

MAINTENANCE MANUAL

YAMADA AIR-OPERATED DIAPHRAGM PUMPS

DP-10

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 2006 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.

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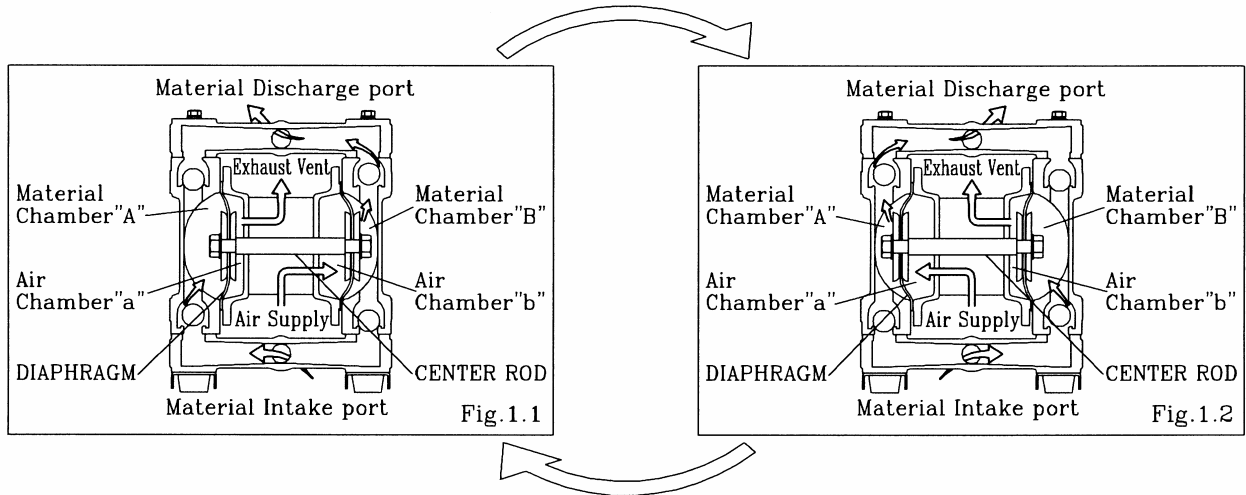
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1.Principles of operation

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

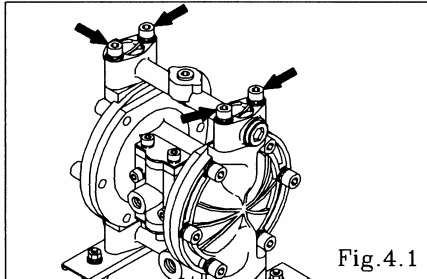
For accurate and speedy shipment of parts, be sure to order the right parts for your model to distributor. Indicate the part numbers, descriptions, and quantities.

4.Balls and Valve seats

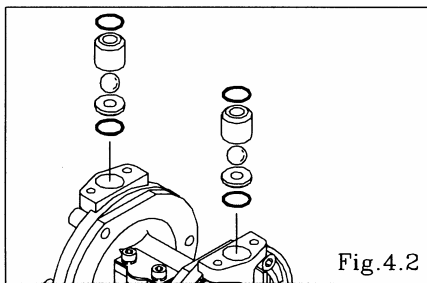
4.1 Removal

■ BA□, BS□ types

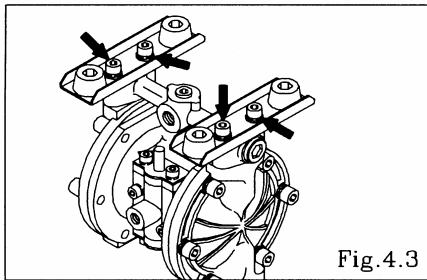
See [9. Exploded View] on after p.9.(Fig. 4.1, 4.2, 4.3 and 4.4 show the DP-BA□.)



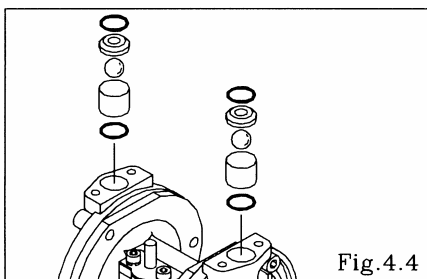
- Remove the 4 retainer bolts from the out manifold, and remove the out manifold. [Fig.4.1]



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



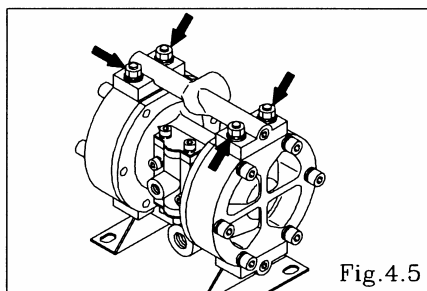
- Turn over the main body assembly. [Fig.4.3]
Remove the 4 retainer bolts from the in manifold, and remove the in manifold. [Fig.4.3]



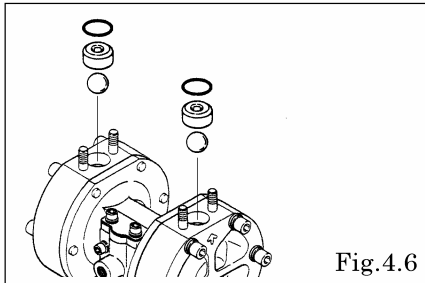
- Remove the O ring, valve seat, ball and valve stopper. [Fig.4.4]

■ BP□ type

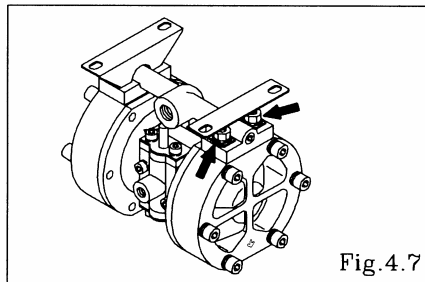
See [9. Exploded View] on after p.9.



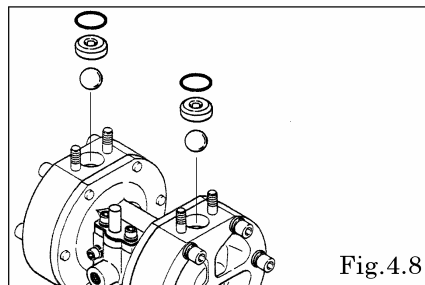
- Remove the 4 retainer nuts from the out manifold, and remove the out manifold. [Fig.4.5]



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

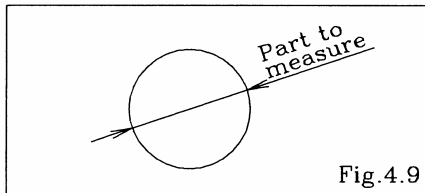


- Turn over the main body assembly. [Fig. 4.7]
Remove the 4 retainer nuts from the in manifold, and remove the in manifold. [Fig. 4.7]



- Remove the O ring, ball and valve seat. [Fig. 4.8]

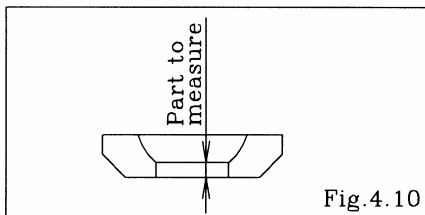
4.2 Inspection



- 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 }



- 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 ~ 0.256 in { 2.0 ~ 6.5 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

BA□, BS□	105 lbf·in { 120 kgf·cm }
BP□	70 lbf·in { 80 kgf·cm }

<NOTE>

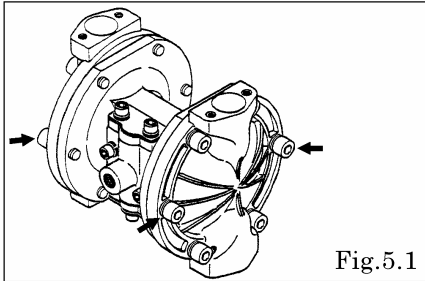
- Make sure there is no dust on the seal surface and the seal is not damaged.
- Replace the PTFE O ring regardless of its condition.

5.Diaphragm

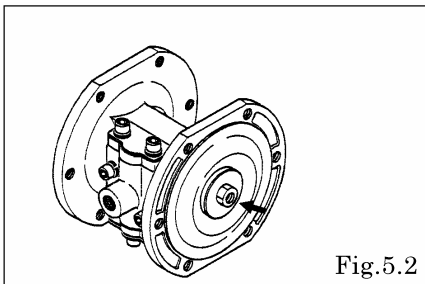
5.1 Removal

■BA□, BS□ types

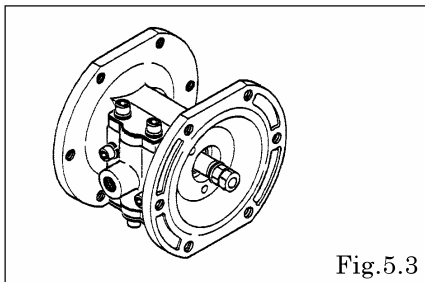
See [9. Exploded View] on after p.9. (Fig.5.1 and 5.2 show the DP-BA□.)



- 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]



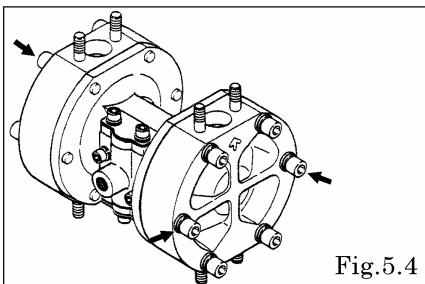
- Remove the nuts on both sides of the center rod. [Fig.5.2]
- After the nuts on one side have been removed, remove the center disk and diaphragm. [Fig.5.2]



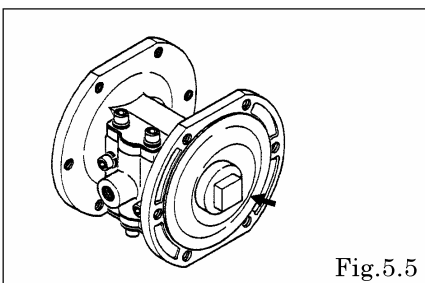
- Remove the nuts on the opposite side using the double nut. [Fig.5.3]
- Remove the coned disk spring, center disk and diaphragm.

■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).

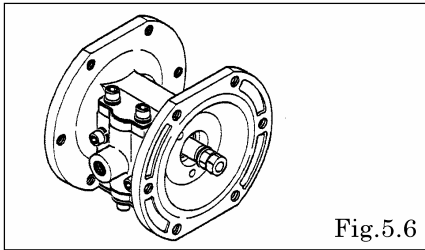


Fig.5.6

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.

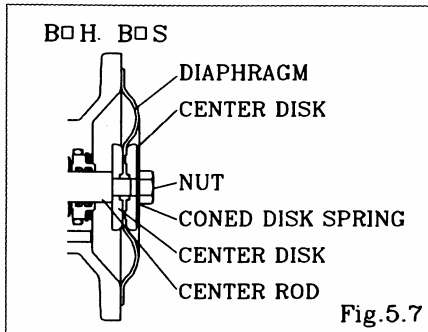


Fig.5.7

- Apply assembly oil 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 lbf-in	105 lbf-in

<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.

■ 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.

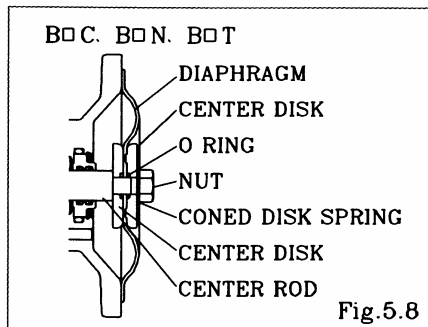


Fig.5.8

- Apply assembly oil 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 lbf-in	105 lbf-in

<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.

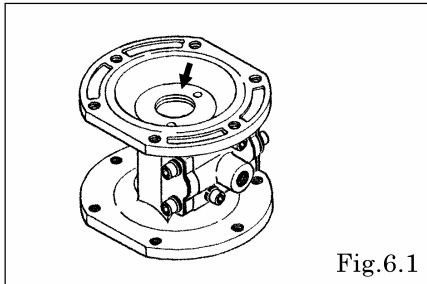


Fig.6.1

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

[Fig.6.1]

6.2 Inspection

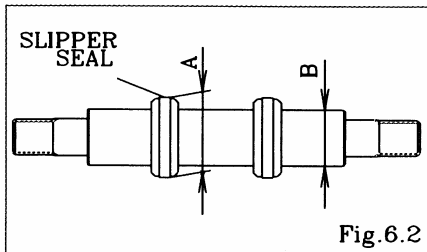


Fig.6.2

- 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)

$\phi 0.783 \sim \phi 0.787$ 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 $\{\phi 13.9 \sim \phi 14.0 \text{ mm}\}$

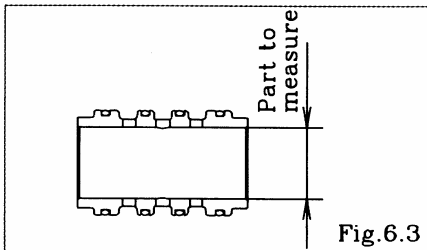


Fig.6.3

- 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 Body

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

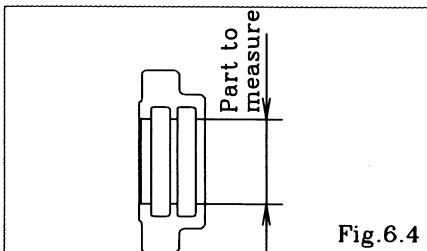


Fig.6.4

- 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

$\phi 0.5520 \sim \phi 0.5544$ 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.
- Apply grease to packing.

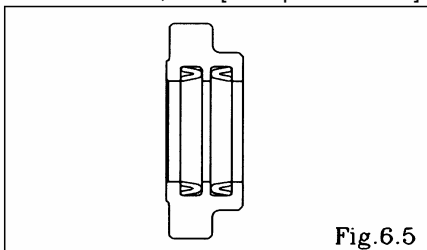
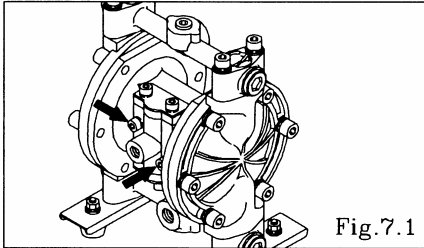


Fig.6.5

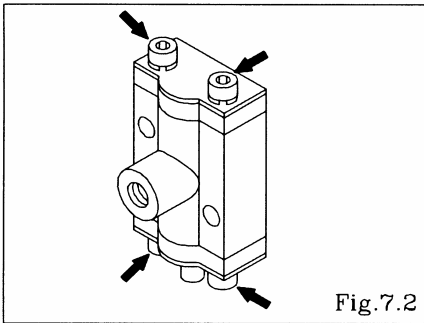
7. Spool valve case and Spool Assembly

7.1 Removal

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

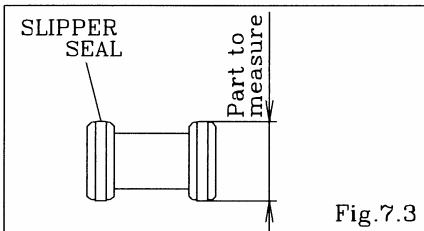


- Remove the 2 retainer from the spool valve case, and remove the spool valve case.[Fig.7.1]



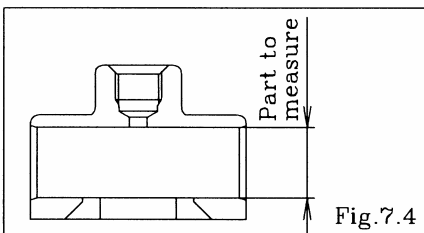
- Remove the 2 retainer bolts from the cap, and remove the reinforcement plate A, cap and reset button.[Fig.7.2]
- Remove the 2 retainer bolts from the cap, and remove the reinforcement plate B, and cap.[Fig.7.2]
- Remove the spool valve assembly from the spool valve case.

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 $\{\phi 19.9 \sim \phi 20.0 \text{ mm}\}$



- 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 $\{\phi 20.00 \sim \phi 20.08 \text{ mm}\}$

7.3 Installation

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

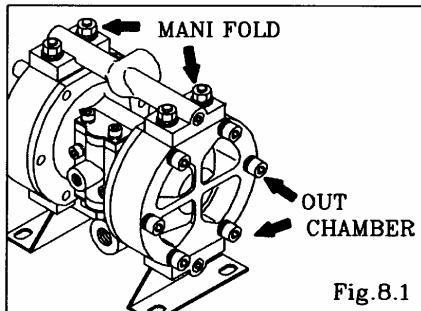
Tightening torque for installation Cap
55 lbf·in

Tightening torque for installation Spool valve case
55 lbf·in

<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.

		Retainer bolts from the out chamber	Retainer bolts from the manifold
DP-10	BP□	105 lbf·in m	70 lbf·in

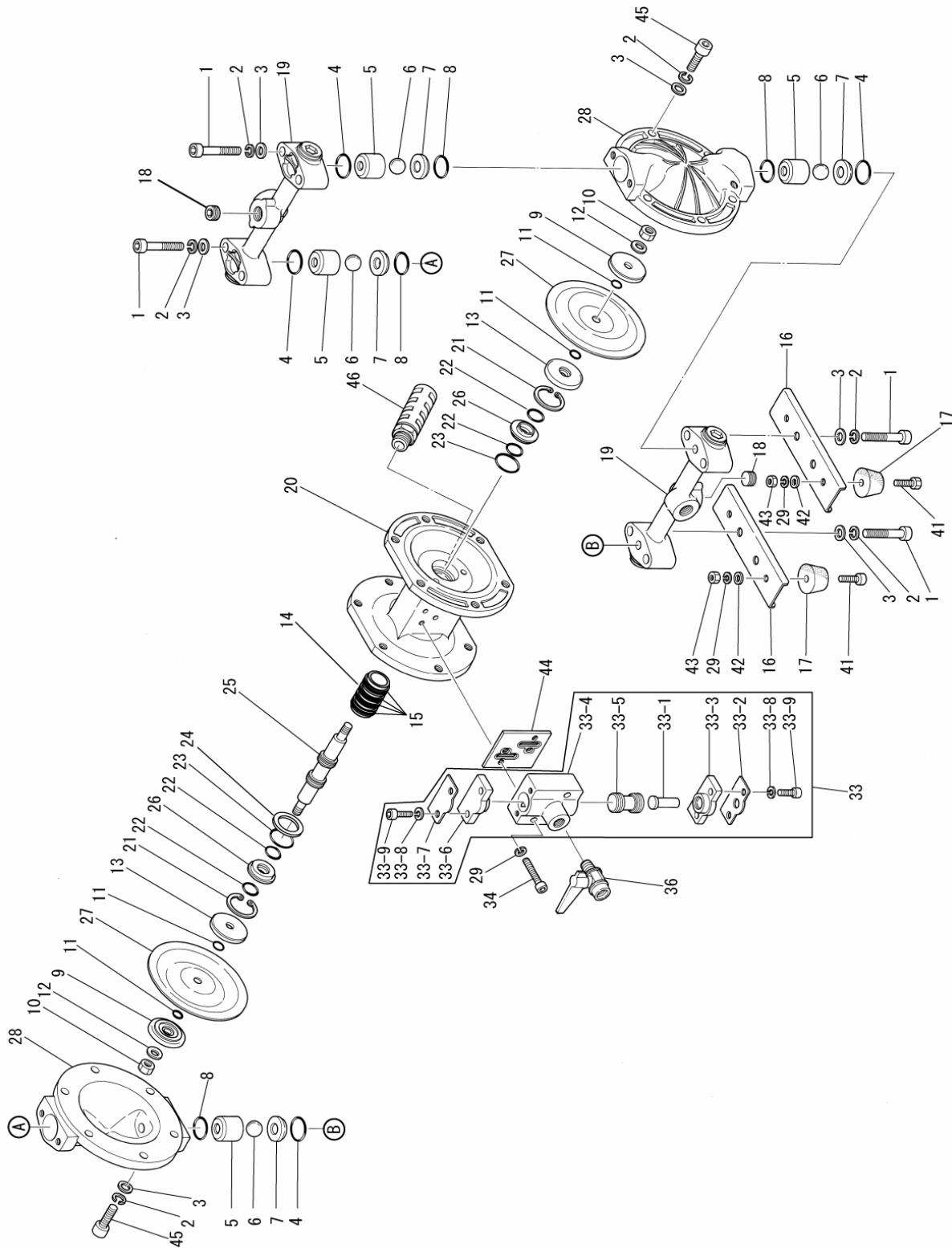
<NOTE>

- Tighten the bolts that balance should be equal from both side on diagonal line with even torque.
- Retighten the Out chamber and then the manifold in this order. [Fig.8.1]

9. Exploded View and Parts List

9.1 Exploded View

■DP-10BA□



9.1 Parts List

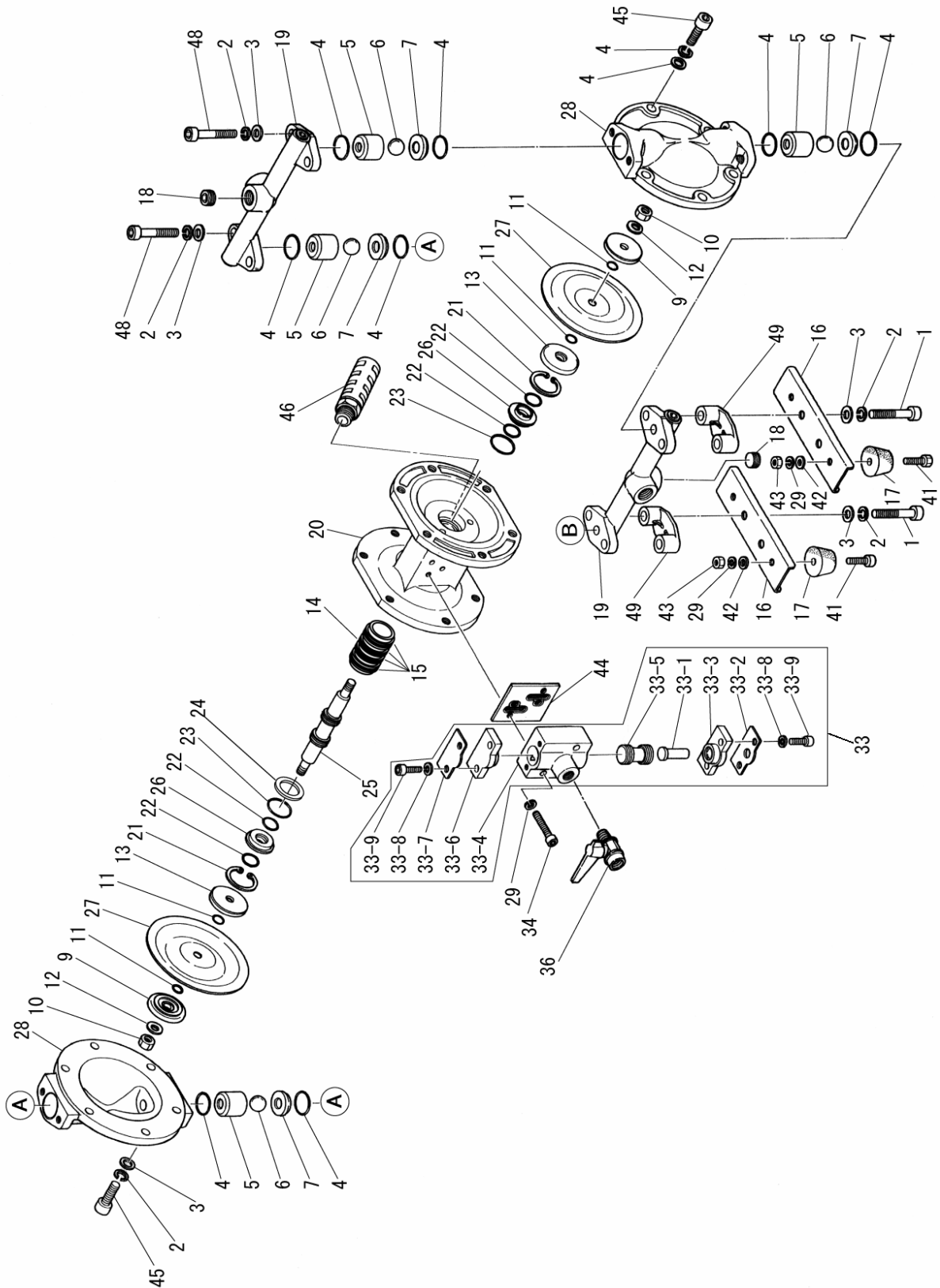
■DP-10BA□

NO.	BA□	DESCRIPTION	Q'TY	NOTE
1	681295	HEXAGON SOCKET HEAD BOLT	8	M8x1.25x45
2	681300	SPRING LOCK WASHER	20	M8
3	631329	PLAIN WASHER	20	M8
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	M8
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	M6
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	M6
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

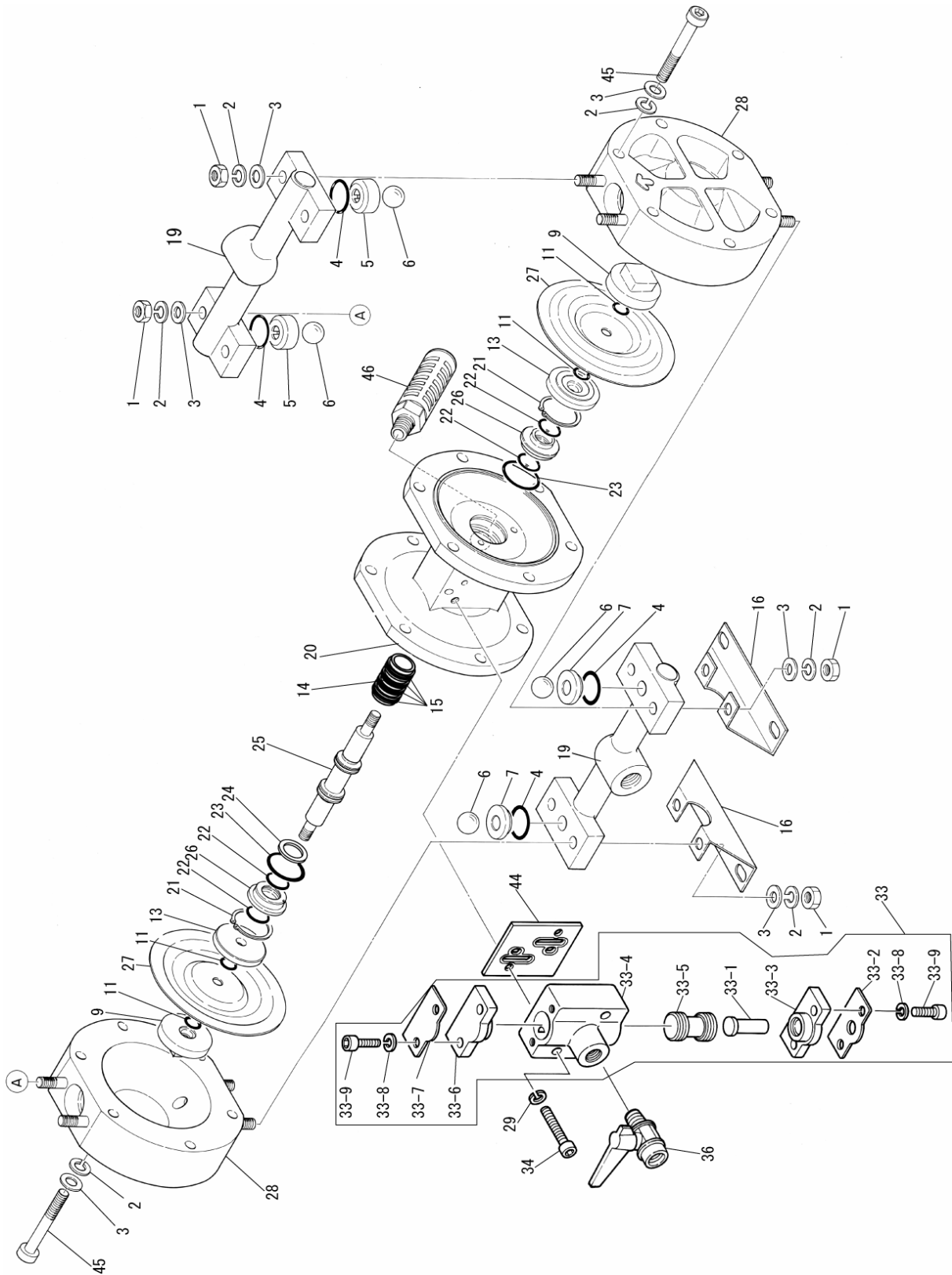
■DP-10BS□

NO.	BS□	DESCRIPTION	Q'TY	NOTE
1	682971	HEXAGON SOCKET HEAD BOLT	4	M8x1.25x40
2	681300	SPRING LOCK WASHER	20	M8
3	631329	PLAIN WASHER	20	M8
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	M8
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	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	M6
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	M6
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	M8
3	631329	PLAIN WASHER	20	M8
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	709512	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	M6
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	M6
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/BP□	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

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