

## CHEMICAL COMPOSITION

| C   | Cr   | Mo  | W | V   |
|-----|------|-----|---|-----|
| 1.9 | 5.25 | 1.3 | - | 9.1 |

SAFETY DATA SHEET SDS: A

## STANDARDS

- No standard

## DELIVERY HARDNESS

- Typical soft annealed hardness is 250 HB

## DESCRIPTION

ASP<sup>®</sup>2009 is a high alloyed PM grade for applications where high wear resistance and toughness are needed.

## APPLICATIONS

- Extrusion tooling
- Hot work tools
- Knives
- Cold work

## FORM SUPPLIED

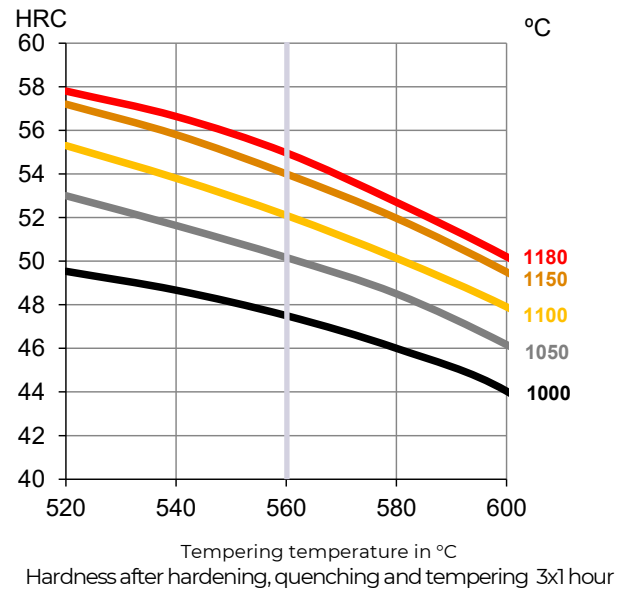
- Coils
- Forged blanks
- Round bars
- Flat & square bars

Available surface conditions: drawn, ground, hot worked, 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 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.
- Tempering at 560°C three times for at least 1 hour each time. Cooling to room temperature (25°C) between temperings.

## GUIDELINES FOR HARDENING



## PROCESSING

ASP<sup>®</sup>2009 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

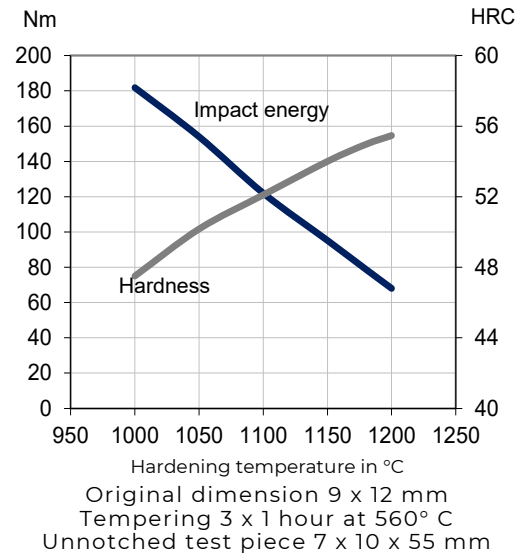
### PHYSICAL PROPERTIES

| Temperature                                  | 20°C                  | 400°C                 | 600°C                 |
|--|-----------------------|-----------------------|-----------------------|
| Density g /cm <sup>3</sup> (1)               | 7.5                   | 7.4                   | 7.3                   |
| Modulus of elasticity kN/mm <sup>2</sup> (2) | 221                   | 197                   | 177                   |
| Thermal expansion ratio per °C (2)           | 11.1x10 <sup>-6</sup> | 11.6x10 <sup>-6</sup> | 11.9x10 <sup>-6</sup> |
| Thermal conductivity W/m°C (2)               | 24                    | 28                    | 27                    |
| Specific heat J/kg °C (2)                    | 420                   | 510                   | 600                   |

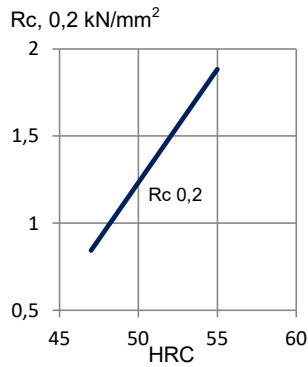
(1)=Soft annealed

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

### IMPACT TOUGHNESS



### COMPRESSION YIELD STRESS



### COMPARATIVE PROPERTIES

