Taylor
Special Steels Ltd

ASP2012

ASP 2012 HIGH SPEED STEEL

COMPOSITION %	C	Si	Mn	Cr	Mo	W	V
	0.60	1.0	0.30	4.0	2.0	2.1	1.5
CONDITION AS SUPPLIED	Soft Annealed				Max 230 HB		

ASP 2012 is a powder-metallurgy steel for cold work and hot-work applications requiring extremely high impact strength manufactured by the ASP process. The steel is gas atomized, consolidated and processed to the dimensions required. The homogeneous microstructure of ASP 2012 with very small and hard MC-carbide particles has resulted in a unique combination of high strength (for all bar dimensions), wear resistance, hot hardness and tempering resistance. Strength is particularly high in the hardness range 50-59 HRC. ASP 2012 offers an extremely high impact strength, three times higher than other "super strength "ASP grades.
ASP 2012 impact strength is on the same level as H13 but can be hardened to 58 HRc and fills the gap between H13 and ASP2005 / ASP2023.
The powder metallurgy manufacture route will also assure dimension and shape stability during heat treatment.

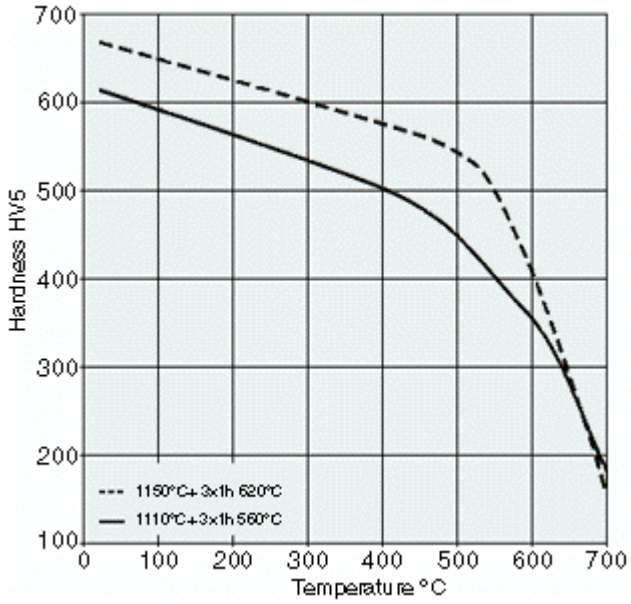
PHYSICAL PROPERTIES

			Temperature °C		
			20	400	600
DENSITY	Kg/m³	1	7835	7730	7665
MODULUS OF ELASTICITY	kN/mm²	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 1180°C and tempered 560°C, 3x1 hour

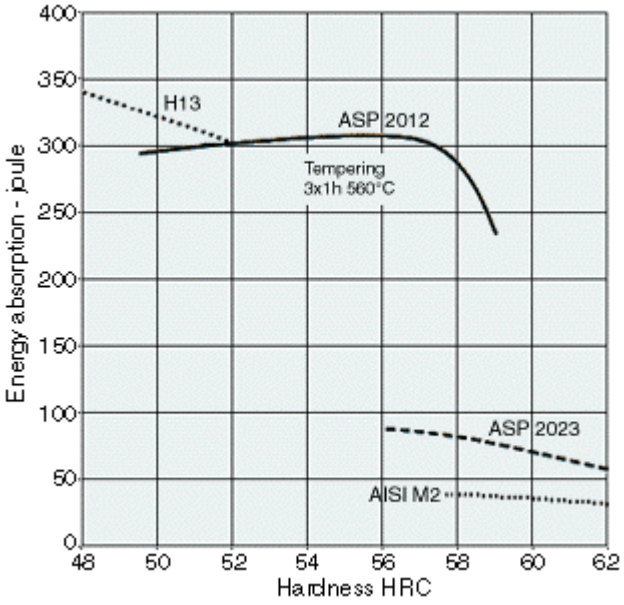
HOT HARDNESS

Curves are given for both normal heat treatment (tempering 3x1 h at 560°C) and high tempering at 620°C. Holding time before indentation = 30 minutes.



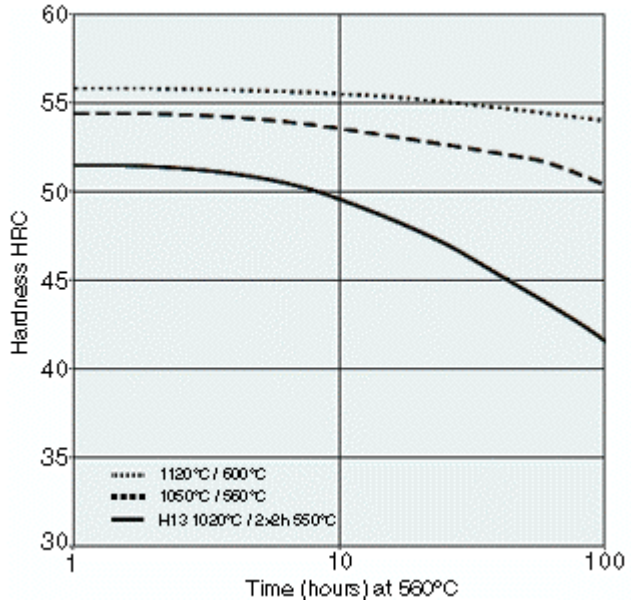
IMPACT STRENGTH

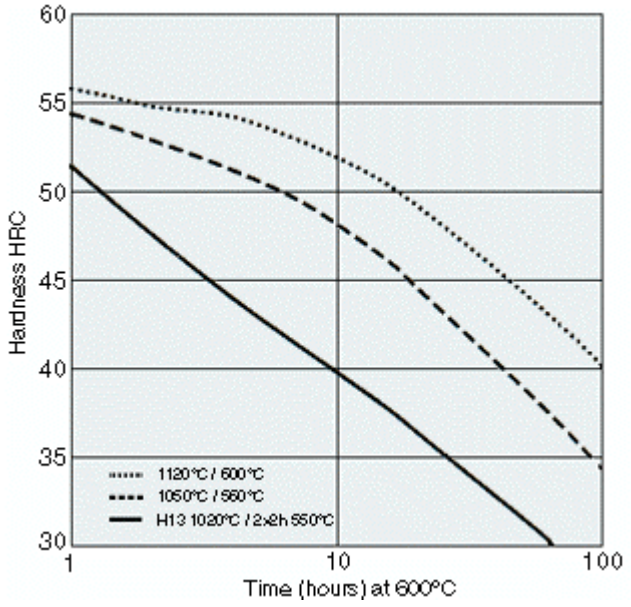
Longitudinal direction of bar section.
Unnotched test piece 7 x 10 x 55 mm



TEMPERING RESISTANCE

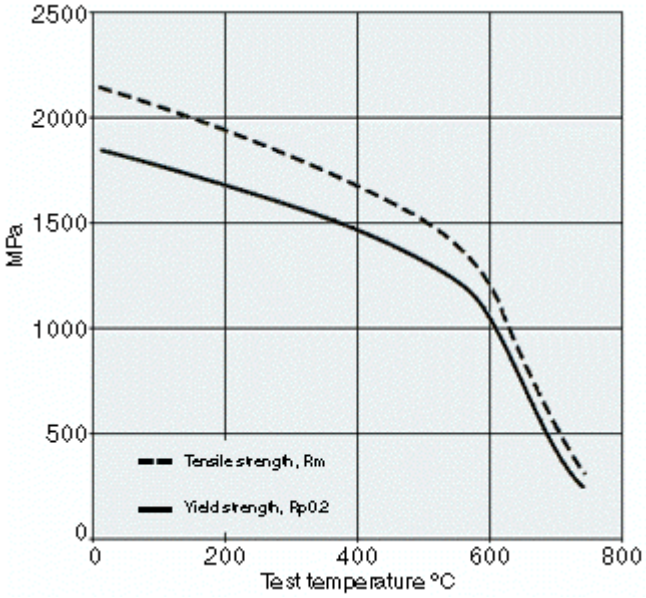
The effect of time at tempering temperature.

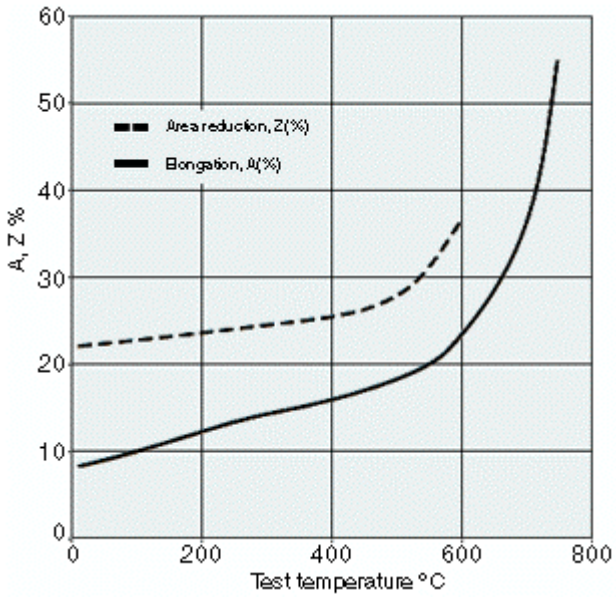




TENSILE STRENGTH

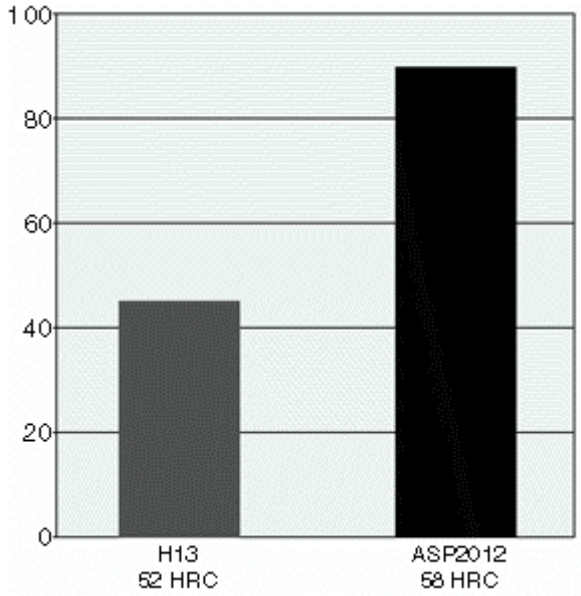
Size of blank Ø 15 mm.
Cylinder - shaped Ø 5x120 mm test piece.
1050°C / 3x1h / 560°C 55 HRC.





WEAR RESISTANCE

Wear resistance is 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 0,3 m/s, load 9N and size of specimen 2x5x30 mm.



ELECTRO DISCHARGE MACHINING (EDM)

The low content of non-metallic inclusions and the homogeneous microstructure of ASP 2012 make the EDM less complicated compared to other tool steels.

CUTTING

ASP 2012 compared to H13.

Flat face milling, cemented-carbide cutting inserts. Feed: 0,2 mm/teeth, cutting: 2 mm.

	Hardness HB	Speed m/nmm
ASP 2012	200	250
H13	180	300

Drilling, HSS-drill

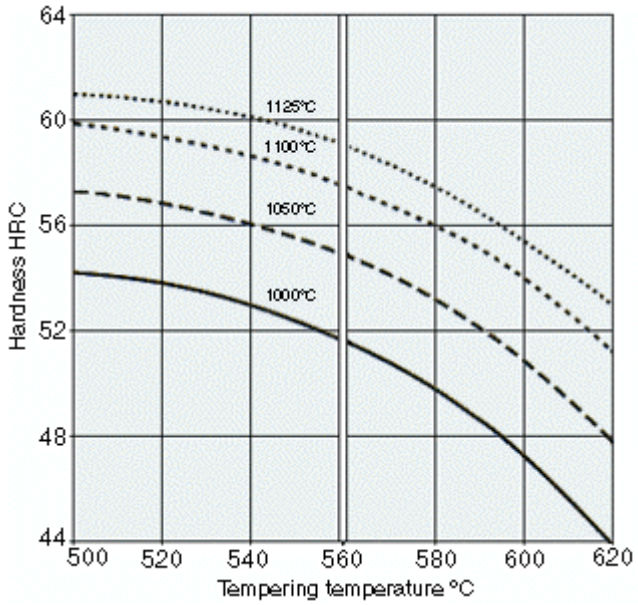
	Hardness HB	Speed m/nmm
ASP 2012	200	250
H13	180	300

HEAT TREATMENT

- Soft-annealing 850°C – 900°C, slow cooling 10°C/h to 700°C, hardness max 230 HB.
- Stress-relieving annealing 600°C – 700°C, approx. 2 hours at temperature, slow cooling to 500°C.
- Hardening according to table.
  Tempering, 3x1h at 560°C .

Hardening Temp. °C	Hardness HRC *	Yield stress in compression MPa	Typical applications
950	49-50	1130	Powder compacting tools. Tools requiring very high impact strength. Hot working tools.
1000	51-52	1410	
1050	54-55	1830	
1100	57-58	2250	
1125	59	2450	

HARDNESS VS TEMPERING TEMPERATURE°C



SURFACE TREATMENT

ASP 2012 can be ion-nitrided, nitrided by gas, plasma or in salt bath (Tenifer). The nitrided layer and especially any white-etching nitride zone, should be thin. ASP 2012 is also excellent as a substrate for PVD and CVD surface coatings.