MEDIUM TENSILE STEEL – AISI 1045

AISI 1045 Medium Carbon, Medium Tensile Steel, supplied black as rolled, black as forged or normalised and bright drawn or smooth turned, offering good strength, toughness and wear resistance. Will through harden in sections up to 63mm – with a tensile strength of 620 - 850 MPa.

TYPICAL APPLICATIONS:
Axles, bolts, connecting rods, studs, rams, pins, rolls, spindles, ratchets, crankshafts, torsion bars, sockets, worms, light gears, guide rods etc.

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

PLATING:
Will electroplate but not suitable for hot dip galvanising

TYPICAL CHEMICAL ANALYSIS
<table>
<thead>
<tr>
<th>Element</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
<td>0.45%</td>
</tr>
<tr>
<td>Silicon</td>
<td>0.25%</td>
</tr>
<tr>
<td>Manganese</td>
<td>0.75%</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>0.050% max</td>
</tr>
<tr>
<td>Sulphur</td>
<td>0.050% max</td>
</tr>
</tbody>
</table>

RELATED SPECIFICATIONS:
- AS 1442-1992 1045 Black
- AS 1443-1994 1045 Bright
- BS 970-3-1991 080A42 OR 080A47
- EN 10083-1-1991 1.1191 C45E
- JIS G 4051 S45C
- SAE & UNS 1045 & G10450
- Werkstoff 1.0503 C45

TYPICAL MECHANICAL PROPERTIES – for guidance only

<table>
<thead>
<tr>
<th>Finish</th>
<th>Yield Strength MPa</th>
<th>Tensile Strength MPa</th>
<th>Elongation %</th>
<th>Hardness HB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold Drawn</td>
<td>500 – 650</td>
<td>640 – 850</td>
<td>8 min</td>
<td>190 – 270</td>
</tr>
<tr>
<td>Smooth Turned</td>
<td>300 – 450</td>
<td>570 – 700</td>
<td>14 – 30</td>
<td>170 – 210</td>
</tr>
<tr>
<td>Hot Rolled / Forged</td>
<td>300 – 450</td>
<td>570 – 700</td>
<td>14 – 30</td>
<td>170 - 210</td>
</tr>
</tbody>
</table>

TYPICAL MECHANICAL PROPERTIES – for guidance only

Water or oil quenched at 830°C – 850°C and tempered between 540°C – 680°C.

<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>Up to 63</td>
<td>370 min</td>
<td>620 – 850</td>
<td>11 min</td>
<td>30</td>
<td>185 – 245</td>
</tr>
</tbody>
</table>

Supplied to chemical analysis only unless ordered in the heat-treated condition.
MEDIUM TENSILE STEEL – AISI 1045 - continued

WELDING:
Readily welded as supplied with the correct procedure, but welding when through hardened, flame or induction hardened 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 when this is possible.

Welding details for guidance only

HEAT TREATMENT:

Forging:
Heat to 1250°C Hold till uniform
Minimum forging temperature 850°C
Cool in still air

Annealing:
Heat to 800°C – 850°C
Cool in furnace

Normalising:
Heat to 870°C – 920°C
Cool in still air

Stress Relieving:
Heat to 550°C – 660°C
Cool in still air

Hardening:
Heat to 820°C – 860°C
Quench in oil or water

Tempering:
Heat to 400°C – 680°C
Cool in still air

Flame and Induction Hardening:
Heat quickly to the required case depth at 830°C – 860°C and quench immediately in water or oil.

Tempering:
Temper 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

Heat treatment details for guidance only

Dimensional Tolerance:
The dimensional tolerance and the straightness of black “as forged” bar can vary quite considerably. Bars should always be checked prior to machining to ensure that they will clean up as required