BÖHLER

BÖHLER N690
EXTRA

STAINLESS STEEL

BÖHLER N690 EXTRA

Properties

Martensitic chromium steel with cobalt, molybdenum and vanadium addition. For tools and components which can be hardened to very high hardness levels. Surface finish required for good corrosion resistance: fine ground or polished. The alternative to conventionally melted BÖHLER N690 EX TRA is BÖHLER N690 ISO EXTRA produ ced by the Electroslag remelting procedure (ESR).

Application

Hardened cutting tools with excellent edge-holding property, such as knive blades, cutting surgical instruments, rotary knives for the meat processing industry, plate and knive-edge fulcrums, corrosion resistant roller bearings, valve needles and pistons for refrigerating machines.

Chemische Zusammensetzung / Chemical composition

(Anhaltswerte in %) / (Average %)

C	Si	Mn	Cr	Mo	V	Co
1,07	0,40	0,40	17,30	1,10	0,10	1,50

Normen / Standards

EN / DIN
< 1.4528 >
X105CrCoMo18-2

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Hot forming

Forging:

1050 to 900℃ / Coo ling in furnace

Heat treatment

Annealing:
800 to 850℃ / Furnace
Hardening:
1030 to 1080℃ / Oil
Tempering:
100 to 200℃
Structure as annealed:
Fer ri te + car bi de
Structure as hardened:
Martensite + carbide

Welding

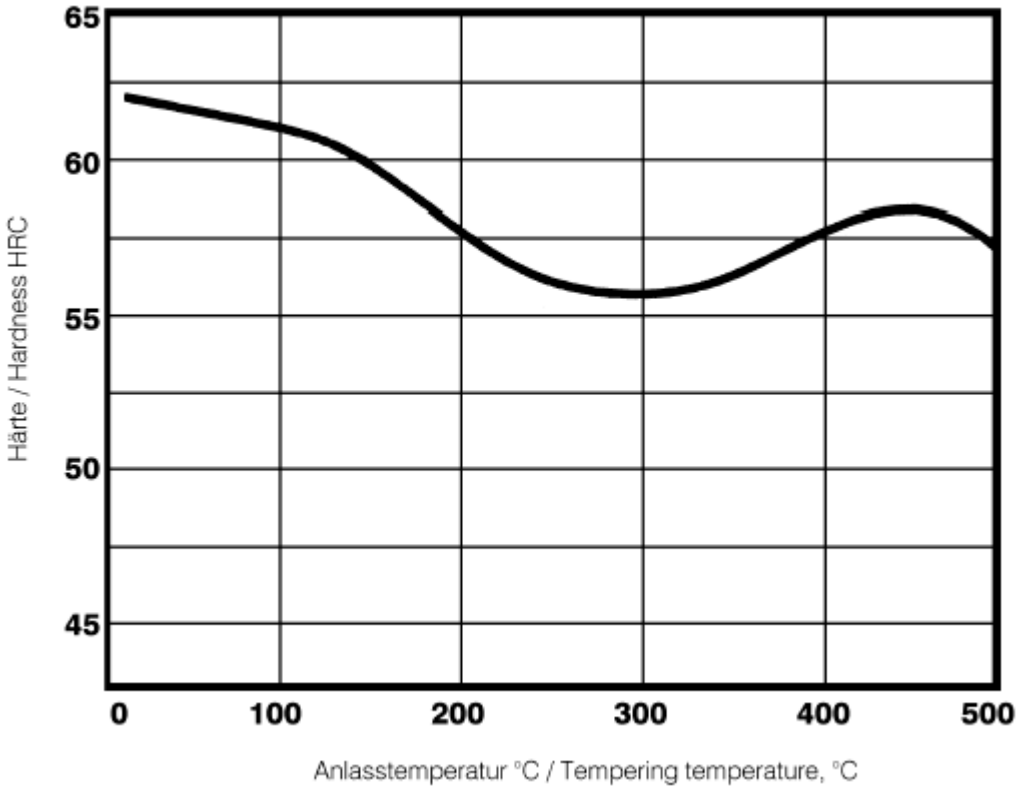
This steel cannot be welded.

Mechanical properties at room temperature

Wärmebehandlungszustand Condition	Härte Hardness
geglüht / annealed	max. 285 HB
gehärtet / hardened	60 - 62 HRC
gehärtet + angelassen / hardened and tempered	58 - 60 HRC

Tempering chart

Tempering time: 2 x 1 hour
Specimen size: square 20 mm.



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Recommendation for machining

(Condition annealed, average values)

Turning with carbide tipped tools

depth of cut mm	0,5 to 1	1 to 4	4 to 8
feed, mm/rev.	0,1 to 0,2	0,2 to 0,4	0,3 to 0,6
BÖHLERIT grade	SB10,SB20,EB10	SB20,EB10,EB20	SB30,EB20,HB10
ISO grade	P10,P20,M10	P20,M10,M20	P30,M20,K10
cutting speed, m/min			
indexable carbide inserts			
edge life 15 min	260 to 200	200 to 150	150 to 110
brazed carbide tipped tools			
edge life 30 min	210 to 170	170 to 130	140 to 90
hardfaced indexable carbide inserts			
edge life 15 min			
BÖHLERIT ROYAL 121/ISO P20	to 240	to 210	to 160
BÖHLERIT ROYAL 131/ISO P35	to 210	to 160	to 140
cutting angles for brazed carbide tipped tools			
clearance angle	6 to 8°	6 to 8°	6 to 8°
rake angle	12 to 15°	12 to 15°	12 to 15°
angle of inclination	0°	0°	- 4°

Turning with HSS tools

depth of cut, mm	0,5	3	6
feed, mm/rev.	0,1	0,5	1,0
HSS-grade BOHLER/DIN	S700 /S10-4-3-10		
cutting speed, m/min			
edge life 60 min	55 to 45	45 to 35	35 to 25
rake angle	14 to 18°	14 to 18°	14 to 18°
clearance angle	8 to 10°	8 to 10°	8 to 10°
angle of inclination	0°	0°	0°

Milling with carbide tipped cutters

feed, mm/tooth	to 0,2	0,2 to 0,3
cutting speed, m/min		
BÖHLERIT SBF / ISO P25	160 to 100	110 to 60
BÖHLERIT SB40 / ISO P40	100 to 60	70 to 40
BÖHLERIT ROYAL 131/ISO P35	140 to 110	- -

Drilling with carbide tipped tools

drill diameter, mm	3 to 8	8 to 20	20 to 40
feed, mm/rev.	0,02 to 0,05	0,05 to 0,12	0,12 to 0,18
BÖHLERIT / ISO-grade	HB10/K10	HB10/K10	HB10/K10
cutting speed, m/min	50 to 35	50 to 35	50 to 35
top angle	115 to 120°	115 to 120°	115 to 120°
clearance angle	5°	5°	5°

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Physikalische Eigenschaften — Physical properties

Dichte bei / Density at ..... 20°C ..... 7,70 ..... kg/dm^3

Wärmeleitfähigkeit bei / Thermal conductivity at ..... 20°C ..... 15,0 ..... W/(m.K)

Spezifische Wärme bei / Specific heat at ..... 20°C ..... 430 ..... J/(kg.K)

Spez. elektr. Widerstand bei / Electrical resistivity at ..... 20°C ..... 0,80 ..... Ohm.mm^2/m

Elastizitätsmodul bei / Modulus of elasticity at ..... 20°C ..... 223 x 10^3 .N/mm^2

Magnetisierbarkeit ..... vorhanden
Magnetic properties ..... magnetic

Wärmeausdehnung zwischen 20°C und ...°C, 10^{-6} m/(m.K) bei Thermal expansion between 20°C and ...°C , 10^{-6} m/(m.K) at	Temperatur / Temperature	10^{-6} m/(m.K)
	100°C	10,4
	200°C	10,8
	300°C	11,2
	400°C	11,6
	500°C	11,9

Elastizitätsmodul, 10^3 N/mm^2 bei Modulus of elasticity, 10^3 N/mm^2 at	Temperatur / Temperature	10^3 N/mm^2
	20°C	223
	100°C	217
	200°C	209
	300°C	201
	400°C	192

As regards applications and processing steps that are not expressly mentioned in this product description/data sheet, the customer shall in each individual case be required to consult us.