Control and Documentation Alternatives for Melting Furnaces

Band Alarm under/over Temperature

A band alarm displays the working range for casting. If the temperature is within the range, a green signal lamp is lit and the melt can be processed. In this range, the controller additionally provides for a signal that the customer can evaluate. Example: Release for the foundry robot.

Manual Program Intervention

If the current program is to be prolonged and the controller should not go to the next segment (e.g. continuation of melting operation in case of overtime), a key switch can be used to change over from program operation to controller operation. The controller continues working with the previously set temperature until the switch is activated again in order to continue with the program.

Documentation with NTLog

For process documentation, the H500-controls can be equipped with NTLog. For detailed description see page 28 - 29.

User interface Control Center NCC based on PC

Documentation with NCC

The H700-controls can be supplemented with the Nabertherm Control Center Software (NCC) including PC. The NCC-controls provide for a convenient documentation of the melting operation with the following documentation options:

- All relevant data, such as furnace temperature, melt bath temperature, messages, etc. are always saved as a file each day
- The furnace is equipped with an additional start and stop button in a separate housing. When the button is pressed, the melt bath temperature is recorded separately and saved as a file. This enables customer charges to be analyzed and archived separately.
- The PC can also be used as a user interface with all the benefits of a computer
- NCC AA (Aviation and Automotive) for applications according to CQI9, AMS or NADCAP

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.

Multi-Step Switch

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.

Control and Documentation Alternatives for Melting Furnaces

Eurotherm 3208 furnace controller

Weekly timer to switch between melting temperature and lower temperature

Melt bath control with a thermocouple in the melt

Furnace Control with Eurotherm 3208 or 3508 and Optional Weekly Timer
In the basic design, Nabertherm melting furnaces are equipped with Eurotherm 3208 or 3508 controllers. The temperature is measured inside the furnace behind the crucible. Two setpoints and one heating ramp can be set. For example, the setpoints could be the working temperature and the lower temperature for night setback. A digital weekly timer can also be used as an accessory which automatically switches between the two temperatures and the onoff function of the furnace. The switching times can be chosen for each working day.

Melt Bath Control (cascade control) via PLC and H500 or H700 Touch Panel for BaleOut and Tilting Furnaces
In the basic design, the baleout and tilting furnaces are controlled with a thermocouple inside the furnace chamber behind the crucible. For fast heat-up times, the operator usually sets a temperature that is higher than the desired melt bath temperature. This control enables fast heating times but also results in temperature overshoots in the melt due to the indirect temperature measurement.

As in option the baleout and tilting furnaces can be equipped with a melt bath control. In addition to the furnace thermocouple, the temperature is also measured with a thermocouple in the melt. Both temperatures are permanently reconciled to achieve the exact melt bath temperature. If the melt bath thermocouple fails, the system automatically switches over to furnace control. This control considerably improves the quality of the melt because overshoots are effectively prevented. This type of temperature control is especially recommended for holding in order to control the melt bath temperature as precisely as possible. It is also the best choice for a quick and automatic melting process without any need for the operator to intervene in the temperature control during melting.

As an alternative to a thermocouple in the melt, a thermocouple in a pocket inside the crucible wall can also be used (special crucible with pocket required) which measures the temperature of the crucible wall. This indirect measurement is not as precise as measuring directly in the melt and automatic melting is slightly slower. However, the thermocouple is in a more protected position. This simplifies charging of the crucible and increases the thermocouple life time.

| Controller Type	Eurotherm 3208		Eurotherm 3508	H500	H700	
Available for furnace type	TM/T/K	TB/TBR/KB/KBR	TC/KC	TC/TM/T/K/KC	TM/T/K	TB/TBR/KB/KBR
Functions						
Furnace control	●	●	●	●	●	●
Melt bath control				●	●	●
Weekly timer	○	○	○	●	●	●
Bridging the melt bath controller				○	○	○
Preparation program with 20 segments				●	●	●
Preparation program with a ramp	●	●	●			
Band alarm under/over temperature	○	○	○	●	●	●
Connection to an overriding system	○	○	○	○	○	○
Operation with reduced power	○			○	○	○
Operating hour counter	○	○	○	●	●	●
Documentation with NTLog				○		
Documentation with NCC					○	○
Manual intervention in the program					○	○

● Standard
○ Option
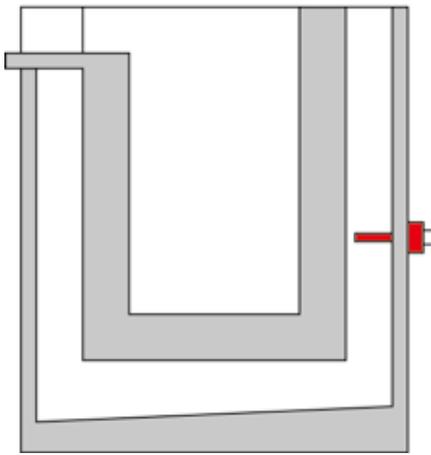
Furnace control
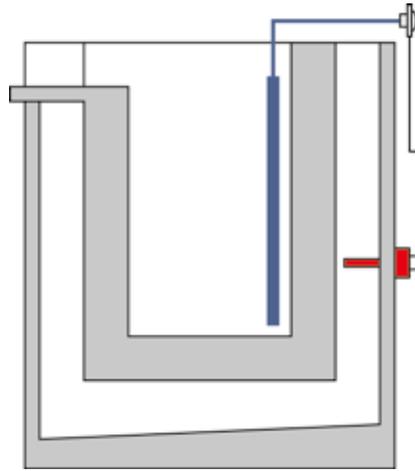
Melt bath control thermocouple in the melt
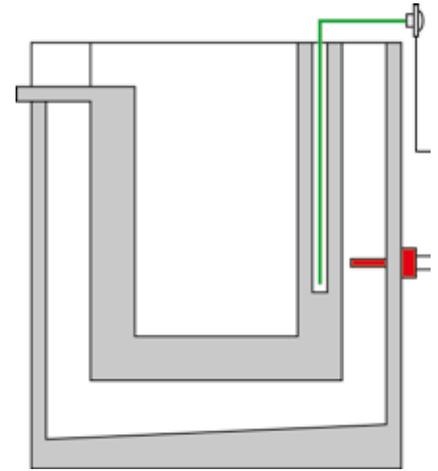
Melt bath control thermocouple in the pocket of the crucible wall

The melt bath is controlled via the H500 PLC-controls (electrically heated furnaces) with a 4 inch (optional 7 inch) touch panel and 4 operating buttons or the H700-controls (gasfired furnaces) with a 7 inch touch panel. It combines simple operation, precise control, and extensive user options. Presentation and program entry are done directly by a very simple to operate touch panel. The functions are displayed in plain text.

- Operation with furnace chamber control or melt bath control alternatively with cascade
- Display on a graphic color screen with overview of all temperatures
- Very easy data entry directly on the operating screen (touch panel)
- Weekly timer for changing temperatures, entries in real time
- A program with 12 segments can be set for each weekday
- Separate, freely programmable preparation program, password protected, e.g. to dry the crucible
- Band alarm with over and/or under temperature monitoring
- Operating hour counter
- Integrated safety system that continues furnace operation at reduced power in case of a fractured melt bath thermocouple to prevent the melt from solidifying
- Trend display of the furnace temperatures in the past 72 hours
- Language choice

Furnaces already in use can be retrofitted with a melt bath controller.

H500

Bridging the Melt Bath Controls to Increase Melting Performance and Reduce Melting Times

If a completely empty crucible is to be refilled, the values measured by the melt bath thermocouple do not correspond to the actual temperature of the cold metals because the charge is not yet melted. A pushbutton is used to temporarily specify a higher furnace temperature than the program would adjust. The operator selects the desired time (max. 120 minutes) and the furnace temperature. When the time has expired, the controller automatically switches back to melt bath control.

Entry of temperature/time programs in tabular format in several segments

Operation with Reduced Power

Operation with reduced power can be used to temporarily reduce the connected load of the furnace when the working temperature is reached. If reduced power is activated and the temperature in the furnace is within or above the set temperature band, part of the heating is switched off to operate the furnace with reduced power.