

# Powder Metallurgy High-Speed Steel ASP® 2060

ERASTEEL



**ASP® 2060 is a very high alloyed grade for applications requiring both hot hardness and wear resistance.**

## STANDARDS

- > EN 1 0027-1 : PMHS 7-7-7-1 1
- > EN 10027-2: 1.3292

## DELIVERY HARDNESS

- > Typical soft annealed hardness is 340 HB

## CHEMICAL COMPOSITION

Safety datasheet available

| C    | Cr  | Mo  | W   | Co   | V   |
|------|-----|-----|-----|------|-----|
| 2.30 | 4.2 | 7.0 | 6.5 | 10.5 | 6.5 |

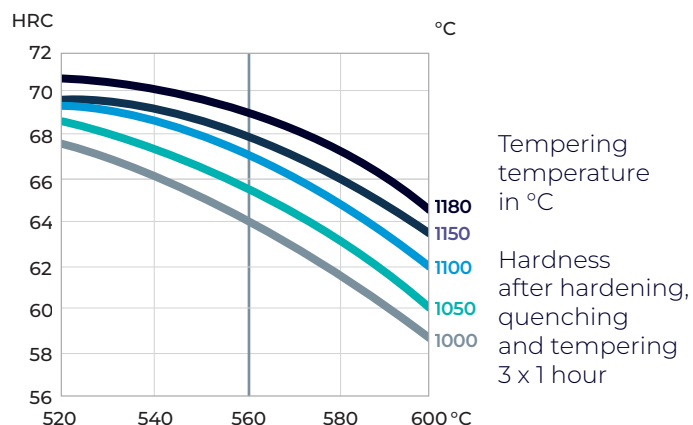
## APPLICATIONS

- > Gear cutting tools
- > Broaches
- > Cold work tools
- > Bearing & other components
- > Taps
- > Drills
- > End mills

## 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 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.

## GUIDELINES FOR HARDENING



## FORM SUPPLIED

- > Round bars
- > Flat & square bars
- > Forged bars
- > Tool bit sections

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

## PROCESSING

ASP® 2060 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.





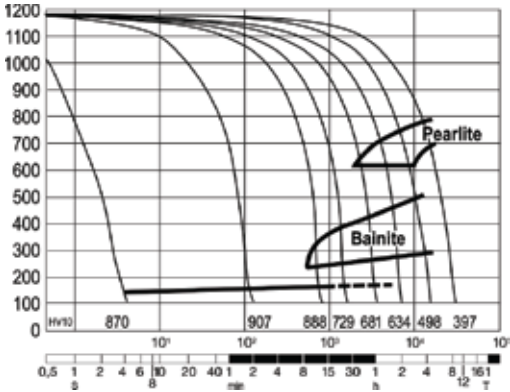
PROPERTIES

PHYSICAL PROPERTIES

| Temperature                                   | 20°C | 400°C                 | 600°C                 |
|-----------------------------------------------|------|-----------------------|-----------------------|
| Density g/cm³ <sup>(1)</sup>                  | 7.9  | 7.9                   | 7.8                   |
| Modulus of elasticity kN/mm² <sup>(2)</sup>   | 250  | 222                   | 200                   |
| Thermal expansion ratio per °C <sup>(2)</sup> | -    | 10.6x10 <sup>-6</sup> | 11.1x10 <sup>-6</sup> |
| Thermal conductivity W/m°C <sup>(2)</sup>     | 24   | 28                    | 27                    |
| Specific heat J/kg°C <sup>(2)</sup>           | 420  | 510                   | 600                   |

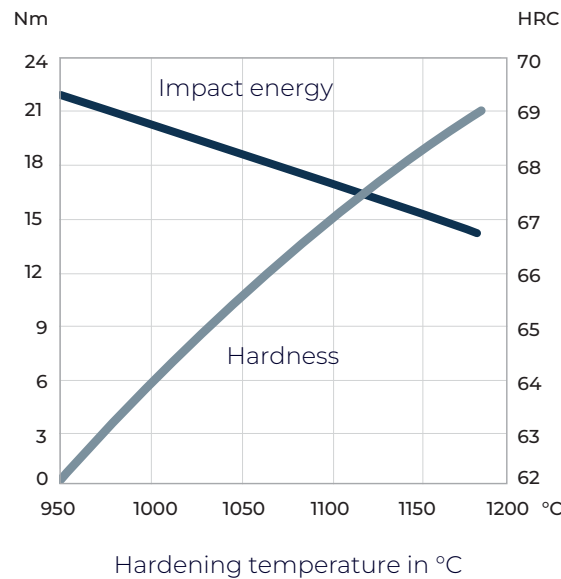
(1) Soft annealed  
(2) Hardened 1180°C and tempered 560°C, 3 x 1 hour

CCT CURVE



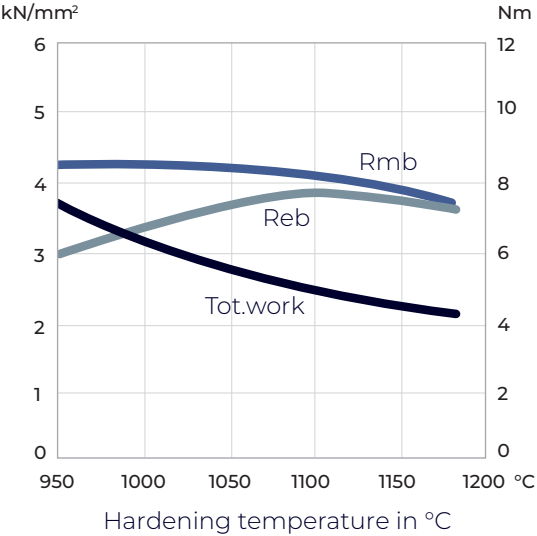
Continuous cooling transformation curve  
Hardening temperature 1180°C

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

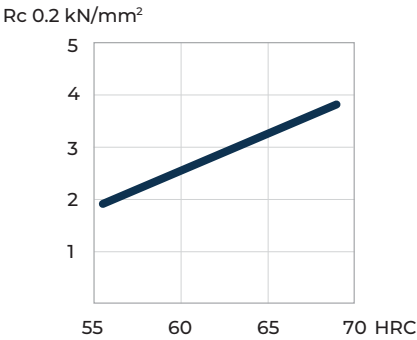
4-POINT BEND STRENGTH



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

