



Doc. No. NDP 497M-03(P)

MAINTENANCE MANUAL

***G*LOBAL SERIES**

Air-Operated Double Diaphragm Pumps

G15 Series

WARNING



- For your own safety, be sure to read these procedures carefully before performing maintenance on this product. After reading this document, be sure to keep it handy for future reference.

These maintenance manuals cover what you should know about maintenance of the Yamada G15 Series Diaphragm Pumps.

This edition is based on the standards for the August 2018 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 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 Operation 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. (Refer to Exploded View and Reminder to order correct item on the separate sheets.)

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 Operation Manual. Also, remember that the pump is heavy, and extreme care must be taken when lifting it.

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1. Principles of operation

There are two diaphragms fixed to the center rod, one at each end. When compressed air is supplied to air chamber b (right side, see Fig.1.1), the center rod moves to the right, the material in material chamber B is pushed out, and at the same time material is sucked into material chamber A.

When the center rod is moved full-stroke to the right, the air switch valve is switched, compressed air is sent to air chamber a (left side, see Fig.1.2), and the center rod moves to the left. The material in material chamber A is pushed out, and at the same time material is sucked into material chamber B.

Through repetition of this operation, material is repeatedly taken in and discharged out.

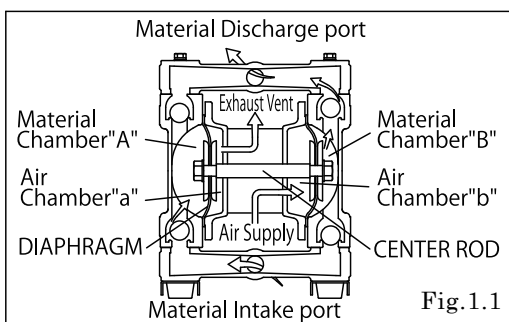


Fig. 1.1

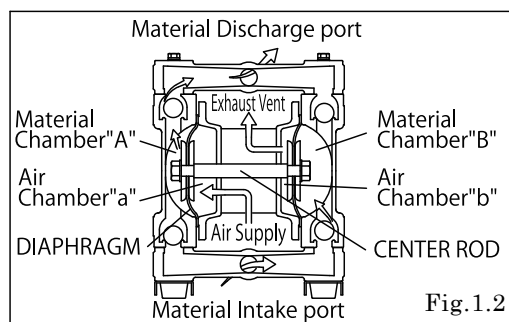


Fig. 1.2

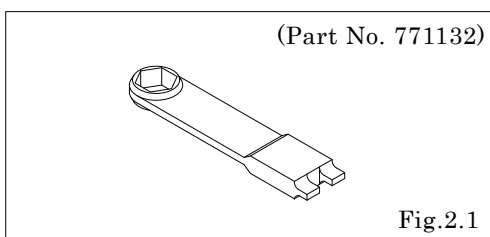
2. Tools, etc.

2.1 General tools

- Socket wrenches 10 mm (A_, S_, P_) , 12 mm (P_) , 13 mm (A_, S_) , 17 mm (A_, S_)
- Open-end wrenches 10 mm (A_, S_) , 12 mm (P_) , 13 mm (A_, S_) , 17 mm (A_, S_) , 22 mm (P_)
- Hexagonal box wrenches 5 mm
- Phillips head screw driver (P_)
- Pliers (P_)

2.2 Special tools (sold separately)

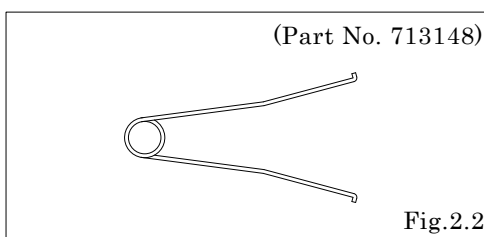
- Cap and disk remover (A_, S_)
 - Purpose: Removing the cap



(Part No. 771132)

Fig.2.1

- Sleeve remover
 - Purpose: For removing sleeves



(Part No. 713148)

Fig.2.2

2.3 Misc.

- Assembly oil Turbine oil none addition class 1(equivalent ISO VG32 grade)
- Grease Urea grease grade (NLGI) No.2
- Thread locking agent Equivalent to LOCTITE® 222(S_), LOCTITE® 243(P_)

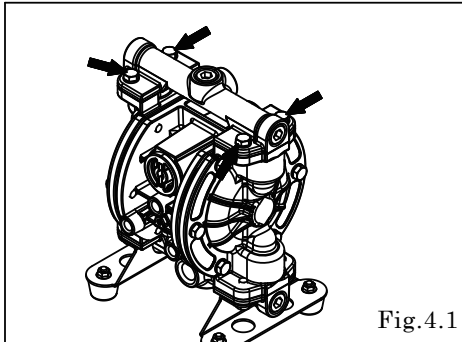
3. Ordering Replacement parts

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.

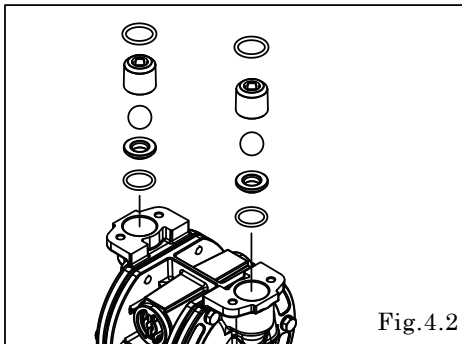
4. Balls, Valve seats

4.1 Removal

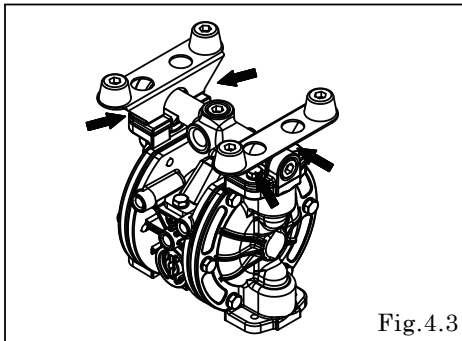
■ A_, S_ Type



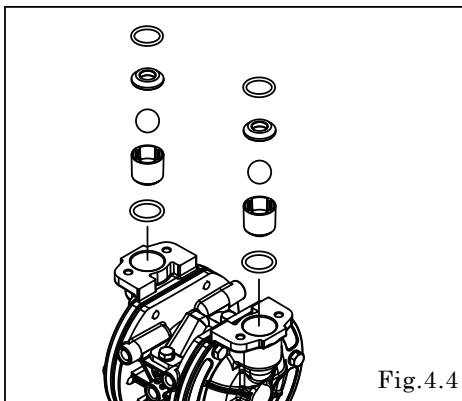
- Remove 4 mounting bolts from upper manifold and remove the manifold. [Fig.4.1]



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

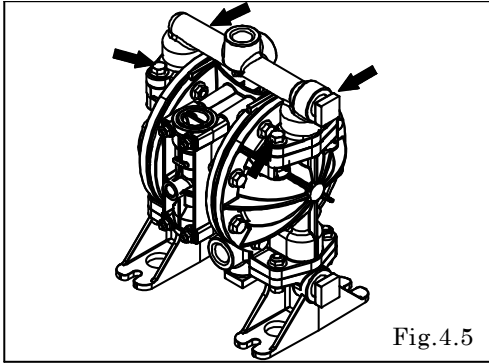


- Turn over the main body assembly. [Fig.4.3]
- Remove 4 mounting bolts from lower manifold and remove the base and the manifold. [Fig.4.3]

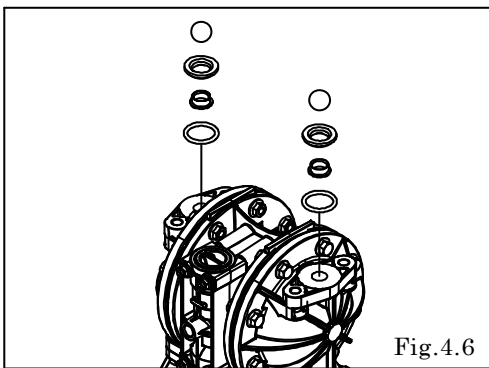


- Remove the O ring, valve seat, ball, valve stopper. [Fig.4.4]

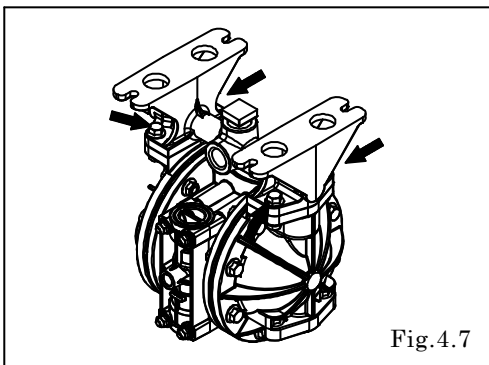
■ P_Type



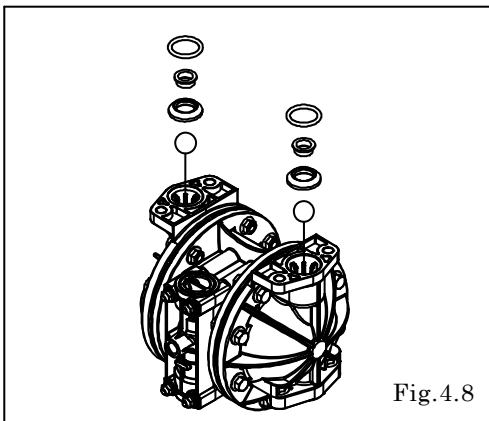
- Remove 4 mounting bolts from upper manifold A and remove the manifold A. [Fig.4.5]



- Remove the Ball, valve seat A, valve seat B, O ring. [Fig.4.6]

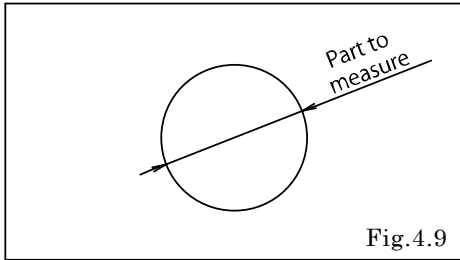


- Turn over the main body assembly. [Fig.4.7]
- Remove 4 mounting bolts from lower manifold B and remove the manifold B. [Fig.4.7]



- Remove the O ring, valve seat B, valve seat A, ball. [Fig.4.8]

4.2 Inspection



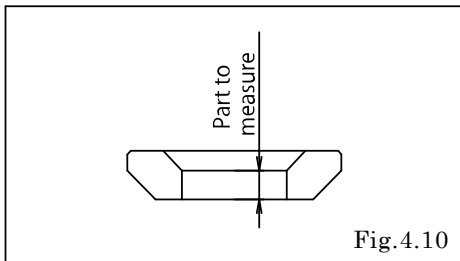
- Ball [Fig.4.9]
Measure the outside diameter, and if it is outside the usable range, replace the ball.

Usable range of Ball

$S\varnothing 0.669 \sim S\varnothing 0.760$ in { $S\varnothing 17.0 \sim S\varnothing 19.3$ mm}

- O ring
If O ring is worn out or cracked, replace it.
Replace the PTFE O ring regardless of its condition.

■ A_, S_ Type

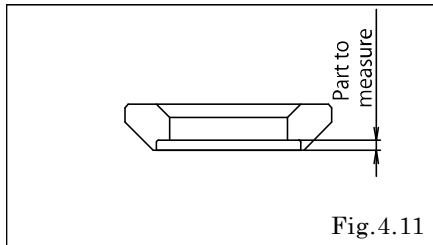


- Valve seat [Fig.4.10]
Measure the dimension shown at left, and if it is outside the usable range, replace the valve seat.

Usable range of Valve seat

0.102 ~ 0.225 in {2.6 ~ 5.7 mm}

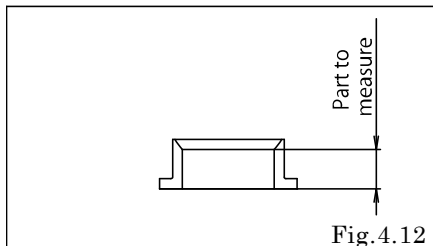
■ P_ Type



- Valve seat A [Fig.4.11]
Measure the dimension shown at left, and if it is outside the usable range, replace the valve seat A.

Usable range of Valve seat A

0.055 ~ 0.071 in {1.4 ~ 1.8 mm}



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

Usable range of Valve seat B

0.177 ~ 0.256 in {4.5 ~ 6.5 mm}

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

AN, AS, SN, SS	105 in-lbf {12 N-m}
AT, ST	160 in-lbf {18 N-m}
PS, PT	89 in-lbf {10 N-m}

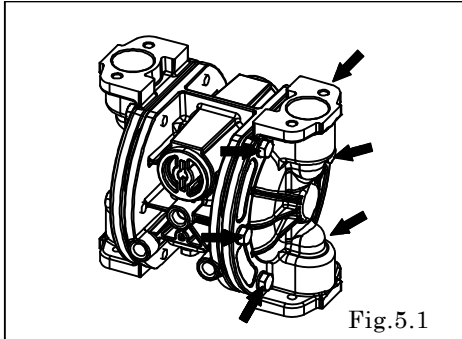
<NOTE>

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

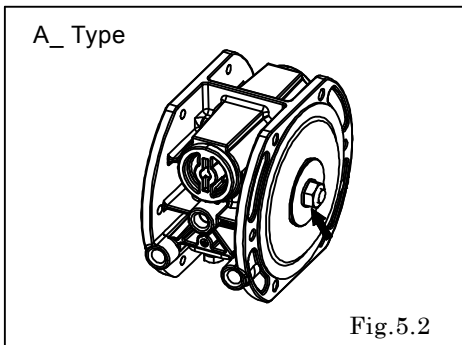
5. Diaphragm and Center rod

5.1 Removal

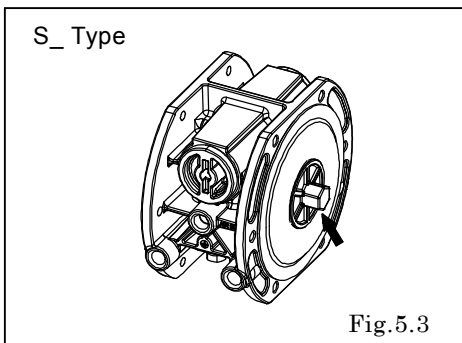
■ A_, S_ Type



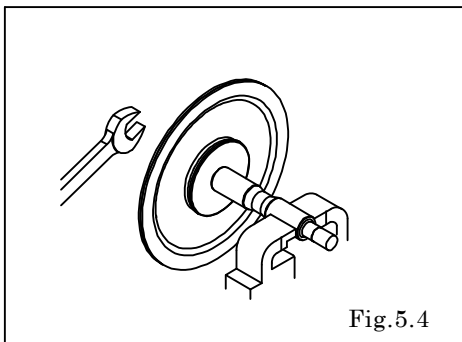
- Remove the O ring, valve stopper, ball, valve seat (see [4.1 Removal]).
- Remove the 12 retainer bolts from the out chamber, and remove the out chamber. [Fig.5.1]



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

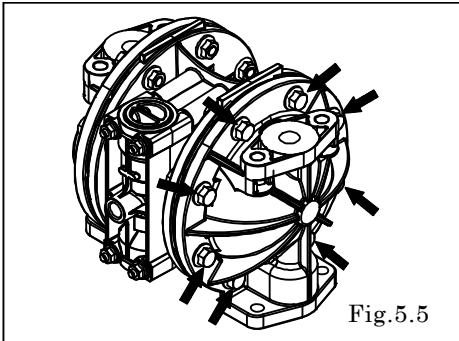


- Remove the center disk on both sides of the center rod. [Fig.5.3]
- After the center disk on one side have been removed, remove the center disk and diaphragm. Remove the diaphragm, center disk and center rod from the opposite side of the main body.

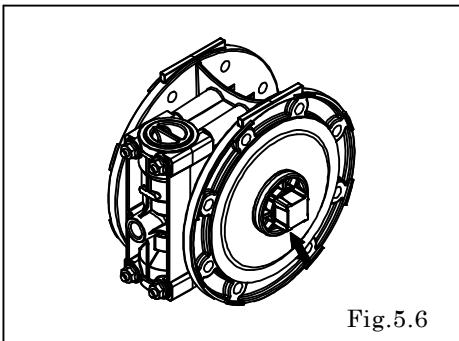


- Put the cloth between the vise and the center rod to prevent the part get scratched. [Fig.5.4]
- Fix the center rod, and then;
 - A_ type: remove the nut
 - S_ type: remove the center disk
- Remove the coned disk spring (only A_ Type), center disk and diaphragm from center rod.

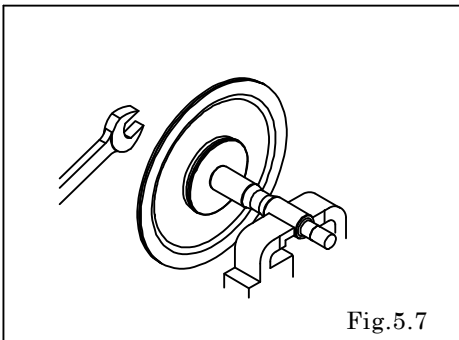
■ P_Type



- Remove the ball, valve seat A, valve seat B, O ring. (see [4.1 Removal]).
- Remove the 16 retainer bolts from the out chamber, and remove the out chamber. [Fig.5.5]



- Remove the center disk on both sides of the center rod. [Fig.5.6]
- After the center disk on one side have been removed using the spanner 22 mm etc., remove the center disk, diaphragm and backup diaphragm (only PT Type). Remove the diaphragm, backup diaphragm (only PT Type), center disk and center rod from the opposite side of the main body.



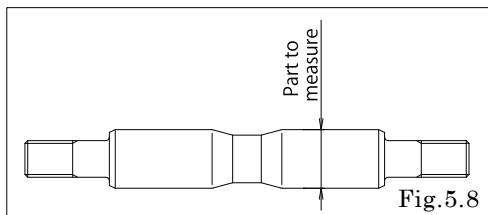
- Put the cloth between the vise and the center rod to prevent the part get scratched.
- Fix the center rod, and remove the center disk. [Fig.5.7]
- Remove the diaphragm, backup diaphragm (only PT Type) and center disk.

5.2 Inspection

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

Guideline of diaphragm life

A_, S_	NBR, PTFE	10,000,000 cycle
	TPO	15,000,000 cycle
P_	PTFE (Including backup diaphragm)	7,000,000 cycle
	TPO	10,000,000 cycle



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

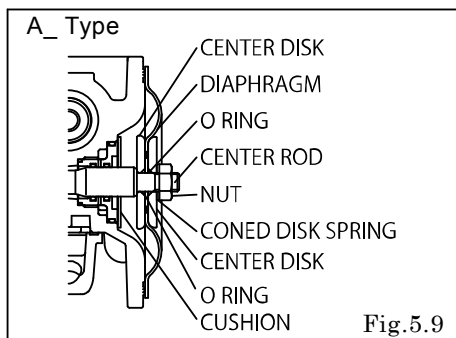
Usable range of center rod

$\varnothing 0.6280 \sim \varnothing 0.6299$ in { $\varnothing 15.95 \sim \varnothing 16.00$ mm}

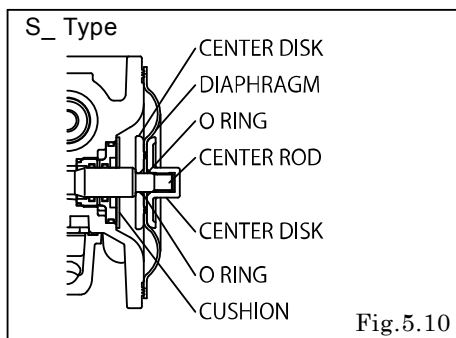
5.3 Installation

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

■ A_, S_ Type



- Apply grease to the center rod, and insert it into the main body.
- Keep the convex side to the outside for diaphragm.
- For the model with PTFE diaphragm, put the O rings into both side of the diaphragms. (cf. Fig.5.9, Fig.5.10).
- A_ type: Tighten the nuts.
- S_ type: Apply screw glue on the thread of center rod, then tighten the center disks.
- Assemble the out chamber. Bolts should not be fully tightened at this point.
- Place the pump on flat surface, stand the pump upright and tighten all the bolts fully.



Tightening torque for center rod and out chamber

Center rod	Out chamber
160 in-lbf {18 N-m}	105 in-lbf {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.

■ P_Type

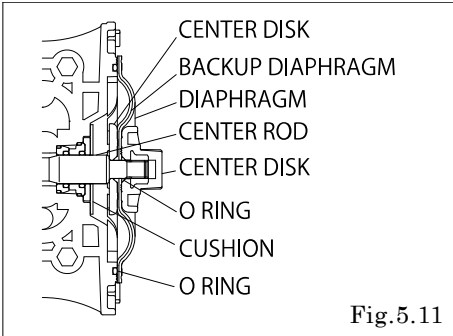


Fig.5.11

- Apply grease to the center rod, and insert it into the main body.
- PT type (PTFE Diaphragm model): Put the backup diaphragm before PTFE diaphragm, and O ring after PTFE diaphragm. (cf. Fig.5.11)
- Keep the convex side to the outside for diaphragm and backup diaphragm.
- Apply thread locker to center disk and tighten the center disk.
- Assemble the out chamber. Bolts should not be fully tightened at this point.
- Place the pump on flat surface, stand the pump upright and tighten all the bolts fully.

Tightening torque for center rod and out chamber

	Center rod	Out chamber
PS	177 in-lbf {20 N-m}	89 in-lbf {10 N-m}
PT	177 in-lbf {20 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. Guide bush

6.1 Removal

■ A_, S_Type

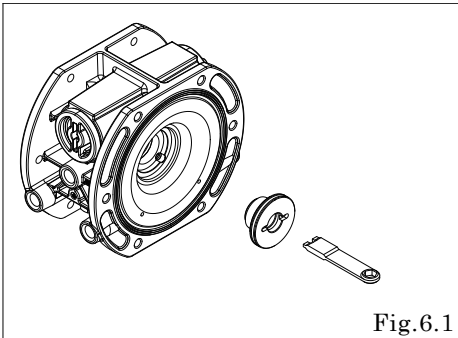


Fig.6.1

- Remove the diaphragm and center rod etc. (see [5.1 Removal]).
- Remove the guide bushing with Cap and disk remover (Special tool: 771132) [Fig. 6.1]

■ P_Type

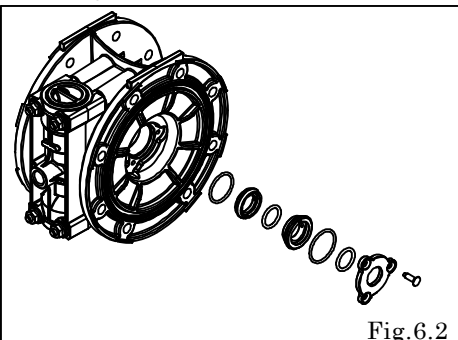


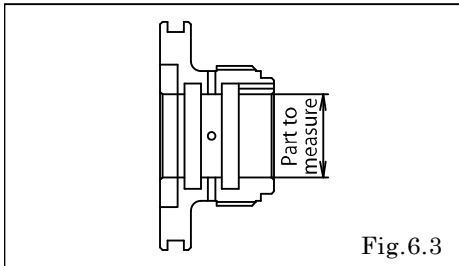
Fig.6.2

- Remove the diaphragm and center rod etc. (see [5.1 Removal]).
- Remove the tapping screw fixing the guide bush stopper and remove the guide bush A, guide bush B and O ring. [Fig.6.2]

6.2 Inspection

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

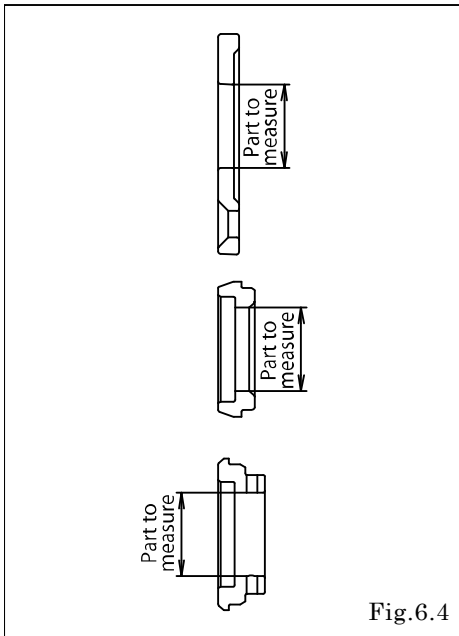
■ A_, S_ Type



- Guide bush [Fig.6.3]
Measure the inside diameter, and if it is outside the usable range, replace the guide.

Usable range of guide $\phi 0.6299 \sim \phi 0.6378$ in $\{\phi 16.0 \sim \phi 16.2 \text{ mm}\}$
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■ P_ Type



- Guide bush stopper, guide bush A, guide bush B [Fig.6.4]
Measure the inside diameter, and if it is outside the usable range, replace the guide bush stopper, guide bush A, guide bush B.

Usable range of guide bush stopper, guide bush A, guide bush B $\phi 0.6299 \sim \phi 0.6496$ in $\{\phi 16.0 \sim \phi 16.5 \text{ mm}\}$
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6.3 Installation

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

Tightening torque for tapping screw	
P_	9 in-lbf {1.0 N-m}

<NOTE>

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

7. Spool assembly and Sleeve

7.1 Removal

■ A_, S_ Type

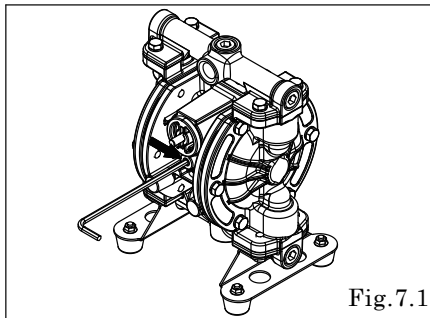


Fig.7.1

- Loosen the plug with hexagonal box wrench and remove remaining air from inside the pump. [Fig.7.1]

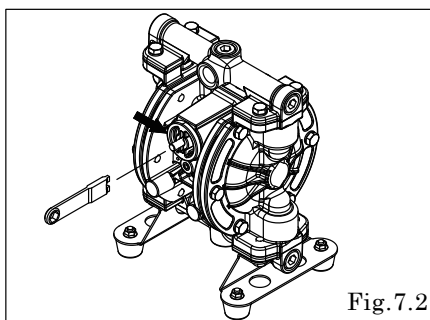


Fig.7.2

- Remove the cap A and cap B using the cap and disk remover. (special tool: Part No. 771132). [Fig.7.2]

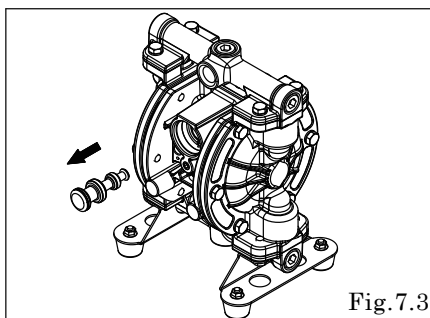


Fig.7.3

- Remove Spool assembly by pushing it from Cap A side (the side without reset button). [Fig.7.3]

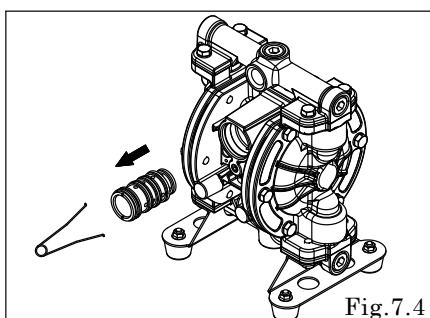
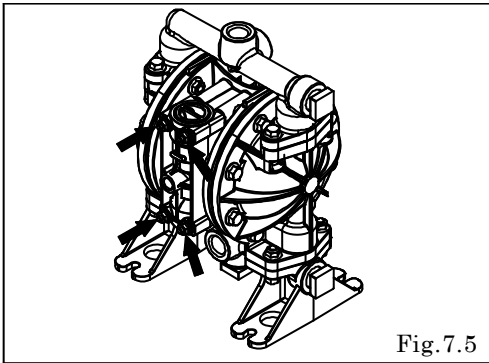


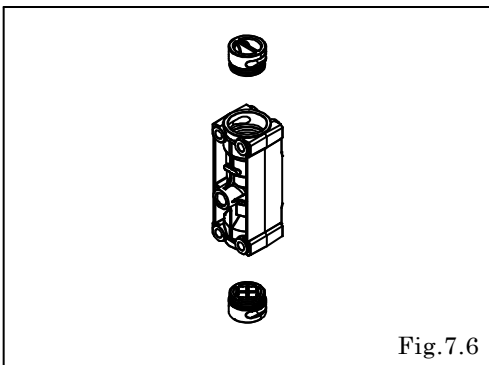
Fig.7.4

- Remove the sleeve using the sleeve remover (special tool: Part number 713148). [Fig.7.4]

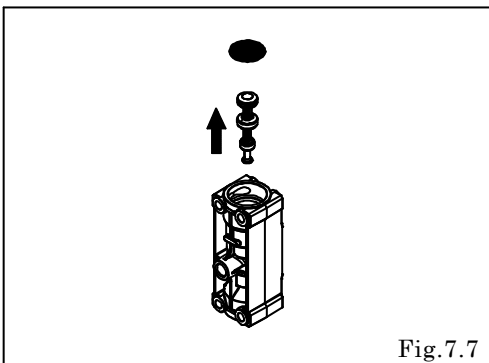
■ P_Type



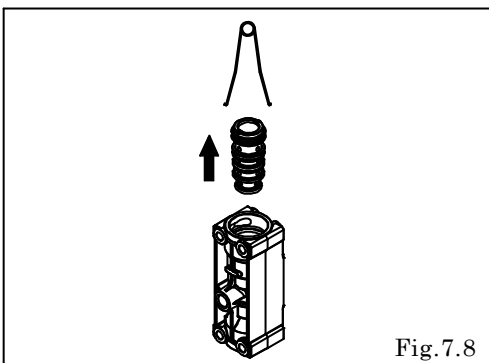
- Remove 4 nuts fixing the valve body assembly and draw out the valve body assembly from the main body. [Fig.7.5]



- Remove the cap using the Pliers. [Fig.7.6]



- Remove the cushion, and then push out the spool assembly from opposite side. [Fig.7.7]



- Remove the sleeve using the sleeve remover (special tool: Part number 713148). [Fig.7.8]

7.2 Inspection

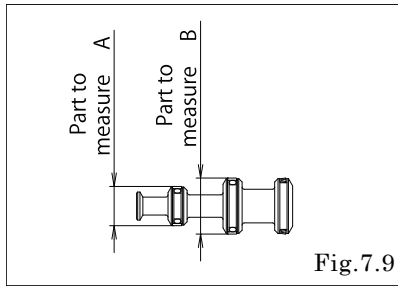


Fig.7.9

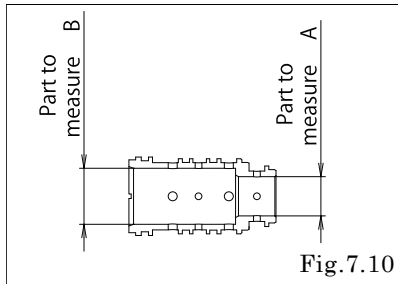


Fig.7.10

- Spool assembly

- Seal ring [Fig.7.9]

- Close the diagonal slit and measure the outside diameter, and if it is outside the usable range, replace the spool assembly.

- If the Seal ring is worn out or cracked, replace spool assembly.

Usable range of Seal ring

A_, S_	Part to measure A	ø0.6909 in and over {ø17.55 mm and over}
	Part to measure B	ø0.9862 in and over {ø25.05 mm and over}
P_	Part to measure A	ø0.4953 in and over {ø12.58 mm and over}
	Part to measure B	ø0.7039 in and over {ø17.88 mm and over}

- Sleeve [Fig.7.10]

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

Usable range of Sleeve

A_, S_	Part to measure A	ø0.6909 ~ ø0.6937 in {ø17.55 ~ ø17.62 mm}
	Part to measure B	ø0.9862 ~ ø0.9890 in {ø25.05 ~ ø25.12 mm}
P_	Part to measure A	ø0.4984 ~ ø0.5016 in {ø12.66 ~ ø12.74 mm}
	Part to measure B	ø0.7055 ~ ø0.7087 in {ø17.92 ~ ø18.00 mm}

- O ring, Packing

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

<NOTE>

- Spool assembly and Sleeve 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.

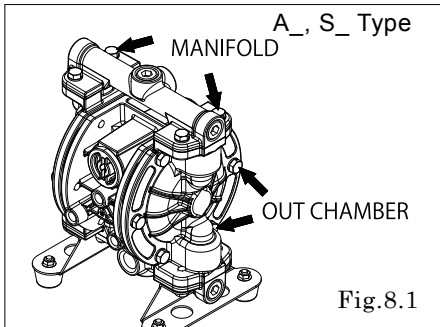
Tightening torque for valve body assembly attaching nuts

P_	9 in-lbf {1.0 N-m}
----	--------------------

<NOTE>

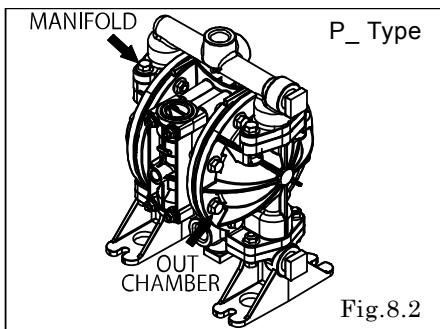
- Make sure there is no dust on the seal surface and it is not damaged.

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.

	Retain bolts for the out chamber	Retain bolts for the manifold
AN, AS SN, SS	105 in-lbf {12 N-m}	
AT, ST	105 in-lbf {12 N-m}	160 in-lbf {18 N-m}
PS	89 in-lbf {10 N-m}	
PT	89 in-lbf {10 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, Fig.8.2]

YAMADA AMERICA, INC

955 E. ALGONQUIN RD., ARLINGTON HEIGHTS, IL 60005, USA
PHONE : 1-847-631-9200 or 1-800-990-7867 (Toll Free)
FAX : 1-847-631-9273
E-mail : sales@yamadapump.com
Web : www.yamadapump.com

Manufactured by:

YAMADA CORPORATION

International Department
1-1-3, Minami-Magome, Ota ku, Tokyo, 143-8504, Japan
PHONE : +81-(0)3-3777-0241
FAX : +81-(0)3-3777-0584
E-mail : intl@yamadacorp.co.jp
Web : www.yamadacorp.co.jp