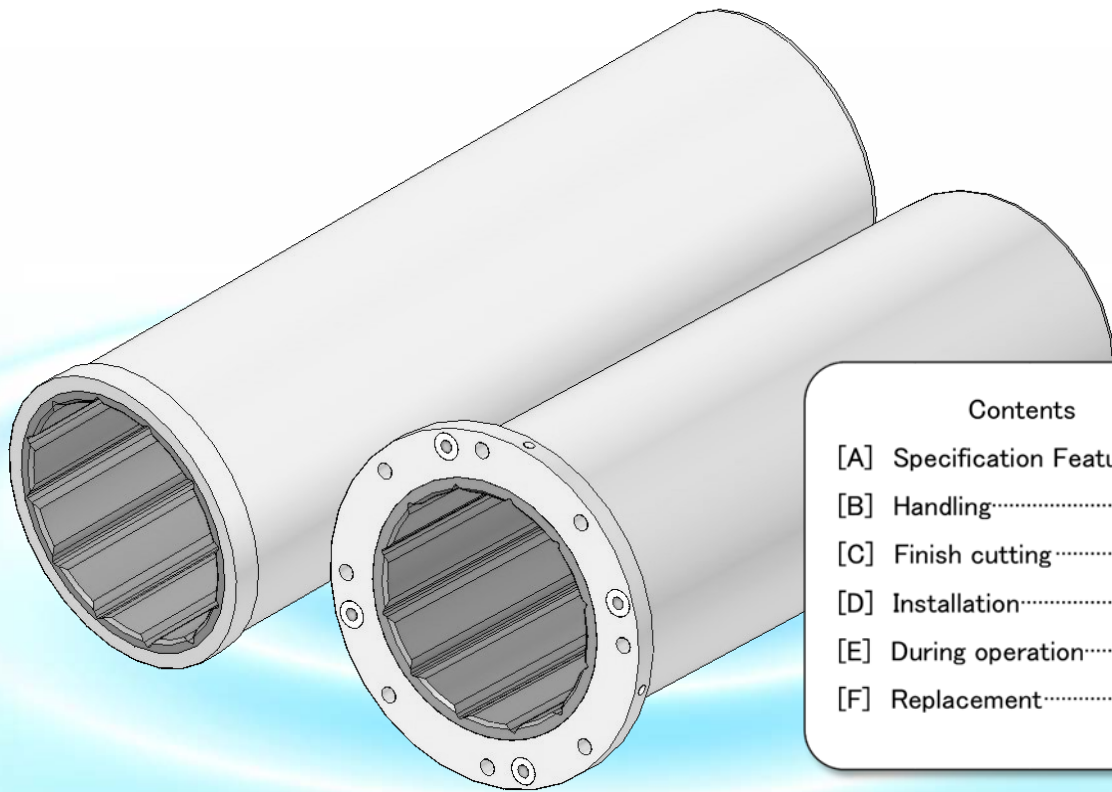


Stern tube bearing INSTRUCTION MANUAL

Type EVR



Contents

[A] Specification Features	1
[B] Handling	1
[C] Finish cutting	2
[D] Installation	3
[E] During operation	4
[F] Replacement	5

- Thank you very much for buying our EVR stern tube bearing this time.
- Please read this instruction manual carefully before use, and then use it correctly.
- Please keep this instruction manual at hand so that it is always available for reference.



[A] Specific Features

1. Combination of Advantages of Reinforced Plastic with Those of Elastomer

The outer shell is made of reinforced plastic formed with glass cloth (=GRP) or cotton cloth (=CRP), and the sliding face is made of elastomer. Therefore, it is of high adhesive property, excellent corrosion resistance and light weight.

2. Outstanding Durability and Stable Performance

Shaft load is balanced by high elasticity of rubber and increased coverage area to avoid concentrated load in the aft end.

3. Effective Absorption of shaft vibration

With the unique features of rubber, the EVR absorbs shaft vibration and prevents premature wear down of components.

4. Prevention of Electrolytic Corrosion on the Shaft Sleeve

Since the construction materials are non-conducting, EVR bearing cuts the corrosive electric current from the shaft sleeve and prevents the shaft sleeve surface from getting sough.

5. Easy Handling

The handling is very easier at light weight than metal materials.

After inserted it in the stern tube, it fits to the stern tube by the imbibition of the outer shell. Therefore, it can insert to the stern tube by clearance fit. It is not necessary to press fit, and easier.

[B] Handling

Be careful about the following, and handle it until insert to stern tube.

1. Avoid the leaving under direct rays of the sun and the high temperature. And keep it indoors so that it is not polluted by rain and sludge.
2. Protect it with the vinyl sheet to prevent the alien substance mixture and the paint adhesion.
3. Do not adherence the solvent, the grease and the oil to the Rubber.
4. Do not give a shock during the transportation and storage.
5. Be standing as possible other than transportation.
6. Do not put the thing on the top of EVR.
7. The hue of outer shell may change with progress of the time. But, in product properties, does not have any problem in performance.

[C] Finish cutting

Cutting it according to the following, when in the case of outer diameter has adjustment thickness.

(Note : Do not machine the inside diameter.)

1. Kind of bits

Use harder kind of bites (JIS K03~K05 or equivalent) for the cast iron.

2. Cutting condition

Decide a cutting condition in reference to Table-1.

Table-1

		Unit	GRP	CRP
(1) Cutting quantity	Rough machining	mm	1.0~2.0 (Max. 3.0) at a diameter	
	Final machining		0.5~1.0 at a diameter	
(2) Cutting speed	Rough machining	m/min	120~150	120~250
	Final machining			
(3) Feeding speed	Rough machining	mm/rpm	0.2~0.3	
	Final machining		0.1~0.2	0.2~0.25

3. Temperature

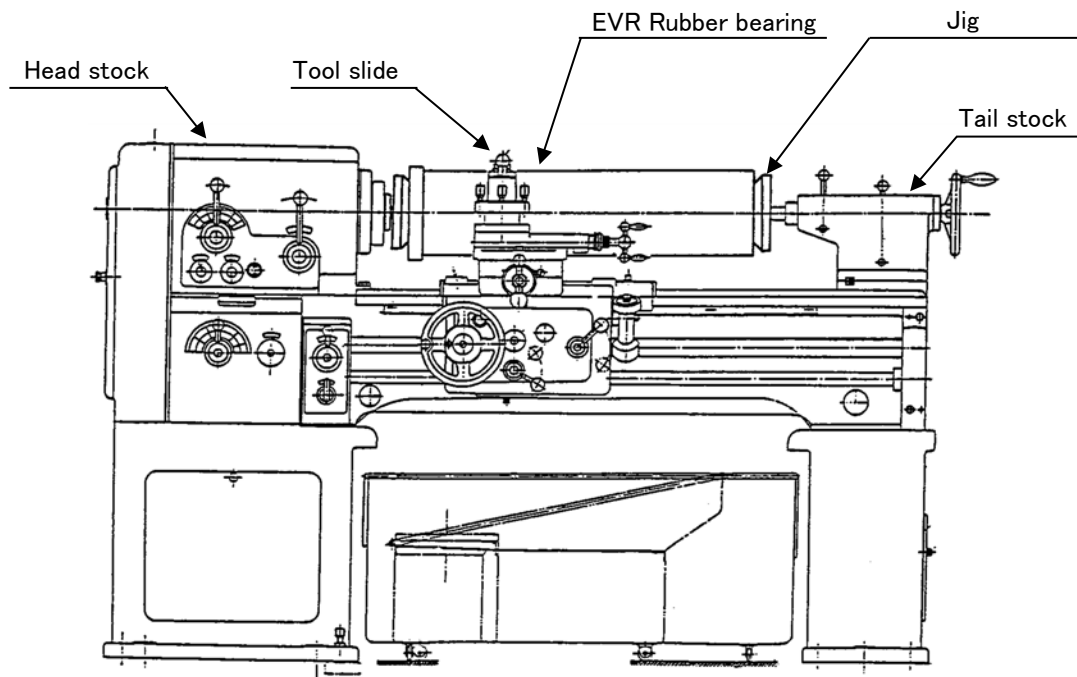
Keep the surface temperature of a bearing less than 50°C by adjusting the cutting speed or quantity if necessary.

4. About chucking

Be careful of chucking of a bearing because it is easy to deform due to its elasticity.

5. About chips (GRP)

Flush a bearing with water sometime and wear a protective mask while machining because glass powder is contained in chips.



[D] Installation

1. Attention of installation

- (1) The stern tube washes it enough, and confirms that there is not an alien substance.
- (2) Confirm the "TOP" marking of the bearing.
- (3) Apply a thin coat of lubricating oil or grease to the inner wall of the bearing cases and to the outside surfaces of the bearing shell. Then, insert the bearing by applying a pressure.
- (4) Do not hammer the bearing directly, but use a suitable protective adapter or wood where needed.

2. Fixing method

(1) Flange type

Fix it to the bulkhead with the Hex head bolts.

Note) Do the looseness prevention wires to the bolts.

(2) Straight type

Fix it to the stern tube as shown below. It is different from the flange type.

① When fixing it on an aft (or fwd) end side.

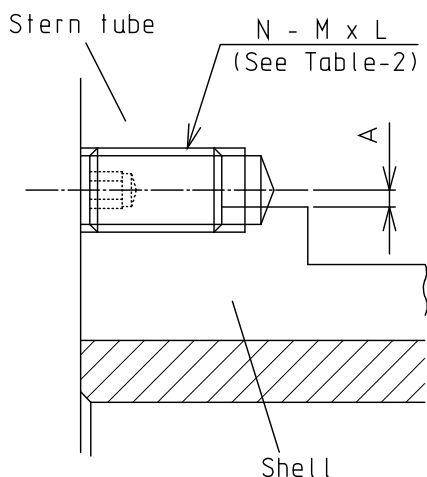


Table-2 List of Set screw (Reference)

Bearing I.D. ID (mm)	Qty N	Size M	Length L (mm)	Position A (mm)
~ 150	4	M10	15	3
150~200	4	M12	20	3
200~250	4	M16	20	5
250~300	4	M16	25	5
300~400	4	M16	30	5
400~500	4	M16	30	5
500~	4	M20	35	6

Note) Do the looseness prevention to the set screws.

② When fixing it on an outer side.

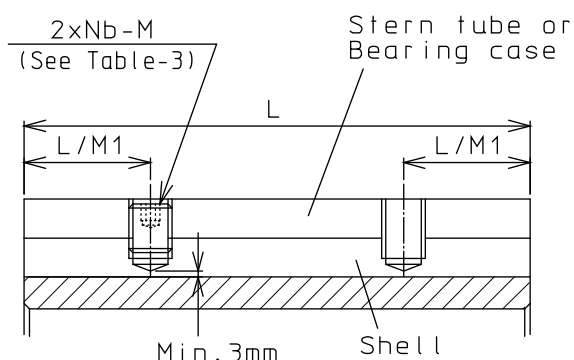


Table-3 Quantity of Set screw (Reference)

Bearing length L (mm)	Partition coefficient M1	Qty (One side) Nb
~ 99	2	1
100~199	3	2
200~499	4	2
500~999	6	3
1000~	8	4

Note) Refer to the Table-2 above for the size of set screw.

Fix the set screw to both sides (Except top and bottom) of the bearing.

Fix the set screw on the length direction at equal intervals.

3. Attention of inserting

- (1) Before inserting the shaft, wet the bearing inside and shaft sleeve surfaces with a soap solution or water (sea water) to ensure smooth insertion.
- (2) When insert a shaft, work carefully so that a shaft end does not bump on the bearing side.
- (3) Do not use of oil and grease they will result in swelling and deterioration of the bearing inside and also in poor lubrication during operation.

[E] During operation

1. Check the valve, cock, pressure gauge and likes for the equipment before operation.
2. During propeller shaft operation, keep feeding an optimum amount of cooling water to rubber bearing.
< Optimum amount of cooling water >
 $(6\sim 7)D_s^2 \times 10^{-3} \text{ [m}^3/\text{h.]}$
Ds: Shaft sleeve diameter [cm]
Note) The bearing must not be operated in dry condition.
3. The cooling water temperature for the bearing must be held as low as the outboard sea water temperature. Even when it is inevitable to use warmed sea water, the water temperature must be below 45°C and it is necessary to feed the water at a greater flow rate 30 to 40% than the specified.
4. In the event of abnormal amount of supply water, immediately stop or reduce the propeller shaft speed. Then, check the pipe line.

[F] Replacement

1. Replacement standard

- (1) When shaft vibration was encouraged by increase of bearing clearance.
- (2) When the rubber of the bearing was locally worn.
- (3) When the contact face of the shaft was harmful damaged or worn mark.
- (4) When rubber of the bearing was burned or badly peeled.
- (5) When bearing clearance exceeds Table-4. But, must not it use to exceed the clearance of the regulation by each ship's register.

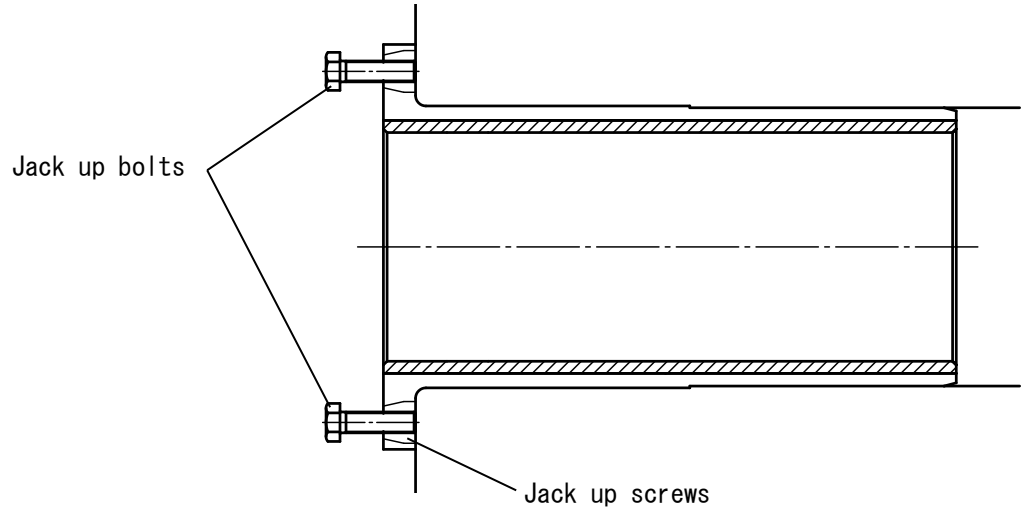
Table-4

Propeller shaft dia (mm)	Shaft sleeve dia (mm)	Bearing Type	Bearing Clearance (mm)	
			Maximum	Standard
40 ~ 70	-	40 ~ 70	2.5	0.4~0.7
71 ~ 100	-	70 ~ 100	3.0	0.5~0.8
101 ~ 120	127 ~ 146	100 ~ 145	3.5	0.6~0.8
121 ~ 170	147 ~ 200	145 ~ 200	4.0	0.6~1.1
171 ~ 230	201 ~ 265	200 ~ 265	4.5	0.8~1.2
231 ~ 305	266 ~ 347	265 ~ 350	5.0	0.9~1.4
306 ~ 380	348 ~ 427	350 ~ 425	5.5	1.0~1.5
381 ~ 450	428 ~ 503	425 ~ 500	6.0	1.1~1.5
451 ~ 500	504 ~ 557	500 ~ 550	6.5	1.1~1.6

2. Pulling out of bearing –Flange type–

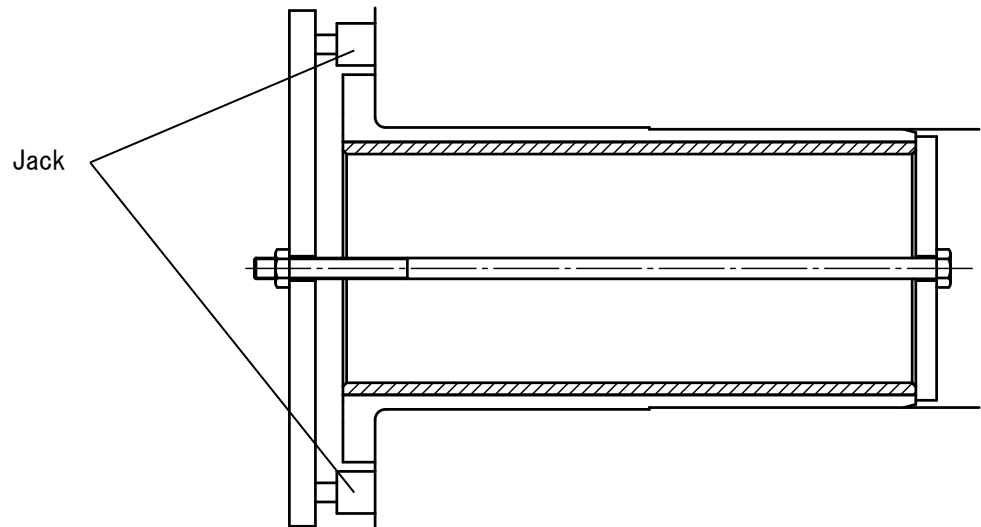
(1) In case of flange with jack up screws

Carry out by using jack up bolts as shown below.



(2) In case of flange without jack up screws

Carry out by using jack as shown below.



(3) In case of difficulty in pulling out

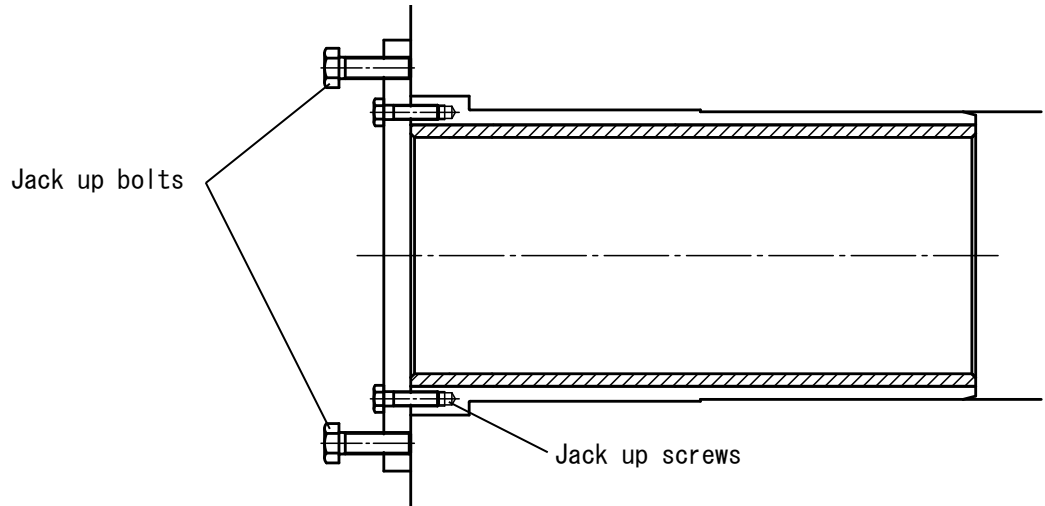
In case of difficulty in pulling out on the above methods, carry out by the following methods.

- ① Make a slit axially at the both grooves of a bearing stave by using a grinder or something. Then, split the slits with a cold chisel or something.
- ② Cool the bearing down with Dry ice or something.

3. Pulling out of bearing –Straight type–

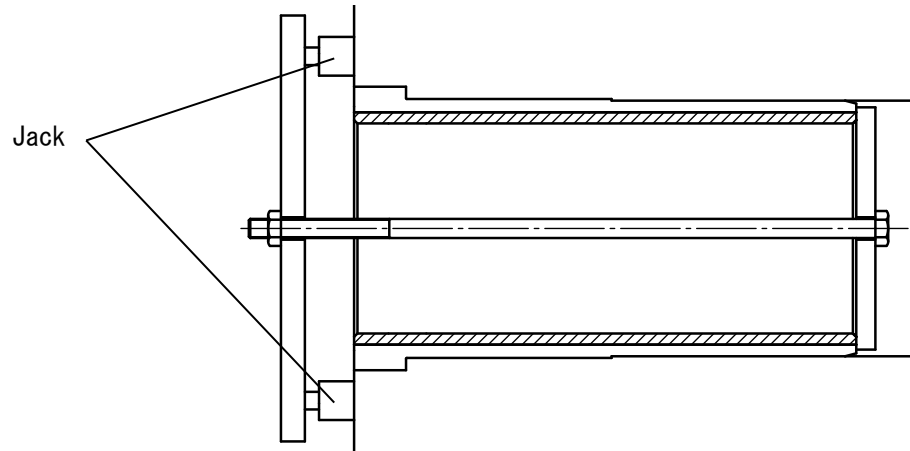
(1) In case of flange with jack up screws

Carry out by using jack up bolts as shown below.



(2) In case of flange without jack up screws

Carry out by using jack as shown below.



(3) In case of difficulty in pulling out

In case of difficulty in pulling out on the above methods, carry out by the following methods.

- ① Make a slit axially at the both grooves of a bearing stave by using a grinder or something. Then, split the slits with a cold chisel or something.
- ② Cool the bearing down with Dry ice or something.