

Pneumatic Positioner

tissin

TS610 Series

Instruction Manual



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1 Introduction

1.1 General information for the user

This instruction includes installation, operation, maintenance, and parts information for Tissin TS610 Valve Positioner. Keep these instructions in a location which is easily accessible to every user and make these instructions available to every new owner of the device.

- Installation, commissioning and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator to do so.
- To avoid possible injury to personnel or damage to valve parts, WARNING, CAUTION and NOTICE should be strictly followed.
- Before installing or commissioning, be sure to read and thoroughly understand the product manual and operate the product properly.
- Operators must strictly observe the applicable national regulations with regards to installation, function tests, repairs, and maintenance of electrical products.
- For additional information or if specific problems occur that are not discussed in these instructions, contact the manufacturer.

The manual can be altered or revised without any prior notice.
Please visit our website (<http://www.tissin.co.kr>) check the latest documentation.

1.2 Limited warranty and disclaimer

- The manufacturer warranty period of the product is 18 months after the product is shipped from Tissin in Korea.
- For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided. This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
- Using the device in a manner that does not fall within the scope of its intended use, disregarding this manual, using under unqualified personnel, or making unauthorized alterations releases the manufacturer from liability for any resulting damage. This renders the manufacturer's warranty null and void.

1.3 Requirement for safety

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. These safety instructions are intended to prevent hazardous situations and/or equipment damage. For the safety, it is important to follow the instructions in the manual.

 **WARNING**

Failure to observe the warning may result in serious injuries or death.

 **CAUTION**

Failure to observe this warning may result in product failure or injuries.

 **NOTICE**

Failure to observe this warning may result in product failure or performance degradation.

 **CAUTION**

- Only trained and authorized person should operate machinery and equipment.
- Do not use this positioner out of the range of its specifications as this can cause failure.
- Do not service or attempt to remove product and machinery/equipment until safety is confirmed.
- Before loosening the pneumatic lines and valves, turn off the pressure and vent the pneumatic lines.

2 Description of products

2.1 Function

Pneumatic valve positioner TS610 series product is a control device for control valves that receives a 0.02~0.1 MPa pneumatic signal from a pneumatic output device (ex. Control room, IP convertor) and proportionally adjusts the opening degree of the valve by adjusting the supply pressure supplied to the valve actuator.

2.2 Features

- Applied to various control valve system
- Fast response time, excellent stability and durability
- Simple zero and span adjustment
- IP 66 enclosure
- Easy maintenance due to built-in module type
- By-pass valve (A/M switch) installed

2.3 Options

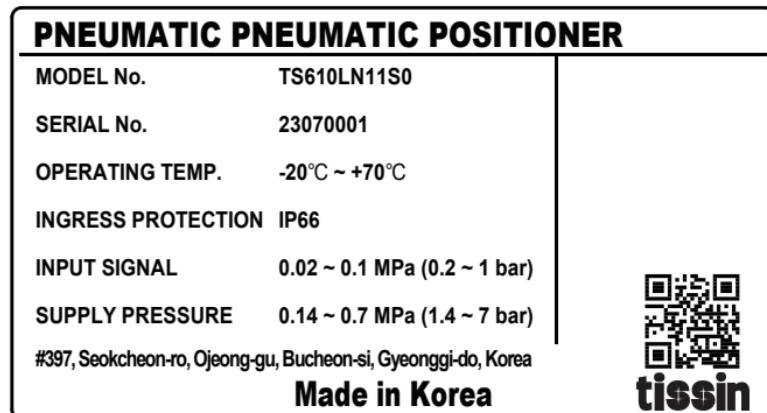
- Position transmitter (4~20mA DC Feedback signal)
- Limit switch (Mechanical or Proximity type)

2.4 Applications

TS610 series are mounted on Control valves and are used for fluid control in industrial parts.

- Oil and gas
- Chemicals
- Power plant
- Paper
- Water treatment
- Pharmaceutical
- Printing and dyeing processing
- Food and beverage
- Etc.

2.5 Label



Item	Description
MODEL No.	Indicates model number.
SERIAL No.	Indicates serial number.
OPERATING TEMP.	Indicates allowable operating temperature.
INGRESS PROTECTION	Indicates enclosure IP grade.
INPUT SIGNAL	Indicates pneumatic input signal range.
SUPPLY PRESSURE	Indicates supply pressure range.

2.6 Product Code

Model	TS610						
Acting type	Linear type	L					
	Rotary type	R					
Connection type	PT1/4		1				
	NPT1/4		2				
	G1/4		3				
Lever type (Linear)	10~40mm			1			
	40~70mm			2			
	70~100mm			3			
	100~150mm			4			
Lever type (Rotary)	M6 x 39L (Fork lever type)			1			
	NAMUR Type			5			
Operating temp.	-20~70°C (standard)				S		
	-20~120°C				H		
	-40~70°C				L		
	-60~70°C				U		
Options	None			0			
	With Dome cover			1			
	External Position transmitter (+TS500)			2			
	External Position transmitter (+TS510)			3			
	External Limit switch (+TS400)			4			
	External Limit switch (+TS410)			5			
	External Position transmitter and Limit switch (+TS510)			6			
	With Limit switch mounting device			7			

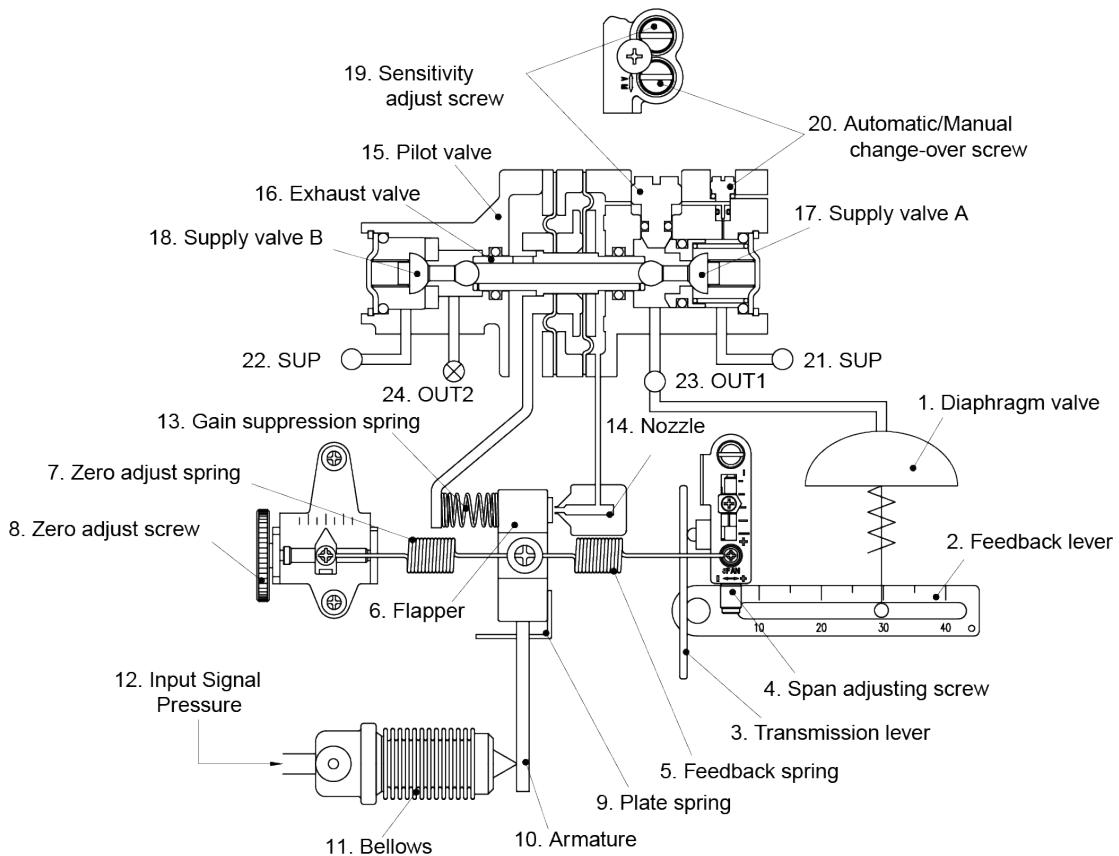
Note : Option no. 1~7 are only available with TS610R (Rotary type).

2.7 Specification

	TS610(Single)	TS610(Double)
Input signal	0.02~0.1MPa	
Supply pressure	0.14~0.7MPa	
Stroke	10~150mm (Linear type), 0~90° (Rotary type)	
Air connection	PT1/4, NPT1/4, G1/4	
Gauge connection	NPT1/8	
Enclosure	IP66	
Ambient temp.	-20°C~70°C (standard)	
Linearity	±1.0% F.S	±2.0% F.S
Sensitivity	±0.2% F.S	±0.5% F.S
Hysteresis	±1.0% F.S	
Repeatability	±0.5% F.S	
Air consumption	Below 2.5LPM (Sup=0.14MPa)	
Flow capacity	Over 80LPM (Sup=0.14MPa)	
Material	Aluminum die cast	
Paint	Polyester powder coating	
Weight	2.8kg	

2.8 Operation Logic

If (12)Input signal pressure(0.02~0.1MPa) increase, (11)Bellows pushes (10)Armature in the right direction and (6)Flapper moves left around (9)Plate spring. The gap between (6)Flapper and (14)Nozzle lowers the nozzle back pressure and reduces the internal pressure of (15)Pilot valve connected to (14)Nozzle, causing (16)Exhaust valve to move to the right. At the same time, (17)Supply valve A on (23)OUT1 also moves to the right to open (17)Supply valve A. (21)SUP increases the pneumatic pressure to (1)Diaphragm valve via (17)Supply valve A and (23)OUT1, and moves (1)Diaphragm valve down. The movement of the valve is transmitted to (5)Feedback spring via (2)Feedback lever and eventually increases the force to pull (6)Flapper to the right. (1)Diaphragm valve is balanced at a position that is equilibrium with the force of (11)Bellows contraction and expansion generated by the force of (5)Feedback spring and (12)Input signal pressure above. (13)Gain suppression spring is intended to immediately feedback the movement of (15)Pilot valve to (6)Flapper, which improves the stability of the loop.

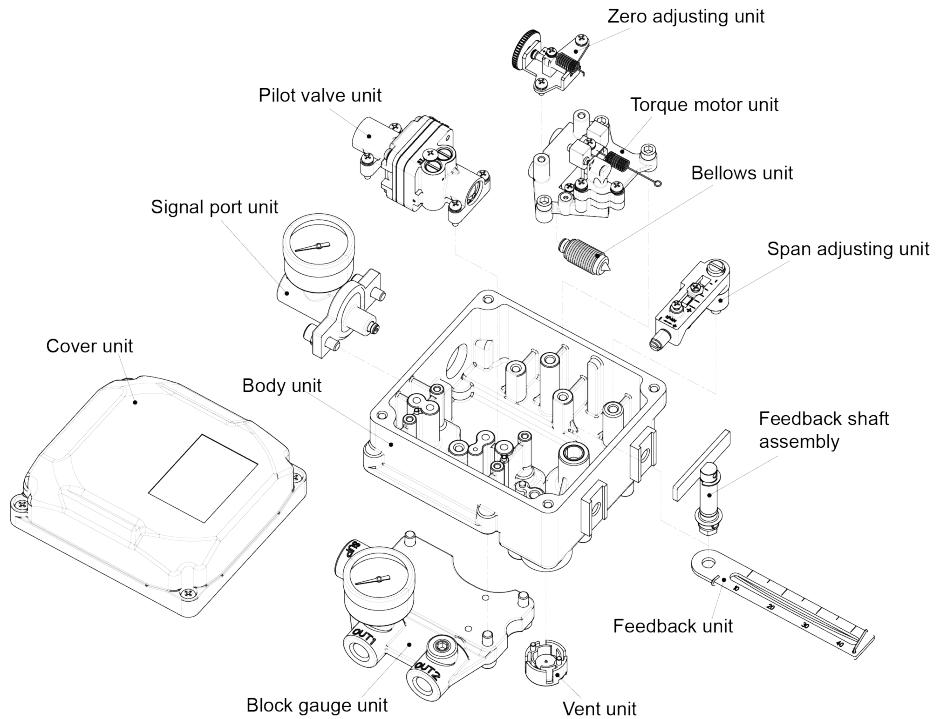


* The above description is based on the TS610L linear type and Reverse Action (RA) type diaphragm valve. TS610R rotary type has different feedback part structure and the operating logic is same.

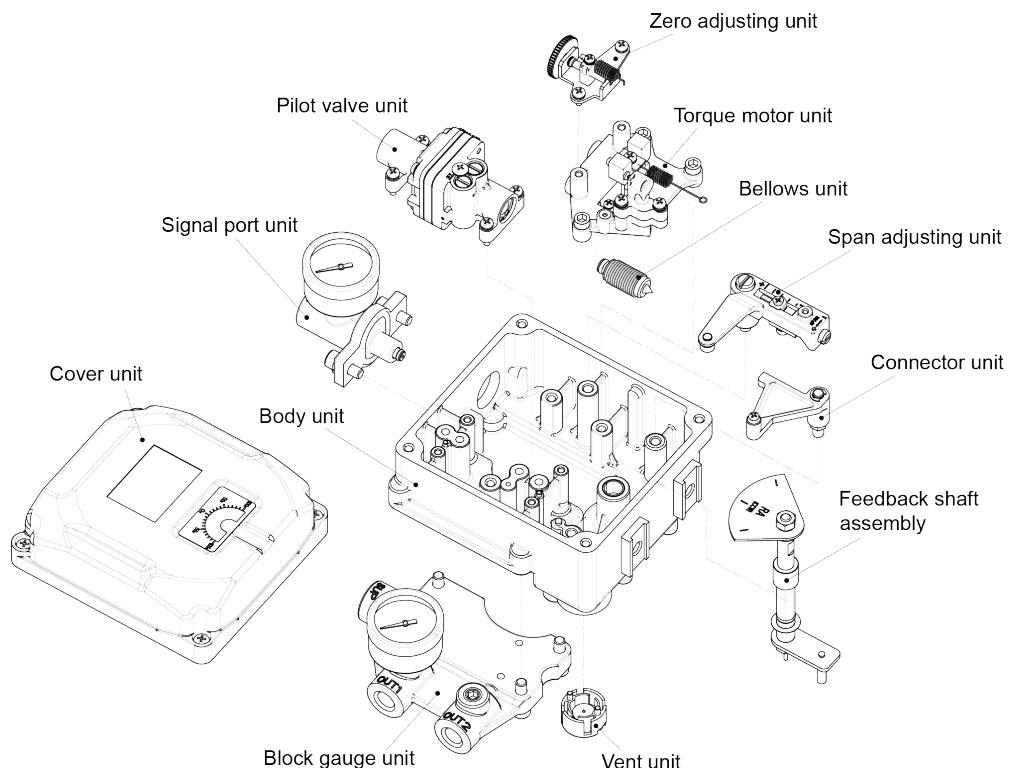
* Nozzle back pressure : Pressure inside Nozzle caused by the degree to which Flapper controls Nozzle

* Loop : Positioner and Control valve form a closed circuit through Feedback lever

2.9 Exploded-view drawing



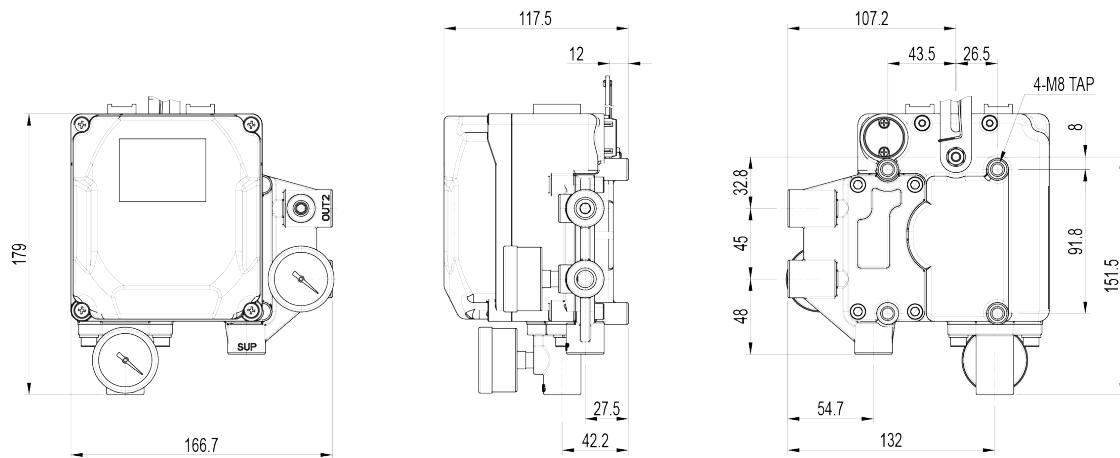
<TS610L linear type>



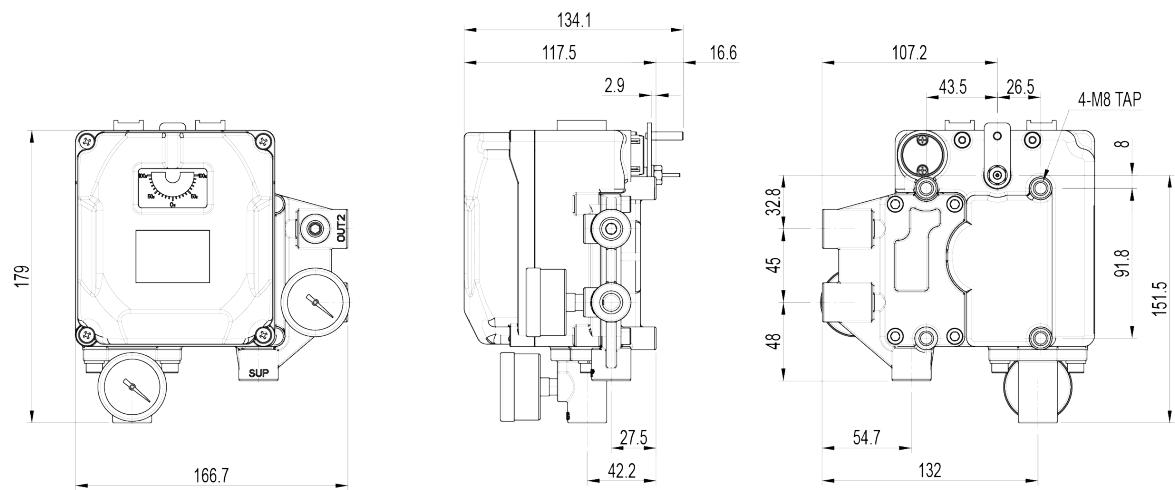
<TS610R Rotary type>

2.10 Dimension

2.10.1 TS610L Dimension



2.10.2 TS610R Dimension



3 Installation

3.1 Safety

 **WARNING**

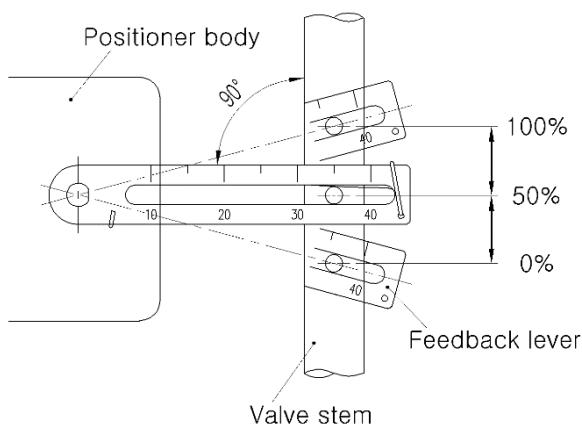
- Before installation, make sure that TS610 meets the valve and actuator installation conditions and field requirements.
- Incorrect installation may result in bad TS610 control characteristics.

3.2 TS610L linear type

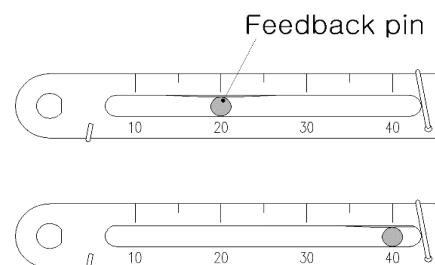
When making mounting brackets and fastening levers to the actuator stem, the following two must be observed. Otherwise, it can affect the performance of the product, such as linearity.

 **CAUTION**

- ① Check if Feedback lever is parallel to the ground at 50% of the valve stroke. <Figure 1>
- ② Feedback lever connection with the pin of the actuator clamp should be installed in such a way that the valve's total stroke and numbers which indicated on the feedback lever must be fitted. <Figure 2>



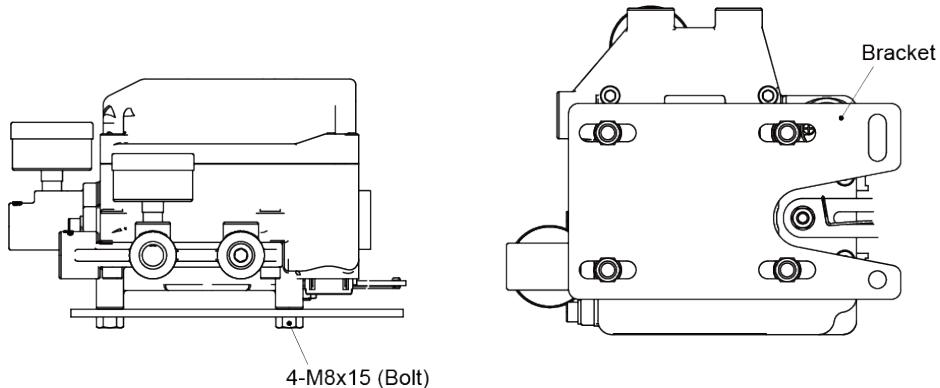
<Figure 1>



<Figure 2>

TS610L bracket Installation

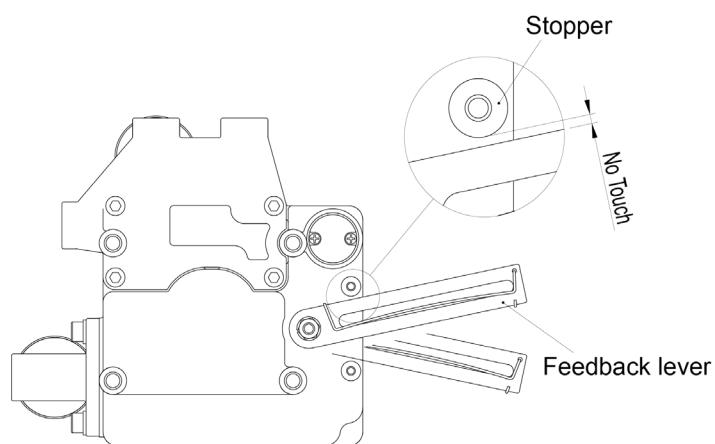
Please consider the above two cautions, and make a suitable bracket for the actuator by referring to the product dimension drawing and the installation example below.



<TS610L bracket installation example>

CAUTION

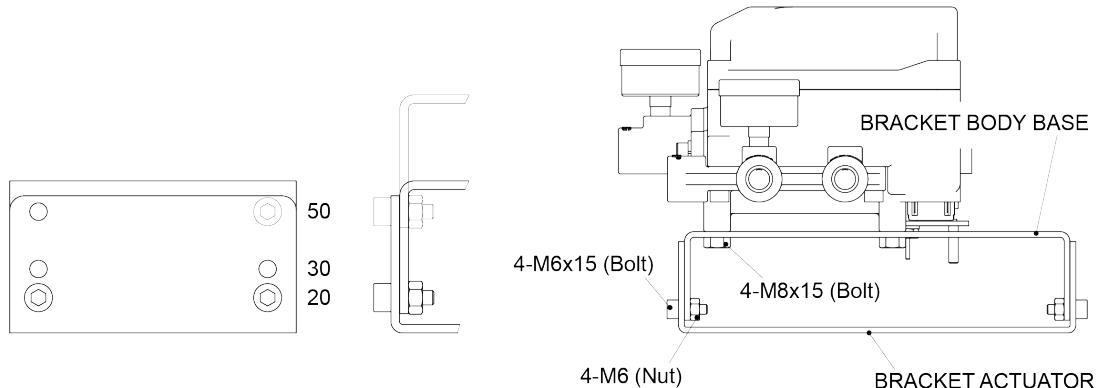
- If correct installation, Feedback lever should not touch Stopper when the valve is Full open/close.
- If Feedback lever touches Stopper, please check the installation again.



<TS610L Feedback lever and Stopper>

3.3 TS610R Rotary type

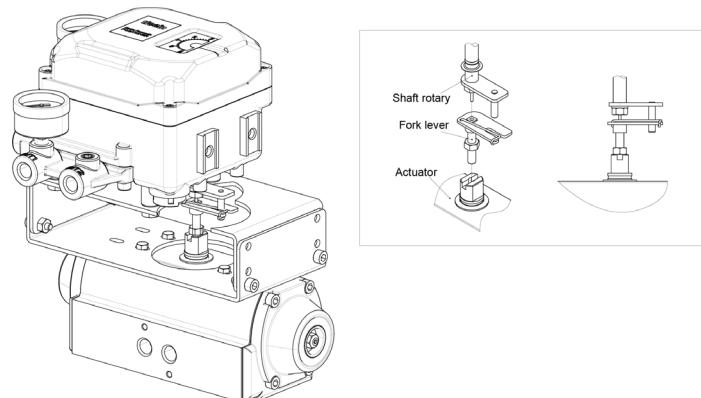
TS610R Rotary type includes the mounting brackets in the package box. Please install the bracket by referring to the manual.



<TS610R bracket installation example>

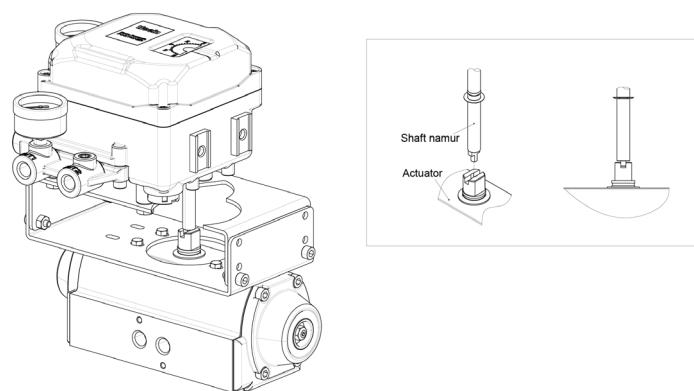
Fork Leve type

Mount Fork lever to actuator as shown below.



NAMUR type

Mount Positioner's shaft to Actuator stem as shown below.



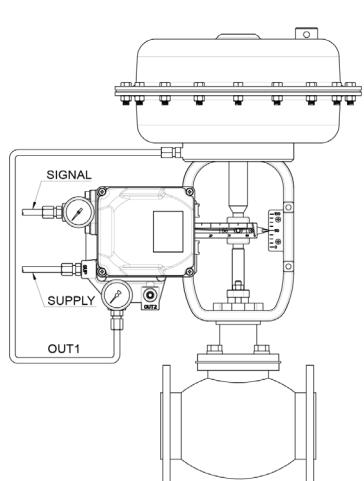
4 Air connection

4.1 Before the air connection

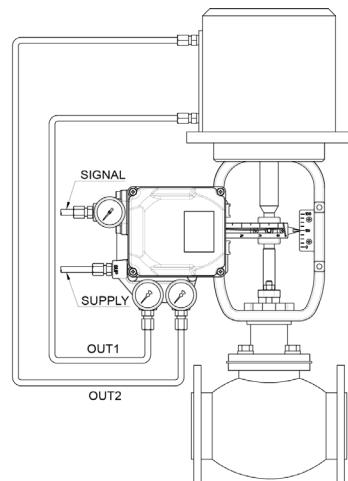
 **NOTICE**

- Please supply the dehumidified/dust removed clean air
- The pneumatic ports must be equipped with a regulator to supply a constant pressure of pneumatic pressure.
- When the input pneumatic signal (0.02 to 0.1 MPa) increases, the pneumatic output of OUT1 port increases.

4.2 TS610L air connection



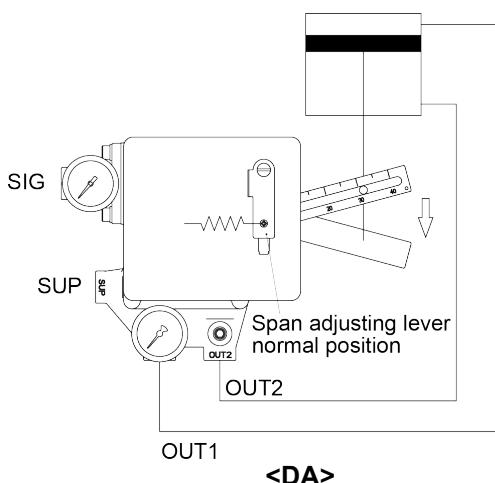
<TS610L Single actuator>



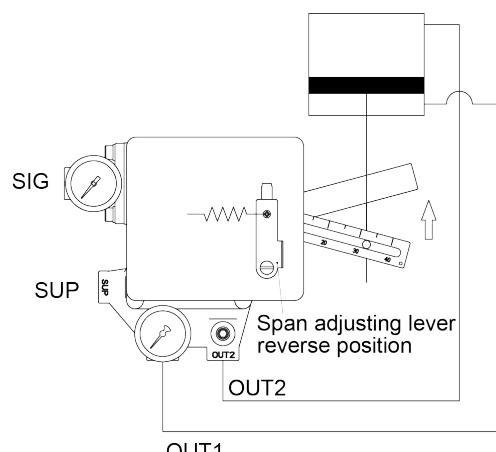
<TS610L Double actuator>

4.3 TS610L RA/DA settings

The product is set as RA at factory. If you want to change it to DA, please change the OUT1/OUT2 piping and the direction of Span adjust unit.

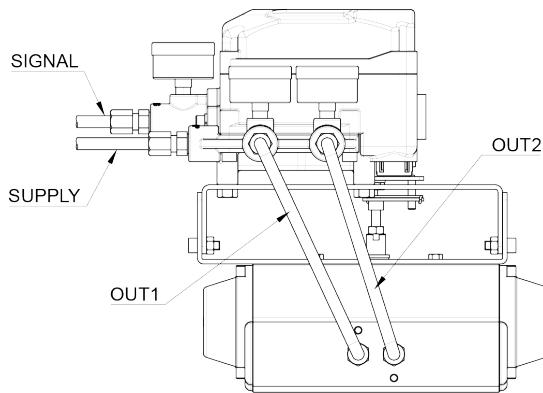


<DA>

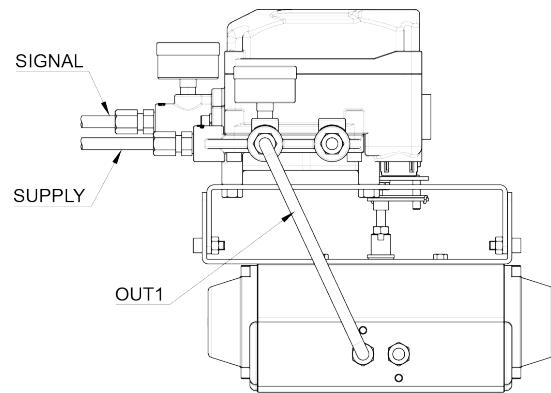


<RA>

4.4 TS610R air connection



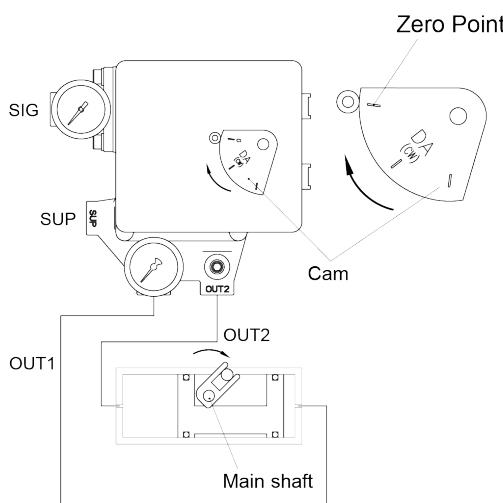
<TS610R Double type actuator >



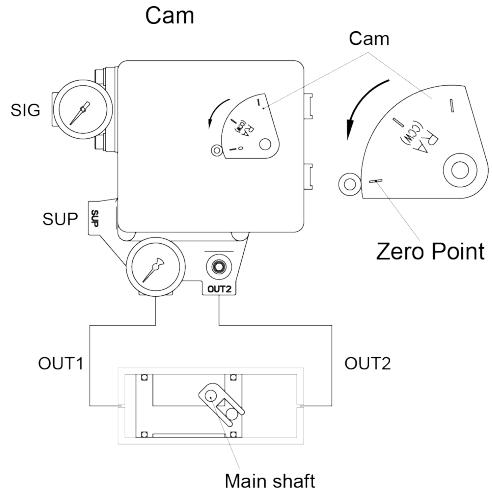
< TS610R Single type actuator >

4.5 TS610R RA/DA settings

The product is set as RA at factory. If you want to change it to DA, please change the OUT1/OUT2 piping and turn CAM upside down to showing DA on CAM.



<DA>



<RA>

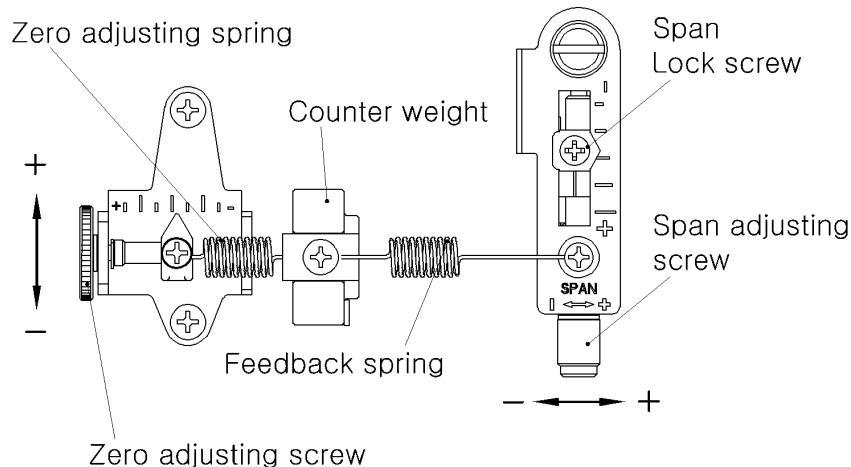
5 Adjustment

CAUTION

Zero and Span must be set correctly so product can be operated normally. If the setting is not correct, impact on performance like linearity. So please set Zero and Span position correctly.

Zero and Span adjustment

- ① Supply 0.02 MPa to Signal port, and adjust Zero adjust unit to make the valve 0%.
- ② Supply 0.1 MPa to Signal port, and adjust Span adjust unit to make the valve 100%.
- ③ If adjust Span adjust unit, the valve's 0% position you set in STEP 1 will be changed, so please do STEP 1 again.
- ④ Please repeat STEP 1~2 until find the valve's Open/Close position correctly.

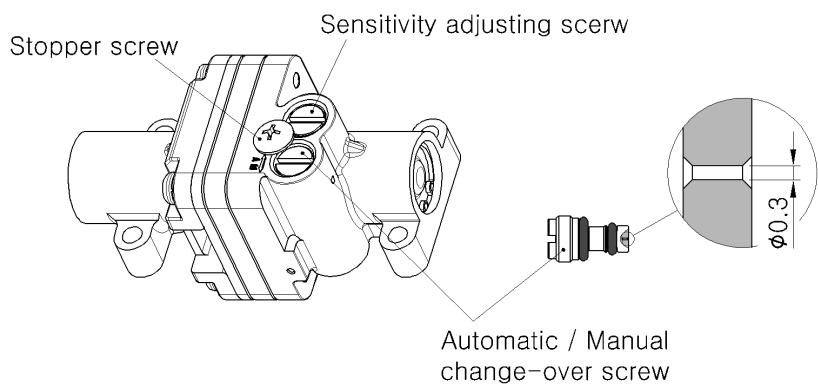


<Zero and Span unit>

6 Troubleshooting

6.1 Common problems

Failure	The valve is fully open regardless of the input signal
Causes	The hole of A / M switch of pilot valve is blocked by foreign matter such as dust
Solution	As shown below, loosen the stopper screw and separate A / M switch and clean the bottom of the hole with 0.2mm drill or wire and re-fitted as original.



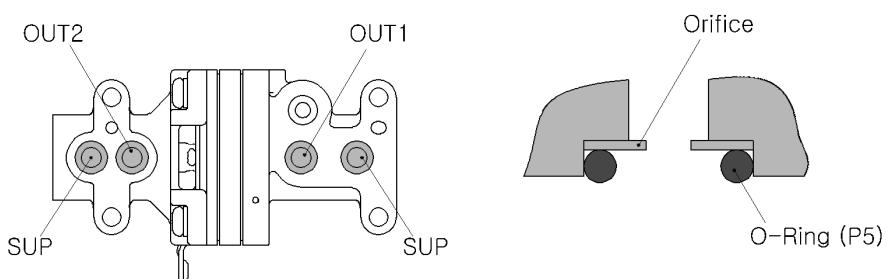
< A/M switch structure>

 **CAUTION**

The sensitivity adjustment screw is set optimally at the factory, so do NOT adjust it.

6.2 Orifice Installation

Failure	When mounted on small size actuator (capacity less than 180cm3) occurs hunting.
Causes	The pneumatic output of the positioner is too large compared to the actuator chamber size.
Solution	As shown below, please remove O-Ring at OUT1 and OUT2 at the bottom of Pilot valve, and install Orifice to Pilot valve.



<Orifice installation example>

6.3 Other problems and Solutions

☞ The positioner does not operate

Checklist	Causes	Corrective action	Reference page
If it does not work by moving the nozzle flapper	A/M switch is loose	Check to see if A/M switch is connected	18
	Nozzle clogged	Nozzle needs clean up	18

☞ The actuator works only with ON / OFF control but not intermediate control.

Checklist	Causes	Corrective action	Reference page
Linear type, check span mounting	Span is mounted upside down	Turn the span body	15
Rotary type, check cam mounting	Cam is mounted upside down	Mount the cam correctly	16
Check OUT1, OUT2 pipeline	OUT1 and OUT2 Pipelines are connected in opposite directions	Install pipeline correctly	15~16

☞ Hunting occurs

Checklist	Causes	Corrective action	Reference page
Hunting period is too short and the width is too large (pressure gauge moves at the same time of valve stem)	Actuator volume is too low	Install the orifice on the bottom part of the pilot	18
Hunting period is too long and the width is too small (Gauge markings move and valve stem slowly follow)	High temperature high pressure valve stem has a large frictional force	1 Perform a necessary action to minimize resistance of actuator or valve stem 2 Increase actuator size	N/A

☞ Linearity is too bad

Checklist	Causes	Corrective action	Reference page
Zero and span setting	zero and span setting is incorrect	Resetting zero and span	17
Check Input pressure is constant	Input pressure is not constant	Check the pressure relief valve on supply pressure is normal.	N/A
Verify lever installation	Lever does not provide optimum rotation angle	Adjust bracket and place drawbar on valve opening mark	12~13

☞ Hysteresis is too bad

Checklist	Causes	Corrective action	Reference page
Check connection of lever spring	Gap between the lever	Tighten the connection to remove the gap	12~13



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