

# MAINTENANCE MANUAL

## YAMADA AIR-OPERATED DIAPHRAGM PUMPS NDP-10

### 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.

These maintenance manuals cover what you should know about maintenance of the Yamada NDP-10 series Diaphragm Pumps.

This edition is based on the standards for the June 1998 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 pumps is heavy, and extreme care must be taken when lifting it.

# Table of Contents

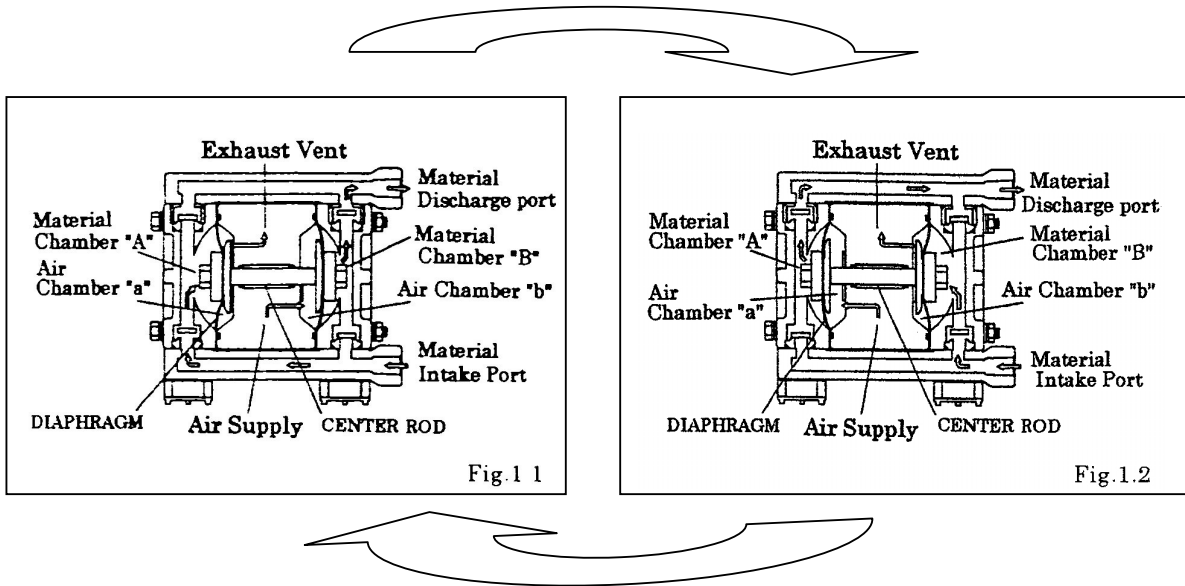
. Warnings and Cautions.....	1
. Table of Contents .....	2
1. Principles of operation.....	3
2. Tools, etc.....	
2.1 General tools .....	3
2.2 Special tools .....	3
2.3 Lubricating Oil.....	3
3. Ordering Replacement Parts .....	3
4. Balls and Valve Seats .....	
4.1 Removal .....	4
■ FP type .....	4
4.2 Checking .....	5
■ Ball valve types .....	5
4.3 Installation.....	5
5. Diaphragm and Centre Rod.....	
5.1 Removal .....	6
5.2 Checking .....	6
5.3 Installation.....	7
6. Pilot valve, Guide and Bushing.....	
6.1 Removal .....	8
6.2 Checking.....	8
6.3 Installation.....	8
7. Seal ring and sleeve .....	
7.1 Removal .....	9
7.2 Checking.....	9
7.3 Installation.....	9
8. Exploded View and Parts List.....	
8.1 NDP-10-BP .....	10
8.2 NDP-10-BTT, BXT .....	12
9. Service kits.....	14

# 1. Principles of operation

There are two diaphragms fixed to the centre rod, one at each end. When compressed air is supplied to air chamber B (right side, see Fig. 1.1.), the centre 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 centre 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 centre 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.



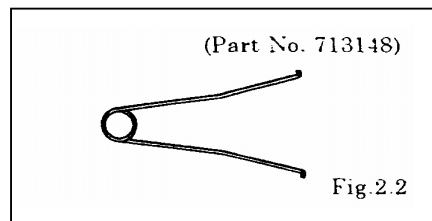
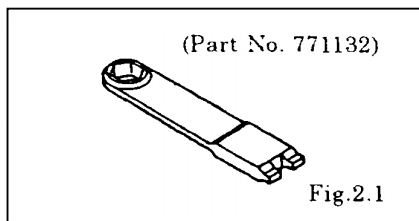
## 2. Tools, etc.

### 2.1 General tools

- Socket wrenches 13mm
- Open-end wrenches 13mm, 21 mm
- Plier

### 2.2 Special tools

- Accessory tool (Accessories) Purpose: Removing the centre disk of BP□ and FV□ types
- Sleeve remover (sold separately) Purpose: for removing sleeves



### 2.3 Misc.

- Lubricating oil Turbine oil equivalent to #32
- Nuts M8x1.25

## 3. Ordering replacement parts

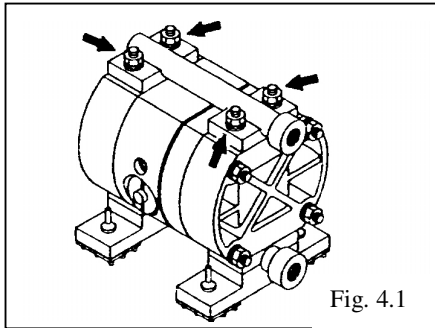
For accurate and speedy shipment of parts, be sure to order the right parts for your model to your dealer or one of our regional offices. Indicate the part number, descriptions, quantities and reasons for replacement, in as much detail as possible.

## 4. Balls and Valve seats

### 4.1 Removal

#### ■ FP□, BP□, BX□, BT□

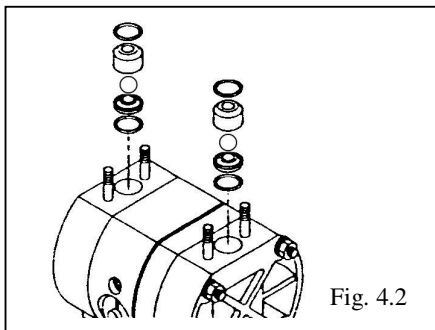
See [8. Exploded View] on and after p. 10. (Fig. 4.1, 4.2, 4.3 and 4.4 show the NDP-10 BPT.)



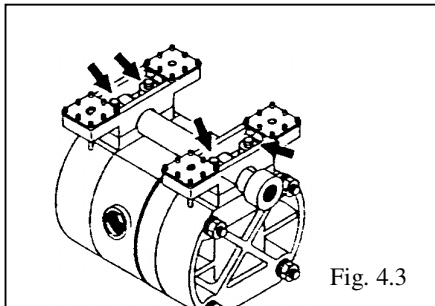
- Remove the 4 retainer nuts from the out manifold, and remove the “out” manifold. [Fig. 4.1]

#### <NOTE>

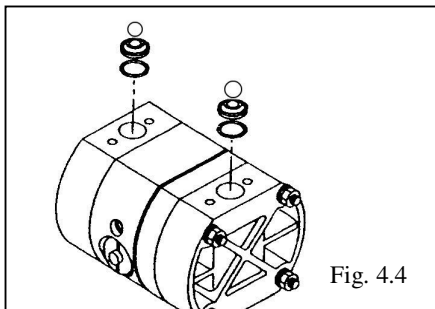
- When the retainer nuts on both sides of the tie rod are removed, the “in” manifold can be removed.



- Remove the O-ring (4x), valve guide, ball valve and valve seat. [Fig. 4.2]



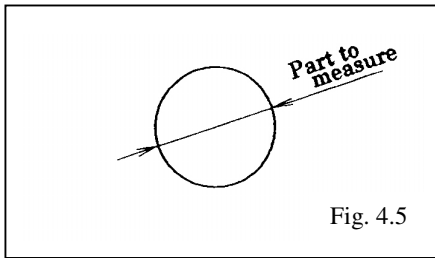
- Turn over the main body assembly. [Fig. 4.3]
- Pull out the bolt, and remove the base and “in” manifold. (NDP-10)
- Remove the 4 retainer bolts from the “in” manifold, and remove the base and “in” manifold. [Fig. 4.3]



- Remove the O-ring (2x), valve seat, ball valve and valve guide. (NDP-10-BP□) [ Fig. 4.4]
- Remove the O-ring (4x), valve seat, ball valve and valve guide. (NDP-10-BXT/BTT).

## 4.2 Checking

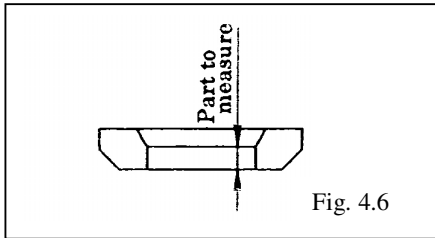
### ■ Ball valve type



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

#### Usable range of ball

NDP-10	S $\phi$ 15.0 ~ S $\phi$ 16.2 mm
--------	----------------------------------



- Valve seat [Fig. 4.6]  
Measure the dimension shown at left, and if it is outside the usable range, replace the valve seat.

#### Usable range of valve seat

NDP-10	2.6 ~ 5.0 mm
--------	--------------

## 4.3 Installation

For installation, see [8. Exploded View] on and after p. 10, and install in the reverse order of disassembly.

#### Tightening torque for manifold retainer bolts or nuts

NDP-10	8 N·m{80kgf·cm}
--------	-----------------

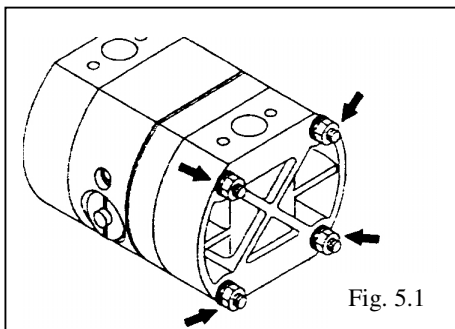
#### <NOTE>

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

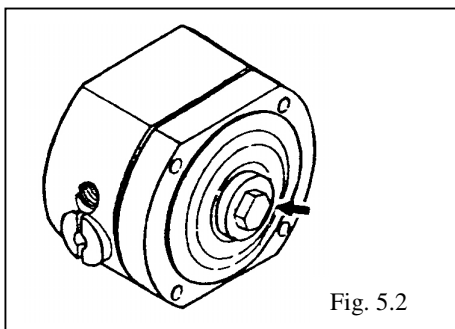
## 5. Diaphragm and Centre rod

### 5.1 Removal

See [8. Exploded View] on and after p.10. (Fig. 5.1, 5.2 and 5.3 show the NDP-10 BPT.)



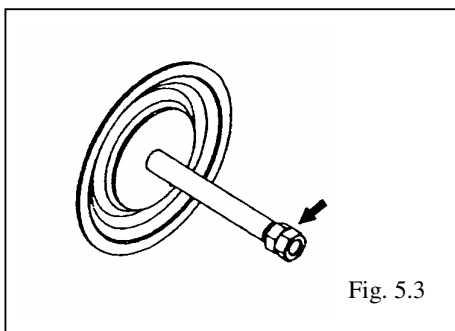
- Remove the valve and valve seat (see [4.1 Removal ] on p.5)
- Remove the 6 retainer nuts from the “out” chamber, and remove the “out” chamber. [Fig. 5.1]



- Remove the centre disk from one side using the Accessory tool (special tool: Part No. 771132) [Fig. 5.2]
- Remove the centre disk from one side. [Fig. 5.2]
- After the centre disk (outside) has been removed, remove the diaphragm and the centre disk (inside).
- Remove the centre disk and centre rod from the opposite side of the main body.

<NOTE>

- When the diaphragms are removed, the main body is separated into 2 pieces. For easy work, leave bolts fastened temporarily before remove the diaphragms.



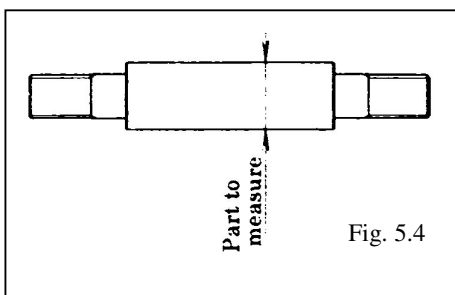
- Remove the centre disk and diaphragm from the opposite side using the double nut. [Fig. 5.3]

### 5.2 Checking

- Diaphragm  
If the diaphragm is worn out or damaged, replace it.

Guideline of diaphragm life

NDP-10	CR, NBR, PTFE, EPDM	10,000,000 strokes
	TPEE, TPO	15,000,000 strokes



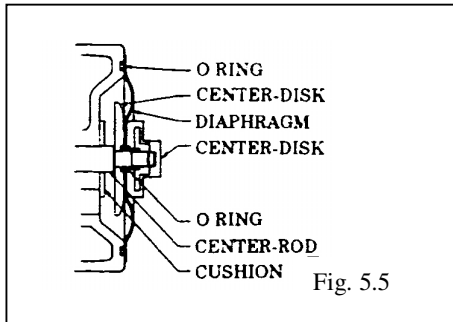
- Centre rod [Fig. 5.4]  
Measure the diameter, and if it is outside the usable range, replace the centre rod.

Usable range of centre rod

NDP-10	$\phi$ 13.96 ~ $\phi$ 14.0mm
--------	------------------------------

### 5.3 Installation

For installation, see [8. Exploded View] on and after p. 10, and install in the reverse order of disassembly.



- Apply lubricating oil to the centre rod, and insert it into the main body.
- Keep the marking “LIQUID” to liquid end for CR, NBR, EPDM diaphragms.
- Keep the convex side to the outside for PTFE diaphragm.
- Install the O-ring (Fig. 5.5).
- Tighten the centre disk using the Accessory tool (special tool: Part No. 771132).
- Tighten the centre 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 centre rod and out chamber

NDP-10	12 N·m {120 kgf·cm}
--------	---------------------

<NOTE>

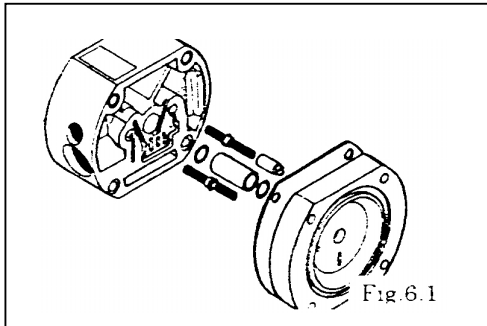
- Make sure there is no dust on the seal surface in order to prevent seal damage.
- Replace the PTFE O-ring by new one.
- Tighten the bolts so that the balance is equal from both sides on diagonal line with even torque.

## 6. Pilot valve, Guide and Bushing

### 6.1 Removal

#### ■ NDP-10

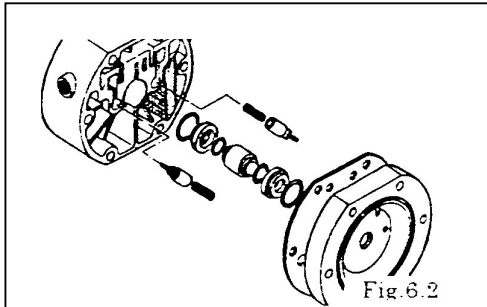
See [8. Exploded View] on and after p. 10.



- Remove the diaphragm and centre rod (see [5.1 Removal] on p. 7).
- Remove the main body. [Fig. 6.1]
- Draw out the pilot valve assembly. [Fig. 6.1]
- Remove the O-ring and bushing. [Fig. 6.1]

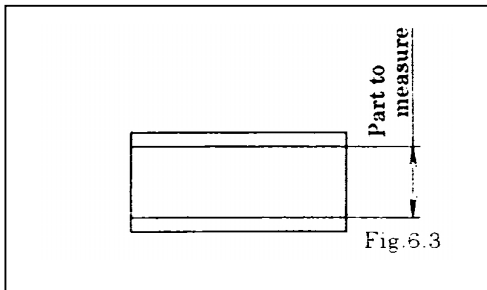
#### ■ NDP-10

See [8. Exploded View] on an after p.10.



- Remove the diaphragm and centre rod (see [5.1 Removal] on p. 7).
- Remove the body B. [Fig. 6.2]
- Draw out the pilot valve assembly. [Fig. 6.2]
- Remove the O-ring, bushing and guide. [Fig. 6.2]

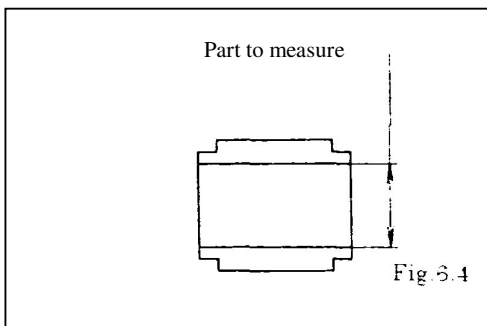
### 6.2 Checking



- Bushing (NDP-10) [Fig. 6.3]  
Measure the inside diameter, and if it is outside the usable range, replace the bushing.

Usable range of bushing

$\varphi$  10.1 ~  $\varphi$  10.3mm



- Guide (NDP-10) [Fig. 6.4]  
Measure the inside diameter, and if it is outside the usable range, replace the guide.

Usable range of guide

$\varphi$  14.1 ~  $\varphi$  14.2mm

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

### 6.3 Installation

For installation, see [8. Exploded View] on and after p. 10, and install in the reverse order of disassembly.

<NOTE>

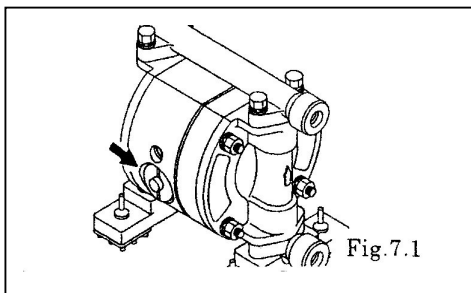
- Make sure there is no dust on the seal surface and the seal is not damaged.



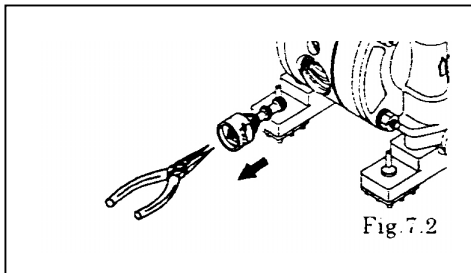
## 7. Seal ring and sleeve

### 7.1 Removal

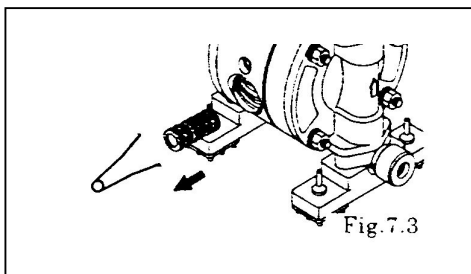
See [8. Exploded View] on and after p. 10. (Fig. 7.1, 7.2 and 7.3)



- Remove the cap using the Accessory tool (special tool: Part No. 771132). [Fig. 7.1]

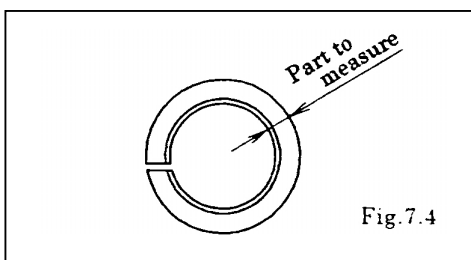


- Draw out the C spool valve assembly using the plier, and remove the seal ring from the C spool valve assembly. [Fig. 7.2]



- Remove the sleeve using the sleeve remover (special tool: Part number 713148). [Fig. 7.3]

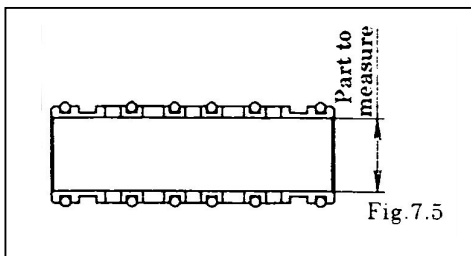
### 7.2 Checking



- Seal ring [Fig. 7.4]  
Measure the inside thick diameter, and if it is outside the usable range, replace the seal ring.  
If the seal ring is worn out or cracked, replace it.

Usable range of seal ring

NDP-10	1.85 ~ 1.90 mm
--------	----------------



- Sleeve [Fig. 7.5]  
Measure the inside diameter, and if it is outside the usable range, replace the sleeve.

Usable range of sleeve

NDP-10	$\phi$ 15.8 ~ $\phi$ 15.85 mm
--------	-------------------------------

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

### 7.3 Installation

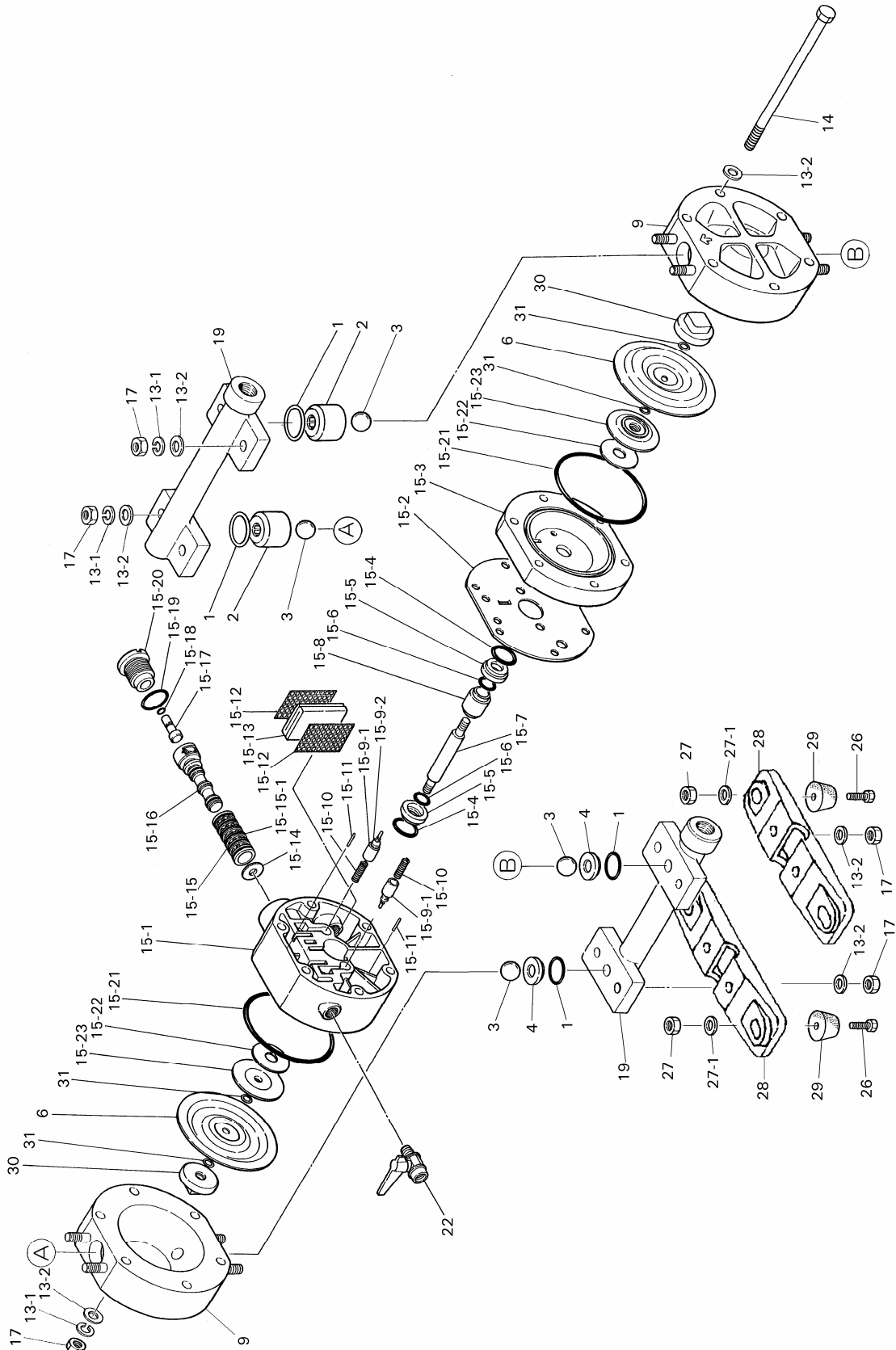
For installation see [8. Exploded View] on and after p.10, and install in the reverse order of disassembly.

<NOTE>

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

# 8.1 EXPLODED VIEW

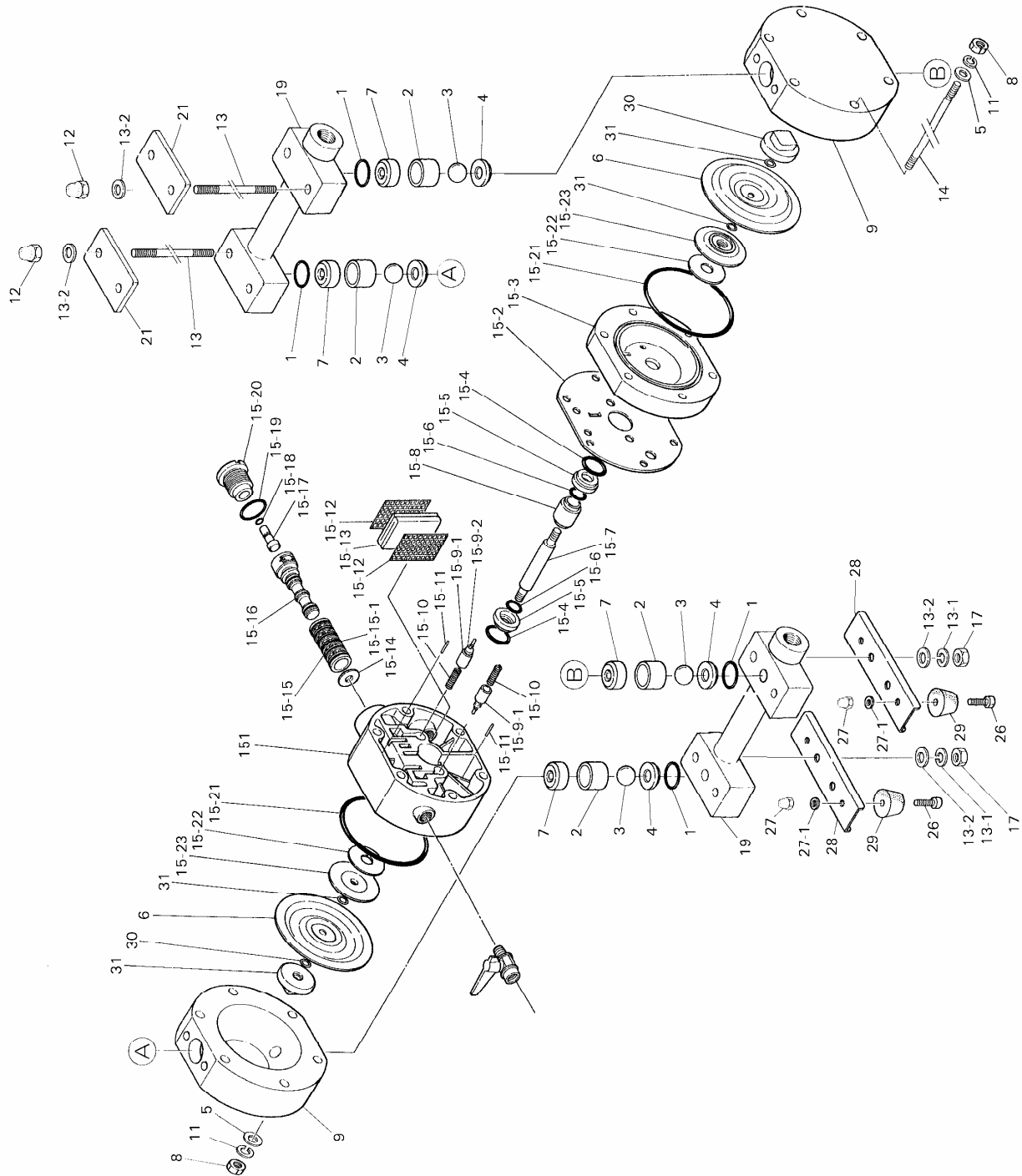
NDP-10BP



PARTS LIST					
NDP-10-BP..					
No.	B P C B P N B P H	No.	B P T B P E B P S	DESCRIPTIONS	QTY
1C		1T	643-018	O-RING	4
N		E	684-112	O-RING	4
H	643-018	S	684-112	O-RING	4
1C	640-018	1T		O-RING	2
N	640-018	E		O-RING	2
H		S		O-RING	2
2	771-136	2	771-136	BALL GUIDE	2
3C	770-970	3T	770-931	BALL	4
N	770-972	E	771-978	BALL	4
H	770-931	S	771-978	BALL	4
4C	770-975	4T	771-187	VALVE SEAT	2
N	770-976	E	771-187	VALVE SEAT	2
H	771-187	S	771-187	VALVE SEAT	2
6C	770-971	6T	770-933	DIAPHRAGM	2
N	770-973	E	771-848	DIAPHRAGM	2
H	771-372	S	771-972	DIAPHRAGM	2
9	780-194	9	780-194	PUMP CHAMBER	2
13-1	681-300	13-1	681-300	SPRING WASHER	10
13-2	631-329	13-2	631-329	WASHER	20
14	000-116	14	000-116	BOLT	6
15	02-0010	15	02-0010	BODY ASSY	1
15-1	780-028	15-1	780-028	BODY	1
15-2	771-347	15-2	771-347	GASKET	1
15-3	780-030	15-3	780-030	BODY	1
15-4	640-020	15-4	640-020	O-RING	2
15-5	771-336	15-5	771-336	BUSH	2
15-6	640-013	15-6	640-013	O-RING	2
15-7	710-578	15-7	710-578	CENTRE ROD	1
15-8	771-337	15-8	771-337	GUIDE	1
15-9	832-141	15-9	832-141	PILOT VALVE ASSY	2
15-10	710-577	15-10	710-577	SPRING PILOT VALVE	2
15-11	632-753	15-11	632-753	SPRING PIN	2
15-12	771-589	15-12	771-589	MESH	2
15-13	771-465	15-13	771-465	MUFLER	1
15-14	771-483	15-14	771-483	CUSHION	1
15-15	683-089	15-15	683-089	SLEEVE ASSY	1
15-15-1	683-123	15-15-1	683-123	O-RING	6
15-16	802-835	15-16	802-835	SPOOL ASSY	1
15-17	771-350	15-17	771-350	RESET BUTTON	1
15-18	640-002	15-18	640-002	O-RING	1
15-19	640-022	15-19	640-022	O-RING	1
15-20	771-695	15-20	771-695	CAP	1
15-21	640-144	15-21	640-144	O-RING	2
15-22	771-342	15-22	771-342	CUSHION	2
15-23	771-344	15-23	771-344	CENTRE DISC	2
17	628-012	17	628-012	NUT	14
19	780-184	19	780-184	MANIFOLD ASSY	2
22	681-292	22	681-292	BALL VALVE	1
26	621-153	26	621-153	BOLT	4
27	628-012	27	628-012	NUT	4
27-1	631-329	27-1	631-329	WASHER	4
28	771-947	28	771-947	BASE	2
29	770-551	29	770-551	STAND RUBBER	4
30	770-968	30	770-968	CENTRE DISC	2
31C	640-005	31T	643-005	O-RING	4
N	640-005	E	643-005	O-RING	4
H		S		O-RING	4

## 8.2 EXPLODED VIEW

## NDP-10BTT, BXT



PARTS LIST					
NDP-10-BTT,BXT					
No.	B T T	No.	B X T	DESCRIPTIONS	QTY
1	643-018	1	643-018	O-RING	4
2	771-585	2	000-094	VALVE/BALL GUIDE	4
3	770-931	3	770-931	BALL	4
4	770-983	4	000-092	VALVE SEAT	4
5	000-076	5	000-076	WASHER	12
6	770-933	6	770-933	DIAPHRAGM	2
7	770-985	7	000-093	RETAINER	4
8	628-012	8	628-012	BOLT	12
9	770-987	9	000-095	PUMP CHAMBER	2
11	681-300	11	681-300	SPRING WASHER	12
12	000-091	12	000-091	CAP NUT	4
13	710-209	13	710-209	THREAD END	4
13-1	681-855	13-1	681-855	SPRING WASHER	4
13-2	631-328	13-2	631-328	WASHER	8
14	710-208	14	710-208	THREAD END	6
15	02-0010	15	02-0010	BODY ASSY	1
15-1	780-028	15-1	780-028	BODY	1
15-2	771-347	15-2	771-347	GASKET	1
15-3	780-030	15-3	780-030	BODY	1
15-4	640-020	15-4	640-020	O-RING	2
15-5	771-336	15-5	771-336	BUSH	2
15-6	640-013	15-6	640-013	O-RING	2
15-7	710-578	15-7	710-578	CENTRE ROD	1
15-8	771-337	15-8	771-337	GUIDE	1
15-9	832-141	15-9	832-141	PILOT VALVE ASSY	2
15-10	710-577	15-10	710-577	SPRING PILOT VALVE	2
15-11	632-753	15-11	632-753	SPRING PIN	2
15-12	771-589	15-12	771-589	MESH	2
15-13	771-465	15-13	771-465	MUFLER	1
15-14	771-483	15-14	771-483	CUSHION	1
15-15	683-089	15-15	683-089	SLEEVE ASSY	1
15-15-1	683-123	15-15-1	683-123	O-RING	6
15-16	802-835	15-16	802-835	SPOOL ASSY	1
15-17	771-350	15-17	771-350	RESET BUTTON	1
15-18	640-002	15-18	640-002	O-RING	1
15-19	640-022	15-19	640-022	O-RING	1
15-20	771-695	15-20	771-695	CAP	1
15-21	640-144	15-21	640-144	O-RING	2
15-22	771-342	15-22	771-342	CUSHION	2
15-23	771-344	15-23	771-344	CENTRE DISC	2
17	628-010	17	628-010	NUT	4
19	02-0991	19	000-097	MANIFOLD	2
21	000-800	21	000-800	PROTECTOR PLATE	2
22	681-292	22	681-292	BALL VALVE	1
26	000-071	26	000-071	BOLT	4
27	000-091	27	000-091	NUT	4
27-1	000-069	27-1	000-069	WASHER	4
28	710-586	28	710-586	BASE	2
29	000-551	29	000-551	STAND RUBBER	4
30	780-122	30	780-122	CENTRE DISC	2
31	643-005	31	643-005	O-RING	4

Service kits Diaphragm pumps (NDP-10)

DIAPHRAGMS KITS (BP<sup>®</sup>,BTT,BXT)

No.	DESCRIPTION	KN10D-PN	QTY	KN10D-PH	QTY	KN10D-PC	QTY	KN10D-PE	QTY	KN10D-PS	QTY
1	O-RING	640-018	4	643-018	4	640-018	4	684-112	4	684-112	4
6	DIAPHRAGM	770-973	2	771-372	2	770-971	2	771-848	2	771-972	2
15-21	O-RING	640-144	2	640-144	2	640-144	2	640-144	2	640-144	2
31	O-RING	640-005	4			640-005	4	643-005	4		

No.	DESCRIPTION	KN10D-PT	QTY
1	O-RING	643-018	4
6	DIAPHRAGM	770-933	2
15-21	O-RING	640-144	2
31	O-RING	643-005	4

VALVE KITS (BP<sup>®</sup>,BTT,BXT)

No.	DESCRIPTION	K10V-PN	QTY	K10V-PT	QTY	K10V-PC	QTY	K10V-PE	QTY	K10V-TT	QTY
1	O-RING	640-018	2	643-018	4	640-018	2	684-112	4	643-018	4
2	BALL GUIDE	771-136	2	771-136	2	771-136	2	771-136	2	770-985	4
3	BALL	770-972	4	770-931	4	770-970	4	771-978	4	770-931	4
4	BALL VALVE	770-976	2	771-187	2	770-975	2	771-187	2	770-983	4

No.	DESCRIPTION	K10V-XT	QTY
1	O-RING	643-018	4
2	BALL GUIDE	000-093	4
3	BALL	770-931	4
4	BALL VALVE	000-092	4

K10/15-AM AIR MOTOR KIT NDP-15				
K10/15-AMS AIR MOTOR SEAL KIT NDP-15				
NO.	PART NO.	DESCRIPTION	K10/15-AM	K10/15-AMS
15-4	640-020	O-RING	2	2
15-6	640-013	O-RING	2	2
15-8	771-337	GUIDE	1	
15-5	771-336	BUSHING	2	
15-2	771-347	GASKET	1	1
15-14	771-483	CUSHION		1
15-15-1	683-123	O-RING		6
15-16	802-835	SPOOL ASSEMBLY	1	
15-19	640-022	O-RING	1	1
15-18	640-002	O-RING	1	1
15-13	771-465	MUFFLER	1	
15-9	832-141	PILOT VALVE ASSY	2	
15-10	710-577	SPRING	2	
	771-338	O-RING(PILOTE VALVE)		2

Yamada Europe BV  
Aquamarijnstraat 50  
NL-7554 NS Hengelo  
The Netherlands



+31.74.242 2032



+31.74.242 1055

[company@yamada.nl](mailto:company@yamada.nl)

[www.yamada.nl](http://www.yamada.nl)