# CROMAX 280X

## Hard chrome bar

Cromax 280X is based on a low carbon, microalloyed steel combining high strength with excellent machinability and weldability. For Ø ≤ 90 mm, yield and tensile strength are 20% higher than normal for hard-chrome bars based on low-carbon weldable steel. This improvement is achieved without detriment to machinability or weldability.
In comparison with standard products based on grade 20MnV6, the superior properties of Cromax 280X offers a number of potential advantages in the design and manufacture of fluid-power cylinders, not the least the possibility to downsize piston rods without loss of load-bearing capacity, thereby reducing not only weight but also cost.

### Average chemical analysis Cromax 280X

| C % | Si % | Mn % | S % | V % | C.E. % (*) |
|---|---|---|---|---|---|
| 0.18 | 0.35 | 1.55 | 0.025 | 0.11 | 0.55 max |

*C.E. = % C + % Mn/6 + (% Cu + % Ni)/15 + (% Cr + % Mo + % V)/5

### Corresponding standards

The table shows the closest equivalent standard for the steel in Cromax 280X.

| Ovako grade | EN | DIN | BS | AFNOR | ASTM |
|---|---|---|---|---|---|
| Ovako 280X | 20MnV6 | 20MnV6 | 55M | E420 | A572 |

### Mechanical properties

| Size (Ø) | Yield stress $R_{eH}$, N/mm², min | Utimate tensile stress $R_{eH}$, N/mm² | Elongation $A_5$, %, min | Hardness HB | Thoughness KV, Joule, min |
|---|---|---|---|---|---|
| <20 | 520 | 650–800 | 12 | 200–240 | No guarantee |
| 20-90 | 520 | 650–800 | 19 | 200–240 | 27 at –20 °C |
| >90 | 440 | 550–700 | 19 | 180–230 | No guarantee (*) |

*Base steel meeting KV≥27J at –20°C can be supplied by special arrangement.

### Chrome layer

For Ø ≤ 20 mm, the chrome layer thickness is 20 µm min. For smaller sizes, the minimum thickness is 15 µm.

### Surface roughness

The surface roughness (Ra) is always less than 0.2 µm and normally in the range 0.05–0.10 µm. Rt (ISO) is always less than 2.0 µm and normally in the range 0.5–1.0 µm.

### Surface hardness

The chrome layer hardness is 850 $HV_{0.1}$min.

### Straightness

For Ø < 30 mm, the maximum deviation is 0.1 mm/0.5 m. The maximum deviation for larger diameters is 0.1 mm/1.0 m.

### Roundness

The out of roundness is maximised at 50 % of the diameter tolerance interval.

### Diameter tolerance

ISO f7 is standard. Other tolerances can be supplied upon request (narrowest range is ISO level 7).

# CROMAX IH 482

## Induction-hardened, hard chrome bar

Induction-hardened Cromax IH 482 is based on a medium carbon, micro-alloyed steel, which is characterised by high strength in the as-rolled condition, i.e. without heat treatment. The 482 base steel is a cost-effective alternative to traditional low-alloy, quenched and tempered grades with, in the context of piston-rod applications, equivalent properties.

The analysis of the base steel in Cromax IH 482 is well adapted to induction hardening and a high and uniform hardness is achieved throughout the case irrespective of diameter. In consequence, the resistance to even high-energy external impact is excellent.

### Average chemical analysis Cromax IH 482

| C % | Si % | Mn % | S % | V % | C.E. % (*) |
|---|---|---|---|---|---|
| 0.39 | 0.40 | 1.20 | 0.02 | 0.13 | max 0.72 |

*C.E. = % C + % Mn/6 + (% Cu + % Ni)/15 + (% Cr + % Mo + % V)/5

### Corresponding standards

The table shows the closest equivalent standard for the steel in Cromax IH 482. In most cases, the correspondence is only approximate.

| Cromax | EN | DIN | AFNOR | SAE/ASTM |
|---|---|---|---|---|
| 482 | 38MnVS6 | 38MnSiVS5 | 30MV6 | 1045V |

### Mechanical properties

| Yield stress $R_{eH}$, N/mm², min | Utimate tensile stress $R_{eH}$, N/mm² | Elongation $A_5$, %, min | Hardness HB | Thoughness KV, Joule, min |
|---|---|---|---|---|
| 580 | 850–1000 | 14 | 250–300 | No guarantee given, but normally 15–30 J at 20°C |

### Chrome layer

The thickness of the chrome layer is 20µm min.

### Surface roughness

The surface roughness (Ra) is always less than 0.2 µm and normally in the range 0.05–0.10 µm. Rt (ISO) is always less than 2.0 µm and normally in the range 0.5-1.0 µm.

### Surface hardness

The chrome layer hardness is 850 $HV_{0.1}$ min. The surface hardness in the induction-hardened zone immediately beneath the chrome layer is 55 HRC min. The depth of hardening, which is defined as the distance from the steel/chrome interface at which the hardness has dropped to 400 $HV_5$, is dependent on diameter as tabulated below:

| Size, Ø mm | Hardening depth, mm |
|---|---|
| < 40 | 1.0–2.5 |
| 40 < = < 90 | 1.0–3.0 |
| = > 90 | 1.0–5.0 |

Other hardening depths can be supplied by special arrangement.

### Straightness

The maximum deviation is 0.2 mm/1.0 m.

### Roundness

The out of roundness is maximised at 50 % of the diameter tolerance interval.

### Diameter tolerance

ISO f7 is standard. Other tolerances can be supplied upon request (narrowest range is ISO level 7).