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

Hardening, Annealing

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

Quenching

- Water
- Air
- Oil
- Polymer

in Air

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

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

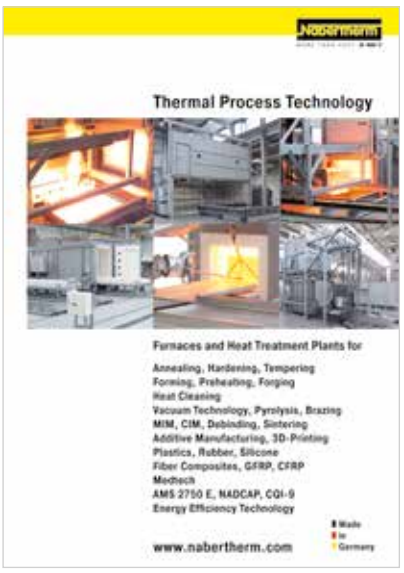
- Hot-wall retort furnaces page 16 - 25
- Cold-wall retort furnaces page 26 - 32
- Bogie hearth furnaces with annealing box page 83*
- Chamber furnaces with annealing box page 43 - 59
- Top hat furnaces with annealing box page 83*
- Rotary hearth furnaces*
- Continuous furnaces page 37
- Strand annealing furnaces page 36
- Wire annealing furnaces page 36

in Salt Bath

- Salt-bath furnaces page 38 - 40

Quenching

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



* See also catalog Thermal Process Technology I

Tempering, Annealing

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

Tempering Plants

- Solution annealing
- Quenching
- Artificial ageing

in Air

Chamber dryers*

Forced convection chamber furnaces > 560 liters*

Forced convection chamber furnaces < 675 liters page 60 - 61*

Forced convection chamber furnaces with clean room technology*

Forced convection bogie hearth furnaces*

Forced convection pit-type furnaces page 66 - 68

Pit-type and top-loading furnaces*

Rotary hearth furnaces*

Continuous furnaces*

under Protective Gases, Reaction Gases or in Vacuum

Hot-wall retort furnaces page 16 - 25

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

Forced convection chamber furnaces with clean room technology*

Sealed forced convection chamber furnaces page 65

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

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

Rotary hearth furnaces*

Continuous furnaces page 37

in Salt Bath

Martempering furnaces page 41

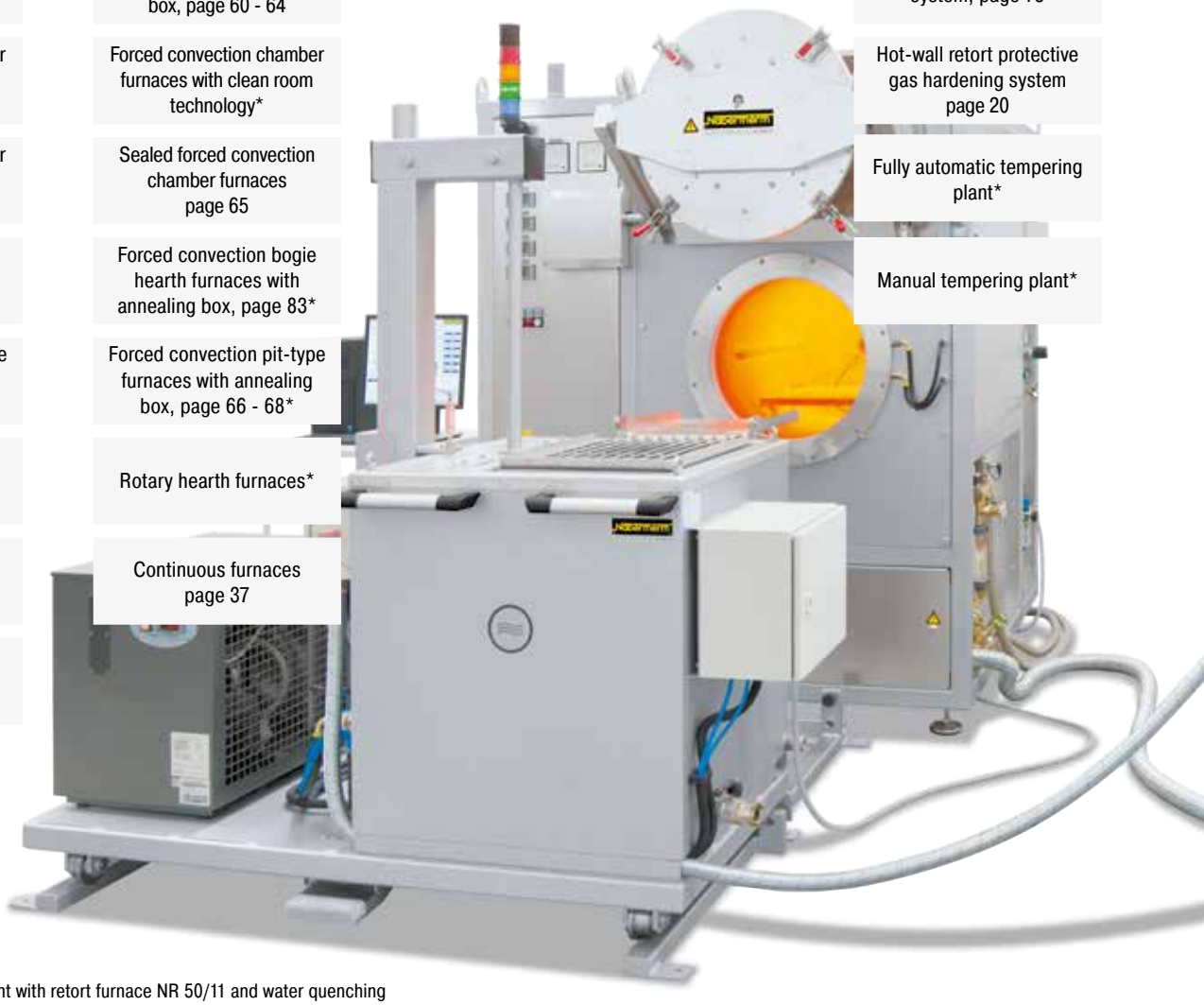
Tool shop hardening systems, page 70 - 72

Protective gas hardening system, page 73

Hot-wall retort protective gas hardening system page 20

Fully automatic tempering plant*

Manual tempering plant*



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

Which Furnace for Which Process?

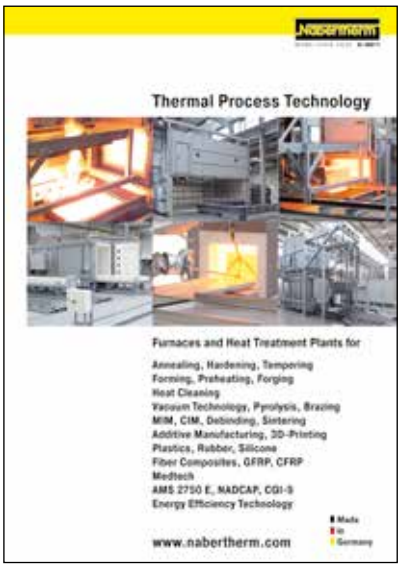
Brazing/Soldering

- Soft soldering
- Brazing
- High-temperature brazing
- Dip brazing of steel

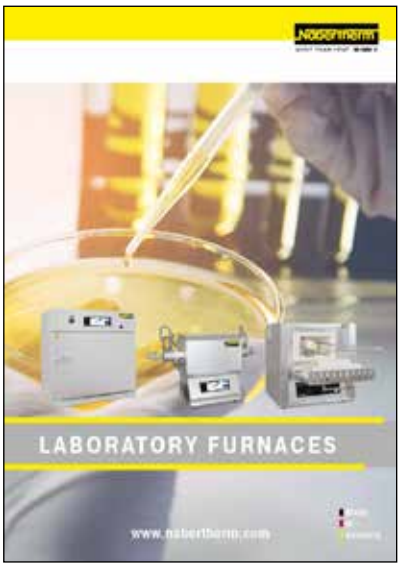
Curing, Tempering, Drying

- Composites
- Molds
- Adhesive
- Plastics
- Lacquers
- PTFE
- Silicone
- Surface Drying
- Preheating
- Vulcanizing
- Conditioning

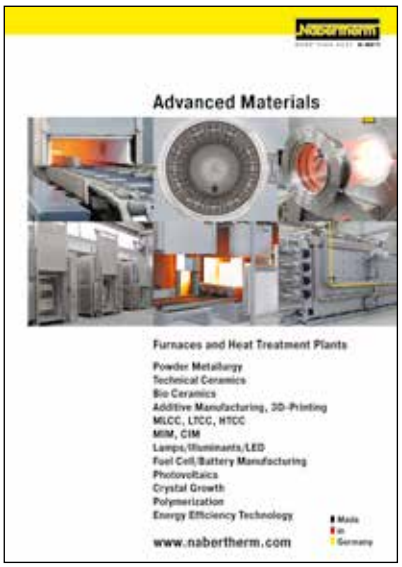
in Salt Bath	in Vacuum	under Protective Gases	Solvent Based	Water Based
Salt-bath furnaces page 38 - 40	Hot-wall retort furnaces page 16 - 25	Hot-wall retort furnaces page 16 - 25	Hot-wall retort furnaces page 16 - 25	Chamber dryers*
	Cold-wall retort furnaces page 26 - 32	Cold-wall retort furnaces page 26 - 32	Chamber dryers*	Forced convection chamber furnaces page 60 - 61*
	Tube furnaces page 34 - 35**	Tube furnaces page 34 - 35**	Forced convection chamber furnaces NA .. LS* page 60 - 61	Ovens*
		Forced convection chamber furnaces with annealing box, page 60 - 64		Forced convection bogie hearth furnaces*
		Chamber furnaces with annealing box, page 43 - 59		Forced convection pit-type furnaces page 60 - 68*
		Forced convection pit-type furnaces with annealing box, page 66 - 68		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

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

Sintering & Debinding

- 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
Hot-wall retort furnaces page 16 - 25	Hot-wall retort furnaces page 16 - 25	Salt-bath furnaces page 38 - 40	Chamber furnaces***	Hot-wall retort furnaces page 16 - 25
Cold-wall retort furnaces page 26 - 32	Cold-wall retort furnaces page 26 - 32		Chamber furnaces gas-fired***	Cold-wall retort furnaces page 26 - 32
Forced convection chamber furnaces page 60 - 61	Forced convection chamber furnaces with annealing box, page 60 - 64		Forced convection chamber furnaces NA .. LS* page 60 - 61	Retort furnaces for catalytic debinding page 21
Bogie hearth furnaces page 83*	Forced convection bogie hearth furnaces with annealing box, page 83*			Forced convection chamber furnaces with annealing box***
Chamber furnaces page 43 - 59*	Bogie hearth furnaces with annealing box page 83*			
Top hat furnaces page 83*	Chamber furnaces with annealing box page 43 - 59			

Thermal Separation Processes

Process	..DB.. / ..LS Debinding and sintering in oxidising atmosphere		..IDB.. Debinding inert atmosphere	NB..CL Heat Cleaning 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