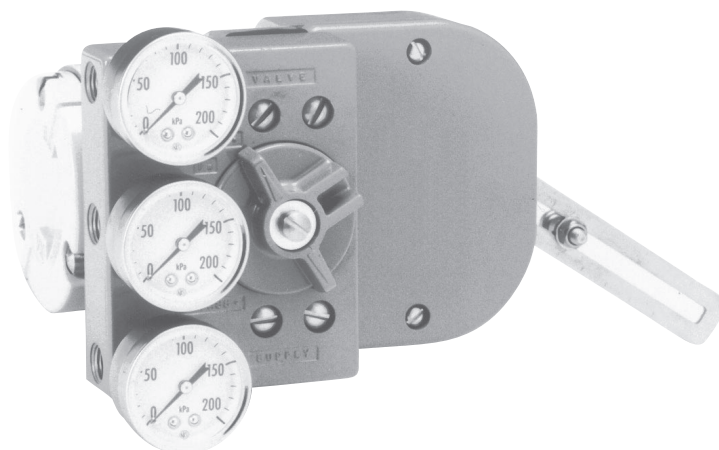


Pneumatic Valve Positioner

Model : HTP

User's Manual



Azbil Corporation

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PNEUMATIC
VALVE POSITIONER
MODEL: HTP

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1. GENERAL CONSTRUCTIONS

The HTP Valve Positioner is a single acting, single stage force-balance type control instrument. Side mounted on a pneumatic operated process control valve, it utilizes an auxiliary air supply and a feedback cam to position the control valve in accordance with the air signal from a controller. The modular construction without any complicated linkages, facilitates a low cost maintenance and repair.

The positioner consists of the major components listed below (See Fig. 1)

a) Pilot Assembly

Contains a pressure input chamber to receive the controller signal and feeds or bleeds air to the valve actuator.

b) Lever Mechanism

Adjusts the stroke travel of actuator.

c) Feedback Cam

d) Feedback Spring

e) Housing and Manifold

Rugged, lightweight die-cast aluminum housing and pilot assembly finished in gray corrosion-resistant baked enamel. Internal parts are also of highest quality materials and are protected with purging air from the pilot.

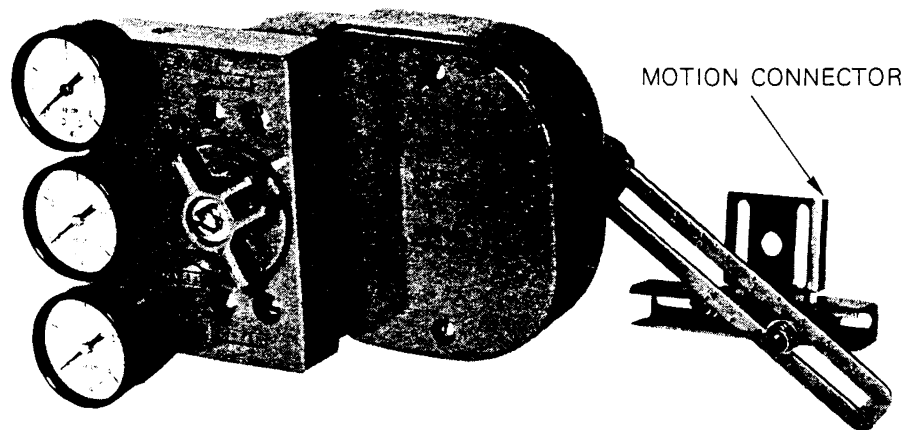


Figure 1. HTP Valve Positioner with Motion Connector*

* Option

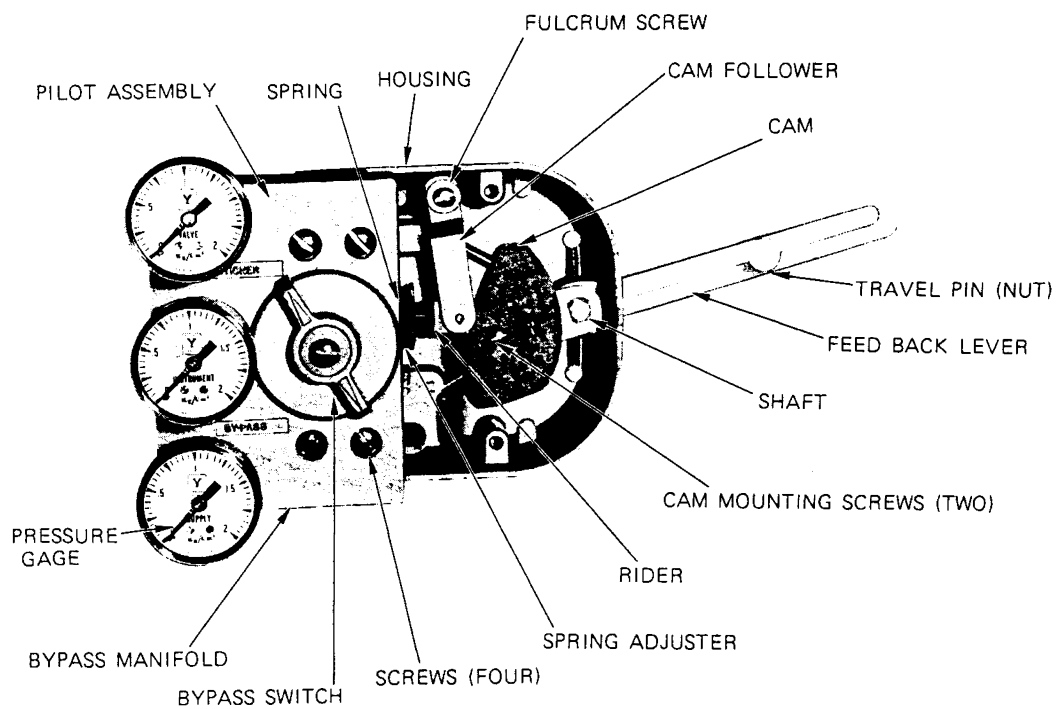


Figure 2. Description of Components

2. DESCRIPTION AND OPERATION

The HTP Valve Positioner is principally a force-balance instrument. By the changes or effects of the air signal from a controller, the positioner feeds or bleeds air to the valve actuator until the force of the controller signal is in balance with the force created by valve stem movement.

To increase operational stability, the pilot is of bleed type which balances between supply and exhaust air volume in normal condition.

Positioner action is available in either direct or reverse action and is quickly changeable from direct to reverse or vice versa.

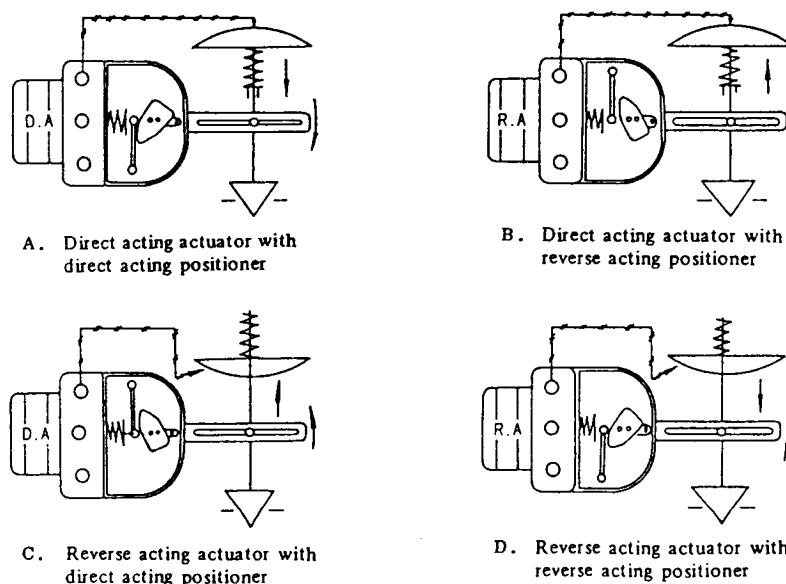
a) Direct Action

As the signal air increase, the pilot stem is moved down, closing the exhaust port and opening the supply port which increases the pressure to actuator (Fig. 4-B). The resultant valve stem movement compresses the feedback spring through the lever and cam, and applies a force to the pilot stem until the force created by the controller signal is in balance with the feedback spring (Fig. 4-C). When the signal air decreases or process flow condition causes valve stem movement, the pilot feeds or bleeds air to actuator until the pilot stem balances in similar manner as described above.

b) Reverse Action

By rotating the pilot assembly by 180 degrees (See Section 6, Changing Positioner Action) and remounting it to the housing, the exhaust and supply ports are functionally reversed. The cam is also reversed to complete a reverse acting positioner.

The combination of HTP Valve Positioner, Actuator, and Controller are as follows:



(Note: Arrow shows a direction of movement with the increase in signal pressure.)

Figure 3. Combinations of Positioner and Actuator

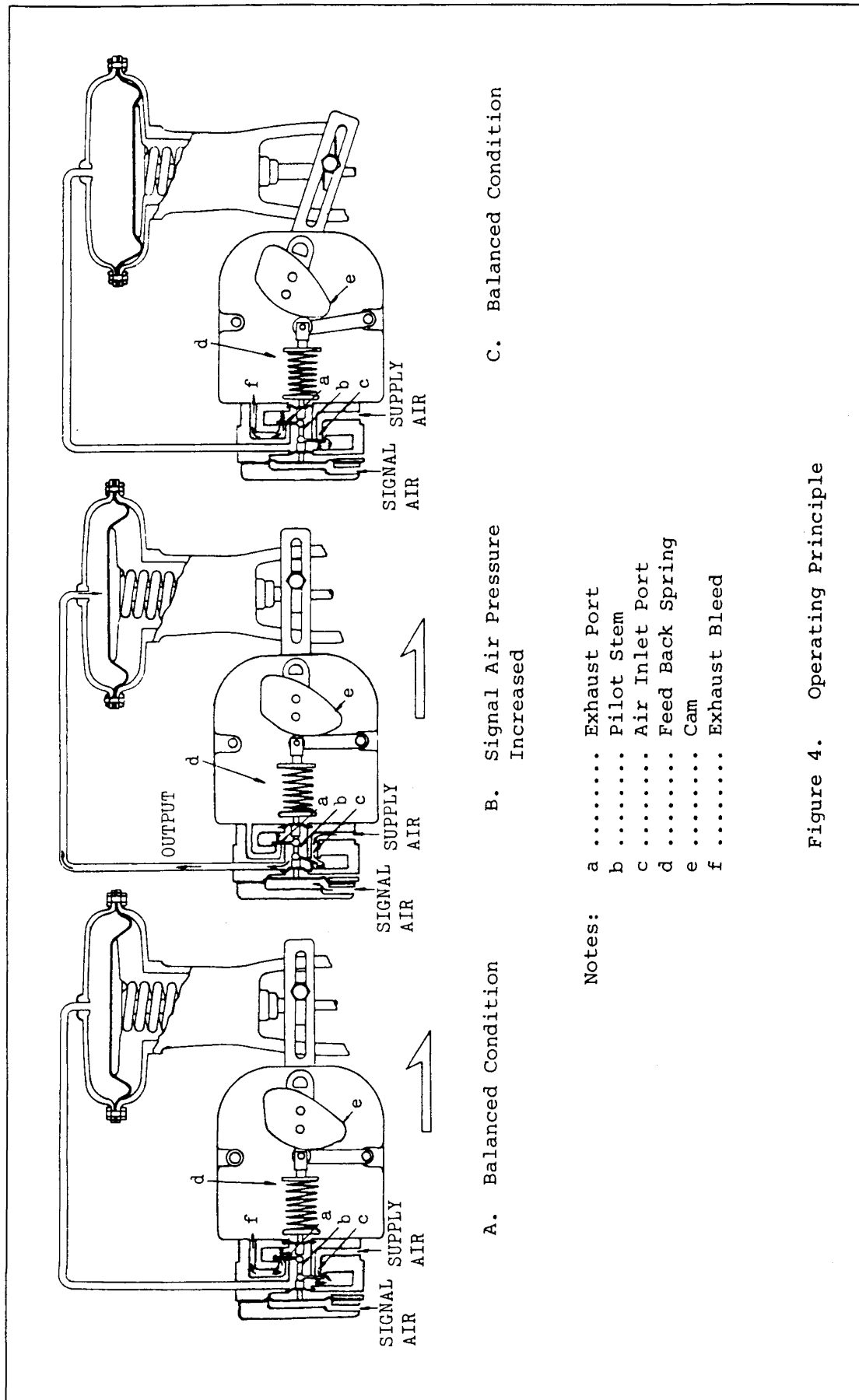


Figure 4. Operating Principle

3. MOUNTING

Yamatake Corporation control valves and actuators ordered with positioner will be delivered with the positioner factory mounted and calibrated. No further adjustments are necessary.

Positioners ordered separately for field installation can be mounted as follows.

1. Mounting of Motion Connector

Fix the motion connector to the pointer with the two hex-hole bolts. Fix the slide rail with the two hex-hole screws of the slide rail section as shown in Figure 5-1. Depending on the type or stroke of the actuator to be used in conjunction, install connector plate ① in the reverse (upside down) of the direction shown in Figure 5-1. Make sure that the slide rail and positioner lever are parallel and horizontal when valve is at midstroke.

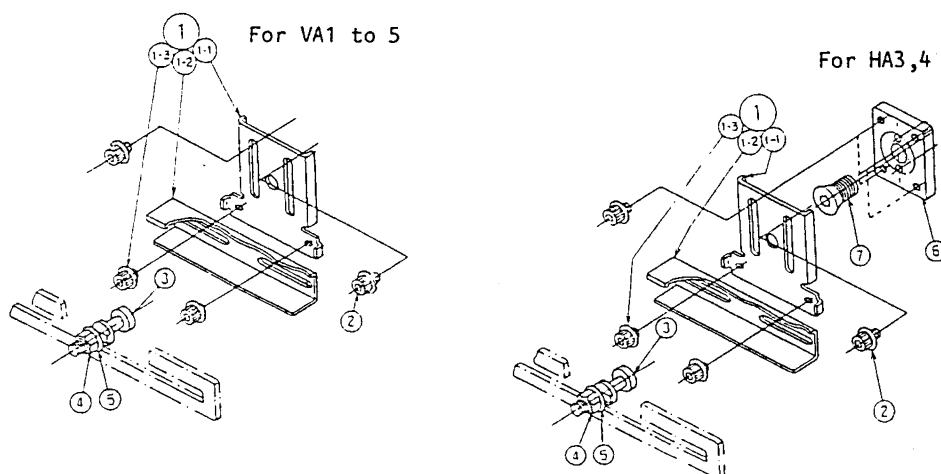


Figure 5-1, HA and VA

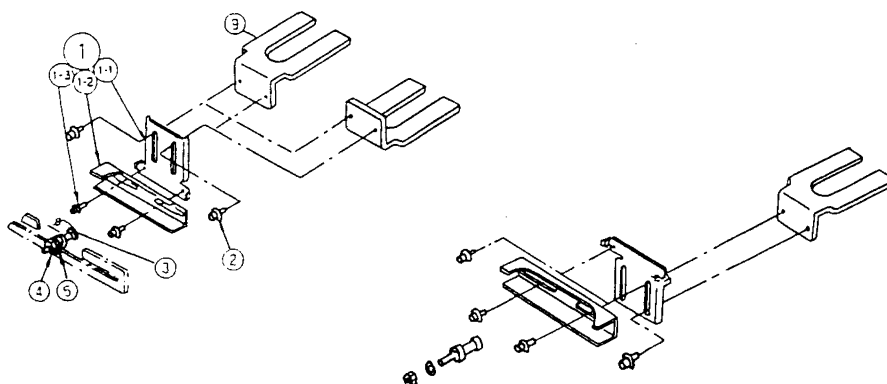


Figure 5-2, GOM

Figure 5. Motion Connector Installation

Table

No.	Parts		Part No.	ITEM, Quantity					
				101	102	103	104	105	
1	Slide Rail Ass'y		82510407-101	1 set					
	1-1	Connector Plate	82510396-101						
	1-2	Slide Rail	82510397-101						
	1-3	Hex-hole Bolt	82592402-101						
2	Hex-hole Bolt		82592402-101	2					
3	Travel Pin		82510398-101	1					
			82510398-101				1		
4	Nylon Nut		82510399-101	1					
5	Polished Washer		YHES230-2200	1					
6	Adapter Plate		82510400-101		1				
			82667710-101			1			
7	Socket Screw		82510401-101		1				
			82667711-101			1			
8	Spring Pin		YHES 262-230-080		2				
9	Adapter		82510405-101					1	
				HA -2	HA -3	HA -4	VA-1 to VA-5		GOM
				HA					

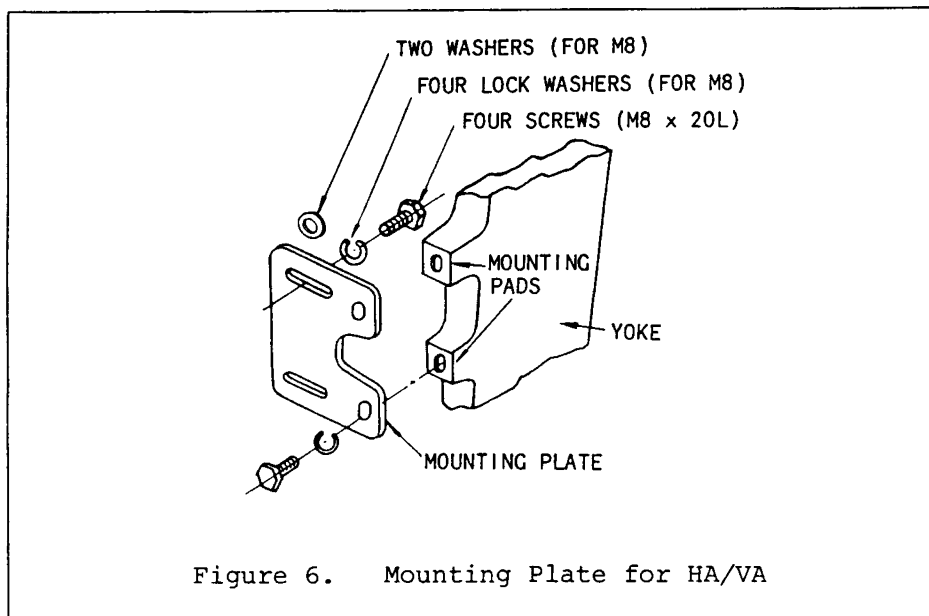
2. Mounting of Positioner

1) Mounting to Diaphragm Actuator (HA/VA)

Diaphragm actuators have two mounting pads on yoke. Attach the mounting plate to the yoke with two Spring Washers and Hexagon Socket Screws. Install the positioner to the mounting plate with the same sized two Hexagon Socket Screws and Spring Washers.

Table 1. Mounting Kit for HA/VA

Description	Part No.	Quantity
Mounting plate HA2 HA3, 4 VA1-5	82667708-101 82667709-101 80250378-101	1
Hexagon socket screw	80592042-2	4
Spring washer	80592133-201	4
Washer	YHES390-2080	2

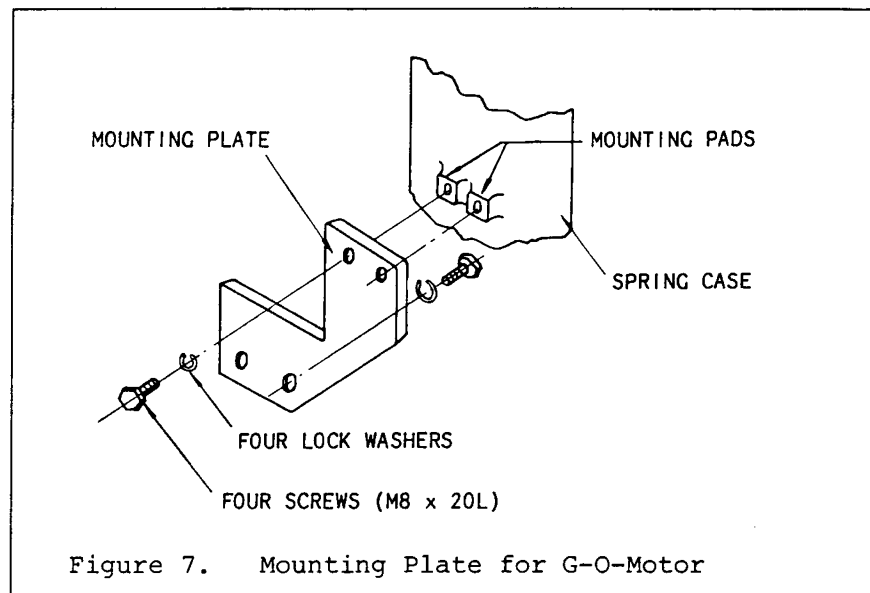


2) Mounting to G-O-Motor Actuator (Spring type)

In case of mounting on the G-O-Motors (Cylinder type pneumatic actuator), they have two mounting pads on the spring case. Attach the mounting plate to the spring case with two Spring Washers and Hexagon Socket Screws. Install the positioner to the mounting plate with the same sized two Hexagon Socket Screws and Spring Washers.

Table 2. Mounting Kit for G-O-Motor

Description	Quantity	Part No.
Mounting plate	1	250393
Hexagon socket screw	4	592042-2
Spring washer	4	592133-201



3. Mounting Adjustment

- 1) Apply regulated air pressure to the actuator and adjust the pressure until the valve stem is at mid-stroke.
- 2) With the valve stem at mid-stroke, adjust the motion connector until the feed back lever and slide rail are horizontal (vertical to valve stem). Tighten the two screws on the motion connector assembly to hold this position.
- 3) Attach the travel pin to the feed back lever and insert to the slide rail.

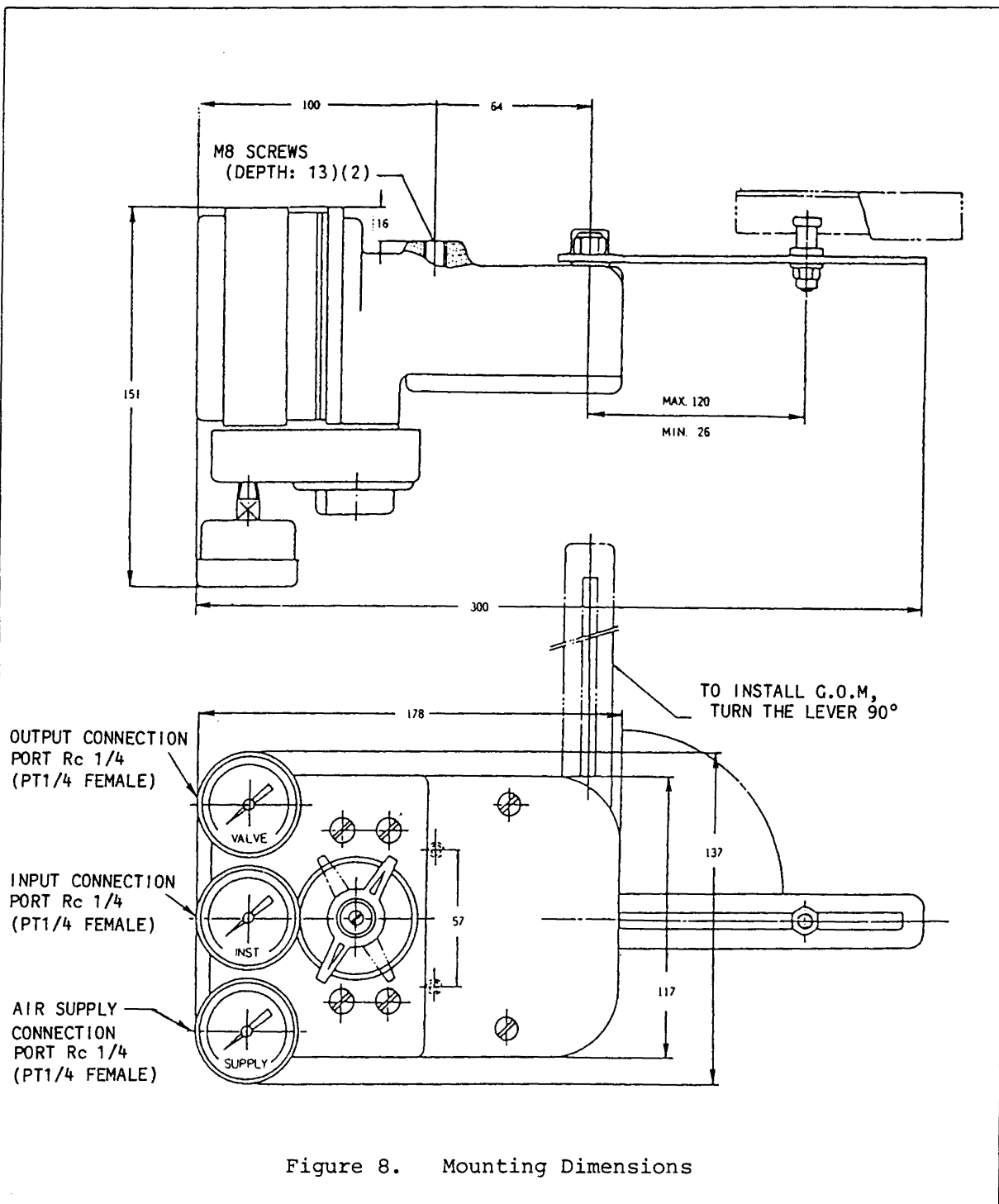
4. Air Connections

If the positioner is ordered without gage and bypass manifold, air connections are made as follows:

- i) To the right of each air connection port, there is an embossed letter: V-"Valve", I-"Instrument", S-"Supply". All ports are 1/4 (PT1/4") female taps.

5. Mounting Dimensions

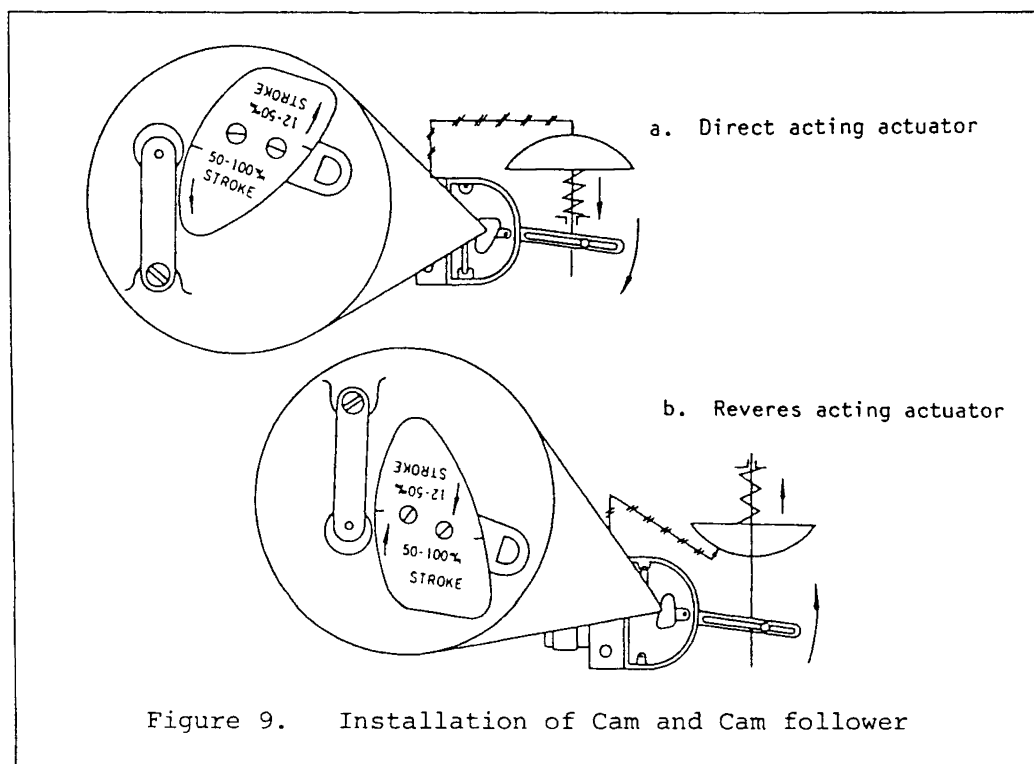
Installing dimensions for positioner on our actuators are shown in dimension drawing attached in this instruction.



4. CALIBRATION

When the valve positioner is combined and shipped with a control valve. The positioner will be calibrated at the factory.

- a) Connect a regulated air supply to the actuator and adjust air pressure to position valve stem at midstroke.
- b) Make sure that the slide rail and positioner lever are parallel and horizontal when valve is at midstroke.
- c) Install cam follower as indicated in Fig. 8-a and 8-b.
- d) Install cam segment corresponding to desired stroke against the cam follower. The arrow on the cam (cam follower side) must point the direction the valve stem movement caused by increasing of signal pressure. For example, in case of direct acting positioner with direct acting actuator. Valve stem moves downward by increasing of signal pressure.
- e) Using the numbers (in mm) stamped on the positioner lever as a guide, move travel pin to desired stroke and tighten pin.
- f) To set the start point, apply the minimum pressure of signal range (for example 20 kPa {0.2 kgf/cm²}) and adjust the spring adjuster until valve stem just starts moving. (Start point adjustment).
- g) Apply the maximum pressure of signal range (for example 100 kPa {1.0 kgf/cm²}) and check for the stem stroke. If stroke travel does not reach to its full stroke, move travel pin to the right. Move to the left if stroke is in excess.
- h) Recheck the start point. Repeat step f) and g) until travel is within acceptable limits.



5. CAM SELECTION

- a) The positioner has 3 cams, each of which is characterized to establish a specific valve travel versus signal pressure relationship (Fig. 9). Fig. 10 shows the family of flow characteristic curves combining if cams and linear characteristic valve plug.

Unless otherwise specified the positioner is shipped with cam 1. If cam 2 or 3 is desired, specify cam No.

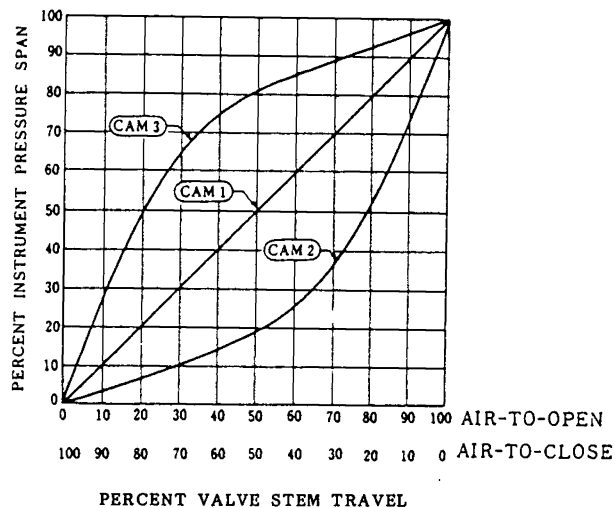


Figure 10. Cam Characteristics

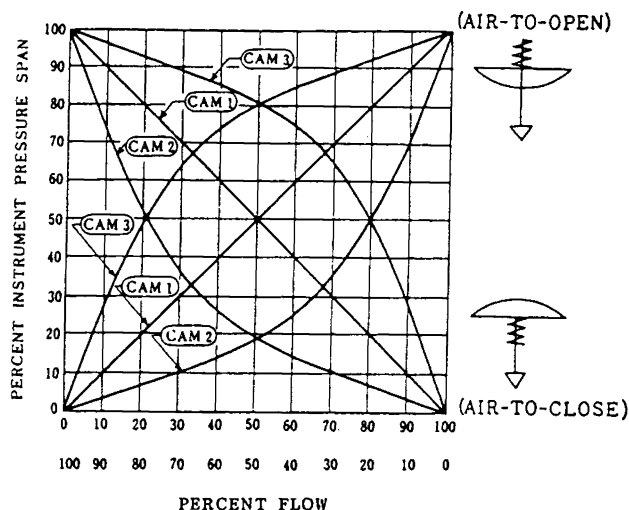


Figure 11. Flow Characteristics and Cam

- b) In most cases positioner with cam 1 is satisfactory because the plug characteristic is generally selected to fit the process and it is desirable to have the plug move linearly with input signal. However, with some valves, ideal flow characteristic for process can not be obtained as the case for butterfly valve which has a fixed flow characteristic because of its construction. In this case, it may be desirable to use cam 2 or cam 3 to improve the characteristic.

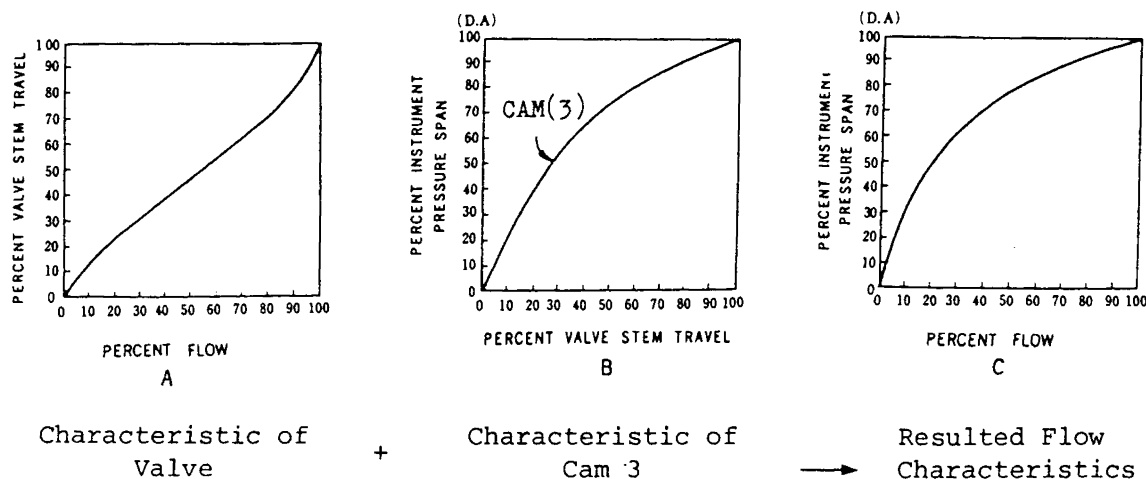


Figure 12. Example of Cam Usage

- c) Assume a air-to-open valve has a flow characteristic as shown in Fig. 11A, however, process requires equal percentage characteristic. Use cam 3 in such a case whose characteristic is redrawn in Fig. 11B. Fig. 11C shows the resultant flow characteristic which is nearly analogous to the equal percentage flow characteristic.
- d) Cam Selection

The selection procedures may be summarized as follows:

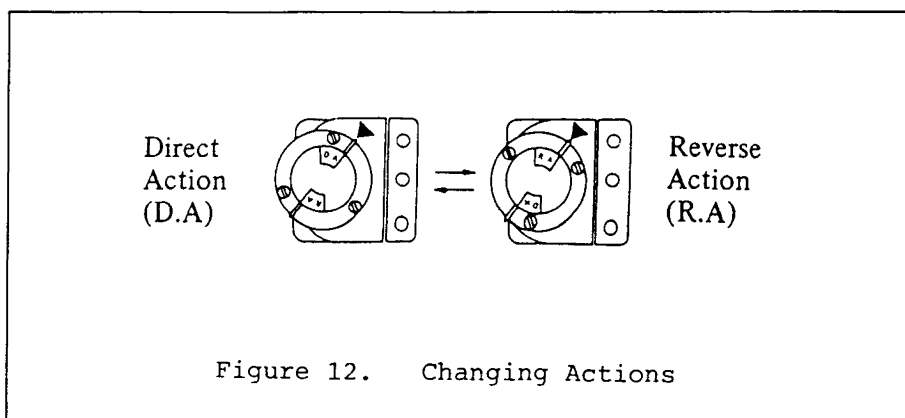
- (1) To obtain the flow characteristics of control valve.
- (2) To check if valve is "air-to-close" type or "air-to-open" type.
- (3) To refer to Fig. 11 when selecting cam to meet a specific flow characteristic required by process.

6. CHANGING POSITIONER ACTION

The HTP positioner can be quickly changed from direct to reverse action or vice versa without additional parts or special tools. And without any repositioning of positioner of piping.

Follow the steps below to change action:

- a) Remove the feedback spring and travel pin.
- b) Remove the three screws and lock washers which fasten the pilot to the housing.
- c) Rotate the pilot by 180° and re-fasten it to the housing. Be sure the "RA" or "DA" pointer is properly lined up with the marking.
- d) Turn over the cam so that the arrow on it points in the opposite direction. (Refer to par. b and c, calibration section).
- e) Replace the feedback spring and travel pin.
- f) Adjust the starting point an stroke. (Refer to calibration section).



7. CHANGING POSITIONER RANGE

Five feedback springs are provided for HTP valve positioner to permit an actuation with each of the five different signal pressure spans.

Table 5 listed the available ranges with color code which are conveniently used for split-range operation and others. However, when equipped with cam 1 (linear characteristic), the range can be changed for some extent simply by adjusting the starting point and stroke.

Table 5 Feedback Springs

Signal pressure span	Color code
20 to 100 kPa { 0.2 to 1.0 kgf/cm ² }	Green
20 to 60 kPa { 0.2 to 0.6 kgf/cm ² }	Orange
60 to 100 kPa { 0.6 to 1.0 kgf/cm ² }	White
40 to 200 kPa { 0.4 to 2.0 kgf/cm ² }	Blue
20 to 100 kPa { 0.2 to 1.0 kgf/cm ² }	Yellow

* Used for strokes between 6 and 12 mm.

8. BYPASSING

The positioner is available with bypass system. The bypass system enables to cutoff the positioner action and to bypass the signal pressure to valve actuator directly. When servicing the positioner, change the switch position from "POSITIONER" to "BYPASS" and remove four screws. The positioner is ready to be removed, leaving the bypass manifold to allow quick servicing of the positioner without disconnecting air tubing.

The manifold without bypass switch is also available and easily interchangeable.

9. SPECIFICATIONS

Supply Air Pressure: 140 kPa { 1.4 kgf/cm² } to 280 kPa { 2.8 kgf/cm² }
(standard)
400 kPa { 4.0 kgf/cm² } (maximum)

Signal Air Pressure: 20 to 100 kPa { 0.2 to 1.0 kgf/cm² } is standard
20 to 60, 60 to 100, 40 to 200 kPa { 0.2 to 0.6,
0.6 to 1.0, 0.4 to 2.0 kgf/cm² } also available

Accuracy: $\pm 1.0 \% \text{ FS}$

Hysteresis: $\pm 1.0 \% \text{ FS}$

Dead Band: Less than 0.1 % FS

Stroke Available: From 12 to 100 mm (3/4" to 4")

Air Consumption: 5 Nl/min (normal)

10. MAINTENANCE

a) Replacing Pilot Assembly

The pilot assembly has been factory calibrated and sealed. Field disassembly for repair is not recommended. However, preferably use factory calibrated spare assembly. To replace the pilot assembly proceed as follows:

Before replacement, make sure that the action of positioner of D.A. or R.A. to avoid the miss alignment when reassembling.

- (1) Remove three screws securing assembly to body.
- (2) Note position of assembly (direct and reverse acting) and remove.
- (3) Inspect existing gasket and replace if necessary.

Note: Do not use sealing compound on gasket.

- (4) Replace in reverse order being sure to mount assembly in original position (direct or reverse).

b) Gasket Replacement

When manifold or pilot are removed, check the gasket is worn or not. If necessary replace gasket with new one.

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