

# **MAINTENANCE MANUAL**

YAMADA AIR-OPERATED DIAPHRAGM PUMPS

**NDP-40** series  
**NDP-50** series  
**NDP-80** series

## **WARNING**



- For your own safety, be sure to read these 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 NDP-40 series, NDP-50 series and NDP-80 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.

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## ·Table of Contents

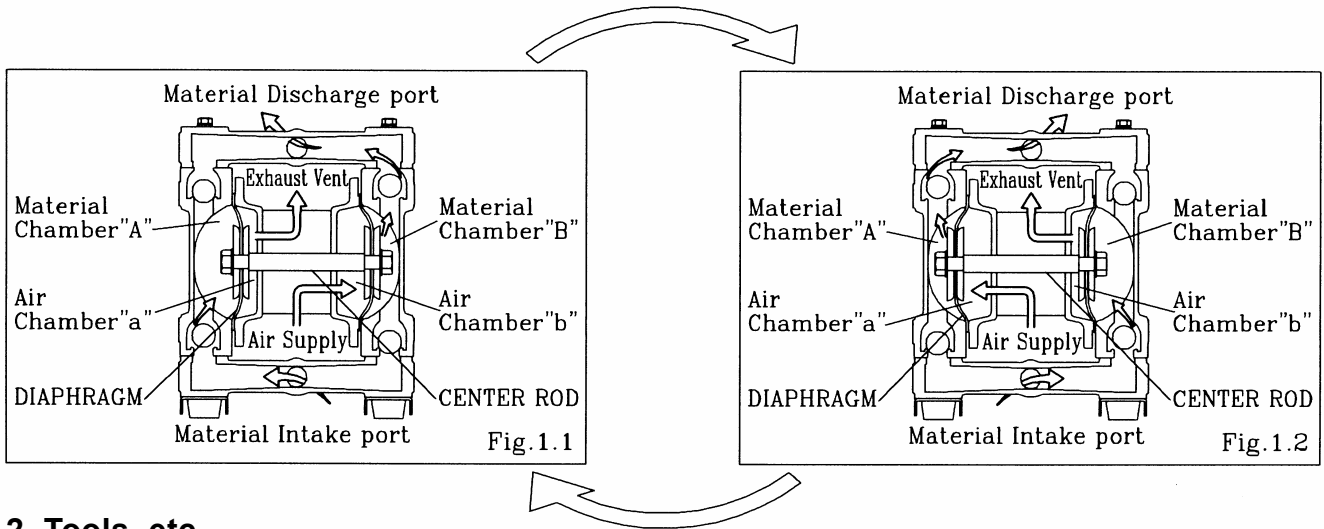
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## 1. Principles of operation

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.



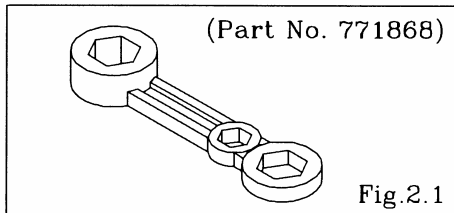
## 2. Tools, etc.

### 2.1 General tools

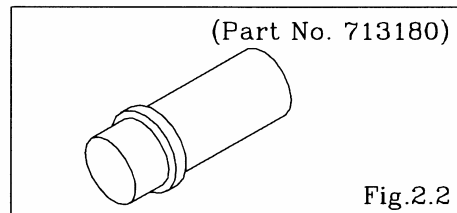
- Socket wrenches 13mm, 17mm, 19mm (except with the NDP-40 BP\_)  
24mm (BA\_, BS\_, BF\_)
- Hexagonal box wrenches 5mm, 6mm
- Small crowbars 2 (B\_C, B\_N, B\_E, B\_V)
- Open-end wrenches 17mm (NDP-40 BP\_-BV\_), 19mm (BA\_, BS\_, BF\_)  
24mm (BA\_, BS\_, BF\_)
- Plastic hammer

### 2.2 Special tools

- PP wrench (sold separately)  
Purpose: Removing the center disk  
of BP\_ and BV\_ types



- Sleeve remover (sold separately)  
Purpose: For removing sleeve



### 2.3 Misc.

- Assembly oil Turbine oil none addition class 1 (equivalent ISO VG32 grade)
- Nuts M16 X 1.5
- Thread locker
- Grease Urea grease grade (NLGI) No. 2

## 3. Ordering Replacement parts

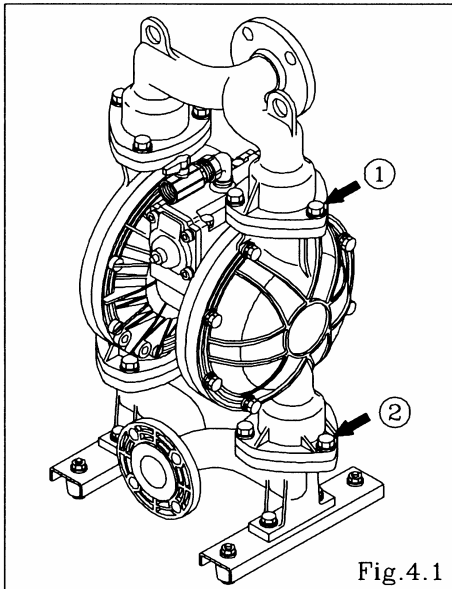
For accurate and speedy shipment of parts, be sure to order the right parts for your model to distributor. Indicate the part numbers, descriptions, and quantities.

## 4. Balls and Valve seats

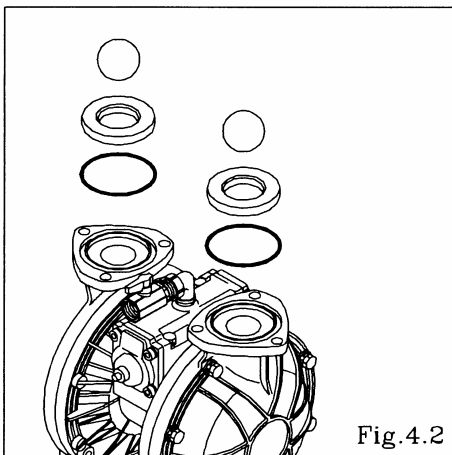
### 4.1 Removal

#### ■ BA\_, BS\_, BF\_, types

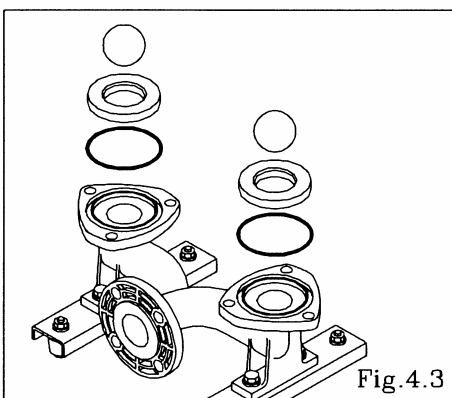
See [9. Exploded View] on after p. 13. (Fig. 4.1, 4.2 and 4.3 show the NDP-50 BS\_.)



- Remove the 6 (8 on the NDP-80) retainer bolts "1" from the out manifold, and remove the out manifold. [Fig.4.1]



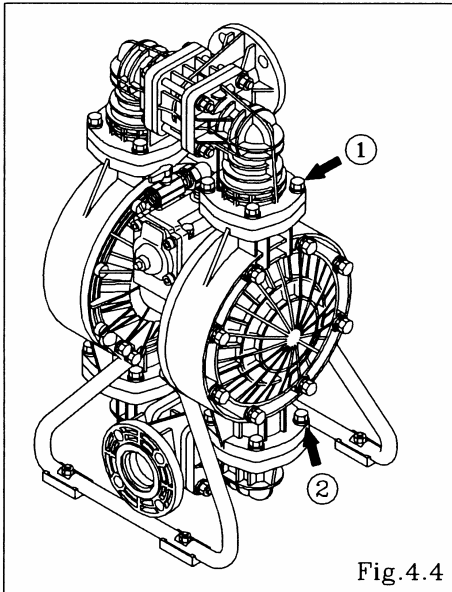
- Remove the ball, valve seat and O ring. [Fig.4.2]



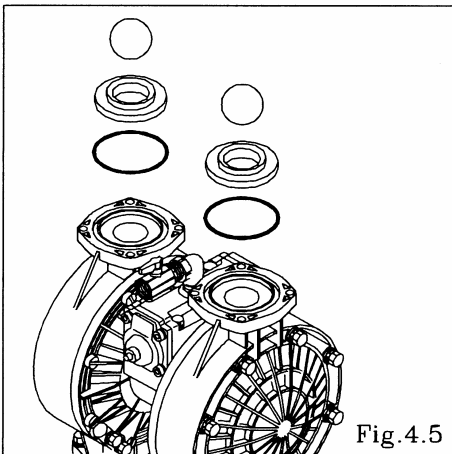
- Remove the 6 (8 on the NDP-80) retainer bolts "2" from the in manifold, and remove the in manifold. [Fig.4.1]
- Remove the ball, valve seat and O ring. [Fig.4.3]

## ■ NDP-40 BP\_·BV\_ type

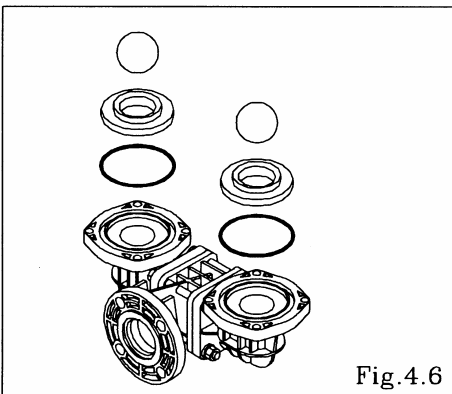
See [9. Exploded View] on after p. 13.



- Remove the 8 retainer bolts "1" from the out manifold, and remove the out manifold. [Fig.4.4]



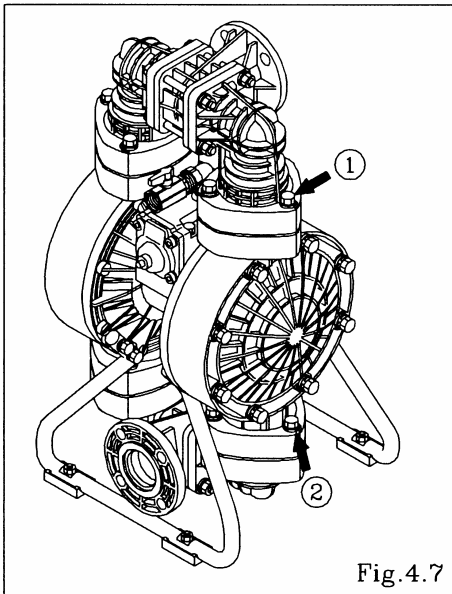
- Remove the ball, valve seat and O ring. [Fig.4.5]



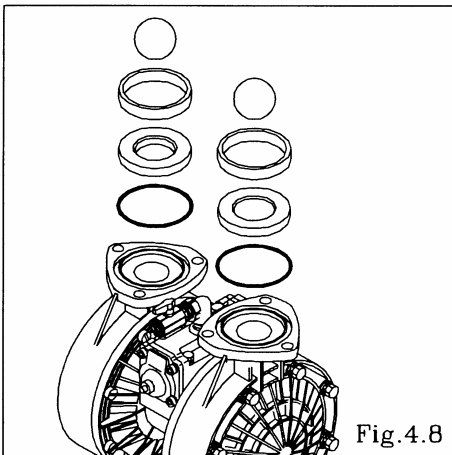
- Remove the 8 retainer bolts "2" from the in manifold, and remove the in manifold. [Fig.4.4]
- Remove the ball, valve seat and O ring. [Fig.4.6]

## ■ NDP-50 BP\_·BV\_, NDP-80 BP\_ types

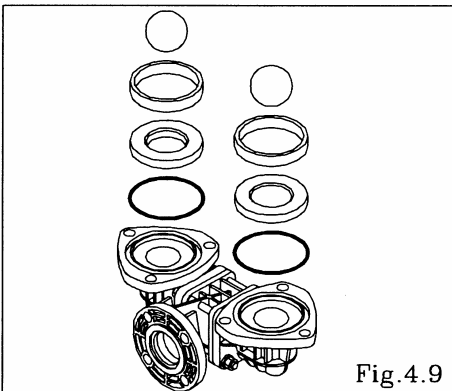
See [9. Exploded View] on after p. 13. (Fig. 4.7, 4.8 and 4.9 show the NDP-50 BP\_.)



- Remove the 6 (8 on the NDP-80) retainer bolts "1" from the out manifold, and remove the protector and out manifold. [Fig.4.7]

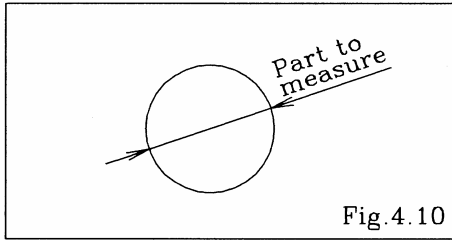


- Remove the ball, valve guide (only NDP-80), valve seat and O ring. [Fig.4.8]



- Remove the 6 (8 on the NDP-80) retainer bolts "2" from the in manifold, and remove the protector and in manifold. [Fig.4.7]
- Remove the ball, valve guide (only NDP-80), valve seat and O ring. [Fig.4.9]

## 4.2 Inspection

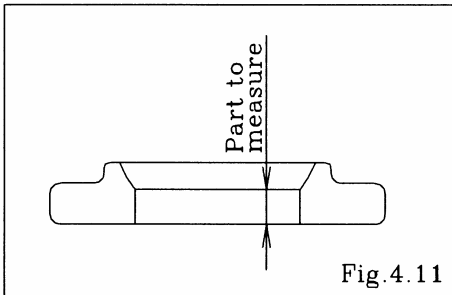


- Ball [Fig.4.10]

Measure the outside diameter, and if it is outside the usable range, replace the ball.

Usable range of ball

NDP-40	Sø1.772 ~ Sø2.028 in {Sø45.0 ~ Sø51.5 mm}
NDP-50	Sø2.232 ~ Sø2.555 in {Sø56.7 ~ Sø64.9 mm}
NDP-80	Sø3.189 ~ Sø3.650 in {Sø81.0 ~ Sø92.7 mm}



- Valve seat [Fig.4.11]

Measure the dimension shown at left, and if it is outside the usable range, replace the seat.

Usable range of valve seat

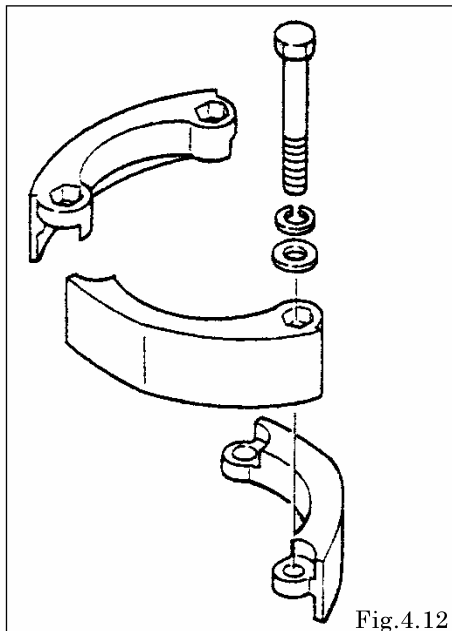
	B_C, B_N, B_E B_V, B_H, B_S	B_T
NDP-40	0.181 ~ 0.453 in {4.6 ~ 11.5 mm}	0.067 ~ 0.161 in {1.7 ~ 4.1 mm}
NDP-50	0.197 ~ 0.492 in	
NDP-80	{5.0 ~ 12.5 mm}	

- 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. 13, and install in the reverse order of disassembly.



Tightening torque for manifold retainer bolts

15 ft-lbf {20 N-m}		
NDP-50 NDP-80	BP_	18 ft-lbf {25 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.
- Match the convex and concave parts of the protector.  
[Fig.4.12] (NDP-50 BP\_·BV\_, NDP-80 BP\_)

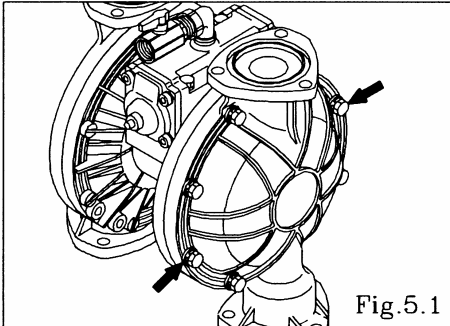


## 5. Diaphragm and Center rod

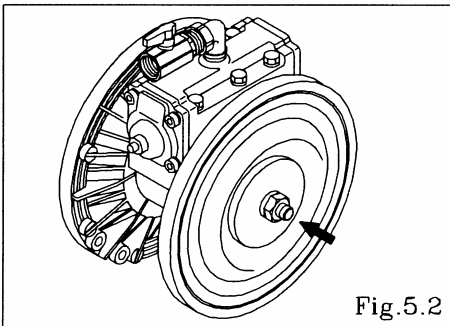
### 5.1 Removal

#### ■BA\_, BS\_, BF\_ types

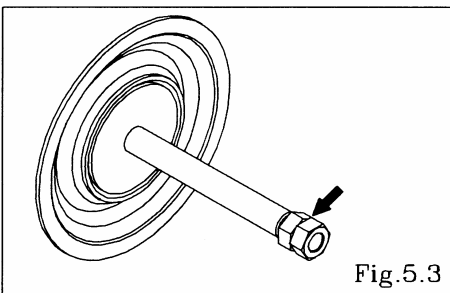
See [9. Exploded View] on after p. 13. (Fig. 5.1 shows the NDP-50 BS\_.)



- Remove the ball and valve seat etc.(see [ 4.1 Removal BA\_, BS\_, BF\_ types] on p. 2)
- Remove the 16 (24 on the NDP-80) retainer bolts from the out chamber, and remove the out chamber. [Fig.5.1]



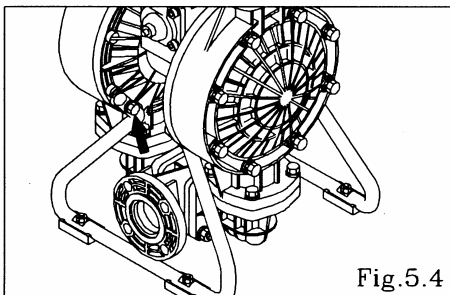
- Remove the nuts on both sides of the center rod. [Fig.5.2]
- After the nut on one side have been removed, remove the center disk and diaphragm. Remove the diaphragm, center disk and center rod from the opposite side of the main body.



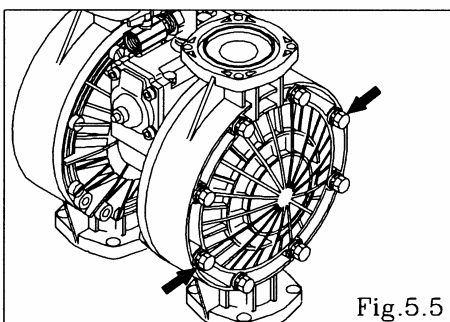
- Remove the nut on the opposite side using the double nut. [Fig.5.3]
- Remove the coned disk spring, center disk and diaphragm.

#### ■BP\_, BV\_ types

See [9. Exploded View] on after p. 13. (Fig. 5.4 shows the NDP-40 BP\_.)



- Remove the ball etc.(see [ 4.1 Removal BP\_, BV\_ types] on pp. 5-6)
- Remove the 8 (4 on the NDP-40) retainer bolts from the stand body, and remove the stand body. [Fig.5.4]



- Remove the 16 (24 on the NDP-80) retainer bolts from the out chamber, and remove the out chamber. [Fig.5.5]

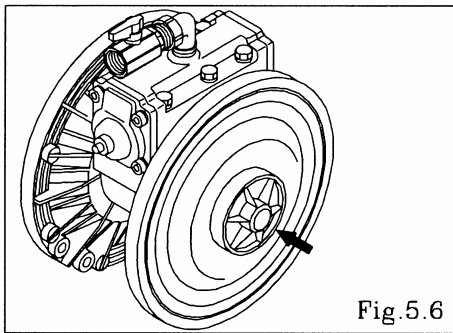


Fig. 5.6

- Remove the center disk from one side using the PP wrench (special tool: Part No. 771868). [Fig.5.6]
- After the center disk (outside) has been removed, remove the diaphragm and the center disk (inside). Remove the center disk and center rod from the opposite side of the main body.

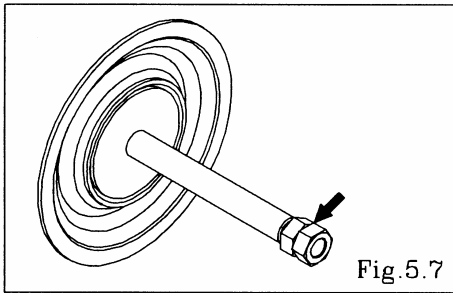


Fig. 5.7

- Fix a double nut to one end of the center rod and take the diaphragm and center disk off the opposite end. [Fig.5.9] 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

CR, NBR, EPDM	10,000,000 cycle
FKM	2,500,000 cycle
PTFE	3,000,000 cycle
TPEE, TPO	15,000,000 cycle

(When used with clean water at room temperature)

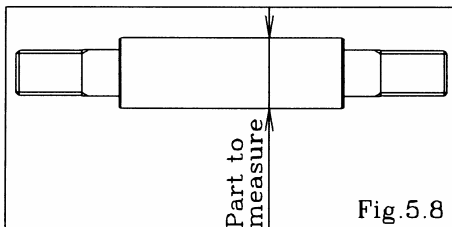


Fig. 5.8

- Center rod [Fig.5.8]  
Measure the diameter, and if it is outside the usable range, replace the rod.

Usable range of center rod

$\phi 0.9815 \sim \phi 0.9843$ in { $\phi 24.93 \sim \phi 25.00$ mm}
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## 5.3 Installation

### ■ B\_C, B\_N, B\_E, B\_V, B\_H, B\_S types

For installation, see [9. Exploded View] on after p. 13, and install in the reverse order of disassembly.

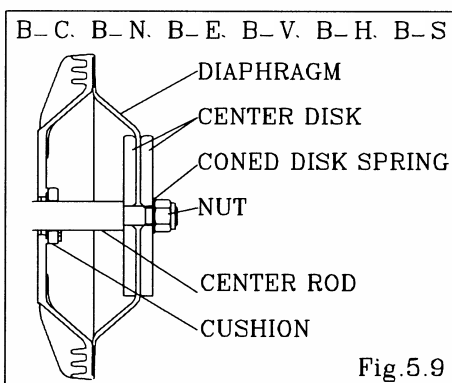


Fig. 5.9

- Apply assembly grease to the center rod, and insert it into the main body.
- Insert the cushion (except with the NDP-80). (cf. Fig.5.9)
- Keep the marking "OUTSIDE" to liquid end for CR, NBR, EPDM, FKM diaphragms. Keep the convex side to the outside for TPEE, TPO diaphragms.
- Tighten the center disk using the PP wrench (special tool: Part No. 771868) for the BP\_, BV\_ types. Apply proper Thread locker to the thread of center disk. (No coned disk springs and nuts are needed.)

Tightening torque for center rod

BA_, BS_, BF_	43 ft-lbf {60 N-m}
BP_, BV_	36 ft-lbf {50 N-m}

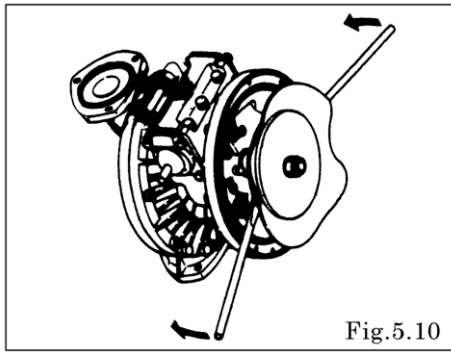


Fig.5.10

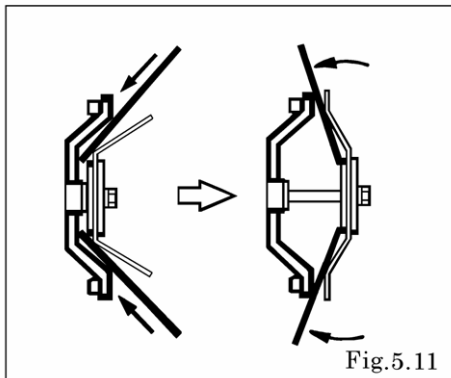


Fig.5.11

- Draw the center disk to one side (exclude B\_H, B\_S type cf. Fig. 5.9).
- And install the out chamber. Tighten the bolts temporarily.
- Grip the inside center disk using crowbars and draw it to the opposite side, then turn the diaphragm over. (exclude B\_H, B\_S type) [Fig. 5.10, 5.11]
- And install the out chamber. Tighten the bolts temporarily.
- 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 out chamber.

BA_, BS_, BF_	29 ft-lbf {40 N-m}
BP_, BV_	26 ft-lbf {35 N-m}

<NOTE>

- Make sure there is no dust on the seal surface in order to prevent seal damaged.
- Be careful not to damage the R portion of the air chamber using a crowbar, etc.
- Tighten the bolts gradually in a diagonal sequence with even torque. (cf. Fig. 5.12)

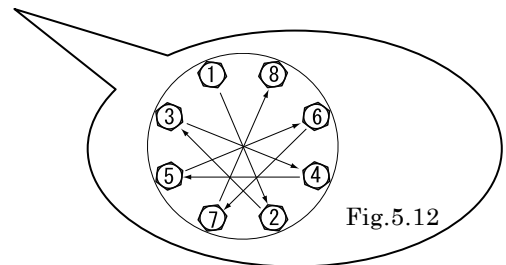


Fig.5.12

## ■ B\_T type

For installation, see [9. Exploded View] on after p. 13, and install in the reverse order of disassembly.

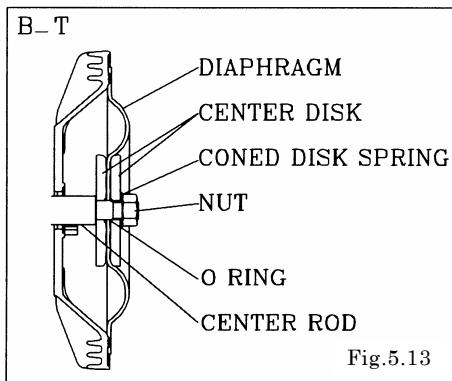


Fig.5.13

- Apply assembly grease to the center rod, and insert it into the main body.
- Keep the convex side to the outside (cf. Fig. 5.13).
- Put the O rings to both sides of the diaphragm. (cf. Fig. 5.13)
- Tighten the center disk using the PP wrench (special tool: Part No. 771868) for the BPT, BVT type. Apply proper Thread locker to the thread of center disk. (No coned disk springs and nuts are needed.)

Tightening torque for center rod

BAT, BST, BFT	43 ft-lbf {60 N-m}
BPT, BVT	36 ft-lbf {50 N-m}

- 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 out chamber

BAT, BST, BFT	29 ft-lbf {40 N-m}
BPT, BVT	26 ft-lbf {35 N-m}

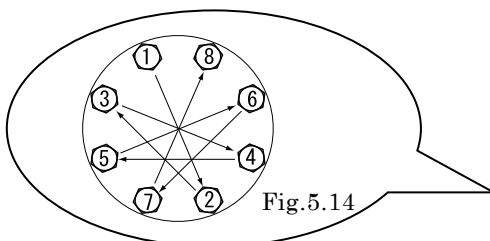


Fig.5.14

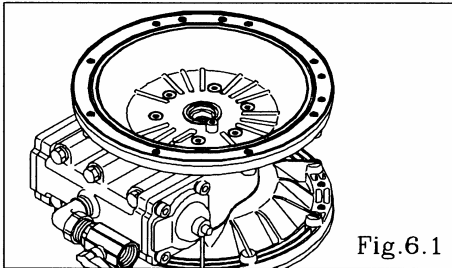
<NOTE>

- 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. (cf. Fig. 5.14)

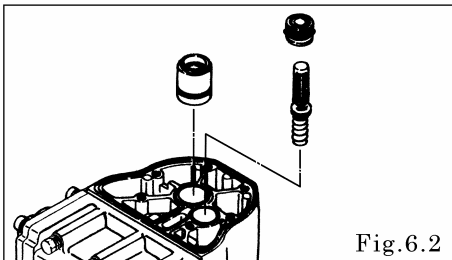
## 6. Throat bearing and Pilot valve

### 6.1 Removal

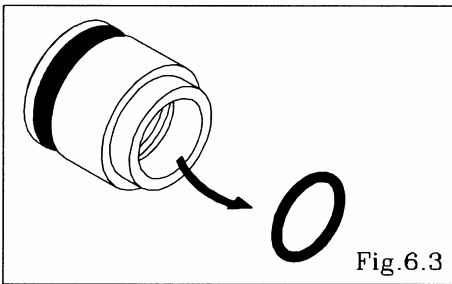
See [9. Exploded View] on after p. 13.



- Remove the diaphragm and center rod (see [5.1 Removal] on pp. 6-7).
- Remove the 12 retainer bolts from the air chamber, and remove the air chamber. [Fig.6.1]

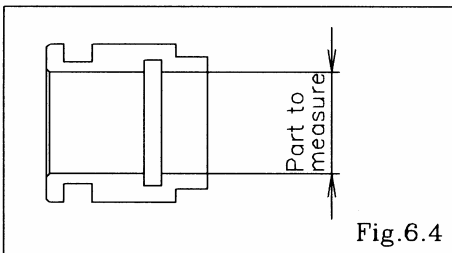


- Draw out the pilot valve and valve seat. [Fig.6.2]
- Draw out the throat bearing. [Fig.6.2]



- Remove the packing from the throat bearing. [Fig.6.3]

### 6.2 Inspection



- Throat bearing [Fig.6.4]  
Measure the inside diameter, and if it is outside the usable range, replace the throat bearing

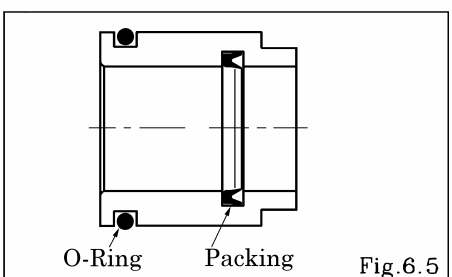
Usable range of throat bearing

$\varnothing 0.9859 \sim \varnothing 0.9894$  in { $\varnothing 25.04 \sim \varnothing 25.13$  mm}

- O ring, Packing  
If the O ring is worn out or cracked, replace it.
- Pilot valve  
If the pilot valve is worn out or cracked, replace it.

### 6.3 Installation

For installation, see [9. Exploded View] on after p. 13, and install in the reverse order of disassembly.



Tightening torque for air chamber retainer bolts

15 ft-lbf {20 N-m}

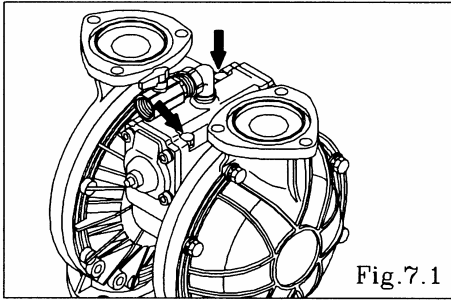
<NOTE>

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

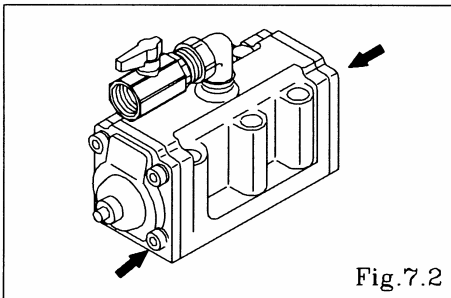
## 7. C spool valve assembly

### 7.1 Removal

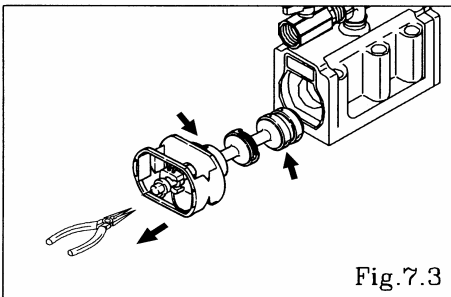
See [9. Exploded View] on after p. 13.



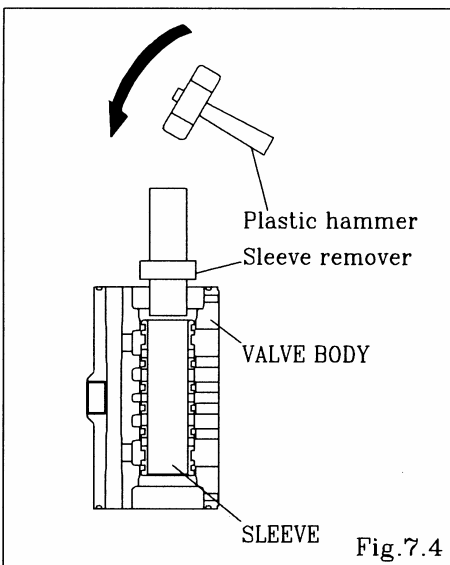
- Remove the out manifold (see 4.1 Removal on pp. 2, 3-4).
- Remove the 6 retainer bolts from the valve body, and remove the valve body. [Fig. 7.1]



- Remove the 8 cap A and cap B retainer bolts, and remove cap A and cap B. [Fig. 7.2]

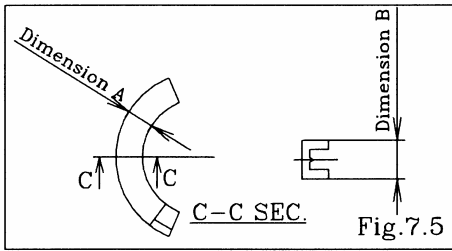


- Draw out the C spool valve assembly, and remove the seal ring from the C spool valve assembly.
- Remove the spring stopper. [Fig. 7.3]



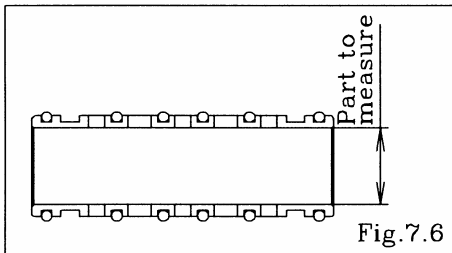
- Remove the sleeve using the sleeve remover (special tool: Part number 713180). [Fig. 7.4]

## 7.2 Inspection



- C Spool Valve Assembly
- Seal ring [Fig.7.5]  
Measure dimensions A and B, and if there is sufficient wear to require replacement, replace the c spool valve assembly.  
If the seal ring is worn out or cracked, replace c spool valve assembly.

Dimension A	More than 0.1988 in {5.05 mm}
Dimension B	More than 0.2874 in {7.30 mm}



- Sleeve Assembly[Fig.7.6]  
Measure the inside diameter, and if it is outside the usable range, replace the c spool valve assembly.

Usable range of sleeve	
$\varnothing 1.305 \sim \varnothing 1.313$ in { $\varnothing 33.15 \sim \varnothing 33.35$ mm}	

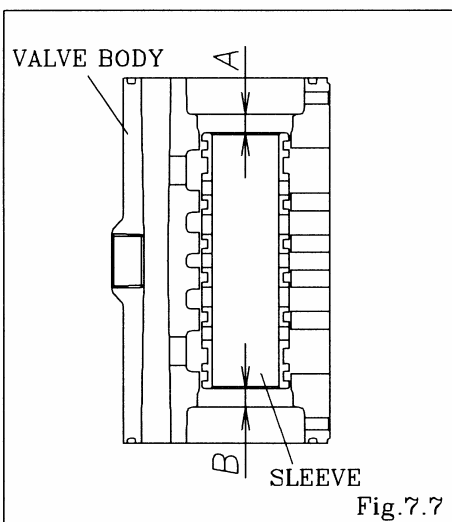
- O ring  
If the O ring is worn out or cracked, replace it.

<NOTE>

- C Spool Valve Assembly must be replaced as a complete set.  
Unable to replace individual component.

## 7.3 Installation

For installation, see [9. Exploded View] on after p. 13, and install in the reverse order of disassembly.



- Install the sleeve using the sleeve remover (special tool: Part No. 713180). At this point, apply assembly oil around the sleeve and O ring.
- Install the sleeve at the center of the valve body.  
(A = B)

Tightening torque for installation cap A, cap B
8 ft-lbf {10 N-m}

Tightening torque for valve body installation bolts
12 ft-lbf {17 N-m}

<NOTE>

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

## 8. Retightening of Tie rods

### ■ Plastic type

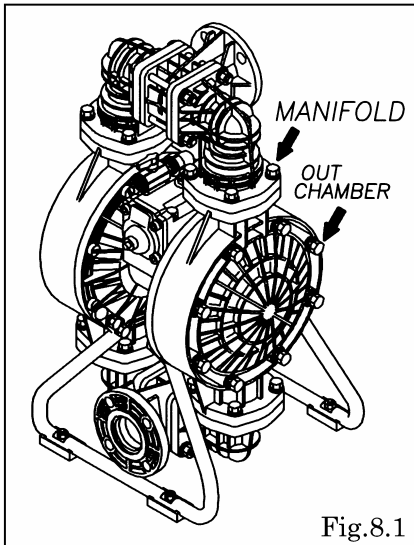


Fig.8.1

- 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
NDP-40.50.80	BP_	26 ft-lbf {35 N-m}	15 ft-lbf {20 N-m}
NDP-40.50	BV_		

<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]

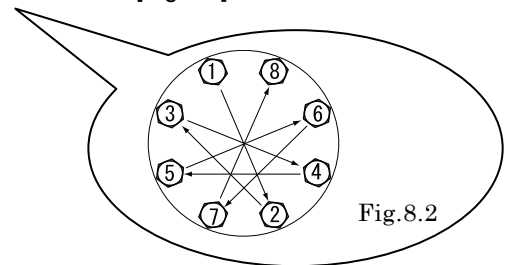


Fig.8.2

### ■ Metal type

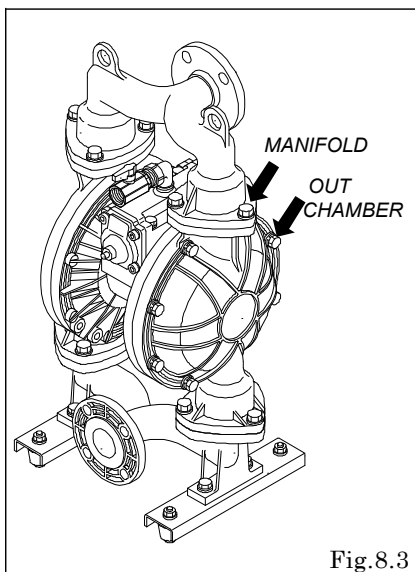


Fig.8.3

- 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
NDP-40.50.80	B_C, B_N B_E, B_V B_T, B_H B_S	29 ft-lbf {40 N-m}	15 ft-lbf {20 N-m}

<NOTE>

- Retighten the Out chamber and then the manifold in this order. [Fig.8.3]
- Tighten the bolts in the order shown. [Fig.8.4]

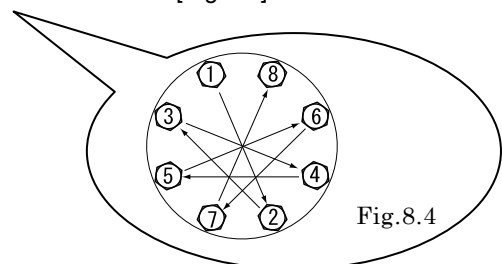
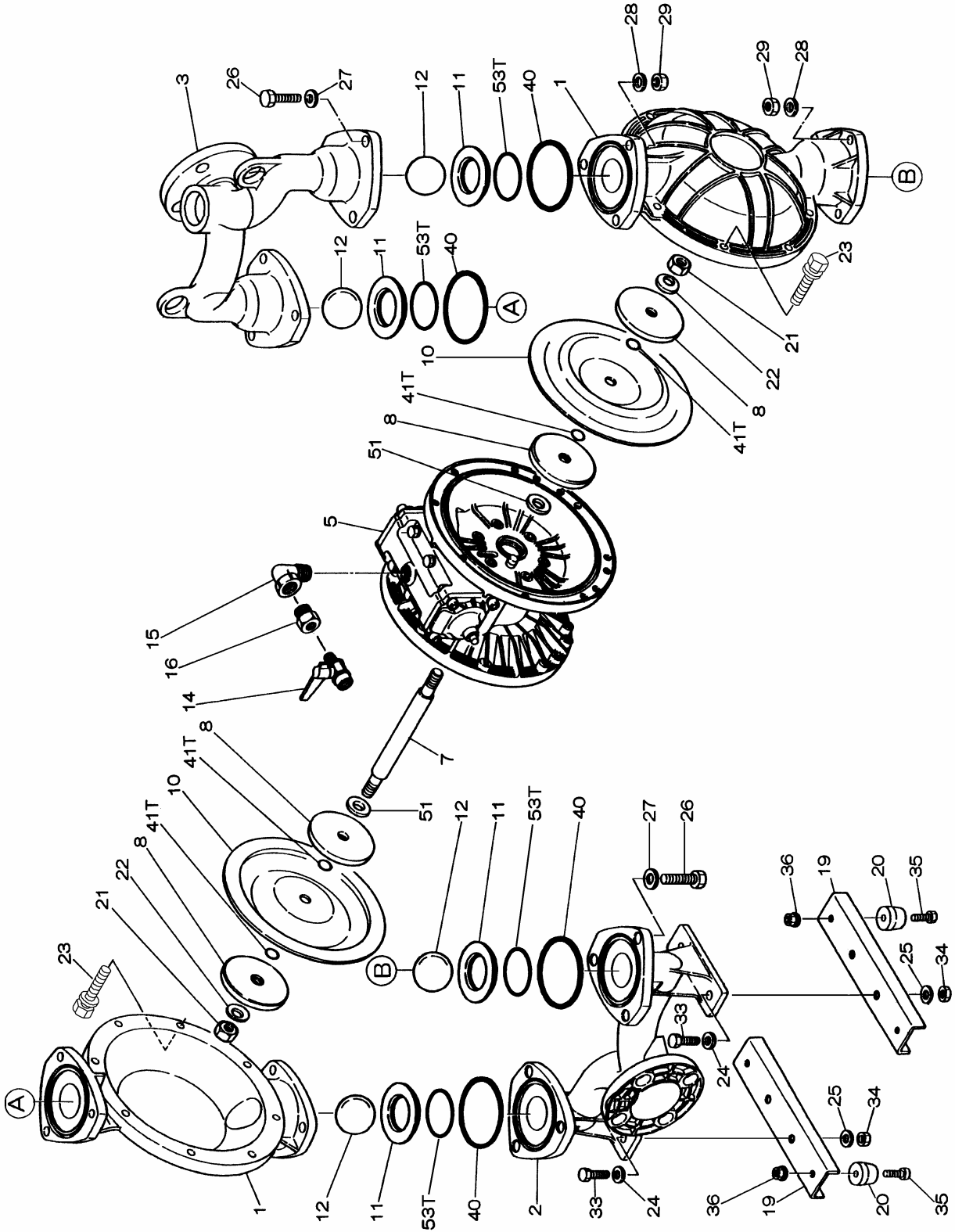


Fig.8.4

# 9. Exploded View and Parts List

## 9.1 Exploded View

■ NDP- 40 ▪ 50BA\_





9.1 Parts List

■ NDP- 40 ■ 50BA\_

NO.	40BA_	50BA_	DESCRIPTION	Q'TY	NOTE
1	580960	580961	OUT CHAMBER	2	
2	714367		IN MANIFOLD	1	581048
		714369		1	581049
3	714361		OUT MANIFOLD	1	581045
		714363		1	581046
5	803111	803112	BODY ASSEMBLY	1	
7	711900	711900	CENTER ROD	1	
7T	711939	711939	CENTER ROD	1	
8	711902	711904	CENTER DISK	4	
8T	707817	707822	CENTER DISK	4	
10	Tab.1	Tab.1	DIAPHRAGM	2	
11	Tab.3	Tab.3	VALVE SEAT	4	
12	Tab.4	Tab.4	BALL	4	
14	684321		BALL VALVE	1	1/2"
		684322	BALL VALVE	1	3/4"
15	682523	682523	ELBOW	1	3/4"
16	684339		BUSHING	1	3/4"x1/2"
19	711911	711928	PUMP BASE	2	
20	771402	771402	CUSHION	4	
21	Tab.6	Tab.6	NUT	2	
22	682740	682740	CONED DISK SPRING	2	
23	686045	686045	BOLT	16	M10x1.5x60
24	631014	631014	PLAIN WASHER	4	
25	631917	631917	WAVE SPRING WASHER	4	
26	611203	611203	BOLT	12	M12x1.75x50
27	631015	631015	PLAIN WASHER	12	
28	631918	631918	WAVE SPRING WASHER	12	
29	627014	627014	NUT	12	M12x1.75
33	611175		BOLT	4	M10x1.5x30
		611177		4	M10x1.5x35
34	627013	627013	NUT	4	M10x1.5
35	611149	611149	BOLT	4	M8x1.25x25
36	682276	682276	NUT WITH FLANGE	4	M8x1.25
40	Tab.8	Tab.8	O RING	4	
41T	643015	643015	O RING	4	P16 PTFE
50	790911	790911	NAME PLATE	1	
51	770582	770582	CUSHION	2	
53T	643136		O RING	4	G55 PTFE
		643139		4	G70 PTFE

NOTE 1)T : BAT

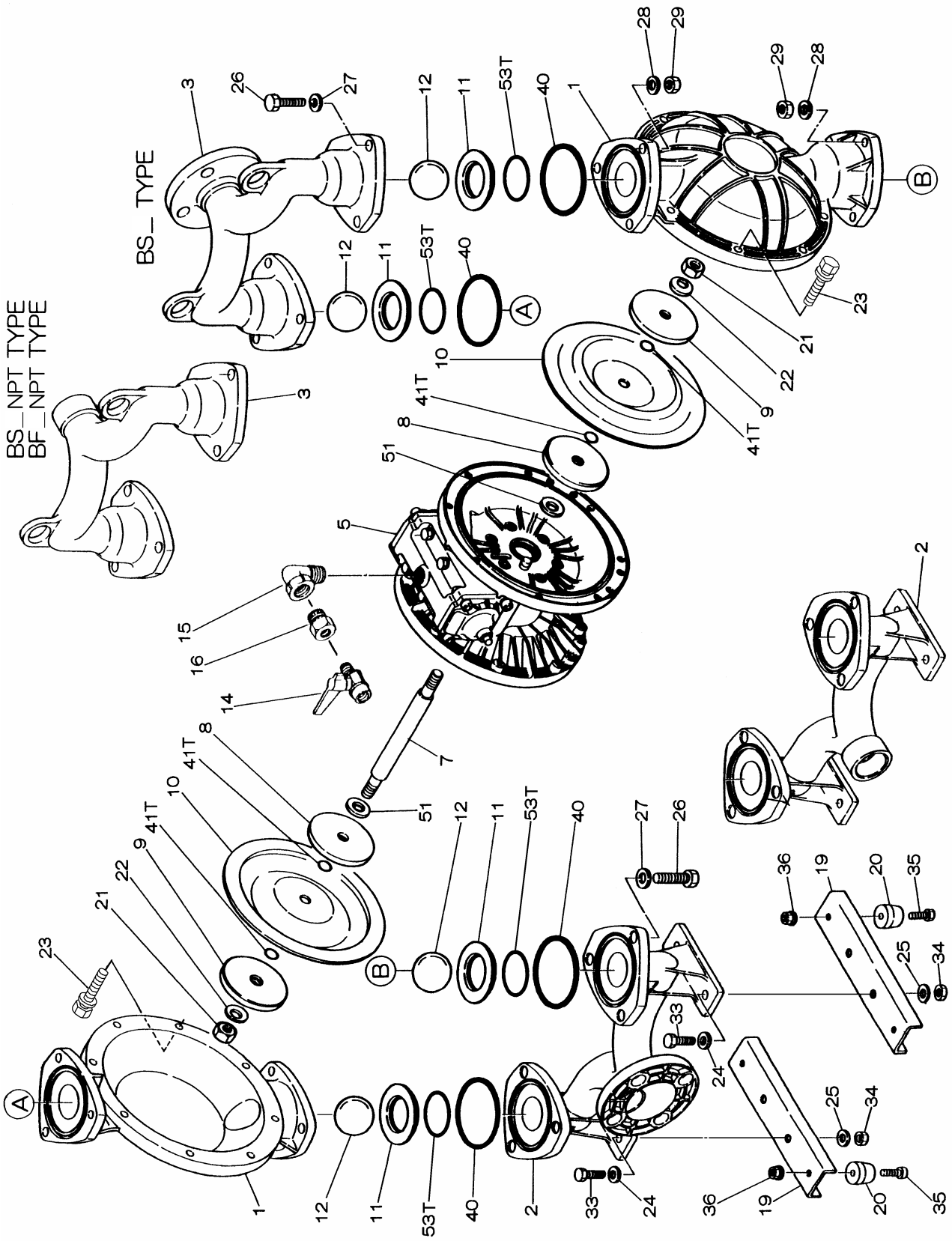
2)Tab.1~Tab.8 : SEE [9.8 PARTS LIST "COMMON PARTS"] ON P.27,P.28.

3)NO.50(NAME PLATE) IS NOT INDICATED IN EXPLODED VIEW

4)NO.23(BOLT) IS COMPOSED OF BOLT(686162)AND WAVE SPRING WASHER(631917)

9.2 Exploded View

■ NDP- 40 ▪ 50BS\_ ,BF\_



9.2 Parts List

■ NDP- 40 ▪ 50BS\_ ,BF\_

NO.	40BS□	40BS□NPT	40BF□NPT	50BS□	50BS□NPT	50BF□NPT	DESCRIPTION	Q'TY	NOTE
1	712931	712931	713156	712932	712932	713157	OUT CHAMBER	2	
2	712599	712601	713168	712557	712559	713169	IN MANIFOLD	1	
3	712598	712600	713165	712556	712558	713166	OUT MANIFOLD	1	
5	803117	803117	803111	803118	803118	803112	BODY ASSEMBLY	1	
7	711900	711900	711900	711900	711900	711900	CENTER ROD	1	
7T	711939	711939	711939	711939	711939	711939	CENTER ROD	1	
8	711902	711902	711902	711904	711904	711904	CENTER DISK	2	
8T	707817	707817	707817	707822	707822	707822	CENTER DISK	2	
9	711903	711903	713369	711905	711905	713370	CENTER DISK	2	
9T	707818	707818	713389	707823	707823	713390	CENTER DISK	2	
10	Tab.1	Tab.1	Tab.1	Tab.1	Tab.1	Tab.1	DIAPHRAGM	2	
11	Tab.3	Tab.3	Tab.3	Tab.3	Tab.3	Tab.3	VALVE SEAT	4	
12	Tab.4	Tab.4	Tab.4	Tab.4	Tab.4	Tab.4	BALL	4	
14	684321	684321	684321				BALL VALVE	1	1/2"
				684322	684322	684322	BALL VALVE	1	3/4"
15	682523	682523	682523	682523	682523	682523	ELBOW	1	3/4"
16	684339	684339	684339				BUSHING	1	3/4"x1/2"
19	711911	711911	711911	711928	711928	711928	PUMP BASE	2	
20	771402	771402	771402	771402	771402	771402	CUSHION	4	
21	Tab.6	Tab.6	Tab.6	Tab.6	Tab.6	Tab.6	NUT	2	
22	682740	682740	682740	682740	682740	682740	CONED DISK SPRING	2	
23	686044 *1	686044 *1	686023 *2	686044 *1	686044 *1	686023 *2	BOLT	16	M10x1.5x45
24	631174	631174	631014	631174	631174	631014	PLAIN WASHER	4	
25	631937	631937	631917	631937	631937	631917	WAVE SPRING WASHER	4	
26	621202	621202	611202	621202	621202	611202	BOLT	12	M12x1.75x45
27	631175	631175	631015	631175	631175	631015	PLAIN WASHER	12	
28	631938	631938	631918	631938	631938	631918	WAVE SPRING WASHER	12	
29	628014	628014	627014	628014	628014	627014	NUT	12	M12x1.75
33	621175	621175	611175	621175	621175	611175	BOLT	4	M10x1.5x30
34	628013	628013	627013	628013	628013	627013	NUT	4	M10x1.5
35	611149	611149	611149	611149	611149	611149	BOLT	4	M8x1.25x25
36	682276	682276	682276	682276	682276	682276	NUT WITH FLANGE	4	M8x1.25
40	Tab.8	Tab.8	Tab.8	Tab.8	Tab.8	Tab.8	O RING	4	
50	790911	790911	790911	790911	790911	790911	NAME PLATE	1	
51	770582	770582	770582	770582	770582	770582	CUSHION	2	
53T	643136	643136	643136				O RING	4	G55 PTFE
				643139	643139	643139	O RING	4	G70 PTFE

NOTE 1)T : BST/BFT

2)Tab.1~Tab.8 : SEE [9.8 PARTS LIST"COMMON PARTS"] ON P.27,P.28.

3)NO.50(NAME PLATE) IS NOT INDICATED IN EXPLODED VIEW

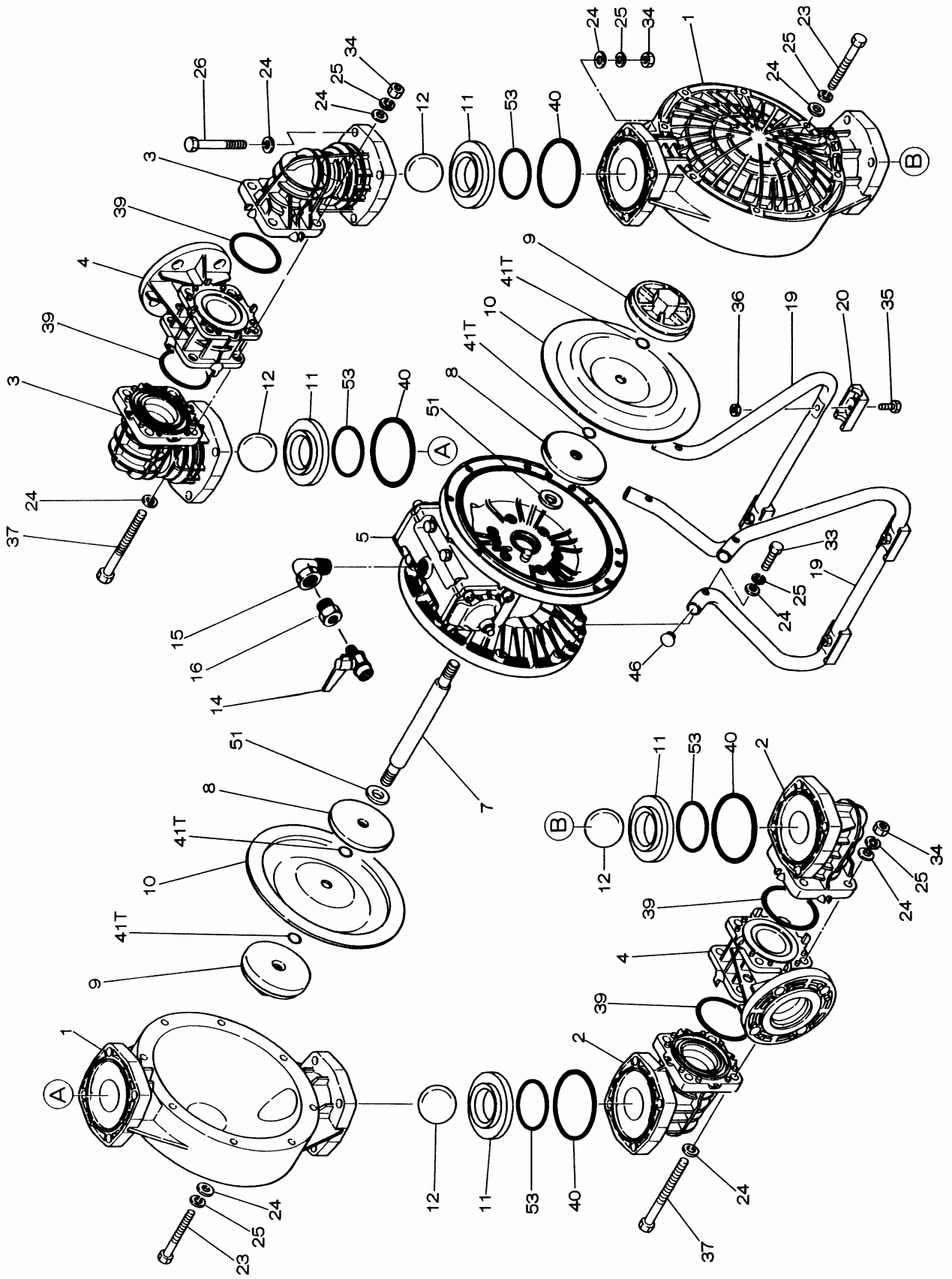
4)NO.23(BOLT)IS COMPOSED OF BOLT AND WAVE SPRING WASHER

\*1 BOLT(621180)&WAVE SPRING WASHER (631937)

\*2 BOLT(686160)&WAVE SPRING WASHER (631917)

9.3 Exploded View

■NDP- 40BP\_,BV\_



9.3 Parts List

■ NDP- 40BP\_,BV\_

NO.	BP_	BV_	DESCRIPTION	Q'TY	NOTE
1	780147	780257	OUT CHAMBER	2	
2	780244	780251	IN MANIFOLD	2	
3	780150	780258	OUT MANIFOLD	2	
4	780248	780216	CENTER MANIFOLD	2	
5	803117	803117	BODY ASSEMBLY	1	
7	711900	711900	CENTER ROD	1	
7T	711939	711939	CENTER ROD	1	
8	711902	711902	CENTER DISK	2	
8T	707817	707817	CENTER DISK	2	
9	771725	772730	CENTER DISK	2	
9T	771726	780207	CENTER DISK	2	
10	Tab.1	Tab.2	DIAPHRAGM	2	
11	772096	772739	VALVE SEAT	4	
12	Tab.4	770692	BALL	4	
14	684321	684321	BALL VALVE	1	1/2"
15	682523	682523	ELBOW	1	3/4"
16	684339	684339	BUSHING	1	3/4"x1/2"
19	711925	711925	STAND BODY	2	
20	771865	771865	CUSHION	4	
23	686156	686156	BOLT	16	M10x1.5x105
24	631330	631330	PLAIN WASHER	68	
25	680257	680257	SPRING LOCK WASHER	44	
26	621183	621183	BOLT	16	M10x1.5x60
33	621179	621179	BOLT	4	M10 × 1.5 × 40
34	628013	628013	NUT	24	M10x1.5
35	621149	621149	BOLT	4	M8x1.25x25
36	683837	683837	NUT WITH FLANGE	4	M8x1.25
37	683542	683542	BOLT	8	M10x1.5x120
39	Tab.7	643060	O RING	4	
40	Tab.8	643064	O RING	4	
41T	643015	643015	O RING	4	P16 PTFE
46	683641	683641	CAP	4	
50	790911	790911	NAME PLATE	1	
51	770582	770582	CUSHION	2	EXCLUDED BPT
53	Tab.11	643136	O RING	4	

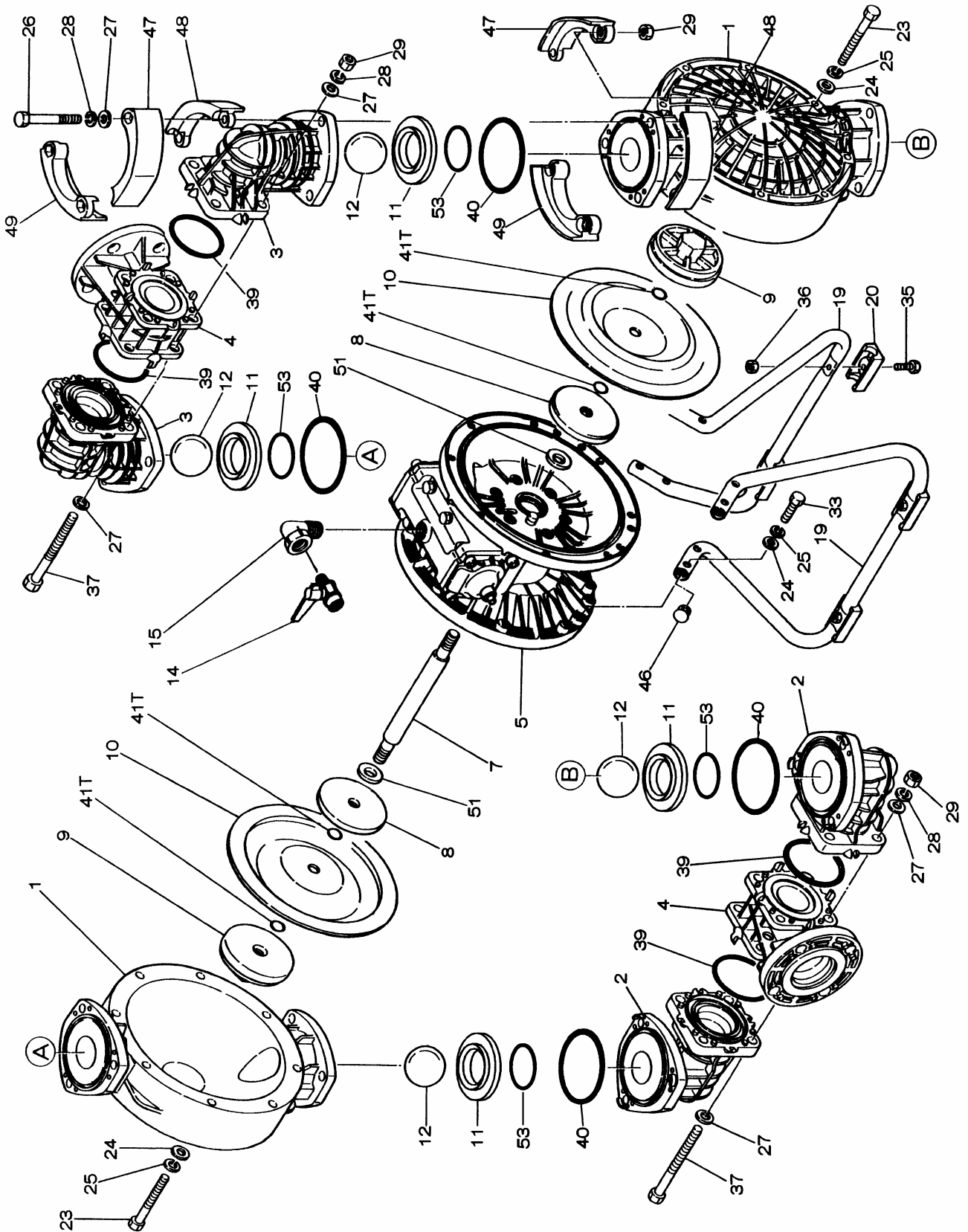
NOTE 1)T : BPT

2)Tab.1~Tab.11 : SEE [9.8 PARTS LIST"COMMON PARTS"] ON P.27,P.28.

3)NO.50(NAME PLATE) IS NOT INDICATED IN EXPLODED VIEW

9.4 Exploded View

■NDP- 50BP\_BV\_



9.4 Parts List

■ NDP- 50BP\_,BV\_

NO.	BP_	BV_	DESCRIPTION	Q'TY	NOTE
1	780148	780153	OUT CHAMBER	2	
2	780245	780252	IN MANIFOLD	2	
3	780151	780154	OUT MANIFOLD	2	
4	780249	780115	CENTER MANIFOLD	2	
5	803118	803118	BODY ASSEMBLY	1	
7	711900	711900	CENTER ROD	1	
7T	711939	711939	CENTER ROD	1	
8	711904	711904	CENTER DISK	2	
8T	707822	707822	CENTER DISK	2	
9	771727	771901	CENTER DISK	2	
9T	780063	780116	CENTER DISK	2	
10	Tab.1	Tab.2	DIAPHRAGM	2	
11	772097	772100	VALVE SEAT	4	
12	Tab.4	Tab.5	BALL	4	
14	684322	684322	BALL VALVE	1	3/4"
15	682523	682523	ELBOW	1	3/4"
19	711926	711926	STAND BODY	2	
20	771865	771865	CUSHION	4	
23	686156	686156	BOLT	16	M10x1.5x105
24	631330	631330	PLAIN WASHER	24	
25	680257	680257	SPRING LOCK WASHER	24	
26	621213	621213	BOLT	12	M12x1.75x100
27	631331		PLAIN WASHER	28	
		631331	PLAIN WASHER	32	
28	680607	680607	SPRING LOCK WASHER	20	
29	628014	628014	NUT	20	M12x1.75
33	621179	621179	BOLT	8	M10x1.5x40
35	621149	621149	BOLT	4	M8x1.25x25
36	683837	683837	NUT WITH FLANGE	4	M8x1.25
37	684592	684592	BOLT	8	M12x1.75x137
39	Tab.7	Tab.9	O RING	4	
40	Tab.8	Tab.10	O RING	4	
41T	643015	643015	O RING	4	P16 PTFE
46	683641	683641	CAP	4	
47	771786	771786	PROTECTOR A	8	
48	771787	771787	PROTECTOR B	8	
49	771788	771788	PROTECTOR C	8	
50	790911	790911	NAME PLATE	1	
51	770582	770582	CUSHION	2	EXCLUDED B_T
53	Tab.11	Tab.11	O RING	4	

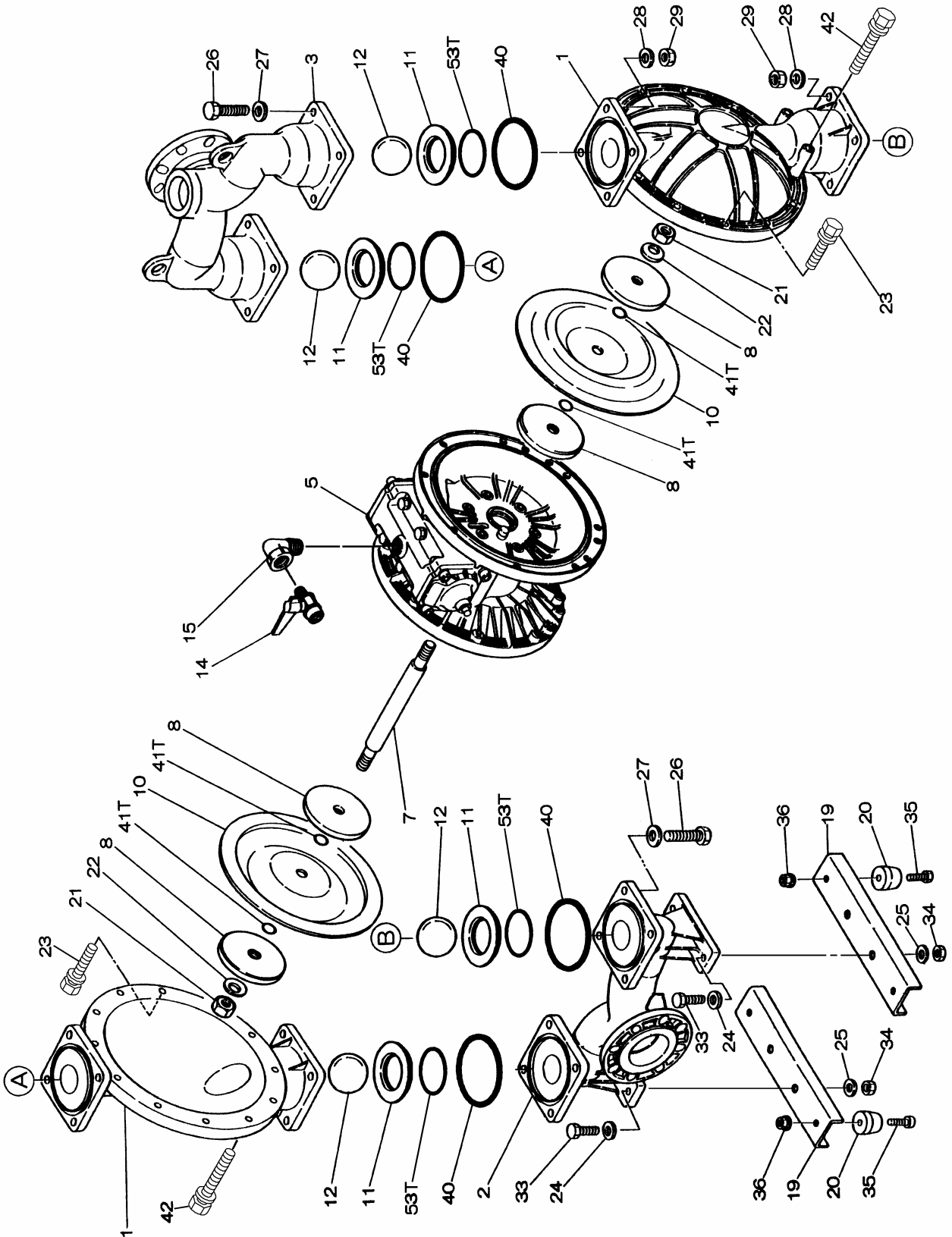
NOTE 1)T : BPT/BVT

2)Tab.1~Tab.11 : SEE [9.8 Parts List"COMMON PARTS"] ON P.27,P.28.

3)NO.50(NAME PLATE) IS NOT INDICATED IN EXPLODED VIEW

9.5 Exploded View

■NDP- 80BA\_





9.5 Parts List

■ NDP- 80BA\_

NO.	BA_	DESCRIPTION	Q'TY	NOTE
1	580962	OUT CHAMBER	2	
2	714371	IN MANIFOLD	1	581050
3	714365	OUT MANIFOLD	1	581047
5	803113	BODY ASSEMBLY	1	
7	711901	CENTER ROD	1	
7T	711940	CENTER ROD	1	
8	711906	CENTER DISK	4	
8T	711041	CENTER DISK	4	
10	Tab.1	DIAPHRAGM	2	
11	Tab.3	VALVE SEAT	4	
12	Tab.4	BALL	4	
14	684322	BALL VALVE	1	3/4"
15	682523	ELBOW	1	3/4"
19	711912	PUMP BASE	2	
20	771402	CUSHION	4	
21	Tab.6	NUT	2	
22	682740	CONED DISK SPRING	2	
23	686025	BOLT	20	M10x1.5x70
24	631014	PLAIN WASHER	4	
25	631917	WAVE SPRING WASHER	4	
26	611204	BOLT	16	M12x1.75x55
27	631015	PLAIN WASHER	16	
28	631918	WAVE SPRING WASHER	16	
29	627014	NUT	16	M12x1.75
33	611177	BOLT	4	M10x1.5x35
34	627013	NUT	4	M10x1.5
35	611149	BOLT	4	M8x1.25x25
36	682276	NUT WITH FLANGE	4	M8x1.25
40	Tab.8	O RING	4	
41T	643015	O RING	4	P16 PTFE
42	686026	BOLT	4	M10x1.5x130
50	790911	NAME PLATE	1	
53T	643145	O RING	4	G100 PTFE

NOTE 1) T : BAT

2) Tab.1~Tab.8 : SEE [9.8 PARTS LIST"COMMON PARTS"] ON P.27,P.28.

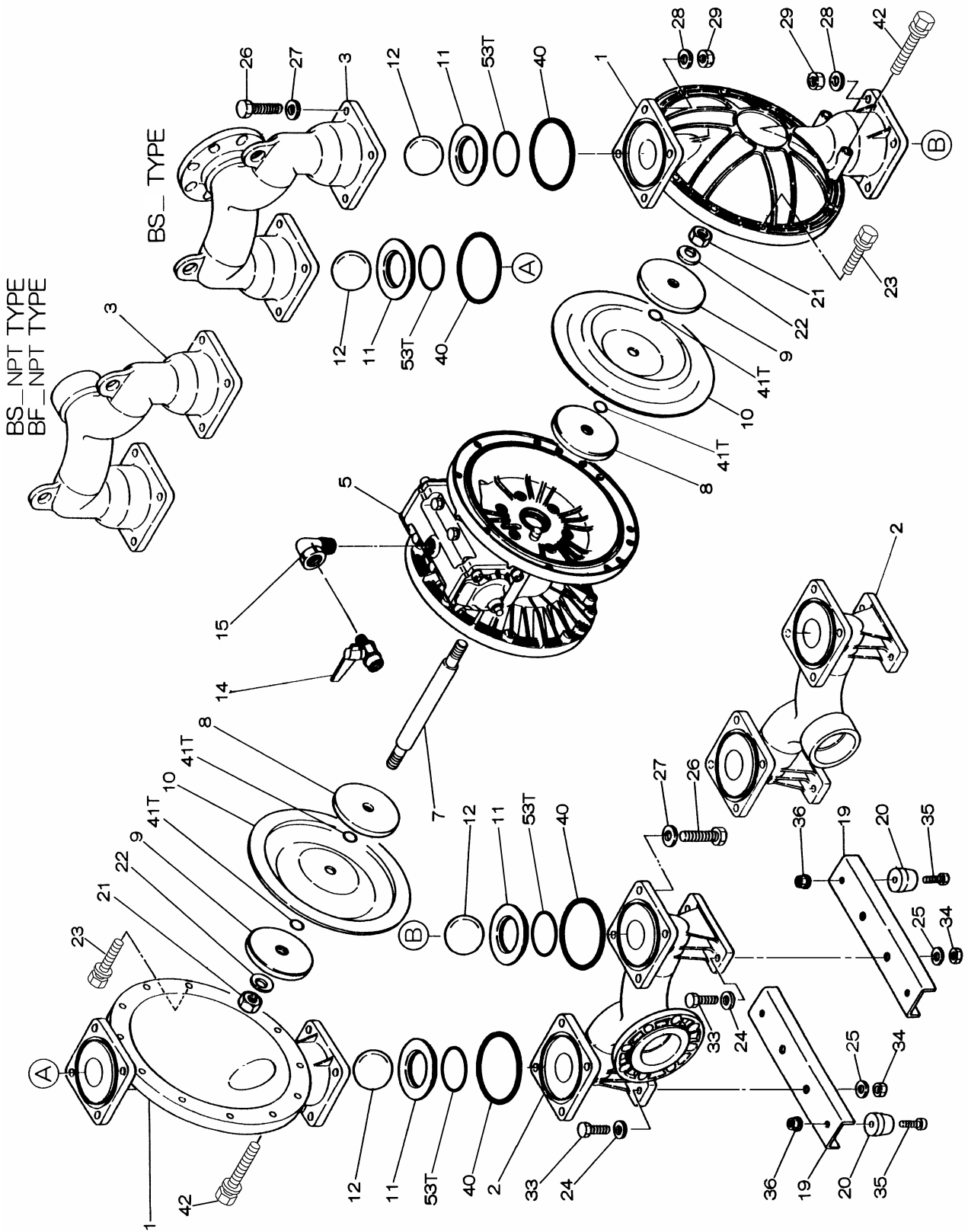
3) NO.50(NAME PLATE) IS NOT INDICATED IN EXPLODED VIEW

4) NO.23(BOLT) IS COMPOSED OF BOLT(686163)AND WAVE SPRING WASHER(631917)

NO.42(BOLT) IS COMPOSED OF BOLT(686164)AND WAVE SPRING WASHER(631917)

# 9.6 Exploded View

■NDP- 80BS\_,BF\_



9.6 Parts List

■ NDP- 80BS\_,BF\_

NO.	BS_	BS_NPT	BF_NPT	DESCRIPTION	Q'TY	NOTE
1	712933	712933	713158	OUT CHAMBER	2	
2	712603	712605	713170	IN MANIFOLD	1	
3	712602	712604	713167	OUT MANIFOLD	1	
5	803119	803119	803113	BODY ASSEMBLY	1	
7	711901	711901	711901	CENTER ROD	1	
7T	711940	711940	711940	CENTER ROD	1	
8	711906	711906	711906	CENTER DISK	2	
8T	711041	711041	711041	CENTER DISK	2	
9	711907	711907	713371	CENTER DISK	2	
9T	711039	711039	713391	CENTER DISK	2	
10	Tab.1	Tab.1	Tab.1	DIAPHRAGM	2	
11	Tab.3	Tab.3	Tab.3	VALVE SEAT	4	
12	Tab.4	Tab.4	Tab.4	BALL	4	
14	684322	684322	684322	BALL VALVE	1	3/4"
15	682523	682523	682523	ELBOW	1	3/4"
19	711912	711912	711912	PUMP BASE	2	
20	771402	771402	771402	CUSHION	4	
21	Tab.6	Tab.6	Tab.6	NUT	2	
22	682740	682740	682740	CONED DISK SPRING	2	
23	686059 *1	686059 *1	686024 *2	BOLT	20	M10x1.5x55
24	631174	631174	631014	PLAIN WASHER	4	
25	631937	631937	631917	WAVE SPRING WASHER	4	
26	621203	621203		BOLT	16	M12x1.75x50
			611204	BOLT	16	M12x1.75x55
27	631175	631175	631015	PLAIN WASHER	16	
28	631938	631938	631918	WAVE SPRING WASHER	16	
29	628014	628014	627014	NUT	16	M12x1.75
33	621177	621177	611177	BOLT	4	M10x1.5x35
34	628013	628013	627013	NUT	4	M10x1.5
35	611149	611149	611149	BOLT	4	M8x1.25x25
36	682276	682276	682276	NUT WITH FLANGE	4	M8x1.25
40	Tab.8	Tab.8	Tab.8	O RING	4	
41T	643015	643015	643015	O RING	4	P16 PTFE
42	686046	686046	686026	BOLT	4	M10x1.5x130
50	790911	790911	790911	NAME PLATE	1	
53T	643145	643145	643145	O RING	4	G100 PTFE

NOTE 1)T : BST/BFT

2)Tab.1~Tab.8 : SEE [9.8 PARTS LIST"COMMON PARTS"] ON P.27,P.28.

3)NO.50(NAME PLATE) IS NOT INDICATED IN EXPLODED VIEW

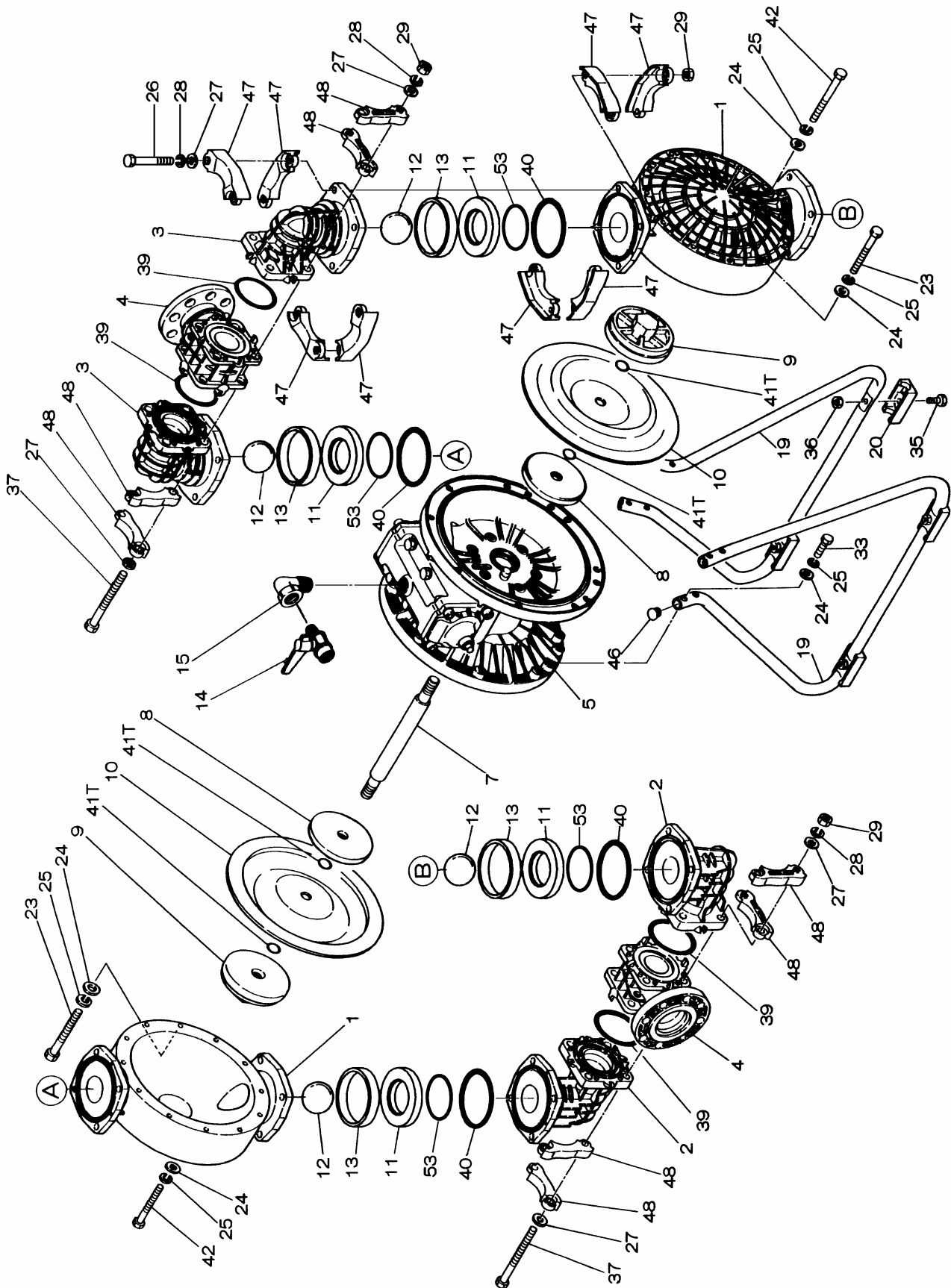
4)NO.23(BOLT) IS COMPOSED OF BOLT AND WAVE SPRING WASHER

\*1 BOLT(621182)& WAVE SPRING WASHER(631937)

\*2 BOLT(686161)& WAVE SPRING WASHER(631917)

# 9.7 Exploded View

■ NDP- 80BP\_



9.7 Parts List

■ NDP- 80BP\_

NO.	BP_	DESCRIPTION	Q'TY	NOTE
1	780149	OUT CHAMBER	2	
2	780246	IN MANIFOLD	2	
3	780152	OUT MANIFOLD	2	
4	780250	CENTER MANIFOLD	2	
5	803119	BODY ASSEMBLY	1	
7	711901	CENTER ROD	1	
7T	711940	CENTER ROD	1	
8	711906	CENTER DISK	2	
8T	711041	CENTER DISK	2	
9	780064	CENTER DISK	2	
9T	771730	CENTER DISK	2	
10	Tab.1	DIAPHRAGM	2	
11	772098	VALVE SEAT	4	
12	Tab.4	BALL	4	
13	772099	VALVE GUIDE	4	
14	684322	BALL VALVE	1	3/4"
15	682523	ELBOW	1	3/4"
19	711927	STAND BODY	2	
20	771865	CUSHION	4	
23	683543	BOLT	20	M10×1.5×130
24	631330	PLAIN WASHER	32	
25	680257	SPRING LOCK WASHER	32	
26	621213	BOLT	16	M12×1.75×100
27	631331	PLAIN WASHER	32	
28	680607	SPRING LOCK WASHER	24	
29	628014	NUT	24	M12×1.75
33	621179	BOLT	8	M10×1.5×40
35	621149	BOLT	4	M8×1.25×25
36	683837	NUT WITH FLANGE	4	M8×1.25
37	683544	BOLT	8	M12×1.75×220
39	Tab.7	O RING	4	
40	Tab.8	O RING	4	
41T	643015	O RING	4	P16 PTFE
42	683552	BOLT	4	M10×1.5×150
46	683641	CAP	4	
47	771789	PROTECTOR A	32	
48	771790	PROTECTOR B	24	INCLUDED 8 PIECES ACCESSORIES
50	790911	NAME PLATE	1	
53	Tab.11	O RING	4	

NOTE 1)T : BPT

2)Tab.1~Tab.11 : SEE [9.8 PARTS LIST"COMMON PARTS"] ON P.27,P.28.

3)NO.50(NAME PLATE) IS NOT INDICATED IN EXPLODED VIEW

9.8 Parts List

■ COMMON PARTS

Tab.1 DIAPHRAGM

[BA\_,BS\_,BF\_,BP\_]

TYPE	NDP-40	NDP-50	NDP-80	MATERIAL
B_C	771853	771855	771857	CR
B_N	771700	771702	771704	NBR
B_E	771854	771856	771858	EPDM
B_V	771799	771800	771801	FKM
B_T	770814	770815	770934	PTFE
B_H	771701	771703	771705	TPEE
B_S	771975	771976	771977	TPO

Tab.2 DIAPHRAGM

TYPE	NDP-40	NDP-50	MATERIAL
	BV_	BV_	
BVC			
BVN			
BVE		771856	EPDM
BVV		771800	FKM
BVT	770814	770815	PTFE
BVH		771703	TPEE
BVS	771975	771976	TPO

Tab.3 VALVE SEAT

[BA\_,BS\_,BF\_]

TYPE	NDP-40		NDP-50		NDP-80		MATERIAL
	BA_	BS/BF_	BA_	BS/BF_	BA_	BS/BF_	
B_C	771956	771956	771957	771957	771958	771958	CR
B_N	771994	771994	771995	771995	771996	771996	NBR
B_E	771921	771921	771949	771949	771999	771999	EPDM
B_V	771997	771997	771987	771987	771998	771998	FKM
B_T	712382		712383		712384		A5056
		711908		711909		711910	SS316
B_H	771793	771793	771794	771794	771795	771795	TPEE
B_S	772003	772003	772004	772004	772005	772005	TPO

Tab.4 BALL

[BA\_,BS\_,BF\_,BP\_]

TYPE	NDP-40	NDP-50	NDP-80	MATERIAL
B_C	770550	770627	770559	CR
B_N	770584	770630	770587	NBR
B_E	770593	770633	770596	EPDM
B_V	770602	770636	770605	FKM
B_T	770692	770693	770694	PTFE
B_H	770584	770630	770587	NBR
B_S	770593	770633	770596	EPDM

Tab.5 BALL

TYPE	BV_	MATERIAL
BVC		CR
BVN		NBR
BVE	770633	EPDM
BVV	770636	FKM
BVT	770693	PTFE
BVH	770630	PTFE
BVS	770693	PTFE

Tab.6 NUT(M16x1.5)

[BA\_,BS\_,BF\_]

TYPE	NDP-40	NDP-50	NDP-80	MATERIAL
B_C	683408	683408	683408	PA,SS316
B_N	683408	683408	683408	PA,SS316
B_E	683408	683408	683408	PA,SS316
B_V	706128	706128	706144	SS316
B_T	706128	706128	706144	SS316
B_H	683408	683408	683408	PA,SS316
B_S	683408	683408	683408	PA,SS316

Tab.7 O RING

TYPE	NDP-40	NDP-50	NDP-80	MATERIAL
	BP□	BP□	BP□	
	P70	P85	P110	
B□C	640060	640064	640070	NBR
B□N	640060	640064	640070	NBR
B□E	683998	684121	684123	EPDM
B□V	642060	642064	642070	FKM
B□T	643060	643064	643070	PTFE
B□H	640060	640064	640070	NBR
B□S	683998	684121	684123	EPDM

Tab.8 O RING

TYPE	NDP-40		NDP-50	NDP-80		MATERIAL
	BA/BS/BF□	BP□	BA/BS/BF/BP□	BA/BS/BF□	BP□	
	P90	P85	P105	P140	P150	
B□C	640065	640064	640069	640078	640080	NBR
B□N	640065	640064	640069	640078	640080	NBR
B□E	683999	684121	684122	684124	684125	EPDM
B□V	642065	642064	642069	642078	642080	FKM
B□T	643065	643064	643069	643078	643080	PTFE
B□H	640065	640064	640069	640078	640080	NBR
B□S	683999	684121	684122	684124	684125	EPDM

Tab.9 O RING

TYPE	BV□	MATERIAL	NOTE
BVC	<del>        </del>		
BVN	<del>        </del>		
BVE	684121	EPDM	P85
BVV	642064	FKM	P85
BVT	771899	PTFE	
BVH	771899	PTFE	
BVS	771899	PTFE	

Tab.10 O RING

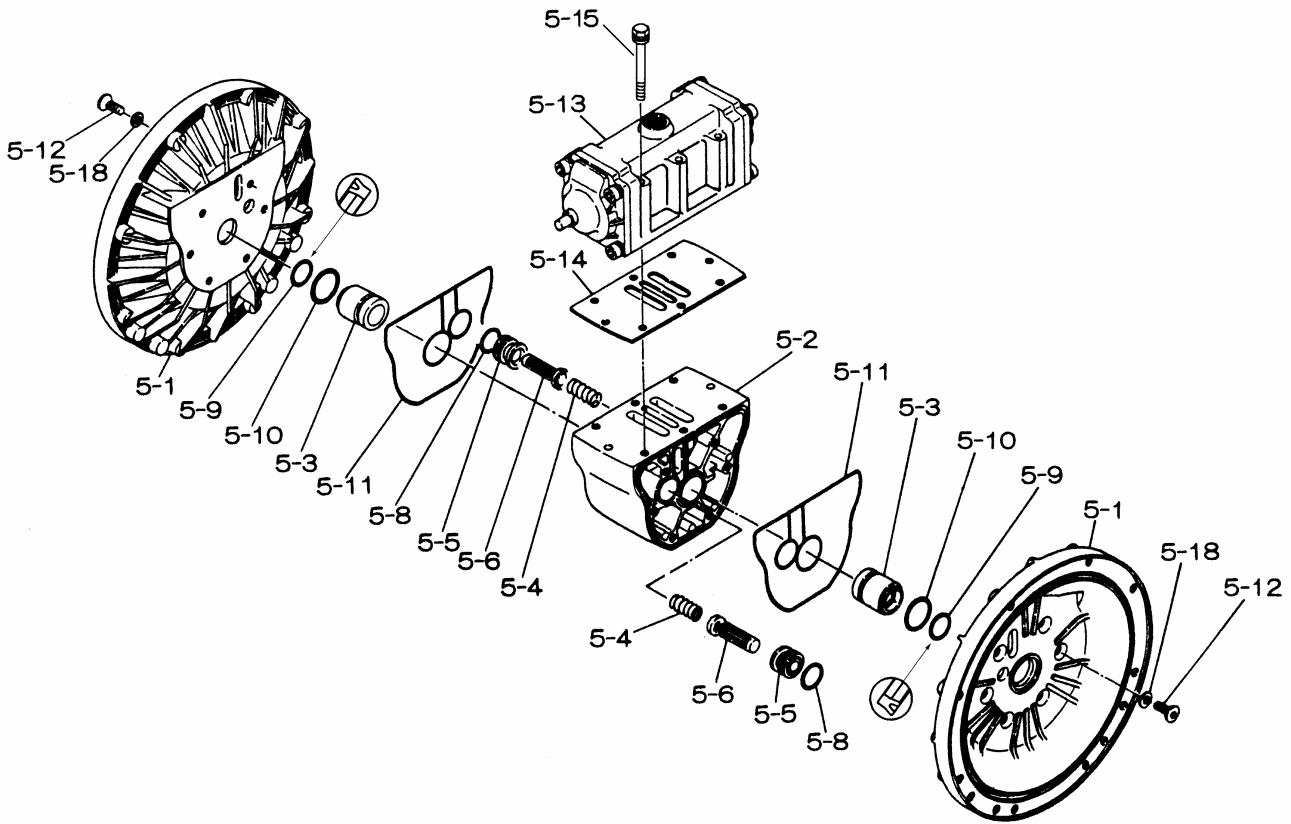
TYPE	BV□	MATERIAL	NOTE
BVC	<del>        </del>		
BVN	<del>        </del>		
BVE	684122	EPDM	P105
BVV	642069	FKM	P105
BVT	772063	PTFE	
BVH	772063	PTFE	
BVS	772063	PTFE	

Tab.11 O RING

TYPE	NDP-40	NDP-50	NDP-80	MATERIAL
	BP□	BP□	BP□	
	G55	G70	G90	
B□C	640136	640139	640143	NBR
B□N	640136	640139	640143	NBR
B□E	685447	685448	685443	EPDM
B□V	642136	642139	642143	FKM
B□T	643136	643139	643143	PTFE
B□H	640136	640139	640143	NBR
B□S	685447	685448	685443	EPDM

### 9.9 Exploded View

### ■ BODY ASSEMBLY



### 9.9 Parts List

### ■ BODY ASSEMBLY

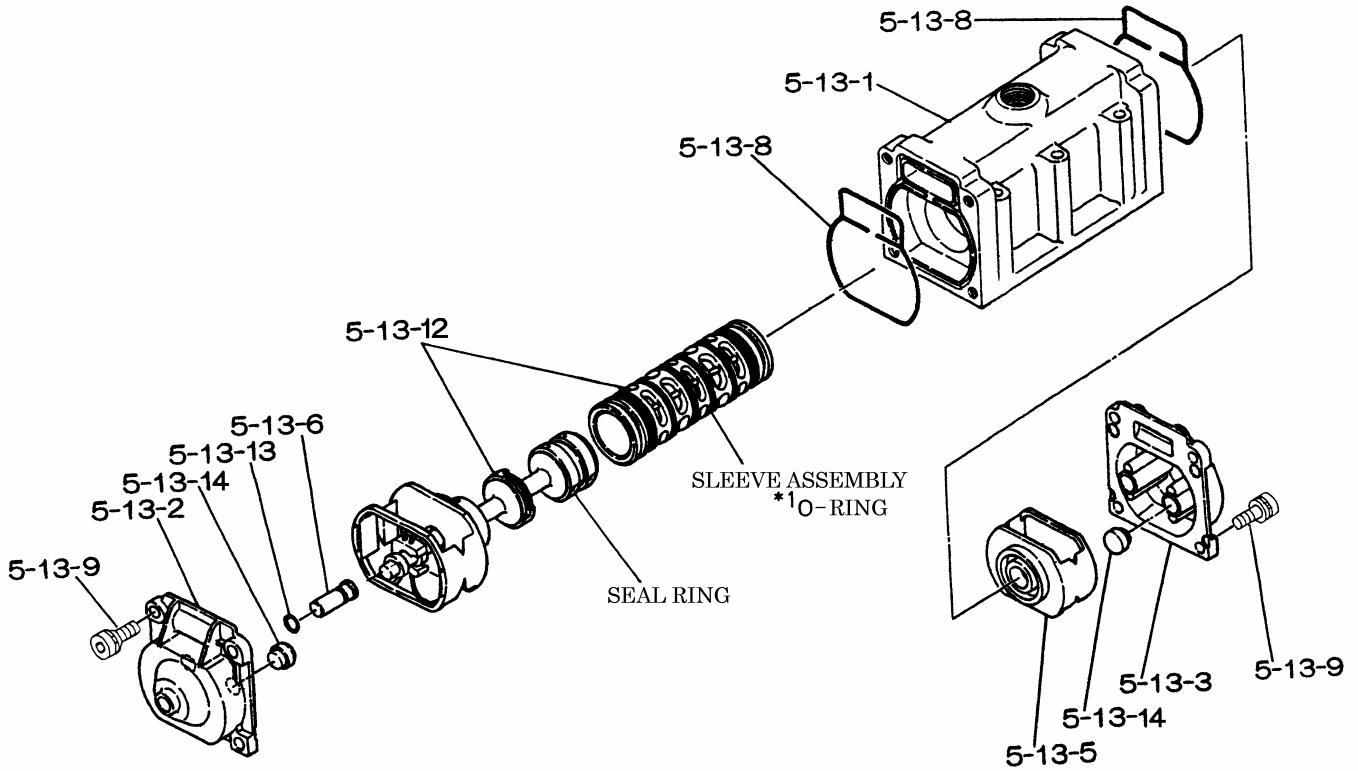
#### BODY ASSEMBLY

NO.	NDP-40	NDP-50	NDP-80	DESCRIPTION	Q'TY	NOTE
	803111	803112	803113			
	803117	803118	803119			
5-1	711933	711934	711935	AIR CHAMBER	2	
5-2	711936	711936	711936	BODY	1	
5-3	772689	772689	772689	THROAT BEARING	2	
5-4	711937	711937	711937	SPRING	2	
5-5	771740	771740	771740	VALVE SEAT	2	
5-6	832162	832162	832163	PILOT VALVE ASSEMBLY	2	
5-8	640020	640020	640020	O RING	2	P22A NBR
5-9	685444	685444	685444	PACKING	2	PNY-25
5-10	640029	640029	640029	O RING	2	P30 NBR
5-11	771742	771742	771742	GASKET	2	
5-12	683812	683812	683812	FLAT HEAD BOLT	12	M8x1.25x20
5-13	802971	802971	802971	VALVE BODY ASSEMBLY	1	
5-14	771712	771712	771712	GASKET	1	
5-15	684240	684240	684240	BOLT	6	M8x1.25x85
5-18	684987	684987	684987	PLAIN WASHER	12	



### 9.10 Exploded View

### ■ VALVE BODY ASSEMBLY



### 9.10 Parts List

### ■ VALVE BODY ASSEMBLY

#### 802971 VALVE BODY ASSEMBLY

NO.	PART NO.	DESCRIPTION	Q'TY	NOTE
5-13-1	711931	VALVE BODY	1	
5-13-2	580999	CAP A	1	
5-13-3	581000	CAP B	1	
5-13-5	771735	SPRING STOPPER	1	
5-13-6	712976	RESET BUTTON	1	
5-13-8	771738	GASKET	2	
5-13-9	685036	HEXAGON SOCKET HEAD BOLT	8	M8x1.25x20
5-13-12	803115	C SPOOL VALVE ASSEMBLY	1	*1(640036)
5-13-13	640005	O RING	1	P8 NBR
5-13-14	684128	CUSHION	4	

NOTE)\*1:PARTS NUMBER MENTIONED ON O RING FOR SLEEVE ASSEMBLY ONLY.

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