### Mechanical properties of bolts, screws, and studs according DIN-ISO 898, part 1

<table>
<thead>
<tr>
<th>Property (at 20 °C)</th>
<th>Property class</th>
<th>3.6</th>
<th>4.6</th>
<th>4.8</th>
<th>5.6</th>
<th>5.8</th>
<th>6.8</th>
<th>8.8 (^{1)}) (\leq 16)</th>
<th>9.8 (^{1)}) (\leq 16)</th>
<th>10.9</th>
<th>12.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile strength, (R^\mathrm{m}), N/mm(^2)</td>
<td>min.</td>
<td>330</td>
<td>400</td>
<td>500</td>
<td>600</td>
<td>800</td>
<td>830</td>
<td>800</td>
<td>800</td>
<td>900</td>
<td>1000</td>
</tr>
<tr>
<td>Vickers hardness (H)</td>
<td>min.</td>
<td>95</td>
<td>120</td>
<td>130</td>
<td>155</td>
<td>160</td>
<td>190</td>
<td>250</td>
<td>255</td>
<td>290</td>
<td>320</td>
</tr>
<tr>
<td>Brinell hardness (HB)</td>
<td>min.</td>
<td>90</td>
<td>114</td>
<td>124</td>
<td>147</td>
<td>152</td>
<td>181</td>
<td>238</td>
<td>242</td>
<td>276</td>
<td>304</td>
</tr>
<tr>
<td>Rockwell hardness (HR)</td>
<td>min.</td>
<td>52</td>
<td>67</td>
<td>71</td>
<td>79</td>
<td>82</td>
<td>89</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Stress ratio (S_{\mathrm{p}} / R_{\mathrm{p},0.2})</td>
<td>–</td>
<td>0.94</td>
<td>0.94</td>
<td>0.91</td>
<td>0.93</td>
<td>0.90</td>
<td>0.92</td>
<td>0.91</td>
<td>0.91</td>
<td>0.90</td>
<td>0.88</td>
</tr>
<tr>
<td>Stress under proof load (S_{\mathrm{p}}) N/mm(^2)</td>
<td>180</td>
<td>225</td>
<td>310</td>
<td>280</td>
<td>380</td>
<td>440</td>
<td>580</td>
<td>600</td>
<td>650</td>
<td>830</td>
<td>970</td>
</tr>
<tr>
<td>Elongation after fracture, (\Delta)</td>
<td>min.</td>
<td>25</td>
<td>22</td>
<td>–</td>
<td>20</td>
<td>–</td>
<td>–</td>
<td>12</td>
<td>12</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>Strength under wedge loading (^{2)})</td>
<td>–</td>
<td>52</td>
<td>52</td>
<td>48</td>
<td>48</td>
<td>44</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) For bolts of property class 8.8 in diameters \(d \leq 16\) mm, there is an increased risk of nut stripping in the case of inadvertent over-tightening inducing a load in excess of proof load. Reference to ISO 898-2 is recommended.

2) For structural bolting the limit is 12 mm.

3) Property class 9.8 applies only to nominal thread diameters \(d \leq 16\) mm.

4) Minimum tensile properties apply to products of nominal length \(l \geq 2.5\) d. Minimum hardness applies to products of length \(l < 2.5\) and other products which cannot be tensile-tested (e.g. due to head configuration.)

5) Surface hardness shall not be more than 30 Vickers points above the measured core hardness on the product when readings of both surface and core are carried out at HV 0.3. For property class 10.9, any increase in hardness at the surface which indicates that the surface hardness exceeds 390 HV is not acceptable.

6) In cases where the lower yield stress \(R_{\mathrm{el},0.2}\) cannot be determined, it is permissible to measure the stress at 0.2% non-proportional elongation \(R_{\mathrm{p},0.2}\)