



GNC-Ox-nitriding

Dimensions:  
max. 1500 mm x 3000 mm

Fully automated Process

## GNC-OX-NITRIDING

### PROCESS

Nitriding or nitrocarburization following the GNC-Ox process is a combination of different thermo-chemical process steps, like gas nitrocarburization, plasma activation and oxidizing. This creates wear resistant and corrosion resistant surface layers. After treatment, the surfaces show a dark grey to black colour.

### AIM OF PROCEDURE

- Functional surfaces are optimized by:
- Increased corrosion resistance
- Improved wear resistance
- Improved mechanical-dynamic properties

### APPLICATION

Individual components and duplicate parts can be processed. A broad range of material qualities, non-alloy construction steel qualities, case-hardened and tempering steels or even high-alloy tool steels can be treated with GNC-Ox. The GNC-Ox process provides an alternative to salt bath nitriding with oxidation for many components of the automotive and hydraulic industry, mechanical engineering and mining.

## DISTORTION AND DIMENSIONAL CHANGE

The GNC-Ox process only has a small impact on distortion and dimensional change of components. The deformation is much smaller compared to carburization or carbonitration respectively. In addition, the deformation can be positively affected by a variation of the process parameters, e.g. temperature. A dimensional change of the components can be observed through formation of the white layer. In case of a previous production, such a dimensional change can already be taken into account.

## CORROSION RESISTANCE

The required corrosion resistance of the components is influenced by different factors: Material, roughness, contamination of the surface and component geometry. They have an impact on the corrosion resistance. The achievable results of the heat treatment can be significantly improved beforehand through discussions and agreements between the customer and Stahlhärterei Haupt. For several materials, the standard requirements of corrosion resistance (> 96h salt spray test DIN 50021 SS) is thus exceeded.



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GNC-OX-NITRIDING II**

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## **GNC-OX-NITRIDING**

### **SURFACE HARDNESS AND NITRATION HARDNESS DEPTH**

Essentially, the achievable surface hardness depends on the raw material. Higher hardness values allow alloying elements like chromium and aluminium. The nitration hardness depth depends on their specifications. The achievable coating parameters are also affected by the condition of the component at delivery, e.g. degree of distortion and heat treatment condition.

### **WHITE LAYER AND DIFFUSION ZONE**

Through diffusion of primary carbon and nitrogen into the surface, a diffusion zone (DZ) and a white layer (WL) are formed. Subsequently, a compact oxide film, which essentially results in the corrosion resistance, creates oxidation of the components.

The wear behaviour of the component is determined by the WL. The mechanical-dynamic properties of the component are affected by the DZ.

## **PRE-TREATMENT AND POST-TREATMENT**

On delivery, components should be as free as possible from contamination and residues, and be metallically bright. Components are usually finish-machined when they are delivered. It is also possible to carry out further treatment by grinding or polishing to improve the roughness. This should be agreed before carrying out the treatment. Nitriding and nitrocarburisation are increasing in importance due to the multiplicity of possible applications. As well as mechanical, technological properties, the resistance to corrosion is playing an ever more important role in the functionality of stressed surfaces. As well as improving the wear characteristics, the GNCOx process also enables the resistance to corrosion to be significantly improved.



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GNC-OX NITRIDING TABLE**

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Material		Strength after tempering (N / mm <sup>2</sup> ) Tempering temperature 600 ° C		Guide values for the surface hardness 90 min. 580 ° C GNC-Ox treated		
Shortname	Material number	2 hours	6 hours	HV 1	HV 10	HV 30
CK15	1.1141	600	550	350	300	200
C45W3	1.1730	750-800	700-800	450	350	250
Ck60	1.1221	750-900	700-800	450	350	250
20MnCr5	1.7147	800-950	800-900	600	450	400
53MnSi4	1.5141	850-950	800-900	450	400	350
90MnV8	1.2842	1000-1200	900-1100	550	450	400
42CrMo4	1.7225	900-1200	900-1100	650	500	450
X19NiCrMo4	1.2764	900-1100	900-1000	600	500	450
55NiCrMoV6	1.2713	1200-1400	1150-1300	650	550	500
56NiCrMoV7	1.2714	1300-1500	1250-1400	650	550	500
50NiCr13	1.2721	1200-1350	1100-1200	660	500	450
X20Cr13	1.2082	1000-1200	1000-1200	>900	600	450
X35CrMo17	1.4122	1000-1200	1000-1200	>900	700	550
X210Cr12	1.2080	1500-1700	1400-1600	>800	600	450
X210CrW12	1.2436	1500-1800	1400-1650	>800	600	500
X165CrMoV12	1.2601	1400-1900	1400-1700	>800	650	500
45CrMoW58	1.2603	1500-1800	1400-1700	800	700	600
X32CrMoV33	1.2365	1700-1800	1600-1750	>900	850	700
X38CrMoV51	1.2343	1700-1900	1500-1700	>900	850	700
X37CrMoV51	1.2606	1700-1900	1600-1800	>900	800	700
X30WCrV53	1.2567	1700-1900	1600-1800	>900	850	750
X30WCrV93	1.2581	1500-1800	1500-1700	>900	850	800