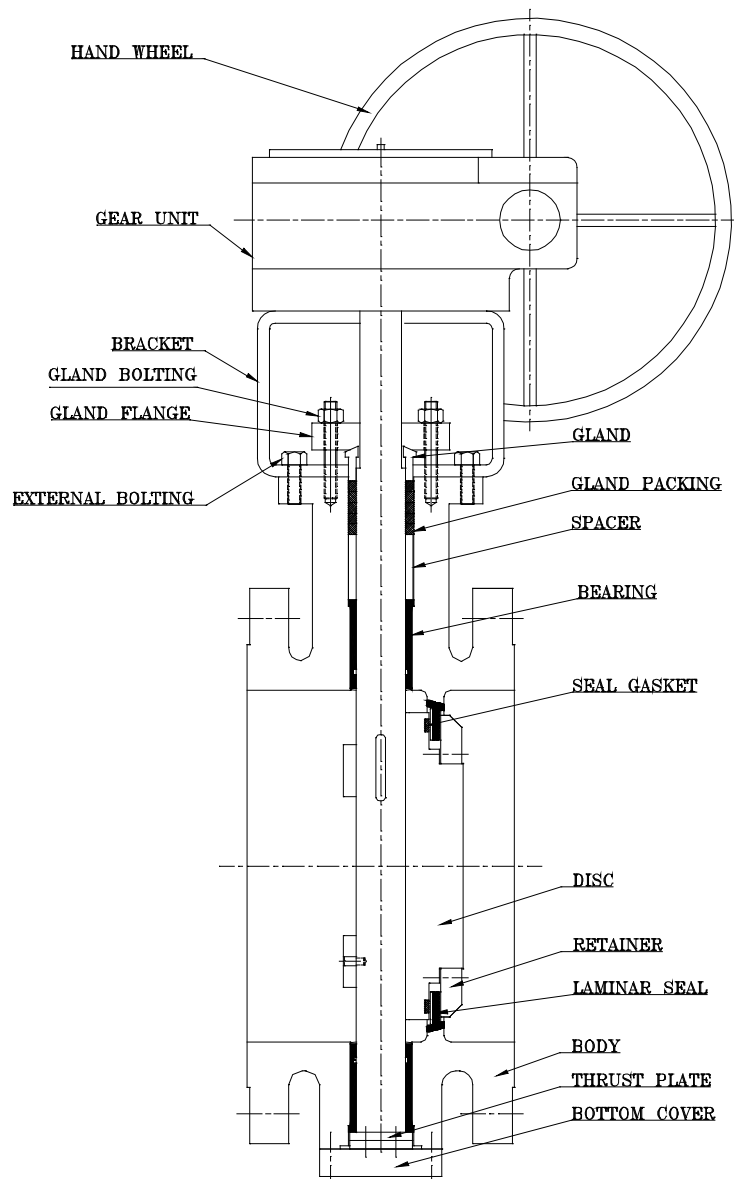


**Installation, Operation  
and Maintenance  
Instructions for  
AIL Metal Seated Triple  
Eccentric Butterfly  
Valves**

# Installation, Operation and Maintenance Instructions for AIL Metal Seated Triple Eccentric Butterfly Valves


## 1.0 Typical Metal Seated Triple Eccentric Butterfly Valve with parts

- 1.1 AIL Metal Seated Triple Eccentric Butterfly valves are of sturdy design and give tight sealing.
- 1.2 It has a Triple offset seat geometry to provide friction-less seal with uniform compressive sealing. A typical valve construction is shown below.



## 2.0 Identification of valves

- 2.1 Each valve has a stainless steel name plate fixed to the body. The nameplate is marked with details such as valve size (in inches), ASME class rating, materials of construction, limiting temperature and serial number of the valve. A typical name plate is shown below.

 <b>AUDCO INDIA LIMITED</b> INDIA					
ASME	150	SIZE	10	SHAFT	SS 410
100°F	285 psig	CAT.	M31211131GU	DISC	WCB
S.No.	001	BODY	WCB	SEAT	HF

- 2.2 Tag number will also be attached to the valve if requested at the time of order.

## 3.0 Storage

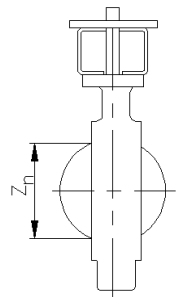
- 3.1 On receipt check that the valve and accessories are intact. Ensure that the valve is in fully closed position.
- 3.2 End protectors on either side of the valve should be kept intact and removed only at the time of installation.
- 3.3 Valve should be stored in a covered area. If covered area is not available waterproof-covering material should be spread over the valves and the valves should be kept on a wooden pallet atleast 6" (150mm) above the ground level.
- 3.4 Do not apply tar, paint, grease or any other material inside the valve, as this will impair the performance of the valve.
- 3.5 While transporting the valve from storage to installation site, it shall not be dragged on the floor.

## 4.0 Planning and Responsibilities

- 4.1 Conduct a risk assessment and eliminate or reduce hazards to an acceptable level.
- 4.2 Work in accordance with safe systems of work.
- 4.3 Observe all site health safety rules.
- 4.4 Due to variety of duties in which this valve can be employed, it is the end user's responsibility to ensure compatibility of media with the material of construction of the product for each specific application.
- 4.5 Before equipment is installed in areas which may be subject to extreme seismic activity consult AIL with data.

## 5.0 Do's & Don'ts

- 5.1 These valves are not to be used for End of line service.
- 5.2 Wear all necessary protective equipment for conducting the work.
- 5.3 Never remove or maintain a valve or joint unless the line has been fully drained and de-pressurized.
- 5.4 Ensure that the valves are used within the pressure temperature service conditions as per ASME B16.34. Also refer name plate for pressure temperature limits. In case of additional assistance consult with AIL.
- 5.5 Valve hand wheels are designed only for operation. The hand wheel must not be used for handling the valve.
- 5.6 Lined Pipes and Heavy walled pipes should have a minimum inside diameter well clear of Dimension "Z<sub>n</sub>" (Refer Figure) in Disc full open position



<b>Z<sub>n</sub>-Dimension of protruding disc, mm</b>											
<b>SIZE in mm</b>	<b>3 80</b>	<b>4 100</b>	<b>6 150</b>	<b>8 200</b>	<b>10 250</b>	<b>12 300</b>	<b>14 350</b>	<b>16 400</b>	<b>18 450</b>	<b>20 500</b>	<b>24 600</b>
<b>Class 150</b>	62	81	134	175	225	289	334	362	397	437	560
<b>Class 300</b>	62	81	134	170	223	285	330	360	393	429	553

## 6.0 Installation

### 6.1 Preparation for Installation

- 6.1.1 Move the valves as close as possible to the installation site before removing the end protectors. After removing the end protectors, check the inside of the valve and remove any rust inhibitor or dirt.
- 6.1.2 Clean the pipe flanges of any rust / dirt.
- 6.1.3 In flanged end valves the raised face should be cleaned and free of any damage/score marks.
- 6.1.4 In BW end valves ensure that the end preparation is in line with the mating part and free from any damage / nicks etc.
- 6.1.5 Ensure that the pipe line has been flushed free of dirt, weld spatter etc. before installation.

### 6.2 Pre-Commissioning Test

- 6.2.1 All valves are factory tested in accordance with API 598, as mentioned in the product catalogue.
- 6.2.2 Wherever valves are required to be re-tested before installation, ensure that a proper test rig is available at the site. Valves should be tested as per API 598, by an authorized faculty as per approved procedures.
- 6.2.3 **Only demineralised water free of dirt and suspended impurities shall be used for testing.** It is advisable to add corrosion inhibitor in the water and it is also recommended that after testing is over, the valve internals are dried with dry nitrogen or air.

### 6.3 Installation Configuration

- 6.3.1 For best performance it is recommended that these valves are installed with the shaft horizontal with the hand wheel facing up.
- 6.3.2 This valve has bi-directional sealing capabilities and therefore can be installed in either direction. However, a preferred flow direction is indicated in the valve by means of an arrow mark and it is strongly recommended that the valve is installed such that the flow is in the direction of the arrow.

### 6.4 Lifting Position

- 6.4.1 **Valves should be lifted using suitable mechanical equipment. Chains, Slings and other lifting equipment should be regularly inspected. Do not attempt to lift the valve by applying load on hand wheel, Gear Unit, actuator or any other accessory. Chains or slings should be fixed around the valve body.**
- 6.4.2 Use lifting lugs, eyebolts for handling.
- 6.4.3 Valves shall be in closed position during handling.
- 6.4.4 **When valves are fitted with Fail-Open actuators, care is to be taken so as to manually override the valves to close position.**

### 6.5 Flanged End Connections

- 6.5.1 These valves are manufactured in accordance to the standards specified in the product catalogue, unless otherwise specified by the customer.
- 6.5.2 Gaskets and flange bolting which are not supplied with the valve should meet the requirement of the end flange standard of the valve. Pipe flanges shall be pulled together evenly by tightening opposite pairs of bolts in star pattern.

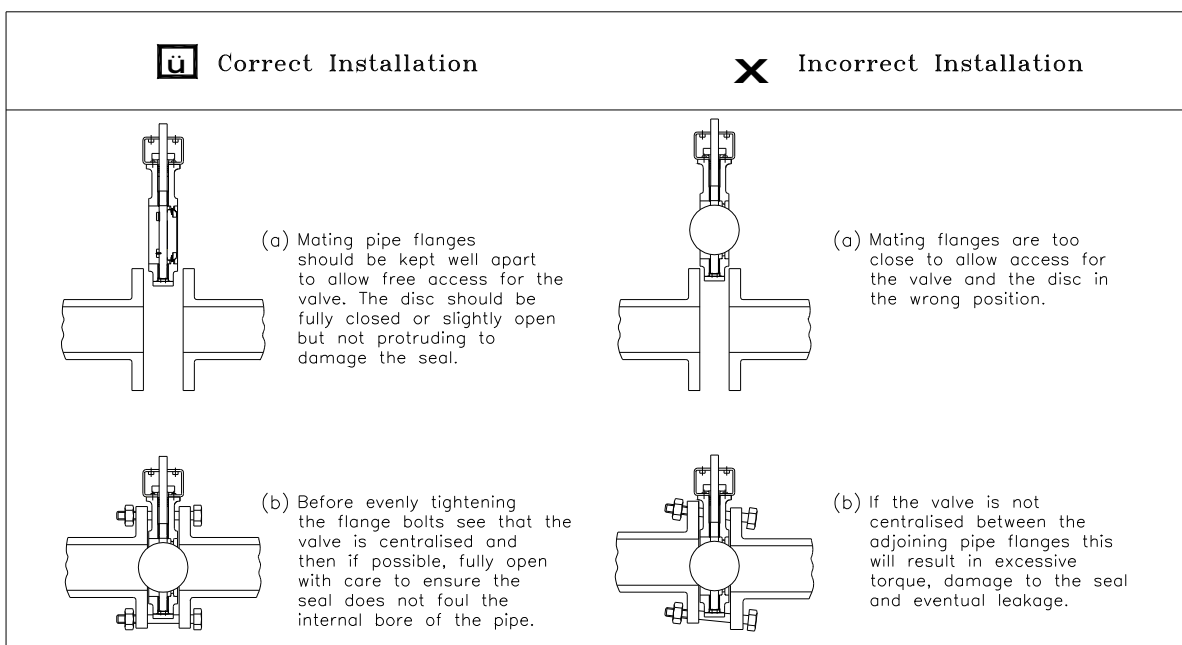
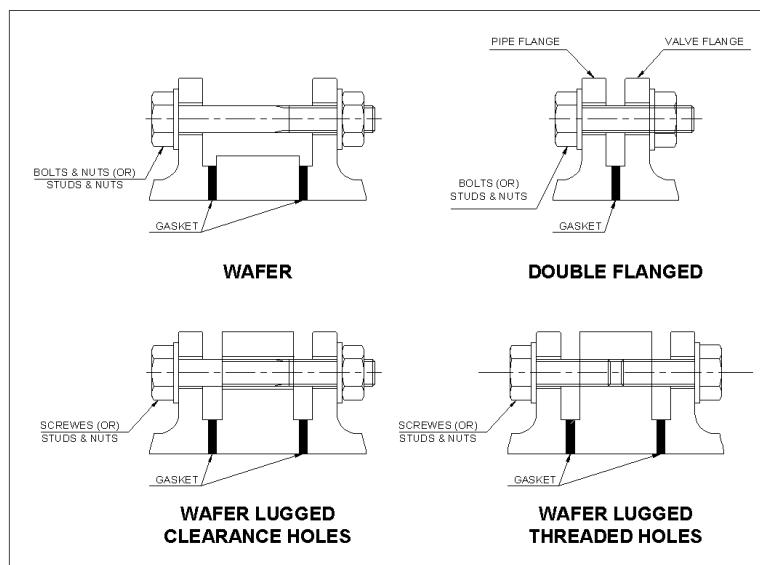
- 6.5.3 For wafer type valves, it has to be ensured that the valve bore is along the centerline of the pipe.
- 6.5.4 Ensure that the pipeline stresses are not transferred on to the valve as this may impair the performance of the valve.
- 6.5.5 Do not use the valve as a jack to pull the pipe into alignment.

**6.6 Butt welded Connections**

- 6.6.1 The valve ends and the pipe ends should be aligned.
- 6.6.2 The pipe work in the butt weld end connection should also have the correct gap to allow the end to end dimension of the valve.
- 6.6.3 Correct welding material shall be used as per approved procedures for welding.  
**WARNING: Valve should be kept in closed position during welding.**

**6.7 Bolting Arrangement**

- 6.7.1 The bolting arrangement will vary according to the type of valve. Refer Fig for details.



## **7.0 Operation**

**7.1** These valves are not to be used for End of line service.

**7.2** These valves are provided with various operators such as Manual (Gear unit), Electric or Pneumatic actuators.

**7.3** Gear units are of worm type and are self-locking. The direction of rotation of the hand wheel to shut the valve is indicated on it. Position indicators on the gear unit show the angular movement of the disc and also the open and shut positions.

### **7.4 Electrical Actuators**

**7.4.1** Electrical actuators are fitted to the manual override gear unit or directly mounted.

**7.4.2** For operational details consult the manufacturer's instruction manual and the appropriate wiring diagram.

**7.4.3** Ensure that electrical connections are given as indicated in the wiring diagram for the specific actuator.

**7.4.4** Before making a test run move the disc to an intermediary position by means of the hand wheel.

**7.4.5** Start the motor and see if the working direction is correct.

**7.4.6** Ensure correct phase connection to avoid failure of actuator.

### **7.5 Pneumatic Actuators**

**7.5.1** Pneumatic actuators are fitted to the manual override gear unit or directly mounted.

**7.5.2** For operational details consult the manufacturer's instruction manual and appropriate pneumatic circuit diagram.

**7.5.3** Ensure that the port connections are as given in the pneumatic circuit.

**7.5.4** For Double acting actuators, move the disc to an intermediate position by using manual override.

**7.5.5** Run a test by supplying air and see if the direction of operation is correct.

### **7.6 Operator Accessories**

**7.6.1** Mechanical Stopper – Mechanical stoppers are provided on gear units and manual override gear units. These are factory set and should not be disturbed.

**7.6.2** Limit Switch – Limit switches are factory set and should not be disturbed. However, for valves with extension spindle, actuator is approximately pre-set and should be reset at site. The pre-setting can also be modified if required once the valve has been put into service. Consult manufacturer instruction for more details.

**7.6 Warning:** In valves fitted with PTFE gland packings, and gasket with PTFE filler, which have been exposed to an external fire, it is recommended that the packing and the gasket be changed immediately before further use of the valve.

## **8.0 In-line Maintenance**

**8.1** These butterfly valves require only minimum in-line maintenance for satisfactory performance.

**8.2** Check Gland nuts for tightness at regular intervals. If loose, tighten them evenly.

**8.3** Refer Table II for Gland nut tightening Torque.

## 9.0 Routine Maintenance

### 9.1 Gland Leak

- 9.1.1 Check the tightness of the gland nuts and tighten evenly if required. If the leak persists, the packing may be renewed.

## 9.2 Packing Replacement

- 9.2.1 **Caution: DO NOT** replace the gland packing when the line is under pressure. Do not over-tighten packing and gland nuts. Over-tightening will increase the torque required to operate the valve.
- 9.2.2 Remove the gear unit/actuator and connecting keys. Its position relative to the valve must be noted for reassembly of gear unit/actuator.
- 9.2.3 Remove gland nut, gland flange and gland.
- 9.2.4 Remove packing and carefully clean packing cavity and shaft.
- 9.2.5 Insert new packing rings. Most of the packing rings are already cut so that they can be inserted around the stem. In case of solid molded packing like Graphite rings, use a sharp knife and cut the ring at 30° angle. The slightly twist the ring and insert it around the stem. Do not open up the ring as it could break.
- 9.2.6 Reassemble gland, gland flange and gland nut.
- 9.2.7 Reassemble connecting keys, gear unit/actuator and close the valve.  
*Caution: The gear unit/actuator will be a free moving fit. Do not force it on the stem.*
- 9.2.8 Tighten the gland nuts and cycle the valve.
- 9.2.9 Pressurize the line. If leakage is detected, tighten the gland nuts slowly and evenly until leakage stops.

## 9.3 Gear Units

- 9.3.1 Gear Operated valves are fitted with enclosed water tight worm gear units. The gears are designed to function without maintenance for many years. All gear units are lubricated with heavy bearing grease when assembled and may be refilled as required.

## 10.0 Periodic Maintenance

### 10.1 Dismantling

- 10.1.1 The pipeline shall be drained of the line fluid and the valve removed from the line before dismantling.
- 10.1.2 **Care should be taken during the removal of wafer and wafer lugged valves fitted with fail-open actuators. Such valves shall be closed using the manual over-ride gear unit before removing from the pipeline. If no manual over-ride is available, the fail open actuator shall be dismantled before the valve is removed from the pipe line. Subsequently, the valve shall be closed with a wrench and then removed.**
- 10.1.3 The Operator may be changed without removing the valve from the pipeline, however, the line pressure should be relieved.
- 10.1.4 Maintenance of the operator shall be done as per manufacturer instruction.
- 10.1.5 Operator shall be changed when the valve shall be in the fully closed condition.
- 10.1.6 If the operator has a fail-safe position that cannot be overridden then unscrewing the bolting on the valve bracket should dismantle the actuator.

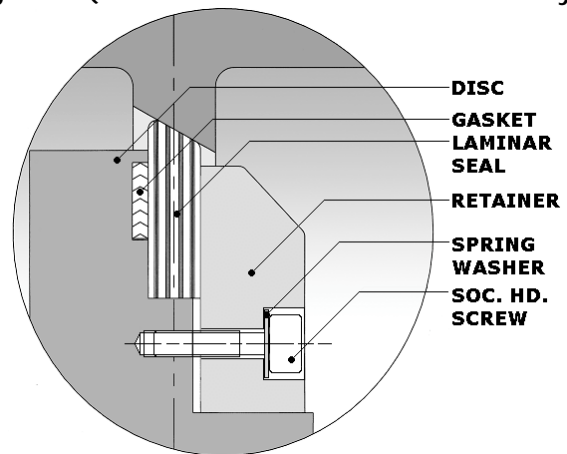
## 10.2 Inspection

- 10.2.1 Keep the valve in full open condition and examine the body seat and laminar seal for wear / damage.

- 10.2.2 The gland nuts can be loosened to operate the valve if no other means of actuation is possible.
- 10.2.3 Check for tightness of the locking screw and grub screw on the disc hub.
- 10.2.4 Check if the retainer bolting is uniformly tight to the specified torque. For torque details refer Table I.

**10.3 Replacement of Seal**

- 10.3.1 If there is excessive damage / wear on the seal, it shall be replaced by a new spare.
- 10.3.2 Remove the retainer by unscrewing of the bolting.
- 10.3.3 Remove the old seal and the locating pin.
- 10.3.4 The gasket under the seal should also be replaced at the time of seal replacement.
- 10.3.5 Place the gasket in the appropriate groove on the disc.
- 10.3.6 Insert the locating pin on the disc.
- 10.3.7 Place the laminar seal over the gasket (so as to mate with the seat in body).  
Locate the seal ring using the locating pin in the recess provided in both the seal and disc.
- 10.3.8 A Punch mark is provided on the laminar seal and this shall be facing the operator during seal assembly.
- 10.3.9 Mount the retainer ring to the disc using the retainer screws and hand tighten them to allow for seal movement.
- 10.3.10 Apply a thin film of lubricant on the body seat as well on the conical seat of the seal.
- 10.3.11 Operate the valve from full open to full close atleast two times and after the seal has aligned with the body seat, tighten the retainer screws to the specified torque. For torque details refer Table I.
- 10.3.12 The Valve shall be in closed position during tightening of the retainer bolting.



**10.4 Reassembly**

- 10.4.1 Gland nuts shall be tightened to the torque values given in Table II
- 10.4.2 With the valve in fully closed position, it shall be installed back in the pipe line as stated in section 6.0
- 10.4.3 The gaskets have to renewed every time the valve is removed from the line.

**11.0 Trouble Shooting Guide**

TROUBLE	PROBABLE CAUSE	REMEDY (see section)
Leaks across Disc	a. Valve not fully closed	a. Re-tighten hand wheel
	b. Valve seating damaged	b. Dismantle and replace seal (10.3)
Leaks through gland	a. Packing loosened	a. Tighten Gland nuts (9.1)
	b. Packing worn out	b. Replace packing (9.2)
Not closing fully	a. Accumulation of debris on seat	a. Flush the pipeline with the valve in fully open condition

### 12.0 Valve Data

It is always advantageous to keep the valve detail handy as shown below for quick reference during periodic maintenance.

Tag No.	Valve Size	Pressure Class	Valve SL. No.	Qty	Location	Remarks
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### 13.0 Repair Kits

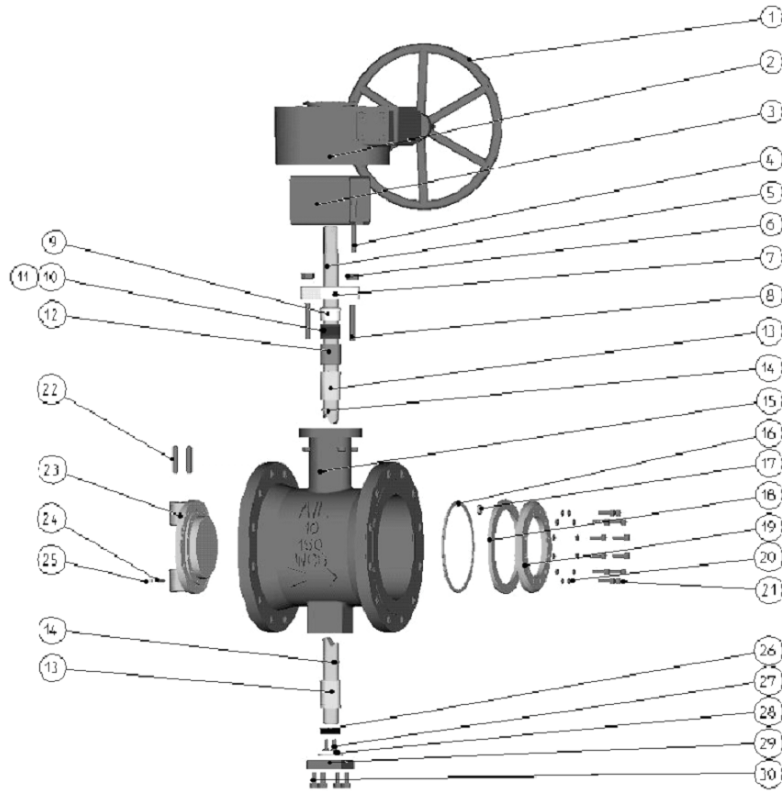
Repair kits are available for all AIL Metal Seated Triple Eccentric Butterfly Valves consisting of a set of gland packings, seal and seal gasket. Details of the content are found in the instruction sheet supplied with the kit.

Dismantling of valves for attending for gland packing replacement as well as replacement of seal should be done under expert supervision, after de-pressurizing the line and evacuating all the line fluid from the valve.

Bolt Dimension (mm)	Torque value (Nm)
8	12
10	24
12	41
14	66
16	103
18	142
20	201
22	274
24	348

Valve Size (in)	Class 150	Class 300
3	13	15
4	14	15
6	25	30
8	28	33
10	29	52
12	47	56
14	49	59
16	52	72
18	66	93
20	82	97
24	121	150
30	144	211

15. Exploded view of valve assembly



Item	Description	Qty
1.	Hand wheel	1
2.	Gear Unit	1
3.	Bracket	1
4.	Key (Gear Unit)	1
5.	Shaft	1
6.	Gland Nut	2
7.	Gland Flange	1
8.	Gland Stud	2
9.	Gland	1
10.	Packing (Braided)	2
11.	Packing (Molded)	3
12.	Spacer	1
13.	Bearing	2
14.	Bearing Seal	2
15.	Body	1

Item	Description	Qty
16.	Gasket	1
17.	Locating Pin	1
18.	Laminar Seal	1
19.	Retainer	1
20.	Spring Washer	As req.
21.	Retainer Bolting	As req.
22.	Key (Disc)	2
23.	Disc	1
24.	Grub Screw	1
25.	Locking Screw	1
26.	Thrust plate	1
27.	Thrust plate bolting	2
28.	Gasket(Bottom Cover)	1
29.	Bottom Cover	1
30.	Cover Bolting	4