CRANKCASE TOLERANCES

Finish of Main Bores:
- 60-90 micro inches Ra.

Bore Tolerance:
- .001" (.025mm) up to 10.000" (250mm) bore

Out-of-Round:
- .001" (.025mm) maximum if horizontal is larger than vertical

Alignment:
- .002" (.050mm) maximum overall misalignment (.001"-.025mm for heavy duty or highly loaded engines)
- .001" (.025mm) maximum misalignment on adjacent bores (.0005"-.013mm for heavy duty or highly loaded engines)

CRANKSHAFT TOLERANCES

MAIN BEARING AND CRANKPIN JOURNALS

Finish of Journals:
- 15 micro inches Ra or better (10 micro inches Ra or better for heavy duty or highly loaded engines)

Diameter Tolerance:
- .0005" (.013mm) up to 1.500" (38mm) journal
- .001" (.025mm) for 1.500" (38mm) to 10.000" (250mm) journal

Out-of-Round:
- .0005" (.013mm) maximum up to 5.000" (125mm) journal
- Never use a maximum out-of-round journal with a maximum out-of-round bore.

Taper:
- .0002" (.005mm) maximum up to 1.000" (25mm) long journal (.0001"-.003mm for heavy duty or highly loaded engines)
- .0004" (.010mm) maximum for 1.000" (25mm) to 2.000" (50mm) long journal (.0002"-.005mm for heavy duty or highly loaded engines)
- .0005" (.013mm) maximum for 2.000" (50mm) or longer journal (.0003"-.008mm for heavy duty or highly loaded engines)

Alignment:
- .001" (.025mm) maximum misalignment on adjacent journals (.0005"-.013mm for heavy duty or highly loaded engines)
- .002" (.050mm) maximum overall misalignment (.001"-.025mm for heavy duty or highly loaded engines)
- Crankpin and main journals should be parallel within .001" (.025mm), .0005"-.013mm for heavy duty or highly loaded engines

Hour-Glass or Barrel Shape Condition: Same as taper

Oil Holes must be well blended into journal surface.

CRANKSHAFT END CLEARANCE

<table>
<thead>
<tr>
<th>Shaft Diameter</th>
<th>End Clearance</th>
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</thead>
<tbody>
<tr>
<td>2.000&quot;-2.750&quot; (50mm-70mm)</td>
<td>.003&quot;-.007&quot; (.075mm-.175mm)</td>
</tr>
<tr>
<td>2.813&quot;-3.500&quot; (71mm-88mm)</td>
<td>.005&quot;-.009&quot; (.125mm-.225mm)</td>
</tr>
<tr>
<td>3.500&quot; or over (89mm or over)</td>
<td>.007&quot;-.011&quot; (.175mm-.275mm)</td>
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</tbody>
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CONNECTING ROD TOLERANCES

Finish of Rod Bores:
- 60-90 micro inches

Rod Tolerance:
- .0005" (.013mm) up to 3.250" (81mm) diameter
- .001" (.025mm) from 3.250" (81mm) to 10.000" (250mm) diameter

Out-of-Round:
- .001" (.025mm) maximum if horizontal is larger than vertical

Taper:
- .0002" (.005mm) up to 1.000" (25mm) length (.0001"-.003mm for heavy duty or highly loaded engines)
- .0004" (.010mm) for 1.000" (25mm) to 2.000" (50mm) length (.0002"-.005mm for heavy duty or highly loaded engines)
- .0005" (.013mm) for 2.000" (50mm) or longer (.0003"-.008mm for heavy duty or highly loaded engines)

Hour-Glass or Barrel Shape Condition: Same as taper

Parallelism between rod bore and wrist pin hole .001" (.025mm) in 5.000" (125mm)

Twist .001" (.025mm) in 6.000" (150mm)

CONNECTING ROD END CLEARANCE

Fillet at end of crankpin should not bind on ends of rod bearing .004" (.10mm) to .010" (.25mm) clearance recommended.

BEARING SPREAD

Main bearings: .005" (.13mm) to .020" (.50mm) in excess of crankcase bore diameter

Connecting rod bearings: .020" (.50mm) in excess of rod bore

OIL CLEARANCE - RESIZED BEARINGS

The oil clearance shown in this catalog are for the factory manufactured precision sizes. When installing a resized bearing, adjust the oil clearance shown as follows:

For babbitt and TM-77 copper-lead:
- Add .004" (.10mm) to both low and high limit

For TM-112 copper-lead:
- Add .0008" (.020mm) to low limit and .0004" (.010 mm) to high limit

PIN BUSHINGS

Resizing:
- Light Ream: .007"/.015"
- Bore: .0157/.030"
APPEARANCE
Wall thickness reduced from original dimension. Bearing surface worn and polished but not smeared, torn or scored. No evidence of heat, no embedded foreign particles.

DAMAGING ACTION
Grinding and polishing the crankshaft journals produce burrs that are so small that we can’t see or feel them. Not only is it important that the surface finish meet recommended average Ra or better, but it is also important to always grind opposite to rotation and polish in the direction of rotation. Otherwise it is possible for these microscopic burrs to disrupt the oil film and abrade away the bearing surface.

POSSIBLE CAUSES
1. Poor journal surface finish.
2. Wear in the presence of adequate lubrication to prevent heat build-up and wiping is caused by peaks in the journal surface finish profile which penetrate the oil film and abrade the bearing.

CORRECTIVE ACTION
1. Check journal surface finish for proper average Ra and regrind as needed.
2. If surface finish is acceptable lightly re-polish in the direction of rotation.
3. Install new bearings.