

## CHEMICAL COMPOSITION

C	Cr	Mo	W	Co	V	Nb
0.78	4.2	2.9	2.9	29	1.1	1.1

SAFETY DATA SHEET SDS: B

## STANDARDS

- Not yet standardized

## DELIVERY HARDNESS

- Typical soft annealed hardness is 400 HB

## DESCRIPTION

ASP®2190 is a high cobalt content grade design for PVD coated gear cutting tools. The grade is designed to maximize hot hardness, while allowing the PVD coating to protect the tool for adhesive and abrasive wear.

## APPLICATIONS

- Gear cutting tools

## FORM SUPPLIED

- Round bars

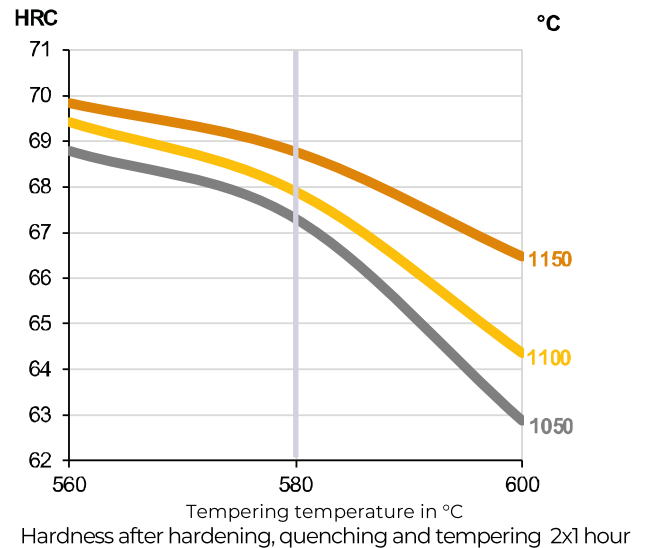
Available surface conditions: hot worked, peeled, rough machined.

## HEAT TREATMENT

- Soft annealing in a protective atmosphere at 920-950°C for 3 hours, followed by slow cooling at 10°C/h down to 700°C, then air cooling.
- Stress-relieving at 600-700°C for approximately 2 hours, slow cooling down to 500°C.
- Hardening in a protective atmosphere with preheating in 2 steps at 450-500°C and 850-900°C and austenitising at a temperature suitable for the given application and wanted hardness level (max 1150°C). Cooling down to 40-50°C.
- Tempering at 580°C two times for at least 1 hour each time. Cooling to room temperature (25°C) between temperings.

It is important to respect the maximum hardening temperature at 1150°C as any higher hardening temperature will result in a rapid decrease in toughness.

## GUIDELINES FOR HARDENING



## PROCESSING

ASP®2190 can be worked as follows:

- machining (grinding, turning, milling)
- polishing
- hot forming
- electrical discharge machining
- welding (special procedure including preheating and filler materials of base material composition).

## GRINDING

During grinding, local heating of the surface, which may alter the temper, must be avoided. Grinding wheel manufacturers can provide advice on the choice of grinding wheels.

## SURFACE TREATMENT

The steel grade is a perfect substrate material for PVD coating. If nitriding is requested, a small diffusion zone is recommended but avoid compound and oxidized layers.

**PROPERTIES**

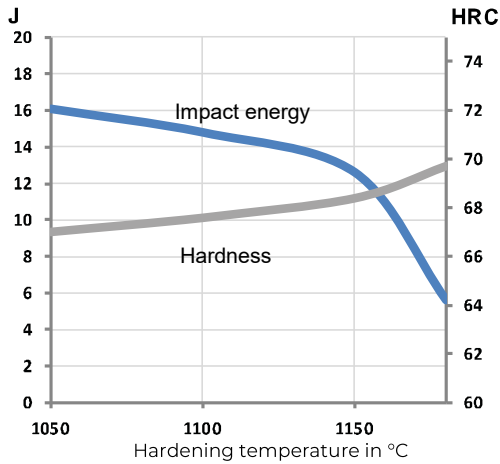
**PHYSICAL PROPERTIES**

Temperature	20°C	400°C	600°C
Density g /cm <sup>3</sup> (1)	8.1	8.0	8.0
Thermal expansion ratio per °C (2)	-	10.7x10 <sup>-6</sup>	11.2x10 <sup>-6</sup>
Thermal conductivity W/m°C (2)	-	-	30

(1)=Soft annealed

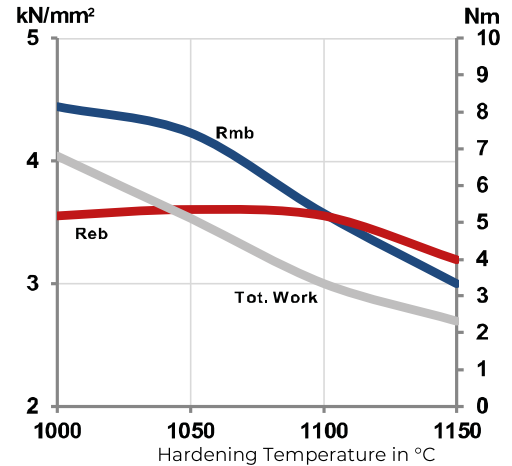
(2)=Hardened 1180°C and tempered 580°C, 2x1 hour

**IMPACT TOUGHNESS**



Original dimension Ø 103 mm  
Tempering 2 x 1 hour at 580° C  
Unnotched test piece 7 x 10 x 55 mm

**4-POINT BEND STRENGTH**



Original dimension Ø 103 mm  
Tempering 2 x 1 hour at 580°C  
Dimension of test piece Ø 4.7 mm  
Rmb = Ultimate bend strength in kN/mm<sup>2</sup>  
Reb = Bend yield strength in kN/mm<sup>2</sup>  
Tot. work = Total work in Nm

**COMPARATIVE PROPERTIES**

