Märker® WM 28
MATERIAL DATA SHEET
Hot Working Steel

Material-No.: 1.2365
EN ISO 4957-Abbreviation: 32CrMoV12-28
AISI: H 10
Chemical composition:

<table>
<thead>
<tr>
<th>Standard values % (mass fraction)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
</tr>
<tr>
<td>0.32</td>
</tr>
</tbody>
</table>

Characteristics:

All-purpose CrMoV-alloyed hot-working tool steel for high demands. The balanced alloy composition guarantees a very high strength and temper resistance while retaining good thermal conductivity.

Applications:

Extrusion tools for heavy metals, including liners, extrusion stems, mandrels, pressure pads, extrusion dies and die holders; pressure die casting dies for brass; forming dies; forging dies and die inserts; tools for the production of nuts, bolts and screws; hot impact extrusion tools.

Heat treatment:

- **Soft annealing:** 800-860°C cooling in furnace
- **Annealing hardness:** max. 230 HB
- **Stress relieve annealing:** 650°C / cooling in furnace
- **Hardening:** 1020-1050°C / oil, gas or hot bath of approx. 500°C
- **Tempering:** min. 2x, see tempering graph

Physical properties:

**Coefficient of thermal expansion:**

<table>
<thead>
<tr>
<th>at °C</th>
<th>20-100 °C</th>
<th>20-200 °C</th>
<th>20-300 °C</th>
<th>20-400 °C</th>
<th>20-500 °C</th>
<th>20-600 °C</th>
<th>20-700 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>[10^-6 m/(m·K)]</td>
<td>12.0</td>
<td>12.7</td>
<td>12.9</td>
<td>13.2</td>
<td>13.5</td>
<td>13.8</td>
<td>14.1</td>
</tr>
</tbody>
</table>

**Thermal conductivity:**

<table>
<thead>
<tr>
<th>at °C</th>
<th>100 °C</th>
<th>200 °C</th>
<th>300 °C</th>
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<th>500 °C</th>
<th>600 °C</th>
<th>700 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>[W/m·K]</td>
<td>34.4</td>
<td>33.9</td>
<td>33.1</td>
<td>31.4</td>
<td>30.1</td>
<td>29.7</td>
<td>29.3</td>
</tr>
</tbody>
</table>

**Density:** 7.85 g/cm³
**Elastic modulus:** 215 x 10⁸ MPa at 20 °C
**Electric resistivity:** 0.36 Ω mm²/m at 20 °C
Information provided on material quality and recommendations for use are intended as a reference only. Such information is based on practical experience as well as on findings obtained through research and development work. Although all specifications concerning the characteristics and applications mentioned in his data sheet accrue to the best of our knowledge, liability has to be excluded.
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