## Which Furnace for Which Process?

### 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 gas-fired page 47
- Chamber furnaces gas-fired page 48
- Chamber furnaces page 49/50
- Top hat furnaces page 54
- Rotary hearth furnaces page 62
- Continuous furnaces page 64
- Forced convection pit-type furnaces page 40
- Pit-type and top-loading furnaces page 41
- Bogie hearth furnaces page 44
- Bogie hearth furnaces gas-fired page 47
- Chamber furnaces gas-fired page 48
- Chamber furnaces page 49/50
- Top hat furnaces page 54
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- Top hat furnaces page 54
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- Continuous furnaces page 64
- Strand annealing furnaces page 68
- Wire annealing furnaces page 68

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

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- Bogie hearth furnaces with annealing box page 44
- Chamber furnaces with annealing box page 49
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### in Salt Bath

- Salt-bath furnaces page 60
- Quench tanks page 57
- Water quench tanks page 72 - 75
- Salt-bath furnace TS 40/30 with exhaust gas collection at crucible rim see page 60

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Annealing furnace with electro-hydraulic lift door on transportable base for preheating of large steel sheets for the automotive industry see page 50

NRA 480/04S see page 12
Tempering, Annealing

- Tempering
- Precipitation annealing
- Ageing annealing
- Recovery annealing

- Solution annealing
- Preheating
- Reduced hydrogen annealing

in Air
- Chamber dryers
  page 32
- Forced convection chamber furnaces > 560 liters
  page 26
- Forced convection chamber furnaces < 675 liters
  page 24
- Forced convection chamber furnaces with clean room technology
  page 23
- Forced convection bogie hearth furnaces
  page 42
- Forced convection pit-type furnaces
  page 39/40
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in Salt Bath
- Martempering furnaces
  page 61
- Fully automatic tempering plant
  page 72/73
- Manual tempering plant
  page 74/75

Tempering Plants

- Solution annealing
- Quenching
- Artificial ageing

Manual tempering plant for hardening of steel rods see page 74/75

Process flow chart
Which Furnace for Which Process?

### Brazing/Soldering
- Soft soldering
- Brazing
- High-temperature brazing
- Dip brazing of steel
- Dip brazing of aluminum

#### in Salt Bath
- Salt-bath furnaces
  page 60

#### in Vacuum
- Hot-wall retort furnaces
  page 12 - 15

#### under Protective Gases
- Hot-wall retort furnaces
  page 12 - 15
- Cold-wall retort furnaces
  page 16 - 21

### Curing, Tempering, Drying
- Composites
- Molds
- Adhesive
- Plastics
- Lacquers
- PTFE
- Silicones
- Surface Drying
- Preheating
- Vulcanizing
- Conditioning

#### Solvent Based
- Hot-wall retort furnaces
  page 12 - 15
- Chamber dryers
  page 32
- Forced convection chamber furnaces
  page 24
- Forced convection chamber furnaces EN 1539
  page 38

#### Water Based
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- Forced convection chamber furnaces
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- Forced convection bogie hearth furnaces
  page 42
- Forced convection pit-type furnaces
  page 39/40
- Rotary hearth furnaces
  page 62
- Continuous furnaces
  page 64

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Sintering of MIM titan parts in a VHT furnace

Brazing in a gas-supply box

VHT 500/22-GR H₂ with graphite insulation and heating see page 16
### Thermal/Thermo-Chemical Processes

**Surface Treatment, Cleaning**

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

### in Powders
- Hot-wall retort furnaces
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- Salt-bath furnaces
  - page 60
- Chamber furnaces
  - NB .. CL, gas-fired
  - page 52
- Chamber furnaces N(B) .. BO
  - page 53
- Forced convection chamber furnaces N .. LS
  - page 38

### in Air
- Chamber furnaces
  - NB .. CL, gas-fired
  - page 52
- Chamber furnaces
  - NB .. CL, gas-fired
  - page 53
- Forced convection chamber furnaces N .. LS
  - page 38

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- Forced convection chamber furnaces
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  - page 22

### Thermal Separation Processes

<table>
<thead>
<tr>
<th>Process</th>
<th>..DB..</th>
<th>..LS</th>
<th>..IDB..</th>
<th>..NB..CL</th>
<th>..BO</th>
<th>..NB..WAX</th>
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<tr>
<td>Avoid igniting</td>
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<td>Provoke igniting</td>
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<td>Open combustion</td>
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<td>≥ 20 %</td>
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<td>≤ 3 %</td>
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<td>fast</td>
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<td>slow - fast</td>
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<td>very fast</td>
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<td>Loading / unloading</td>
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Blueing of drills in water steam atmosphere in a furnace of the NRA range see page 14.