

XP100

Pneumatic Positioner Operating Manual

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Linear motion/Side lever type

# XP-S1



**3S** Safety Speed Service **3S Co., Ltd.**

## Safety precautions

### Cautions and Warnings – read before operating



“Warning” Indicates a situation where incorrect operation while failing to heed the warning could result in death or serious injury if not avoided.



#### **Warning**

When removing or disassembling component screws or pressure gauges etc. for inspection reduce the output pressure to 0 and then disconnect the supply pressure.

When operating the equipment during adjustment or inspection (see pages 1 and 2), do not touch moving parts such as cams, bearings, clamps or levers with your hands.



“Caution” Indicates a situation where incorrect operation while failing to heed the caution could result in malfunction or physical damage.

During use ensure the supply pressure remains within the maximum POSI-POWER range of 0.7 MPa.

The normal value during single acting and double acting is 0.14 – 0.28 MPa and 0.4 MPa respectively.

Use the equipment with the POSI-POWER cover Assy installed.

If drainage or debris etc. accumulates in the pressure line on the supply side, the orifice will become plugged and cause a malfunction, so install an air filter (such as Mini-Set, manufactured by 3S Co., Ltd.) of 5 microns or less and supply air cleansed by a dryer etc.

When checking to see if debris or blockage is observed in the orifice or mesh filter, first shut off the supply pressure.

When carrying out pipe work, always flush the pipes sufficiently.

When screwing pipes and fittings, leave about one fifth of the screw and bind remainder with seal tape or apply liquid sealant.

Using lubricator will block the orifice or nozzle. Avoid using lubricator.

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# 1. Introduction

This manual is intended for use with the side lever type for linear motion single and double acting pneumatic positioner valve.

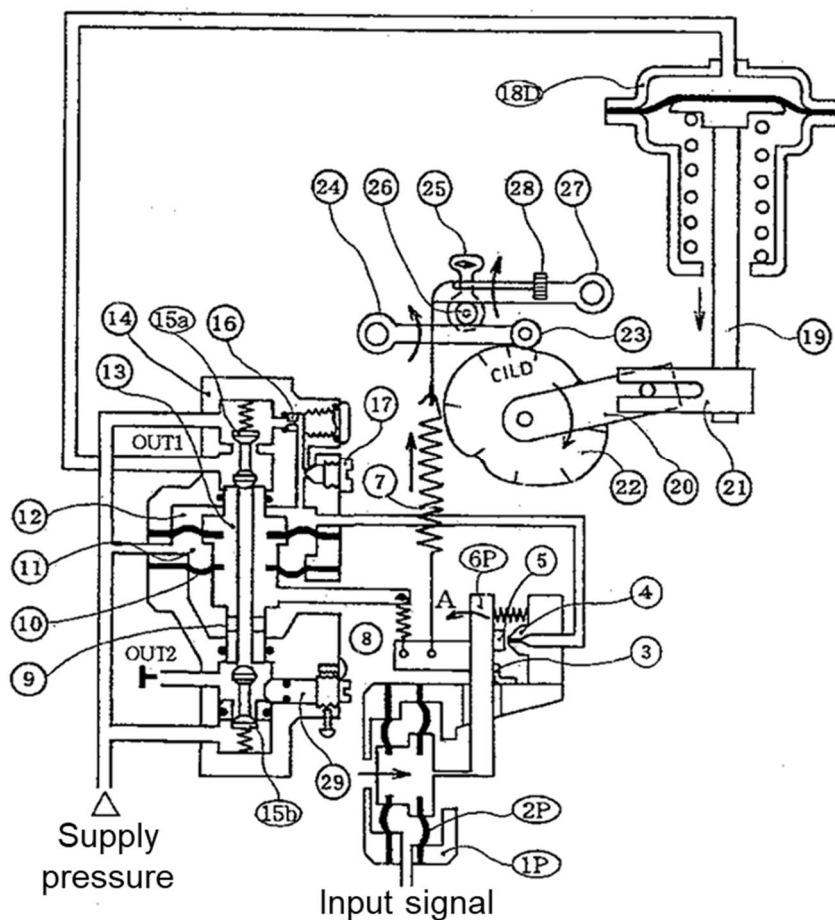
Please refer to the relevant manual for other types.

# 2. Operation

## (1) Single acting

When an input signal is applied to input chamber (1P), the flapper holder (6P) moves in the direction of arrow A by the flexure. This movement separates the flapper (5) from the nozzle (4) to reduce pressure in the nozzle back chamber (12), the balance between this pressure and that in the pressure chamber (11) is lost and eventually the relay spool (13) opens port (15a) to introduce the output of OUT1 to the pressure chamber (18D) of the diaphragm actuator, thereby lowering the stem (19).

This movement is transmitted to the feedback levers (20) and (21), cam (22), range (24) and zero arm (27) to expand the feedback spring (7) until the tension of this spring and the output of input chamber (1P) balance, obtaining a change in the stem (19) proportional to the input signal.

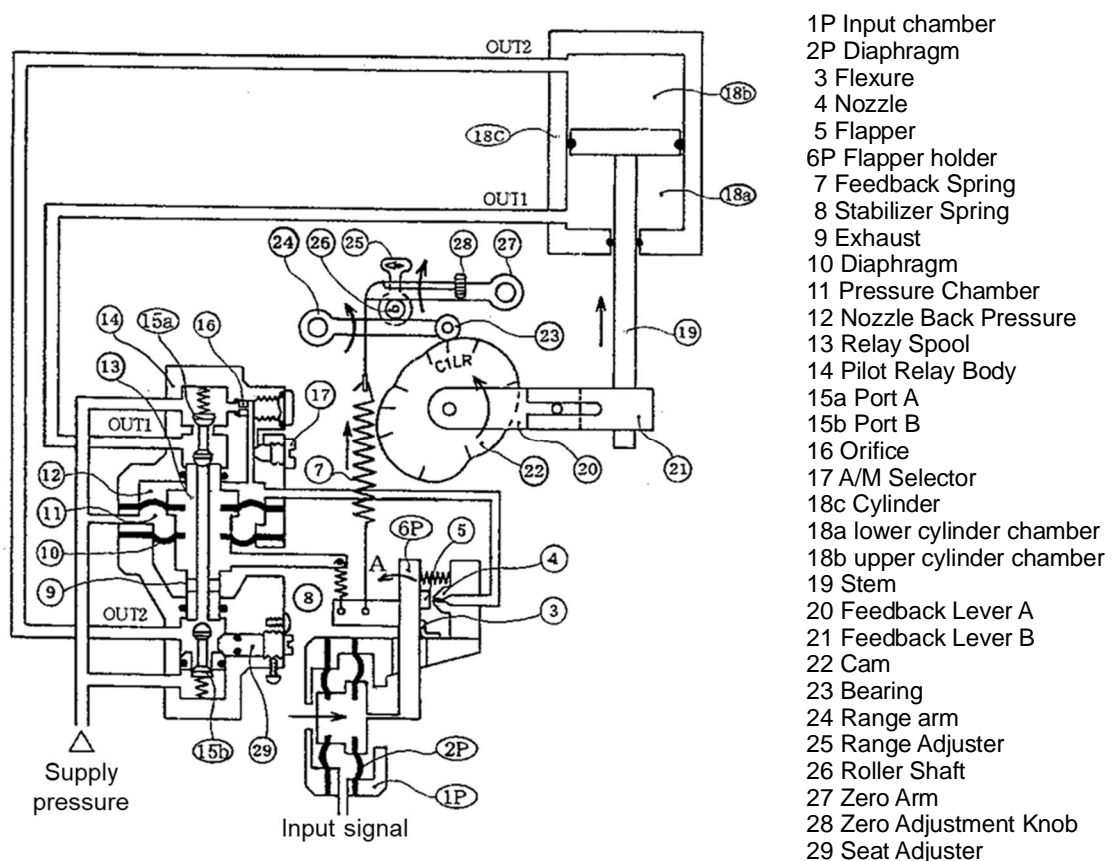


- 1P Input chamber
- 2P Armature
- 3 Flexure
- 4 Nozzle
- 5 Flapper
- 6P Flapper holder
- 7 Feedback Spring
- 8 Stabilizer Spring
- 9 Exhaust
- 10 Diaphragm
- 11 Pressure Chamber
- 12 Nozzle Back Pressure
- 13 Relay Spool
- 14 Pilot Relay Body
- 15a Port A
- 15b Port B
- 16 Orifice
- 17 A/M Selector
- 18D Diaphragm Actuator (Pressure Chamber)
- 19 Stem
- 20 Feedback Lever A
- 21 Feedback Lever B
- 22 Cam
- 23 Bearing
- 24 Range arm
- 25 Range Adjuster
- 26 Roller Shaft
- 27 Zero Arm
- 28 Zero Adjustment Knob
- 29 Seat Adjuster

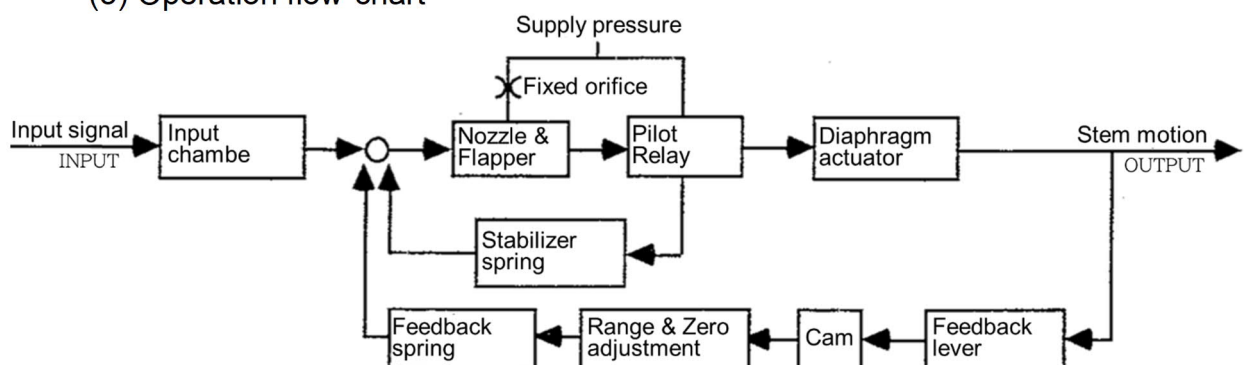
## (2) Double acting

When an input signal is applied to input chamber (1P), the flapper holder (6P) moves in the direction of arrow A by the flexure. This movement separates the flapper (5) from the nozzle (4) to reduce pressure in the nozzle back pressure chamber (12). As a result, the balance between the above chamber and that in the pressure chamber (11) is lost, and eventually the relay spool (13) opens port (15a) and port (15b) simultaneously separates from the end of the relay spool. In response to this movement, the output of OUT 1 flows into the lower cylinder chamber (18a) and the upper cylinder chamber (18b) connects to the vent to raise steam.

This movement is transmitted to the feedback levers (20) and (21), cam (22), range (24) and zero arm (27) to expand the feedback spring (7) until the tension of this spring and the output of the input chamber (1P) balance, obtaining a change in the stem (19) proportional to the input signal.



## (3) Operation flow-chart



### 3. Specifications

Specifications	Single acting	Double acting
Input signal	20~100kPa	
Supply air pressure	0.14~0.7MPa / 140~700kPa	
Stroke	10~100mm	
Air connector	Rc1/4 (pressure measurement Rc 1/8 )Option; 1/4 NPT (pressure measurement 1/8 NPT)	
Pressure gauge		0 - 0.2MPa,
	Standard;	0-0.4 MPa,Option; kPa, psi*1, bar
		0-1.0 MPa
Construction	Standard: anti-dust, anti-drip IP65 equivalent (IEC529-1989)	
Cam	Standard; Linear, Equal Option; non-linear characteristics	
Ambient temperature	Standard use (S); -20 to 83°C Low temperature use (L); -50 to 60°C High temperature use (L); 0 to 100°C	
Weight	1.3kg	1.4kg
Material	Main body; Cast aluminium (special alumite treatment) Cover; PBT resin (containing glass fibre)/Cast aluminium...optional	

Characteristics	Single acting	Double acting
Linearity	±1% F · S	±1.5% F · S
Hysteresis	0.5% F · S	1.0% F · S
Repeatability	0.3% F · S	0.5% F · S
Sensitivity	0.2% F · S	0.5% F · S
Supply pressure change	0.2%/0.01MPa	0.3%/0.01MPa
Vibration resistance	1%/1G	
Posture error	0.2%/10°, 4%/90°	
Air usage (NI/min)	3 NI/min /0.14 MPa	10 NI/min /0.14 MPa
Max. Air treatment (NI/min)	160 / 0.14 MPa Output side at max. open (orifice φ 5)	370 / 0.4 MPa Output side at max. open (orifice φ 5)

※ No domestic sales in Japan due to Non-SI unit.

\*1: Sales of Non-SI unit products in Japan are not permitted under Japanese law.

## 4. Installation

### (1). Installation

#### 1). Installation

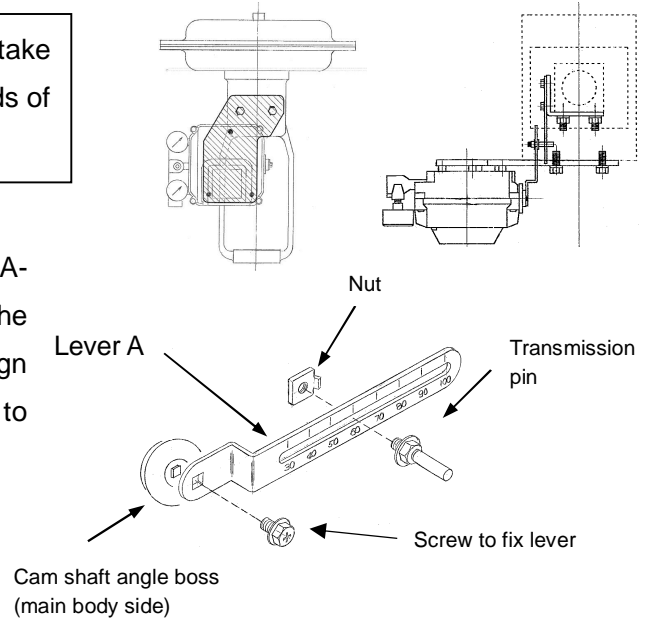
The diagram on the right shows an example of mounting with a one-sided bracket.

When using in a place with strong vibrations, take anti-vibration measures such as fixing both ends of the mounting bracket.

#### 2) Loading A-lever (positioner side)

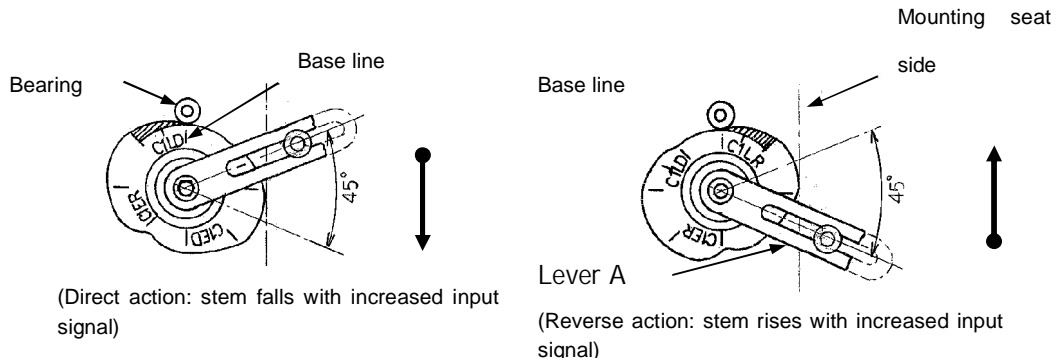
- ① Stroke measurement lines are etched into the A-lever (feedback lever), so it fixes to match with the prescribed stroke, completing the lever, so align the transmission pin with the specified stroke to complete the lever.

With max. and min. stroke, assemble by facing the nut's claw towards the lever's long hole.



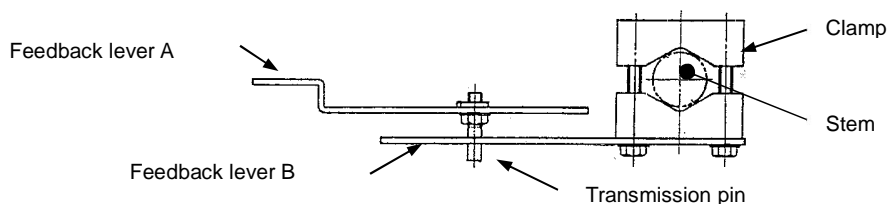
- ② Align the completed lever with the actuator action, and fix in place to the main body's cam shaft angle boss with a screw.

Unless otherwise specified, shipped with linear characteristics. When selecting Equal %, modified in accordance with 9-2 (3) Equal % Cam characteristics (pg. 14)



#### 3) Installing to actuator

While inserting the A Lever (feedback lever) transmission pin into the long hole in Feedback Lever B on the valve stem side, interpose the brackets and install on the positioner actuator. At this point check that Feedback Levers A and B are level and that the transmission pin has the prescribed stroke.



## (2) Adjusting installation position

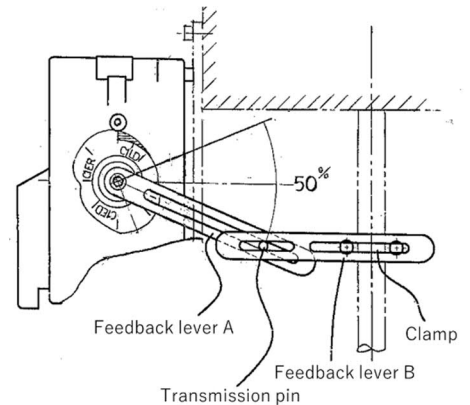
### 1) Linear-characteristic zero-point/reevaluating

When lowering the linear characteristics to zero or raising them, follow the guideline below for positioning.

After alignment, carry out zero/range adjustment and check that the values are at zero or have been raised.

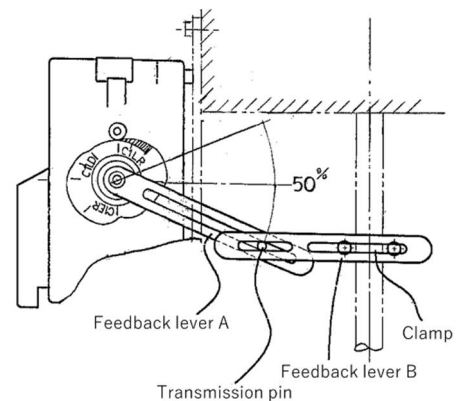
#### ① Direct action/reevaluation of normal stopper position

- a. Select C1-LD for the Cam
- b. Turn the actuator valve to 0% (valve closed)
- c. Adjust upwards or downwards the bracket, clamp and stamp lever so that the top of the extension line for the baseline showing maximum Cam displacement (100%) is on the center of the bearings.  
(see graph on right)



#### ② Reverse action actuator/stopper at zero-point

- a. Select C1-LD for the Cam
- b. Turn the actuator valve to 0% (valve closed)
- c. Adjust upwards or downwards the bracket, clamp and stamp lever so that the top of the extension line for the baseline showing maximum Cam displacement (100%) is on the center of the bearings (see graph on right)



#### ③ Direct action /reverse stopper at zero-point

In this case, look at the Cam from the side of lever installation, and reinstall so that the Cam is reversed and the Cam code not visible, turning it to C1-LR. For assembly method see Converting to Equal % Cam Characteristics (Pg. 14) For position alignment follow the same procedures as described in ② above.

### 2) Near equal % characteristics

When approaching equal percentage characteristics, this model does not possess zero-falling or reevaluating function, but for Cam alignment follow the basic guidelines in 1) above.

\* When changing from a linear-characteristic Cam to an equal-percentage Cam, reassemble for equal-percentage characteristics and reinstall. See Converting to Equal % Cam Characteristics (Pg. 14).



# 5. Cam

## (1) Cam type and code

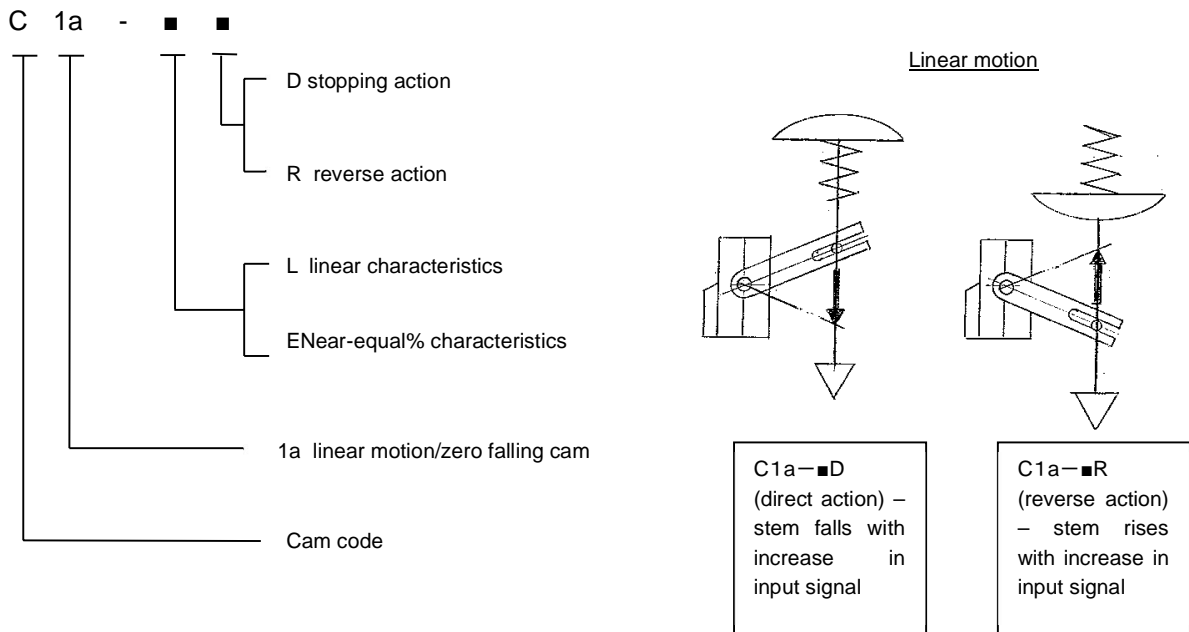
Standard Cam enables selection of linear and near-equal percentage characteristics.

CAM properties can be selected to suit the valve properties.

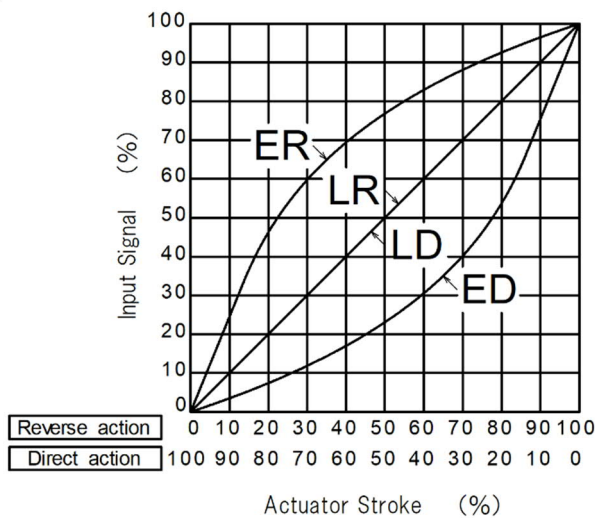
Unless otherwise specified, the default shipping setting is standard linear motion. When using as near-equal%, see Converting to Equal % Cam Characteristics (Pg. 14).

## (2) Cam characteristics and specifications

The valve properties and CAM properties can be selected to suit the objectives of use.



The input signal and stroke are related as described in the diagrams below.



### Cam characteristics/applications

Cam code	Cam characteristics/applications		
	Direct	Characteristics	Applicable actuator
C1-LD	Linear motion	Linear	Direct
C1-LR			Reverse
C1-ED		Near equal %	Direct
C1-ER			Reverse

Note: Direct action means the valve stem falls when input signal increases. Reverse action means the valve stem rises when input signal increases

## 6. Pneumatic piping

### (1) Pneumatic piping

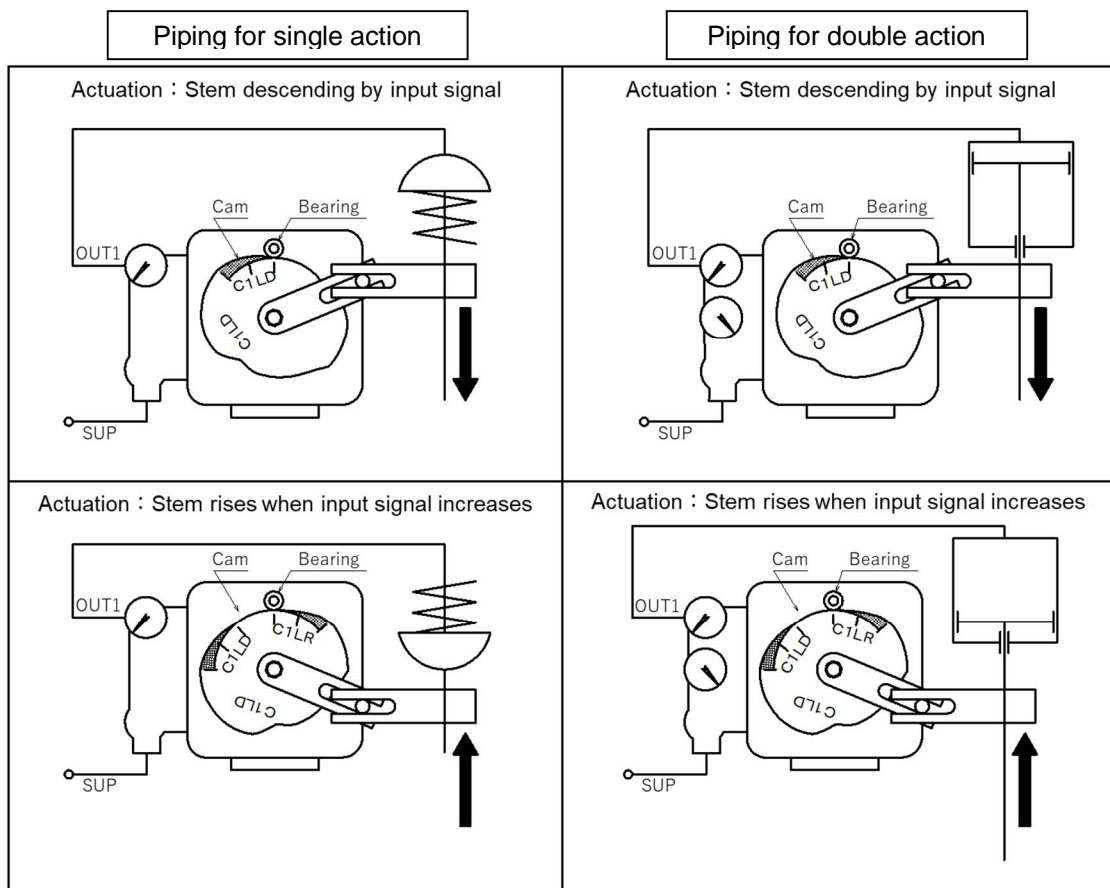
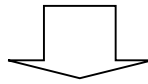
- 1) The connection is selectable, either Rc1/4 or 1/4 NPT as required. Please use the appropriate connector.
- 2) Ensure no foreign articles or cutting chips are contained in the piping by purging appropriately.
- 3) Use supply air that has been dried and filtered.

**\* Use a filter around the supply air nozzle that has a filtration value of less than  $5 \mu m$**

**\* Inappropriate supply air can cause malfunctioning and shorten the product's life-span.**

- 4) Regulate the supply pressure to the required pressure, using for example a Mini-set (pressure reduction valve with filter attached, provided by us).
- 5) When double acting type is used as a single acting type, blind OUT 2 connector nozzle (or OUT 1 when used as reverse action pilot), remove the pressure gauge and blind that port also.

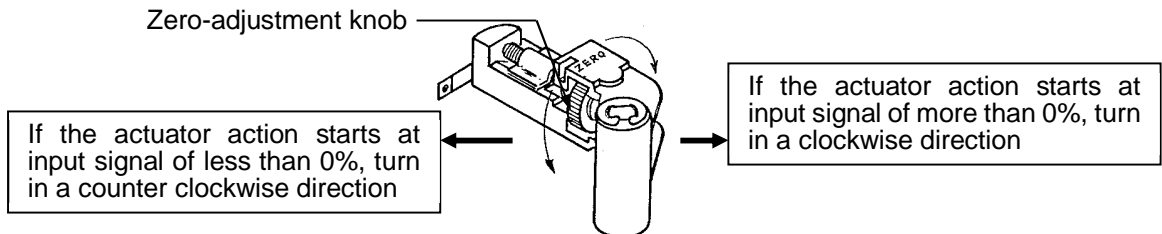
For single action/reverse action pilot (the method of using OUT2 with reduced output from increase in input signal) see page 10.



## 7. Adjustment

### (1) Zero point adjustment

- 1) Set input signal to the stroke starting signal (20kPa) then turn the zero adjustment knob clockwise or counter clockwise. (Because the CAM has zero-falling, rising characteristics, adjust by the valve in closed position)



- 2) For Zero Point Adjustment, we recommend checking Output pressure adjustment as well as the stroke.

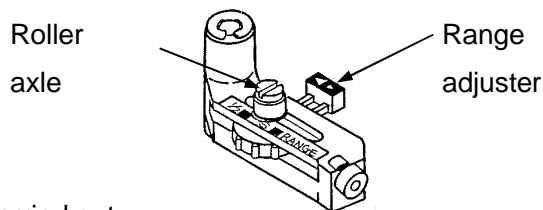
The table below shows output pressure when emphasizing tight-shut.


Output pressure gauge	Double Acting		Single Acting	
	RA	DA	RA	DA
OUT1	0	MAX	0	(※1)0.12 - 0.14
OUT2	MAX	0	—	—

(Units: MPa) ※1When diaphragm motor is SUP0.14MPa (a range of 0.02 – 0.1MPa)

### (2) Range adjustment

Adjust Range Adjustment so that actuator stops at 0% position of the stroke by the 0% applied input signal and 100% position for 100% input signal respectively. (When Stopper or Valve Seat stays at the 100% or 0% position of the actuator, the adjustment is made at the 10% - 90% position or, otherwise, 25% - 75% position)



- ① First Zero Adjustment is carried out.
- ② Check the actuator stroke is positioned at 100% when 100% input signal is applied. Checking for the input signal and stroke has to be done carefully because over-ranged adjustment causes over-traveling in the actuator stroke, before the input signal reaches 100%.
- ③ Use the controls on the range adjuster  as marked. The large mark is to increase the range; the small mark is to decrease the range.
- ④ The Range Adjuster can be free to move by loosening the Roller Shaft slightly using a screw driver.

Holding the Roller Shaft in place with the screw driver used to loosen the Shaft, move and adjust the Range Adjuster and lock it again. Do not loosen too much because the Roller Shaft will be slanted and its adjustment will become unreliable due to the zero-shifted stroke.

- ⑤ Range adjustment and zero adjustment is carried out alternately.
- ⑥ If Range adjustment cannot be achieved by full range movement of the Adjuster, check the position of the transmission pin on the feedback lever.

### (3) Seat adjuster

1) The Seat Adjuster is designed to adjust the output pressure balance pressure, and is thus adjusted before the shipment for balanced output pressure (75% - 80% of supply air pressure). Thus, do not adjust unless you have accidentally turned the seat adjuster. Incorrect operation can result in malfunction.

2) Adjusting the balance pressure helps address the following issues. When adjusting follow the directions detailed in 10.3, Troubleshooting/Poor performance. Contact us before carrying out any adjustments.

- ① Alleviates 'hunting' phenomenon ( High Pressure Balance)
- ② Reduction in Hys. (shifting balance point)

### (4) A/M Selector

A/M Selector is a valve for changing between Auto and Manual

1) When using in Auto mode, turn the Selector towards A (clockwise) until fast.

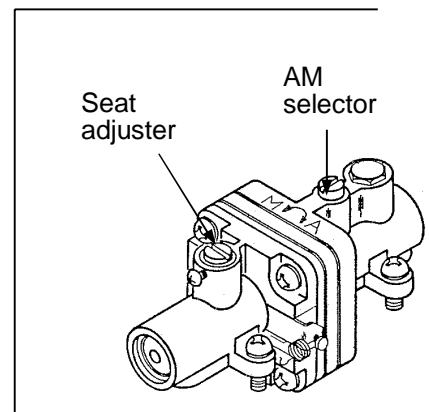
Use a torque equivalent to JIS or 6x100 screwdriver.

(Shipped products are set to Auto))

2) To use in manual mode turn the Selector to M (anti-clockwise, about one quarter to one and a half turns)

The actuator can be operated in manual mode using the supply pressure reduction valve.

Not available for Single Acting-OUT2 and Double Acting.



### (5) Linearity adjustment

Insufficient linearity can be caused by misalignment of CAM position (pointers position) when positioning the closed valve.

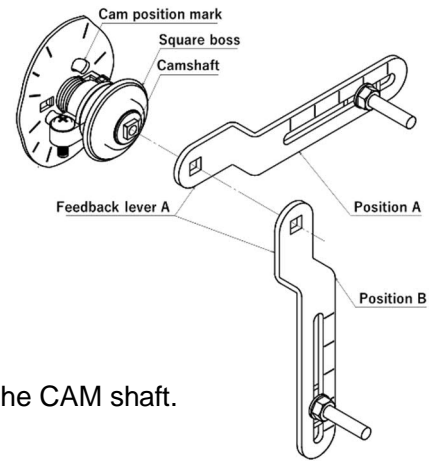
If this occurs, carry out micro adjustments on the bracket and/or clamp while checking the positioning of the pointers.

Refer to Adjustment of Installation Position, page 5, for adjustment range.

## 8. Change of operation

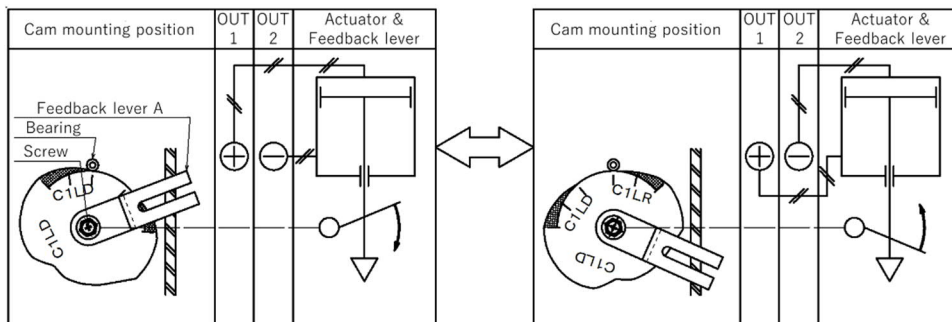
There is no need to turn the CAM over to change direct action of the actuator, instead change the installation position of the feedback lever.

For double-acting type, flip OUT1 and OUT2 output wires.



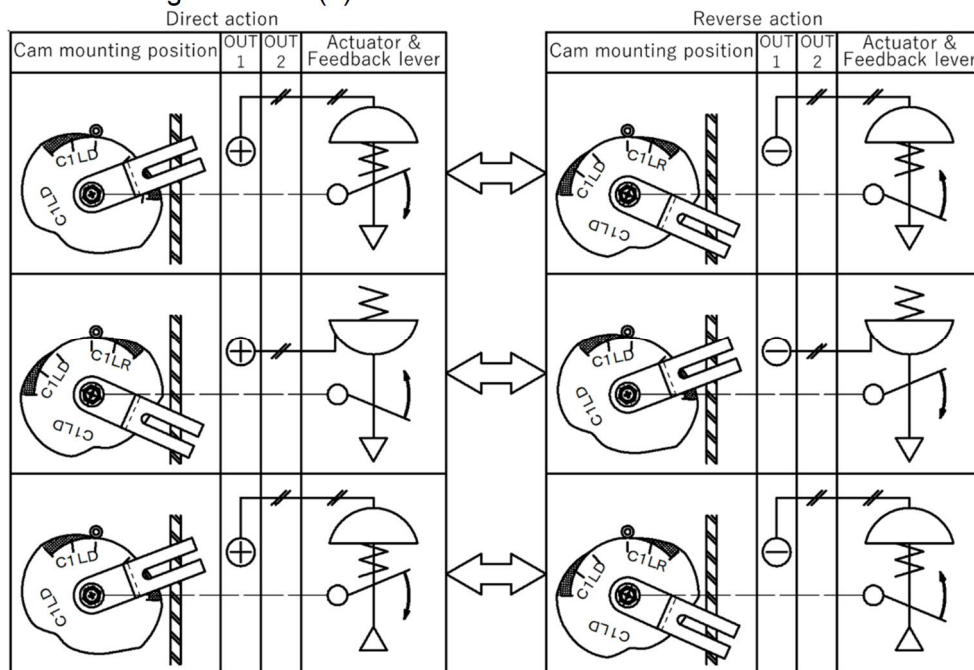
### (1) Double acting

- ① Flip OUT1, 2 wires.
- ② Remove the screw for fixing Lever A, and remove the lever from the CAM shaft.
- ③ Flip Lever A in the direction as indicated on the CAM shaft (D,R).
- ④ Adjust Zero and Span adjustments.



### (2) Single acting

There is no need to change the piping (though there is a need for reverse acting pilots), however follow the guidance in (1) above.



※ For reverse acting pilot (increase in signal input and decrease in output) follow the guidance below.

- ① Flip piping, screw plug and output gauge to OUT2.
- ② Relocate the Feedback Lever at the desired position.
- ③ Adjust Zero and Range Adjustments.

## 9. Maintenance

### 9 – 1 Regular inspection

Carry out regular inspections for maintenance. Refer to the Regular Inspection Manual below.

Refer to pages 1, 2 and 20 for unit names and position of parts.

#### Regular Inspection Manual

○ Check (Replace defective parts) ◇ Checking and Cleaning ■ Replace △ Checking and Greasing

Unit	Check point	Checking period (Year)	Summary of checking point
Base & Cover	Supply pressure filter	1	◇ ; Alien objects, dust etc.
	Pressure gauge	1	○ ; Indication error
		5	■
	Cover packing	3	○ ; Defects, Hardening
5		■	
Zero & Range Arm	Shaft holder	1	△ ; Wear, Greasing
	Bearing	3	○ ; Damage, Grease leak
	Zero-adjustment plate	5	○ ; Crack, Damage
Cam & Lever	Cam Plate	5	○ ; Wear
	Cam Shaft	1	△ ; Wear, Greasing
	Spring	1	○ ; Damage
	Transmission pin	1	△ ; Wear, Dust, Greasing
	Cam Shaft packing	5	■
Input chamber unit ※1	Flexure spring	5	○ ; Loose screws
	Nozzle, flapper	1	◇ ; Dirt, Wear, Tear
Pilot Relay ※2	Fixed Orifice ※3	1	○ ; Dirt, clogging
	Filter mesh (when cleaner attached)	1	○ ; Dirt, clogging
Others	packing (rubber)	5	■

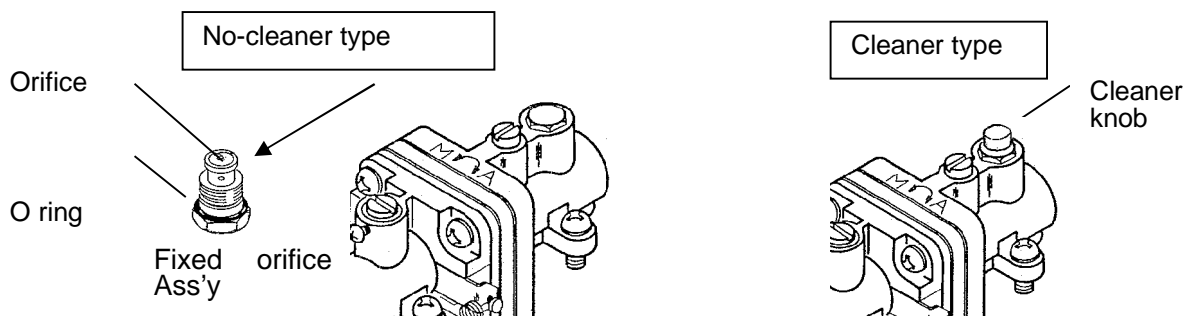
Note1. Dismantling the input chamber unit (※1) can harm the **performance of the explosion-proof characteristics and is prohibited.**

Note 2. Dismantling the Pilot Relay Unit (※2) can harm the **performance of the explosion-proof characteristics and is prohibited.**

Note 3. Change the Pilot Relay Unit every five years using the units provided.

\* Determine the exchange period based on the conditions of use (frequency, opening and closing speed) and ambient range of temperature.

Note 4. Check that the supply air source is stopped and there is no residual pressure before cleaning the orifice (※3).



Remove the orifice Ass'y from the pilot relay unit, and clean with 0.3 diameter piano wire and purified air.

Push the cleaner knob (red), and dispose of rubbish

## 9 – 2 Replacing or changing unit parts

### (1) Replacing pilot relay unit

Before replacing parts, always cut off the supply air pressure and check that no residual pressure remains.

#### Removing

① Remove the stabilizer spring from the hanger using a pin set.

\* Be careful not to bend or stretch the stabilizer spring.

② Remove the four installation screws (M4 small cross hole screws: CN4-12WFWS), and remove the Pilot Relay Unit.

When removing, check to make sure that O-ring on the Pilot Relay side is not still attached to the base side.

If it is still attached, then remove.

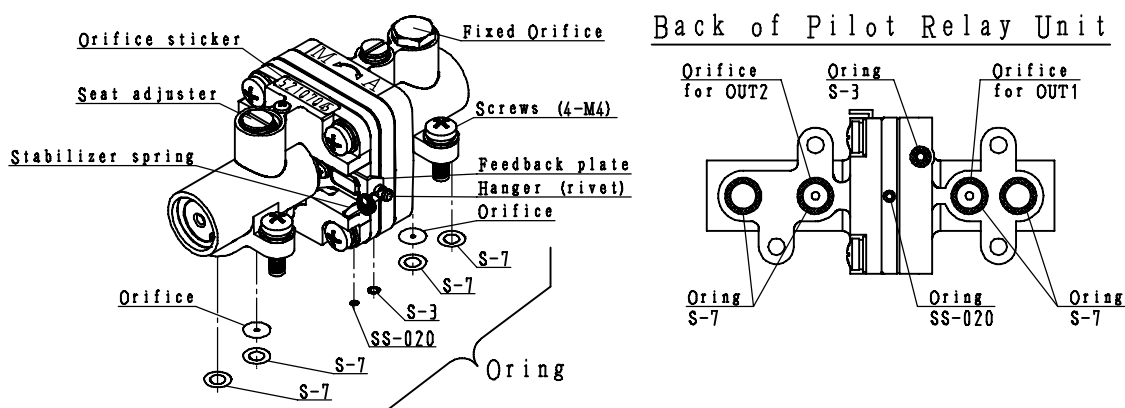
#### Installation/checking

① Before installing the new Pilot Relay Unit, check that all the O-rings on the install seating are attached.

Check particularly for S-3 and SS-020 O-rings, which are small and can get lost during removal of the unit.

② Set the new Pilot Relay Unit on the base, fix in place with the four installation screws and then hang the stabilizer spring from the hanger.

③ Before finishing the operation, check the operation and hysteresis. Check that there is no breathe sound to indicate air release from the base of the Pilot Relay Unit installation. A loud breathing sound could suggest major air release, in which case check that the O-rings are attached correctly.



## (2) Changing the orifice

When using small capacity actuator, hunting (or overshooting) may occur. If this happens, replace the actuator capacity on the orifice on the Positioner output side (Pilot Relay attachment) in accordance with the guidelines below.

Actuator capacity (liters)	Orifice diameter ( $\phi$ )
0.5~0.7	0.7
1.0	1.0
$2.0 < V$	2.0, 5.0 (when increasing action speed)

① After removing the Pilot Relay Unit following the replacement guidelines in (1) above, remove the O-ring (S-7) for use in the unit rear seat pressure output OUT1 and OUT2, and the orifice to be replaced.

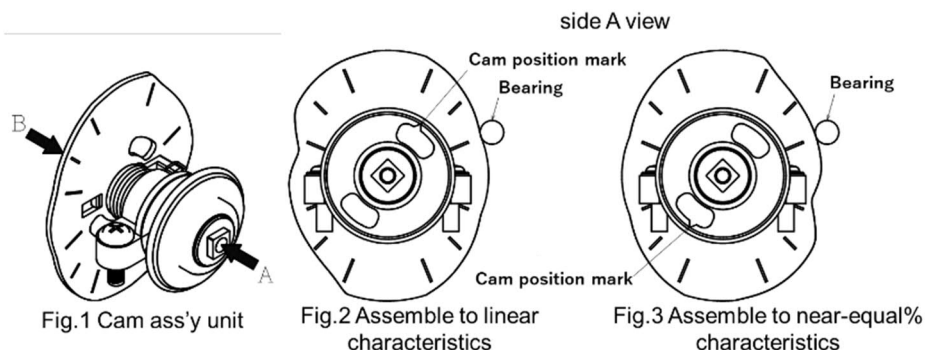
② After replacing with the specified orifice, attach the O-ring (S-7), and install the Pilot Relay Unit and Stabilizer Spring.

Circle the appropriate figures for the diameter of the new orifice on the orifice diameter sticker.

③ After replacement, follow the guidelines above, and check activity and functionality

## (3) Changing to equal % Cam characteristics

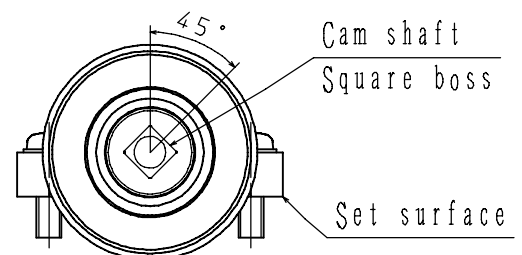
When changing from linear-characteristic to equal-percentage characteristic, it is necessary to remove the Cam from the base and change the Cam shaft unit.



The procedure is described below.

① Set the angle boss position

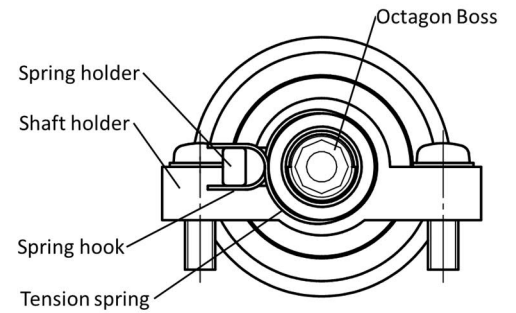
Rotate the cam shaft in the direction of arrow A direction in Fig.1, until the shaft's flat surface is slanted at a  $45^{\circ}$  angle as shown in the illustration on the right.





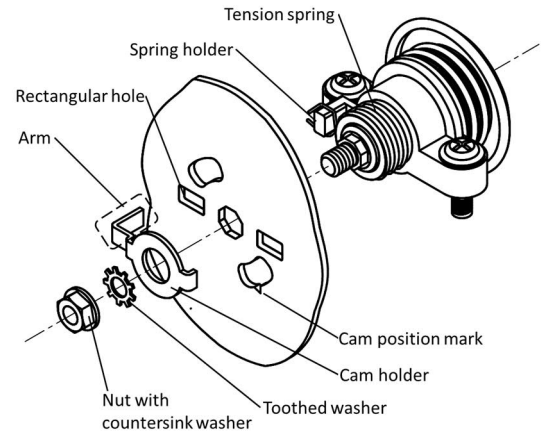
## ② Tension spring setting

Turn the Cam shaft holder 180° in reverse in the direction of arrow B). In this state set the tension spring in the spring holder so that the spring hooks are in a cross shape as shown in the illustration.



## ③ Inserting the cam into the cam shaft

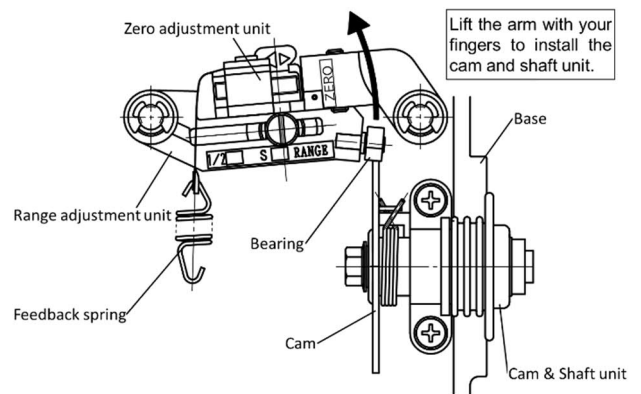
When setting the cam's symbol side as the reverse side in the near-equal% characteristic, move the cam position mark to the lower right and insert into the cam shaft octagonal boss. (For linear-characteristic rotate the can 180°, to move the cam position mark to the upper left)



## ④ Cam holder installation

When the cam is inserted, the cam rectangular hole and the spring holder position are aligned.

In this state, pass the cam holder through the cam rectangular hole and insert it in where the tension spring hooks are crossed and then set the arm. Next, insert the sprocket washer and then screw on the nut with disc washer and tighten it firmly. (At this time be careful that the tension spring does not come between the cam and the cam shaft holder). Finally check that the Cam runs smoothly.



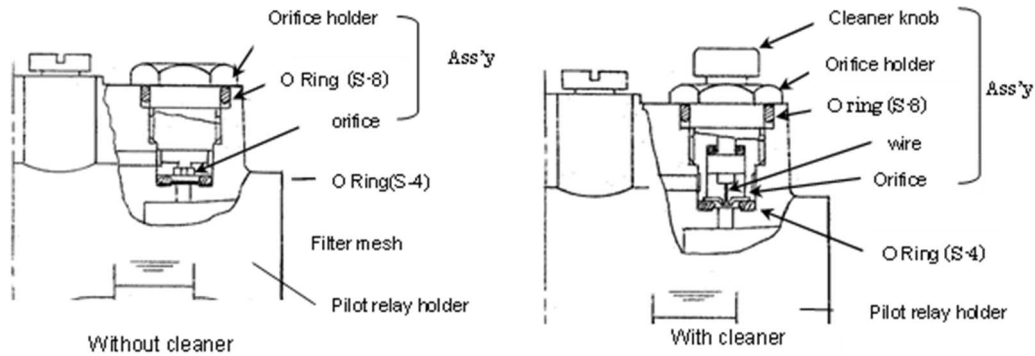
## ⑤ Cam shaft unit installation

Fit the assembled cam and shaft unit to the positioner. Fit in position using your finger to avoid damaging range-arm unit end bearings. Also be careful not to install the unit in reverse.

#### (4) Replacing orifice Ass'y

The orifice Ass'y comes in versions with cleaner attached and without cleaner. (Internal construction differs. See diagram below.)

Follow the guidelines below when converting from non-cleaner to cleaner-attached versions to avoid problems arising from quality of supply air. (When converting make sure the supply air is turned off and that there is no residual pressure).



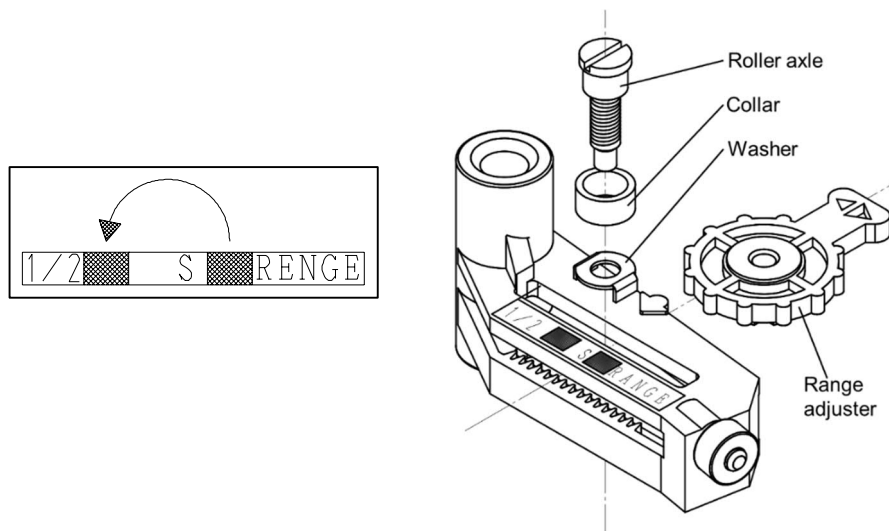
- ① Use an auxiliary 10 spanner and remove the orifice Ass'y from the Pilot Relay Menu.
  - ② Using a tool such as tweezers, remove the O-ring and filter mesh from the orifice Ass'y installation holes. (Use new O-ring's for the O-ring (S-4))
  - ③ If the orifice Ass'y installation holes are dirty, clean by method such as applying air pressure to the area.
  - ④ Re-attach the O-rings (S-4) to the holes. (Do not use the filter mesh)
  - ⑤ Remove the orifice Ass'y and check operations.
- \* At this point check that O-ring (S-8) is attached to the orifice Ass'y.

#### (5) Changing to split range

When converting to Split Range remove the roller shaft as shown below, then adjust as described above after repositioning the Range Adjuster gears to the 1/2 mark.

For 20-60 kPa range: Adjust to 20 kPa at 0% and 60kPa at 100%.

For 60-100 kPa range: Adjust to 60 kPa at 0% and 100 kPa at 100%.



# 10 Troubleshooting

## 1) Not operating with Input Signal applied

Identification and assessment of problems can be done by gently moving the counter block (with flapper attached) by hand and attaching it to the nozzle and checking the output pressure.


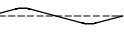
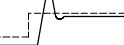




Check at counterblock	Cause	Action
When counterblock is moved, output pressure is activated/switched normally	Incorrect wiring (+/-)	Tighten or correct wiring
	Torque motor is open or short circuited	Replace motor (✖)
	Loose or incorrectly mounted feedback lever	Tighten or re-mount
When nozzle is closed at counterblock, OUT1 is raised and at a constant level	Orifice or cleaner orifice is jammed	Clean or replace/press clean knob
	Incorrect replacement of A/M selector	Tighten towards arrow A
	Incorrect flapper contact, broken flapper	Replace motor (✖)
When nozzle is open at counterblock, OUT1 is raised and at a constant level	Low or no supply pressure	Check DP Valve, or original pressure
	Jammed nozzle	Replace motor (✖)
	Faulty pilot relay unit	Replace pilot relay unit

## 2) Malfunction

Issue	Cause	Action
Incorrect zero position	Loose feedback lever connection	Tighten and readjust
	Metal material near cover	Remove materials and readjust
Wrong stroke	Transmission pin wrongly positioned	Tighten and readjust
	Cam wrongly positioned	
	Loose range adjuster roller shaft	
Operation is not smooth	Loose set or lock screws	Tighten and readjust
	Cam shaft worn out	Replace if backlash is too big
Wrong linearity	Feedback lever setting is wrongly positioned	Correct setting
	Cam is worn out	Replace cam and readjust
Response time is slow (both ways)	Supply port screen is clogged	Clean
	DP valve filter is clogged	Replace filter
Extremely slow response (one way, OUT1 pressure hard to raise)	A/M selector not completely closed	Rotate to arrow
	Clogged orifice	Clean or replace
	Incorrect contact between nozzle and flapper	Replace motor (✖)

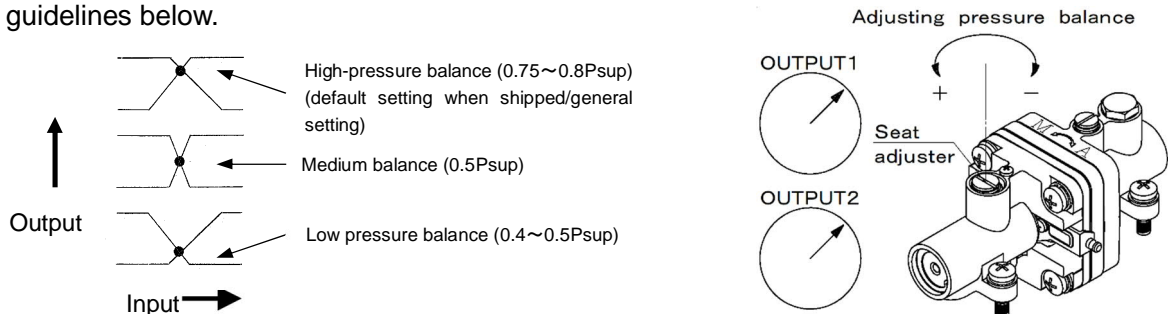
✖ **Motors returned to us will be replaced**

### 3) Insufficient Performance

Issue	Cause	Action
Fast Cycle Hunting 	Fixed orifice becoming clogged	Clean or replace
Slow Cycle Hunting 	Grand packing worn out	Increase the actuator size
	Insufficient actuator strength	Replace grand packing or increase actuator size
	Pilot relay balance pressure too low	Adjust seat adjuster (※)
Overshoot 	Pilot relay balance pressure too low	Adjust seat adjuster (※)
	Delayed transmission of feedback circuit	Check wearing and backlash
Jumping 	Insufficient actuator torque	Increase the actuator size
Knocking 	Pilot relay balance pressure too low	Adjust seat adjuster (※)
	Actuator defect	Switch to manual mod, check and repair
	Lack of supply pressure capacity or clogged SUP filter	Increase DP valve size and clean or replace
Large hysteresis 	Feedback circuit is worn	Tighten loose screws/replace defective equipment
	Balance pressure not adjusted	Readjust seat adjuster (※)
Poor response 	Problem with balance pressure	Readjust seat adjuster (※)
	Damaged, dirty or mispositioned nozzle/flapper	Replace torque motor (SSS will replace)

#### (※) Adjusting the Seat Adjuster

If the Seat Adjuster is turned in the wrong direction, and emergency recovery is required, follow the guidelines below.



- ① So that the actuator balances at arbitrary intermediate values (other than at full-open or tight-shut), change the input signal appropriately and check the internal air pressure of the balance point cylinder.

(Warning: When air escapes from between the positioner and actuator, the balance point becomes lower)

- ② When lowering the balance point, rotate the Seat Adjuster clockwise, and when raising the balance point rotate in an anti-clockwise direction.

※After rotational adjustment (about 1/10 of a full rotation), change the input signal and check the output pressure balance point.

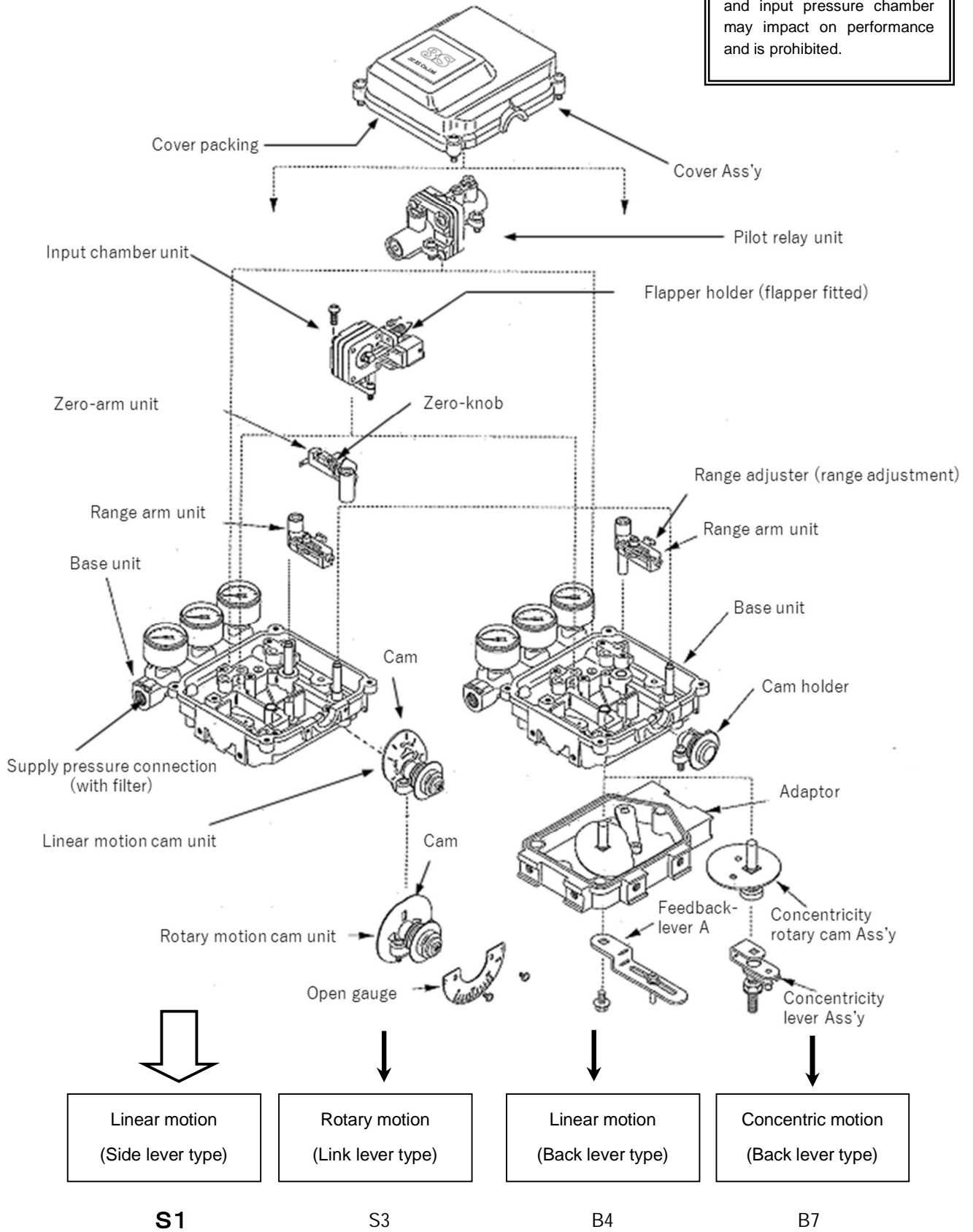
If the value falls outside the standard range for adjustment, rotate slightly in either direction as required.

The maximum rotation range is 1/4 of a full rotation. Excessive rotation will damage the unit.

A difference in the effective surface area of pistons on either side, a spring inserted from one side, heavy loading can all cause pressure difference between OUT1 and OUT2. In such cases, set a high standard pressure.

# 11. Part names (common to XP models)

— Disassembly prohibited —  
 Disassembly of pilot relay unit and input pressure chamber may impact on performance and is prohibited.



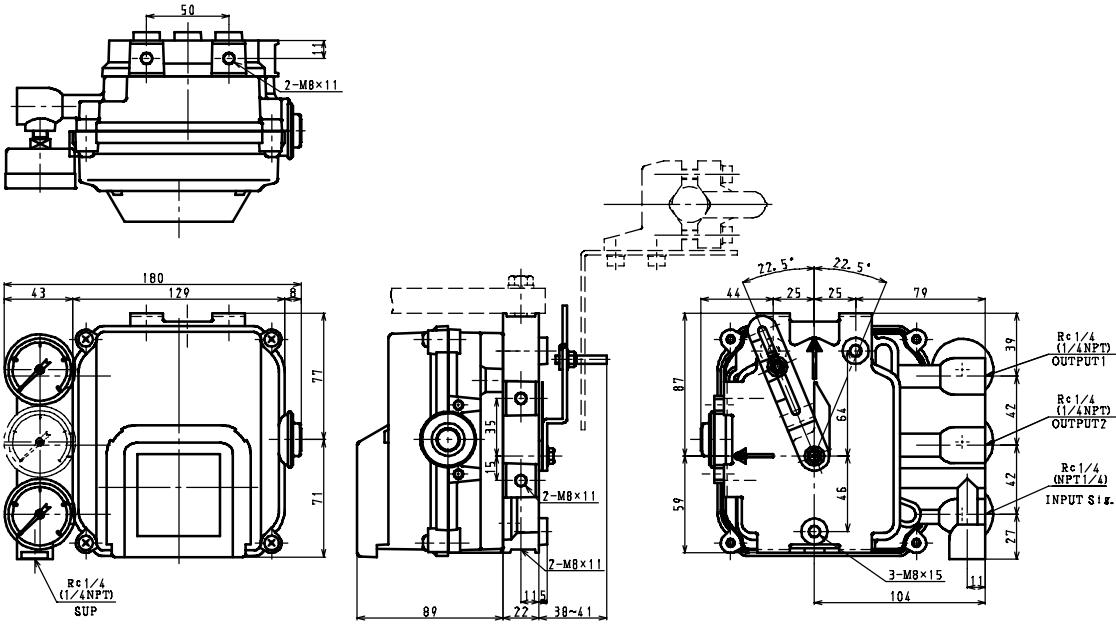
## 12. Model notation

1	2	3	4	-	5a	5b	/	6	7	8	9

Specification		Definition	Code
1	Basic code	P/P Positioner	XP
2	Series	100 series	1
3	Construction	Standard	0
4	Connection & acting	Rc1/4 & single acting	1
		Rc1/4 & double acting	2
		1/4NPT & single acting	3
		1/4NPT & double acting	4
5a	Ambient temp.	Standard temp. model: -20 to 83°C	S
		Low temp. model: -50 to 60°C	L
		High temp. model: 0 to 100°C	H
5b	Mount	Linear motion / side lever	S1
		Rotary motion / side lever (link lever)	S3
		Linear motion / back lever	B4
		Rotary motion / back lever	B7
6	Outlet pressure gage	0.2MPa, 0.4MPa, 1.0MPa	M2, M4, M0
		200kPa, 400kPa, 1000kPa	K2, K4, K0
		30psi, 60psi, 150psi *1	P2, P4, P0
		2bar, 4bar, 10bar	B2, B4, B0
7	Pilot Relay	Standard without cleaner (filter mesh protector)	F*
		Standard with cleaner	Q*
		Stable without cleaner (filter mesh protector)	G*
		Stable with cleaner	J*
		Quick speed without cleaner (filter mesh protector)	R1
		Quick speed with cleaner	T1
		* is orifice size code. 1 = $\phi$ 5.0, 2 = $\phi$ 2.0, 4 = $\phi$ 1.0, 5 = $\phi$ 0.7, 6 = $\phi$ 0.45	
8	Input signal	20 to 100kPa	B1
		20 to 60kPa	B2
		60 to 100kPa	B3
9	Cam	Linear and near equal% for linear motion / side lever (S1)	C1a
		Linear for rotary motion / side lever (linkage lever) (S3)	C3L
		Near equal% for rotary motion / side lever (linkage lever) (S3)	C3E
		Square law for rotary motion / side lever (linkage lever) (S3)	C3B
		Reverse equal% for rotary motion / side lever (linkage lever) (S3)	C3P
		Linear for linear motion / back lever (B4)	C4La
		Near equal% for linear motion / back lever (B4)	C4E
Linear for rotary motion / back lever (B7)	C7L		

\*1: Sales of Non-SI unit products in Japan are not permitted under Japanese law.

### 13. Dimensions



Clamp and lever depend on actuator.

## Annex A. Pilot Relay

### (1) Type of Pilot Relay

There are 3 types of XP100 series Pilot Relay. It will explain about each feature.

#### ① Standard

It is the standard type recommended by us.

By changing Orifice, it is possible to properly control various large and small actuators.

#### ② Stable

To shorten the stabilization time, it is the type that changed parts of Pilot Relay.

Slow movements before stabilization are eliminated, but as a disadvantage, the consumption flow rate will rise.

As with the standard type, it is possible to change Orifice.

#### ③ Quick speed

It is a type that changed parts of Pilot Relay and increased air capacity.



Although the operating speed increases when Input Signal changes significantly, air consumption increases. Moreover, hunting tends to occur easily in the small capacity actuator.

Orifice is only  $\phi 5.0$ .

### (2) Other

Although it is possible to install Pilot Relay of Electropneumatic Positioner XE100 series, the used parts are different. When installing Pilot Relay of XE100 series, operation, adjustment, performance etc. cannot be guaranteed.

How to distinguish

Specification	XE100	XP100
Without Cleaner	No groove in Fixed Orifice Holder 	Groove in Fixed Orifice Holder 
With Cleaner	Fixed Orifice Holder is colorless (Aluminum color)	Fixed Orifice Holder is yellow

omestic sales in Japan due to Non-SI unit.