

CHEMICAL COMPOSITION

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

STANDARDS

- Europe: HS 2-2-2
- Germany: 1.3397

DELIVERY HARDNESS

Soft annealed max. 230 HB

DESCRIPTION

ASP®2012 is the best in class for high toughness up to 58 HRC in cold-, warm- and hot applications.

APPLICATIONS

- Cold work tools: Powder compacting tools, cold extrusion tools, cold-heading dies, fine blanking tools.
- Plastic injection moulders, broaches and injector pins.
- Machine components and rolls.
- Warm- and hot-work applications: extrusion dies, forging dies and punches, hot forming dies.

FORM SUPPLIED

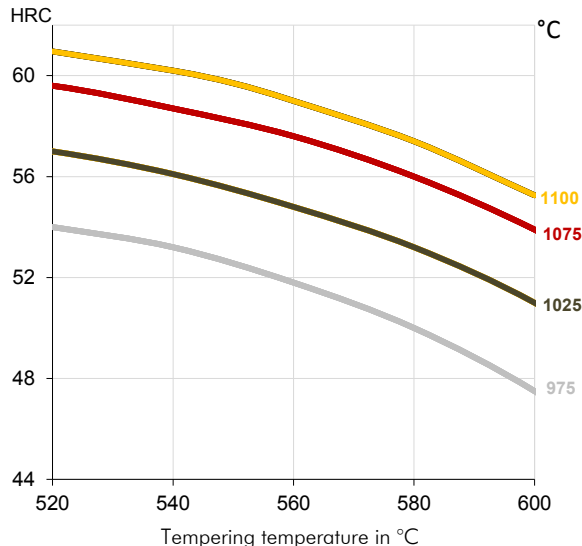
- Round bars
- Flat bars

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

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.

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.

PROPERTIES

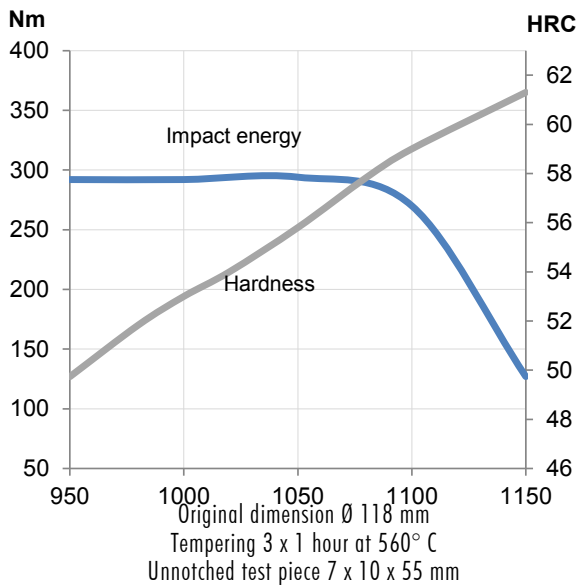
PHYSICAL PROPERTIES

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
Thermal conductivity W/m°C (2)	26	30	30
Specific heat J/kg °C (2)	420	510	600

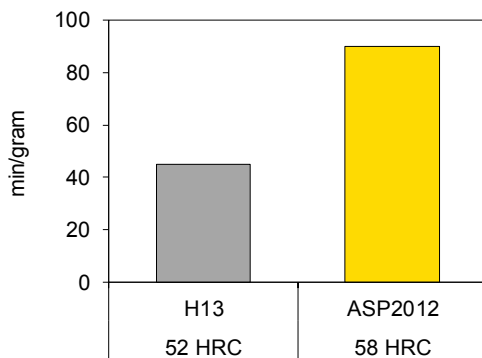
(1)=Soft annealed

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

IMPACT TOUGHNESS



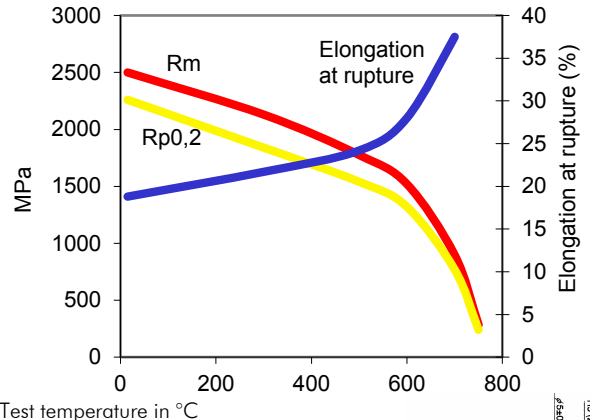
WEAR RESISTANCE



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.

TENSILE STRENGTH

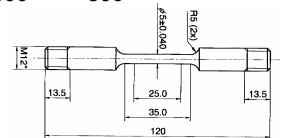


Test temperature in °C

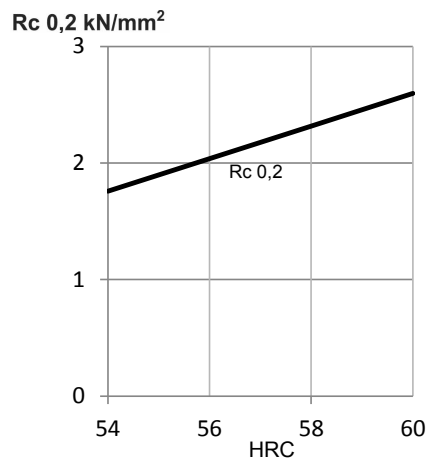
Size of blank Ø15mm

Test piece dimensions are given below.

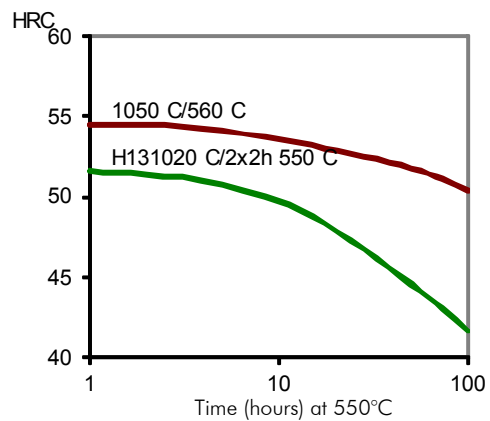
Hardness 58 HRC



COMPRESSION YIELD STRESS



TEMPERING RESISTANCE



SAFETY DATA SHEET SDS: A

COMPARATIVE PROPERTIES

