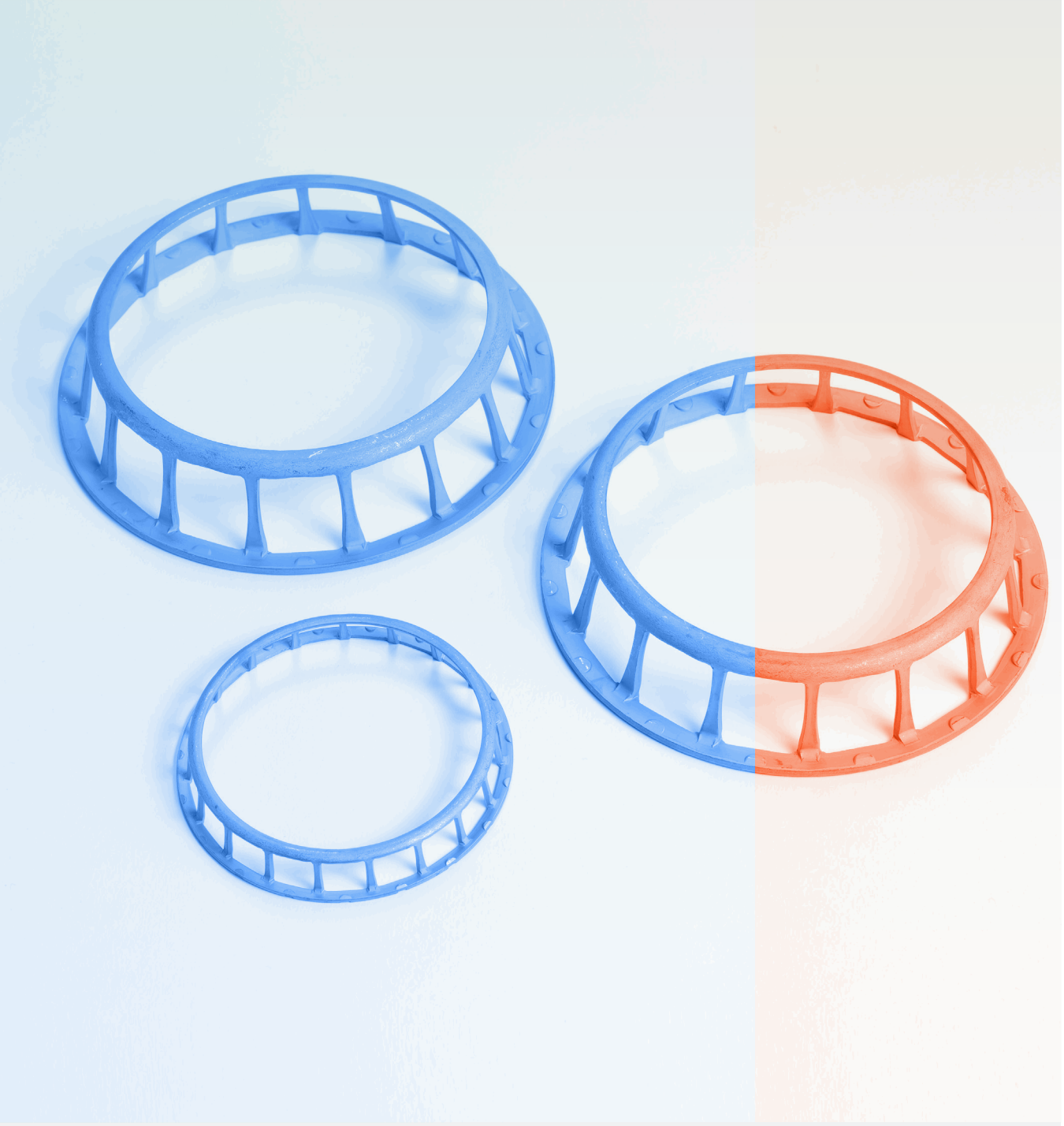
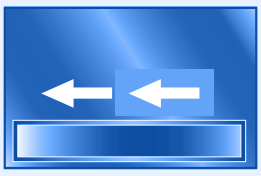


Nitriding / Nitrocarburising

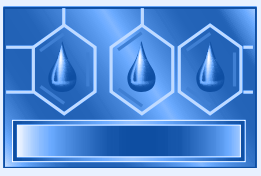
Surface hardening of steel in gas/plasma

High wear resistance

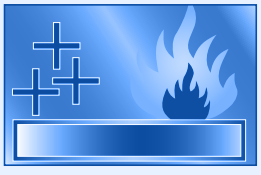
High surface hardness



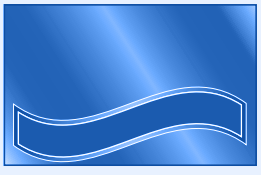
Reduction of the friction coefficient



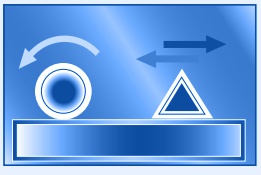
Improved corrosion resistance



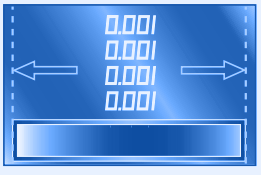
Improved heat resistance



Increased fatigue strength



High resistance to abrasion



Good dimensional and shape accuracy

an Aalberts Industries company

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H&ST

MAMESTA B.V.
Spikweien 27
NL • 5943 AC Lomm
Tel.: +31 77 308 13 33
info@mamesta.nl
www.mamesta.nl

HEAT & SURFACE TREATMENT B.V.
Achtseweg Noord 5
Gebouw AL, NL • 5651 GG Eindhoven
Tel. +31 40 266 30 00
info@h-st.nl
www.h-st.nl

Nitriding / Nitrocarburising

Surface hardening of steel in gas/plasma

What is nitriding / nitrocarburising?

Gas nitriding and nitrocarburising belong to thermochemical processes. During these processes the surface of several workpieces or machine parts is enriched with nitrogen (nitriding) or nitrogen with carbon (nitrocarburising). The former to improve the mechanic properties of the surface of the workpieces or machine parts.

How does nitriding / nitrocarburising take place?

During nitriding the components are exposed to a nitrogen emitting environment at a temperature between 480–580 °C, whereby this nitrogen is diffused in the surface of the component.
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480–580 °C, whereby this nitrogen is diffused in the surface of the component.

Build-up and structure.

Nitriding and nitrocarburising layers consist typically of two areas. The inner area, the diffusion area, is characterized by formation of nitride needles at the edge of the component. The normal layer thickness is between 0.2 to 1.5 mm. The outer area with a thickness between approximately 5 to 30 µm is called the compound layer. This non-metal layer consists mainly of γ'-nitrides (Fe4N), ε-nitrides ($Fe_{2...3}$ N) and possibly of carbon nitrides ($Fe_xC_yN_z$).
Moreover, at alloyed steel nitrides and carbon nitrides of the alloy elements are formed.
The outer zone of the connection zone can be formed as a pore edge that later, however, through later oxidation improves the anti-corrosive properties (Nitrotec®).
Depending on the material, surface hardness can be achieved of maximum 1.500 HV0.01.

Process Variations

Nitriding and nitrocarburising processes can be performed in gas atmosphere, where the nitrogen and carbon are available as gas, in a salt bath, where the nitrogen and carbon are offered by molten salts, or in plasma, where the carbon and nitrogen is provided in a vacuum atmosphere with ionized gasses. Except salt bath processes, all nitriding or nitrocarburising processes can be performed. Also, the special processes such as Nitrotec® or Stainihard® can be performed.

Suitable materials

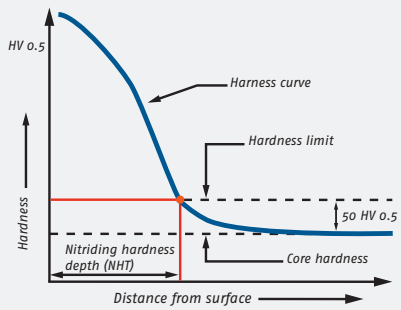
All conventional steel, cast iron and sintering materials can be treated. Unalloyed as wel as low and/or medium and alloyed steels are suitable for gas nitriding or nitrocarburising.
High-alloy steels with more than 13% Cr are due to their surface passivity only suitable for treatment under certain conditions. Alloying elements such as aluminum, chromium and titanium favor thereby increasing hardness and wear-resistance in the edge zone.
Alternatively, for these highly alloyed (austenitizing) steels the Stainihard® process was developed. During this, stainless steel can be hardened without adversely affecting its corrosion resistance.

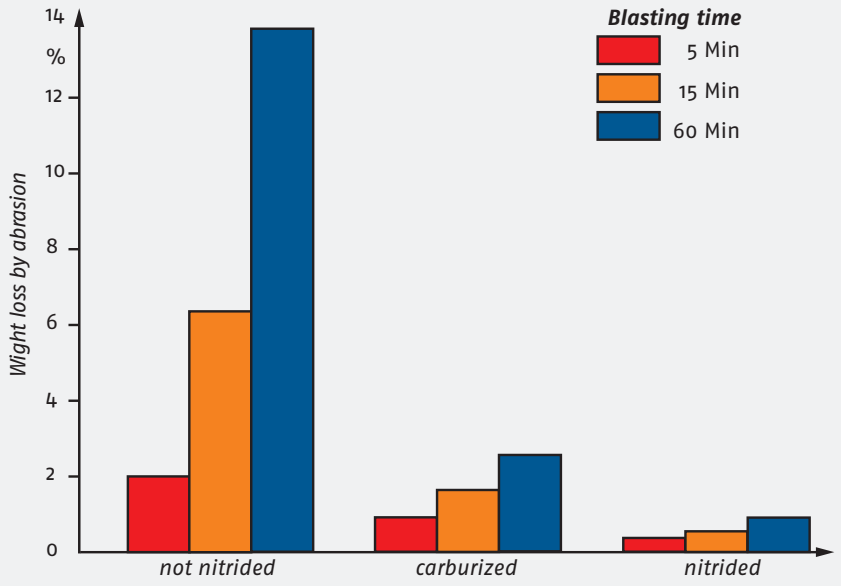
Hardness Penetration Depth

Nitriding and nitrocarburising layers are characterized by the following layer thickness and hardness penetration depth.
The Nitriding Hardness Depth (NHT) according to DIN 50 190-3- is the vertical distance from the edge, where the hardness reaches the value of the core hardness plus 50 HV 0.5 hardness limit.
The thickness of the connection zone and the Nitriding Hardness Depth must often be agreed with the client according to the specific material and the application.

Properties

- High resistance to abrasion
- High surface hardness
- Lower friction coefficient
- Improved corrosion resistance
- Improved heat resistance to about 500 °C
- Increased fatigue strength
- Good size and shape accuracy





Weight loss on a tested sample of Heat & Surface Treatment B.V.