

**ASP® 2012 is the best in class for high toughness up to 62-63 HRC in plastic, cold, warm, and hot applications.**

## STANDARDS

- > EN 10027-1: PMHS 2-2-2
- > EN 10027-2: 1.3397

## DELIVERY HARDNESS

- > Typical soft annealed hardness is 220 HB

## CHEMICAL COMPOSITION

Safety datasheet available

C	Cr	Mo	W	Co	V
0.60	4.0	2.0	2.1	-	1.5

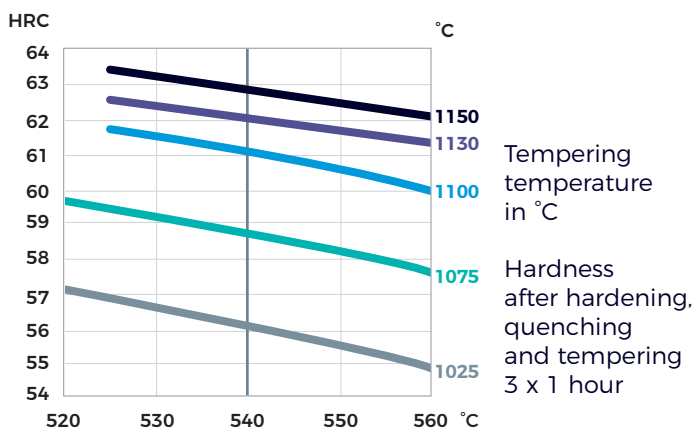
## APPLICATIONS

- > Cold work tools: powder compacting tools, cold extrusion tools, cold-heading dies, fine blanking tools
- > Plastic injection: mould for fibers reinforced plastics, broaches and injector pins
- > Machine components and rolls
- > Warm and hot-work applications: extrusion dies, forging dies and punches, press hardening tools

## 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 preheating 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.
- > The temperature tempering range from 520 to 560°C, depending on the hardening temperature, the application and the targeted hardness (55 to 63 HRC). Cooling to room temperature between tempering.

## GUIDELINES FOR HARDENING



## FORM SUPPLIED

- > Round bars
- > Flat bars

Available surface conditions: drawn, peeled, rough-machined.

## PROCESSING

ASP® 2012 can be worked as follows:

- > machining (grinding, turning, milling)
- > polishing
- > hot 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 provide advice on the choice of grinding wheels.

## 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 compound and oxidized layers.

ASP® 2012 has a good flexibility in heat treatment with hardening temperatures commonly used for cold work tool steel applications.

To achieve the optimal hardness and toughness combination, we recommend tempering at 560°C.

For a hardness above 58 HRC, do not hesitate to contact our technical support to define the best heat treatment process for the application.



**PROPERTIES**

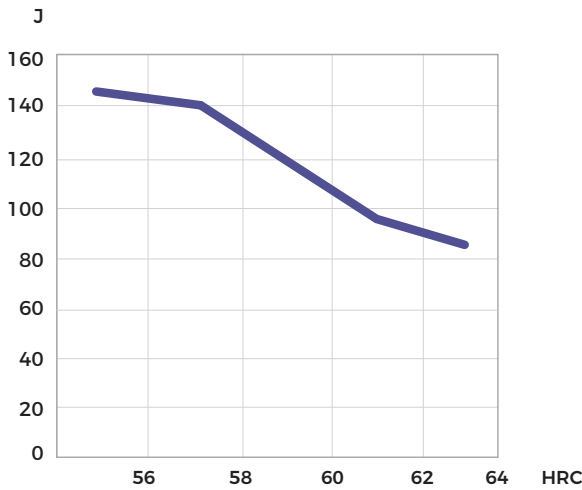
**PHYSICAL PROPERTIES**

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)	26	30	30
Specific heat J/kg°C (2)	420	510	600

(1) Soft annealed

(2) Hardened 1100°C and tempered 560°C, 3 x 1 hour

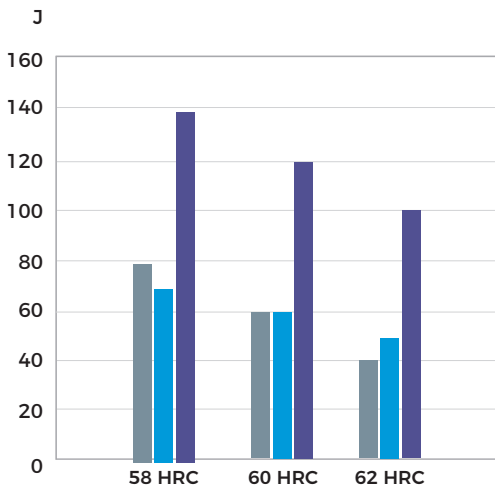
**IMPACT TOUGHNESS**



Hardening temperature in °C

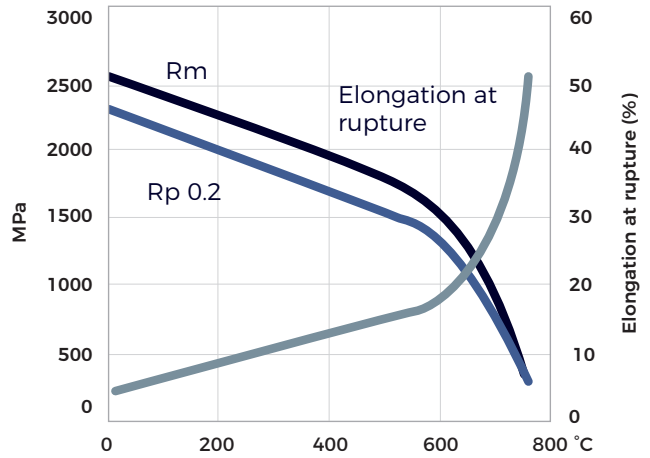
Original dimension Ø 118 mm  
 Tempering 3 x 1 hour at 560 °C  
 Unnotched test piece 7 x 10 x 55 mm  
 Transverse direction

**TOUGHNESS COMPARAISON**



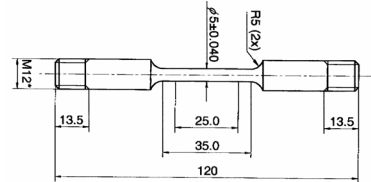
- X70CrMoV5.3
- X140CrMoV5.4.4
- ASP® 2012

**TENSILE STRENGTH**

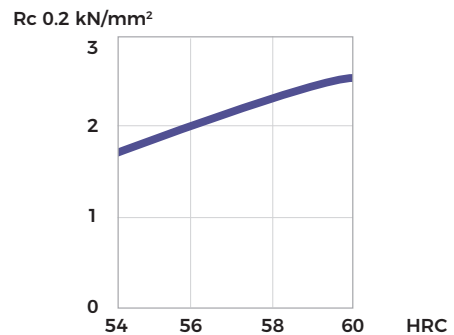


Test temperature in °C

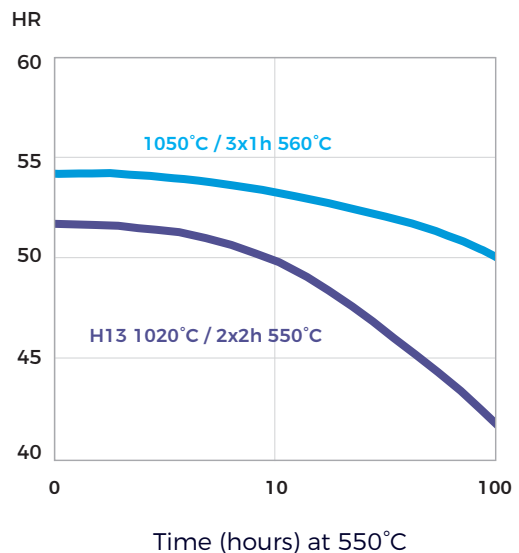
Size of blank Ø15mm  
 Test piece dimensions are given in the drawing on the right.  
 Hardness 58 HRC



**COMPRESSION YIELD STRESS**



**TEMPERING RESISTANCE**



## COMPARATIVE PROPERTIES

