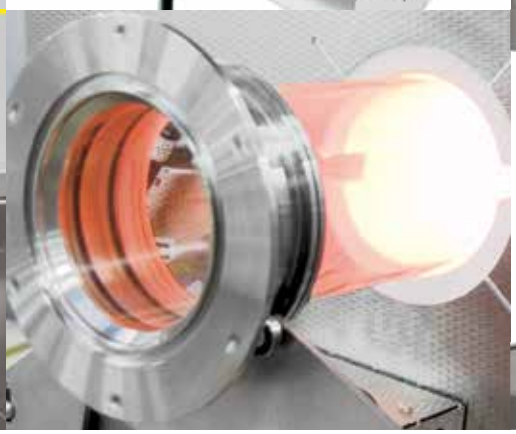
Nabertherm
MORE THAN HEAT 30-3000 °C

Laboratory




Muffle Furnaces
Preheating Furnaces
Ashing Furnaces
Tube Furnaces
Ovens
Air Circulation Furnaces
Chamber Furnaces
Melting Furnaces
High-Temperature Furnaces
Retort Furnaces
Vacuum Furnaces
Brazing Furnaces
Clean Room Furnaces

Made in Germany

www.nabertherm.com

Made in Germany

Nabertherm with 450 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 plants with material handling and charging systems. Complete thermal processes are realized by customized system solutions.

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

Global Sales and Service Network – Close to you

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

Large Customer Test Center

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

Customer Service and Spare Parts

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

Experience in Many Fields of Thermal Processing

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

Weighing Furnace incl. Scale and Software for Determination of Combustion Loss

L 9/11/SW

L 9/11/SW - LT 9/12/SW

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

- Tmax 1100 °C or 1200 °C
- Heating from two sides
- Ceramic heating plates with integral heating element which is safeguarded against fumes and splashing, and easy to replace
- Insulation made of non-classified fiber material
- Housing made of sheets of textured stainless steel
- Optional flap door (L) which can be used as work platform or lift door (LT) with hot surface facing away from the operator
- Adjustable working air inlet in the door
- Exhaust air outlet in rear wall of furnace
- Solid state relays provide for lownoise operation
- Delivery includes base, ceramic plunger with base plate in the furnace lining, precision scale and software package
- 4 scales available for different maximum weights and scaling ranges
- Software for documentation of the temperature curve and combustion loss using a PC
- Defined application within the constraints of the operating instructions
- Controls description see page 60

4 scales available for different maximum weights and scaling areas

Additional equipment

- Chimney, chimney with fan or catalytic converter
- Over-temperature limiter with adjustable cutout temperature for thermal protection class 2 in accordance with EN 60519-2 as temperature limiter to protect the furnace and load
- Please see page 12 for more accessories

Over-temperature limiter

Model flap door	Tmax °C	Inner dimensions in mm w	d	h	Volume in l	Outer dimensions in mm W	D	H	Connected load kW	Electrical connection*	Weight in kg	Minutes to Tmax[2]
L 9/11/SW	1100	230	240	170	9	480	550	800	3.0	1-phase	55	75
L 9/12/SW	1200	230	240	170	9	480	550	800	3.0	1-phase	55	90

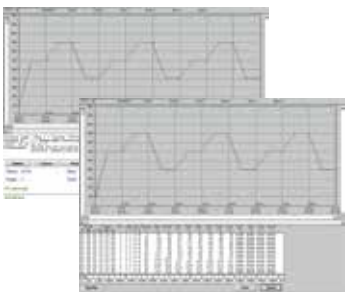
Model Lift door	Tmax °C	Inner dimensions in mm w	d	h	Volume in l	Outer dimensions in mm W	D	H[1]	Connected load kW	Electrical connection*	Weight in kg	Minutes to Tmax[2]
LT 9/11/SW	1100	230	240	170	9	480	550	800+290	3.0	1-phase	55	75
LT 9/12/SW	1200	230	240	170	9	480	550	800+290	3.0	1-phase	55	90

[1]Including opened lift door

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

*Please see page 60 for more information about supply voltage

Scale type	Readability in g	Weight range in g	Weight of plunger in g	Calibration value in g	Minimum load in g
EW-2200	0,01	2200 incl. plunger	850	0,1	0,5
EW-4200	0,01	4200 incl. plunger	850	0,1	0,5
EW-6200	0,01	6200 incl. plunger	850	-	1,0
EW-12000	0,10	12000 incl. plunger	850	1,0	5,0



Software for documentation of the temperature curve and combustion loss using a PC

Exhaust Systems/Accessories

Article No.:
631000140

Chimney for connection to an exhaust pipe.

Article No.:
631000812

Chimney with fan, to remove exhaust gas from the furnace better. The B 400 - P 480 controllers can be used to activate the fan automatically (not for models L(T) 15.., L 1/12, LE 1/11, LE 2/11).*

Article No.:
631000166

Catalytic converter with fan for removal of organic components from the exhaust air. Organic components are catalytically oxidized at about 600 °C, broken into carbon dioxide and water vapour. Irritating odors are thus largely eliminated. The B 400 - P 480 controllers can be used to switch the catalytic converter automatically (not for models L(T) 15.., L 1/12, LE 1/11, LE 2/11).*

* Note: If other controller types are used an adapter cable for connection to mains supply has to be ordered separately. The device will be activated by plugging in the socket.

Exhaust torch to burn exhaust gases which are generated during the process. The torch is gas-fired and will be operated with propane gas. If a catalytic afterburner cannot be used for the process this torch is recommended.

Article No.:
699000279 (saggar)
699000985 (lid)

Square saggar for furnaces HTC and LHT, Tmax 1600 °C
The load is placed in ceramic saggars for optimal utilization of the furnace space. Up to three saggars can be stacked on top of each other in the furnace. Each saggar has cut-outs for better ventilation. The top saggar should be closed with a lid made of ceramics also.

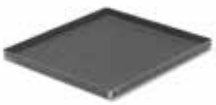
Article No.:
699001054 (sintering dish)
699001055 (spacer ring)

Round saggar (Ø 115 mm) for furnaces LHT/LB, Tmax 1650 °C
These saggars are perfectly suited for furnaces LHT/LB. The load is placed in the saggars. Up to three saggars can be stacked on top of each other in order to use the overall furnace chamber.

Select between different **bottom plates** and **collecting pans** for protection of the furnace and easy loading (for models L, LT, LE, LV and LVT on pages 4 - 11).

Ceramic ribbed plate, Tmax 1200 °C

Ceramic collecting pan, Tmax 1300 °C



Steel collecting pan, Tmax 1100 °C

For models	Ceramic ribbed plate		Ceramic collecting pan		Steel collecting pan (Material 1.4828)	
	Articel No.	Dimensions in mm	Articel No.	Dimensions in mm	Articel No.	Dimensions in mm
L 1, LE 1	691601835	110 x 90 x 12.7	-	-	691404623	85 x 100 x 20
LE 2	691601097	170 x 110 x 12.7	691601099	100 x 160 x 10	691402096	110 x 170 x 20
L 3, LT 3, LV 3, LVT 3	691600507	150 x 140 x 12.7	691600510	150 x 140 x 20	691400145	150 x 140 x 20
LE 6, L 5, LT 5, LV 5, LVT 5	691600508	190 x 170 x 12.7	691600511	190 x 170 x 20	691400146	190 x 170 x 20
L 9, LT 9, LV 9, LVT 9, N 7	691600509	240 x 220 x 12.7	691600512	240 x 220 x 20	691400147	240 x 220 x 20
LE 14	691601098	210 x 290 x 12.7	-	-	691402097	210 x 290 x 20
L 15, LT 15, LV 15, LVT 15, N 11	691600506	340 x 220 x 12.7	-	-	691400149	230 x 330 x 20
L 24, LT 24	691600874	340 x 270 x 12.7	-	-	691400626	270 x 340 x 20
L 40, LT 40	691600875	490 x 310 x 12.7	-	-	691400627	310 x 490 x 20

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

Article No.:
493000004

Gloves, Tmax 650 °C.

Article No.:
491041101

Gloves, Tmax 700 °C.

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

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

Temperature Uniformity and System Accuracy

Holding frame for measurement of temperature uniformity

Temperature uniformity is defined as the maximum temperature deviation in the work space of the furnace. There is a general difference between the furnace chamber and the work space. The furnace chamber is the total volume available in the furnace. The work space is smaller than the furnace chamber and describes the volume which can be used for charging.

Specification of Temperature Uniformity in +/- K in the Standard Furnace

In the standard design the temperature uniformity is specified in +/- K at a defined set-temperature with the work space of the empty furnace during the dwell time. In order to make a temperature uniformity survey the furnace should be calibrated accordingly. As standard our furnaces are not calibrated upon delivery.

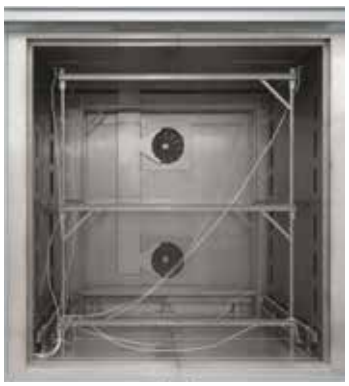
Calibration of the Temperature Uniformity in +/- K

If an absolute temperature uniformity at a reference temperature or at a defined reference temperature range is required, the furnace must be calibrated appropriately. If, for example, a temperature uniformity of +/- 5 K at a set temperature of 750 °C is required, it means that measured temperatures may range from a minimum of 745 °C to a maximum of 755 °C in the work space.

System Accuracy

Tolerances may occur not only in the work space, they also exist with respect to the thermocouple and in the controls. If an absolute temperature uniformity in +/- K at a defined set temperature or within a defined reference working temperature range is required, the following measures have to be taken:

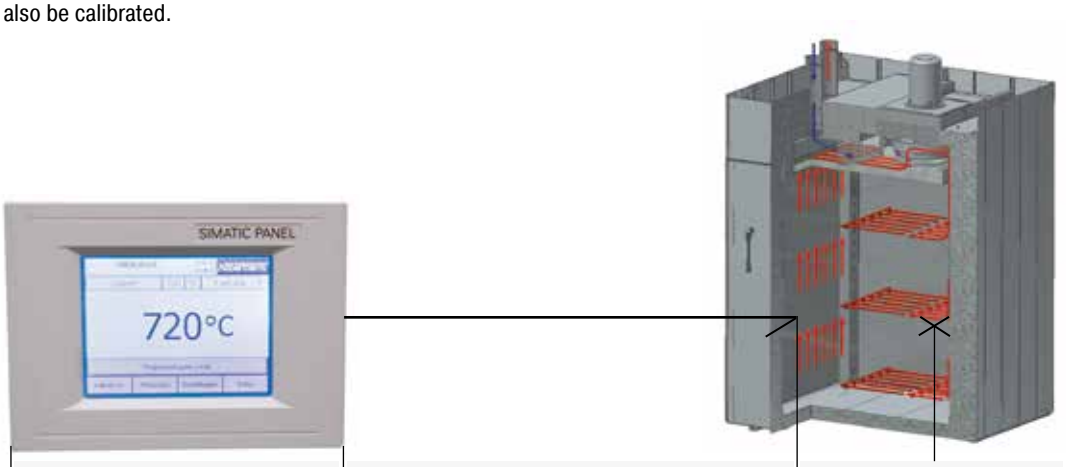
- Measurement of total temperature deviation of the measurement line from the controls to the thermocouple
- Measurement of temperature uniformity within the work space at the reference temperature or within the reference temperature range
- If necessary, an offset is set at the controls to adjust the displayed temperature at the controller to the real temperature in the furnace
- Documentation of the measurement results in a protocol



Pluggable frame for measurement for air circulation chamber furnace N 7920/45 HAS

Temperature Uniformity in the Work Space incl. Protocol

In standard furnaces a temperature uniformity is guaranteed as +/- K without measurement of temperature uniformity. However, as additional feature, a temperature uniformity measurement at a reference temperature in the work space compliant with DIN 17052-1 can be ordered. Depending on the furnace model, a holding frame which is equivalent in size to the work space is inserted into the furnace. This frame holds thermocouples at 11 defined measurement positions. The measurement of the temperature uniformity is performed at a reference temperature specified by the customer at a pre-defined dwell time. If necessary, different reference temperatures or a defined reference working temperature range can also be calibrated.



The system accuracy is defined by adding the tolerances of the controls, the thermocouple and the work space

Precision of the controls, e.g. +/- 1 K

Deviation of thermocouple, e.g. +/- 1.5 °C

Deviation from measuring point to the average temperature in the work space e.g. +/-3 °C

B 400/C 440/ P 470

B 410/C 450/P 480

H 1700 with colored, tabular depiction

H 3700 with colored graphic presentation

Process Control and Documentation

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

Standard Controllers

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

HiProSystems Control and Documentation

This professional process control with PLC controls 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 air flaps, 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 for HiProSystems

Process control H 500/H 700

This basic panel accommodates most basic needs and is very easy to use. Firing cycle data and the extra functions activated are clearly displayed in a table. Messages appear as text. Data can be stored on a USB stick using the „NTLog Comfort“ option (not available for all H 700).

Process control H 1700

Customized versions can be realized in addition to the scope of services of the H 500/H 700

Process control H 3700

Display of functions on a large 12‘‘ display. Display of basic data as online trend or as a graphical system overview. Scope as H 1700

Control, Visualisation and Documentation with Nabertherm Control Center NCC

Upgrading the HiProSystems-Control individually into a PC-based 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 extension can be used also in accordance with the AMS 2750 E (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 overriding systems
- Connection to mobile phone or stationary network for malfunction message transmission via SMS
- Control from various locations over the network
- Measurement range calibration up to 18 temperatures per measuring point for use at different temperatures. For norm-relevant applications a multilevel calibration is possible.

Assignment of Standard Controllers to Furnace Families

	L1/12	L 3 - LT 40	LE 1/11 + LE 2/11	LE 6/11 + LE 14/11	LV, LVT	L 9/11/SKM	L(T) 9/../SW	N .. CUP	N 7/H - N 87/H	LH 15/12 - LF 120/14	HTCT	LHT ../.. (D)	LHT 02/17 LB + LHT 16/17 LB	LHT 04/16 SW + LHT 04/17 SW	HT	HTC 16/16 - HTC 450/16	HFL	TR	N 15/65 HA	NA 30/45 - N 500/85 HA	RD	R	RT	RHTC	RHTH/RHTV	RS	RSRB, RSRC	K	KC	LS	GR	NRA 17/06 - NRA 1000/11	NR, NRA .. H_2	NR, NRA .. IDB	SVHT	VHT
Catalog page	4	4,7	6	6	8	10	11	13	14	16	18	19	20	21	22	24	25	26	28	28	30	31	32	33	34	36	38	48	48	49	49	50	52	52	53	54
Controller																																				
B 180		●[1]			●[1]	●[1]	●[1]				●[1]							○	●[1]			●[1]	●[1]	●[1]												
P 330		○			○	○	○				○							○	○			○	○	○												
R 7	●		●															●			●															
C 6/3208																			○									●	●							
B 150				●				●[1]	●[1]	●[1]									●[1]							●[1]	●[1]									
P 300				○				●[1]	○	○									○							○	○					●[1]				
P 310												●[1]	●[1]	●[1]	●[1]	●[1]	●[1]								●[1]											
3216	○		○																		○															
3504								○										○		○		○		○	○	○	○					○				
B 400								●[1]	●[1]	●[1]																●[1]	●[1]									
B 410		●[1]			●[1]	●[1]	●[1]				●[1]							○	●[1]			●[1]	●[1]	●[1]												
C 440										○																○	○									
C 450		○			○	○	○				○							○				○	○	○												
P 470									○	○		●[1]	●[1]	●[1]	●[1]	●[1]	●[1]			●[1]					●[1]	○	○			●[1]		●[1]				
P 480		○			○	○	○				○							○				○	○	○												
H 500/PLC										○					●[1]	●[1]	●[1]								○	○	○			●[1]						
H 700/PLC															○		○								○	○	○							●	●
H 1700/PLC															○	○	○			○											●		●		
H 3700/PLC															○	○	○			○					○	○	○				○	○	●		○	○

[1]Depending on the design

Functionality of the Standard Controllers

	R6	C6	3216	3208	B130	B150	B180	B400/ B410	C280	C440/ C450	P300	P310	P330	P470/ B480	3504	H500	H700	H1700	H3700	NCC
Number of programs	1	1	1		2	1	1	5	9	10	9	9	9	50	25	20	1/10[4]	10	10	50
Segments	1	2	8		3	2	2	4	3	20	40	40	40	40	500[4]	20	20	20	20	20
Extra functions (e.g. fan or autom. flaps)								2	2	2	2[3]	2[3]	2	2-6	2-8[4]	3[4]	○[4]	6/2[4]	8/2[4]	16/4[4]
Maximum number of control zones	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2[1,2]	1-3[4]	○[4]	8	8	8
Drive of manual zone regulation								●		●		●		●						
Charge control/bath control														●	○	○	○	○	○	○
Auto tune			●	●	●	●	●	●	●	●	●	●	●	●	●					
Real-time clock								●		●			●	●		●	●	●	●	●
Plain, blue-white LC-display					●	●	●	●	●	●	●	●	●	●						
Graphic color display																4"7"	7"	7"	12"	19"
Status messages in clear text				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Data input via number pad							●				●	●	●							
Data entry via touchpanel																●	●	●	●	
Data entry via jog wheel and buttons								●		●				●						
Entering program names (i.e."Sintering")								●		●				●						●
Keypad lock					●	●		●	●	●				●	●					
User administration								●		●				●		○	○	○	○	●
Skip-button for segment jump								●		●	●	●	●	●		●	●	●	●	●
Program entry in steps of 1 °C or 1 min.	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Start time configurable (e.g. to use night power rates)					●	●	●	●	●	●	●	●	●	●		●	●	●	●	●
Switch-over °C/°F	○		○	○	●	●	●	●	●	●	●	●	●	●	○	●	●[4]	●[4]	●[4]	●[4]
kWh meter					●	●	●	●	●	●	●	●	●	●						
Operating hour counter					●	●	●	●	●	●	●	●	●	●		●	●	●	●	●
Programmable power outlet													●[5]							
Real-time clock				○				●		●				●	○		○	○	○	○
Set point output																○	○	○	○	
NTLog Comfort for HiProSystems: Recording of process data on an external storage medium					○	○	○	●	○	●	○	○	○	●						
NTLog Basic for Nabertherm Controller: Recording of process data with USB-flash drive					○	○	○	○	○	○	○	○	●	○						
Interface for MV software					○	○	○		○	○		○	●							

[1] Not for melt bath control
[2] Control of additional separate slave regulators possible
[3] As an extra feature in air circulation furnaces
[4] Depending on the design
[5] Not for model L(T)15..

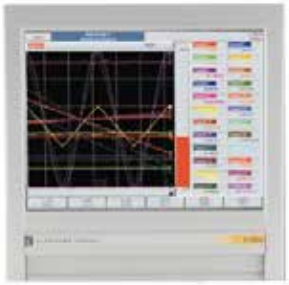
● Standard
○ Option

Mains Voltages for Nabertherm Furnaces

1-phase: all furnaces are available for mains voltages from 110 V - 240 V at 50 or 60 Hz.

3-phase: all furnaces are available for mains voltages from 200 V - 240 V or 380 V - 480 V, at 50 or 60 Hz.

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

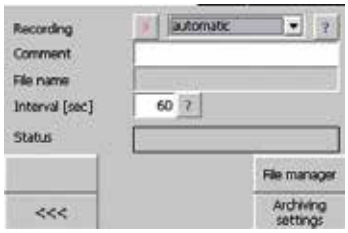


Temperature recorder

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 E			x



NTLog Comfort for data recording of a Siemens PLC

Data storing of Nabertherm controllers with NTLog Basic

NTLog Basic allows for recording of process data of the connected Nabertherm Controller (B 400, B 410, C 440, C 450, P 470, P480) on a USB stick.

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

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

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

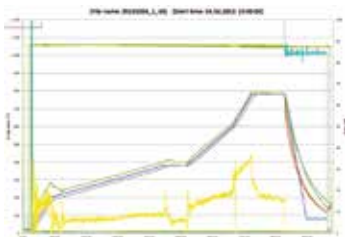
Data storing of HiProSystems with NTLog Comfort

The extension module NTLog Comfort offers the same functionality of NTLog Basic module. Process data from a HiProSytems control are read out and stored in real time on a USB stick (not available for all H 700 systems). The extension module NTLog Comfort can also be connected using an Ethernet connection to a computer in the same local network so that data can be written directly onto this computer.

Visualization with NTGraph

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

NTGraph is available in seven languages (DE/EN/FR/SP/IT/CH/RU). In addition, selected texts can be generated in other languages.



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

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 on basis of Nabertherm controllers.

Controltherm MV Software for Control, Visualisation and Documentation

In the basic version one furnace can be connected to the MV-software. The system can be extended to 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.

For furnaces which are not controlled via a Nabertherm controller, the furnace temperature can be 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
- Available for controllers B 400/B 410/C 440/C 450/P 470/P 480
- Suitable for PC with operating system Microsoft Windows 8/8.1 (32/64 Bit), Windows 7 (32/64 Bit), XP with SP3
- All Nabertherm controllers with optional ethernet interface connectable
- Encoded storage of temperature curves of up to 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
- Selectable languages: German, English, French, Italian or Spanish

Clear display of connected furnaces

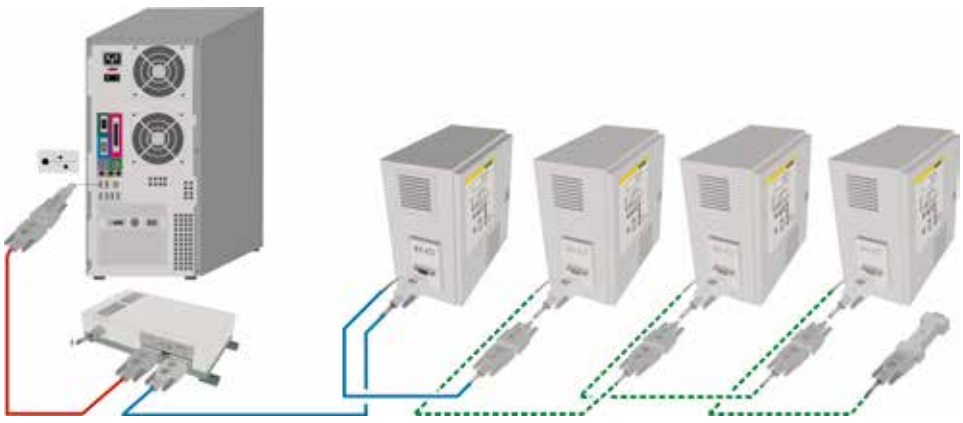
Extension Package II for Connection of one Additional Temperature Measuring Point, Independent of the Controller

- 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 see MV-software features

Graphical display of setpoint and acutal values

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



Extendable for connection of up to 16 furnaces