High-Performance Engineered Bushings and Sleeve Bearings

For more than 50 years, HEF has designed and developed high performance bushings and joints for demanding applications in industries such as construction, mining, steel processing, transportation, forestry, material handling, agriculture and others. HEF bushings are recognized world-wide for their excellent frictional and anti-seizure properties, and their ability to withstand high loads. HEF bushings are also industry’s choice for applications requiring extended intervals between lubrication.

Three factors combine to give our engineered bushings exceptional serviceability for high-load/low rotational speed applications. These factors are:

- Optimum steel selection and heat treatment
- Patented surface treatments
- Patented surface topographies: ID cross-hatching & surface cavities

HEF Bushings for different operating conditions

<table>
<thead>
<tr>
<th>Lubrication (greasing interval, hours)</th>
<th>Operating Temp</th>
<th>Wear Conditions</th>
<th>Corrosion Conditions</th>
<th>Loads (max. pressure MPa)</th>
<th>Velocity (m/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular (8-50)</td>
<td>Ambient</td>
<td>Shock</td>
<td>Normal</td>
<td>Low (&lt;50)</td>
<td>Low (&lt;1)</td>
</tr>
<tr>
<td>Frequent (50-150)</td>
<td>Low (&lt;250°C)</td>
<td></td>
<td></td>
<td>Medium (50 –150)</td>
<td>Medium (1-5)</td>
</tr>
<tr>
<td>Periodic (150-350)</td>
<td>Medium (250 - 400°C)</td>
<td></td>
<td>Moist (outdoors)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marginal (350-500)</td>
<td>High (400 - 500°C)</td>
<td>Abrasion</td>
<td>Saline (on or off-shore)</td>
<td>High (150 –200)</td>
<td>High (&gt;5)</td>
</tr>
<tr>
<td>Never</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
**Bushing Portfolio**

**Steel Bushings**

**Patented designs:** Interior topography designed to create grease reserves to maximize lubricant retention and allow the possibility of wear debris to be evacuated from the joint.

- PEL
- PEL HP
- PEL BH Family
- PEL T

- High dynamic pressure: 100 to 250 MPa
- Maximum speed: 1.5 M/sec (PEL T: 8 M/sec)
- Greasing interval: up to 1000 hours
- Excellent abrasion resistance

**Special Purpose Bushings**

**Fam**
- Manganese steel: work hardens during usage, providing excellent wear and abrasion resistance

**Tesco**
- High resistance to wear and seizure at high temperatures
- Excellent Abrasion resistance

**Cod 11**
- Copper-Aluminum alloy
- ID Surface treatment and topography
- Excellent corrosion resistance

**Composite Bushings**

- H Liner S
- H Liner S1
- H Liner M
- H Liner With Lip

- The ID friction layer formed by a fine woven polymer material wound in a particular orientation to provide improved wear and fatigue resistance
- PTFE particles distributed in the resin leads to the self-lubricating properties of these bushings
- The high strength back layer is made from wound glass fiber with epoxy resin

**Benefits**

- Dynamic pressure: 80 to 150 MPa
- Maximum speed: 0.5 m/sec
- Maintenance free
- Excellent corrosion resistance
Construction & Mining

Applications
- Bucket linkage joints
- High-loaded joints
- Hydraulic cylinder joints
- Clamping systems
- Attachments

Operating Conditions
- Heavy loads: 100 -250 MPa
- Greasing intervals up to 500 hours (in some cases 1000 hours)
- Low & medium velocities (max. 1.5 m/sec)
- Ambient temperature
- Abrasive, shock & moist conditions

Hydraulic Excavator
Grapples
Wheel Excavator
Back Hoe
Dump Trucks
Tunneling Equipment
Mining Equipment
**Steel / Non-ferrous Metal Manufacturing & Processing**

### Applications
- Trunnions
- Crane components
- Clamp joints
- Conveyor rollers
- Continuous casting equipment components
- Furnace door and roller components

### Operating Conditions
- Heavy loads: 100-250 MPa
- Greasing intervals up to 500 hours (in some cases 1000 hours)
- Low velocities (max. 1.5 m/sec)
- Medium & high temperatures
- Moist, abrasive conditions
Material Handling

Applications
- Pivot joints
- Rollers
- Guiding slides
- Cylinder joints
- Attachment joints
- Pulleys

Operating Conditions
- Moderate loads: 50-150 MPa
- Greasing intervals up to 500 hours (in some cases 1000 hours)
- Low & medium velocities (max. 1.5 m/sec)
- Ambient temperature
- Normal & moist conditions
- Saline environment for port & off-shore
Agriculture & Forestry Equipment

Applications
- Linkage joints
- Hydraulic cylinder joints
- Clamping systems

Operating Conditions
- Low to loads: 50-150 MPa
- Maintenance free: no greasing preferable
- Low velocities 0.5 m/sec
- Ambient temperatures
- Moist, abrasive conditions

Applications
- Strip Tillage
- Ploughs
- Disc Harrow
- Seeder
- Bush Cutters
- Front Loader
- Harvesting Head
- Strip Tillage
Attachments

Applications
- Linkage joints
- Bucket joints
- High-loaded joints
- Hydraulic cylinder joints

Operating Conditions
- Low to heavy loads: 50-250 MPa
- Greasing intervals up to 500 hours (in some cases 1000 hours)
- Low velocities (max 1.5 m/sec)
- Ambient to low temperature
- Diverse conditions: normal, abrasive, moist, saline
HEF Bushings & Associated Products

**Pin**
- High abrasive and adhesive wear resistance
- Ductility under flexion
- High corrosion resistance
- Low surface roughness and friction

**Bushing**
- High wear & abrasion resistance
- Adequate load bearing capability
- Ability to operate for long intervals without lubrication

Technical solution for the pin will depend on the bushing selection. Usually pin surface hardness needs to be higher than that of the bushing.

**HEF pins** are designed for specific operating conditions and are surface treated to provide superior performance compared to untreated or chrome/nickel/zinc plated pins.

**Spherical Bushings**
Bushings designed to accept alignment errors, angular misalignment or deformation of components during operation (bending of pins, etc.) and wide tolerances.