Flanged Bearings

- Solid Naval Brass Shell
- Nitrile Rubber Lined

Installation & Storage Manual

Duramax Marine® is an ISO 9001:2008 Certified Company

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INSTALLATION INSTRUCTIONS For Johnson Cutless Flanged Bearings

PRE-INSTALLATION INSPECTION OF BEARING HOUSING:

Bearing Housings (stern tube, strut or A-Bracket housings) should be inspected prior to installing of Johnson Cutless Bearings.

1. Bearing housings should be clean and free of all dirt, corrosion and foreign materials.
2. Dimensional inspection should be conducted to ensure proper housing dimensions and to assist with proper step machining of the bearing shells.

PRE-INSTALLATION INSPECTION OF PROPELLER SHAFTING:

Before installing the propeller shaft through the Johnson Cutless Bearings, visually inspect the propeller shaft and bearing journals.

1. Remove any metal burrs and sharp edges that can damage the rubber bearing surface.
2. Propeller shafts should be checked for straightness and bearing journals/sleeves should be inspected for proper and allowable dimensional run-out.
3. Shafts or bearing journals/sleeves in way of Johnson Cutless Bearings must be non-corrodible in the water used to lubricate the rubber bearings.
4. The propeller shaft or bearing journal/shaft sleeve must be smooth and true to size in way of the Cutless Bearings to insure long bearing life.
5. Shafts or bearing journals/sleeves should be fairly hard, close grained and free of porosity, pitting, sand inclusions and other defects.
6. Shafts or bearing journals/shaft sleeves in way of Johnson Cutless Bearings should have a smooth, ground and polished or piston finished surface.
7. Always dimensionally inspect the shaft and bearing journal/shaft sleeve diameters to verify they are of proper dimensions for the installed Johnson Cutless Bearings.

NOTE: *All Johnson Cutless Bearings are factory finished to provide the proper over-shaft running clearance for a designated shaft or bearing journal/shaft sleeve diameter.*

INTERFERENCE FITTING OF BEARING:

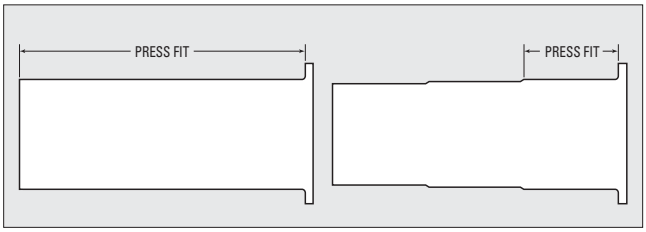
Johnson Cutless Flanged Bearings should be installed with a light press or interference fit of 0.02 to 0.06 mm (.0008 to .0024 in) between the bearing outside diameter and the bearing housing inside diameter.

WARNING: If the press fit between the bearing outside diameter and the housing inside diameter is more than a light press fit, the required pounding of trying to force the bearing into the housing can create sufficient shock that may separate the rubber to metal bond.

CAUTION: When press fitting, do not lubricate the bearing housing or the bearing shell.

STEP MACHINING THE SHELL MATERIAL OF BEARING:

To assist in bearing installation and bearing replacement, the outside diameter of the Johnson Cutless Flanged Bearing can be stepped machined to reduce the length of interference fit between the inside diameter of the bearing housing (stern tube, strut or A-Bracket housing) and the outside diameter of the bearing shell.



CAUTION: When step machining the bearing shell material, do not reduce the original shell material wall thickness by more than 50%

DRILLING THE BEARING FLANGE:

In addition to the press fitting, mounting fasteners should be installed through the bearing flange into the bearing housing to prevent bearing shell rotation inside the bearing housing (stern tube, strut or A-Bracket housing).

1. Johnson Cutless Flanged Bearings are supplied with the bearing flange undrilled.
2. The bearing flange should be drilled to match the hole pattern of the bearing housing.
3. Drilled holes must provide adequate diametrical clearance to facilitate the installation of mounting studs through the bearing flange into the bearing housing.

CHILLING / SHRINKING OF BEARING:

Chilling the Johnson Cutless Flanged Bearing Brass Shell is an acceptable practice to assist with the press/interference fitting of the bearing into the bearing housing (stern tube, strut or A-Bracket housing).

1. The method of chilling the brass shell must be achieved by gradual cooling to not more than 0 degrees F. or – 17.8 degrees C.

NOTE: *If the chilling is fast with extreme temperature differential, the thermal shock can result in the damage of the bond between the rubber polymer and bearing shell material.*

WARNING: Never immerse a Johnson Cutless bearing in dry ice as it will cause rubber to metal bond failure and will severely damage the rubber polymer.

WARNING: Bearings should be pressed into the housing. If the interference fit is more than a light press fit, the resultant pounding of trying to force the bearing into the housing can create sufficient shock to the chilled bearing and cause rubber to metal bond failure. Do not physically shock the bearing by pounding or striking the bearing during the press fitting process.

PROTECTING THE BEARING DURING INSTALLATION OF PROPULSION SHAFT:

Common shipyard practice is to install the propeller shaft after the Johnson Cutless Bearings have been installed into the bearing housings. Use extreme care when installing the propeller shaft through the bearing to avoid damaging the Cutless Rubber bearing surface.

1. During installation, the weight of the propeller shaft should be properly supported to reduce excessive loading on the rubber bearing surface and to prevent physical damage of the rubber bearing surface.

2. The Cutless Rubber Bearing surface and the large diameter areas of the propeller shaft should be coated with a mild, water soluble soap or Glycerin prior to installing and moving the propulsion shaft through the bearings.

3. The water soluble soap or Glycerin will reduce drag and reduce friction caused by the shaft contacting the rubber bearing surface during shaft installation.

4. The lubricant used should be a product that does not contain acids, ammonia, chlorine or any other harmful additive.

WARNING: Although the Cutless Rubber is oil resistant, do not use Petroleum Based or Non-Water Soluble Lubricants to assist with installing the propeller shaft through the Johnson Cutless Bearings. These types of lubricants will clog or block bearing water lubrication grooves and may restrict bearing lubrication flow.

OVER-SHAFT RUNNING CLEARANCES:

Johnson Cutless Bearings are factory finished to provide the proper over-shaft running clearances for a designated shaft or bearing journal/shaft sleeve diameter.

1. Bearing running clearances are easier to check prior to installation. However, it is difficult to make accurate rubber I.D. measurements on a Johnson Cutless Bearing with two-point micrometers because the soft rubber lining will deflect and provide a false reading. Therefore, the best practice is to check the rubber inside diameter with plug gages.

2. Bearing running clearances can be measured after installing the propeller shaft by utilizing feeler gages. However, to ensure proper bearing running clearance measurement, rubber deflection caused by the static weight of the propeller shaft must be eliminated.

3. Position the propeller shaft so that it is touching the rubber bearing surface but in a manner that prevents compressing the rubber.

4. Using a feeler gage, measure the clearance between the shaft and the rubber bearing surface at a point 180 degrees opposite the location where the shaft touches the bearing surface.
EXAMPLE: *If the shaft is touching the bearing surface at the 6 o'clock position, the clearance should be measured at the 12 o'clock position.*

5. Whenever possible, measure and record clearances at both ends of the Cutless bearing.

6. Variations in ambient temperature will produce dimensional changes in Cutless Bearings because the coefficient of thermal expansion of rubber is substantially greater than metal.

7. The rubber expands and contracts with changes in ambient air temperature. Therefore, in the field, bearing running clearances can differ from the factory measurements.

8. Duramax Marine Engineering Department can verify bearing running clearances based on the ambient air temperature at time of shipyard inspection. Contact Duramax Marine with the bearing part number, field clearance measurement results and the ambient air temperature at time of your inspection.

WARNING: Improper over-shaft running clearances can result in the reduction of lubricating water flow, elevated bearing operating temperatures and additional reduction of bearing over-shaft clearances. These conditions can severely damage the rubber bearing surface and result in pre-mature bearing wear and/or total bearing failure.

WATER LUBRICATION REQUIREMENTS FOR FLANGED BEARINGS:

It is imperative that Johnson Cutless Bearings be thoroughly wetted whenever the propeller shaft is in rotational operation.

1. Lubrication flow/circulation dissipates frictional heat and discharges abrasive particles or foreign materials through the bearing water grooves before they can clog the water lubrication grooves.

2. If the frictional heat is not dissipated, the Cutless rubber expands reducing over-shaft bearing clearances and can result in bearing damage or failure.

3. The ends of the Johnson Cutless Bearing should be open and free of restrictive rings or parts that may impede the flow of water lubrication.

4. If the Johnson Cutless Bearing is installed in a location where sufficient flow of lubricating water is not present, such as a forward stern tube bearing, the bearing should be forced lubricated.

5. Johnson Cutless Bearings operate with nominal bearing loads of 0.28 MPa (megapascals) (40 psi) or less, and require a continuous flow of water lubrication of 0.02 cubic meters per hour per millimeter of bearing journal diameter (2 US gallons per minute of inch of shaft diameter). ***EXAMPLE:*** *a 100mm bearing journal diameter would require a minimum water lubricant flow of 2.0 cubic meters per hour (8 US gallons per minute).*

6. Johnson Cutless Bearings installed as Propeller Strut or A-Bracket Bearings that are open to the seawater on both ends and located in a continuous water flow stream area may not require forced water lubrication. However, propulsion systems utilizing Controllable Pitch Propellers may require special forced lubrication designs for Propeller Strut/A-Bracket Bearings because water flow may be interrupted when operating the CPP propeller at zero (0) blade pitch.

WARNING: Lack of proper water lubrication flow results in elevated bearing operational temperatures and reduction of bearing over-shaft clearances that can severely damage the rubber bearing surface and result in pre-mature bearing wear or total bearing failure.

PROTECTION OF BEARINGS DURING VESSEL LAY-UP OR LONG PERIODS OF INACTIVITY

During long periods of propulsion system inactivity such as a vessel lay-up, Johnson Cutless Bearings should be protected from prolonged concentrated loading of the bearing surface from the static weight of the propulsion system.

1. Concentrated loading can create compression set of the Cutless Rubber Bearing surface resulting in an out of round bearing surface and increased bearing running clearances. Both of which may reduce bearing operating life.

2. Prolonged periods of severe concentrated loading of the Cutless rubber bearing surface by the propeller shaft can result in the static adhesion of the Cutless Rubber Bearing to the propeller shafting material.
NOTE: *If static adhesion occurs, the Cutless bearing surface can be damaged when the propeller shaft rotates.*

3. Protection from compression set and static adhesion can be accomplished by lifting or jacking the shaft off the bearing surfaces so that the rubber bearing surfaces are not being compressed by the weight of the propeller shaft.

4. If the propeller shaft can not be supported, it is recommended to rotate the propeller shaft periodically (minimum of one time per week).
NOTE: *Rotation should be at least 1-1/4 turns or 450 degrees.*

CAUTION: During this rotation, the propeller shaft and bearings must have lubrication present to prevent damage to the bearing surface.

STORAGE INSTRUCTIONS Of Bearings For Optimum Shelf Life

Johnson Cutless Bearings should be stored indoors in a temperature controlled environment (HVAC) in the original factory packaging. Do not unpack bearings and place on open shelf storage. The factory packaging has been designed to protect and minimize aging.

WARNING: DO NOT REMOVE BEARINGS FROM THE ORIGINAL FACTORY PACKAGING.

KEEP BEARINGS IN FACTORY PACKAGING TO PROTECT AGAINST AGE HARDENING.

Rubber can be damaged by oxygen, ozone, and ultra-violet light. These factors can instigate, alone or in combination, hardening or cracking of the rubber surface. The factory packaging is designed to minimize the effects of oxygen, ozone and pollutants.

1. **PROTECTION FROM OZONE.**
   Johnson Cutless Bearings should never be stored near electrical transformers, electric motors, arc welders, or other high voltage equipment as the ozone these devices create is very harmful to rubber bearings in storage.
2. **PROTECTION FROM ULTRAVIOLET LIGHT.**
   Since sunlight is usually the major source of ultraviolet light, protection can usually be accomplished by storage in a dark place. To protect from sunlight, Johnson Cutless Bearings are wrapped in opaque, polyethylene bags before being placed in the standard wood boxing. Also, locate bearing storage to prevent direct sunlight on the bearing packaging.
3. **PROTECTION FROM EXCESSIVE HEAT.**
   Prolonged exposure to excessive heat will harden the rubber. This can be minimized by storing Johnson Cutless Bearings away from heat sources. Store in a temperature controlled environment with a HVAC system so the ambient air temperature does not exceed 30 degrees C.
4. **PROTECTION FROM EXCESSIVE COLD.**
   Cyclic temperature changes can affect the rubber to metal bond. Excessively cold temperatures can create shrinkage stresses which also damage the bond. Therefore, it is recommended that temperatures are maintained above -18 degrees C (or 0 degrees F).

Successful storage of Johnson Cutless Bearings depends in a large extent on periodic monitoring to assure the above specified storage protection is in place and that no deterioration is occurring.

Notes:

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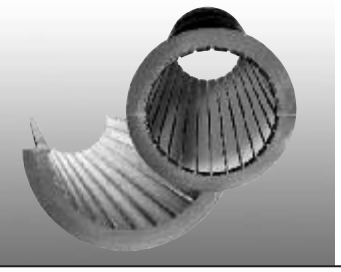
Duramax Marine® is committed to providing excellence in every product we manufacture. Our Johnson Cutless® marine and industrial bearings, heat exchangers, impact protection systems and sealing systems are known worldwide for their engineered quality and dependable performance. Please contact the factory for information on any of the following Duramax Marine® products:

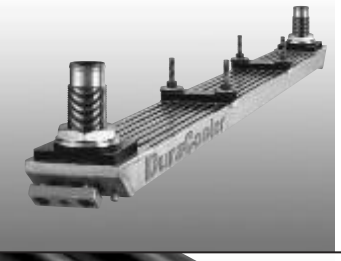
JOHNSON CUTLESS® WATER-LUBRICATED BEARING SYSTEMS

Johnson Cutless® Sleeve and Flanged Bearings
DX 490 Rudder Bushings



DURAMAX® ADVANCED WATER-LUBRICATED BEARING SYSTEMS

Johnson® Demountable Stave Bearings
ROMOR®I Stave Bearings and Segmental Housings
ROMOR® C- Partial Arc Bearings
DMX® Polymer Alloy Bearings
Duramax® DuraBlue® Rudder & Pintle Bushings, Thrust Washers, and Wear Pads
Industrial Pump Bearing Systems



DURAMAX® HEAT EXCHANGE SYSTEMS

DuraCooler® Keel Coolers
Duramax® Demountable Keel Coolers
Duramax® BoxCoolers
Duramax® Plate Heat Exchangers

DURAMAX® IMPACT PROTECTION SYSTEMS

Johnson® Commercial Dock Bumpers, Fenders & Tow Knees
Weatherstrip Door Gaskets, Window Channel and Hatch Cover Gaskets
LINERITE® Composite Batterboard Systems

DURAMAX® SHAFT SEALING SYSTEMS

Duramax® Shaft Seal Systems
Johnson® Heavy-Duty Air Seal Stuffing Boxes
Duramax® Ultra-X® High Performance Compression Packing
Johnson® Strong Boy Stern Castings and Stuffing Boxes

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