

Which Furnace for Which Process?

This catalog describes furnaces working under non-flammable or flammable gases or under vacuum. For furnaces working under air please see our catalog „Thermal Process Technology I“.

Preheating for Forging

- Press Hardening
- Heating of sheet metals
- Preheating of molds

in Air

- Bogie hearth furnaces*
- Bogie hearth furnaces gas-fired*
- Chamber furnaces gas-fired*
- Chamber furnaces*
- Top hat furnaces*
- Rotary hearth furnaces*
- Continuous furnaces*

Hardening, Annealing

- Ageing
- Austempering
- Diffusion annealing
- Pack hardening
- Recovery annealing
- Coarse grain annealing
- Hardening
- Solution annealing
- Annealing
- Recrystallization annealing
- Stress-relieving
- Soft annealing

in Air

- Forced convection pit-type furnaces*
- Pit-type and top-loading furnaces*
- Bogie hearth furnaces*
- Bogie hearth furnaces gas-fired*
- Chamber furnaces gas-fired*
- Chamber furnaces*
- Top hat furnaces*
- Rotary hearth furnaces*
- Continuous furnaces*
- Strand annealing furnaces*
- Wire annealing furnaces*

under Protective Gases, Reaction Gases or in Vacuum

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- Bogie hearth furnaces with annealing box page 83*
- Chamber furnaces with annealing box page 43 - 59
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in Salt Bath

- Salt-bath furnaces page 38 - 40

Quenching

- Water
- Air
- Oil
- Polymer

- Quench tanks page 80 - 81
- Water quench tanks*



* See also catalog Thermal Process Technology I

Tempering, Annealing

Tempering Plants

- Tempering
- Precipitation annealing
- Ageing annealing
- Recovery annealing
- Solution annealing
- Preheating
- Reduced hydrogen annealing

- Solution annealing
- Quenching
- Artificial ageing

in Air

under Protective Gases, Reaction Gases or in Vacuum

in Salt Bath

Chamber dryers*

Hot-wall retort furnaces
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Martempering furnaces
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Tool shop hardening
systems, page 70 - 72

Forced convection chamber
furnaces > 560 liters*

Forced convection chamber
furnaces with annealing
box, page 60 - 64

Protective gas hardening
system, page 73

Forced convection chamber
furnaces < 675 liters
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Forced convection chamber
furnaces with clean room
technology*

Hot-wall retort protective
gas hardening system
page 20

Forced convection chamber
furnaces with clean room
technology*

Sealed forced convection
chamber furnaces
page 65

Fully automatic tempering
plant*

Forced convection bogie
hearth furnaces*

Forced convection bogie
hearth furnaces with
annealing box, page 83*

Manual tempering plant*

Forced convection pit-type
furnaces
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Forced convection pit-type
furnaces with annealing
box, page 66 - 68*

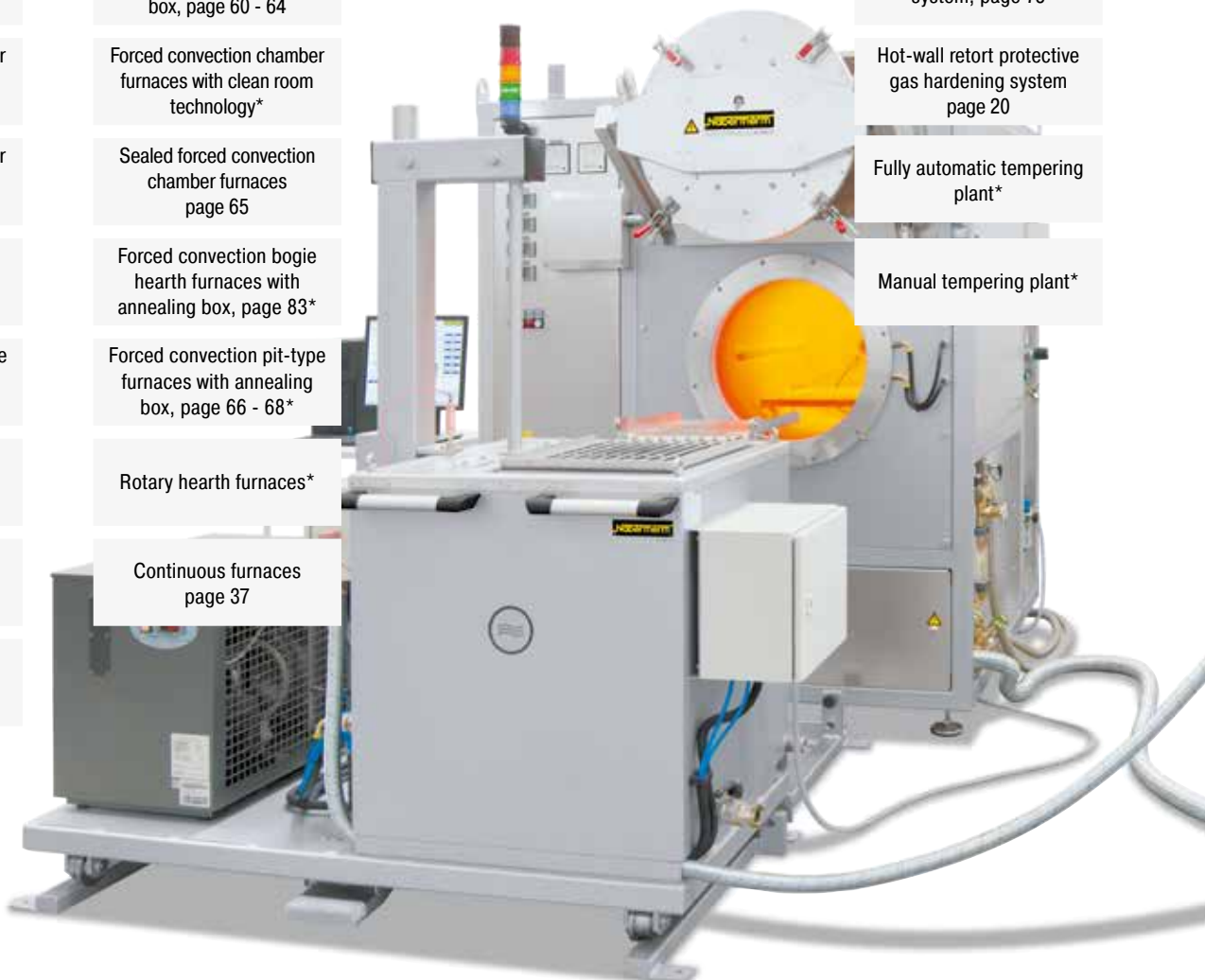
Pit-type and top-loading
furnaces*

Rotary hearth furnaces*

Rotary hearth furnaces*

Continuous furnaces
page 37

Continuous furnaces*



Semi-automatic tempering plant with retort furnace NR 50/11 and water quenching

Which Furnace for Which Process?

Brazing/Soldering

Curing, Tempering, Drying

- Soft soldering
- Brazing
- High-temperature brazing

- Dip brazing of steel
- Dip brazing of aluminum

- Composites
- Molds
- Adhesive
- Plastics
- Lacquers
- PTFE

- Silicone
- Surface Drying
- Preheating
- Vulcanizing
- Conditioning

in Salt Bath

in Vacuum

under Protective Gases

Solvent Based

Water Based

Salt-bath furnaces
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Hot-wall retort furnaces
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Hot-wall retort furnaces
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Hot-wall retort furnaces
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Chamber dryers*

Cold-wall retort furnaces
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Cold-wall retort furnaces
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Chamber dryers*

Forced convection chamber furnaces
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Tube furnaces
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Tube furnaces
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Forced convection chamber furnaces NA .. LS*
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Ovens*

Forced convection chamber furnaces with annealing box, page 60 - 64

Forced convection bogie hearth furnaces*

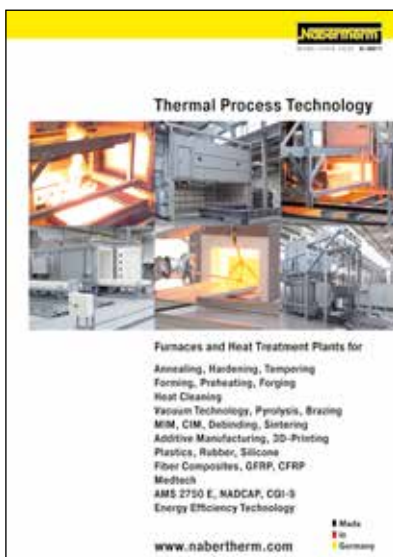
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Forced convection pit-type furnaces
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Rotary hearth furnaces*

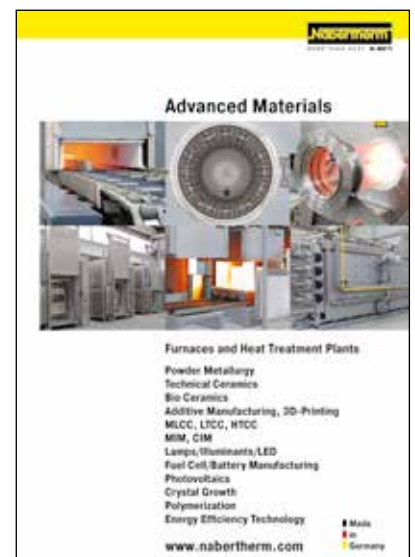
Continuous furnaces*



* See also catalog Thermal Process Technology



** See also catalog Laboratory



*** See also catalog Advanced Materials

**Thermal/Thermo-Chemical Processes
 Surface Treatment, Cleaning**

**Sintering
 & Debinding**

- Carburizing
- Blueing (e.g. with water steam)
- Nitriding/nitrocarborizing
- Boriding
- Deoxidizing under hydrogen
- Pyrolysis
- Heat cleaning
- Oxidizing
- Siliconizing

- Additive manufacturing
- Debinding
- MIM
- CIM
- Sintering

in Powders

**under Protective
 Gases, Reaction Gases**

in Salt Bath

in Air

**under Protective Gases,
 Reaction Gases or in Vacuum**

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Thermal Separation Processes

Process	..DB.. Debinding and sintering in oxidising atmosphere	..LS Heat cleaning in oxidising atmosphere	..IDB.. Debinding in inert atmo- sphere	NB..CL Heat Clean- ing in inert atmosphere	..BO Heat Cleaning in oxidising atmosphere	NB..WAX Dewaxing and burn off
Avoid igniting	✓	✓	✓	✓		
Provoke igniting					✓	✓
Diluted atmosphere	✓	✓				
Inerted atmosphere			✓	✓		
Open combustion					✓	✓
O ₂ content	≥ 20 %	≥ 20 %	0-3 %	≤ 3 %	<> 20 % varies	<> 20 % varies
Vaporisation speed	slow	fast	slow	slow - fast	slow - fast	very fast
Loading / unloading	cold/cold	cold/cold hot/hot	cold/cold	cold/cold	cold/cold	> 750 °C/ > 750 °C
Tmax	1800 °C	450 °C	850 °C	500 °C	1400 °C	850 °C
Electrically heated	✓	✓	✓		✓	
Gas-fired				✓	✓	✓
External TNV	✓	(✓)	✓		✓	
Internal TNV				✓	✓	✓
External KNV	✓	(✓)	(✓)			



Blueing of drills in water steam atmosphere in a furnace of the NRA range see page 16