Typical Analysis

<table>
<thead>
<tr>
<th>Element</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.95</td>
</tr>
<tr>
<td>Cr</td>
<td>8.00</td>
</tr>
<tr>
<td>Mo</td>
<td>2.00</td>
</tr>
<tr>
<td>V</td>
<td>0.30</td>
</tr>
<tr>
<td>Si</td>
<td>1.00</td>
</tr>
<tr>
<td>Mn</td>
<td>0.40</td>
</tr>
</tbody>
</table>

Characteristics

- Higher hardness (62-63HRc) than D2 after heat treatment
- Twice the toughness of D2 with a superior wear resistance
- 20% higher fatigue strength than D2
- Smaller primary carbides than D2 protect the die from chipping and cracking
- Secondary refining process (DLF) reduces impurities
- Machines and grinds up to 40% faster than D2
- Less residual stress after wire EDMing
- The chart top right shows where DC53 properties lie compared with conventional tool steels and powder metallurgy tool steels

Colour Code

Orange  Yellow

Typical Applications

- Plastic Moulds
- Stepped punch and press-punching dies
- Concrete sprayer parts, rotor plates
- Swaging dies and backers
- Dies for cold forging
- Thread-rolling dies for heat-treated bolts
- Forming dies
- Stripper plates for lead frame blanking
- Gauges
- Screws for injection moulding machines

Case Studies

Shearing mild steel rolled sections. The 12,000 operations before tool failure using D2 material increased to 30,000 using DC53

Stock

CARRS DC53 is stocked in a range of diameters and plate and cut to customers requirements

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Rectangular sections from 25mm³ up to 430 X 430 X 150mm can be delivered fine milled on all six faces to - 0+0.1mm and with squareness guaranteed to 0.1mm/m.

Punching operations. This D2 compression punch was achieving only 2,000 operations before regrinding or failure. Changing to DC53 resulted in more than 25,000 operations before regrinding.
HEAT TREATMENT

Welding
Lower minimum pre-and post-heating temperature than D2 reduces the incidence of weld cracking and simplifies welding. Low hardness decline in heat affected zone minimizes any deterioration in performance.

toughness is required, double temper between 200 and 300°C (depending on application). Note the material tempered at the lower temperature should not be subjected to subsequent high temperature processes such as PVD. For the fullest details of application related heat treatments, please ask for our detailed publication on the subject.

Hardening Vacuum Furnace
Pre-heat to 300-400°C and then to 800-850°C allowing sufficient time to equalise. Raise to 1,020-1,040°C and allow soaking time according to the chart below:

<table>
<thead>
<tr>
<th>Maximum Section (mm)</th>
<th>Soaking Time (mins)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 and below</td>
<td>20-30 mins per 25mm</td>
</tr>
<tr>
<td>Above 100</td>
<td>10-20 mins per 25mm</td>
</tr>
</tbody>
</table>

Quenching Vacuum Furnace
The high hardenability of this steel enables it to be satisfactorily quenched in a vacuum furnace.

Surface Treatments
Surface treatments such as CVD, PVD, TD and Nitriding require the use of relatively high processing temperatures. While this can be a problem with standard D2, the higher through hardness of DC53 at elevated temperatures will allow these surface treatments to be used successfully.

Tempering
Double temper according to the hardness and toughness charts below. As with D2, a third temper at 400°C should be carried out to avoid any chance of any delayed grain growth and distortion. This is the preferred heat treatment for most applications as high hardness will be the primary consideration. Where maximum

Further information
Detailed information covering physical properties, welding and surface treatments are available, please ask.