STANDARD REFERENCE:
EN 10083-3: 2006 (Hot-rolled products)  |  EN 10277-5: 2008 (Bright products)

RODACCIAl REFERENCES AND COMPARABLE STANDARDS

<table>
<thead>
<tr>
<th>EUROPE</th>
<th>ITALY</th>
<th>GERMANY</th>
<th>FRANCE</th>
<th>UK</th>
<th>USA</th>
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</thead>
<tbody>
<tr>
<td>EN 10083-3: 2006</td>
<td>(UNI 7845-78)</td>
<td>(DIN 17200-86)</td>
<td>(NF A 35-552-86)</td>
<td>(BS 970 pt.3-96)</td>
<td>ASTM A 29</td>
</tr>
<tr>
<td>39NiCrMo3</td>
<td>1.6510</td>
<td>39NiCrMo3</td>
<td>-</td>
<td>-</td>
<td>817M40</td>
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CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

<table>
<thead>
<tr>
<th>EUROPE</th>
<th>C</th>
<th>Si</th>
<th>Mn</th>
<th>P / max</th>
<th>S</th>
<th>Cr</th>
<th>Mo</th>
<th>Ni</th>
<th>Al</th>
<th>Pb</th>
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</thead>
<tbody>
<tr>
<td>39NiCrMo3</td>
<td>0,35-0,43</td>
<td>0,15-0,40</td>
<td>0,50-0,80</td>
<td>0,025</td>
<td>0,020-0,035</td>
<td>0,60-1,00</td>
<td>0,15-0,25</td>
<td>0,70-1,00</td>
<td>0,020-0,050</td>
<td>-</td>
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<tr>
<td>39NiCrMo3Pb</td>
<td>0,15-0,30</td>
<td>0,15-0,40</td>
<td>0,50-0,80</td>
<td>0,025</td>
<td>0,020-0,035</td>
<td>0,60-1,00</td>
<td>0,15-0,25</td>
<td>0,70-1,00</td>
<td>0,020-0,050</td>
<td>0,15-0,30</td>
</tr>
</tbody>
</table>

MECHANICAL PROPERTIES - AS ROLLED CONDITION

<table>
<thead>
<tr>
<th>Size mm</th>
<th>HB max to condition</th>
<th>Quenched and tempered (+QT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Treated to improve shearability (+S)</td>
<td>Rp0.2 (MPa) min</td>
</tr>
<tr>
<td>≤ 16</td>
<td>240</td>
<td>785</td>
</tr>
<tr>
<td>&gt; 16 ≤ 40</td>
<td>240</td>
<td>735</td>
</tr>
<tr>
<td>&gt; 40 ≤ 100</td>
<td>240</td>
<td>685</td>
</tr>
<tr>
<td>&gt; 100 ≤ 160</td>
<td>240</td>
<td>635</td>
</tr>
<tr>
<td>&gt; 160 ≤ 250</td>
<td>240</td>
<td>540</td>
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</tbody>
</table>

MECHANICAL PROPERTIES - BRIGHT PRODUCTS CONDITION

<table>
<thead>
<tr>
<th>Size mm</th>
<th>as Rolled+Turned (+A+SH)</th>
<th>Quenched+Tempered+Turned (+QT+5H)*</th>
<th>Quenched+Tempered+Gold Drawn (+QT+C)</th>
<th>as Rolled+Gold Drawn (+C+C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hardness HB max</td>
<td>Rp0.2 (MPa) min</td>
<td>Rm (MPa)</td>
<td>A5 (%) min</td>
</tr>
<tr>
<td>≥ 5 ≤ 10</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>&gt; 10 ≤ 16</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>&gt; 16 ≤ 40</td>
<td>240</td>
<td>735</td>
<td>930-1130</td>
<td>11</td>
</tr>
<tr>
<td>&gt; 40 ≤ 63</td>
<td>240</td>
<td>735</td>
<td>880-1080</td>
<td>12</td>
</tr>
<tr>
<td>&gt; 63 ≤ 100</td>
<td>240</td>
<td>735</td>
<td>880-1080</td>
<td>12</td>
</tr>
</tbody>
</table>

*This values are valid also for Cold Drawn - Quenched + Tempered Condition (+C +QT)
For size <5 mm the mechanical properties may be agreed at the time of enquiry and order

WORKING TEMPERATURES RECOMMENDED

<table>
<thead>
<tr>
<th>Operation</th>
<th>Hot forgings deformation</th>
<th>Isothermal annealing</th>
<th>Soft annealing</th>
<th>Quenching in oil</th>
<th>Tempering</th>
</tr>
</thead>
<tbody>
<tr>
<td>°C</td>
<td>850-11150</td>
<td>830-860 → 650</td>
<td>640-680</td>
<td>830-850</td>
<td>550-650</td>
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</table>
### HARDNESS LIMITS (JOMINY TEST)

<table>
<thead>
<tr>
<th>Limits of range</th>
<th>1.5</th>
<th>3</th>
<th>5</th>
<th>7</th>
<th>9</th>
<th>11</th>
<th>13</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>+H Max</td>
<td>60</td>
<td>60</td>
<td>59</td>
<td>58</td>
<td>58</td>
<td>57</td>
<td>57</td>
<td>56</td>
<td>55</td>
<td>52</td>
<td>51</td>
<td>49</td>
<td>48</td>
<td>46</td>
<td>45</td>
</tr>
<tr>
<td>Min</td>
<td>52</td>
<td>51</td>
<td>50</td>
<td>49</td>
<td>48</td>
<td>46</td>
<td>44</td>
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<td>39</td>
<td>36</td>
<td>34</td>
<td>33</td>
<td>32</td>
<td>31</td>
<td>30</td>
</tr>
</tbody>
</table>

#### TEMPERING CURVE

- **TTT**
- **CCT**

**Hardness HRC at a distance from quenched end of test pieces (mm)**

<table>
<thead>
<tr>
<th>Distance (mm)</th>
<th>1.5</th>
<th>3</th>
<th>5</th>
<th>7</th>
<th>9</th>
<th>11</th>
<th>13</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>+H Max</td>
<td>60</td>
<td>60</td>
<td>59</td>
<td>58</td>
<td>58</td>
<td>57</td>
<td>57</td>
<td>56</td>
<td>55</td>
<td>52</td>
<td>51</td>
<td>49</td>
<td>48</td>
<td>46</td>
<td>45</td>
</tr>
<tr>
<td>Min</td>
<td>52</td>
<td>51</td>
<td>50</td>
<td>49</td>
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<td>46</td>
<td>44</td>
<td>43</td>
<td>39</td>
<td>36</td>
<td>34</td>
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<td>30</td>
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