



LINGENHÖLE TECHNOLOGIE

**Center for heat treatment
Mechanical Components
Hydropower plants - Turbine manufacturing**

HEAT TREATMENT

| | mechanical requirements | | | |
|---------------------------------|--------------------------------|------------------------|------------------------|-----------------------|
| | <i>Abrasion</i> | <i>heat resistance</i> | <i>impact strength</i> | <i>low distortion</i> |
| <i>Plasma-Plasox</i> | • | •• | | • |
| <i>Plasma-Plasnit</i> | •• | •• | | • |
| <i>Saltbathnitrocarburizing</i> | • | •• | • | • |
| <i>Gasnitriding</i> | •• | •• | •• | • |
| <i>Gasnitrocarburizing</i> | • | •• | • | •• |
| <i>Carbonitriding</i> | •• | •• | •• | • |
| <i>Vacuum hardening</i> | • | • | • | •• |
| <i>Case hardening</i> | •• | • | •• | • |
| <i>Surface hardening</i> | •• | • | •• | • |

• = well •• = very well

| | physical requirements | | | |
|---------------------------------|------------------------------|------------------|------------------------|-------------------------|
| | <i>corrosion resistance</i> | <i>roughness</i> | <i>layer thickness</i> | <i>sliding property</i> |
| <i>Plasma-Plasox</i> | •• | •• | • | •• |
| <i>Plasma-Plasnit</i> | • | •• | •• | •• |
| <i>Saltbathnitrocarburizing</i> | •• | • | • | • |
| <i>Gasnitriding</i> | • | •• | •• | •• |
| <i>Gasnitrocarburizing</i> | •• | •• | • | •• |
| <i>Carbonitriding</i> | • | • | •• | • |
| <i>Vacuum hardening</i> | | | | |
| <i>Case hardening</i> | • | • | •• | • |
| <i>Surface hardening</i> | • | • | •• | • |

• = well •• = very well

Nitriding treatments

| Treatment | max. length (mm) | max. Ø (mm) | remarks |
|--|-------------------------|--------------------|------------------------|
| <i>Plasmanitriding (with Oxidation)</i> | 1250 | 1000 | <i>MicroPulsPlasma</i> |
| <i>Plasmanitrocarburizing (with Oxidation)</i> | | | <i>Plasnit, Plasox</i> |
| <i>Plasmanitriding (with Oxidation)</i> | 4000 | 850 | <i>MicroPulsPlasma</i> |
| <i>Plasmanitrocarburizing (with Oxidation)</i> | | | <i>Plasnit, Plasox</i> |
| <i>Gasnitriding</i> | | | |
| <i>Gasnitrocarburizing (with Oxidation)</i> | 3000 | 900 | - |
| <i>Saltbathnitriding</i> | 1400 | 800 | <i>Tenifer</i> |

Härten und Glühen

| Treatment | max. length (mm) | max. Ø (mm) | remarks |
|-------------------------------|-------------------------|--------------------|---------------------|
| <i>Carbonitriding</i> | 500 x 800 x 500 | - | - |
| <i>Case hardening</i> | 500 x 800 x 500 | - | - |
| <i>Quench and temper</i> | 500 x 800 x 500 | - | - |
| <i>Vacuum hardening</i> | 600 x 900 x 600 | - | - |
| <i>inert gas annealing</i> | 2000 | 900 | - |
| <i>Induction hardening HF</i> | 800 | 100 | - |
| <i>Induction hardening MF</i> | 5000 | 400 | max. weight 4000 kg |