

**MAINTENANCE MANUAL**  
YAMADA AIR-OPERATED DIAPHRAGM PUMPS  
DP-15

## **WARNING**



- For your own safety, be sure to read procedures carefully before performing maintenance on this product. After reading this document, be sure to keep it handy for future reference.

This maintenance manual covers what you should know about maintenance of the Yamada DP-15 series Diaphragm Pumps.

This edition is based on the standards for the March 2005 production run. Remember, the specifications are always subject to change; therefore, some of the information in this edition may not apply to new specifications.

### **Warnings and Cautions**

For safe use of this product, be sure to note the following: In this document, warnings and cautions are indicated by symbols. These symbols are for those who will operate this product and for those who will be nearby, for safe operation and for prevention of personal injury and property damage. The following warning and caution symbols have the meanings described below. Be sure to remember their meanings.



**WARNING** : If you ignore the warning described and operate the product in an improper manner, there is danger of serious bodily injury or death.



**CAUTION** : If you ignore the caution described and operate the product in an improper manner, there is danger of personal injury or property damage.

Furthermore, to indicate the type of danger and damage, the following symbols are also used along with those mentioned above:



This symbol indicates a DON'T, and will be accompanied by an explanation on something you must not do.



This symbol indicates a DO, and will be accompanied by instructions on something you must do in a certain situation.

## **WARNING**



- Before starting maintenance work, cut off the feed air and clean the pump. If air pressure or residue remain in the pump, there is danger of explosion, or possible poisoning resulting in serious injury or death if chemicals adhere to the skin or are accidentally swallowed. (For details on cleaning the pump, refer to Chapter 6 of the operating manual.)
- When replacing parts, be sure to use the recommended genuine parts or Equivalents. Use of other parts may cause a malfunction of the product.

## **CAUTION**



- When it is instructed that special tools must be used, be sure to use the specified tools. Otherwise, the pump may be damaged.
- Refer to 10.1 "Specifications" in the Operating Manual. Also, remember that the pump is heavy, and extreme care must be taken when lifting it.

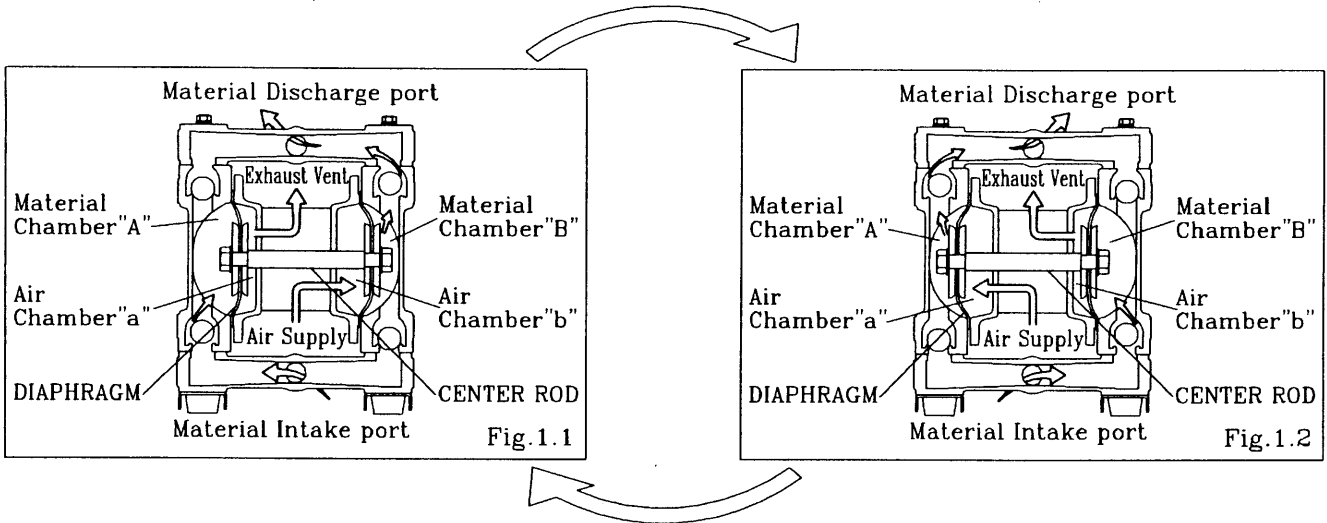
# Table of Contents

·Warnings and Cautions	
·Table of Contents	
<b>1.Principles of operation</b>	1
<b>2.Tools, etc.</b>	
2.1 General tools	1
2.2 Misc.	1
<b>3.Ordering Replacement parts</b>	1
<b>4.Balls and Valve seats</b>	
4.1 Removal	
■BP□, FDT type	2
4.2 Inspection	3
4.3 Installation	3
<b>5.Diaphragm</b>	
5.1 Removal	
■BP□, FDT type	4
5.2 Inspection	4
5.3 Installation	
■□PH, □PS types	5
■□PN, □PT, FDT types	5
<b>6.Center rod, Body and Guide bush</b>	
6.1 Removal	6
6.2 Inspection	6
6.3 Installation	6
<b>7. Spool valve case and Spool Assembly</b>	
7.1 Removal	7
7.2 Inspection	7
7.3 Installation	7
<b>8.Retightening of tie rods</b>	8
<b>9.Exploded View and Parts List</b>	
9.1 DP-15BP□,FP□, FDT	9
9.2 DP-15 COMMON PARTS	11

## 1. Principles of operation

There are two diaphragms fixed to the center rod, one at each end. When compressed air is supplied to air chamber b (right side, see Fig. 1.1), the center rod moves to the right, the material in material chamber B is pushed out, and at the same time material is sucked into material chamber A.

When the center rod is moved full-stroke to the right, the air switch valve is switched, compressed air is sent to air chamber a (left side, see Fig.1.2), and the center rod moves to the left. The material in material chamber A is pushed out, and at the same time material is sucked into material chamber B. Through repetition of this operation, material is repeatedly taken in and discharged out.



## 2. Tools, etc.

### 2.1 General tools

- Socket wrenches 13mm
- Hexagonal box wrenches 5mm
- Open-end wrenches 21mm
- Snap ring pleyer

### 2.2 Misc.

- Assembly oil Turbine oil none addition class 1( equivalent to ISO VG32 grade )

## 3. Ordering Replacement parts

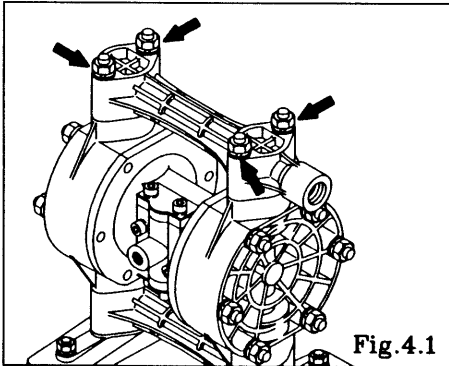
For accurate and speedy shipment of parts, be sure to order the right parts for your model to distributor. Indicate the part numbers, descriptions, and quantities.

## 4. Balls and Valve seats

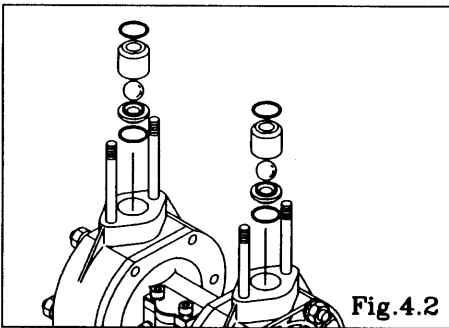
### 4.1 Removal

#### ■ BP□, FP□, FDT type

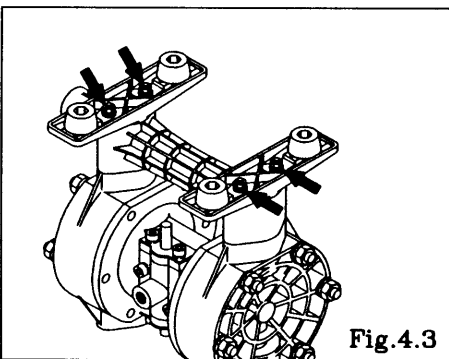
See [9. Exploded View] on after p.9. ( Fig.4.1,4.2,4.3 and 4.4 show the DP-15 BP□ )



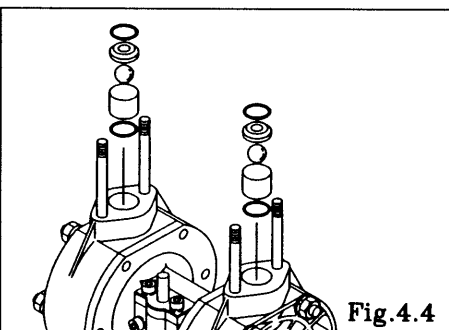
- Remove the 4 retainer nuts from the out manifold, and remove the out manifold. [Fig.4.1]



- Remove the O ring, valve stopper, ball ( flat valve ) and valve seat. [Fig.4.2]



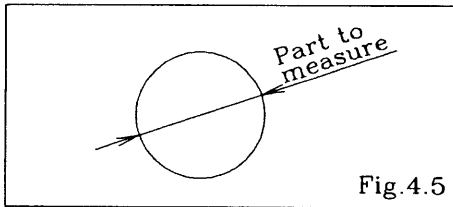
- Turn over the main body assembly. [Fig.4.3]  
Remove the 4 retainer nuts from the in manifold, and remove the base and in manifold. [Fig.4.3]



- Remove the O ring, valve seat, ball ( flat valve ) and valve stopper. [Fig.4.4]

## 4.2 Inspection

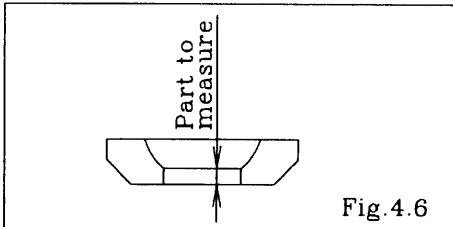
### ■ Ball valve type



- Ball [Fig.4.5]  
Measure the outside diameter, and if it is outside the usable range, replace the ball.

Usable range of ball

$S\phi 0.787 \sim S\phi 0.898$  in { $S\phi 20.0 \sim S\phi 22.8$  mm}

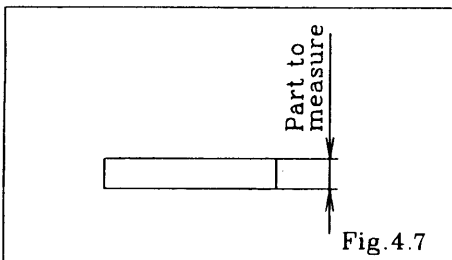


- Valve seat [Fig.4.6]  
Measure the dimension shown at left, and if it is outside the usable range, replace the seat.

Usable range of valve seat

$0.102 \sim 0.256$  in { $2.6 \sim 6.5$  mm}

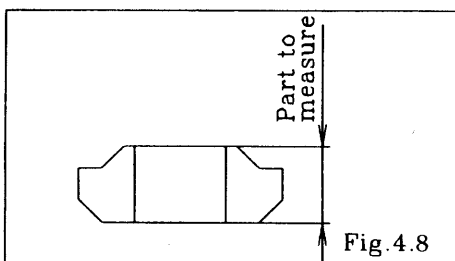
### ■ Flat valve type



- Flat valve [Fig.4.7]  
Measure the dimension shown at left, and if it is outside the usable range, replace the seat. If the seal ring is worn out or cracked, replace it.

Usable range of Flat valve

$0.169 \sim 0.197$  in { $4.3 \sim 5.0$  mm}



- Valve seat [Fig.4.8]  
Measure the dimension shown at left, and if it is outside the usable range, replace the seat.

Usable range of Valve seat

$0.323 \sim 0.394$  in { $8.2 \sim 10.0$  mm}

- O ring (other than PTFE)  
If O rings are worn out or cracked, replace them.

## 4.3 Installation

For installation, see [9. Exploded View] on after p.9, and install in the reverse order of disassembly.

Tightening torque for manifold retainer bolts

$105$  lbf-in {  $120$  kgf-cm }

<NOTE>

- Make sure there is no dust on the seal surface and the seal is not damaged.
- Replace the PTFE O ring regardless of its condition.

## 5. Diaphragm

### 5.1 Removal

#### ■ BP□, FDT type

See [9. Exploded View] on after p.9

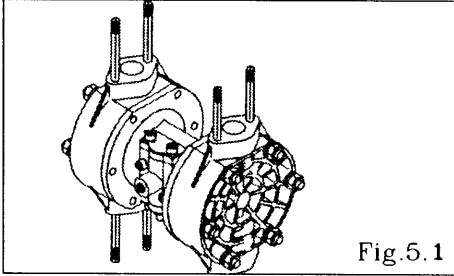


Fig.5.1

- Remove the ball ( flat valve ), valve stopper and valve seat etc.(see [ 4.1 Removal BP□ type] on p. 2)
- Remove the 12 retainer bolts from the out chamber, and remove the out chamber. [Fig.5.1]

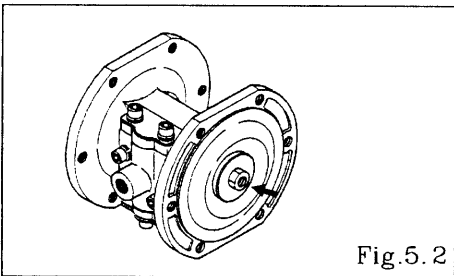


Fig.5.2

- Remove the center disk from one side. [Fig.5.2]
- After the center disk (on one side) have been removed, remove the diaphragm and the center disk (inside).

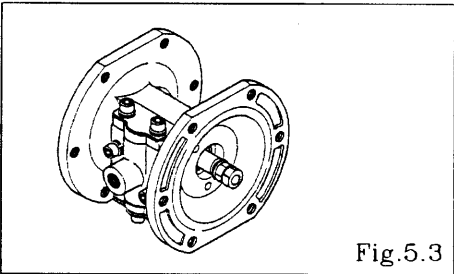


Fig.5.3

- Remove the center disk and diaphragm from the opposite side using the double nut. [Fig.5.3]  
Be careful not to scratch or score the center rod.

### 5.2 Inspection

- Diaphragm

If the diaphragm is worn out or damaged, replace it.  
New replace just one diaphragm.

#### Guideline of diaphragm life

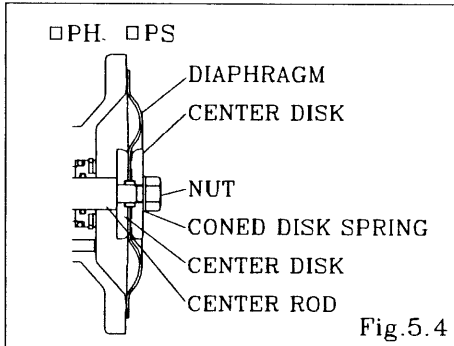
NBR, PTFE	10,000,000 cycle
TPEE, TPO	15,000,000 cycle

(When used with clean water at room temperature)

### 5.3 Installation

#### ■ □PH, □PS types

For installation, see [9. Exploded View] on after p.9, and install in the reverse order of disassembly.



- Apply assembly oil to the center rod, and insert it into the main body.
- Keep the convex side to the outside (cf. Fig.5.4).
- Tighten the center disk using the open-end wrenches. (No coned disk springs and nuts are needed.)
- Tighten the out chamber temporarily at first.
- After installation of the out chambers on both sides, place the pump on a flat surface and stand the pump upright for further assembly.

Tightening torque for center rod and out chamber

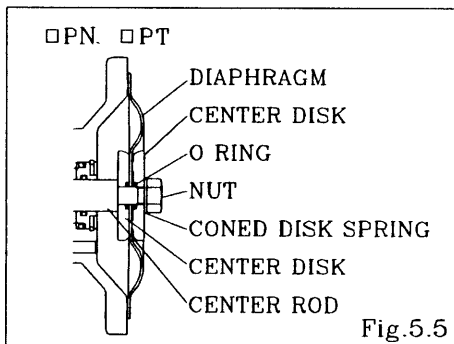
Center rod	Out chamber
122 lbf·in { 140 kgf·cm }	105 lbf·in { 120 kgf·cm }

<NOTE>

- Make sure there is no dust on the seal surface in order to prevent seal damaged
- Tighten the bolts that balance should be equal from both side on diagonal line with even torque.

#### ■ □PN, □PT, FDT types

For installation, see [9. Exploded View] on after p.9, and install in the reverse order of disassembly.



- Apply assembly oil to the center rod, and insert it into the main body.
- Keep the marking "LIQUID" to liquid end for NBR, diaphragms.
- Keep the convex side to the outside for PTFE diaphragm.
- Install the O ring (cf. Fig.5.5).
- Tighten the center disk using the open-end wrenches. (No coned disk springs and nuts are needed.)
- After installation of the out chambers on both sides, place the pump on a flat surface and stand the pump upright for further assembly.

Tightening torque for center rod and out chamber.

Center rod	Out chamber
122 lbf·in { 140 kgf·cm }	105 lbf·in { 120 kgf·cm }

<NOTE>

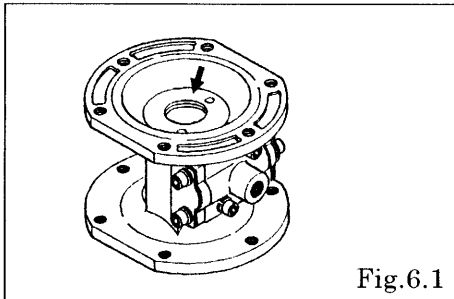
- Make sure there is no dust on the seal surface in order to prevent seal damaged.
- Replace the PTFE O ring by new one.
- Tighten the bolts that balance should be equal from both side on diagonal line with even torque.



## 6. Center rod, Body and Guide bush

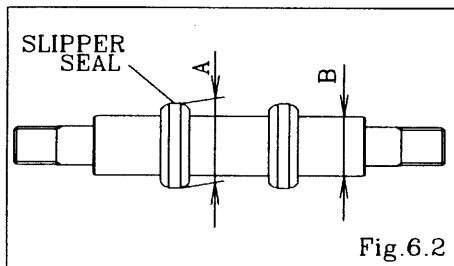
### 6.1 Removal

See [9. Exploded View] on after p.9.



- Remove the diaphragm etc.(see [5.1 Removal] on p. 4)
- Remove the snap ring, and remove the guide bush and center rod assembly using the snap ring ptyer. [Fig.6.1]

### 6.2 Inspection



- Center rod assembly [Fig.6.2]  
Measure the outside diameter (A), and if it is outside the usable range, replace the slipper seal.

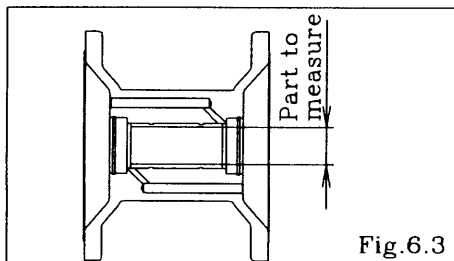
Usable range of Slipper seal (A)

$\phi 0.783 \sim \phi 0.787$  in  $\{\phi 19.9 \sim \phi 20.0 \text{ mm}\}$

- Measure the outside diameter (B), and if it is outside the usable range, replace the center rod Slipper seal.

Usable range of Center rod (B)

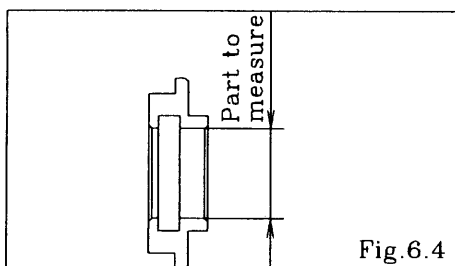
$\phi 0.547 \sim \phi 0.551$  in  $\{\phi 13.9 \sim \phi 14.0 \text{ mm}\}$



- Body [Fig.6.3]  
Measure the inside diameter, and if it is outside the usable range, replace the Body.

Usable range of Body

$\phi 0.7874 \sim \phi 0.7906$  in  $\{\phi 20.00 \sim \phi 20.08 \text{ mm}\}$



- Guide bush [Fig.6.4]  
Measure the inside diameter, and if it is outside the usable range, replace the guide bush.

Usable range of Guide bush

$\phi 0.5520 \sim \phi 0.5544$  in  $\{\phi 14.02 \sim \phi 14.08 \text{ mm}\}$

- O ring  
If the O ring is worn out or cracked, replace it.

### 6.3 Installation

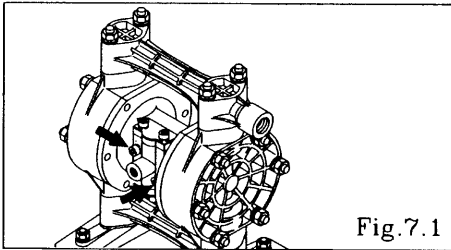
For installation, see [9. Exploded View] on after p.9, and install in the reverse order of disassembly <NOTE>

- Make sure there is no dust on the seal surface and it is not damaged.

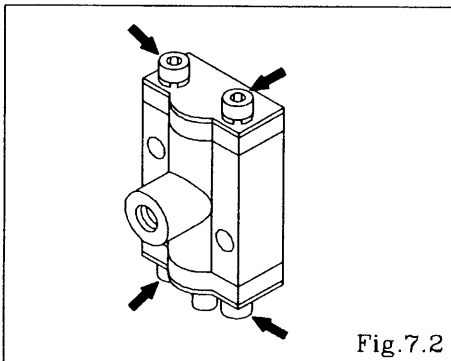
## 7. Spool valve case and Spool Assembly

### 7.1 Removal

See [9. Exploded View] on after p.9.

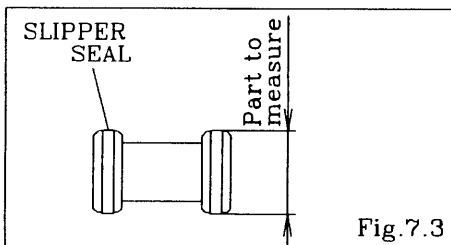


- Remove the 2 retainers from the spool valve case, and remove the spool valve case.[Fig.7.1]



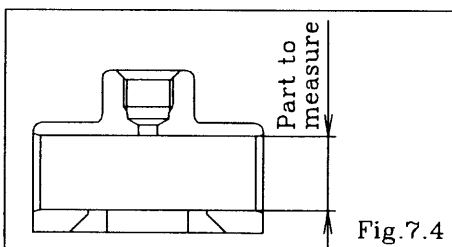
- Remove the 2 retainer bolts from the cap, and remove the reinforcement plate A, cap and reset button.[Fig.7.2]
- Remove the 2 retainer bolts from the cap, and remove the reinforcement plate B, and cap.[Fig.7.2]
- Remove the spool valve assembly from the spool valve case.

### 7.2 Inspection



- Spool valve assembly [Fig.7.3]  
Measure the outside diameter, and if it is outside the usable range, replace the slipper seal.

Usable range of spool valve assembly  
 $\varnothing 0.783 \sim \varnothing 0.787$  in {  $\varnothing 19.9 \sim \varnothing 20.0$  mm }



- Spool valve case[Fig.7.4]  
Measure the inside diameter, and if it is outside the usable Range, replace the Spool valve case.

Usable range of spool valve case  
 $\varnothing 0.7874 \sim \varnothing 0.7906$  in {  $\varnothing 20.00 \sim \varnothing 20.08$  mm }

### 7.3 Installation

For installation, see [9.Exploded View] on after p.9, and install in the reverse order of disassembly.

Tightening torque for installation Cap

55 lbf-in { 60 kgf·cm }

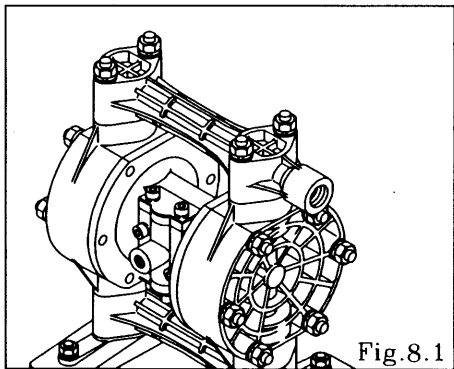
Tightening torque for installation Spool valve case

55 lbf-in { 60 kgf·cm }

<NOTE>

- Make sure there is no dust on the

## 8. Retightening of Tie rods



- The torque should be applied on the occasion of
  - (1) Right before the pump to use
  - (2) There are any leaks of material on daily inspecting a pump.

### Retightening of tie rods and torque

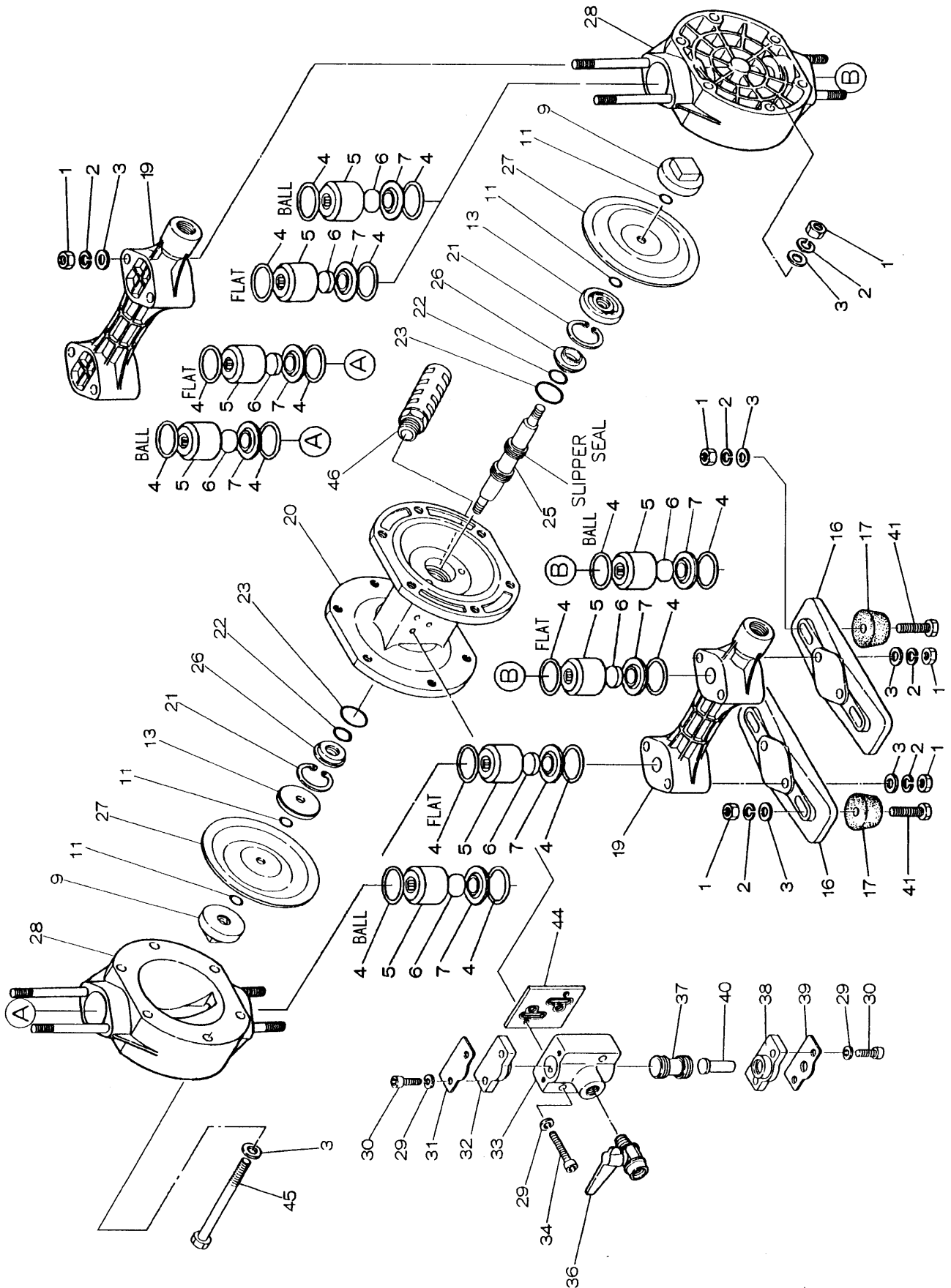
Horizontal tie rods	Vertical tie rods
105lb•in {120kgf•cm}	105lb•in {120kgf•cm}

### <NOTE>

- Fasten the nut (tie rods) on a diagonal line alternately with even force.
- Retighten the horizontal tie rods and then the vertical tie rods. [Fig.8.1]

# 9. Exploded View and Parts List

## 9.1 Exploded View DP-15BP□, FP□, FDT



9.1 Parts List ■ DP-15BP□, FP□, FDT

NO.	BP□	FP□	FDT	DESCRIPTION	Q'TY	NOTE
1	628012	628012	628012	NUT	12	M8x1.25
2	681300	681300	681300	SPRING LOCK WASHER	24	M8
3	631329	631329	631329	PLAIN WASHER	24	M8
4	Tab.1	Tab.1	Tab.1	O RING	8	P29
5	771806	771341	772718	VALVE STOPPER	4	
6	Tab.2	<del>771340</del>	<del>771340</del>	BALL	4	
		771340	771340	FLAT VALVE	4	
7	780162	771345	772719	VALVE SEAT	4	
9	770968	770968	772722	CENTER DISK	2	
11	Tab.3	Tab.3	Tab.3	O RING	4	P8
13	708506	708506	708506	CENTER DISK	2	
16	771352	771352	772720	BASE	2	
17	770551	770551	770551	CUSHION	4	
19	780190	780190	780220	MANI FOLD	2	
20	710852	710852	710852	BODY	1	
21	630611	630611	630611	RETAINING RING C TYPE	2	
22	640013	640013	640013	O RING	2	P14
23	640130	640130	640130	O RING	2	G25
24	790910	790910	790910	NEME PLATE	1	
25	801785	801785	801785	CENTER ROD ASSEMBLY	1	
26	708502	708502	708502	GUIDE BUSH	2	
27	Tab.4	Tab.4	Tab.4	DIAPHRAGM	2	
28	780119	780119	780119	OUT CHAMBER	2	
29	681855	681855	681855	SPRING LOCK WASHER	6	
30	682943	682943	682943	HEXAGON SOCKET HEAD BOLT	4	M6X1X18
31	710636	710636	710636	REINFORCEMENT PLATE B	1	
32	771356	771356	771356	CAP	1	
33	710853	710853	710853	SPOOL VALVE CASE	1	
34	682918	682918	682918	HEXAGON SOCKET HEAD BOLT	2	M6X1X35
36	683055	683055	683055	BALL VALVE	1	1/4
37	801404	801404	801404	SPOOL VALVE ASSEMBLY	1	
38	771357	771357	771357	CAP	1	
39	710587	710587	710587	REINFORCEMENT PLATE A	1	
40	706798	706798	706798	RESET BUTTON	1	
41	621153	621153	621153	BOLT	4	M8x1.25X35
44	771358	771358	771358	GASKET	1	
45	621160	621160	621160	BOLT	12	M8X1.25X65
46	682520	682520	682520	SILENCER	1	

NOTE)NO.24(NAME PLATE) IS NOT INDICATED IN EXPLODED VIEW

9.2 Parts List      ■ DP-15 COMMON PARTS

Tab.1 O RING (P29)

TYPE	BP□/FP□	MATERIAL
BPN/FPN	640027	NBR
BPT/FPT	643027	PTFE
BPH/FPH	640027	NBR
BPS/FPS	684115	EPDM
FDT	643027	PTFE

Tab.2 BALL

TYPE	BP□	MATERIAL
BPN	771525	NBR
BPT	771524	PTFE
BPH	771525	NBR
BPS	771979	EPDM

Tab.3 O RING (P8)

TYPE	BP□/FP□	MATERIAL
BPN/FPN	640005	NBR
BPT/FPT	643005	PTFE
BPH/FPH		
BPS/FPS		
FDT	643005	PTFE

Tab.4 DIAPHRAGM

TYPE	BP□/FP□	MATERIAL
BPN/FPN	770973	NBR
BPT/FPT	770933	PTFE
BPH/FPH	771372	TPEE
BPS/FPS	771972	TPO
FDT	770933	PTFE

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