INDUCTION HARDENED AND GROUND HOLLOW LINEAR SHAFTS
STEEL GRADES CORRESPONDENTS

<table>
<thead>
<tr>
<th>EN</th>
<th>Werkstoff</th>
<th>DIN</th>
<th>B.S.</th>
<th>UNI</th>
<th>JIS</th>
<th>GOST</th>
<th>AISI / SAE / ASTM</th>
</tr>
</thead>
<tbody>
<tr>
<td>C60E</td>
<td>1.1221</td>
<td>Ck60</td>
<td>060A62, 070M60</td>
<td>C60</td>
<td>558C</td>
<td>60, 60G, 60GA</td>
<td>1060</td>
</tr>
</tbody>
</table>

CHEMICAL COMPOSITION - IN % BY WEIGHT

<table>
<thead>
<tr>
<th>Steel grade</th>
<th>C</th>
<th>Si</th>
<th>Mn</th>
<th>P</th>
<th>S</th>
<th>Cr</th>
<th>Ni</th>
<th>Mo</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>C60E</td>
<td>0.57 ÷ 0.65</td>
<td>0.10 ÷ 0.40</td>
<td>0.60 ÷ 0.90</td>
<td>max. 0.025</td>
<td>max. 0.035</td>
<td>max. 0.4</td>
<td>max. 0.4</td>
<td>max. 0.1</td>
<td>-</td>
</tr>
</tbody>
</table>

MECHANICAL PROPERTIES

<table>
<thead>
<tr>
<th>Steel grade</th>
<th>Tensile strength $R_m$ N/mm²</th>
<th>Yield strength $R_{p0.2}$ N/mm²</th>
<th>Elongation $A_5$ %</th>
</tr>
</thead>
<tbody>
<tr>
<td>C60+NBK</td>
<td>720 - 900</td>
<td>min. 390</td>
<td>min. 13</td>
</tr>
</tbody>
</table>

NBK = normalized in a protective atmosphere.

HARDENABILITY

<table>
<thead>
<tr>
<th>Steel grade</th>
<th>Surface hardness HRC min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C60E</td>
<td>60</td>
</tr>
</tbody>
</table>

The hardening depth (SHD according to EN ISO 15787 or Rht according to DIN 6773) is defined as the distance from the steel surface up to the point where the hardness value is 80% of the minimum guaranteed value of the surface hardness and it is established in accordance with ISO 13012, depending on the shaft's size.

The minimum guaranteed value of the surface hardness varies depending on the steel grade.
Steel grades: C60E
Surface hardness: 62±2 HRC
Surface roughness: Ra max. 0.20 μm
Length tolerance: ±200 mm
Surface hardening depth, SHD: according to EN ISO 15787
On request: special lengths, tolerances and dimensions

### NI-WH / METRIC

<table>
<thead>
<tr>
<th>Outside Diameter OD</th>
<th>Inside Diameter ID</th>
<th>Weight Series</th>
<th>Standard length</th>
<th>Surface hardening depth (min. + tol.)</th>
<th>Roundness (circularity)</th>
<th>Parallelism (cylindricity)</th>
<th>Straightness</th>
<th>Standard tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>mm</td>
<td>kg/m</td>
<td>mm</td>
<td>mm + μm</td>
<td>μm max.</td>
<td>μm max.</td>
<td>mm/m</td>
<td>μm</td>
</tr>
<tr>
<td>12</td>
<td>4</td>
<td>0.79</td>
<td>NI-WH 12x4</td>
<td>6000</td>
<td>0.4 + 0.4</td>
<td>5</td>
<td>8</td>
<td>0.20</td>
</tr>
<tr>
<td>12</td>
<td>7</td>
<td>0.59</td>
<td>NI-WH 12x7</td>
<td>6000</td>
<td>0.4 + 0.4</td>
<td>5</td>
<td>8</td>
<td>0.20</td>
</tr>
<tr>
<td>16</td>
<td>7</td>
<td>1.28</td>
<td>NI-WH 16x7</td>
<td>6000</td>
<td>0.4 + 0.4</td>
<td>5</td>
<td>8</td>
<td>0.20</td>
</tr>
<tr>
<td>20</td>
<td>14</td>
<td>1.25</td>
<td>NI-WH 20x14</td>
<td>6000</td>
<td>0.6 + 0.5</td>
<td>5</td>
<td>8</td>
<td>0.20</td>
</tr>
<tr>
<td>25</td>
<td>15</td>
<td>2.47</td>
<td>NI-WH 25x15</td>
<td>6000</td>
<td>0.8 + 0.8</td>
<td>6</td>
<td>9</td>
<td>0.15</td>
</tr>
<tr>
<td>30</td>
<td>18</td>
<td>3.55</td>
<td>NI-WH 30x18</td>
<td>6000</td>
<td>0.9 + 0.8</td>
<td>6</td>
<td>9</td>
<td>0.15</td>
</tr>
<tr>
<td>40</td>
<td>28</td>
<td>5.03</td>
<td>NI-WH 40x28</td>
<td>6000</td>
<td>1.2 + 1.1</td>
<td>7</td>
<td>11</td>
<td>0.15</td>
</tr>
<tr>
<td>40</td>
<td>26</td>
<td>5.70</td>
<td>NI-WH 40x26</td>
<td>6000</td>
<td>1.2 + 1.1</td>
<td>7</td>
<td>11</td>
<td>0.15</td>
</tr>
<tr>
<td>50</td>
<td>30</td>
<td>9.87</td>
<td>NI-WH 50x30</td>
<td>6000</td>
<td>1.5 + 1.2</td>
<td>7</td>
<td>11</td>
<td>0.15</td>
</tr>
<tr>
<td>60</td>
<td>36</td>
<td>14.20</td>
<td>NI-WH 60x36</td>
<td>6000</td>
<td>1.5 + 1.2</td>
<td>8</td>
<td>13</td>
<td>0.15</td>
</tr>
<tr>
<td>80</td>
<td>57</td>
<td>19.42</td>
<td>NI-WH 80x57</td>
<td>6000</td>
<td>1.6 + 1.3</td>
<td>10</td>
<td>13</td>
<td>0.20</td>
</tr>
</tbody>
</table>

The hardening depth (SHD according to EN ISO 15787 or Rht according to DIN 6773) is defined as the distance from the steel surface up to the point where the hardness value is 80% of the minimum guaranteed value of the surface hardness and it is established in accordance with ISO 13012, depending on the shaft’s size.

The minimum guaranteed value of the surface hardness varies depending on the steel grade.
Steel grades C60E
Surface hardness 62±2 HRC
Surface roughness Ra max. 0.20 μm
Length tolerance ±200 mm
Surface hardening depth, SHD according to EN ISO 15787
On request special lengths, tolerances and dimensions

The hardening depth (SHD according to EN ISO 15787 or Rht according to DIN 6773) is defined as the distance from the steel surface up to the point where the hardness value is 80% of the minimum guaranteed value of the surface hardness and it is established in accordance with ISO 13012, depending on the shaft’s size.
The minimum guaranteed value of the surface hardness varies depending the steel grade.
INDUCTION HARDENED AND GROUND
HOLLOW LINEAR SHAFTS

PACKING SOLUTIONS

• Branorost paper, spacer rings, raffia and wooden boxes for Ø 4 - 16 mm.
• Bundles protected with branorost paper, spacer rings and raffia for Ø over 16 mm. Same range but in chrome plated condition can be packed in individual cardboard tubes.
• Customized packaging solutions - wooden cases and wooden Euro-pallets.
• Aluminum foil vacuum bags extra protection of bundles for overseas transportation.

STORAGE AND HANDLING RECOMMENDATIONS

• Keep the products stored in dry and covered spaces.
• Whenever possible, please use the crane to load or unload the bundles; when you use the fork lift, please avoid the direct contact of the forks with the products.
• Always lift the bundles using textile slings. Do not use metal slings during handling of bundles.
• Always use gloves when handling the shafts.
• Always keep dry the cardboard tubes that protect the chromed products.