

## CHEMICAL COMPOSITION

C	Cr	Mo	W	Co	V
1.50	4.0	2.5	2.5	-	4.0

ASP 2005 is a grade for applications demanding high toughness.

## STANDARDS

\_ Europe: HS 3-3-4

## DELIVERY HARDNESS

Soft annealed max. 260 HB  
Cold drawn max. 310 HB  
Cold rolled max. 310 HB

## FORM SUPPLIED

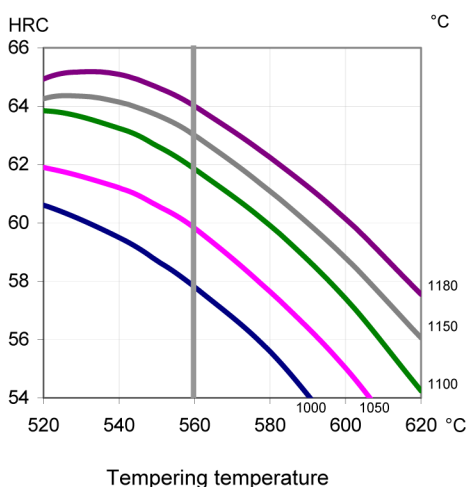
\_ Round bars  
\_ Flat & square bars

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

## 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

Hardness HRC	High Speed Steel		Tool steel	
	Hardening temperature °C	Tempering temperature °C 3x1 Std	Hardening temperature °C	Tempering temperature °C 2x2 Std
64	1180	560		
63	1140	560		
62	1110	560	1150	200
61	1090	560	1000	200
60	1060	560	1025	525
59	1040	560	1000	525

## PROCESSING

ASP 2005 can be worked as follows :

- \_ machining (grinding, turning, milling)
- \_ polishing
- \_ plastic 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 furnish advice on the choice of grinding wheels.



SURFACE TREATMENT

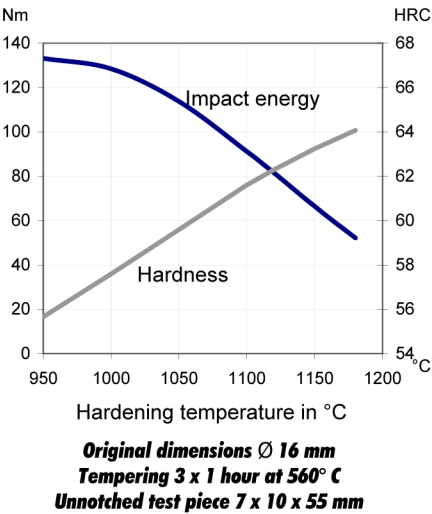
The steel grade is a good substrate material for PVD and CVD coating. If nitriding is requested a small zone of 2-15 µm is recommended. The steel grade can also be steam-tempered if so desired.

PROPERTIES  
PHYSICAL PROPERTIES

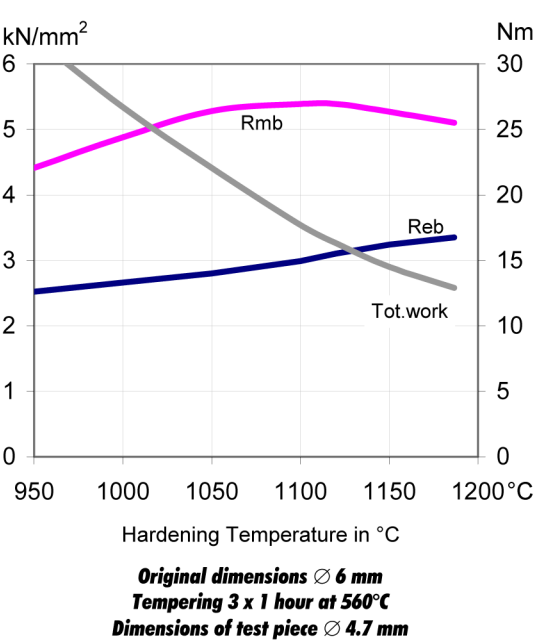
	Temperature		
	20°C	400°C	600°C
Density g /cm <sup>3</sup> (1)	7.8	7.7	7.6
Modulus of elasticity kN/mm <sup>2</sup> (2)	220	195	175
Thermal expansion ratio per °C (2)	-	12,1x10 <sup>-6</sup>	12,7x10 <sup>-6</sup>
Thermal conductivity W/m°C (2)	24	28	27
Specific heat J/kg °C (2)	420	510	600

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

IMPACT STRENGTH

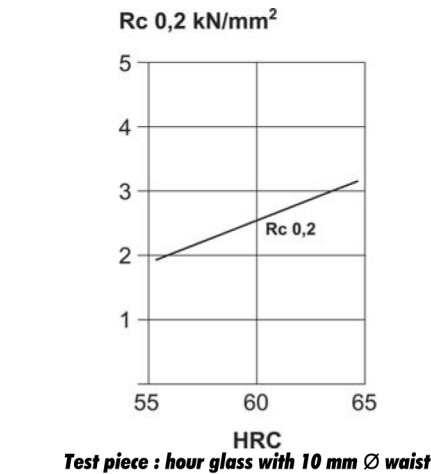


4-POINT BEND STRENGTH



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

COMPRESSION YIELD STRESS



COMPARATIVE PROPERTIES

