

MAINTENANCE MANUAL

YAMADA AIR-OPERATED DIAPHRAGM PUMPS

DP-10F/N

DP-20F/N

DP-25F/N

WARNING



- For safety's sake, be sure to read this maintenance manual thoroughly before starting maintenance for this product. After reading the manual, keep it in an easy-to-access place so that the user may refer to it whenever necessary.

This maintenance manual describes the items required for maintenance of the Yamada DP-F/N series Diaphragm Pumps.

This document is based on the products that are manufactured in March 2008. Note that its contents are subject to change as a result of specification changes to be made in future.

- Warnings and Cautions

To use this product safely, be sure to observe the contents of the following description. In this manual, warnings and cautions are indicated by using symbols. These symbols are intended to prevent death or serious injury that may be caused to the operator or those who are around the product and damage that may be caused to the articles that are around the product, as well as to use the product safely and correctly. Each symbol is indicated and has a meaning as shown below. Read the description with a good understanding of its contents.



WARNING: This indicates the existence of potential hazard which, if not avoided, will result in death or serious injury.



CAUTION : This indicates the existence of potential hazard which, if not avoided, may result in bodily injury or in physical damage.

To indicate the contents of danger and damage, the following symbols are used together with the above indications.



This symbol indicates an act that is prohibited (prohibition). The concrete contents of prohibition are indicated by the side of the indication.



This symbol indicates the contents that must be observed. The concrete contents of observance are indicated by the side of the indication.

WARNING



- Before starting the maintenance work, shut off the supply air and clean the pump. If air pressure or residual liquid remains in the pump, damage or explosion may be caused to the product or serious injury or death may be caused if it sticks on the eyes or skin or inhaled or swallowed. (For cleaning the pump, refer to Chapter 6 of the Operation Manual.)



- When replacing parts, be sure to use the genuine parts or equivalents. Using parts other than these parts may result in a fault.

CAUTION



- When it is indicated that dedicated tools should be used, be sure to use these dedicated tools, otherwise the pump may be damaged.



- Check the weight of the pump by referring to 10.1 Main specifications in the operation manual and take extreme care when lifting it.

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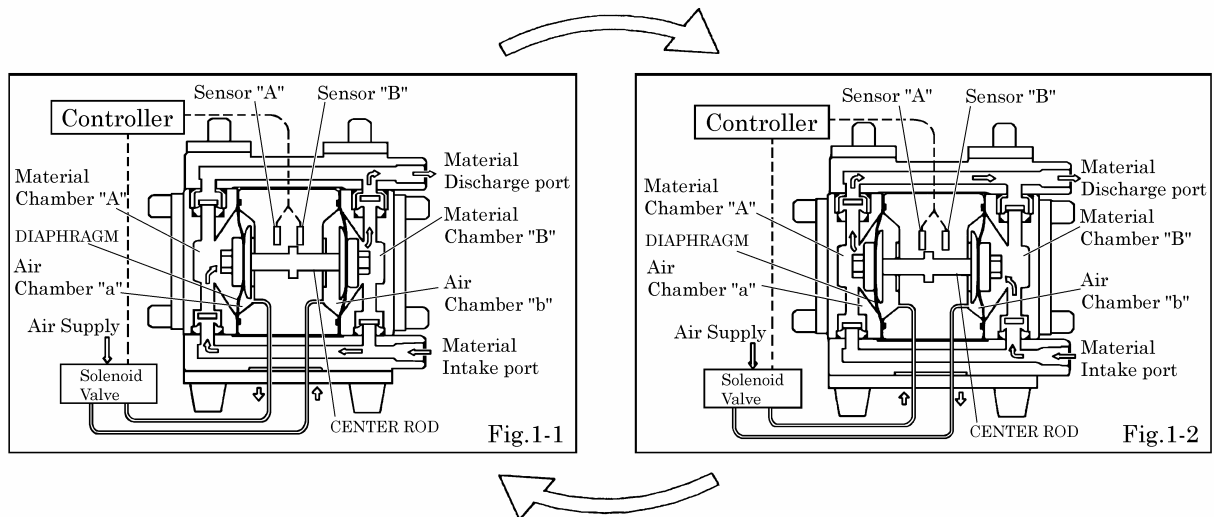
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1. Principles of operation

There are two diaphragms fixed to the center rod, one at each end. As shown in Fig.1-1, when the compressed air is supplied to the right air chamber "b," the center rod moves to the right, material in the material chamber B is pushed out, and at the same time the material is sucked into the material chamber A.

When the center rod is moved full-stroke to the right, the sensor B detects it, the electromagnetic valve is switched via the controller (sequence controller) to send the compressed air into the left air chamber "a" (see Fig.1-2), and the center rod moves to the left. As the result, the material in the material chamber A is pushed out, and at the same time, material is sucked into the material chamber B. Through repetition of this operation, material is repeatedly discharged out from the material discharge port.



2. Prepared devices

2.1 General tools

Socket wrench	10 mm, 13 mm
Wrench	10 mm, 13 mm, 24 mm

2.2 Dedicated tools

* Socket for a guide (sold separately)

Purpose: Removing the guide. (DP-10F/N)
Part No. 804014

Purpose: Removing the guide. (DP-20F/N,25F/N)
Part No. 803989

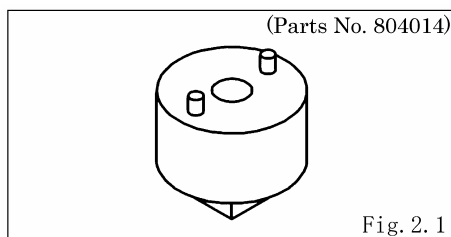


Fig. 2. 1

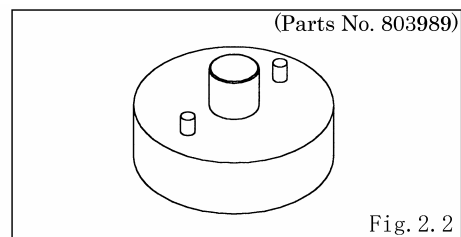


Fig. 2. 2

2.3 Misc.

* Lubricant Solvay Solexis k.k.: FOMBLIN Y25/A or equivalent

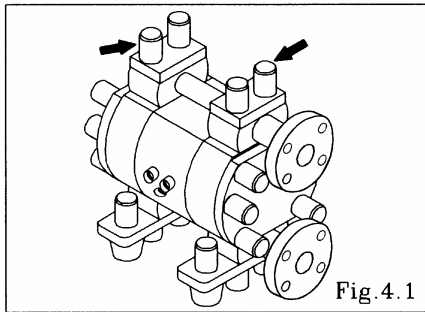
3. Ordering replacement parts

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.

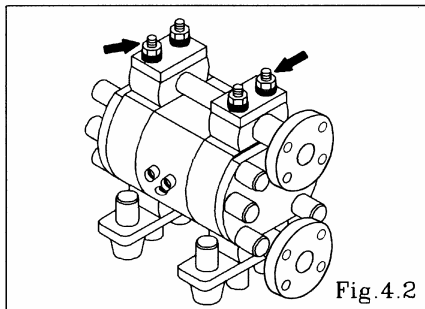
4. Balls and Valve seats

4.1 Removal

See [8. Exploded View] on after p. 8. (Fig.4-1, 4-2, 4-3, 4-4 and 4-5 show the DP-20F/N flange connection.)



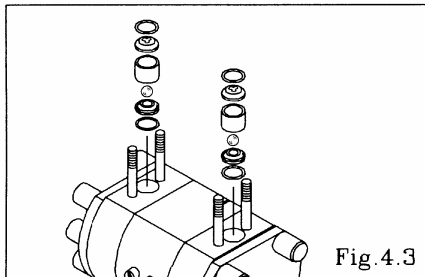
- * Remove the 8 caps from the both sides of the upright tie rod. [Fig.4.1]



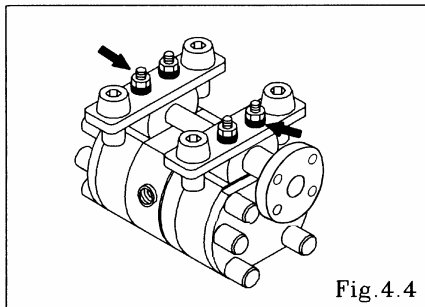
- * Remove the 4 retainer nuts from the upper side of the upright tie rods, and remove the out manifold. [Fig.4.2]

<NOTE>

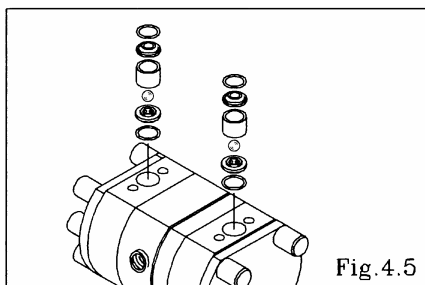
When the retainer nuts both sides of the upright tie rods remove, the in manifold removes.



- * Remove the O-ring, valve stopper, valve guide, ball and valve seat. [Fig.4.3]

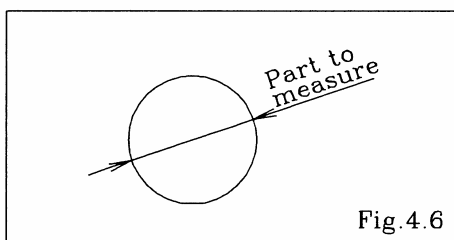


- * Turn over the main body assembly. [Fig.4.4]
- * Pull out the upright tie rods, and remove the base and in manifold. [Fig.4.4]



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

4.2 Inspection

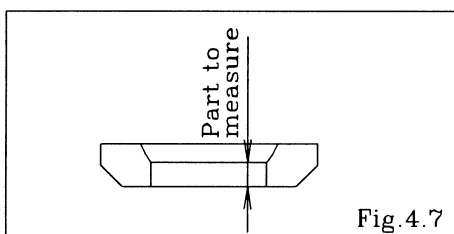


* Ball [Fig.4-6]

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

Usable range of Ball

DP-10F/N	SØ14.3 ~ SØ16.3 mm
DP-20F/N	SØ24.3 ~ SØ27.8 mm



* Valve seat [Fig.4-7]

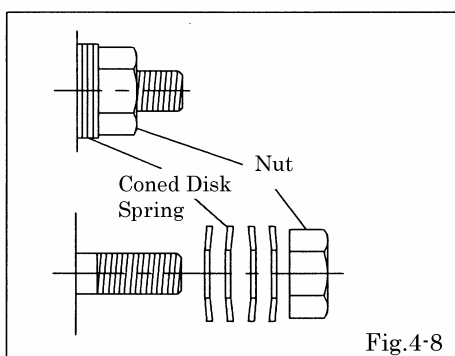
Measure the dimension shown at left, and if it is outside the usable range, replace the valve seat.

Usable range of Valve seat

DP-10F/N	2.4 ~ 6.0 mm
DP-20F/N	2.8 ~ 7.0 mm

4.3 Installation

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



Tightening torque for vertical tie rods

DP-10F/N	5 N·m (50 kgf·cm)
DP-20F/N	

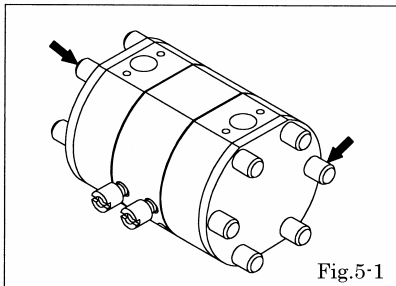
<NOTES>

- * 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.
- * Make sure that direction the coned disk springs. [Fig.4-8]
- * Retighten the tie rods before starting the pump. (See [7. Retightening of tie rods] on p. 7)

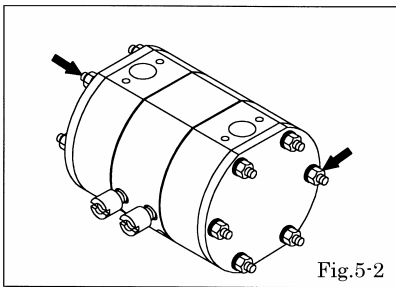
5. Diaphragm, Center rod and Bushing

5.1 Removal

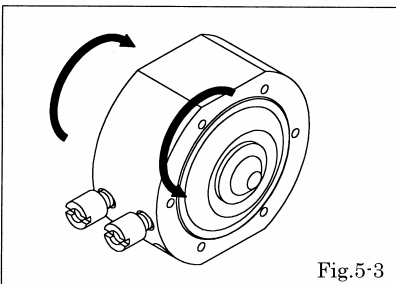
See [8. Exploded View] on after p 8.



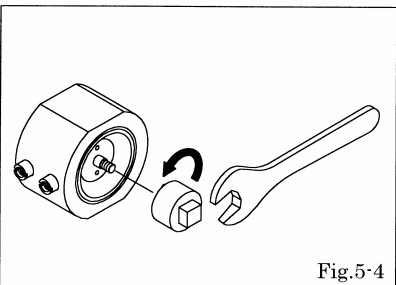
- * Remove the ball, valve seat, valve guide and valve stopper etc. (see [4.1 Removal] on p. 2)
- * Remove the 12 caps from the both sides of horizontal tie rods. [Fig.5-1]



- * Remove the 12 retainer nuts from the both sides of horizontal tie rods, and remove the reinforcement plate and out chamber. [Fig.5-2]



- * Hold the edges of both diaphragms with both hands, and turn them until one diaphragm is removed. [Fig.5-3]

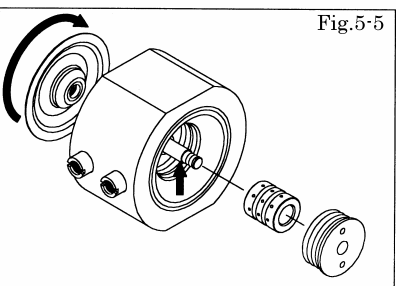


DP-10F/N

- * Remove the guide of one side by using the socket for a guide (dedicated tool : Part No. 804014) and the spanner. [Fig.5-4]

<NOTE>

When you remove the guide, the sleeve is removed from the main body also.



- * Fix the center rod by hand, and turn it until the diaphragm is removed. (When the diaphragm is removed, the center rod is removed from the body.) [Fig.5-5]

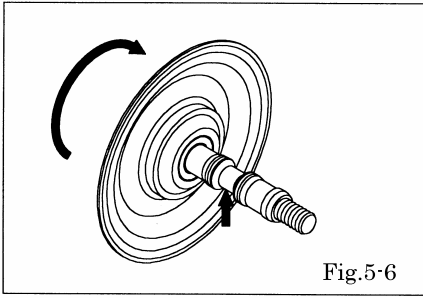


Fig.5-6

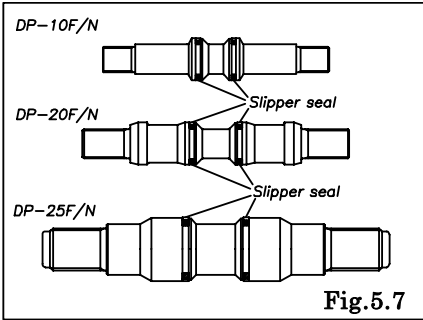


Fig.5.7

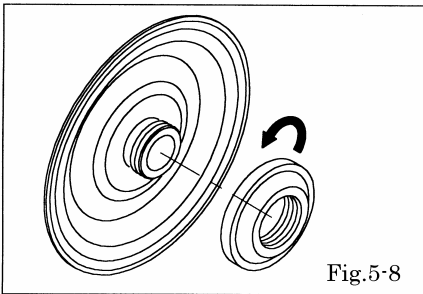


Fig.5-8

DP-20F/N,25F/N

- * Fix the central part of the center rod by hand or with the vice, and turn it until the diaphragm is removed. [Fig.5-6]

<NOTE>

Make sure the slipper seal of the center rod not be damaged. [Fig.5-7]

- * Fix the diaphragm, and turn the bushing to remove it. [Fig.5-8]

5.2 Inspection

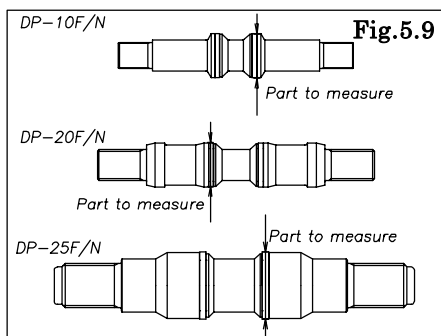


Fig.5.9

* Diaphragm

If the diaphragm is worn out or damaged, replace it.
New replace just one diaphragm.

Guideline of diaphragm life

DP-10F/N	6,000,000 cycles
DP-20F/N	3,000,000 cycles
DP-25F/N	6,000,000 cycles

* Center rod (Slipper seal) [Fig.5-9]

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

Usable range of slipper seal

DP-10F/N, DP-20F/N	$\phi 19.90 \sim \phi 20.10$ mm
DP-25F/N	$\phi 29.90 \sim \phi 30.10$ mm

* Bushing

If the screw is damaged, replace it with a new one.

* O-Ring

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

5.3 Installation

For installation, see [8. Exploded View] on page 8, and follow the instructions described for Removal in the reserve order.

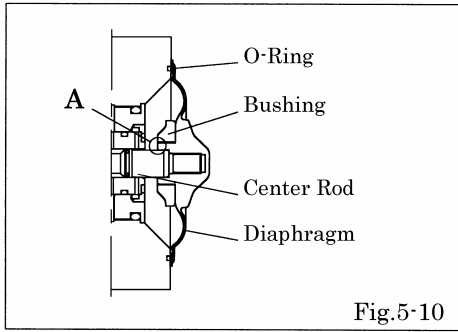


Fig.5-10

- * Attach the bushing onto the diaphragm. [Fig.5-10]
- * Attach the diaphragm by turning it until its level difference with the center rod of the section A becomes even. [Fig.5-10]

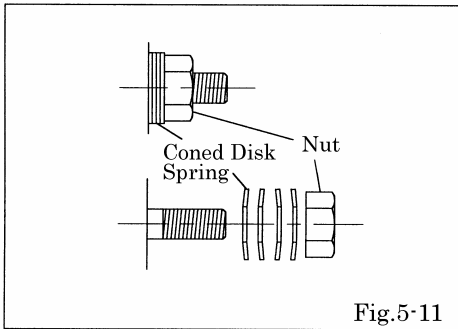


Fig.5-11

<NOTES>

- * Make sure there is no dust on the seal surface and the seal is not damaged.
- * Tighten the bolts on a diagonal line with even torque.
- * Attach the coned disk spring with making sure of its direction. [Fig.5-11]
- * Make sure to attach the bushing onto the center disk securely.
- * Retighten the tie rod immediately before starting the pump.
(See [7. Retightening of Tie rods on after P.7.]

6. Guide, Sleeve

6.1 Removal

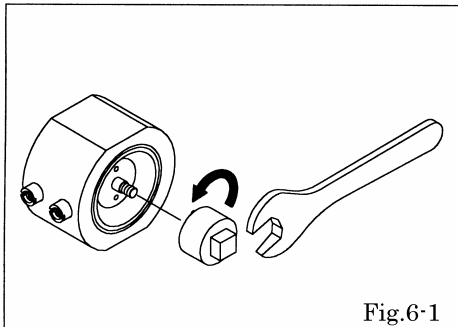


Fig.6-1

- In the case of DP-10F/N
- * See Clause 5.1 on page 4.

- In the case of DP-20F/N, 25F/N

- * Remove the guides of both sides using the socket for a guide (dedicated tool: Part No. 803989) and the spanner. [Fig.6-1]

<NOTE>

- * When the guide is removed, the sleeve is removed from the main body also.

6.2 Inspection

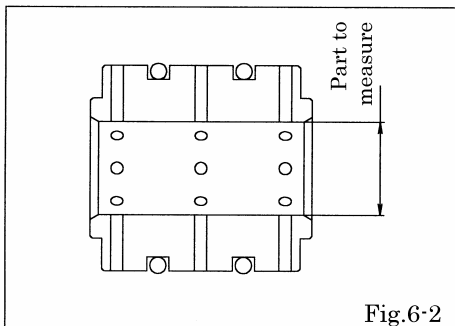


Fig.6-2

- * Guide
If the screw is damaged, replace it with a new one.
- * Sleeve
Measure the inside diameter, and if it is out of the usable range, replace it with a new one. [Fig.6-2]

Usable range of Sleeve

DP-10F/N, DP-20F/N	φ20.00 ~ φ20.10 mm
DP-25F/N	φ30.00 ~ φ30.15 mm

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

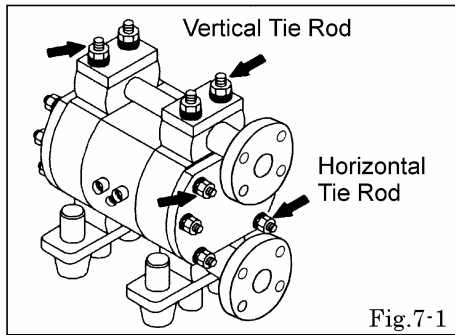
6.3 Installation

For installation, see [8. Exploded View] on page 8, and follow the instructions described for Removal in the reserve order.

<NOTES>

- * Make sure there is no dust on the seal surface and the seal is not damaged.
- * Use the dedicated tools.
- * Apply a small amount of lubricant on the O-ring.

7. 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.

Retightening of tie rods and torque

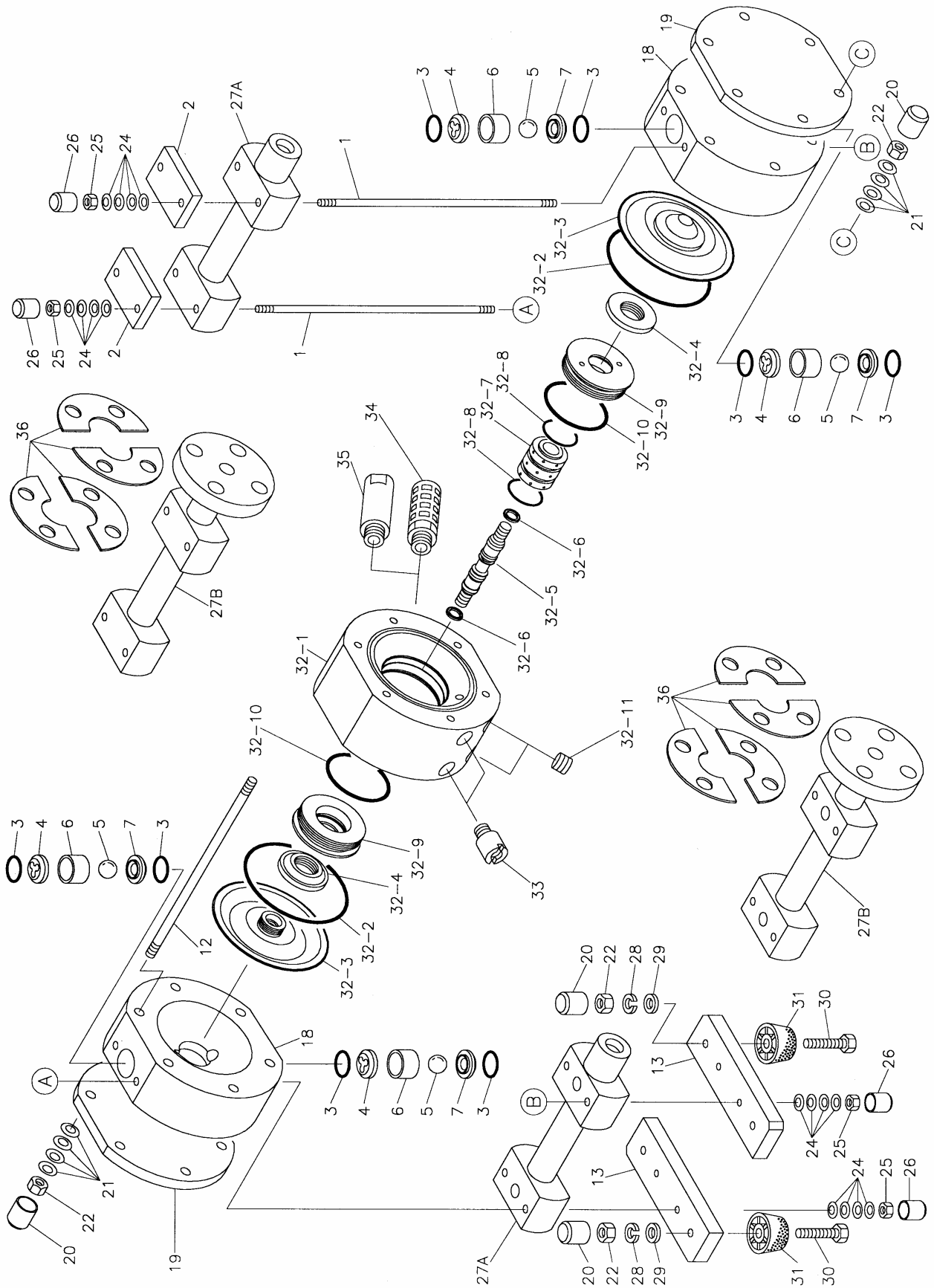
	Horizontal tie rods	Vertical tie rods
DP-10F/N	6 N·m { 60 kgf·cm }	4 N·m { 40 kgf·cm }
DP-20F/N	6 N·m { 60 kgf·cm }	4 N·m { 40 kgf·cm }
DP-25F/N	8 N·m { 80 kgf·cm }	6 N·m { 60 kgf·cm }

<NOTES>

- * Fasten the nut (tie rods) on a diagonal line alternately with even force.
- * Retighten the horizontal tie rods and then the vertical tie rods. [Fig.7-1]

8. Exploded view and Parts list

8.1 Exploded view DP-10F/N



Parts list DP-10F/N

Item No.	Connection structure		Parts Name	Q'ty	Note
	Screw	Flange			
1	711253	←	Tie Rod	4	
2	771541	←	Reinforcement Plate	2	
3	643018	←	O-Ring	8	P21 PTFE
4	772767	←	Valve Stopper	4	
5	770931	←	Ball	4	
6	771585	←	Valve Guide	4	
7	772766	←	Valve Seat	4	
8	790910	←	Label	1	
12	711017	←	Tie Rod	6	
13	771535	←	Base	2	
18	770987	←	Out Chamber	2	
19	771536	←	Reinforcement Plate	2	
20	771783	←	Cap	16	
21	681880	←	Coned Disk Spring	48	M8
22	683635	←	Nut	16	M8x1.25
24	682300	←	Coned Disk Spring	32	M6
25	683634	←	Nut	8	M6x1
26	771114	←	Cap	8	
27A,B	771434	771679	Manifold	2	
28	681300	←	Spring Lock Washer	4	M8
29	681173	←	Plan Washer	4	M8
30	621155	←	Bolt	4	M8x1.25x40
31	770551	←	Cushion	4	
32	803999	←	Body Assembly	1	
33	771482	←	Union	2	
34	681293	←	Silencer	1	
35	771490	←	Union	1	
36		711167	Reinforcement Plate	8	

Note 1 Item No.8 (Label) is not indicated in exploded view.

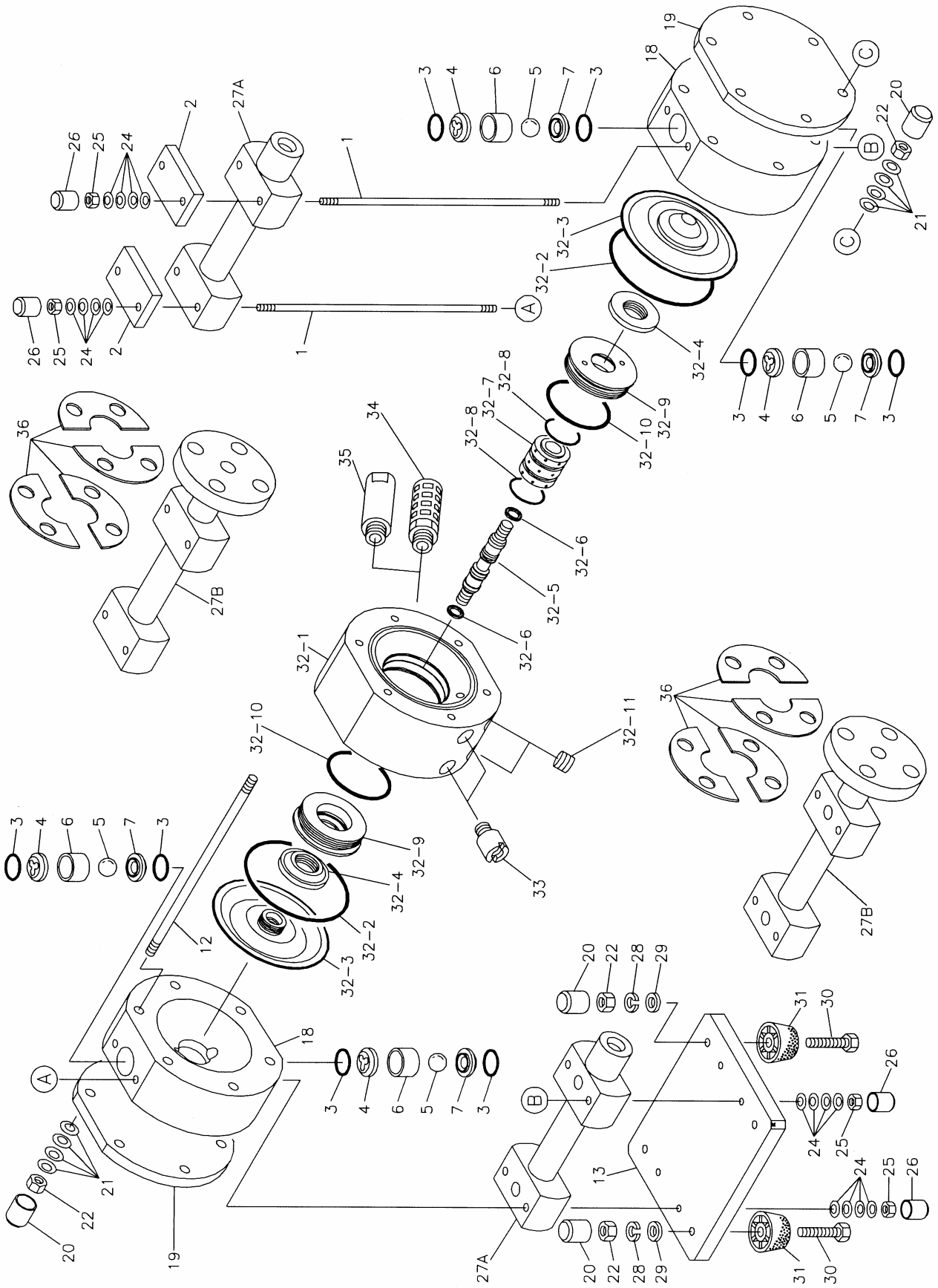
Note.2 Refer to the following about Item No.32 (Body Assembly).

803999 BODY ASSEMBLY

DP-10F/N

Item No.	Parts No.	Parts Name	Q'ty	Note
32-1	772292	Body	1	
32-2	643145	O-Ring	2	G100 PTFE
32-3	772279	Diaphragm	2	
32-4	772294	Bushing	2	
32-5	772293	Center Rod	1	
32-6	681294	Slipper Seal	2	
32-7	772296	Sleeve	1	
32-8	640029	O-Ring	2	P30 NBR
32-9	772295	Guide	2	
32-10	640047	O-Ring	2	P50 NBR
32-11	771301	Plug	2	

8.2 Exploded view DP-20F/N



Parts list DP-20F/N

Item No.	Connection structure		Parts Name	Q'ty	Note
	Screw	Flange			
1	711173	←	Tie Rod	4	
2	771472	←	Reinforcement Plate	2	
3	643033	←	O-Ring	8	P34 PTFE
4	772769	←	Valve Stopper	4	
5	770736	←	Ball	4	
6	770994	←	Valve Guide	4	
7	772768	←	Valve Seat	4	
8	790910	←	Label	1	
12	711672	←	Tie Rod	6	
13	771652	←	Plate	1	
18	770995	←	Out Chamber	2	
19	771475	←	Reinforcement Plate	2	
20	771783	←	Cap	16	
21	681880	←	Coned Disk Spring	48	M8
22	683635	←	Nut	16	M8x1.25
24	682300	←	Coned Disk Spring	32	M6
25	683634	←	Nut	8	M6x1
26	771114	←	Cap	8	
27A,B	771651	771655	Manifold	2	
28	681300	←	Spring Lock Washer	4	M8
29	631173	←	Plan Washer	4	M8
30	621155	←	Bolt	4	M8x1.25x40
31	770551	←	Cushion	4	
32	803933	←	Body Assembly	1	
33	771482	←	Union	2	
34	681293	←	Silencer	1	
35	771490	←	Union	1	
36		711190	Reinforcement Plate	8	

Note 1 Item No.8 (Label) is not indicated in exploded view.

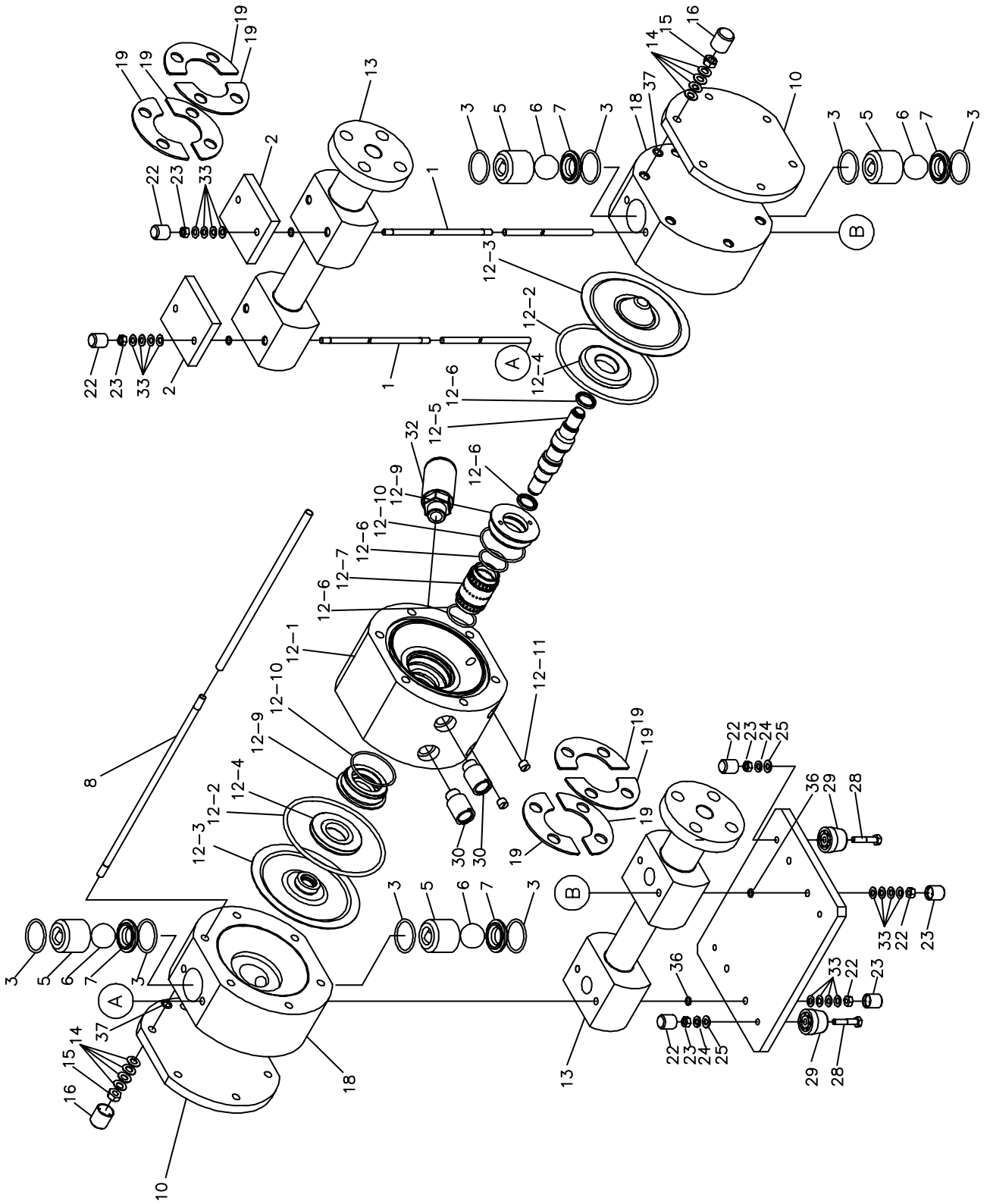
Note.2 Refer to the following about Item No.32 (Body Assembly).

803933 BODY ASSEMBLY

DP-20F/N

Item No.	Parts No.	Parts Name	Q'ty	Note
32-1	772224	Body	1	
32-2	643151	O-Ring	2	G130 PTFE
32-3	772090	Diaphragm	2	
32-4	772089	Bushing	2	
32-5	772227	Center Rod	1	
32-6	681294	Slipper Seal	2	
32-7	772226	Sleeve	1	
32-8	640037	O-Ring	2	P38 NBR
32-9	772225	Guide	2	
32-10	640060	O-Ring	2	P70 NBR
32-11	771301	Plug	2	

8.3 Exploded view DP-25F/N



Parts list DP-25F/N

Item No.	Connection structure	Parts Name	Q'ty	Note
	Flange			
1	714511	Tie Rod	4	
2	772423	Reinforcement Plate	2	
3	643041	O-Ring	8	P42 PTFE
5	772774	Valve Stopper	4	
6	770691	Ball	4	
7	772770	Valve Seat	4	
8	714524	Tie Rod	6	
9	790910	Label	1	
10	772422	Reinforcement Plate	2	
11	772421	Base	1	
12	804615	Body Assembly	1	
13	772420	Manifold	2	
14	681303	Coned Disk Spring	48	M10
15	683636	Nut	12	M10x1.5
16	771644	Cap	12	
18	772419	Out Chamber	2	
19	708964	Reinforcement Plate	8	
22	771783	Cap	12	
23	683635	Nut	12	M8x1.25
24	681300	Spring Lock Washer	4	M8
25	631173	Plan Washer	4	M8
28	621155	Bolt	4	M8x1.25x40
29	771402	Cushion	4	
30	771621	Union	2	
32	684501	Silencer	1	
33	681880	Coned Disk Spring	32	M8
34	772556	Tube	4	
35	772557	Tube	6	
36	642006	O-Ring	8	P9
37	642009	O-Ring	12	P11

Note 1 Item No.9 (Label) is not indicated in exploded view.

Note.2 Refer to the following about Item No.12 (Body Assembly).

804615 BODY ASSEMBLY

DP-25F/N

Item No.	Parts No.	Parts Name	Q'ty	Note
12-1	772994	Body	1	
12-2	643156	O-Ring	2	
12-3	772437	Diaphragm	2	
12-4	772438	Bushing	2	
12-5	772997	Center Rod	1	
12-6	686047	Slipper Seal	2	
12-7	772996	Sleeve	1	
12-8	642133	O-Ring	2	
12-9	772995	Guide	2	
12-10	6421338	O-Ring	2	
12-11	771301	Plug	2	
12-12	772425	Cushion	2	

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