Oil lubrication systems

Compared to grease-lubricated bearings, the application of lubricating oils enables long-term reliable operation at maximum speeds.

Different methods are available for the supply of oil to high speed bearings:
- Oil air lubrication (minimum quantity lubrication)
- Oil injection lubrication
- Oil fog lubrication

Oil air lubrication

Oil air lubrication provides specific as well as volume-regulated lubricant delivery to the rolling and sliding surfaces in the bearing.

The oil is transported by means of an air stream that form streaks along the inner wall of the transparent supply hose and released uniformly at lubricating points in specified intervals.

Oil air lubrication guarantees utmost effectiveness with respect to consumption and lubricating effect at maximum speeds:
- Reduced flexing work
- Minimum friction losses
- Reduced heat generation
- High operating security
- Specific, volume-regulated lubricant supply
- Low oil consumption
- Low oil fog formation
- Very good lubricating effect
- Environmentally friendly and highly economical
- Oil cooling and oil filtering not required (in comparison to oil injection lubrication)
Oil supply

Conventional bearing lubrication systems have oil injection nozzles in an intermediate sleeve or in a spacer between 2 bearings.

A nozzle position aligned parallel to the spindle axis is sufficient for applications in high speed ranges.

A nozzle position aligned at an angle increases bearing speed suitability (more accurate lubricant supply in the rolling area).

Length and bore diameter of the oil nozzle:
Sufficient lubricant supply is assured with a ratio of nozzle length/nozzle bore diameter of more than 3 and less than 5 (pressure of oil air current greater than opposing pressure generated by bearing turbulences).

Oil for high precision spindles:
Hydraulic oil with kinematic viscosity VG 32 or VG 46 mm²/s

Oil filtering:
Purity class 13/10 per ISO 4406:99 (particle size < 5µm)

Oil volume per lubrication pulse:
30 up to 35 mm³ per connection for 1 or 2 bearings

Cycle time:
VG32: 2 to 4 min., VG46: 4–10 min. (independent of dbearing)

Number of nozzles:
1 per bearing

Nozzle diameter:
1.2 mm (dbearing < 50 mm) ..... 1.6 mm (dbearing > 70 mm)

Nozzle position:
Between cage and inner ring rim (technical data tables, TA cage)

Oil supply, oil drain:
Transparent hose, d = 4 mm

Air pressure upstream of spindle:
0.6 to 1 bar

Air volume:
3 to 4 m³/h (50 to 65 L/min)

Air quality:
Meets ISO 8573: particle size < 5µm,
particle concentration < 5 mg/m³,
dew point < 3°C, oil concentration < 1mg/m³

Start-up:
Spindle start-up only after oil supply is secured
### Lubricating oils

Mineral lubricating oils achieve adequate bearing lubrication for the lubrication of machine tool spindles.

<table>
<thead>
<tr>
<th>Oil type</th>
<th>Operating Pour point</th>
<th>Flashpoint [°C]</th>
<th>Kinematic viscosity [mm²/s]</th>
<th>temperature range [°C]</th>
<th>Remarks / Application</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>40°C</td>
<td>100°C</td>
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<tr>
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<td>-33</td>
<td>+120</td>
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<td>-15 to +110</td>
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<td>+220</td>
<td>12.2</td>
<td>3.2</td>
<td>-35 to +130</td>
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<td>+280</td>
<td>60</td>
<td>20</td>
<td>-55 to +200</td>
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<tr>
<td>Ester</td>
<td>-68</td>
<td>+220</td>
<td>14.3</td>
<td>3.7</td>
<td>-50 to +120</td>
</tr>
</tbody>
</table>