

MAINTENANCE MANUAL
YAMADA AIR-OPERATED DIAPHRAGM PUMPS
DP-10 series

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-10 series Diaphragm Pumps.

This edition is based on the standards for the March 2009 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.

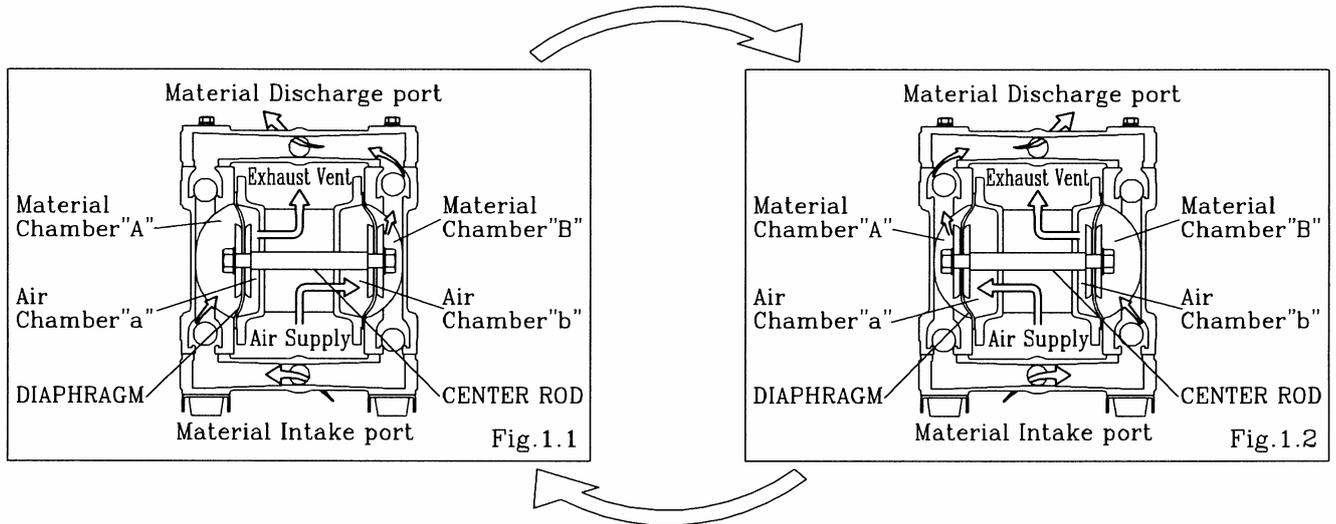
Table of Contents

·Warnings and Cautions	
·Table of Contents	
1.Principles of operation	1
2.Tools, etc.	
2.1 General tools	1
2.2 Misc.	1
3.Ordering Replacement parts	1
4.Balls and Valve seats	
4.1 Removal	
■BA_, BS_ types	2
■BP_ type	2
4.2 Inspection	3
4.3 Installation	3
5.Diaphragm	
5.1 Inspection	
■BA_, BS_ types	4
■BP_ type	4
5.2 Inspection	5
5.3 Installation	
■B_H, B_S types	5
■B_C, B_N, B_T types	5
6.Center rod, Body and Guide bush	
6.1 Removal	6
6.2 Inspection	6
6.3 Installation	6
7. Spool valve case and Spool Assembly	
7.1 Removal	7
7.2 Inspection	7
7.3 Installation	7
8.Retightening of Tie rods	8
9.Exploded View and Parts List	
9.1 DP-10BA_	9
9.2 DP-10BS_	11
9.3 DP-10BP_	13
9.4 DP-10 COMMON PARTS	15

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, 6mm
- Open-end wrenches 21mm(BP_)
- Snap ring plyer

2.2 Misc.

- Assembly oil Turbine oil none addition class 1(equivalent to ISO VG32 grade)
- Nuts M8×1.25 (BA_, BS_)
- Grease Urea grease grade (NLGI) No.2

3.Ordering Replacement parts

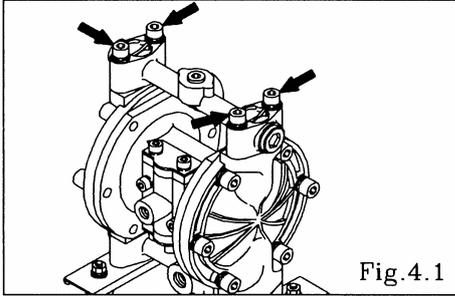
For accurate and speedy shipment of parts, be sure to order the right parts for your model to distributor. Indicate the part numbers, descriptions, and quantities.

4.Balls and Valve seats

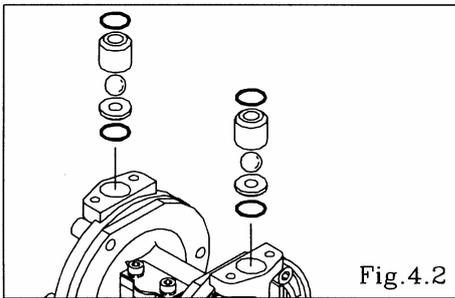
4.1 Removal

■ BA_, BS_ types

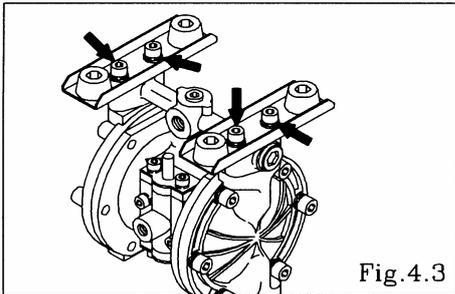
See [9. Exploded View] on after p.9.(Fig. 4.1, 4.2, 4.3 and 4.4 show the DP-BA_.)



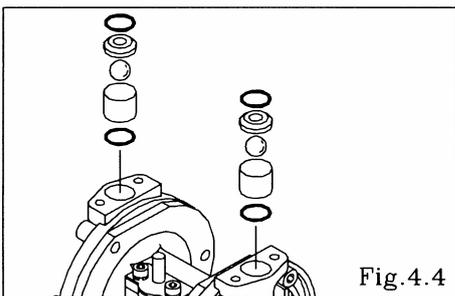
- Remove the 4 retainer bolts from the out manifold, and remove the out manifold. [Fig.4.1]



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



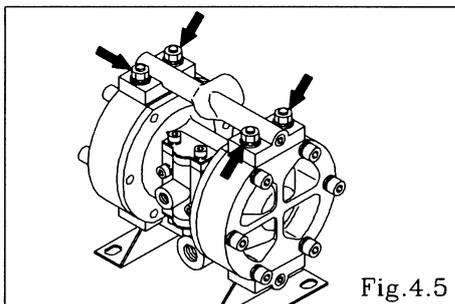
- Turn over the main body assembly. [Fig.4.3]
Remove the 4 retainer bolts from the in manifold, and remove the in manifold. [Fig.4.3]



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

■ BP_ type

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



- Remove the 4 retainer nuts from the out manifold, and remove the out manifold. [Fig.4.5]

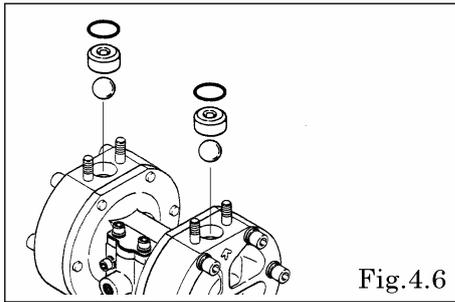


Fig.4.6

- Remove the O ring, valve stopper, ball and valve seat. [Fig.4.6]

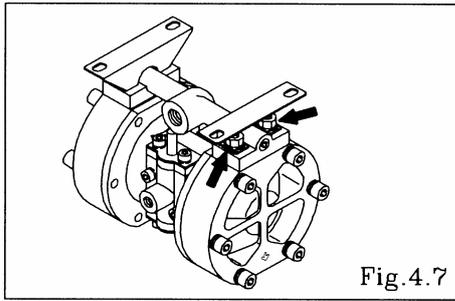


Fig.4.7

- Turn over the main body assembly. [Fig.4.7]
Remove the 4 retainer nuts from the in manifold, and remove the in manifold. [Fig.4.7]

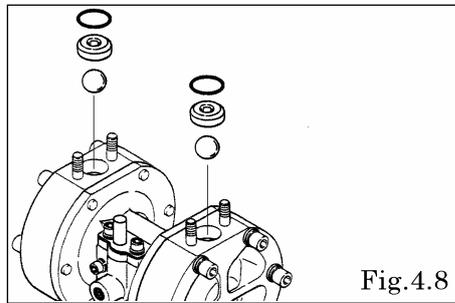


Fig.4.8

- Remove the O ring (excluded BPC, BPN), ball and valve seat. [Fig.4.8]

4.2 Inspection

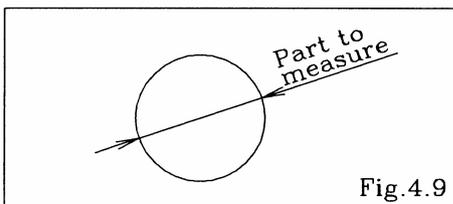


Fig.4.9

- Ball [Fig.4.9]
Measure the outside diameter, and if it is outside the usable range, replace the ball.

Usable range of ball

$S\phi 0.563 \sim S\phi 0.642$ in { $S\phi 14.3 \sim S\phi 16.3$ mm}

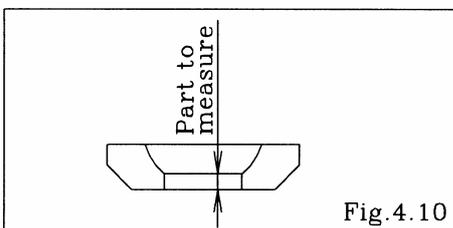


Fig.4.10

- Valve seat [Fig.4.10]
Measure the dimension shown at left, and if it is outside the usable range, replace the seat.

Usable range of valve seat

BA_, BS_, BPH, BPT, BPS	0.079 ~ 0.201 in {2.0 ~ 5.1 mm}
BPC, BPN	0.079 ~ 0.264 in {2.0 ~ 6.7 mm}

- O ring (other than PTFE)
If O ring is worn out or cracked, replace it.

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

BA_, BS_	105 in-lbf {12 N·m}
BP_	70 in-lbf {8 N·m}

<NOTE>

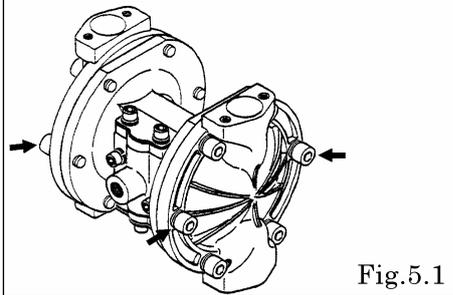
- Make sure there is no dust on the seal surface and the seal is not damaged.
- Replace the PTFE O ring regardless of its condition.

5. Diaphragm

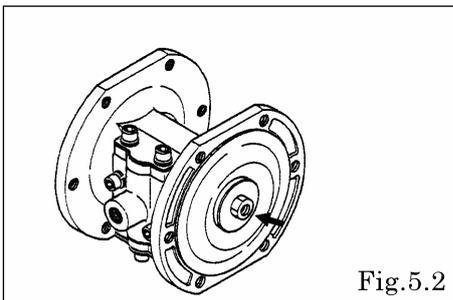
5.1 Removal

■ BA_, BS_ types

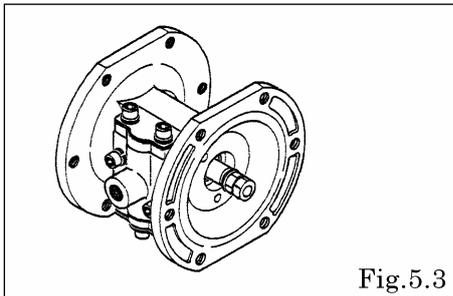
See [9. Exploded View] on after p.9. (Fig.5.1 and 5.2 show the DP-BA_)



- Remove the ball and valve seat etc. (see [4.1 Removal BA_, BS_ types] on p. 4)
- Remove the 12 retainer bolts from the out chamber, and remove the out chamber. [Fig.5.1]



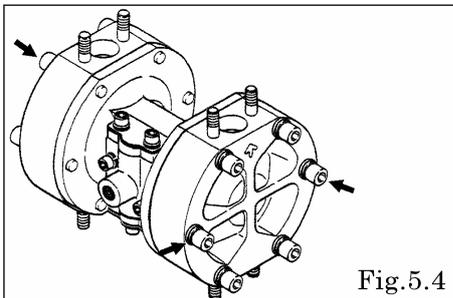
- Remove the nuts on both sides of the center rod. [Fig.5.2]
- After the nuts on one side have been removed, remove the center disk and diaphragm. [Fig.5.2]



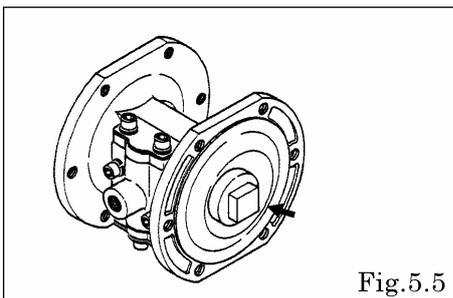
- Remove the nuts on the opposite side using the double nut. [Fig.5.3]
- Remove the coned disk spring, center disk and diaphragm.

■ BP_ type

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



- Remove the ball 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.5.4]



- Remove the center disk from one side. [Fig.5.5]
- After the center disk (outside) has been removed, remove the diaphragm and the center disk (inside).

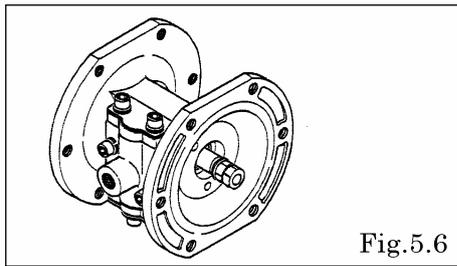


Fig.5.6

5.2 Inspection

- Remove the center disk and diaphragm from the opposite side using the double nut. [Fig.5.6]
Be careful not to scratch or score the center rod.

- Diaphragm

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

Guideline of diaphragm life

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

(When used with clean water at room temperature)

5.3 Installation

■ B_H, B_S types

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

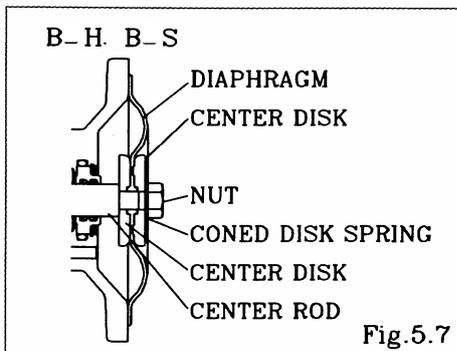


Fig.5.7

- Apply assembly grease to the center rod, and insert it into the main body.
- Keep the convex side to the outside (cf.Fig.5.7).
- Tighten the center disk using the open-end wrenches for the DP-10BP_. (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 in-lbf {14 N-m}	105 in-lbf {12 N-m}

<NOTE>

- Make sure there is no dust on the seal surface in order to prevent seal damaged
- Tighten the bolts gradually in a diagonal sequence with even torque. [Fig.5.8].

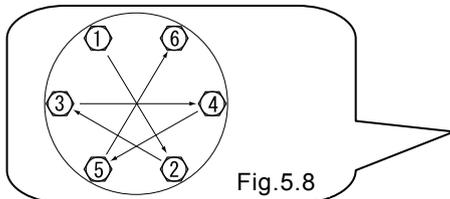


Fig.5.8

■ B_C, B_N, B_T types

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

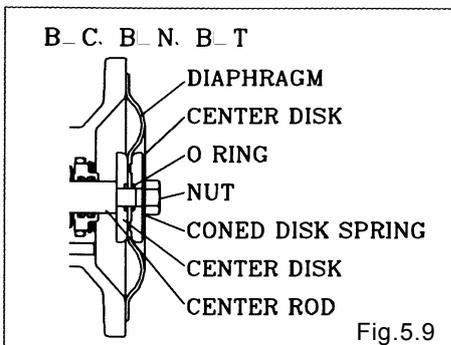


Fig.5.9

- Apply assembly grease to the center rod, and insert it into the main body.
- Keep the marking "LIQUID" to liquid end for CR, NBR diaphragms.
- Keep the convex side to the outside for PTFE diaphragm.
- Install the O ring (cf. Fig.5.8).
- Tighten the center disk using the open-end wrenches for the DP-10BP_. (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 in-lbf {14 N-m}	105 in-lbf {12 N-m}

<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 gradually in a diagonal sequence with even torque. [Fig.5.10]

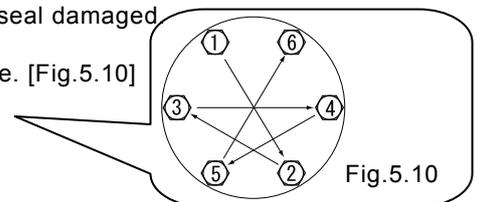


Fig.5.10

6.Center rod, Body and Guide bush

6.1 Removal

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

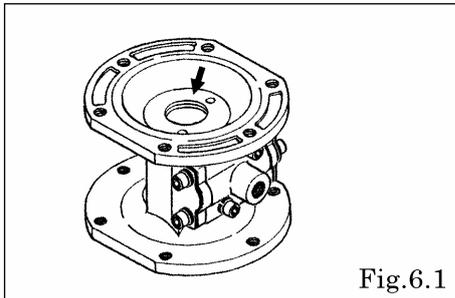


Fig.6.1

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

6.2 Inspection

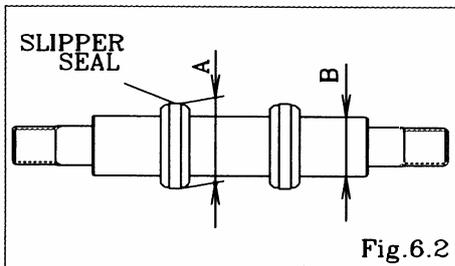


Fig.6.2

- 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)

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

- 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)

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

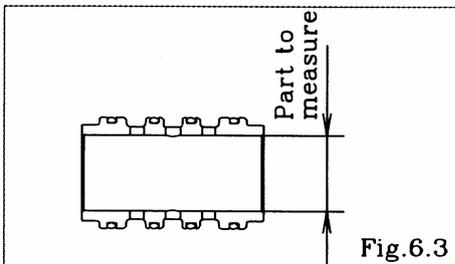


Fig.6.3

- Sleeve [Fig.6.3]
Measure the inside diameter, and if it is outside the usable range, replace the Sleeve.
Remove the Sleeve from the Spacer side.

Usable range of sleeve

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

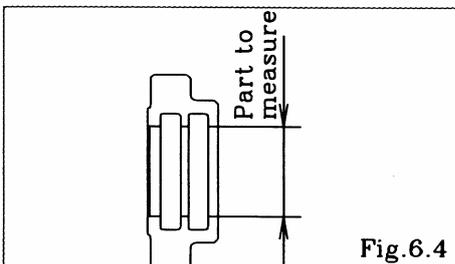


Fig.6.4

- 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

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

- 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

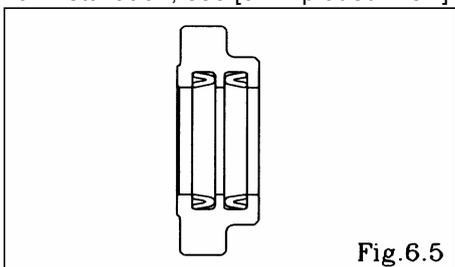


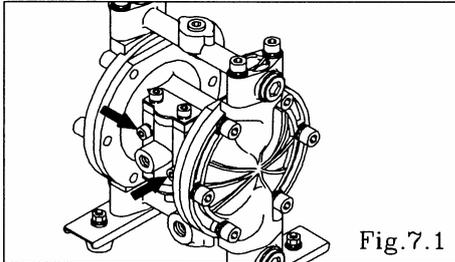
Fig.6.5

- <NOTE>
- Make sure there is no dust on the seal surface and it is not damaged.
 - Apply grease to packing.

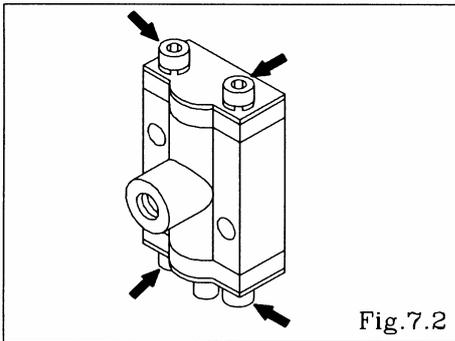
7. Spool valve case and Spool Assembly

7.1 Removal

See [9. Exploded View] on after p.9. (Fig.7.1 shows the DP-BA_.)

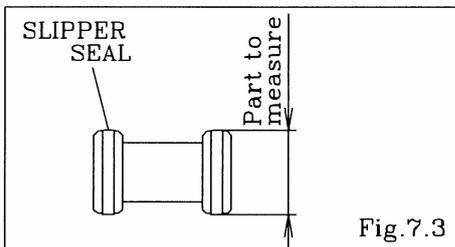


- Remove the 2 retainers from the spool valve case, and remove the spool valve case.[Fig.7.1]



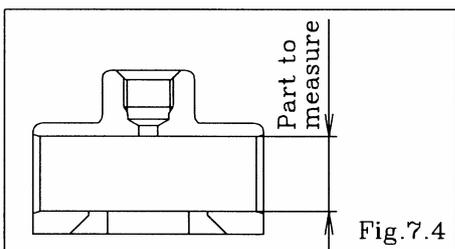
- Remove the 2 retainer bolts from the cap, and remove the reinforcement plate A, cap and reset button.[Fig.7.2]
- Remove the 2 retainer bolts from the cap, and remove the reinforcement plate B, and cap.[Fig.7.2]
- Remove the spool valve assembly from the spool valve case.

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

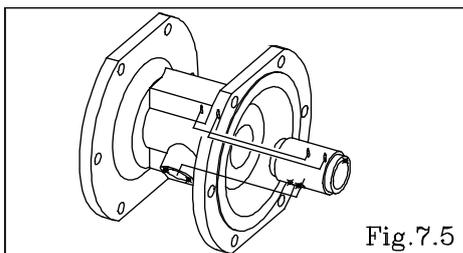


- Spool valve case[Fig.7.4]
Measure the inside diameter, and if it is outside the usable Range, replace the Spool valve case.

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

7.3 Installation

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

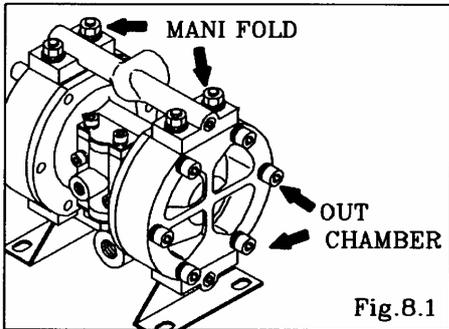


Tightening torque for installation Cap
 55 in-lbf {6 N-m}

Tightening torque for installation Spool valve case
 55 in-lbf {6 N-m}

- Sleeve [Fig.7.5]
When inserting the sleeve into the body, please make sure the position of the 3 holes in the sleeve match the corresponding holes in the body.
<NOTE>
- Make sure there is no dust on the seal surface and it is not damaged.

8. Retightening of Tie rods



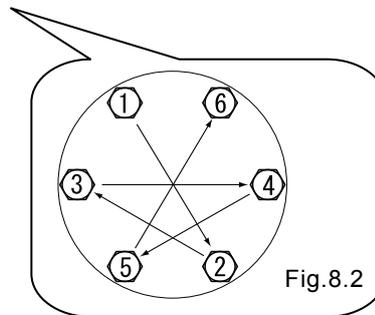
▪ All bolts should be retorqued:

- (1) Right before start up.
- (2) There are any leaks of material on daily inspecting a pump.

		Retain bolts for the out chamber	Retain bolts for the manifold
DP-10	BP_	105 in-lbf {12 N-m}	70 in-lbf {8 N-m}

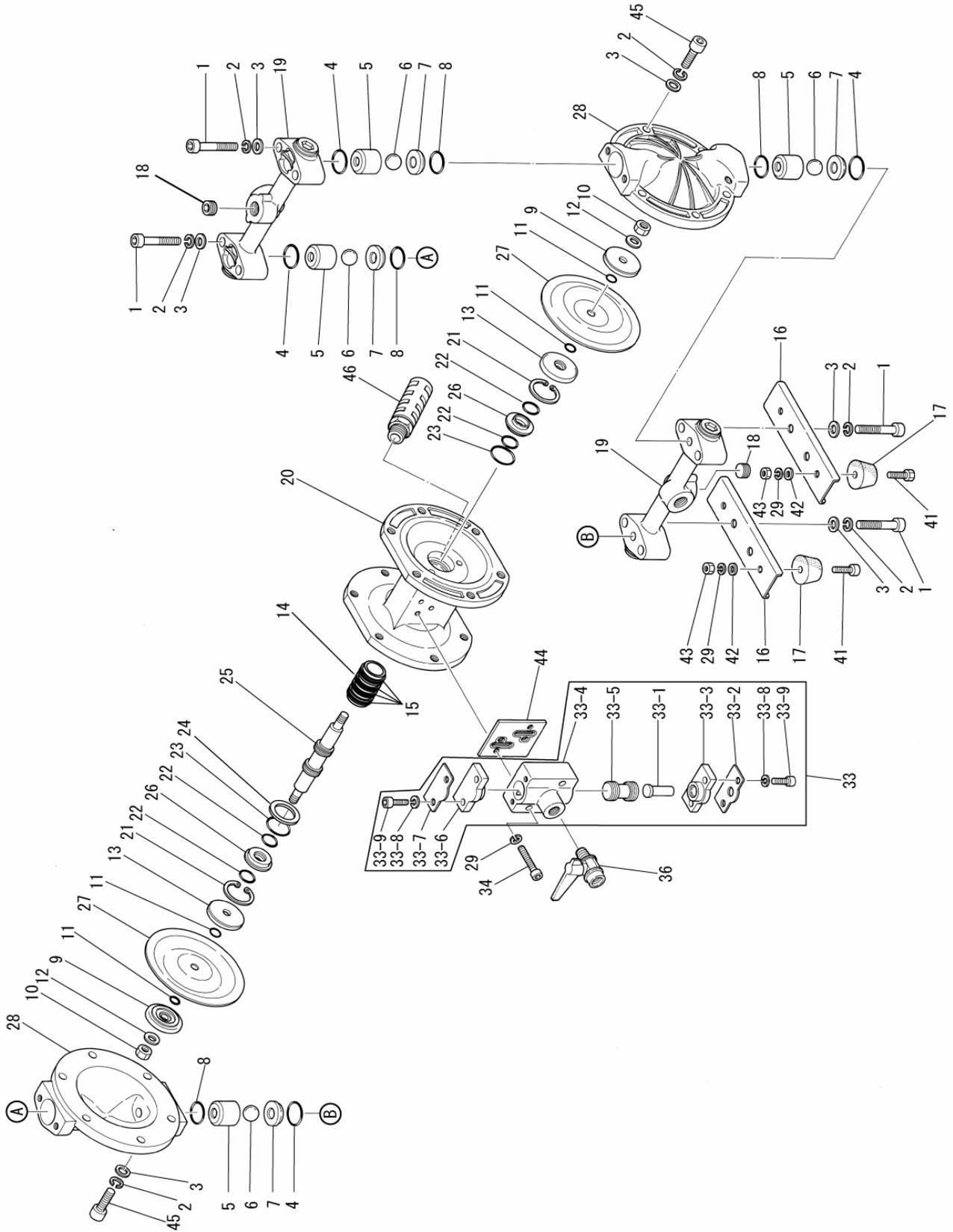
<NOTE>

- Retighten the Out chamber and then the manifold in this order. [Fig.8.1].
- Tighten the bolts in the order shown. [Fig.8.2]



9. Exploded View and Parts List
9.1 Exploded View

■ DP-10BA_



9.1 Parts List

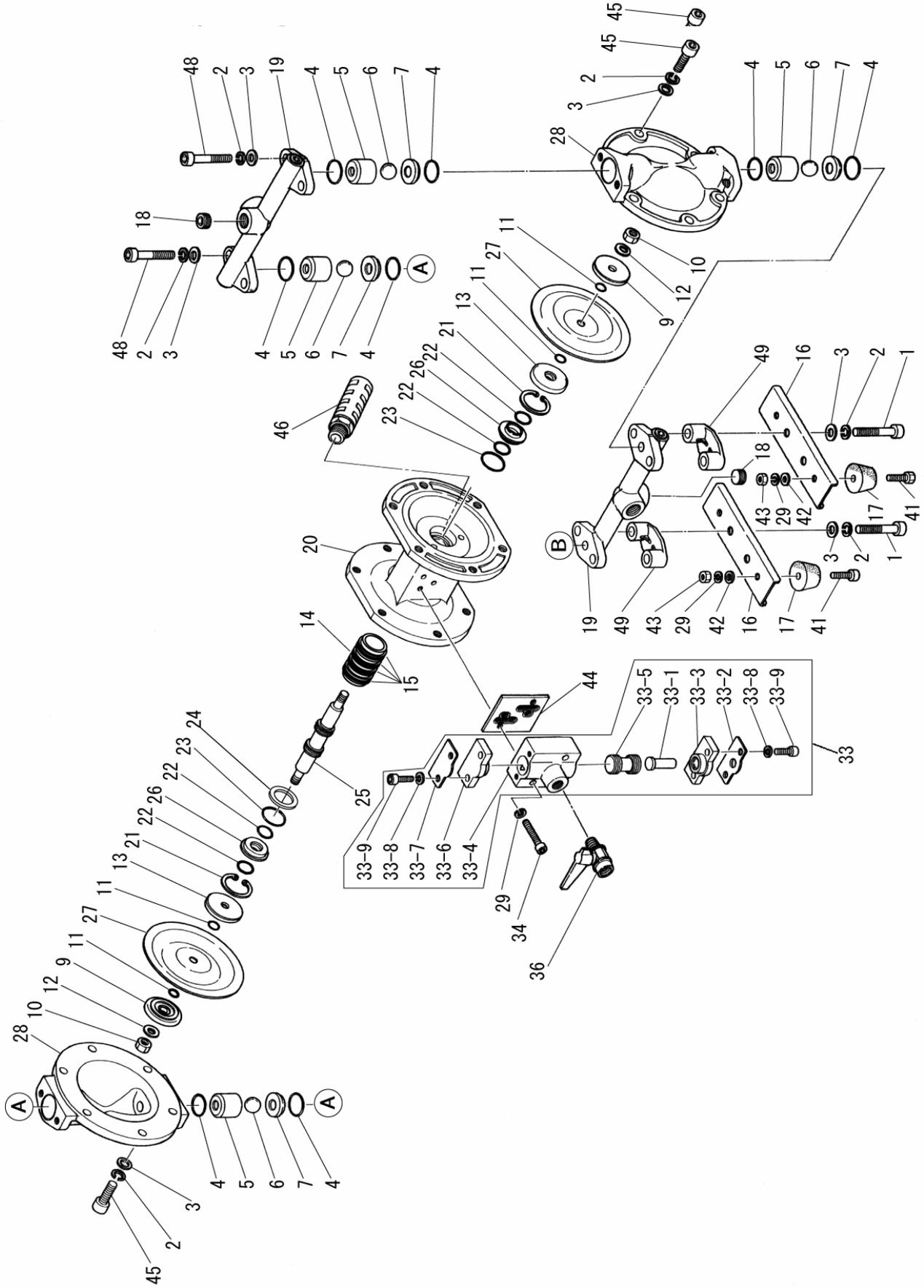
■DP-10BA_

NO.	BA_	DESCRIPTION	Q'TY	NOTE
1	681295	HEXAGON SOCKET HEAD BOLT	8	M8x1.25x45
2	681300	SPRING LOCK WASHER	20	
3	631329	PLAIN WASHER	20	
4	643018	O RING	4	P21 PTFE
5	771368	VALVE STOPPER	4	
6	Tab.1	BALL	4	
7	710638	VALVE SEAT	4	
8	643017	O RING	4	P20 PTFE
9	708770	CENTER DISK	2	
10	681849	NUT	2	M8x1.25
11	Tab.2	O RING	4	
12	684916	CONED DISK SPRING	2	
13	709512	CENTER DISK	2	
14	714678	SLEEVE	1	
15	684900	O RING	4	
16	710586	PUMP BASE	2	
17	771123	CUSHION	4	
18	709872	HEXAGON SOCKET HEAD PLUG	2	3/8"
19	802591	MANIFOLD ASSEMBLY	2	
20	715107	BODY	1	
21	630807	RETAINING RING R TYPE	2	
22	684284	PACKING	4	
23	640131	O RING	2	G30
24	772651	SPACER	1	
25	801785	CENTER ROD ASSEMBLY	1	
26	772619	GUIDE BUSH	2	
27	Tab.3	DIAPHRAGM	2	
28	710572	OUT CHAMBER	2	
29	681855	SPRING LOCK WASHER	6	
33	804505	VALVE BODY ASSEMBLY	1	
34	682918	HEXAGON SOCKET HEAD BOLT	2	M6x1x35
36	683055	BALL VALVE	1	1/4"
41	621102	BOLT	4	M6x1x22
42	631328	PLAIN WASHER	4	
43	628010	NUT	4	M6x1
44	771358	GASKET	1	
45	682944	HEXAGON SOCKET HEAD BOLT	12	M8x1.25x25
46	682520	SILENCER	1	
51	790911	NAME PLATE	1	

NOTE) NO.51(NAME PLATE) IS NOT INDICATED IN EXPLODED VIEW

9.2 Exploded View

■ DP-10BS_



9.2 Parts List

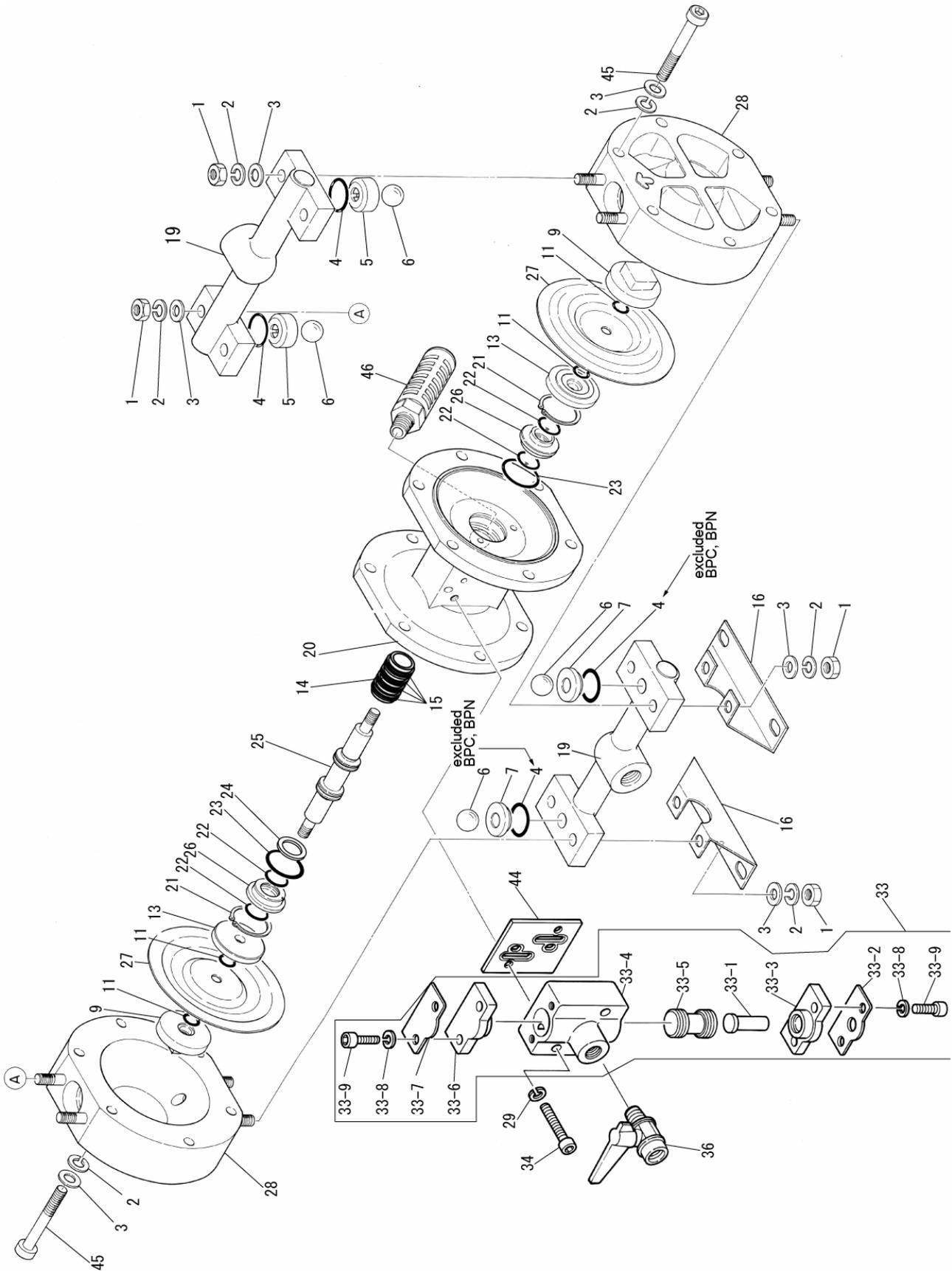
■DP-10BS_

NO.	BS_	DESCRIPTION	Q'TY	NOTE
1	682971	HEXAGON SOCKET HEAD BOLT	4	M8x1.25x40
2	681300	SPRING LOCK WASHER	20	
3	631329	PLAIN WASHER	20	
4	Tab.4	O RING	8	
5	710637	VALVE STOPPER	4	
6	Tab.1	BALL	4	
7	708913	VALVE SEAT	4	
9	708506	CENTER DISK	2	
10	681849	NUT	2	M8x1.25
11	Tab.2	O RING	4	
12	684916	CONED DISK SPRING	2	
13	709512	CENTER DISK	2	
14	714678	SLEEVE	1	
15	684900	O RING	4	
16	710586	PUMP BASE	2	
17	771123	CUSHION	4	
18	710914	HEXAGON SOCKET HEAD PLUG	2	3/8"
19	831559	MANIFOLD ASSEMBLY	2	
20	715107	BODY	1	
21	630807	RETAINING RING R TYPE	2	
22	684284	PACKING	4	MYA-14
23	640131	O RING	2	G30 NBR
24	772651	SPACER	1	
25	801785	CENTER ROD ASSEMBLY	1	
26	772619	GUIDE BUSH	2	
27	Tab.3	DIAPHRAGM	2	
28	710660	OUT CHAMBER	2	
29	681855	SPRING LOCK WASHER	6	
33	804505	VALVE BODY ASSEMBLY	1	
34	682918	HEXAGON SOCKET HEAD BOLT	2	M6x1x35
36	683055	BALL VALVE	1	1/4"
41	621102	BOLT	4	M6x1x22
42	631328	PLAIN WASHER	4	
43	628010	NUT	4	M6x1
44	771358	GASKET	1	
45	682944	HEXAGON SOCKET HEAD BOLT	12	M8x1.25x25
46	682520	SILENCER	1	
48	681297	HEXAGON SOCKET HEAD BOLT	4	M8x1.25x20
49	771380	SPACER	2	
51	790911	NAME PLATE	1	

NOTE) NO.51(NAME PLATE) IS NOT INDICATED IN EXPLODED VIEW

9.3 Exploded View

■ DP-10BP_



9.3 Parts List

■DP-10BP_

NO.	BP_	DESCRIPTION	Q'TY	NOTE
1	628012	NUT	8	M8x1.25
2	681300	SPRING LOCK WASHER	20	
3	631329	PLAIN WASHER	20	
4	Tab.5	O RING	-	
5	771136	VALVE STOPPER	2	
6	Tab.1	BALL	4	
7	Tab.6	VALVE SEAT	2	
9	770968	CENTER DISK	2	
11	Tab.2	O RING	4	
13	708770	CENTER DISK	2	
14	714678	SLEEVE	1	
15	684900	O RING	4	
16	708511	PUMP BASE	2	
19	831316	MANIFOLD ASSEMBLY	2	
20	715107	BODY	1	
21	630807	RETAINING RING R TYPE	2	
22	684284	PACKING	4	MYA-14
23	640131	O RING	2	G30 NBR
24	772651	SPACER	1	
25	801785	CENTER ROD ASSEMBLY	1	
26	772619	GUIDE BUSH	2	
27	Tab.3	DIAPHRAGM	2	
28	780194	OUT CHAMBER	2	
29	681855	SPRING LOCK WASHER	2	
33	804505	VALVE BODY ASSEMBLY	1	
34	682918	HEXAGON SOCKET HEAD BOLT	2	M6x1x35
36	683055	BALL VALVE	1	1/4"
44	771358	GASKET	1	
45	682945	HEXAGON SOCKET HEAD BOLT	12	M8x1.25x50
46	682520	SILENCER	1	
51	790911	NAME PLATE	1	

NOTE) NO.51(NAME PLATE) IS NOT INDICATED IN EXPLODED VIEW

9.4 Parts List ■ DP-10 COMMON PARTS

804505 VALVE BODY ASSEMBLY

NO.	PART NO	DESCRIPTION	Q'TY	NOTE
33-1	706798	PUSH ROD	1	
33-2	710587	REINFORCEMENT PLATE A	1	
33-3	771357	CAP	1	
33-4	710853	SPOOL VALVE CASE	1	
33-5	801404	SPOOL VALVE ASSEMBLY	1	
33-6	771356	CAP	1	
33-7	710636	REINFORCEMENT PLATE B	1	
33-8	681855	SPRING LOCK WASHER	4	
33-9	682943	HEXAGON SOCKET HEAD BOLT	4	M6x1x18

Tab.1 BALL

TYPE	BA/BS/BP_	MATERIAL
B_C	770970	CR
B_N	770972	NBR
B_T	770931	PTFE
B_H	770972	NBR
B_S	771978	EPDM

Tab.2 O RING(P8)

TYPE	BA/BS/BP_	MATERIAL
B_C	640005	NBR
B_N	640005	NBR
B_T	643005	PTFE
B_H		
B_S		

Tab.3 DIAPHRAGM

TYPE	BA/BS/BP_	MATERIAL
B_C	770971	CR
B_N	770973	NBR
B_T	770933	PTFE
B_H	771372	TPEE
B_S	771972	TPO

Tab.4 O RING(P21)

TYPE	BS_	MATERIAL
B_C	640018	NBR
B_N	640018	NBR
B_T	643018	PTFE
B_H	640018	NBR
B_S	684112	EPDM

Tab.5 O RING(P21)

TYPE	BP_	MATERIAL	Q'TY
BPC	640018	NBR	2
BPN	640018	NBR	2
BPT	643018	PTFE	4
BPH	640018	NBR	4
BPS	684112	EPDM	4

Tab.6 VALVE SEAT

TYPE	BP_	MATERIAL
BPC	770975	CR
BPN	770976	NBR
BPT	771187	PPG
BPH	771187	PPG
BPS	771187	PPG

YAMADA AMERICA, INC

955 E. ALGONQUIN RD., ARLINGTON HEIGHTS, IL 60005, USA
PHONE: 1-847-631-9200 or 1-800-990-7867 (Toll Free) FAX : 1-847-631-9273
www.yamadapump.com

Manufactured by:

YAMADA CORPORATION

International Department
1-1-3 CHOME, MINAMI MAGOME, OHTA-KU, TOKYO, 143-8504, JAPAN
PHONE : +81-(0)3-3777-0241 FAX : +81-(0)3-3777-0584

200906 NDP015M