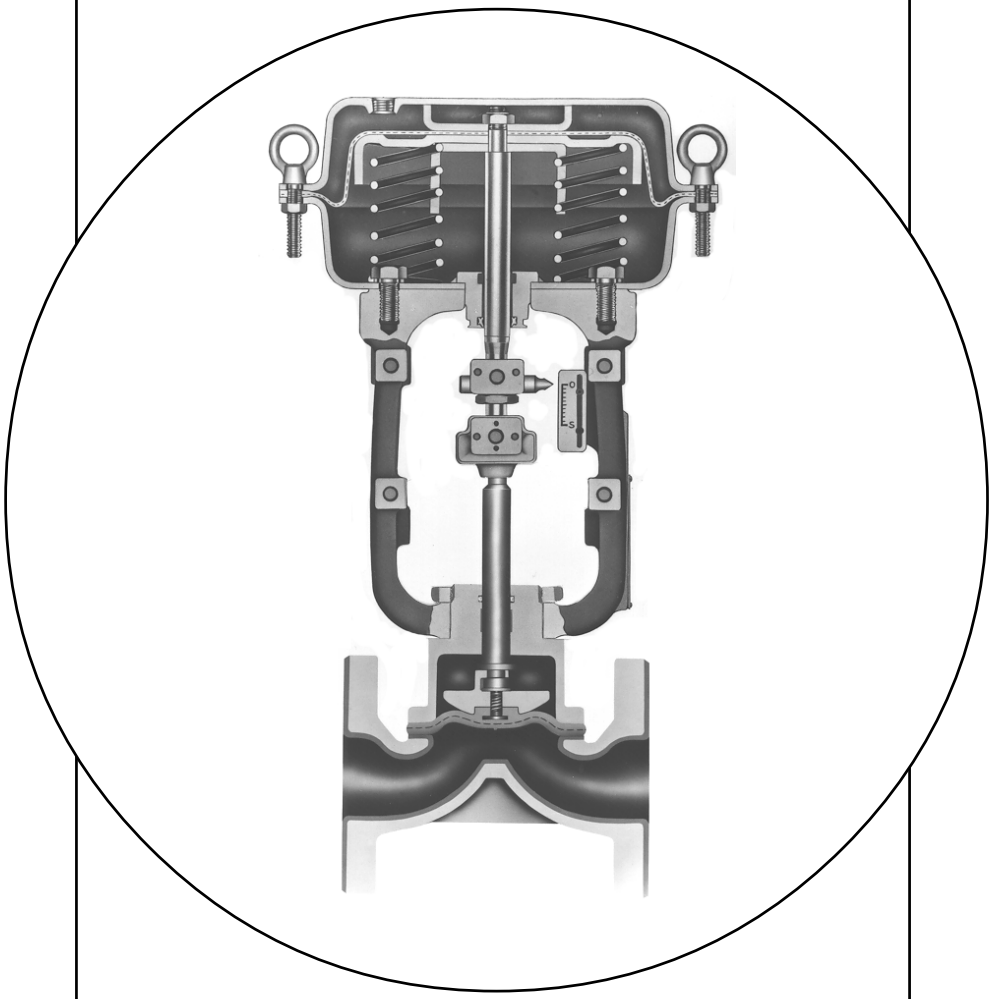
azbil

OM2-8110-0530

Weir-Type Diaphragm Control Valve Model : VDD User's Manual



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Chapter 1: GENERAL

1.1 Scope

This manual covers the installation, operation and maintenance instructions for Models VDD Weir-type Diaphragm Control Valves.

1.2 Composition

Each of the control valves is comprised of two major sections, namely, a valve body section and an actuator section. Control valves of various models 'are structured by Various combinations of different valve sizes pressure ratings, types of connections, and types of materials. For details, refer to Specification Sheet SS2-8110-0530.

1.3 Structure

A typical Structure of the Weir-type Diaphragm Control Valve is shown in Figure 1.

The valve body section is comprised primarily of a valve body, a weir diaphragm of valve body, a spindle,. a compressor, and a bonnet. The weir diaphragm controls the flow as it is driven vertically into or out of the weir section of the valve body by the actuator via the spindle and compressor. The parts exposed to the flow medium are the bottom surface of the weir diaphragm and the inner surface of the valve body only.

The actuator is a multi-spring diaphragm motor. It converts the pneumatic control signal into a mechanical displacement force with its diaphragm and springs.
The displacement force is conveyed via the spindle and compressor to the diaphragm to dictate the valve lift.

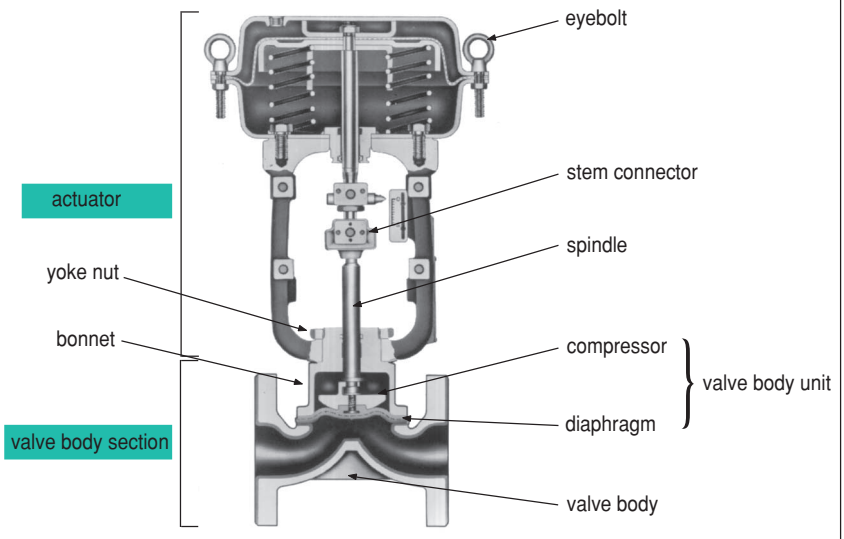


Figure 1 Overall Structure of Control Valve

1.4 Nameplate

A nameplate as shown in Figure 2 is posted on each of the Weir-type Diaphragm Control Valves. The nameplate indicates the model number, valve size' pressure rating, trim material, date of manufacture, and other major specifications of the control valve. Before installing the control valve, make sure that the specifications indicated on the nameplate conform with the conditions of use. The nameplate indicates also the product number (PROD. No.) of the control valve. Please mention this number also when consulting an Azbil Corporation agent for modifications, parts replace-ments, or other types of service for the control valve.

Fig 2 Nameplate

Chapter 2: INSTALLATION

When handling the control valve, observe the instructions given in this chapter.

• Handle with care: The inner surfaces of certain models of control valves are lined with glass, hardened rubber, or other material which is not highly resistant against mechanical shocks. Exercise care when handling such models of control valves.

2.1 Hoisting Limit Weights of Eyebolts

To hoist the actuator, a pair of eyebolts are provided on the diaphragm case (two of the clamping bolts of the diaphragm case are with eye holes to connect the hoisting wires). The limits of weights which can be hoised by means of the eyebolts are as shown in Table 1.

~Note

The primary purpose of eyebolts is to hoist the actuator alone in order to connect it to or disconnect it from the valve buy.

The eyebolts of the Weir-type Diaphragm Control Valve may be used to hoist the entire control valve (the actuator section and valve section coupled together). When hoisting the entire control valve, be extremely careful so that no mechanical shocks are applied to the control valve.

Table 1 Hoisting Limit Weight of Eyebolts

Actuator	Hoisting Limit Weight (kgf)	Product Weight (kgf)
PSA1	160kg	11 to 15
HA2	160kg	20 to 35
HA3	160kg	40 to 60
HA4	220kg	90 to 100

2.2 Installing Valve in Process Pipe

When installing the control valve in a process pipe, observe the following instructions:

(1) Before installing the valve in the process pipe, remove foreign matter (such as scales and welding chips) from both upstream and downstream sides of the process pipe.

(2) Pay attention so that the pipe connection gaskets do not extrude into the process pipe inside. Be sure to use gaskets made of material which is suitable for the process fluid.

(3) Pay attention so that no unreasonably large stresses are conveyed from the process pipe to the valve. Uniformly tighten the bolts for flange connection.

(4) Make sure that the flange gaskets are correctly installed without slant or off-center. Note that the valve nay be damaged or process fluid nay leak if the gaskets are incorrectly installed.

(5) Before connecting the air pipes to the actuator and positioner, blow the pipes to clean their insides.
(6) Do not install any heating or cooling provisions on the bonnet.
(7) Exercise care When handling the valve. Never drop or hit the valve - even the valve body which seemingly is sturdy.
(8) To change the coupling direction of the actuator with respect to the valve body, perform the procedures of Steps (1) and (2) of Chapter 4.1, loosen the yoke nut, rotate the actuator to the required direction, tighten the yoke nut, and then perform the procedures of Steps (2) through (8) of Chapter 4.4.

2.3 Check After Installation

To make sure that' the control valve has been correctly installed and is ready to be started up, observe the following instructions:

(1) Check that there are no leaks from the air pipings.
(2) Check that the bolts and nuts of the diaphragm case are securely tightened. The tightening torques should be approximately as follows:
Models PSA1, HA2, HA3 (M8 bolts/nuts) : 16 N*m(160kgf*cm)
Models HA4 (M12 bolts/nuts) : 54 N*m(550 kgf*cm)
(3) Pressurize the control valve inside and check that there are no leaks of fluid from the valve body Section and flange gaskets.

~Note

Do not feed a fluid (such as steam) at temperature higher than the rated temperature of the control valve, even for a short period for cleaning or sterilizing the control valve.

Chapter 3: ROUTINE MAINTENANCE INSPECTION

Check the following items routinely for maintenance of the control valve.

(1) Check that the valve lift is not hunting.
(2) Check that the control valve is not oscillating or generating abnormal sound.
(3) Check that there are no leaks of fluid from the air vent hole of the bonnet.

Table 2. Troubleshooting

Sympton tom	Check	Action
Valve lift hunting, Abnormal sound, or Oscillation	Is the input signal not hunting?	Eliminate the input hunting.
	Is there any abhor-malty with optional devices?	Readjust. Correct the malfunc-tionality.
	Is every screw fastened tightly and evenly?	Fasten correctly.
Fluid leak from air vent hole		The diaphragm damaged. Replace the diaphragm with new one per para-graph 4.

Chapter 4: DISASSEMBLY AND ASSEMBLY

This chapter covers the disassembly and assembly Procedures of the control valve for overhaul or modifications.

Precautions:

(1) When disassembling the actuator from the valve body which is left installed in the process pipe, be sure to shut down the process flow and release the process pressure from the valve and wait until the valve is cooled off.

(2) Note that process fluid nay be remaining the valve. Drain out entrapped fluid completely, especially when the fluid is corrosive or hazardous.

(3) When disassembling or assembling the valve, wear gloves. The test should be done in a veil ventilated place.

4.1 Detaching Actuator from Valve Body

Detach the actuator from the valve buy as follows:

(1) Apply to the actuator an air pressure so that the valve lift pointer indicates a pint of 10%-20% of full scale above the fully closed point.

(2) Loosen the clanging-bolts of the stem connector, remove the stem connector, and detach the actuator stem from the valve spindle.

(3) Remove the clamping-nut of the yoke. Detach the actuator from the valve body by hoisting the actuator.

4.2 Disassembly and Assembly of Valve Body Section

To disassemble/assemble the valve body section, observe the instructions given in this chapter.

(A) Disassembly

(1) Remove the clamping-bolts of the bonnet using a wrench.

(2) Detach the valve body, bonnet and bay-diaphragm unit, exercising case so that the O-rings in the bonnet are not damaged.

~Note

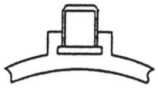
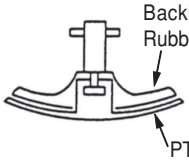
If the diaphragm sticks to the valve body and does not readily comes off, gradually detach the diaphragm by slightly leaning the bonnet to right and left, front and back. Never attempt to detach forcefully the diaphragm by using a pointed tool such as a Screwdriver.

Handle With care

The inner Surfaces of the valve bodies of certain models of control valves are lined with glass, hardened rubber, or other material which is not highly resistant against mechanical shocks. Exercise care when handling such models of control valves.

(3) The structure of the diaphragm differs by its material and the valve size as shown in Table 2: To detach the diaphragm from the compressor, observe the instructions given below.

Table 3. Connection Methods and Types of Diaphragms

Diaphragm Material	Valve Size (in.)	Diaphragm Connection Method	Diaphragm Shape
Rubber	1/2 to 3/4	 Fit-in Type	 Normally open type
	1 to 4	 Screw-in Type	
Teflon	1/2 to 4	 Bayonet Type	 Normally closed type

(a) The fit-in type of diaphragm can be detached by pulling twistingly.

(b) The screw-in type of diaphragm can be detached by turning it counterclockwise.

(c) The bayonet type of diaphragm can be detached by turning it 90 degrees of angle clockwise or counterclockwise and pulling it.

Precausion:

The compressor is connected to the spindle with a pin and cannot be detached.

(B) Assembly

Notes:

Before starting assembling the valve, check the below-mentioned items and replace the weared or damaged parts with new ones. When ordering parts, mention the product number which is indicated on the nameplate.

(1) Check that the fluid-contacted surface of valve body is not corroded or worn. Check that there are no cracks or other damage on the lining surface.

(2) Check that the diaphragm is not worn or deteriorated. Check that there are no cracks or other damage on the diaphragm.

(3) Check that the spindle is not. damaged.

To assemble the valve, proceed as follows:

(1) Attach the diaphragm to the compressor as follows:

Fit-in type: Wet the extrusion of the diaphragm with water, and drive the exclusion into the hole of the compressor. (See Figure 3.)

Screw-in type: Turn the diaphragm until the rubber Section of the diaphragm is brought into contact with the indent of the compressor. Then, turn back the diaphragm to the level that it is aligned with the bonnet hole When the valve is .assembled.

Bayonet type: Align the diaphragm pins (bayonets) with the compressor slots, fully insert the pins into the slots, and then turn the diaphragm 90 degrees clockwise or counterclockwise. (See Figure 3.)

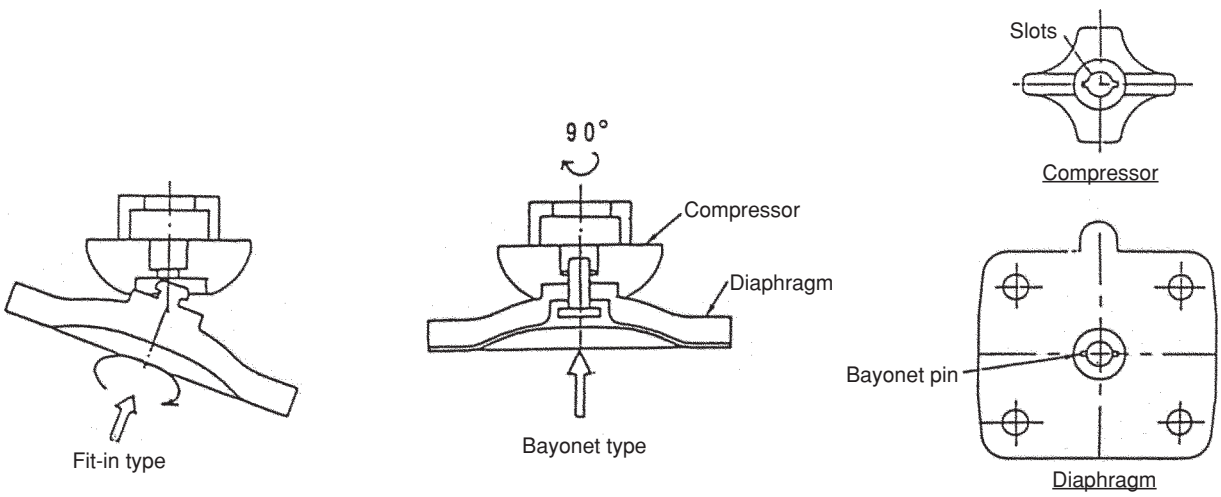


Figure 3. Types Of Couplings Between Diaphragm and Compressor

(2) Apply lubricant to the spindle, O-rings, and threaded sections of the bolts and nuts. Fix together the diaphragm unit, bonnet and the valve body by driving the nuts in turns (tighten the nuts in the order of diagonally located ones in turns so that they are tightened unifirmly). An appropriate tightening force is as shown in Figure 4.

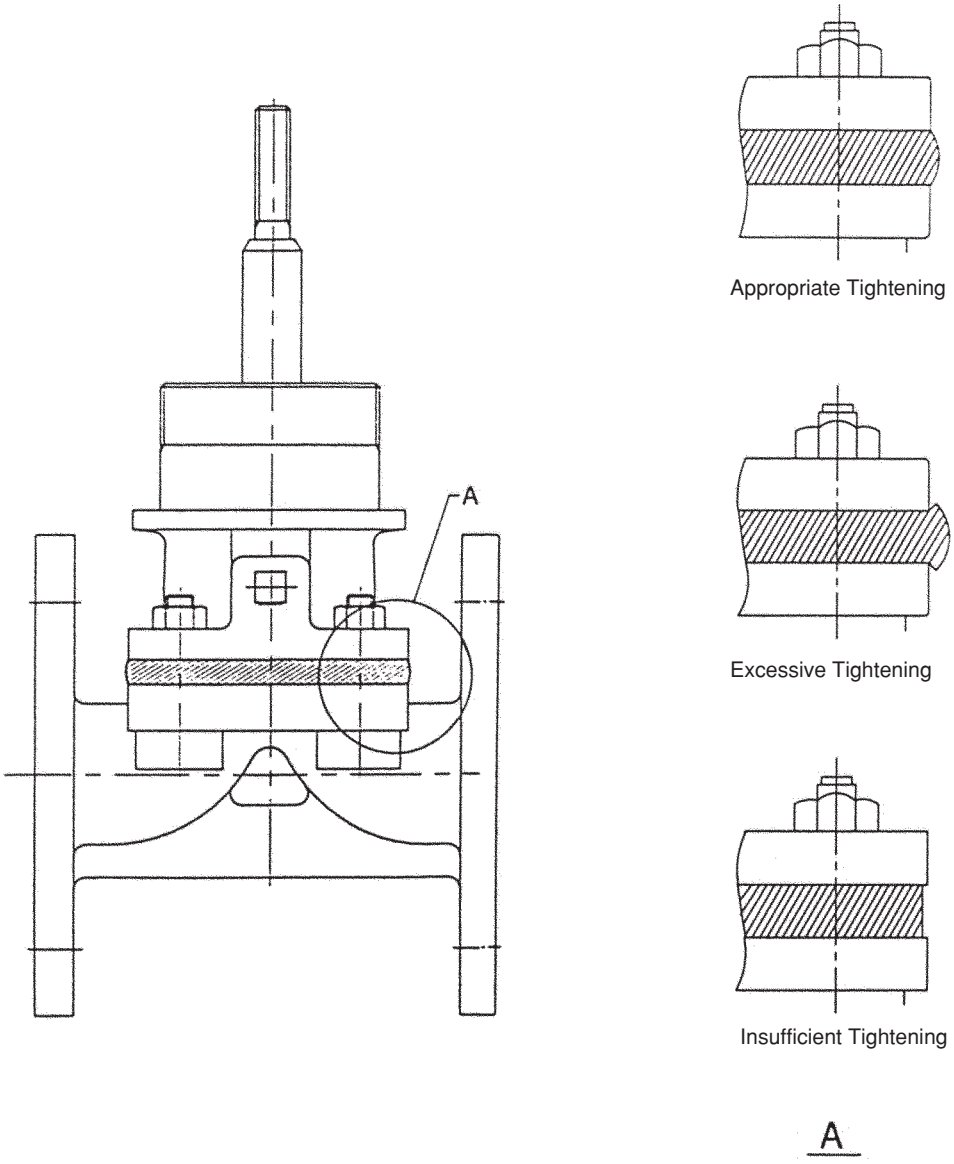


Figure 4. States of Diaphragm Periphery

~Notes

(1) Exercise care so that the diaphragm is not stained with lubricant.

(2) In order to prevent introduction of foreign matter after starting valve operation, make sure when assembling the valve that no foreign matter is remaining on the diaphragm, lining or weir section.

4.3 Disassembly and Assembly of Actuator

As a general rule, the actuator is not required to be disassembled.
When it is necessary to be disassembled and assembled for parts replacement or performance modification, refer to Operator's Manual OM2-8213-0500 "Multi-spring Diaphragm Motor."

4.4 Connecting Actuator to Valve Body

To connect the actuator to the valve body, Proceed as follows:

(1) Put the actuator On the valve body. Tighten securely the yoke clamping-nut.

(2) Make an air piping to the actuator to provide a pneumatic control signal. A pressure regulator may be used for the pneumatic control signal source.

~Note

For the direct action type of control valve, connect the air piping to the top diaphragm chamber; for the reverse action type of control valve, connect the air piping to the bottom diaphragm chamber.

(3) Lower the spindle until the diaphragm is fully seated on the weir section of the valve.

(A) For direct action type Of control valve

(4) Set the pneumatic signal at the high limit value of the spring range. (See Table 3.)

(5) Increasing the pneumatic signal to the supply pressure, check that the actuator stem moves in response. (This is for an allowance of stroke.)

(6) Decrease the pneumatic signal once. Increase again the pneumatic signal to the high limit value of the spring range in the increasing direction and, in this State, fix the stem connector with the hex bolts, connecting the actuator stem to the valve spindle by means of binding of the threads.

(B) For reverse action type of control valve

(4) Set the pneumatic signal at the low limit value of the spring range .(Shown on the nameplate). Check that the actuator stem moves by 1 to 2 m in response. (This is for an allowance of stroke.)

(5) Increase the pneumatic signal once. Decrease the pneumatic signal to the low limit value of the spring range in decreasing direction and, in this state, fix the stem connector with the hex bolts, connecting the actuator stem to the valve spindle by means of binding of the threads.

Valve Size (in.)	Spring range (kPa (kgf/cm^2))
1/2	20 to 53 (0.2 to 0.54)
3/4	20 to 64 (0.2 to 0.65)
1	20 to 74 (0.2 to 0.76)
1-1/2	20 to 96 (0.2 to 0.98)
2	20 to 82 (0.2 to 0.84)
2-1/2	20 to 95 (0.2 to 0.97)
3	20 to 81 (0.2 to 0.83)
4	20 to 102 (0.2 to 1.04)

Table 3. Spring Ranges of Direct-action ol Valves

4.5 Adjustment of Positioner

- Model VPE OM2-8310-0410 Pnematic valve positioner for small actuators
- Model HTP OM2-8310-0200 Pnematic valve positioner (Single Acting type)
- Model HEP 15,16,17 OM2-8213-0100 EIectro-Pnematic Valve Positioner (Single Acting type)
- Model HEP 35,37 CM2-HEP350-2001 Electro-Pnematic Valve Positioner (Single Acting type)
- Model AVP300,301,302,200,201,202 CM2-AVP300-2001 Smart valve positioner
- Model AVP303,203 CM2-AVP303-2001 Smart valve positioner

Recornmendable replacement periods of Wearable components of the control valve are as follows:

(A) Valve Body Section

O-rings : 5 years
Weir diaphragm : 1 years

(B) Actuator Section

Diaphragm : 5 years
Bushing : 5 years (Only HA2, 3, 4)
Cap : 5 years
Seal washer : 5 years(To be replace whenever actuator is disassembled)
Dust seal : 5 years(To be replace whenever actuator is disassembled)
Rod seal : 5 years(To be replace whenever actuator is disassembled)

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