1045 AISI (USA)

Standards

AISI
American Iron and Steel Institute

Chemical composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.43</td>
<td>0.50</td>
</tr>
<tr>
<td>Mn</td>
<td>0.6</td>
<td>0.9</td>
</tr>
<tr>
<td>P</td>
<td>&lt; 0.04</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>&lt; 0.04</td>
<td></td>
</tr>
<tr>
<td>Fe</td>
<td></td>
<td>Rest</td>
</tr>
</tbody>
</table>

Si : By agreement
When boron treatment for killed steels is specified, the steels can be expected to contain 0.0005 - 0.003% B.
If the usual titanium additive is not permitted, the steels can be expected to contain B > 0.005.

Properties

By ASTM A311

Normal Draft Cold Drawn and Stress Relieved Annealed

Diameter or thickness: < 20 mm :
- **Yield Strength:** > 585 MPa
- **Tensile Strength:** > 655 MPa
- **Elongation:** > 12 %
- **Reduction of area:** > 35 %

Diameter or thickness: 20 - 30 mm :
- **Yield Strength:** > 550 MPa
- **Tensile Strength:** > 620 MPa
- **Elongation:** > 11 %
- **Reduction of area:** > 30 %

Diameter or thickness: 30 - 50 mm :
- **Yield Strength:** > 520 MPa
- **Tensile Strength:** > 585 MPa
- **Elongation:** > 10 %
- **Reduction of area:** > 30 %

Diameter or thickness: > 50 mm :
- **Yield Strength:** > 485 MPa
- **Tensile Strength:** > 550 MPa
- **Elongation:** > 10 %
- **Reduction of area:** > 30 %

Heavy Draft Cold Drawn and Stress Relieved Annealed

Diameter or thickness: < 50 mm :
- **Yield Strength:** > 690 MPa
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Tensile Strength: > 795 MPa
Elongation: > 10 %
Reduction of area: > 25 %
Diameter or thickness: 50 - 75 mm ;

Yield Strength: > 690 MPa
Tensile Strength: > 795 MPa
Elongation: > 9 %
Reduction of area: > 25 %
Diameter or thickness: > 75 mm ;

Yield Strength: > 620 MPa
Tensile Strength: > 725 MPa
Elongation: > 7 %
Reduction of area: > 20 %

By ASTM A519

Hot rolled
Yield Strength: 310 MPa
Tensile Strength: 517 MPa
Elongation: 15 %
Hardness HRB: 80

Cold rolled
Yield Strength: 552 MPa
Tensile Strength: 621 MPa
Elongation: 5 %
Hardness HRB: 90

Stress relieved
Yield Strength: 483 MPa
Tensile Strength: 552 MPa
Elongation: 8 %
Hardness HRB: 85

Annealing
Yield Strength: 241 MPa
Tensile Strength: 448 MPa
Elongation: 20 %
Hardness HRB: 72

Normalized
Yield Strength: 331 MPa
Tensile Strength: 517 MPa
Elongation: 15 %
Hardness HRB: 60