

Powder metallurgy HSS

ASP[®] 2012

CHEMICAL COMPOSITION

C	Si	Mn	Cr	Mo	W	V
0.60	1.0	0.3	4.0	2.0	2.1	1.5

ASP 2012 is a powder-metallurgy high-speed steel for hot- and cold-work applications, where high toughness is needed.

DELIVERY HARDNESS

Soft annealed max. 230 HB

APPLICATIONS

- _ Cold work tools: Powder compacting tools, cold extrusion tools, cold-heading dies, fine blanking tools, moulds and inserts for hard plastics
- _ Machine components and rolls
- _ Hot-work applications: extrusion dies, forging dies and punches, hot forming dies

FORM SUPPLIED

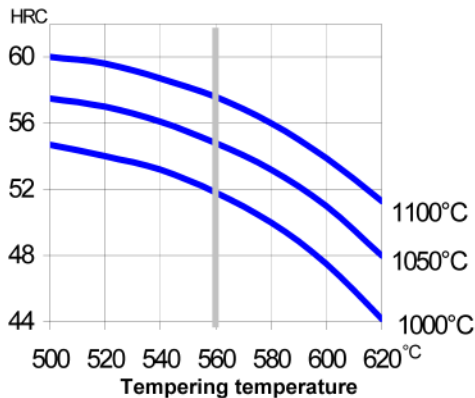
- _ Round bars
- _ Flat bars

Available surface conditions: Drawn, peeled, rough machined.

HEAT TREATMENT

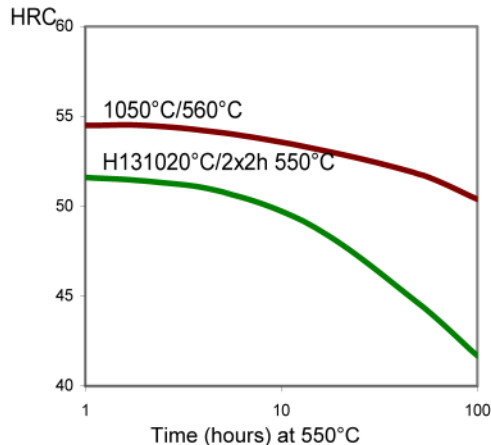
- _ Soft annealing in a protective atmosphere at 850-900°C for 3 hours, followed by slow cooling at 10°C/h down to 700°C, then air cooling.
- _ Stress-relieving at 600-700°C for approximately 2 hours, slow cooling down to 500°C.
- _ Hardening in a protective atmosphere with pre-heating in 2 steps at 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

TEMPERING RESISTANCE



PROCESSING

ASP 2012 can be machined 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.

ZAPP

ZAPP MATERIALS ENGINEERING
TOOL ALLOYS

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PROPERTIES

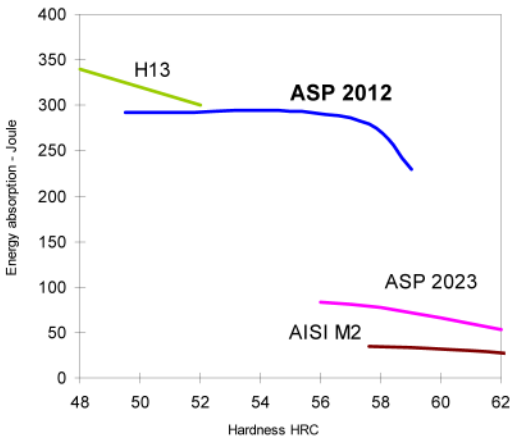
PHYSICAL PROPERTIES

	Temperature		
	20°C	400°C	600°C
Density g/cm ³ (1)	7.8	7.7	7.6
Modulus of elasticity kN/mm ² (2)	220	195	175
Coefficient of thermal expansion from 20°C, per °C (2)	-	12,1x10 ⁻⁶	12,7x10 ⁻⁶

(1)=Soft annealed

(2)=Hardened 1120°C and tempered 560°C, 3x1 hour

IMPACT STRENGTH



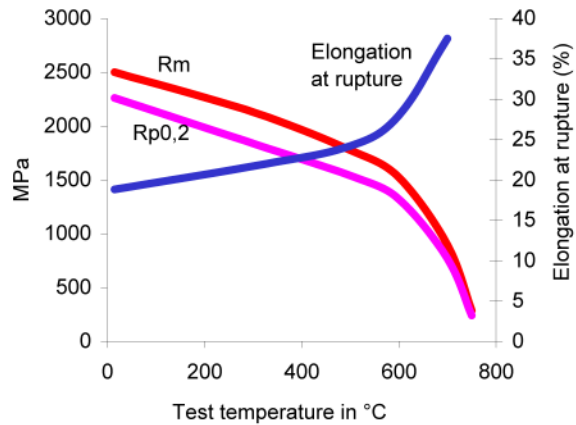
Hardening temperature in °C

Original dimensions Ø 118 mm

Tempering 3 x 1 hour at 560° C

Unnotched test piece 7 x 10 x 55 mm

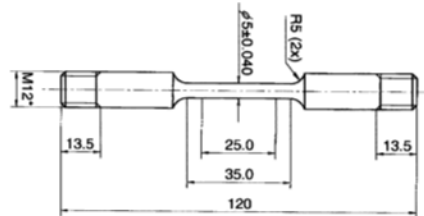
TENSILE STRENGTH



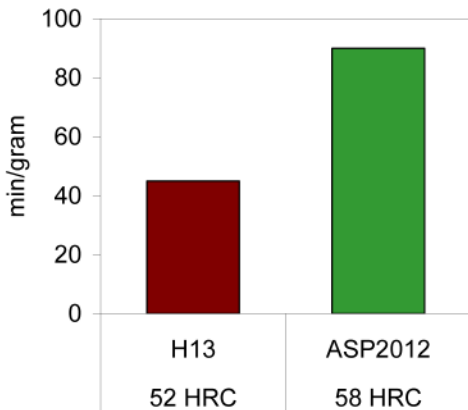
Test temperature in °C

Size of blank Ø15mm.

Test piece dimensions are given below.
Hardness 58 HRC



WEAR RESISTANCE



Wear resistance is measured as the time needed for removal of one-gram material from a test piece. Technique: Pin-on-cylinder, dry SiO₂-paper of grade 00, sliding rate 0,3m/s, load 9N and size of specimen 2 x 5 x 30mm.

COMPARATIVE PROPERTIES

