Well balanced steel in high wear resistance and high toughness!!

DURO-V5 is made by using NACHI’s original steel manufacturing and refining technologies. It combines the toughness of Matrix HSS with the wear resistance that is higher than SKH51 (M2).

- High purification reduces levels of non-metallic inclusions for super toughness and great fatigue strength
- Carbide volume and size are the best controlled to get superior balance of toughness and wear resistance.

### Features

<table>
<thead>
<tr>
<th>Applications</th>
<th>Features</th>
<th>Hardness (HRC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold working die and mold steel</td>
<td>Higher wear resistance than Matrix HSS or SKH51 (M2). Good toughness like Matrix HSS and higher than SKH51 (M2). Well balanced wear resistance and toughness in the range of 60 to 62 HRC.</td>
<td>56 – 62</td>
</tr>
</tbody>
</table>

### Applications

- Fine-blanking die for hard-workable materials like high-tensile steel sheets
- Thin round punch which requires toughness
- Thin or complex shape blanking punch which requires toughness
- Die and mold for cold forging
- Mandrel for flow-forming process

### Heat treatment conditions

#### Recommended heat treatment conditions

<table>
<thead>
<tr>
<th>Quenching (°C)</th>
<th>Tempering (°C)</th>
<th>Hardness (HRC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[For toughness] 1140</td>
<td>580 x 2 times</td>
<td>60.0</td>
</tr>
<tr>
<td>[Standard] 1160</td>
<td>560 x 2 times</td>
<td>62.0</td>
</tr>
</tbody>
</table>

### Hardness chart

- Quenching temperature
  - 1140°C
  - 1120°C
  - 1100°C
  - 1080°C

- Tempering temperature (°C)
  - 480
  - 500
  - 520
  - 540

*Hardness may be 2 HRC lower than this chart if you use vacuum furnace.

* Matrix HSS: Tough HSS grades with less carbides.
**Mechanical properties**

**Wear resistance**

<table>
<thead>
<tr>
<th>Wear ratio (mm/kgf (v^3))</th>
<th>Friction speed (m/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>0</td>
</tr>
<tr>
<td>2.0</td>
<td>1</td>
</tr>
<tr>
<td>3.0</td>
<td>2</td>
</tr>
<tr>
<td>4.0</td>
<td>3</td>
</tr>
<tr>
<td>5.0</td>
<td>4</td>
</tr>
</tbody>
</table>

- Ogoshi wear tester
  - Rotor: SCM435
  - Distance: 200 m
  - Final load: 6.3 kg
- SKH51 (M2) (82 HRC) vs. DURO-V5 (60 HRC)

**Dimensional change after heat treatment**

- AsQ 540 560 580 600
- Distortion (%)
  - Axial direction
  - Radial direction

**Bending fracture strength**

- Matrix HSS
  - DURO-V5
- SKH51 (M2)

- Hardness (HRC)
  - 60 61 62 63

- Charpy impact value (J/cm\(^2\))
  - 0 20 40 60 80 100

**Impact value**

- No notch sample
  - Sample size: 5 x 10

**Production Range**

- Round Bar: Max 240 mm dia.
- Square Bar/Flat Bar: Max 200 x 200 mm

* Detail information about size will be suggested by Nachi sales staffs.

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