Original Instructions CE

Doc. No.	PlusAir OP5-15

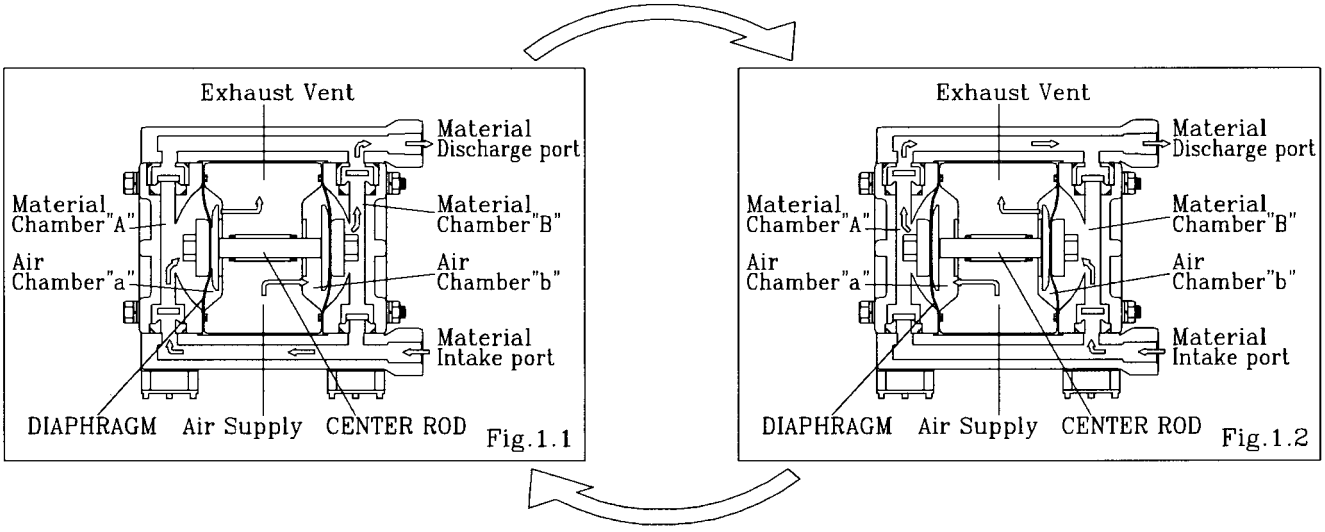
OPERATION MANUAL

PlusAir AIR-OPERATED DIAPHRAGM PUMPS

PlusAir v-5 series
PlusAir -10 series
PlusAir -10 series

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.



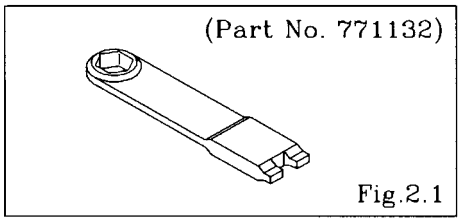
2.Tools, etc.

2.1 General tools

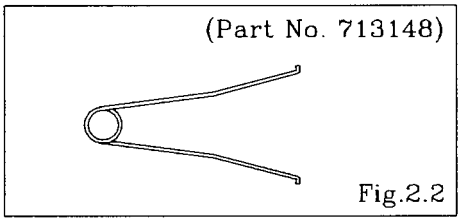
- Socket wrenches 10mm(PlusAir-5), 13mm(PlusAir -15)
- Open-end wrenches 10mm (PlusAir -5), 13mm(PlusAir -15), 21mm(PlusAir -15)
- Plyer

2.2 Special tools (sold separately)

- Cap and disk remover
  Purpose: Removing the center disk of FP□ and FV□ and FDT types



- Sleeve remover
  Purpose: For removing sleeves



2.3 Misc.

- Assembly oil Turbine oil none addition class 1(equivalent to ISO VG32 grade)
- Nuts M6 X 1(PlusAir -5), M8 X 1.25(PlusAir -15)
- 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, Flat valves and Valve seats

4.1 Removal

■FAT, FST, BA□, BS□ types

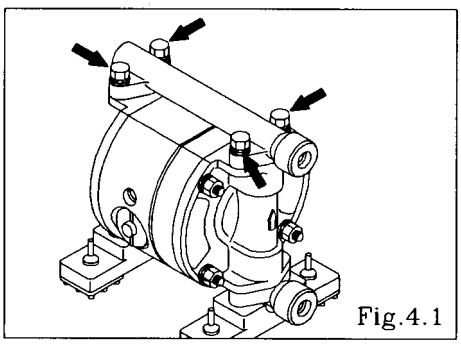


Fig.4.1

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

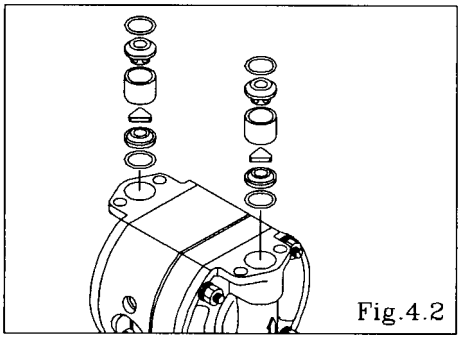


Fig.4.2

- Remove the O ring, valve stopper, valve guide, flat valve and valve seat. (PlusAir -5) [Fig.4.2]
- Remove the O ring, valve guide, ball and valve seat. (PlusAir -15) [Fig.4.2]

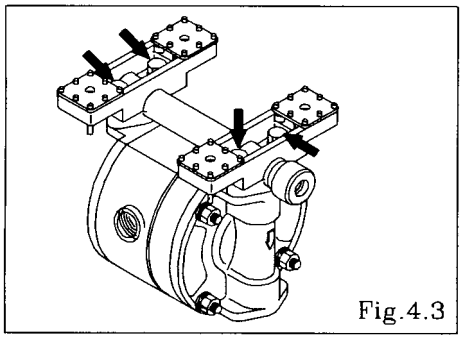


Fig.4.3

- Turn over the main body assembly. [Fig.4.3]
- Remove the 4 retainer bolts from the in manifold, and remove the base and in manifold. [Fig.4.3]

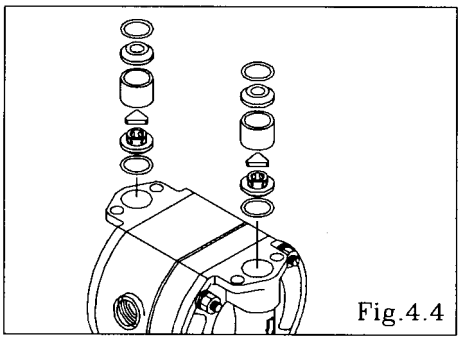


Fig.4.4

- Remove the O ring, valve seat, flat valve, valve guide and valve stopper. (PlusAir -5) [Fig.4.4]
- Remove the O ring, valve seat, ball and valve guide. (PlusAir -15) [Fig.4.4]

■FP□, FV□, FDT types

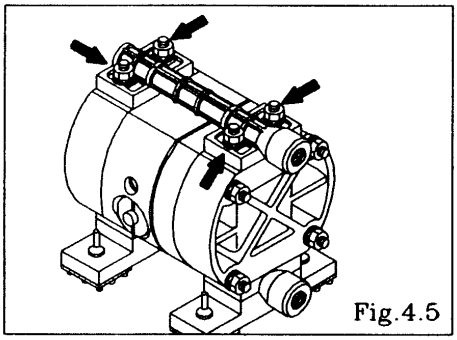


Fig.4.5

▪ Remove the 4 retainer nuts from the out manifold, and remove the out manifold. [Fig.4.5]

< NOTE >

▪ When the retainer nuts both side of the tie rod remove, the in manifold removes.(PlusAir -5)

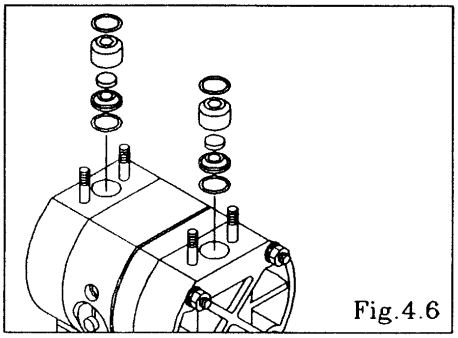


Fig.4.6

▪ Remove the O ring, valve stopper, flat valve and valve seat. [Fig.4.6]

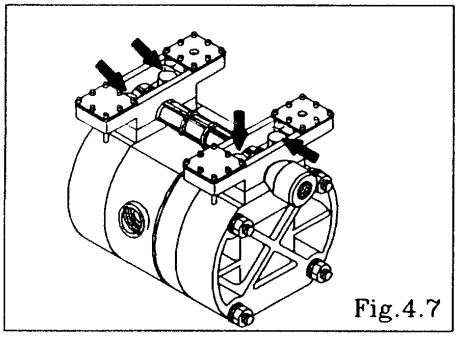


Fig.4.7

▪ Turn over the main body assembly. [Fig.4.7]
▪ Pull out the bolt, and remove the base and in manifold. (PlusAir -5)
▪ Remove the 4 retainer bolts from the in manifold, and remove the base and in manifold. (PlusAir -15) [Fig.4.7]

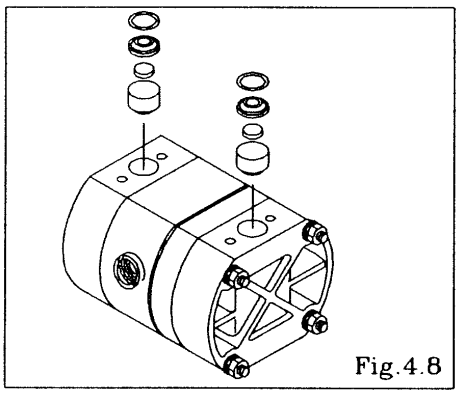


Fig.4.8

▪ Remove the O ring, valve seat, flat valve and valve stopper. [Fig.4.8]

4.2 Inspection

■Ball valve type

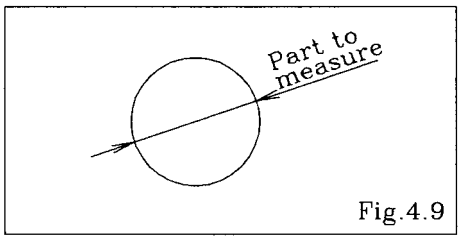


Fig.4.9

▪ Ball [Fig.4.9]
Measure the outside diameter, and if it is outside the usable range, replace the ball.

Usable range of Ball

PlusAir -15	Sø 20.0 ~ Sø 22.8 mm

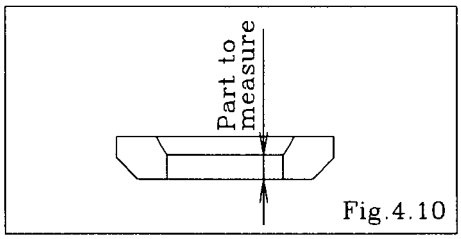


Fig.4.10

▪ Valve seat [Fig.4.10]
Measure the dimension shown at left, and if it is outside the usable range, replace the seat.

Usable range of Valve seat

PlusAir -15	2.6 ~ 6.5 mm

■Flat valve type

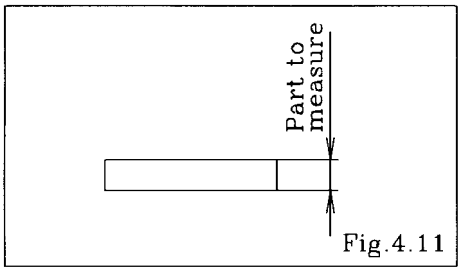


Fig.4.11

▪ Flat valve [Fig.4.11]
Measure the dimension shown at left, and if it is outside the usable range, replace the seat. If the seal ring is worn out or cracked, replace it.

Usable range of Flat valve

PlusAir -5	2.5 ~ 3.1 mm
PlusAir -15	4.3 ~ 5.0 mm

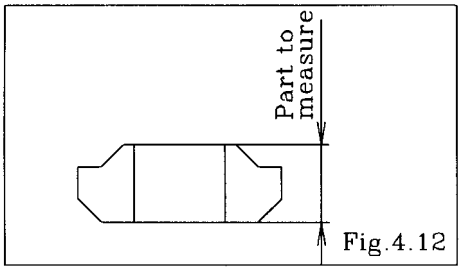


Fig.4.12

▪ Valve seat [Fig.4.12]
Measure the dimension shown at left, and if it is outside the usable range, replace the seat.

Usable range of Valve seat

PlusAir -5	5.8 ~ 7.1 mm
PlusAir -15	8.2 ~ 10.0 mm

▪ O ring (other than PTFE)
If O ring is worn out or cracked, replace it.

4.3 Installation

For installation, see [Exploded View] on the separate sheet and install in the reverse order of disassembly.

Tightening torque for manifold retainer bolts or nuts

PlusAir -5	7.5 N・m
PlusAir -15	12 N・m

< NOTE >

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

5.Diaphragm and Center rod

5.1 Removal

■FAT, FST, BA□, BS□ types

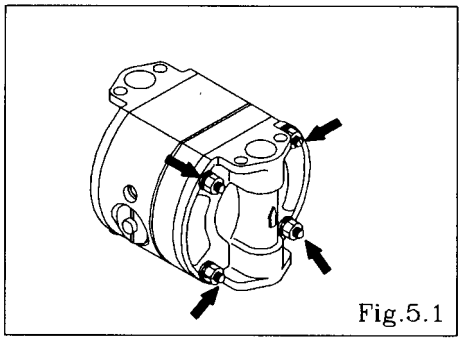


Fig.5.1

- Remove the ball or flat valve and valve seat (see [4.1 Removal FAT, FST, BA□, BS□ types] on P. 2).
- Remove the 8 (12 on the PlusAir -15) retainer bolts from the out chamber, and remove the out chamber. [Fig.5.1]

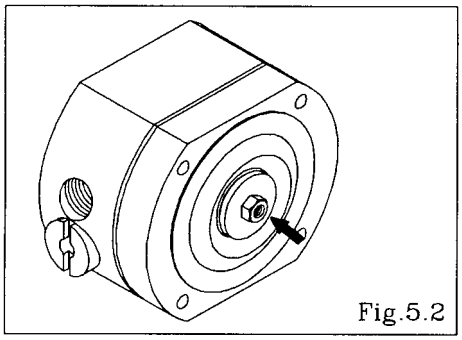


Fig.5.2

- Remove the nuts on both sides of the center rod. [Fig.5.2]
- After the nuts 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.

<NOTE>

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

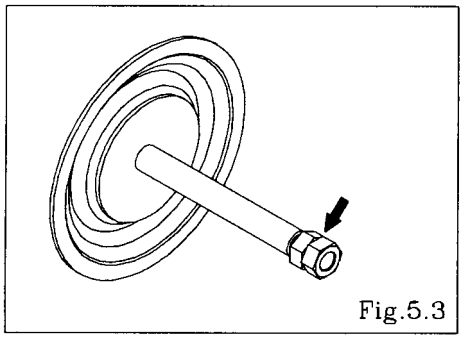


Fig.5.3

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

■FP□, FV□, FDT types

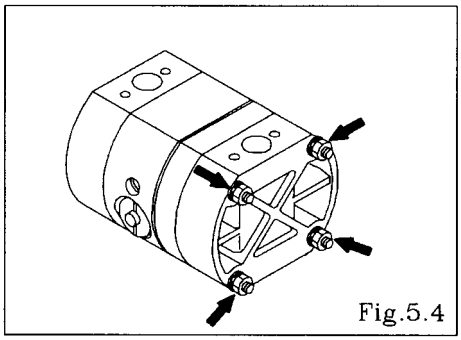


Fig.5.4

- Remove the flat valve and valve seat
  (see [4.1 Removal FP□, FV□, FDT types] on P. 3).
- Remove the 8 (12 on the PlusAir -15) retainer nuts from the out chamber, and remove the out chamber. [Fig.5.4]

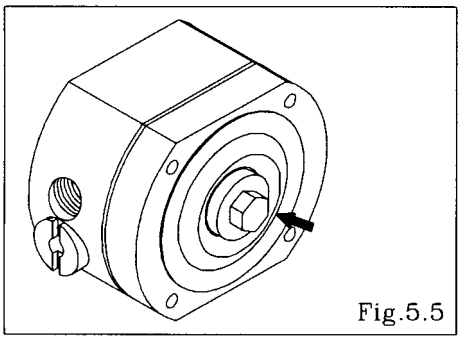


Fig.5.5

- Remove the center disk using the cap and disk remover. (special tool: Part No. 771132). (PlusAir -5) [Fig.5.5]

- Remove the center disk from one side.(PlusAir -15) [Fig.5.5]
- 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.

<NOTE>

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

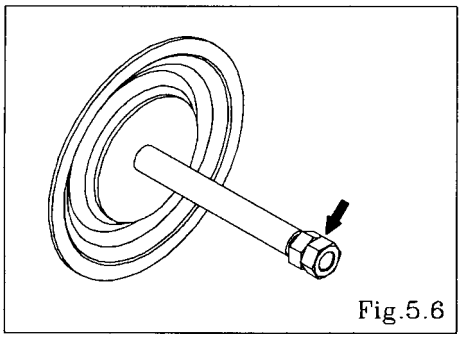


Fig.5.6

- Fix a double nut to one end of the center rod and take the diaphragm and center disk off the opposite end. [Fig.5.6]

- 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

PlusAir -5	PTFE	30,000,000 cycle
PlusAir -15	CR, NBR, PTFE	10,000,000 cycle
	TPEE, TPO	15,000,000 cycle

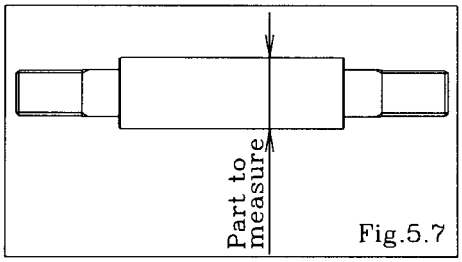


Fig.5.7

- Center rod [Fig.5.7]
  Measure the diameter, and if it is outside the usable range, replace the rod.

Usable range of center rod

PlusAir -5	ø 9.95 ~ø 10.0 mm
PlusAir -15	ø 13.96 ~ø 14.0 mm

5.3 Installation

■B□H, B□S, FPH, F□S types

For installation, see [Exploded View] on the separate sheet and install in the reverse order of disassembly.

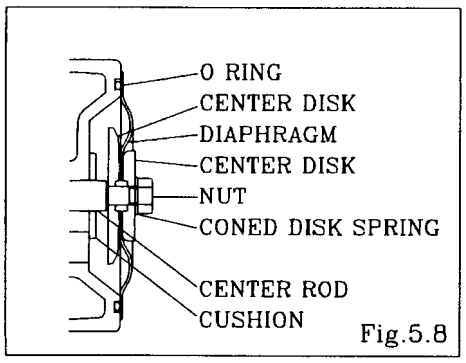


Fig.5.8

- Apply grease to the center rod, and insert it into the main body.
- Keep the convex side to the outside.
- Tighten the center disk using the open-end wrenches for the PlusAir -15FP□, FVS.

  (No coned disk springs and nuts are needed.)
- Tighten the out chamber temporarily at first.
- After installation of the out chambers on both sides, place the pump on a flat surface and stand the pump upright for further assembly.

Tightening torque for center rod and out chamber

	Center rod	Out chamber
PlusAir -5	7.5 N・m	
PlusAir -15	14 N・m	12 N・m

<NOTE>

- Make sure there is no dust on the seal surface in order to prevent seal damaged.
- Tighten the bolts that balance should be equal from both side on diagonal line with even torque.

■B□C, B□N, B□T, FPC, FPN, F□T types

For installation, see [Exploded View] on the separate sheet and install in the reverse order of disassembly.

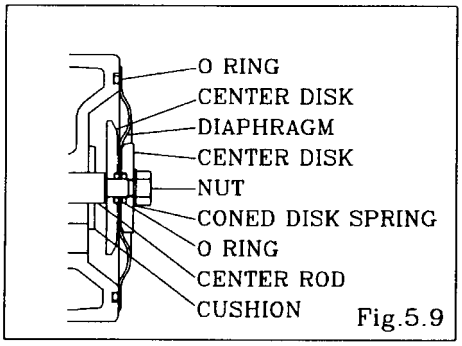


Fig.5.9

- Apply grease to the center rod, and insert it into the main body.
- Keep the marking “LIQUID” to liquid end for CR, NBR diaphragms.
- Keep the convex side to the outside for PTFE diaphragm. Install the O ring (cf. Fig.5.9).
- Tighten the center disk using the open-end wrenches.
- After installation of the out chambers on both sides, place the pump on a flat surface and stand the pump upright for further assembly.

Tightening torque for center rod and out chamber

	Center rod	Out chamber
PlusAir -5	7.5 N・m	
PlusAir -15	14 N・m	12 N・m

< NOTE >

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

6.Pilot valve Assembly, Guide and Bushing

6.1 Removal

■PlusAir-5

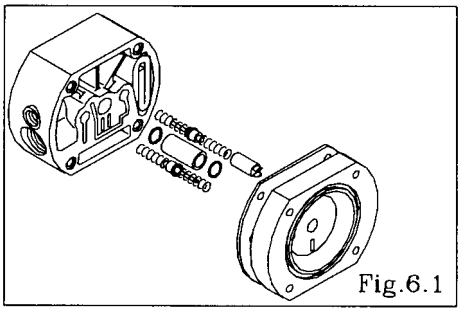


Fig.6.1

- Remove the cap using the cap and disk remover. (see [5.1 Removal] on P.5)
- Remove the main body. [Fig.6.1]
- Draw out the pilot valve assembly. [Fig.6.1]
- Remove the packing and bushing. [Fig.6.1]

■PlusAir-15

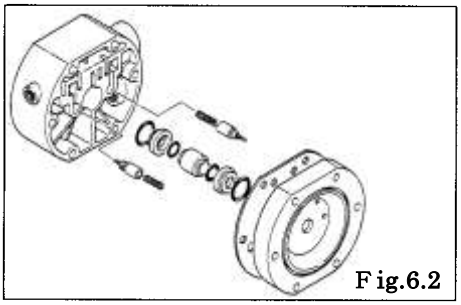


Fig.6.2

- Remove the diaphragm and center rod etc.(see [5.1 Removal] on P.5)
- Remove the body B. [Fig.6.2]
- Draw out the pilot valve assembly. [Fig.6.2]
- Remove the packing, bushing and guide. [Fig.6.2]

6.2 Inspection

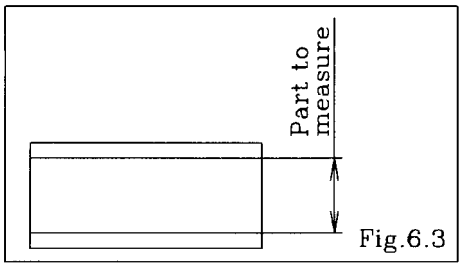


Fig.6.3

- Bushing (PlusAir -5) [Fig.6.3]
  Measure the inside diameter, and if it is outside the usable range, replace the bushing.

Usable range of bushing
ø 10.1 ~ ø 10.3 mm

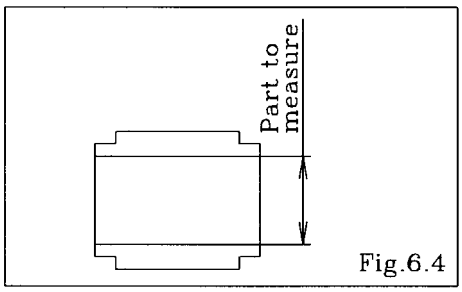


Fig.6.4

- Guide (PlusAir -15) [Fig.6.4]
  Measure the inside diameter, and if it is outside the usable range, replace the guide.

Usable range of guide
ø 14.1 ~ ø 14.2 mm

- O ring, Packing
  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 [Exploded View] on the separate sheet and install in the reverse order of disassembly.

The correct direction of the V packing

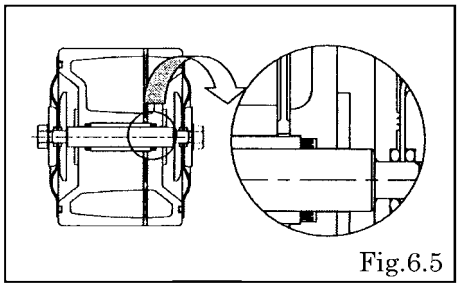


Fig.6.5

<NOTE>

- Make sure there is no dust on the seal surface and the seal is not damaged.
- Apply grease to packing.
- The open side of the V faces toward the diaphragm (air chamber).

7.C spool valve assembly and Sleeve assembly

7.1 Removal

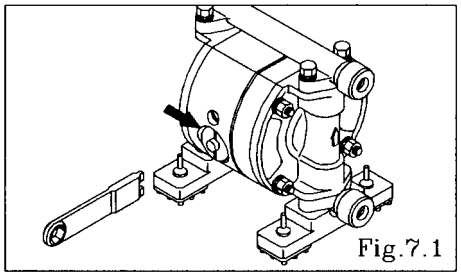


Fig.7.1

▪ Remove the cap using the cap and disk remover. (special tool: Part No. 771132). [Fig.7.1]

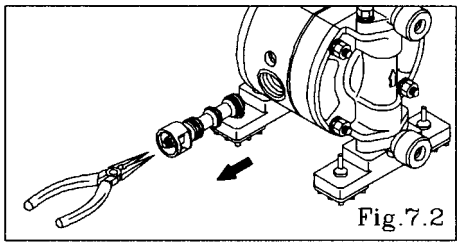


Fig.7.2

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

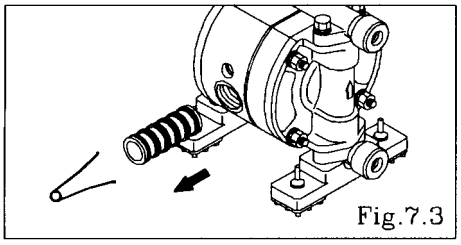


Fig.7.3

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

7.2 Inspection

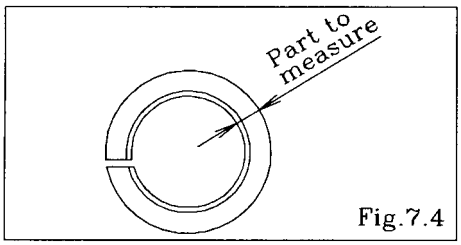


Fig.7.4

▪ C Spool valve Assembly

▪ Seal ring [Fig.7.4]

Measure the inside thick diameter, and if it is outside the usable range, 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

PlusAir -5	1.43 ~ 1.48 mm
PlusAir -15	1.85 ~ 1.90 mm

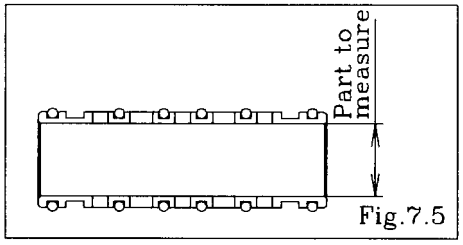


Fig.7.5

▪ Sleeve Assembly [Fig.7.5]

Measure the inside diameter, and if it is outside the usable range, replace the sleeve assembly.

Usable range of Sleeve

PlusAir -5	ø 9.5 ~ ø 9.55 mm
PlusAir -15	ø 15.8 ~ ø 15.85 mm

▪ O ring

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

<NOTE>

▪ C Spool Valve Assembly and Sleeve Assembly must be Replaced complete set. Unable to replace individual component.

7.3 Installation

For installation, see [Exploded View] on the separate sheet 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. Retightening of Tie rods

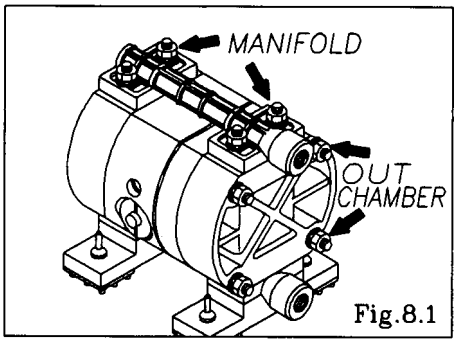


Fig.8.1

- The torque should be applied on the occasion of
  (1) Right before the pump to use.
  (2) There are any leaks of material on daily inspecting a pump.

		Retainer bolts from the out chamber	Retainer bolts from the manifold
PlusAir -5	FPT, FVT, FDT	7.5 N・m	7.5 N・m
PlusAir -15	FP□, FV□, FDT	12 N・m	12 N・m

<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]