Powder metallurgy HSS

ASP® 2053

CHEMICAL COMPOSITION

<table>
<thead>
<tr>
<th>C</th>
<th>Cr</th>
<th>Mo</th>
<th>W</th>
<th>Co</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.48</td>
<td>4.2</td>
<td>3.1</td>
<td>4.2</td>
<td>-</td>
<td>8.0</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Hardness</th>
<th>Hardening temperature °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>56</td>
<td>950</td>
</tr>
<tr>
<td>58</td>
<td>1000</td>
</tr>
<tr>
<td>60</td>
<td>1030</td>
</tr>
<tr>
<td>61</td>
<td>1050</td>
</tr>
<tr>
<td>62</td>
<td>1075</td>
</tr>
<tr>
<td>63</td>
<td>1100</td>
</tr>
<tr>
<td>64</td>
<td>1130</td>
</tr>
<tr>
<td>65</td>
<td>1150</td>
</tr>
<tr>
<td>66</td>
<td>1180</td>
</tr>
</tbody>
</table>

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
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

<table>
<thead>
<tr>
<th>Property</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20°C</td>
</tr>
<tr>
<td>Density g/cm³ (1)</td>
<td>7.7</td>
</tr>
<tr>
<td>Modulus of elasticity kN/mm² (2)</td>
<td>250</td>
</tr>
<tr>
<td>Thermal conductivity W/m°C (2)</td>
<td>24</td>
</tr>
<tr>
<td>Specific heat J/kg °C (2)</td>
<td>420</td>
</tr>
</tbody>
</table>

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

IMPACT STRENGTH

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

COMPARATIVE PROPERTIES

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