Kaydon infinite® bearing solutions for Semiconductor Fabrication

www.kaydonbearings.com
In semiconductor fabs and foundries, where tolerances are tight and contamination can be disastrous, Reali-Slim® bearings help keep your productivity high. From robots to mechanical polishers to photolithography equipment, they make rotating devices smaller, lighter and simpler.

Reali-Slim bearings are the world’s most-specified thin section bearings, known for saving space and weight in demanding applications. Pioneered by Kaydon Bearings in the 1950s, they have a cross-section that stays the same as the bore size increases, providing the dynamic capacity of bigger bearings without the bulk.

Kaydon’s advanced manufacturing processes and proprietary lubricants are two more reasons why Reali-Slim bearings are so popular for robot hubs, motors, elbows, wrists, and pivot positions. In OEM designs or as aftermarket replacements, they deliver significant benefits for fabricators:

- Smoother operation
- Longer service life
- Less robot downtime
- Greater positional accuracy
- Reduced particle contamination
- Fewer broken wafers

Kaydon AMR (AfterMarket Replacement) bearings are dimensionally-equivalent “drop-in” bearings that give you OEM-or-better performance. They usually provide a cost advantage, as well as a 12-month warranty on materials and workmanship.

SME (Semiconductor Manufacturing Equipment) bearings are custom-engineered to solve specific problems. They come with a 24-to-36-month guarantee… the best in the industry.

SME and AMR bearings feature all the specialized attributes that are so critical in semiconductor applications:

- Special cleaning
- Low particle generation

They also withstand environmental conditions not found in typical industrial settings and perform with distinction, cycle after cycle. The result? Higher chip yield that contributes to a healthier bottom line.

Kaydon AMR and SME bearings are available globally from qualified distributors who provide local customer support. These distributors also offer a variety of other products, presenting fabs and foundries with opportunities to consolidate their supply bases.
Superior performance in OEM and aftermarket applications

Kaydon AMR (aftermarket replacement) bearings

AMR bearings are the high-performance, cost-effective choice to replace OEM bearings. They are not exact copies, but equivalent or better. While similar to OEM designs, AMR bearings are engineered and manufactured by the world’s leading producer of thin section bearings. And they often sell for less than OEM-supplied components. (Note: “Copy Exact” limitations may apply.)

All AMR bearings come with a standard 12-month warranty on materials and workmanship. They are always packaged with graphic assembly instructions, to ensure proper orientation during assembly.

Kaydon SME (semiconductor manufacturing equipment) bearings

SME bearings are not simply OEM equivalents, but specialized solutions — solutions that OEMs are usually unable (or unwilling) to provide. Using their many years of experience solving problems for fabs, Kaydon engineers recommend design improvements, material upgrades and lubricant changes to meet each fabricator’s special challenge.

SME bearings typically offer better performance than OEM parts and are backed by a 24-36 month performance guarantee (some conditions apply; see graph). They have integral shields to keep contamination out and lubricant in. Non-metallic load balls, spacers and separators reduce particle generation while enhancing corrosion resistance. They also produce a smoother rotation and are not affected by magnetic fields.

The advantages don’t stop there. SME bearings feature vacuum-compatible lubricants (see next page) that do not degrade like conventional lubricants, reducing the chances of contamination and bearing failure. Whatever the challenge, you can count on Kaydon SME bearings to provide long life with very little downtime.

SME & AMR Bearing Materials

Races

- AISI 52100 Steel
- AISI 440C Stainless Steel
- 17-4 PH Stainless Steel

Balls

- 52100 Steel
- 440C Stainless Steel
- Borosilicate glass
- Ceramic

Separators

- Brass
- Nylon/Acetyl
- 440C stainless steel spacer balls
- 52100 steel spacer balls
- PEEK
- Torlon® spacer balls
- Teflon® or Vespel® toroids

Torlon is a registered trademark of Solvay Specialty Polymers. Teflon is a registered trademark of The Chemours Company. Vespel is a registered trademark of E. I. DuPont de Nemours and Company.
Endura-Vac® lubricants: low outgassing and particle generation

Kaydon SME and AMR bearings are cleanroom-cleaned and lubricated with specialized, low-outgassing lubricants suitable for the rated vapor pressure and temperature range. Endura-Vac® lubricants are available in a variety of formulations to meet specific needs and process conditions. Developed in conjunction with premier lubricant manufacturers, they have been field-tested and validated in semicon fabs around the world. Two primary types are available: perfluorinated polyether (PFPE) and multiply alkylated cyclopentane (MAC).

Linear PFPE’s
- Good low temperature properties, including better torque at low temperature
- Good outgassing properties
- Poor load carrying properties, typically around 100,000 psi contact stress
- Poor resistance to Lewis Acids at temperatures that are normally considered safe for PFPE’s

Branched PFPE’s
- Good high temperature properties, including better torque at high temperature
- Outgassing properties depend on viscosity grade
- Good load carrying properties
- Better resistance to Lewis Acids than Linear PFPE’s

MAC’s
- Superior lubricity and much higher load-carrying properties than PFPE’s
- Extremely low outgassing
- The additive solubility of hydrocarbon

From a wide range of Endura-Vac lubricants, Kaydon engineers choose one to suit each application’s vapor pressure, temperature, and process gases.
Semiconductor Application Information Sheet

Contact Name ________________________________________________________________

Company _________________________________________________________________

Phone _____________________________  Email ____________________________________________

1. In what semiconductor process will this bearing be used?
   ___________________________________________________________________________

2. Which robot platform? __________________________________________________________

3. What position on the robot? _____________________________________________________

4. Which part number is being replaced? (please specify aftermarket, OEM or Kaydon P/N)
   ________________________________

5. Describe the bearing performance issues that have been experienced to-date. Examples could include: lubricant turned black, robot positioning error, outgassing, particle generation, noise, corrosion, etc.
   ___________________________________________________________________________
   ___________________________________________________________________________
   ___________________________________________________________________________
   ___________________________________________________________________________

6. What is the current bearing service life? ____________ years ______________ months or _____________ wafer cycles

7. What is the operating temperature of the process? _________________________________

8. If the operating temperature at or near the bearings is known, please report that value as well. ________________________

9. What is the vacuum pressure of the process? ________________________________ Torr (if atmospheric, please indicate this)

10. What process gasses are used in the process? (essential to recommend bearing materials and lubricant type)
   ________________________________________________________________
There are many reasons to choose Reali-Slim® bearings (see other side), but none is more critical than Performance. Design engineers know they can count on a Reali-Slim bearing not just to do its job well, but to do it longer than other bearings.

In side-by-side tests, Reali-Slim bearings consistently outperform other thin section bearings. In the series shown here, three competitors’ bearings failed within 24 hours while the Kaydon bearings ran for up to 120 hours—more than five times longer.

**How Reali-Slim® bearings outperform other thin section bearings**

Each test applied approximately 60% of a bearing’s dynamic radial load rating to samples at a testing speed of 1,780 rpm. For comparability, each bearing had a 4-inch bore. (Competitors’ bearings were obtained through distribution channels.)

Each test continued until automatic shut-off (150% of baseline vibration level) or until audible noise indicated possible bearing failure, then disassembled and inspected for spalling. After all were run to failure, the elapsed times were entered into Kaydon’s Weibull analysis software to determine the fatigue life.

<table>
<thead>
<tr>
<th>Competitor C</th>
<th>Competitor B</th>
<th>Competitor A</th>
<th>Kaydon</th>
<th>Kaydon</th>
<th>Kaydon</th>
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<tr>
<td>76.0</td>
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<td>23.2</td>
<td>19.1</td>
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