HIGH TENSILE STEEL – AISI 4340

AISI 4340 Nickel – Chrome - Moly High Tensile Steel, generally supplied hardened and tempered to condition “U” in sections up to 100mm, with a tensile strength of 930 – 1080 MPa and aiming for this strength range in larger sections. It offers a very good balance of strength, toughness and wear-resistance.

TYPICAL APPLICATIONS:
Heavy-duty axles, shafts, heavy-duty gears, spindles, pins, studs, collets, bolts, couplings, sprockets, pinions, torsion bars, connecting rods, crow bars, conveyor parts etc.

TYPICAL CHEMICAL ANALYSIS

<table>
<thead>
<tr>
<th>Element</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
<td>0.40%</td>
</tr>
<tr>
<td>Silicon</td>
<td>0.25%</td>
</tr>
<tr>
<td>Manganese</td>
<td>0.70%</td>
</tr>
<tr>
<td>Nickel</td>
<td>1.85%</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.80%</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>0.25%</td>
</tr>
</tbody>
</table>

RELATED SPECIFICATIONS:
- AS 1444-1996 4340
- BS EN10083-1-1991 817M40
- BS 970-1955 EN 24
- JIS G 4103 SNCM 439
- SAE & UNS 4340 & G43400
- Werkstoff - 1.6565 40NiCrMo6

SURFACE TREATMENT:
Will Nitride with a typical surface hardness up to HRC 60.
Will Flame or Induction harden with a typical surface hardness up to HRC 58.

MECHANICAL PROPERTY REQUIREMENTS IN CONDITION “U” – to AS 1444-1996

<table>
<thead>
<tr>
<th>Section mm</th>
<th>0.2% Proof Stress MPa</th>
<th>Tensile Strength MPa</th>
<th>Elongation on 5.65\sqrt{S_o} %</th>
<th>Impact Izod J</th>
<th>Charpy J</th>
<th>Hardness HB</th>
</tr>
</thead>
<tbody>
<tr>
<td>*up to 63</td>
<td>755 min</td>
<td>930 - 1080</td>
<td>9 min</td>
<td>-</td>
<td>-</td>
<td>269 - 331</td>
</tr>
<tr>
<td>up to 100</td>
<td>740 min</td>
<td>930 - 1080</td>
<td>12 min</td>
<td>47min</td>
<td>42min</td>
<td>269 - 331</td>
</tr>
</tbody>
</table>

*Applies only to bars bright drawn after hardening and tempering

TYPICAL MECHANICAL PROPERTIES – Hardened and tempered in section size listed

<table>
<thead>
<tr>
<th>Section mm</th>
<th>Yield Strength MPa</th>
<th>Tensile Strength MPa</th>
<th>Elongation %</th>
<th>Impact Izod J</th>
<th>Hardness HB</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>880</td>
<td>1000</td>
<td>17</td>
<td>85</td>
<td>295</td>
</tr>
<tr>
<td>100</td>
<td>850</td>
<td>980</td>
<td>17</td>
<td>80</td>
<td>290</td>
</tr>
<tr>
<td>200</td>
<td>730</td>
<td>930</td>
<td>17</td>
<td>75</td>
<td>275</td>
</tr>
</tbody>
</table>

Typical Mechanical Properties for guidance only

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HIGH TENSILE STEEL – AISI 4340 - continued

WELDING:
Readily welded in the annealed condition but avoid when possible if hardened and tempered due to the effect on the mechanical properties. Welding in the nitrided, flame or induction hardened condition is not recommended.

Welding procedure:
Low hydrogen electrodes are recommended. Pre-heat at 200°C – 300°C and maintain during welding. Cool slowly in ashes or sand etc and stress relieve if this is possible.

Welding details for guidance only

HEAT TREATMENT:

Forging:
Heat to 1150°C Hold till uniform
Minimum forging temperature 850°C
Cool slowly in ashes or sand etc

Annealing:
Heat to 830°C – 850°C
Cool in furnace

Stress Relieving:
Annealed: Heat to 600°C – 650°C
Hardened: Heat to 500°C – 550°C
Cool in still air

Hardening:
Heat to 830°C – 880°C
Cool in Oil or Polymer

Tempering:
Heat to 450°C – 660°C cool in still air
NB. Tempering within the range 250°C – 450°C will result in temper brittleness and should be avoided

Flame and Induction Hardening:
Heat quickly to the required case depth at 850°C – 870°C and quench immediately in water or oil.
Tempering at 150°C – 200°C will reduce stresses in the case with minimal effect on its hardness.
All de-carburised surface material must first be removed to ensure best results

Nitriding:
Heat to 500°C – 530°C and hold for sufficient time to develop the depth of case required
Parts should be pre-hardened and tempered as required and also pre-machined leaving a small grinding allowance only.

Heat treatment details for guidance only