



Installation and Maintenance Manual

55-IP5000 / 55-IP5100

Pneumatic Positioner

CE Ex II 2GD c T6 $-20^{\circ}\text{C} \leq T_a \leq 60^{\circ}\text{C}$ *
 T5 $-20^{\circ}\text{C} \leq T_a \leq 80^{\circ}\text{C}$ *
*(for High / Low temperature model ATEX classifications refer to specifications table)

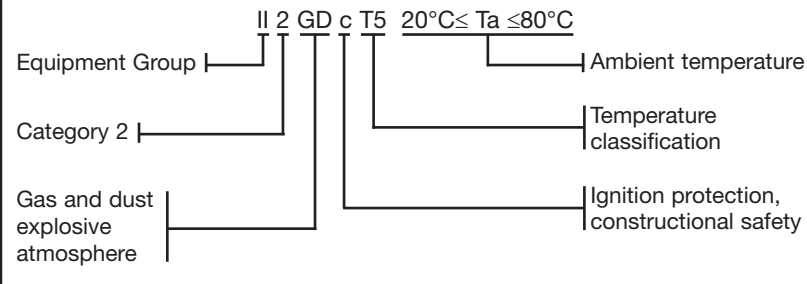
Read this manual before using this product.

For future reference, please keep this manual in a safe place.

The information within this document is to be used by pneumatically trained personnel only.

This manual should be read in conjunction with the current catalogue.

ATEX marking description



1 SAFETY RECOMMENDATION

1.1 General recommendation

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by label of "Caution", "Warning" or "Danger". To ensure safety, be sure to observe ISO4414 (Note1), JIS B 8370 (Note2) and other safety practices.

Note 1: ISO 4414: Pneumatic fluid power - Recommendations for the application of equipment to transmission and control systems. Note 2: JIS B 8370: Pneumatic system axiom.

- CAUTION: Operator error could result in injury or equipment damage.
- WARNING: Operator error could result in injury or loss of life.
- DANGER: In extreme conditions, there is possible result of serious injury or loss of life.

WARNING

- The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications. Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements.
- Only trained personnel should operate pneumatically operated machinery and equipment. Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.
- Do not service machinery/equipment or attempt to remove component until safety is confirmed.
 - Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
 - When equipment is to be removed, confirm the safety process as mentioned above. Switch off air and electrical supplies and exhaust all residual compressed air in the system.
 - Before machinery/equipment is re-started, ensure all safety measures to prevent sudden movement of cylinders etc. (Supply air into the system gradually to create backpressure, i.e. incorporate a soft-start valve).
- Contact SMC if the product is to be used in any of the following conditions:
 - Conditions and environments beyond the given specifications, or if product is used outdoors.
 - Installations in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuits, press applications, or safety equipment.
 - Applications, which have the possibility of having negative effects on people, properties or animals, requiring special safety analysis.

1.2 Conformity to standard

This product is certified to and complies with the following standards:

- ATEX Directive 94/9/EC
 - EN 13463-1:2001
 - EN 13463-5 : 2003
- Non-electrical equipment for potentially explosive atmospheres
 Basic method and requirements
 Non-electrical equipment for potentially explosive atmospheres
 Protection by constructional safety (c)

2 SPECIFICATIONS

Protect the unit from impact and dropping during transfer and when mounted. It may cause failure of the unit.

- Do not use the unit in places with high humidity & temperature. It may cause malfunctions.
- Do not use this positioner outside of the range of it's specifications as this can cause failure.

Classification	Ambient temperature range		
	Low Temp. model 55-IP5*00-***L*-*	Standard model 55-IP5*00-***-*	High Temp. model 55-IP5*00-***T*-*
II 2GD c T4			-5°C ≤ Ta ≤ 100°C
II 2GD c T5		-20°C ≤ Ta ≤ 80°C	-5°C ≤ Ta ≤ 80°C
II 2GD c T6	-30°C ≤ Ta ≤ 60°C	-20°C ≤ Ta ≤ 60°C	-5°C ≤ Ta ≤ 60°C

Item	Type	55-IP5000	55-IP5100
		Lever type lever	Rotary type cam
		Single action	Double action
Supply pressure		0.14~0.7MPa	
Input pressure		0.02~0.1MPa	
Standard stroke		10~85mm	60°~100°
Sensitivity		Within 0.1%F.S.	Within 0.5%F.S.
Linearity		Within ±1%F.S.	Within ±2%F.S.
Hysteresis		Within 0.75%F.S.	Within 1%F.S.
Repeatability		Within ±0.5%F.S.	
Output flow rate	Note 1	80 l/min (ANR) or more (SUP.=0.14MPa) 200 l/min (ANR) or more (SUP.=0.4MPa)	
Air consumption	Note 2	Within 5 l/min (ANR) or more (SUP.=0.14MPa) Within 11 l/min (ANR) or more (SUP.=0.4MPa)	
Ambient and using fluid Temperature		-20°C~80°C (Standard model) -30°C~60°C (Low Temp) -5°C~100°C (High Temp)	
Thermal coefficient		Within 0.1%F.S./°C	
Air connection port		Rc1/4 (Standard)	
Material		Aluminium diecast, Stainless steel, Brass, Nitrile rubber	
Mass		Approx. 1.4kg	Approx. 1.2kg
Size		118 x 102 x 86 (Body)	118 x 92 x 77.5 (Body)

Note 1 : Refer to Fig. 1 for details of the output flow rate.

Note 2 : Refer to Fig. 2 for details of the air consumption.

* Standard air temperature : 20° , Absolute pressure : 101.3KPa
 Relative humidity : 65%

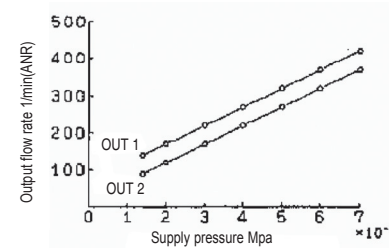


Fig.1 Output flow characteristic

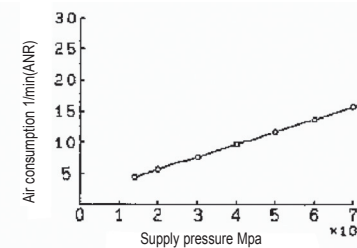
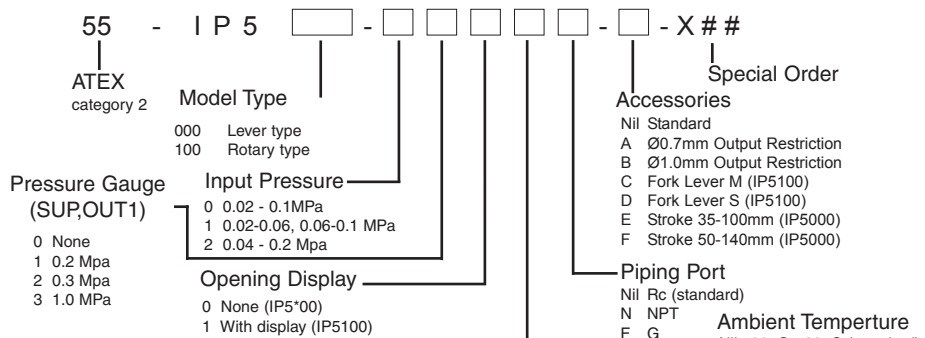


Fig.2 Air consumption characteristic

2.1 How to Order



Note 1) If two or more accessories are required, the part numbers should be made according to alphabetical order. (ex. IP5000-010-AC)

Note 2) The standard lever is not attached to accessor as E and F.

Note 3) Angle display type for IP5000 is 0 only. (NO DISPLAY)

3 INSTALLATION

WARNING

- Do not install unless the safety instructions have been read and understood.
- Since zero-point varies depending on the mounting position, the zero point should be adjusted after installation.
- Avoid hitting the product with metallic objects!
- Avoid using this product in non-explosive environments which can become explosive due to air leakage!
- When using this product in hazardous areas, ensure that the operational speed of the moving parts is less than 1m/s, and that the actuator is not hunting!

3.1 Environment

WARNING

- Do not use in an environment where the product is directly exposed to corrosive gases, chemicals, salt water, water or steam.
- The product should not be exposed to prolonged sunlight that can generate a surface temperature higher than the value given for the temperature classification. Use a protective cover.
- Do not mount the product in a location where it will be subject to strong vibrations and/or shock.
- Do not mount the product in a location where it is exposed to radiant heat.
- Allow sufficient space for maintenance and adjustment around the product when mounted.

3.2 Piping

CAUTION

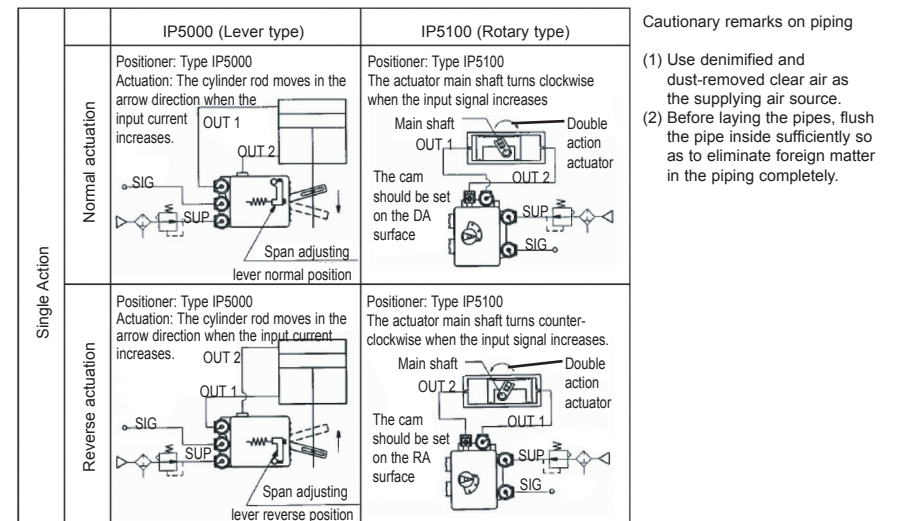
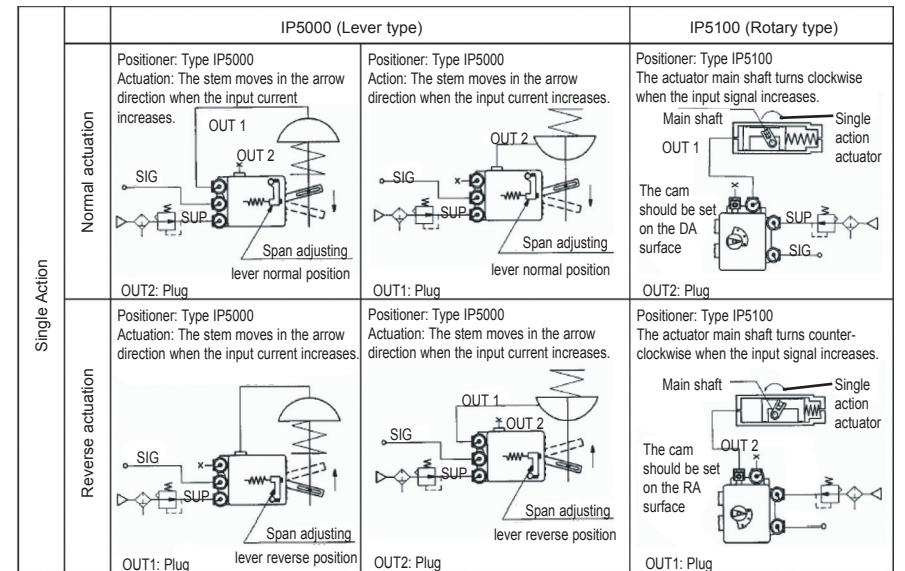
- Before piping make sure to clean away all chips, cutting oil, dust etc.
- When installing piping or fitting into a port, ensure that sealant material does not enter the port inside. When using seal tape, leave 1.5 to 2 threads exposed on the end of the pipe/fitting.

Thread	Appropriate tightening torque (Nm)
Rc(PT) 1/8	7 to 9
Rc(PT) 1/4	12 to 14

3.3 Lubrication

CAUTION

- The positioner has a fixed orifice and nozzle, which contain fine paths in them. Use filtered, dehydrated air and avoid the use of lubricants as this may cause malfunction of the positioner. Ensure that the air supply system is filtered to 5 micron.



Cautionary remarks on piping
 (1) Use deminified and dust-removed clear air as the supplying air source.
 (2) Before laying the pipes, flush the pipe inside sufficiently so as to eliminate foreign matter in the piping completely.

4 MOUNTING

4.1 Type IP5000 (Lever type)

For positioner and diaphragm, brackets are to be manufactured according to the installation method. The unit should be attached using bolts firmly fixed through mounting holes on the side or back of the positioner.

For Side installation, "P" mark attaching screw is interchangeable for IP300 and "E" mark mounting screw is interchangeable for IP600 and IP6000.

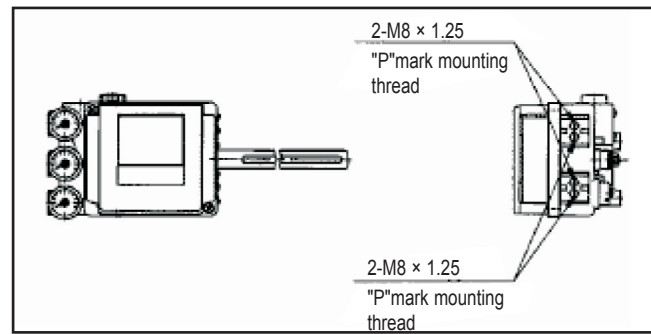


Fig 7 Mounting position of "P" mark and "E" mark (Lever type)

4.1.1 Examples of installations to actuator

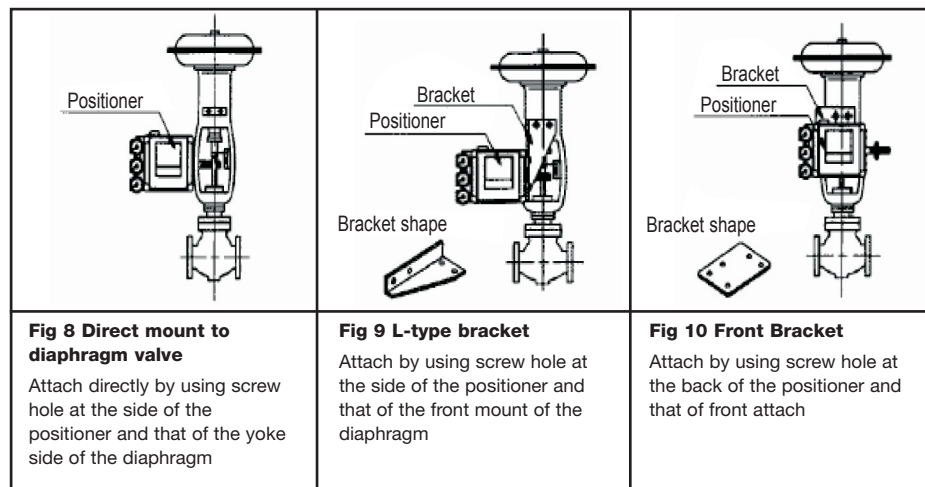


Fig 8 Direct mount to diaphragm valve

Attach directly by using screw hole at the side of the positioner and that of the yoke side of the diaphragm

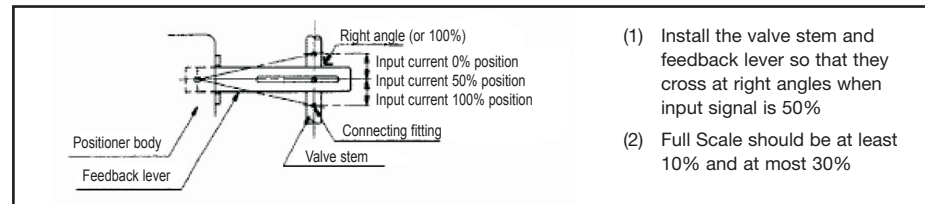
Fig 9 L-type bracket

Attach by using screw hole at the side of the positioner and that of the front mount of the diaphragm

Fig 10 Front Bracket

Attach by using screw hole at the back of the positioner and that of front attach

4.1.2 Connection with external feed back lever



- Install the valve stem and feedback lever so that they cross at right angles when input signal is 50%
- Full Scale should be at least 10% and at most 30%

4.2 Type IP5100 (Rotary Type)

For Positioner and rotary actuator, brackets should be manufactured according to the installation method. The unit should be attached using bolts firmly fixed through the mounting holes on the side or back of the positioner. For Side installation, "E" mark mounting screw is interchangeable for IP610 and IP6100. Fork lever assembly M type is usable since it is interchangeable for serration fitting.

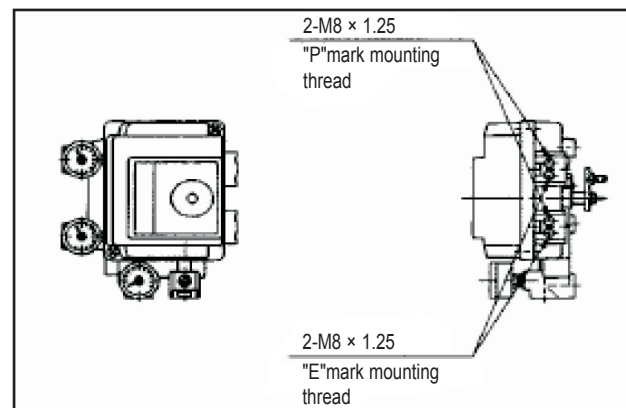


Fig 12 Mounting position of "P" mark and "E" mark (Rotary type)

4.2.1 Actuator Installation

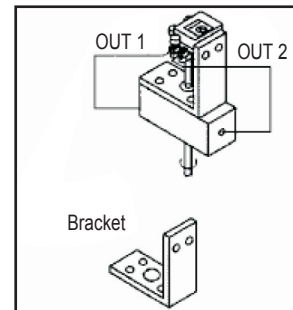


Fig 13 Mounting by positioner side screw

Install using screw hole at the side of the positioner and the screw hole on the actuator.

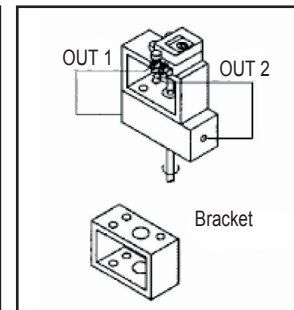
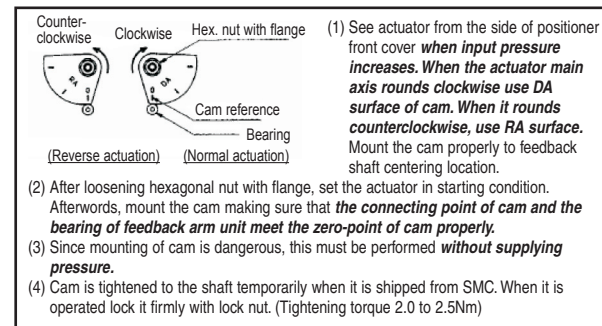


Fig 14 Mounting by positioner back screw

Install using screw hole at the back of the positioner and the screw hole on the actuator top.

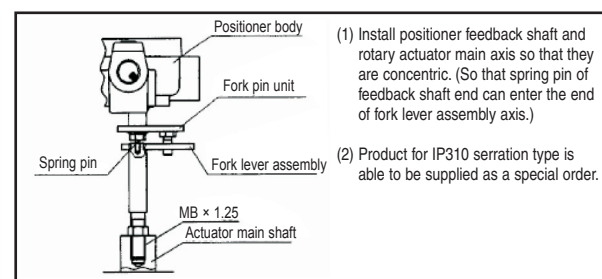
4.2.2 Feedback shaft connecting



- See actuator from the side of positioner front cover **when input pressure increases. When the actuator main axis rounds clockwise use DA surface of cam. When it rounds counterclockwise, use RA surface.** Mount the cam properly to feedback shaft centering location.
- After loosening hexagonal nut with flange, set the actuator in starting condition. Afterwards, mount the cam making sure that **the connecting point of cam and the bearing of feedback arm unit meet the zero-point of cam properly.**
- Since mounting of cam is dangerous, this must be performed **without supplying pressure.**
- Cam is tightened to the shaft temporarily when it is shipped from SMC. When it is operated lock it firmly with lock nut. (Tightening torque 2.0 to 2.5Nm)

Fig 15 Example of attaching actuator using fork lever type joint

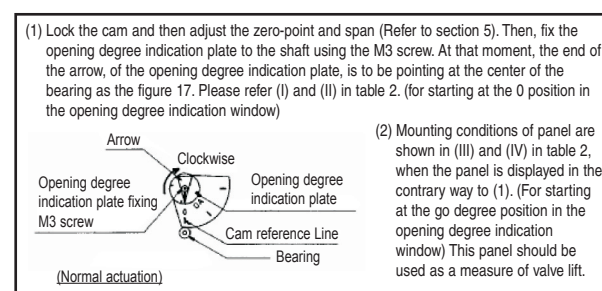
4.2.3 Cam attaching procedure



- Install positioner feedback shaft and rotary actuator main axis so that they are concentric. (So that spring pin of feedback shaft end can enter the end of fork lever assembly axis.)
- Product for IP310 serration type is able to be supplied as a special order.

Fig 16 Mounting of Cam

4.2.4 Mounting procedure of opening degree indication plate



- Lock the cam and then adjust the zero-point and span (Refer to section 5). Then, fix the opening degree indication plate to the shaft using the M3 screw. At that moment, the end of the arrow, of the opening degree indication plate, is to be pointing at the center of the bearing as the figure 17. Please refer (I) and (II) in table 2. (for starting at the 0 position in the opening degree indication window)
- Mounting conditions of panel are shown in (III) and (IV) in table 2, when the panel is displayed in the contrary way to (1). (For starting at the go degree position in the opening degree indication window) This panel should be used as a measure of valve lift.

Fig 17 Installation example of opening degree indication plate

5 ADJUSTMENT

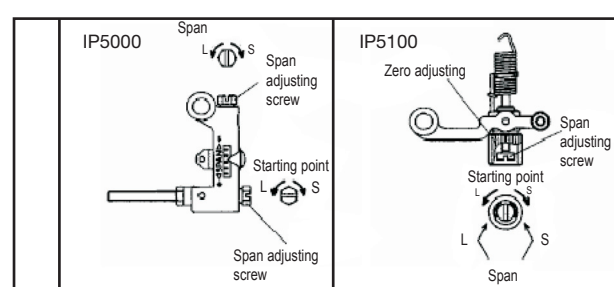
CAUTION

- For this positioner, span and zero point adjustment of each actuator is necessary. Adjustment shall be done based on each actuator size.
- Keep in mind that span and zero point adjustment interfere in each other.
- Lock the zero-span lock nut after adjustment.
- Characteristics changes due to change of mounting position, ambient temperature and supply pressure.
- This positioner is force balanced type. Characteristics depends on the mounting direction. If the direction of initial adjustment and the final adjustment differ, please re-adjust it.
- If it takes long time until operation after initial adjustment, check and adjust this product.

Check the following prior to start the adjustment.

- Check that the pipeline is correctly connected with the pressure supply port and OUT1 and OUT2 ports.
- Check that the actuator and positioner are sturdily connected.
- Check that the feed back arm of internal feed back (Type IP5000) is attached to the correct (normal or reverse) position. (Refer to Tables 3 and 4.)
- Check for correct use of the cam face (normal or reverse) in Type IP5100 and that the flange nut is firmly locked. (Refer to Table 2.)

5.1 Zero-point adjustment and span adjustment



- Set input pressure 0%, then set the actuator starting point by turning zero-adjustment screw.
- Secondly, vary the input pressure and see the stroke of actuator. When span is not long enough or too long, adjust it according to the drawing.
- Set input pressure 0%, and again adjust at zero-point like (1).
- Repeat (1)-(3) until the stroke of actuator become proper stroke for input pressure.

Table 6 Adjustment procedure

5.2 Sensitivity adjustment

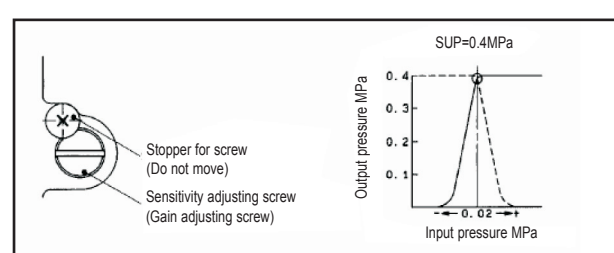


Fig.18 Pilot valve Fig.19 Input/output pressure characteristics

Fig.19 shows the input-output pressure characteristics of OUT1 and OUT2 of the pilot valve. When the positioner is shipped out of our plant, the output pressure is set to optimum state as shown in Fig.19 and this needs no adjustment ordinarily.

CAUTION

The sensitivity adjustment of pilot valve is effective to the actuator of double action type only. If the sensitivity is poor because of the actuator type of load condition, turn the sensitivity adjust screw clockwise. If hunting occurs, turn the sensitivity adjust screw counterclockwise. (The amount of turning varies by actuators. Turn it by 1/16 to one turn. Do not loosen the stopper screw at this time since it is set to avoid the screw coming off.)

* If hunting occurs with an actuator of small capacity, refer to the description in 9.1 (for both single action and double action.)

6 MAINTENANCE

WARNING

- After installation, repair and disassembly, connect compressed air and perform a proper function test and leak test. If bleed noise is louder than the initial state, or operation is abnormal, stop operation and check if installation is correct or not.

CAUTION

- Check if supply air is clean or not. Inspect compressed air cleaning system periodically so that dust, oil and humidity, which can cause malfunction and failure of the unit, do not enter the equipment
- If handled improperly, compressed air can be dangerous. Maintenance and replacement of unit parts should only be performed by trained and experienced personnel for instrumentation equipment, as well as following the product specifications.
- Check the positioner once a year. When an excessively worn diaphragm, O-ring or other packing of any unit that has been damaged is found, replace with new ones. Treatment at an early stage is especially important if the positioner is used in a place of severe environment, such as coastal areas.
- Before removing the positioner for maintenance, or replacing unit parts after installation, ensure the supply pressure is shut off and all residual air pressure is released from the piping.
- When the fixed orifice is clogged with carbon particles or other material, remove the pilot valve Auto/Manual change over screw (built in fixed aperture) and clean it by inserting a 0.3mm diameter wire into the aperture.
- When you disassemble the pilot valve, coat the O-ring of the sliding section with grease. (Use the TORAY SILICONE SH45 grease.)
- Check for air leaks from the compressed air piping. Air leaks could lower the performance characteristics of the positioner. Air is normally discharged from a bleed port, but this is necessary air consumption based on the construction of the positioner, and is not an abnormality if the air consumption is within the specified range.

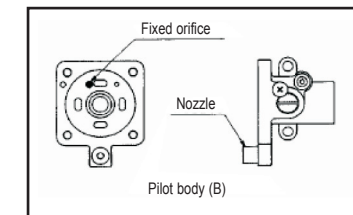


Fig.20 Fixed orifice position

7 CONTACTS

To enquire about the product, please contact the following :-

SMC Corporation

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DENMARK	(45) 70 25 29 00	POLAND	(48) 22-548 50 85
FINLAND	(358) 9-859 580	PORTUGAL	(351) 2 610 89 22
FRANCE	(33) 1-64 76 1000	SPAIN	(34) 945-18 4100
GERMANY	(49) 6103 4020	SWEDEN	(46) 8-603 0700
GREECE	(30) 1- 342 6076	SWITZERLAND	(41) 52-396 3131
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