

CHEMICAL COMPOSITION

C	Cr	Mo	W	Co	V
2.45	5.25	1.3	-	-	9.75

STANDARDS

- USA: AISI A11

DELIVERY HARDNESS

Soft annealed max. 280 HB
 Cold drawn max. 320 HB
 Cold rolled max. 320 HB

DESCRIPTION

ASP 2011 is a high vanadium grade for wearing applications

APPLICATIONS

- Knives
- Wear parts
- Cold work

FORM SUPPLIED

- Coils
- Coarse Round bars
- Flat and square bars
- Sheets
- Discs
- Pieces cut from sheets

Available surface conditions: peeled, rough machined, cold rolled, hot rolled.

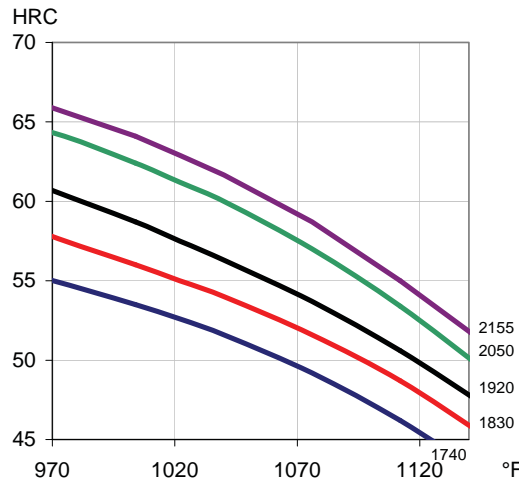
HEAT TREATMENT

- Soft annealing in a protective atmosphere at 1560-1650°F for 3 hours, followed by slow cooling at 20°F/h down to 1290°F, then air cooling.
- Stress-relieving at 1110°F to 1290°F for approximately 2 hours, slow cooling down to 930°F.
- Hardening in a protective atmosphere with pre-heating in 2 steps at 840-930°F and 1560-1650°F and austenitising at a temperature

suitable for chosen working hardness. Cooling down to 100-120°F.

- Tempering at 1040°F three times for at least 1 hour each time. Cooling to room temperature (77°F) between temperings.

GUIDELINES FOR HARDENING



Hardness after hardening, quenching and tempering 3x1 hour

PROCESSING

ASP 2011 can be worked 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.



PROPERTIES

PHYSICAL PROPERTIES

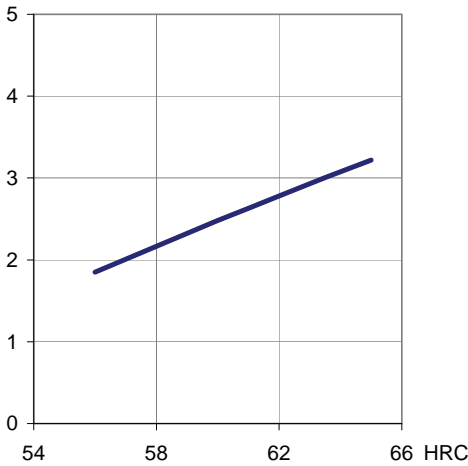
	Temperature		
	70°F	750°F	1110°F
Density lb/in ³ (1)	0.27	0.26	0.26
Modulus of elasticity psi (2)	3.2x10 ⁷	2.8 x10 ⁷	2.5 x10 ⁷
Thermal expansion ratio, per °F (2)	-	6,6x10 ⁻⁶	6,8x10 ⁻⁶
Thermal conductivity Btu/ft h °F (2)	12	14	15
Specific heat Btu/lb °F (2)	0.10	0.12	0.14

(1)=Soft annealed

(2)= Hardened 2155°F and tempered 1040°F, 3 x1 hour

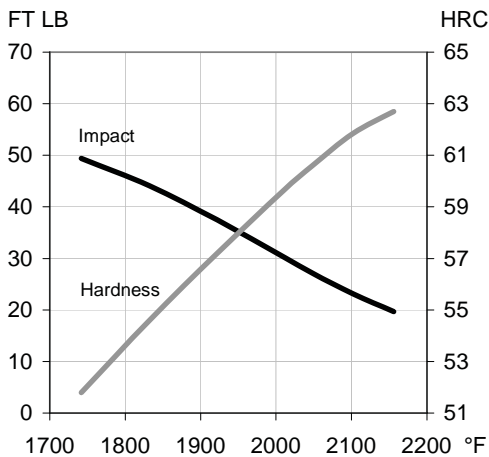
COMPRESSION YIELD STRESS

Rc 0.2
kN/mm²



Test piece : hour glass with 2/5 inch Ø waist

IMPACT STRENGTH



Hardening temperature in °F

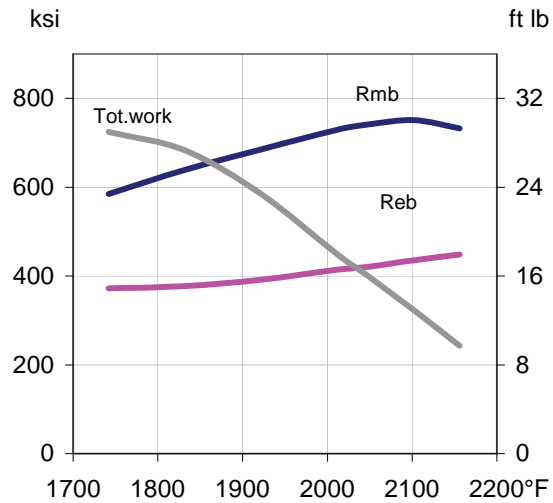
Original dimensions 1/3x1/2 mm

Tempering 3 x 1 hour at 1040° F

Unnotched test piece 9/32 x13/32 x 25/32 inch

4-POINT BEND STRENGTH

04/05 The above is for information only and does not create any binding contractual obligations
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Hardening temperature in °F

Original dimensions Ø 0.3 inch

Tempering 3 x 1 hour at 1040° F

Dimension of test piece Ø1/5 inch

NB: High quality surface

Rmb = Ultimate bend strength in ksi

Reb = Bend yield strength in ksi

Tot. work = Total work in ft lb

COMPARATIVE PROPERTIES



Hardening temperature in °F

Original dimensions 1/3x1/2 mm

Tempering 3 x 1 hour at 1040° F

Unnotched test piece 9/32 x13/32 x 25/32 inch