Installation and Maintenance Manual
56-IP5000 / 56-IP5100
Pneumatic Positioner

II 3GD c T6 -20°C ≤ Ta ≤ 60°C *
T5 -20°C ≤ Ta ≤ 80°C *

* (for High / Low temperature model ATEX classifications refer to specifications table)

ATEX marking description

II 3 GD c T5 20°C≤ Ta ≤80°C

- Equipment Group
- Category 3
- Gas and dust explosive atmosphere
- Ambient temperature
- Temperature classification
- Ignition protection, constructional safety

1 Safety Instructions

- This manual contains essential information for the protection of users and others from possible injury and/or equipment damage.
- Read this manual before using the product, to ensure correct handling, and read the manuals of related apparatus before use.
- Keep this manual in a safe place for future reference.

- These instructions indicate the level of potential hazard by label of "DANGER", "WARNING" or "CAUTION", followed by important safety information which must be carefully followed.
- To ensure safety of personnel and equipment the safety instructions in this manual and the product catalogue must be observed, along with other relevant safety practices.

⚠ DANGER	In extreme conditions, there is a possibility of serious injury or loss of life.
⚠ WARNING	If instructions are not followed there is a possibility of serious injury or loss of life.
⚠ CAUTION	If instructions are not followed there is a possibility of injury or equipment damage.

⚠ 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 can be used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications or after analysis and/or tests to meet 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 personnel.
- **Do not service machinery/equipment or attempt to remove components until safety is confirmed.**
  1) Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
  2) 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.
  3) 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 back pressure, i.e. incorporate a soft-start valve).

1 Safety Instructions (continued)

- **Do not use this product outside of the specifications. Contact SMC if it is to be used in any of the following conditions:**
  1) Conditions and environments beyond the given specifications, or if the product is to be used outdoors.
  2) 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.
  3) An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

⚠ CAUTION

- Ensure that the air supply system is filtered to 5 microns.

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 56-IP5*00-***L*-*	Standard model 56-IP5*00-****-*	High Temp. model 56-IP5*00-***T*-*
II 3GD c T4			-5°C≤ Ta ≤100°C
II 3GD c T5		-20°C≤ Ta ≤80°C	-5°C≤ Ta ≤80°C
II 3GD c T6	-30°C≤ Ta ≤60°C	-20°C≤ Ta ≤60°C	-5°C≤ Ta ≤60°C

Item \ Type	56-IP5000		56-IP5100	
	Lever type lever		Rotary type cam	
	Single action	Double action	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%

2 Specifications (continued)

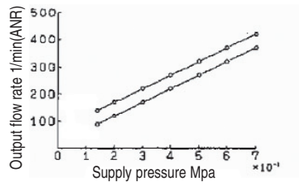


Fig.1 Output flow characteristic

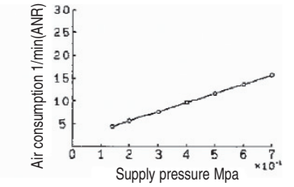


Fig.2 Air consumption characteristic

2.1 How to Order

56 - IP5 □ - □□□□□ - □ - X##

- ATEX category 3
- Model Type: 000 Lever type; 100 Rotary type
- Input Press: 0 0.02 - 0.1MPa; 1 0.02-0.06, 0.06-0.1 MPa; 2 0.04 - 0.2 Mpa
- Pressure Gauge (SUP,OUT1): 0 None; 1 0.2 Mpa; 2 0.3 Mpa; 3 1.0 MPa
- Opening Display: 0 None (IP5*00); 1 With display (IP5100)
- Ambient Temperature: Nil -20°C - 80°C (standard); T -5°C - 100°C (high temp); L -30°C - 60°C (low temp)
- Accessories: Nil Standard; A Ø0.7mm Output Restriction; B Ø1.0mm Output Restriction; C Fork Lever M (IP5100); D Fork Lever S (IP5100); E Stroke 35-100mm (IP5000); F Stroke 50-140mm (IP5000)
- Piping Port: Nil Rc (standard); N NPT; F G
- Special 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 supplied with accessory E and F.
Note 3) Opening display type for IP500 is 0 only. (No Dispay)

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.

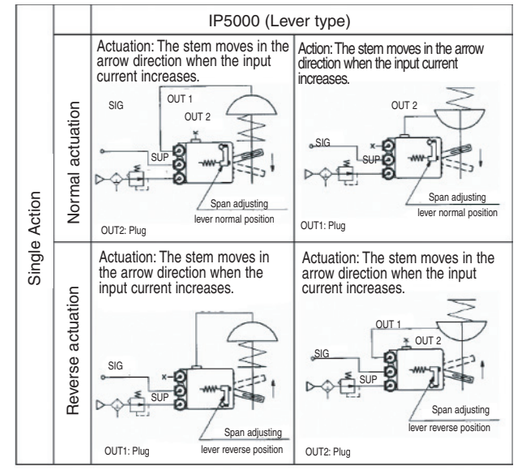
Thread	Appropriate tightening torque (Nm)
Rc(PT) 1/8	7 to 9
Rc(PT) 1/4	12 to 14

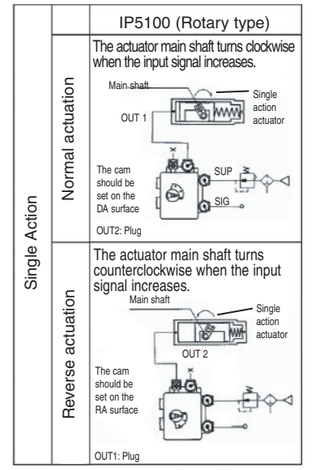
3 Installation (continued)

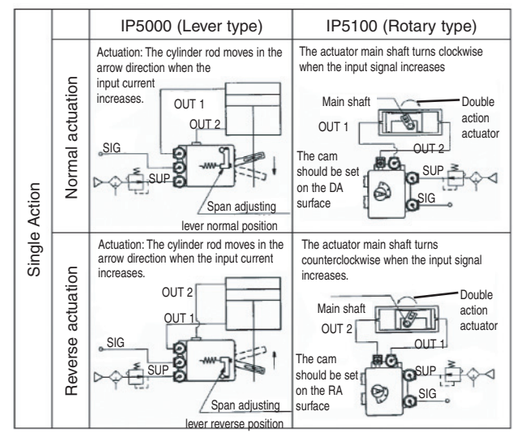
3.3 Lubrication

⚠ CAUTION

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







Cautionary remarks on piping

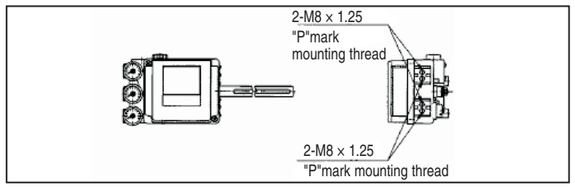
(1) Use denimified and dust-removed clear air as the supplying air source.
(2) Before laying the pipes, flush the pipe inside sufficiently so as to eliminate foreign matter in the piping completely.

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.

4.1.1 Examples of installations to actuator



4.1.1 Examples of installations to actuator

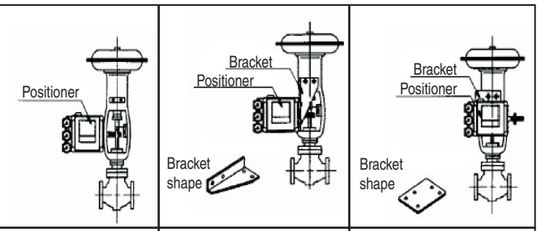
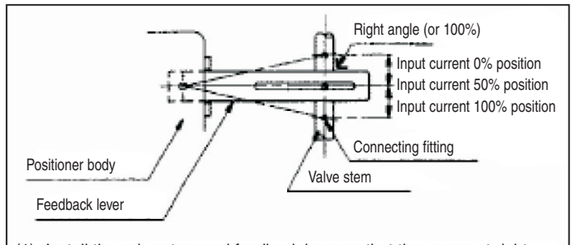


Fig 8 Direct mount to diaphragm valve	Fig 9 L-type bracket	Fig 10 Front Bracket
Attach directly by using screw hole at the side of the positioner and that of the yoke side of the diaphragm	Attach by using screw hole at the side of the positioner and that of the front mount of the diaphragm	Attach by using screw hole at the back of the positioner and that of front attach

4.1.2 Connection with external feed back lever



(1) Install the valve stem and feedback lever so that they cross at right angles when input signal is 50%
(2) 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.

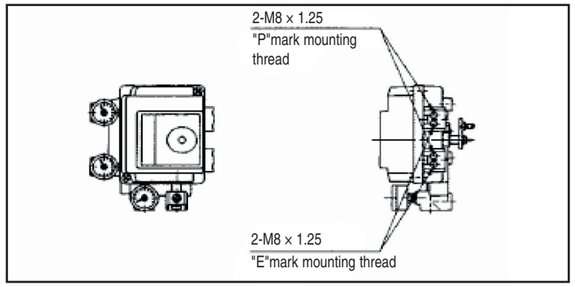


Fig 12 Mounting position of "P" mark and "E" mark (Rotary type)

4 Mounting (continued)

4.2.1 Actuator Installation

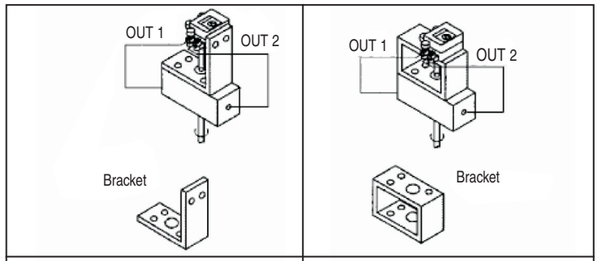
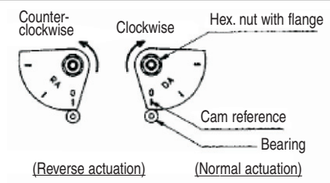


Fig 13 Mounting by positioner side screw	Fig 14 Mounting by positioner back screw
Install using screw hole at the side of the positioner and the screw hole on the actuator.	Install using screw hole at the back of the positioner and the screw hole on the actuator top.

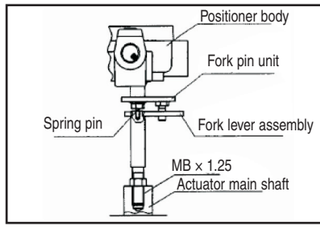
4.2.2 Feedback shaft connecting



(1) 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.
(2) After loosening hexagonal nut with flange, set the actuator in starting condition. Afterwords, 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.***
(3) Since mounting of cam is dangerous, this must be performed ***without supplying pressure.***
(4) 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



(1) 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.)
(2) 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

(1) 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)
(2) 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.

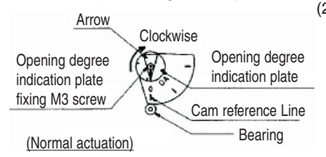


Fig 17 Installation example of opening degree indication plate

5 Adjustment

⚠ CAUTION

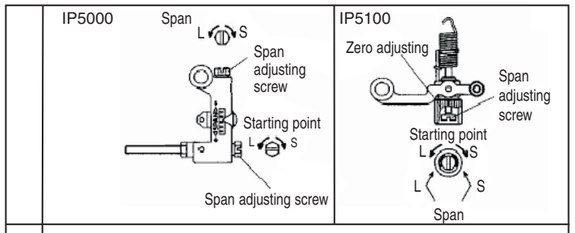
(1) For this positioner, span and zero point adjustment of each actuator is necessary. Adjustment shall be done based on each actuator size.
(2) Keep in mind that span and zero point adjustment interfere in each other.
(3) Lock the zero-span lock nut after adjustment.
(4) Characteristics changes due to change of mounting position, ambient temperature and supply pressure.

5 Adjustment (continued)

(5) 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.
(6) If it takes long time until operation after initial adjustment, check and adjust this product.

Check the following prior to start the adjustment.
(1) Check that the pipeline is correctly connected with the pressure supply port and OUT1 and OUT2 ports.
(2) Check that the actuator and positioner are sturdily connected.
(3) 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.)
(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



Adjusting procedure

(1) Set input pressure 0%, then set the actuator starting point by turning zero-adjustment screw.
(2) 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.
(3) Set input pressure 0%, and again adjust at zero-point like (1).
(4) Repeat (1)~(3) until the stroke of actuator become proper stroke for input pressure.

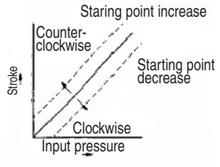


Table 6 Adjustment procedure

5.2 Sensitivity adjustment

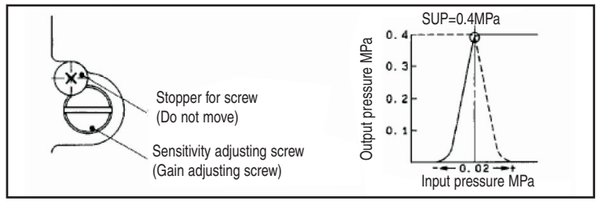


Fig.18 Pilot valve Fig.19 Input/output pressure characteristics

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 counter-clockwise. (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

(1) 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.

6 Maintenance (continued)

⚠ CAUTION

(1) 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
(2) 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.
(3) 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 costal areas.
(4) 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.
(5) 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.
(6) When you disassemble the pilot valve, coat the O-ring of the sliding section with grease. (Use the TORAY SILICONE SH45 grease.)
(7) Check for air leaks from the compressed air piping. Air leaks could lower the performance characteristics of the positioner. Air is normally discharged form 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.

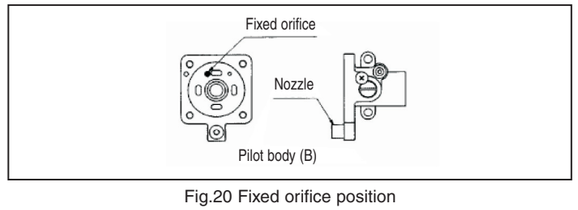


Fig.20 Fixed orifice position

7 Contact

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BELGIUM	(32) 3 355 1464	NORWAY	(47) 67 12 90 20
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