DC53 Features:

- Uniform distribution of fine carbides
- Excellent galling and wear resistance
- Exceptional toughness and fatigue resistance
- High temper resistance to support PVD and Nitride surface treatments
- Machining and grinding characteristics superior to most other tool steels
- Rounds from 1/4” diameter up to 20” diameter
- Flats from 1/2” to 12” thick & widths up to 24” wide

The High Performance Alternative for:

- Punches
- Dies
- Draw & Form Dies
- Shear Blades
- Shredder Knives
- Thread & Form Rolls
- Cold Heading Dies
- Mill Rolls & Slitters
**DC53** is a general purpose cold work tool steel with exceptional Toughness, Wear Resistance, Compressive Strength and Temper Resistance. These properties are obtained through its chemistry as well as its unique manufacturing process of ladle refinement, vacuum degassing and forging methods. **DC53** also has excellent machining characteristics and is well suited as a substrate for PVD surface treatments. **DC53** can also be hot process CVD and TD (Thermal Diffusion) coated, however post heat treat is generally recommended.

### Primary Carbides

Primary Carbides in **DC53** are relatively small with highly uniform distribution as compared to other tool steel grades such as D2. This helps to provide **DC53** with its superior toughness and fatigue resistances.

![](Image)

**Grinding**

DC53 can typically be machined 20% to 40% faster than D2 while experiencing as much as 50% less tool wear and breakdown.

Faster feeds and speeds reduce machining cost and yield an improved surface finish.

### Chemical Composition %

<table>
<thead>
<tr>
<th>Element</th>
<th>DC53</th>
<th>D2</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>.95</td>
<td>.55</td>
</tr>
<tr>
<td>Si</td>
<td>1.0</td>
<td>0.6</td>
</tr>
<tr>
<td>Mn</td>
<td>0.4</td>
<td>0.2</td>
</tr>
<tr>
<td>Cr</td>
<td>8.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Mo</td>
<td>2.0</td>
<td>1.5</td>
</tr>
<tr>
<td>V</td>
<td>0.3</td>
<td>0.2</td>
</tr>
</tbody>
</table>

### Fatigue Strength

![Graph showing fatigue strength comparison between DC53 and D2](Image)

### Machining

**Cutting Speeds for DC53 in Surface Feet per Minute**

<table>
<thead>
<tr>
<th>Operation</th>
<th>HSS Tools</th>
<th>Carbide Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turning</td>
<td>70 SFM</td>
<td>235 SFM</td>
</tr>
<tr>
<td>Drilling</td>
<td>50 SFM</td>
<td>150 SFM</td>
</tr>
<tr>
<td>Milling</td>
<td>55 SFM</td>
<td>195 SFM</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length of Cut</th>
<th>DC53 (63 HRC)</th>
<th>D2 (61 HRC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1m</td>
<td>0.2</td>
<td>0.4</td>
</tr>
<tr>
<td>3m</td>
<td>0.4</td>
<td>0.6</td>
</tr>
<tr>
<td>4m</td>
<td>0.6</td>
<td>0.8</td>
</tr>
</tbody>
</table>

![](Image)
Heat Treatment

### Austenize

<table>
<thead>
<tr>
<th>Temperature</th>
<th>DC53</th>
<th>D2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,030°C</td>
<td>1,004°F</td>
<td>968°F</td>
</tr>
<tr>
<td>520°C</td>
<td>HRC 62/64</td>
<td>HRC 60/62</td>
</tr>
<tr>
<td>540°C</td>
<td>HRC 58/60</td>
<td></td>
</tr>
</tbody>
</table>

* Material growth .10% to .15% (.0010" to .0015" per inch). An optional third temper recommended for intricate high precision components requiring EDM work or PVD coatings.

### Harden

- Pre-Heat 800-850°C
- Austenitize 1,030°C
- Quench 65°C
- Harden at 520°C – 550°C
- Temper 520°C – 550°C
- Optional Temper 400°C

### Tempering Hardness Curve

- DC53: Hardened at 1030°C / 1886°F
- D2: Hardened at 1030°C / 1886°F

### Vacuum Austenitize

<table>
<thead>
<tr>
<th>Dia./Thickness</th>
<th>Heating Time (min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot; (100mm) &amp; Under</td>
<td>20-30 min./inch of thickness</td>
</tr>
<tr>
<td>over 4&quot; (100mm)</td>
<td>10-20 min./inch of thickness</td>
</tr>
</tbody>
</table>

2 bar quench pressure recommended

### Salt Bath Austenitize

<table>
<thead>
<tr>
<th>Dia./Thickness</th>
<th>Immersing Time (min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4&quot; (6 mm)</td>
<td>5 - 8 minutes</td>
</tr>
<tr>
<td>1/2&quot; (12 mm)</td>
<td>8 - 10 minutes</td>
</tr>
<tr>
<td>3/4&quot; (18 mm)</td>
<td>10 - 15 minutes</td>
</tr>
<tr>
<td>1-1/2&quot; (36 mm)</td>
<td>15 - 20 minutes</td>
</tr>
<tr>
<td>2&quot; (48 mm)</td>
<td>20 - 25 minutes</td>
</tr>
<tr>
<td>4&quot; (96 mm)</td>
<td>30 - 40 minutes</td>
</tr>
</tbody>
</table>
Here is what our customer’s are saying:

“The key to the project was selecting the right tool steel to get a successful draw. Given the rigors of the stainless steel Class A surface application, a stronger material was required. We chose DC53 and have experienced an increase in tool life by a factor of three compared to traditional draw tooling.”

“With DC53 we are able to offer our customer’s a better performing steel while decreasing our production costs, definitely a win-win situation.”

Alro Steel is the authorized distributor of DC53 for Daido Steel Co. Ltd.
Tool Steel Characteristics

Toughness

<table>
<thead>
<tr>
<th>Steel Type</th>
<th>S7 57RC</th>
<th>A2 60RC</th>
<th>D2 61RC</th>
<th>DC53 62RC</th>
<th>M2 62RC</th>
<th>PMLV 62RC</th>
<th>PMM4 62RC</th>
<th>A11 60RC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>9</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Wear Resistance

<table>
<thead>
<tr>
<th>Steel Type</th>
<th>S7 57RC</th>
<th>A2 60RC</th>
<th>D2 61RC</th>
<th>DC53 62RC</th>
<th>M2 62RC</th>
<th>PMLV 62RC</th>
<th>PMM4 62RC</th>
<th>A11 60RC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>9</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Compressive Strength

<table>
<thead>
<tr>
<th>Steel Type</th>
<th>S7 57RC</th>
<th>A2 60RC</th>
<th>D2 61RC</th>
<th>DC53 62RC</th>
<th>M2 62RC</th>
<th>PMLV 62RC</th>
<th>PMM4 62RC</th>
<th>A11 60RC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>4.5</td>
<td>4.0</td>
<td>3.5</td>
<td>4.0</td>
<td>3.0</td>
<td>2.5</td>
<td>2.5</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Temper Resistance

<table>
<thead>
<tr>
<th>Steel Type</th>
<th>S7 57RC</th>
<th>A2 60RC</th>
<th>D2 61RC</th>
<th>DC53 62RC</th>
<th>M2 62RC</th>
<th>PMLV 62RC</th>
<th>PMM4 62RC</th>
<th>A11 60RC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>888</td>
<td>888</td>
<td>888</td>
<td>888</td>
<td>888</td>
<td>888</td>
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<td>888</td>
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