ASP®2060

Powder metallurgy HSS

CHEMICAL COMPOSITION

C	Cr	Mo	W	Co	V
2.30	4.2	7.0	6.5	10.5	6.5

STANDARDS

- Europe: PMHS 7-7-7-11
- Germany: 1.3292
- AMS6560

DELIVERY HARDNESS

- Typical soft annealed hardness is 345 HB

DESCRIPTION

ASP®2060 is a very high alloyed grade for applications requiring both hot hardness and wear resistance.

APPLICATIONS

- Gear cutting tools
- Broaches
- Cold work tools
- Bearing & other Components
- Taps
- Drills
- End mills

FORM SUPPLIED

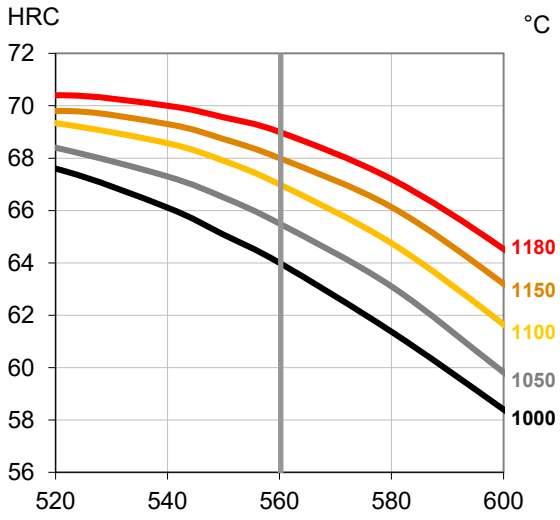
- Round bars
- Forged bars
- Flat & square bars
- Tool bit sections

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

HEAT TREATMENT

- Soft annealing in a protective atmosphere at 850-900°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 pre-heating in 2 steps at 450-500°C and 850-900°C and austenitising at a temperature, suitable for chosen working hardness. Cooling down to 40-50°C.
- Tempering at 560°C three times for at least 1 hour each time. Cooling to room temperature (25°C) between temperings.

GUIDELINES FOR HARDENING



Hardness after hardening, quenching and tempering 3x1 hour

PROCESSING

ASP®2060 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

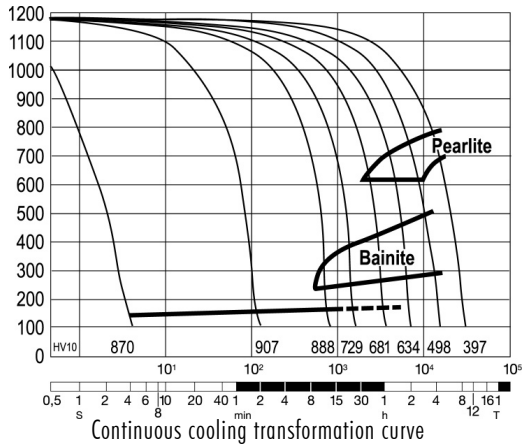
The steel grade is a perfect substrate material for PVD coating. If nitriding is requested, a small diffusion zone is recommended but avoid compound and oxidized layers.

PHYSICAL PROPERTIES

Temperature	20°C	400°C	600°C
Density g /cm³ *(1)*	7.9	7.9	7.8
Modulus of elasticity kN/mm² *(2)*	250	222	200
Thermal expansion ratio per °C *(2)*	-	$10.6x10^{-6}$	$11.1x10^{-6}$
Thermal conductivity W/m°C *(2)*	24	28	27
Specific heat J/kg °C *(2)*	420	510	600

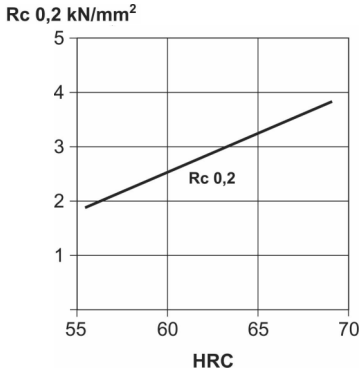
(1)=Soft annealed
(2)=Hardened 1180°C and tempered 560°C, 3x1 hour

CCT CURVE

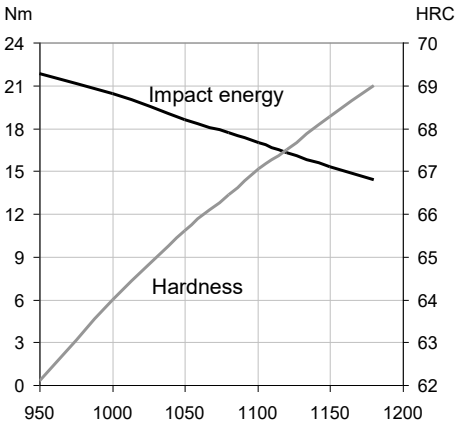


Continuous cooling transformation curve
Hardening Temperature 1180°C

COMPRESSION YIELD STRESS

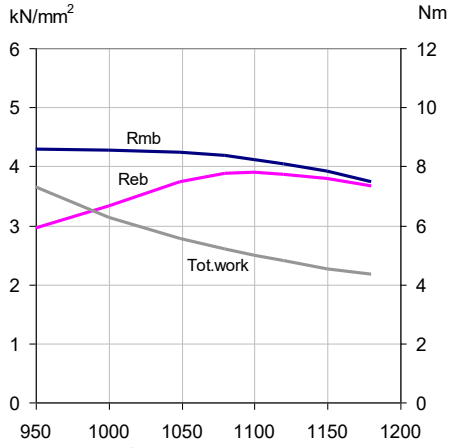


IMPACT TOUGHNESS



Hardening temperature in °C
Original dimension 9 x 12 mm
Tempering 3 x 1 hour at 560° C
Unnotched test piece 7 x 10 x 55 mm

4-POINT BEND STRENGTH



Hardening Temperature in °C
Original dimension Ø 6 mm
Tempering 3 x 1 hour at 560°C
Dimensions of test piece Ø 4.7 mm

Rmb = Ultimate bend strength in kN/mm²
Reb = Bend yield strength in kN/mm²
Tot. work = Total work in Nm

SAFETY DATA SHEET SDS: B

COMPARATIVE PROPERTIES