Nabertherm
MORE THAN HEAT 30-3000 °C

Dental

Furnaces and Accessories

Sintering Furnaces for
- **Translucent Zirconia**
- **Zirconia**
- **CoCr Alloys**
- **CAD/CAM Systems**

Laser Sintering
Burnout Furnaces
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.

Front made of textured stainless steel

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.

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

High-temperature bottom loading furnace LHT 01/17 LB Speed with rapid cooling function

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

Due to their maximum temperature of 1650 °C and their large furnace chamber, the high-temperature bottom loading furnaces are perfectly suited for sintering translucent zirconia. The motor-driven lifting table significantly simplifies the charging of the high-temperature furnace. The all-around heating of the cylindrical furnace chamber ensures a very even temperature uniformity.

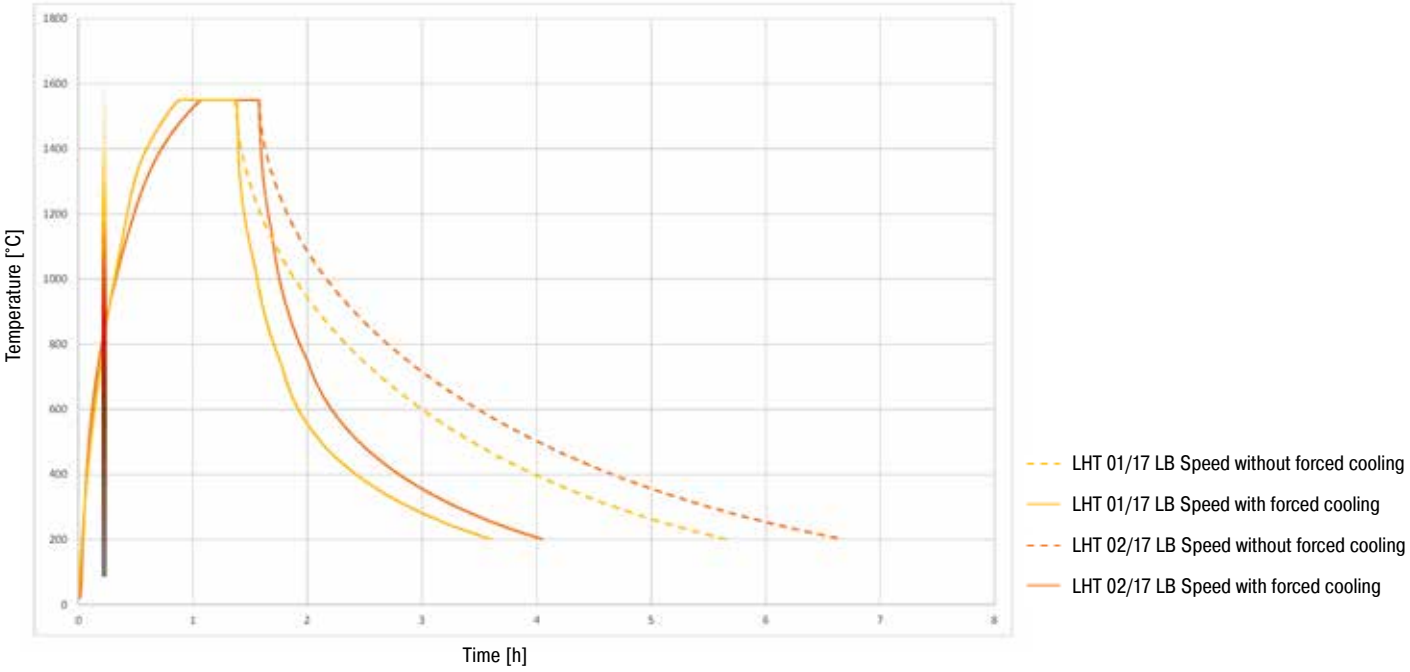
Charge saggar, starter-set

Equipped with special heating elements made of molybdenum disilicide, chemical interactions between the charge and the furnace components are optimally avoided. The sintered material is placed in saggars made of technical ceramics. Up to two batch containers for max. 15 single crowns per level can be accommodated in the LHT 01/17 LB Speed. The LHT 02/17 LB Speed offers space for up to three saggars for max. 25 individual crowns per level and thus guarantees high productivity.

The high-temperature bottom loading furnaces are additionally equipped with a drying as well as a forced cooling function. For residual drying, the oven remains open gapwise during heating up to a defined temperature and thus ensures reliable removal of moisture. For accelerated cooling, the furnace is automatically opened step by step under program control. Depending on the batch used and the saggars, these high-temperature furnaces can achieve total cycle times of less than two and a half hours. The furnaces can be individually programmed for all recommended sintering curves of all zirconia manufacturers.

- Tmax 1650 °C
- Furnace chamber with a volume of 1 or 2 liters, table with large floor space
- High-quality heating elements made of molybdenum disilicide offer best possible protection against chemical interaction between charge and heating elements
- Appealing, double-walled stainless steel housing
- Only fiber materials are used which are not classified as carcinogenic according to TRGS 905, class 1 or 2
- Outstanding temperature uniformity due to all-round furnace chamber heating

LHT ../17 LB Speed Heat Up and Cooling Times



- Delivery includes a starter set for charging on one level, additional levels as additional equipment
- Precise, motorized toothed belt drive of the table with button operation
- Residual drying function for better ventilation of the oven when heating up
- Forced cooling function with automatic, step-by-step opening from a preset temperature
- Exhaust air vent in the roof
- Type S thermocouple
- Controller P480 with memory for 50 programs, 2 sample programs
- Usable for sintering blanks of all leading manufacturers
- 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 22

Automated table lowering for cooling

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
- Stackable saggars for loading in up to two or three levels, depending on model, see page 9
- Process control and documentation via VCD software package for monitoring, documentation and control see page 23

Model	Tmax °C	Inner dimensions in mm w	d	h	Volume in l	Maximum units	Outer dimensions in mm[1] W	D	H	Connected load kW	Electrical connection*	Weight in kg	Minutes to Tmax
LHT 01/17 LB Speed	1650	145	180	100	1	30	350	590	680	2.2	1-phase	40	85
LHT 02/17 LB Speed	1650	185	180	185	2	75	390	590	765	3.4	1-phase	50	75

*These furnaces are available for main voltage of 200 V, 208 V, 220 V - 240 V, 1/N/PE or 2/PE
[1]External dimensions vary when furnace is equipped with additional equipment. Dimensions on request.

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

LHT 01/17 D

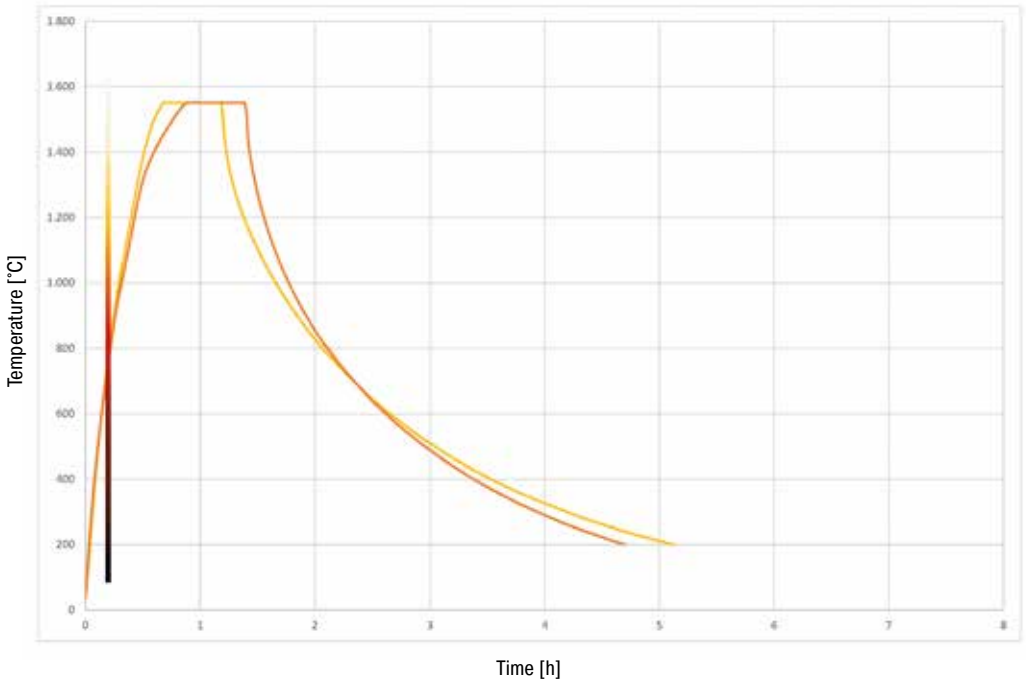
LHT 03/17 D

These high-temperature furnaces are ideally suited for sintering bridges and crowns made of translucent zirconia. The special heating elements made of molybdenum disilicide promise the best possible protection against chemical interaction between the charge and the furnace components. The bridges and crowns are loaded in ceramic saggars. These high-temperature furnaces are particularly convincing due to their excellent price-performance ratio. The furnaces can be individually programmed for all recommended sintering curves by almost all zirconium manufacturers.

Over-temperature limiter

- Tmax 1650 °C
- Furnace chamber with a volume of 1 or 4 liters
- Special heating elements made of molybdenum disilicide offer best possible protection against chemical interaction between charge and heating elements
- Dual shell housing made of textured stainless steel sheets with additional fan cooling for low surface temperature
- Only fiber materials are used which are not classified as carcinogenic according to TRGS 905, class 1 or 2
- Compact design with lift door, opening upwards
- Delivery includes a starter set for charging on one level, additional levels as additional equipment
- Adjustable air inlet
- Furnace chamber can be charged with up to two (LHT 01/17D) or three (LHT 03/17D) saggars, 15 or 25 individual crowns per level (depending on model)
- 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) with memory for 50 programs
- Freely usable for sintering blanks of almost all leading manufacturers
- Defined application within the constraints of the operating instructions

LHT ../17 D Heat Up and Cooling Times



- NTLog Basic for Nabertherm controller: recording of process data with USB-flash drive
- Controls description see page 22

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 23

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

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

Model	Tmax °C	Inner dimensions in mm w	d	h	Volume in l	Maximum units	Outer dimensions in mm³ W	D	H²	Connected load kW	Electrical connection*	Weight in kg	Minutes to Tmax¹
LHT 01/17 D	1650	110	120	120	1	30	385	425	525+195	2.2	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 200 V, 208 V, 220 V - 240 V, 1/N/PE or 2/PE
¹If connected at 230 V 1/N/PE
²External dimensions vary when furnace is equipped with additional equipment. Dimensions on request.
²Including opened lift door

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

LHTCT 01/16

LHTCT 01/16

Designed as a table-top model with SiC heating rods, this comparably inexpensive high-temperature furnace offers numerous advantages when sintering non-translucent zirconia with an operating temperature of up to 1500 °C. Compared to other models, however, the costs for changing the heating elements are higher.The large heating chamber and fast heat-up times make this model a good choice for CAD/CAM machining of zirconia. The controller of the furnace is freely programmable for the individual sintering of the zirconia material. The high-temperature furnace is also designed for connection to the single-phase power grid.

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 (LHTCT 01/16)
- Dual shell housing made of textured stainless steel sheets with additional fan cooling for low surface temperature
- Only fiber materials are used which are not classified as carcinogenic according to TRGS 905, class 1 or 2
- 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 22

Saggars with top lid

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 (15 single crowns) see page 9
- Lid for top saggar
- Process control and documentation via VCD software package for monitoring, documentation and control see page 23

Model	Tmax °C	Inner dimensions in mm w	d	h	Volume in l	Maximum units	Outer dimensions in mm[4] W	D	H[1]	Connected load kW	Electrical connection*	Weight in kg	Minutes to Tmax[2]
LHTCT 01/16	1550	110	120	120	1.5	30	340	300	460 + 195	3.5	1-phase	18	40
LHTCT 03/16	1550	120	210	120	3.0	90	400	535	530 + 215	9.0	3-phase[3]	40	40

*These furnaces are available for main voltage of 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

[3]Heating only between two phases

[4]External dimensions vary when furnace is equipped with additional equipment. Dimensions on request.

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, LHTCT 03/16 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 LHT 01/17 Speed, LHTCT 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	-
LHTCT ../16	4 x 602212884		-	540300384	2 x 691400598	601604420
LHT ../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.

Sintering Furnace LT 02/13 CR for Cobalt-Chromium

LT 02/13 CR

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.

Forced cooling system with compressed air

- Tmax 1300 °C
- Working temperature up to 1280 °C, depending on the CoCr material
- Single-phase connection
- Only fiber materials are used which are not classified as carcinogenic according to TRGS 905, class 1 or 2
- 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 22

Flowmeter for Argon

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 23

Model	Tmax °C	Inner dimensions in mm w	d	h	Volume in l	Maximum units	Outer dimensions in mm[5] W	D	H[1]	Connected load kW	Electrical connection[2]	Weight in kg	Minutes to Tmax[4]
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
[2]These furnaces are available for main voltage of 200 V, 208 V, 220 V - 240 V, 1/N/PE or 2/PE
[3]Including compressed air connection for forced cooling
[4]If connected at 230 V 1/N/PE
[5]External dimensions vary when furnace is equipped with additional equipment. Dimensions on request.

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

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

LT 02/13 CR

Sintering Bell for Sintering Furnace LT 02/13 CR
For sintering of NEM restorations under Argon, a sintering bell with very good sealing is used. The sintering bell is made of durable, low-wear SiC material. The material is placed in the sintering bell and sintered under argon. In total, up to 30 units per sintering process can be inserted.

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.

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.

Sintering Pearls
Article No.: 699001185

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.

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

Annealing After Laser Sintering

LH 60/12 with manual lift door and protective gas box for non-flammable protective or reactive gases

Chamber furnace LH 30/12

The models LH 15/12 - LH 60/12 have proven themselves for many years as professional chamber furnaces. For stress relief annealing after laser sintering, the furnaces are equipped with a protective gas box for non-flammable protective gas, e.g. argon, and a manual protective gas supply with solenoid valve. The design with gas supply box is a cost-effective alternative to retort furnaces and is suitable for many processes. The batch to be sintered is wrapped in annealing / hardening foil during the process to protect it from oxidation and decarburization. To protect the bottom insulation of the furnace from mechanical stress, a charging plate is required when using a gas supply box.

Cooling fan in combination with motor-driven exhaust air flap to reduce cooling time

Gas supply system for non-flammable protective or reaction gases

- Tmax 1200 °C
- Recommended operating temperatures up to 1100 °C, at operating temperatures up to 1150 °C increased wear of the protective gas box must be expected
- Dual shell housing with rear ventilation, provides for low shell temperatures
- High furnace chamber with five-sided heating for very good temperature uniformity
- Heating elements on support tubes ensure free heat radiation and a long service life
- Multi-layered insulation of light refractory bricks and special backup insulation
- Self-supporting arch for high stability and greatest possible protection against dust
- Motor driven exhaust air flap
- Adjustable air inlet in furnace floor
- Base included
- Protective gas boxes for inert gas atmosphere with additional thermocouple, type K
- Solenoid valve, controlled via the extra function of the controller P470
- Charge control for measuring the temperature directly at the load in the gas supply 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 22

Model	Tmax furnace	Inner dimensions protective gas box in mm			Volume	Outer dimensions in mm[3]			Heating	Electrical	Weight	Minutes to
	°C	w	d	h	in l	W	D	H	power in kW	connection*	in kg	1100 °C[2]
LH 15/12	1200	100	100	100	15	680	860	1230	5.0	3-phase[1]	170	44
LH 30/12	1200	170	170	170	30	710	930	1290	7.0	3-phase[1]	200	60
LH 60/12	1200	250	250	250	60	790	1080	1370	8.0	3-phase	300	85

[1]Heating only between two phases

*Please see page 22 for more information about supply voltage

[2]If connected at 230 V 1/N/PE rsp. 400 V 3/N/PE

[3]External dimensions vary when furnace is equipped with additional equipment. Dimensions on request.

Chamber furnace N 41/H

Chamber furnaces N 7/H - N 41/H with their low but deep furnace chamber are particularly suitable for smaller batches. The process in these furnaces can be carried out exactly as in the chamber furnaces LH 15/12 - LH 60/12.

- Tmax 1150 °C
- The recommended working temperature is max. 1100 °C. Higher wear and tear of the protective gas box has to be expected at higher working temperatures up to 1150 °C
- Deep furnace chamber with three-sides heating: from both side walls and 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 P470
- Charge control for measuring the temperature directly at the load in the gas supply 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 22

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

Chamber furnace N 7/H with protective gas box

Model	Tmax	Inner dimensions protective gas box in mm			Volume	Outer dimensions in mm[3]			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 22 for more information about supply voltage
[2]If connected at 230 V 1/N/PE rsp. 400 V 3/N/PE
[3]External dimensions vary when furnace is equipped with additional equipment. Dimensions on request.

Equipment for Annealing After Laser Sintering

Protective Gas Boxes for Models LH 15/12 - LH 60/12

Protective Gas Boxes with Loading from the Top

Due to the high interior of the chamber furnaces LH 15/12 - LH 60/12 with gas supply box, these models are ideally suited for higher batches during stress relief annealing after laser sintering of cobalt chrome. The gas supply boxes have a standard batch thermocouple type K, which can be used for charge control.

Protective gas box for furnaces with hinged door

The gas supply box is made of heat-resistant material 1.4841 (DIN) and can be used up to a maximum temperature of 1100 °C. For working temperatures up to 1150 °C we offer gas boxes made of 2.4633 (DIN). The lid is equipped with a fiber seal and a locking bolt. The boxes have a lid for loading from above, protective gas inlet and outlet.

The protective gas pipe runs through the floor into the box. This is used to flush the box with non-flammable protective gases such as argon. The protective gas inlet and outlet is guided through the furnace collar on the left in the case of a furnace with hinged door, and through the lower furnace collar in the case of the lift door version. For the protective gas connection, a quick coupling with hose connection (inner diameter 9 mm) is included in the scope of delivery.

The scope of delivery also includes a charge thermocouple type K, which can be used for charge control. The gas supply box can be used for temperatures up to 1100 °C. For working temperatures up to 1150 °C we offer gas supply boxes made of 2.4633 (DIN).

Article no.	Furnace	Inner dimensions in mm			Outer dimensions in mm[1]			Charging method
		w	d	h	W	D	H	of the box
631001276	LH 15/..	100	100	100	165	182	166	draw hook
631001277	LH 30/..	170	170	170	235	252	236	draw hook
631001278	LH 60/..	250	250	250	315	332	316	draw hook

Article no. 601655055, 1 set of fiber insulation cord, 5 strips of 610 mm each

[1] Without piping

Work space = box inner dimensions: - 30 mm to all sides

Larger boxes and custom dimensions available upon request

Protective gas box which stays in the furnace

Protective Gas Boxes with Charging from the Front

Design as the described protective gas boxes, but with charging from the front. These protective gas boxes remain in the oven and are equipped with a lid that can be opened to the front. After the lid has been opened, the batch can be removed directly.

Article no.	Furnace	Inner dimensions in mm			Outer dimensions in mm[1]			Charging method
		w	d	h	W	D	H	of the box
631001310	LH 15/..	100	100	100	170	148	194	-
631001311	LH 30/..	170	170	170	240	218	264	-
631001312	LH 60/..	250	250	250	320	298	344	-

Article no. 601655055, 1 set of fiber insulation cord, 5 strips of 610 mm each

[1] Without piping

Work space = box inner dimensions: - 30 mm to all sides

Larger boxes and custom dimensions available upon request

Protective Gas Boxes for Models N 7/H - N 41/H

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 gas box made of heat-resistant material 1.4841 (DIN) is supplied with cover, sealed with ceramic fiber, protective gas inlet and outlet through the upper furnace collar and sealing profile as well as incl. quick coupling with 3/8“ hose connection. The scope of delivery also includes a batch thermocouple type K, which can be used for charge control. The gas supply box can be used for temperatures up to 1100°C. For working temperatures up to 1150°C we offer gas boxes made of 2.4633 (DIN).

Box with protective gas connection

Gas Feed Fitting with Solenoid Valve

The protective gas 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.

Charge Control for the Protective Gas Box

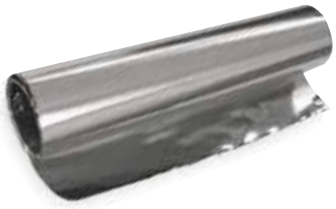
The heating and cooling processes can be individually adapted to the charge in the protective gas box. The temperature in the protective gas box is measured using an additional thermocouple. With the P470 controller, the furnace chamber temperature and the temperature inside the protective gas box are compared and the furnace chamber temperature is controlled in such a way that the desired temperature curve in the protective gas box is maintained.

Charging plate

Annealing/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.



Stainless steel heat treating foil

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.

Adjustable air inlet integrated in the door

- 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
- Only fiber materials are used which are not classified as carcinogenic according to TRGS 905, class 1 or 2
- 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 17
- 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 22

Over-temperature limiter

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)

Burnout furnace LT 5/12

Burnout furnace L 3/11 with casting muffle

- Manual or automatic gas supply system
- Please see page 20 for more accessories
- Process control and documentation via VCD software package for monitoring, documentation and control see page 23

LT 3/..

LT 5/..

LT 9/..

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.

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
N 7/H	42	20	9	6
N 11/H, N 11/HR	63	28	14	11
N 17/HR	91	43	20	15

Model	Tmax	Inner dimensions in mm			Volume	Outer dimensions in mm[3]			Connected	Electrical	Weight	Minutes
	°C	w	d	h	in l	W	D	H[1]	load kW	connection*	in kg	to Tmax[2]
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 (up to 1,5 kW) 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
[3]External dimensions vary when furnace is equipped with additional equipment. Dimensions on request.

Compact Burnout Furnaces

Burnout furnace LE 6/11

Burnout furnace LE 1/11

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.

Maximum chargeable number of burnout muffles see page 13

- 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
- Only fiber materials are used which are not classified as carcinogenic according to TRGS 905, class 1 or 2
- 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 17
- Defined application within the constraints of the operating instructions
- Controls description see page 22

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 20 for more accessories

Over-temperature limiter

Model	Tmax °C	Inner dimensions in mm w	d	h	Volume in l	Outer dimensions in mm² W	D	H	Connected load kW	Electrical connection*	Weight in kg	Minutes to Tmax[1]
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
[2]External dimensions vary when furnace is equipped with additional equipment. Dimensions on request.

Burnout Furnaces with Brick Insulation

Burnout furnace N 7/H as table-top model

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.

- 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 17
- 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 22

Maximum chargeable number of burnout muffles see page 13

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 20 for more accessories
- Process control and documentation via VCD software package for monitoring, documentation and control see page 23

Model	Tmax	Inner dimensions in mm			Volume	Outer dimensions in mm[3]			Connected	Electrical	Weight	Minutes
	°C	w	d	h	in l	W	D	H	load kW	connection*	in kg	to Tmax[2]
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
[3]External dimensions vary when furnace is equipped with additional equipment. Dimensions on request.

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

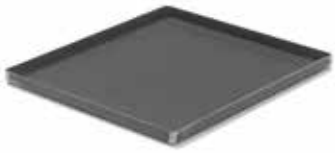
Catalytic converter with fan for removal of organic components from the exhaust air. Organic components are catalytically oxidized at about 600 °C, broken into carbon dioxide and water vapour. Irritating odors are thus largely eliminated. The B400 - P480 controllers can be used to switch the catalytic 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 16 - 17).

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

	LHT ... LB Speed	LHT 01/17 D	LHT 03/17 D	LHTCT ../16	LT 02/13 CR	LH ../12	N 7/H - N 41/H	L 1/12 - LT 15/12	LE 1/11 - LE 14/11	N 7/H - N 17/HR
Catalog page	4	6	6	8	10	12	13	16	18	19
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.

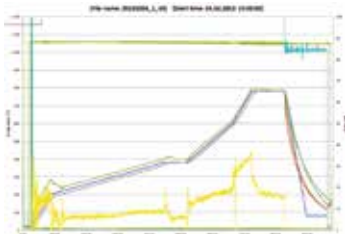
The connecting rates in the catalog refer to the standard furnace with 400 V (3/N/PE) respectively 230 V (1/N/PE).

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.



NTGraph, a freeware for the easy-to-read analysis of recorded data using MS Excel

Visualization with NTGraph for Single-Furnace Control

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 an additional 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.

Software NTEdit for Entering Programs on the PC

By using the software NTEdit (Freeware) the input of the programs becomes clearer and thus easier. The program can be enttered on customers PC and then be imported into the controller with a USB stick. The display of the set curve is tabular or graphical. The program import in NTEdit is also possible. With NTEdit Nabertherm provides a user-friendly free tool. A prerequisite for the use is the client installation of MS-Excel for Windows (2007/2010/2013). NTEdit is available in eight languages (DE/EN/FR/SP/IT/CH/RU/PT).

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 at a PC. 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.

VCD Software for Control, Visualisation and Documentation

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

Nabertherm
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