

Heat treatment and thermochemical treatment

Hardening

- **volumetric hardening** – hardening in air temperature practically all kinds of steel: structural steel, tool steel, alloy steel; the maximum length of the component: 2500 mm, the maximum weight of the component 650 kg (larger components require individual consultation),
- **salt-bath hardening** – the maximum component dimensions: 400x300x100 mm, (maximum length of the treated components 1000 mm),
- **isothermal quenching (hardening)** – the maximum component dimensions: 400x300x100 mm
- **tool hardening** – tools made of fast finishing steel, high-speed steel and high-alloy steel undergo salt-bath hardening, this type of technology assures the highest quality, and preservation of tools is achieved through individual hardening; furnace chamber dimensions: \varnothing 180 mm, length: 650 mm,
- **induction hardening** – shaft hardening, sprocket wheel hardening, pin hardening etc. the maximum component diameter: \varnothing 150 mm, length: 800 mm,
- **constant spot surface hardening of structural material in furnace** – the 4-axis device is designated for induction hardening and drawback treatment (in vertical position); the furnace is equipped with thermal camera which allows manual adjustment of the temperature between $300^{\circ}\text{C} \div 900^{\circ}\text{C}$; the induction hardening goes 0,5mm \div 5mm deep, furnace length: 700 mm, the maximum length of retail component cannot exceed 1200 mm, the maximum weight of the retail component equals 15 kg.



Carburizing

- **gas carburizing** – it is a computer controlled process with a full and adequate parameter archiving process, this type of technology allows achieving accurate manufacturing replicability; the maximum component dimensions are the following: \varnothing 300x1000 mm and the allowed weight equals 700 kg,
- **powder carburizing** – it's perfect for small components rendered in small series – these components undergo partial protection with formulations against carburization (e.g. threads).



Annealing

- **normalizing annealing** – (e.g. after forging), furnace chamber dimensions: 3000x1800x1200 mm,
- **stabilizing annealing** – (e.g. after initial mechanical treatment), furnace chamber dimensions: 3000x1800x1200 mm,
- **stress relief annealing** – (e.g. after grinding), furnace chamber dimensions: 3000x1800x1200 mm,
- **annealing in a furnace with a protective nitrogen atmosphere** – component annealing after laser cutting or burner cutting in order to prepare the material for further mechanical working (e.g. bending, turning, beading); the applied vacuum or protective atmosphere secures the components from surface decarburization, especially those components that are made of sheet metal; furnace chamber dimensions: \varnothing 600x1100 mm.

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Nitriding

▪ **gas nitriding using NITREG® method** – according to AMS 2750D and 2759/10 methods, there are three types of processes:

- NITREG®–C – nitro-carburizing,
- ONC® – used for oxidation,
- NITREG®–S – used for nitriding of stainless steel and acid-resistant steel.

The NITREG® technology unlike other standard processes used for gas nitriding gives a possibility to control the factors such as hardness parameters and thickness of diffusion area. The method is conducted through usage of highly advanced technology, namely the furnaces manufactured by NITREX® Canada.

The advantages of NITREG® processes are the following:

- excellent dependability and replicability of results,
- entire control of process parameters,
- deformations minimizing,
- greater usage properties that give full control over nitrogen fixed in a layer.

The NITREG® process basically allows nitriding all sorts of steel alloys.

Usable size of the furnace: Ø 800x2000 mm, the maximum weight of the charge – 1500 kg.

▪ **salt bath nitriding using TENIFER® method** – salt-cyanide (plating) bath treatment in two varieties: QP and QPQ. The pre-finished components undergo nitriding through this method. Most types of machined steel components appear in color black. This method is used for details that must exhibit high resistance to abrasion, corrosion and high fatigue strength (e.g. hydraulic cylinders, shaft joints or slide valves). Injection moulds for thermoplastic weights guarantee better surface smoothness and maintain permanent parameters. At the same time, the tools that undergo nitriding and are used for plastic workings are not susceptible to adherence of material. The achieved surface hardness depends on a given sort of material and is equal to 500 HV_{0.3} or higher up to 1300 HV_{0.3}. The corrosion resistance is greater than chromium and nickel coatings. Furnace chamber dimensions: Ø300x600 mm, the maximum weight of the charge: 50 kg.



Hyper-quenching and quench ageing

Aluminium alloys, copper alloys and high-chromium steel.