Dental

Furnaces and Accessories

Sintering Furnaces for
Zirconia
Translucent Zirconia
CoCr Alloys
CAD/CAM Systems
Burnout Furnaces
Laser Sintering
Model Casting
Production Furnaces

www.nabertherm.com

Made
in
Germany

Made in Germany

Nabertherm with 500 employees worldwide have been developing and producing industrial furnaces for many different applications for 70 years. As a manufacturer, Nabertherm offers the widest and deepest range of furnaces worldwide. 150,000 satisfied customers in more than 100 countries offer proof of our commitment to excellent design, quality and cost efficiency. Short delivery times are ensured due to our complete inhouse production and our wide variety of standard furnaces.

Setting Standards in Quality and Reliability

Nabertherm does not only offer the widest range of standard furnaces. Professional engineering in combination with in house manufacturing provide for individual project planning and construction of tailor-made thermal process plants with material handling and charging systems. Complete thermal processes are realized by customized system solutions.

Innovative Nabertherm control technology provides for precise control as well as full documentation and remote monitoring of your processes. Our engineers apply state-of-the-art technology to improve the temperature uniformity, energy efficiency, reliability and durability of our systems with the goal of enhancing your competitive edge.

Front made of textured stainless steel

Global Sales and Service Network — Close to you

Nabertherm´s strength is one of the biggest R&D departments in the furnace industry. In combination with central manufacturing in Germany and decentralized sales and service close to the customer we can provide for a competitive edge to live up to your needs. Long term sales and distribution partners in all important world markets ensure individual on-site customer service and consultation. There are various reference customers in your neighborhood who have similar furnaces or systems.

Large Customer Test Center

What furnace is the right choice for this specific process? This question cannot always be answered easily. Therefore, we have set up our modern test center which is unique in respect to size and variety. A representative number of furnaces is available for tests for our customers.

Customer Service and Spare Parts

Our professional service engineers are available for you worldwide. Due to our complete inhouse production, we can despatch most spare parts from stock over night or produce with short delivery time.

Experience in Many Fields of Thermal Processing

In addition to furnaces for laboratory, Nabertherm offers a wide range of standard furnaces and plants for many other thermal processing applications. The modular design of our products provides for customized solutions to you individual needs without expensive modifications.

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Sintering Furnace LT 02/13 CR for Cobalt-Chromium

LT 02/13 CR

Forced cooling system with compressed air

Flowmeter for Argon

The sintering furnace LT 02/13 CR is perfectly suited for sintering of cobalt-chromium restorations. The blanks are placed in a special sintering bell and will be heat-treated under argon. The specific design in combination with sintering pearls provides for good sintering results in a nearly oxygen-free atmosphere at very low argon consumption.

The system is open and can be programmed for various materials up to sintering temperatures of 1300 °C. Two pre-installed sample programs, which can be adjusted individually. Furthermore, the sintering furnace LT 02/13 CR is designed for a single-phase connection.

- Tmax 1300 °C
- Working temperature up to 1280 °C, depending on the CoCr material
- Single-phase connection
- Furnace chamber insulation made of non-carcinogenic fiber materials
- Double-walled housing made of textured stainless steel provide for low surface temperatures
- Gas supply system with solenoid valve and flow meter
- Forced cooling system with compressed air
- Sintering bell with good sealing for sintering up to 30 single crowns under argon
- Sintering pearls, Ø 1,25 mm (200 g) included in delivery scope
- Special tongs included in the delivery scope
- Type S thermocouple
- Controller C450 allows for automatic temperature control and switching of the gas flow
- Switching system with solid-state-relays to switch the heating
- Two different gas flows can be set for the optimal adaptation to the sintering cycle
- Defined application within the constraints of the operating instructions
- NTLog Basic for Nabertherm controller: recording of process data with USB-flash drive
- Controls description see page 18

Additional equipment

- Over-temperature limiter with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the furnace and load
- Process control and documentation via VCD software package for monitoring, documentation and control see page 19

Model	Tmax °C	Inner dimensions in mm			Volume in l	Maximum units	Outer dimensions in mm			Connected load kW	Electrical connection[2]	Weight in kg	Minutes to Tmax[4]
		w	d	h			W	D	H[1]				
LT 02/13 CR	1300	130	120	120	1,9	30	422	320 (430[3])	430 + 230	2.2	1-phase	25	35

[1]Including opened lift door
[3]Including compressed air connection for forced cooling

[2]These furnaces are available for main voltage of 110 V - 120 V, 200 V, 208 V, 220 V - 240 V, 1/N/PE or 2/PE
[4]If connected at 230 V 1/N/PE

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Accessories for Sintering Furnace LT 02/13 CR for Cobalt-Chromium

Sintering Bell Set, Ø 95 x 50 mm
Article No.: 699001186

Sintering Bell for Sintering Furnace LT 02/13 CR

The sintering bell with good sealing is perfectly suited to sinter non-ferrous metals under argon. The sintering blanks are placed in the sintering bell and will be sintered under argon. Up to 30 single crowns can be used per sintering cycle.

The specific design in combination with sintering pearls provides for good sintering results in a nearly oxygen-free atmosphere at a very low argon consumption.

LT 02/13 CR

Sintering Pearls for Sintering Furnace LT 02/13 CR

The use of sintering pearls which reduce the atmosphere inside the sintering bell ensures perfect results. They prevent the crowns and bridges from sticking or jamming during the sintering process.

It must be ensured that the frameworks und single crowns are imbedded in sintering pearls up to their upper edge. Though, it must be ensured that they should not enter the crowns in order not to hinder the sintering shrinkage.

Special Tongs for Charging the Sintering Bell

We offer a pair of special tongs for loading and unloading the furnace. The sintering bell can easily be removed from the sintering chamber.

Note: The accessories described above are designed for cold charging and discharging. Removing them in hot condition is not permitted.

Sintering Pearls
Article No.: 699001185

Special Tongs, Length: 250 mm
Article No.: 699001189

High-Temperature Furnaces up to 1650 °C
Suitable for Sintering Translucent Zirconia

LHT 03/17 D

LHT 01/17 D

Saggars with top lid for high-temperature furnace LHT 01/17 D

Charge saggar, starter-set for high-temperature furnace LHT 03/17 D

Over-temperature limiter

These high-temperature furnaces are perfectly suited for sintering of translucent zirconia units. The special molybdenum discilicide heating elements offer best possible protection against chemical interaction between charge and heating elements.

The zirconia units are positioned in ceramic saggars. Up to three saggars can be stacked into the high-temperature furnace.

- Tmax 1650 °C
- Furnace chamber with a volume of 1 or 2 liters
- Special heating elements made of molybdenum disilicide offer best possible protection against chemical interaction between charge and heating elements
- Furnace chamber insulation made of non-carcinogenic fiber materials
- Housing made of sheets of textured stainless steel
- Dual shell housing with additional fan cooling for low surface temperature
- Compact design with lift door, opening upwards
- Adjustable air inlet
- Exhaust air opening in the roof
- Type S thermocouple
- Precise temperature control, also in the lower temperature range for drying
- Controller P480 (LHT 01/17 D) or P470 (LHT 03/17 D)
- Switchgear with steady control of the heating elements
- Delivery incl. starter set to charge the zirconia works
- Defined application within the constraints of the operating instructions
- NTLog Basic for Nabertherm controller: recording of process data with USB-flash drive
- Controls description see page 18

Additional equipment

- Over-temperature limiter with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the furnace and load
- Saggar for charging of up to three layers see page 9
- Protective gas connection for non-flammable protective or reaction gases for LHT 03/17 D
- Manual or automatic gas supply system
- Process control and documentation via VCD software package for monitoring, documentation and control see page 19

Model	Tmax °C	Inner dimensions in mm			Volume in l	Maximum units	Outer dimensions in mm			Connected load kW	Electrical connection*	Weight in kg	Minutes to Tmax[1]
		w	d	h			W	D	H[2]				
LHT 01/17 D	1650	110	120	120	1	45	385	425	525+195	3.4	1-phase	28	10
LHT 03/17 D	1650	135	155	200	4	75	470	630	770+260	3.0	1-phase	75	60

*These furnaces are available for main voltage of 110 V - 120 V, 200 V, 208 V, 220 V - 240 V, 1/N/PE or 2/PE
[1]If connected at 230 V 1/N/PE
[2]Including opened lift door

High-Temperature Bottom Loading Furnace up to 1650 °C with Integrated Speed Cooling System for Sintering of Translucent Zirconia

Due to its maximum temperature of 1650 °C and the large chamber the high-temperature bottom loading furnace is perfectly suited for sintering of translucent zirconia. The electrically driven lift-bottom provides for easy charging. The heating all around the cylindrical furnace chamber provides for a good temperature uniformity.

By using special heating elements made of molydenum disilicide crowns and bridges are protected against chemical contamination at the best. The charge will be placed in saggars made of technical ceramics. Up to three saggars on top of each other guarantee high productivity.

The high-temperature bottom loading furnace is additionally equipped with rapid cooling device. The furnace automatically opens stepwise for faster cooling. Depending on the charge and the type of saggars process times shorter than two hours can be realized.

- Tmax 1650 °C
- High-quality heating elements made of molybdenum disilicide offer best possible protection against chemical interaction between charge and heating elements
- Furnace chamber insulation made of non-carcinogenic fiber materials
- Outstanding temperature uniformity due to all-round furnace chamber heating
- Furnace chamber with a volume of 2 liters, table with large floor space
- Precise, electric belt drive with push button operation, automatic opening of Speed model for cooling possible
- Housing made of sheets of textured stainless steel
- Exhaust air vent in the roof
- Type S thermocouple
- Controller P470
- Speed model with drying function. When starting the program the table will be driven in drying position and closes automatically at 500 °C
- Delivery incl. one starter set to charge the zirconia works
- Defined application within the constraints of the operating instructions
- NTLog Basic for Nabertherm controller: recording of process data with USB-flash drive
- Controls description see page 18

Additional equipment
- Over-temperature limiter with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the furnace and load
- Saggar for charging of up to three layers see page 9
- Process control and documentation via VCD software package for monitoring, documentation and control see page 19

High-temperature bottom loading furnace LHT 02/17 LB Speed with rapid cooling function
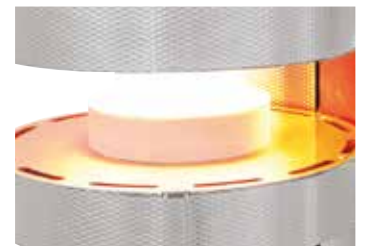
Automated table lowering for cooling

Charge saggar, starter-set

Model	Tmax °C	Inner dimensions in mm Ø	h	Volume in l	Maximum units	Outer dimensions in mm W	D	H	Connected load kW	Electrical connection*	Weight in kg	Minutes to Tmax[1]
LHT 02/17 LB Speed	1650	Ø 120	130	2	75	540	610	740	3.3	1-phase	85	80

*These furnaces are available for main voltage of 110 V - 120 V, 200 V, 208 V, 220 V - 240 V, 1/N/PE or 2/PE
[1]If connected at 230 V 1/N/PE

High-Temperature Furnace with SiC Rod Heating
for Sintering Zirconia up to 1550 °C

HTCT 01/16

HTCT 01/16

Designed as table model with SiC heating rods, this model offers numerous advantages when sintering zirconia at an attractive price. The large heating chamber and fast heating-up times make this model a good selection for the CAD/CAM processing of zirconia. The furnace controller can be freely programmed for the individual sintering of the zirconia material. The high-temperature furnace is moreover designed for connection to the single-phase mains supply.

Furnace chamber with high-quality fiber materials and SiC heating rods on both sides of the furnace

- Tmax 1550 °C
- Working temperature 1500 °C, increased wear and tear must be expected in case of working at higher temperatures
- Single-phase connection
- Furnace chamber insulation made of non-carcinogenic fiber materials
- Housing made of sheets of textured stainless steel
- Dual shell housing for low external temperatures and high stability
- Adjustable air inlet
- Type S thermocouple
- Controller C450
- Switching system with solid-state-relays, power tuned to the SiC rods
- Easy replacement of heating rods
- Defined application within the constraints of the operating instructions
- NTLog Basic for Nabertherm controller: recording of process data with USB-flash drive
- Controls description see page 18

Additional equipment
- Over-temperature limiter with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the furnace and load
- Square saggar for charging of up to three layers see page 9
- Lid for top saggar
- Process control and documentation via VCD software package for monitoring, documentation and control see page 19

Saggars with top lid

Model	Tmax °C	Inner dimensions in mm			Volume in l	Maximum units	Outer dimensions in mm			Connected load kW	Electrical connection*	Weight in kg	Minutes to Tmax[2]
		w	d	h			W	D	H[1]				
HTCT 01/16	1550	110	120	120	1,5	45	340	300	460 + 195	3.5	1-phase	18	40

*These furnaces are available for main voltage of 110 V - 120 V, 200 V, 208 V, 220 V - 240 V, 1/N/PE or 2/PE
[1]Including opened lift door
[2]If connected at 230 V 1/N/PE

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Accessories for Sintering Furnaces

Starter-Set, Ø 115 mm
Article No.: 699001066

Sintering Dish, Ø 115 mm
Article No.: 699001054

Spacer Ring with Ventilation Openings
Article No.: 699001055

Charge Saggars for Sintering Furnaces LHT 02/17 LB Speed and LHT 03/17 D

For charging zirconia workpieces charge saggars are recommended. A saggar basically consists of the sintering dish as base and the spacer ring with ventilation openings. The material is highly resistant to temperature fluctuations and can be used for processes with short heat-up and cool-down times.

When charging the furnace it must be ensured that the lower charge carrier is generally resting on the spacer ring. This provides for air-circulation under this carrier and improves the temperature uniformity. It is recommended to cover upper saggar with another sintering dish as lid.

The starter set consists of a charge saggar, a spacer ring as a base and a second sintering dish as lid. The use of additional saggars (sintering dish and spacer ring) allows charging on additional levels. Both furnace models are designed to get charged with up to three charge saggars.

Number of required charge levels in overview:
- 1 level: Starter set which includes 2 sintering dishes and 2 spacer rings
- 2 levels: Starter set + 1 sintering dish + 1 spacer ring
- 3 levels: Starter set + 2 sintering dishes + 2 spacer rings

Charge Saggar, 110 x 75 x 30 mm
Article No.: 699000279

Lid for Charge Saggar
Article No.: 699000985

Safe charging on up to three levels

Charge Saggar for Sintering Furnaces HTCT 01/16 and LHT 01/17 D

Placing the zirconia product in charge saggars provides for optimum utilization of the furnace chamber. Up to three saggars can be stacked in the furnaces. The integrated air slots ensure a better air circulation of the charge. The upper saggar can be closed with a separate ceramic lid.

Note: The Accessories Described above are Designed for Cold Charging and Discharging. Removing the Accessories in Hot Condition is not Possible.

Spare Parts for Sintering Furnaces

Model	Heating elements		Support tubes	Thermocouple	Spring lift door	Bottom plate
	Article No.	Image	Article No.	Article No.	Article No.	Article No.
LHT 01/17 D	4 x 692253380		-	540300384	2 x 691400598	601604420
LHT 03/17 D	4 x 692252721		-	540300554	2 x 691400599	-
HTCT 01/16	4 x 602212884		-	540300384	2 x 691400598	601604420
LHT 02/17 LB Speed	4 x 692252721		-	540300554	-	-
LT 02/13 CR	2 x 692253400		12 x 692040251	540300257	2 x 691400598	-

Additional Information or Detailed Offers for Spare Parts are Available on Request. Our Spare Part Department is Available by Phone at +49 (4298) 922-474.

Chamber Furnaces for Annealing after Laser Sintering

Chamber furnace N 41/H

Chamber furnace N 7/H with protective gas box

For the annealing of frameworks made of cobalt-chromium after laser sintering the chamber furnaces N 7/H - N 41/H are used. These furnaces will be equipped with a gax-box as well as an automatic gas-supply system for one non-flammable protective gas, e.g. Argon. Please ask for our catalog "Thermal Process Technology".

- Tmax 1150 °C
- The recommended working temperature is max. 1100 °C. Higher wear and tear of the gassing box has to be expected at higher working temperatures up to 1150 °C
- Three-sided heating from both sides and the bottom
- Heating elements on support tubes ensure free heat radiation and a long service life
- Bottom heating protected by heat-resistant SiC plate
- Multi-layer insulation with high-quality lightweight refractory bricks in the furnace chamber
- Exhaust opening in the side of the furnace, or on back wall of chamber furnace in the N 41/H models and higher
- Chamber furnaces N 7/H - N 17/HR are designed as tabletop models
- Base included with chamber furnace N 41/H
- Protective gas boxes for inert gas atmosphere with additional thermocouple, type K
- Solenoid valve, controlled via the extra function of the controller B400
- Digital temperature indicator for measuring the temperature inside the gassing box
- Charging plate and annealing and hardening foils
- Defined application within the constraints of the operating instructions
- NTLog Basic for Nabertherm controller: recording of process data with USB-flash drive
- Controls description see page 18

Further information about the accessories for inert gas applications can be found on the following pages.

Model	Tmax	Inner dimensions protective gas box in mm			Volume	Outer dimensions in mm			Connected	Electrical	Weight	Minutes
	°C	w	d	h	in l	W	D	H	load kW	connection*	in kg	to Tmax[2]
N 7/H	1150	180	190	90	9	800	650	600	3.0	1-phase	60	180
N 11/H	1150	180	290	90	11	800	750	600	3.5	1-phase	70	180
N 11/HR	1150	180	290	90	11	800	750	600	5.5	3-phase[1]	70	120
N 17/HR	1150	180	440	90	17	800	900	600	6.4	3-phase[1]	90	120
N 41/H	1150	280	380	200	41	1040	1250	1340	15.0	3-phase	260	120

[1]Heating only between two phases   *Please see page 18 for more information about supply voltage
[2]If connected at 230 V 1/N/PE rsp. 400 V 3/N/PE

Accessories for Annealing after Laser Sintering

Protective Gas Box made of 1.4841

The protective gas boxes with gas inlet and outlet are neccessary for annealing of frameworks made of Cobalt-Chromium after laser sintering. The gassing box will be flushed with non-flammable inert gases, such as argon.

The gassing box made of heat resistant 1.4841 (DIN) is delivered with lid, which is sealed with ceramic fiber, with protective gas inlet and outlet provided through the upper furnace collar and seal profile incl. quick coupling with 3/8" hose connection. Included is also a thermocouple type K.

The gas box can be used up to a maximum temperature of 1100 °C, at temperatures up to 1150 °C higher wear and tear has to be expected.

Manual Gas Supply Valve for Gas Bottles

The gassing box, described above, is additionally equipped with manual gas feed fitting and solenoid valve for gas bottles.

Included is a pressure reducing valve with built-in flow meter, indicating the bottle pressure, which is controlled by the extra function of the controller. The built-in flow meter with float ball allows a good readability of the gas flow. The inlet pressure is 200 bar, the outlet pressure equals to 4 bar. Included in the delivery scope is a 4 m long connecting tube 3/8" and a screw connection for gas bottles.

Digital Temperature Indicator

To measure the exact temperature inside the gassing box, a thermocouple type K is used. This can be connected to an digital temperature indicator or temperature recorder.

For temperature measurements we offer a digital temperature indicator with LED display and interface for the documentation with the Nabertherm software. This indicator is mounted in an separate metal housing. The temperature indicator is equipped with an 2-pole plug connector for connecting the thermocouple. The temperature can be determined und possibly adjusted on the controller. On request it is possible to control the furnace over a charge control with thermocouple directly at the charge.

Annealing and Hardening Foils and Charging Plates

To protecting the furnace floor against mechanical damage a charging plate made of 1.4841 raw material is neccessary. This plate has a three-side edging for an maximum temperatures of 1100 °C. For protection the charge against oxidation and decarbonization we offer annealing and hardening foils for max. working temperatures up to 1200 °C.

Burnout Furnaces
for Burn-Out of Muffles and Speed Investment Material

Burnout furnace L 3/12

Burnout furnace L 5/11

These burnout furnaces are the perfect choice for daily work in the dental laboratory. These furnaces stand for excellent workmanship, advanced, attractive design and highest level of reliability. They are perfectly suitable for burnout of muffles and also for speed investments. These furnaces come equipped with either a flap door or lift door at no extra charge. The burnout furnaces come with a fiber insulation for 1100 °C or 1200 °C.

- Tmax 1100 °C or 1200 °C
- Heating from two sides by ceramic heating plates
- Ceramic heating plates with integral heating element which is safeguarded against fumes and splashing, and easy to replace
- Furnace chamber insulation made of non-carcinogenic fiber materials
- Housing made of sheets of textured stainless steel
- Dual shell housing for low external temperatures and high stability
- Optional flap 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
- Solid state relays provide for low-noise operation
- Controller B410
- For maximum number of chargeable muffles in the furnace models see page 13
- Defined application within the constraints of the operating instructions
- NTLog Basic for Nabertherm controller: recording of process data with USB-flash drive
- Controls description see page 18

Additional equipment

- Chimney, chimney with fan or catalytic converter (not for L 1). For burn-out of muffles and speed investment materials we recommend the use of a catalyst.
- Over-temperature limiter with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the furnace and load
- Protective gas connection to purge with non-flammable protective or reaction gases (not available in combination with chimney, chimney with fan or catalytic converter)
- Manual or automatic gas supply system
- Please see page 16 for more accessories
- Process control and documentation via VCD software package for monitoring, documentation and control see page 19

Adjustable air inlet integrated in the door

Over-temperature limiter

Burnout furnace LT 3/11

Burnout furnace LT 5/12

Maximum Chargeable Number of Burnout Muffles

The table below indicates the maximum number of burnout out muffles that can be charged in our different muffle furnaces.

L(T) 3/..

L(T) 5/..

L(T) 9/..

Model	Muffle type			
	Size 1 x (Ø 37 mm)	Size 3 x (Ø 55 mm)	Size 6 x (Ø 72 mm)	Size 9 x (Ø 88 mm)
LE 1	6	4	1	1
LE 2	8	6	2	2
LE 6	20	9	4	2
LE 14	35	20	12	6
L 1	6	4	1	1
L 3	12	6	2	2
L 5	20	9	4	2-3
L 9	36	16	9	4
L 15	54	24	12	6

Model	Tmax °C	Inner dimensions in mm			Volume in l	Outer dimensions in mm			Connected load kW	Electrical connection*	Weight in kg	Minutes to Tmax[2]
		w	d	h		W	D	H[1]				
L, LT 3/11	1100	160	140	100	3	385	330	405+155	1.2	1-phase	20	60
L, LT 5/11	1100	200	170	130	5	385	390	460+205	2.4	1-phase	30	60
L, LT 9/11	1100	230	240	170	9	415	455	515+240	3.0	1-phase	35	75
L, LT 15/11	1100	230	340	170	15	415	555	515+240	3.5	1-phase	40	90
L 1/12	1200	90	115	110	1	250	265	340	1.5	1-phase	10	25
L, LT 3/12	1200	160	140	100	3	385	330	405+155	1.2	1-phase	20	75
L, LT 5/12	1200	200	170	130	5	385	390	460+205	2.4	1-phase	30	75
L, LT 9/12	1200	230	240	170	9	415	455	515+240	3.0	1-phase	35	90
L, LT 15/12	1200	230	340	170	15	415	555	515+240	3.5	1-phase	40	105

*These furnaces are available for main voltage of 110 V - 120 V resp. 200 V - 240 V, 1/N/PE or 2/PE
[1]Including opened lift door
[2]If connected at 230 V 1/N/PE

Compact Burnout Furnaces

Burnout furnace LE 1/11

Burnout furnace LE 6/11

With their unbeatable price/performance ratio, these compact burnout furnaces are perfect for burnout in the dental laboratory. They convince by very fast possible heating ramps and attractive design. Quality features like the dual shell housing of stainless steel, their compact, lightweight design, or the heating elements installed in quartz glass tubes make this burnout furnace a reliable partner for your dental 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
- ■ Furnace chamber insulation made of non-carcinogenic fiber materials
- ■ Housing made of sheets of textured stainless steel
- ■ Dual shell housing for low external temperatures and high stability
- ■ Flap door which can also be used as a work platform
- ■ Exhaust air outlet in rear wall
- ■ Solid state relays provide for low-noise operation
- ■ Compact dimensions and light weight
- ■ Controller R7
- ■ Controller mounted under the door to save space
- ■ For maximum number of chargeable muffles in the furnace models see page 13
- ■ Defined application within the constraints of the operating instructions
- ■ Controls description see page 18

Maximum chargeable number of burnout muffles see page 13

Additional equipment

- ■ Chimney, chimney with fan or catalytic converter (not for LE 1 and LE 2). For burn-out of muffles and speed investment materials we recommend the use of a catalyst.
- ■ Over-temperature limiter with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the furnace and load
- ■ Protective gas connection to purge with non-flammable protective or reaction gases
- ■ Manual gas supply system
- ■ Please see page 16 for more accessories

Over-temperature limiter

Model	Tmax °C	Inner dimensions in mm			Volume in l	Outer dimensions in mm			Connected load kW	Electrical connection*	Weight in kg	Minutes to Tmax[1]
		w	d	h		W	D	H				
LE 1/11	1100	90	115	110	1	290	280	410	1,5	1-phase	10	10
LE 2/11	1100	110	180	110	2	330	385	410	1.8	1-phase	10	25
LE 6/11	1100	170	200	170	6	390	435	470	1.8	1-phase	18	35
LE 14/11	1100	220	300	220	14	440	535	520	2.9	1-phase	25	40

*These furnaces are available for main voltage of 110 V - 120 V resp. 200 V - 240 V, 1/N/PE or 2/PE
[1]If connected at 230 V 1/N/PE

Burnout Furnaces with Brick Insulation

With their brick insulation and the robust table-top design, the burnout furnaces are the workhorses for the daily use in the dental laboratory. Heating elements in both sides and the bottom provide for excellent temperature uniformity even if the furnace is fully charged. The burnout furnace can be used for the burnout of muffles or for speed investments.

Burnout furnace N 7/H as table-top model

■ Tmax 1280 °C
■ Three-sided heating from both sides and the bottom
■ Heating elements on support tubes ensure free heat radiation and a long service life
■ Bottom heating protected by heat-resistant SiC plate
■ Multi-layer insulation with high-quality lightweight refractory bricks in the furnace chamber
■ Exhaust opening in the side of the furnace
■ Controller B400
■ For maximum number of chargeable muffles in the furnace models see page 13
■ Defined application within the constraints of the operating instructions
■ NTLog Basic for Nabertherm controller: recording of process data with USB-flash drive
■ Controls description see page18

Additional equipment
■ Chimney, chimney with fan or catalytic converter
■ Over-temperature limiter with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the furnace and load
■ Protective gas connection for non-flammable protective or reaction gases
■ Manual or automatic gas supply system
■ Please see page 16 for more accessories
■ Process control and documentation via VCD software package for monitoring, documentation and control see page 19

Maximum chargeable number of burnout muffles see page 13

Model	Tmax °C	Inner dimensions in mm			Volume in l	Outer dimensions in mm			Connected load kW	Electrical connection*	Weight in kg	Minutes to Tmax[2]
		w	d	h		W	D	H				
N 7/H	1280	250	250	140	9	800	650	600	3,0	1-phase	60	180
N 11/H	1280	250	350	140	11	800	750	600	3,5	1-phase	70	180
N 11/HR	1280	250	350	140	11	800	750	600	5,5	3-phase[1]	70	120
N 17/HR	1280	250	500	140	17	800	900	600	6,4	3-phase[1]	90	120

*These furnaces are available for main voltage of 110 V - 120 V resp. 200 V - 240 V, 1/N/PE or 2/PE
[1]Heating only between two phases
[2]If connected at 230 V 1/N/PE

Accessories for Preheating Furnaces

Article No.: 631000140

Chimney for connection to an exhaust pipe.

Article No.: 631000812

Chimney with fan, to remove exhaust gas from the furnace better. The B400 - P480 controllers can be used to activate the fan automatically (not for models L(T) 15.., L 1/12, LE 1/11, LE 2/11).*

Article No.: 631000166

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 B400 - P480 controllers can be used to switch the catalytic converter automatically (not for models L(T) 15.., L 1/12, LE 1/11, LE 2/11).*

* Note: If other controller types are used an adapter cable for connection to mains supply has to be ordered separately. The device will be activated by plugging in the socket.
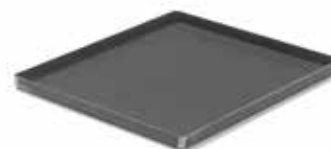
Select between different **bottom plates** and **collecting pans** for protection of the furnace and easy loading (for models L, LT and LE on pages 12 - 14).

Ceramic ribbed plate, Tmax 1200 °C

Ceramic collecting pan, Tmax 1300 °C

Steel collecting pan, Tmax 1100 °C

For models	Ceramic ribbed plate		Ceramic collecting pan		Steel collecting pan (Material 1.4828)	
	Articel No.	Dimensions in mm	Articel No.	Dimensions in mm	Articel No.	Dimensions in mm
L 1, LE 1	691601835	110 x 90 x 12,7	-	-	691404623	85 x 100 x 20
LE 2	691601097	170 x 110 x 12,7	691601099	100 x 160 x 10	691402096	110 x 170 x 20
L 3, LT 3	691600507	150 x 140 x 12,7	691600510	150 x 140 x 20	691400145	150 x 140 x 20
LE 6, L 5, LT 5	691600508	190 x 170 x 12,7	691600511	190 x 170 x 20	691400146	190 x 170 x 20
L 9, LT 9, N 7	691600509	240 x 220 x 12,7	691600512	240 x 220 x 20	691400147	240 x 220 x 20
LE 14	691601098	210 x 290 x 12,7	-	-	691402097	210 x 290 x 20
L 15, LT 15, N 11	691600506	340 x 220 x 12,7	-	-	691400149	230 x 330 x 20

General Accessories

Heat-resistant **gloves** for protection of the operator when loading or removing hot materials, resistant to 650 °C or 700 °C.

Article No.: 493000004

Gloves, Tmax 650 °C

Article No.: 491041101

Gloves, Tmax 700 °C

Article No.: 493000002 (300 mm) 493000003 (500 mm)

Various **tongs** for easy loading and unloading of the furnace.

Production Furnaces for Debinding and Presintering or for Sintering

Chamber furnace N 300/14 DB200 for debinding and pre-sintering of zirconia blanks in the production

Hot-wall retort furnace NRA 150/09 for debinding and pre-sintering of cobalt-chromium blanks under inert and reactive gas atmosphere

In addition to the furnaces shown in the laboratory scale, Nabertherm also offers numerous solutions for production. For the production of zirconia blanks there are e.g. production plants that initially provide for the debinding followed by the presintering of the product. In these plants, highest precision with regard to temperature uniformity and reproducibility is of utmost importance in order to satisfy the requirements on the blank with respect to shrinkage and compliance with the later sintering temperature.

For the full sintering of milled crowns and bridges in production scale, Nabertherm offers high-temperature furnaces having a considerably larger capacity than the laboratory furnaces shown here. Nabertherm also offers retort furnaces for the production of blanks made of cobalt-chromium under inert and reactive gases. In this connection, please ask for our special "Advanced Materials" catalog.

Production furnace HT 160/17 DB200 for sintering zirconia

Process Control and Documentation

Controller

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

Standard Controllers

Our extensive line of standard controllers satisfies most customer requirements. Based on the specific furnace model, the controller regulates the furnace temperature reliably and is equipped with an integrated USB-interface for documentation of process data (NTLog/NTGraph).

The standard controllers are developed and fabricated within the Nabertherm group. When developing controllers, our focus is on ease of use. The user can choose between 17 languages. 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 and PID microprocessor control with self-diagnosis system, we have a solution to meet your requirements.

B400

C440

P470

Allocation of the Standard Controller to the Furnace Groups	LT 02/13 CR	LHT 01/17 D	LHT 03/17 D	LHT 02/17 LB Speed	HTCT 01/16	N 7/H - N 41/H	LE 1/11 - LE 14/11	L 1/12 - LT 15/12	N 7/H - N 17/HR
Catalog page	4	6	6	7	8	10	14	12	15
Controller									
R7							●		
3216								○	
B400						●			●
C440						○			○
P470			●	●					
B410								●	
C450	●				●			○	
P480		●							

Functionality of the Standard Controllers	R7	3216	B400/ B410	C440/ C450	P470/ P480
Number of programs	1	1	5	10	50
Segments	1	8	4	20	40
Extra functions (e.g. fan or autom. flaps) maximum			2	2	2-6
Maximum number of control zones	1	1	1	1	3
Drive of manual zone regulation			●	●	●
Auto tune		●	●	●	●
Real-time clock			●	●	●
Status messages in clear text			●	●	●
Data input via jog dial and buttons			●	●	●
Entering program names (i.e. "Sintering")			●	●	●
Keypad lock			●	●	●
User administration			●	●	●
Skip-button for segment jump			●	●	●
Program entry in steps of 1 °C or 1 min.	●	●	●	●	●
Start time configurable (e.g. to use night power rates)			●	●	●
Switch-over °C/°F	○	○	●	●	●
kWh meter			●	●	●
Operating hour counter			●	●	●
Set point output			●	●	●
NTLog Basic for Nabertherm Controller: Recording of process data with USB-flash drive			●	●	●
Interface for VCD software			○	○	○
Malfunction memory			●	●	●
Number of selectable languages			17	17	17

● Standard
○ Option

B410/C450/P480

Supply Voltages for Nabertherm Furnaces

1-phase: All furnaces are available for 110 V - 240 V, 50 or 60 Hz.

3-phase: All furnaces are available for 200 V - 240 V and/or 380 V - 480 V, 50 or 60 Hz.

The connecting rates in the catalog refer to the standard furnace with 400 V (3/N/PE) respectively 230 V (1/N/PE).

Process Control and Documentation

Processdocumentation

Data Storing of Nabertherm Controllers with NTLog Basic

The Controller B400/B410, C440/C450 and P470/P480 are equipped with a USB interface as standard, which allows data recording via the NTLog Basic. The process data is recorded with a client-side USB-stick which is inserted during the process.

The process documentation with NTLog Basic requires no additional thermocouples or sensors. Only data recorded which are available in the controller.

The data stored on the USB stick (up to 80,000 data records, format CSV) can afterwards be evaluated on the PC either via NTGraph or a spreadsheet software used by the customer (e.g. MS Excel).

For protection against data manipulation the generated data records contain checksums.

Visualization with NTGraph

The process data from NTLog can be visualized either using the customer's own spreadsheet program (e.g. MS-Excel) or NTGraph (Freeware). With NTGraph Nabertherm provides for a user-friendly tool free of charge for the visualization of the data generated by NTLog. Prerequisite for its use is the installation of the program MS Excel for Windows (version 2003/2010/2013). After data import presentation as diagram, table or report can be chosen. The design (color, scaling, reference labels) can be adapted by using prepared sets.

NTGraph is available in seven languages (DE/EN/FR/SP/IT/CH/RU). In addition, selected texts can be generated in other languages.
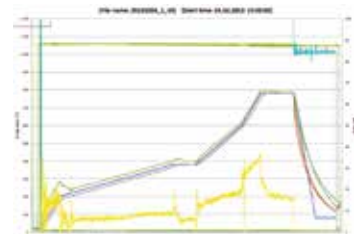
NTGraph, a freeware for the easy-to-read analysis of recorded data using MS Excel

VCD-Software for Visualization, Control and Documentation

Documentation and reproducibility are more and more important for quality assurance. The powerful VCD software represents an optimal solution for single multi furnace systems as well as charg documentation on the basis of Nabertherm controllers.

The VCD software is used to record process data from the controllers B400/B410, C440/C450 and P470/P480. Up to 400 different heat treatment programs can be stored. The controllers are started and stopped via the software. The process is documented and archived accordingly. The data display can can be carried-out in a diagram or as data table. Even a transfer of process data to MS Excel (.csv format *) or the generation of reports in PDF format is possible.

Features
- Available for controllers B400/B410/C440/C450/P470/P480
- Suitable for operating systems Microsoft Windows 7 or 8/8.1 or 10 (32/64 Bit)
- Simple installation
- Setting, Archiving and print of programs and graphics
- Operation of controllers via PC
- Archiving of process curves from up to 16 furnaces (also multi-zone controlled)
- Redundant saving of archives on a server drive
- Higher security level due to binary data storage
- Free input of charge data with comfortable search function
- Possibility to evaluate data, files can be converted to Excel
- Generation of a PDF-report
- 17 languages selectable

VCD Software for Control, Visualisation and Documentation

MORE THAN HEAT 30 - 3000 °C

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 especially about our products.

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

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