| H 100      | ✓         | ✓           | ✓           | ✓       | ✓       | ✓     | ✓     | ✓     | ✓     | ✓ | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| HiProSystems 2208e | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| H 700      | ✓         | ✓           | ✓           | ✓       | ✓       | ✓     | ✓     | ✓     | ✓     | ✓ | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |

*with additional slave controllers C6Z

Functionality of the Standard Controllers

<table>
<thead>
<tr>
<th>Function</th>
<th>B 170</th>
<th>B 150</th>
<th>P 320</th>
<th>R 6</th>
<th>C 6</th>
<th>C 290</th>
<th>C 295</th>
<th>H 100</th>
<th>C 42</th>
<th>C 295</th>
</tr>
</thead>
<tbody>
<tr>
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<td>9</td>
<td>1</td>
<td>1</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Steps per program</td>
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<td>8</td>
<td>1</td>
<td>2</td>
<td>40</td>
<td>8</td>
<td>18</td>
<td>18</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td>Extra functions (e.g. fan or autom. flaps)</td>
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<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Skip-button for segment jump</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>Clear, blue-white LCD display</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>Status messages in clear text</td>
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<td>✓</td>
<td>✓</td>
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<td>✓</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Start time configurable (e.g. to use night power rates)</td>
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<tr>
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<td>✓</td>
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<tr>
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<td>✓</td>
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</tr>
<tr>
<td>Program entry in steps of 1 °C or 1 min.</td>
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</tr>
<tr>
<td>Keypad lock</td>
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<td>✓</td>
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<tr>
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<td>✓</td>
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<td>✓</td>
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<tr>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

*2 steps equal to one ramp-soak pair
*not for model L(T)15...

Mains Voltages for Nabertherm Furnaces

Single-phase: all furnaces are available for mains voltages from 110 V - 240 V at 50 or 60 Hz.
Three-phase: all furnaces are available for mains voltages from 200 V - 240 V or 380 V - 480 V, at 50 or 60 Hz.
Alternatives for High-Performance Control and Documentation

HiProSystems Control and Documentation
This professional control system for single and multi-zone furnaces is based on Siemens hardware and can be upgraded extensively. HiProSystems control is used in the following situations:

When more than two process-dependent functions, such as exhaust dampers, cooling fans, automatic movements, etc., have to be handled during a cycle; when furnaces with more than one zone have to be controlled; when special documentation of each batch is required and; when remote telediagnostic service is necessary. The system is also perfectly suited for controlling multiple furnaces or furnace groups. It is flexible and is easily tailored to your process or documentation needs.

Alternative User Interfaces

Touch Panel H 700
This basic panel accommodates most basic needs and is very easy to use.

Touch Panel H 1700
Firing cycle data and the extra functions activated are clearly displayed in a table. Messages appear as text.

Touch Panel H 3700
All functions and process data are stored and displayed in easy to read charts. The data can be exported through various interfaces (RS 232, RS 422/485, USB, Ethernet TCI/IP, MPI, Profibus) to a local PC or your company network for further processing. A CF card also gives the opportunity for data storage and transfer to a PC with a card reader.

Nabertherm Control Center NCC (PC-based)
Upgrading the HiProSystems-Control into an NCC provides for additional interfaces, operating documentation, and service benefits in particular for controlling furnace groups including charge beyond the furnace itself (quenching tank, cooling station etc.):

- Charge data can be read in via barcodes
- Interface for connection to existing Enterprise Database systems (e.g. SAP, Oracle)
- Internet connection for remote operation and monitoring
- Connection to mobile phone network for alarm message transmission via SMS
- Control from various locations over the network
- Documentation according to ISO 9000, etc.
- Maximum operator convenience: full keyboard, large screen
- Ideal for controlling furnace groups and documentation

Controltherm MV Software for Monitoring, Documentation and Control with Standard Controllers
Documentation and reproducibility are more important with the quality standards certain industries demand. Here, the powerful Nabertherm software, Controltherm MV provides an optimum solution for the control and documentation of one or more furnaces (furnace data only).

Features
- Parallel control/monitoring and documentation of up to 16 furnaces
- Programming, archiving and printing of programs and graphics
- Documentation of furnace data according to ISO 9000 etc.
- Free input of descriptive charge data text
- Data exportable into Excel format for further evaluation
- Start/stop of the Controller from the local PC

Temperature Recorder
Reliable documentation method with a dot printer or continuous pen and up to six measuring points, also available with various digital storage systems (e.g. disk, CF card).
Furnaces for Applications outside the Laboratory

Besides the laboratory furnaces described in this catalog, the construction and fabrication of furnaces and furnace systems for industrial production is also part of the Nabertherm product spectrum. This makes Nabertherm your competent partner as your product moves from the laboratory into production.

Whatever your heat treatment requirements, we would be happy to produce a solution to meet your needs. We can satisfy the majority of customer requirements from our standard product line. Our engineers can also develop custom solutions for your application.

Examples

Air circulation furnaces with loading systems, like loading carriages, are particularly well-suited for drying processes, curing and other heat treatments involving exact temperature uniformity. From the standard furnace with 30 liters of volume to production furnaces with many thousands of liters, we can provide a solution.

Many heat treatment processes for glass, such as tempering, bending, arching, cooling, and melting require furnace systems with particularly good temperature control. We supply furnaces like the bending furnace shown which can satisfy these requirements.

Multifurnace systems with automatic conveyor technology for various applications. HiProSystems controls not only regulate the heat treatment process, but can also automatically control the movement of goods into furnaces or from furnaces to a cooling station. Complete process documentation including documentation of conveyor events can also be implemented.

We provide our customers with bogie hearth furnaces or shuttle table furnaces for load weights of up to 100 tons. The furnaces are used at a variety of customer groups. Our customers include foundries, hardening shops, glass-processing operations, and even makers of porcelain and ceramics. Manufacturers of technical ceramics also use product furnaces from Nabertherm for their debinding and sintering processes.
The Nabertherm Product Range – www.nabertherm.com

**Arts & Crafts**
Art is the union of style and technical skill. Good tools are functional and efficient. Are Nabertherm’s kilns for pottery, fused glass, painted porcelain, and enamel ware tools or art?

**Glass**
Different furnace concepts for annealing, bending slumping, decorating and tempering make Nabertherm your strong partner for the heat treatment of glass and quartz.

**Technical Ceramics MIM/CIM, Solar, Silicon/BioCeramics**
Wire-heated kilns for use up to 1400 C and MoSi\(^2\) kilns for use up to 1800 C offer the best value and quality for sintering Technical Ceramics. All are available in sizes from bench-top to walk-in. To remove binders, we offer solutions from our Combi-Furnaces that debind and sinter in the same furnace to specialized systems for binder removal in a specialized atmosphere (e.g. BASF Catamold).

**Heat Treatment of Metals, Plastics and Surface Finishing**
Tempering, annealing, hardening and quenching, solution annealing, forging, curing, preheating, drying, ageing – these are only some of the applications which are possible with our extensive program of furnaces and systems. From the compact hardening furnace to fully-automatic systems with conveying technology and process documentation – we certainly will find a solution tailored to your application.

**Foundry**
Every furnace for the shop that casts metal, beginning with ovens to dry cores and dewax investments, to fuel-fired and electric resistance melting furnaces, to thermal decoring and heat treatment systems. All Nabertherm Foundry furnaces are designed for energy efficiency and integration with automation systems for low total cost of ownership.
The whole World of Nabertherm: www.nabertherm.com

Please visit our website www.nabertherm.com and find out all you want to know about us and our products.

In addition to our current calendar of trade fairs and training dates, there is also the opportunity to get in touch directly with your local sales office or nearest dealer worldwide.

Professional Solutions for:
- Arts & Crafts
- Glass
- Ceramics
- Laboratory/Dental
- Heat Treatment of Metals, Plastics and Surface Finishing
- Foundry

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