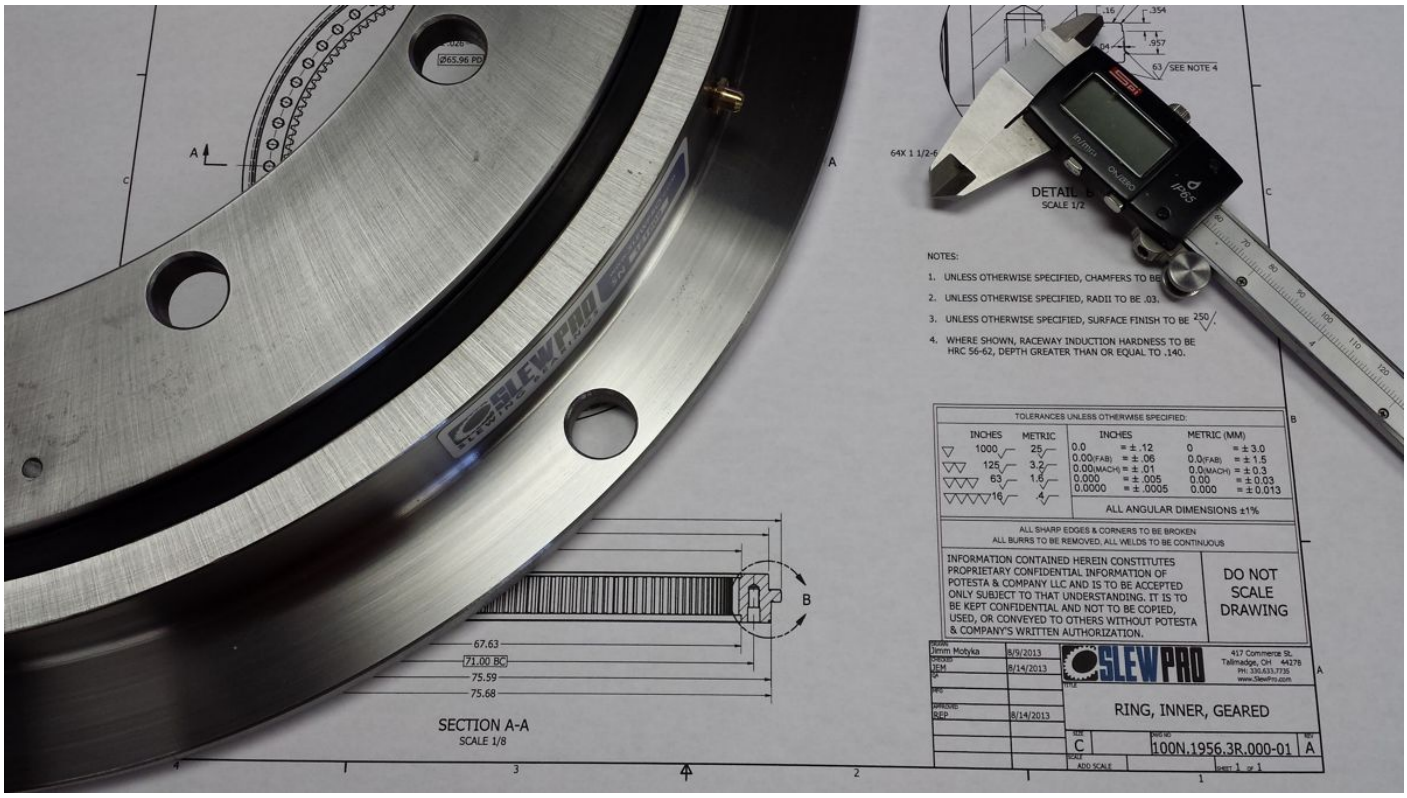
SLEWPRO
SLEWING BEARINGS

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FIELD GUIDE

Slewing Ring Bearing Installation and Maintenance

Storage, mounting, bolting, lubrication, inspection and what to do when a bearing fails. A practical checklist from the SlewPro engineering team.



Keep this guide with the machine.

Your bearing drawing and the instructions supplied with it always take priority over this guide.

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The checklist

Tick each step as you go. The pages that follow explain why each one matters.

Before installation

- ☐ Bearing kept flat, in its original packing, in a clean dry place
- ☐ In storage for more than six months? Raceway regreased and checked for rust
- ☐ Unpacked without cutting or nicking the seals
- ☐ Lifted at several points with rated gear; gear teeth protected
- ☐ Mounting structure stress-relieved after welding, then machined flat, rigid, clean and free of paint, spatter and burrs
- ☐ Support plates at least the thickness in section 2; flatness within the limits in section 2
- ☐ Bolt holes on a uniform circle, not only in the loaded zone
- ☐ New fasteners of the grade, size and number on the bearing drawing (Grade 8 or 10.9 unless the drawing says otherwise); hardened flat washers, no lock washers, no fully threaded bolts

Installation

- ☐ Loading plug and hardness gap placed in the minimum load zone
- ☐ Bolts tightened in stages, in the crosswise sequence, to the drawing torque
- ☐ Bearing rotated while tightening: no tight spots
- ☐ Races round after tightening
- ☐ Rotating torque as expected (no large increase after mounting)
- ☐ Gear backlash set at the marked high point of the gear, then checked over one full turn
- ☐ Pinion contact even across the full face width; several pinions all set alike
- ☐ Bearing turned at least three full turns after final tightening

Before first use

- ☐ Raceway greased after mounting, rotating while greasing
- ☐ Gear lubricated by brush or spray
- ☐ Seals and any gear shroud in place

In service

- ☐ Relubrication on schedule with a compatible grease (see section 5)
- ☐ Bolt torque rechecked at about 200 hours, 600 hours, then every 2,000 hours (section 4)
- ☐ Seals inspected at least once a year; purged grease and surfaces checked at every greasing
- ☐ Noise, heat, torque change or metal in grease investigated, not greased over
- ☐ Idle equipment greased at least every six months

Your drawing takes priority. Where the bearing drawing or the instructions supplied with the bearing give a value, such as bolt grade, tightening torque, grease or relubrication interval, use theirs. Every SlewPro quote includes a 3D model and drawing so these are in hand before the structure is built.

1. Receiving and storage

A slewing ring carries heavy axial, radial and moment loads in the worst conditions a machine sees, but it still has to be treated as a precision instrument. Many early failures trace back to something that happened between the delivery truck and the first full-load cycle.

- **Keep it in its packaging until you install it.** Bearings leave us lightly lubricated, wrapped and crated for shipping and short-term storage. Store them in a clean, dry place. When you unpack it, cut the wrapping away from the seals: a nicked seal lets water and grit into the raceway from day one.
- **Store and move it flat.** Transport and store slewing rings horizontally, in a purpose-built crate. Standing a ring on edge or hanging it from one point can take it out of round.
- **Lift it properly.** Use a sling or lifting gear rated for the bearing, lift at several points, and protect gear teeth from contact with other surfaces.
- **Watch the storage time.** We recommend no more than six months in storage. Beyond that, keep the raceways greased and free of rust, and relubricate before installation. Light surface corrosion on the outside can be cleaned off; a bearing stored for years may need to come back to us for reconditioning before it is used.
- **Operating temperature.** Standard bearings are designed for -22 °F to 158 °F (-30 °C to 70 °C) unless the drawing says otherwise. Outside that range the grease, seals and clearances need to be specified for it: ask us.

2. Prepare the mounting structure

The structure the bearing bolts to matters as much as the bearing. Do not assume it will spread the load evenly: many structures do not. Local deflection changes how the load is shared around the ring, so parts of the bearing see far more than the design load.

- **Stress-relieve after welding, then machine.** A welded structure moves as it relaxes. Stress-relieve it before the mounting faces are machined, or the face you machined flat will not stay flat.
- **Flat, rigid and machined.** Both mounting surfaces must be machined flat (a 250 µin / 6.3 µm finish is typical) and stiff enough not to deflect under load. Riser pads, weld spatter, paint runs or excess metal between bearing and structure all distort the ring. The support face must be at least as wide as the ring face it carries.
- **Clean.** Even a small chip under the ring concentrates load in one area.
- **Bolt holes all the way round.** Load acts around the whole arc. Bolts concentrated in the maximum-load zone let the ring flex; a uniform bolt circle shares the load between bearing, fasteners and structure.

A distorted mounting surface shows up as load concentrating in one part of the raceway, false readings during bolt tensioning, bolt fatigue and, in the worst case, total bearing failure.

Minimum support plate thickness and flatness

Guide values for a plain plate under the bearing; the structure designer confirms them for the actual loads. Flatness includes any slope, and the full deviation should occur only once in 180°, as a gentle wave, never as a step.

Raceway diameter	Min. plate
to 20 in	1 in
to 30 in	1 1/4 in
to 40 in	1 3/8 in
to 60 in	2 in
to 80 in	2 3/8 in
to 120 in	3 1/8 in

Raceway diameter	Single-row ball	Double-row ball	Roller
to 40 in	.006 in	.008 in	.004 in
to 60 in	.0075 in	.010 in	.005 in
to 80 in	.009 in	.012 in	.006 in
to 100 in	.010 in	.014 in	.007 in
to 160 in	.012 in	.016 in	.008 in
to 240 in	.016 in	.020 in	.012 in

Left: minimum plate thickness by raceway diameter. Right: maximum out-of-flatness of the machined support face, including slope, by bearing type.

3. Position and bolt the bearing

- **Loading plug and hardness gap in the minimum load zone.** Both are marked on the bearing. Placed in the heavy load zone, they are a common cause of premature failure.
- **The specified fasteners, and new ones.** Bolt grade, size and number are part of the bearing design: Grade 8 (metric 10.9) unless the drawing says otherwise, with hardened flat washers under the heads and nuts. No lock or spring washers, no fully threaded bolts, and never reuse bolts, nuts or washers. The equipment designer is usually responsible for the fasteners; your fastener supplier can confirm expected bolt loads for your structure.
- **Tighten in stages, crosswise, with a calibrated torque wrench** (hydraulic tensioning on large rings) to the torque on the drawing. Go round the circle lightly first, then in two or three passes to full torque, always jumping across the ring so it is pulled down evenly rather than from one side.
- **Rotate the bearing as you tighten.** A tight spot that develops while you torque the bolts points to a flatness or distortion problem. Stop and find it.

Guide tightening torques

Lubricated threads, friction factor 0.14. **The torque on your bearing drawing takes priority.** Values in lb-ft.

UNC	Grade 5	Grade 8
5/8-11	133	192
3/4-10	236	339
7/8-9	384	538
1-8	568	811
1 1/8-7	715	1,150
1 1/4-7	1,010	1,615

UNF	Grade 5	Grade 8
5/8-18	155	214
3/4-16	266	376
7/8-14	428	605
1-12	634	892
1 1/8-12	811	1,300
1 1/4-12	1,120	1,800

Metric	Class 8.8	Class 10.9
M12	58	86
M14	93	136
M16	142	206
M18	199	285
M20	285	412
M24	491	704
M27	730	1,030
M30	996	1,415

1 lb-ft = 1.356 N·m. Class 12.9 bolts are used only in rare cases and only when the drawing calls for them.

4. Check it before it goes into service

- **Races are round** after the bolts are tightened.
- **Rotating torque** is what you expect. A bearing that turns noticeably harder after mounting than before almost always has a mounting problem.
- **Turn it at least three full revolutions** after the last bolt is torqued, and check the backlash over a whole turn, not just at one spot.
- **Gear backlash** is set at the high point of the gear, normally marked on the bearing (paint on two or three teeth), and is never less than **0.05 ÷ DP inches** (0.05 × module in mm): a 2 DP gear needs at least .025 in. Where there are several pinions, every one is set to the same backlash.
- **Tooth contact** is even across the full face width of the ring gear. A contact patch to one side means the pinion axis is not parallel to the ring axis: correct the alignment before running.
- **Bolt torque is rechecked** after the first period of operation, to catch any loss from settling, and on the schedule below.

Bolt inspection schedule

When	What to do
About 200 hours	Check the torque of every bolt. If more than 10% have lost torque, check again after another 200 hours.
About 600 hours	Check the torque of every bolt.
Every 2,000 hours	Check the torque of every bolt. If a bolt is below 80% of its torque, replace it and its two neighbours with new bolts. If 20% or more are below 80%, replace the whole bolt circle.
Every 12,000 hours	Replace all bolts, nuts and washers with new ones.
At least once a year	Inspect the seals and replace any that are damaged. Standard nitrile seals last about five years; Viton seals, used for high temperatures, a little longer.

5. Lubrication

Slewing rings run under high loads at slow speeds, which are ideal conditions for metal-to-metal wear if the grease film breaks down. Grease reduces friction, pushes out contaminants and stops corrosion. Lubrication is the cheapest way to make a bearing last, and the most common reason one does not.

Choosing the grease

- **Grade and additives.** For most industrial slewing rings we recommend an NLGI grade 2 grease with EP (extreme-pressure) and anti-wear additives, often with a solid lubricant such as molybdenum disulfide.
- **Base oil viscosity.** Heavier loads and slower speeds call for higher viscosity.
- **Thickener.** Lithium and lithium-complex are the norm; calcium-sulfonate where water resistance matters most.
- **Temperature.** Choose a grease rated for the ambient and the operating temperature.
- **Harsh service.** Water, dust and heavy shock, as in mining or marine work, may need a specialized grease. Ask us.

EP2 raceway greases sold in North America

Any of these NLGI 2 extreme-pressure greases suits a standard slewing ring raceway. Pick one and stay with it: do not mix thickener types in the same bearing. If your drawing or order acknowledgement names a grease, use that one.

Brand	Raceway grease (NLGI 2, EP)	Thickener
Mobil	Mobilux EP 2	Lithium
Mobil	Mobilgrease XHP 222	Lithium complex
Shell	Gadus S2 V220 2 (formerly Alvania EP 2)	Lithium
Chevron	Ultra-Duty Grease EP 2	Lithium
Chevron	Starplex EP 2	Lithium complex
Castrol	Spheerol EPL 2	Lithium
Phillips 66	Unoba EP 2	Lithium
Petro-Canada	Precision XL EP2	Lithium complex
Klüber	Centoplex 2 EP	Lithium

Open gear and pinion: an open-gear lubricant applied by brush or spray, such as Mobiltac 375 NC, Shell Malleus OGM or Klüber Grafloscon C-SG 0 Ultra, or the open-gear product from the same supplier as your raceway grease.

How often to relubricate

Situation	Typical starting point
After installation	Grease the raceway once mounted, even though it arrived pre-greased; lubricate the gear by brush or spray.
Normal service	Every 50 to 100 operating hours: ball-type rings toward 100 hours, roller-type rings every 50 hours. 100 hours is the upper limit.
Continuous rotation	Shorter: as often as every 20 hours of continuous use.
Heavy, dusty, wet or outdoor service	Shorten the interval.
Idle equipment and storage	At least every six months, to prevent corrosion.

Always rotate the bearing while greasing, so the grease reaches the whole circumference and pushes old grease and contaminants out.

Four mistakes to avoid

- **Greasing once a year.** Far too infrequent for most applications.
- **Mixing greases.** Two incompatible greases in one raceway can both stop working. Use the same grease, or one confirmed compatible.
- **Greasing until it overflows.** Grease purging past the seals means too much; it raises temperature and pressure in the bearing.
- **Greasing a noisy bearing and carrying on.** Noise can mean internal damage, and extra grease only hides it for a while.

6. Warning signs and what they usually mean

Almost every failure we see has one of four causes, lubrication, installation, overload and fatigue, or corrosion, and almost all of them give warning first.

Warning sign	Often caused by	What to do
Noise or vibration that is not normal	Dry raceway, contamination, internal damage, overload	Investigate before relubricating; check purged grease and the load.
Rising temperature or hot spots	Not enough grease, wrong grease, over-tight bolts, overload	Check grease type and quantity, bolt torque and the load chart.
Irregular torque or new resistance	Mounting distortion, contamination, raceway damage	Check flatness and bolts; inspect the raceway and seals.
Metal flakes in purged grease or filters	Raceway or gear wear, fatigue	Take it seriously: plan an inspection and a replacement.
Discoloration, peeling or scoring	Lubrication breakdown, overheating	Relubricate early; find the cause.
Grease leaking, or damaged seals	Seal wear, over-greasing, impact	Replace seals; keep contaminants out.
Increasing axial or radial play	Wear, fatigue, loose bolts	Measure and record it; contact us with the trend.
Rust on the rings or gear	Damp storage, washdown, salt, no fresh grease	Clean, regrease; review seals and protection.

Stay inside the load chart

Every bearing has limits for load, speed and temperature on its load chart. Repeated loading beyond them, or many cycles near them without maintenance, starts fatigue cracks in the raceways that can end in sudden failure. If the application has changed since the bearing was selected, have the selection checked.

7. Replacing a bearing

If a bearing has failed and the machine is down, speed matters. Send us whatever you have:

- **the part number,** from any manufacturer. More than 800 SlewPro designs are already crossed to other brands, and you can look them up at **slewpro.com/crossovers**;
- **the drawing**; or
- **photos and the main dimensions:** outside and inside diameter, height, bolt circles and gear details.

Talk to our engineers. Send it to **info@slewpro.com** or call **330-633-7735**, and we will identify the replacement and tell you what, if anything, differs from the original. More guides at **slewpro.com/blog**.