

ASP® 2048 is a high alloyed Powder Metallurgy steel for high performance cutting tools.

STANDARDS

> ASTM: AISI M48

DELIVERY HARDNESS

> Typical soft annealed hardness is 290 HB

CHEMICAL COMPOSITION

Also available with sulfur
Safety datasheet available

| C | Cr | Mo | W | Co | V |
|------|-----|-----|-----|-----|-----|
| 1.50 | 3.8 | 5.3 | 9.8 | 8.5 | 3.1 |

APPLICATIONS

- > Hobs
- > End mills
- > Shaper cutters

FORM SUPPLIED

- > Coils
- > Round bars
- > Flat & square bars

Available surface conditions: drawn, ground, hot-worked, peeled, rough-machined, hot-rolled.

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 austenitizing 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.

PROCESSING

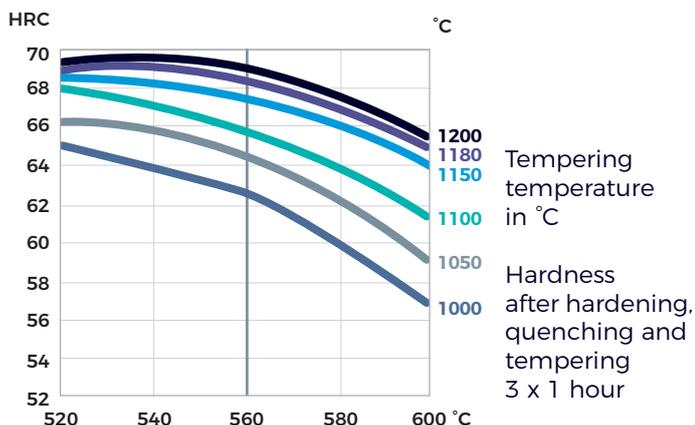
ASP® 2048 can be worked as follows:

- > 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.

GUIDELINES FOR HARDENING



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.



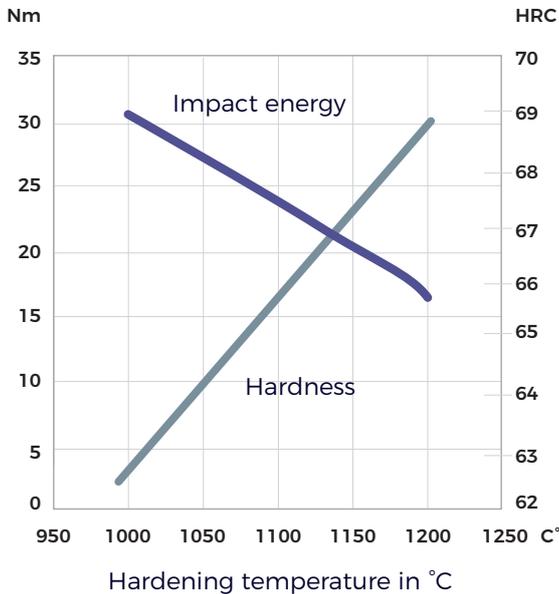
PROPERTIES

PHYSICAL PROPERTIES

| Temperature | 20 °C | 400 °C | 600 °C |
|---|-----------------------|-----------------------|-----------------------|
| Density g/cm ³ ⁽¹⁾ | 8.3 | 8.2 | 8.2 |
| Modulus of elasticity kN/mm ² ⁽²⁾ | 214 | 185 | 270 |
| Thermal expansion ratio per °C ⁽²⁾ | 10.8x10 ⁻⁶ | 11.4x10 ⁻⁶ | 12.2x10 ⁻⁶ |
| Thermal conductivity W/m°C ⁽²⁾ | 24 | 28 | 27 |
| Specific heat J/kg°C ⁽²⁾ | 420 | 510 | 600 |

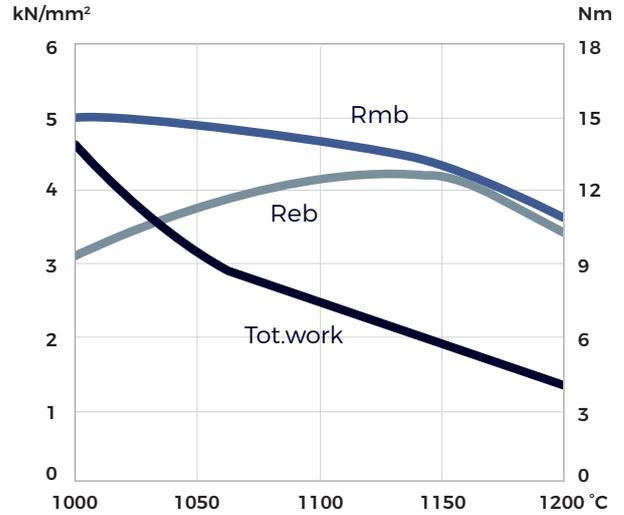
(1) Soft annealed
 (2) Hardened 1180°C and tempered 560°C, 3 x 1 hour

IMPACT TOUGHNESS



Original dimension 9 x 12 mm
 Tempering 3 x 1 hour at 560° C
 Unnotched test piece 7 x 10 x 55 mm

4-POINT BEND STRENGTH

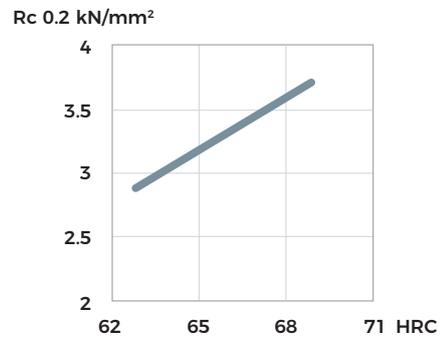


Hardening temperature in °C

Original dimension Ø 6 mm
 Tempering 3 x 1 hour at 560°C
 Dimension of test piece Ø 4.7 mm

Rmb = Ultimate bend strength in kN/mm²
 Reb = Bend yield strength in kN/mm²
 Tot. work = Total work in Nm

COMPRESSION YIELD STRESS



COMPARATIVE PROPERTIES

