# Powder metallurgy HSS

# ASP®2053

## CHEMICAL COMPOSITION

| C | Cr | Mo | W | Co | V |
|---|---|---|---|---|---|
| 2.48 | 4. 2 | 3.1 | 4.2 | - | 8.0 |

ASP 2053 is a high V-alloyed grade with excellent abrasive wear resistance.

## STANDARDS

_ Europe: HS 4-3-8

## DELIVERY HARDNESS

Soft annealed max. 300 HB
Cold drawn max. 340 HB
Cold rolled max. 340 HB

## FORM SUPPLIED

_ Coils
_ Round bars
_ Forged blanks
_ Flat & square bars
• _ Sheets
• _ Discs
• _ Laserstrip

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

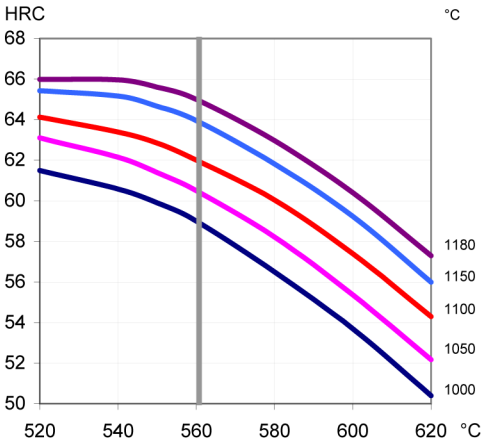
## HEAT TREATMENT

_ 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 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.

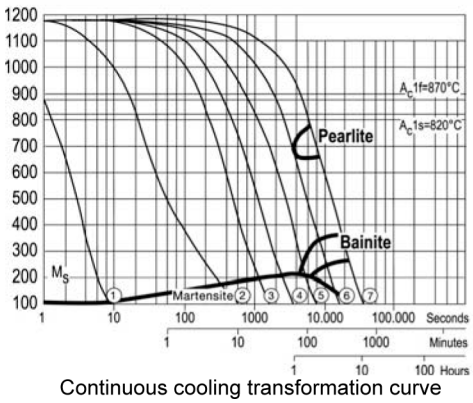
## GUIDELINES FOR HARDENING

| Hardness HRC | Hardening temperature °C |
|---|---|
| 56 | 950 |
| 58 | 1000 |
| 60 | 1030 |
| 61 | 1050 |
| 62 | 1075 |
| 63 | 1100 |
| 64 | 1130 |
| 65 | 1150 |
| 66 | 1180 |

Tempering Temperature
Tempering time 3x1 hour at 560°C




## CCT CURVE




Continuous cooling transformation curve
Hardening Temperature 1180°C

## PROCESSING

ASP 2053 can be worked as follows:
_ machining (grinding, turning, milling)
_ polishing
_ plastic forming
_ electrical discharge machining
_ welding (special procedure including


zapp
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## 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.

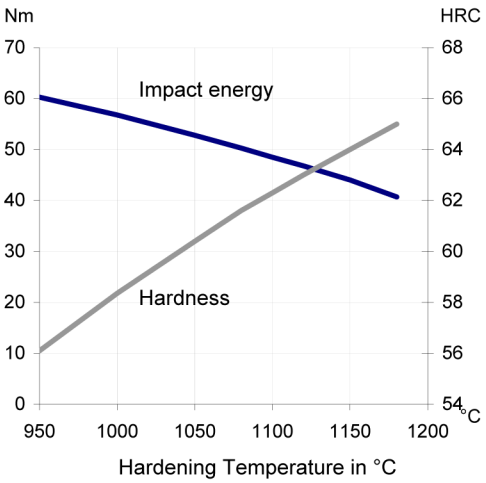
# PROPERTIES

## PHYSICAL PROPERTIES

| | Temperature | | |
|---|---|---|---|
| | 20°C | 400°C | 600°C |
| Density g /cm³ *(1)* | 7.7 | 7.6 | 7.5 |
| Modulus of elasticity kN/mm² *(2)* | 250 | 220 | 200 |
| Thermal conductivity W/m°C *(2)* | 24 | 28 | 27 |
| Specific heat J/kg °C *(2)* | 420 | 510 | 600 |

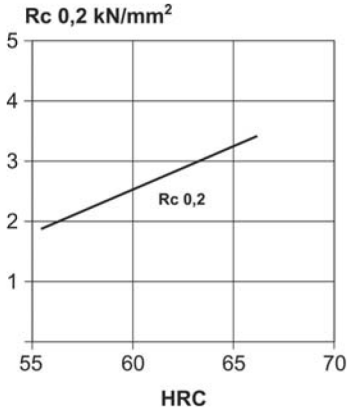
*(1)*=Soft annealed
*(2)*=Hardened 1180°C and tempered 560°C, 3x1 hour

## IMPACT STRENGTH



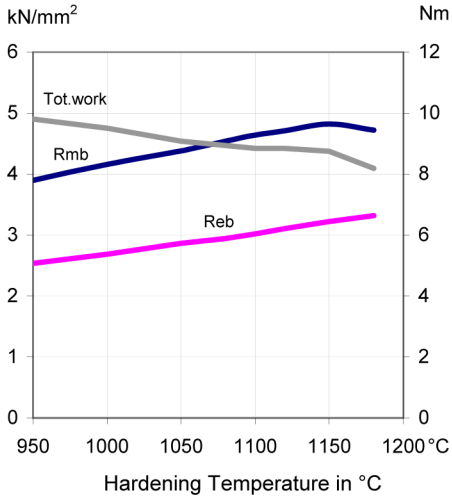

***Original dimensions ∅ 16 mm***
***Tempering 3 x 1 hour at 560°C***
***Unnotched test piece 7 x 10 x 55 mm***

## COMPRESSION YIELD STRESS




***Test piece : hour glass with 10 mm ∅ waist***

## 4-POINT BEND STRENGTH




***Original dimensions ∅16 mm***
***Tempering 3 x 1 hour at 560°C***
***Dimensions of test piece ∅ 4.7 mm***

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

## COMPARATIVE PROPERTIES