

Lubrication

Grease lubrication is usually satisfactory up to the normal maximum speeds shown in our Product Catalogue, subject to temperature and axial loads. We recommend (up to 100°C) the use of a good quality lithium based grease with extreme pressure (EP) additives i.e. EP2 or equivalent.

Greases with extreme pressure additives (EP) are advantageous, especially for high radial or axial loads. The permitted axial load on a (GR) fixed bearing is reduced by 50% if an EP grease is not used.

For extreme temperatures, speeds and high loads it is always advisable to obtain recommendations from our technical department. Greases of No2. consistency can generally be used for most applications and are also suitable for most pumped systems.

Procedure

Calculate dN by multiplying the shaft speed by the bore of the bearing in millimetres. e.g 750 rpm x 100mm = 75000dN. Ensure that all bearing parts are clean and apply grease as follows.

For speeds up to dN = 50,000, the roller bearing and cartridge should be packed full on assembly, (full pack weights are given in the table). As the dN value increases, use progressively less grease to coat the bearing parts, from a full coating of the cage and bearing surfaces at dN = 50,000 or less down to a smear about 1mm thick at dN = 200,000 or more. Proportional amounts are shown here.

| Over | dN | to | Full Pack |
|---------|----|---------|-----------|
| - | | 50,000 | 100% |
| 50,000 | | 100,000 | 75% |
| 100,000 | | 150,000 | 50% |
| 150,000 | | 200,000 | 33% |
| 200,000 | | - | 25% |

All cartridge and seals should be well lubricated on assembly including the bores of the triple labyrinth seals and thrust bearings where fitted. Felt seals should be soaked in oil before fitting. Blanking plates should be sealed with grease or jointing compound. **Never assemble the bearing dry and inject grease after closing the cartridge. Always coat the swivel seatings with oil or grease.**

Lubrication Points

Cooper cartridges are tapped 1/8 or 1/4 NPT according to size and Series. Grease nipples or temporary plugs are fitted as standard. Special lubricators by arrangement. BSP fittings are acceptable, but will screw in further and care must be taken to avoid blocking off the horizontal grease passage. The lubricant is injected through the outer race directly onto the rolling surfaces. Pipework must be flexible to allow the swivel cartridge to function.

Clamping Ring Screw Sizes and Tightening Torques

The table below shows the clamping ring screw sizes and tightening torques. The tightening torques for cartridge and pedestal joint screws are 75% of the values shown for the same screw size. The tightening torques of cartridge radial screws are 50% of the values shown for the same screw size. (These are not necessarily the same size as the clamping ring screws).

The tightening torques of side screws are as follows:

M4: 2.0Nm M6:7.8Nm M10: 30Nm M16: 125Nm

Bearing Sizes in Millimetres

| | | | | | | | | | |
|------------|-------|-------|---------|---------|---------|---------|---------|---------|---------|
| Series 01 | 40-75 | 80-90 | 100-130 | 135-200 | 220-300 | 320-480 | 500-600 | - | - |
| Series 02 | - | 50-60 | 70-100 | 110-150 | 160-180 | 190-260 | 280-460 | 480-600 | - |
| Series 03 | - | - | - | - | 100-150 | 160-200 | 220-260 | 280-320 | 340-600 |
| Screw Size | M4 | M5 | M6 | M8 | M10 | M12 | M16 | M20 | M24 |
| Key A/F | 3 | 4 | 5 | 6 | 8 | 10 | 14 | 17 | 19 |
| Torque Nm | 4.5 | 8.5 | 15 | 35 | 70 | 120 | 300 | 560 | 950 |

Bearing Sizes Imperial

| | | | | | | | | | |
|---------------|---------|-------------|---------|---------|---------|---------|-------|-------|-------|
| Series 01 | 1 1/2-3 | 3 1/4-3 1/2 | 3 3/4-5 | 5 1/2-8 | 9-12 | 13-19 | 20-24 | - | - |
| Series 02 | - | 1 3/4-2 1/2 | 2 3/4-4 | 4 1/2-6 | 6 1/2-7 | 8-10 | 11-18 | 19-24 | - |
| Series 03 | - | - | - | - | 4-6 | 6 1/2-8 | 9-10 | 11-13 | 14-23 |
| Torque lbf ft | 3.5 | 6.5 | 11 | 26 | 52 | 88 | 220 | 415 | 700 |

Grease Weights

| Grease Weights kg | | Full Pack Approx | | | Grease Weights kg | | Full Pack Approx | | |
|-------------------|---------|------------------|--------|--------|-------------------|---------|------------------|--------|--------|
| Bearing | Bearing | Series | Series | Series | Bearing | Bearing | Series | Series | Series |
| Bore | Bore | 01 | 02 | 03 | Bore | Bore | 01 | 02 | 03 |
| inch | mm | kg | kg | kg | inch | mm | kg | kg | kg |
| 1 1/2 | 40 | 0.06 | - | - | 5 1/2 | 140 | 0.78 | 1.40 | 2.00 |
| 2 | 50 | 0.09 | 0.15 | - | 6 | 150 | 0.90 | 1.40 | 2.70 |
| 2 1/2 | 65 | 0.15 | 0.21 | - | 6 1/2 | 170 | 1.00 | 1.40 | 3.60 |
| 3 | 75 | 0.18 | 0.30 | - | 7 | 180 | 1.10 | 2.00 | 4.20 |
| 3 1/2 | 90 | 0.30 | 0.45 | - | 8 | 200 | 1.40 | 2.70 | 5.40 |
| 4 | 100 | 0.36 | 0.60 | 1.20 | 9 | 220 | 1.40 | 3.60 | 6.90 |
| 4 1/2 | 110 | 0.51 | 0.90 | 1.40 | 10 | 260 | 2.00 | 4.20 | 8.10 |
| 5 | 130 | 0.60 | 1.10 | 1.40 | 11 | 280 | 2.00 | 4.80 | 10.00 |
| | | | | | 12 | 300 | 2.00 | 5.40 | 11.00 |

If possible re-grease the bearing as it rotates. The grease charges listed below are for bearings up to 75mm bore; use progressively more grease as the bearing size increases.

Expansion (EX) Bearings

One or two shots (3ml) from a grease gun every 400 operating hours is usually sufficient.

Fixed (GR) Bearings for Thrust

One or two shots (3ml) from a grease gun every two weeks i.e. 100 operating hours according to duty and experience.

Fixed (GR) Bearings used for Location Only

Treat as Expansion (EX) bearings.

For bearings with speeds up to dN=50,000 which are assembled with a full pack grease, re-greasing intervals can be increased to one year, provided the thrust load on the GR bearings is nominal.

Pumped systems should be metered to be equivalent to the above quantities. Clean out and replace the grease after several years or as conditions dictate or determine.

Shaft Tolerance

| Diameters | Over | - | 50 | 80 | 120 | 180 | 250 | 315 | 400 | 500 | Surface Texture | |
|-------------------------------|--------|--------------------------|----|-----|-----|-----|-----|-----|-----|-----|-------------------|--------|
| | to | 50 | 80 | 120 | 180 | 250 | 315 | 400 | 500 | 630 | Maximum Roughness | |
| Shafts | BS4500 | Tolerance. µm. (0.001mm) | | | | | | | | | µmRa Grade | |
| Uni-directional loads | +0 | | | | | | | | | | | |
| at speeds up to dn = 100,000 | d h7 | - | 25 | 30 | 35 | 40 | 46 | 52 | 57 | 63 | 70 | 3.2 N8 |
| Moderate Loads (C/P > 10) | | | | | | | | | | | | |
| Reciprocating loads | | | | | | | | | | | | |
| Vibratory duty | +0 | | | | | | | | | | | |
| Extra fine clearance bearings | d h6 | - | 16 | 19 | 22 | 25 | 29 | 32 | 36 | 40 | 44 | 1.6 N7 |
| Speeds over dn = 100,000 | | | | | | | | | | | | |
| Heavy loads (C/P < 10) | | | | | | | | | | | | |
| Geometric Accuracy | | | | | | | | | | | | |
| Cylindricity of Shaft Journal | d IT6 | 16 | 19 | 22 | 25 | 29 | 32 | 36 | 40 | 44 | - | - |

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COOPER®



Caution

Some components have sharp edges. Please read instructions before assembly

Assembly and Lubrication Instructions

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Preliminary Notes

On simple shaft arrangements with one GR (Fixed) bearing and one or two EX (Expansion) bearings, the GR bearing should be positioned adjacent to the drive. On multiple bearing shaft arrangements please consult our technical department for bearing positions.

The GR (Fixed) bearing locates the shaft axially and should be, where possible, fitted first. EX (Expansion) bearings should be fitted to ensure the rollers will be central on the outer race when the bearing is in the correct running position or offset to allow for expansion. See Stage 2.

Unwrap bearings parts, then unclip cage joint - you generally will have one of three options:

- 'U' Clips:** Remove and retain 2 steel clips using a small screwdriver - Diagram 5.
- Spring Plate Joint:** Lift up the jointing plate over locating pins using flat bladed screwdriver - Diagram 5A.
- Pressed Steel Cage:** Insert a small flat bladed screwdriver into one of the slots in the upper tab at the joint, rotate the blade to open the joint, first on one side, then the other. Repeat for the second cage joint. Both joints must be disengaged before separating cage halves. Failure to do this may distort the cage thereby making it unusable. (See Diagram 5B).

Other types of jointing may be used, for advice please consult our technical department.

Undo clamping ring screws and remove clamping rings from inner race. Remove the preservative from all parts. Handle half cages and rollers with care. Keep the bearing safe from damage. Lightly oil threads and interfaces, including bores of clamping rings. Complete roller bearings are interchangeable between similar Cooper cartridges, individual parts should not be interchanged.

Cartridges are also interchangeable between standard outer castings except where S1 spherical fit has been specified. Pairing marks must match.

The fixed (GR) bearing has guiding lips on both inner and outer races. In the case of Series 01 and 02 bearings to 300mm and Series 03 to 150mm, rollers are guided by clamping ring faces and the lips of the outer race.

All bearing components (with the exception of pressed steel cages and die cast cages) cartridges and outer castings are marked with matching numbers on each half. Ensure the numbers on each half component are the same and are together when assembled.

Fitting an Outer Race where Radial and or Axial Screws are used

All lipped outer races must be clamped axially. Side screws 'C' are fitted to all GR cartridges but rods are not required for sizes 100mm - 155mm in Series 01 and 02. Clean the outer race seating in the cartridge to remove preservative and lightly oil. Fit the half outer races - See Stage 6.

Stage 1

Clean and inspect the shaft diameter. Refer to the table for tolerances. The inner race, before assembly, measures undersize equivalent to the final gap at the joints. When assembled on the shaft, there should be a gap at each inner race joint. **This gap is a feature of the design to ensure that the half races grip the shaft.**

Stage 2

Lightly oil the shaft with thin machine oil, then remove the excess with a clean wiper. Place the inner race at the correct position on the cleaned shaft. Soft packing on the joint faces, or feeler gauges should be used to ensure the joint gaps are approximately equal. Expansion races normally are set centrally with the roller, but in cases of axial expansion, may be offset within +/-10% of the roller length.

Stage 3

Fit the clamping rings with joints approximately 90° to the inner race joint. Discolouration on certain clamping rings is associated with localised heat treatment to increase wear resistance. There should be equal gaps at both joints of the clamping rings and races. Progressively tighten all clamping screws equally using the correct hexagon key and torque wrench (or key and tube extension if the torque wrench is not available).

Stage 4

Tap down each half of the inner race and clamping rings all round the shaft using a soft faced hammer or, insert a hardwood block between a steel hammer and bearing parts. Re-tighten screws. Repeat until screws are fully tight. The recommended torque values are shown on the reverse. Check there is a gap at both joints of the inner race. The total gap varies and is not critical provided the shaft is within the required tolerance. Check that expansion inner races will be central or correctly offset when all parts are finally positioned.

Stage 5

Coat the roller cage with grease and lightly cover the other parts for protection. Place cage around the inner race and join together as follows:

- 'U' Clips:** Press the 2 jointing clips in place - Diagram 5.
- Spring Plate Joint:** Push the 2 cage halves together until the jointing plates clip over the protruding pins - Diagram 5A (screwdriver not required).
- Pressed Steel Cage:** Ensure the tabs of one end of each cage half can engage into the body of the other cage half. Using even pressure on each side of the joint, push the tabs fully home until the joint locks, repeat with second joint. Check that both sides of the joint are fully home.

Stage 6

Place the half outer race with the lubrication hole in the top half cartridge and the second half race into the lower half cartridge, ensuring the pairing marks match. Ensure the ends of the outer race project from the cartridge joint face by equal amounts. Where there are axial or radial screws, fit as shown in diagram 6: just enter radial holding screws 'D' where provided, it is important to fit washers. Fit the side rods and screws 'C' where provided and very lightly tighten. Place together the half cartridges and fully tighten the cartridge joint screws 'B'. Progressively and fully tighten the radial screws 'D' and or side screws 'C'.

In some sizes, two cartridge joint screws must be removed to gain access to the side screws. Inject grease to fill the grease passages. Remove screws 'B' from cartridge joints, separate cartridge taking care the upper half outer race does not fall out of position where radial screws are not fitted

Stage 7

Fit seals into cartridge end bores (or TL seals on the shaft). Felt seals should be soaked in oil before fitting. Coat the inside of the cartridge, cage and rollers and all seals with grease. (See lubrication table for quantity). Place the bottom half of the cartridge on top of the bearing and rotate 180° into the pedestal. End bore seals should be left well lubricated on assembly including the bores of the revolving triple labyrinth seals. Blanking plates should be sealed with grease or compound. Add the correct quantity of grease to the cartridge as specified overleaf. Place the top half of the cartridge on top of the bottom half of the cartridge ensuring the pairing marks appear on the same side. Close cartridge and fully tighten joint screws. Lubricate the spherical seating. Anti-scaffing compounds are advantageous. Pedestal bases must be supported to avoid deflection. **To ensure swivel alignment, the shaft should be run for a short period before fully tightening the pedestal cap screws.** Where oil lubrication is to be used, the cartridge joint faces and screws should be treated with sealing compound.

Check List

- The correct shaft size is important.
- Fully tighten clamping ring screws.
- Parts should not be interchanged.
- Lubricate before closing the cartridge.
- Match marks should coincide.
- Lubricate swivel seating.
- Lightly oil threads and interfaces.
- Safeguard rolling surfaces for transit.
- Gap at each inner race joint.

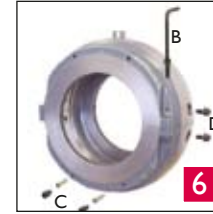
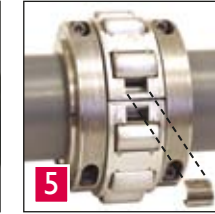
Technical Support

Please consult our Product Catalogue or consult Cooper technical department in case of doubt regarding suitability for any application or operating condition.

Health and Safety at Work

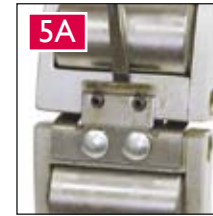
We draw attention to the aspect of safety in the fitting and use of bearings. Damage to equipment and personal injury may result if bearings are not installed according to the instructions given here, or operated outside the limits and load given in the Product Catalogue. Any significant mist from lubricant should be ducted away. All threaded lifting holes are marked with the appropriate size. e.g. M16. Note that all bearings for the UK coal industry have modified specifications excluding aluminium materials.

Assembly Procedure



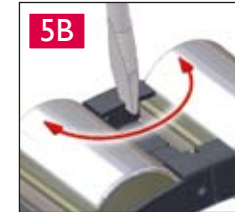
Jointing Plates

Cage jointing plates for larger bearings.



01E Series

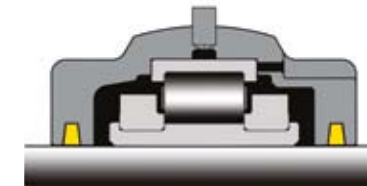
Pressed Steel Cages



Bearing Types

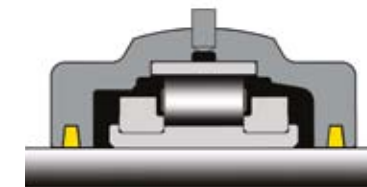
Fixed (GR) Bearing

Bearings with grooved inner race assemblies and grooved outer races for radial and axial loads. To be fitted in GR cartridges with side screws. (See diagram 6).



Expansion (EX) Bearing

Bearings with grooved inner race assemblies and plain outer races for radial loads. To be fitted in EX cartridges without side screws.



Special Expansion (EXILOG) Bearing

Bearing with plain inner race assemblies and grooved outer races, must be fitted into GR cartridges with side screws. (See diagram 6).