

ASP[®] 2012

Powder Metallurgy HSS

ERASTEEL



For cold work applications



STANDARD

- Europe: HS 2-2-2
- EN: X60CrWMoV4.2.2.2

DELIVERY HARDNESS

- Typical soft annealed hardness is 230 H.

DESCRIPTION

ASP®2012 is a powder metallurgical tool steel with a unique analysis that offers outstanding ductility level together with excellent compressive strength and a good wear resistance up to 62/63 HRC.

APPLICATIONS

ASP®2012 is particularly suitable when chipping, cracks and adhesive wear are the main failures mechanism during production of Advanced High Strength Steels, soft material and thick sheet pieces.

ASP®2012 is the best in class for very high demanding application such as:

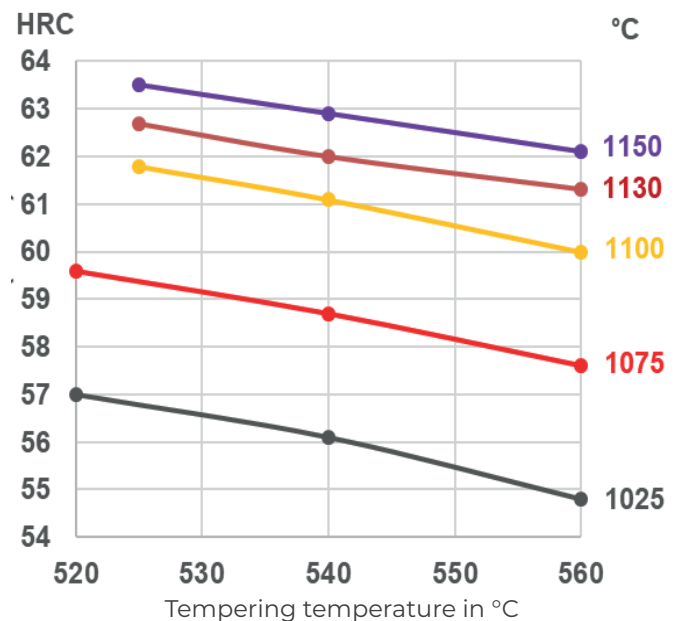
- Blanking and forming
- Deep drawing
- Fine blanking
- Powder compaction
- Plastic injection moulds, broaches to improve H11/H13 wear resistance, especially in case of large series with reinforced moulding materials (fibers).
- Machine components and rolls.
- Warm- and hot-work applications : extrusion dies, forging dies and punches
- Press hardening tools

Segment	Application	Hardness HRC	Current grades
Cold work	-Blanking, -Punching of HSS/UHSS -Fine blanking -Coining punch	58/63	-D2, M2, -PM23 types -X110CrMoV8 -X70CrMoV5
Plastic injection	Long series of small and medium parts for automotive industry	54/60	-H11 -H13 -X50CrMoV5
Press hardening	Inserts in the forming tool to enhance the wear resistance	54/59	-X50CrMoV5 -1.2367 Mod -X40CrMoV7

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.
- In case of big dimensions (>150 mm cross section) a third preheating step is recommended.
- ASP®2012 offers a variety of heat treatment possibilities depending on the application and the targeted hardness (55 to 63 HRC). The hardening temperatures range from 1025 and 1150 °C, whereas the tempering one is 525 to 560°C.
In order to better stabilize the tools, we recommend to perform 3 tempers at the chosen tempering temperature.

GUIDELINES FOR HARDENING



PROCESSING

ASP®2012 can be worked as follows:

- Machinability (grinding, turning, milling): machinability is very good, far better compared to D2 and Cr 8% type or PM23. Machinability is similar to H11/H13.
- Polishability: due to the good cleanliness level and the very even distribution of the small primary carbides, ASP®2012 is suitable for high quality surface requirements after polishing.
- Electrical discharge machining: the low content of non metallic inclusion and the homogeneous microstructure of ASP®2012 gives after EDM process a better surface finish.
- Grinding: the grindability is good, much better compared to conventional cold work tool steels.
- Welding: A special procedure has to be followed including preheating and filler materials with analysis close to the base metal. Laser welding for moulds maintenance is easy.

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 the too brittle white layer.

CHEMICAL COMPOSITION

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

PROPERTIES

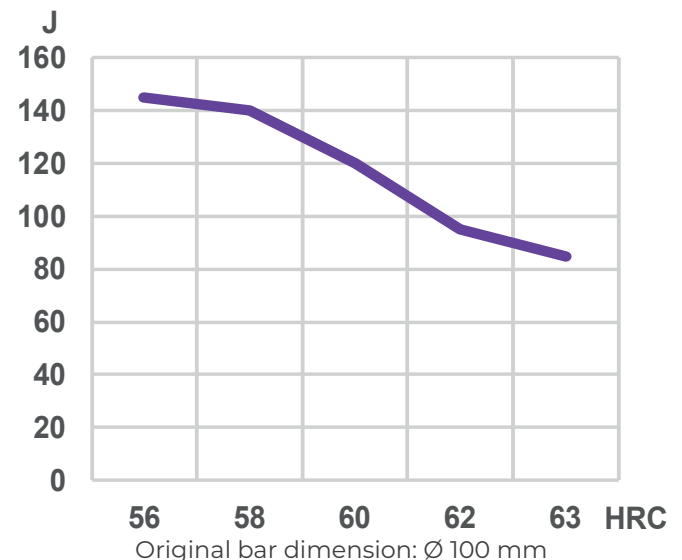
PHYSICAL PROPERTIES

Temperature	20°C	400°C	600°C
Density g /cm ³ (1)	7.8	7.7	7.6
Modulus of elasticity GPa (2)	220	195	175
Coefficient of thermal expansion from 20°C, per m/°C (2)	-	12.1x10 ⁻⁶	12.7x10 ⁻⁶
Thermal conductivity W/m°C (2)	26	30	30
Specific heat J/kg °C (2)	420	510	600

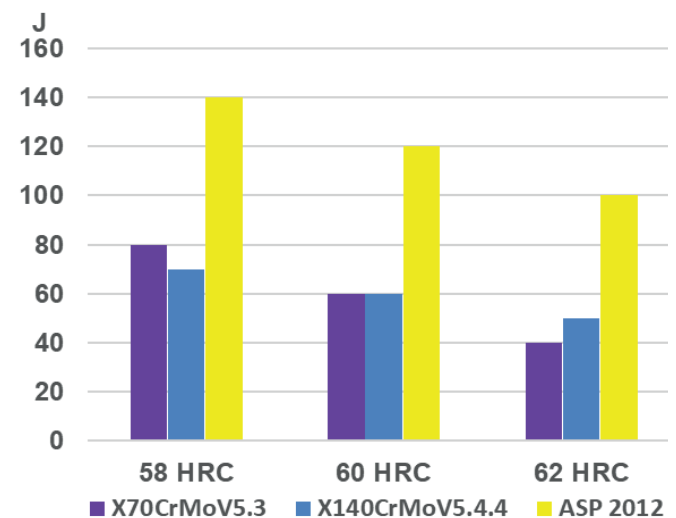
(1)=Soft annealed

(2)=Hardened 1150°C and tempered 560°C, 3x1 hour

TRANSVERSE IMPACT RESISTANCE VERSUS HARDNESS



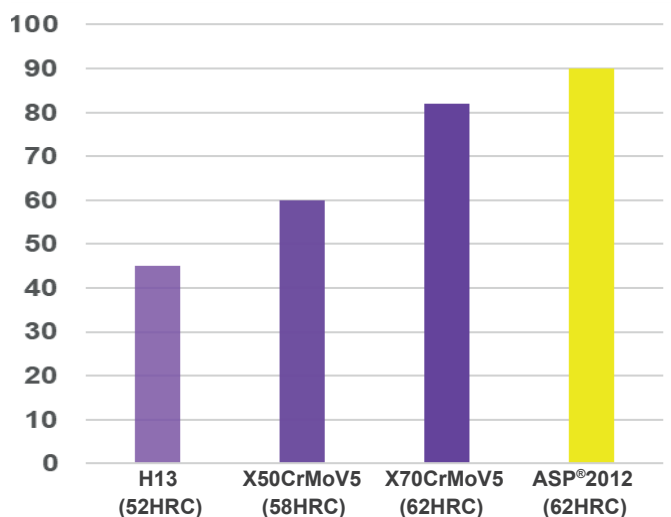
IMPACT RESISTANCE COMPARISON WITH OTHER GRADES (J)



WEAR RESISTANCE

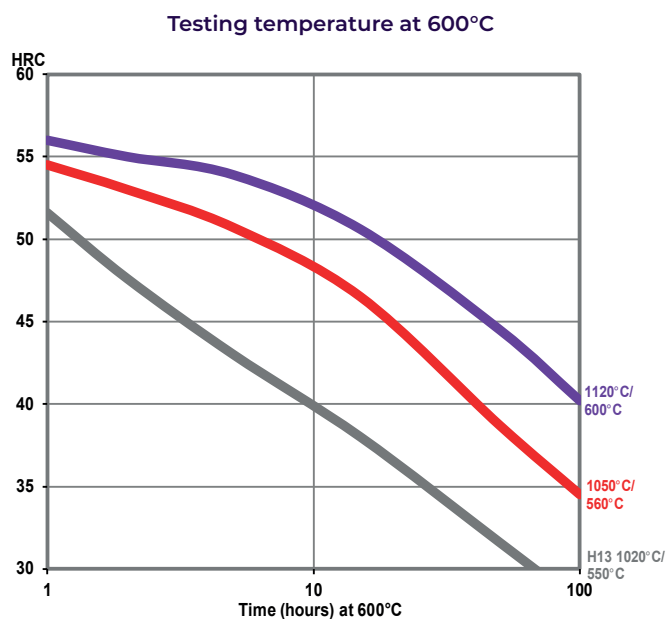
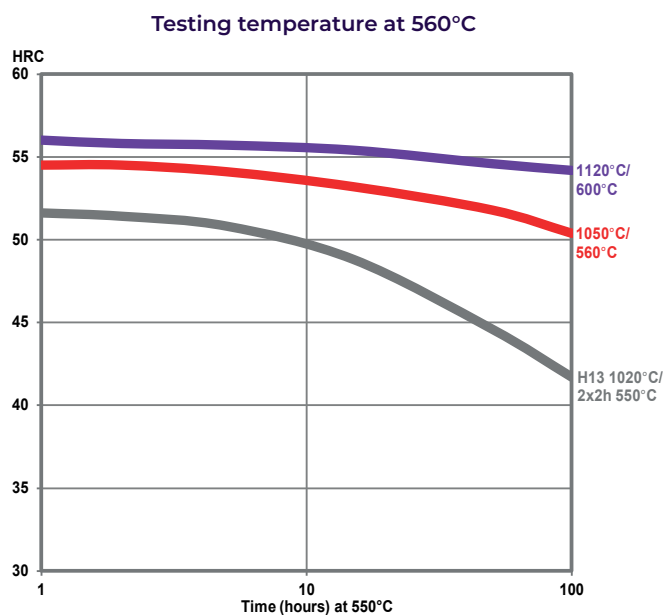
Wear resistance is the time needed for removal of one-gram material from a test piece.

RELATIVE ABRASIVE WEAR RESISTANCE COMPARISON



TEMPERING RESISTANCE

The effect of time at tempering temperature on hardness:



COMPARATIVE PROPERTIES

Grade	Abrasive wear resistance	Adhesive wear resistance	Chipping/cracking resistance	Compressive strenght	Polishability
ASP®2012	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
X160CDV12 / D2	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
X70CrMoV5.2	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
X50CrMoV5.2	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
H11 / H13	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>