

CROMAX[®] 482 INDUCTION HARDENED

RELATED SPECIFICATIONS:

Europe	EN 38MnVS6
Germany	DIN 38MnSiVS5
France	AFNOR 30MV6
USA	SAE/ASTM 1045V

DESCRIPTION:

Induction-hardened **Cromax[®] 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.

Cromax 482 can even be supplied in non-induction-hardened execution. Even in this condition, the product has very good resistance to surface damage from light, inadvertent impact such as may occur during rod manufacture.

TYPICAL CHEMICAL ANALYSIS:

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

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

MECHANICAL PROPERTIES:

Yield stress Rp0.2,N/nn2, min.	Ultimate tensile Stress, Rm,N/nn2	Elongation A5, %, min.	Hardness HB	Toughness 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 is minimum 20 µm.

SURFACE ROUGHNESS:

The surface roughness (Ra) is always less than 0.2 µm and normally in the range 0.05-0.15 µm. Rt (ISO) is always less than 2.0 µm and normally in the range 0.5-1.5 µm.

SURFACE HARDNESS, INDUCTION HARDENING:

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 HV₁, is tabulated below:

Size Ø mm	Hardening depth, mm
<28	1.0 - 1.5
>28-40	1.3 - 1.7
>40	1.7 - 2.3

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).

TOLERANCE RANGES:

Size, mm	ISO f7. μm	
	Upper	Lower
>18 - 30	- 20	- 41
>30 - 50	- 25	- 50
>50 - 80	- 30	- 60
>80 - 120	- 36	- 71
>120	- 43	- 83

WELDABILITY:

Cromax 482 can be MMA or MAG welded at elevated temperature. Preheating to 200-300°C is recommended; the upper limit should not be exceeded because of risk for deterioration of the chrome layer.

Cromax 482 can normally be friction welded without problems. However, special procedures may be necessary for larger diameters.

MACHINING:

Specific machining recommendations for turning and threading of Cromax 482 (base steel) are tabulated below.

Operation parameters	Rough turning	Fine turning	Threading
Feed, mm/r	0.3 - 0.6	0.05 - 0.3	—
Cut depth, mm	2 - 5	0.2 - 2.0	—
Tool (coated)	ISO P15 - P 30	ISO P10 - P15	ISO P20 - P30
Speed, m/min.	180 - 230	230 - 280	120 - 150

TURNING OF INDUCTION-HARDENED LAYER:

Recommended data are tabulated below.

Tool	Speed m/min.	Feed, mm/r	Depth of cut, mm
Whisker-reinforced ceramic	100 - 150	0.14	2.0
Mixed ceramic	60	1.10	2.0
Cubic boron nitride	120 - 150	0.08 - 0.15	0.1 - 0.5

CORROSION RESISTANCE:

The chromium layer generated in hard chrome plating contains micro cracks and its corrosion resistance is thereby limited. Ovako's Cromax products are characterised by a controlled micro crack distribution with high crack density, which in combination with specially adapted finishing procedures, provides for superior corrosion resistance.

Most corrosion resistance specifications for hard chrome products are based on salt spray testing following the ISO 9227 standard or its equivalents (see below), combined with evaluation according to ISO 10289.

ISO 9227	ASTM	DIN 50021	SALT SPRAY TYPE
NSS	B 117	SS	Neutral
AASS	B 287	ESS	Acetic acid
CASS	B 368	CASS	Copper accelerated acetic acid

While the correlation between these methods is not always clear, our experience is that a given degree of corrosion is reached 2-3 times as fast in the AASS test as in NSS testing.

Cromax in standard execution is guaranteed to attain rating 9 or better after 40 h in AASS test. The same rating will be achieved in NSS test after about 100h.

DELIVERY LENGTHS:

Production lengths are between 4.0-7.6m. Standard is 6.1 +0.1/-0m. Bars with length 7.6 +0.1/-0m can only be supplied for diameters between 40-80mm.

The "unchromed length" of each bar, i.e. the distance at each end over which the chrome layer properties and tolerances can not be guaranteed, is at most 0.15m per end, i.e. 0.3m in total per bar.

Fixed, cut lengths can be supplied if required, but at a higher price than production lengths.

PACKAGING:

Yellow plastic sleeve in wooden case. Every Cromax bar is marked with product and batch information so as to facilitate full traceability.

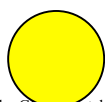
SIZES AVAILABLE:

Diameter	
mm	inches
25.4	1
30	
31.75	1 ¼
38.1	1 ½
40	
44.45	1 ¾
45	
50	
50.8	2
55	
57.15	2 ¼

Diameter	
mm	inches
60	
63.5	
65	
69.85	2 ¾
70	
75	
76.2	3
80	
82.55	3 ¼
85	
88.9	3 ½

Diameter	
mm	inches
90	
95	
95.25	3 ¾
100	
101.6	4
105	
110	
114.3	
120	
127	5

COLOUR CODE: YELLOW



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