Doc. No.	NDP 173M-04

MAINTENANCE MANUAL

YAMADA AIR-OPERATED DIAPHRAGM PUMPS

DP-15 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-15 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.

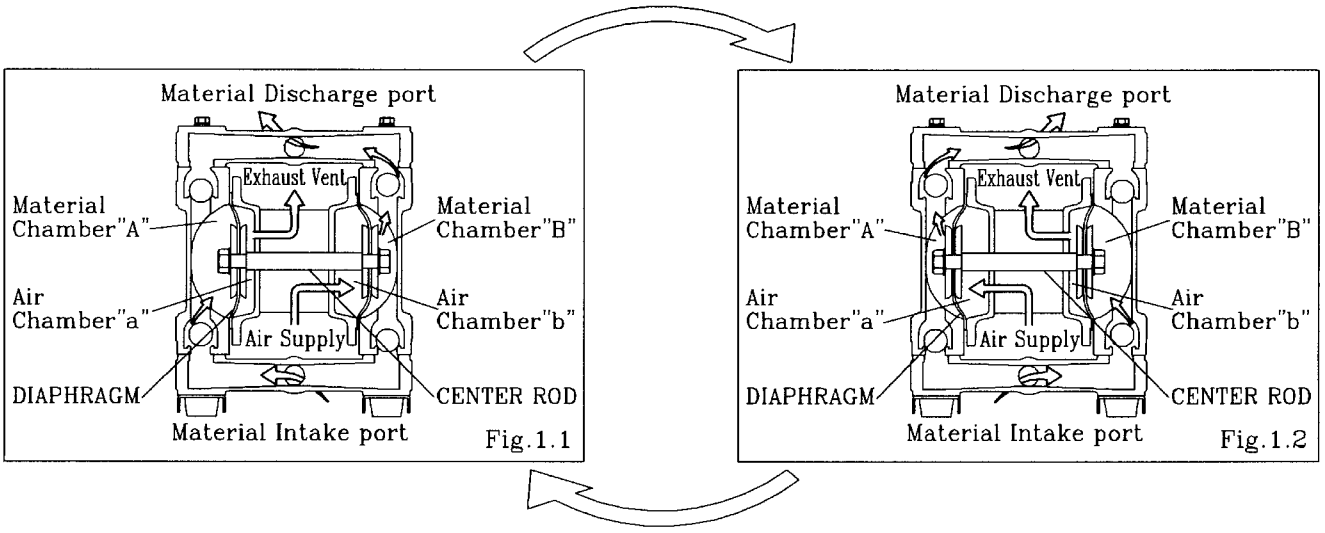
Table of Contents

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 plyer	

2.2 Misc.

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

■ 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_)

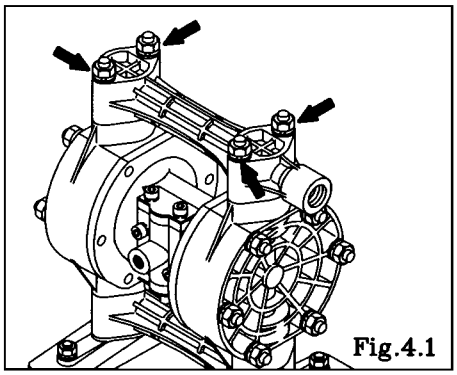


Fig.4.1

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

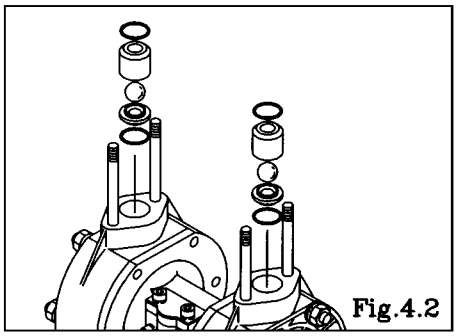


Fig.4.2

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

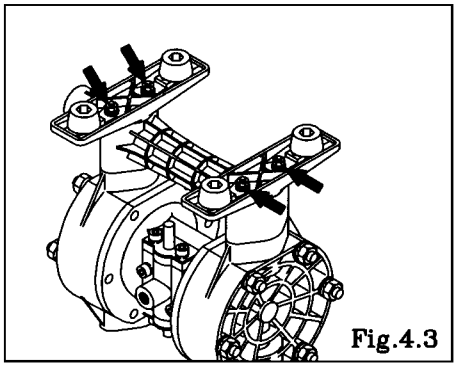


Fig.4.3

- 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]

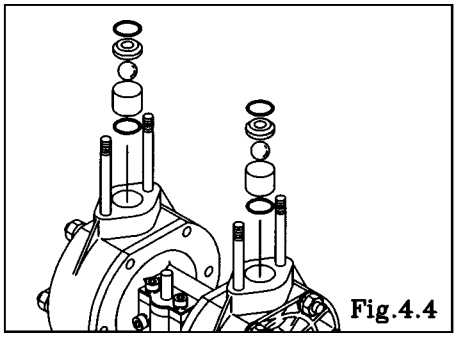


Fig.4.4

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

4.2 Inspection

■ Ball valve type

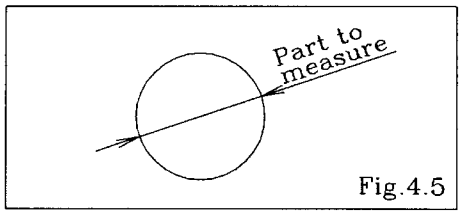


Fig.4.5

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

Usable range of ball

Sø0.787 ~ Sø0.898 in {Sø20.0 ~ Sø22.8 mm}

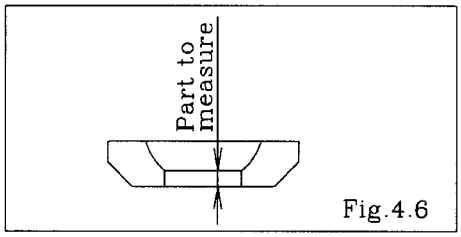


Fig.4.6

▪ 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 ~ 0.256 in {2.6 ~ 6.5 mm}

■ Flat valve type

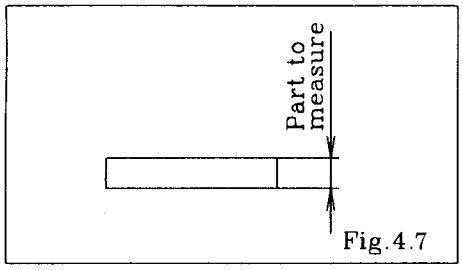


Fig.4.7

▪ 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 ~ 0.197 in {4.3 ~ 5.0 mm}

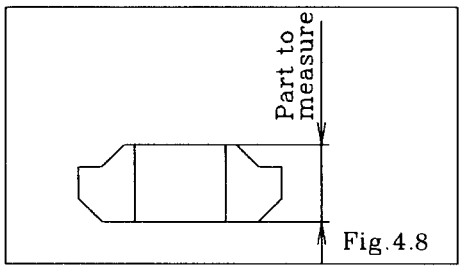


Fig.4.8

▪ 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 ~ 0.394 in {8.2 ~ 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 in-lbf {12 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

■ BP_, FDT type

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

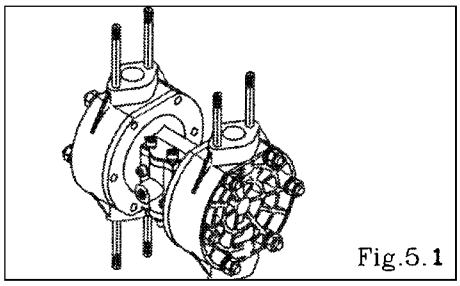


Fig.5.1

- 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]

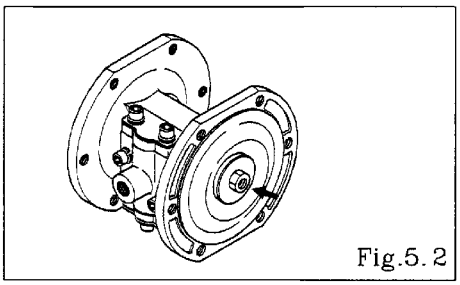


Fig.5.2

- 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).

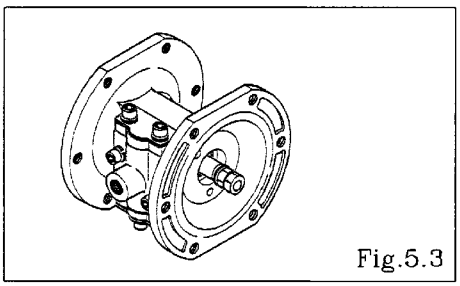


Fig.5.3

- 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.

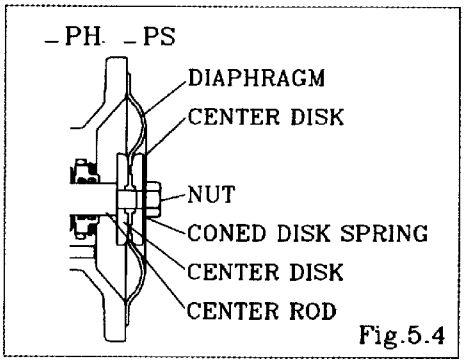


Fig.5.4

- 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 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 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.

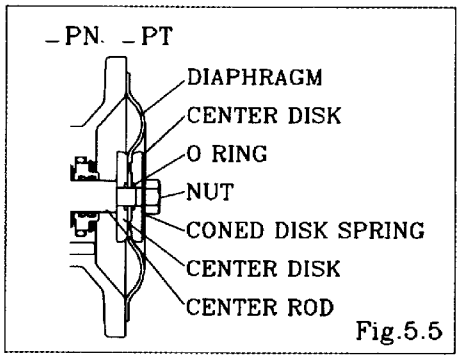


Fig.5.5

- Apply assembly grease 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 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 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.

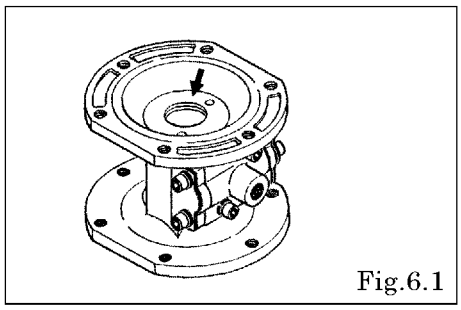


Fig.6.1

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

6.2 Inspection

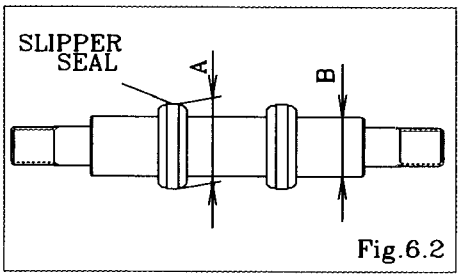


Fig.6.2

- 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)
ø0.783 ~ø0.787 in {ø19.9 ~ø20.0 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)
ø0.547 ~ø0.551 in {ø13.9 ~ø14.0 mm}

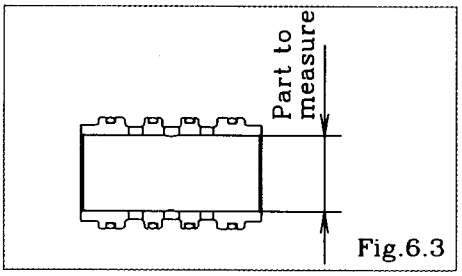


Fig.6.3

- 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
ø0.7874 ~ø0.7906 in {ø20.00 ~ø20.08 mm}

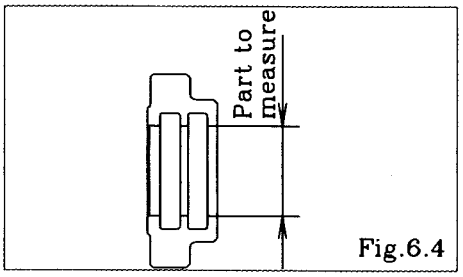


Fig.6.4

- 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
ø0.5520 ~ø0.5544 in {ø14.02 ~ø14.08 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

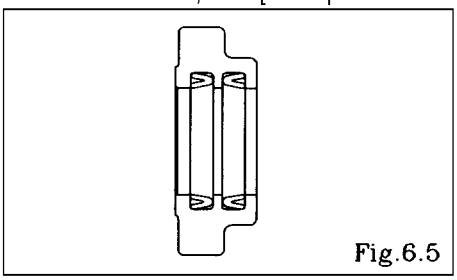


Fig.6.5

<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.

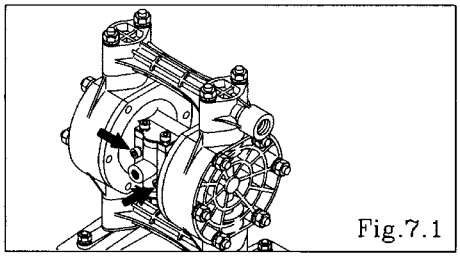


Fig.7.1

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

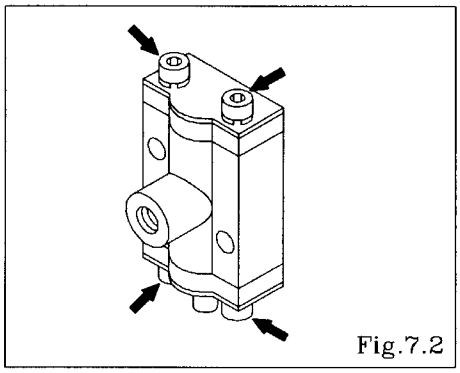


Fig.7.2

- Remove the 2 retainer bolts from the cap, and remove the reinforcement plate A, cap and reset button.[Fir.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

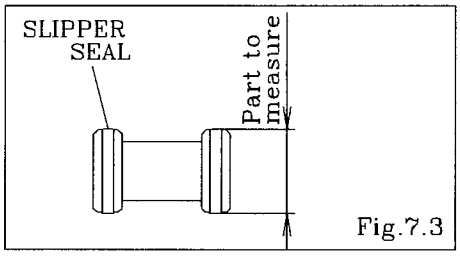


Fig.7.3

- 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
ø0.783 ~ø0.787 in {ø19.9 ~ø20.0 mm}

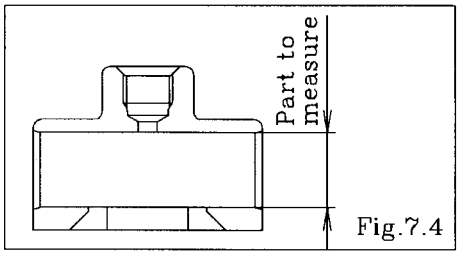


Fig.7.4

- 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
ø0.7874 ~ø0.7906 in {ø20.00 ~ø20.08 mm}

7.3 Installation

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

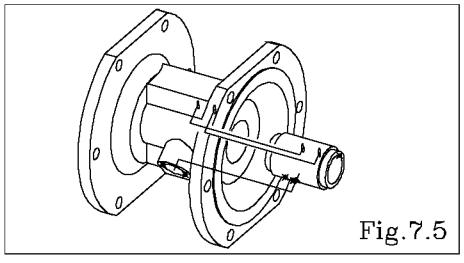


Fig.7.5

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

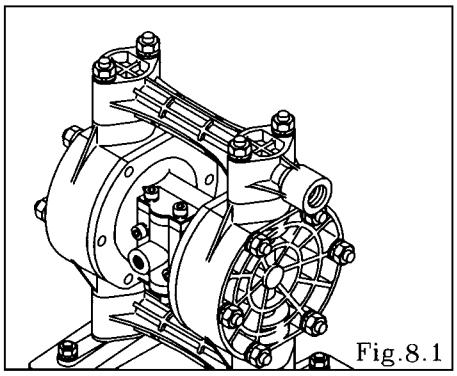


Fig.8.1

▪ 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
105 in-lbf {12 N-m}	105 in-lbf {12 N-m}

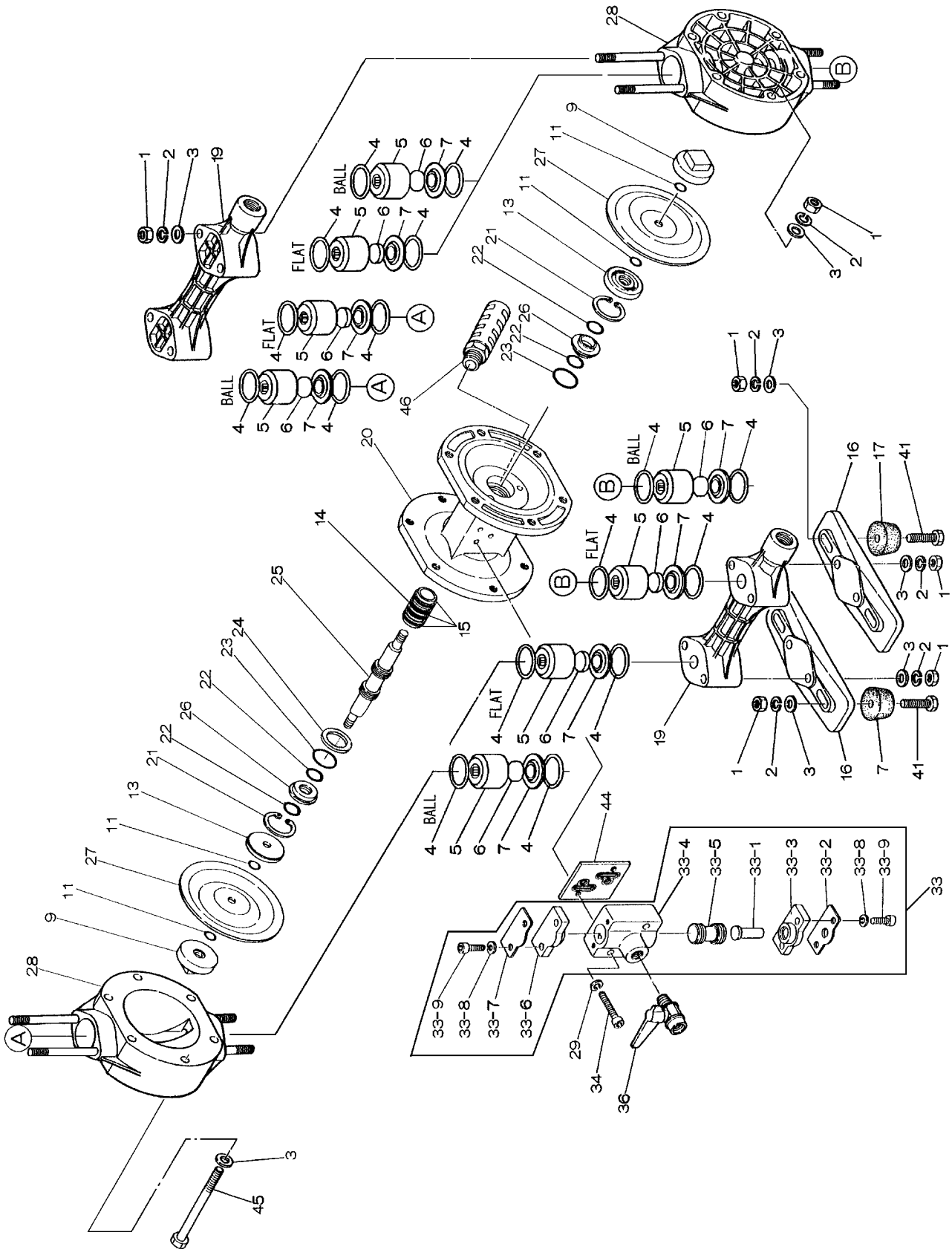
<NOTE>

▪ 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			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	708770	708770	708770	CENTER DISK	2	
14	714678	714678	714678	SLEEVE	1	
15	684900	684900	684900	O RING	4	
16	771352	771352	772720	BASE	2	
17	770551	770551	770551	CUSHION	4	
19	780190	780190	780220	MANI FOLD	2	
20	715107	715107	715107	BODY	1	
21	630807	630807	630807	RETAINING RING R TYPE	2	
22	684284	684284	684284	PACKING	4	MYA-14
23	640131	640131	640131	O RING	2	G30
24	772651	772651	772651	SPACER	1	
25	801785	801785	801785	CENTER ROD ASSEMBLY	1	
26	772619	772619	772619	GUIDE BUSH	2	
27	Tab.4	Tab.4	Tab.4	DIAPHRAGM	2	
28	780119	780119	780199	OUT CHAMBER	2	
29	681855	681855	681855	SPRING LOCK WASHER	2	
33	804505	804505	804505	VALVE BODY ASSEMBLY	1	
34	682918	682918	682918	HEXAGON SOCKET HEAD BOLT	2	M6X1X35
36	683055	683055	683055	BALL VALVE	1	1/4
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	
51	790911	790911	790911	NAME PLATE	1	

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

9.2 Parts List ■ DP-15 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 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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