

Foundry



Melting
Holding
Transporting
Core Drying
Thermal Decoring
Dewaxing
Heat Treatment
Annealing
Tempering
Preheating
Quenching
Energy Efficiency Technology
AMS 2750 D, NADCAP, CQI-9
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■ in
■ Germany



Made in Germany

Nabertherm with 350 employees worldwide have been developing and producing industrial furnaces for many different applications for over 60 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 inhouse manufacturing provide for individual project planning and construction of tailor-made thermal process systems 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

Centralized engineering and manufacturing and decentralized sales and service define our strategy 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 world-wide. 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 foundry, Nabertherm offers a wide range of standard furnaces and systems for many other thermal processing applications. The modular design of our products provides for customized solutions to your individual needs without expensive modifications.

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Which Furnace for which Process?

Melt

Heat Treatment

Melting

Melting and Holding

Holding, Transporting

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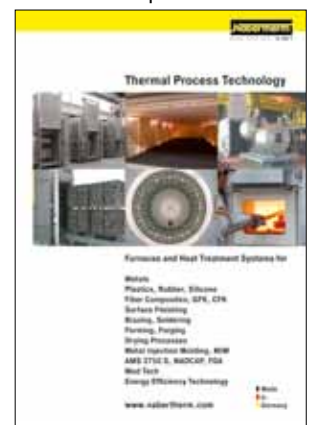
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Other products:



Other products:



Heat Treatment of Forms and Cast Pieces

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fired continuous furnaces
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Debinding, Sintering



Please order our "Advanced
Materials" catalog which
contains a large number of
solutions for debinding and
sintering!

Exhaust Gas Cleaning Systems, Energy Efficiency Concepts

Catalytic afterburning
systems
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systems
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Alternative Melting Furnace Concepts

Alternative Heating Technologies

The application of alternative heating technologies depends on the requirements for melt quality, productivity and energy efficiency. In principle either electrically or gas-fired furnaces can be used. In this context, with respect to costs the local pricing for the alternative energy play a decisive role.

Gas Heating

Gas-fired furnaces are ideal for melting, particularly if equipped with exhaust gas discharge over the crucible edge. Side exhaust gas discharge is best if a high melt quality is required. However, a higher melt quality means a lower energy efficiency since a fuel-fired furnace with side exhaust gas discharge consumes approx. 20-25 % more energy than a furnace with an exhaust gas discharge over the crucible edge.

Fuel-fired furnaces provide for optimal energy efficiency in combination with highest melt quality due to their burner system that includes heat recovery via recuperator. The hot exhaust gases from the furnace preheat the combustion air for the burner via a heat exchanger. This system leads to savings of up to 25 % compared to conventional fuel-fired furnaces with a side exhaust gas discharge.

Electric Heating

If the melt quality and energy efficiency take priority, an electrically heated furnace is the best choice. The heating is controlled very steadily and precisely. The melt is not polluted through immissions from a fuel-fired heating. Electrically heated furnaces can achieve up to 85 % of the melting performance of fuel-fired furnaces with a side exhaust gas discharge. If the furnaces are used only for holding, we recommend the T.../10 models, which are very energy efficient due to their very good insulation and reduced connected load.

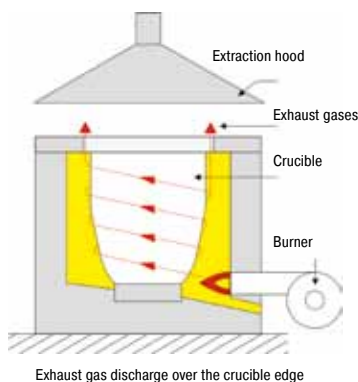


Alternative Exhaust Gas Systems

Exhaust Gas Discharge over the Crucible Edge

Exhaust gas discharge over the crucible edge is the standard design for our gas and oil-fired furnaces, except for the TB models for furnace temperatures of 1200 °C, since these furnaces are normally used as holding furnaces. Due to the high melting performance, the furnaces are perfectly suited for melting. This type of exhaust gas discharge is characterised as follows:

- + Very high melting performance, ideal for use as a melting furnace
- + Low power consumption since the crucible is not just heated from the outside but part of the heat also enters the crucible from above. Energy savings of up to 20 % compared to furnaces with a side exhaust gas discharge
- Limitations on the melt quality due to higher burn-off and increased hydrogen absorption by the melt from the exhaust gases
- Bath control not recommended

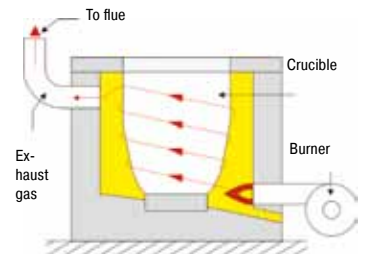


Side Exhaust Gas Discharge

a) without Recuperator Technology

The side exhaust gas discharge is available for all fuel-fired crucible furnaces. Although the melting performance is not as high as with an exhaust gas discharge over the crucible edge, it provides for better melt quality and, in combination with a bath control, is highly recommended for holding operation.

- + High melt quality due to low burn-off and reduced hydrogen inclusions in the melt
- + Swing lid-reduction of power consumption up to 50 % during holding with a closed swing lid
- + Operator exposed to less heat in the area above the crucible
- + Best melt quality if a bath control for precise temperature control is used
- Lower melting performance compared to furnaces with exhaust gas discharge over the crucible edge
- Power consumption during melting around 25 % higher compared to furnaces with exhaust gas discharge over the crucible edge



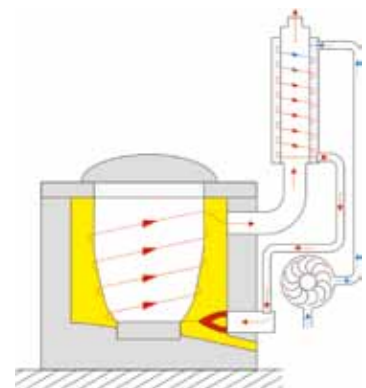
Side exhaust gas discharge

b) with Recuperator Technology

Fuel-fired furnaces with burner systems that include heat recovery via a recuperator provide for optimum energy efficiency in connection with a top melt quality. The combustion air for the burner is pre-heated with the hot exhaust gases from the furnace via heat exchanger. The system results in savings of up to 25 % compared to conventional fuel-fired furnaces with side exhaust gas discharge.

Depending on the utilisation the relatively higher acquisition costs pay off already after a short period of time.

- + Burner systems with a recuperator system save around 25 % of the power compared to furnaces with a side exhaust gas discharge
- + High melt quality due to low burn-off and reduced hydrogen absorption in the melt
- + Reduced power consumption by up to 50 % during holding with a closed swing lid
- + Operator exposed to less heat in the area above the crucible
- + Best melt quality if a bath control for a precise temperature control is used
- Lower melting performance than furnaces with exhaust gas discharge over the crucible edge
- Power consumption during melting around 20-25 % higher than furnaces with exhaust gas discharge over the crucible edge



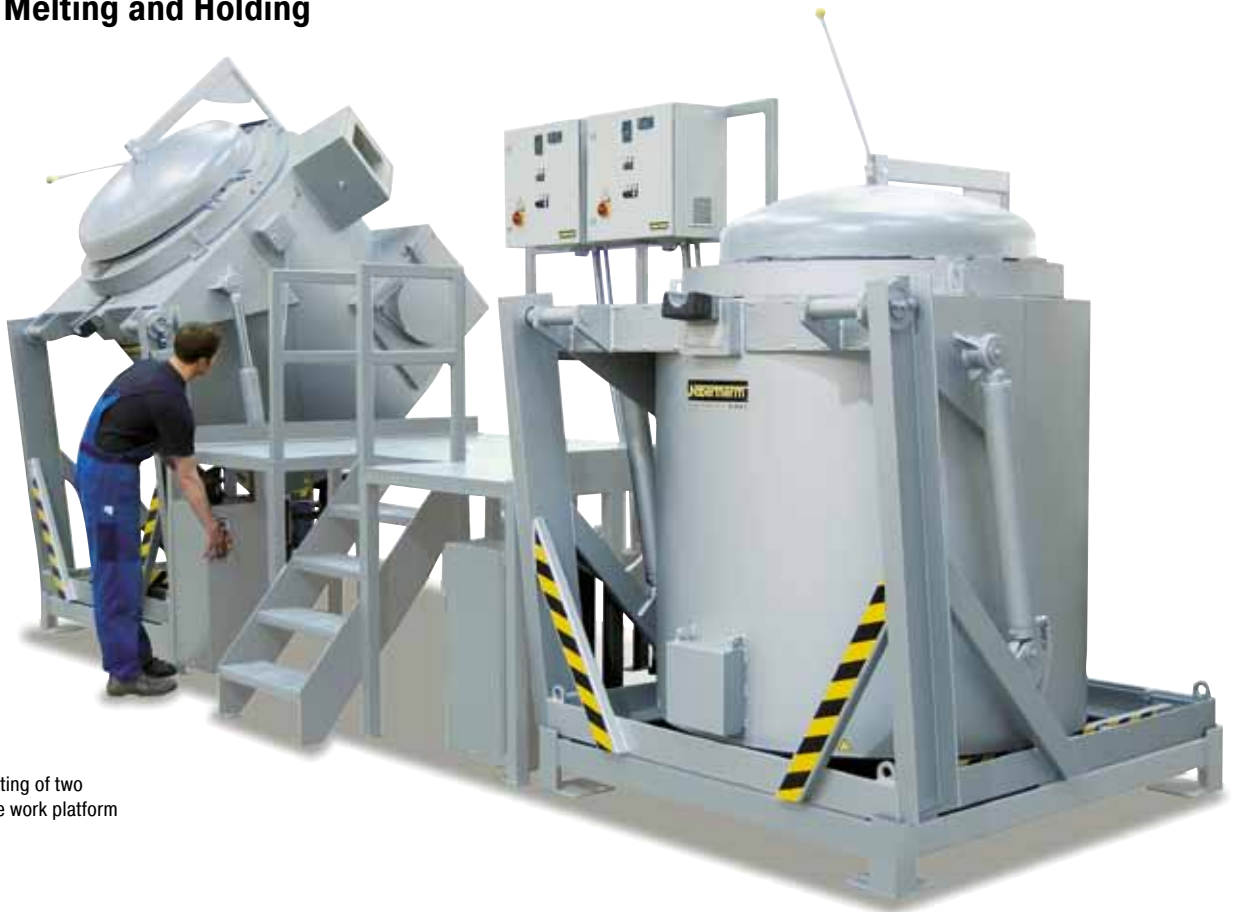
Side exhaust gas discharge with recuperator technology



Decision Aid for Melting Furnaces

	Use	Productivity	Melt Quality	Energy Consumption	Noise Emissions
Models TB/KB Exhaust gas discharge over the crucible edge	Melting	++	-	0	-
Models TB/KB Side exhaust gas discharge	Melting + Holding	+	+	-	-
Models TBR/KBR Side exhaust gas discharge with recuperator	Melting + Holding	+	+	+	-
Models T/TF/K/KF Electrically heated with bath control	Melting + Holding	0	+++	++	+
Models T/TF/K/KF Electrically heated without bath control	Melting + Holding	0	++	++	+
Modelle T../10 Electrically heated with bath control	Holding	-	+++	+++	+
Models TC/KC Electrically heated via SiC rods	Melting + Holding	+	+	0	+

Tilting Furnaces KB Gas-Fired, for Melting and Holding



Melting furnace plant consisting of two furnaces KB 360/12 with one work platform



Hydraulic system with flame resistant hydraulic fluid



Two-stage burner, mounted on furnace frame

The gas-fired or oil-heated tilting furnaces in the KB series provide for high melting output, making them ideal for melting operations. The use of high-quality insulation materials results in very low energy consumption. The two-stage burner can be configured for either gas or oil operation. Designed with an exhaust vent over the crucible edge, these models achieve very high melting rates and optimum energy efficiency.

- KB../12 with Tmax of 1200 °C for aluminum and zinc alloys
- KB../14 with Tmax of 1400 °C, suitable for copper alloys with a maximum melting bath temperature of 1300 °C (appropriate in some cases for aluminum)
- Fuel heating with gas or oil
- Two-stage output control: High load for melting operation, low load for holding operation with automatic switching between both modes
- Modern burner system with optimized flame guide: High efficiency provided by over-pressure operation to keep out entrained air
- Gas system consisting of pressure regulator, gas filter, manometer and solenoid valves
- Safe flame monitoring
- Burner technology with easy-to-service design, e.g. flame head can be removed from the rear when the burner is swung out
- Burner technology compliant with DIN 746, Part 2
- Designed for natural gas or liquid natural gas with 8.8 kWh/m³ - 25.9 kWh/m³
- Required gas input pressure: 50 mbar
- Operation with other fuels and/or with another gas input pressure possible
- High melting output powered by high-performance burners and high-quality insulation
- Crucible made of isostatically pressed clay-graphite
- Electro-hydraulic tilting system with flame resistant HFCE hydraulic fluid
- Safe, uniform and precise pouring enabled by the optimum pivot point of the furnace and the manual operation of the slider valve
- Multi-layered insulation with lightweight refractory bricks provide the furnace chamber lining, 1400 °C models come with an additional wear-and-tear layer made of copper-resistant refractory concrete
- Emergency outlet for safe discharge of the melt in case of a crucible break

- Exhaust gas discharge over the crucible edge, resulting in approx. 20 % more melting output compared to side exhaust discharge, design without swing lid
- Exhaust gas vent options, see page 6
- Over-temperature limit controller for the furnace chamber with automatic reset to protect against over-temperature. The limit controller switches off the heating when the pre-set limit temperature has been reached and does not switch it on again until the temperature falls below the setting again.
- Furnace chamber control with temperature measurement behind the crucible, recommended when using as pre-melt furnace
- Information about temperature control, see page 24
- Side-wall exhaust gas vent for KB.../12 models, see additional equipment



KB 400/12

Additional equipment

- Side exhaust gas discharge for melt and holding operation
 - Low burn-off provides for high quality melt
 - Low hydrogen absorption by the melt
 - Low heat exposure for the operator in the area above the crucible
 - Swing lid which, when closed during holding operation, saves up to 50 % energy
 - Approx. 20 % lower melting output than for exhaust gas venting over the crucible edge
- Insulated connecting piece (exhaust flue) for side-wall exhaust gas vent to a connected customer suction system
- Exhaust gas collection hood for furnaces featuring exhaust gas venting over the crucible edge
- Information about exhaust venting, see page 6
- Work platform or platform for easier charging
- Crucible breakage monitoring with optical and acoustic signal (only for models KB .../12)
- SMS-message to one or more mobile phones in case of crucible breakage. One or more furnaces can be connected to the messaging device in parallel
- Bath control system
 - Furnace control via the bath temperature
 - Thermocouples in the furnace chamber and the melt
 - Improved melt quality ensured by a reduction in temperature overshoots
 - Integrated safety controller system that, in case of bath thermocouple breakage, continues to operate the furnace at a reduced output to prevent the melt from solidifying
- Information on other accessories on page 22



KB 240/12 for melting aluminum alloys



Model	Tmax	Crucible	Capacity		Melting output ³		Consumption holding lid closed KWh/h	Consumption melting KWh/kg	Burner output kW	Outer dimensions			Weight in kg	
	°C		Kg Al	Kg Cu	Kg Al/h	Kg Cu/h				in mm				
AL														
KB 80/12	1200	TP 287	180	550	220 ¹	-	10	1.3 - 1.5	300	2030	1700	1510	1800	
KB 150/12	1200	TP 412	330	970	240 ¹	-	11	1.3 - 1.5	300	2140	1900	1710	2200	
KB 180/12	1200	TP 412 H	370	1200	260 ¹	-	13	1.3 - 1.5	300	2140	1900	1810	2400	
KB 240/12	1200	TP 587	570	-	400 ¹	-	15	1.3 - 1.5	390	2650	2030	1810	2600	
KB 360/12	1200	TBN 800	750	-	420 ¹	-	17	1.3 - 1.5	450	2650	2080	1910	2900	
KB 400/12	1200	TBN 1100	1000	-	450 ¹	-	19	1.3 - 1.5	450	2650	2080	2080	3300	
KB 40/14	1400	R 400/TP 982	120	400	-	330 ²	22	1.0 - 1.3	400	2070	1700	1770	2300	
KB 60/14	1400		R 500	150	500	-	360 ²	25	1.0 - 1.3	400	2070	1900	1810	2500
KB 80/14	1400		R 600	180	600	-	380 ²	25	1.0 - 1.3	400	2070	1900	1910	2650

¹At 700 °C

²At 1000 °C

³The stated melting outputs are maximum values. Daily operation comes up to roughly 80 %.



Insulated connecting piece for side-wall exhaust gas vent to a connected customer suction system

Tilting Furnaces K (Brick Insulation) and KF (Fiber Insulation) Electrically Heated, for Melting and Holding



K 150/12



KF 240/12



Side wall insulation with fiber materials in KF models



Charging of transport ladle with K 360/12

The electrically heated tilting furnaces of the K and KF series are characterized by high melting performance with very uniform temperature distribution in the melt. Aluminum and brass can be melted in the 1200 °C version. The 1300 °C version can also be used to melt bronze alloys. For faster heating-up cycles in batch operation furnaces can be insulated with fiber resulting in lower heat storage (KF models).

- K, KF../12 with maximum furnace chamber temperature of 1200 °C for aluminum or brass. Maximum bath temperature, depending on the condition of the crucible, between 1050 °C and 1100 °C
- K, KF../13 with maximum furnace chamber temperature of 1300 °C also suitable for bronze alloys or brass, with a maximum melt temperature of 1200 °C
- Heating from three sides using electric heating elements, radiating freely on carrier tubes, simple exchange of individual heating elements
- Multi-step wiring of the heating elements for furnaces with more than 50 kW electrical rating
- Heating of furnaces up to 24 kW power rating controlled using long-lasting, noiseless solid-state-relays
- Heating of furnaces beyond 24 kW with contactors
- High melting performance with uniform temperature distribution in the melt
- Insulation constructed in multiple layers with lightweight refractory bricks on the hot face (K models)
- Insulation constructed in multiple layers with fiber material in the side walls and corner bricks to support heating elements (KF models)
- Crucible of clay-graphite up to K 240, isostatically pressed clay-graphite or SiC from K, KF 360 and up
- Electro-hydraulic tilting system with flame resistant HFCE hydraulic fluid
- Safe, even, and precise pouring thanks to optimum pivot point in the furnace and manual throttling valve operation
- Emergency outlet for safe draining of the melt in case of crucible breakage
- No exhaust gas discharge needed
- Integrated safety system which continues to operate the furnace at reduced power in case of malfunction in the bath thermocouple, in order to prevent the freezing of the melt
- Over-temperature limit controller in furnace chamber for protection against overheating. The limiter switches the heating off when the set limit temperature is reached, and only switches it back on after the temperature has fallen again
- Furnace chamber control with temperature measurement behind the crucible, recommended for melting
- Information on temperature regulation, see page 24



3 x K 300/12 with work platform for melting of aluminum

Additional equipment

- Work platform for easy charging
- Crucible breakage monitor with visual and audible signal (only for models K, KF .. /12)
- SMS-message to one or more mobile phones in case of crucible breakage. One or more furnaces can be connected to the messaging device in parallel
- Bath control with thermocouples in the furnace chamber and in the melt. The furnace temperature is controlled through the melt. Temperature overshoots are reduced, thus the quality of the melt is improved
- Heating system operated through thyristors in phase--angle mode provides for even load on the heating elements and results in longer service life
- Multi-step switching of the furnace heat (see page 21). In holding mode, a switch or the controller is used to turn off one heating section in order to reduce the electrical rating
- Higher electrical ratings to increase melting performance
- For information on other accessories, see page 22

Model	Tmax °C	Crucible	Capacity		Outer dimensions in mm			Connected load kW	Weight in kg	Melting performance ³		Holding lid closed/open kW
			Kg Al	Kg Cu	W	D	H			kg/hr Al	kg/h Cu	
K, KF 10/12	1200	A 70	20	70	1510	1240	1040	16	750	32 ¹	47 ²	3/7 ¹
K, KF 20/12	1200	A 150	45	150	1660	1360	1060	20	940	42 ¹	63 ²	3/7 ¹
K, KF 40/12	1200	A 300	90	300	1740	1470	1140	26	1270	58 ¹	84 ²	3/7 ¹
K, KF 80/12	1200	TP 287	180	550	1800	1700	1180	50	1430	126 ¹	190 ²	4/10 ¹
K, KF 150/12	1200	TP 412	330	970	1870	1900	1460	60	1800	147 ¹	220 ²	5/12 ¹
K, KF 240/12	1200	TP 587	570	-	2010	2000	1460	80	2290	210 ¹	-	8/17 ¹
K, KF 300/12	1200	TP 587H	650	-	2010	2000	1560	80	2400	210 ¹	-	9/18 ¹
K, KF 360/12	1200	BUK 800	750	-	2120	2100	1550	100	2780	260 ¹	-	11/20 ¹
K, KF 400/12	1200	TBN 1100	1050	-	2120	2100	1700	126	3030	295 ¹	-	12/22 ¹
K, KF 10/13	1300	A 70	20	70	1510	1240	1040	16	800	32 ¹	47 ²	5/8 ²
K, KF 20/13	1300	A 150	45	150	1660	1360	1060	20	1040	42 ¹	63 ²	5/8 ²
K, KF 40/13	1300	A 300	90	300	1740	1470	1140	26	1350	58 ¹	84 ²	5/8 ²
K, KF 80/13	1300	TP 287	180	550	1800	1700	1180	50	1600	126 ¹	190 ²	6/11 ²

¹At 700 °C

²At 1000 °C

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

Bale-Out Furnaces TB Gas-Fired, for Melting and Holding



TB 20/14



TB 240/12



Thermocouple for melting bath control

The gas-fired or oil-heated bale-out furnaces of the TB series provide for high melting output. The use of modern burner systems, optimized pressures and flame guide in the furnace as well as the processing of high-quality insulation materials result in very low energy consumption.

The TB ../12 models are largely used for melting and holding of aluminum and zinc alloys, for example in die-cast foundries. The side exhaust gas discharge provides for a high quality melt. The TB 10/14 to TB 40/14 models are mostly used for melting copper alloys in small foundries. This is why these furnaces are equipped with an exhaust gas vent over the crucible edge for high melting output and with a collar plate as a standard which can be swung to the side for pulling the crucible.



- TB../12 with maximum furnace chamber temperature of 1200 °C for aluminum and zinc alloys
- TB../14 with maximum furnace chamber temperature of 1400 °C, suitable for copper alloys with a maximum melting bath temperature of 1300 °C (appropriate in some cases for aluminum)
- Fuel heating with gas or oil
- Two-stage output control: High load for melting operation, low load for holding operation with automatic switching between both modes
- Modern burner system with optimized flame guide: High efficiency provided by over-pressure operation to keep out entrained air
- Gas system consisting of pressure regulator, gas filter, manometer and solenoid valves
- Safe flame monitoring
- Burner technology with easy-to-service design, e.g. flame head can be removed from the rear when the burner is swung out
- Burner technology compliant with DIN 746, Part 2
- Designed for natural gas or liquid natural gas with 8.8 kWh/m³ - 25.9 kWh/m³
- Required gas input pressure 50 mbar
- Operation with other fuels and/or with another gas input pressure possible
- High melting output powered by high-performance burners and high-quality insulation
- Multi-layered insulation with lightweight refractory bricks provide the furnace chamber lining, 1400 °C models come with an additional wear-and-tear layer made of copper-resistant refractory concrete
- Emergency outlet for safe discharge of the melt in case of a crucible break



Emergency outlet for safe melt discharge in case of crucible break

- Exhaust gas discharge
 - Exhaust gas discharge over the crucible edge TB.../14 models, resulting in approx. 20% more melting output compared side exhaust discharge, design without swing lid
 - Side-wall exhaust gas vent for TB.../12 models (for description, see additional equipment)
 - Exhaust gas discharge options, see page 6
- Crucible pulling device with swinging collar plate for models to TB 10/14 - TB 40/14
- Over-temperature limit controller for the furnace chamber with automatic reset to protect against over-temperature. The limit controller switches off the heating when the pre-set limit temperature has been reached and does not switch it on again until the temperature falls below the setting again.
- Furnace chamber control with temperature measurement behind the crucible, recommended when using as pre-melt furnace
- Information about temperature control, see page 24

Additional equipment

- Side exhaust gas discharge (for 1400 °C models)
 - Low burn-off provides for high quality melt
 - Low hydrogen absorption by the melt
 - Low heat exposure for the operator in the area above the crucible
 - Swing lid which saves energy when closed
 - Approx. 20% lower melting output than for exhaust gas venting over the crucible edge
- Insulated connecting piece (exhaust flue) for side-wall exhaust gas vent to a connected customer suction system
- Exhaust gas collection hood for furnaces featuring exhaust gas venting over the crucible edge
- Information about exhaust venting, see page 6
- Work platform or platform for easier charging
- Crucible breakage monitoring with optical and acoustic signal (only for models KB .../12)
- SMS-message to one or more mobile phones in case of crucible breakage. One or more furnaces can be connected to the messaging device in parallel
- Bath control system (only for 1200 °C models)
 - Furnace control via the bath temperature
 - Thermocouples in the furnace chamber and the melt
 - Improved melt quality ensured by a reduction in temperature overshoots
 - Integrated safety controller system that, in case of bath thermocouple breakage, continues to operate the furnace at a reduced output to prevent the melt from solidifying
- Crucible pulling device with swinging collar plate for models to TB 20
- Information on other accessories on page 22



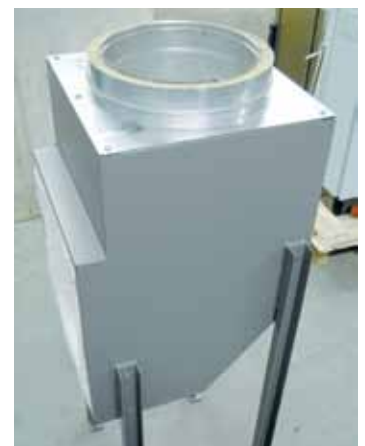
TB 40/14 with crucible pulling device

Model	Tmax	Crucible	Capacity		Melting output³		Consumption holding lid closed kWh/h	Consumption melting kWh/kg	Burner output kW	Outer dimensions			Weight in kg
	°C		Kg Al	Kg Cu	Kg Al/h	Kg Cu/h				in mm			
										W	D	H	
AL													
TB 80/12	1200	BU 200	200	650	140¹	-	10	1.3 - 1.5	180	1200	1870	1240	900
TB 100/12	1200	BU 250	250	830	140¹	-	11	1.3 - 1.5	180	1310	1980	1380	1000
TB 110/12	1200	BU 300	300	1000	150¹	-	13	1.3 - 1.5	210	1310	1980	1510	1200
TB 150/12	1200	BU 350	350	1150	220¹	-	15	1.3 - 1.5	300	1310	1980	1550	1400
TB 180/12	1200	BU 500	500	1650	270¹	-	17	1.3 - 1.5	300	1450	2140	1560	1700
TB 240/12	1200	BU 600	600	2000	330¹	-	19	1.3 - 1.5	390	1490	2180	1700	1900
TB 360/12	1200	BN 800	800	-	350¹	-	20	1.3 - 1.5	400	1590	2280	1800	2000
TB 400/12	1200	BN 900	900	-	350¹	-	22	1.3 - 1.5	400	1590	2280	1900	2100
TB 500/12	1200	BU 1210	1200	-	350¹	-	23	1.3 - 1.5	400	1690	2380	1850	2300
TB 600/12	1200	BU 1310	1300	-	420¹	-	25	1.3 - 1.5	500	1690	2380	2000	2400
TB 650/12	1200	BU 1810	1400	-	420¹	-	26	1.3 - 1.5	500	1760	2450	1630	2300
TB 700/12	1200	BU 1510	1500	-	420¹	-	28	1.3 - 1.5	500	1690	2380	2120	2600
TB 800/12	1200	BU 1810	1800	-	440¹	-	30	1.3 - 1.5	500	1760	2450	2100	2800
Cu													
TB 10/14	1400	A 100	30	100	-	90²	22	1.0 - 1.3	210	980	1590	1190	1000
TB 20/14	1400	A 150	45	150	-	100²	22	1.0 - 1.3	210	1080	1870	1310	1250
TB 40/14	1400	A 400	120	400	-	300²	25	1.0 - 1.3	300	1210	2000	1460	1500
TB 60/14	1400	A 500	150	500	-	320²	25	1.0 - 1.3	320	1210	2000	1510	1600
TB 80/14	1400	A 600	180	600	-	320²	25	1.0 - 1.3	320	1260	2050	1540	1750

¹At 700 °C

²At 1000 °C

³The stated melting outputs are maximum values. Daily operation comes up to roughly 80 %.



Insulated connecting piece for side exhaust gas discharge for connection to an exhaust gas system

Crucible Furnaces TBR or KBR with Recuperative Burner Gas-Fired, for Melting and Holding



TBR 110/11



KBR 240/12



2 x TBR 100/11 in production

The fuel-heated melting furnaces in the TBR and KBR series fitted with the side exhaust gas discharge provide for optimum energy utilization combined with highest quality melt. Fitted with a burner system including heat-recovery system using a recuperative burner, the energy efficiency of ordinary fuel-heated melting furnaces is significantly improved.

Depending on utilization the hot exhaust gases from the furnace are guided through a heat exchanger in order to preheat the combustion air for the burner. The system provides for energy savings of up to 25 % compared to ordinary fuel-heated furnaces with side exhaust gas discharge. The higher purchase costs are amortized within a short time.

- Tmax 1100 °C for aluminum and zinc alloys
- Two-stage output control: High load for melting operation, low load for holding operation with automatic switching between both modes
- Modern burner system with optimized flame guide: High efficiency provided by over-pressure operation to keep out entrained air
- Heat exchanger in the exhaust gas duct to preheat the combustion air for the burners
- Energy savings of up to 25% in comparison to other fuel-heated melting furnaces featuring side-wall exhaust gas vents
- Gas system consisting of pressure regulator, gas filter, manometer and solenoid valves
- Safe flame monitoring
- Burner technology with easy-to-service design, compliant with DIN 746, Part 2
- Designed for natural gas or liquid natural gas with 8.8 kWh/m³ - 25.9 kWh/m³
- Required gas input pressure 70 mbar
- Operation with other fuels and/or with another gas input pressure possible
- High melting output powered by high-performance burners and high-quality insulation
- Multi-layered insulation with lightweight refractory bricks provide the furnace chamber lining
- Emergency outlet for safe discharge of the melt in case of a crucible break

Energy Efficiency

- Side exhaust gas discharge
 - Low burn-off provides for high quality melt
 - Low hydrogen absorption by the melt
 - Low heat exposure for the operator in the area above the crucible
- Over-temperature limit controller for the furnace chamber with automatic reset to protect against over-temperature. The limit controller switches off the heating when the pre-set limit temperature has been reached and does not switch it on again until the temperature falls below the setting again.
- Furnace chamber control with temperature measurement behind the crucible
- Information about temperature control, see page 24

Additional standard equipment KBR models

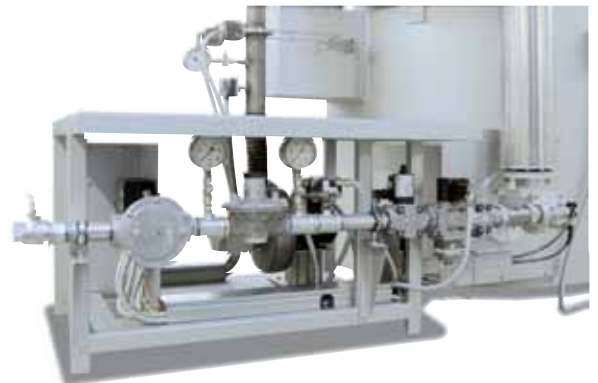
- Electro-hydraulic tilting system with flame resistant HFCE hydraulic fluid
- Safe, uniform and precise pouring enabled by the optimum pivot point of the furnace and the manual operation of the slider valve of the hydraulic system
- Crucible is standard

Additional equipment for all models

- Crucible made of clay-graphite
- Information about exhaust venting, see page 6
- Work platform or platform for easier charging
- Crucible break monitoring with optical and acoustic signal
- Bath control system
 - Furnace control via the bath temperature
 - Thermocouples in the furnace chamber and the melt
 - Improved melt quality ensured by a reduction in temperature overshoots
 - Integrated safety controller system that, in case of bath thermocouple breakage, continues to operate the furnace at a reduced output to prevent the melt from solidifying
- Information on other accessories on page 22



Production with 16 x TBR 100/12 and 2 x TBR 180/11



Burner with gas supply system

Model	Tmax °C	Crucible	Capacity		Melting output ²		Consumption holding lid closed kWh/h	Consumption melting kWh/kg AL	Burner output kW
			Kg Al	Kg Cu	Kg Al/h	Kg Cu/h			
TBR 80/11	1100	BU 200	200	650	140 ¹	-	8.0	1.0 - 1.1	180
TBR 100/11	1100	BU 250	250	830	140 ¹	-	8.8	1.0 - 1.1	180
TBR 110/11	1100	BU 300	300	1000	150 ¹	-	10.4	1.0 - 1.1	210
TBR 150/11	1100	BU 350	350	1150	220 ¹	-	12.0	1.0 - 1.1	240
TBR 180/11	1100	BU 500	500	1650	270 ¹	-	13.6	1.0 - 1.1	300
TBR 240/11	1100	BU 600	600	2000	330 ¹	-	15.2	1.0 - 1.1	320
TBR 360/11	1100	BU 800	800	-	350 ¹	-	16.0	1.0 - 1.1	320
KBR 80/11	1100	TP 287	180	550	220 ¹	-	8.0	1.0 - 1.1	300
KBR 150/11	1100	TP 412	330	970	240 ¹	-	8.8	1.0 - 1.1	300
KBR 180/11	1100	TP 412 H	370	1200	260 ¹	-	10.4	1.0 - 1.1	300
KBR 240/11	1100	TP 587	570	-	400 ¹	-	12.0	1.0 - 1.1	390
KBR 360/11	1100	TBN 800	750	-	420 ¹	-	13.6	1.0 - 1.1	450
KBR 400/11	1100	TBN 1100	1000	-	450 ¹	-	15.2	1.0 - 1.1	450

¹At 700 °C

²The stated melting outputs are maximum values. Daily operation comes up to roughly 80 %.



Heat exchanger in the exhaust gas duct

Bale-Out Furnaces T (Brick Insulation) and TF (Fiber Insulation) Electrically Heated, for Melting and Holding

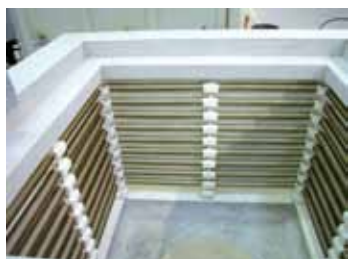


T 110/11



TF 150/11

Due to their high-grade insulation and optimized connected loads the models T and TF can be used both for melting and holding. They feature good melting output together with outstanding temperature uniformity in the melt. The 1100 °C version can be used for melting aluminum, the 1200 °C version for brass as well. The 1300 °C version can also be used for melting bronze alloys.



Four side heating for excellent temperature uniformity

The T models are fitted with multi-layer insulation. The furnace chamber insulation with high-quality lightweight refractory bricks is recommended for holding operation. For rapid heat-up times in non-continuous operation, the TF models can also be used, which are lined with a fiber insulation with low heat retention capacity.

- T, TF../11 with maximum furnace chamber temperature of 1100 °C for aluminum or zinc. Maximum melt temperatures, depending on the condition of the crucible, between 950 °C and 980 °C
- T, TF../12 with maximum furnace chamber temperature of 1200 °C also suitable for brass. Maximum melt temperatures, depending on the condition of the crucible, between 1050 °C and 1100 °C
- T, TF../13 with maximum furnace chamber temperature of 1300 °C, also suitable for bronze alloys. Maximum melt temperatures, depending on the condition of the crucible, between 1150 °C and 1200 °C
- Four-side heating using electric heating elements, freely radiating on carrier tubes
- Simple replacement of individual heating elements. In case of crucible breakage, only the defective heating elements on each level need to be replaced
- Heating of furnaces up to 60 kW power rating controlled using long-lasting, noiseless solid-state-relays
- Heating of furnaces beyond 60 kW with contactors
- High melting performance with uniform temperature distribution in the melt
- Insulation constructed in multiple layers with lightweight refractory bricks on the hot face (T models)
- Insulation constructed in multiple layers with fiber material in the side walls and corner bricks to support heating elements (TF models)
- Emergency outlet for safe draining of the melt in case of crucible breakage
- No exhaust gas discharge needed
- Integrated safety system which continues to operate the furnace at reduced power in case of malfunction in the bath thermocouple, in order to prevent the freezing of the melt
- Over-temperature limit controller in furnace chamber for protection against overheating. The limiter switches the heating off when the set limit temperature is reached, and only switches it back on after the temperature has fallen again
- Furnace chamber control with temperature measurement behind the crucible, recommended for melting
- Crucible not included in the standard version
- For Information on temperature regulation, see pages 24



Manual ladling from a T 80/10



T 240/11



T 800/11

Additional equipment

- Crucible of clay-graphite or SiC
- Work platform
- Crucible breakage monitor with visual and audible signal (not for 1300 °C models)
- SMS-message to one or more mobile phones in case of crucible breakage. One or more furnaces can be connected to the messaging device in parallel
- Bath control with thermocouples in the furnace chamber and in the melt (not for 1300 °C models). The furnace temperature is controlled through the melt. Temperature overshoots are reduced, thus the quality of the melt is improved
- Heating system operated through thyristors in phase-angle mode assures an even charging of heating elements
- Multi-step switching of the furnace heat (see page 23). In holding mode, a switch or the controller is used to turn off one heating section in order to reduce the electrical rating
- Higher electrical ratings to increase melting performance
- For information on other accessories, see page 22



Side-wall insulation made of fiber material for TF models

Model	Tmax °C	Crucible	Capacity		Outer dimensions in mm			Connected load kW	Weight in kg	Melting performance ³		Holding lid closed/open kW
			Kg Al	Kg Cu	W	D	H			kg/hr Al	kg/h Cu	
T, TF 10/11	1100	A 70	20	-	860	860	790	16	400	32 ¹	-	3/5 ¹
T, TF 20/11	1100	A 150	45	-	940	940	790	20	460	42 ¹	-	3/6 ¹
T, TF 40/11	1100	A 300	90	-	1010	1010	880	26	580	58 ¹	-	3/7 ¹
T, TF 80/11	1100	BU 200	200	-	1110	1110	940	50	650	126 ¹	-	4/9 ¹
T, TF 110/11	1100	BU 300	300	-	1200	1200	1040	60	880	136 ¹	-	5/10 ¹
T, TF 150/11	1100	BU 350	350	-	1200	1200	1250	60	900	147 ¹	-	5/10 ¹
T, TF 180/11	1100	BU 500	500	-	1370	1370	1250	70	1080	168 ¹	-	7/15 ¹
T, TF 240/11	1100	BU 600	600	-	1370	1370	1350	80	1200	210 ¹	-	7/15 ¹
T, TF 360/11	1100	BN 800	800	-	1510	1510	1490	110	2000	200 ¹	-	8/17 ¹
T, TF 400/11	1100	BN 900	900	-	1510	1510	1590	110	2100	200 ¹	-	10/20 ¹
T, TF 500/11	1100	BN 1200	1200	-	1510	1510	1640	110	2450	200 ¹	-	11/21 ¹
T, TF 600/11	1100	BU 1310	1300	-	1615	1615	1730	110	2550	200 ¹	-	13/23 ¹
T, TF 650/11	1100	BP 1000	1400	-	1685	1685	1360	110	2400	240 ¹	-	13/20 ¹
T, TF 700/11	1100	BU 1510	1500	-	1615	1615	1850	140	2750	240 ¹	-	13/23 ¹
T, TF 800/11	1100	BU 1800	1800	-	1685	1685	1830	140	2800	240 ¹	-	15/25 ¹
T, TF 10/12	1200	A 70	20	70	860	860	770	16	440	32 ¹	47 ²	5/8 ²
T, TF 20/12	1200	A 150	45	150	940	940	770	20	520	42 ¹	63 ²	5/10 ²
T, TF 40/12	1200	A 300	90	300	1010	1010	860	26	600	58 ¹	84 ²	5/12 ²
T, TF 80/12	1200	BU 200	200	650	1110	1110	930	50	760	126 ¹	190 ²	5/15 ²
T, TF 10/13	1300	A 70	20	70	900	900	890	16	600	32 ¹	47 ²	5/8 ²
T, TF 20/13	1300	A 150	45	150	980	980	890	20	640	42 ¹	63 ²	5/10 ²
T, TF 40/13	1300	A 300	90	300	1050	1050	970	26	760	58 ¹	84 ²	5/12 ²
T, TF 80/13	1300	BU 200	200	650	1150	1150	1030	50	960	126 ¹	190 ²	5/15 ²

¹At 700 °C

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

²At 1000 °C



Emergency outlet for the safe draining of melt in case of crucible breakage

Tilting Furnace KC and Bale-Out Furnace TC SiC-Rod-Heated, for Melting



KC 180/14



TC 80/14



Heated on both sides by high performance SiC rods



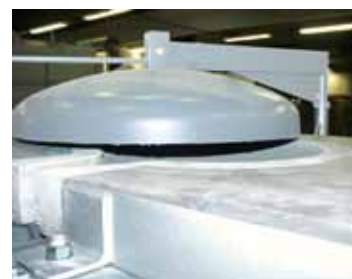
Wiring of the heating elements in sections above each other

The electrically heated tilting and bale-out furnaces of the KC and TC series are characterized by a higher melting performance than achievable with wire heated melting furnaces. These furnaces are designed for permanent operation at working temperatures.

- Tmax 1400 °C, also suitable for bronze alloys with a maximum melt temperature of up to 1320 °C, subject to the condition of crucible
- Heating from two sides by generously dimensioned SiC rods, uniform temperature distribution
- Simple exchange of individual heating elements
- Heat operation by thyristors in phase-angle mode with performance control:
The resistance of the SiC rods changes with temperature and age. Performance control ensures constant power of heating irrespective to the condition of the heating elements.
- High melting performance with uniform temperature distribution
- Insulation constructed in multiple layers with lightweight refractory bricks on the hot face
- SiC-Crucible
- Electro-hydraulic tilting system with flame resistant HFCE hydraulic fluid
- Safe, even, and precise pouring thanks to optimum pivot point in the furnace and manual throttling valve operation (KC models)
- Emergency outlet for safe draining of the melt in case of crucible breakage
- No exhaust gas discharge needed
- Integrated safety system which continues to operate the furnace at reduced power in case of malfunction in the bath thermocouple, in order to prevent the freezing of the melt
- Over-temperature limit controller in furnace chamber for protection against overheating. The limiter switches the heating off when the set limit temperature is reached, and only switches it back on after the temperature has fallen again
- Furnace chamber control with temperature measurement behind the crucible, recommended for melting
- For Information on temperature regulation, see page 24



KC 150/14



Swing lid with good sealing to collar plate to avoid heat loss over the crucible opening

Additional equipment

- Work platform for simplified loading
- For information on other accessories, see page 22

Model	Tmax °C	Crucible	Capacity		Outer dimensions in mm			Connected load kW	Weight in kg	Melting performance ³	
			Kg Al	Kg Cu	W	D	H			kg/hr Al	kg/h Cu
KC 20/14	1400	A 150	45	150	1710	1900	1050	36	1500	80 ¹	120 ²
KC 40/14	1400	A 300	90	300	1770	1900	1100	36	1600	80 ¹	120 ²
KC 80/14	1400	TCP 287	200	650	1880	1970	1160	48	1900	120 ¹	180 ²
KC 150/14	1400	TCP 412	300	1000	2000	2070	1300	66	2700	140 ¹	220 ²
KC 180/14	1400	TCP 412H	-	1000	2000	2070	1500	99	3000	-	230 ²
TC 20/14	1400	A 150	45	150	1200	1250	930	36	830	80 ¹	120 ²
TC 40/14	1400	A 300	90	300	1260	1250	1020	36	950	80 ¹	120 ²
TC 80/14	1400	BU 200	200	650	1360	1350	1080	48	1050	120 ¹	180 ²
TC 150/14	1400	BU 300	300	1000	1450	1320	1300	66	1300	140 ¹	220 ²

¹At 700 °C

²At 1000 °C

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



Switchgear with thyristors in phase angle operation for economic power consumption

Bale-Out Furnaces T ../10

Electrically Heated, for Holding



Bale-out of T 650/10 with robot

The perfect insulation and the reduced electric connected loads provide for perfect energy efficiency and make the T ../10 models optimally suitable for holding operation. Due to the reduced connected load these furnaces are only suitable for melting to a limited extent. This is why they are mostly used in foundries with central pre-melting furnaces followed by transportation of the melt to the holding furnace.



T 150/10

- Tmax 1000 °C, ideally suited for the holding of aluminum
- Four-side heating using electric heating elements, freely radiating on carrier tubes
- Simple replacement of individual heating elements. In case of crucible breakage, only the defective heating elements on each level need to be replaced
- Heating of furnaces up to 60 kW power rating controlled using long-lasting, noiseless solid-state-relays
- Heating of furnaces beyond 60 kW with contactors
- Particularly good 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
- Crucible not included in the standard version
- Integrated safety system which continues to operate the furnace at reduced power in case of malfunction in the bath thermocouple, in order to prevent the freezing of the melt
- Over-temperature limit controller in furnace chamber for protection against overheating. The limiter switches the heating off when the set limit temperature is reached, and only switches it back on after the temperature has fallen again.
- Furnace chamber control with temperature measurement behind the crucible, recommended for melting
- For Information on temperature regulation, see page 24



Additional equipment, see T, TF furnaces, page 17



Design of a holding furnace with bath control system containing thermocouples for the melt, the furnace chamber and the over-temperature limit controller

Model	Tmax °C	Crucible	Capacity		Outer dimensions in mm			Connected load kW	Weight in kg	Melting performance ²		Holding lid closed/open kW
			Kg Al	Kg Cu	W	D	H			kg/hr Al	kg/h Cu	
T 80/10	1000	BU 200	200	-	1150	1150	1030	20	660	holding only		4/9 ¹
T 110/10	1000	BU 300	300	-	1240	1240	1130	26	890			5/10 ¹
T 150/10	1000	BU 350	350	-	1240	1240	1290	38	920			5/10 ¹
T 180/10	1000	BU 500	500	-	1410	1410	1290	42	1120			7/15 ¹
T 240/10	1000	BU 600	600	-	1410	1410	1390	50	1240			7/15 ¹
T 360/10	1000	BN 800	800	-	1510	1510	1490	50	2000			8/17 ¹
T 400/10	1000	BN 900	900	-	1510	1510	1590	50	2100			10/20 ¹
T 500/10	1000	BU 1210	1200	-	1615	1615	1580	50	2450			11/21 ¹
T 600/10	1000	BU 1310	1300	-	1615	1615	1730	50	2550			13/23 ¹
T 650/10	1000	BP 1000	1400	-	1685	1685	1360	60	2400			13/20 ¹
T 700/10	1000	BU 1510	1500	-	1615	1615	1850	60	2750			13/23 ¹
T 800/10	1000	BU 1800	1800	-	1685	1685	1830	70	2800			15/25 ¹

¹At 700 °C

²The specified melting performances are maximum values. In practice, approx. 80 % are achieved.

Transportable Bale-Out Furnaces Electrically Heated, for Holding Aluminum



Transportable holding furnace TM 80/10



The bale-out furnaces of the TM series were developed especially for use at different pouring locations. The cylindrical, very stable furnace housing, the very high-quality insulation and the meandering heating elements are the special features of this furnace family. The furnaces are designed to be transported by forklift truck and come with a plug-in connection to the control gear. With a forklift truck the furnace can be transported to the pre-melt furnace for filling. When additional switchgear and control boxes are used, the furnace can also be optionally used at different pouring locations.

- Tmax 1000 °C, ideal for holding of aluminum
- Cylindrical, highly stable furnace housing
- Slots under the furnace for safe forklift transportation of the furnace inside the foundry
- All-round heating provided by resistant meandering heating elements
- Switchgear and control box for plug-in connection
- Heating of furnaces up to 60 kW power rating controlled using long-lasting, noiseless solid-state-relays
- Heating of furnaces beyond 60 kW with contactors
- Especially good insulation, multi-layered with fiber material in the furnace chamber
- Emergency outlet for safe discharge of the melt in case of a crucible break
- No exhaust gas vent necessary
- Crucible in standard design not included
- Furnace chamber control with temperature measurement behind the crucible
- Over-temperature limit controller in the furnace chamber to protect against over-temperature The limit controller switches off the heating when the pre-set limit temperature setting has been reached and does not switch it on again until the temperature falls below the setting again.
- For Information on temperature regulation, see page 24



Slots under the furnace for the forklift forks



Meander heating elements

Additional equipment, see T, TF furnaces, page 15

Model	Tmax	Crucible		Capacity		Outer dimensions in mm			Connected load	Melting output ²		Holding Lid closed/ open kW
	°C	Ø	H	Kg Al	Kg Cu	W	D	H		kg/h Al	kg/h Cu	
TM 80/10	1000	BU 200		200	-	1000	1100	950	21	only for holding		4/9 ¹
TM 150/10	1000	875	600	350	-	1320	1440	1000	36			5/10 ¹
TM 240/10	1000	BU 600		600	-	1220	1340	1300	42			7/15 ¹

¹At 700 °C

²The specified melting performances are maximum values. In practice, approx. 80 % are achieved..



Plug socket on the furnace for the cable connection to the switchgear and control box

Accessories for Bale-Out and Tilting Furnaces



Crucible Pulling Feature with swinging collar plate

Crucible Pulling Feature with Swinging Collar Plate

In standard version, Nabertherm crucible furnaces are built with a collar plate fixed to the furnace. The bale-out is done manually or by robot. As additional equipment, the smaller models up to T 40 can be equipped with a swinging collar plate which allows crucible pulling. To pull the crucible, the collar plate is swung to the side, so that the operator has free access to the crucible from above.



Pneumatic lid opener

Pneumatic Lid Opener for Bale-Out Furnaces for Holding

The Crucible furnaces of the T. Series can be equipped with an optional pneumatic lid opener. The pneumatic lid opener is activated by depressing a foot pedal. Optionally, the pneumatic lid opener can be controlled and triggered by an external signal to fully automate the ladling process. The furnace lid swings to the side and the operator has free access to the crucible. This practical feature increases energy efficiency because the furnace is only open during charging and bale-out. Over 50% energy savings can be realized with the pneumatic lid opener vs. an always open furnace (see tables for energy consumption for each model of melting furnace, page 7).



Charging funnel for ingots

Charging Funnel for Ingots

The charging funnel made of stainless steel 1.4301 (304) makes charging the furnace much easier, especially when melting ingots. Long ingots can also be charged extending over the crucible edge, and then sink, guided, into the crucible. Furnaces which are designed with a control system with night-time reduction can, for example, be filled in the evening and, on the following morning a complete melt is ready for use. The funnel is suitable for all melting furnaces, electrically heated or gas- with a side exhaust gas discharge.



Work platform for K 240/12

Work Platform for Loading for Bale-Out and Tilting Furnaces

For bale-out and tilting furnaces, customized work platforms for charging and servicing can be provided as additional equipment. This feature is used to simplify access to the furnace, particularly for larger furnace models. The operator has access to the top of the furnace to charge ingots or clean the melt.

Crucible Breakage Alarm Device (up to T(B)..../12)

Nabertherm melting furnaces are equipped with emergency outlet. In case of crucible breakage or leaking melt the crucible breakage alarm device will provide for a warning as soon as fluid metal emerges from the emergency outlet. The warning signal of the alarm is both optical, with an signal lamp, and acoustic, using a horn. As additional equipment it is possible to send an alarm as SMS-message to one or more mobile phones. One or more furnaces can be connected to the messaging device in parallel.

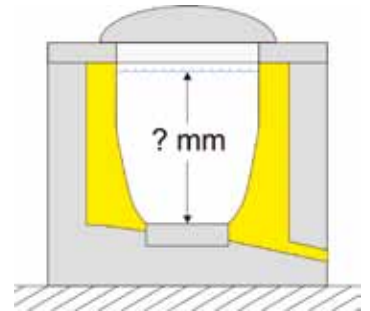


Crucible breakage alarm device under the emergency outlet of a melting furnace

Filling Level Measurement by means of Optical Detection or Weight Loss

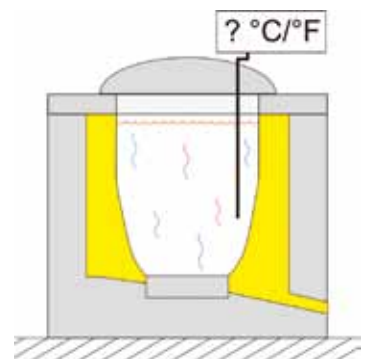
When crucible furnaces are used in continuous operation, it can be necessary to monitor the filling level of the crucible and provide for a signal when defined levels are reached. The signal can be either optical, acoustic, or a signal for automatic filling of the crucible. When the minimum level is reached, a signal to fill a crucible is given. On reaching the maximum level this process is stopped.

The measurement of fill level can either be done by using a scale under the furnace or by using a measurement probe to detect the fill level and which records the data very precisely independent from external influences.



Separate Bath Temperature Measurement Device

For melting furnaces with only furnace chamber temperature control, a separate bath temperature measurement device can be used to check the bath temperature. The measurement device is suitable for a temperature range from 0 to 1300 °C, and can be delivered with different dip pipe lengths (200, 380, 610 mm). Temperature measurement is carried out using a NiCr-Ni thermocouple. The submersion length of the pipe should be 2/3 of the element length to achieve the most ideal reaction time. The average reaction time is 40 seconds. The thermocouple is suitable for all nonferrous metals except phosphor bronze.



Additional Equipment for All Electrically Heated Melting Furnaces

Multi-Step Switch for Reduction of Connected Rating

A multi-step switch switches off a part of the heating depending on the power of the corresponding furnace model. Generally, the furnace can be operated at full load for melting. If the furnace is only used in holding mode the connected rating of the furnace can be reduced by turning off a defined part of the heating capacity, resulting in a significant cost advantage. As an option, this function can be automatically switched depending on temperature.

Power Management for Reduction of the Electrical Connection Value

If several crucible furnaces are used the installation of an intelligent power management can be the right choice. Monitoring all furnaces the power management is continuously reconciling the switch-on times of the heating. This effectively prevents all furnaces from switching-on at the same time. The positive impact is that the total connected rating provided by the energy provider can be significantly reduced.

Switchgear Cooling with Fans or Air-Conditioning

The switchgear of our furnaces is designed for environment temperatures of up to 40 °C. To secure a failure-free and long lasting operation of the switchgear in case of higher temperatures they can be equipped with active fan cooling or even with an air-conditioner.



Multi-Step Switch

Control and Documentation Alternatives for Melting Furnaces



Eurotherm 2208e controller

Furnace Control with the Eurotherm 3208

In the basic model, Nabertherm melting furnaces are equipped with furnace chamber control using the Eurotherm 2208 controller. The temperature is measured in the furnace chamber behind the crucible. Two set values and a heat-up ramp rate may be entered. For example, the set values could be the pouring temperature and the lower idle temperature. Optionally, a 7-day digital timer can be fitted to automatically switch between the two temperatures and different switching times can be selected for each working day.



Work platform of K 360/12

Bath Control for Bale-Out and Tilting Crucible Furnaces (Cascade Control)

In the basic version, the bale-out and tilting crucible furnaces of the T.. and K.. series are equipped with with a thermocouple in the furnace chamber behind the crucible. To achieve fast heat-up times the temperature is set significantly higher than the desired bath temperature. Therefore, this control allows very fast heating-up times, but results in considerable temperature overshoots in the melt due to the indirect temperature measurement.

As an option these furnaces can be equipped with a bath control system, which is particularly well-suited for holding operations. A second thermocouple in the bath is used in addition to the furnace chamber thermocouple to measure the bath temperature. Both temperatures are reconciled by the controller. The bath temperature is the target parameter and the chamber temperature is the working tool. This control system significantly improves the melt quality because overshoots can be effectively prevented. As an alternative to the thermocouple in the melt, a thermocouple in a special pocket in the crucible wall can be used (a special crucible with pocket is required) which measures the temperature of the crucible wall. Of course, this indirect control is not as precise as a measurement in the melt. However, the thermocouple is positioned in a protected location.



Bath control with thermocouple in the melt.

Bath Control with Controller Eurotherm 3504

All melting furnaces can be fitted with an optional bath control system. Instead of only being monitored by a thermocouple behind the crucible, the temperature is also measured in the melt, respectively in the pocket of the crucible wall, (see also description on page 23). Furnaces already in use can also be upgraded with a bath control system. An optional digital seven-day timer which automatically switches between two temperatures can also be added. The two alternate times can be selected for each working day. This allows the bath temperature, for example, to be lowered at night to save energy.

- Alternative operation modes with furnace chamber control of bath control via cascade
- Multi-line and plain text display
- Data entering by using function keys
- Programming the furnace operation with two set values (second temperature, e.g. for night-time temperature reduction)
- A separate, freely programmable preparation program, e.g. to dry the crucible. An external switch is used to switch over to the preparation program.

Additional equipment

- Seven-day timer for switching between two temperatures (e.g. night-time reduction). Switching times can be separately selected for each working day.



Compact controller Eurotherm 3504

Bath Controls with PLC and Touch Panel

The H 700 PLC features state-of-the-art bath control. It provides a combination of precise control, ease of operation and a wide variety of user applications and professional documentation. A touch panel using plain text provides a simple and clean user interface for programming and control.

- Furnace chamber control or alternatively bath control via cascade applicable
- Colored graphic display of all temperatures
- Touch panel provides a simple and clean user interface
- Seven day timer for temperature switching
- For each weekday, a program can be configured with 12 segments
- A separate, user-entered furnace preparation program that can be used to dry the crucible, etc. Access to the program is controlled by a key switch
- Customer can switch between different languages



Seven-day timer for switching between melting temperature and lowered temperature

Additional equipment for H 700

- Manual Overriding of automatic control
If a running program needs to be extended (for example, when working overtime to meet a customer's schedule), a key switch can be used to put the programmer into Manual mode in order to continue working at the present temperature. In the background, the original program is continued, and when the key switch is turned back to Program mode, the furnace resumes its currently scheduled set point.
- Documentation of melting process
The H 700 controls can be upgraded with the Nabertherm Control Center package (NCC) on a personal computer. NCC controls provide for a professional documentation of the melting process among others, with the following features:
 - All relevant data, such as furnace chamber temperature, bath temperature, messages, etc. are always automatically stored as a daily file.
 - The switchgear is equipped with start and stop buttons. By pressing these buttons, the bath temperature is documented and stored as a file. For instance, customer batches can be monitored and archived separately.
 Additionally the Personal Computer can be used as user interface with all advantages of a PC.



H 700

Additional Equipment for all Controllers

- Temporary overriding of bath control to increase melting performance
When an empty crucible is recharged, the values measured by the bath thermocouple do not correspond to the actual temperature of the solid metal. Using melt bath regulation in this case would reduce the power available to melt the metal. A pushbutton on the panel allows the operator to temporarily bypass normal control, and have the controller maintain a higher than normal chamber temperature to melt the metal faster. A user-set timer (up to 120 minutes) and set point allows the operator to optimize the time it takes to melt. When the timer elapses, the controller resumes its normal control mode.



Multi-Step Switch

Melting Furnaces in Customized Dimensions



K 240/12 with lifting platform for charging and pouring at different levels

Tilting Furnaces with Electrohydraulic Lifting Platforms

Depending on the material flow and space requirements in a foundry, the charging height and pouring height may need to be different for a tilting furnace. For instance, if loading is performed at ground level and the metal is poured into a machine at a higher level, then an optional electro-hydraulic lifting platform can adjust for the difference. The operation of the lifting platform is by means of a 2 hand operation with a manual throttling valve. It can also be interlocked with other machinery and be automatically operated.



Electrically heated combi transport ladle TRP 240/S for melting, holding, and transport

Combi Transport Ladle for Melting, Holding, and Transporting

Especially in smaller foundries or in foundries with narrow space availability, our TRP 240/S combi transport pan is available. It combines a melting furnace and a transport ladle in one unit. Its electrical connected rating allows the furnace to be used for melting.

- Tmax 900 °C for melting and holding of aluminum
- Electrically heated
- Connection between switchgear and furnace pluggable
- Customer must provide plant crane
- Comfortable planetary gearbox
- Simple handling and precise pouring
- Optimally arranged heating modules resulting in very long crucible standing times

Model	Tmax °C	Crucible	Melting performance kg Al/hr	Outer dimensions in mm			Connected load kW
				W	D	H	
TRP 240/S	900	TP 587/TP 587 SF	200	2230	1430	1210	69



K 240/11 for melting of lead

Melting Furnaces for Heavy Metals

Our melting furnaces in the K, KF, T, and TF series can be upgraded with adapted electrical heating for melting of heavy metals like lead and zinc. The furnace is equipped with a special crucible, in most cases a steel crucible. The melting power is tailored to the type of metal to ensure optimum utilization of the furnace.

Rotary Table System for Continuous Pouring

For continuous processes, multiple crucible furnaces can be combined on a rotary table system. For example, when using three furnaces with a rotation in 120° steps, loading takes place at the first space, de-gassing at the second space, and bale-out at the third. This ensures a continuous supply of liquid metal at the pouring location. The rotary table is designed with an emergency drain below in case of crucible breakage.



Rotary table system with 3 x T 150/11

Bath Furnaces, Electrically Heated, for Holding

The B 120 - B 500 bath furnaces (without crucibles) have been especially developed for stationary holding operation in die-cast foundries with removal of the melt by a bale-out robot. The tub of the furnace is lined with special long-life brick. The multi-layered backing insulation is designed for lowest electric connected load. The furnace tub is divided into three interconnected chambers. The heating proceeds from the lid into the center chamber. The bale-out openings are dimensioned to enable the robot to be optimally used. In holding operation bath furnaces, when used properly, provide better energy efficiency than crucible bale-out furnaces.



B 500

Model	Tmax °C	Capacity Kg Al	Outer dimensions in mm			Weight in kg	Bale-out opening mm	Connected load kW	Holding kW
			W	D	H				
B 120	1000	300	1900	1150	1160	1900	300 x 300	11	2
B 250	1000	600	2030	1280	1200	2450	380 x 380	14	3
B 500	1000	1200	2350	1450	1240	3700	430 x 430	20	5

Energy Efficiency

Magnesium Melting Furnaces

For a variety of projects, Nabertherm has supplied melting furnaces to be upgraded by the customer for the melting of magnesium. Nabertherm supplied the furnace with all necessary control systems and the steel crucible. The furnaces were completed by the customer with the safety devices, pump systems for bale-out, and protective-gas systems. We are capable of implementing furnace systems to provide for a crucible volume of 1500 liters of magnesium.



Tilting furnaces for magnesium K 1500/75 S with 1500 liters crucible volume

Laboratory Melting Furnaces Electrically Heated



K2/10 as crucible furnace with steel crucible for lead melting



KC 2/15

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

Additional equipment

- Other crucible types available, e.g. steel or SiC
- Design as crucible furnace without tilting device, e.g. for lead melting
- Over-temperature limit controller for the furnace chamber with automatic reset to protect against over-temperature. The limit controller switches off the heating when the pre-set limit temperature has been reached and does not switch it on again until the temperature falls below the setting again.
- Observation hole for melt



KC 2/15

Model	Tmax °C	Crucible	Volume in l	Outer dimensions in mm			Connected load kW	Electrical connection	Weight in kg
				W	D	H			
K 1/10	1000	A 6	1.0	520	680	660	3.0	single-phase	85
K 2/10	1000	A10	2.0	520	680	660	3.0	single-phase	90
K 4/10	1000	A25	4.0	570	755	705	3.6	single-phase	110
K 1/13 ²	1300	A 6	1.0	520	680	660	3.0	single-phase	120
K 2/13 ²	1300	A10	2.0	520	680	660	3.0	single-phase	125
K 4/13 ²	1300	A25	4.0	570	755	705	5.5	3-phase ¹	170
KC 1/15 ³	1500	A6	1.0	580	630	580	10.5	3-phase	170
KC 2/15 ³	1500	A10	2.0	580	630	580	10.5	3-phase	170

¹Heating only between two phases

²Outer dimensions of furnace, transformer in separate housing (500 x 570 x 300 mm)

³Switchgear and controller mounted in a floor standing cabinet

Cleaning Furnace for Riser Tubes Electrically Heated



SRO 170/1000/11

SRO 170/1000/11

Riser tubes for low-pressure melting furnaces must be cleaned in regular intervals. To remove deposits the pipe must be removed from the furnace and heated. In comparison to applying an open flame to heat the pipe, the SRO 170/1000/11 furnace offers the advantages of very uniform tube heating. The quality of the heat treatment is clearly better and the life-time of the risers can be extended when cleaned regularly. The heated rising tube can be removed from the furnace hot and returned to the low-pressure melting furnace.

The furnace is charged from above using a crane provided by the customer. Located in the lower section of the furnace is a steel catch drawer which is filled with sand or sizing compound. The rising tube hangs in the receptacle with a crane eye and the deposits drip into the drawer. Designed as a drawer, it can be easily pulled out, emptied and filled again.

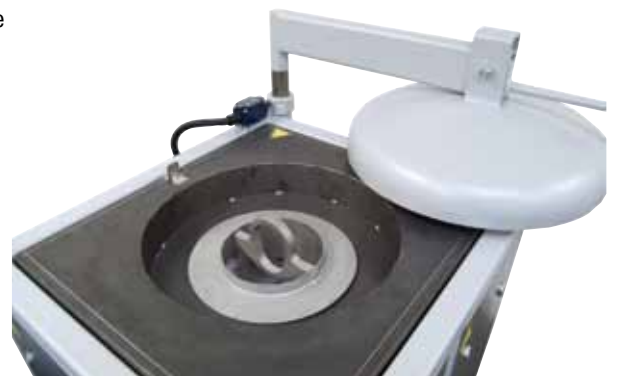
- Tmax. 1100 °C
- Charging opening with collar plate and swing lid on the furnace. Charging of the rising tube using the customer crane
- Max. dimensions of the rising tube: L: 1000 mm, outer dimension 90 mm with single-side flange with an outer diameter of 115 mm
- Heated length: 1000 mm
- Charge receptacle with crane eye for holding smaller risers
- Steel catch draw, filled by the customer with sand, which collects deposits
- Steel collector designed as a drawer
- Furnace on rollers
- Switchgear and control equipment fastened directly to the furnace

Additional equipment

- Design for other riser dimensions on request
- Switchgear on rollers



Furnace SRO 170/1000/11 with suspended pipe



To be pulled with crane eye for riser tubes with flange

Model	Tmax °C	Outer dimensions in mm			Outer tube-Ø/ mm	Heated length/mm	Connected load kW	Electrical connection
W	D	H						
SRO 170/1000/11	1100	590	640	1700	90	1000	12,0	3phase

Chamber Dryer Electrically Heated or Gas-Fired



Standard models

The chamber dryers of the KTR range can be used for complex drying processes and heat treatment of charges of normal weight and packing density to an application temperature of 260 °C. The high-performance air circulation enables optimum temperature uniformity throughout the usable space. A wide range of accessories allow the furnace to be modified to meet specific process requirements. The design for the heat treatment of combustible materials in conformance with EN 1539 is available for all sizes.

- Tmax 260 °C
- Electrically heated (via a heating register with integrated chrome steel heating elements) or gas-fired (direct gas heating including injection of the hot air into the intake duct)
- Optimum temperature uniformity up to ± 3 K according to DIN 17052-1



Production system for tempering silicone, consisting of four chamber dryers for moving the load during heat treatment along with a three-stage heat exchanger to optimize energy efficiency



KTR 8000

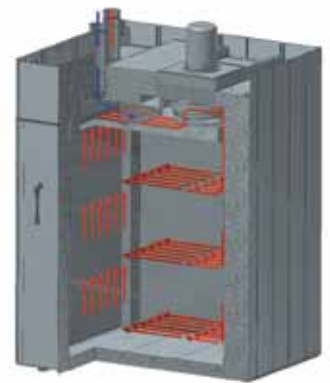


KTR 2000 S with observation window and rotary rack for the charge

- High-quality mineral wool insulation provides for outer temperatures of < 20 °C above room temperature
- High air exchange for fast drying processes
- Double-wing door for furnaces KTR 3100 and larger
- Over-temperature limit controller with manual reset for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the dryer and load
- Incl. floor insulation

Additional equipment

- Entry ramp for pallet trucks or track cutouts for charging trolley
- Optimal air circulation for individual charges by means of adjustable air outlets
- Fan system for faster cooling with manual or automatic control
- Programmed opening and closing of exhaust vents
- Observation window and furnace chamber lighting
- Safety technology according to EN 1539 for charges containing solvents, see page 42
- Catalytic or thermal exhaust gas cleaning systems
- Custom-built sizes
- Tightly welded inner housing
- Process control and documentation with Controltherm MV software package, see page 62 ff.



Air-circulation in the chamber dryer

Model	Tmax °C	Inner dimensions in mm			Volume in l	Outer dimensions in mm			Connected load kW	Electrical connection
		w	d	h		W	D	H		
KTR 1500	260	1000	1000	1500	1500	1930	1430	2315	21	3-phase
KTR 3100	260	1250	1250	2000	3100	2160	1680	2880	30	3-phase
KTR 4500	260	1500	1500	2000	4500	2410	1930	2880	50	3-phase
KTR 6125	260	1750	1750	2000	6125	2660	2180	3000	50	3-phase
KTR 8000	260	2000	2000	2000	8000	2910	2430	3000	59	3-phase



Adjustable outflow openings as additional equipment

Air Circulation Chamber Furnaces < 500 Liters Electrically Heated



N 30/65 HA with gas supply system



N 250/65HA with gas supply system



N 15/65HA as table-top model

The very good temperature uniformity of these chamber furnaces with air circulation provides for ideal process conditions for annealing, curing, solution annealing, artificial ageing, pre-heating, or soft annealing and brazing. The furnaces are equipped with a suitable annealing box for soft annealing of copper or tempering of titanium, and also for annealing of steel under protective gases. The modular furnace design allows for adaptation to specific process requirements with appropriate accessories.

- Tmax 450 °C, 650 °C, or 850 °C
- Heating from bottom, sides and top
- Stainless steel air-baffle box in the furnace for optimum air circulation
- Swing door hinged on the right side
- Base frame included in the delivery, N 15/65 HA designed as table-top model (table available as an option)
- Horizontal air circulation
- Optimum temperature uniformity up to ± 4 K according to DIN 17052-1
- Optimum air distribution enabled by high flow speeds
- One removable tray and rails for two additional trays included in the scope of delivery (N 15/65 HA without removable tray)

Additional equipment (not for model N 15/65HA)

- Optimization of the temperature uniformity up to ± 3 K according to DIN 17052-1
- Fan cooling to accelerate the cooling process
- Motorized exhaust vents
- Manual lift door
- Pneumatic lift door



N 500/45HAS with lift door and roller conveyor in the furnace



N 120/85HAS with charging basket

- Adjustable air circulation for sensitive components
- Additional removable trays
- Roller conveyor in furnace chamber for heavy charges
- Annealing boxes
- Feed and charging aids
- Designed for Tmax 950 °C, fan blade driven indirectly via a belt to protect the air recirculation motor against over-heating
- Process control and documentation with Controltherm MV software package, see page 62 ff.



Customized air circulation furnace
N 500/HAS with four compartments, each
with roller conveyor and individual door

Model	Tmax °C	Inner dimensions in mm			Volume in l	Outer dimensions in mm			Connected load kW	Electrical connection	Weight in kg
		w	d	h		W	D	H			
N 30/45 HA	450	290	420	260	30	607 + 255	1175	1315	3.6	1-phase	195
N 60/45 HA	450	350	500	350	60	667 + 255	1250	1400	6.6	3-phase	240
N 120/45 HA	450	450	600	450	120	767 + 255	1350	1500	9.6	3-phase	310
N 250/45 HA	450	600	750	600	250	1002 + 255	1636	1860	19.0	3-phase	610
N 500/45 HA	450	750	1000	750	500	1152 + 255	1886	2010	28.0	3-phase	1030
N 15/65 HA ¹	650	295	340	170	15	470	845	460	2.7	1-phase	55
N 30/65 HA	650	290	420	260	30	607 + 255	1175	1315	6.0	3-phase ²	195
N 60/65 HA	650	350	500	350	60	667 + 255	1250	1400	9.6	3-phase	240
N 120/65 HA	650	450	600	450	120	767 + 255	1350	1500	13.6	3-phase	310
N 250/65 HA	650	600	750	600	250	1002 + 255	1636	1860	21.0	3-phase	610
N 500/65 HA	650	750	1000	750	500	1152 + 255	1886	2010	31.0	3-phase	1030
N 30/85 HA	850	290	420	260	30	607 + 255	1175	1315	6.0	3-phase ²	195
N 60/85 HA	850	350	500	350	60	667 + 255	1250	1400	9.6	3-phase	240
N 120/85 HA	850	450	600	450	120	767 + 255	1350	1500	13.6	3-phase	310
N 250/85 HA	850	600	750	600	250	1002 + 255	1636	1860	21.0	3-phase	610
N 500/85 HA	850	750	1000	750	500	1152 + 255	1886	2010	31.0	3-phase	1030

¹Table-top model

²Heating only between two phases

Air Circulation Chamber Furnaces > 500 Liters Electrically Heated or Gas-Fired



N 3920/26HAS



N 4000/26HA with lift-door



Enclosed heater coils on electrically heated models



Gas burner positioned along the furnace side

These air circulation chamber furnaces are available for maximum operating temperatures of 260 °C, 450 °C, 600 °C or 850 °C and are perfectly suited for demanding processes. Due to their robust and solid design even heavy loads can be heat treated. These furnaces are suited for use with baskets, pallets, and mobile furnace racks. The charging can be carried out with fork lift, pallet truck, or charging trolley. The basic furnace is standing on the shop floor without floor insulation. Charging can be simplified by roller conveyors, if necessary also motorized. All furnaces are available with electric or gas heating.

Standard version for models up to 600 °C (850 °C models, see page 36)

- Tmax 260 °C, 450 °C or 600 °C
- Electrically heated or gas-fired
- Electric heating by means of heater coils
- Direct gas heating or upon request with indirect gas heating with radiation tube, e.g. for heat treatment of aluminum
- Optimal air circulation for your charge by means of adjustable air outlets
- Horizontal air flow (type ../HA)
- High air exchange for perfect heat transfer
- Ground level charging without floor insulation for 260 °C models
- Optimum temperature uniformity up to ± 4 K according to DIN 17052-1
- Furnace chamber lined with alloy 1.4301 (DIN)
- High quality mineral wool insulation provides for low outer temperatures
- High-grade, multi-layered insulation with light weight refractory bricks on the hot face for 850 °C models
- Air inlet and air outlet openings closable with plug
- Inside unlocking device for furnaces with walk-in chambers
- Furnace sizes suitable for common charging systems, such as pallets, baskets, etc.
- Double-wing door for furnaces N 1500 and larger



N 2520/60HA with roller conveyor inside and in front of the furnace



N 1500/85HA with lift door and work piece holders in the furnace

- Over-temperature limit controller with manual reset for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the furnace and load

Additional Accessories for models up to 600 °C

- Optional floor insulation provides for improved temperature uniformity for 260 °C models
- Entry ramps or track cutouts for floor-level charging of models with bottom insulation
- Furnace positioned on base frame provides for ergonomic charging height
- Electro-hydraulic lift door
- Fan system for faster cooling with manual or automatic control
- Automatic control of exhaust air vents for better ventilation of the furnace chamber
- Observation window and/or furnace chamber lighting
- Optimum temperature uniformity up to ± 3 K according to DIN 17052-1
- Safety technology according to EN 1539 for charges containing solvents, see page 42
- Charging systems or roller conveyors, also electrically driven provide for easy charging
- Catalytic or thermal exhaust gas cleaning systems
- Custom sizes up to 30,000 liters and charge weights up to 30 tons
- Process control and documentation with Controltherm MV software package, see page 62 ff.



Pull-out drawers for heavy loads



Track cutouts for pallet truck or charging trolley

Air Circulation Chamber Furnaces > 500 Liters Electrically Heated or Gas-Fired



Standard version for models 850 °C

- Tmax 850 °C
- Electrically heated or gas-fired
- Electric heating with heating elements on supports tubes
- Direct gas heating into the outlet of the air circulation fan
- Optimal air circulation for your charge by means of adjustable air outlets
- Horizontal air-flow (type ../HA)
- Manually adjustable air inlet and exhaust air vents
- High air exchange provides for perfect heat transfer
- Base frame with 900 mm charging height
- Optimum temperature uniformity up to ± 5 K according to DIN 17052-1
- Air baffles made of 1.4828 (DIN)
- Multi-layered insulation with fiber plates (not classified according to EU directive 67/548) and light-weight refractory bricks in the floor incl. microporous backing insulation provides for low outer temperatures
- Furnaces sizes perfectly suited to accommodate common charging systems, e.g. like pallets or pallet boxes
- Over-temperature limit controller with manual reset for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the furnace and load

Additional accessories for models 850 °C

- Electro-hydraulic lift door
- Fan system for faster cooling with manual or automatic control
- Automatic control of exhaust air vents for better ventilation of the furnace chamber
- Optimum temperature uniformity up to ± 3 K according to DIN 17052-1
- Base frame for customized charging height
- Charging systems or roller conveyors, also electrically driven provide for easy charging
- Custom sizes up to 30,000 liters and charge weights up to 30 tons
- Designed for Tmax 950 °C, fan wheel to protect the air recirculation motor against over-heating, driven indirectly via a belt
- Process control and documentation with Controltherm MV software package, see page 62 ff.



N 12000/25AS



N 24500/20HAS

Model	Tmax °C	Inner dimensions in mm			Volume in l	Outer dimensions in mm			Circulation rate m³/h	Connected load kW	Electrical connection
		w	d	h		W	D	H			
N 560/26HA	260	750	1000	750	560	1450	1865	2220	900	13.0	3-phase
N 1000/26HA	260	1000	1000	1000	1000	1930	1900	1600	3600	18.0	3-phase
N 1500/26HA	260	1500	1000	1000	1500	2380	1900	1600	3600	22.0	3-phase
N 1500/26HA1	260	1000	1500	1000	1500	1880	2400	1600	3600	22.0	3-phase
N 2000/26HA	260	1500	1100	1200	2000	2380	2000	1800	6400	22.0	3-phase
N 2000/26HA1	260	1100	1500	1200	2000	1980	2400	1800	6400	22.0	3-phase
N 2010/26HA	260	1000	1000	2000	2000	1880	1900	2720	7200	30.0	3-phase
N 2880/26HA	260	1200	1200	2000	2880	2080	2100	2720	9000	54.0	3-phase
N 4000/26HA	260	1500	2200	1200	4000	2380	3110	1800	9000	47.0	3-phase
N 4000/26HA1	260	2200	1500	1200	4000	3080	2410	1800	9000	47.0	3-phase
N 4010/26HA	260	1000	2000	2000	4000	1880	2900	2720	9000	54.0	3-phase
N 4500/26HA	260	1500	1500	2000	4500	2380	2400	2720	12800	54.0	3-phase
N 5600/26HA	260	1500	2500	1500	5600	2110	3180	2340	9000	69.0	3-phase
N 6750/26HA	260	1500	3000	1500	6750	2110	3680	2340	19200	98.0	3-phase
N 7200/26HA	260	2000	1500	2400	7200	2610	2410	3000	18000	93.0	3-phase
N 10000/26HA	260	2000	2500	2000	10000	2610	3180	2840	25600	106.0	3-phase
N 560/45HA(E¹)	450	750	1000	750	560	1450	1865	2220	900	13.0¹/ 19.0	3-phase
N 1000/45HA(E¹)	450	1000	1000	1000	1000	1930	1900	1600	3600	18.0¹/ 40.0	3-phase
N 1500/45HA(E¹)	450	1500	1000	1000	1500	1900	1600	1320	3600	22.0¹/ 40.0	3-phase
N 1500/45HA1(E¹)	450	1000	1500	1000	1500	1880	2400	1600	3600	22.0¹/ 40.0	3-phase
N 2000/45HA(E¹)	450	1500	1100	1200	2000	2380	2000	1800	6400	22.0¹/ 46.0	3-phase
N 2000/45HA1(E¹)	450	1100	1500	1200	2000	1980	2400	1800	6400	22.0¹/ 46.0	3-phase
N 2010/45HA(E¹)	450	1000	1000	2000	2000	1880	1900	2720	7200	30.0¹/ 54.0	3-phase
N 2880/45HA(E¹)	450	1200	1200	2000	2880	2080	2100	2720	9000	54.0¹/ 66.0	3-phase
N 4000/45HA(E¹)	450	1500	2200	1200	4000	2380	3110	1800	9000	47.0¹/ 65.0	3-phase
N 4000/45HA1(E¹)	450	2200	1500	1200	4000	3080	2410	1800	9000	47.0¹/ 65.0	3-phase
N 4010/45HA(E¹)	450	1000	2000	2000	4000	1880	2900	2720	9000	54.0¹/ 66.0	3-phase
N 4500/45HA(E¹)	450	1500	1500	2000	4500	2380	2400	2720	12800	54.0¹/ 66.0	3-phase
N 5600/45HA(E¹)	450	1500	2500	1500	5600	2110	3180	2340	9000	69.0¹/ 93.0	3-phase
N 6750/45HA(E¹)	450	1500	3000	1500	6750	2110	3680	2340	19200	98.0¹/ 116.0	3-phase
N 7200/45HA(E¹)	450	2000	1500	2400	7200	2610	2410	3000	18000	93.0¹/ 117.0	3-phase
N 10000/45HA(E¹)	450	2000	2500	2000	10000	2610	3180	2840	25600	106.0¹/ 130.0	3-phase
N 1000/60HA	600	1000	1000	1000	1000	1930	1900	1600	3600	40.0	3-phase
N 1500/60HA	600	1500	1000	1000	1500	2380	1900	1600	3600	40.0	3-phase
N 1500/60HA1	600	1000	1500	1000	1500	1930	2400	1600	3600	40.0	3-phase
N 2000/60HA	600	1500	1100	1200	2000	2380	2000	1800	6400	46.0	3-phase
N 2000/60HA1	600	1100	1500	1200	2000	1980	2400	1800	6400	46.0	3-phase
N 4000/60HA	600	1500	2200	1200	4000	2380	3110	1800	9000	65.0	3-phase
N 4000/60HA1	600	2200	1500	1200	4000	3080	2410	1800	9000	65.0	3-phase
N 1000/85HA	850	1000	1000	1000	1000	2100	2000	1900	3600	46.0	3-phase
N 1500/85HA	850	1500	1000	1000	1500	2600	2000	1900	3600	46.0	3-phase
N 1500/85HA1	850	1000	1500	1000	1500	2100	2600	1900	3600	46.0	3-phase
N 2000/85HA	850	1500	1100	1200	2000	2600	2100	2100	6400	64.0	3-phase
N 2000/85HA1	850	1100	1500	1200	2000	2200	2800	2100	6400	64.0	3-phase
N 4000/85HA	850	1500	2200	1200	4000	2600	3400	2100	9000	97.0	3-phase

¹Reduced connected power for plastics applications



N 4010/45HA with track cutouts, chamber lighting and observation window

Air Circulation Bogie Hearth Furnaces Electrically heated or Gas-Fired



W 3300/85S with chain drive



W 4000/60AS with charging basket made of 1.4828

The air circulation bogie hearth furnaces W 1000/60 A - W 1000/85A are used when heavy charges weighing up to more than 25 t have to be heat-treated. They are ideal for processes such as solution annealing, artificial ageing, annealing or soft annealing, for which a high degree of temperature uniformity

is crucial. The high-performance air circulation assures that the temperature uniformity achieved throughout the usable space is outstanding. A broad selection of additional equipment enables these furnaces to be optimally adapted to suit specific processes.



Cooling fan for accelerated cooling

- Tmax 600 °C or 850 °C
- Dual shell housing with rear ventilation provides for low shell temperatures for the 850 °C models
- Swing door hinged on the right side
- Heating from chrome steel heating elements in the intake area of the air circulation system for the 600 °C models
- Heating from three sides (both side walls and the trolley) for the 850 °C models
- High-performance air circulation fan with vertical circulation
- Optimum temperature uniformity up to ± 5 K according to DIN 17052-1
- Bottom heating protected by SiC tiles on the bogie providing level stacking surface for the 850 °C models
- Furnace chamber fitted with inner sheets made of stainless steel 1.4301 for 600 °C models and of 1.4828 for 850 °C models



Charge support in a circulating air bogie hearth furnace for 850 °C



- Insulation structured with high-quality mineral wool for 600 °C models
- Insulation made of high-quality, non-classified fiber material for 850 °C models
- Bgies with flanged wheels running on rails for easy and precise movement of heavy loads
- Electric chain-driven bogie in combination with rail operation for smooth movement of heavy loads from model W 4800

Circulating air bogie hearth furnace for heat-treating coils

- Over-temperature limit controller with manual reset for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the furnace and load

Additional equipment

- Direct gas heating or upon request with indirect gas heating with radiation tube
- Custom-built sizes
- Electric chain-driven bogie in combination with rail operation for smooth movement of heavy loads up to Model W 4000
- Optimization of the temperature uniformity up to ± 3 K according to DIN 17052-1
- Bogie running on steel wheels with gear rack drive, no rails in front of the furnace necessary
- Different possibilities for an extension to a bogie hearth furnace system:
 - Additional bogies
 - Bogie transfer system with parking rails to exchange bogies running on rails or to connect multiples furnaces
 - Motor-driven bogies and cross-traversal system
 - Fully automatic control of the bogie exchange
- Electro-hydraulic lift door
- Motor-driven exhaust air vents, adjustable via the program
- Controlled cooling system with frequency-controlled cooling fan and motorized exhaust air vent
- Multi-zone control adapted to the particular furnace model provides for optimum temperature uniformity in the 850 °C models
- Commissioning of the furnace with test firing and temperature uniformity measurement (also with load) for the purpose of process optimization
- Designed for T_{max} 950 °C, fan blade driven indirectly via a belt to protect the air recirculation motor against over-heating
- Process documentation and control with Controltherm MV software package and the Nabertherm NCC control center for monitoring, documentation and control, see page 62 ff.



W 10430/85AS in custom sizes



W 13920/60AS4 with floor grid for heavy loads

Model	T _{max} °C	Inner dimensions in mm			Volume in l	Outer dimensions in mm			Connected load kW	Electrical connection
		w	d	h		W	D	H		
W 1000/.. A	600 or 850	800	1600	800	1000	1800	2390	2305	50.0	3-phase
W 1600/.. A		1000	1600	1000	1600	2000	2390	2535	50.0	3-phase
W 2200/.. A		1000	2250	1000	2200	2000	3040	2535	95.0	3-phase
W 3300/.. A		1200	2250	1200	3300	2200	3040	2745	95.0	3-phase
W 4000/.. A		1500	2250	1200	4000	2500	3040	2780	120.0	3-phase
W 4800/.. A		1200	3300	1200	4800	2200	4090	2780	120.0	3-phase
W 6000/.. A		1500	3300	1200	6000	2500	4090	2900	156.0	3-phase
W 6600/.. A		1200	4600	1200	6600	2200	5390	2770	152.0	3-phase
W 7500/.. A		1400	3850	1400	7500	2400	4640	2980	154.0	3-phase
W 8300/.. A		1500	4600	1200	8300	2500	5390	2780	203.0	3-phase

Air Circulation Pit-Type Furnaces Electrically Heated or Gas-Fired



S 1780/60AS



S 1000/85A

S 100/60A - S 1000/85A

Due to their robust design, these pit-type furnaces with air circulation are particularly useful for a professional heat treatment demanding optimum temperature uniformity. Production processes such as tempering, solution annealing, artificial ageing, and soft annealing can be realized with these pit-type furnaces.

- Tmax 600 °C oder 850 °C
- Useful for heavy charge weights
- Air circulation fans in the furnace lid, high circulation rate
- Heating chamber with air baffle cylinder
- Heating elements on all wall surfaces
- Distribution of air flow through grid at the furnace floor
- Pneumatic or hydraulic lifting device
- Optimum temperature uniformity up to ± 3 K according to DIN 17052-1

Additional equipment

- Integral fan for fast cooling
- Optimization of the temperature uniformity up to ± 2 K according to DIN 17052-1
- Variable rpm converter control of the air circulation velocity for sensitive parts
- Multiple zone control or special air circulation system for optimum temperature uniformity tailored to the charge
- Custom dimensions up to 10,000 liters
- Charge weights up to 7 tons
- Designed for Tmax 950 °C, fan wheel to protect the air recirculation motor against over-heating, driven indirectly via a belt
- Process control and documentation with Controltherm MV software package, see page 62 ff.

Model	Tmax °C	Inner dimensions cond. cylinder		Volume in l	Outer dimensions in mm			Connected load kW	Electrical connection	Weight in kg
		ø in mm	h in mm		W	D	H			
S 100/..A	600 °C or 850 °C	450	600	100	1100	1200	1600	17,5	3-phase	1000
S 200/..A		600	800	200	1200	1300	2050	28,5	3-phase	1300
S 300/..A		600	1000	300	1200	1300	2250	39,5	3-phase	1500
S 500/..A		800	1000	500	1400	1600	2400	52,5	3-phase	1600
S 600/..A	850 °C	800	1200	600	1400	1600	2600	62,5	3-phase	1800
S 800/..A		1000	1000	800	1600	1800	2400	70,0	3-phase	1900
S 1000/..A		1000	1300	1000	1600	1800	2700	90,0	3-phase	2200

Pit-Type and Top-Loading Furnaces with or without Air Circulation Electrically Heated or Gas-Fired

Our top-loading furnaces are perfectly suited for the heat treatment of longer or heavier components. The furnace is usually charged with a factory crane. Due to their high-performance air recirculation system, the furnaces provide for excellent temperature uniformity up to a maximum temperature of 850 °C. The top-loading furnaces for the temperature range up to 1280 °C provide for very good temperature distribution due to their five-side heating. Alternatively, these furnaces can also be provided with gas heating. Customized dimensions are designed and produced to accommodate the size and weight of the components to be treated.

- Tmax 260 °C, 450 °C, 600 °C or 850 °C for furnaces with air recirculation
- Tmax 900 °C or 1280 °C for furnaces with radiant heating
- Electrically heated or gas-fired
- Heating from both long sides for furnaces with air recirculation
- Heating from all four sides and the floor with SiC plates in the floor as level stacking support for models to bis 900 °C or 1280 °C
- High-quality insulation, adapted to the specific maximum temperature
- Electrohydraulic opening system of the lid with two-hand operation
- Closable air supply vents in the lower area of the furnace chamber
- Closable exhaust air vents in the lid
- Over-temperature limit controller with manual reset for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the furnace and load

Additional equipment

- Automatic exhaust air flaps for faster cooling
- Controlled fan cooling with electrically driven exhaust air flaps
- Multi-zone control of the heating provides for optimum temperature uniformity
- Furnace chamber can be divided in length for short workparts, partitions can be controlled separately
- Customized dimensions
- Customized charging racks
- Designed for Tmax 950 °C, fan blade driven indirectly via a belt to protect the air recirculation motor against over-heating
- Process control and documentation with Controltherm MV software package, see page 62 ff.



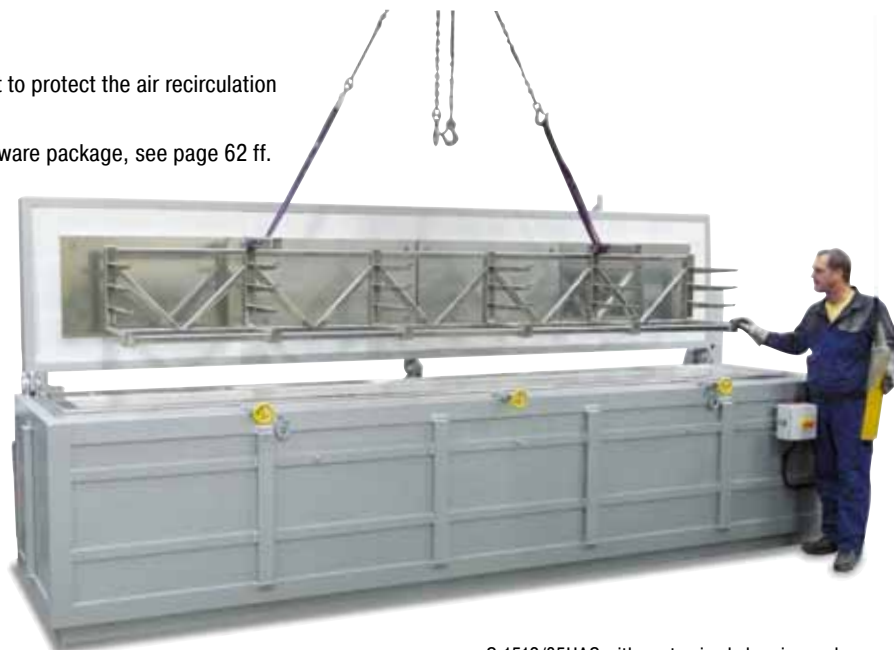
S 5120/GS1 with individual customized dimensions, furnace chamber divided in two sections, split cover



Furnace chamber S 5120/GS with device for an insulating plate in order to divide the furnace chamber



S 4100/S with customized dimensions for sintering of high parts



S 1512/85HAS with customized charging rack

**Air Circulation Chamber Furnaces/Ovens with Safety Technology
for Solvent-Containing Charges according to EN 1539 or NFPA 86**



Ship-lock type furnace N 560/ 6HACLS with safety technology, front charging and rear unloading



Drying oven KTR 1500 for drying of foundry cores with an alcohol-based binder

Safety Technology for Air Circulation Chamber Furnaces

Certain processes release and vaporize solvents or other flammable vapors. The concentration of these vapors must be kept below a certain limit to prevent ignition. European Norm EN 1539 and NFPA 86 in the USA prescribe the required safety equipment for these processes.

For these applications and processes, all air circirculation furnaces of the KTR and N ..HACLS product lines are suited with safety technology for protection of a potential ignition in the furnace chamber.

To avoid an ignition in the furnace, flammable vapors must be diluted with air. Special care must be taken so high concentrations of flammable materials do not accumulate in “dead” areas within the furnace. For this purpose, the furnaces are equipped with an exhaust gas fan providing for a defined suction flow. A measurement system monitors this flow, while fresh air is simultaneously resupplied. In parallel, the furnace atmosphere is diluted by the inflow of fresh air. The air circulation is also monitored by the measurement system.

- Furnace sizes between 120 and 10,000 liters
- Powerful exhaust fan capable of maintaining negative furnace pressure
- Defined and monitored air circulation flow and exhaust air
- Visual and audible emergency signals
- Over-temperature limit controller with manual reset for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter for the furnace and the product



Exhaust port and powerful exhaust fan mounted on the furnace



Guide-in tracks for furnaces with bottom insulation

Max. amount of solvent* at °C in grams per charge	N 560/..	N 1000/..	N 1500/..	N 2000/..	N 2010/..	N 3920/..	N 4000/..	N 4010/..	N 4500/..	N 5600/..	N 6750/..	N 7200/..	N 10000/..
150 °C	37	71	76	92	92	162	162	162	172	183	225	235	263
200 °C	26	50	57	69	99	121	121	121	132	139	171	180	203
250 °C	21	39	45	55	55	96	96	96	98	112	137	145	165

*Due to low vaporizing rates the amount of solvent for drying of impregnating resin can be increased by a factor of 20, in the case of mold varnish drying, by a factor of 10. In any case, the customer is advised to check that the application is in compliance with the respective norm.

Energy Efficiency Technology

In face of rising energy prices and stricter environmental regulations there is increasing demand for heat treatment systems with greater energy efficiency.

Depending on the furnace size and the process there is always a certain amount of potential energy which can be recovered from the waste heat and re-used. This is especially true for large furnace systems or long process times which allow for huge energy savings that the additional investment has a short pay-back time. The thermal energy from finished charges can also be used to pre-heat cold charges which is also an efficient way of saving energy.

The following examples outline engineering alternatives for heat recovery:

Heat Exchangers

The principle of the counterflow heat exchanger is to use the hot exhaust gas coming from the furnace to pre-heat the cold fresh air channelled into the furnace. In many cases, there is no need anymore for a separate fresh air preheating unit. Such a system is recommended if the process requires continuous air exchange in the furnace chamber, such as when tempering silicone, or during drying processes that are covered by the EN 1539 industrial standard.

Recuperator Burners

Large gas-fired heat-treatment furnaces are especially advantageous for the installation of recuperator burners. Recuperator burners also use hot exhaust gas; to pre-heat the combustion air. Depending on the furnace model and the process, substantial energy savings of as much as 25% can be realized by using recuperator burners so that there is a short pay-back time for the additional purchase costs.

Heat Transfer Chambers

Heat transfer chambers, which can also be described as cooling/heating chambers, offer two enormous advantages. For one, they help save energy, and for another, using a heat transfer chamber increases productivity.

The load is removed from the furnace while it is still hot and placed in the heat transfer chamber. The chamber also has room for a new, cold charge. Circulating the air cools the hot charge and, at the same time, preheats the cold charge before it is put into the furnace. Consequently, the furnace heating does not have to provide the thermal energy and through-put capacity of the furnace is increased of the same time.

The above systems for enhancing energy efficiency are only a few examples of technical alternatives. We would be happy to advise you on whether an additional heat recovery module would also be a sensible add-on to your furnace or system.



Counterflow heat exchanger for the air circulation chamber furnace N 2560/26 ACLS



Recuperator burner for aluminum melting furnace 16 x TBR 110/12 and 2 x TBR 180/12



Heat transfer between a hot and a cold charge



Production system for tempering silicone, consisting of four chamber dryers for moving the load during heat treatment along with a three-stage heat exchanger to optimize energy efficiency

Tempering Plants for Steel and NE-Metals



Fully automatic tempering system for aluminum with 2 pit furnaces, water bath, and 6 parking places

Fully Automatic Tempering System with Air-Circulating Pit-Furnace S 1780/65 AS for Solution Annealing, Water Bath, Lift Conveyor and Pit Furnace S 3180/26AS for Artificial Aging

This tempering system is available for the tempering of aluminum parts with a quenching time of 30 seconds. All functional processes are fully automated. Both, the solution annealing and the artificial aging furnaces are designed as pit furnaces.



Removal of the charge basket from solution annealing and transfer to water bath

To save time, the conveyor unit picks-up the lid of the solution annealing furnace after solution annealing, along with the attached load basket and transports it to the water bath. The lid is then unlinked and conveyed back to the solution annealing furnace. After quenching, the basket is parked in a free spot.

The subsequent artificial aging process also takes place in a pit furnace. Due to the longer period needed for artificial aging, the artificial aging furnace is equipped for the introduction of two baskets, while the solution annealing furnace can only handle one.

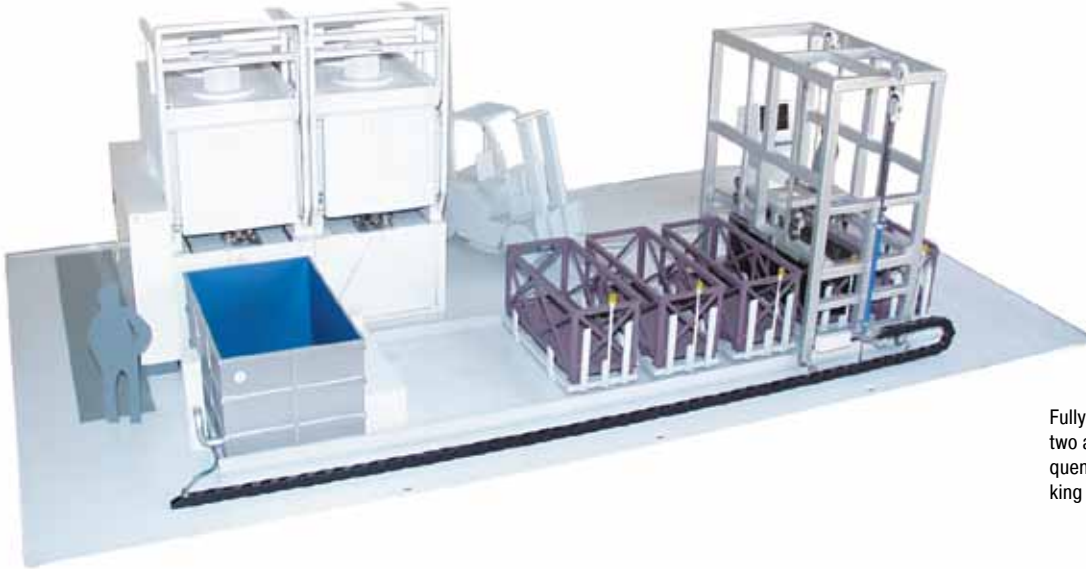
The entire heat treatment, including all movements, is fully automated. The PLC controls handle all movement and locking processes. The system automatically detects occupied parking spaces and furnaces and starts the programmed processes according to priority. Charge documentation takes place on an ongoing basis, that is, the loaded basket is documented from the time it is loaded into a parking place until removal after the end of the process.



PC interface for central operation

Systems design

- Pit furnace S 1780/65 AS for solution annealing of one basket, Tmax 650 °C, volume 1780 liters
- Pit furnace S 3180/26 AS for artificial aging of two baskets, Tmax 260 °C, volume 3180 liters
- Water bath with powerful circulation and heating, along with control of the water temperature
- Linear lift conveyor for all movement processes
- PLC controls with Nabertherm Control Center (NCC) for temperature regulation, control of all movements, and parallel batch documentation
- 6 parking spots with automatic occupancy detection, loading with forklift
- Safety fence around the entire system



Fully automated tempering system with two air-circulating bogie hearth furnaces, quench bath, conveyor system, and parking spots for five charge baskets

Fully Automated Heat Treatment System with Air-Circulating Bogie Hearth Furnace W 2780/60 AS for Solution Annealing, W 2780/26 AS for Artificial Aging, Lift Conveyor, and Heated Water Bath

This tempering system is available for the tempering of T6 aluminum alloys with a quenching time of 10 seconds. All functional processes are fully automated. Both the solution annealing furnace and the artificial aging furnace are mounted on a platform and are designed as bogie hearth furnaces. After solution annealing, the conveyor unit positions itself in front of the furnace, the door opens, the bogie moves out, and the basket is automatically picked-up by the lift conveyor. The bogie moves back into the furnace and the load is quenched in the water bath underneath.

After the quenching process, the basket is lifted back out of the water bath, drips off, and is conveyed to the artificial aging furnace. After artificial aging, the lift conveyor transports the basket to a free parking spot.

The entire heat treatment, including all movements, is fully automated. The PLC controls handle all movement and locking processes. The system automatically detects occupied parking spaces and furnaces and starts the programmed processes according to priority. Charge documentation takes place on an ongoing basis, that is, the loaded basket is documented from its process start in the parking space until removal after the end of the process.

System Design

- Bogie hearth furnace W 2780/60 AS for solution annealing, Tmax 600 °C, volume 2780 liters
- Bogie hearth furnace W 2780/26 AS for artificial aging, Tmax 260 °C, volume 2780 liters
- Water bath with powerful circulation and heating, along with control of the water temperature
- Linear lift conveyor for all movement processes
- PLC controls with Nabertherm Control Center (NCC) for temperature regulation, control of all movements, and parallel batch documentation
- 5 parking spots with automatic occupancy detection, loading with forklift
- Safety fence around the entire system



Heat Treatment Systems for Steel and NE-Metals



Bogie hearth furnace W 7440/26 AS for solution annealing and water bath WB 24000/S for quenching



2 x S 3570/65 AS for solution annealing

Manual Heat Treatment System with Two Air-Circulating Pit Furnaces S 3570/65 AS for Solution Annealing, Water Bath, Bogie Hearth Furnace W 7440/26 AS for Artificial Aging

This tempering system was built for the tempering of aluminum parts for automotive industry. The movement processes are performed manually using the customer's crane. These solution annealing furnaces are designed as pit furnaces, while the artificial aging furnace is a bogie hearth furnace.

Solution annealing of the components takes place in two pit furnaces with 3570 liter furnace chambers. After the solution annealing process is concluded, the lid of the furnace is opened pneumatically, the basket is removed using the crane, and it is placed into the water bath. For better quench results, the water bath is equipped with a powerful circulation pump.

After quenching, the operator uses the crane to move the load onto the bogie of furnace W 7440/26 AS for artificial aging. The bogie hearth furnace is equipped with a chain-driven bogie which is moved out of the furnace electrically. The furnace is dimensioned to accept the loads from both solution annealing furnaces.

The furnace has PLC controls for temperature measurement and charge documentation. Every load can be assigned a name or a charge number, which is then stored along with the date.

System Design

- 2 pit furnaces S 3570/65 AS for solution annealing of one basket each, Tmax 650 °C, volume 3570 liters
- Bogie hearth furnace W 7440/26 AS for artificial aging of two baskets, Tmax 260 °C, volume 7440 liters
- Water bath with powerful circulation and heating, along with control of the water temperature
- PLC controls with Nabertherm Control Center (NCC) for charge documentation



Water bath with powerful circulation pump



Annealing system with top-hat furnace H 4263/12S and water bath

Manual Heat Treatment System for Steel with Top-Hat Furnace H 4263/12S and Water Bath

This tempering system is available for the tempering of 8 meter steel profiles with a quenching time of 30 seconds. The furnace is a top-hat furnace which is loaded with a crane. After heat treatment, the operator positions the crane with attached C-hook in front of the furnace. The furnace is electrohydraulically opened by the operator at 1150 °C and the bogie is moved out of the furnace.

The charge holder on the bogie and the C-hook are designed in such a way that the charge is positioned into the C-hook directly when the bogie drives out. The crane only needs to lift it up. The operator then moves the material over the water bath and lowers it for quenching. After the quenching process, the basket is lifted back out of the water bath, drips dry, and is manually placed onto a free parking spot with the crane.

The system has PLC controls for temperature measurement and charge documentation. Every load can be assigned a name or a charge number, which is then stored along with the date.

System Design

- Top-hat furnace H 4263/12S, Tmax 1200 °C, volume 4260 liters, electrohydraulic hood drive, chain drive for bogie
- Water bath with powerful circulation
- PLC controls with Nabertherm Control Center (NCC) for temperature regulation and charge documentation
- Safety fence around the entire system



Moving furnace table and material under the C hook of the crane



Quenching of steel bars in water

Dewaxing Furnaces

Electrically Heated (N../WAX) or Directly Gas-Fired (NB../WAX)



N 150/WAX



N 660/WAX



Grid bottom

N 100/WAX - N 2200/WAX with Electrical Heating

These furnaces are especially suitable for dewaxing and subsequent burning of the ceramic mold. The electrically heated models are used for dewaxing below the flashpoint of the wax. The furnaces have a heated outlet in the floor of the furnace chamber which funnels down to the middle. The outlet is made of stainless steel. Stainless-steel grids are used for flat charging which can be taken out for cleaning. To prevent the molten wax from catching fire, there is a leak-tight, stainless-steel catch basin in a pull-out drawer in which the wax is collected. After completing the dewaxing process, the furnace heats to a higher temperature to burn the form.

Standard equipment N../WAX, electrically heated

- Chamber furnace with wide-opening swinging door
- Tmax 850 °C
- Four side heating with freely radiating heating elements on ceramic carrier tubes
- Heated drainage in floor, controlled by a separate controller up to a maximum of 200 °C, to reliably prevent freezing of the draining wax - Release of furnace heating only possible after drain temperature is reached, to prevent clogging
- Stainless steel floor pan with grid bottom for level loading
- Rugged self-supporting, vaulted arch construction
- Exhaust gas vent in furnace ceiling for connection with ductwork (starting with N 440 manual exhaust flap)
- Air inlet openings for reliable air exchange
- Dual shell furnace housing for low exterior temperatures
- Removable base included in delivery (fixed base for models N 440 and larger)
- Second over-temperature limit controller with manual reset for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the furnace and load



Drain pan in floor



Gas-fired NB 660/WAX

NB 660/WAX - NB 1000/WAX with Directly Gas-Fired

These furnaces can be operated above the flash point of wax without further safety equipment. They are used if large amounts of wax have to be molten or the wax flash point is unknown. The molten wax drains off in a stainless steel container through an outlet in the furnace bottom. Additionally, a part of the wax is already vaporized inside the furnace.

Standard equipment NB../WAX, directly gas-fired

- Features like N../WAX, except:
- Furnace volumes 660 liters and 1000 liters
- Directly gas-fired using burners with fully automatic temperature regulation
- Gas fittings with safety system
- Automatic ignition with monitor
- Gas types: city gas, natural gas, or propane gas
- Special positioning of the gas burner for optimum temperature uniformity
- Exhaust hood with exit connection 150 mm

Additional equipment for N and NB

- Catalytic or thermal afterburning systems, see page 55



Drawer for collection of liquid wax

Model	Tmax °C	Inner dimensions in mm			Volume in l	Outer dimensions in mm			Max. drain- off volume in l	Con- nected load kW	Electrical connection	Weight in kg
		w	d	h		W	D	H				
NB 660/WAX	850	550	700	780	300	860	1340	1750	20	36.0	-	430
NB 1000/WAX	850	600	1100	1000	650	1000	1820	1820	25	105.0	3-phase	850
N 100/WAX	850	400	530	460	100	660	1045	1430	5	7.5	3-phase	340
N 150/WAX	850	450	530	590	150	710	1045	1560	8	9.5	3-phase	360
N 200/WAX	850	500	530	720	200	760	1045	1690	10	11.5	3-phase	440
N 300/WAX	850	550	700	780	300	810	1215	1750	15	15.5	3-phase	480
N 440/WAX	850	600	750	1000	450	1010	1440	1815	17	20.5	3-phase	885
N 660/WAX	850	700	850	1100	650	1120	1540	1925	20	26.5	3-phase	1000
N 1000/WAX	850	800	1000	1250	1000	1290	1730	1830	25	40.5	3-phase	1870
N 1500/WAX	850	900	1200	1400	1500	1390	1930	1990	35	57.5	3-phase	2570
N 2200/WAX	850	1000	1400	1600	2200	1490	2130	2190	50	75.5	3-phase	3170



Gas burner for NB 660/WAX model.

Bogie Hearth Furnaces Electrically Heated



W 8250/S in customized dimensions



W 2200/S with exchangeable table system

W 1000/G - W 10000

For annealing and hardening of larger parts, for example heavy cast parts or tool steel dies to temperatures between 800 °C and 1200 °C, we recommend our bogie hearth furnaces with radiation heating. The bogie can be loaded outside the furnace. When the design includes an electro-hydraulic lift door and a motorized bogie, the furnace can be opened while hot and the load can be removed for cooling or quenching. When several bogies are used together with a second door or bogie-transfer system, one bogie can be loaded outside the furnace while the other bogie is in the furnace. This shortens process times and the residual energy of the furnace can be used when the new charge is heated.

- Tmax 900 °C or 1280 °C
- Dual shell housing with rear ventilation, provides low shell temperatures
- Swing door hinged on the right side
- Heating from five sides (four sides and bogie) provides for a optimum temperature uniformity
- Bogie heating receives power via blade contacts when driven in
- Heating elements mounted on support tubes provide for free radiation and long service life



W 6430/S1

- Bottom heating protected by SiC tiles on the bogie providing level stacking surface
- Multi-layer insulation consisting of lightweight refractory bricks backed by microporous silica insulation
- Self-supporting and long-life ceiling construction with bricks laid in arched construction
- Bgies with flanged wheels running on rails for easy and precise movement of heavy loads
- Adjustable air inlet damper
- Manual vapor vent on the furnace roof
- Over-temperature limit controller with manual reset for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the furnace and load

Additional equipment

- Customized dimensions
- Fiber insulation for short heating time requirements
- Electric chain-driven bogie in combination with rail operation for smooth movement of heavy loads
- Bogie running on steel wheels with gear rack drive, no rails in front of the furnace necessary
- Different possibilities for an extension to a bogie hearth furnace system:
 - Additional bogies
 - Bogie transfer system with parking rails to exchange bogies running on rails or to connect multiples furnaces
 - Motor-driven bogies and cross-traversal system
 - Fully automatic control of the bogie exchange
- Electro-hydraulic lift door
- Motor-driven exhaust air flap, switchable via the program
- Controlled cooling system with frequency-controlled cooling fan and motorized exhaust air flap
- Multi-zone control adapted to the particular furnace provides model for optimal the temperature uniformity
- Commissioning of the furnace with test firing and temperature uniformity measurement (also with load) for the purpose of process optimization
- Process documentation and control with Controltherm MV software package for Nabertherm Control Center (NCC) for monitoring, documentation and control, see page 62 ff.



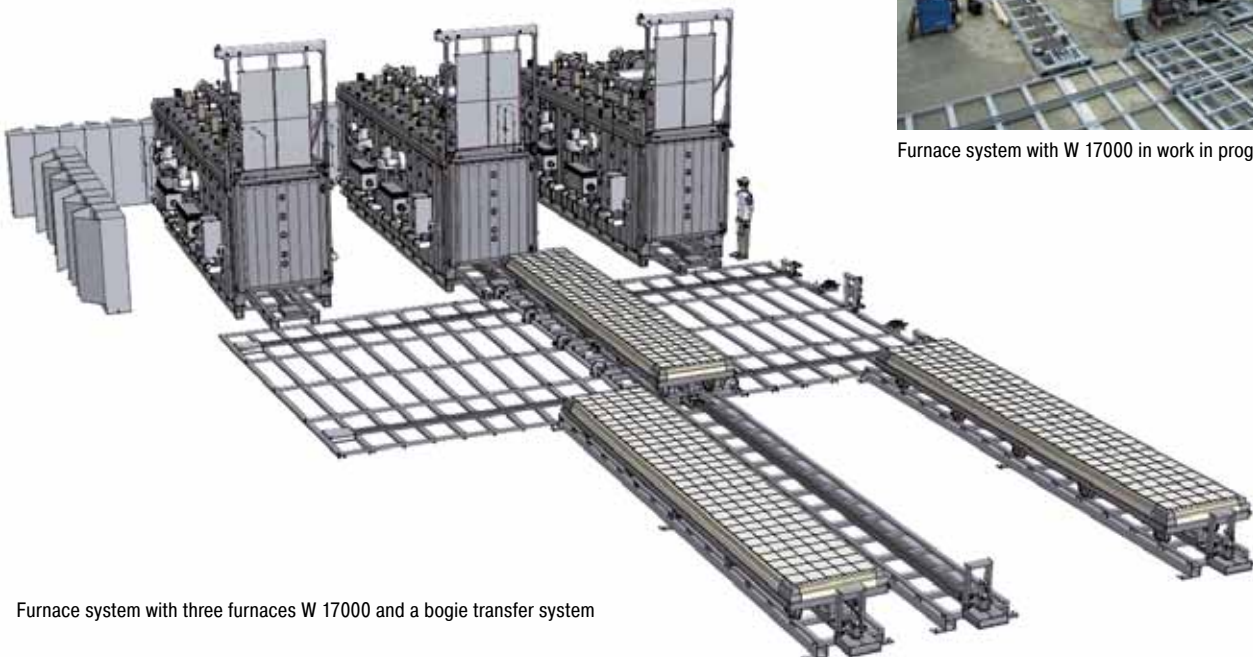
Bogie running on steel wheels with gear rack drive, no rails necessary



Bogie hearth furnace with gas supply system

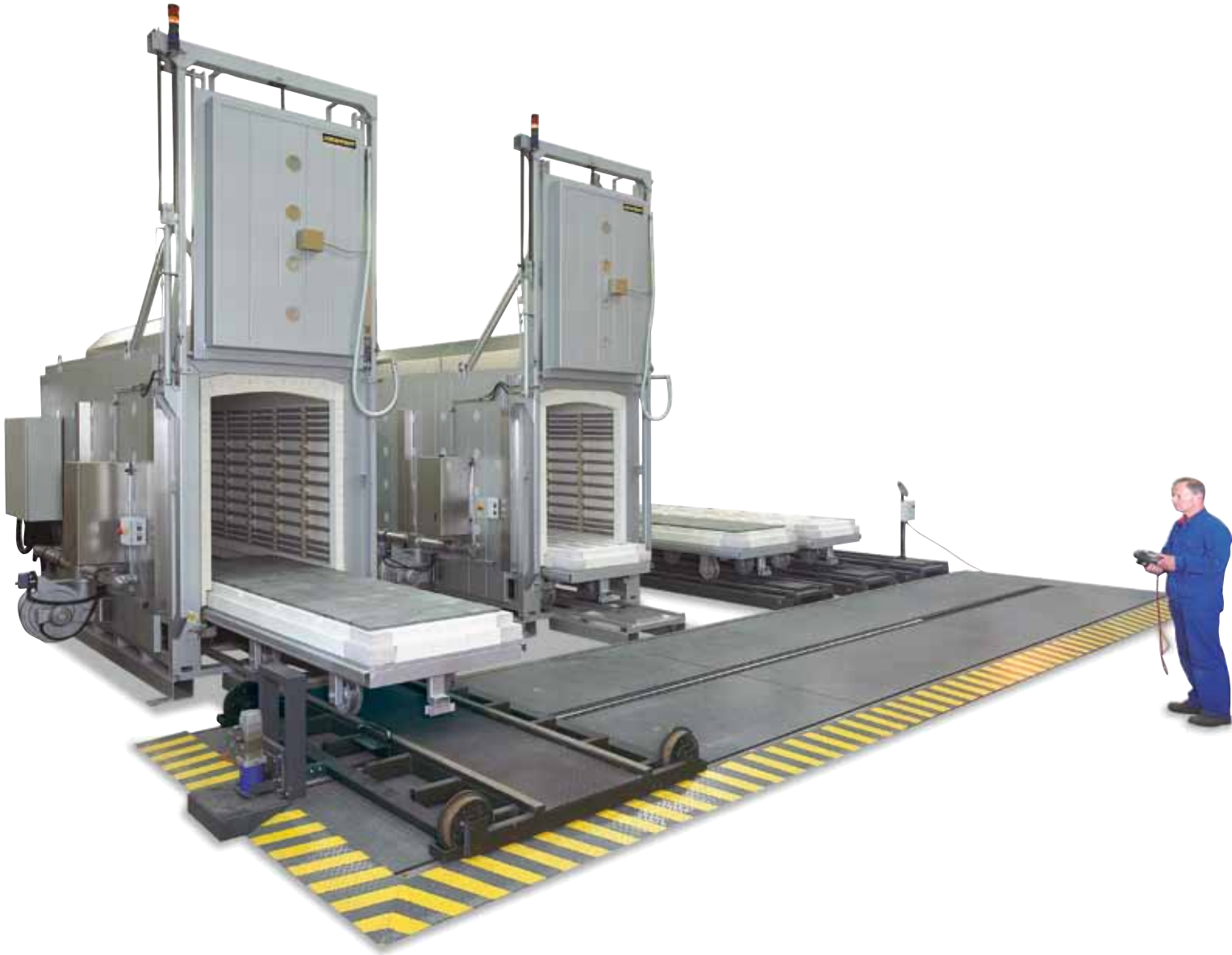


Furnace system with W 17000 in work in progress



Furnace system with three furnaces W 17000 and a bogie transfer system

Bogie Hearth Furnaces Electrically Heated



Combi furnace system consisting of two furnaces W 5000/H and two additional bogies incl. bogie transfer system and incl. necessary park rails



Bogie hearth furnace W 6340S in customized dimensions

Model	Tmax °C	Inner dimensions in mm			Volume in l	Outer dimensions in mm			Connected load kW	Electrical connection	Weight in kg
		w	d	h		W	D	H			
W 1000/G	900	800	1600	800	1000	1400	2350	1880	40	3-phase	3000
W 1500/G	900	900	1900	900	1500	1500	2650	2010	57	3-phase	3500
W 2200/G	900	1000	2200	1000	2200	1600	2950	2120	75	3-phase	4000
W 3300/G	900	1000	2800	1200	3300	1600	3550	2320	110	3-phase	5300
W 5000/G	900	1000	3600	1400	5000	1600	4350	2520	140	3-phase	7500
W 7500/G	900	1000	5400	1400	7500	1600	6150	2520	185	3-phase	9100
W 10000/G	900	1000	7100	1400	10000	1600	7850	2520	275	3-phase	11000
W 1000	1280	800	1600	800	1000	1470	2400	1820	57	3-phase	3000
W 1500	1280	900	1900	900	1500	1570	2700	2010	75	3-phase	3500
W 2200	1280	1000	2200	1000	2200	1670	3000	2120	110	3-phase	4500
W 3300	1280	1000	2800	1200	3300	1670	3600	2320	140	3-phase	5300
W 5000	1280	1000	3600	1400	5000	1670	4400	2520	185	3-phase	7300
W 7500	1280	1000	5400	1400	7500	1670	6200	2520	235	3-phase	10300
W 10000	1280	1000	7100	1400	10000	1670	7900	2520	300	3-phase	12500

Bogie Hearth Furnaces Gas-Fired



Bogie hearth furnace WB 14880S

Gas-fired bogie hearth furnaces distinguish by their unique efficiency. The use of high-speed burners allows for short heating times. The burners are arranged according to the furnace geometry providing for a optimum temperature uniformity. Depending on the furnace dimensions, the burners can alternatively be equipped with recuperator technology to save energy. The high-quality, long-life fiber insulation with storage capacity provides for short heating and cooling times.

- Tmax 1300 °C
- Powerful, sturdy high-speed burner with pulse control and special flame control in the furnace chamber provide for optimum temperature uniformity
- Operation with city gas, natural gas or liquified gas
- Fully automatic PLC control of the temperature as well as monitoring of the burner function
- Reduction-resistant fiber insulation with low heat storage provides for short heating and cooling times
- Dual shell housing provides for low outside temperatures
- Exhaust hood with fittings for further discharge of the exhaust gases
- Over-temperature limit controller with manual reset for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the furnace and load

Additional equipment

- Customized furnace dimensions
- Automatic lambda control to set the furnace atmosphere
- Exhaust air and exhaust gas piping
- Recuperator burners utilizing part of the waste heat in the exhaust tract to preheat the combustion air and considerably contribute to energy saving
- Thermal or catalytic exhaust cleaning systems
- Process documentation and control with Controltherm MV software package for Nabertherm Control Center (NCC) for monitoring, documentation and control, see page 62
- Other additional equipment for bogie hearth furnaces, see pages 51 ff.



Piping at a bogie hearth furnace



Furnace chamber with eight high-speed burners

Chamber Furnaces Gas-Fired



NB 660



Chamber furnace with gas supply system

NB 300 - NB 600

NB 4330/S

Certain heat treatment processes require a gas-fired chamber furnace. Short heating times due to the high power are a convincing argument. The chamber furnaces with powerful atmospheric gas burners cover a wide variety of these processes. In the basic version the burners are manually ignited once at the start of the process. The automatic control system then takes over control of the temperature curve. At program end, the burners are automatically switched off. Depending on the process, the furnaces can be equipped with automatically controlled fan burners and safety technology for debinding. Depending on the model, these furnaces can be upgraded with fully automatic fan burners and additional accessories.

- Tmax 1300 °C
- Powerful, atmospheric burners for operation with liquified gas or natural gas
- Special positioning of the gas burners with flame guide top-down provides for optimum temperature uniformity
- Fully automatic temperature control
- Gas fittings with flame control and safety valve in accordance with DVGW (German Technical and Scientific Association for Gas and Water)
- Multi-layer, reduction-proof insulation with light-weight refractory bricks and special back-up insulation result in low gas consumption
- Self-supporting and rugged ceiling, bricks laid in arched construction or as fiber insulation
- Dual shell housing, side panels made of stainless steel (NB 300), for low outside temperatures
- Solid, dual shell door
- Exhaust hood with 150 mm (NB 300) and 200 mm (NB 440, NB 600) diameter connection
- Over-temperature limit controller with manual reset for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the furnace and load

Additional equipment

- Customized furnace dimensions
- Fan burner with fully automatic control
- Exhaust air and exhaust gas piping
- Thermal or catalytic exhaust cleaning systems
- Recuperator technology for heat recovery, see page 43
- Process documentation and control with Controltherm MV software package for Nabertherm Control Center (NCC) for monitoring, documentation and control, see page 62 ff.



NB 2880/S

Catalytic and Thermal Afterburning Systems



Combi chamber furnace system with catalytic afterburning for debinding and sintering

Catalytic and Thermal Afterburning Systems (KNV and TNV)

For exhaust gas cleaning, in particular in debinding, Nabertherm offers exhaust gas cleaning systems tailored to the process. The afterburning system is permanently connected to the exhaust gas fitting of the furnace and accordingly integral part of the control system and the safety matrix of the furnace. For existing furnaces, independent exhaust gas cleaning systems are also available that can be separately controlled and operated.

Catalytic exhaust cleaning is especially recommended due to energetic reasons when only pure hydrocarbon compounds must be cleaned during the debinding process in air. Thermal afterburning systems are used if large volumes of exhaust gas from the debinding process in air must be cleaned and/or if there is a risk that the exhaust gases might damage the catalyst. Thermal afterburning is also used for debinding applications under protective gas or under hydrogen.

Catalytic afterburning systems (KNV)

- Perfectly suited for debinding processes in air with only organic exhaust gases
- Catalytic conversion of the unburned hydrocarbons to their nontoxic, natural components
- Integrated in a compact stainless steel housing
- Electric heating provides for preheating of the exhaust gas to the optimal reaction temperature for catalytic treatment
- Cleaning in different layers of catalytic honeycombs within the system
- Thermocouples for measuring the temperatures of raw gas, reaction honeycombs and discharge
- Over-temperature limit controller with adjustable cutout temperature protects the catalyst
- Tight connection between the exhaust gas outlet of the debinding furnace and the exhaust gas fan with corresponding integration into the overall system with respect to control and safety technology
- Catalyst dimensioned in relation to the exhaust gas flow
- Measuring port for clean gas measurements (FID), see additional equipment

Thermal afterburning systems (TNV)

- Optimally suited for debinding processes in air with large exhaust gas flow, erratic large exhaust gas volumes, large volume flow or for debinding processes under protective gases, hydrogen or in vacuum
- Burn-off at temperatures up to 850 °C provides for thermal decomposition of the exhaust gases
- Heating with compact gas burner with automatic firing device
- Thermocouples in the combustion chamber and in the raw gas inlet
- Over-temperature limit controller for protecting the thermal afterburning
- Design depending on the exhaust gas flow
- Measuring port for clean gas measurements (FID), see additional equipment

Additional equipment for catalytic afterburners and thermal afterburners

- Design for retrospective integration in existing furnace systems, including system-independent control of the thermal afterburner heating or catalytic afterburner heating
- Compliance with national exhaust gas regulations
- Emission measurements (FID) for compliance with exhaust gas regulations



Exhaust torch for laboratory furnaces



Chamber furnace N 150/14 with catalytic afterburning system



High-temperature furnace HT 166/17 LTS with thermal afterburning system

Rotary Hearth Furnaces up to 1300 °C with and without Air Circulation Electrically Heated or Gas-Fired



Rotary hearth furnace DH 3020/1480/450/11, movable on rails, for preheating of molds for two forges



Gear rim drive under the furnace



Rotary table with base plates made of highly heat-resistant steel to protect the insulation



Exhaust hood above charging opening

The compact furnaces of the DH product line are optimally suited for continuous processes on a small floor space. They are designed for preheating processes such as the preheating of molds in foundries. Charging and discharging can, be done at one position – either by a person or fully automatic. The hearth rotates in pre-set segments individually reconciled with the workpart geometry. The rotational speed and rotational intervals can be defined by the control system or by manual switching.

The rotary hearth furnaces are specifically designed for the required throughput and charge dimensions. They are heated electrically or alternatively gas-fired by means of powerful gas burners. Subject to the temperature range these furnaces are equipped with or without air circulation.

- Tmax 1100 °C, 1200 °C or 1300 °C without air circulation
- Tmax 260 °C, 600 °C or 850 °C with air circulation
- Wire heating elements in the furnaces ceiling for furnaces up to 1200 °C
- SiC heating rods in the furnace ceiling for furnaces up to 1300 °C
- Gas heating as an alternative to electrical heating
- Models for 650 °C and 850 °C with powerful air circulation for better heat transfer onto the charge and to optimize the temperature uniformity
- Very compact design compared with continuous furnaces
- Designed for continuous operation at one working temperature
- Table diameter up to 3000 mm
- Hearth movement in defined segments
- Low-vibration movement of the rotary hearth
- Parallel swivel door
- Automatic drive or rotational motion initiated by foot switch
- Furnace floor can be lowered using a forklift truck for maintenance purposes



Rotary hearth furnace DH 1200/-/300/11

Additional equipment

- Customized dimensions
- Exhaust hood above the door opening for discharge of the warm exhaust air when door is open
- Pneumatic drive of the parallel swivel door
- Charging aids for ease of loading and unloading
- Multi-zone control for adjustable thermal profile during the cycle
- Protective gas connections
- Process control and documentation with Controltherm MV software package, see page 62 ff.



Pre-heating of steel rings for forging

Model	Tmax °C	Inner dimensions in mm			Volume in l	Outer dimensions in mm			Connected load kW	Electrical connection	Weight in kg
		Ø Outer	Ø Inner	h		W	D	H			
DH 1200/-/300/11	1100	1200	0	300	340	2200	2200	2500	54.0	3-phase	1000
DH 1500/800/250/11	1100	1500	800	250	630	2400	2300	2450	21.0	3-phase	1500
DH 3020/1480/450/11	1100	3022	1480	450	2500	4000	4000	2500	98.0	3-phase	3500



Furnace floor can be lowered for maintenance purposes

Continuous Furnaces Electrically Heated or Gas-Fired



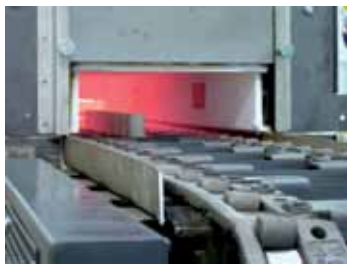
Continuous furnace D 650/S with chain conveyor for 950 °C



Service flap door at furnace side

Continuous furnaces are a good choice for processes with fixed cycle times such as drying or preheating, curing or degassing of plastic parts. The standard models are available for temperatures between 100 °C and 1000 °C. The furnace design is subject to the required throughput, the process requirements for the heat treatment and the required cycle time. The conveyor technology (e.g. belt, rollers) is tailored to the required operational temperature and the charge geometry to be handled. The conveyor speed and the number of control zones also depend on process requirements.

- Temperatures between 100 °C and 1000 °C
- Conveyor speed infinitely variable
- Customized conveyor belt width



Discharge of D 650/S

Additional equipment

- Charge and discharge section tailored to process requirements
- Heating-up and cooling section with defined gradients to follow specific temperature profiles
- Exhaust gas treatment facilities
- Different conveyor specifications corresponding to the parts to be conveyed
- Roller conveyors
- Charging aids for loading and unloading
- Different heating concepts depending on process requirements, e.g. radiation heating, air circulation, infrared or gas-fired
- Retorts for operation under protective gas



Continuous belt furnace for heat treatment of rivets



Continuous roller furnace N 650/45 AS for heat treatment of heavy workparts

AMS 2750 D, NADCAP, CQI-9

Standards such as the AMS 2750 D (Aerospace Material Specifications) are applicable for the industrial processing of high-quality materials. They define industry-specific requirements for heat treatment. Today, the AMS 2750 D and derivative standards such as AMS 2770 for the heat treatment of aluminum are the guidelines for the aerospace industry. After the introduction of the CQI-9, the automotive industry has also committed to submit heat treatment processes to stricter rules. These standards describe in detail the requirements applicable to thermal processing plants.

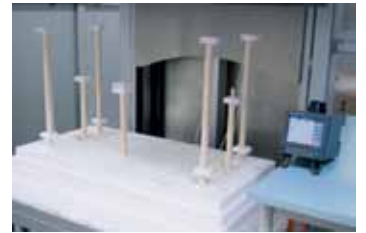
- Temperature uniformity in the charge space (TUS)
- Instrumentation (definition of measurement and control systems)
- Calibration of the measurement system (IT) from the controller via the measurement line to the thermocouple.
- Inspections of system accuracy (SAT)
- Documentation of the inspection cycles

Norm compliance is necessary to ensure that the required quality standard of the manufactured components can also be reproduced in series. For this reason, extensive and repeated inspections as well as controls of the instrumentation, including the relevant documentation, are required.

Furnace Class and Instrumentation Requirements of the AMS 2750 D

Depending on the quality requirements of heat treatment job the customer specifies instrumentation type and the temperature uniformity class. The instrumentation type describes the necessary combination of the applied control, recording media as well as thermocouples. The temperature uniformity of the furnace and the class of the selected instrumentation are defined based on the required furnace class. The higher the requirements are set for the furnace class the more precise the instrumentation must be.

Instrumentation	Type					Furnace class	Temperature uniformity	
	A	B	C	D	E		°C	°F
Each control zone has a thermocouple connected to the controller	x	x	x	x	x	1	± 3	± 5
Recording of the temperature measured by the control thermocouple	x	x	x	x		2	± 6	± 10
Sensors for recording the coldest and hottest spots	x		x			3	± 8	± 15
Each control zone has a charge thermocouple with recording system	x	x				4	± 10	± 20
Each control zone has an over-temperature protection unit	x	x	x	x		5	± 14	± 25
						6	± 24	± 50



Measurement set-up in a high-temperature furnace



Measurement set-up in an annealing furnace

Regular Inspections

The furnace or the heat treatment system must be designed so that the requirements of the AMS 2750 D can be met and be reproduced. The standard also requires the inspection intervals for the instrumentation (SAT = System Accuracy Test) and the temperature uniformity of the furnace (TUS = Temperature Uniformity Survey). The SAT/TUS tests must be performed by the customer with measuring devices and sensors which operate independently of the furnace instrumentation.

Nabertherm Services

The suitable furnace model for the corresponding heat treatment can be designed based on the process, the charge, the required furnace class and the type of instrumentation. Depending on the required specs, alternative solutions can be offered.

- Furnace designs, which meet standards, following customer specifications regarding furnace class and instrumentation, incl. gauge connections for repeated customer inspections at regular intervals. No consideration of requirements with respect to documentation
- Data recording devices (e.g., temperature recorder) for TUS and/or SAT measurements, see page 60
- Data recording, visualization, time management via the Nabertherm Control Center (NCC), based on Siemens WinCC software, see page 60
- Commissioning at site, incl. the first TUS and SAT inspection
- Connection of existing furnace systems to meet norm requirements
- Documentation of the complete process chain in line with the corresponding norm

Nabertherm Thermal Survey Report

Survey report number: 001

Customer Address:

Nabertherm Identifier or Tag: 000011
Nabertherm Manufacturer: Nabertherm GmbH
Model No.: NAB 1403
Serial No.: 200811
Class Type: 20

Customer Test Procedure: AMS 2750D

Survey Date/Time start: 28. Jul 2008 @ 14:38:35
Survey Date/Time end: 29. Jul 2008 @ 1:18:55
Gate Source: Nabertherm-Nabertherm 10 Class 2
N 200 Working

Next Survey Due: After installation

Survey Engineer: Human Steinhilber

User:

Survey Result:

Remarks:

Surveying Station and Coordinates: Nabertherm
Customer Name and Address: Nabertherm
Date: 28. Jul 2008

AMS 2750 D, NADCAP, CQI-9



Implementation of AMS 2750 D

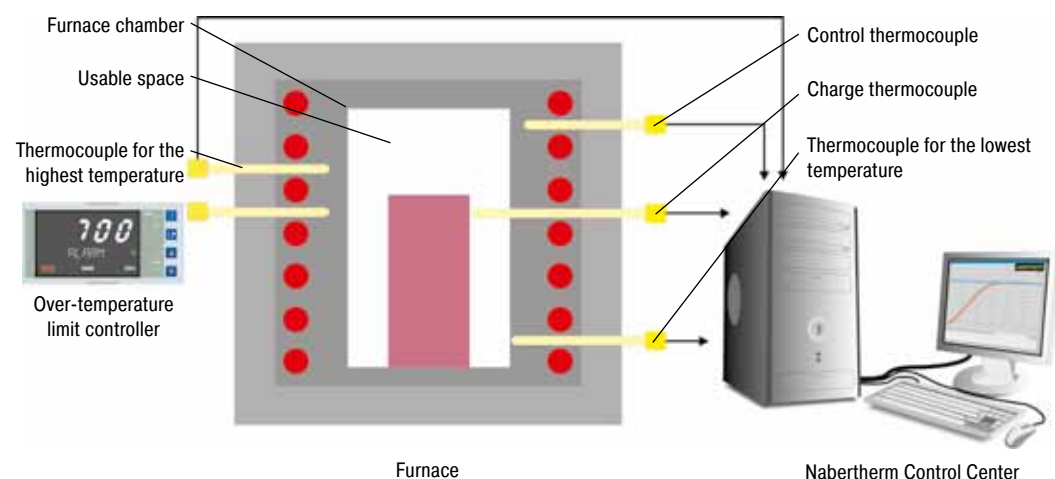
Basically, two different systems are available for control and documentation, a proven Nabertherm system solution or instrumentation using Eurotherm controllers/temperature recorders. The Nabertherm AMS package is a convenient solution that includes the Nabertherm Control Center for control, visualization, and documentation of the processes and test requirements based on PLC control.

Instrumentation with Nabertherm Control Center (NCC) for Control, Visualization, and Documentation based on a Siemens PLC Controls

The attractive feature of the instrumentation with Nabertherm Control Center in combination with PLC controls of the furnace is the convenient data input and visualization. The software programming is structured in a way that both the user and the auditor can navigate it without difficulty.

In daily use, the following product characteristics stand out:

- Very easy to navigate and straight-forward presentation of all the data in plain text on the PC
- Automatic saving of the charge documentation at the end of the program
- Administration of the calibration cycles in the NCC
- Results of the measurement distance calibration are entered in the NCC
- Schedule management of the required testing cycles including a reminder function. The testing cycles for TUS (Temperature Uniformity Survey) and SAT (System Accuracy Test) are entered in days and monitored by the system and the operator or tester is informed in time about up-coming tests. The values of the tests are entered directly into NCC and saved as PDF files on the PC. There are no additional tasks involved in documenting the tests.
- Option of transferring the measurement data to a customer's server



Example of a design with Type A Nabertherm Control Center



The Nabertherm Control Center can be extended to enable a complete documentation of the heat treatment process apart from just the furnace data. For example, when heat-treating aluminum, in addition to the furnace, the temperatures in the quenching basin or a separate cooling medium can also be documented.

Instrumentation for TUS Measurements as a Separate Model

The TUS standard requires that the temperature uniformity of the furnace be tested with a TUS measurement at regular intervals. This measurement must be performed by an independent measurement system and not by the instrumentation used for process control. The testing intervals are filed in the NCC in days. The system reminds in time that a test must be performed.

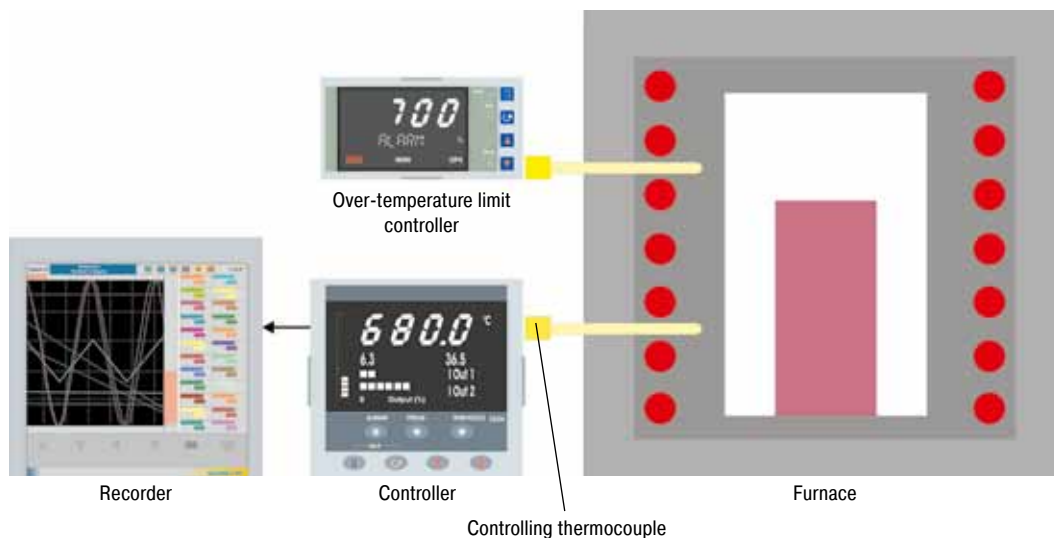
This test can be performed either using an independent temperature recorder (see page 62) with the customer's calibrated testing thermocouples or using the Nabertherm TUS module that is connected to the Nabertherm Control Center as a separate module.

The TUS module has its own PLC which converts the measurement results of the testing thermocouples. The evaluation, including an easy-to-navigate and simply log function, is then performed via the furnace's Nabertherm Control Center.



TUS module with ports for 16 thermocouples and PROFIBUS connection to the Nabertherm Control Center

Alternative Instrumentation with Temperature Controllers and Recorders from Eurotherm



Example of a design containing Type D Eurotherm instrumentation

As an alternative to instrumentation with the Nabertherm Control Center (NCC) and PLC controls, instrumentation with controllers and temperature recorders is also available. The temperature recorder has a log function that must be configured manually. The data can be saved to a USB stick and be evaluated, formatted, and printed on a separate PC. Besides the temperature recorder, which is integrated into the standard instrumentation, a separate recorder for the TUS measurements is needed (see also page 62).



N 12012/26 HAS1 according to AMS 2750 D

Professional Control and Documentation Alternatives



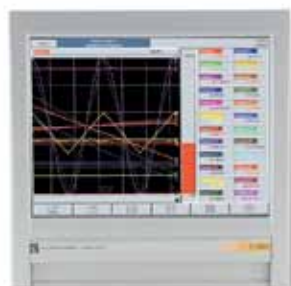
PC for HiProSystems control in a separate cabinet



H 1700 with colored, tabular depiction of the data



H 3700 with colored graphic presentation of data



Temperature recorder

HiProSystems Control and Documentation

This professional control system for single and multi-zone furnaces is based on Siemens hardware and can be adapted and upgraded extensively. HiProSystems control is used 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 required. 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 (Ethernet TCP/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.

For Control, Visualisation and Documentation

Nabertherm Control Center NCC

Upgrading the HiProSystems-Control individually 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.):

- Recommended for heat treatment processes with extensive requirements in respect to documentation e.g. for metals, technical ceramics or in the medicine field
- Software can be used also in accordance with the AMS 2750 D (NADCAP)
- Documentation according to the requirements of Food and Drug Administration (FDA), Part 11, EGV 1642/03 possible
- Charge data can be read in via barcodes
- Interface for connection to existing Enterprise Database systems (e.g. SAP, Oracle)
- Connection to mobile phone network for alarm message transmission via SMS
- Control from various locations over the network
- Calibration of each measuring point for a specific temperature possible
- Extendable for calibration of a polygonal line with up to 18 temperatures per measuring point for use at different temperatures e.g. for AMS 2750 D applications

For Documentation

Nabertherm Documentation Center NDC

If the process data of the HiProSystems control unit only need to be recorded, this can be done using a personal computer (PC) with the high-performance NDC software. The data are documented, forgery-proof, and can be evaluated both in the form of a table or a chart. Individual charge data can be entered by the customer and are archived together with the process data.

Temperature Recorder

Besides the documentation via the software which is connected to the controls, Nabertherm offers different temperature recorders which can be used with respect to the application.

	Model 6100e	Model 6100a	Model 6180a
Data input using touch panel	x	x	x
Size of colour display in inch	5,5	5,5	12,1
Number of thermocouple inputs	3	18	48
Data read-out via USB-stick	x	x	x
Input of charge data		x	x
Evaluation software included	x	x	x
Applicable for TUS-measurements acc. to AMS 2750 D			x

Controltherm MV Software for Control, Visualisation and Documentation

Documentation and reproducibility gain increased attention with steadily rising quality standards. The powerful Nabertherm software Controltherm MV provides for an optimum solution for the control and documentation of one or more furnaces as well as charge data. This software is also perfectly suitable for retrofitting in order to comply with new norms and directives. Generally, all Nabertherm controllers with integrated interface can be connected to the MV-software.

In the basic version one furnace can be connected to the MV-software. The system can be extended to four, eight or even 16 multi-zone controlled furnaces. Up to 400 different heat treatment programs can be stored. The process will be documented and filed. Process data can be read-out graphically or in table format. A data transfer to MS-Excel is also possible.

Furnaces which are not controlled via a Nabertherm controller can be also documented with the MV-software. We deliver an extension package as optional equipment. With respect to the individual version, three, six or even nine independent thermocouples can be connected. Independent of the control system, the values of each thermocouple will be read-out and evaluated by the MV-software.

Features

- Simple installation without specific knowledge
- All Nabertherm controllers with interface connectable
- Manipulation protected storage of temperature curves of up to one, four, eight or 16 furnaces (also multizone-controlled), depending on the version of MV-software
- Redundant storage on a network server possible
- Programming, archiving and printing of programs and graphics
- Free input of descriptive charge data text with comfortable search function
- Data exportable into Excel format for further evaluation
- Start/stop of the controller from the local PC (only with Nabertherm controllers mit interface)
- Selectable languages: German, English, French, Italian or Spanish
- 400 additional programs storable (only with Nabertherm controllers with interface)

Extension Package II for Connection of one Additional Temperature Measuring Point, Independent of the Controller

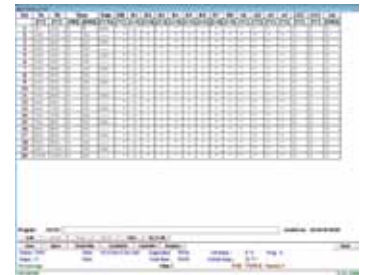
- Connection of an independent thermocouple, type K or S with display of the measured temperature on the included controller C 6 D, e.g. for documentation of charge temperature
- Conversion and transmission of measured data to the MV-software
- For data evaluation, please see MV-software features

Extension Package II for Connection Three, Six or Nine Temperature Measuring Points, Independent of the Controller

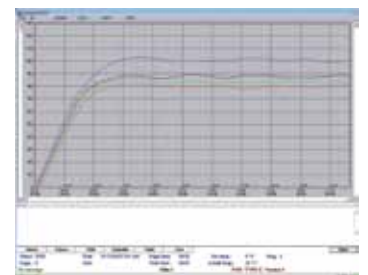
- Connection of three thermocouples, type K, S, N or B to the supplied connection box
- Extendable to two or three connection boxes for up to nine temperature measuring points
- Conversion and transmission of measured data to the MV-software
- For data evaluation, please see MV-software features



Controltherm MV Software for Control, Visualisation and Documentation



Data input in table format if used together with Nabertherm controllers



Graphical display of set and actual temperature curve



Extendable for connection of up to 16 furnaces

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.

Professional Solutions for:

- Arts & Crafts
- Glass
- Advanced Materials
- Laboratory/Dental
- Thermal Process Technology for Metals, Plastics and Surface Finishing
- Foundry



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