Doc. No.	NDP 196M-19

MAINTENANCE MANUAL

YAMADA PULSATION DAMPENER SERIES

AD Series
AD-TT Series

⚠ WARNING

- For safety reasons, be sure to read this maintenance manual thoroughly before starting maintenance of 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 Pulsation Dampener AD Series, AD-TT Series.
This document is based on products that were manufactured in July 2022 or sooner. Note that its contents are subject to change as a result of specification changes to be made in future. The units described in this manual are unified into SI units (international system of units).

- Warnings and Cautions

To use this product safely, be sure to observe the contents of the following descriptions. In this manual, warnings and cautions are indicated by using symbols. These symbols are intended to prevent death or serious injury. Each symbol is indicated and has a definition 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 .

This symbol indicates the contents that must be observed.

⚠ WARNING

- Before starting maintenance, shut off supply air and clean the pulsation dampener. If air pressure or residual liquid remains in the pulsation dampener, damage or explosion may occur. (For cleaning the pulsation dampener, refer to Chapter 6 of the Operation Manual.)

- When replacing parts, be sure to use the genuine YAMADA parts or equivalents. Using parts other than genuine parts may result in failure.
(Refer to Parts list the separate sheets.)

⚠ CAUTION

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

- Check the weight of the pulsation dampener by referring to “10.1 Main Specifications” in the operation manual and take extreme care when lifting it.

Table of Contents

1. Principles of Operation

1.1 AD-10, AD-25, AD-40 and AD-50

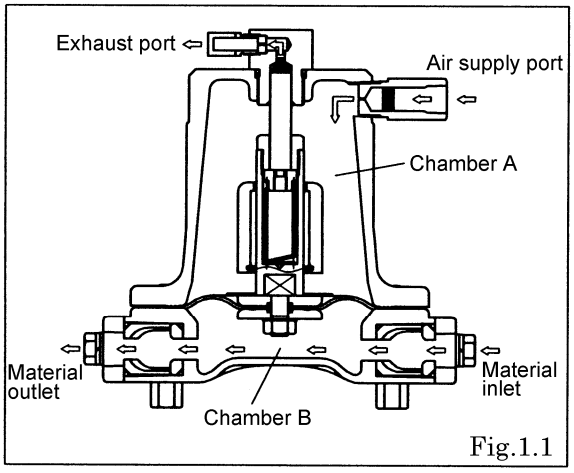

Fig.1.1

When the pressure of chamber B is increased by pulsation caused by pump operation, the diaphragms go up to increase the capacity of chamber B, so that the pressure is absorbed. When the pressure of chamber B is reduced, the diaphragms go down to reduce the capacity of chamber B, so that the pressure is increased. This operation acts as an air cushion to absorb the pulsation of liquid.

When the diaphragms go down to the lower limit, the center rod caused to go down by the diaphragms opens the valve, so that the compressed air in the chamber A is discharged from the exhaust port and the diaphragms are pushed up.

When the diaphragms go up, the air of chamber B is pressed to push down the diaphragms. The diaphragms are always are put in the intermediate position by supplying air under the same pressure as that of chamber B, so that the air cushion functions.

1.2 AD-10TT, AD-25TT, AD-38TT

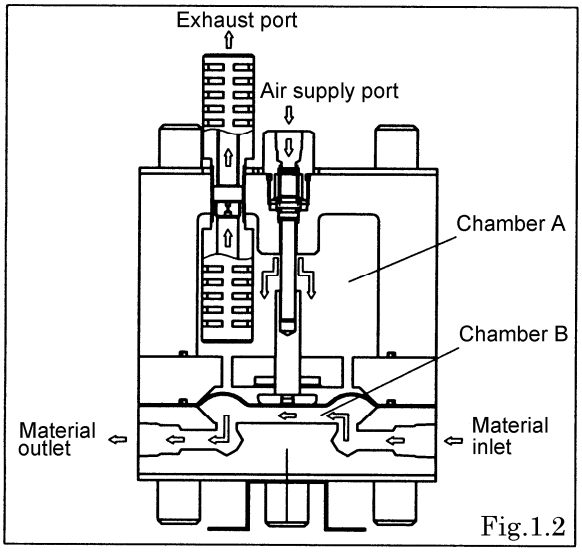

Fig.1.2

When the pressure of chamber B is increased by pulsation caused by pump operation, the diaphragms go up to increase the capacity of chamber B, so that the pressure is absorbed. When the pressure of chamber B is reduced, the diaphragms are caused to go down by the pressure of chamber A to reduce the capacity of chamber B, so that the pressure is increased.

This operation acts as an air cushion to absorb the pulsation of liquid.

The compressed air of chamber A is always discharged little by little. When the pressure of chamber A becomes smaller than the pressure of chamber B, the center rod goes up according to the rise of the diaphragms, so that the valve is opened to supply air to chamber A. The diaphragms are always put in the intermediate position by supplying air under higher pressure than the pressure of chamber B, so that the air cushion functions.

2. Maintenance and Tools

2.1 Maintenance

Since Pulsation Dampener can be used in many different applications varying in pressure, temperature, viscosity corrosiveness, and other properties, it is best to do a periodic inspection. Recording data on each installed Pulsation Dampener during inspections will also serve as a record for any future maintenance. Typical maintenance involves inspection of the air valve, diaphragms and O-rings.

Diaphragms should be replaced if they show any sign of wear, abrading, or cracking. Refer to this manual for acceptable measurable working tolerances on other wearing components.

2.2 General Tools

- Socket Wrenches
  - 13 mm (AD-10, AD-25P☐, AD-25VT, AD-10TT)
  - 17 mm (AD-25, AD-40, AD-50, AD-25TT, AD-38TT)
  - 19 mm (AD-40, AD-50 excluding AD-40P☐)
  - 22 mm (AD-25A☐, AD-25S☐, AD-25F☐)
  - 24 mm (AD-40☐, AD-50A☐, AD-50S☐, AD-50F☐ excluding AD-40P☐)
- Box wrench
  - 13 mm (AD-10, AD-25P☐, AD-25VT, AD-10TT)
  - 17 mm (AD-10, AD-25, AD-40, AD-50, AD-25TT, AD-38TT)
  - 19 mm (AD-40, AD-50 excluding AD-40P☐)
  - 21 mm (AD-10P☐)
  - 22 mm (AD-25A☐, AD-25S☐, AD-25F☐)
- For snap ring pliers (AD-10, AD-25, AD-40, AD-50)
- Adjustable angle wrenches
- Hexagonal bar wrench 6 mm (AD-10P☐)
- Flat-blade screwdriver

2.3 Dedicated Tools

- Dedicated tool (sold separately)
  Removal of center disk (AD-25P☐, AD-25VT)
  Part No.771244

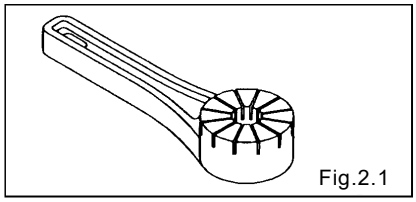
Fig.2.1

- PP wrench (sold separately)
  Removal of center disk (AD-40P☐, AD-50P☐)
  Part No.771868

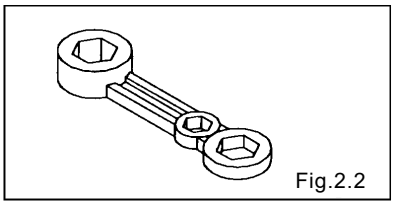
Fig.2.2

- Socket for a guide (sold separately)
  Removal of a spring sheet
  Part number: 804131

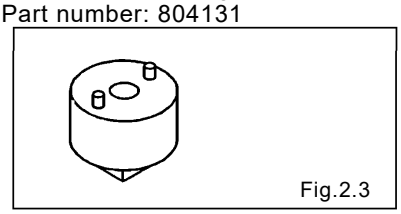
Fig.2.3

- Tweezers for a sleeve (sold separately)
  Removal of a guide
  Part number: 713148

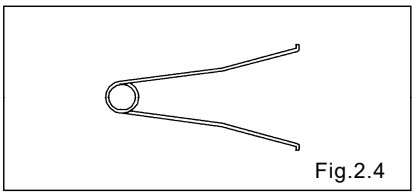
Fig.2.4

- Valve cap opener (supplied with a DP-Fi)
  Removal of the DP-10Fi or DP-20Fi valve cap
  Part number: 832517

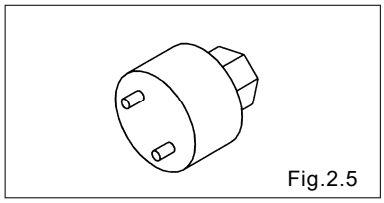
Fig.2.5

2.4 Other

- Grease — Urea grease grade (NLGI) No. 2 or equivalent
- Grease — Fomblin® GR AR555 or equivalent (AD-TT)
- Thread locking agent — Equivalent to LOCTITE® 222

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. AD-10, AD-25, AD-40 and AD-50

4.1 Removal

■A□, S□ and F□ types

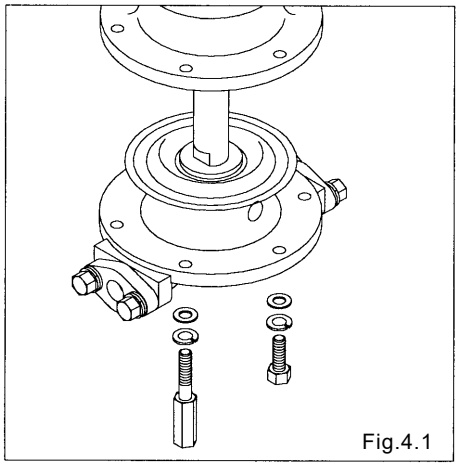

Fig.4.1

- Remove 6 out chamber mounting bolts and studs respectively, and remove the out chamber. (AD-10, AD-25) [Fig.4.1]
- Remove the 8 out chamber locking bolts, studs and nuts respectively, and remove the out chamber. (AD-40, AD-50) [Fig.4.1]

- Pull out the diaphragm, center disk and center rod from the main body. [Fig.4.2]

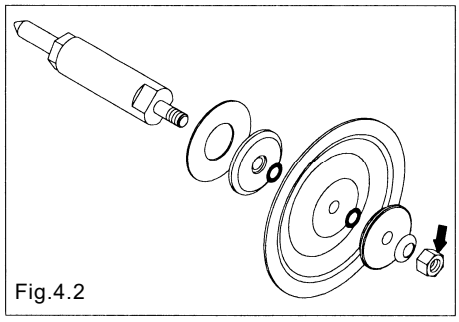

Fig.4.2

- Remove the nut, and remove the center disk, diaphragm and O ring (□T, 10□C, 10□N) from the center rod. [Fig.4.2]

＜NOTE＞

- Set the spanner at the 2 way part of the center rod.

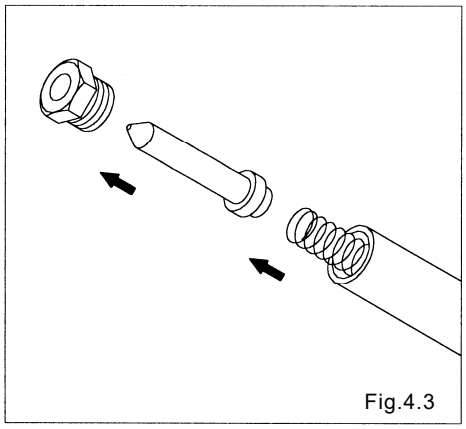

Fig.4.3

- Remove the nut, and remove the valve from the center rod. [Fig.4.3]
- Remove the nut from the valve.

＜NOTE＞

- Set the spanner at the 2 way part of the center rod. Take care not to give damage to the slide portion with pipe wrench.

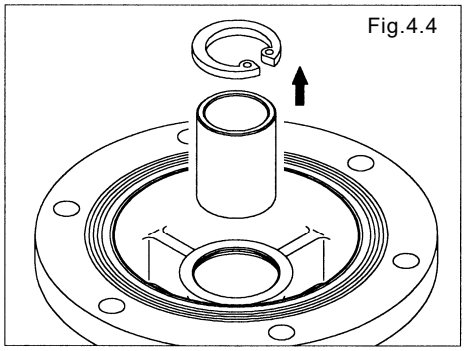

Fig.4.4

- Remove the C type snap ring, and remove the throat bearing from the air chamber. [Fig.4.4]

■P□, VT type

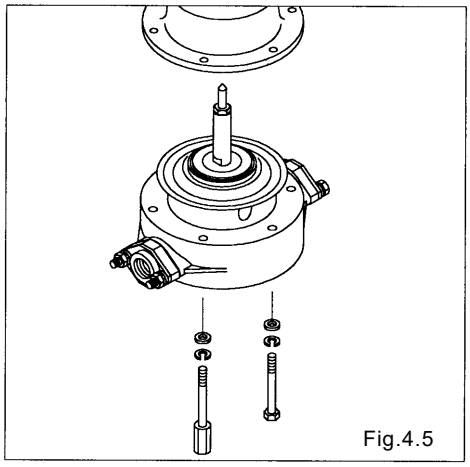
Fig.4.5

- Remove the 6 out chamber locking bolts and studs and remove the out chamber. (AD-10, AD-25) [Fig.4.5]
- Remove the 8 out chamber locking bolts, studs and nuts respectively, and remove the out chamber. (AD-40, AD-50) [Fig.4.5]
- Pull out the diaphragm, center disk and center rod from the main body. [Fig.4.5]

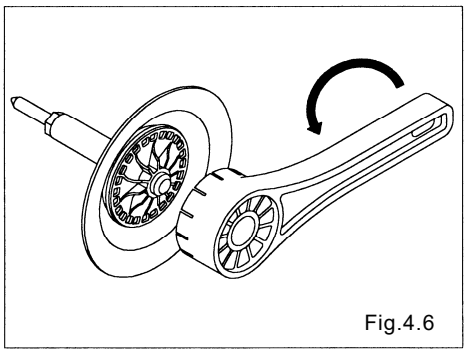
Fig.4.6

- Remove the center disk with supana(21mm), and remove the diaphragm, center disk and O ring (PC, PT) from the center rod. (AD-10P□) [Fig.4.6]
- Remove the center disk with the attached tool (dedicated tool: part No.771244), and remove the diaphragm, center disk and O ring (□T) from the center rod. (AD-25P□, VT) [Fig.4.6]
- Remove the center disk with the PP wrench (dedicated tool: part No.771868), and remove the diaphragm, center disk and O-ring (□T) from the center rod. (AD-40P□, AD-50P□) [Fig.4.6]

<NOTE>
- Set the spanner at the 2 way part of the center rod.

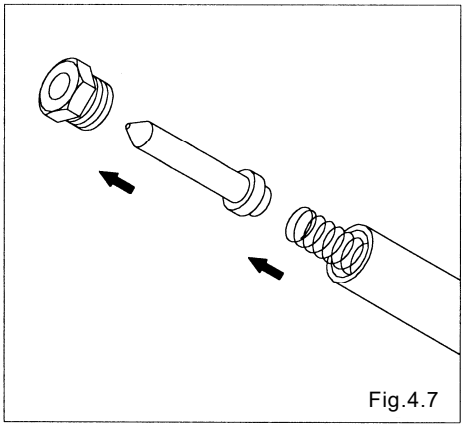
Fig.4.7

- Remove the nut, and remove the valve from the center rod. [Fig.4.7]

<NOTE>
- Set the spanner at the 2 way part of the center rod.
- Be careful not to damage to the slide portion with pipe wrench.

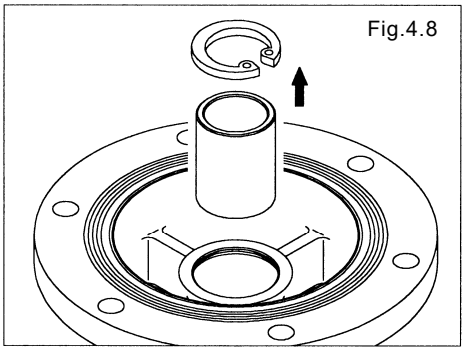
Fig.4.8

- Remove the C type snap ring, and remove the throat bearing from the air chamber. [Fig.4.8]

4.2 Inspection

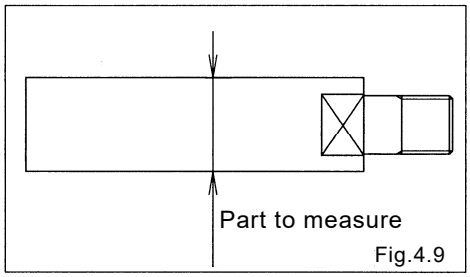

Fig.4.9

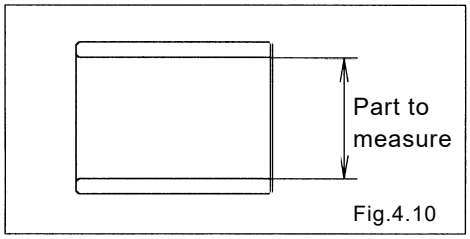

Fig.4.10

-Diaphragm

If the diaphragm is worn or damaged, replace it.

Frequency of inspecting the diaphragms
(Transferring water at room temperature)

AD-10	CR, NBR, PTFE	20,000,000 cycle
	TPEE, TPO	30,000,000 cycle
AD-25 AD-40 AD-50	CR, NBR, EPDM	20,000,000 cycle
	FKM	5,000,000 cycle
	PTFE	6,000,000 cycle
	TPEE, TPO	30,000,000 cycle

*The standard in our facility is 'Air supply pressure 0.5 MPa with no discharge pressure.

*It's recommended to conduct an inspection, if 3 months have passed since you start using the pump, or if the number of cycles reaches the above.

-Center rod [Fig.4.9]

Measure the diameter. If the diameter is out of the usable range, replace it.

Usable range

Φ22.28 - Φ22.38 mm

-Throat bearing [Fig.4.10]

Measure the internal diameter. If the internal diameter is out of the usable range, replace it.

Usable range

Φ22.47 - Φ22.63 mm

-Valve

If the valve is worn away or damaged, replace it with a new one.

4.3 Installation

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

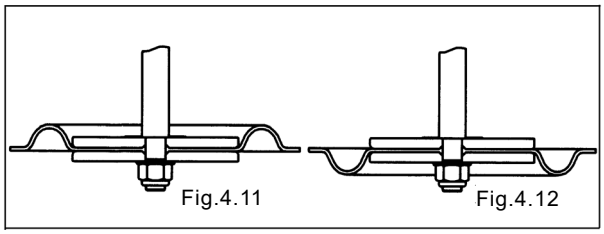
Fig.4.11 Fig.4.12

An installation direction of diaphragm.

- AD-10,25 and AD-40,50(☐T,☐H,☐S) of An installation direction of diaphragm. [Fig.4.11]
- AD-40,50(☐C,☐N,☐E,☐V) of An installation direction of diaphragm. [Fig.4.12]
- Apply the screw locking agent and tighten the valve and nut. [Fig.4.13 A portion]
- Apply the grease on a valve side, a nut and a center rod. [Fig.4.13 B portion]
- Install the O ring at the center disk. (☐T, AD-10☐C and AD-10☐N) [Fig.4.14, Fig.4.15]
- Apply the screw locking agent and tighten the center disk with dedicated tool. (part No.771244 :AD-25P☐,VT or part No. 771868 :AD-40P☐, AD-50P☐)[Fig.4.15]

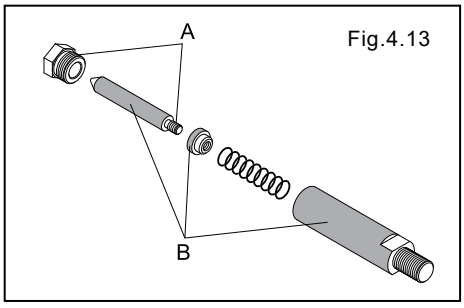

Fig.4.13

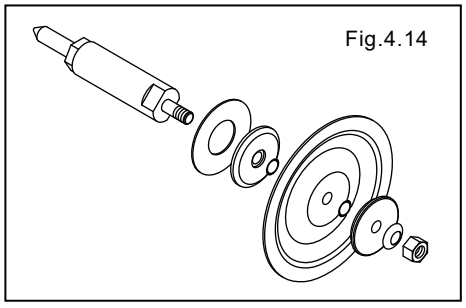
Fig.4.14

Center rod torque

AD-10		12 N・m
AD-25	☐C, ☐N, ☐E	40 N・m
	☐H, ☐S, ☐T	
AD-40 AD-50	A☐, S☐, F☐	60 N・m
	P☐	50 N・m

Valve torque

AD-10	5 N・m
AD-25	7 N・m
AD-40, AD-50	10 N・m

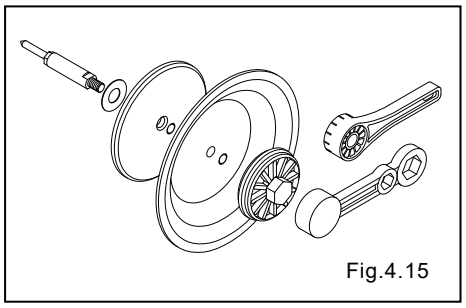

Fig.4.15

Out chamber locking bolt torque

		Diaphragm material	
		C, N, E	H, S, T
AD-10		12 N・m	
AD-25		10 N・m	20 N・m
AD-40	A□, S□, F□	40 N・m	
AD-50	P□	35 N・m	

＜NOTE＞
- Torque bolts diagonally for uniform force.
- Take care about the installation direction of the conical spring.

4.4 Torque

■Plastic type

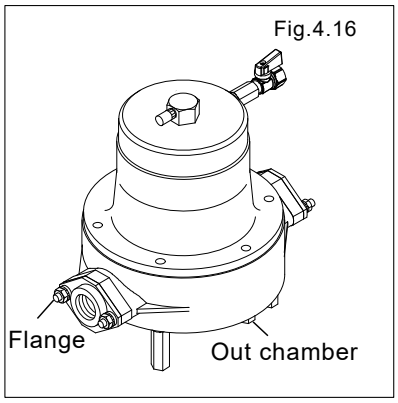

Fig.4.16

- The torque should be applied on the occasion of
  (1) Immediately before you operate the dampener for the first time.
  (2) Liquid leakage is found at routine inspection.

		Bolt (Out chamber)	Nut (Flange)
AD-10		12 N・m	8 N・m
AD-25	PC	10 N・m	10 N・m
	PT, VT	20 N・m	12 N・m
	PH	20 N・m	10 N・m
AD-40, AD-50		35 N・m	20 N・m

<NOTE>
- Torque bolt diagonally for uniform force.
- Retighten the out chamber and then the flange in this order.
  [Fig.4.16] (Fig.4.16 shows the AD-25P□.)

■Metal type

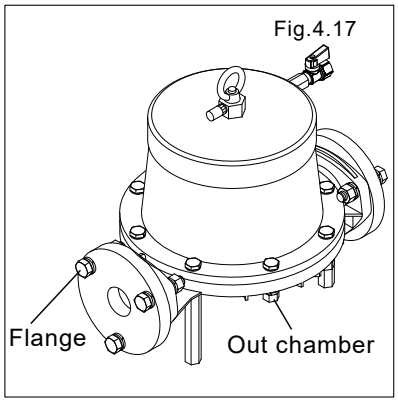

Fig.4.17

- The torque should be applied on the occasion of
  (1) Immediately before you operate the dampener for the first time.
  (2) Liquid leakage is found at routine inspection.

		Bolt (Out chamber)	Nut (Flange)
AD-10		12 N・m	12 N・m
AD-25	□C, □N, □E	10 N・m	10 N・m
	□T	20 N・m	35 N・m
	□H	20 N・m	10 N・m
AD-40, AD-50		40 N・m	25 N・m

<NOTE>
- Torque bolt diagonally for uniform force.
- Retighten the out chamber and then the flange in this order.
  [Fig.4.17] (Fig.4.17shows the AD-40A□.)

5. AD-10TT, AD-25TT and AD-38TT

5.1 Removal

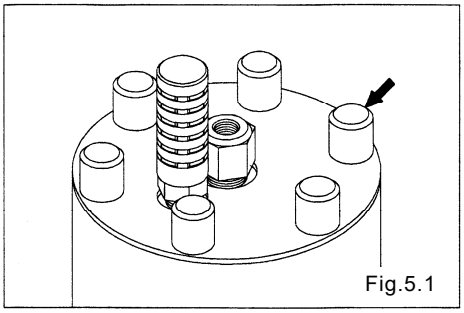
Fig.5.1

- Remove the 6 upper and lower caps at the both ends of the tie rod. (8 caps each in the AD-38TT)
- Remove the 6 upper and lower nuts at both ends of the tie rod (8 nuts each in the AD-38TT), and remove the out chamber, diaphragm and air chamber B. [Fig. 5.1]

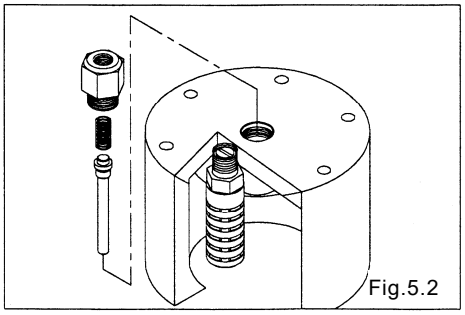
Fig.5.2

- Remove the union, and remove the spring and valve from air chamber A. [Fig. 5.2]

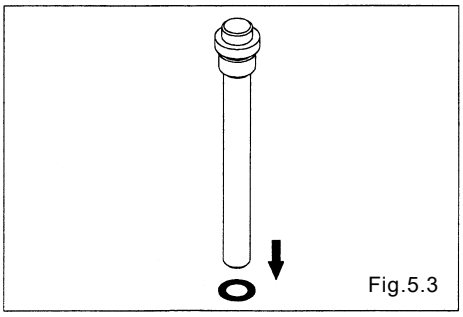
Fig.5.3

- Remove the O ring from the valve. [Fig. 5.3]

5.2 Inspection

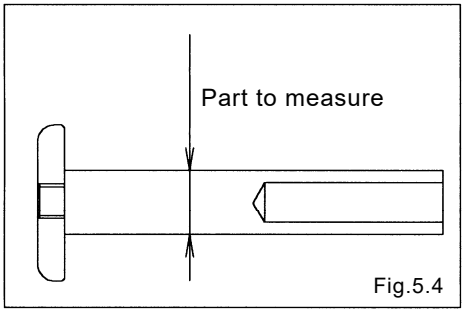

Fig.5.4

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

Frequency of inspecting the diaphragms
(Transferring water at room temperature)

AD-10TT	24,000,000 cycle
AD-25TT, AD-38TT	12,000,000 cycle

*The standard in our facility is 'Air supply pressure 0.5 MPa with no discharge pressure.
*It's recommended to conduct an inspection, if 3 months have passed since you start using the pump, or if the number of cycles reaches the above.

- Rod [Fig. 5.4]
  Measure the diameter. If the diameter is out of the usable range, replace it with a new one

Usable range

AD-10TT, AD-25TT	Φ11.80 - Φ12.00 mm
AD-38TT	Φ17.80 - Φ18.00 mm

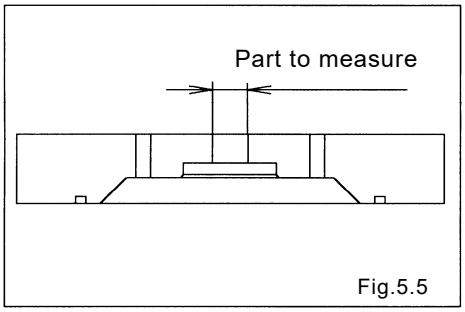

Fig.5.5

- Air chamber B [Fig. 5.5]
  Measure the internal diameter. If the internal diameter is out of the usable range, replace it with a new one.

Usable range

AD-10TT, AD-25TT	Φ12.05 - Φ12.50 mm
AD-38TT	Φ18.05 - Φ18.50 mm

- O ring
  If the O ring is worn away or damaged, replace it with a new one.

5.3 Installation

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

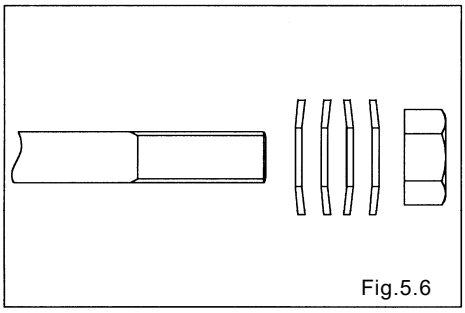
Fig.5.6

- Install the diaphragm with its convex side upward.

Union torque

AD-10TT	5 N・m
AD-25TT, AD-38TT	7 N・m

Tie rod torque

AD-10TT	7 N・m
AD-25TT	10 N・m
AD-38TT	15 N・m

<NOTE>
- Take care not to admit foreign materials or give damage onto the seal surface.
- Tighten the bolts diagonally by uniform force.
- Take care about the installation direction of the conical spring. [Fig. 5.6]
- Perform tightening completely immediately before use. (Refer to “5.4 Torque”)

5.4 Torque

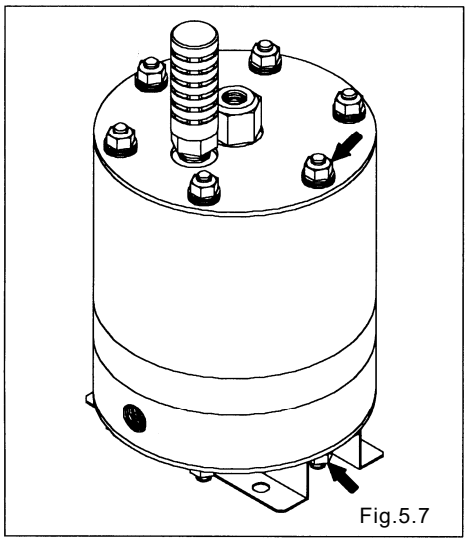
Fig.5.7

- Regarding the AD-10TT, AD-25TT and AD-38TT, there is potential that dimensional changes may be caused by operating temperature and secular changes due to properties of resin material. Accordingly, check each seal part for leakage and perform torque periodically.
- In the following cases, perform torque.
  (1) Immediately before you operate the dampener for the first time
  (2) When the dampener is inspected every three months after installation.
  (Every six months when it is used at a place whose temperature is from - 5℃ to + 5℃ such as a clean room)
  (3) When the dampener restarts at low temperature if the environment or the temperature of liquid is hot while it is operating and low while it stops.
  (4) Liquid leakage is found at routine inspection.

Tie rod torque

AD-10TT	6 N・m
AD-25TT	8 N・m
AD-38TT	13 N・m

＜NOTE＞
- Torque nuts (tie rods) diagonally for uniform force. (Fig.5.7 shows the AD-10TT.)

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