Powder metallurgy HSS

ASP®2060

CHEMICAL COMPOSITION

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

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

STANDARDS

_ Europe: HS 6-7-6-10
_ Germany: W.Nr. 1.3241

DELIVERY HARDNESS

Soft annealed max. 340 HB

FORM SUPPLIED

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

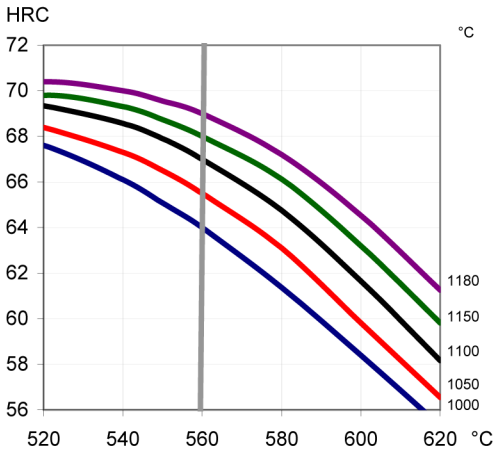
Available surface conditions : drawn, ground, hot worked, peeled, rough machined.

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.

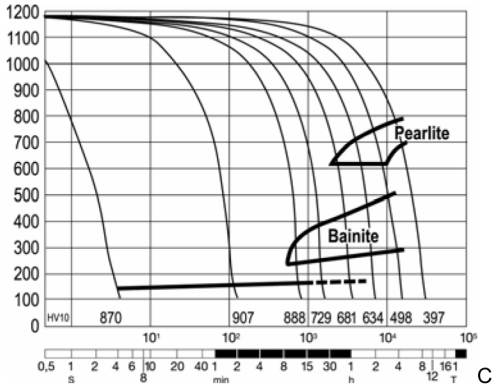
GUIDELINES FOR HARDENING

Hardness HRC	Hardening temperature °C
58	900
59	920
60	940
61	950
62	960
63	975
64	1000
65	1030
66	1070
67	1100
68	1150
69	1180



Tempering time 3x1 hour at 560°C

CCT CURVE



Continuous cooling transformation curve
Hardening Temperature 1150°C

PROCESSING

ASP 2060 can be worked as follows:
_ machining (grinding, turning, milling)
_ polishing
_ plastic forming
_ electrical discharge machining

ZAPP MATERIALS ENGINEEERING
TOOL ALLOYS

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_ 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 demanded a small zone of 2-15 µm is requested. The steel grade can also be steam-tempered if so desired.

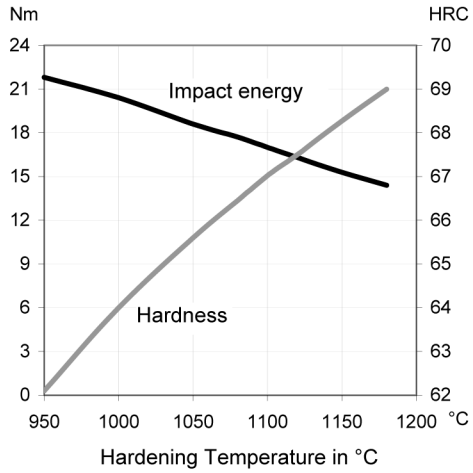
PROPERTIES

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)*	-	10.6×10^{-6}	11.1×10^{-6}
Thermal conductivity W/m°C *(2)*	24	28	27
Specific heat J/kg °C *(2)*	420	510	600

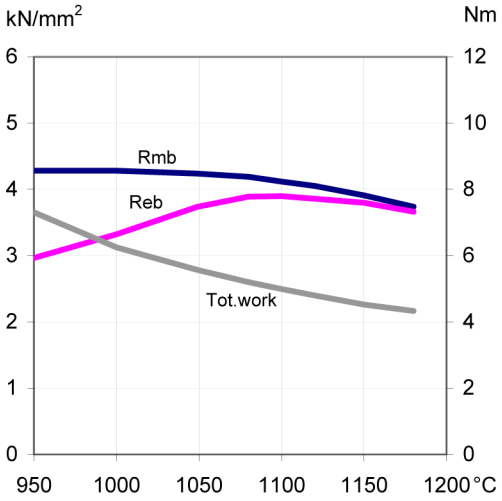
(1)=Soft annealed
(2)=Hardened 1180°C and tempered 560°C, 3x1 hour

IMPACT STRENGTH



Original dimensions 9 x 12 mm
Tempering 3 x 1 hour at 560° C
Unnotched test piece 7 x 10 x 55 mm

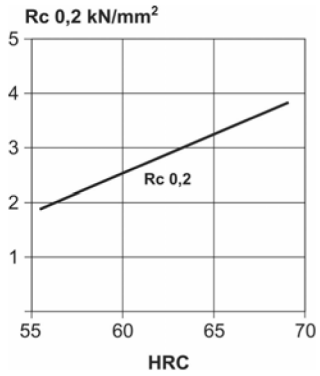
4-POINT BEND STRENGTH



Original dimensions ∅ 6 mm
Tempering 3 x 1 hour at 560°C
Dimensions of test piece ∅ 4.7 mm

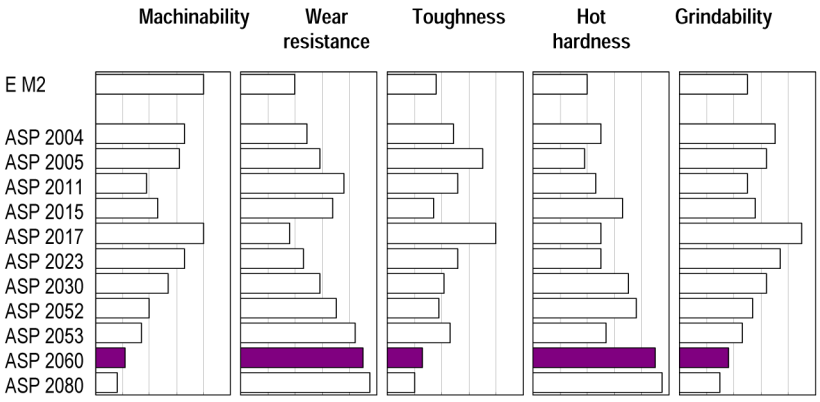
Rmb = Ultimate bend strength in kN/mm²
Reb = Bend yield strength in kN/mm²
Tot. work = Total work in Nm

COMPRESSION YIELD STRESS



Test piece : hour glass with 10 mm ∅ waist

COMPARATIVE PROPERTIES



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