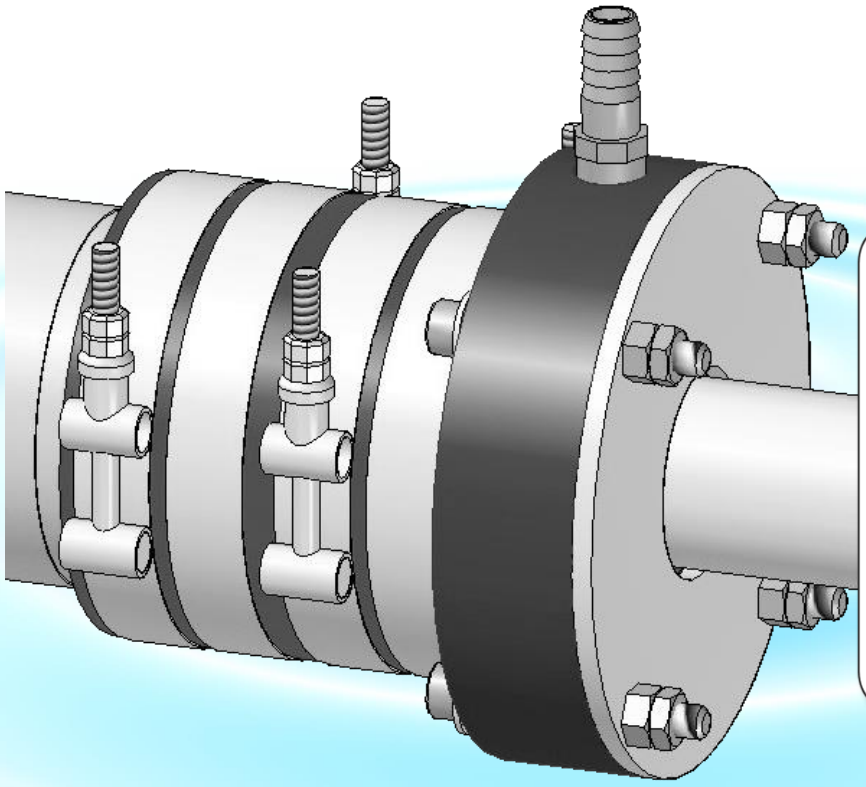
Doc. No. 20ME-001

Stern tube seal

INSTRUCTION MANUAL

Type Marine Ace Seal



Contents

- Thank you very much for buying our Marine Ace Seal 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.

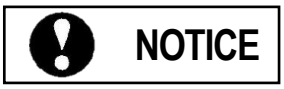
KEMEL EKK EAGLE INDUSTRY CO., LTD.
URL http://www.kemel.com

[A] Description

A.1 Notations

1. Read following warnings and instructions before starting your installation.
2. Check the seal model and the details in the seal drawing.
3. This manual describes basic operation of stern tube system based on the typical lubrication diagram.
4. To prevent accidents or damage by misuse, caution symbols are placed throughout this manual. The meaning of each symbol are as follows.

To realize the full performance of seals, the consent with this symbol should be read carefully and understood.



The consent with this symbol should be strictly followed.

If these warnings and instructions, are not followed properly, may lead to personal injury or even death, or physical, environmental or property damage.

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6. The products described in, and the contents of this manual are subject to revision at any time without notice.
7. If you have any queries or suggestions regarding the products described in or the contents of this manual, contact EAGLE INDUSTRY CO., LTD.

A.2 Operation condition

This product is a stern tube sealing for small vessel, and available for following conditions.

PV value = less than 0.3 MPa･m/sec (P = Maximum 0.1MPa water pressure.)

Inlet cooling water temperature	:	maximum 0～40 degree C.
Quantity of cooling water	:	over 3 Litter/min.
Applicable propeller shaft diameters	:	45 to 85 mm (5 mm increments) and 2″ to 3″ (0.5″ increments)
Tolerance of propeller shaft diameter	:	±0.1mm [Recommendation value]
Roughness of propeller shaft surface	:	Ra 0.4～1.6 (▽▽▽) [Recommendation value]

A.3 Structure

Marine Ace Seal mainly consists of seal ring, mating ring and rubber housing, each characteristic as following. (See Fig.A-1)

1. Seal Ring
   Made of Nitrile Rubber (NBR) material. The seal ring has abrasion resistance and weatherability. The seal ring rotates with a shaft, and slides with the mating ring and seals seawater.

2. Mating Ring
   Made of stainless steel, which has abrasion and corrosion resistance. The worn mating ring can be reused after reconditioning if the thickness is within allowable limit.

3. Rubber Housing
   Made of Isoprene Rubber (IR) material, which has a vibration absorption.

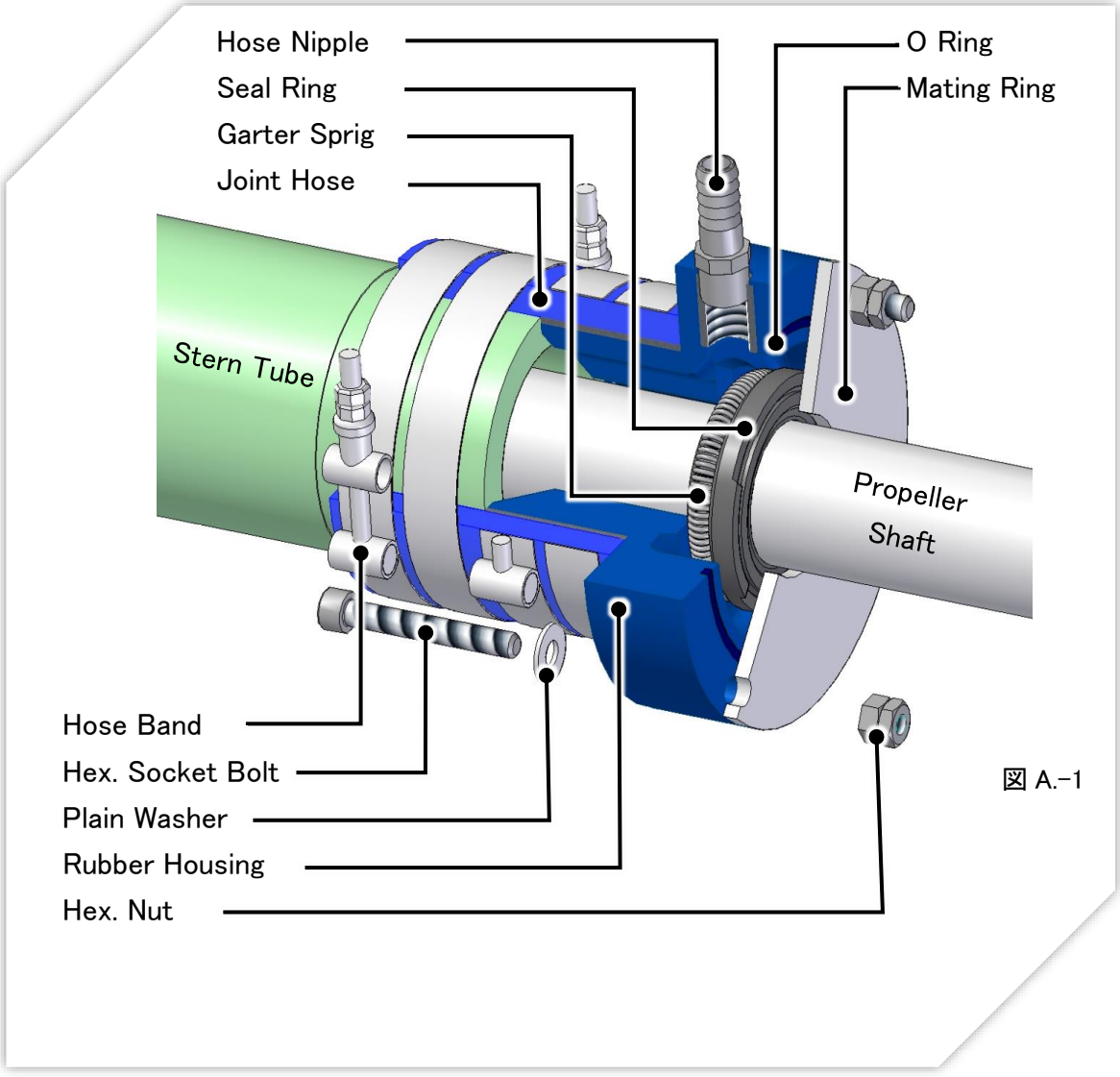

図 A.-1

[B] Before installing

B1. Measurement items

Before installing the Marine Ace Seal, take the following measurements: (See Fig.B-1)

1. Shaft diameter
   Measure propeller shaft diameter. Record the measurement on A below.

2. Stern tube outside diameter
   Measure the outside diameter of stern tube where the Marine Ace Seal joint hose will be installed on. Record the measurement on B below.

3. Installation distance
   Measure the distance between the end of the stern tube and the end of the propeller shaft coupling flange. The area where Seal is installed on, and nearly must be clean and smooth. Record this measurement on C below.

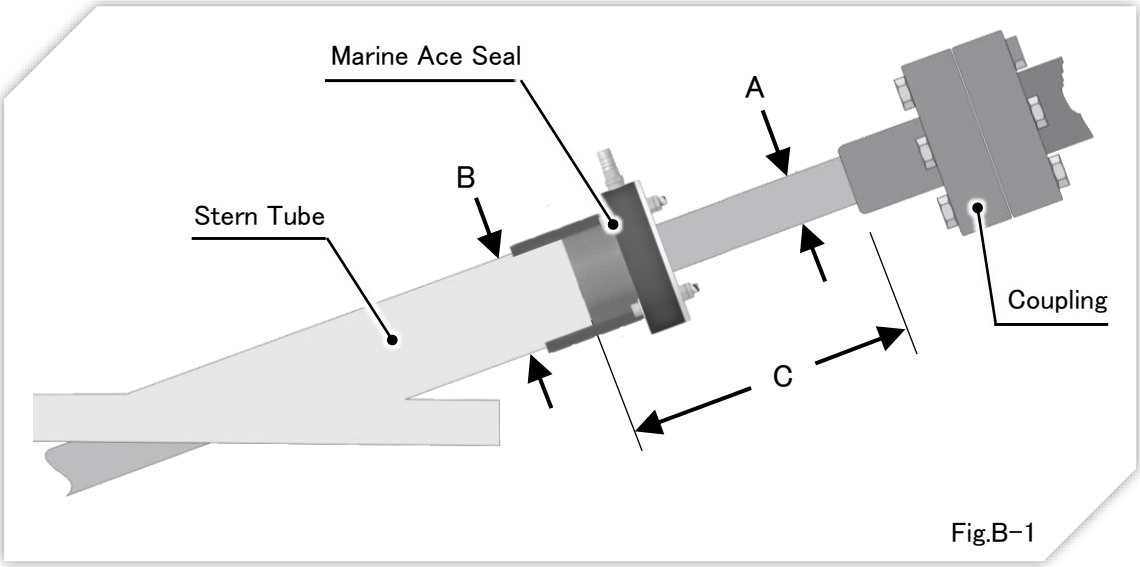

Fig.B-1

A = _____ B = _____ C = _____

[C] Installation

C1. Rubber housing

1. Check the expected position where seal ring will be placed, by bringing the set of Marine Ace Seal beside the stern tube.

NOTICE	Install Marine Ace Seal only when ship is out of the water.

2. Clean surface in installation area of the shaft and stern tube with fine emery paper (#200 or #400) to remove any debris or rough edges. Then, make sure there are no dents, scratches any defects on surface that could cause leaks. (See Fig.C-1)

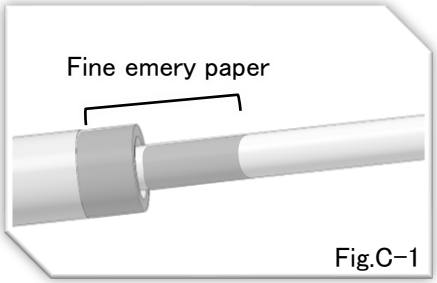

Fig.C-1

3. Back the shaft away from the coupling to have enough space to install the Marine Ace Seal. Then carefully slide from the rubber housing assembly (joint hose end first).

4. After clean surface of the propeller shaft, slide seal ring, O ring, mating ring onto the shaft in order. (See Fig.C-2)

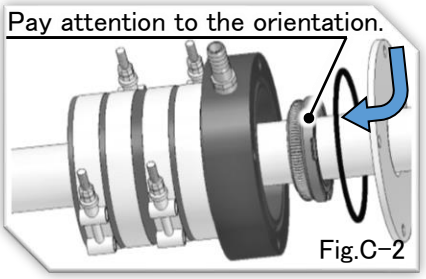

Fig.C-2

CAUTION	Attention to the orientation of the seal ring, mating ring

5. Reattach the coupling flange to the propeller shaft and reducer. And make sure that it is installed in the maker's specifications and tolerances. Make sure that all safety devices recommended by the coupling maker are in place.

6. Push the joint hose into the stern tube. Adjust the housing position to provide a uniform clearance between the housing and the shaft. The maximum fitting error of clearance is 0.5mm. (See Fig.C-3)

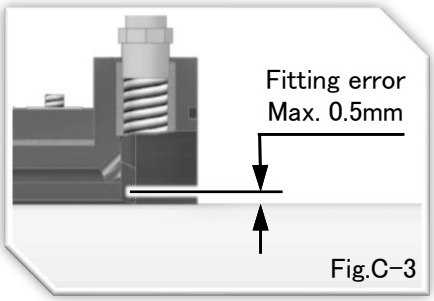

Fig.C-3

7. After adjusting to a proper clearance, tighten the hose band to secure the joint hose to the stern tube. Recommended tightening torque is 7.8 N·m. (See Fig.C-4)

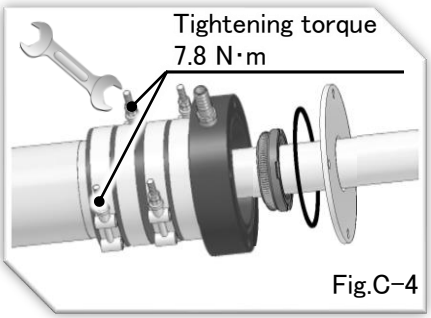

Fig.C-4

C2. Seal ring and mating ring

Install seal ring and mating ring after finishing the installation of rubber housing in the [C1].

1. After remove dirt from the rubber housing and the propeller shaft, apply a thin coat of grease to the surface of the propeller shaft. Then wipe away surplus grease with your hand. (See Fig.C-5)
2. After applying a thin coat of grease to the pocket of the seal ring, hook a garter spring up in the pocket.
3. Place "O" ring in the groove of the rubber housing.
4. Push and move the seal ring by hand until it is about 10 mm in front of the rubber housing end face.
5. Push the seal ring with the mating ring. (See Fig.C-6)
6. Fasten the mating ring to the rubber housing with bolts. At this time, fasten evenly each symmetrical pair of bolts so that the seal ring may be pushed in equally around the circumference. Recommended tightening torque is 5.5 N·m.

CAUTION	Don't bite in the O ring.

7. Then, remove grease from the sliding surface of mating ring, shaft surface and seal ring COMPLETELY with cleaning solvent. (See Fig.C-7)

CAUTION	Remove grease from the sliding surface of mating ring, shaft surface and seal ring COMPLETELY.

8. Connect tightly the Marine Ace Seal to a pressurized water supply source (a point in the engine's raw water-cooling system) by the water injection hose to the hose nipple on the rubber housing.
   In cases of our supplied hose nipple does not fit, please prepare suitable nipple. Hose nipple connection hole size of Marine Ace Seal is Rc3/8.

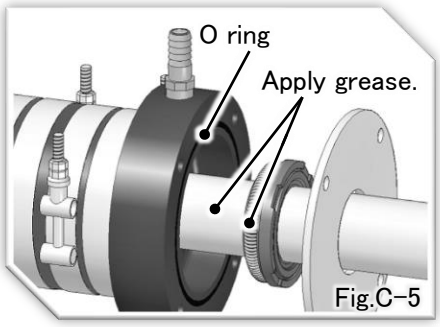

Fig.C-5

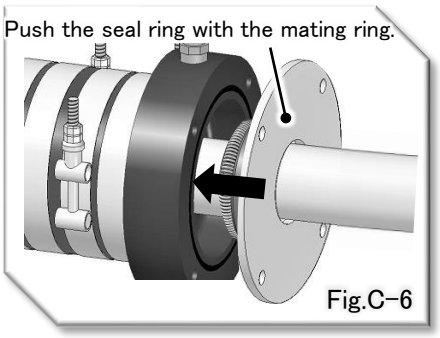

Fig.C-6

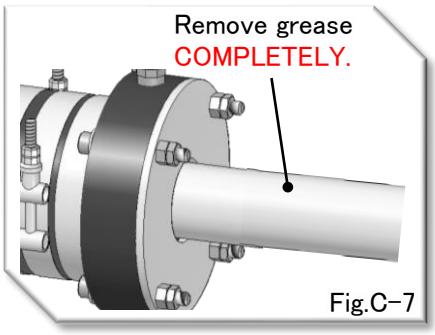

Fig.C-7

[D] Handling

D.1 Preparation before running

1. There should be at least 3 litter/min. flowing into the Marine Ace Seal at engine idle.

CAUTION	Check water supply from the engine to the Marine Ace seal before operating.

2. Check no water leakage from the Marine Ace Seal after launching and during engine idle.

D.2 During oparation

1. Check the performance of the seal ring periodically. A small water leakage is good for lubrication and cooling.
2. Check and clean the water pipe periodically.
3. When using fire near the sealing device, use care not to allow fire flames and sparks to come in direct contact with the sealing device.
4. If a large amount of water leaks continuously, check the seal ring condition and replace it if necessary.

D.3 Check sheet

Check sheet of the Marine Ace Seal is following. To be printed out as required.

Table D-1 : Check sheet

Item	Contents	Check
To be checked at installation.	1. No serious defects shall exist on the propeller shaft surface and the seal mounting surface of the stern tube.	
	2. The rubber housing shall be aligned to the propeller shaft surface within fitting error ±0.5mm.	
	3. A thin coat of grease shall be applied to the surface of the propeller shaft when the seal ring is installed.	
	4. Wipe away surplus of grease with your hand.	
	5. There must be no partial deformation of the seal ring. The seal ring shall be installed in correct direction.	
	6. No steps, warping or damage shall be on the sliding surface of the mating ring.	
	7. Remove grease from the sliding surface of mating ring and seal ring completely with solvent.	
	8. All of bolts and hose band fitted with recommended torque.	
To be checked at launching.	1. No excessive leakage shall occur from the sliding surface.	
	2. There is no leakage from in place other than sliding surface position.	
	3. Operation control of valves shall be done without fail.	
To be checked during operation.	1. No exessive heating on the mating ring.	
	2. Sealing condition shall be without problem at any time such as at stoppage, during forward and back sailing, etc.	
	3. There is no leakage from in place other than sliding surface position.	

[E] Repair

E. Reconditioning of the mating ring

The worn mating ring can be reused after reconditioning. In case of the mating ring thickness will be less than 3mm, it should be renewed.

[Reconditioning of the mating ring]

If the amount of wear down on the sliding surface is over 0.5mm in depth, it should be reconditioned by lathing. (See Fig.E-1)
In case lathing is not necessary, finish it as flat as possible using emery paper (#100 or #200) or equivalent.

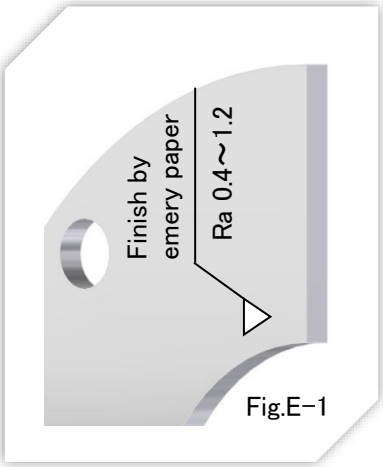

Fig.E-1

[F] Maintenance

F.1 Periodical maintenance

Please carry out maintain of Marine Ace Seal as following. As well as the prevention of the damage, it can minimize the damage by performing check properly even if abnormality occurs .

Table F-1: Maintenance list

	Item		Judgement	Method	Note
Every time	Sealing condition		No rapid increase of water leak.	Visual Measure	
	Cooling water		The estimation temperature of mating ring during operation is under cooling water plus 20℃, or less than 50℃(Can be touch by hand)	Touch Measure	
	Hose band		No loosen screw and corrosion.	Visual Measure	Re-tighten screw. Recommended tighten torque : 7.8 N･m Corroded part should be renew.
Every half a	Rubber housing		Check no crack of the rubber.	Visual	Planed Renew
	Joint hose		Check no crack of the rubber.	Visual	Planed Renew
	Bolts, nuts		No loosen screw and corrosion.	Visual Measure	Re-tighten screw. Recommended tighten torque : 5.5 N･m Corroded part should be renew.
Every year	(Disassembly condition)	Seal ring	No excessive wear and deformation.	Visual	
		Garter spring	No corrosion.	Visual	Corroded part should be renew.
		O ring	Check the crack of the rubber.	Visual	Planed Renew
		Mating ring	Check wears down condition of mating ring. If the amount of wear down on the sliding surface is over 0.5mm in depth, it should be reconditioned by lathing.	Measure	

F.2 Replacing interval

As a preventive maintenance, Marine Ace seal is composed rubber parts and recommended to renew all parts within 5 years, regardless of its condition. In case of renewal, it is necessary to replace complete set.

Replacing interval is expected a little shorter in case of running in muddy water frequently.

[G] Trouble shooting

G. Trouble shooting

Item	Normal condition	Abnormality	Cause of the trouble	Course of action
Temp. of the mating ring	Cooling water supply temp. + 20℃ or less. (less than 50℃) At initial operating with new seal ring , temp. may become higher.	Too hot to touch. Smell of burning rubber noted.	High water pressure due to excessive water supply.	Adjust water pressure by orifice or control valve.
			Fishing net caught on propeller.	Remove fishing net.
			Clogged sealing ring sliding notches.	Disassemble mating ring, clean sealing ring sliding notches.
			Lack of water supply	Adjust the water supply, properly.
				Check and clean filter or pipe if there is clogging.
Leakage of seal ring (between mating ring and shaft)	None, or water dropping	Rapid increase of water leak.	Something caught between seal ring and mating ring.	Disassemble mating ring, clean mating and seal rings.
			Deformation of seal ring. (If transportation and storage are bad.)	Pour hot (70～80℃) water on seal ring.
			Worn seal ring.	Need Renew.
			Worn mating ring. (More than 0.5mm depth)	Refer [E] repair section.
			Something caught between seal ring and shaft.	Slide seal ring out, clean shaft and inside of the seal ring.
Leakage from the parts excepting seal ring	No leakage	Leakage, But not from seal ring	Deteriorated of rubber housing.	Need Renew.
			Deteriorated of joint hose.	Need Renew.
			Loosened hose band.	Re-tightening hose band.
			Deteriorated of O ring.	Need Renew.
			Defect on the stern tube.	Re-finish the stern tube surface where joint hose fitted.

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