Doc. No.	NDP 188M-04

MAINTENANCE MANUAL

YAMADA AIR-OPERATED DIAPHRAGM PUMPS

NDP-40
NDP-50
NDP-80

⚠ 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 2007 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 or property damage.

⚠ 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.

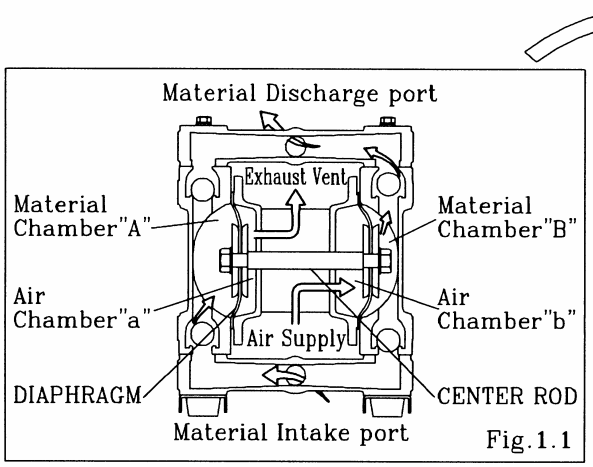


Fig.1.1

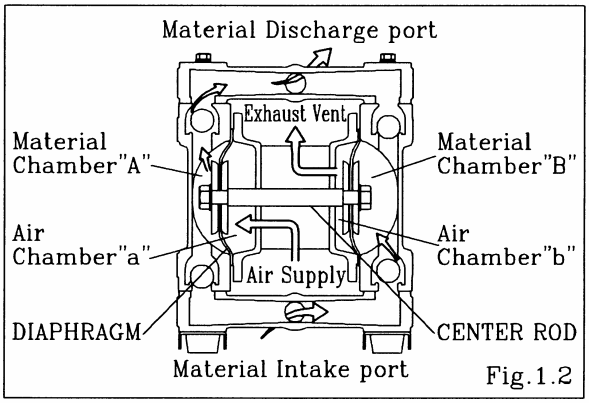


Fig.1.2

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□, B□V), 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

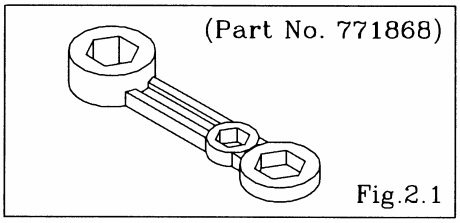


Fig.2.1

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

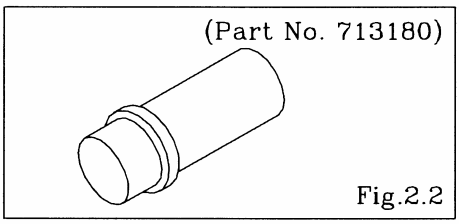


Fig.2.2

2.3 Misc.

·Assembly oil	Turbine oil none addition class 1 (equivalent to 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□.)

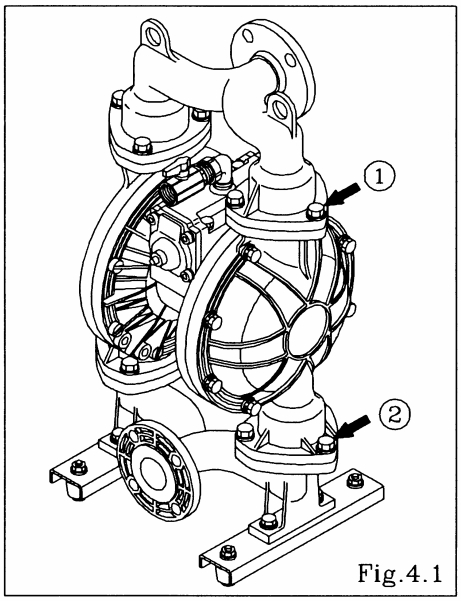


Fig.4.1

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

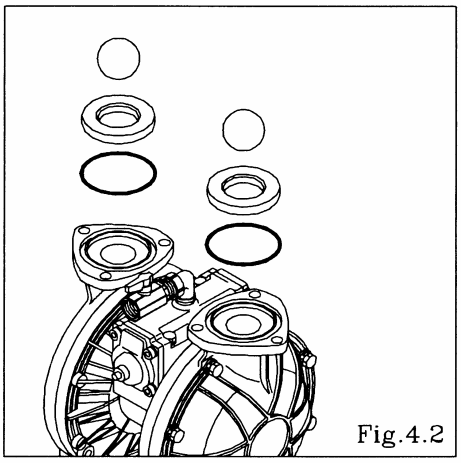


Fig.4.2

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

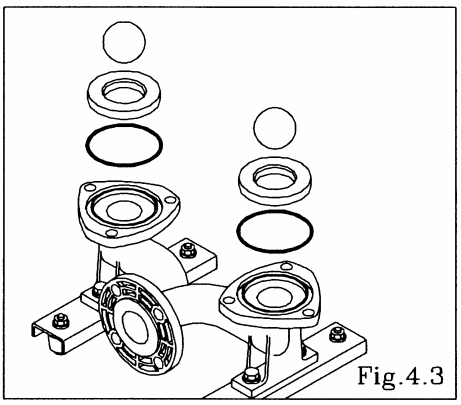


Fig.4.3

▪ 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.

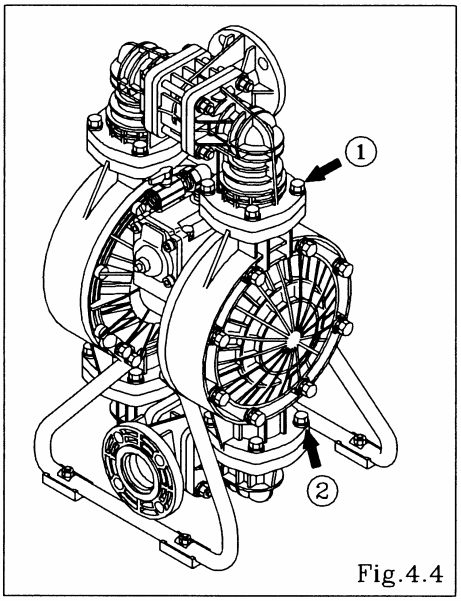


Fig.4.4

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

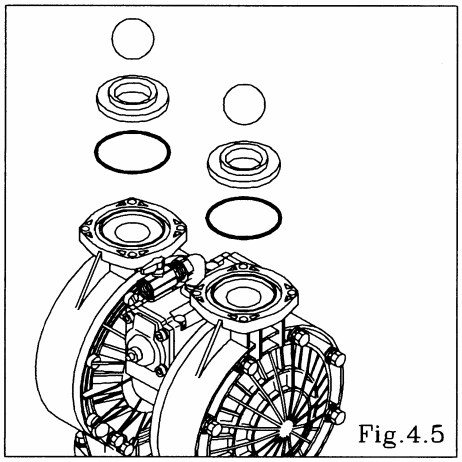


Fig.4.5

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

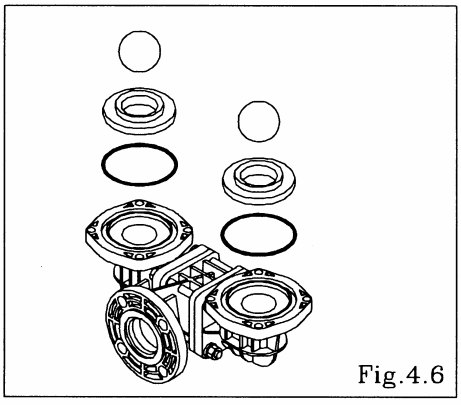


Fig.4.6

▪ 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□.)

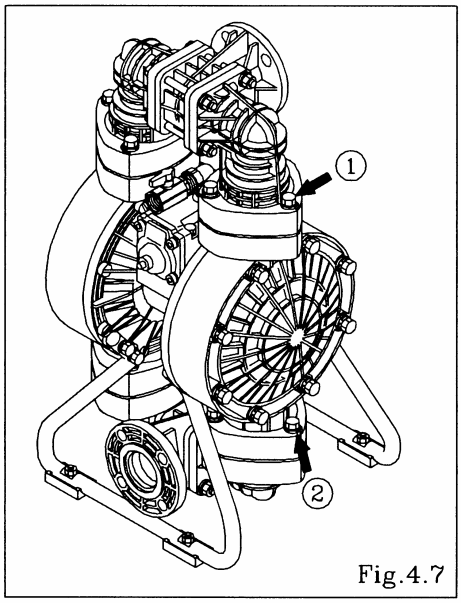


Fig.4.7

- 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]

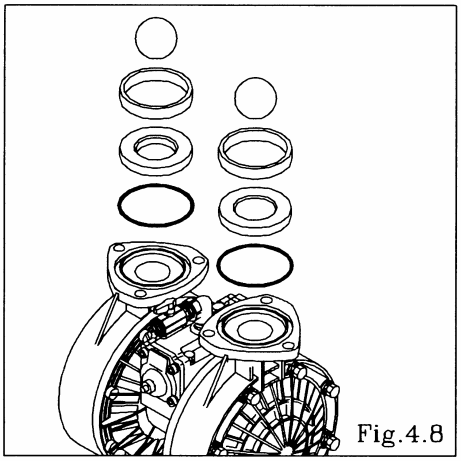


Fig.4.8

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

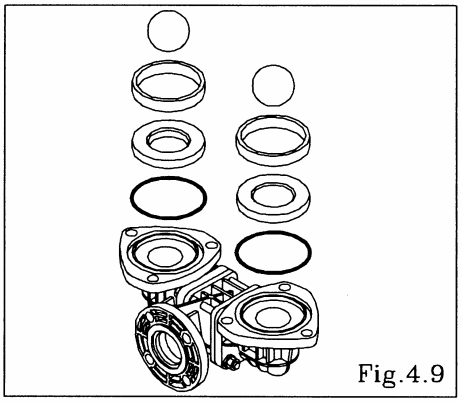


Fig.4.9

- 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

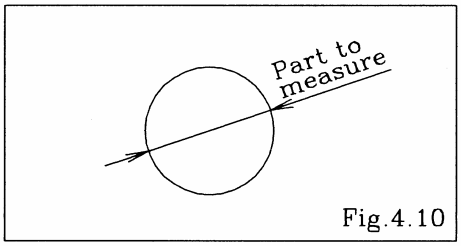


Fig.4.10

▪ 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	SØ 45.0 ~ SØ 51.5 mm
NDP-50	SØ 56.7 ~ SØ 64.9 mm
NDP-80	SØ 81.0 ~ SØ 92.7 mm

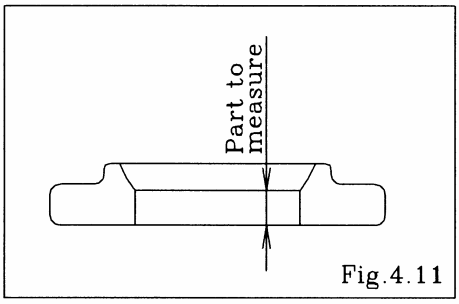


Fig.4.11

▪ 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	4.6 ~ 11.5 mm	1.7 ~ 4.1 mm
NDP-50	5.0 ~ 12.5 mm	
NDP-80		

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

Tightening torque for manifold retainer bolts

20 N・m{ 200 kgf・cm}

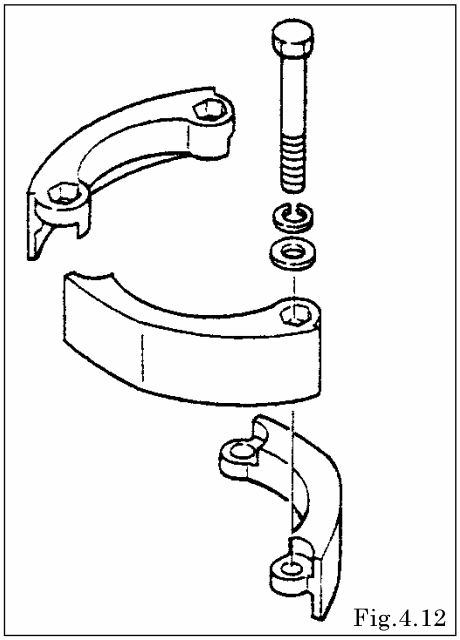


Fig.4.12

<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□.)

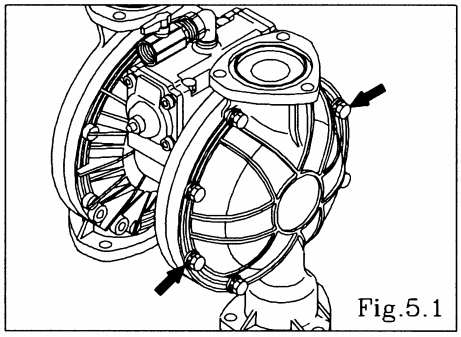


Fig.5.1

- 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]

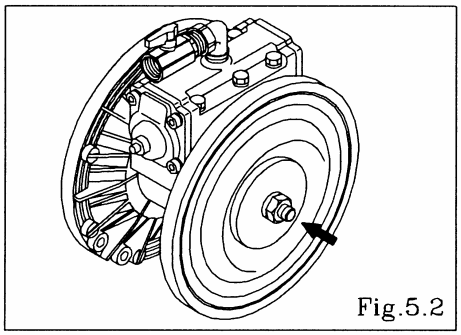


Fig.5.2

- 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.

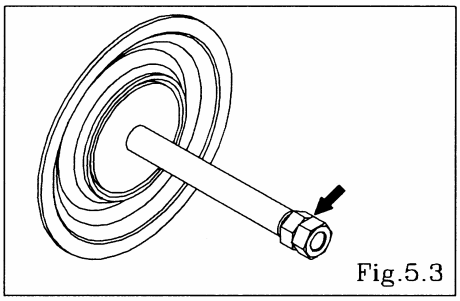


Fig.5.3

- 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□.)

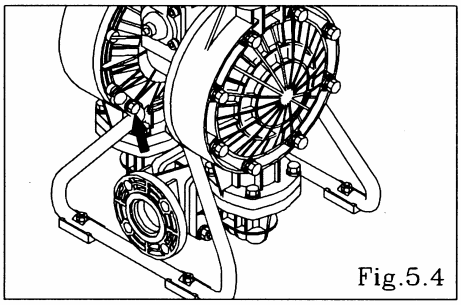


Fig.5.4

- Remove the ball etc.(see [4.1 Removal BP□, BV□ types] on pp. 3-4)
- Remove the 8 (4 on the NDP-40) retainer bolts from the stand body, and remove the stand body. [Fig.5.4]

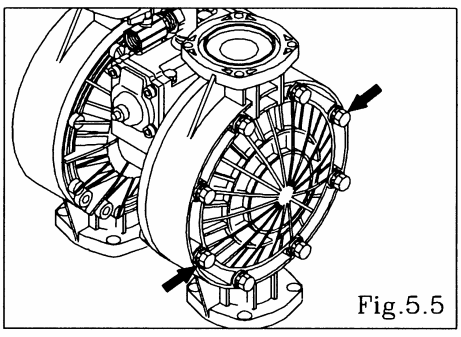


Fig.5.5

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

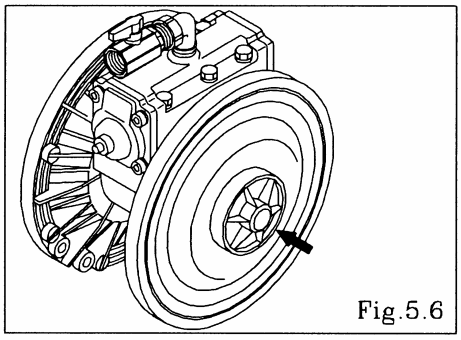


Fig.5.6

- 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.

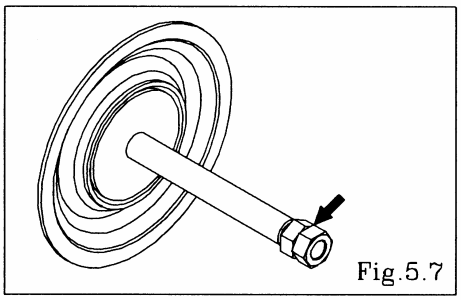


Fig.5.7

- Fix a double nut to one end of the center rod and take the diaphragm and center disk off the oppsite end. [Fig.5.7]
  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)

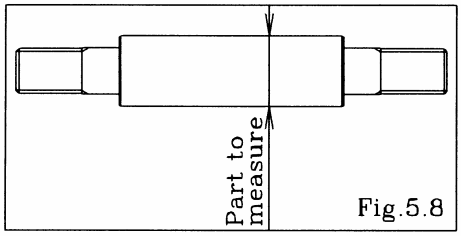


Fig.5.8

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

Usable range of center rod

Ø 24.93 ~ Ø 25.00 mm

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.

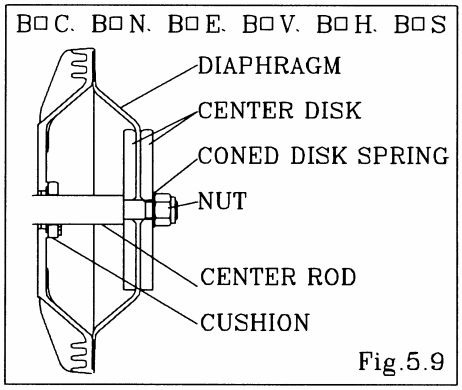


Fig.5.9

- Apply assembly grease to 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□	60 N・m { 600 kgf・cm }
BP□, BV□	50 N・m { 500 kgf・cm }

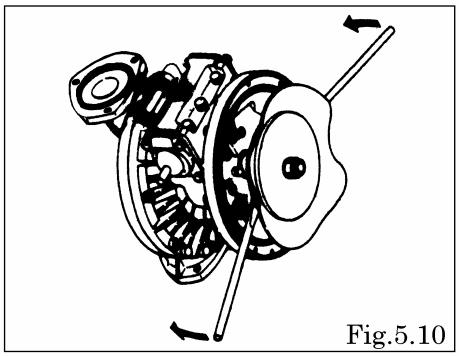


Fig.5.10

- 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.

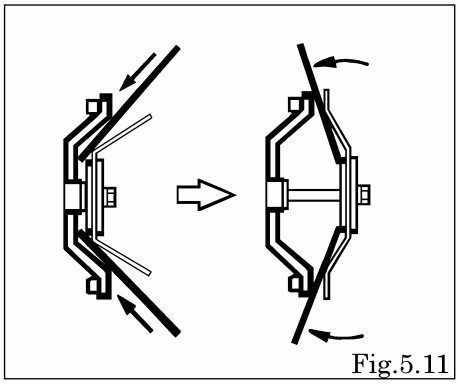


Fig.5.11

Tightening torque for out chamber.

BA□, BS□, BF□	CR, NBR, EPDM,FKM	35 N・m{ 350 kgf・cm }
	TPEE, TPO	40 N・m{ 400 kgf・cm }
BP□, BV□	CR, NBR, EPDM,FKM	30 N・m{ 300 kgf・cm }
	TPEE, TPO	35 N・m{ 350 kgf・cm }

<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 that balance should be equal from both side on diagonal line with even torque.

■B□T type

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

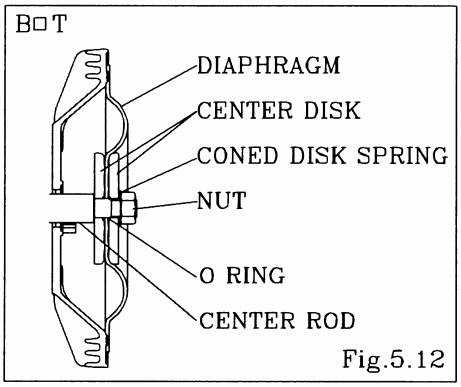


Fig.5.12

- Apply assembly grease to center rod, and insert it into the main body.
- Keep the convex side to the outside (cf. Fig.5.12).
- Put the O rings to both sides of the diaphragm. (cf. Fig.5.12)
- 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	60 N・m { 600 kgf・cm }
BPT, BVT	50 N・m { 500 kgf・cm }

- 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	40 N・m{ 400 kgf・cm }
BPT, BVT	35 N・m{ 350 kgf・cm }

<NOTE>

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

6.Throat bearing and Pilot valve assembly

6.1 Removal

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

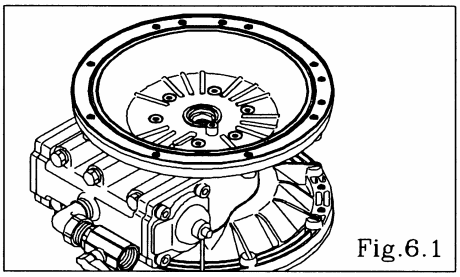


Fig.6.1

- 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]

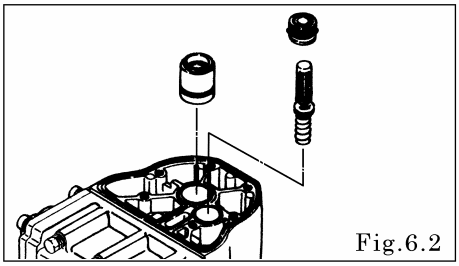


Fig.6.2

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

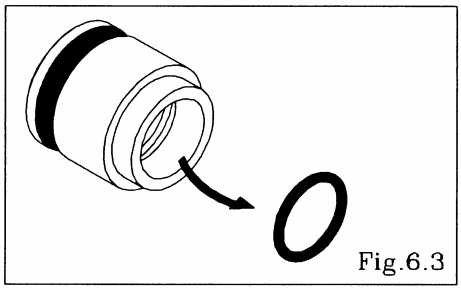


Fig.6.3

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

6.2 Inspection

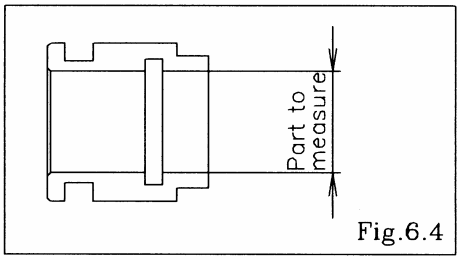


Fig.6.4

- 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

Ø 25.04~ Ø 25.13mm

- O rings, Packing
  If the O rig 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.

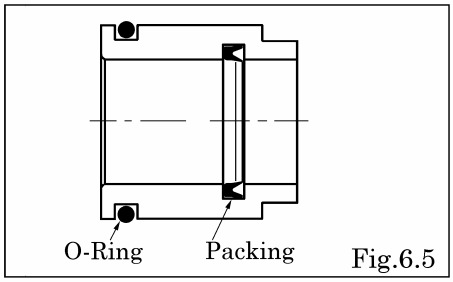


Fig.6.5

Tightening torque for air chamber retainer bolts

20 N・m { 200kgf・cm }

<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.

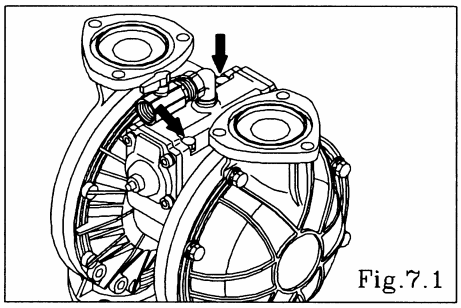


Fig.7.1

- 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]

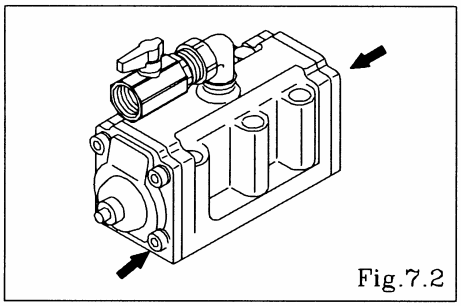


Fig.7.2

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

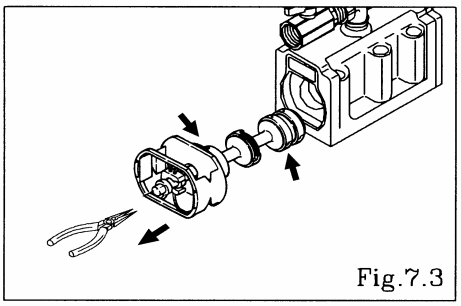


Fig.7.3

- 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]

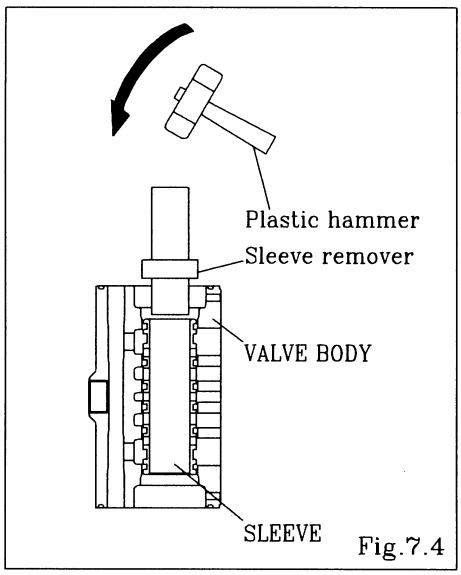


Fig.7.4

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

7.2 Inspection

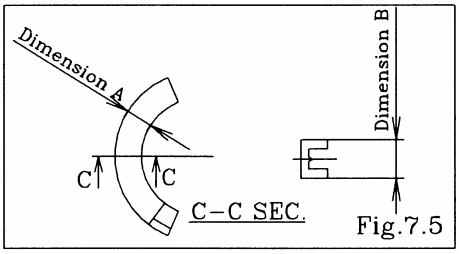


Fig.7.5

▪ 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.

Usable range of seal ring

Dimension A	More than 5.05 mm
Dimension B	More than 7.30 mm

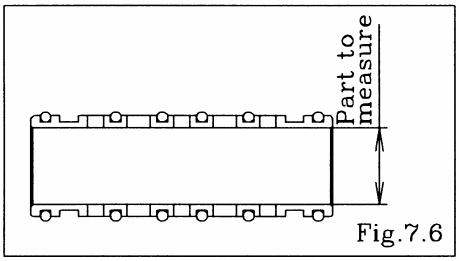


Fig.7.6

▪ 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

Ø 33.15 ~ Ø 33.35 mm

▪ O rings

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

<NOTE>

▪ C Spool Valve Assembly must be replaced 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.

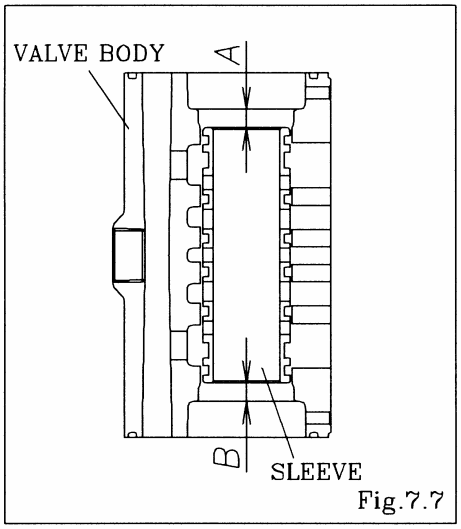


Fig.7.7

▪ 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

10 N・m { 100 kgf・cm }

Tightening torque for valve body installation bolts

17 N・m { 170 kgf・cm }

<NOTE>

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

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.

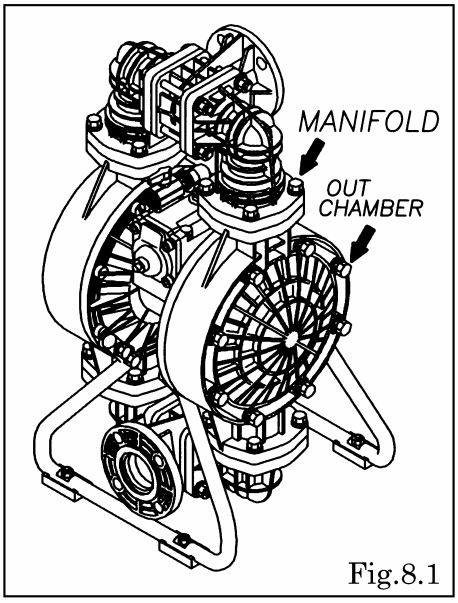
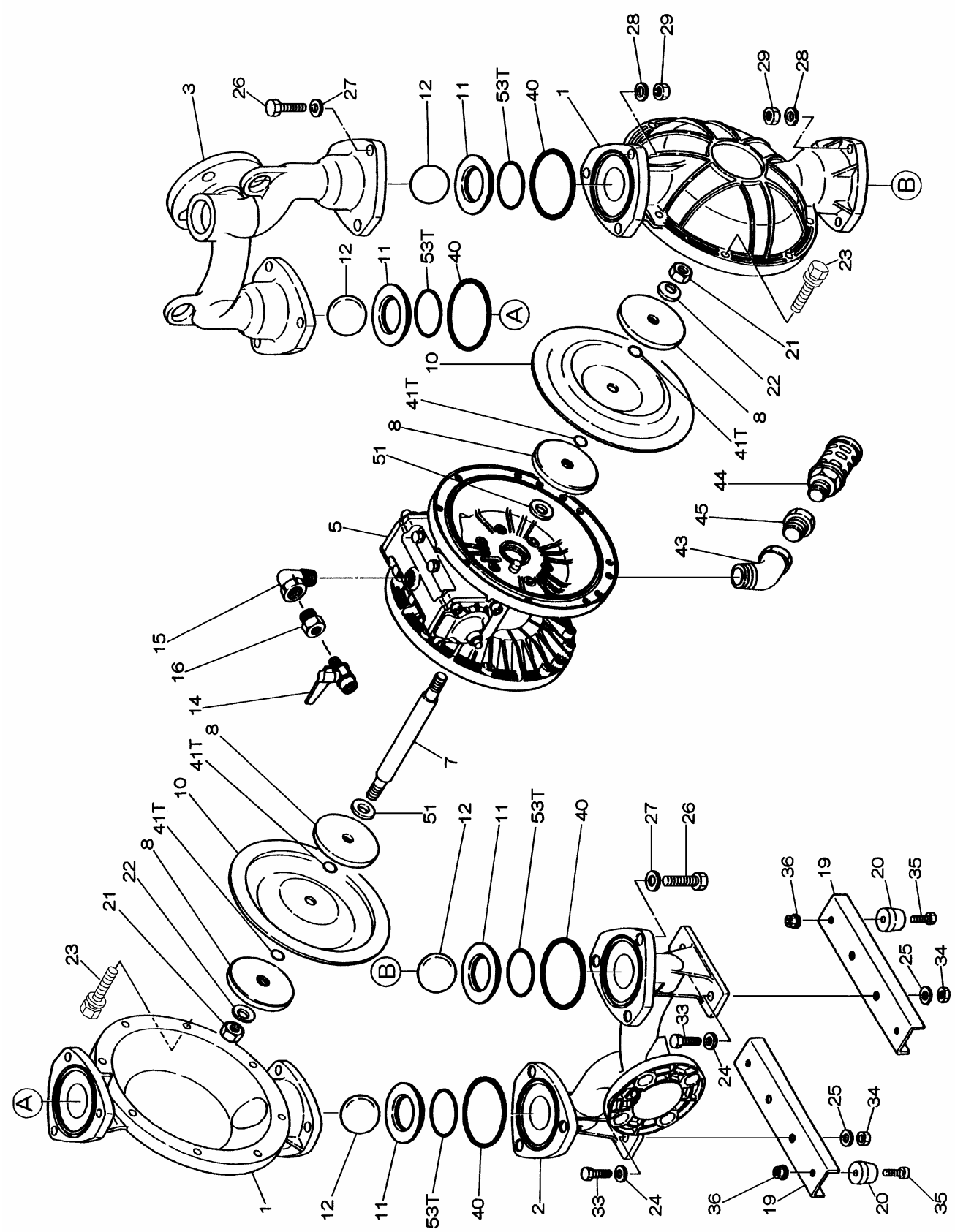


Fig.8.1

<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 ■ NDP-40 ▪ 50BA□



9.1 Parts List ■ NDP-40 ▪ 50BA□

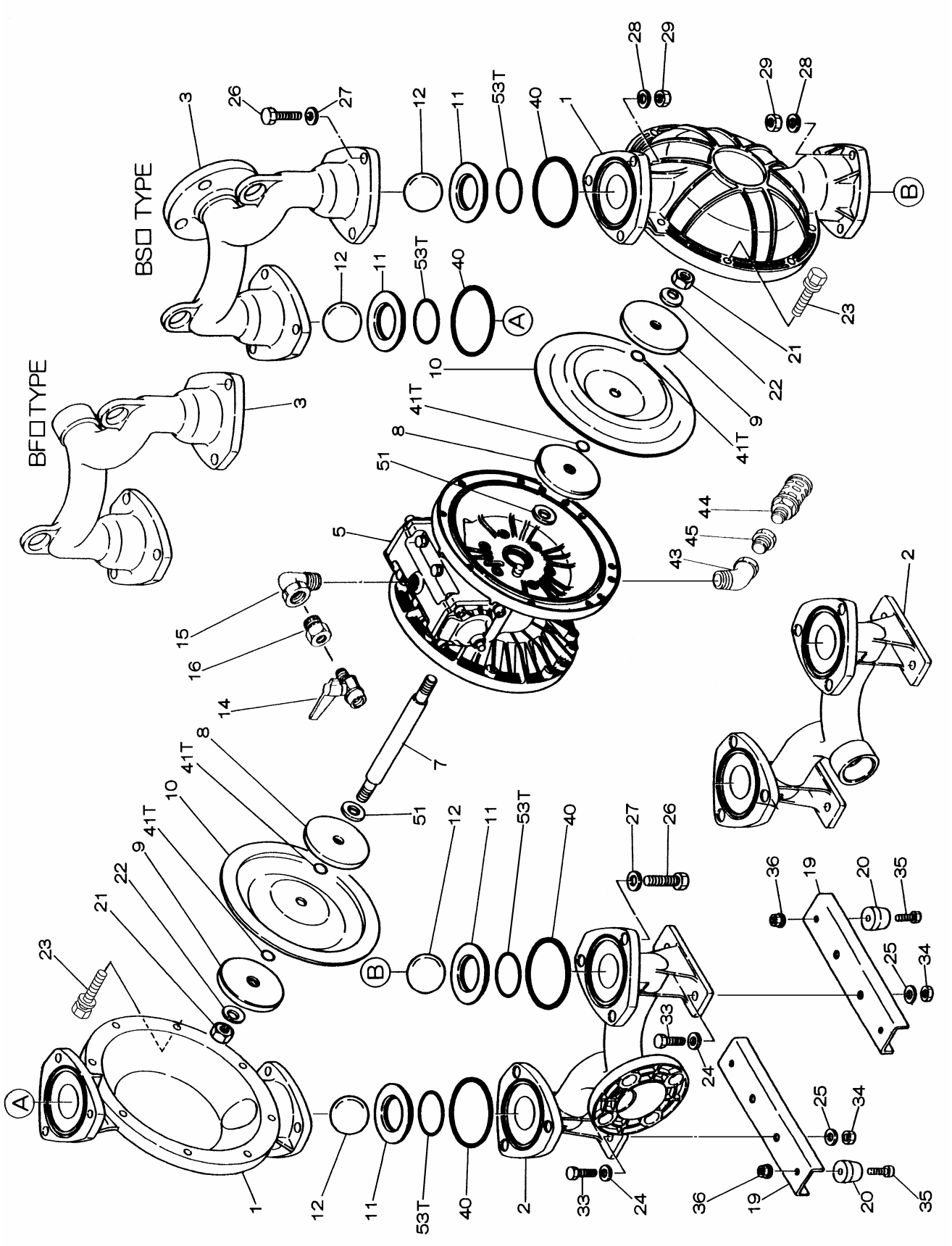
NO.	40BA□	50BA□	DESCRIPTION	Q'TY	NOTE
1	580960	580961	OUT CHAMBER	2	
2	714366		IN MANIFOLD	1	581048
		714368		1	581049
3	714360		OUT MANIFOLD	1	581045
		714362		1	581046
5	803121	803122	BODY ASSEMBLY	1	
7	711900	←	CENTER ROD	1	
7T	711939	←	CENTER ROD	1	
8	711902	711904	CENTER DISK	4	
8T	707817	707822	CENTER DISK	4	
10	Tab.1	←	DIAPHRAGM	2	
11	Tab.3	←	VALVE SEAT	4	
12	Tab.4	←	BALL	4	
14	684323		BALL VALVE	1	1/2"
		684324	BALL VALVE	1	3/4"
15	634034	←	ELBOW	1	3/4"
16	634601		BUSHING	1	3/4"x 1/2"
19	711911	711928	PUMP BASE	2	
20	771402	←	CUSHION	4	
21	Tab.6	←	NUT	2	M16 x 1.5
22	682740	←	CONED DISK SPRING	2	M16
23	686045	←	BOLT	16	M10 x 1.5 x 60
24	631014	←	PLAIN WASHER	4	M10
25	631917	←	WAVE SPRING WASHER	4	M10
26	611203	←	BOLT	12	M12 x 1.75 x 50
27	631015	←	PLAIN WASHER	12	M12
28	631918	←	WAVE SPRING WASHER	12	M12
29	627014	←	NUT	12	M12 x 1.75
33	611175		BOLT	4	M10 x 1.5 x 30
		611177		4	M10 x 1.5 x 35
34	627013	←	NUT	4	M10 x 1.5
35	611149	←	BOLT	4	M8 x 1.25 x 25
36	682276	←	NUT WITH FLANGE	4	M8 x 1.25
40	Tab.8	←	O RING	4	
41T	643015	←	O RING	4	P16 PTFE
43	634050	←	ELBOW	1	1"
44	680913		SILENCER	1	3/4"
		681040	SILENCER	1	1"
45	634605		BUSHING	1	1" x 3/4"
50	791071	←	NAME PLATE	1	
51	770582	←	CUSHION	2	EXCLUDED BAT
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

9.2 Exploded View ■ NDP-40 ▪ 50BS□, BF□

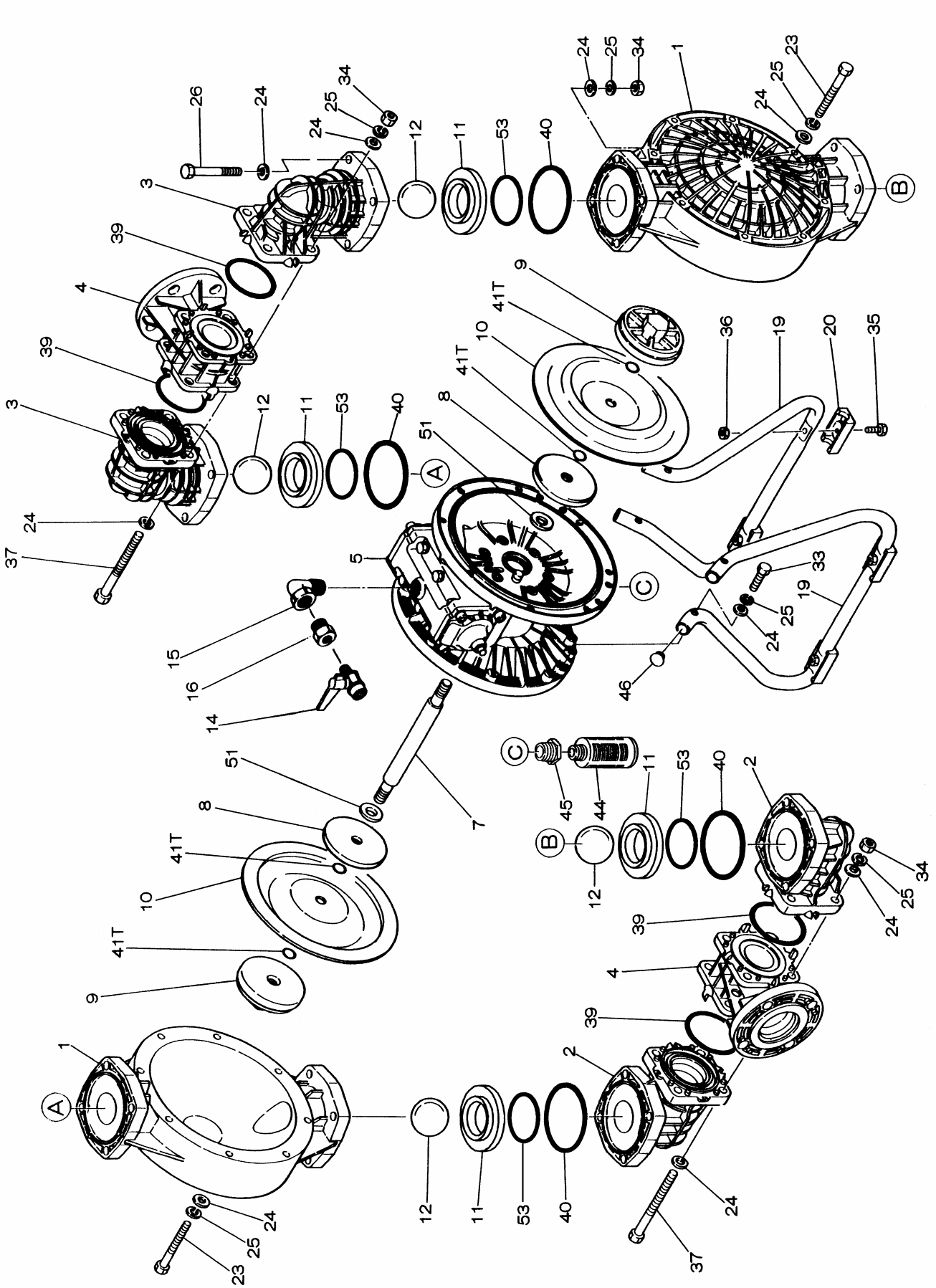


9.2 Parts List ■ NDP-40 ▪ 50BS□, BF□

NO.	40BS□	40BF□	50BS□	50BF□	DESCRIPTION	Q'TY	NOTE
1	712931	713156	712932	713157	OUT CHAMBER	2	
2	712610	713162	712557	713163	IN MANIFOLD	1	
3	712609	713159	712556	713160	OUT MANIFOLD	1	
5	803125	803121	803126	803122	BODY ASSEMBLY	1	
7	711900	←	←	←	CENTER ROD	1	
7T	711939	←	←	←	CENTER ROD	1	
8	711902	←	711904	←	CENTER DISK	2	
8T	707817	←	707822	←	CENTER DISK	2	
9	711903	713369	711905	713370	CENTER DISK	2	
9T	707818	713389	707823	713390	CENTER DISK	2	
10	Tab.1	←	←	←	DIAPHRAGM	2	
11	Tab.3	←	←	←	VALVE SEAT	4	
12	Tab.4	←	←	←	BALL	4	
14	684323	←			BALL VALVE	1	1/2"
			684324	←	BALL VALVE	1	3/4"
15	634034	←	←	←	ELBOW	1	3/4"
16	634601	←			BUSHING	1	3/4" x 1/2"
19	711911	←	711928	←	PUMP BASE	2	
20	771402	←	←	←	CUSHION	4	
21	Tab.6	←	←	←	NUT	2	M16 x 1.5
22	682740	←	←	←	CONED DISK SPRING	2	M16
23	686044	680623	686044	686023	BOLT	16	M10 x 1.5 45
24	631174	631014	631174	631014	PLAIN WASHER	4	M10
25	631937	631917	631937	631917	WAVE SPRING WASHER	4	M10
26	621202	611202			BOLT	12	M12 x 1.75 x 45
			621203	611203	BOLT	12	M12 x 1.75 x 50
27	631175	631015	631175	631015	PLAIN WASHER	12	M12
28	631938	631918	631938	631918	WAVE SPRING WASHER	12	M12
29	628014	627014	628014	627014	NUT	12	M12 x 1.75
33	621175	611175	621175	611175	BOLT	4	M10 x 1.5 x 30
34	628013	627013	628013	627013	NUT	4	M10 x 1.5
35	611149	←	←	←	BOLT	4	M8 x 1.25 x 25
36	682276	←	←	←	NUT WITH FLANGE	4	M8 x 1.25
40	Tab.8	←	←	←	O RING	4	
41T	643015	←	←	←	O RING	4	P16 PTFE
43	634050	←	←	←	ELBOW	1	1"
44	680913	←			SILENCER	1	3/4"
			681040	←	SILENCER	1	1"
45	634605	←			BUSHING	1	1" x 3/4"
50	791071	←	←	←	NAME PLATE	1	
51	770582	←	←	←	CUSHION	2	EXCLUDED B□T
53T	643136	←			O RING	4	G55 PTFE
			643139	←		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

9.3 Exploded View ■ NDP-40BP□, BV□



9.3 Parts List ■ NDP-40BP□, BV□

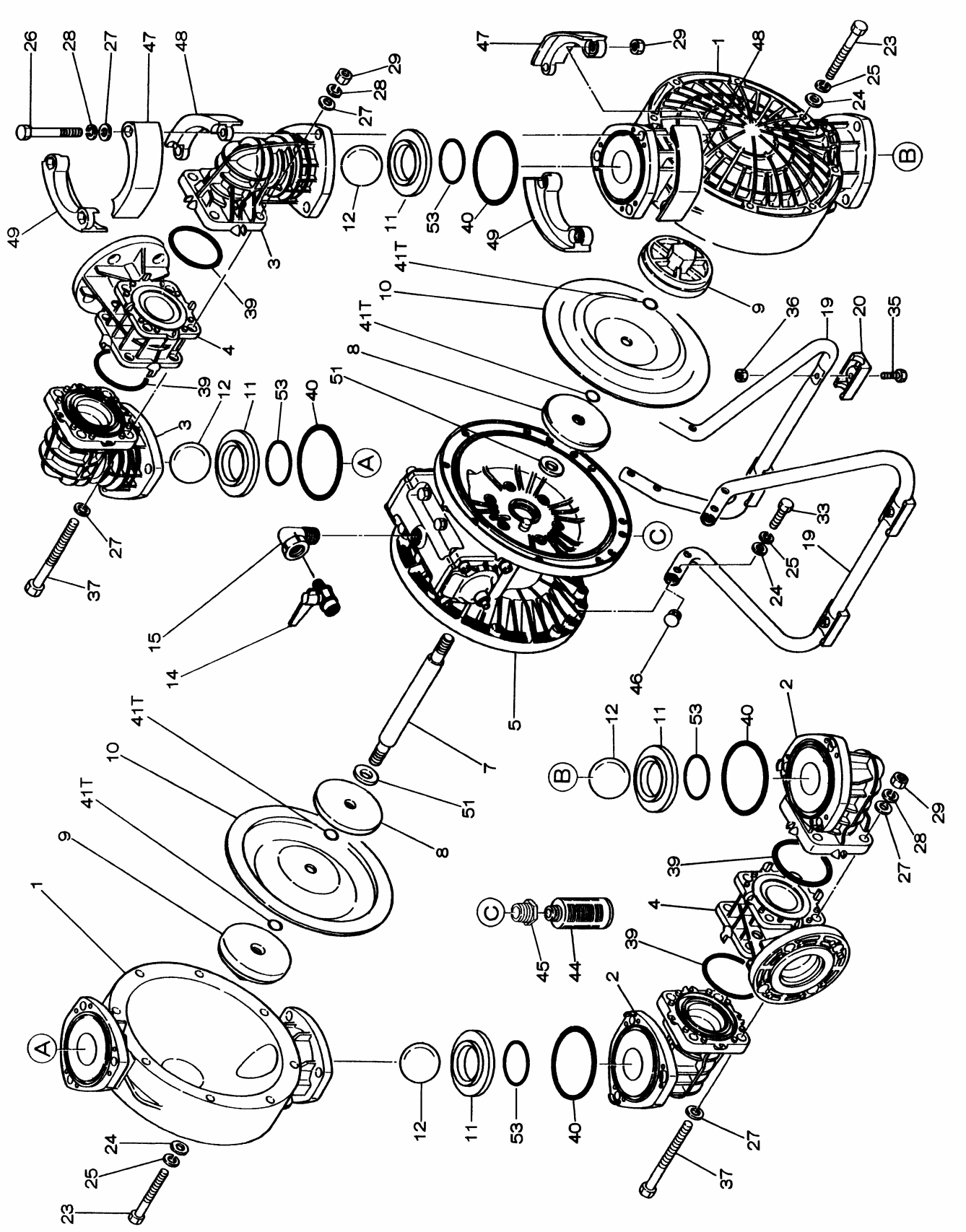
NO.	BP□	BV□	DESCRIPTION	Q'TY	NOTE
1	772076	780215	OUT CHAMBER	2	
2	772079	772727	IN MANIFOLD	2	
3	780150	780205	OUT MANIFOLD	2	
4	771797	780219	CENTER MANIFOLD	2	
5	803125	←	BODY ASSEMBLY	1	
7	711900	←	CENTER ROD	1	
7T	711939	←	CENTER ROD	1	
8	711902	←	CENTER DISK	2	
8T	707817	←	CENTER DISK	2	
9	771725	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	Tab.5	BALL	4	
14	684323	←	BALL VALVE	1	1/2"
15	634034	←	ELBOW	1	3/4"
16	634601	←	BUSHING	1	3/4" x 1/2"
19	711925	←	STAND BODY	2	
20	771865	←	CUSHION	4	
23	683541	←	BOLT	16	M10 x 1.5 x 110
24	631330		PLAIN WASHER	68	M10
		631330		84	M10
25	680257	←	SPRING LOCK WASHER	44	M10
26	621183	←	BOLT	16	M10 x 1.5 x 60
33	621179	←	BOLT	4	M10 x 1.5 x 40
34	628013	←	NUT	24	M10 x 1.5
35	621149	←	BOLT	4	M8 x 1.25 x 25
36	683837	←	NUT WITH FLANGE	4	M8 x 1.25
37	683542	←	BOLT	8	M10 x 1.5 x 120
39	Tab.7	Tab.9	O RING	4	
40	Tab.8	Tab.10	O RING	4	
41T	643015	←	O RING	4	P16 PTFE
44	683098	←	SILENCER	1	3/4"
45	634605	←	BUSHING	1	1"×3/4"
46	683641	←	CAP	4	
50	790910	←	NAME PLATE	1	
51	770582	←	CUSHION	2	EXCLUDED BPT
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

9.4 Exploded View ■ NDP-50BP□, BV□



9.4 Parts List ■ NDP-50BP□, BV□

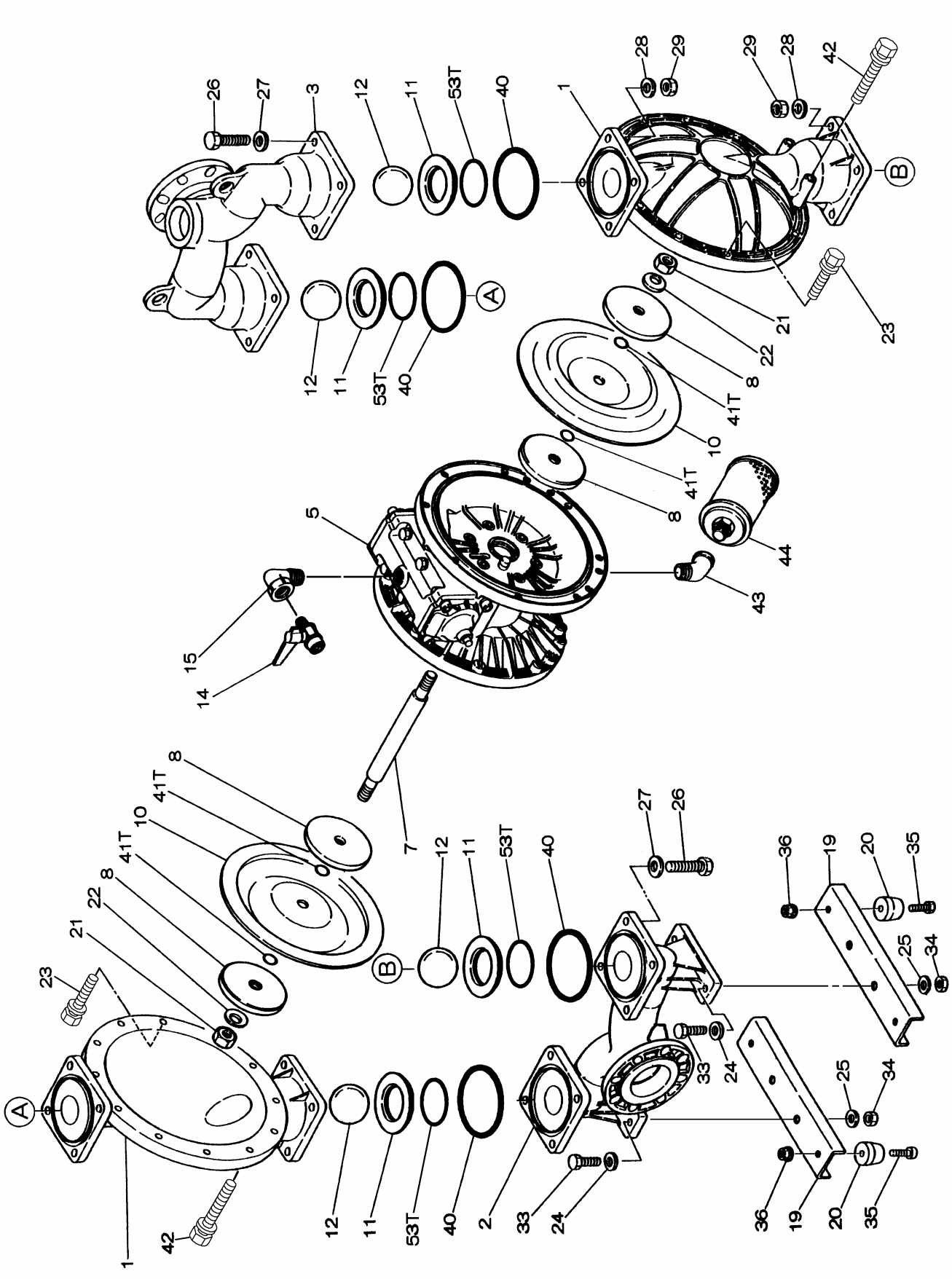
NO.	BP□	BV□	DESCRIPTION	Q'TY	NOTE
1	780148	780153	OUT CHAMBER	2	
2	772080	772086	IN MANIFOLD	2	
3	780151	780154	OUT MANIFOLD	2	
4	771723	780115	CENTER MANIFOLD	2	
5	803126	←	BODY ASSEMBLY	1	
7	711900	←	CENTER ROD	1	
7T	711939	←	CENTER ROD	1	
8	711904	←	CENTER DISK	2	
8T	707822	←	CENTER DISK	2	
9	771727	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	684324	←	BALL VALVE	1	3/4"
15	634034	←	ELBOW	1	3/4"
19	711926	←	STAND BODY	2	
20	771865	←	CUSHION	4	
23	683541	←	BOLT	16	M10 x 1.5 x 110
24	631330	←	PLAIN WASHER	24	M10
25	680257	←	SPRING LOCK WASHER	24	M10
26	621213	←	BOLT	12	M12 x 1.75 x 100
27	631331		PLAIN WASHER	28	M12
		631331	PLAIN WASHER	32	M12
28	680607	←	SPRING LOCK WASHER	20	M12
29	628014	←	NUT	20	M12 x 1.75
33	621179	←	BOLT	8	M10 x 1.5 x 40
35	621149	←	BOLT	4	M8 x 1.25 x 25
36	683837	←	NUT WITH FLANGE	4	M8 x 1.25
37	684592	←	BOLT	8	M12 x 1.75 x 137
39	Tab.7	Tab.9	O RING	4	
40	Tab.8	Tab.10	O RING	4	
41T	643015	←	O RING	4	P16 PTFE
44	683098	←	SILENCER	1	3/4"
45	634605	←	BUSHING	1	1" x 3/4"
46	683641	←	CAP	4	
47	771786	←	PROTECTOR A	8	
48	771787	←	PROTECTOR B	8	
49	771788	←	PROTECTOR C	8	
50	790910	←	NAME PLATE	1	
51	770582	←	CUSHION	2	EXCLUDED B□T
53	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□

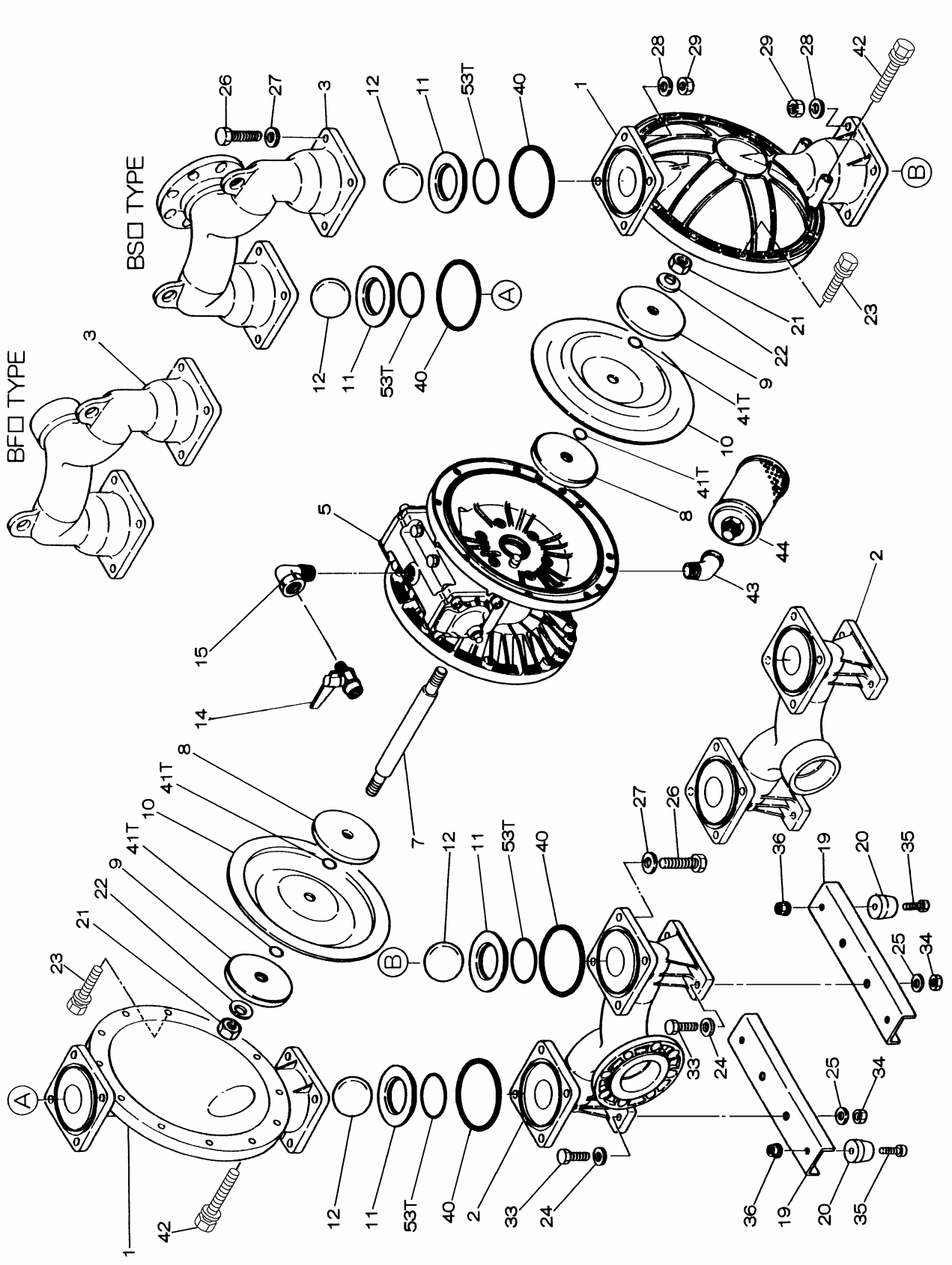
NO.	BA□	DESCRIPTION	Q'TY	NOTE
1	580962	OUT CHAMBER	2	
2	714370	IN MANIFOLD	1	581050
3	714364	OUT MANIFOLD	1	581047
5	803123	BODY ASSEMBLY	1	
7	711901	CENTER ROD	1	
7T	711940	CENTER ROD	1	
8	711906	CENTER DISK	4	
8T	711041	CENTER DISK	4	
10	Tab.1	DIAPHRAGM	2	
11	Tab.3	VALVE SEAT	4	
12	Tab.4	BALL	4	
14	684324	BALL VALVE	1	3/4"
15	634034	ELBOW	1	3/4"
19	711912	PUMP BASE	2	
20	771402	CUSHION	4	
21	Tab.6	NUT	2	
22	682740	CONED DISK SPRING	2	M16
23	686025	BOLT	20	M10 x 1.5 x 70
24	631014	PLAIN WASHER	4	M10
25	631917	WAVE SPRING WASHER	4	M10
26	611204	BOLT	16	M12 x 1.75 x 55
27	631015	PLAIN WASHER	16	M12
28	631918	WAVE SPRING WASHER	16	M12
29	627014	NUT	16	M12 x 1.75
33	611177	BOLT	4	M10 x 1.5 x 35
34	627013	NUT	4	M10 x 1.5
35	611149	BOLT	4	M8 x 1.25 x 25
36	682276	NUT WITH FLANGE	4	M8 x 1.25
40	Tab.8	O RING	4	
41T	643015	O RING	4	P16 PTFE
42	686026	BOLT	4	M10 x 1.5 x 130
43	634050	ELBOW	1	1"
44	681040	SILENCER	1	1"
50	791071	NAME PLATE	1	
53T	643135	O RING	4	G100 PTFE

NOTE 1)T:BAT

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

9.6 Exploded View ■ NDP-80BS□, BF□



9.6 Parts List ■ NDP-80BS□, BF□

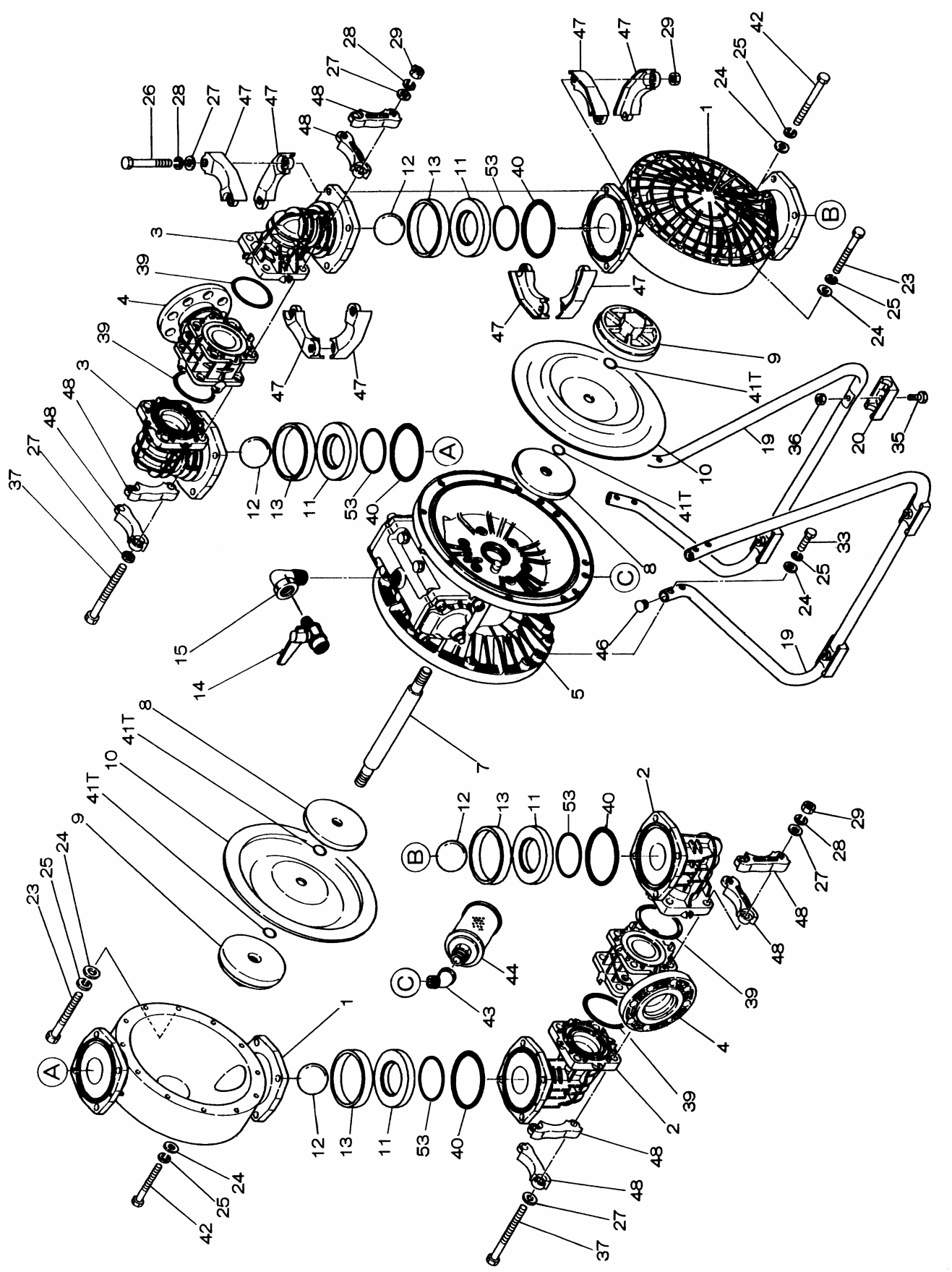
NO.	BS□	BF□	DESCRIPTION	Q'TY	NOTE
1	712933	713158	OUT CHAMBER	2	
2	712603	713164	IN MANIFOLD	1	
3	712602	713161	OUT MANIFOLD	1	
5	803127	803123	BODY ASSEMBLY	1	
7	711901	←	CENTER ROD	1	
7T	711940	←	CENTER ROD	1	
8	711906	←	CENTER DISK	2	
8T	711041	←	CENTER DISK	2	
9	711907	713371	CENTER DISK	2	
9T	711039	713391	CENTER DISK	2	
10	Tab.1	←	DIAPHRAGM	2	
11	Tab.3	←	VALVE SEAT	4	
12	Tab.4	←	BALL	4	
14	684324	←	BALL VALVE	1	3/4"
15	634034	←	ELBOW	1	3/4"
19	711912	←	PUMP BASE	2	
20	771402	←	CUSHION	4	
21	Tab.6	←	NUT	2	
22	682740	←	CONED DISK SPRING	2	M16
23	686059	686024	BOLT	20	M10 x 1.5 x 55
24	631174	631014	PLAIN WASHER	4	M10
25	631937	631917	WAVE SPRING WASHER	4	M10
26	621203		BOLT	16	M12 x 1.75 x 50
		611204	BOLT	16	M12 x 1.75 x 55
27	631175	631015	PLAIN WASHER	16	M12
28	631938	631918	WAVE SPRING WASHER	16	M12
29	628014	627014	NUT	16	M12 x 1.75
33	621177	611177	BOLT	4	M10 x 1.5 x 35
34	628013	627013	NUT	4	M10 x 1.5
35	611149	←	BOLT	4	M8 x 1.25 x 25
36	682276	←	NUT WITH FLANGE	4	M8 x 1.25
40	Tab.8	←	O RING	4	
41T	643015	←	O RING	4	P16 PTFE
42	686046	686026	BOLT	4	M10 x 1.5 x 130
43	634050	←	ELBOW	1	1"
44	681040	←	SILENCER	1	1"
50	791071	←	NAME PLATE	1	
53T	643135	←	O RING	4	G100 PTFE

NOTE 1)T:BST

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

9.7 Exploded View ■ NDP-80BP□



9.7 Parts List ■ NDP-80BP□

NO.	BP□	DESCRIPTION	Q'TY	NOTE
1	780149	OUT CHAMBER	2	
2	772081	IN MANIFOLD	2	
3	780152	OUT MANIFOLD	2	
4	771724	CENTER MANIFOLD	2	
5	803127	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	684324	BALL VALVE	1	3/4"
15	634034	ELBOW	1	3/4"
19	711927	STAND BODY	2	
20	771865	CUSHION	4	
23	683543	BOLT	20	M10 x 1.5 x 130
24	631330	PLAIN WASHER	32	M10
25	680257	SPRING LOCK WASHER	32	M10
26	621213	BOLT	16	M12 x 1.75 x 100
27	631331	PLAIN WASHER	32	M12
28	680607	SPRING LOCK WASHER	24	M12
29	628014	NUT	24	M12 x 1.75
33	621179	BOLT	8	M10 x 1.5 x 40
35	621149	BOLT	4	M8 x 1.25 x 25
36	683837	NUT WITH FLANGE	4	M8 x 1.25
37	683544	BOLT	8	M12 x 1.75 x 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 x 1.5 x 150
43	634050	ELBOW	1	1"
44	681040	SILENCER	1	1"
46	683641	CAP	4	
47	771789	PROTECTOR A	32	
48	771790	PROTECTOR B	16	
50	790910	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
B□H/T	771701	771703	771705	TPEE

Tab.2 DIAPHRAGM

TYPE	NDP-40	NDP-50	MATERIAL
	BV□	BV□	
BVC			
BVN			
BVE	771854	771856	EPDM
BVV		771800	FKM
BVT	770814	770815	PTFE
BVH			
BVS	771975		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	←	771957	←	771958	←	CR
B□N	771994	←	771995	←	771996	←	NBR
B□E	771921	←	771949	←	771999	←	EPDM
B□V	771997	←	771987	←	771998	←	FKM
B□T	712382		712383		712384		A5056
		711908		711909		711910	SUS316
B□H	771793	←	771794	←	771795	←	TPEE
B□S	772003	←	772004	←	772005	←	TPO
B□H/T	771793	←	771794	←	771795	←	TPEE

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
	B□H/T	770692	770693	770694	PTFE

NOTE)*:"852557,852558,852559,852896" WERE INSTALLED 770692(PTFE)
"852560,852561,852562,852823" WERE INSTALLED 770693(PTFE)
"852563,852564,852565,852897" WERE INSTALLED 770694(PTFE)

Tab.5 BALL

TYPE	NDP-40	NDP-50	MATERIAL
	BV□	BV□	
BVC			
BVN			
BVE	770593	770633	EPDM
BVV		770636	FKM
BVT	770692	770693	PTFE
BVH			
BVS	770593		EPDM

Tab.6 NUT(M16×1.5)

[BA□,BS□,BF□]

TYPE	NDP-40	NDP-50	NDP-80	MATERIAL
B□C	683408	←	←	PA,SUS316
B□N	683408	←	←	PA,SUS316
B□E	683408	←	←	PA,SUS316
B□V	706128	←	706144	SUS316
B□T	706128	←	706144	SUS316
B□H	683408	←	←	PA,SUS316
B□S	683408	←	←	PA,SUS316
B□H/T	683408	←	←	PA,SUS316

Tab.7 O RING

	TYPE	NDP-40	NDP-50		NDP-80	MATERIAL
		BA/BP□	BA□	BP□	BA/BP□	
		P70	P80	P85	P110	
	B□C	640060	640063	640064	640070	NBR
	B□N	640060	640063	640064	640070	NBR
	B□E	683998	684120	684121	684123	EPDM
	B□V	642060	642063	642064	642070	FKM
	B□T	643060	643063	643064	643070	PTFE
*	B□H	640060	640063	640064	640070	NBR
	B□S	683998	684120	684121	684123	EPDM
	B□H/T	640060	640063	640064	640070	NBR

NOTE)*:"852557,852559" WERE INSTALLED 643060(PTFE)
"852560" WERE INSTALLED 643063(PTFE)
"852562" WERE INSTALLED 643064(PTFE)
"852563,852565" WERE INSTALLED 643070(PTFE)

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
	B□H/T	640065	640064	640069	640078	640080	NBR

NOTE)*:"852557,852558,852896" WERE INSTALLED 643065(PTFE)
"852559" WERE INSTALLED 643064(PTFE)
"852560,852561,852562,852823" WERE INSTALLED 643069(PTFE)
"852563,852564,852897" WERE INSTALLED 643078(PTFE)
"852565" WERE INSTALLED 643080(PTFE)

Tab.9 O RING

TYPE	NDP-40	NDP-50	MATERIAL
	BV□	BV□	
	P70	P85	
BVC			
BVN			
BVE	683998	684121	EPDM
BVV		642064	FKM
BVT	772740	771899	PTFE
BVH			
BVS	683998		

Tab.10 O RING

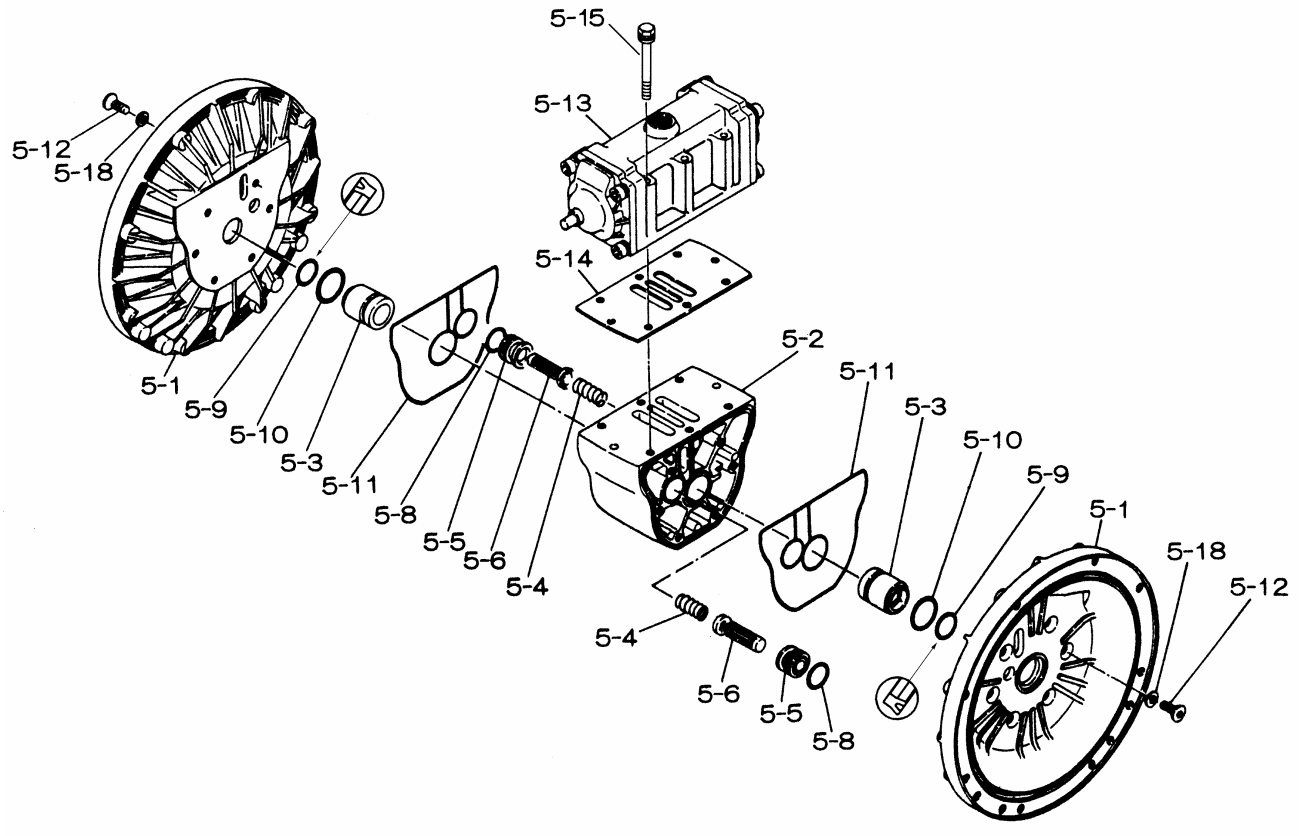
TYPE	NDP-40	NDP-50	MATERIAL
	BV□	BV□	
	P85	P105	
BVC			
BVN			
BVE	684121	684122	EPDM
BVV		642069	FKM
BVT	772741	772063	PTFE
BVH			
BVS	684121		EPDM

Tab.11 O RING

	TYPE	NDP-40	NDP-50	NDP-80	MATERIAL
		BP□/BV□	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
	B□H/T	640136	640139	640143	NBR

NOTE)*:"852559" WERE INSTALLED 643064(PTFE)
"852562" WERE INSTALLED 643069(PTFE)
"852565" WERE INSTALLED 643080(PTFE)

9.9 Exploded View ■ BODY ASSEMBLY



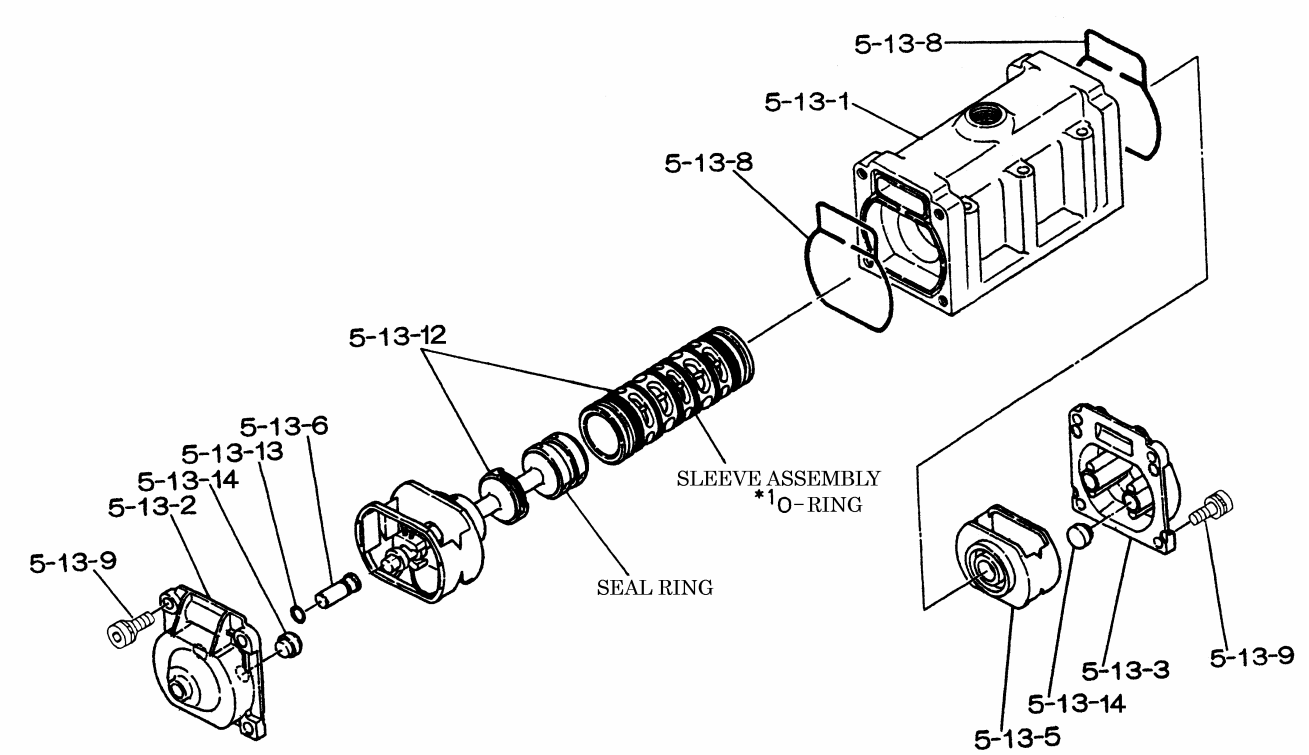
9.9 Parts List ■ BODY ASSEMBLY

BODY ASSEMBLY

NO.	NDP-40 803121*1 803125*2	NDP-50 803122*1 803126*2	NDP-80 803123*1 803127*2	DESCRIPTION	Q'TY	NOTE
5-1	711933	711934	711935	AIR CHAMBER	2	
5-2	711947	←	←	BODY	1	
5-3	772689	←	←	THROAT BEARING	2	
5-4	711937	←	←	SPRING	2	
5-5	771740	←	←	VALVE SEAT	2	
5-6	832162	←	832163	PILOT VALVE ASSEMBLY	2	
5-8	640020	←	←	O RING	2	P22A NBR
5-9	685444	←	←	PACKING	2	PNY-25
5-10	640029	←	←	O RING	2	P30 NBR
5-11	771742	←	←	GASKET	2	
5-12	683812	←	←	FLAT HEAD BOLT	12	M8 x 1.25 x 20
5-13	803120	←	←	VALVE BODY ASSEMBLY	1	
5-14	771712	←	←	GASKET	1	
5-15	684240	←	←	BOLT	6	M8 x 1.25 x 85
5-18	684987	←	←	PLAIN WASHER	12	

NOTE)*1:NO PAINTED , *2:PAINTED

9.10 Exploded View ■ VALVE BODY ASSEMBLY



9.10 Parts List ■ VALVE BODY ASSEMBLY

803120 VALVE BODY ASSEMBLY

NO.	PART NO.	DESCRIPTION	Q'TY	NOTE
5-13-1	711946	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	M8 x 1.25 x 20
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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