

BULK HEAD
SEALING SYSTEM
TYPE-SKH
INSTRUCTION MANUAL

 *STERN KEEPER CO., LTD.*

CONTENTS

SECTION 1	SAFETY ITEMS	2
1	WARNINGS	2
2	CAUTIONS	3
SECTION 2	PERFORMANCE	4
1	SPECIFICATION	4
SECTION 3	STRUCTURE AND OPERATION	5
1	STRUCTURE	5
2	OPERATION	5
SECTION 4	SAFETY TREATMENT	6
1	NOTICE ON NORMAL RUN	6
2	NOTICE ON EMERGENCY RUN	6
3	ACTION AFTER EMERGENCY RUN	6
SECTION 5	INSTALLATION	7
1	INSTALLATION WORK	7
SECTION 6	MAINTENANCE	10
1	MAINTENANCE WORK	10
2	DISMANTLEMENT AND ASSEMBLY WORK	10
2-1	DISMANTLEMENT WORK	11
2-2	ASSEMBLY WORK	12
3	SEAL RING BONDING WORK	13
4	O RING BONDING WORK	13
5	RIGHT ANGLE CHECK AND ADJUSTMENT	14
ATTACHMENT	15

SECTION 1 SAFETY ITEMS

1 WARNINGS

The Warning items in this manual are listed in Table 1.1

The 「Warnings」 means the operation or maintenance would cause accidents resulting in injury or death under safety failure.

TABLE 1-1 LIST OF WARNING ITEMS

WARNINGS			OUTLINE OF WORK	WARNINGS
PAGE	ITEM NO	ITEMS		
6	1 (2)	NOTICE ON NORMAL RUN	Check temperature of Casing② outside by hand-touch. Normal: Below 60℃. In case of hard-to-touch ,the temperature is over 60℃	Keep hands off running Shaf to check temperature.
1 0	1	MAINTENANCE	Clean Seal ring① and apply grease on it.	Implement the work during Shaft-stop. Implement the work during Shaft-stop and shipyard.
			Change Seal ring① and O ring ⑬ on periodic check timing.	
			Check Right angle.	
			Adjust right angle between Casing and Shaft.	
1 1	2	DISMANTLE-MENT& ASSEMBLY	Implement dismantlement and assembly.	Implement the work during Shaft-stop.

2 CAUTIONS

The Caution items in this manual are listed in TABLE 1.2

The 「Cautions」 means the operation or maintenance would cause accidents resulting in damage the unit under safety failure.

TABLE 1-2 LIST OF CAUTION ITEMS

CAUTIONS			OUTLINE OF WORK	CAUTIONS
PAGE	ITEM NO	ITEMS		
6	1 (1)	NOTICE ON NORMAL RUN	Confirm no abnormality on the sealing unit visually (Deformation, loosen bolts)	Cause accidents resulting in damage the sealing system.
	2 (1)	NOTICE ON EMERGENCY RUN		
	3 (1)	ACTION AFTER EMERGENCY RUN		
7	1	INSTALLATION WORK	Degrease split-face of Casing② clearly and apply liquid packing. Then combine the split-face with Bolt and Washer	Not to give any wear and tear on split-faces of Casing②.
9			Degrease the split-face of Stop ring ③ clearly and apply liquid packing and combine the split-face with Bolt⑩ and Spring washer⑪	Not to give any wear and tear on the split faces of Stop ring③.

SECTION 2 PERFORMANCE

The specification of the unit is listed in TABLE 2-1

TABLE 2-1

			NORMAN RUN	EMERGENCY RUN
RUN CONDITION			Dry	Sea water sealing
SHAFT ELATICITY			±5mm	±5mm
SHAFT ECCENTRICITY			±1mm	±1mm
SHAFT SURFACE SPEED			0~10m/s	0~10m/s
ALLOOWABLE LEAKAGE			—————	Below 21 ℓ/min
USABLE TIME			—————	Within 14days
WATER PRESSURE			—————	Below 0.1 MPa
SURFACE TEMP. OF METAL			Max.60℃	Max.60℃
RIGHT ANGLE LIMIT	SHAFT DIA. (mm)	Below φ 209	Below 0.3 mm	Below 0.3 mm
		φ 210~ φ 399	Below 0.4 mm	Below 0.4 mm
		Over φ 400	Below 0.5 mm	Below 0.5 mm

SECTION 3 STRUCTURE AND OPERATION

1. STRUCTURE

As shown in FIG-1, the structure of Sealing system is simple. The Seal ring ① with Band ④ is set in metal space of Casing② and Stop ring③ which are combined to Bulk head. The Seal ring① is set on sliding faces of Casing②, Stop ring③ and Shaft without almost no interface. The Seal ring ① meets the movement of Shaft back and forth direction. It is a kind of floating type sealing.

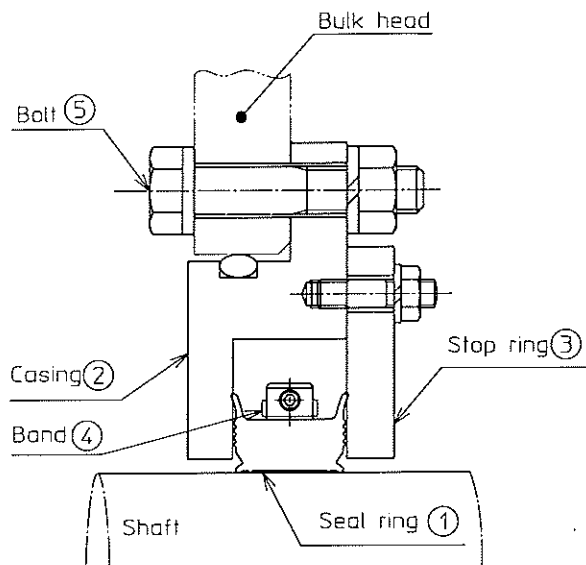


FIG-1 CROSS SECTION OF
BULK HEAD SEALING SYSTEM

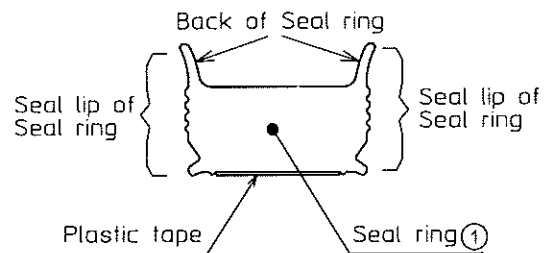


FIG-2 CROSS SECTION OF
SEAL RING

(1) Seal ring ①

The Seal ring is made of synthetic rubber (NBR), on which self lubricant plastic tape is adhered. (Refer to FIG-2)

(2) Casing② and Stop ring ③

Both Casing② and Stop ring③ are separated in two pieces and are combined with bolts. (Refer to FIG-1)

2. OPERATION

During normal run, the Seal ring① goes around with Shaft lightly due to low frictional plastic tape adhered on Seal ring①.

In addition grease is applied on both seal lips of Seal ring① and lubricate performance is improved.

During emergency case, the water pressure is applied on back face of Seal ring① and it works as self-sealing performance. It is possible to seal leaked water from both sides(Inside and outside).

SECTION 4 SAFETY TREATMENT

1 NOTICE ON NORMAL RUN

- (1) Confirm no abnormality on the system visually (Deformation, loosen bolts etc)

CAUTION

Cause accidents resulting in damage the sealing system.

- (2) Check temperature of Casing② outside by hand-touch.

Normal: Below 60°C. In case of hard-to-touch, the temperature is over 60°C

WARNING

Keep hands off running Shaft to check temperature

2 NOTICE ON EMERGENCY RUN

- (1) Confirm no abnormality on the system visually (Deformation, loosen bolts etc)

CAUTION

Cause accidents resulting in damage the sealing system.

- (2) Check for no water leakage

3 ACTION AFTER EMERGENCY RUN

- (1) Confirm no abnormality on the system visually (Deformation, loosen bolts etc)

CAUTION

Cause accidents resulting in damage the sealing system.

- (2) Change Seal ring① to new one

- (3) Check for right angle between Casing① and Shaft to be within specification in Table 4-1.

TABLE-4-1

SHAFT DIA(mm)	RIGHT ANGLE LIMIT (mm)
Below ϕ 209	Below 0.3
ϕ 210~ ϕ 399	Below 0.4
Over ϕ 400	Below 0.5

SECTION 5 INSTALLATION

1 INSTALLATION WORK

(1) Combination of two split-faces of Casing

Degrease two split-faces of Casing② clearly and apply Liquid packing. Then combine them with Bolt⑬ and Washer⑭. Sandpaper the step on contacted face of two split-faces of Seal ring①.

CAUTION

Not to give any wear and tear on split-faces of Casing②

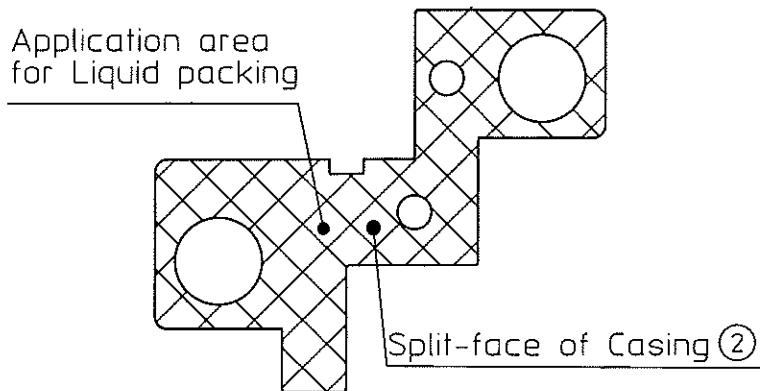


FIG-3 LIQUID PACKING APPLICATION ONTO CASING FACE

(2) O ring bonding (Refer to SECTION 6 - 4 O RING BONDING WORK)

Adhere O ring⑱ on the Shaft.

(3) O ring setting on the CASING (FIG-4)

Set the greased O ring⑱ into groove of Casing② outside.

(4) Casing② installation on Bulk head

Install Casing② on Bulk-head with Bolt⑤, Seal washer⑲ and Nut⑦ as shown FIG-4.

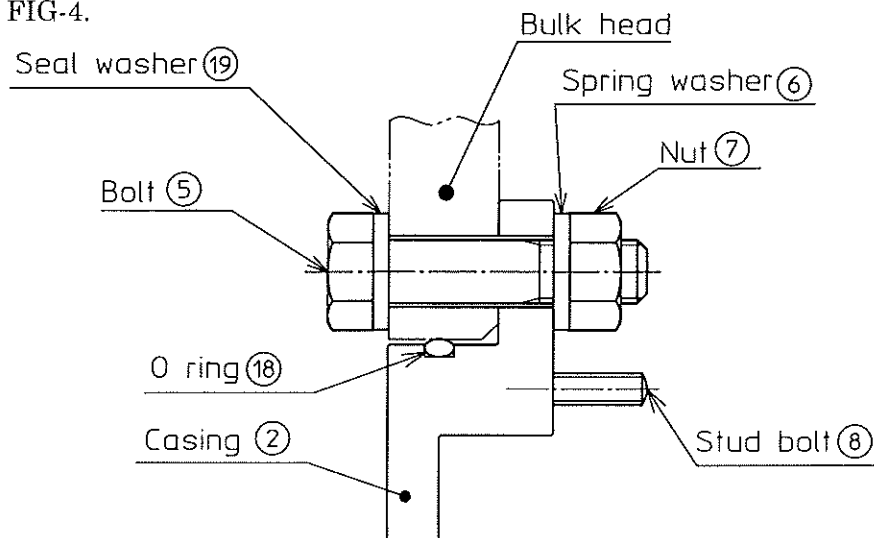


FIG-4 CASING INSTALLATION

- (5) Check and adjustment for right angle (Refer to SECTION 6-5 RIGHT ANGLE CHECK AND ADJUSTMENT)
 After check the right angle, adjust it with Bolt⑰ and Nut⑱ when it is over the limit.
- (6) Seal ring① installation (Refer to SECTION 6-6 SEAL RING BONDING WORK)
 Adhere SEAL RING① on the Shaft and put Band④ on it. Then tighten Band④ with Bolt⑳.
- (7) Grease application (Refer to FIG-5 and FIG-6)
 After degreasing, apply grease on location A of Seal ring① and all around Shaft where Seal ring① is set. Then push it on specified location by hand and turn around 2~3 times.



FIG-5 GREASE APPLICATION
 AREA FOR SEAL RING

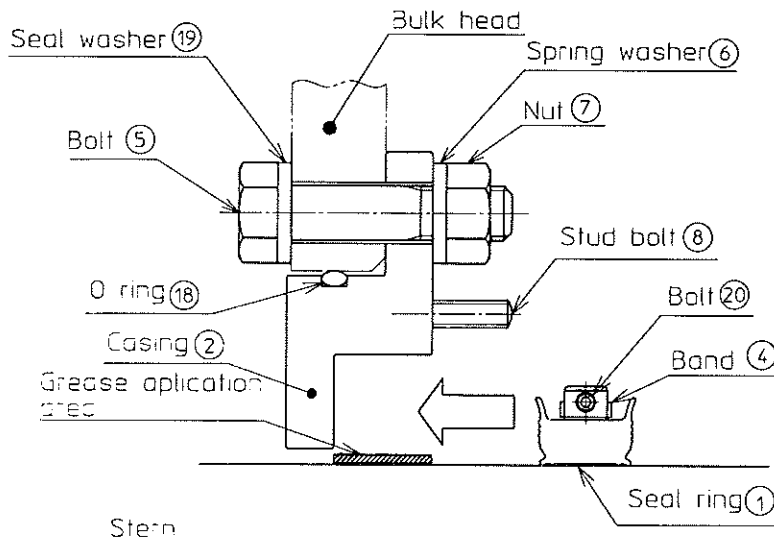


FIG-6 GREASE APPLICATION
 AREA FOR SHAFT

- (8) Combination of two split-faces of Stop ring③(Refer to attachment and FIG-7)
 Degrease two split-faces of Stop ring③ clearly and apply liquid packing. Then combine them with Bolt⑩ and Washer⑪. Sandpaper the step on contacted face of two split-faces of Stop ring③.

CAUTION

Not to give any wear and tear on split-faces of Stop ring③

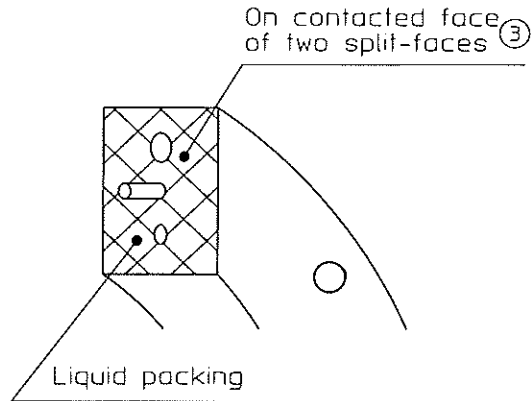


FIG-7 LIQUID PACKING APPLICATION AREA FOR STOP RING

- (9) Installation of STOP RING③ onto CASING② (Refer to FIG-8)

Fix Stop ring③ onto Casing② with Nut⑳ and Spring washer⑨.

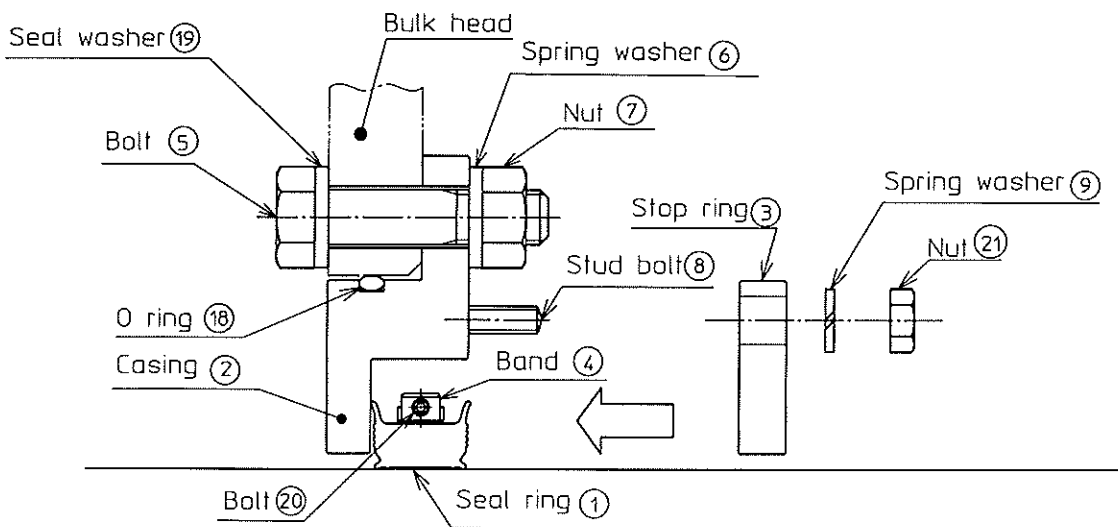



FIG-8 STOP RING INSTALLATION

SECTION 6 MAINTENANCE

1 MAINTENANCE WORK

Frequency	Check items	Safety action	Materials	Procedure						
Annual check	Seal ring① cleaning and grease application	WARNING Implement the work during Shaft-stop	Grease No.2	Dismantle Stop ring③ off Casing ② and pull it off. After cleaning it, apply grease on the location A of it and all around surface where it is set. Then push it on specified location by hand and turn around it 2 or 3 times.  FIG-9 GREASE APPLICATION AREA FOR SEAL RING						
On periodic check Per 6-2	Seal ring① change	WARNING Implement the work during Shaft-stop and shipyard	Wrench	Change to new part.						
	O ring⑱ change		Solvent Glue Gage Sandpaper (#240)	Change to new part.						
	Bolts, Nuts change and Maintenance		Spanner Wrench	After cleaning each part, change or repair it in case corrosion or damage is found.						
	Check for right angle		Dial gauge	Check right angle between Shaft and Casing. Refer to SECTION 6-5 for right angle measurement and adjustment. And TABLE-4-1 for right angle limit. <table border="1" data-bbox="1002 1778 1410 2024"> <thead> <tr> <th>SHAFT DIA (mm)</th> <th>RIGHT ANGLE LIMIT</th> </tr> </thead> <tbody> <tr> <td>Below φ 209</td> <td>Below 0.3 mm</td> </tr> <tr> <td>φ 210~ φ 399</td> <td>Below 0.4 mm</td> </tr> <tr> <td>Over φ 400</td> <td>Below 0.5 mm</td> </tr> </tbody> </table>	SHAFT DIA (mm)	RIGHT ANGLE LIMIT	Below φ 209	Below 0.3 mm	φ 210~ φ 399	Below 0.4 mm
SHAFT DIA (mm)	RIGHT ANGLE LIMIT									
Below φ 209	Below 0.3 mm									
φ 210~ φ 399	Below 0.4 mm									
Over φ 400	Below 0.5 mm									

2 DISMANTLEMENT AND ASSEMBLY WORK

2-1 DISMANTLEMENT WORK

WARNING
Stop Shaft run

- (1) Remove Nut²¹, Spring washer⁹. Then dismantle Stop ring³ out of Casing².
- (2) Pull Seal ring¹ out of Casing²
- (3) Remove Nut⁷ and Washer⁶. Then dismantle Casing² out of Bulk head
- (4) Remove Band⁴ after remove Bolt²⁰. Then cut the Seal ring¹ with knife and remove it out of Shaft.
- (5) Remove O ring¹⁸ out of groove of Casing² and cut it to remove out of Shaft.

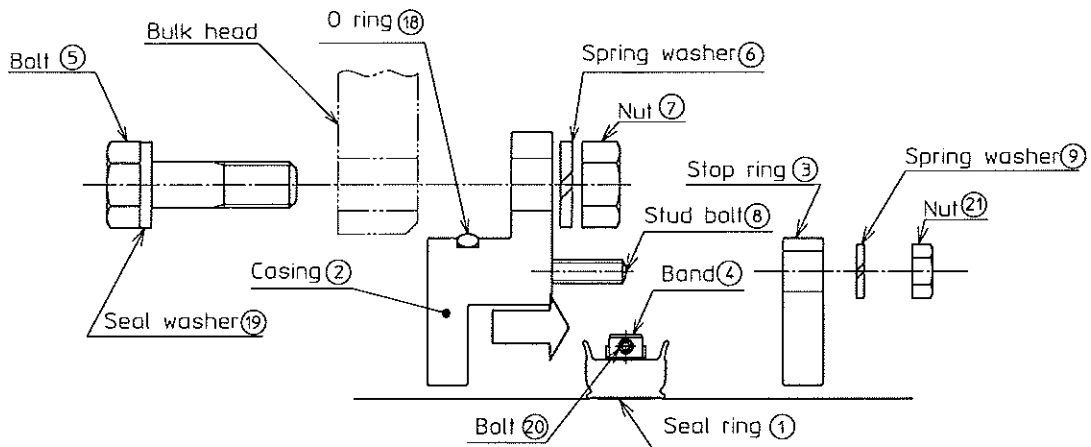


FIG- 1 0 DISMANTLEMENT

2-2 ASSEMBLY WORK (Refer to FIG-11&12)

- (1) Clean relevant part of Bulk head sealing system and relevant area of Shaft.
- (2) Adhere O ring¹⁸ on Shaft (Refer to SECTION 6 - 4)
- (3) Set greased O ring¹⁸ into outside groove of Casing².
- (4) Install Casing² on Bulk head with Bolt⁵, Seal washer¹⁹ Spring washer⁶ and Nut⁷. Then check the right angle and adjust it with Bolt¹⁷ and Lock Nut¹⁶ when it is over the limit .
- (5) Adhere Seal ring¹ on Shaft and put Band⁴ on it. Then tighten Band⁴ with Bolt²⁰.
- (6) Apply grease on location A of Seal ring¹ and all around Shaft where Seal ring¹ is set. Then push it on specified location by hand and turn around 2 to 3 times.

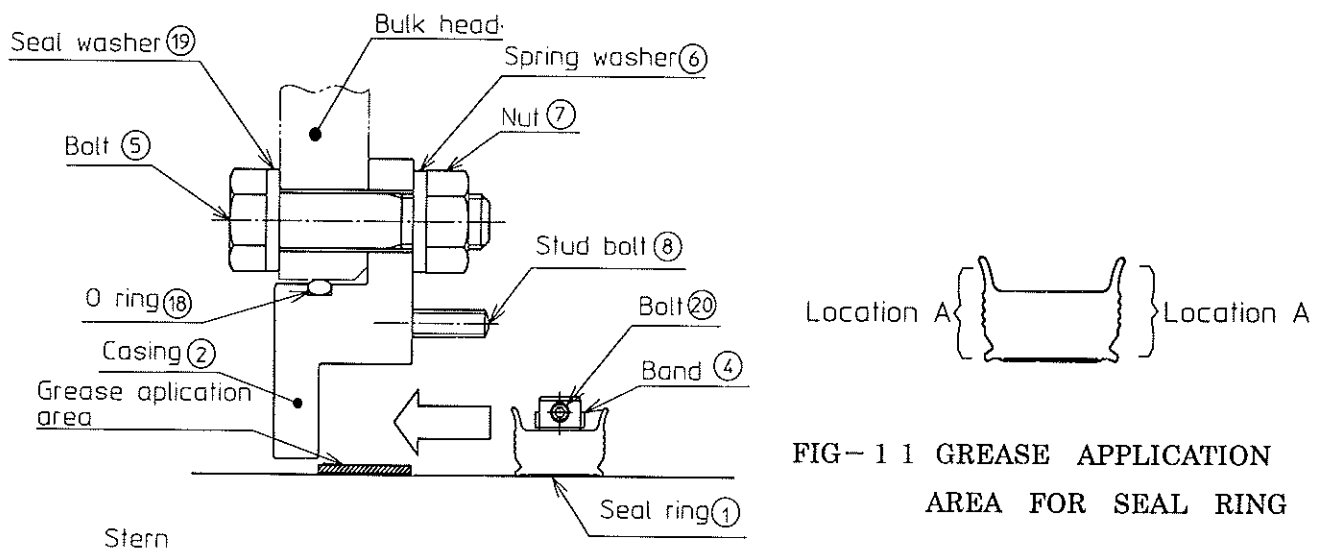


FIG- 1 1 GREASE APPLICATION AREA FOR SEAL RING

FIG- 1 2 GREASE APPLICATION AND CASING INSTALLATION

- (7) Fix Stop ring³ on Casing² with Nut²¹ and Spring washer⁹.

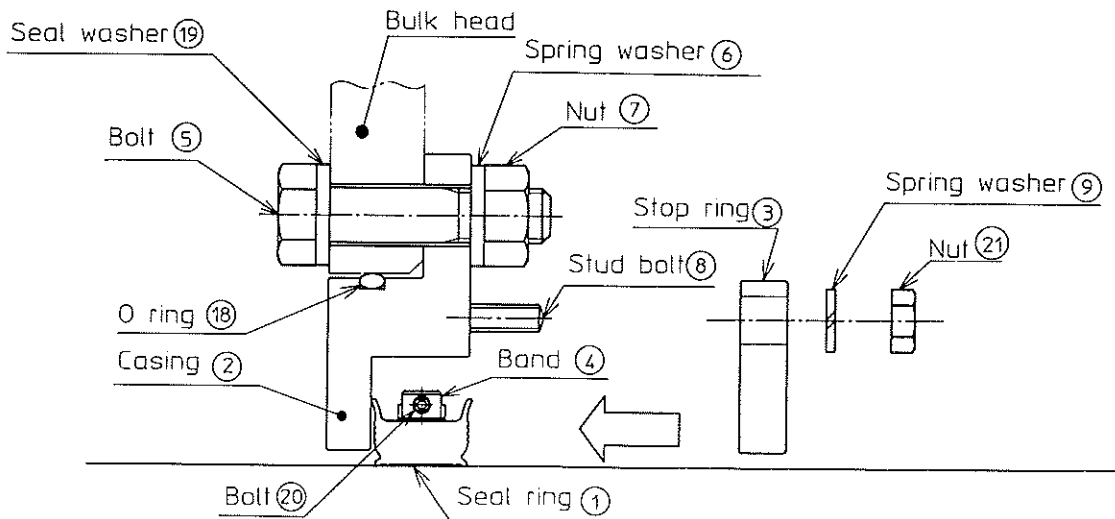
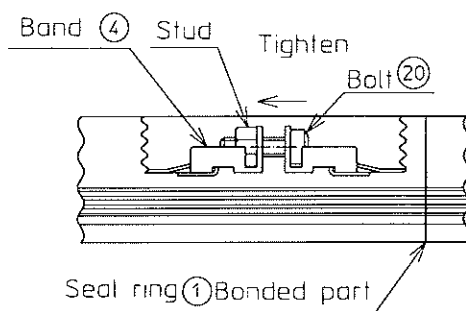


FIG- 1 3 STOP RING INSTALLATION

3 SEAL RING BONDING WORK (Refer to FIG- 1 4)

- (1) Sandpaper the split-face of Seal ring①
 - (2) Degrease sandpapered the split-face with solvent
 - (3) After drying degreased the split-face, apply glue.
 - (4) Push and hold the bonded the split-face firmly with hand not to leave any step on it.
 - (5) Check for complete bonding by pulling the bonded split-face lightly. In case of partial peel-off, adhere again by dropping glue. Sandpaper extra glue with sandpaper.
 - (6) Put Band④ on Seal ring① and tighten Band④ with Bolt②①.
- Move Band④ stopper off not to be on the bonded line.



Tools required for adhesion work

- Glue
- Solvent
- Gage
- Sandpaper(#240)

FIG- 1 4 SEAL RING BONDING WORK

4 O RING BONDING WORK

- (1) Sandpaper the split-face of O ring⑱
- (2) Degrease sandpapered the split-face with solvent
- (3) After drying the degreased split-face, apply glue.
- (4) Push and hold the bonded split-face firmly with hand not to leave any step on it.
- (5) Check for complete bonding by pulling the bonded split-face lightly. In case of partial peel-off, adhere again by dropping glue. Sandpaper extra glue with sandpaper.

5 RIGHT ANGLE CHECK AND ADJUSTMENT

(1) RIGHT ANGLE MEASUREMENT

Put Dial gauge on Shaft and make tip of it contact to end of Casing②. On turning Shaft slowly, check that right angle is below the limit of it.

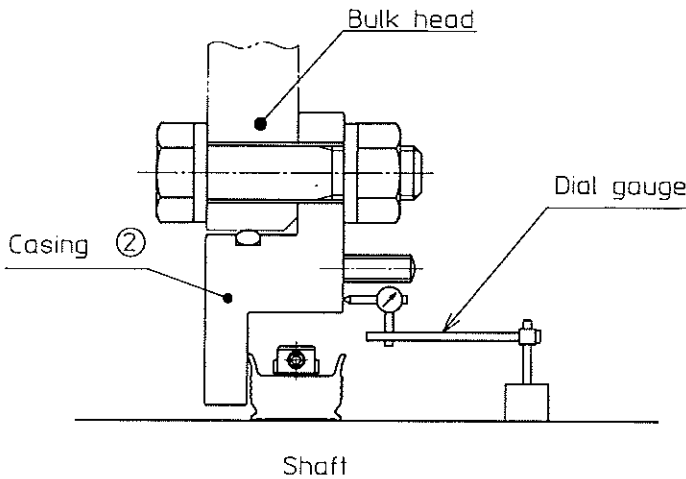


TABLE 6 - 3

SHAFT DIA (mm)	RIGHT ANGLE LIMIT
Below ϕ 209	Below 0.3 mm
ϕ 210~ ϕ 399	Below 0.4 mm
Over ϕ 400	Below 0.5 mm

FIG-15 RIGHT ANGLE ADJUSTMENT WORK

(2) RIGHT ANGLE ADJUSTMENT (Refer to FIG-16 & 17)

In the right angle is over limit of TABLE 6 - 3, loosen all Nuts⑦ loosen one of Lock nuts⑯, which located at smallest right angle area, and push Adjust bolt⑰.

Remove Bolts⑤, Nuts⑦ and Spring washer⑥ which locate near Adjust bolt⑰ and Adjusting liner between Bulk head and Casing② as FIG-16 and tighten all Nuts⑦ to be below the limit of right angle.

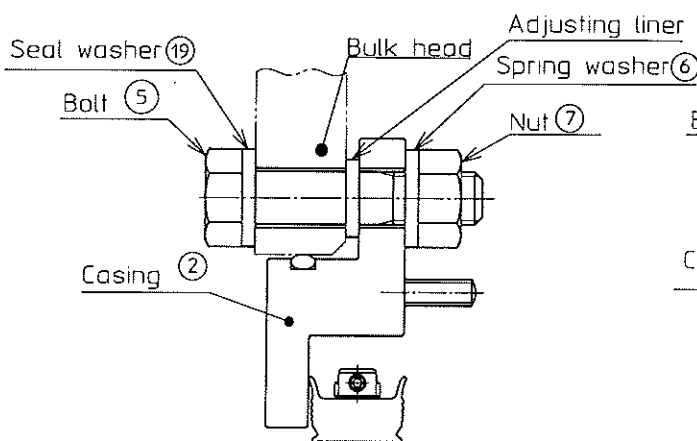


FIG-16 LINER LOCATION

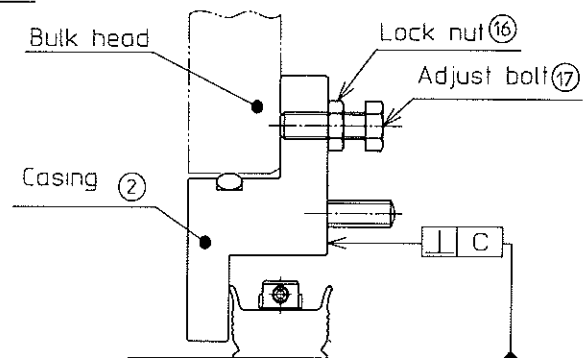
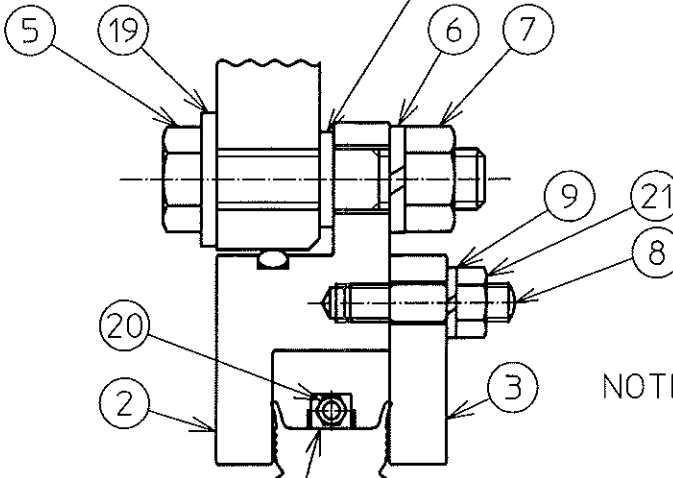


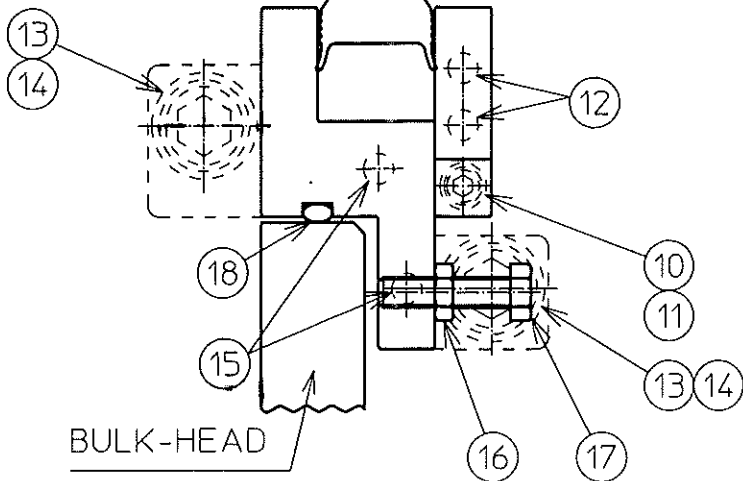
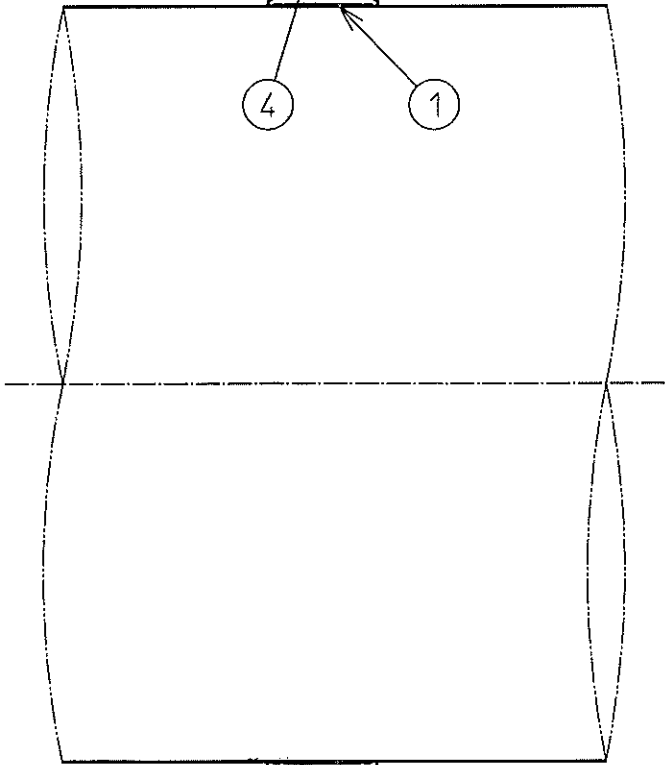
FIG-17 RIGHT ANGLE ADJUSTMENT WORK

ADJUSTING LINER
FOR PERPENDICULARITY

(PREPARE BY
SHIP YARD)



NOTE 1. Apply grease generously on both side of SEAL RING ① and surface of shaft when seal is assembled.
Example: 1) SUNLIGHT GREASE No.2 (SHOWA SHELL SEKIYU KK.)
2) ARAPEN RB300 (ESSO)



BULK-HEAD

(PREPARE BY
SHIP YARD)

21	NUT	SUS304
20	BOLT	SUS304
19	SEAL WASHER	SUS NBR
18	O RING	NBR
17	BOLT	SUS304
16	NUT	SUS304
15	PIN	SUS304
14	SPRING WASHER	SUS304
13	BOLT	SUS304
12	PIN	SUS304
11	SPRING WASHER	SUS304
10	BOLT	SUS304
9	SPRING WASHER	SUS304
8	STUD BOLT	SUS304
7	NUT	SUS304
6	WASHER	SUS304
5	BOLT	SUS304
4	BAND	SUS316
3	STOP RING	CAC403
2	CASING	CAC403
1	SEAL RING	NBR
REF No	NAME OF PART	MATERIAL

DRAWING -1