Document n.: ***IOM - 01*** *Rev.:* ***06***

G-Stream® Control Valve

Body Sub-assembly

For further INSTRUCTIONS and INFORMATION see document "PROEN_018"

(Residual Hazards with regard to Essential Safety Requirements of Directive ATEX 201/34/EU, Annex II)

Index

2. GENERAL INFORMATION

The following instructions are designed to assist in the installation, operation and maintenance of G-Stream globe control valve, as necessary.
The G-Stream series comprises also globe-type cryogenic control valves with welded extension for temperatures as low as -425°F (-253°C): in this configuration the valve plug has small communication orifices or a spring loaded teflon sealing that allows that a small fraction of the liquefied gas flows to the inside the extension, where the liquid is vaporized and forms a barrier that protect the packing against ultra-low temperatures.
Users and maintenance personnel should read this bulletin carefully before the installation, operation or servicing of the valve, actuator, positioner or any other accessory installed on the valve. Reading the maintenance bulletin of the actuator, positioner and other accessories installed on the valve is also recommended.

WARNING!

If it is necessary to store the products before field installation, Petrolvalves recommends storing valves in dry, fresh, closed places. Do not store valves in places where relative humidity is higher than 85% or the room temperature is lower than 41°F or higher than 113°F (5 to 45°C). Environments containing excessive UV radiation, acid or alkaline mist or ozone sources must be avoided. Product storage in non-recommended places may void the manufacturer warranty.

3. UNPACKING

When removing the valve from its package, check the packing list or the valve datasheet, comparing it with the received material. A specification sheet of the valve and assembled accessories is shipped inside each shipping container.
When lifting the valve from shipping container, position the lifting straps properly in order to avoid damages to the tubing and accessories assembled in the valve. The G-Stream valves may be lifted by the lifting eyes provided on the top of the actuators (only for sizes 25 and 50). In case there is no lifting eyes provided, lift the valve using straps attached to the yoke legs.

CAUTION

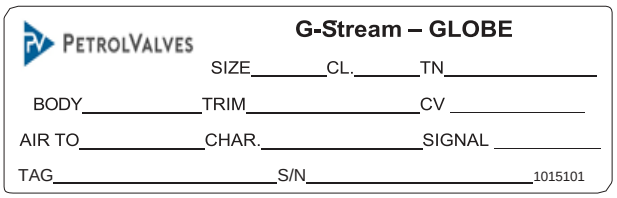
When lift the assembly using straps passed through the yoke legs, take care center of gravity is above the lifting point. An adequate support must be provided to prevent the assembly from turning. A failure in this procedure may cause severe injuries, as well as valve damage and to equipment nearby.

In case of damages during transport, immediately contact the shipper.
In case of any problem, call your Petrolvalves representative.

4. IDENTIFICATION

G-Stream valves have a stainless steel name plate. The name plate provides the following data:

SIZE:	Valve size in inches
CL:	Body rating (ANSI)
TN:	Trim size
BODY:	Body material
TRIM:	Trim material
CV:	Rated Cv
AIR TO:	Air action (open/close)
CHAR:	Flow characteristic
SIGNAL:	Instrument signal range
TAG:	Customer identification
S/N:	Serial number



SAFETY WARNING!

To avoid potential injury and/or damage to the valve parts, WARNING and CAUTION notes must be strictly observed. Changing this product characteristics, using non original spare parts or using maintenance procedures different from those presented herein may affect the performance of the valve, be hazardous to personnel and equipment and may void the manufacturer warranty.

WARNING!

Standard industry safety practices must be applied when using this equipment. Industry safety standards for personal protection and for equipment handling must also be observed.

CAUTION

Removing the valve for maintenance: piping must be completely depressurized and process fluid drained. In case of toxic, caustic or hazardous fluid services, the valve must be decontaminated to avoid accidents.

WARNING!

It is the user responsibility the proper material selection of the fasteners necessary to install the valve in the process. User will take into account the material strength and its resistance to stress corrosion cracking. As with any mechanical equipment, periodic inspection and maintenance is required.

CAUTION

Consider the total weight before lifting or transporting the valve. A failure to observe this warning may result in serious injury.

5. INSTALLATION

Before installing the valve, clean the piping to remove any debris, scaling and other foreign material. Clean the gasket surfaces to assure that there is no leakage.

The valve must be installed in the upright position whenever possible. The installation in the upright position allows easier maintenance.

In case of valves for cryogenic applications, the upright position with the actuator installed towards the top is important to maintain the packing insulated from the fluid that flows through the valve, allowing the temperature of the packing to remain close to the environment temperature.

WARNING!

Do not insulate extended bonnet expected to operate with too low or too high temperatures.

Make sure that there is an adequate clearance above the actuator to allow the disassembly of the actuator from the valve body. Refer to *Table 1* to find the necessary clearance for disassembling the actuator.

Table 1

Free space necessary to disassemble the actuator

Valve Size [Inches]	ANSI Class	Clearance	
		[inches]	[mm]
½ to 1	150 - 600	3.0	76
1½ & 2	150 - 600	5.0	127
3	150 - 600	6.0	152
4	150 - 600	8.0	203
6	150 - 600	10.0	254
8	150 - 600	13.0	330
10	150 - 600	14.0	356
12	150 - 600	15.0	381

Note: Consult factory for sizes and pressure classes not listed above

Check the flow direction to make sure that the valve is installed with the correct flow direction, indicated by the arrow plate attached to the bonnet flange.

Valves with unbalanced standard trims and air to open action (fail closed), must be installed with the flow tending to close the valve, except under special circumstances, which will be clearly indicated.

If the valve is welded to the piping, care must be taken to avoid excessive heat transfer to the valve.

In case of valves equipped with separable flanges, the half rings of the flanges must be installed in the valve body before the valve is installed in the piping. This procedure will assure a rigid connection between the valve flanges and the piping flanges.

CAUTION

Failure to follow the separable flange assembly procedure may cause serious injury

Connect air supply and instrument signal (throttling control valves are generally equipped with positioners). The air inlet are identified indicating the air supply and the instrument signal. The actuator can operate with air supply pressure up to 150 psi (10.3 Bar). However, the sticker attached to the cylinder must be checked for maximum pressure allowed. Air filter is recommended, unless the instrument air is clean and dry.

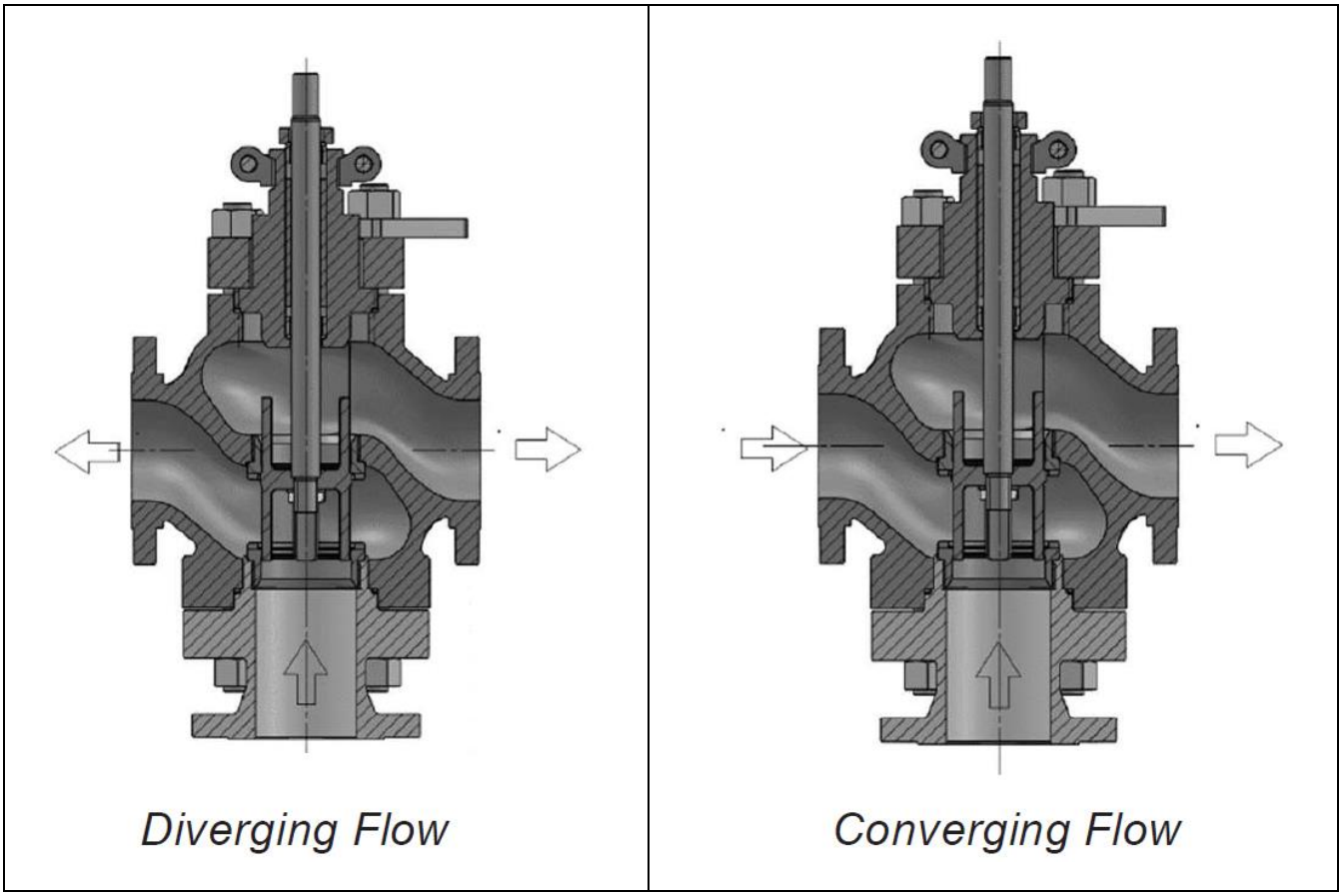
Note: *under special circumstances, the maximum air supply pressure must be limited to 80 or 100 psi depending on the actuator size and the positioner installed.*

WARNING!

For transport reasons, the air filter may be installed out of the vertical position. Before operating the actuator, position the air filter pointing down.

5.1. THREE WAY variant (G-Stream Control Valve)

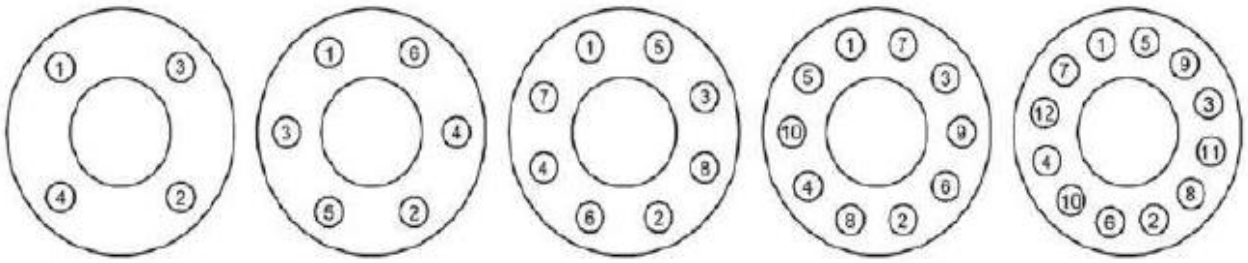
Before installing the valve, the pipe which channels the process fluid must be cleaned, by performing, if required, an energetic blowing with steam or compressed air.
The entrance of any dirt in the plug will be prevented by the installation of the filter upstream the valve.
The installation of three shut off valves, located upstream and downstream of the three-way valve, is recommended to perform periodical maintenance operations of the valves installed on continuous operation systems.
The three shut off valves must be characterized by the same internal diameter of the control valve.
During the installation of the valve, make sure that the flow in the pipe goes in the same direction as indicated by the arrow on the valve.
The accumulation of any impurities which are contained in the fluid must be avoided because this phenomenon should damage the valve, thus it is recommended to assemble the valve with the actuator pointed upward (the assembling position of the valve does not limit its operation



The accumulation of any impurities which are contained in the fluid must be avoided because this phenomenon should damage the valve, thus it is recommended to assemble the valve with the actuator pointed upward (the assembling position of the valve does not limit its operation.

5.2. INSTALLATION OF THE VALVE ON THE PIPE

A criss-cross sequence must be followed on the flange bolts in order to ensure a uniform load and a uniform alignment, as indicated in the following figure.



These instructions must be followed carefully:

1 Prevent any excessive tightening.

2 Use the recommended tightening torques.

3 Prevent any pipe misalignment

4 Choose the flange gasket according to the operating conditions and the manufacturer prescription, if any.

6. QUICK CHECK

Prior to start up, check the control valve according to the following steps:

- Check the full stroke making appropriate instrument signal change. Observe the position indicator of the plug, located on the stem clamp, and the stroke plate. The plug must move smoothly, from one end position to the other end.

CAUTION

When operating the valve, keep your hands, hair, clothes, etc. away from moving parts. Failure to follow this warning may result in serious injury.

- Check all air connections for leaks. Tighten the fittings connections and replace any leaking ferrule, if necessary.
- Tighten the packing gland nuts evenly (the usual torque for braided PTFE packing is around 14 ft.lbs/19 Nm). After the valve has been in operation for a short time or a temperature gradient has occurred, make sure that the bonnet flange, nuts and the packing nuts are correctly tightened (retighten if necessary).
- In case there is a leakage in the packing, tighten the packing nuts only enough to stop the leakage. The bonnet flange nuts must be retightened to assure that the bonnet gasket does not leak (see *Table 2)*.
  Note: *This procedure is particularly important in case the valves operate at high temperatures*

Table 2

Suggested Bonnet Bolting Torque Values

Bolt Size	Torque			
	Carbon Steel		Stainless Steel	
	ft-lbs (± 10)	Nm (± 13)	ft-lbs (± 10)	Nm (± 13)
5/8 UNC	80	109	50	68
3/4 UNC	140	190	90	122
7/8 UNC	230	312	150	203
1 UNC	350	475	220	298
1.1/8 - 8 UN	510	691	330	447
1.1/4 - 8 UN	730	990	460	624
1.3/8 - 8 UN	990	1342	630	854
1.1/2 - 8 UN	1320	1790	840	1139

WARNING!

Do not overtighten packing. This may cause excessive packing wear and increase the friction on the plug stem, blocking its movement

- Check the failsafe position in case of air supply or instrument signal lack. Position the valve in the middle of its stroke and shutoff the air supply to the actuator or cutoff the instrument signal sent to positioner. Observe the stroke plate to confirm that the plug reaches the specified failsafe position

7. PREVENTIVE MAINTENANCE

Check if the valve is working properly at least every six months following the preventive steps indicated below. This sequence can be performed with the valve installed in the line and, in some cases, without disturbing operation. In case there is a potential problem inside the valve, refer to the section “Disassembly and Reassembly”.

- Inspect signs of leakage in the bonnet gasket and in the piping flanges. Tighten the nuts of bonnet flange (see Table 2) and of the piping flanges, if necessary.
- Inspect signs in case the valve is equipped with a metal bellows sear or with a drain plug, check if there is a leakage to the atmosphere through these components.
- Observe if corrosive vapors or process fluid dripping is damaging the valve.
- Clean valve and repaint areas of severe oxidation.
- Check tightness of the packing box nuts. Packing nuts must be tightened with a torque slightly over finger tight; however, tighten just enough to avoid leakage through the plug stem.
- If the valve is supplied with a lubricator, check the lubricant reservoir and add new lubricant, if necessary. Refer to the recommended lubricants chart on Table 3.
- If possible, stroke the valve and, observing the stroke plate, check if the valve travels its full stroke in a smooth and uniform way. An unsteady movement of the stem may indicate an internal problem of the valve (jerky stem motion is normal when graphite packing is used).
- Verify valve calibration, comparing the pressure indicated in the positioner gauges against the stroke plate of the actuator. Make sure that the positioner is calibrated within the correct range. Refer to the positioner instructions for information about preventive maintenance

CAUTION

When operating the valve, keep your hands, hair, clothes, etc. away from moving parts. Failure to follow this warning may result in serious injury.

- Make sure that mechanical linkage of the positioner with the actuator is connected in a safe way. Verify also if the stem clamp is properly tightened and if the plug stem is correctly threaded into the actuator stem.
- Make sure all accessories, brackets and bolts are properly tightened.
- If possible, shut off air supply and observe on the stroke plate if the specified failsafe position is reached.
- Verify if actuator stem bellows is worn out.
- Apply a soap solution around the cylinder retaining ring, adjusting screw and actuator bushings to check if there are air leaks through the O-rings and adjusting screw gasket.
- Remove any contaminant or other foreign material from the exposed areas of valve stem.
- If air filter is supplied, check and replace cartridge if necessary

Table 3 Recommended Lubricants for Packings			
Lubricant	**Manufacturer**	**Temperature Range**	**Description / Applications**
Krytox 206	E. I. DuPont	-5 to 550˚F (-20 to 288˚C)	Fluorinated general-purpose grease; handles common liquids and gases; good lubricity in harsh mediums; nonflammable, chemically inert; will not harm plastic or metal parts
GP 460	Graphite Products Co.	32 to 1000˚F (0 to 540˚C)	Graphite in petrolatum; high pressures; anti galling, graphite remains above 600˚F / 316˚C
Aeroshell Grease 7	Shell Oil Co.	-100 to 300˚F (-75 to 150˚C)	Synthetic oil based; low temperature applications
Garlock Luball	Garlock Inc.	32 to 500˚F (0 to 260˚C)	General-purpose molybdenum disulfide lubricant; economical; good in water, steam and common chemicals; not good in harsh mediums where Krytox 206 is recommended

8. BODY DISASSEMBLING

In case of suspected internal valve problem, disassembly is required. For valve disassembly observe Figures 1 to 9 and proceed as follows:

CAUTION

Removing the valve for maintenance: piping must be completely depressurized and process fluid drained. In case of toxic, caustic or hazardous fluid services, the valve must be decontaminated to avoid accidents.

- If the valve is air to close (fail open), proceed to the next step. In case valve is air to open (fail close), pressurize the lower chamber of the actuator to lift the plug off the seat, before disassembling the valve.
- Remove the bonnet flange nuts and then lift the actuator, bonnet and plug. Taking them out of the valve.

CAUTION

Heavy actuators may require using a hoist for their removal. In case the actuator has one lifting ring, use it to lift the actuator, otherwise, use a hook or pass lifting straps through the yoke legs to raise the assembly. During the disassembly, the actuator must be maintained in the upright position to prevent damages to the plug and to the seat.

- Remove the cage, seat retainer (where applicable), seat ring and gaskets from the body.
- Check if the seating surfaces on the seat ring and plug are not damaged and can assure tight shutoff. Check if the gasket seating surfaces on the seat, bonnet and body are clean and not damaged.
- To inspect the plug, release the clamp that secures the plug stem in the actuator, remove the gland flange and the yoke fixing clamps. Turn the actuator to unfasten the plug from the actuator stem. Use an open wrench to avoid the plug rotation inside the bonnet. Pull the plug carefully through the packing box.

Note: *On air to close valves (normally open in case of air supply lack), it may be necessary to pressurize the upper chamber of the actuator to move the plug out of the bonnet. If this is not carried out, the plug stem may be scratched or scored.*

WARNING!

To prevent scratching the guides and the plug stem, follow exactly the procedure described above.

- Remove the gland flange, the yoke clamp and separate the bonnet from the actuator assembly.
- To replace the packing set or change configuration of the packing box, remove the upper guide and, with aid of hook or one dowel of the same approximate size as the plug stem, remove the packing and other internal components of the valve bonnet.

WARNING!

Take care to avoid scratching the plug guides and the internal surface of the packing box during the disassembly of the bonnet internal components.

- In case it is necessary to remove the separable flanges from the body, remove the rivet or the welding spot located in the back face of each flange.

Note: *to avoid that the separable flanges of the valve body are displaced during transportation, one weld spot or one stainless steel rivet may be applied on the back of the flange.*

WARNING!

In case of valves equipped with separable flanges, if the piping gaskets are of spiral wound type, use gaskets with outer backup rings to avoid excessive stress on the gasket in some applications.

9. BODY RESASSEMBLING

To reassembly the body of the G-Stream Series control valve, observe Figures 1 to 9 and proceed as indicated below:

- When reassembling the packing set into the bonnet, make sure that a gap of at least 1/8 in. (3.2 mm) is left on the top of the packing box to assemble the upper guide. Spacers with different lengths allow using

several configurations of packing, as twin seal or packing for vacuum applications. Lubrication of packing set is recommended; this facilitates the reassemble (see Table 3 for recommended lubricants on).

WARNING!

On valves with extended bonnets or metal bellows seal, the lower packing set cannot be installed. However, in such cases, the lower packing set must be installed together with the upper assembly. The installation of the packing in the lower part of bonnet when the valve is equipped with extended bonnet or metal bellows seal will reduce the integrity of the stem sealing.

- In case the valve has guides with graphite inserts, these inserts must be replaced whenever the packing set must be replaced. In whatever circumstance the valve will be reassembled without the graphite inserts on these stem guides.
- Insert the plug into the bonnet, taking care to avoid scratching any component.
- Secure the bonnet in a vise, in the upright position with the plug head supported over a soft surface.

WARNING!

Take care to avoid damages to the plug head during the step above.

- Place the actuator back on top of the plug, without allowing the plug to rotate inside the bonnet. Make sure that the bonnet flange, gland flange and stem locknut (if applicable) are in their respective places before threading the actuator stem on plug stem.

Note: *take care to the polished surfaces of the plug stem and pay attention to not touch or scratch them with gland flange during assembling.*

- Taking care to prevent turning the plug over the seat, turn the actuator over the plug stem. Let approximately 3 or 4 threads exposed. Install the yoke clamp bolts or the yoke bolts, tightening then firmly. Tighten the bolts of the packing box with a torque slightly over finger tight.
- Install new bonnet and seat gaskets with beveled edge up for Teflon gaskets.
- Insert the seat ring into the body with the step side downward. Place the cage into the body, with the thinner end of the cathedral window downward.
- On valves with air to open configuration apply air in the lower chamber of the actuator to retract the plug.
- Keeping the assembly comprised by the actuator, bonnet and plug in the upright position, lower this assembly over the valve body, taking care to prevent scratching or damaging the plug while being inserted into the valve body.
- To align the plug and the seat properly, tighten the bonnet flange nuts with your fingers. In case of valves equipped with pneumatic actuators, apply air pressure in the actuator upper chamber to seat the plug into the seat ring. Proceed to the next step.

***Note**: the next step is applicable only to valves equipped with pneumatic actuators. In case an electrical or hydraulic actuator is used, return the plug for the half stroke position and continue to tighten the nuts of the bonnet flange.*

WARNING!

Failure to return the plug to the half stroke position (for valves equipped with electrical or hydraulic actuators) will cause damages to the actuator and/or to the valve during the bonnet tightening sequence. This is caused because majority of electrical and hydraulic actuators is unable to retract 1/8 in. (3.2 mm) during the tightening sequence of the bonnet flange.

- On valves with air to close configuration skip this step and proceed to the next one. On valves with air to open configuration, check the correct seating of the plug: when the correct seat/plug seating is achieved, the bonnet flange is forced upward, against the flange nuts with a force that will render it impossible to move the flange. If the seating is not correct, the bonnet flange can be wiggled with light hand force. If this occurs, apply air in the actuator lower chamber and retract the plug to the half stroke position.
- Turn the plug outwards from the actuator stem exposing another thread of plug stem. When it is not possible to move the bonnet flange with your hands, the correct seating of the plug has been achieved. If necessary, repeat this procedure until the plug is correctly seated.
- Move the plug to the closed position, in case of valves equipped with pneumatic actuators, or to the half-stroke position in case of valves equipped with hydraulic, electrical or mechanical actuators. Start by tightening the bonnet flange nuts in order to maintain the bonnet flange parallel to the body. Tighten the first nut with a 1/6 of a turn, and then tighten the directly opposite nut with 1/6 of a turn and so on, successively. Tighten completely all nuts to seat the bonnet and assure the compression of the gaskets.
- Apply air in the upper chamber of the actuator to seat the plug. Adjust the stem clamp in a such way that, with the maximum signal of the instrument sent to positioner, the line indicating “maximum signal” on the positioner cam is positioned toward the center of the cam roller bearing.

***Note**: On on-off valves, the lower part of the stem clamp must be simply aligned at 1/16 in. (1.6 mm) of the actuator stem end.*

- Tighten the stem clamp bolt. The appropriate tightening is important, as the clamp secures the plug stem in the actuator stem. Adjust the stroke plate so that the stem clamp indicates the “closed” position.
- If the valve has been removed of the piping, make sure it is reinstalled with the correct flow direction.

10. PRESSURE BALANCED PLUG DISASSEMBLING

To valve disassemble equipped with pressure balanced plug, proceed as indicated below:

- To Retract the plug all the way, until the stem clamp points to open position.
- Remove the bonnet flange nuts and then, lift the actuator, bonnet and plug assembly, removing it from the valve.
- If the seat retainer gets stuck in the plug during the disassembly, apply air in the upper chamber of the

actuator and advance the piston completely, enabling the seat retainer to remain in the body and the bonnet to be lifted over above this component.

- In the gap between the upper portion of the seat retainer or cage and the lower portion of the bonnet, place wood blocks with same thickness in at least three places.
- Apply air underneath the piston and retract the actuator stem until the plug head is free form seat retainer or cage.
- Remove the seat retainer, the cage, the seat ring and the gaskets.
- Remove the plug seals installed in the plug head.
- If necessary, the plug may be dismantled apart from the bonnet and the actuator.

11. PRESSURE BALANCED PLUG REASSEMBLING

For reassemble a pressure-balanced plug, proceed as indicated below.

CAUTION

Removing the valve for maintenance: piping must be depressurized and process fluid drained. In case of toxic, caustic or hazardous fluid services, the valve must be decontaminated to avoid accidents. When operating the valve, keep your hands, hair, clothes, etc. away from moving parts. Failure to follow this warning may result in serious injury.

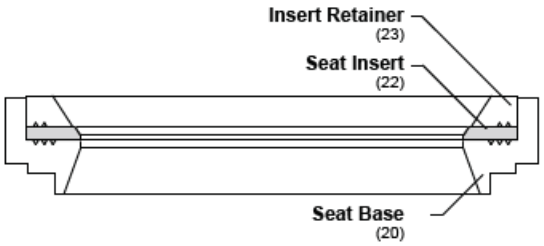
- Carefully inspect the plug head and the inner surface of the seat retainer or cage checking for scratches or roughness. Surface scratches can be removed using a fine emery cloth.
- For plug seals replacing proceed as follows:
  Heat one plug seal up to 150 °C and slide it up to the slot in the plug head. The high temperature will expand the ring, making it easy to slide it up to the slot. Special care must be taken to prevent the ring from rolling instead of sliding over the plug head. The second plug seal can be installed in the same way as the first one.
- Install a new seat gasket and place the seat ring in its place. Note: all gaskets must be replaced whenever the valve is disassembled.
- Install the seat retainer or cage (with the thinner end of the cathedral window downward), the bonnet gasket and the seat retainer/cage gasket.
- Lower the assembly comprised by actuator, bonnet and plug perpendicularly over the seat retainer bore. If PTFE plug seals or O-ring are used, the plug may remain retracted when it is inserted into the seat retainer. Special care must be taken with sealing surfaces (inner surface of P/B seat retainer and plug seals) to prevent risks or scratches on these components as the plug start to slide through the bore of the seat retainer. If the sealing of the plug is carried out with metal piston rings, the plug must be extended a few inches to allow the use of a compressor ring on the stem until the plug head is free from seat retainer. A suitable sized screw-type hose clamp may also be used to compress the rings during reassembly.
- Once the bonnet is resting squarely in the valve body, tighten the bonnet flange nuts with your fingers.
- Using the actuator, move the valve plug, seating it in the seat ring two or three times to ensure proper

alignment of the plug with the seat.

- In case of valves equipped with pneumatic actuators, let the plug seated on the seat ring and start tightening the bonnet flange nuts, keeping the flange parallel to body. Tighten the first nut 1/6 of turn, then tighten the directly opposite nut 1/6 of turn and so on, successively. Tighten completely all nuts to assure the proper compression of the gaskets. The bonnet must remain completely seated in the valve body, metal to metal, which can be easily felt through wrench used to tighten the nuts.

12. SOFT SEAT DISASSEMBLING

G-Stream control valves can be also equipped with soft seat, these configuration of the valve permits to meet the requirement of ANSI B16.104/FCI-70.2, class VI tightness. The soft seat assembly consist of a seat base, a seat inserts – usually manufactured with a polymer material – and an insert retainer, as represented in following image.



For valve of the same model, size, pressure class and trim size, the soft seat assembly is totally interchangeable with the metal seat. The standard manufacturing material for inserts is virgin PTFE, but inserts can be optionally manufactured with fiberglass reinforced PTFE, FEP, PEEK, polyurethane or KEL-F.
To disassemble a valve equipped with soft seat proceed as follows:

CAUTION

Removing the valve for maintenance: piping must be depressurized and process fluid drained. In case of toxic, caustic or hazardous fluid services, the valve must be decontaminated to avoid accidents. When operating the valve, keep your hands, hair, clothes, etc. away from moving parts. Failure to follow this warning may result in serious injury.

- If the valve is air-to-open, apply air in the lower chamber of the actuator to lift the plug off the seat before disassembling the valve.On air-to-close valves, the safety spring of the actuator will maintain the valve plug off the seat.
- Remove the bonnet flange nuts and then, lift the actuator, bonnet and plug, taking them out of the valve.
- Remove the seat retainer or cage, soft seat assembly and gaskets from the body.
- Check if the seating surfaces on the seat and plug are not damaged and can assure tight shutoff. In case the soft seat insert is worn out or damaged, it must be replaced during the reassembly. Since the seating surface of the plug does not contact the insert retainer, it is not necessary to correct minor damages existing on this part.
- Make sure the gasket seating surfaces on the seat, bonnet and body are clear and not damaged.

13. SOFT SEAT REASSEMBLING

To reassemble a valve equipped with soft seat proceed as follows:

- Using a new seat insert, assemble the three components of the soft seat assembly
- Install the new bonnet and seat gaskets.

***Note**: on valves equipped with soft inserts, use only flat gasket (resilient). Using spiral wound gasket may cause problems during assembly and operation.*

- Insert the soft assembly into the body with the step side downward. Place the seat retainer or cage into the body, with the thinner end of the cathedral window downward.
- On air-to-open valves (fail-close), apply air in the lower chamber of the actuator to retract the plug.
- Keeping the assembly comprised by the actuator, bonnet and plug in the upright position, lower this assembly over the valve body, taking care to prevent scratching or damaging the plug while being inserted into the valve body.
- To align the plug and the seat properly, tighten the bonnet flange nuts with your fingers. In case of valve equipped with pneumatic actuators, apply air pressure in the actuator upper chamber to seat the plug into the seat ring.
- In case of valves equipped with pneumatic actuators, keep the upper chamber of the actuator pressurized and start tightening the bonnet flange nuts in such a way to maintain the bonnet flange parallel to the body.
- In case of valves equipped with pneumatic actuators, keep the upper chamber of the actuator pressurized and start tightening the bonnet flange nuts in such a way to maintain the bonnet flange parallel to the body.
- Tighten the first nut with 1/6 of a turn, then tighten the directly opposite nut with 1/6 of a turn, and so on, successively. Tighten completely all nuts to seat the bonnet in the body and to assure the proper compression of the gaskets. The correct tightening requires a considerable force, but the bottoming of the bonnet in the body (metal-to-metal) can be easily felt through the wrench.
- If the valve has been removed of the piping for inspection, repair or replacement of the soft seat, make sure it is reinstalled with the correct flow direction.

14. ACTUATOR DISASSEMBLING

On normally closed valves, the actuator can be disassembled with the actuator yoke still connected to the valve. On normally open valves, the actuator must be removed from the valve before its disassembly. To disassemble the actuator, observe the Figures 1 to 9 and proceed as follows:

- Make sure that the plug is not seated in the seat ring or resting in the bottom of the bonnet. To do this, apply air in the proper chamber of the cylinder and release the pressure on the opposite chamber.

WARNING

Roughness on critical surfaces may indicate that the plug is not correctly positioned between the seat and the bonnet during disassembly.

- Loose the stem clamp.
- Remove the bolts from the gland flange and from the yoke clamp. Remove the clamp itself.
- Turn the actuator completely outward the plug stem, preventing the plug to rotate inside the bonnet.

WARNING

Do not allow that after the removal of the actuator the plug drops over the valve seat.

With the actuator removed out of the valve:

- Disconnect the tubings.
- Release the compression of the spring, removing completely the adjusting screw.

CAUTION

The spring compression must be completely relieved before disassembling the actuator. If this is not done, the cylinder may be ejected out of the yoke when the retaining ring is removed from the cylinder, causing serious injury.

- Remove the retaining ring from the groove at the base of the cylinder using two screwdrivers. Intro- duce the tip of a screwdriver in the slot on the ring and remove the ring out of its channel. Use another screwdriver to help the operation of removing the ring.
- Pull the cylinder out of the yoke and piston (some O-ring resistance may be felt).

CAUTION

Do not use air pressure to remove cylinder. This may cause the cylinder to be ejected out of the yoke, causing serious injury.

- In the “air-to-open” configuration, remove the spring(s) and the spring button for cleaning and inspection (see Figure 9). Remove the locknut and slide the piston and the stem spacer out from the actuator stem. On actuators with dual springs the spring guide must be removed also.
- Remove the O-rings from the piston, the piston stem and from the yoke.
- To inspect the actuator stem O-ring, remove the stem clamp and corresponding rubber bellows. Push the actuator stem through the yoke, taking care not to gall the stem. The O-ring may now be inspected and replaced if necessary.
- In the “air-to-close” configuration (Fig. 6), slowly release and remove the actuator stem locknut, making sure that the piston follows the locknut and is not jammed on the actuator stem. Remove the stem locknut, spring button, piston, spring and stem spacer.

CAUTION

The upper and lower actuator stem bushings are pressed into the yoke. It is not necessary to remove them to replace the actuator stem O-ring.

- If the bushings are worn out or damaged use a press with appropriate size to extract the used bushings and insert the new ones in the yoke

15. ACTUATOR REASSEMBLING

To reassemble the actuator, refer to the Figure 9 and proceed as follows:

- All the O-Rings must be replaced and the new ones must be lubricated. The majority of the O-rings can be lubricated with silicone lubricant (Dow Corning 55M or equivalent). Silicone O-Rings must be lubricated with Magnalube-G or equivalent (do not use a silicone lubricant on silicone O-rings).
- Assure that all internal parts are completely clean before starting to assemble. Apply the proper lubricant to the cylinder wall.
- If the bushings have been removed, lubricate the external side of the replacement bushings. Press the new lower stem bushing into the yoke until it touches the bottom shoulder. Press the upper stem bushing until it is aligned with the top of the yoke (see Figure 9).
- Replace the O-rings on the actuator stem and on the yoke. Reassemble the actuator stem.
- Reassemble the piston, the piston stem O-ring and the stem spacer in the actuator stem, according to the desired air action. Replace the piston O-ring. The air-to-extend configuration requires that the spring button be fixed by the actuator stem locknut. Tighten the nut firmly.
- In the air-to-close configuration, place the spring below the piston and insert the actuator stem through the yoke, taking care not to strike (and scratch) the stem or bushings. For air-to-open configurations insert the actuator stem through the yoke and place the spring(s) and the spring button on the top of the piston.
- Assemble the cylinder in the yoke, assuring that these parts are correctly positioned to allow the installation of the cylinder retaining ring. Care must be taken to avoid scratching or cutting the O-rings on the piston and on the yoke.
- Insert the retaining ring into the cylinder groove, by steps, until it is fitted in place. Using a hammer and a drift rod, tap gently on the retaining ring, already fitted in place, to confirm that it is securely installed.

CAUTION

The cylinder retaining ring must be securely fixed into the groove so that the cylinder does not escape when pressurized, causing personal injury. During installation, avoid damaging or deforming the edge of the retaining ring square section.

- Reinstall the adjusting screw, using a new adjusting screw gasket

WARNING

In the air-to-open configuration make sure that the hole in the spring button is centered directly under the adjusting screw hole.

- Tighten the adjusting screw sufficiently so that the gasket provides a leak proof sealing. Do not over-tighten it

WARNING

Do not use a screwdriver, bar, etc. to turn the adjusting screw since this procedure may cause damages to the lifting ring weld. Use an adequate open wrench on flat surfaces of the screw head.

- Replace the stem bellows and reinstall the stem clamp.

WARNING

When installing the stem clamp, make sure that the bolt of the clamp is square to one of the flat faces machined on the actuator stem. This assures a more rigid connection.

- Apply air in the upper chamber of the cylinder and place the actuator subassembly onto the valve, making sure that the gland flange and the bonnet flange are in their respective places. Connect the threads of the actuator stem to the plug stem. Carefully, turn the actuator clockwise until the plug stem is connected by 3 or 4 threads.

WARNING

To prevent roughness in the plug stem or in the seating surfaces, do not allow that the plug turns inside the bonnet and over the seat during the maintenance steps described above and below.

- Apply enough air in the lower chamber of the actuator (in air-to-open configuration) or in the upper chamber of the actuator (if air-to-close) to prevent the plug head from touching the seat ring or the bottom of the bonnet. Continue to turn the actuator over the plug stem until only 2 or 3 threads of the plug stem are exposed.

WARNING

Do not allow the gland flange to touch or scratch the polished surfaces of the plug stem.
To prevent possible scratching of the plug stem and/or seat ring, do not allow that the plug turns inside the bonnet and over the seat.

- Apply air over the top of the piston. This will make the plug to rest over the seat ring and will raise the

actuator yoke about 1/16 in. (1.6 mm) above the bonnet. If the gap created is lower than 1/16 in. (1.6 mm), apply air in the lower chamber of the actuator to retract the actuator stem and thread the plug inward or outward, as necessary. Repeat this step until a 1/16 in. (1.6 mm) gap is created.

- Apply air in the actuator lower chamber, secure the yoke clamps and tighten the packing box bolting. Tighten the yoke clamps bolting firmly. The packing box nuts must be tightened slightly over finger-tight

WARNING

Do not overtighten packing. This may cause excessive packing wear and in- crease the friction on the plug stem, blocking its movement.

- Apply air in the upper chamber of the actuator to seat the plug. Adjust the stem clamp in a such way that, with the maximum signal of the instrument sent to positioner, the line indicating “maxi- mum signal” on the positioner cam is positioned toward the center of the cam roller bearing.

***Note**: On on-off valves, the lower part of the stem clamp must be simply aligned at 1/16 in. (1.6 mm) of the actuator stem end.*

- Tighten the stem clamp bolt. The appropriate tightening is important, as the clamp secures the plug stem in the actuator stem. Adjust the stroke plate so that the stem clamp indicates the “closed” position.
- Reconnect the tubing, the supply line and the signal line.

16. VALVE & ACTUATOR PERFORMANCE TESTING

Scope of this test is to verify if the valve stem, moved by the actuator, is able to complete the entire stroke. Acceptability criteria is listed in table below.

Table 4

Acceptance Criteria

TEST	Control Valves with positioner	Control Valves without positioner	Control Valves With manual override
Valve position & stroke check	± 3% of the amplitude of signal field	± 10% of the supply pressure	Measured stroke higher or equal to nominal stroke
Response time check	Measured time lower or equal to nominal time declared	Measured time lower or equal to nominal time declared	N.A.
Linearity	± 1% of the amplitude of signal field	N.A.	N.A.
Dead band	± 1% of the amplitude of signal field	N.A.	N.A.

Valve equipped with positioner

The test is performed by checking the plug position at control range limits (e.g.: 4 mA = valve in open position / 20 mA = valve in closed position). Test is done to verify that the valve nominal stroke is completed between the signal range limits, including also the portion of the signal range dedicated to valve seating force. The test starts with valve in closed position and signal at minimum (for air to open) or at maximum (air to close) according to what stated in valve IDS (valve data sheet) or CQP.

Valve without positioner

The test is performed acting on the manual override, or by operating the actuator, starting from minimum air supply pressure and up to the air supply pressure value indicated in IDS.

Response time test

When specified on IDS the response time in controlling or in fast actuation shall be checked. The time must be measured from the moment when the signal is sent to the valve.

Linearity test

Linearity test is carried out only upon Customer request. The test has the scope to determine the difference between theoretical signal and effective signal necessary for the actuator to perform a given travel.

Dead band tets

Dead band referred to a given value of the plug travel is the maximum difference between the value of the air pressure supplied to the actuator necessary to reach the aforesaid travel point and the air pressure value needed for the plug to move to the opposite direction. The test is normally carried out at 50% of the full travel.

Performance test of pneumatic & electric actuator

The test scope is to ascertain whether the actuator thrust is suitable under the heaviest expected operating condition. The test is carried out together with the seat leakage test of the valve at the maximum differential pressure in service. The test is performed in a different way depending on the the leakage class required.

The following recommendations are applicable to electric actuators provided with torque switches:

- the torque to-close, set initially at the nominal value, may be later set at a higher value, until the required tightness between seat and plug is obtained.
- should the torque switch be later set again, the VSI Technical Department will be consulted.

For any additional information please refer to ***SPP_003 Performance test for control valves procedure.***

For actuator maintenance please refer to the specific IOM.

17. SPARE PARTS

For the supply of spare parts, it is necessary to inform Petrolvalves the name and the part number of the required item and/or the name of the required com- ponent and the valve serial number. To facilitate this task, lists containing the part numbers of all valve and actuator components are provided inside each trans- port packaging.

In case the valve is disassembled the user may also check the component part number marked in a per- manent way in all metallic components of the valve.

18. RECYCLING INFORMATION

G-Stream control valves may present a very long operational life depending on the application they are provided

for and the proper maintenance care. However, at the end of their operational life the part number marked on all metallic components may help the user to adopt the best procedure for disposal of the materials that may be recycled. In case of doubt, please contact your Petrolvalves representative.

19. G-Stream Valve Troubleshooting Chart

Problem	Probable Cause	Corrective Action
Stem moves slowly or does not move	Overtightened packing	Adjust packing box nuts to slightly over finger-tight
	Service temperature is above the operating limits of trim design	Reconfirm service conditions and contact the manufacturer
	Insufficient air supply	Check for leaks in air supply or instrument signal system; tighten loose fittings and replace the leaking ferrules
	Malfunctioning positioner	See positioner IOM
	Insufficient actuator thrust	Verify air supply pressure to actuator; if pressure is adequate, double check service conditions and contact the manufacturer
Excessive leakage through the valve seat	Insufficient tightness on the bonnet flange nuts	See steps on “Reassembling the Body” for tightening procedures
	Worn or damaged seat ring	Disassemble valve and change or repair seat ring
	Worn or damaged seat gasket	Disassemble valve and replace gaskets
	Insufficient actuator thrust	Verify air supply pressure to actuator; if pressure is adequate, double check service conditions and contact the manufacturer
	Improper plug adjustment	See section “Reassembling the Body” for correct plug adjustment
	Zero adjustment incorrectly carried out	Carry out the positioner calibration
	Worn or damaged plug seating surface	Disassemble the valve and replace plug
	Incorrect flow direction	Verify air supply pressure to actuator; if pressure is adequate, double check service conditions and contact the manufacturer
	Incorrect adjustment of the auxiliary handwheel, limiting the stroke	See section “Reassembling the Body” for correct plug adjustment
Inadequate flow	Incorrect plug adjustment, limiting the stroke	See section “Reassembling the Body” for correct plug adjustment
	Malfunctioning positioner	See positioner IOM
	Service conditions exceed the trim nominal capacity	Check service conditions and contact the manufacturer
	Insufficient air supply	Check air supply requirements
	Incorrect flow direction	Correct flow direction

Problem	Probable Cause	Corrective Action
Valve does not fail in correct position	Incorrect flow direction	Correct flow direction
	Incorrect assembly of the actuator	Change failsafe position of the actuator spring;
	Insufficient actuator thrust	Recheck service conditions and contact the manufacturer
The plug is hitting	Incorrect adjustment of the plug allowing the formation of inadequate air cushion between the piston and the actuator yoke.	Refer to the section “Reassembling the Body” for the correct adjustment of the plug
	Inadequate air supply	Check the adequate supply pressure for the actuator, repair leakages and remove any restrictions in the supply line
	Trim size is too large for the flow rate through the valve	Install a trim with lower Cv
Excessive air consumption	Leaks in air supply or instrument signal system	Tighten the fittings and replace any leaking ferrule
	Malfunctioning positioner	See positioner IOM
	Leaks through O-rings or through the adjusting screw gasket	Replace O-rings and gasket
Excessive leakage through the valve soft seat	Extruded polymer insert	Replace the polymer insert. Check the service conditions to assure the compatibility of the insert material.
Soft seat insert with short operating service life	High pressure and temperatures	Check the operating conditions (the max. operating temperature for PTFE insert must be below 150° C; for high pressure applications, the max. temperature must be below 38° C
	Impact of particles carried by fluid at high velocity	Use a polyurethane insert (polyurethane inserts present extended life time under high speed flow conditions)
	Corrosive service conditions (polyurethane inserts are attacked by some acids and solvents)	Use PTFE or KEL-F inserts (KEL-F inserts present excellent resistance to most chemical and solvents)
Misalignment of the soft seat assembly	Improper setting of the parts (high-pressure and low-pressure designs are not interchangeable)	Make sure the soft seat assembly is designed for a valve with the same pressure class as the one where the assembly is being installed.
	Warped or bent assembly	Repair or replace the assembly.
	Damages in the seating surface	Replace the seat insert. Replace the plug if its seating surface presents roughness of scratches.

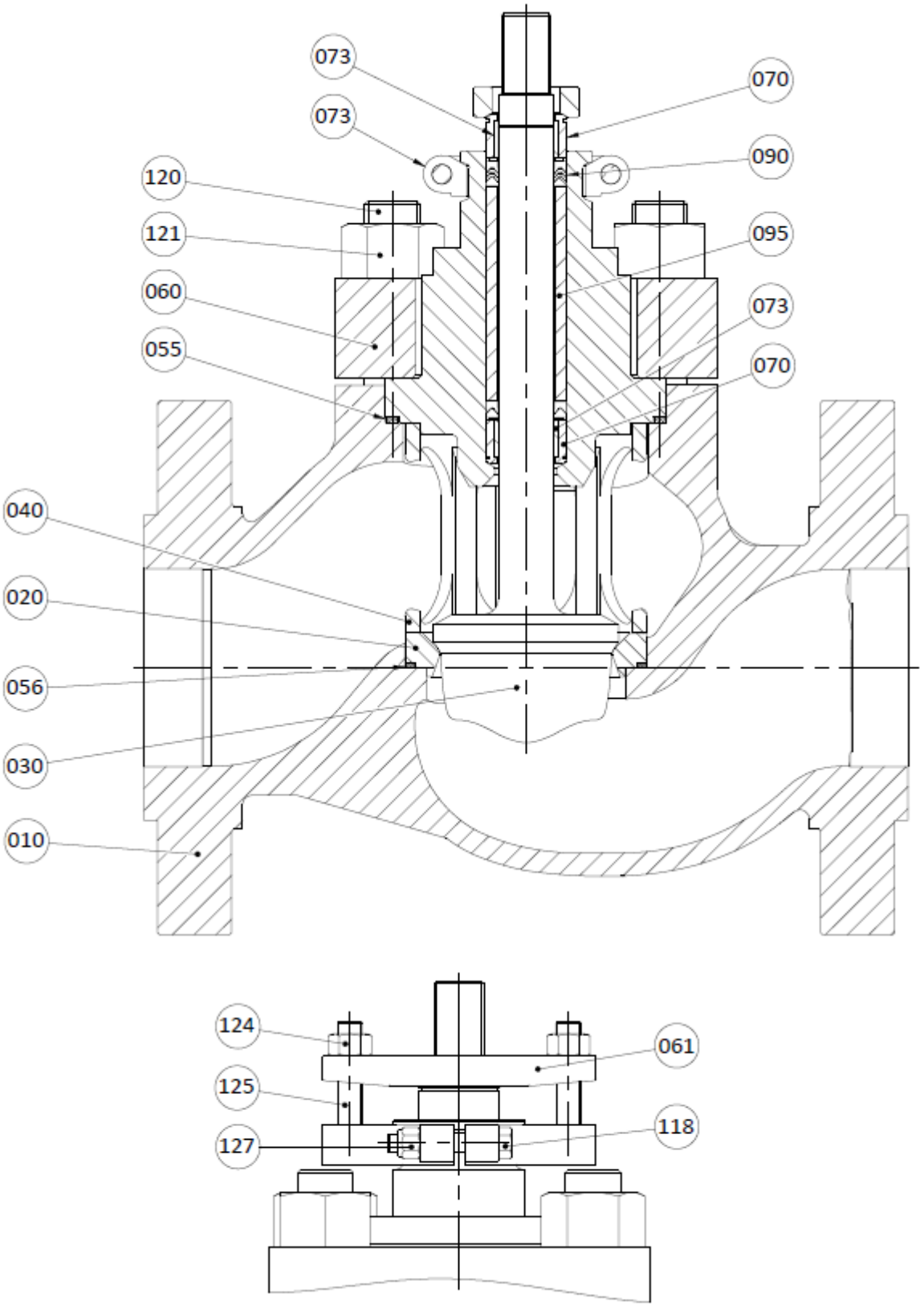


Figure 1 – *G-Stream Control Valve Contoured TRIM*

1) STRATEGIC - SUGGESTED SPARE PARTS

2) COMMISSIONING AND TWO YEARS SUGGESTED SPARE PARTS

	ITEM	Q.TY	DESCRIPTION
	127	2	Nut
	125	2	Screw
	124	2	Nut
	121	4	Heavy nut
	120	4	Stud
	118	2	Screw
	95	1	Spacer set
(1) (2)	90	1	Packing set
(1) (2)	75 73	1	Guide insert
	71 70	1	Guide
	66	2	Yoke Clamp
	61	1	Packing flange
	60	1	Bonnet flange
(1) (2)	56	1	Gasket
(1) (2)	55	1	Gasket
	50	1	Bonnet
	40	1	Seat retainer
(1)	30	1	Plug
(1)	20	1	Seat
	10	1	Body

Figure 1a – *G-Stream Control Valve Contoured TRIM*

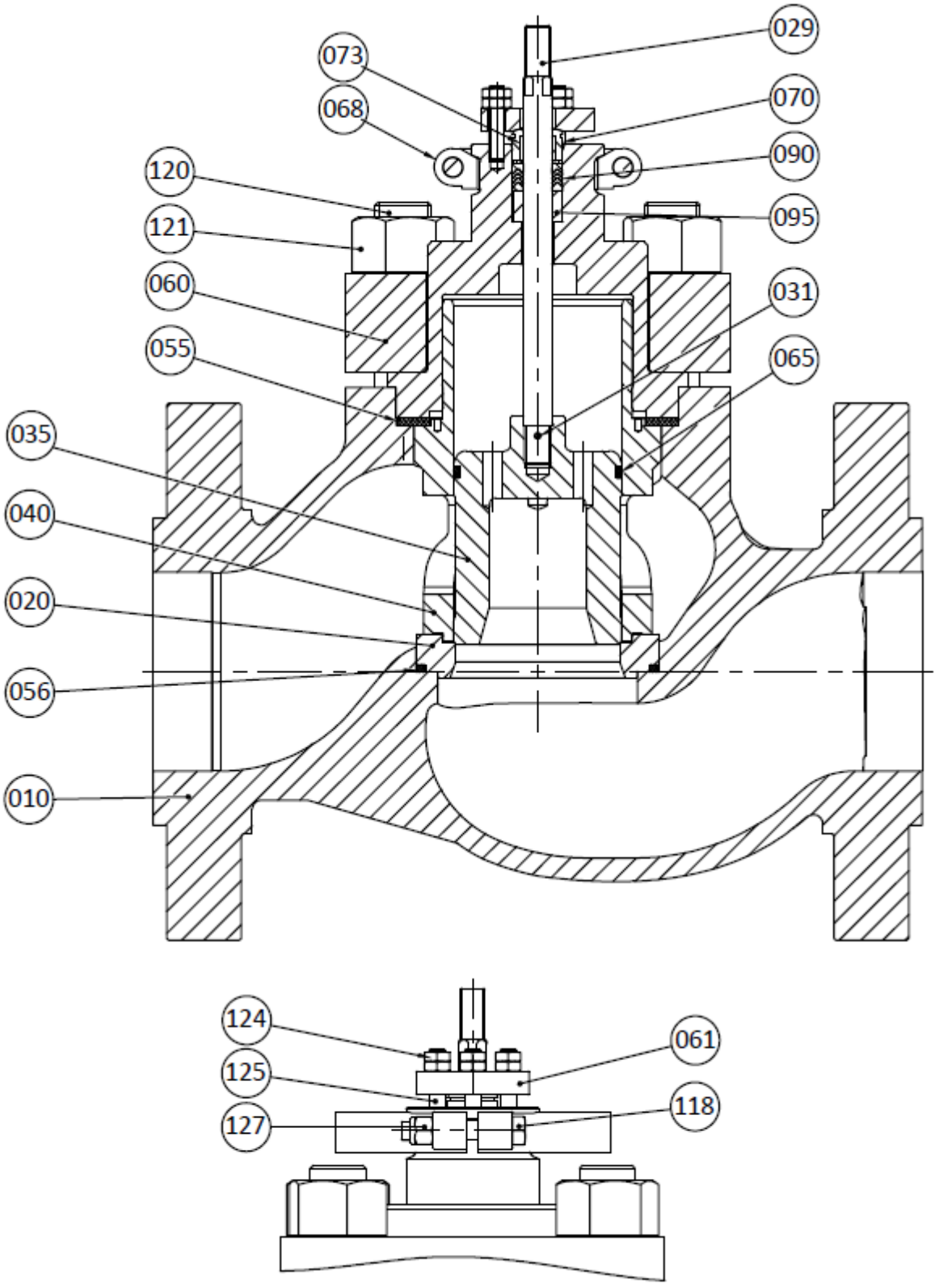


Figure 2 – *G-Stream Control Valve Cage guided TRIM*

	1) STRATEGIC - SUGGESTED SPARE PARTS 2) COMMISSIONING AND TWO YEARS SUGGESTED SPARE PARTS		
	127	2	Nut
	125	2	Stud
	124	2	Nut
	121	4	Heavy nut
	120	4	Stud
	118	2	Screw
	95	1	Spacer set
(1)(2)	90	1	Packing set
	73	1	Guide insert
	70	1	Guide
	66	2	Yoke Clamp
(1)(2)	65	1	Lip Seal
	61	1	Packing flange
	60	1	Bonnet flange
(1)(2)	56	1	Gasket
(1)(2)	55	1	Gasket
	50	1	Bonnet
	40	1	Cage
(1)	35	1	Plug
(1)	31	1	Pin
(1)	29	1	Stem
(1)	20	1	Seat
	10	1	Body
	ITEM	Q.TY	DESCRIPTION

Figure 2a – *G-Stream Control Valve Cage guided TRIM*

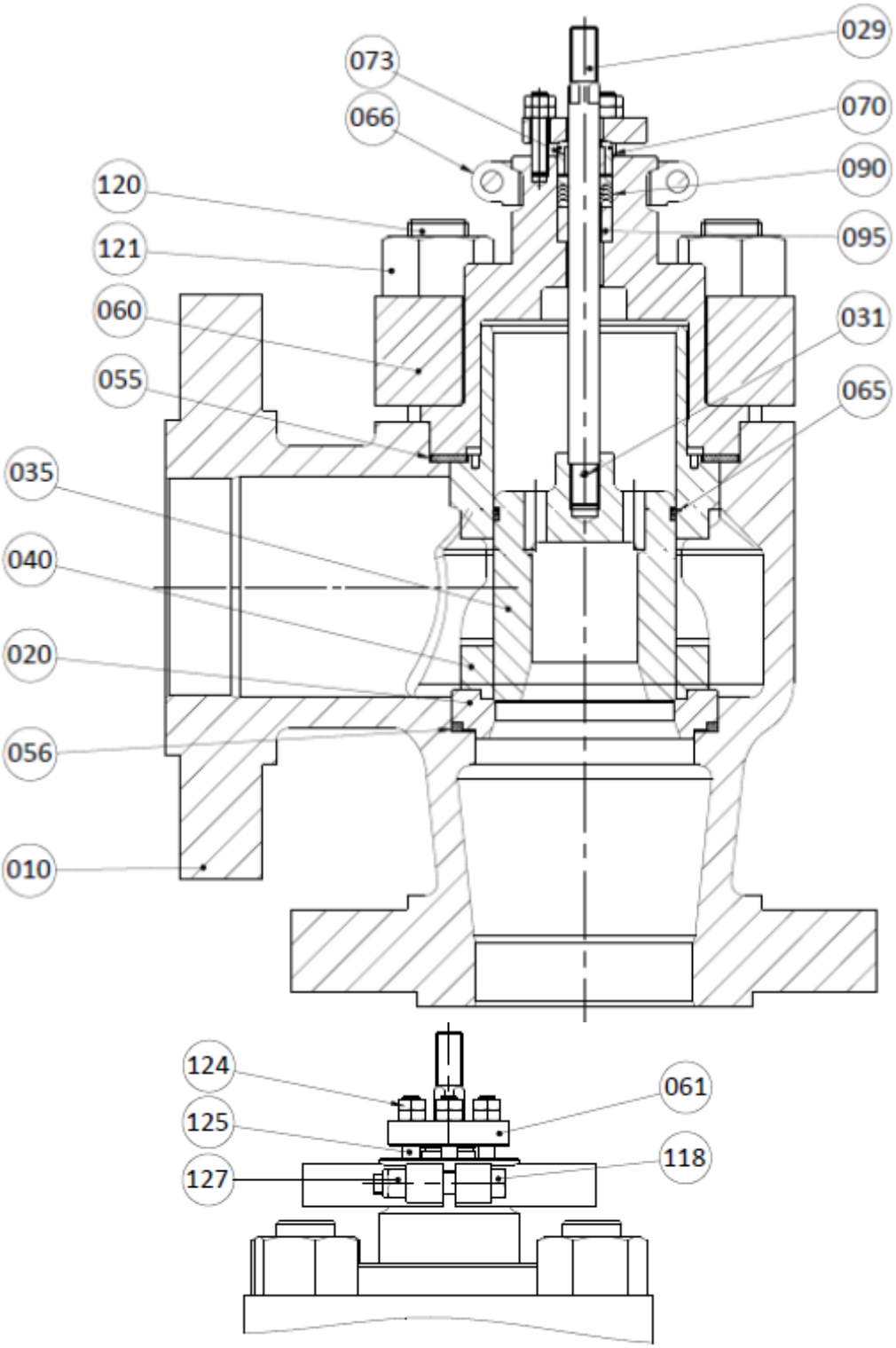


Figure 3 – Angle G-Stream Control Valve Cage guided TRIM

1) STRATEGIC - SUGGESTED SPARE PARTS
2) COMMISSIONING AND TWO YEARS SUGGESTED SPARE PARTS

	ITEM	Q.TY	DESCRIPTION
	127	2	Nut
	125	2	Stud
	124	2	Nut
	121	4	Heavy nut
	120	4	Stud
	118	2	Screw
	95	1	Spacer set
(1)(2)	90	1	Packing set
	73	1	Guide insert
	70	1	Guide
	66	2	Yoke Clamp
(1)(2)	65	1	Lip Seal
	61	1	Packing flange
	60	1	Bonnet flange
(1)(2)	56	1	Gasket
(1)(2)	55	1	Gasket
	50	1	Bonnet
	40	1	Cage
(1)	35	1	Plug
(1)	31	1	Pin
(1)	29	1	Stem
(1)	20	1	Seat
	10	1	Body

Figure 3a – Angle G-Stream Control Valve Cage guided TRIM

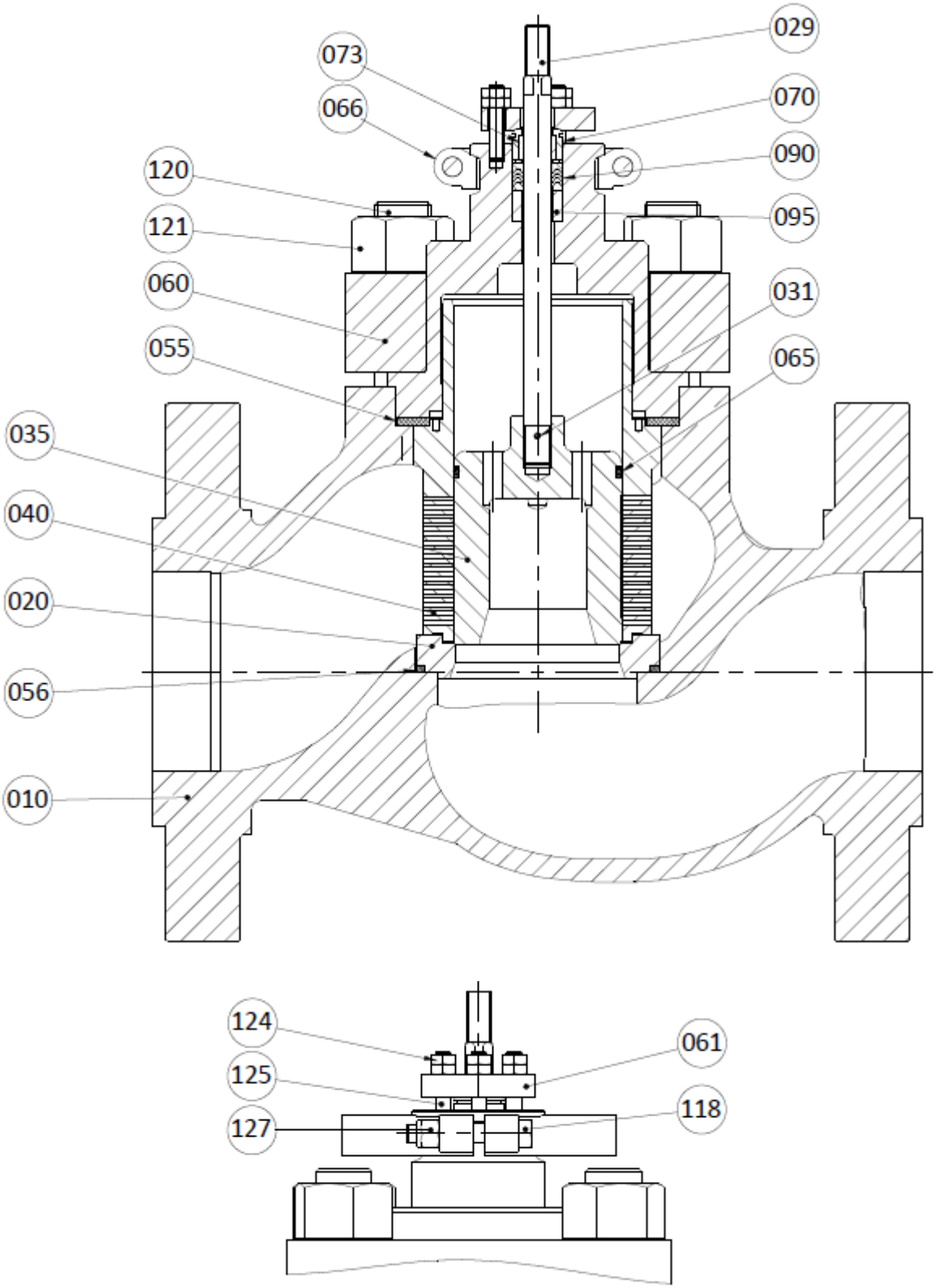


Figure 4 – *G-Stream Control Valve Alpha / Beta TRIM*

	1) STRATEGIC - SUGGESTED SPARE PARTS 2) COMMISSIONING AND TWO YEARS SUGGESTED SPARE PARTS		
	127	2	Nut
	125	2	Stud
	124	2	Nut
	121	4	Heavy nut
	120	4	Stud
	118	2	Screw
	95	1	Spacer set
1)(2)	90	1	Packing set
	73	1	Guide insert
	70	1	Guide
	66	2	Yoke Clamp
1)(2)	65	1	Lip Seal
	61	1	Packing flange
	60	1	Bonnet flange
1)(2)	56	1	Gasket
1)(2)	55	1	Gasket
	50	1	Bonnet
	40	1	Cage
(1)	35	1	Plug
(1)	31	1	Pin
(1)	29	1	Stem
(1)	20	1	Seat
	10	1	Body
	ITEM	Q.TY	DESCRIPTION

Figure 4a – *G-Stream Control Valve Alpha / Beta TRIM*

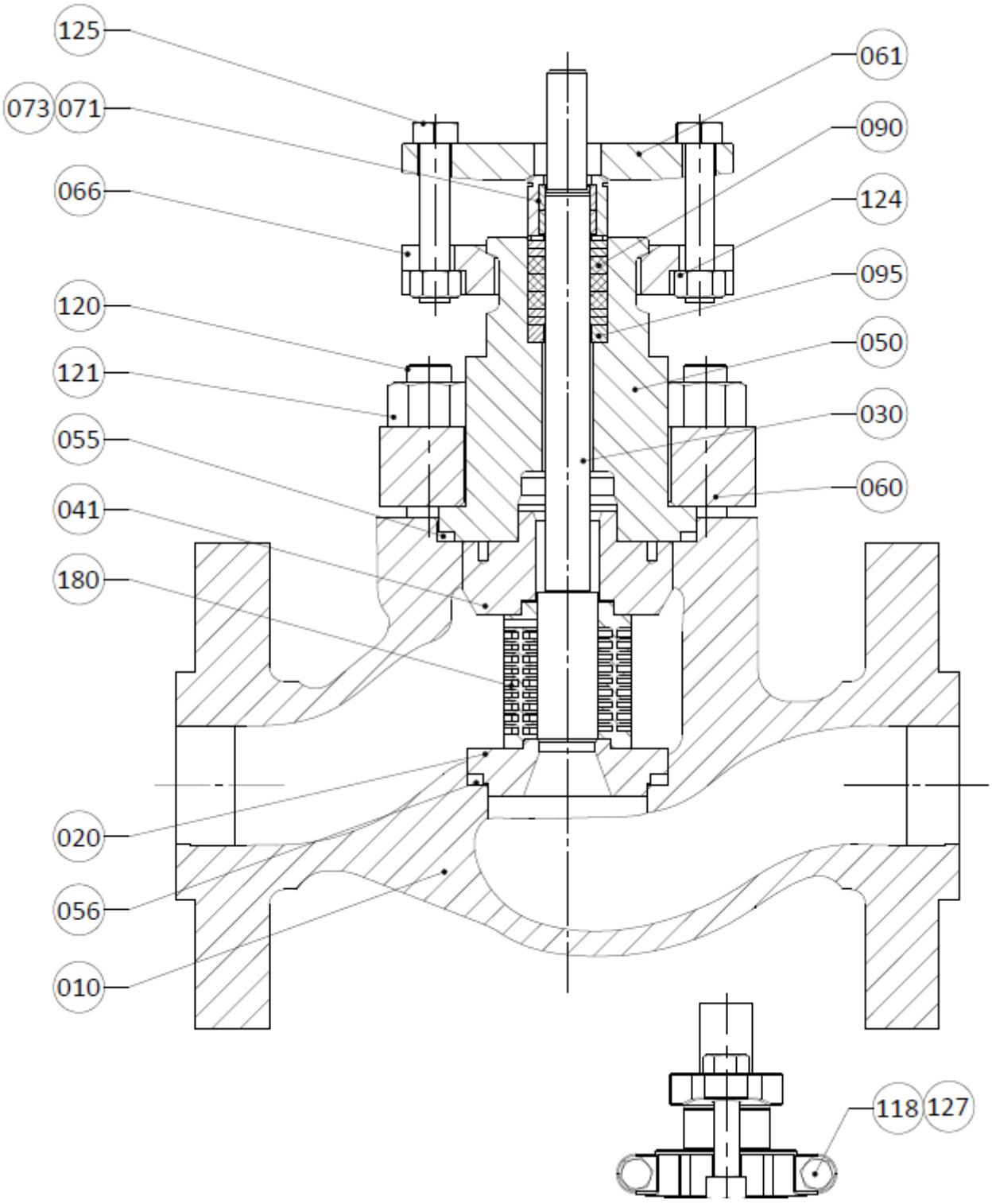


Figure 5 – *G-Stream Control Valve Epsilon TRIM*

(1) STRATEGIC - TWO YEARS SUGGESTED SPARE PARTS
(2) STARTUP - COMMISSING AND STARTUP SUGGESTED SPARE PARTS

	ITEM	QTY	DESCRIPTION	MATERIAL
	180	1	Epsilon Cage	
	127	2	Nut	
	125	2	Screw	
	124	2	Nut	
	121	4	Heavy nut	
	120	4	Stud	
	118	2	Screw	
	095	1	Spacer set	
(1)(2)	090	1	Packing set	
(1)(2)	073	1	Guide insert	
	071	1	Guide	
	066	2	Yoke Clamp	
	061	1	Packing flange	
	060	1	Bonnet flange	
(1)(2)	056	1	Seat Gasket	
(1)(2)	055	1	Bonnet Gasket	
	050	1	Bonnet	
	041	1	Seat retainer	
(1)	030	1	Plug	
(1)	020	1	Seat	
	010	1	Body	

Figure 5a – *G-Stream Control Valve Epsilon TRIM*

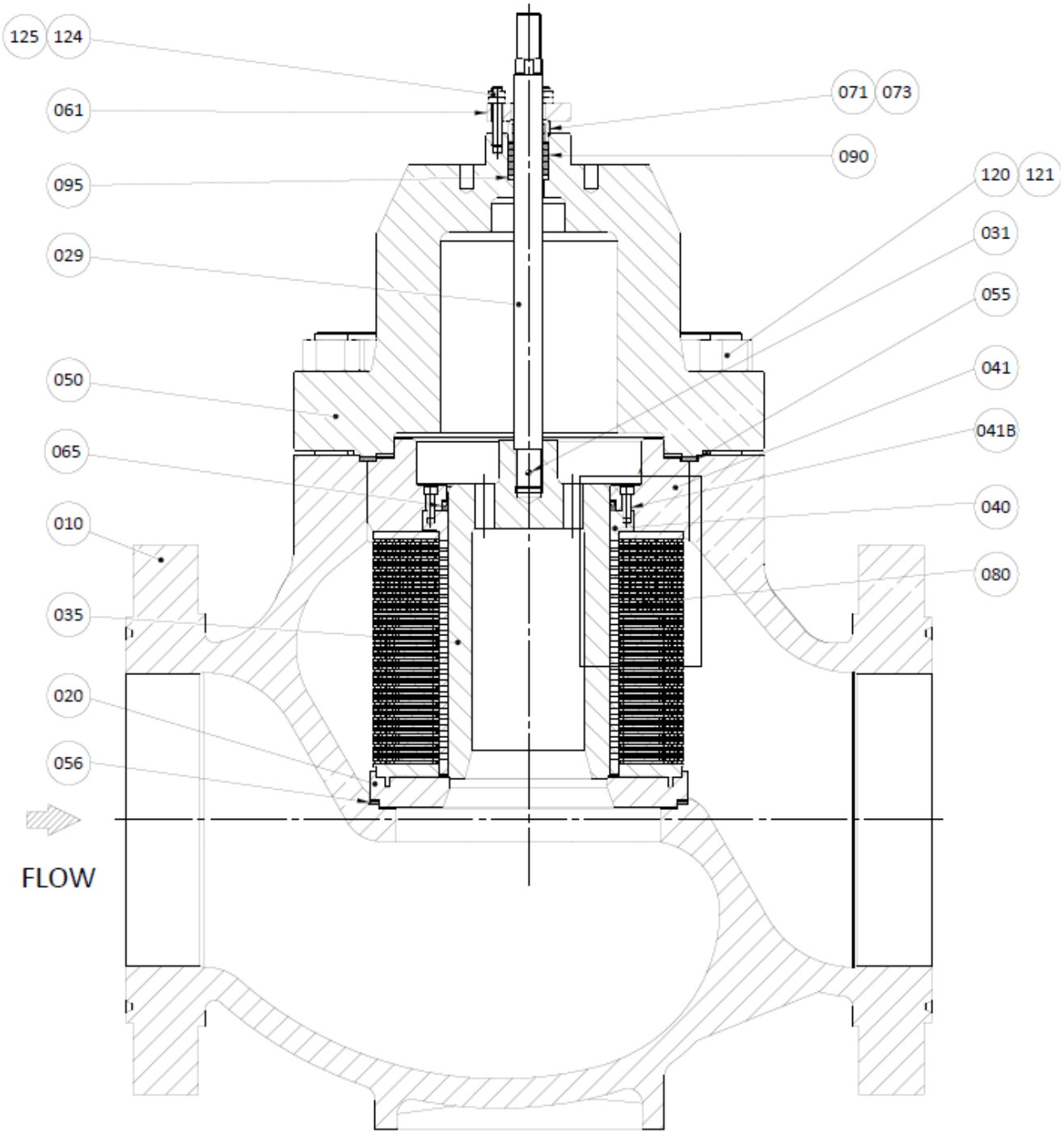


Figure 6 – *G-Stream Control Valve Delta / Etha TRIM*

Note:
(1) Strategic - Suggested Spare parts
(2) Commissioning and two years suggested spare parts

	Item	Description	Material description
	125	Packing Stud	ASTM A193 B8
	124	Packing Nut	ASTM A194 Gr.8
	121	Body/Bonnet Nut	ASTM A194 Gr.8
	120	Body/Bonnet Stud	ASTM A193 B8M
	095	Packing spacer	ASTM A479 316/316L
(2)	090	Packing Graphite	Graphite
(2)	080	Eta Disk Stack	ASTM A240 316/316L
	073	Guide insert	Graphite
	071	Stem guide	ASTM A479 316/316L
	065	Lip Seal	Loaded PTFE + Elgiloy
	061	Packing Flange	ASTM A479 316/316L
(1) (2)	056	Seat gasket	AISI 316 + GRAFITE
(1) (2)	055	Bonnet Gasket	AISI 316 + GRAFITE
	050	Bonnet	ASTM A182 F316
	041B	Adapter Screws	ASTM A193 B8
	041	Adapter	ASTM A479 316/316L
(2)	040	Cage	ASTM A479 316/316L
(2)	035	Plug	ASTM A182 F316 + Stellite 6
(2)	031	Pin	ASTM A240 316/316L
(2)	029	Stem	ASTM A479 XM-19
(2)	020	Seat	ASTM A182 F316 + Stellite 6
	010	Body	ASTM A351 CF8M

Figure 6a – *G-Stream Control Valve Delta / Etha TRIM*

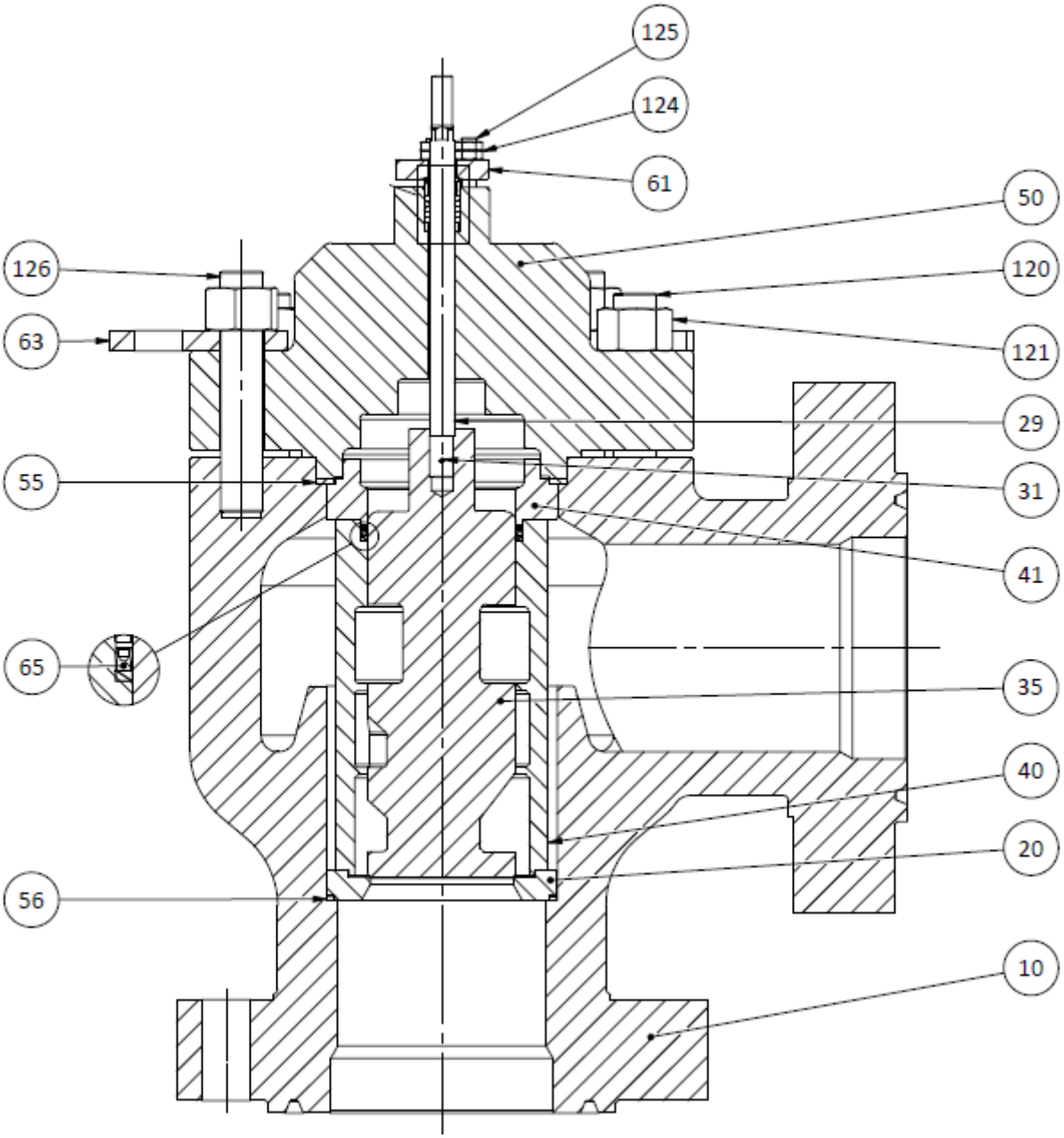


Figure 7 – *G-Stream Control Valve Gamma TRIM*

126	4	STUD	ASTM A320 L7 BICHROMATE
125	3	STUD	ASTM A193 B8 CL.1
124	6	NUT	ISO 3506 A2-70
121	12	HEAVY NUT	ASTM A194 GR.7 BICHROMATE
120	8	STUD	ASTM A320 L7 BICHROMATE
95C	1	SPACER	ASTM A479 316/316L
95B	1	SPACER	ASTM A240 316/316L
90A	1	PACKING SET	GRAPHITE
73	1	GUIDE INSERT	GRAPHITE
70	1	STEM GUIDE	ASTM A479 316/316L
65	1	LIP SEAL	LOADED PTFE + ELGILOY + PEEK
63	4	LIFTING PLATE	ASTM A516 70 + ZINC.
61	1	PACKING FLANGE	ASTM A479 316/316L
56	1	BODY / SEAT GASKET	316 + GRAPHITE
55	1	BODY / BONNET GASKET	316 + GRAPHITE
50	1	INTEGRAL BONNET	ASTM A352 LCC
41	1	ADAPTER	ASTM A350 LF2 CL.1
40	1	SLEEVE	ASTM A276 420 Annealed Nitrided
35	1	PLUG	ASTM A564 TP630 17-4PH H1150D
31	1	PIN	INOX
29	1	STEM	ASTM A564 TP630 17-4PH H1150D
20	1	SEAT	ASTM A564 TP630 17-4PH H1150D
10	1	BODY	ASTM A352 LCC
ITEM	**Q.TY**	**DESCRIPTION**	**MATERIAL**

Figure 7a – *G-Stream Control Valve Gamma TRIM*

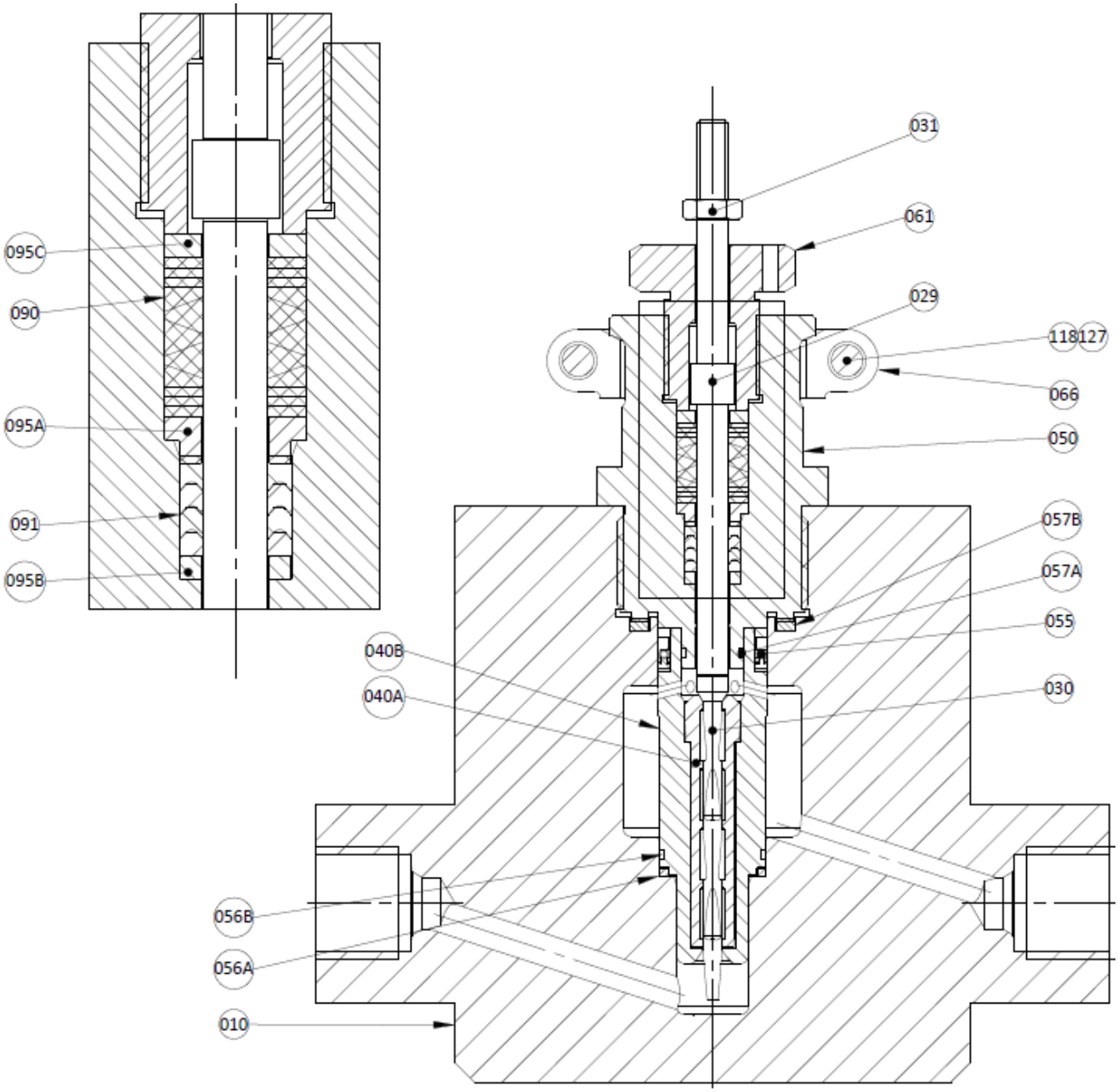


Figure 8 – *G-Stream Control Valve micro-Gamma TRIM*

	127	410000010100000	Nut	ISO 3506 A4-70	
	118	400008350200000	Screw	ASTM A1082 S31803	
	095C	095APC01003M001	Spacer	AISI 316	
	095B	095APC01003M101	Spacer	AISI 316	
	095A	095APC01003M201	Spacer	AISI 316	
(1)(2)	091	090ATRS01U0Y001	Packing Chevron	Loaded PTFE + PEEK	
(1)(2)	090	090AGRS01U0Y001	Packing Graphite	Graphite	
	066	066APC052000001	Yoke clamp	ASTM A351 CF8M	
	061	061APC017000101	Packing Plug	ASTM A479 316/316L	
(1)(2)	057B	45OR20140000000	Gasket	PTFE	
(1)(2)	057A	AGS0041E0032M25	Gasket	PTFE	
(1)(2)	056B	45OR20210000000	Gasket	PTFE	
(1)(2)	056A	AGS0026E0023E15	Gasket	PTFE	
(1)(2)	055	AL4027F03A10HA1	Lip Seal	Loaded PTFE + Elgiloy	
	050	050ACLCA8200001	Bonnet	ASTM A479 316/316L	MDS AB001
(1)	040B	040BCLCA8200001	Seat for Guide	ASTM A479 XM-19	MDS-AF039
(1)	040A	040ACLCA8200001	Guide	Tungsten carbide	MDS-STC-F
(1)	030	030ACLCA8200001	Plug	Tungsten carbide	MDS-STC-F
	031	410001080200000	Antirotation Nut	ISO 3506 A4-70	
(1)	029	029APC01140M011	Stem	ASTM A479 XM-19	MDS-AF039
	010	010ACLSA8200001	Body	ASTM A479 316/316L	MDS AB001
	Item	**Part number**	**Description**	**Material description**	**MDS**

(1) STRATEGIC – SUGGESTED SPARE PARTS
(2) COMMISSIONING AND TWO YEARS SUGGESTED SPARE PARTS

Figure 8a – *G-Stream Control Valve micro-Gamma TRIM*

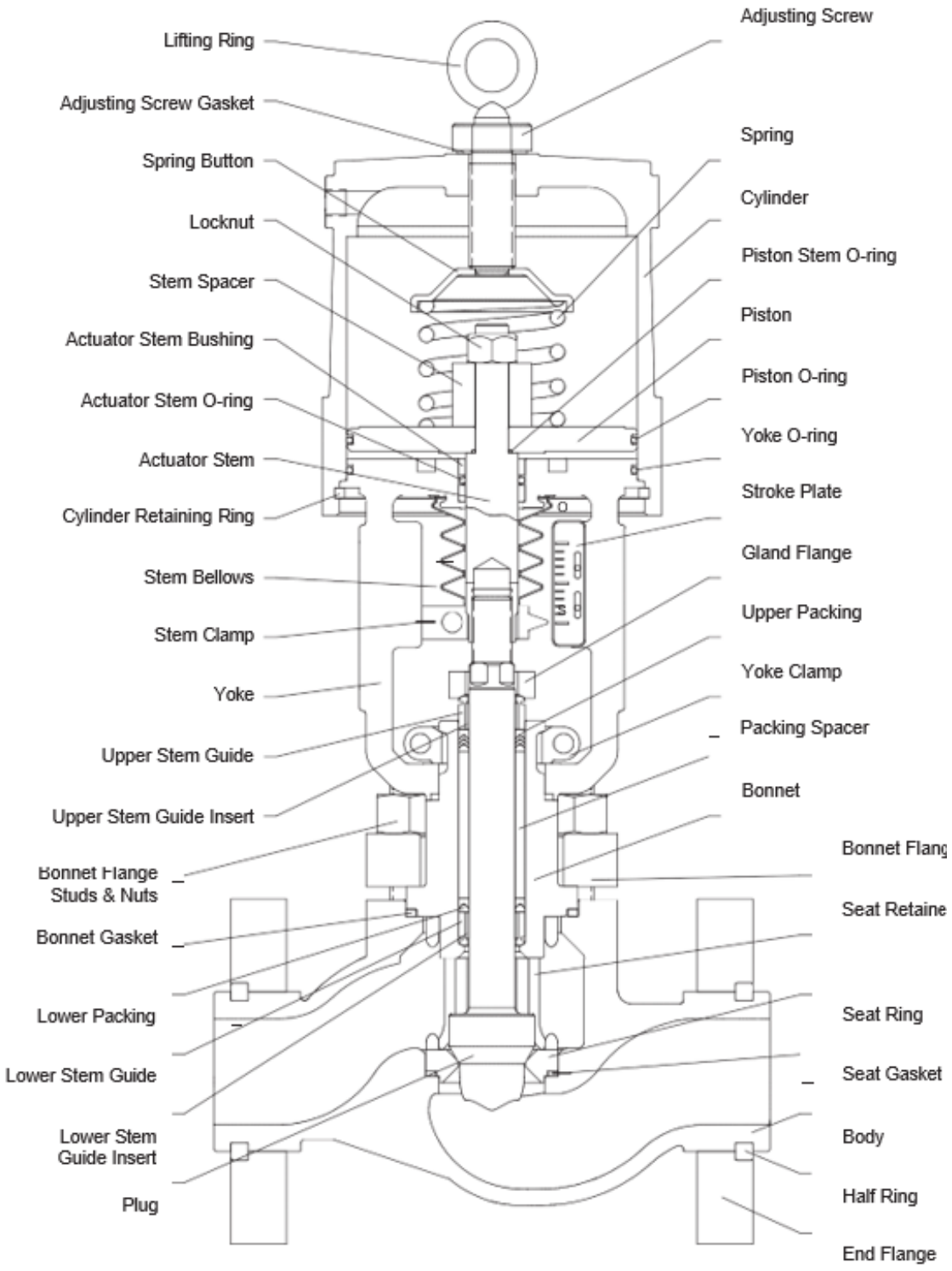


Figure 9 – *G-Stream Control Valve Actuator Detail*

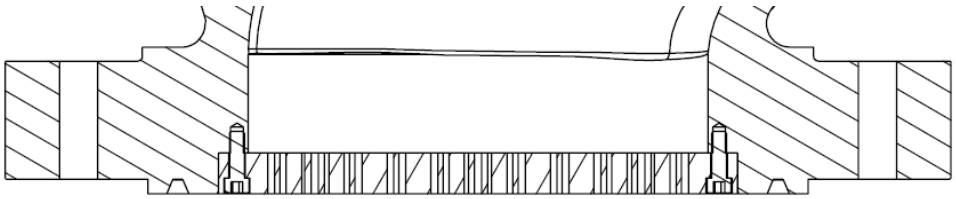


Figure 10 – Drilled disc on valve outlet: *in special case, for severe service condition, in order to reduce the valve noise, it is possible to install a drilled disc on valve outlet.*
In this way differential pressure across the valve can be reduced and, as consequence, achieve a sensible reduction of fluid velocity, main cause of aerodynamic noise

Although Petrolvalves provides precise and detailed installation, operation and maintenance instructions, in accordance with their design reviews, the customer/user shall be responsible for the information provided to generate product specifications, shall understand precisely the operation and maintenance instructions provided with the products and shall provide training for their employees and contracted personnel regarding the safe use of Petrolvalves products, in accordance with the specific applications they were designed for. The information herein shall not be considered as a certificate for assurance of satisfactory results. Petrolvalves products are continuously improved and upgraded and the specification, dimensions and information contained herein are subject to change without notice. For further information or to confirm these presented here, consult Petrolvalves at Phone: +39 02 673 83 411.

Quality Management System

ISO 9001-2008

Installation, Operation and Maintenance Instructions

L-Act Linear Actuators 05

Spring-Cylinder Type

INDEX

1.1 - GENERAL INFORMATION

The following instructions are designed to assist in the installation, operation and maintenance of VSI Controls' spring-cylinder L-Act linear actuators, as necessary.
Users and maintenance personnel should read this bulletin carefully before the installation, operation or servicing of the actuator, positioner or any other accessory installed on the actuator. Separate maintenance instructions cover additional characteristics such as handwheel, stroke limiters, limit switches, etc.
Reading the maintenance bulletin of the valve or equipment where the actuator is installed is also recommended.

WARNING!

If it is necessary to store the products before field installation, VSI Controls recommends that actuators be stored in dry, fresh, closed places. Do not store actuators in places where relative humidity is higher than 85% or the room temperature is lower than 41°F or higher than 113°F (5 to 45°C). Environments containing excessive UV radiation, acid or alkaline mist or ozone sources must be avoided.
Product storage in non-recommended places may void the manufacturer warranty.

1.2 - UNPACKING

- When removing the actuator from its package, check the packing list or the actuator datasheet, comparing it with the received material.
- When lifting the actuator from shipping container, position the lifting straps properly in order to avoid damages to the tubings and accessories assembled in the actuator. Actuators with sizes 25 and 50 may be lifted by the lifting rings provided on the top of the cylinder. In case there is no lifting ring provided, lift the actuator using straps attached to the yoke legs.
- In case of damages during transport, immediately contact the shipper.
- In case of any problem, call your VSI Controls representative.

1.3 - SAFETY WARNINGS

To avoid potential injury and/or damage to the actuator parts, WARNING and CAUTION notes must be strictly observed.
Changing this product characteristics, using non-original spare parts or using maintenance procedures different from those presented herein may affect the performance of the actuator, be hazardous to personnel and equipment and may void the manufacturer warranty.

WARNING!

Standard industry safety practices must be applied when using this equipment. Industry safety standards for personal protection and for equipment handling must also be observed.

CAUTION

The lifting hooks on the actuator must be used to lift the actuator alone. Under no circumstances these hooks should be used to lift the actuator and valve assembly.
When lifting an actuator using straps passed through the yoke legs, take care when the center of gravity is above the lifting point. An adequate support must be provided to prevent the actuator from turning. A failure in this procedure may cause severe injuries, as well as damage to the valve and to the equipment nearby.

CAUTION

Consider the total weight before lifting or transporting the actuator. A failure to observe this warning may result in serious injury.

1.4 - INSTALLATION

Before installing the actuator on a control valve or other equipment make sure there is sufficient height available for the actuator in order to allow its removal from valve body and to provide the adequate maintenance.

Table I: Free space necessary to disassemble the actuator

Valve Dimension (in)	Disassembly clearance					
	Valve Class					
	150	300	600	900	1500	2500
	mm	mm	mm	mm	mm	mm
0.5	100	100	100			
0.75	100	100	100	100	100	100
1	100	100	100	100	100	100
1.5	110	110	110	120	120	120
2	110	110	110	120	120	120
3	120	120	120	120	120	150
4	120	120	120	120	120	150
6	150	150	150	150	150	
8	200	200	200	200	200	
10	200	200	200	200	200	
12	200	200	200	200	200	
14	200	200	200			
16	200	200	200			
20	200	200	200			
24	200	200	200			

- Connect air supply and instrument signal (throttling actuators are generally equipped with positioners). The air ports are identified indicating the air supply and the instrument signal. The actuator can operate with air supply pressure up to 150 psi (10.3 Bar). However, the sticker attached to the cylinder must be checked for maximum pressure allowed. Air filter is recommended, unless the instrument air is clean and dry.

Note: under special circumstances, the maximum air supply pressure must be limited to 80 or 100 psi depending on the actuator size and the positioner installed.

CAUTION

Do not exceed the maximum pressure indicated on sticker: people may be injured and damage to the equipment may occur.

WARNING

For transport reasons, the air filter may be installed out of the vertical position. Before operating the actuator, position the air filter pointing down.

- Using a soap solution, make sure that there are no leakages in all pneumatic fittings.

1.5 - PREVENTIVE MAINTENANCE

Check if the actuator is working properly at least every six months following the preventive maintenance steps indicated below.

This sequence can be performed with the actuator in service and, in some cases, without disturbing operation. In case there is a potential problem inside the actuator, refer to the section “Disassembly and Reassembly”:

- Inspect signs of leakage through the pneumatic fittings. Tighten loosen pneumatic fittings and replace leaking ferrules.
- Observe if corrosive vapors or process fluid dripping is damaging the actuator.
- Clean the actuator and repaint areas of severe oxidation.
- If possible, stroke the actuator and check if the actuator stem travels its full stroke in a smooth and uniform way.

CAUTION

When operating the actuator, keep your hands, hair, clothes, etc. away from moving parts. Failure to follow this warning may result in serious injury.

- If the actuator is equipped with a positioner, check the calibration of assembled unit, comparing the pressure indicated in the positioner gauges against the stroke plate of the actuator. Make sure that the positioner is calibrated within the correct range. Refer to the positioner instructions for information about preventive maintenance.
- If applicable, certify that mechanical linkage with the positioner is connected in a safe way. Check also if the stem clamp is firmly secured and if the pug stem is properly connected to the actuator stem.
- Make sure that all accessories, brackets and bolts are firmly secured.
- If possible, shutoff air supply and observe on stroke plate if specified failsafe position is reached.
- Apply a soap solution around the cylinder retaining ring, the actuator bushings and the adjusting screw and check if there are air leaks through the O-rings and gasket.
- Remove any contaminant or other foreign material from the exposed areas of actuator stem.
- If an air filter is supplied, check and replace cartridge if necessary.

DISASSEMBLY AND REASSEMBLY

1.6 - DISASSEMBLING THE ACTUATOR

In case any internal problem is suspected with the actuator requiring its disassembly, refer to Figures 1, 2 and 3 and proceed as follows:

- Before disconnecting the actuator from the valve or removing the complete valve from pipeline, observe the note below:

CAUTION

Removing the valve for maintenance: piping must be completely depressurized and process fluid drained. In case of toxic, caustic or hazardous fluid services, the valve must be decontaminated to avoid accidents.

- Shutoff the air supply and cutoff instrument signal and electric devices (if applicable). If the actuator is assembled on a VSI Controls valve, read also the corresponding valve IOM before removing the actuator from the valve.
- Disconnect all tubings, remove the stem clamp and the stem bellows.
- Following the steps indicated on valve IOM, disconnect the actuator from the valve.
- Using an open wrench, relieve completely the spring compression, removing the adjusting screw. Remove also the adjusting screw gasket.

WARNING

Do not use a screwdriver, bar, etc. to turn the adjusting screw since this procedure may cause damages to the lifting ring weld. Use an adequate open wrench on flat surfaces of the screw head.

CAUTION

The spring compression must be completely relieved before disassembling the actuator. If this is not done, the cylinder may be ejected out of the yoke when the retaining ring is removed from the cylinder, causing serious injury.

- Remove the retaining ring from the groove at the base of the cylinder using two screwdrivers. Introduce the tip of a screwdriver in the slot on the ring and remove the ring out of its channel. Use another screwdriver to help the operation of removing the ring.
- Pull the cylinder out of the yoke and piston (some O-ring resistance may be felt).

CAUTION

Do not use air pressure to remove cylinder. This may cause the cylinder to be ejected out of the yoke, causing serious injury.

- In the “air-to-retract” configuration, remove the spring(s) and the spring button for cleaning and inspection (see Figures 1 and 2). Remove the locknut and slide the piston and the stem spacer out from the actuator stem. On actuators with dual springs the spring guide must be removed also.
- In the “air-to-extend” configuration (Fig. 3), slowly release and remove the actuator stem locknut, making sure that the piston follows the locknut and is not jammed on the actuator stem. Remove the stem locknut, spring button, piston, spring and stem spacer.
- Remove the O-rings from the piston, the piston stem and from the yoke.

WARNING

The maintenance step indicated below can only be performed if the actuator has been removed from the valve.

- To inspect the actuator stem O-ring, remove the stem clamp and corresponding rubber bellows. Push the actuator stem through the yoke, taking care not to gall the stem. The O-ring may now be inspected and replaced if necessary.

WARNING

The upper and lower actuator stem bushings are pressed into the yoke. It is not necessary to remove them to replace the actuator stem O-ring.

- If the bushings are worn out or damaged use a press with appropriate size to extract the used bushings and insert the new ones in the yoke.

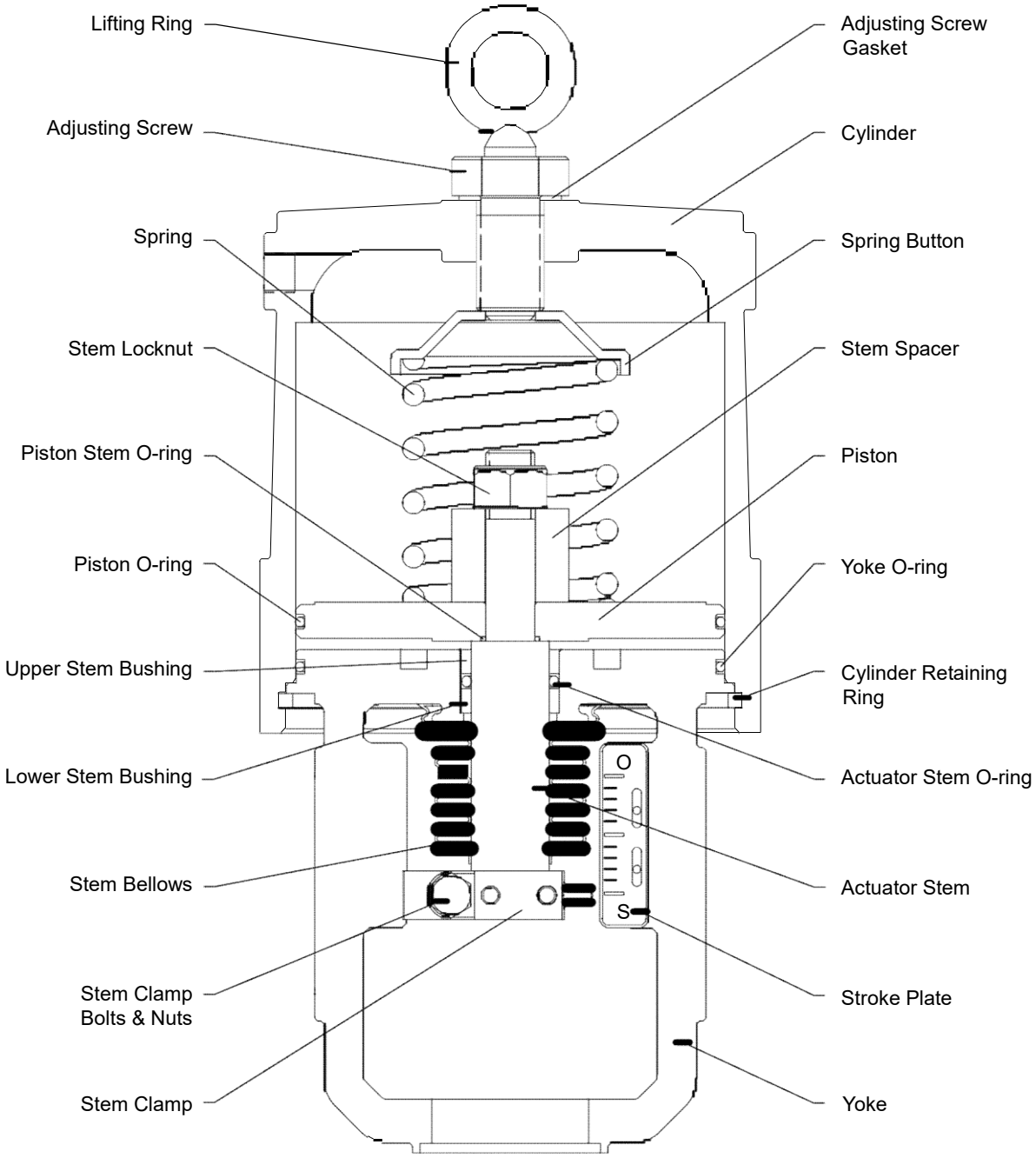


Figure 1 – L-Act Spring-Cylinder Actuator (Air-to-Retract)

[1] As standard, the lifting rings are provided just for actuators sizes 25 and 50.

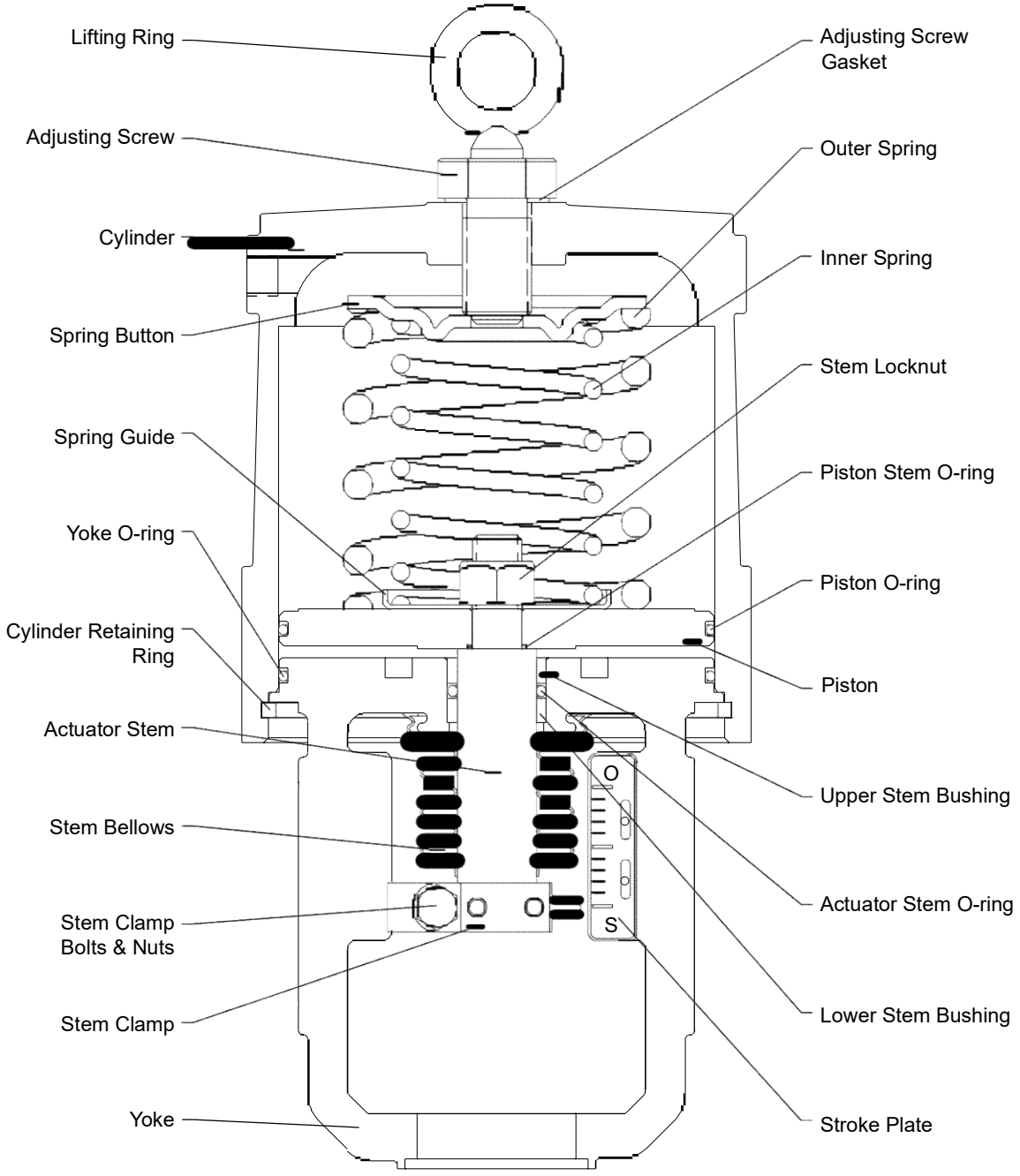


Figure 2 – L-Act Spring-Cylinder Actuator with Dual Spring (Air-to-Retract)

[1] As standard, the lifting rings are provided just for actuators sizes 25 and 50.

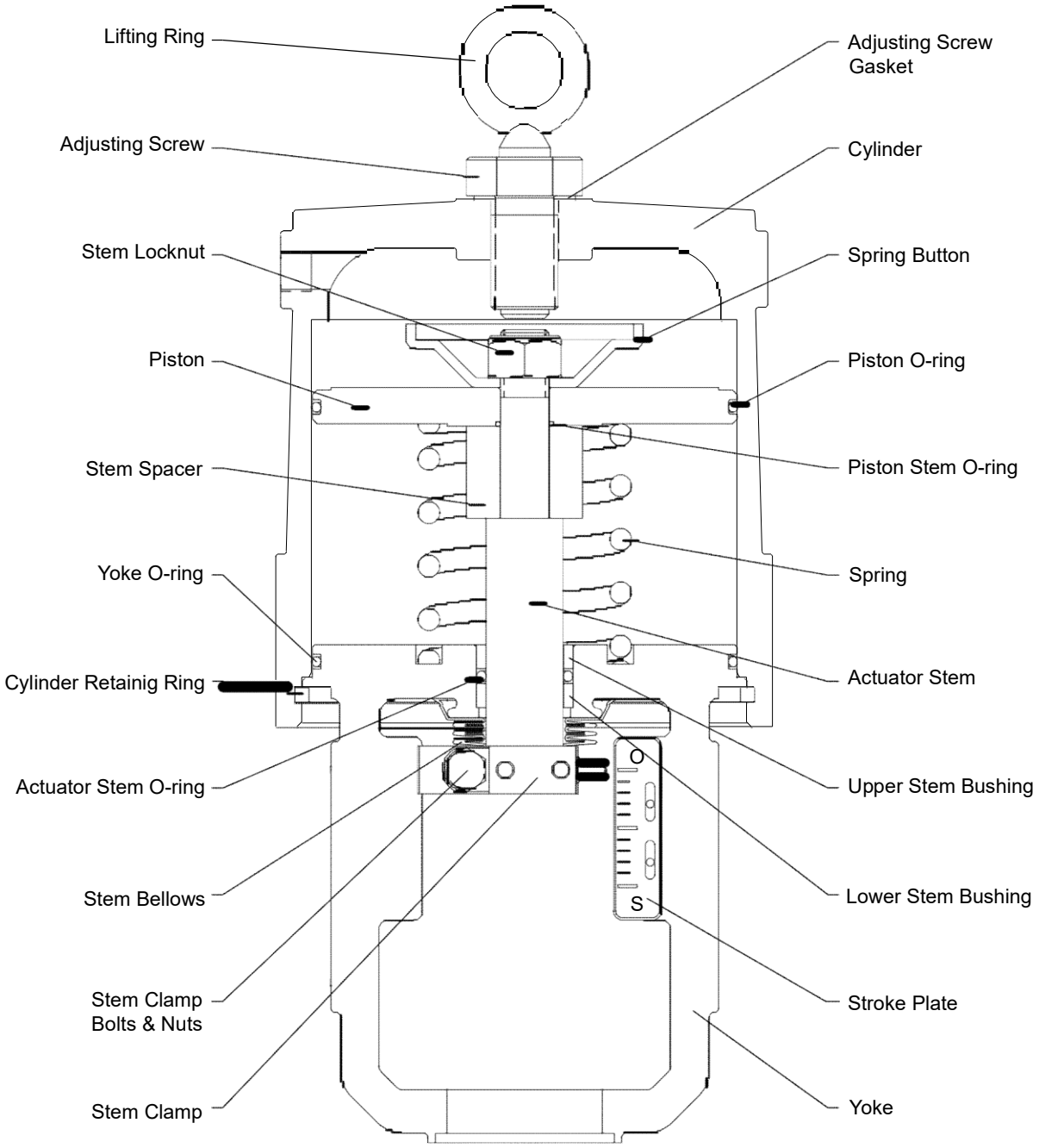


Figure 3 – L-Act Spring-Cylinder Actuator (Air-to-Extend)

[1] As standard, the lifting rings are provided just for actuators sizes 25 and 50.

1.7 – REASSEMBLING THE ACTUATOR

To reassemble the actuator refer to the Figures 1, 2 e 3 and proceed as follows:

- All the O-Rings must be replaced and the new ones must be lubricated. The majority of the O-rings can be lubricated with silicone lubricant (Dow Corning 55M or equivalent). Silicone O-rings must be lubricated with Magnalube-G or equivalent (do not use a silicone lubricant on silicone O-rings).
- Assure that all internal parts are completely clean before starting to assemble. Apply the proper lubricant to the cylinder wall. If the bushings have been removed, lubricate the external side of the replacement bushings. Press the new lower stem bushing into the yoke until it touches the bottom shoulder. Press the upper stem bushing until it is aligned with the top of the yoke (see Figure 4).

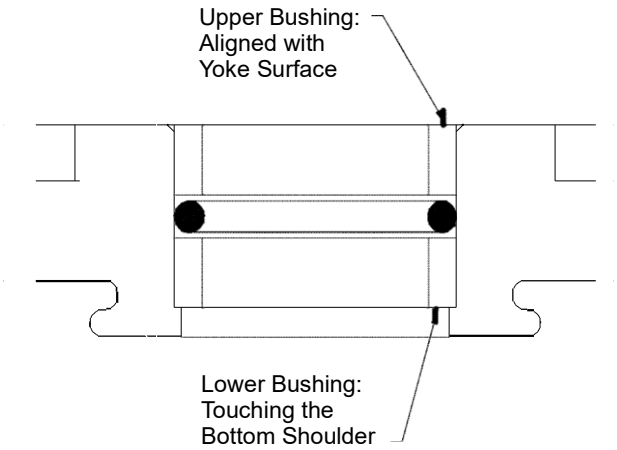


Figure 4 – Assembling the Stem Bushings

- Replace the O-rings on the actuator stem and on the yoke. Reassemble the actuator stem.
- Reassemble the piston, the piston stem O-ring and the stem spacer in the actuator stem, according to the desired air action (see figures 1, 2 and 3). Replace the piston O-ring. The air-to-extend configuration requires that the spring button be fixed by the actuator stem locknut. Tighten the nut firmly.
- In the air-to-extend configuration, place the spring below the piston and insert the actuator stem through the yoke, taking care not to strike (and scratch) the stem or bushings. For air-to-retract configurations insert the actuator stem through the yoke and place the spring(s) and the spring button on the top of the piston.
- Assemble the cylinder in the yoke, assuring that these parts are correctly positioned to allow the installation of the cylinder retaining ring. Care must be taken to avoid scratching or cutting the O-rings on the piston and on the yoke.
- Insert the retaining ring into the cylinder groove, by steps, until it is fitted in place. Using a hammer and a drift rod, tap gently on the retaining ring, already fitted in place, to confirm that it is securely installed.

CAUTION

The cylinder retaining ring must be securely fixed into the groove so that the cylinder does not escape when pressurized, causing personal injury. During installation, avoid damaging or deforming the edge of the retaining ring square section.

- Reinstall the adjusting screw, using a new adjusting screw gasket.

WARNING

In the air-to-retract configurations make sure that the hole in the spring button is centered directly under the adjusting screw hole.

- Tighten the adjusting screw sufficiently so that the gasket provides a leak proof sealing. Do not overtighten it.

WARNING

Do not use a screwdriver, bar, etc. to turn the adjusting screw since this procedure may cause damages to the lifting ring weld. Use an adequate open wrench on flat surfaces of the screw head.

- Replace the stem bellows and reinstall the stem clamp.
- Apply air on top of the piston. With the stem clamp adjusted indicating the “closed position” on the stroke plate, tighten the stem clamp bolt.

WARNING

When installing the stem clamp, make sure that the bolt of the clamp is square to one of the flat faces machined on the actuator stem. This assures a more rigid connection.

1.8 – REVERSING THE AIR ACTION

Changing to Air-to-Retract

To reverse the configuration from “air-to-extend” to “air-to-retract”, refer to Figure 6 and proceed as follows:

- Disassemble the actuator according to the section “Disassembling the Actuator”.
- Reassemble the actuator with the stem spacer, the spring and the spring button over the piston (make sure that the hole in the spring button is centered directly under the adjusting screw hole).
- If the actuator is equipped with a positioner, the positioner must be reversed too (refer to positioner IOM prior to proceed).

Changing to Air-to-Extend

To reverse the configuration from “air-to-retract” to “air-to-extend”, refer to Figure 6 and proceed as follows:

- Disassemble the actuator according to the section “Disassembling the Actuator”.
- Reassemble the actuator with the stem spacer and the spring underneath the piston. The spring must be seated on the groove existing on the top of the yoke and the spring button must be stored above the piston (secured by the stem locknut).
- If the actuator is equipped with a positioner, the positioner must be reversed too (refer to positioner IOM prior to proceed).

1.9 – SEALING OF THE RETAINING RING

If the actuator is installed in environments with extremely high relative humidity or potentially very corrosive, the sealing of the cylinder retaining ring (made from zinc plated carbon steel) is recommended to avoid permanent contact with the aggressive atmosphere. In cases like this, RTV silicone sealant must be applied between the yoke and the cylinder as indicated on Figure 5 below.

In case of exceptionally aggressive atmospheres, cylinder retaining rings made from stainless steel are available as optional item.

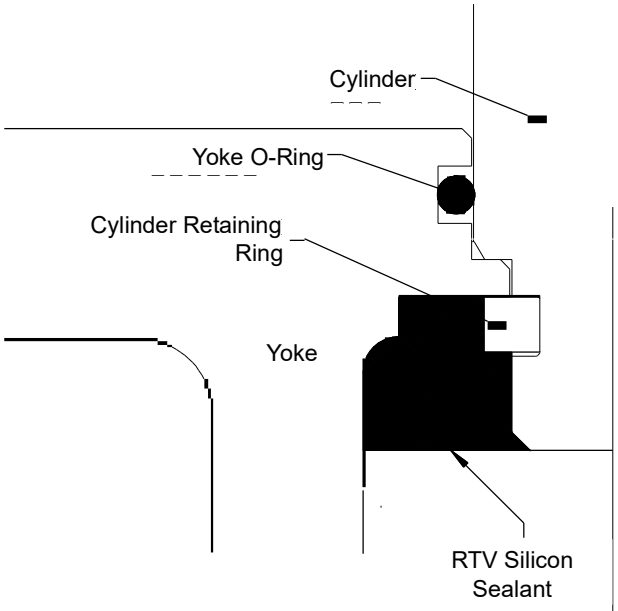


Figure 5 – Sealing of the Retaining Ring

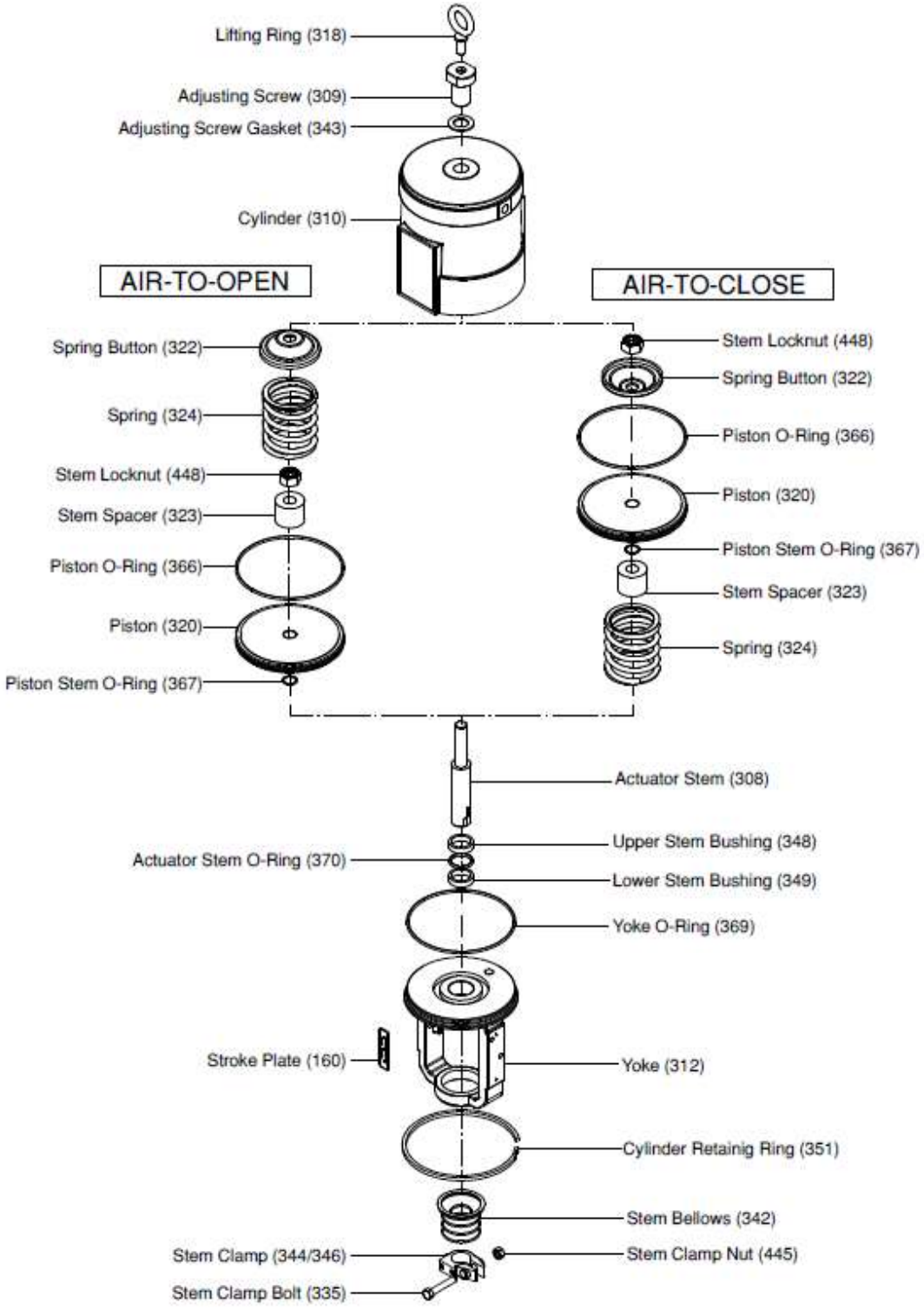


Figure 6 - Exploded View, L-Act Spring-Cylinder Actuator

[1] Item numbers above correspond directly to the actuator's bill of material.
[2] As standard, the lifting rings (item no. 318) are provided just for actuators sizes 25 and 50.

1.10 - LINEAR ACTUATOR TROUBLESHOOTING CHART

Problem	Probable Cause	Corrective Action
Excessive air consumption	• Leaks in air supply or instrument signal system • Malfunctioning positioner • Leaks through O-rings or adjusting screw gasket	• Tighten the fittings and replace any leaking ferrule • See positioner IOM • Replace O-rings and/or gasket
Actuator does not fail in correct position	• Air pressure in cylinder not venting because of malfunctioning positiner • Spring failure • Internal valve problem	• See positioner IOM • Replace spring • See valve IOM
Stem moves slowly or does not move	• Insufficient air supply • Unlubricated cylinder wall • Worn or damaged stem bushings • Improperly assembled spring • Internal valve problem	• Check for leaks in air supply or instrument signal system; tighten loose fittings and replace any leaking ferrule • Lubricate cylinder wall with the proper lubricant • Check actuator stem for damages; replace actuator stem, O-ring and stem bushings, if necessary • Disassemble actuator and check cylinder and piston for damages; reassemble actuator correctly • See valve IOM

1.11 - SPARE PARTS

For the supply of spare parts it is necessary to inform VSI Controls the name and the part number of the required item and/or the name of the required component and the actuator serial number.

1.12 - RECYCLING INFORMATION

Linear actuators supplied by VSI Controls may present a very long operational life depending on the application they are provided for and the proper maintenance care.
In case of doubt, please contact your VSI Controls representative.

Although VSI Controls provides precise and detailed installation, operation and maintenance instructions, in accordance with their design reviews, the customer/user shall be responsible for the information provided to generate product specifications, shall understand precisely the operation and maintenance instructions provided with the products and shall provide training for their employees and contracted personnel regarding the safe use of VSI Controls products, in accordance with the specific applications they were designed for. The information herein shall not be considered as a certificate for assurance of satisfactory results. VSI Controls products are continuously improved and upgraded and the specification, dimensions and information contained herein are subject to change without notice. For further information or to confirm these presented here, consult VSI Controls at Phone: +39 02 673 83 411.

Quality Management System

ISO 9001-2008

Certificate No. 311001 QM

SMART POSITIONER
YT-3300 / 3350 / 3303 / 3301 SERIES

PRODUCT MANUAL

YT-3300

YT-3350

YT-3303

YT-3301

rotork®
Rotork YTC Limited

Contents

1 Introduction

1.1 General Information for the users

Thank you for purchasing Rotork YTC Limited products. Each product has been fully inspected after its production to offer you the highest quality and reliable performance. Please read the product manual carefully prior to installing and commissioning the product.

- Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator accordingly.
- The manual should be provided to the end-user.
- **Factory Mutual approved Intrinsically Safe and Non-Incendive units must be Installed Per drwg SKC_18601_150326.pdf**
- **CSA approved Intrinsically Safe and Non-Incendive units must be Installed Per drwg SKC-8465.pdf**
- The manual can be altered or revised without any prior notice. Any changes in product's specification, design, and/or any components may not be printed immediately but until the following revision of the manual.
- When the manual refers to **"Valve Zero / Zero"** means the final valve position upon pneumatic pressure has been fully exhausted from positioner's OUT1 port. For example, the valve zero position may differ between linear direct and reverse actions. (DA/RA)
- The manual should not be duplicated or reproduced for any purpose without prior approval from Rotork YTC Limited, Gimpo-si, South Korea.
- In case of any other problems that are not stated in this manual, please make immediate contact to Rotork YTC Limited.
- Positioner is an accessory of the control valve, so please make sure to read the applicable instruction manual of the control valve prior to installation and operation.

1.2 Manufacturer Warranty

- For the safety, it is important to follow the instructions in the manual. Manufacturer will not be responsible for any damages caused by user's negligence.
- Any modifications or repairs to the product may only be performed if expressed in this manual. Injuries and physical damages caused by customer's modifying or repairing the product without a prior consultation with Rotork YTC Limited will not be compensated. If any alterations or modifications are necessary, please contact Rotork YTC Limited directly.
- The warranty period of the product is (18) months from the date of shipment unless stated otherwise. Date of shipment can be checked by providing the LOT NO. or SERIAL NO. to us.

- Manufacturer warranty will not cover products that have been subjected to abuse, accidents, alterations, modifications, tampering, negligence, misuse, faulty installation, lack of reasonable care, repair or service in any way that is not contemplated in the documentation for the product, or if the model or serial number has been altered, tampered with, defaced or removed; damages that occurs in shipment, due to act of God, failure due to power surge, or cosmetic damage. Improper or incorrectly performed maintenance will void this limited warranty.
- For detailed warranty information, please contact the corresponding local Rotork YTC Limited office or main office in South Korea.

1.3 Explosion Proof Warning (Only for Intrinsic safety type positioners)

Please ensure the unit is being used and installed in conformity with local, regional, and national explosion proof within the proper safety barrier environment.

- Refer to “2.6 Certifications”
- Explosion proof type of cables and gaskets should be used, when explosion gases are present at the installation site.
- Positioner has 2 ports for power connection. Explosion proof type wires and packing should be used. Blind plug is required when any port is not being used.
- Ring terminal with surface area of more than 1.25mm^2 with M4 spring washer should be used to connect the power.
- For external ground terminal, ring terminal with surface area of more than 5.5mm^2 should be used.
- Wiring in these applications shall utilize appropriate methods for Class I, Division 2 / Zone 2
- Substitution of components may impair intrinsic safety.
- WARNING – EXPLOSION HAZARD – Substitution of components may impair suitability for Class I, Division 2.
- “AVERTISSEMENT – RISQUE D'EXPLOSION – Remplacement des composants peut nuire à la conformité de Classe I, Division 2”
- EXPLOSION HAZARD. Do not connect or disconnect wiring unless all sources of power have been removed or the area is known to be non-hazardous.
  (French) RISQUE D'EXPLOSION. Ne pas raccorder ou débrancher le câblage à moins Toutes les sources d'énergie ont été enlevées ou la zone est connue pour être non dangereux.
- The enclosure of models YT-3300, YT-3301, and YT-3303 contains aluminum, which is considered to constitute a potential risk of ignition when subjected to impact or friction. Care must be used during installation in locating this equipment to prevent impact or friction
- Some of the enclosure parts are made of non-metallic materials. To prevent the risk of Electrostatic sparking, clean the enclosure only with a damp cloth.
- The product must be installed in such a manner as to minimize the risk of impact or friction with other metal surfaces.

- For Intrinsically Safe installations, the product must be connected to suitably rated intrinsically safe equipment, and must be installed in accordance with applicable intrinsically safe installation standards.
- Special conditions for safe use :

  The ambient temperature range deviates from the standard temperature range and amounts to:

  Equipment must be protected from risk of mechanical impact hazard.

  Temperature class T5 / T100 °C: -40°C to +60°C
  Temperature class T6 / T85 °C: -40°C to +40°C

2 Product Description

2.1 General

YT-3300 / 3350 / 3303 / 3301 series Smart Valve Positioner accurately controls valve stroke in response to an input signal of 4~20mA from the controller. Built-in micro-processor optimizes the positioner's performance and provides unique functions such as **Auto-Calibration, PID Control, and HART Protocol Communications.**

2.2 Main Features and Functions

- LCD display enables users to monitor the positioner status.
- User will easily understand the method of using 4 buttons because it work same in all versions of firmware interfaces.
- When unexpected situation like momentary blackout happens, our positioner boot-time only take 0.5 second and this can minimize the travel of valve which consequentially increase the safety of system.
- Positioner operates normally even there are sudden changes in supply pressure and / or high vibration environment.
- YT-3301 remote positioner is stronger on high temperature and vibration environment because it is separated into remote sensor and positioner.
- The method of Auto Calibration is very simple.
- As an advantage of having very low air consumption, It could greatly reduce operating costs in large-scale plants.
- It is compatible with most of controllers.
- Orifices can be installed even in the field to minimize the hunting occurrence and optimize operating conditions.
- Various information about positioner can be processed by HART communication (HART option)
- Valve system becomes more stable by outputting analog feedback signal.
- Different valve characteristics can be adjusted – Linear, Quick Open, Equal Percentage, and User Set which user can make 5 or 18 points characterizations.
- Tight Shut – Close and Shut - Open can be set.
- PID parameters can be adjusted in the field without any additional communicator.
- A/M switch can be used to direct supply air to the actuator or to manually operate the positioner or valve without any signal.
- Split range 4~12mA or 12~20mA can be set.
- Operating temperature for remote sensor of YT-3301 is -40 ~ 120°C.
  Operating temperature for positioners is -30 ~ 85°C or -40 ~ 85°C (Please check certified explosion proof temperature)
- Hand calibration function can set Zero point or End point manually.
- It has IP66, Type 4X(FM) protection grade.
- Polyester powder coating resists the corrosion process. (except YT-3350).

- Maintenance of the positioner is easy because of modularized inner structure.
- SIL2 certified.(For more information, see SIL Safety Instruction on homepage)

2.3 Label Description

- MODEL : Indicates the model number and additional options.
- EXPLOSION PROOF : Indicates certified explosion proof grade.
- INGRESS PROTECTION : Indicates enclosure protection grade.
- INPUT SIGNAL : Indicates input signal range.
- OPERATING TEMP. : Indicates the allowable operating temperature.
- SUPPLY PRESSURE : Indicates the supply pressure range.
- SERIAL NUMBER : Indicates unique serial number.
- MONTH.YEAR : Indicates manufactured month and year.

- INTRINSIC SAFETY / NONINCENDIVE : Indicates intrinsic safety explosion proof grade.
- AMBIENT TEMP. : Indicates the allowable ambient temperature for explosion proof.
- Ui, Ii, Pi, Ci, Li : Indicates the allowable electrical data in the certificate.
  ATEX: Ui = 28 V, Ii = 93 mA, Pi = 651 mW, Ci = 0.6 nF, Li = 10 μH
  FM: Ui = 28 V, Ii = 93 mA, Pi = 651 mW, Ci = 0.55 nF, Li = 12 μH
  You can also see the details in the certificate.

※ Precautions

Be careful not to apply volatile solvent (hardener of instant adhesive, acetone, WD-40, etc.) to the sticker nameplate. Printed contents may be erased.

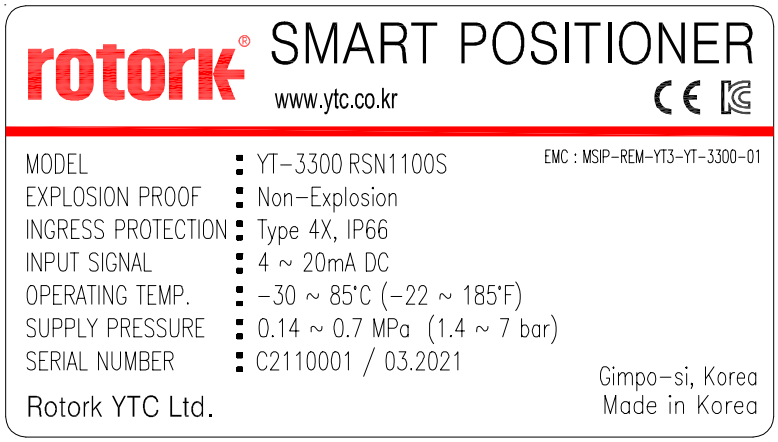


Fig. L-1: YT-3300 / 3303 / 3301 Non-explosion proof

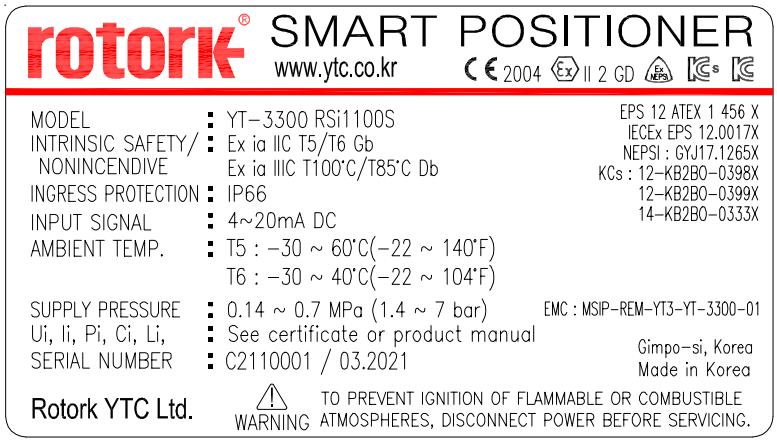


Fig. L-2: YT-3300 / 3303 Intrinsic safety type (ATEX, IECEx, KCs, NEPSI)

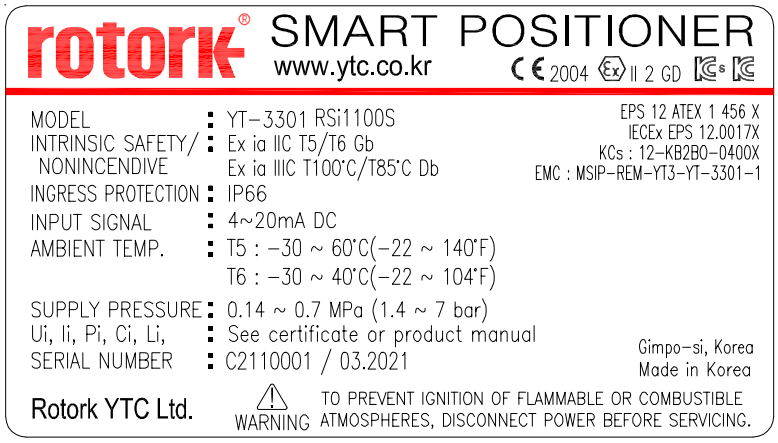


Fig. L-3: 3301 Intrinsic safety type (ATEX, IECEx, KCs)

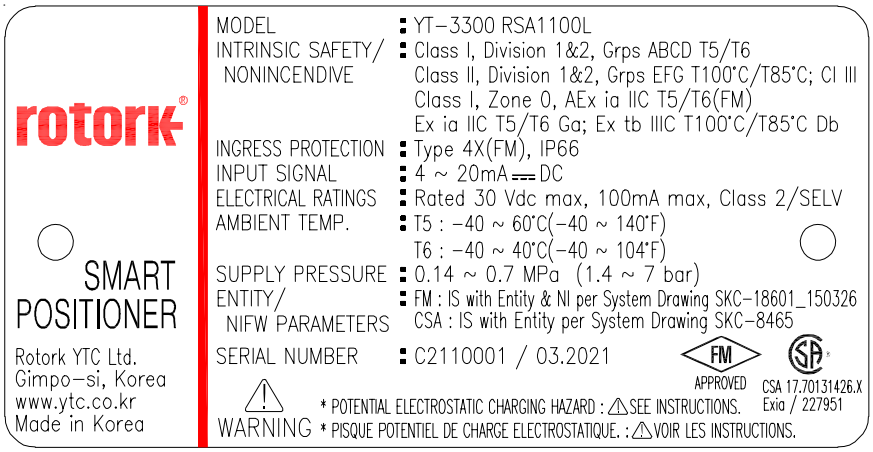


Fig. L-4: YT-3300 / 3303 Intrinsic safety type (FM, CSA)

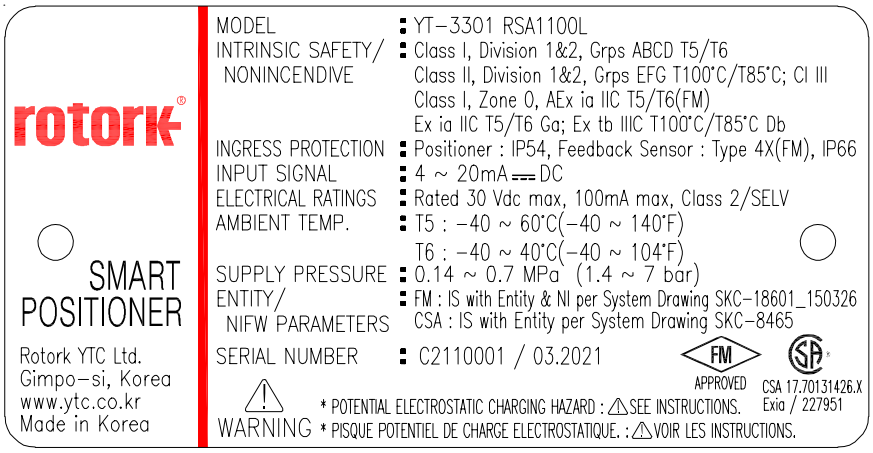


Fig. L-5: YT-3301 Intrinsic safety type (FM, CSA)

Fig. L-6: YT-3300 / 3303 / 3301 Non-explosion proof (EAC)

Fig. L-7: YT-3300 / 3303 / 3301 Intrinsic safety type (EAC)

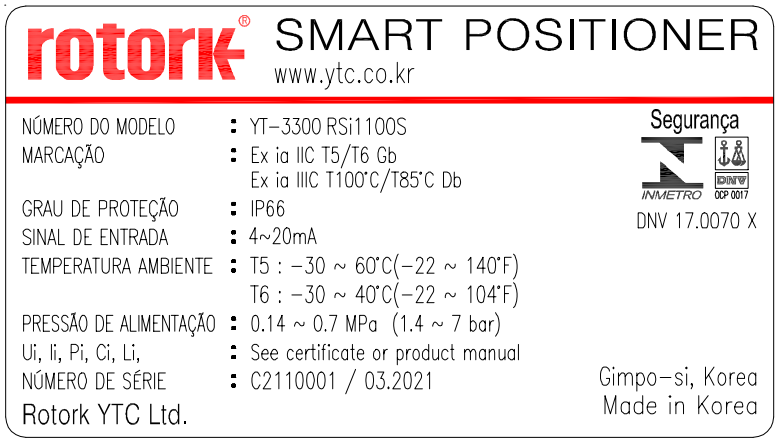


Fig. L-8: YT-3300 / 3303 / 3301 Intrinsic safety type (INMETRO)

Fig. L-9: YT-3300 Intrinsic safety type (CCC)

Fig. L-10: YT-3303 Intrinsic safety type (CCC)

Fig. L-11: YT-3301 Intrinsic safety type (CCC)

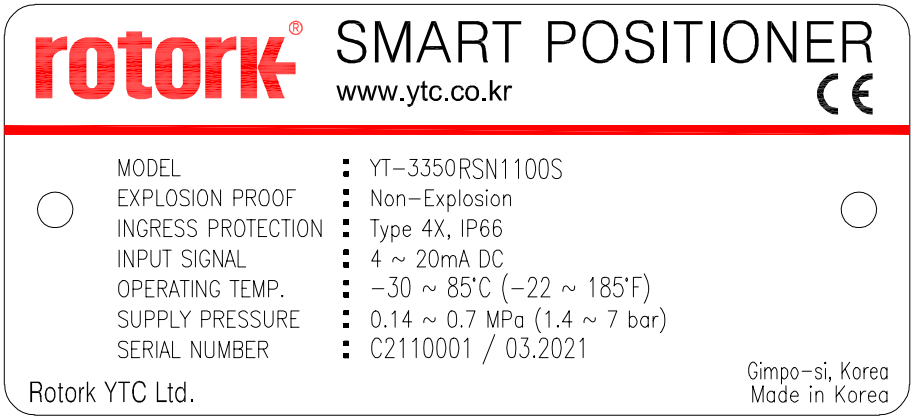


Fig. L-12: YT-3350 Non-explosion proof

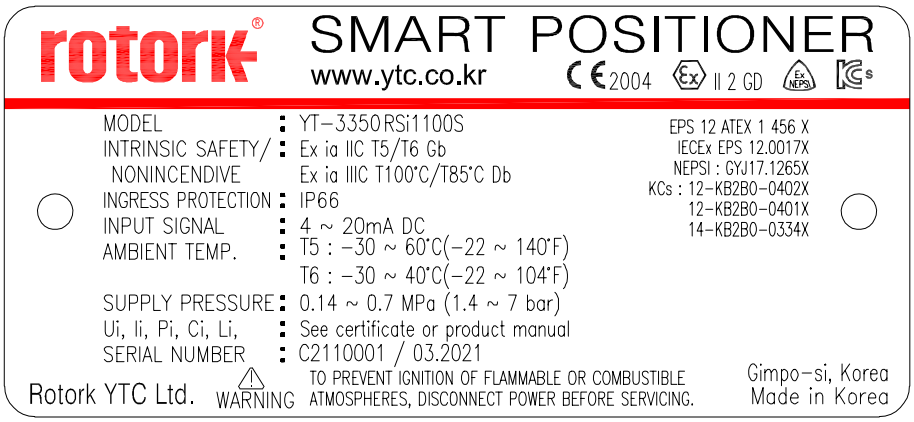


Fig. L-13: YT-3350 Intrinsic safety type (ATEX, IECEx, KCs, NEPSI)

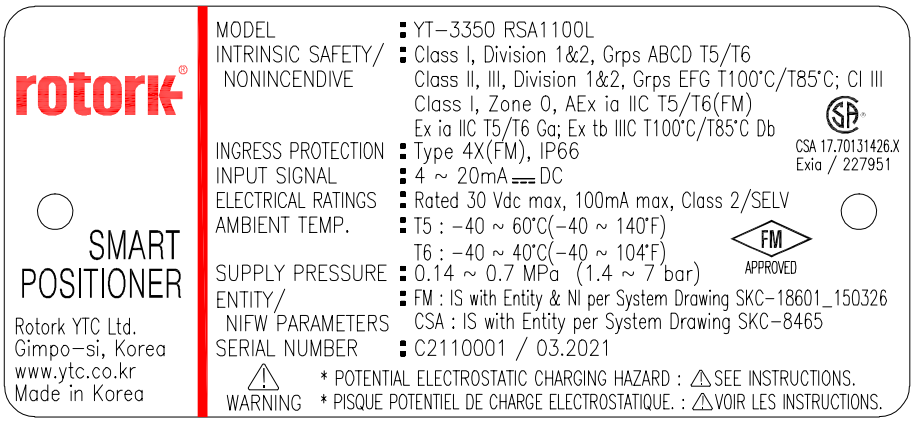


Fig. L-14: YT-3350 Intrinsic safety type (FM, CSA)

Fig. L-15: YT-3350 Intrinsic safety type (EAC)

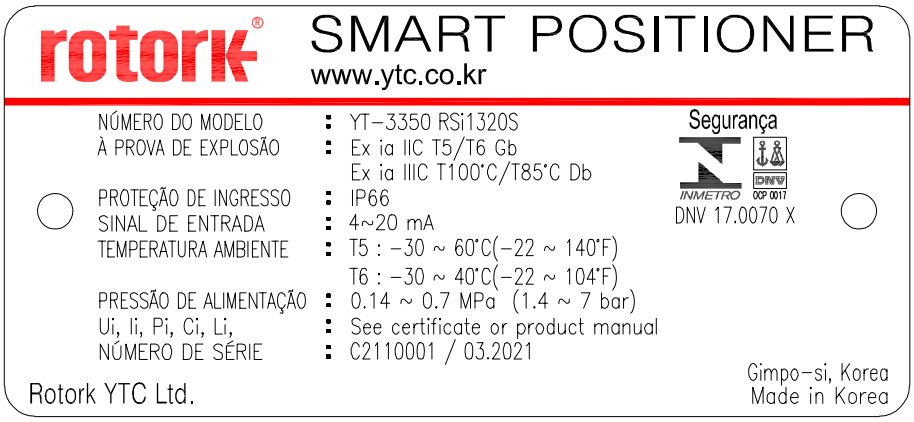


Fig. L-16: YT-3350 Intrinsic safety type (INMETRO)

Fig. L-17: YT-3350 Intrinsic safety type (CCC)

2.4 Product Code

2.4.1 YT-3300 / 3350 series follows suffix symbols as follows.

YT-3300 / 3350 [1] [2] [3] [4] [5] [6] [7] [8]

[1] Motion Type		L :	Linear (Positioner is attached the right yoke of actuator.)
		R :	Rotary
[2] Acting type		S :	Single
		D :	Double
[3] Explosion Proof		N :	Non-Explosion
		i :	ATEX, IECEx, KCs, NEPSI, INMETRO : Ex ia IIC T5/T6 Gb, Ex iaD IIIC T100°C/T85°C Db, IP66
		A :	FM & CSA : Class I, Division 1&2 Groups ABCD T5/T6 Class II, Division 1&2 Groups EFG T100°C/T85°C; Class III Class I, Zone 0, AEx ia IIC T5/T6, Ex ia IIC T5/T6 Ga; Ex tb IIIC T100°C/T85°C Db
		E :	Intrinsic safety for EAC
		Z :	Intrinsic safety for CCC
[4] Lever Type	Linear	0 :	10 ~ 40 mm (Standard type)
		1 :	20 ~ 100 mm (Standard type)
		2 :	90 ~ 150 mm (Standard type)
		3 :	16 ~ 30 mm (Adapter type)
		4 :	16 ~ 60 mm (Adapter type)
		5 :	16 ~ 100 mm (Adapter type)
		6 :	90 ~ 150 mm (Adapter type)
	Rotary	1 :	M6 x 34L
		2 :	M6 x 63L
		3 :	M8 x 34L
		4 :	M8 x 63L
		5 :	Namur
[5] Conduit - Air Connection Type		1 :	G 1/2 – Rc 1/4
		2 :	G 1/2 – 1/4 NPT (YT-3350 is available for No. 2 ONLY)
		3 :	G 1/2 – G 1/4
		4 :	M20x1.5P – 1/4 NPT
		5 :	1/2 NPT – 1/4 NPT
[6] Communication		0 :	None
		2 :	+ HART Communication

7 Option	0 : None 1 : + Position Transmitter 2 : + Limit Switch(Mechanical Type) [1] 3 : + Limit Switch(Inductive Proximity Type) [2] 4 : + Position Transmitter and Limit Switch (Mechanical Type) [3] 5 : + Position Transmitter and Limit Switch (Inductive Proximity Type) [4]
8 Operating Temp. (Non-explosion proof) [5]	S : -30 ~ 85°C (-22 ~ 185°F, except EAC explosion proof) L : -40 ~ 85°C (-40 ~ 185°F) A : -55 ~ 85°C (-67 ~ 185°F, only EAC explosion proof)

[1] [3] These options are only available for “S”, “L” in 8 operating temp.

[2] [4] These options are only available for “S” in 8 operating temp.

[5] This option is just the normal operating temperature of the product and is not related to explosion proof temperature. See “2.6 Certificates” for explosion proof temperature.

2.4.2 YT-3303 series follows suffix symbols as follows.

YT-3303 1 2 3 4 5 6 7 8

1 Motion Type	L : Linear (Positioner is attached the left yoke of actuator.) R : Rotary
2 Acting type	S : Single D : Double
3 Explosion Proof	N : Non-Explosion i : ATEX, IECEx, KCs, INMETRO : Ex ia IIC T5/T6 Gb, Ex iaD IIIC T100°C/T85°C Db, IP66 A : FM & CSA : Class I, Division 1&2 Groups ABCD T5/T6 Class II, Division 1&2 Groups EFG T100°C/T85°C; Class III Class I, Zone 0, AEx ia IIC T5/T6, Ex ia IIC T5/T6 Ga; Ex tb IIIC T100°C/T85°C Db E : Intrinsic safety for EAC Z : Intrinsic safety for CCC

4 Lever Type	Linear	1 : 10 ~ 40 mm 2 : 20 ~ 70 mm 3 : 50 ~ 100 mm 4 : 100 ~ 150 mm
	Rotary	1 : M6 x 34L 2 : M6 x 63L 3 : M8 x 34L 4 : M8 x 63L 5 : Namur
5 Conduit – Air Connection Type		1 : G 1/2 – Rc 1/4 2 : G 1/2 – 1/4 NPT 3 : G 1/2 – G 1/4 4 : M20x1.5P(Adapter type) – 1/4 NPT 5 : 1/2 NPT(Adapter type) – 1/4 NPT
6 Communication		0 : None 2 : + HART Communication
7 Option		0 : None 1 : + Position Transmitter
8 Operating Temp. (Non-explosion proof) [1]		S : -30 ~ 85°C (-22 ~ 185°F, except EAC explosion proof) L : -40 ~ 85°C (-40 ~ 185°F) A : -55 ~ 85°C (-67 ~ 185°F, only EAC explosion proof)

[1] This option is just the normal operating temperature of the product and is not related to explosion proof temperature. See “2.6 Certificates” for explosion proof temperature.

2.4.3 YT-3301 series follows suffix symbols as follows.

YT-3301 [1] [2] [3] [4] [5] [6] [7] [8] [9]

1 Motion Type	L : Linear R : Rotary
2 Acting type	S : Single D : Double

[3] Explosion Proof		N : Non-Explosion i : ATEX, IECEx, KCs, INMETRO : Ex ia IIC T5/T6 Gb, Ex iaD IIIC T100°C/T85°C Db, IP66 A : FM & CSA : Class I, Division 1&2 Groups ABCD T5/T6 Class II, Division 1&2 Groups EFG T100°C/T85°C; Class III Class I, Zone 0, AEx ia IIC T5/T6, Ex ia IIC T5/T6 Ga; Ex tb IIIC T100°C/T85°C Db E : Intrinsic safety for EAC Z : Intrinsic safety for CCC
[4] Lever Type	Linear	1 : 10 ~ 40 mm 2 : 20 ~ 70 mm 3 : 50 ~ 100 mm 4 : 100 ~ 150 mm
	Rotary	5 : Namur
[5] Conduit – Air Connection Type		1 : G 1/2 – Rc 1/4 2 : G 1/2 – 1/4 NPT 3 : G 1/2 – G 1/4 4 : M20x1.5P(Adapter type) – 1/4 NPT 5 : 1/2 NPT(Adapter type) – 1/4 NPT
[6] Communication		0 : None 2 : + HART Communication
[7] Option		0 : None 1 : + Position Transmitter
[8] Operating Temp. (Non-explosion proof) [1]		S : -30 ~ 85°C (-22 ~ 185°F, except EAC explosion proof) L : -40 ~ 85°C (-40 ~ 185°F) A : -55 ~ 85°C (-67 ~ 185°F, only EAC explosion proof)
[9] Cable Length [2]		1 : 5m 2 : 10m 3 : 15m 4 : 20m

[1] Maximum cable length is 20m.

[2] This option is just the normal operating temperature of the product and is not related to explosion proof temperature. See “2.6 Certificates” for explosion proof temperature.

2.5 Product Specification

2.5.1 YT-3300 / 3303 / 3350 Specification

Model		YT-3300 / 3303		YT-3350	
Housing Material		Aluminum		Stainless Steel 316	
Motion Type		Linear	Rotary	Linear	Rotary
Acting Type		Single / Double			
Input Signal		4~20mA DC			
Minimum Current Signal		3.2mA(Standard), 3.8mA(HART Included)			
Supply Pressure		0.14 ~ 0.7 MPa (1.4 ~ 7 bar)			
Stroke		10 ~ 150 mm	55 ~ 110°	10 ~ 150 mm	55 ~ 110°
Impedance		Max. 500Ω @ 20mA DC			
Air Connection		Rc 1/4 or 1/4 NPT or G 1/4		1/4 NPT	
Gauge Connection		Rc 1/8 or 1/8 NPT		1/8 NPT	
Conduit Entry		G 1/2 or 1/2 NPT or M20x1.5P		G 1/2	
Ingress Protection		IP66, Type 4X(FM)			
Explosion Proof		1. None-explosion proof 2. Intrinsic safety : ATEX, IECEx, KCs, NEPSI, EAC, INMETRO, FM, CSA, CCC ※ NEPSI only for YT-3300/3350 ※ See “2.6 Certificates” for details			
Operating Temperature	Standard Type	-30 ~ 85°C (-22 ~ 185°F) Inductive proximity limit switch internal type : -25 ~ 85°C (-13 ~ 185°F) Except EAC explosion proof			
	Low Temp. Type	-40 ~ 85°C (-40 ~ 185°F)			
	Arctic Temp. Type	-55 ~ 85°C (-67 ~ 185°F, only EAC explosion proof)			
Ambient Temperature Of Explosion Proof	T5	-40 ~ 60°C (-40 ~ 140°F) EAC : -55 ~ 60°C (-67 ~ 140°F)			
	T6	-40 ~ 40°C (-40 ~ 104°F) EAC : -55 ~ 40°C (-67 ~ 104°F)			
Linearity		±0.5% F.S.			
Hysteresis		±0.5% F.S.			
Sensitivity		±0.2% F.S.			
Repeatability		±0.3% F.S.			
Flow Capacity		70 LPM (Sup.=0.14 MPa)			
Air Consumption		Below 2 LPM (Sup.=0.14 MPa @ idle)			
Output Characteristic		Linear, Quick Open, EQ%, User Set			
Vibration		No Resonance up to 100Hz @ 6G			
Humidity		5-95% RH @ 40°C			

Communication (Option)	HART Communication (HART 7)	
Feedback Signal (Option)	4~20mA (DC 9~28V)	
Weight	2 kg (4.4 lb)	5.1 kg (11.2 lb)
Painting	Polyester Powder Coating	-

⚠ Tested under ambient temperature of 20°C, absolute pressure of 760mmHg, and humidity of 65%.
Please contact Rotork YTC Limited for detailed testing specification.

2.5.2 YT-3301 Specification

Model			**YT-3301**	
Housing Material			Aluminum	
Motion Type			Linear	Rotary
Acting Type			Single / Double	
Input Signal			4~20mA DC	
Minimum Current Signal			3.2mA(Standard), 3.8mA(HART Included)	
Supply Pressure			0.14 ~ 0.7 MPa (1.4 ~ 7 bar)	
Stroke			10 ~ 150 mm	55 ~ 110°
Impedance			Max. 500Ω @ 20mA DC	
Air Connection			Rc 1/4 or 1/4 NPT or G 1/4	
Gauge Connection			Rc 1/8 or 1/8 NPT	
Conduit Entry			G 1/2 or 1/2 NPT or M20x1.5P	
Ingress Protection	**Positioner module**		IP54	
	Feedback sensor		IP66, Type 4X(FM)	
Explosion Proof			1. None-explosion proof 2. Intrinsic safety : ATEX, IECEx, KCs, EAC, INMETRO, FM, CSA, CCC ※ See “2.6 Certificates” for details	
Operating Temperature	**Sensor**		-55 ~ 120°C (-67 ~ 248°F)	
	Body	**Standard**	-30 ~ 85°C (-22 ~ 185°F, except EAC explosion proof)	
		Low temp.	-40 ~ 85°C (-40 ~ 185°F)	
		Arctic temp.	-55 ~ 85°C (-67 ~ 185°F, only EAC explosion proof)	
Ambient Temperature Of Explosion proof		**T5**	-40 ~ 60°C (-40 ~ 140°F) EAC : -55 ~ 60°C (-67 ~ 140°F)	
		T6	-40 ~ 40°C (-40 ~ 104°F) EAC : -55 ~ 40°C (-67 ~ 104°F)	
Linearity			±0.5% F.S.	
Hysteresis			±0.5% F.S.	
Sensitivity			±0.2% F.S	
Repeatability			±0.3% F.S.	
Flow Capacity			70 LPM (Sup.=0.14 MPa)	
Air Consumption			Below 2 LPM (Sup.=0.14 MPa @ idle)	

Output Characteristic		Linear, Quick Open, EQ%, User Set	
Vibration		No Resonance up to 100Hz @ 6G	
Humidity		5-95% RH @ 40°C	
Communication (Option)		HART Communication (HART 7)	
Feedback Signal (Option)		4~20mA (DC 9~28V)	
Weight	**Positioner**	2.2 kg (4.9 lb)	
	Remote Sensor	0.6 kg (1.2 lb)	1.0 kg (2.1 lb)
	Cable(5M)	0.6 kg (1.3 lb)	
Painting		Polyester Powder Coating	

⚠ Tested under ambient temperature of 20°C, absolute pressure of 760mmHg, and humidity of 65%.
Please contact Rotork YTC Limited for detailed testing specification.

2.6 Certifications

※ All certifications below are posted on Rotork YTC Limited homepage(www.ytc.co.kr).

➢ KCs (Korea)

Type : Intrinsic safety
Rating : Ex ia IIC T5/T6, Ex iaD T100°C/T85°C, IP66
Certification No. : 12-KB2BO-0398X(YT-3300)
12-KB2BO-0399X{YT-3300+LS(Dry contact)}
14-KB2BO-0333X{YT-3300+LS(Non-contact)}
12-KB2BO-0402X(YT-3350)
12-KB2BO-0401X{YT-3350+LS(Dry contact)}
14-KB2BO-0334X{YT-3350+LS(Non-contact)}
14-KB2BO-0335X(YT-3303)
12-KB2BO-0400X(YT-3301)
Ambient temperature : -40 ~ +60°C (T5/T100°C), -40 ~ +40°C (T6/T85°C)

➢ ATEX

Type : Intrinsic safety
Rating : II 2G Ex ia IIC T5/T6 Gb, II 2D Ex ia IIIC T100°C/T85°C Db, IP6X
Certification No. : EPS 12 ATEX 1 456 X
Ambient temperature : -40 ~ +60°C (T5), -40 ~ +40°C (T6)

➢ IECEx

Type : Intrinsic safety
Rating : Ex II 2G Ex ia IIC T5/T6 Gb, Ex II 2D Ex ia IIIC T100°C/T85°C Db, IP6X
Certification No. : IECEx EPS 12.0017X
Ambient temperature : -40 ~ +60°C (T5/T100°C), -40 ~ +40°C (T6/T85°C)

➢ NEPSI

Type : Intrinsic safety (Only YT-3300/3350)
Rating : Ex ia IIC T5/T6
Certification No. : GYJ17.1265X

- **EAC (TRCU)**

  Type : Intrinsic safety
  Rating : 1Ex ia IIC «T6 ... T5» Gb X, Ex ia IIIC «T85°C ... T100°C» Db X
  Certification No. : RU C-KR.МЮ62.B.04756
  Ambient temperature : -55 ~ +60°C (T5/T100°C), -55 ~ +40°C (T6/T85°C)

- **FM**

  Rating : Class I, Div 1, Groups ABCD
  Class I, Zone 0 AEx ia IIC
  Class II/III, Div 1, Groups EFG
  Class I, II, III, Div 2, Groups ABCDEFG
  NEMA Type 4X, IP66
  (Only YT-3301: Positioner IP54, Feedback sensor Type 4X, IP66)
  Certificate No.: FM16US0268X
  Ambient temperature : -40 to +60°C(T5), -40 to +40°C(T6)

- **CSA**

  Type : Intrinsic safety
  Rating : Class I, Division 1&2 Groups ABCD T5/T6
  Class II, Division 1&2 Groups EFG T100°C/T85°C
  Class III
  Ex ia IIC T5/T6 Ga
  Ex tb IIIC T100°C/T85°C Db
  IP66
  Certificate No.: CSA 17.70131426
  Ambient temperature : -40 to +60°C(T5), -40 to +40°C(T6)

- **INMETRO(Brazil)**

  Type : Intrinsic safety
  Rating : Ex ia IIC T5/T6 Gb, Ex ia IIIC T100°C/T85°C Db, IP66
  Certification No. : DNV 17.0070 X
  Ambient temperature : -40 ~ +60°C (T5), -40 ~ +40°C (T6)

- **CCC (China)**

  Type : Intrinsic safety
  Rating : Ex ia IIC T5/T6 Gb, Ex iaD 21 T100/T85
  Certification No. : 20200322307000617
  Ambient temperature : -40 ~ +60°C (T5/T100°C), -40 ~ +40°C (T6/T85°C)

- **SIL2 (in a redundant structure up to SIL 3)**

  Intended application : Safety function is defined as to move into fail-safe-position, when signal to positioner is interrupted.
  Certification No. : 968/V 1155.00/20

- **Electromagnetic Compatibility (EMC)**

  - EMC directive 2014/30/EC from April 2016
  - EC Directive for CE conformity marking

2.7 Parts and Assembly

2.7.1 YT-3300 / 3350

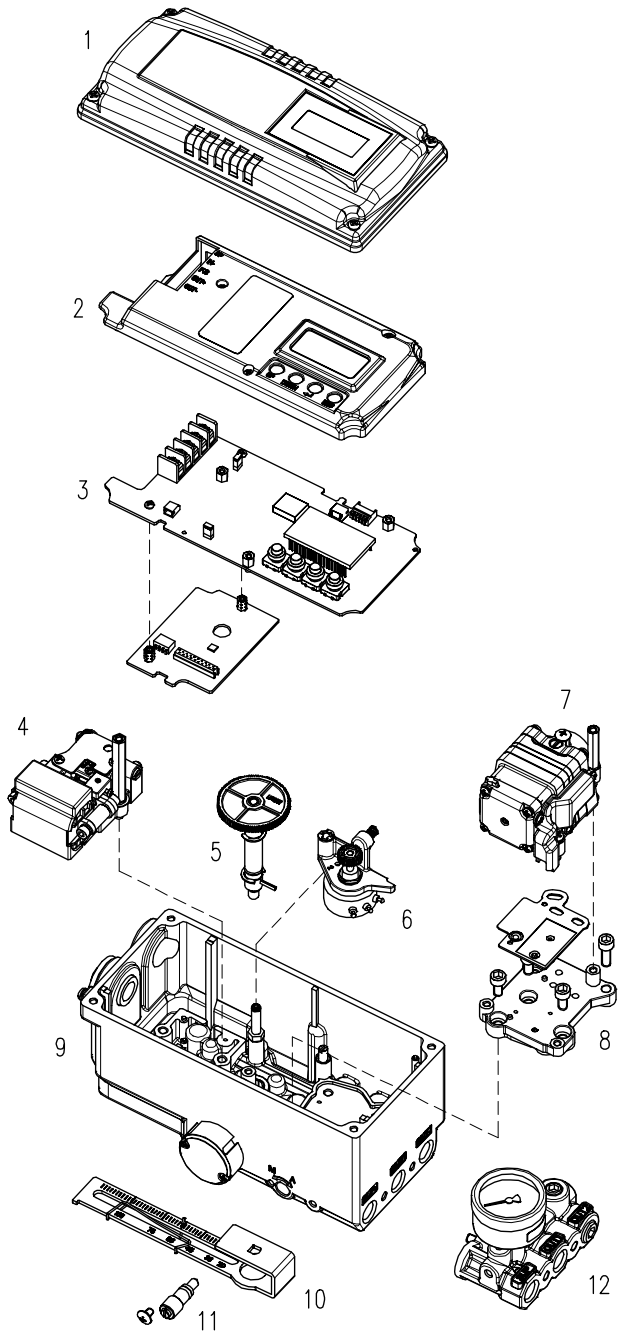


Fig. 2-1: YT-3300 / 3350 exploded view

1. Base Cover
2. PCB Cover
3. Main PCB
4. Torque Motor
5. Main Shaft
6. Potentiometer
7. Pilot
8. Pilot Block
9. Base body
10. Feedback Lever
11. Auto Manual Switch
12. Gauge Block

2.7.2 YT-3303

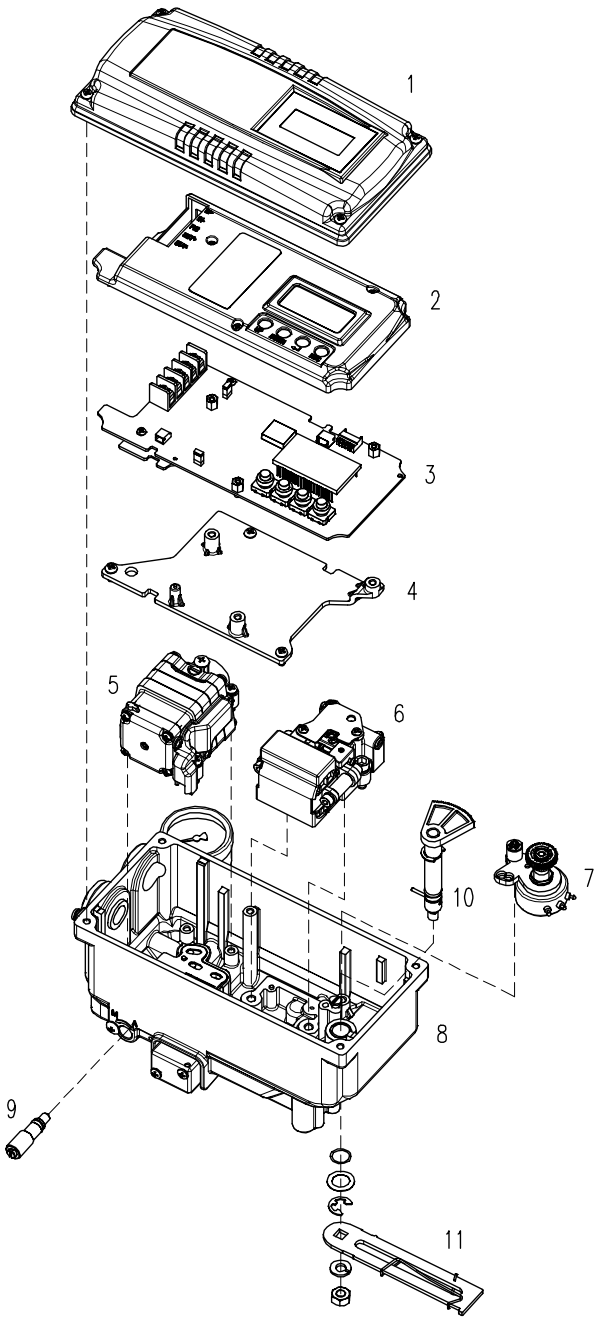


Fig. 2-2: YT-3303 exploded view

1. Base Cover
2. PCB Cover
3. Main PCB
4. Support PCB
5. Pilot
6. Torque Motor
7. Potentiometer
8. Base body
9. Auto Manual Switch
10. Main Shaft
11. Feedback Lever

2.7.3 YT-3301

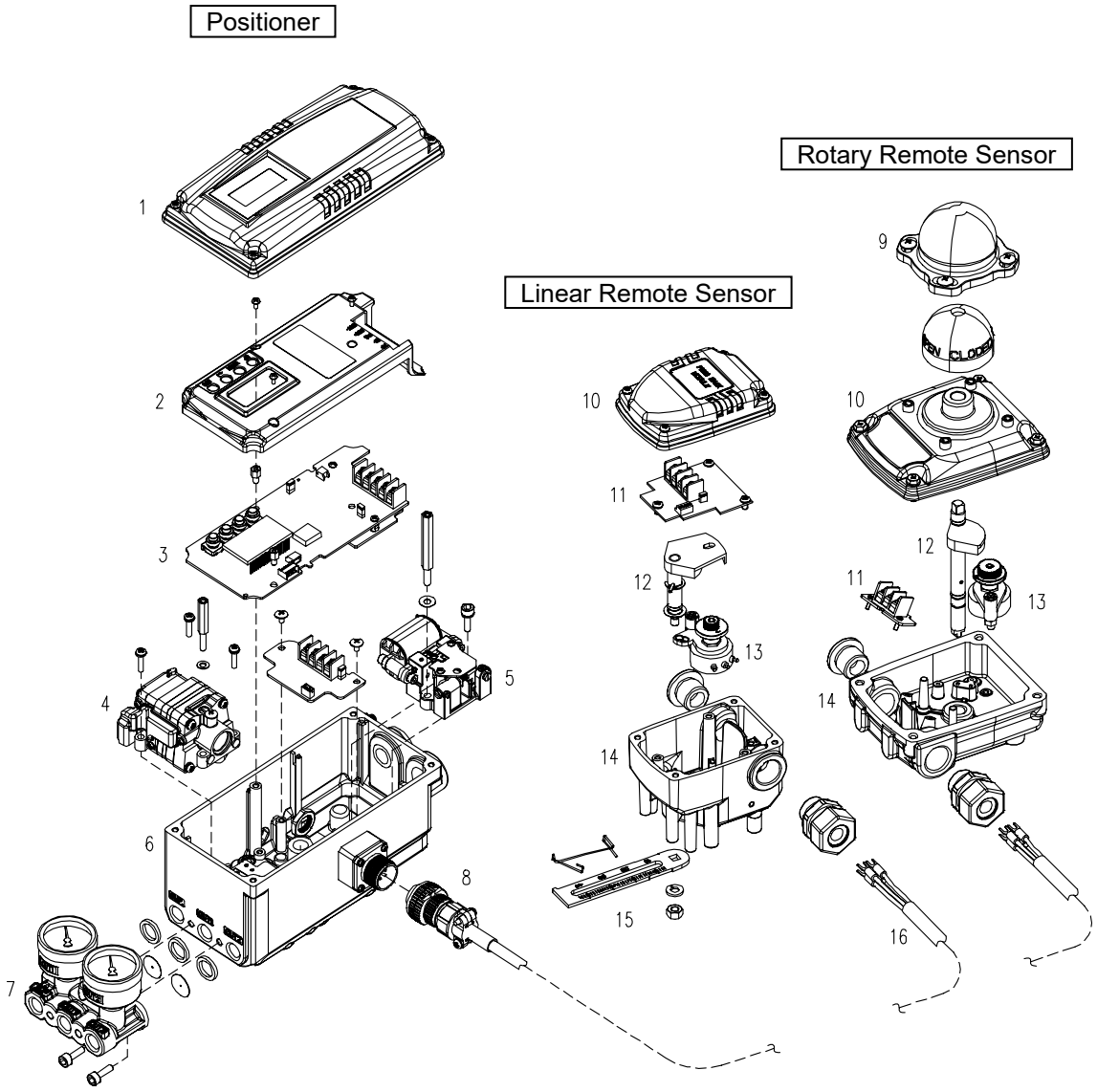


Fig. 2-3: YT-3301 exploded view

1. Base cover of Positioner
2. PCB cover of Positioner
3. PCB of Positioner
4. Pilot of Positioner
5. Torque motor of Positioner
6. Base body of Positioner
7. Gauge block of Positioner
8. MS connector of Positioner
9. Dome cover of Remote sensor
10. Base cover of Remote sensor
11. Terminal of Remote sensor
12. Main shaft of Remote sensor
13. Potentiometer of Remote sensor
14. Base body of Remote sensor
15. Lever of Remote sensor
16. Remote cable

2.8 Product Dimension

2.8.1 YT-3300

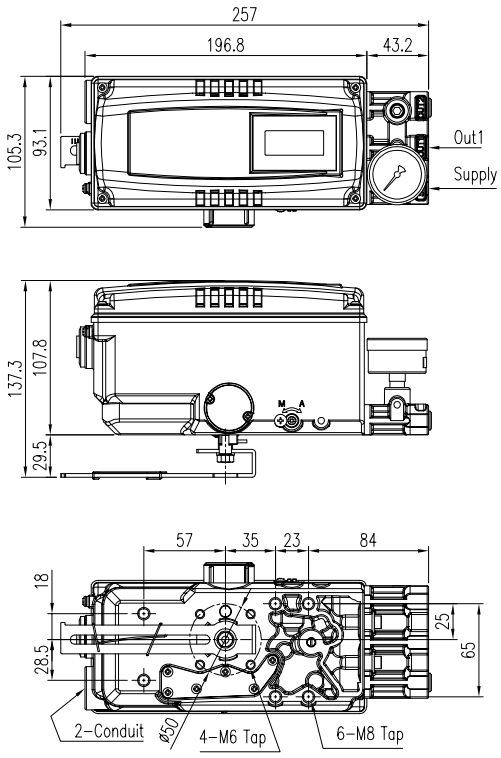


Fig. 2-4: YT-3300L (Standard Lever Type)

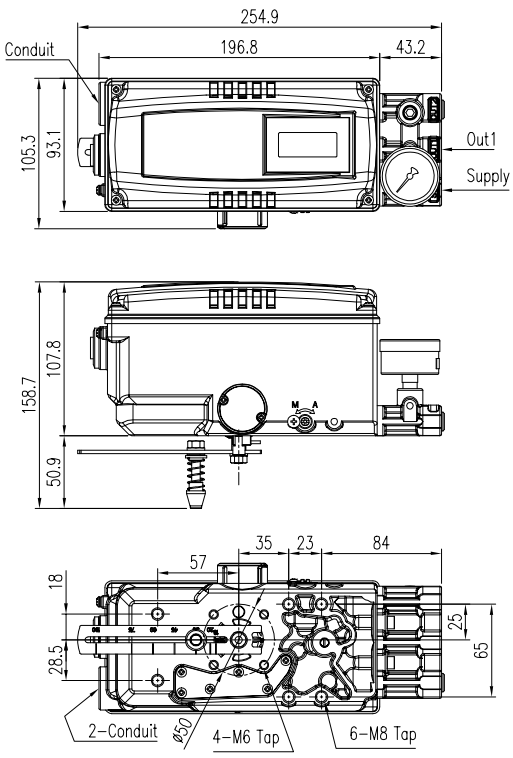


Fig. 2-5: YT-3300L (Adapter Lever Type)

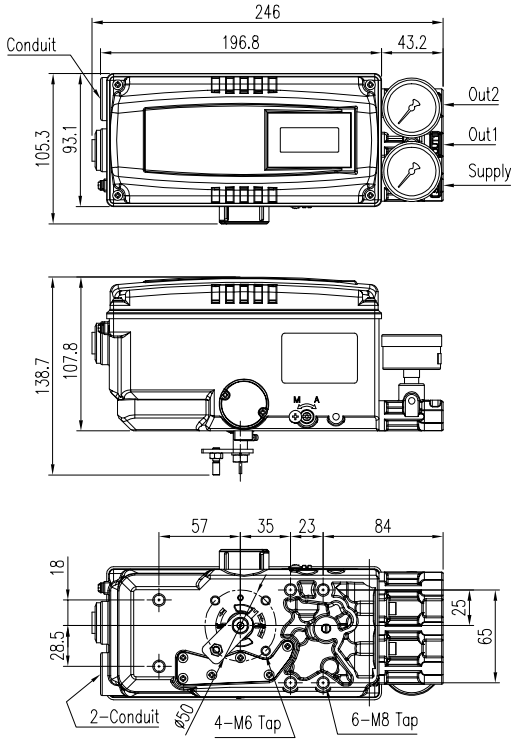


Fig. 2-6: YT-3300R (Fork lever Type)

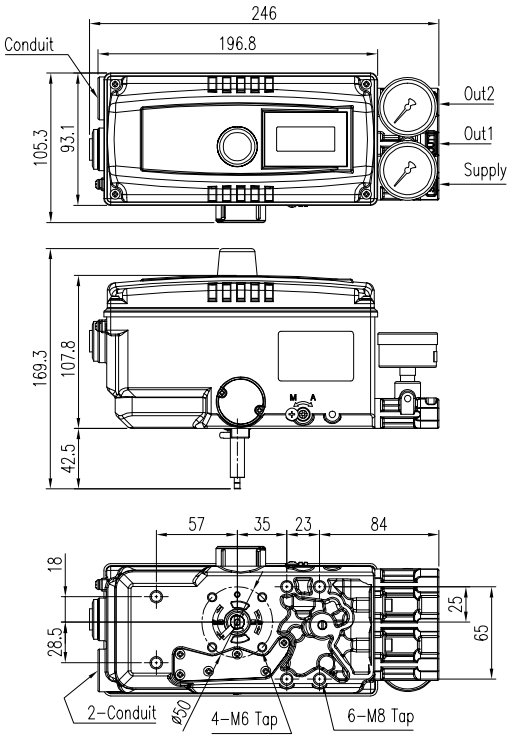


Fig. 2-7: YT-3300R+LS (Namur Type)

2.8.2 YT-3350

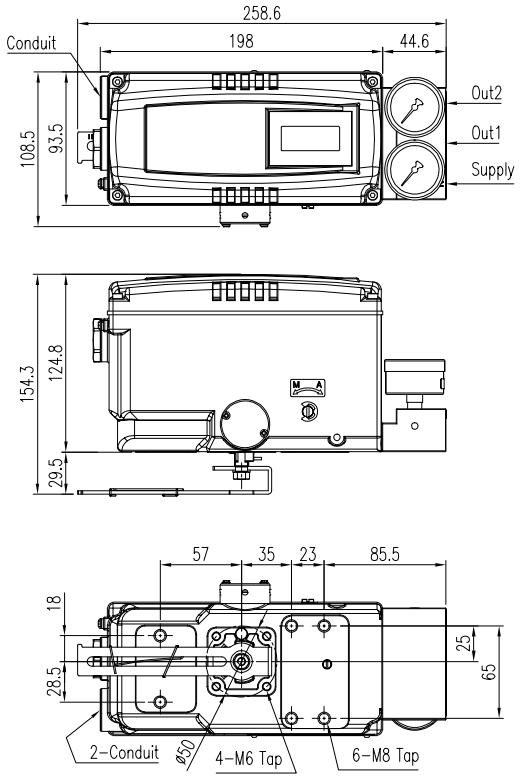


Fig. 2-8: YT-3350L (Standard Lever Type)

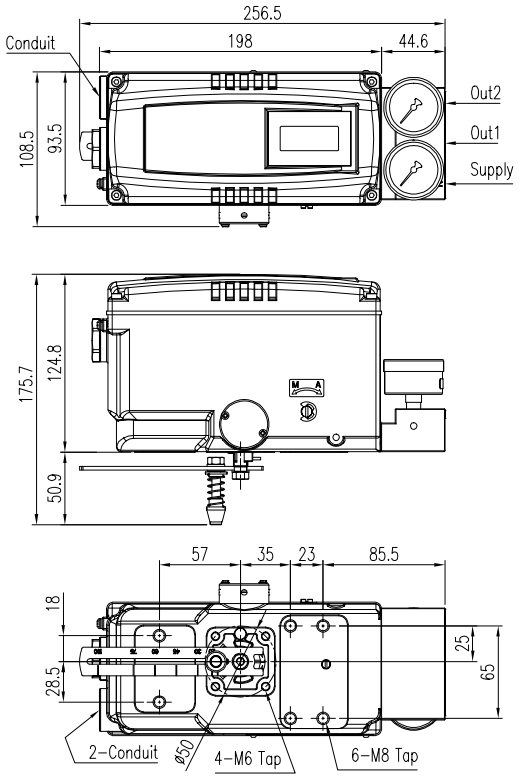


Fig. 2-9: YT-3350L (Adapter Lever Type)

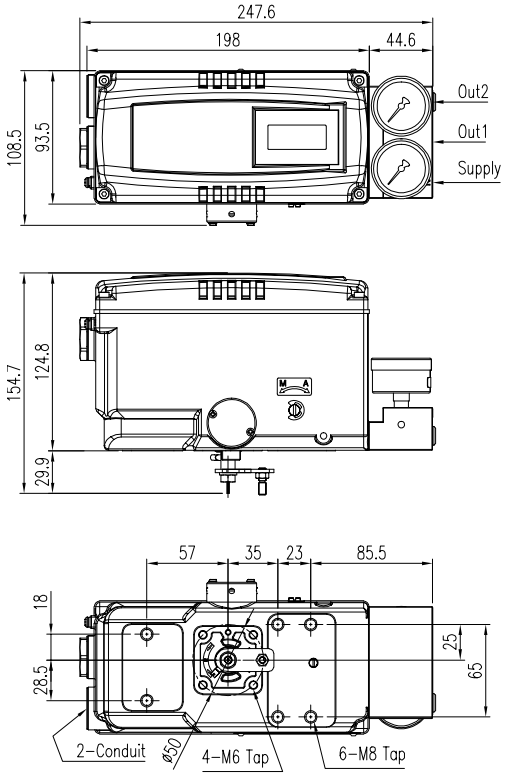


Fig. 2-10: YT-3350R (Fork lever Type)

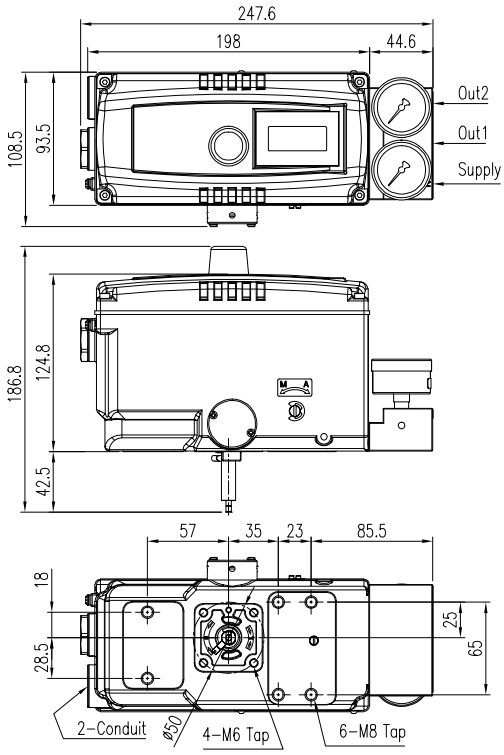


Fig. 2-11: YT-3350R+LS (Namur Type)

2.8.3 YT-3303

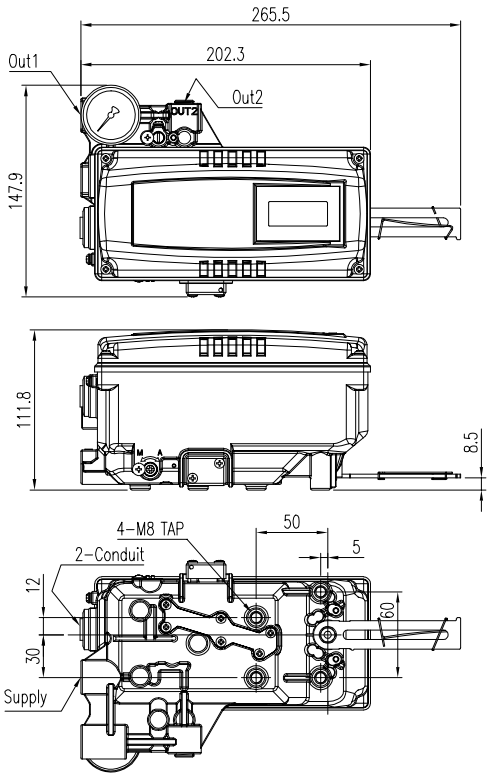


Fig. 2-12: YT-3303L

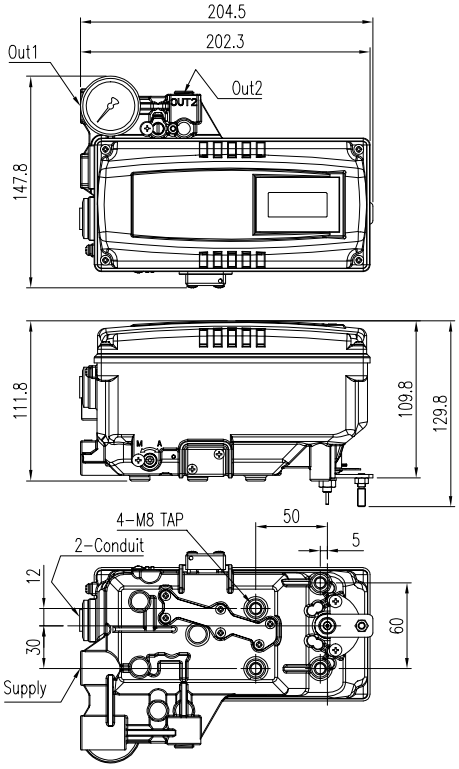


Fig. 2-13: YT-3303R (Fork lever Type)

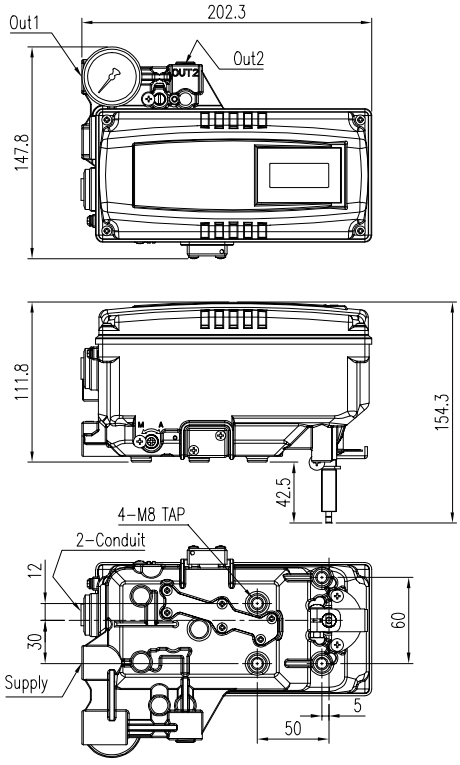


Fig. 2-14: YT-3300R+LS (Namur Type)

2.8.4 YT-3301

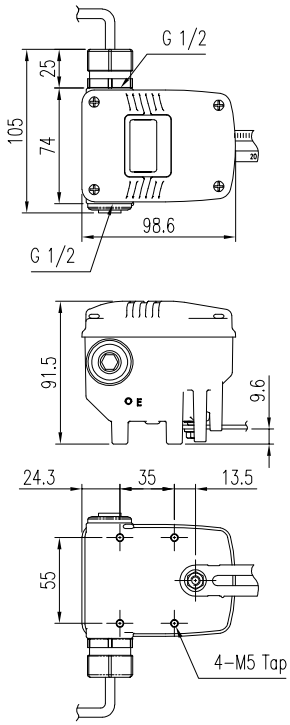


Fig. 2-15: Linear Remote Sensor

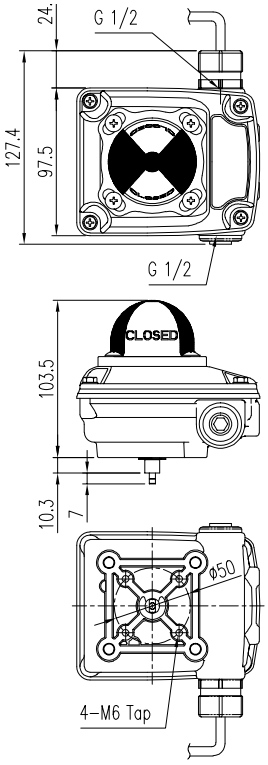


Fig. 2-16: Rotary Remote Sensor

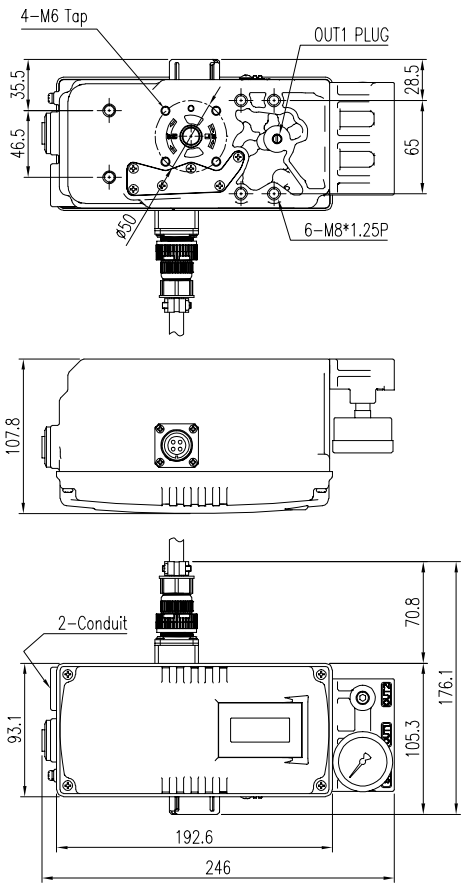


Fig. 2-17: YT-3301 Positioner

3 Installation

3.1 Safety

When installing a positioner, please ensure to read and follow safety instructions.

- Any input or supply pressures to valve, actuator, and / or to other related devices must be turned off.
- Use bypass valve or other supportive equipment to avoid entire system “shut down”.
- Ensure there is no remaining pressure in the actuator.
- The positioner has a vent cover to exhaust internal air and drain internal condensation water. When installing the positioner, make sure the vent cover must be facing downward. Otherwise, the condensation water could cause damages to PCB.

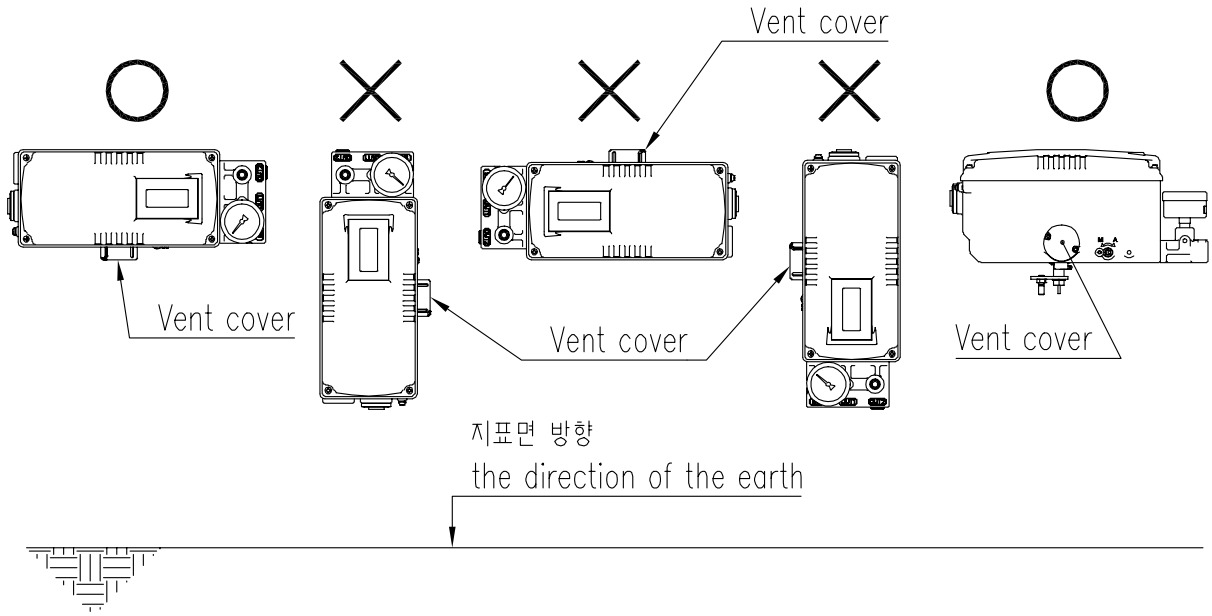


Fig. 3-1: The correct positions of a vent cover

※ Installed in accordance with the National Electrical Code(NEC), ANSI/NFPA 70, or CEC Part 1 as applicable.(FM approved product)

3.2 Tools for installation

- Hex key set for hex socket cap bolts
- (+) & (-) Screw drivers
- Spanners for hexagonal-head bolts

3.3 Linear positioner Installation

Linear positioner should be installed on linear motion valves such as globe or gate type which uses spring return type diaphragm or piston actuators.

3.3.1 Linear positioner Installation of Standard lever type

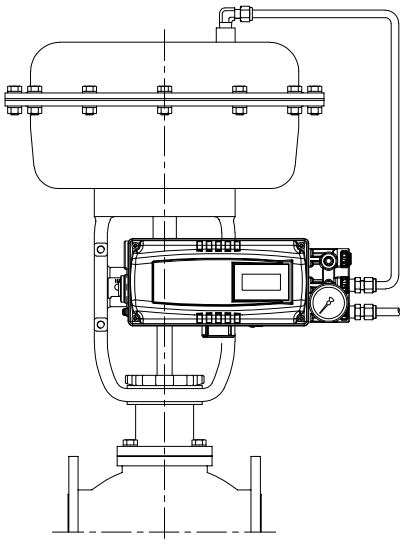


Fig. 3-2: YT-3300L / 3350L installation of standard lever type example

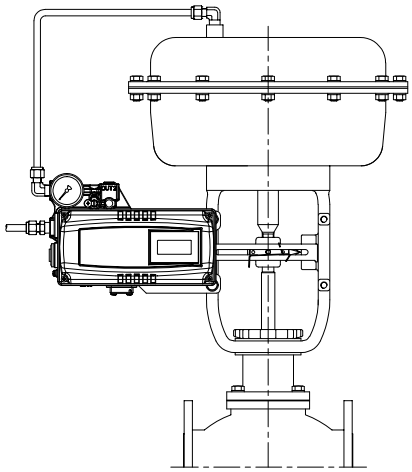


Fig. 3-3: YT-3303L installation example

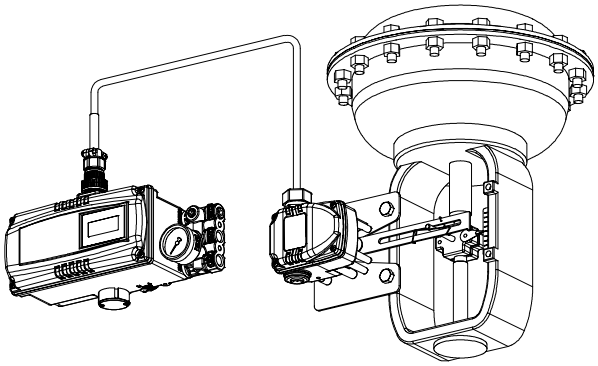


Fig. 3-4: YT-3301L installation example

Before proceeding with the installation, ensure following components are available.

- Positioner
- Linear remote sensor (Only YT-3301L)
- Remote cable (Only YT-3301L)
- Feedback lever and lever spring
- M6 nut and spring washer (fastening feedback lever to a main shaft)
- Bracket, bolts and washers for positioner or sensor – not supplied with the positioner
- Connection bar – not supplied with the positioner

3.3.1.1 Safety

Proper bracket must be made in order to adapt the positioner on the actuator yoke.
Please consider following important points when a bracket is being designed.

- Positioner's feedback lever must be vertical to the valve stem at 50% of the valve stroke.
- The connection bar of the actuator clamp for the feedback lever should be installed in such a way that the valve stroke length coincides with the corresponding figure in "mm" marked on the feedback lever. Improper setting may cause poor linearity

3.3.1.2 Standard lever type positioner Installation Steps

1) Assemble the positioner or remote sensor with the bracket made in previous step by fastening the bolts.

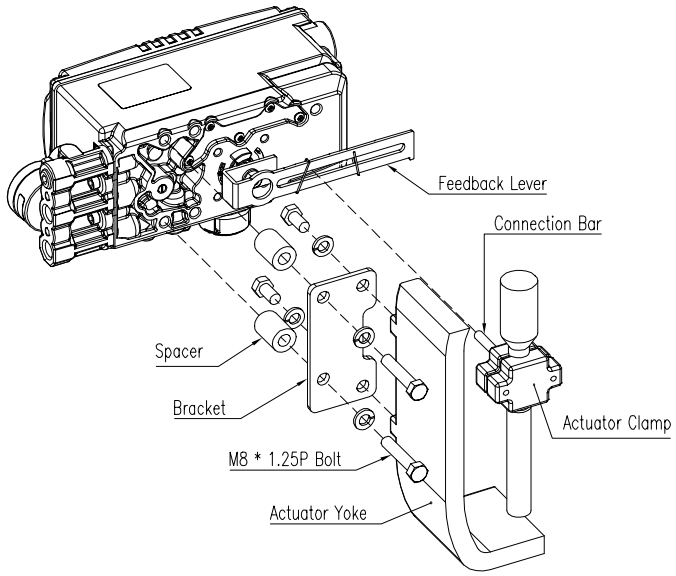


Fig. 3-5: YT-3300L / 3350L (Standard Lever Type)

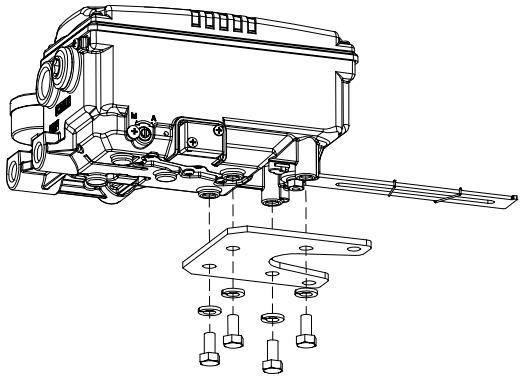


Fig. 3-6: Attaching positioner to bracket (YT-3303L)

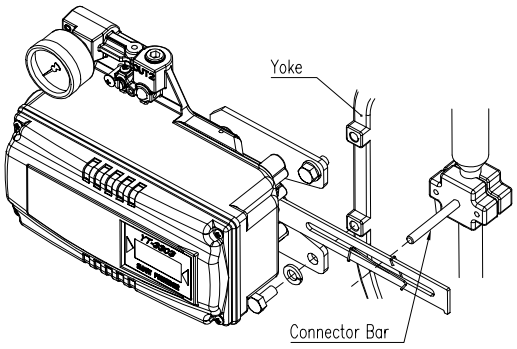


Fig. 3-7: Attaching the bracket to actuator yoke (YT-3303L / 3301L)

2) Attach the positioner (or remote sensor) with the bracket to the actuator yoke
   – **DO NOT TIGHTEN THE BRACKET COMPLETELY.**

3) Connect connection bar to the actuator clamp. The hole gap on the feedback lever is 6.5mm so the connection bar's outer diameter should be less than 6mm.

4) Connect an air-filter regulator to the actuator temporarily. Supply enough air pressure to the actuator in order to position the valve stroke at 50% of the total stroke.

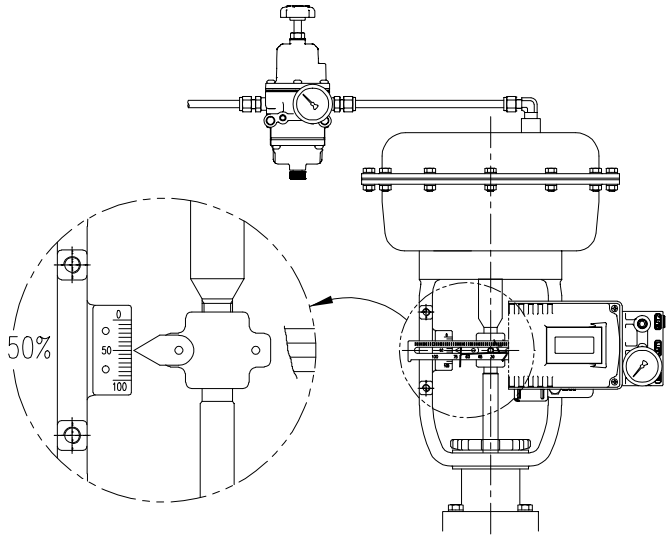


Fig. 3-8: YT-3300L / 3350L (Standard Lever Type)

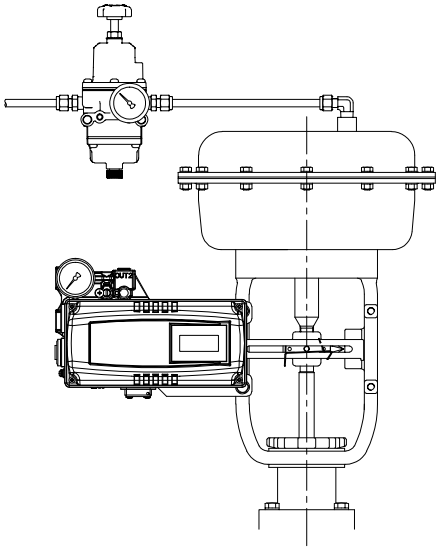


Fig. 3-9: YT-3303L / 3301L

5) Insert the connection bar between the feedback lever and lever spring. The connection bar must be located upward from the lever spring as shown below left figure. If it is located downward from the lever spring as shown below right figure, the connection bar or the lever spring will be worn out quickly because of excessive strong tension.

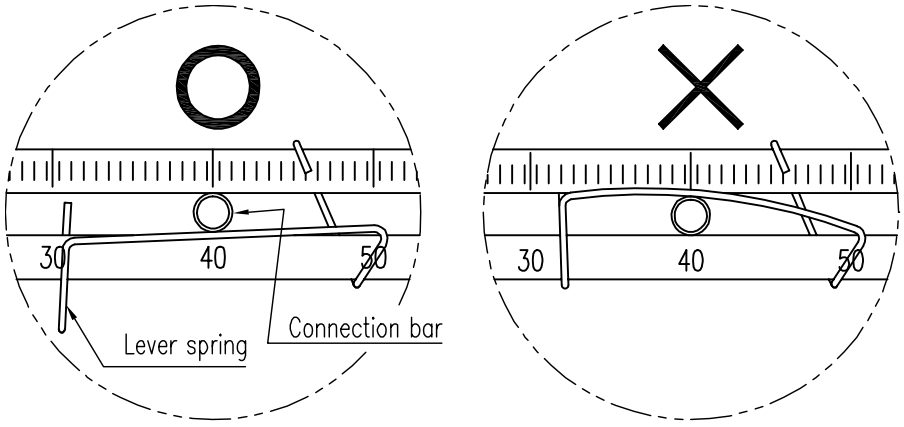


Fig. 3-10: Proper way to insert connection bar between feedback lever and lever spring

6) Check if feedback lever is vertical to the valve stem at 50% of the valve stroke. If it is not vertical, adjust the bracket or the connection bar to make vertical. Improper installation may cause poor linearity.

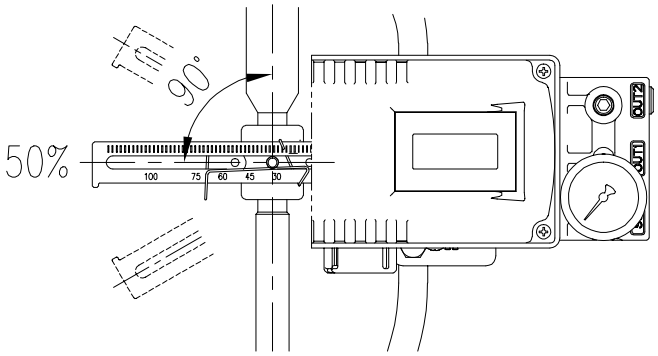


Fig. 3-11: YT-3300L / 3350L Feedback lever and valve stem

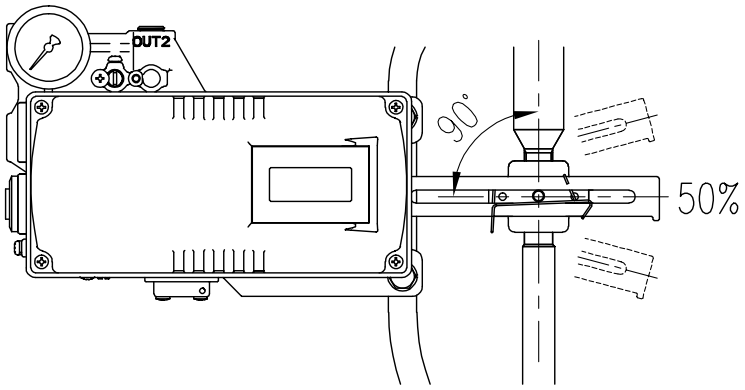
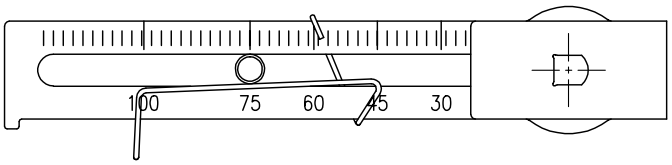


Fig. 3-12: YT-3303L / 3301L Feedback lever and valve stem

7) Check the valve stroke. The stroke numbers are engraved on the feedback lever of the positioner. Position the connection bar at the number on the feedback lever which corresponds with the desired valve stroke. To adjust, move the bracket, the connection bar or both.

※ The effective linear lever angle of YT-3300L / 3350L is 60 degree and it of YT-3303L / 3301L is 30 degree.

Stroke : 75mm



Stroke : 45mm

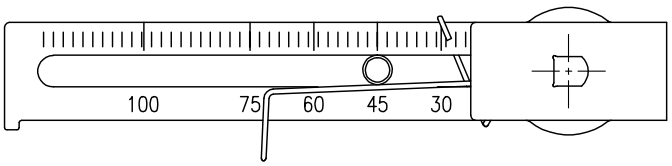


Fig. 3-13: YT-3300L / 3350L Feedback lever and location of the connection bar

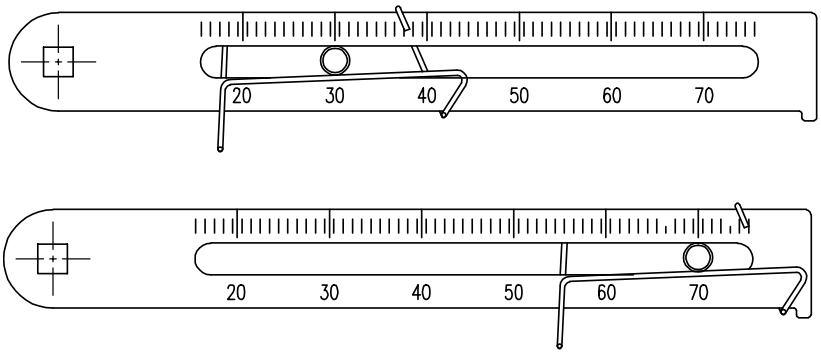


Fig. 3-14: YT-3303L / 3301L Feedback lever and location of the connection bar

8) After installing the positioner, operate the valve from 0% to 100% stroke by using direct air to the actuator. On both 0% and 100%, the feedback lever should not touch the lever stopper, which is located on the backside of the positioner. If the feedback lever touches the stopper, the positioner should be installed further away from center of the actuator.

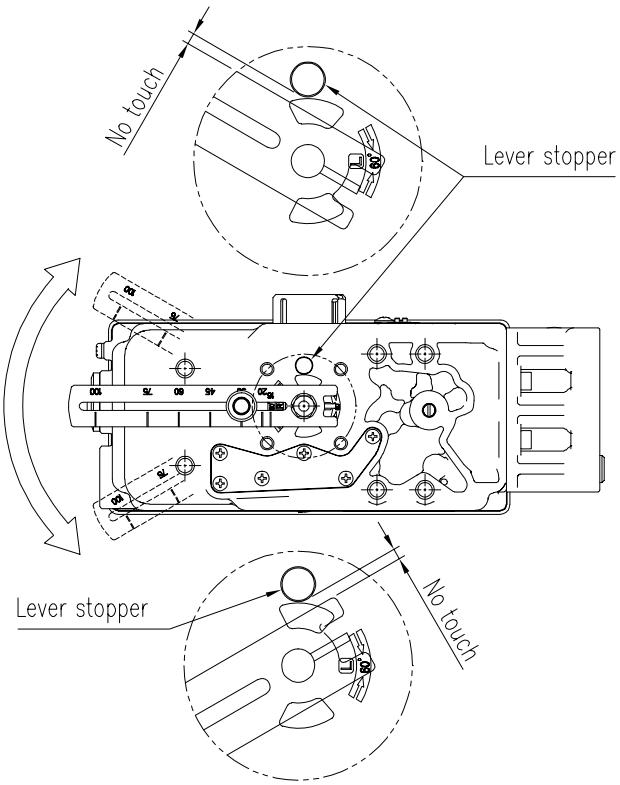


Fig. 3-15: YT-3300L / 3350L Feedback lever should not touch lever stopper on 0% ~ 100% valve stroke.

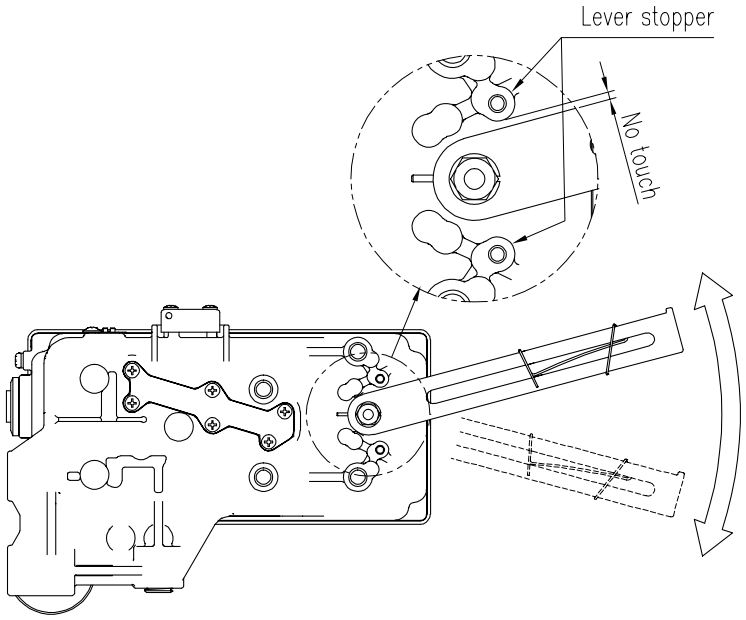


Fig. 3-16: YT-3303L / 3301L Feedback lever should not touch lever stopper on 0% ~ 100% valve stroke.

9) After the installation, tighten all of the bolts on the bracket and the connection bar.

3.3.2 YT-3300L / 3350L Installation of Adapter lever type (on tubeless actuator)

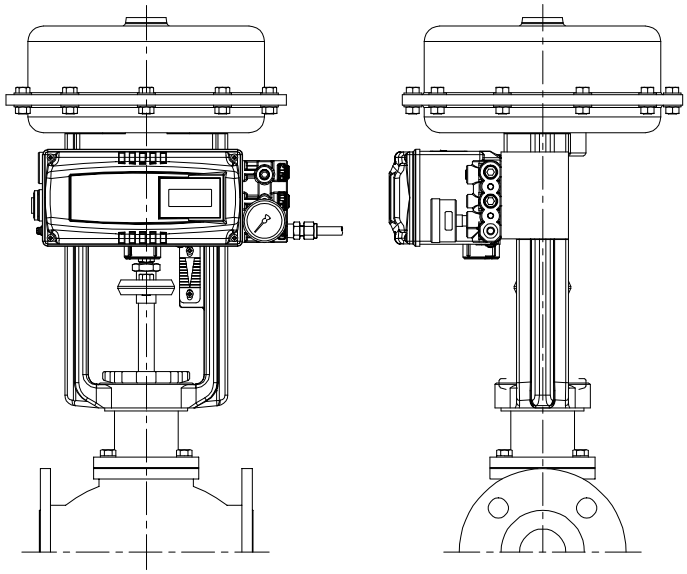


Fig. 3-17: YT-3300L / 3350L installation of adapter lever type example

Before proceeding with the installation, ensure following components are available.

- Positioner
- Feedback lever
- M6 nut and spring washer (fastening feedback lever to a main shaft of positioner)
- O-ring(Connect out1 port of positioner and actuator) – not supplied with the unit
- 1/4 plug – not supplied with the unit
- Adapter holder – not supplied with the unit
- 2 pcs x bolts (M8 x 1.25P) – not supplied with the unit

※ When using adapter lever, generally tubeless actuator which doesn't requires pipe between actuator and positioner is used. Therefore, in this section, installation method of tubeless actuator and positioner will be introduced like below.

3.3.2.1 Safety

- Positioner's feedback lever must be vertical to the valve stem at 50% of the valve stroke.
- Adapter of feedback lever should be installed in such a way that the valve stroke length coincides with the corresponding figure in "mm" marked on the feedback lever.

3.3.2.2 Adapter lever type positioner Installation Steps

1) Remove Out1 Plug(Fig. 3-19) on the bottom of the positioner. Plug up out1 port of gauge block with 1/4 plug using sealant.

2) Check the valve stroke. The stroke numbers are engraved on the feedback lever of the positioner. Position the adapter at the number on the feedback lever which corresponds with the desired valve stroke. To adjust, loosen M6 nut behind the adapter, move the adapter to correct position, and then tighten the M6 nut.

Stroke : 75mm

Stroke : 30mm

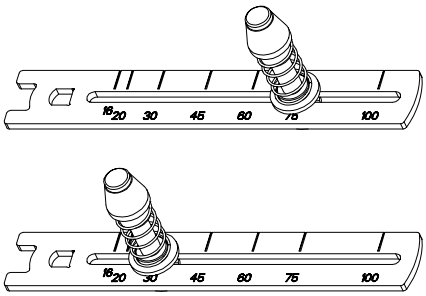


Fig. 3-18: Feedback lever and location of the connection bar

3) **Loosen Adapter holder on actuator's stem.**

4) Add O-ring between the positioner and actuator and attach the positioner to the actuator yoke tightly by fastening the bolts (M8 x 1.25P, 2 pieces).

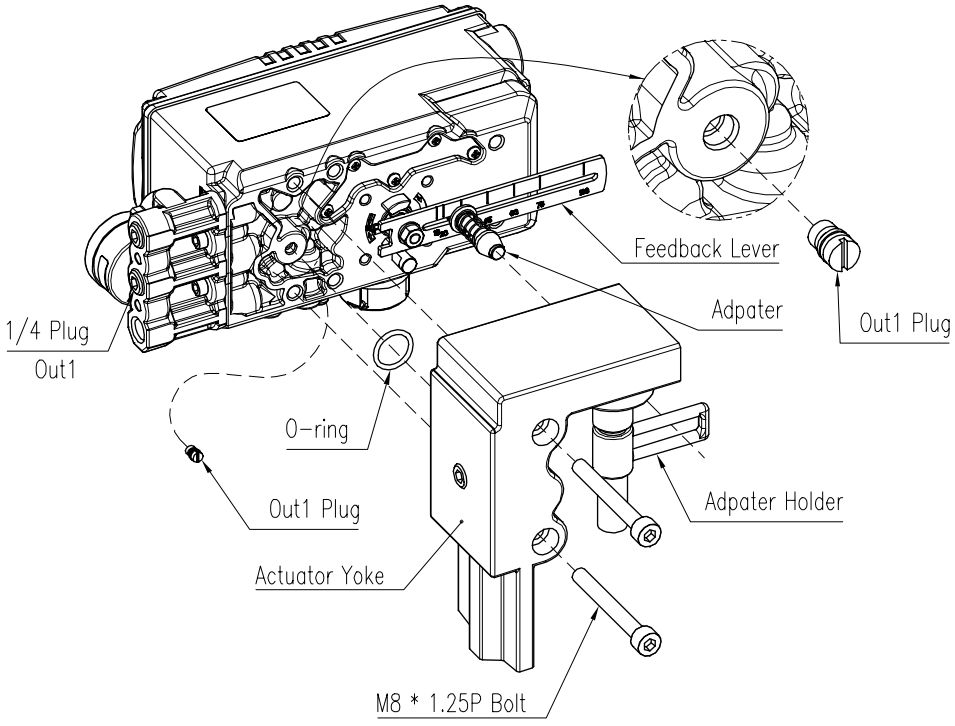


Fig. 3-19: Installing the positioner on the actuator

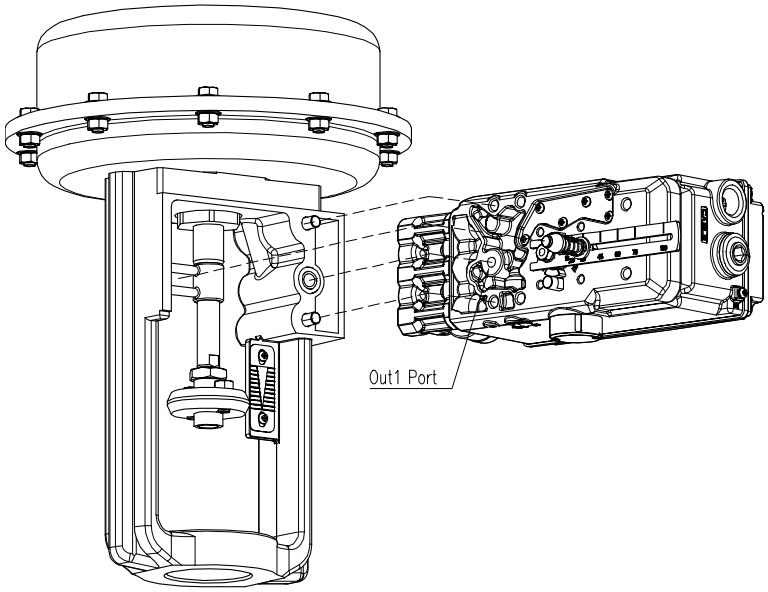


Fig. 3-20: YT-3300 / 3350L(Adapter Lever Type)

5) Connect Air-filter regulator to Supply port of the positioner.

6) Turn the Auto/Manual switch counterclockwise (toward “M”). Refer to 6.2 for more detail. Supply enough air pressure to the actuator in order to position the valve stroke at 50% of the total stroke.

7) Check if feedback lever is vertical to the valve stem at 50% of the valve stroke. If it is not vertical, adjust the adapter holder on the actuator’s stem to make vertical – **DO NOT TIGHTEN THE ADAPTER HOLDER COMPLETELY.** Improper installation may cause poor linearity.
Refer to Fig 3-11.

8) After installing the positioner, operate the valve from 0% to 100% stroke by using direct air to the actuator. On both 0% and 100%, the feedback lever should not touch the lever stopper, which is located on the backside of the positioner. If the feedback lever touches the stopper, the adapter holder should be moved or the adapter of feedback lever should be moved further away from the main shaft of the positioner.
Refer to Fig 3-15.

9) After the installation, tighten the adapter holder. And Turn the Auto/Manual switch clockwise (toward “A”) tightly. Refer to 6.2 for more detail.

3.4 Rotary positioner Installation

Rotary positioner should be installed on rotary motion valve such as ball or butterfly type which uses rack and pinion, scotch yoke or other type of actuators which its stem rotates 90 degrees. Before proceeding with the installation, ensure following components are available.

3.4.1 YT-3300R / 3350R Components

- Positioner
- Fork lever (Only Fork lever type)
- Rotary bracket set (2 pieces) → The upper brackets of fork lever type and Namur type are different.
- 4 pcs x hexagonal headed bolts (M8 x 1.25P) → Fork lever type
- 4 pcs x M8 plate washers → Fork lever type
- 4 pcs x wrench headed bolts (M6 x 1P x 10L) → Namur type, For the positioner and the upper bracket
- 4 pcs x wrench headed bolts (M6 x 1P x 15L) : For the bracket set
- 4 pcs x M6 nuts : For the bracket set
- 4 pcs x M6 spring washers : For the bracket set
- Bolts and washers to attach bracket to actuator – not supplied with the positioner

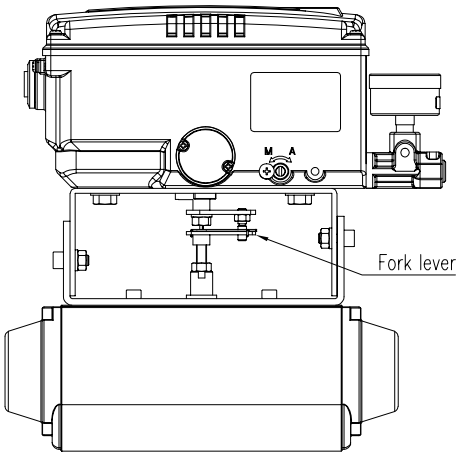


Fig. 3-21: YT-3300R / 3350R Fork lever type

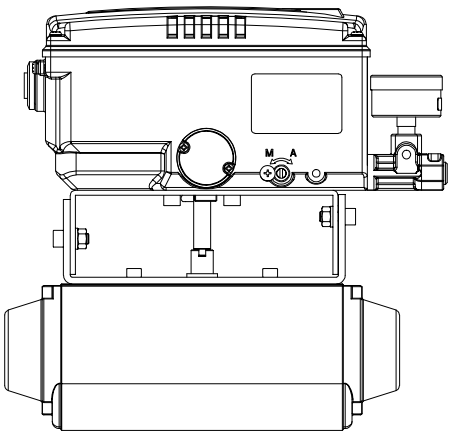


Fig. 3-22: YT-3300R / 3350R Namur type

3.4.2 YT-3303R Components

- Positioner
- Fork lever (Only Fork lever type)
- Rotary bracket set (2 piece)
- 4 pcs x hexagonal headed bolts (M8 x 1.25P)
- 4 pcs x M8 plate washers
- 4 pcs x wrench headed bolts (M6 x 1P x 15L)
- 4 pcs x M6 nuts
- 4 pcs x M6 spring washers
- Bolts and washers to attach bracket to actuator – not supplied with the positioner

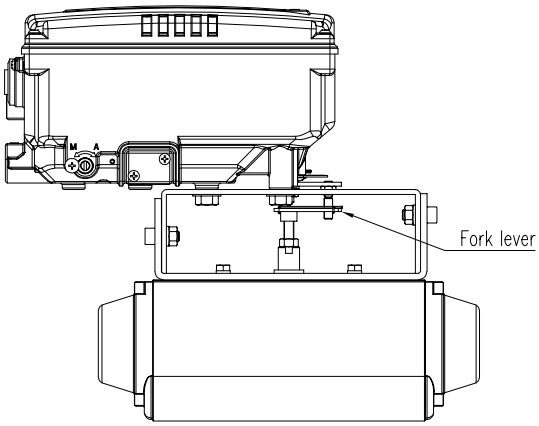


Fig. 3-23: YT-3303R Fork lever type

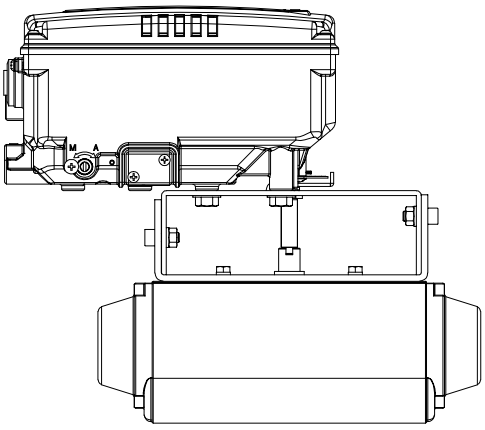


Fig. 3-24: YT-3303R Namur type

3.4.3 YT-3301R remote sensor components

- Rotary remote sensor
- Bracket for actuator stem height 20mm (1 piece)
- 4 pcs x hexagonal headed bolts (M6)
- 4 pcs x M6 spring washers
- Bolts and washers to attach bracket to actuator – not supplied with the positioner

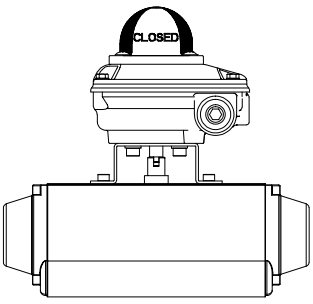


Fig. 3-25: YT-3301R Rotary remote sensor

3.4.4 Rotary Bracket Information (Only YT-3300R / 3350R / 3303R)

The rotary bracket set (included with the positioner) contains two components. (but the upper brackets of Fork lever type and Namur type are different in case of YT-3300 / 3350). The bracket is designed to fit onto the actuator with 20mm, 30mm and 50mm stem height (H) according to VDI/VDE 3845 standard. Please refer to below table how to adjust the height of the bracket.

Actuator stem height (H)	Markings of bolt holes			
	A-L	B-L	A-R	B-R
20mm	H : 20	H : 20, 30	H : 20	H : 20, 30
30mm	H : 30	H : 20, 30	H : 30	H : 20, 30
50mm	H : 50	H : 50	H : 50	H : 50

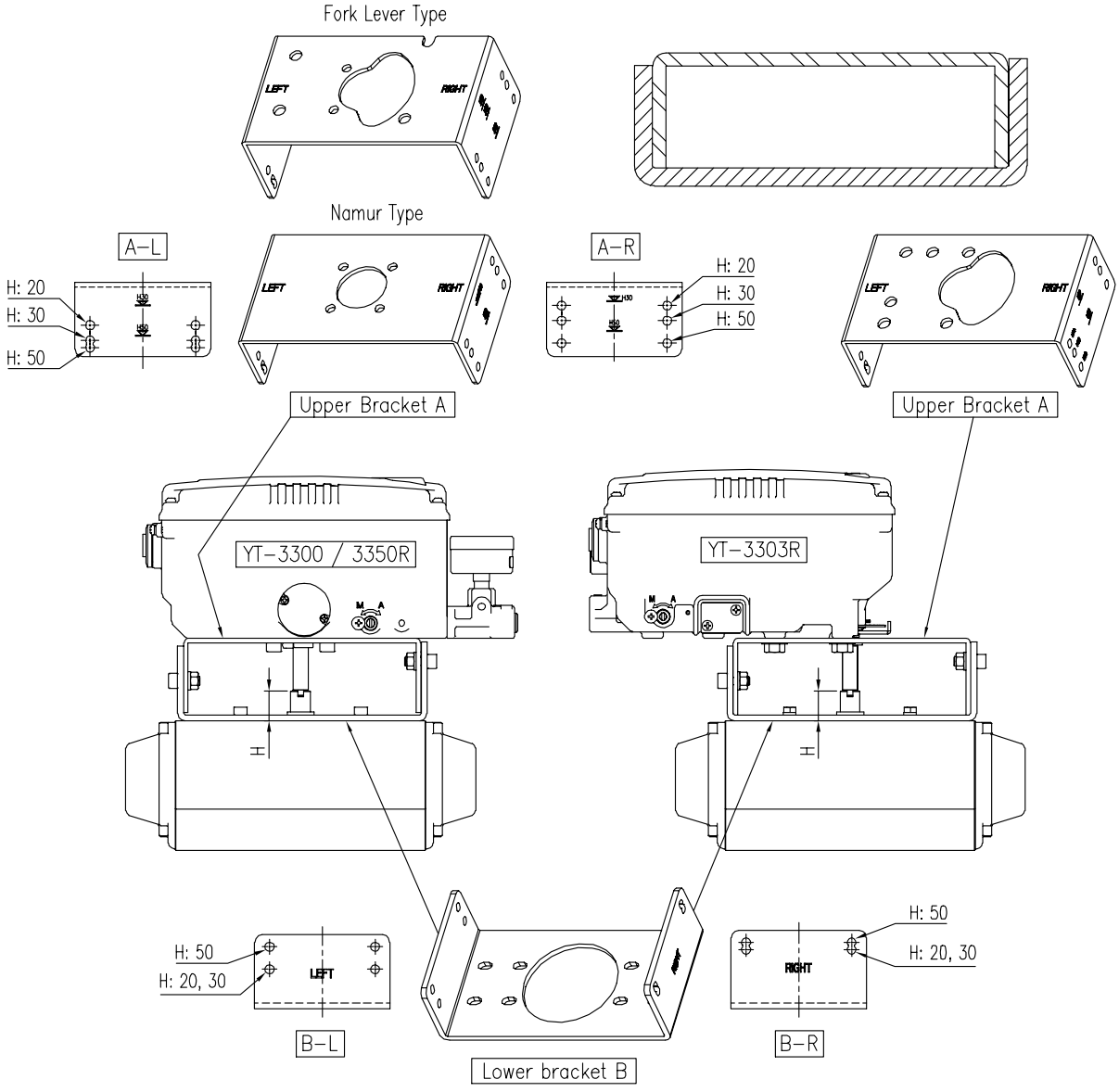


Fig. 3-26: YT-3300R / 3350R / 3303R Brackets and positioner

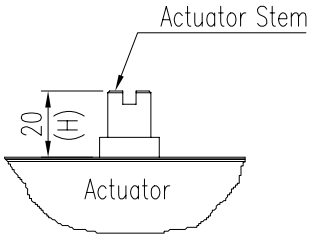


Fig. 3-27: Actuator stem Height

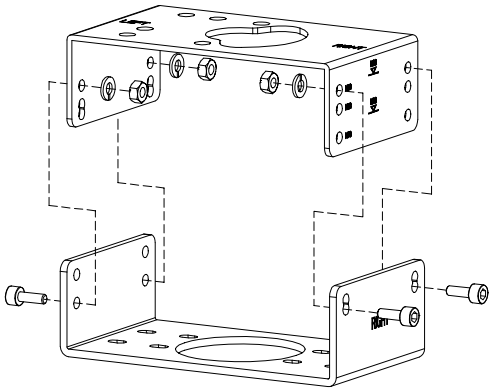


Fig. 3-28: Exploded Brackets

3.4.5 Rotary positioner Installation Steps

1) Please check the actuator's stem height and adjust the brackets by referring to the above bracket table.

2) Attached the brackets onto the actuator. It is recommended to use spring washer so the bolts will not be loosen from vibration.

3) Set rotation position of the actuator stem at 0%. For single acting actuator, it is easy to check 0% point by supplying no pressure to the actuator. For double acting actuator, check actuator stem's rotation direction – clockwise or counter-clockwise - by supplying pressure to the actuator.

4) (Only Fork lever type) Install the fork lever after setting actuator's stem at 0%. Check the actuator stem's rotation direction – clockwise or counter-clockwise.
Installation angle of the fork lever should be 45˚ to the longitudinal direction of the actuator.

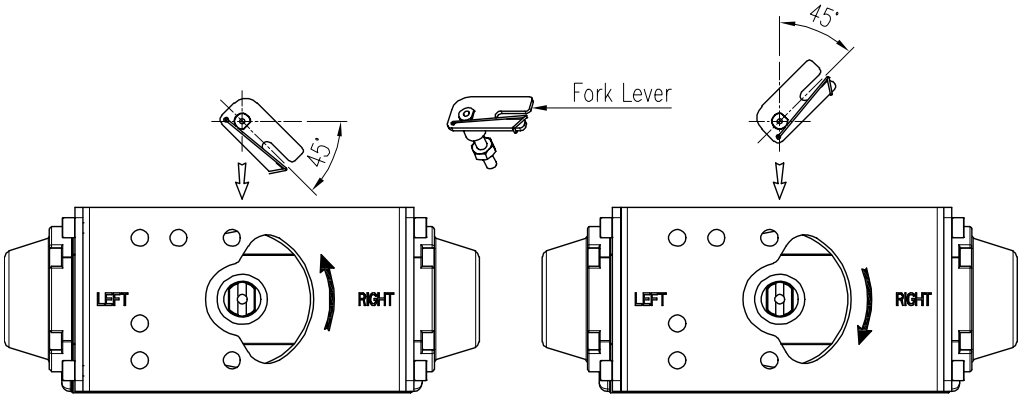


Fig. 3-29: Counter-clockwise and clockwise rotation.

5) (Only Fork lever type) After setting fork lever position, fasten lock nuts which are located on the bottom of the fork lever. Ensure to set the gap between the top of upper bracket and the top of the fork lever within **23~28mm**(YT-3300R / 3350R) and **6~11mm**(YT-3303R).

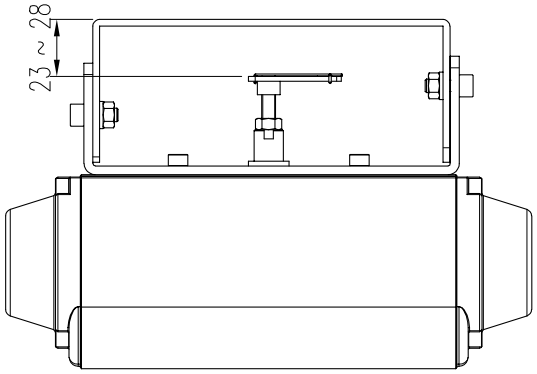


Fig. 3-30: Height to the bracket (fork lever type of YT-3300R / 3350R)

6) Attach the positioner to the bracket. <*Only fork lever type of YT-3300R / 3350R / 3303R: Fix the clamping pin (5mm Dia.) into the fork lever slot and insert center pin (2mm Dia.) of the main shaft of the positioner into the hole of center of the fork lever. The clamping pin will be locked to the fork lever spring.*> Setting alignment of center of main shaft of the positioner and center of the actuator's stem is very important. Poor alignment of the main shaft and the actuator's stem decreases the positioner's durability due to unnecessary forces on the main shaft.

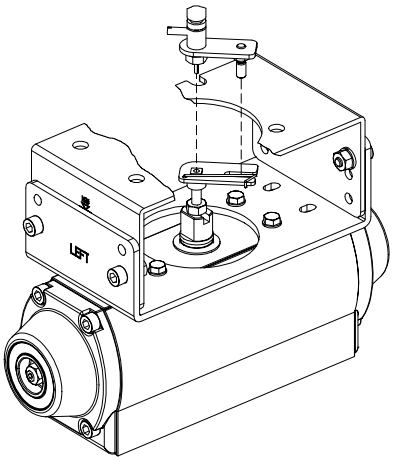


Fig. 3-31: Main shaft center alignment (Fork lever)

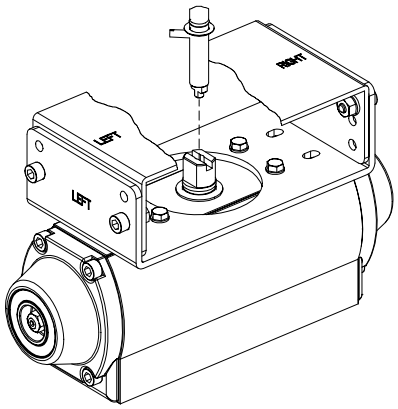


Fig. 3-32: Main shaft center alignment (Namur)

7) Tighten the positioner and the bracket with bolts **after checking the positioner's position.**

4 Connection - Air

4.1 Safety

- Supply pressure should be clean and dry air – avoiding moisture, oil and dust.
- Always recommended to use air filter regulator (i.e. YT-200 series).
- Rotork YTC Limited **has not tested positioner's operation with any other gases other than clean air. Please contact Rotork YTC Limited for any questions.**

4.2 Supply Pressure Condition

- Dry air with dew point of at least 10°C lower than ambient temperature.
- Avoid from dusty air. Use 5 micron or smaller filter.
- Avoid oil.
- Comply with ISO 8573-1 or ISA 7.0.01.
- Supply pressure range is 0.14 ~0.7 MPa (1.4 ~ 7 bar)
- Set air filter regulator's pressure level 10% higher than actuator's spring range pressure.

4.3 Piping Condition

- Ensure inside of pipe is clean of obstructions.
- Do not use pipeline that is squeezed or shows any type of damamges.
- Pipeline should have more than 6mm of inner diameter (10mm outer diameter) to maintain flow rate.
- The length of pipeline system should not be extremely long. Longer pipeline system may affect flow rate due to the friction inside of the pipeline.

4.4 Connection – Piping with actuator

4.4.1 Single acting actuator

Singe acting type positioner is set to use only OUT1 port. OUT1 port of positioner should be connected with supply port of actuator when using spring return actuator of single acting type.

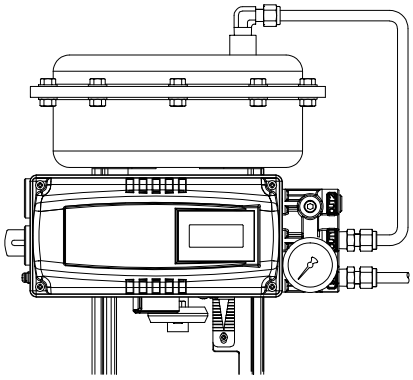


Fig. 4-1: Single acting linear actuator (YT-3300L / 3350L / 3303L)

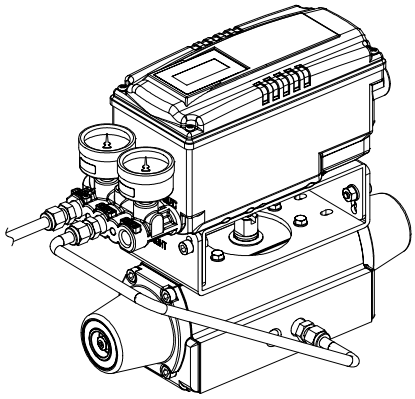


Fig. 4-2: Single acting rotary actuator (YT-3300R / 3350R / 3303R)

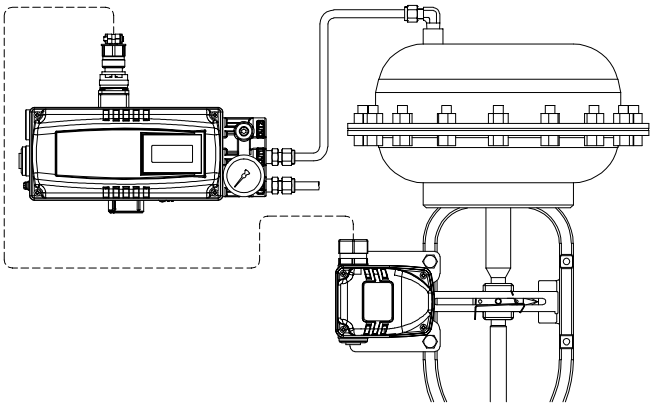


Fig. 4-3: Single acting linear actuator (YT-3301L)

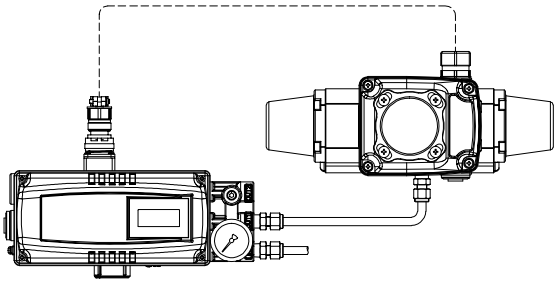


Fig. 4-4: Single acting rotary actuator (YT-3301R)

4.4.2 Double acting actuator

Double acting type positioner is set to use OUT1 and OUT2 port. As input signal increases, the supply pressure will be supplied through OUT1 port.

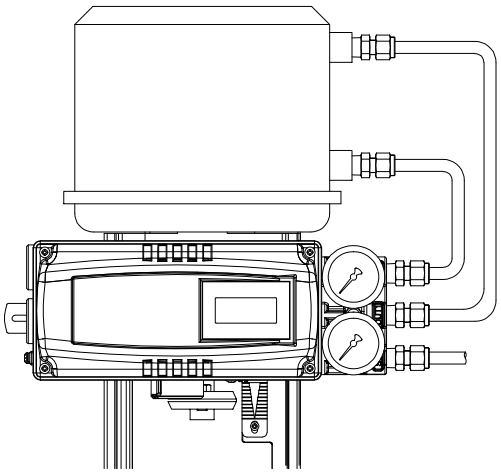


Fig. 4-5: Double acting linear actuator (YT-3300L / 3350L / 3303L)

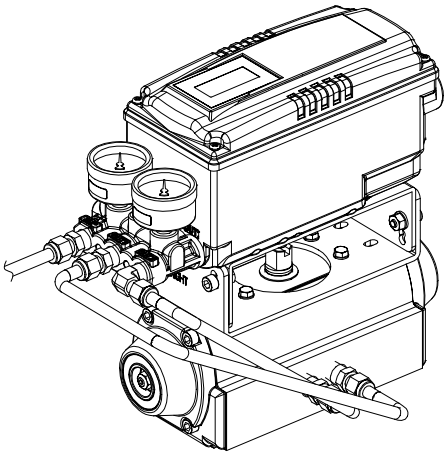


Fig. 4-6: Double acting rotary actuator (YT-3300R / 3350R / 3303R)

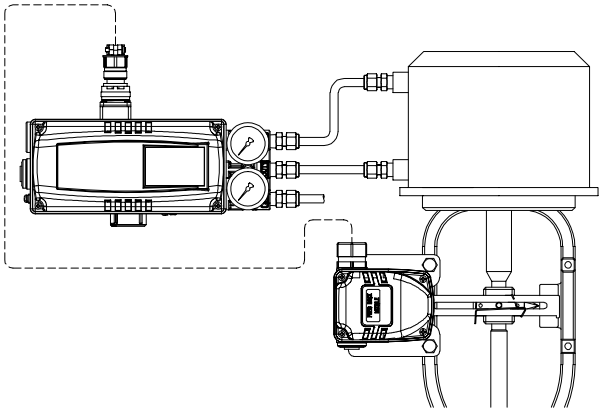


Fig. 4-7: Double acting linear actuator (YT-3301L)

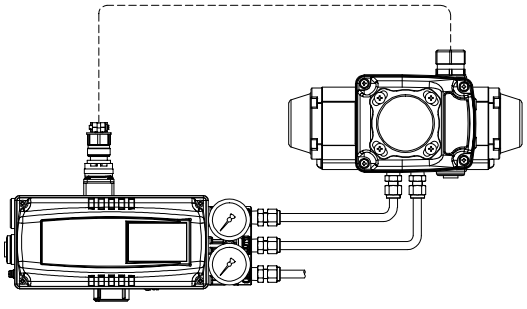


Fig. 4-8: Double acting rotary actuator (YT-3301R)

5 Connection – Power

5.1 Safety

- There are two conduit entries on the product. See “2.4 Product Code” for conduit entry threads.
- Before connecting terminal, ensure that the power is off completely.
- Please use ring terminal to protect against vibration or any other external impact.
- Positioner usually uses 4~20mA DC. Minimum ampere of input signal of standard type positioner is 3.2 mA and HART internal type positioner’s minimum ampere of input signal is 3.8 mA but maximum ampere of input signal should be 24mA or under.
- Compliance voltage of current source must be Min. 10V and Max. 28V. If the length of the supply cable between the current source and the positioner is long, or if there is a filter or safety barrier, then consider using a current source which could supply higher Compliance voltage.
- Positioner with PTM options must be supplied with **9~28V DC** separately. For mechanical limit switch option, separate **12~30V DC** must be supplied. For inductive proximity limit switch option, separate **8.2V DC** must be supplied.
- **DO NOT connect Voltage source (9~28V DC) to Input (4~20mA DC) terminal (IN+, IN-) as it will cause PCB failure.**
- Positioner should be grounded.
- Please use twisted cable with conductor section are 1.25mm^2 and that is suitable for 600V (complying with the conductor table of NEC Article 310). The outer diameter of the cable should be between 6.35 ~ 10mm. Use shield wire to protect against electro-magnetic field and noise.
- Please do not install the cable near high noise equipment, such as high-capacity transformer or motor.

5.2 Connection

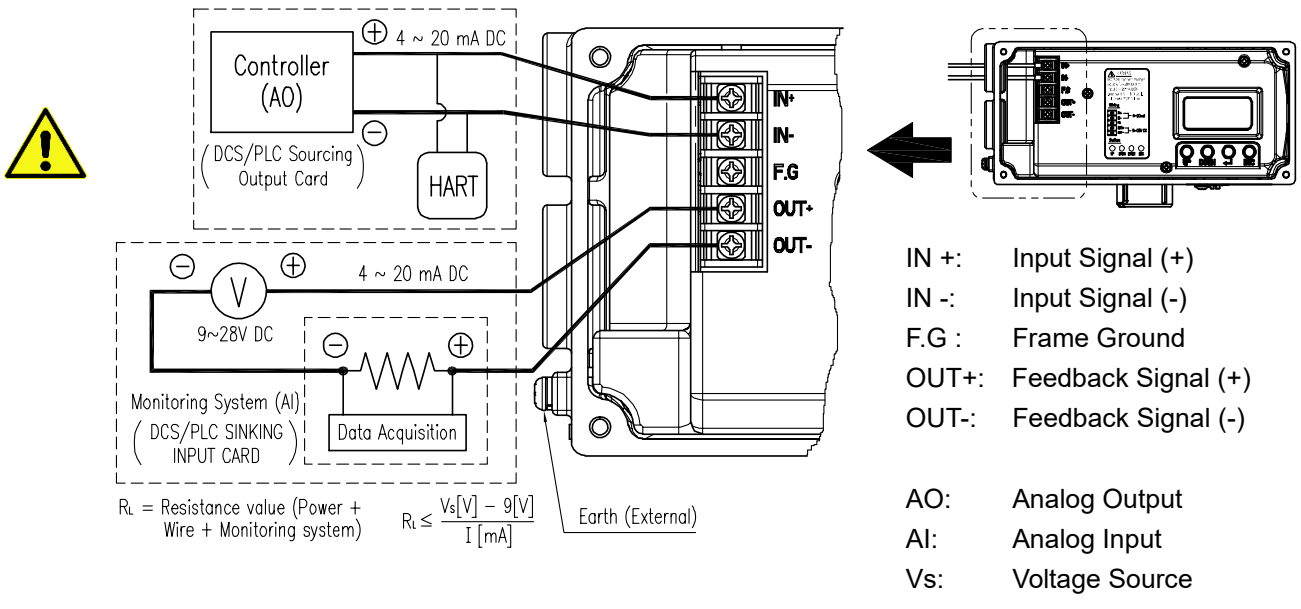


Fig. 5-1: Terminal Overview

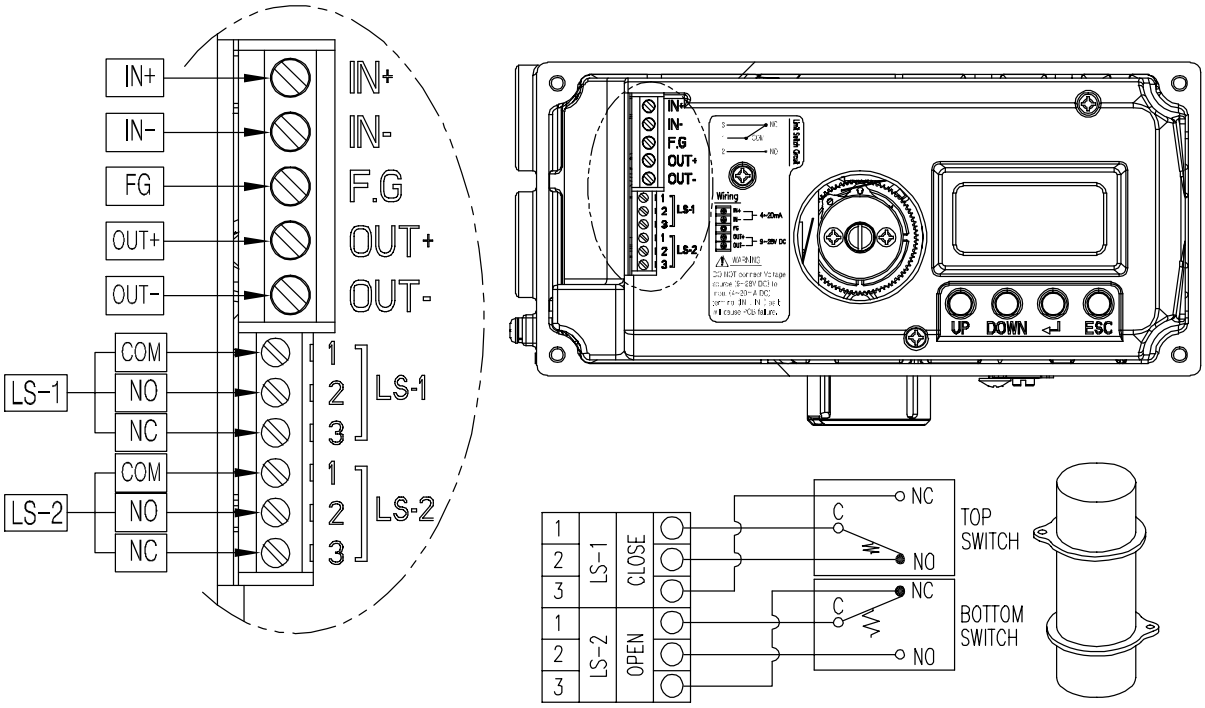


Fig. 5-2: Mechanical Switch Terminal (Only YT-3300 / 3350)

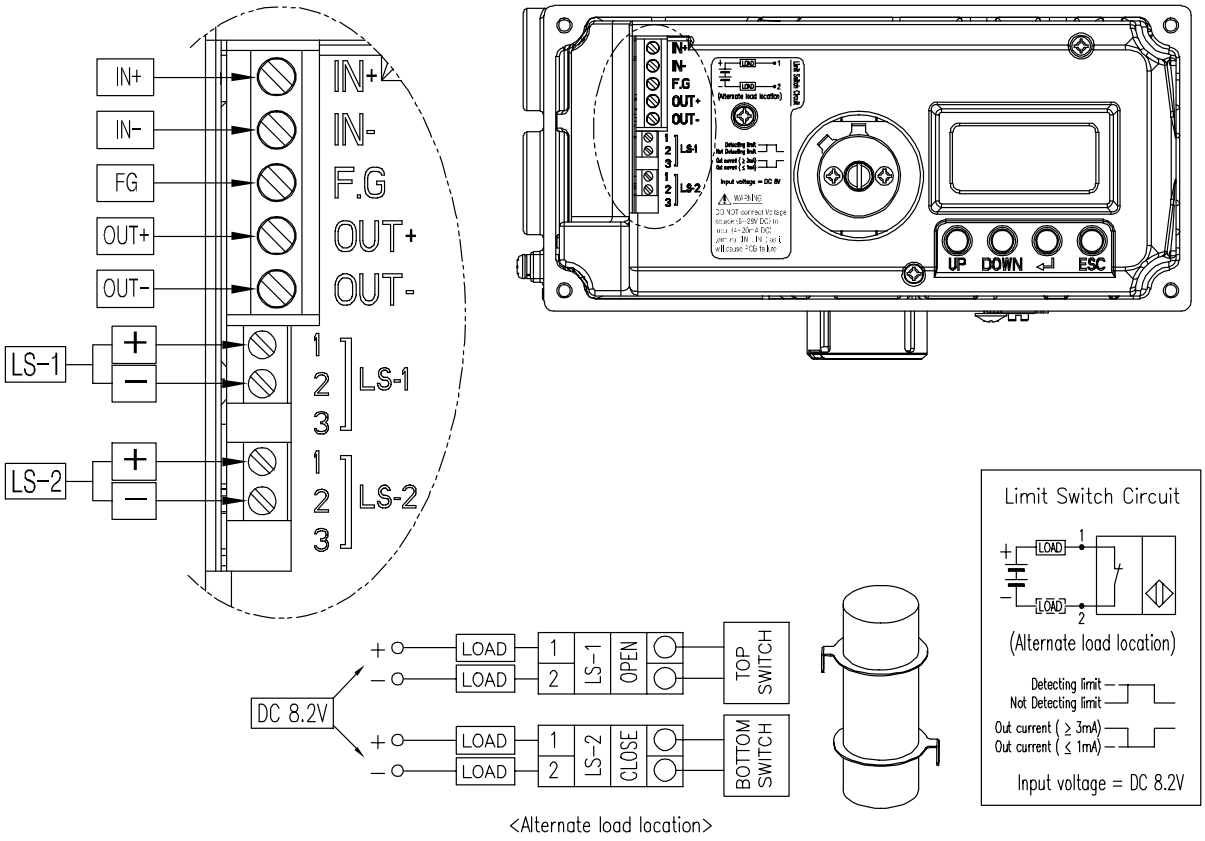


Fig. 5-3: Inductive Proximity Sensor Switch Terminal (Only YT-3300 / 3350)

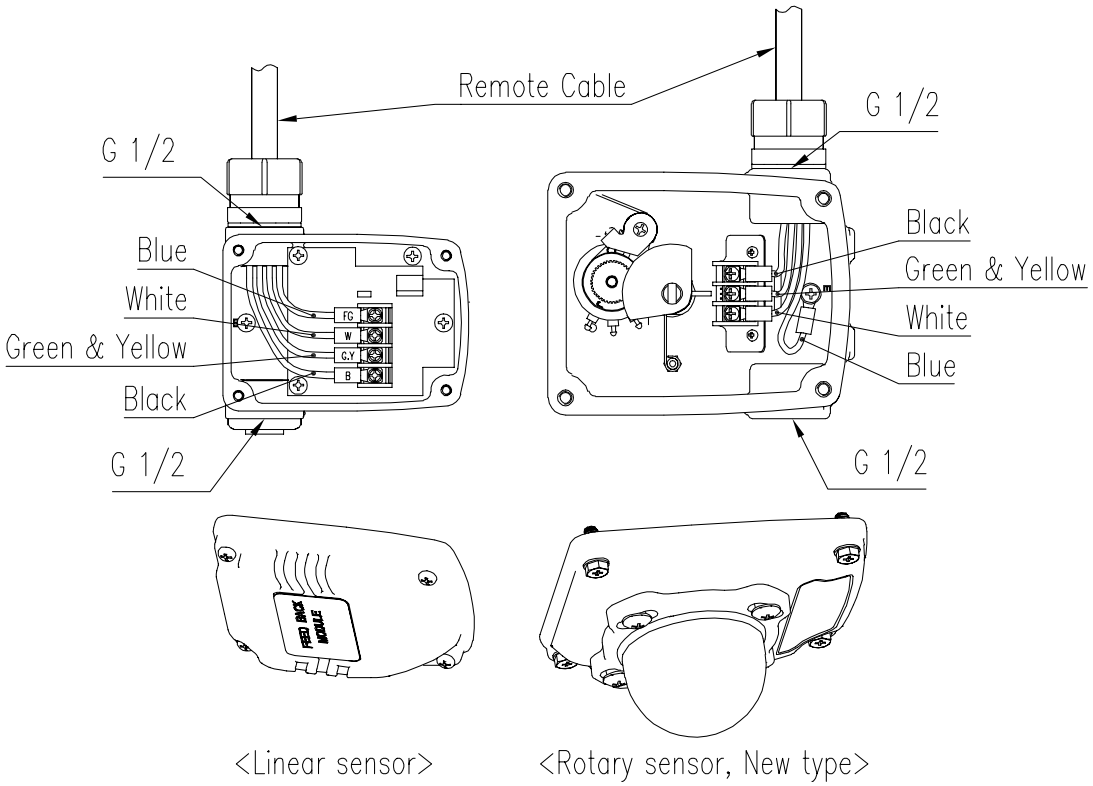


Fig. 5-4: Remote sensor and cables (Only YT-3301L)

5.3 Ground

1) Ground must be done before operating the positioner.
2) Open base cover and there is an internal ground “F.G” on the left hand.
   An external ground bolt is located next to the conduit entry. Please make sure that the resistance is less than 100 ohm.

6 Adjustments

6.1 Limit Switch Adjustment

YT-3300 / 3350 can have limit switch option. If user wants to adjust the sensing position, please loosen bolts and adjust cam.

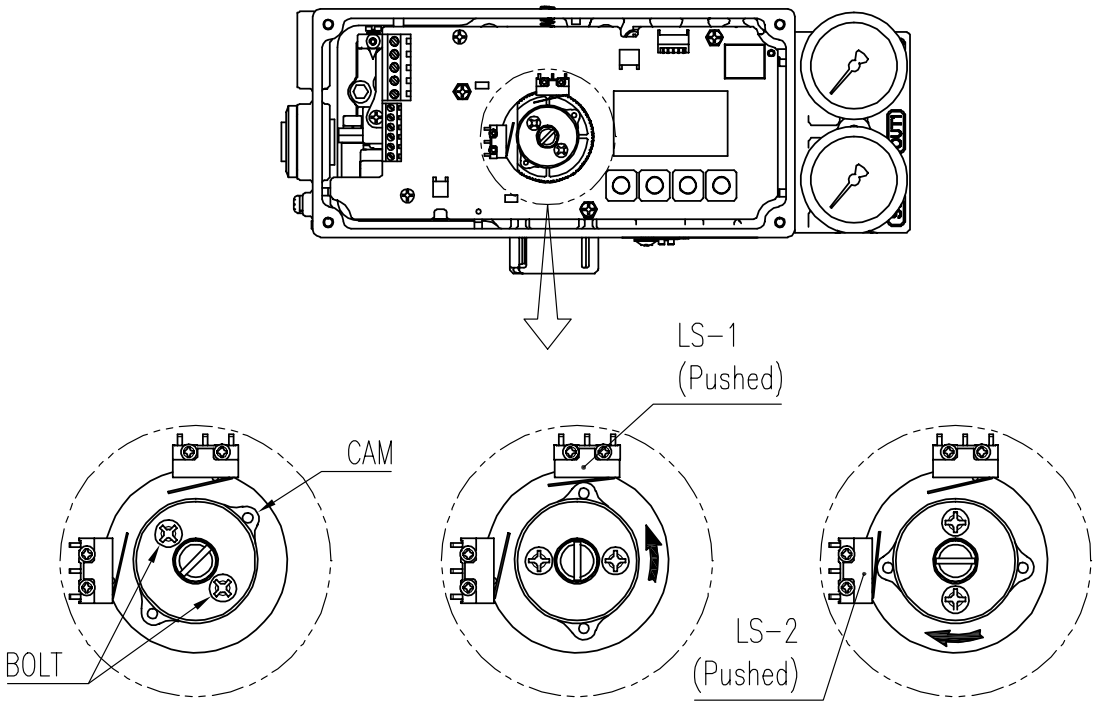


Fig. 6-1: Mechanical Type

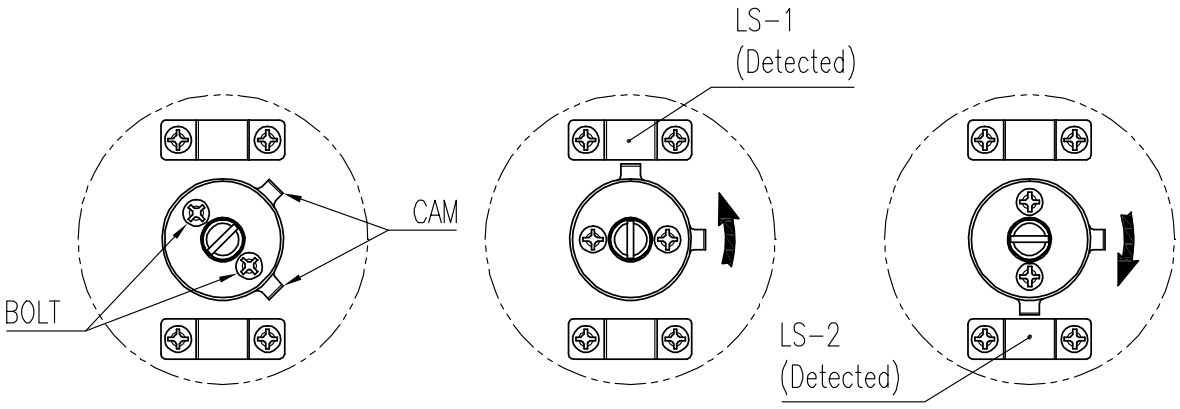


Fig. 6-2: Inductive proximity Type

6.2 A/M switch adjustment

1) On the right hand bottom of positioner, there is A/M switch (Auto/Manual). A/M Switch allows the positioner to be functioned as by-pass. If the switch is turned clockwise (toward “A”) and it is fasten tightly, then the supply pressure will be transferred to actuator through outport by positioner control. On the other hand, if the switch is turned counter-clockwise (toward “M”), it is loosened, then the supply pressure will be directly supplied to the actuator regardless of positioner control. It is extremely important to check the allowed pressure level of the actuator when the switch is loosened.
2) Check whether the supply pressure is too high.
3) After using “Manual” function, A/M switch should be returned to “Auto”.

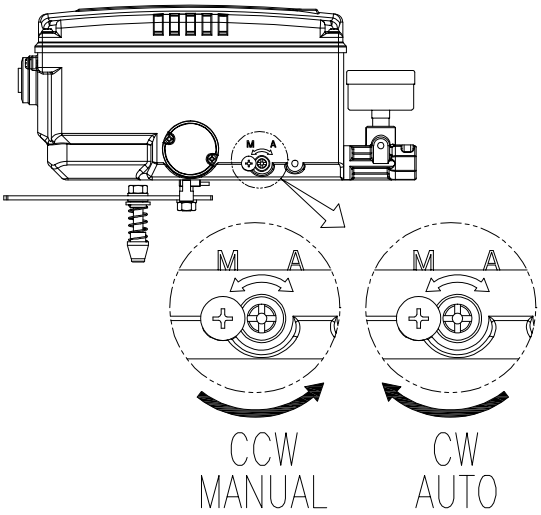


Fig. 6-3: A/M switch adjustment

6.3 Orifice Installment

Hunting can be occurred when the actuator's volume is too small. In order to prevent hunting, orifice can be used.

6.3.1 Plate type Orifice Installment (except YT-3303)

By installing the plate type orifice, the flow rate of the supply pressure to actuator can be reduced. The diameter of orifice hole is 1 mm.

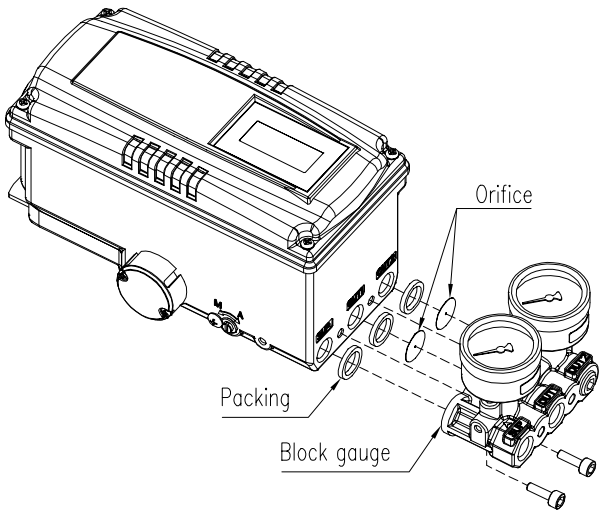


Fig. 6-4: Plate type Orifice installment

6.3.2 Variable Orifice Adjustment (Only YT-3303)

By adjusting the orifice, the flow rate of the supply pressure to actuator can be adjusted. Please use (-) driver to adjust the orifice. When slot (-) of the orifice is vertical like the below left figure, the flow rate becomes maximum. When slot (-) of the orifice is horizontal like the below right figure, the flow rate becomes minimum.

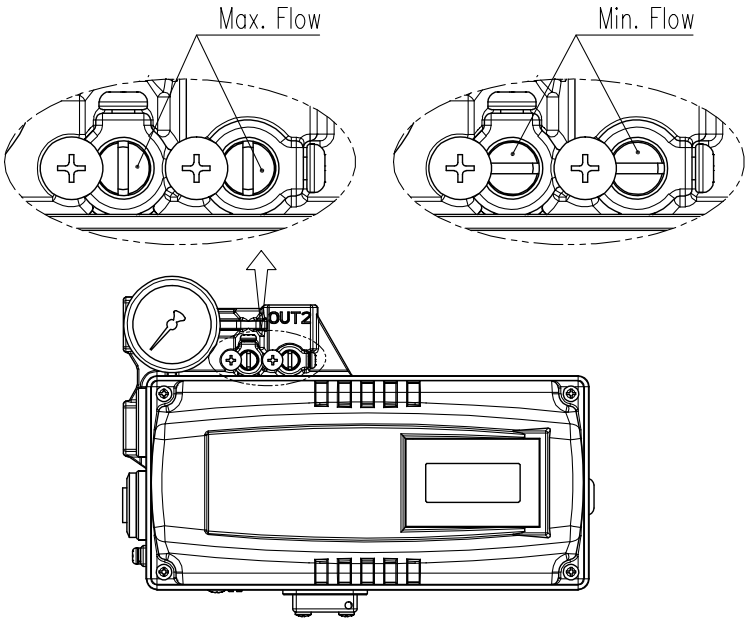
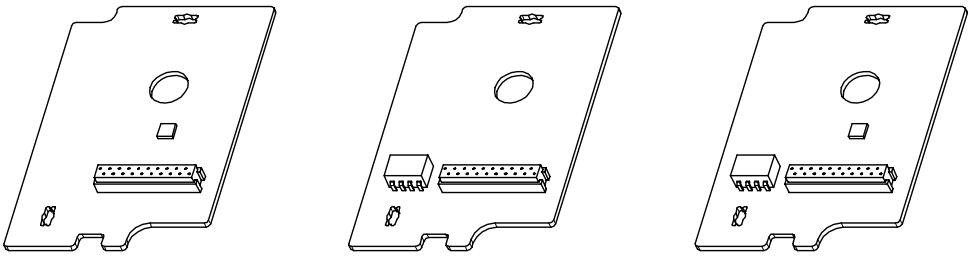


Fig. 6-5: Variable orifice adjustment

7 Optional Sub-PCB Installment

By adding sub-PCB, the positioner can have additional functions. There are 3 types of sub-PCB.



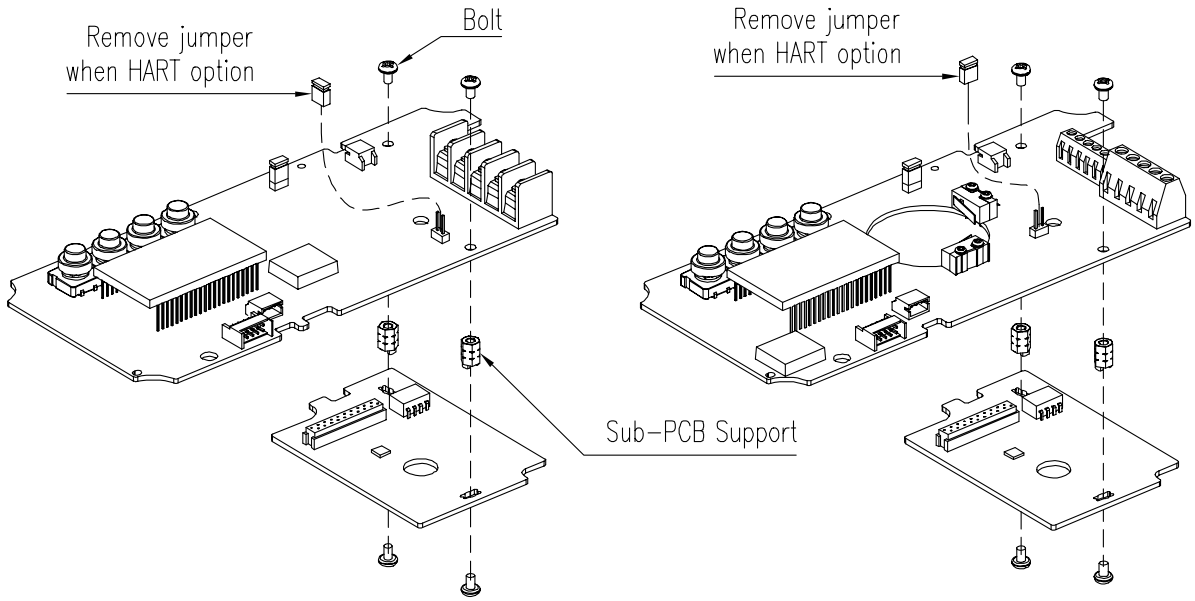
HART Only Ptm Only Ptm+HART

Fig. 7-1: Three types of Sub-PCB

When purchasing option sub-PCBs separately, 4 Bolts and 2 supports are supplied together with sub-PCB.

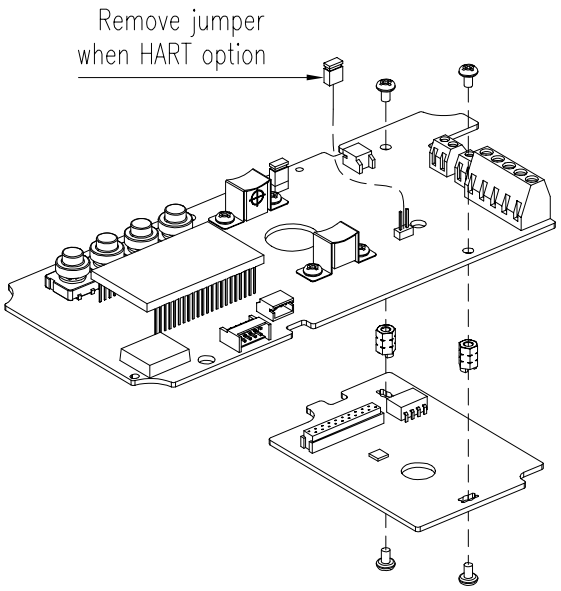
7.1 Installation steps

1) Mount 2ea of sub-PCB support on sub-PCB with 2ea of bolt.
2) Open base cover, PCB cover. Separate the Main PCB from base body.
3) Insert connector of sub-PCB into connector of main PCB correctly.
4) Fasten sub-PCB with the rest of bolt 2ea.



Standard type Mechanical Limit switch type

Fig. 7-2: Installation of Option PCB on Main PCBs



Inductive proximity limit switch type

Fig. 7-3: Installation of Option PCB on Main PCBs

JP1 jumper must be removed, when HART option included sub-PCB is being mounted.

5) After PTM sub-PCB is installed newly, values of TR_ZERO and TR_END must be calibrated for correct output signals. For the calibration of TR_ZERO and TR_END, please refer to section 9.7.2 of this manual.

8 Maintenance

8.1 Supply air

If Supply air pressure is not stable or Supply air is not clean, the positioner may not function properly. Air quality and pressure should be checked regularly to see if the air is clean and pressure set is normal.

8.2 Seals

Once a year, it is recommend to check if there are any damaged parts of the positioner. If there are damaged rubber parts such as diaphragms, o-rings and packings, replace with new ones.

9 Auto Calibration and PCB Operation

9.1 Warning

Following process will operate valve and actuator. Before proceeding with any Auto Calibration, please separate valve from the entire system by using bypass valve, so Auto Calibration will not affect entire valve process.

9.2 Button Description

Positioner has 4 buttons, and they enable to perform various functions.

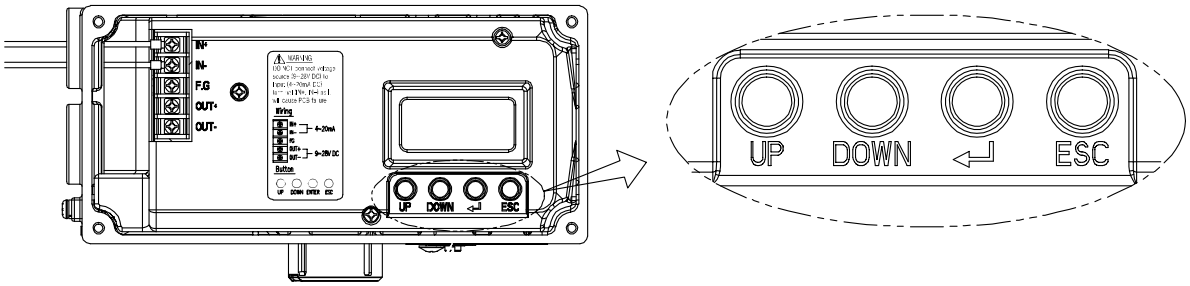


Fig. 9-1: <UP> & <DOWN>: Move to next menu, and adjust.
< ↵ , ENTER>: Enter to main and sub menus, and save
<ESC>: Return to previous menu

9.3 Run Mode (RUN)

After power connection to the positioner, Run Mode will be appeared on positioner's LCD screen in about 0.5 seconds. "RUN" indicates that the positioner adjusts the valve stroke according to the receiving signal. There are six types of display message in "RUN" Mode.

1) Run PV (%): Process Value - valve stroke
2) Run SV (%): Set Value – input signal 0~100%
3) Run SV (mA): Set Value – input signal 4~20mA
4) Run MV: Manipulate Value – Motor Manipulate Value (Digit)
5) Run VEL: Velocity – Current valve stem's velocity (Digit)
6) Run ERR (%): Error – Difference between SV and PV

To change the RUN PV to another RUN mode, hold <ESC> button and press the <UP> or <DOWN> button to display the above 6 modes sequentially each time when it is pressed.
By pressing <ESC>, the display will return to "RUN PV" mode.

※ Please note that the screen will return to "RUN PV" mode if 100 seconds elapse from the last button pressed.

※ By pressing <ESC> button several times from any MODES, it will return to “RUN PV” mode. Therefore, if the users have entered into wrong modes by mistake or do not wish to proceed with their current work, they could return to “RUN PV” mode.

9.4 Auto Calibration mode (AUTO CAL)

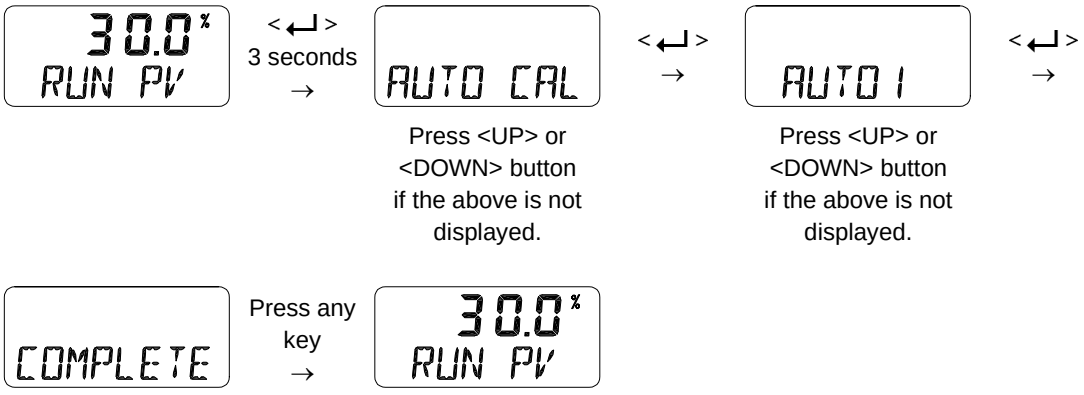
Auto Calibration mode (AUTO CAL) automatically calibrates the positioner. “AUTO CAL” process takes about 2~3 minutes, and the duration of the process varies upon the size of the actuator. There are 4 types of AUTO CAL.

	Zero Point	End Point	P, I, D	RA / DA	BIAS	KF
AUTO 1	O	O	X	X	X	X
AUTO 2	O	O	O	O	O	X
AUTO 3	O	O	O	O	O	O
AUTO HF	O	O	O	O	O	X

It is recommend to perform AUTO2 calibration for initial positioner setting.

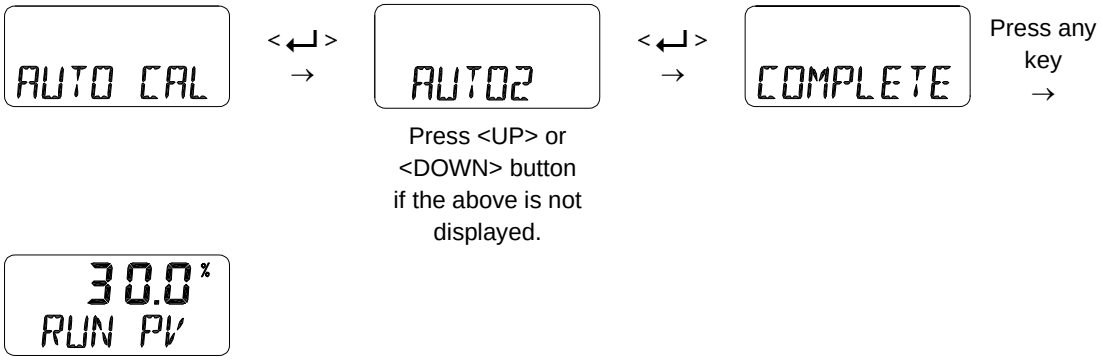
9.4.1 AUTO1 Calibration (AUTO1)

AUTO1 changes only zero and end points; however other parameters(P, I, D etc.) will not be adjusted. It is recommended to perform AUTO1 when the positioner has been set by the valve manufacturer already, and the field user wants to re-calibrate the positioner.



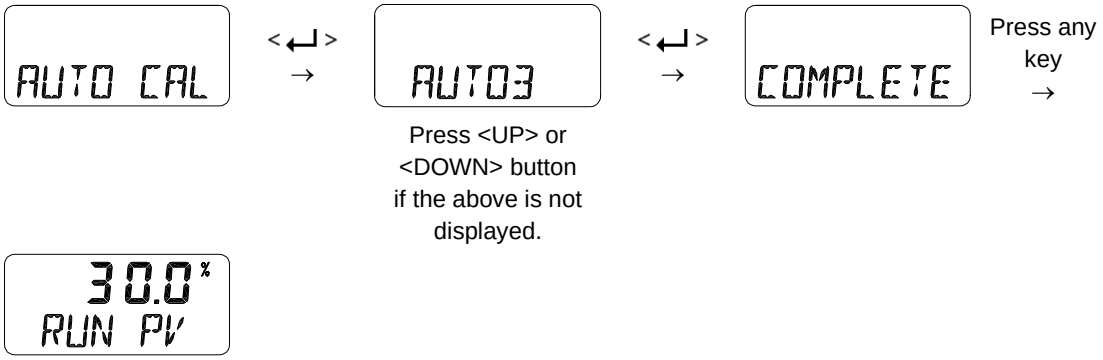
9.4.2 AUTO2 Calibration (AUTO2)

AUTO2 changes all of the parameters. It is recommended to perform AUTO2 when the positioner has been installed on the valve for the first time or the positioner has been reinstalled after dissemble from an actuator.



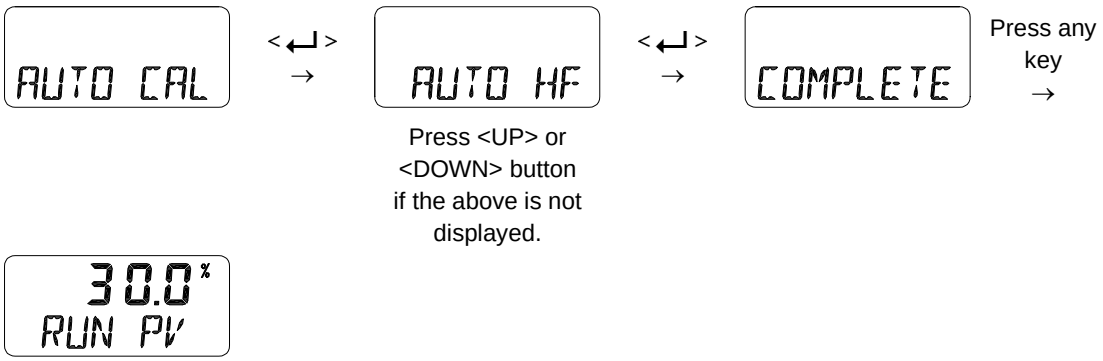
9.4.3 AUTO 3 Calibration (AUTO 3)

This calibration is with KF function added to AUTO2. Use when the valve has long dead time.



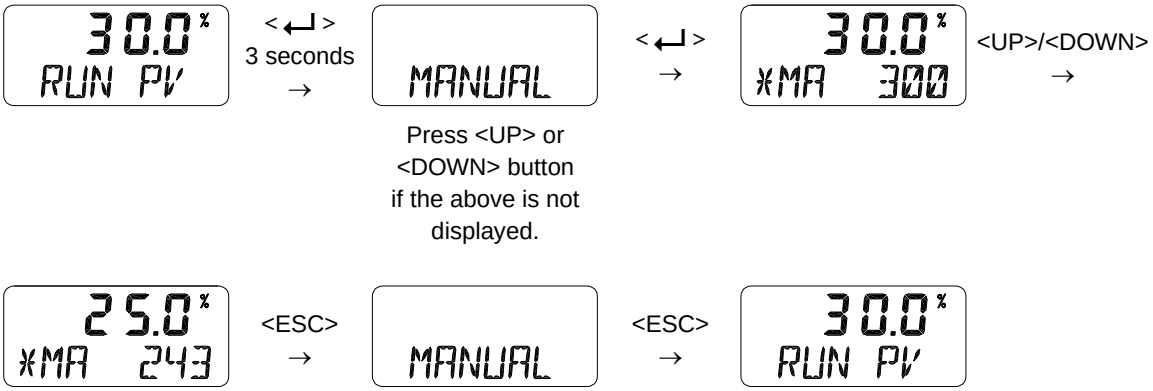
9.4.4 AUTO HF Calibration (AUTO HF)

AUTO HF calibration is almost same calibration process as to AUTO2, but AUTO HF is used when the valve has high friction level. The responsiveness is somewhat slower.



9.5 Manual Mode (MANUAL)

Manual mode is used to manually raise or lower the valve stem. In the manual mode, the positioner does not control the valve according to the electric signal inputted from the outside but the stroke of the valve can be adjusted only by the operation of <UP> or <DOWN> button of the positioner. Move the stem up and down to make it visible. If you press <ESC> button twice to return to RUN mode, the positioner is controlled by the input electric signal again.



9.6 Parameter Mode (PARAM)

AUTO CAL optimizes most of the valve actuator control values. However, in some instances, hunting or oscillation may occur when the valve actuator control values are not optimized. Hunting or oscillation can be prevented by adjusting parameter values.

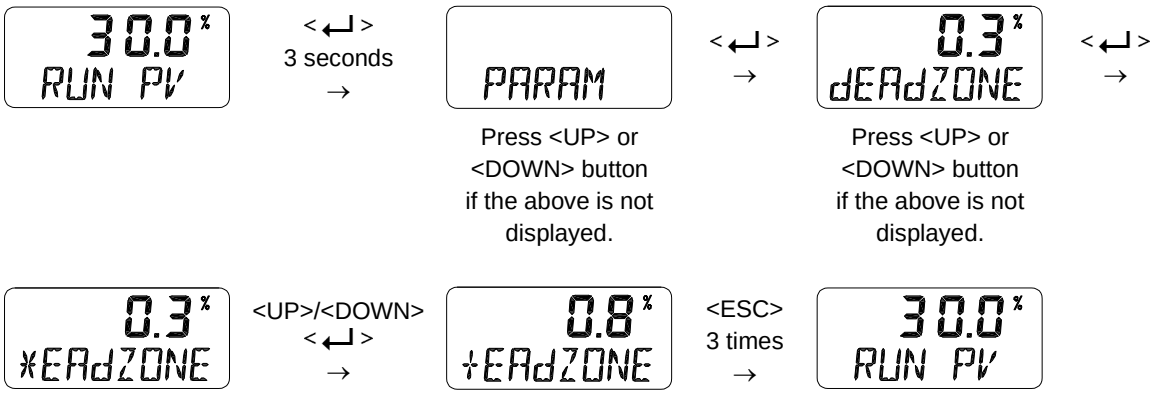
If you change the parameter values with <UP> <DOWN> buttons, the changed value is immediately applied to the positioner control. When the desired control status is reached, you must press <↵> button to save the values.

Below are the list of features which could be set from Parameter mode.

1) Dead-Zone (dEAdZONE)
2) P value (KP)
3) I value (KI)
4) D value (Kd)
5) P_, I_, D_ value (KP_, KI_, Kd_)
6) KF Up value (KFUP)
7) KF Down value (KFdN)
8) Control mode (CTRL)

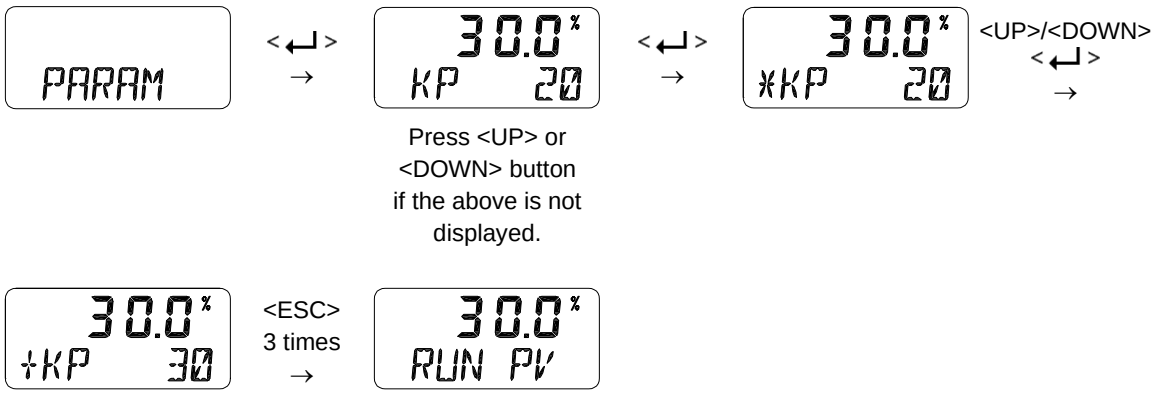
9.6.1 Dead-Zone (dEAdZONE, %)

Dead-Zone indicates the percentage of error allowance. In case of high level of packing friction, which may cause hunting, increasing the value of Dead-Zone can stable the valve operation.



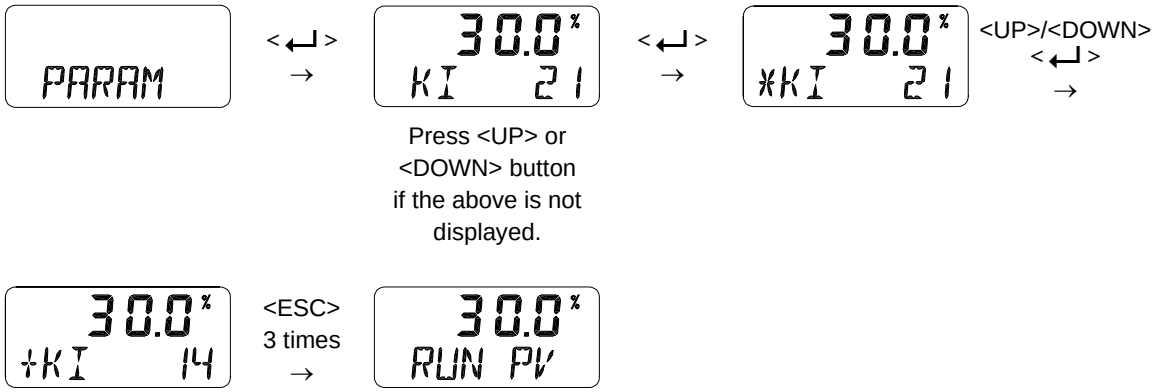
9.6.2 P Value (KP)

P value indicates the ratio of the compensation signal based on the percentage of error allowance. As the value increase, the positioner finds the target point quickly, but it is more likely to have hunting. As the value decrease, the stability of the positioner is higher, but it finds the target point slowly.



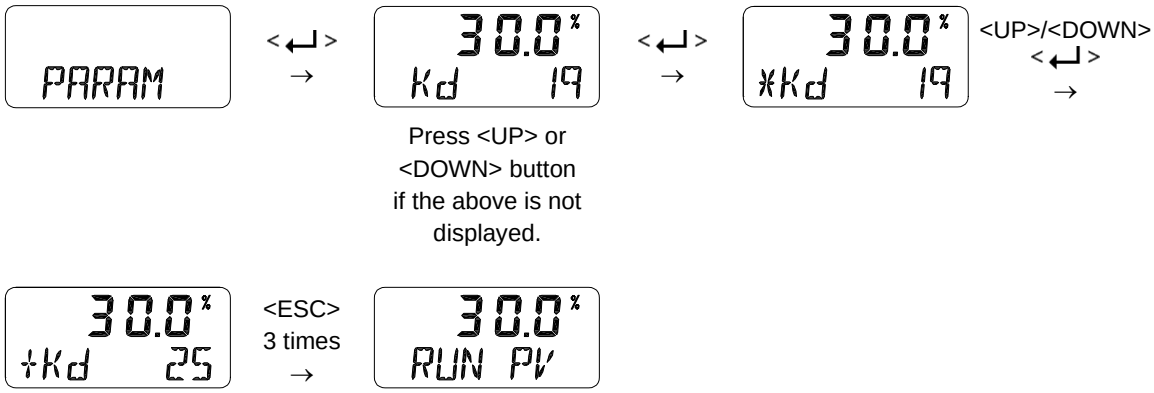
9.6.3 I Value (KI)

I value indicates the additional compensation signal based on the percentage of error allowance. As the value increase, it is more likely to have hunting. As the value decreases, the positioner will move slowly to the target position.



9.6.4 D Value (Kd)

D value indicates the derivative value of the compensation signal based on the percentage of error allowance. As the value increase, it is more likely to have hunting. As the value decreases, it can have poor linearity or dynamic characteristic.

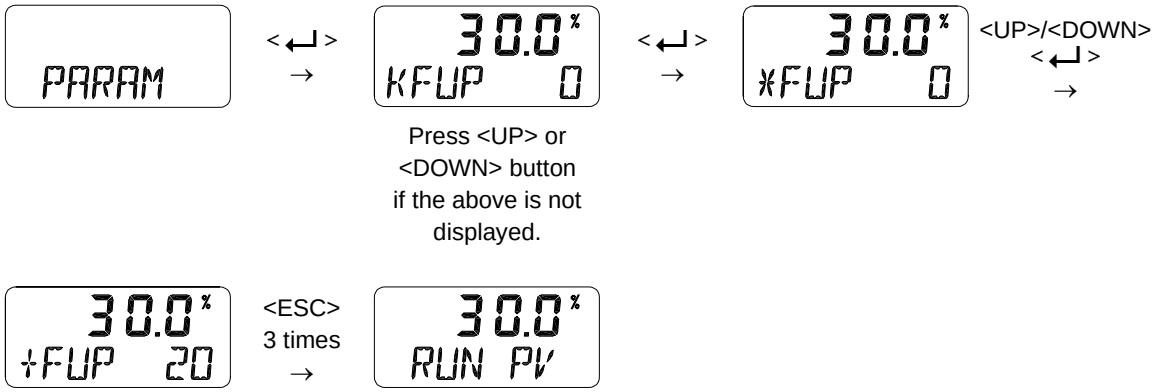


9.6.5 P_ (KP_), I_(KI_), D_ (Kd_) Values

P_, I_, and D_ values' principles are same as P, I, and D values, but these values will be activated when the error percentage is within 1%.

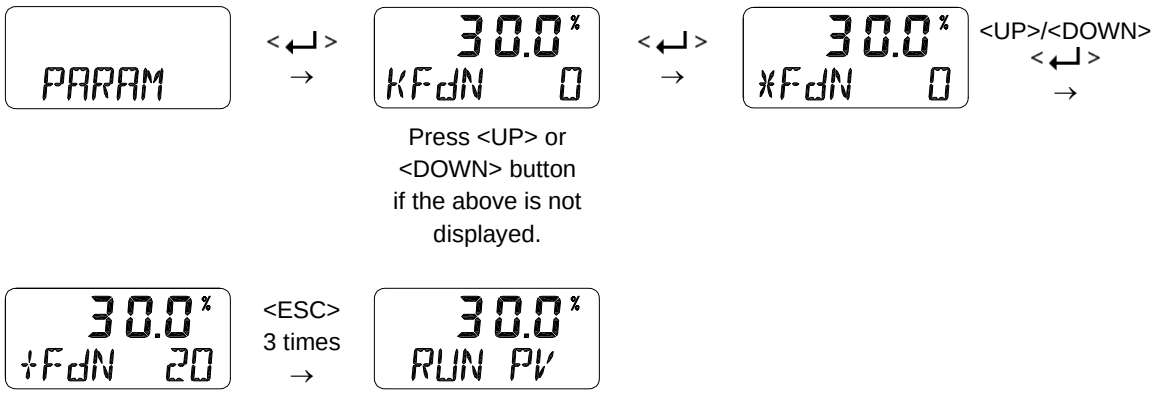
9.6.6 KF Up Value (KFUP)

KF Up control value corrects valve friction when moving from 0% to 100%, reducing the dead time.



9.6.7 KF Down Value (KFdN)

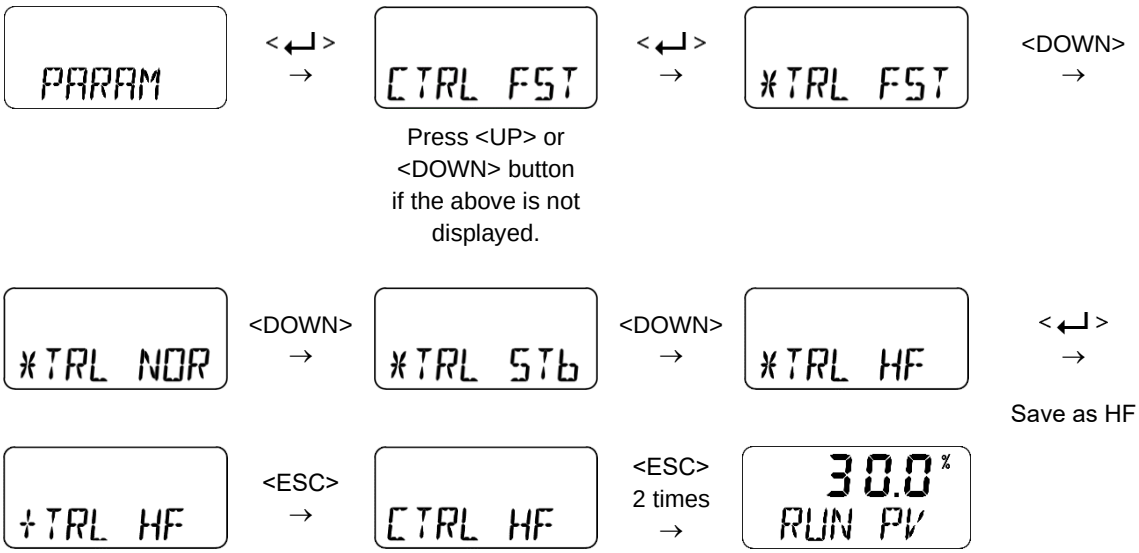
KF Down control value is used to reduce the dead time when the valve friction is high when moving from 100% to 0%.



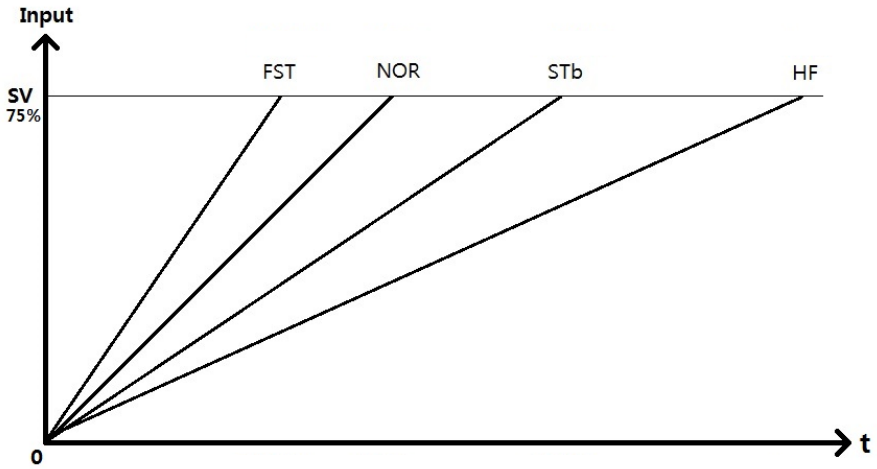
9.6.8 Control mode (CTRL)

This function is used to select the menu that stores the PID values corresponding to the valve, not the way the user changes the KP, KI, KD values respectively..

- FAST (FST): This parameter is optimized for fast response characteristics. (Default)
- NORMAL (NOR): This is an optimized parameter when general response characteristics are required..
- STABLE (STb): This parameter is slower than NORMAL but optimized for stable response and characteristics.
- HIGH FRICTION (HF): Optimized for high friction valves.



※ An example of target position arrival time according to control mode selection (It may differ depending on the valve).



9.7 Hand Calibration Mode (HAND CAL)

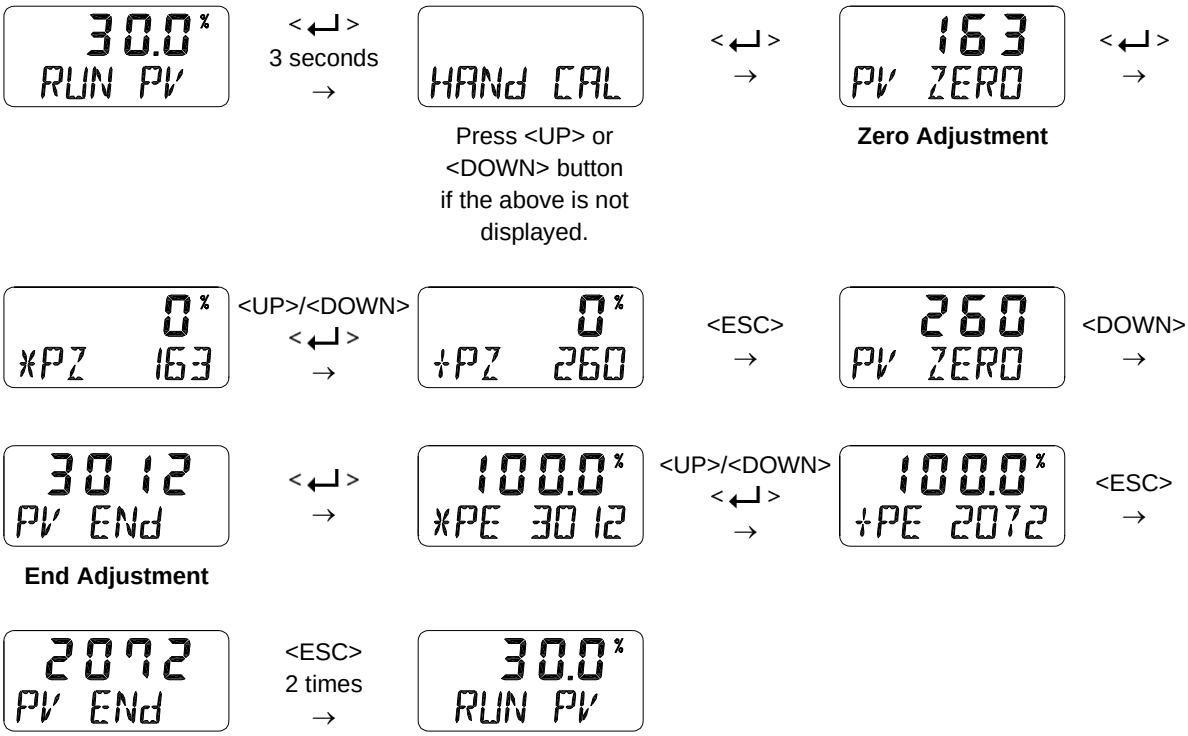
Hand Calibration mode is used when zero-point and end-point require re-adjustment to use partial range of total strokes after Auto Calibration has been performed.

Below are the list of features which could be set from Hand CAL mode.

1) Zero-Point (PV ZERO) and End-Point (PV END) for Valves
2) Zero-Point (TR ZERO) and End-Point (TR END) for Transmitter
3) Normal / Reverse Feedback Signal (TR NORM / REVS)
4) Normal / Reverse HART Signal (HT NORM / REVS)

9.7.1 Zero-Point (PV ZERO) and End-Point (PV END) for Valves

PZ ZERO adjusts the zero point of the valve, and PV END adjusts the end point of the valve.



9.7.2 Zero-Point (TR ZERO) and End-Point (TR END) for Transmitter

TR ZERO adjusts the zero point of the transmitter (4mA feedback), and TR END adjusts the end point of the transmitter (20mA feedback). This is used when output signal becomes unstable and requires re-adjustment or when feedback output signal and actual stroke need to be used differently.

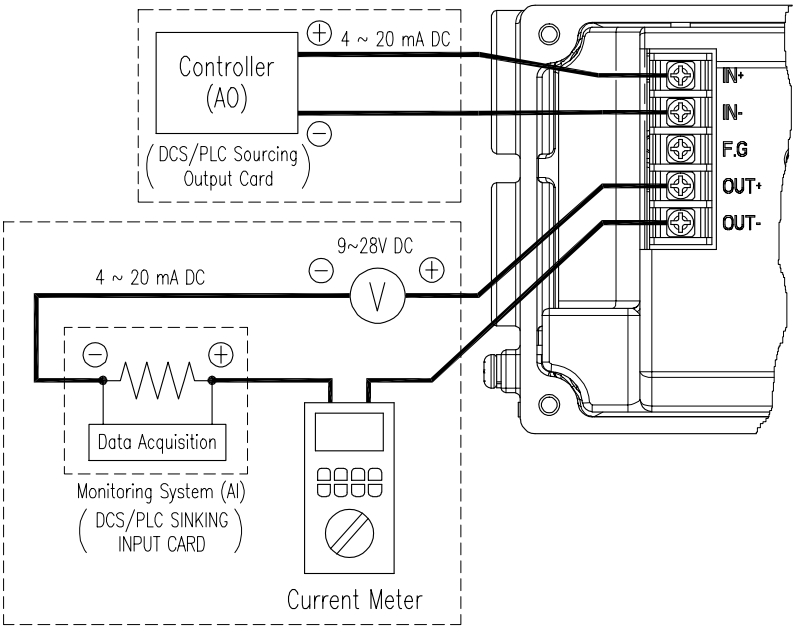
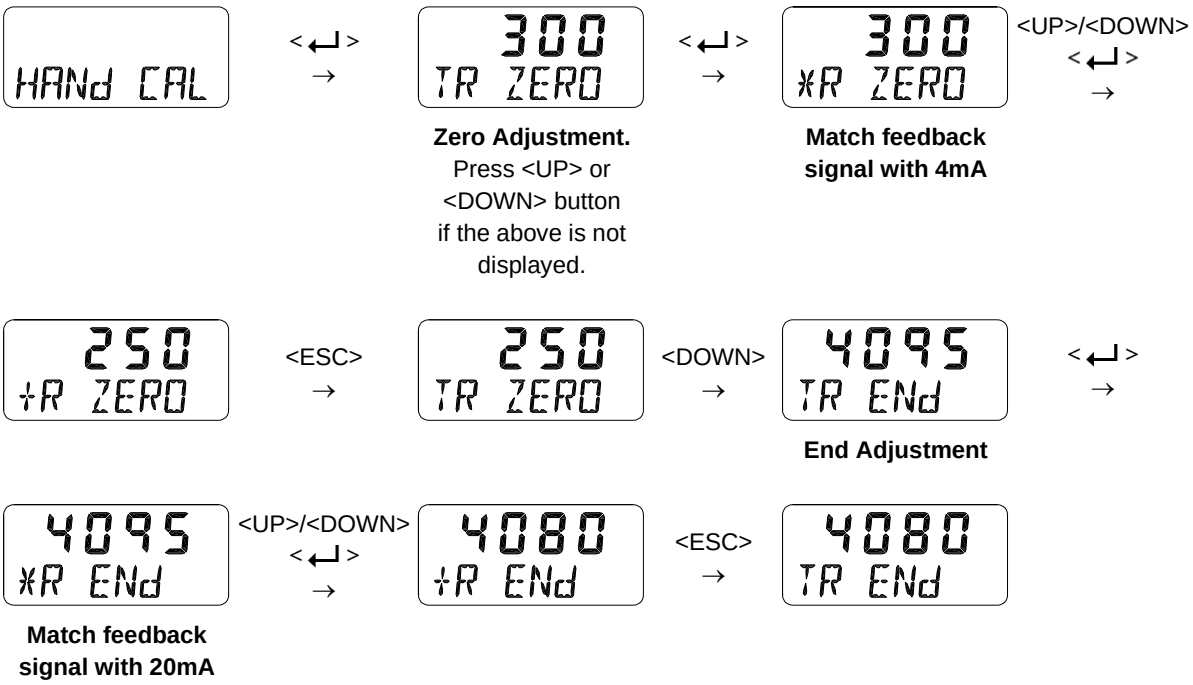
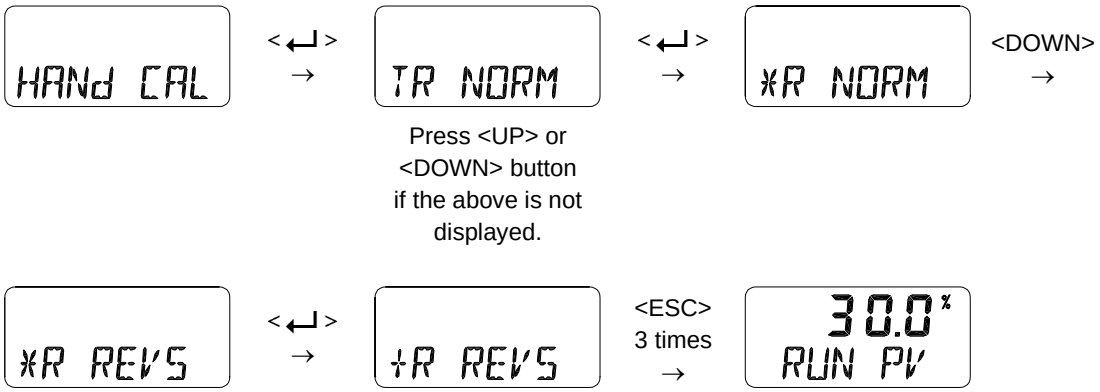


Fig. 9-2: Setting transmitter



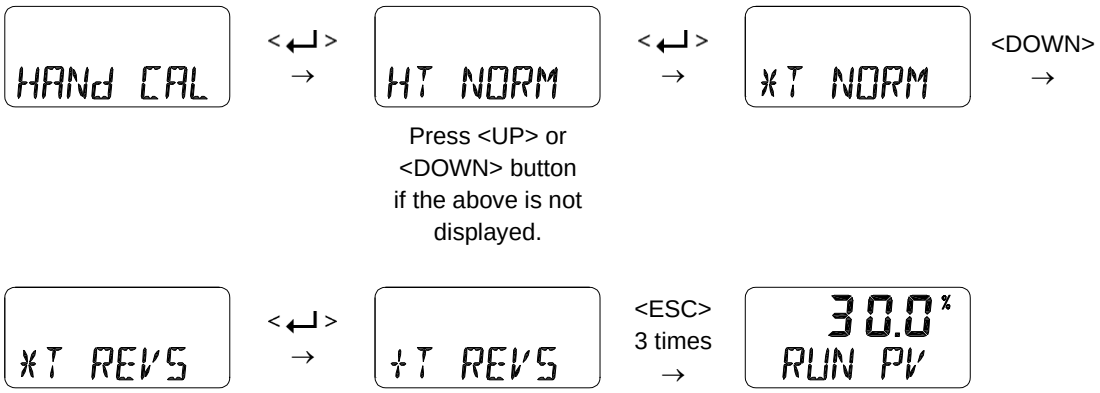
9.7.3 Normal / Reverse Feedback Signal (TR NORM / REVS)

The feedback signal from the positioner can be changed to normal or reverse.



9.7.4 Normal / Reverse HART Signal (HT NORM / REVS)

Feedback signal of HART communication from the positioner can be changed to normal or reverse.



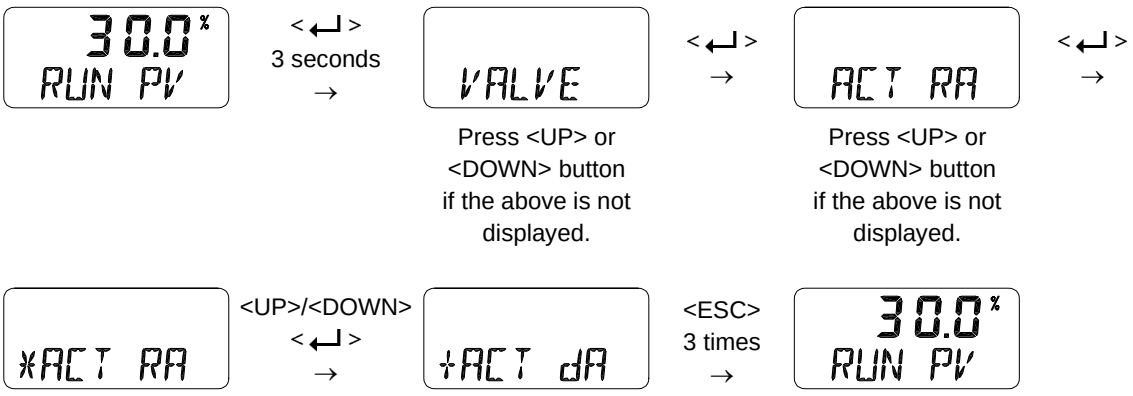
9.8 Valve Mode (VALVE)

Valve mode offers useful and various function settings for operating the control valve.
Below are the list of functions which could be set from Valve mode.

1) Acting Adjustment (ACT RA / dA)
2) Characteristic Adjustment (CHAR)
3) User Characteristics (USER SET)
4) Tight Shut Open (TSHUT OP)
5) Tight Shut Close (TSHUT CL)
6) Split Range Mode (SPLIT)
7) Custom Zero Setting Mode of Split Range (CST ZERO)
8) Custom End Setting Mode of Split Range (CST ENd)
9) Interpolation Mode (ITP ON / OFF)
10) Acting Type (SINGLE / dOUBLE)
11) Lever Type (STd / AdT)

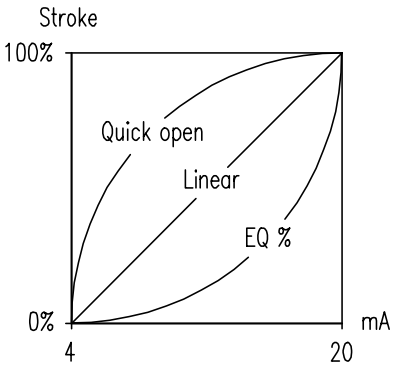
9.8.1 Acting Adjustment (ACT RA / dA)

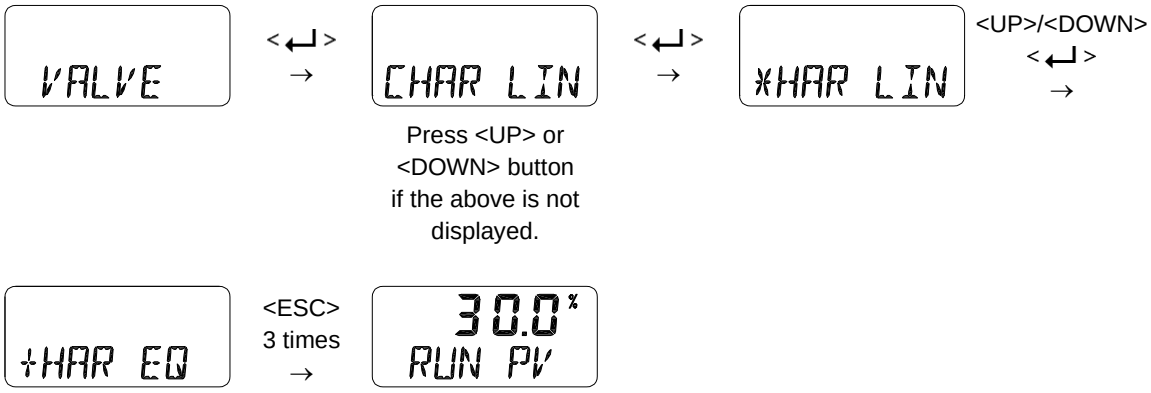
RA & DA are automatically set by performing “AUTO 2” from Auto Calibration. However, this function is used when the user wants to change RA & DA.
The positioner can be set as Direct Action (DA) or Reverse Action (RA).



9.8.2 Valve flow Characteristic Adjustment (CHAR)

The valve flow characteristic can be set on the field's requirement. There are 4 types of characteristics – linear (LIN), user setting (USR), quick open (QO), and equal percentage (EQ).

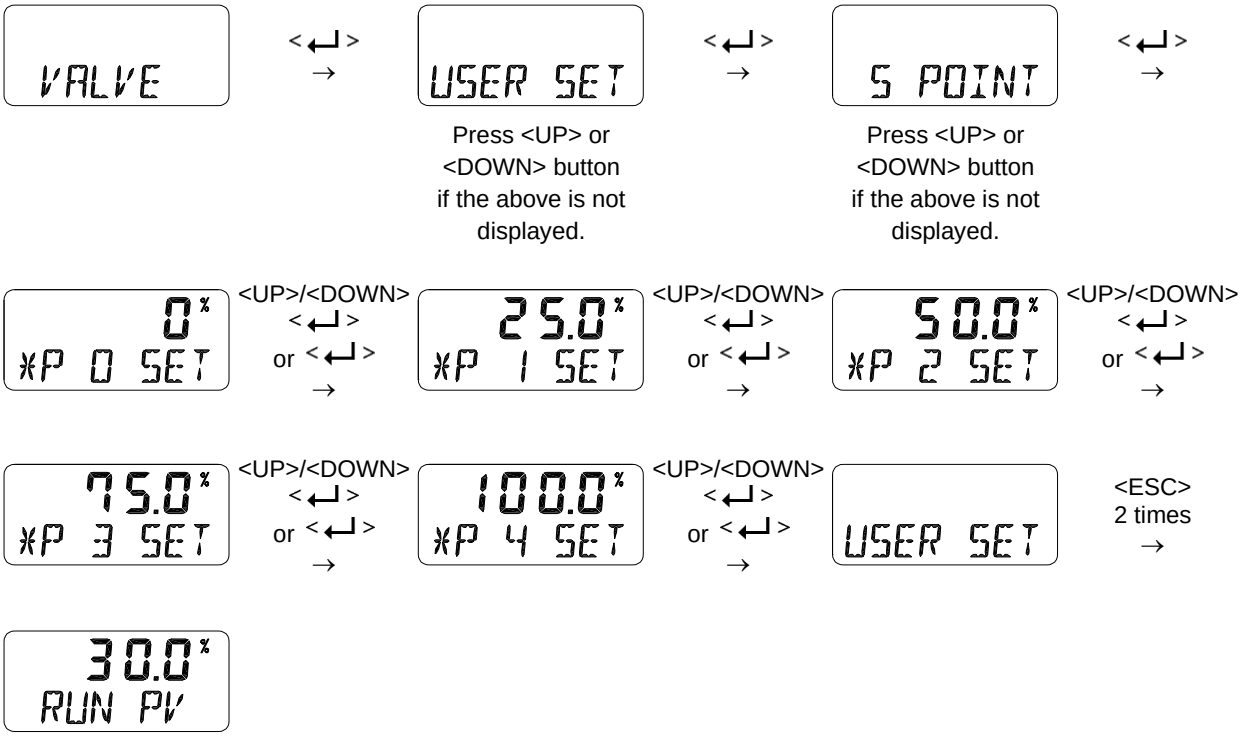




9.8.3 User defining flow Characteristics (USER SET)

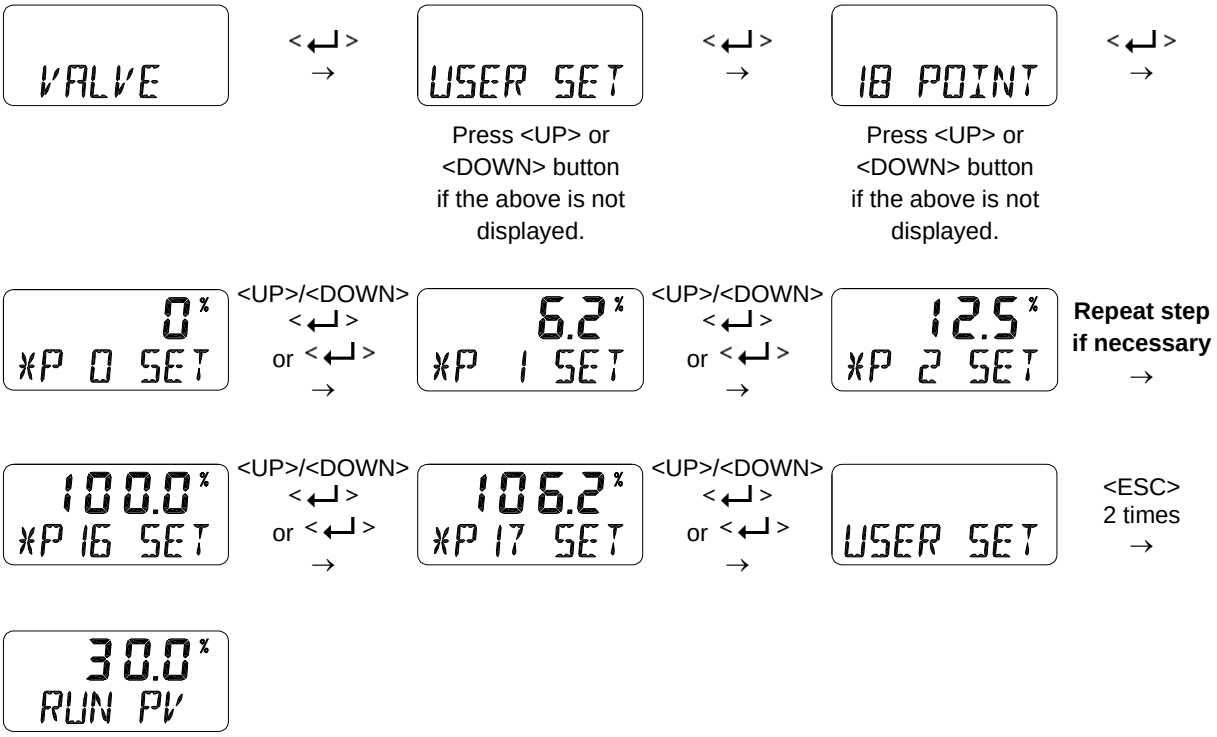
User can make its own flow characteristic curve with this mode. USER SET can be set in two ways, 5 points and 18 points. User can choose whichever is more suitable for their application.

1) 5 points setting can be set with 4mA intervals. The initial positions are P0(4mA=0%), P1(8mA=25%), P2(12mA=50%), P3(16mA=75%) and P4(20mA=100%) but user can change the % values to different values. User can change all 5 points or only change partially and exit the menu by pressing <ESC> button.



This function can be activated by selecting “CHAR USR” mode of above 9.8.2 Valve flow Characteristic Adjustment (CHAR).

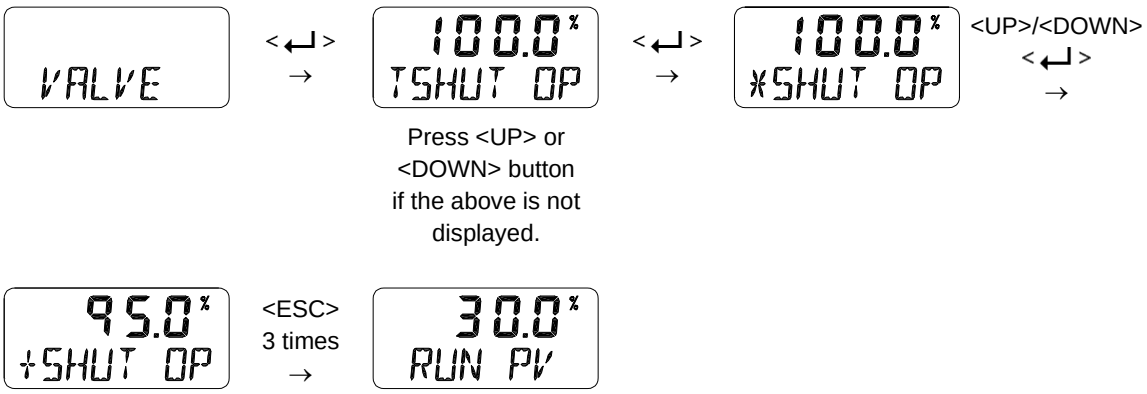
2) 18 points setting can be set with 1mA intervals. The initial positions are P0(4mA=0%), P1(5mA=6.25%), P2(6mA=12.5%), … P16(20mA=100%) and P17(21mA=106.25%) but user can change the % values to different values. User can change all 18 points or only change partially and exit the menu by pressing <ESC> button.



This function can be activated by selecting “CHAR USR” mode of above 9.8.2 Valve flow Characteristic Adjustment (CHAR).

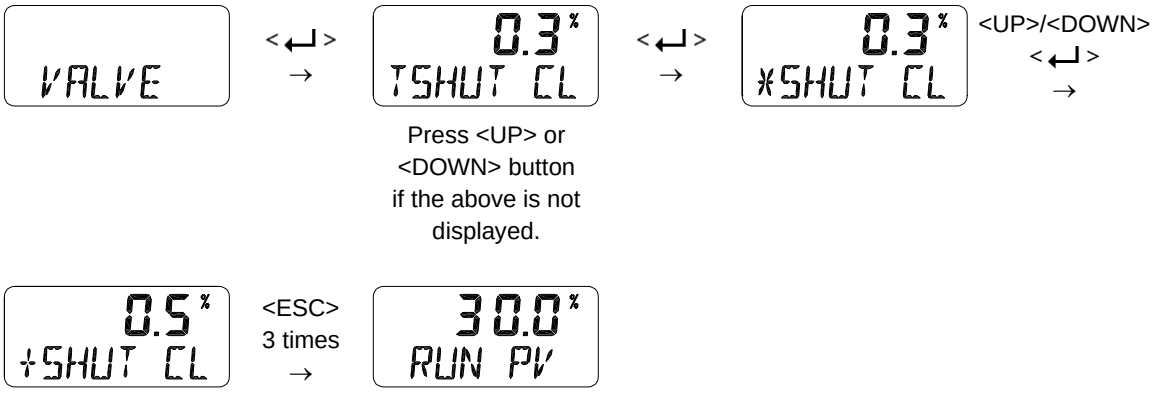
9.8.4 Tight Shut Open (TSHUT OP)

Tight shut open shows the current value in percentage (%). Input current of 4mA is 0%, 20mA is 100%. If temporary Tight shut open value (≤100%) is set and input current value is above the set % value, the valve's position is immediately moved to 100%. For example, if linear actuator is used and the valve's closing direction is 100% and input value of the current is above Tight shut open set value, the set pressure from the regulator will be transferred to the actuator which will enhance the power to close the valve and keep it from any leakage.



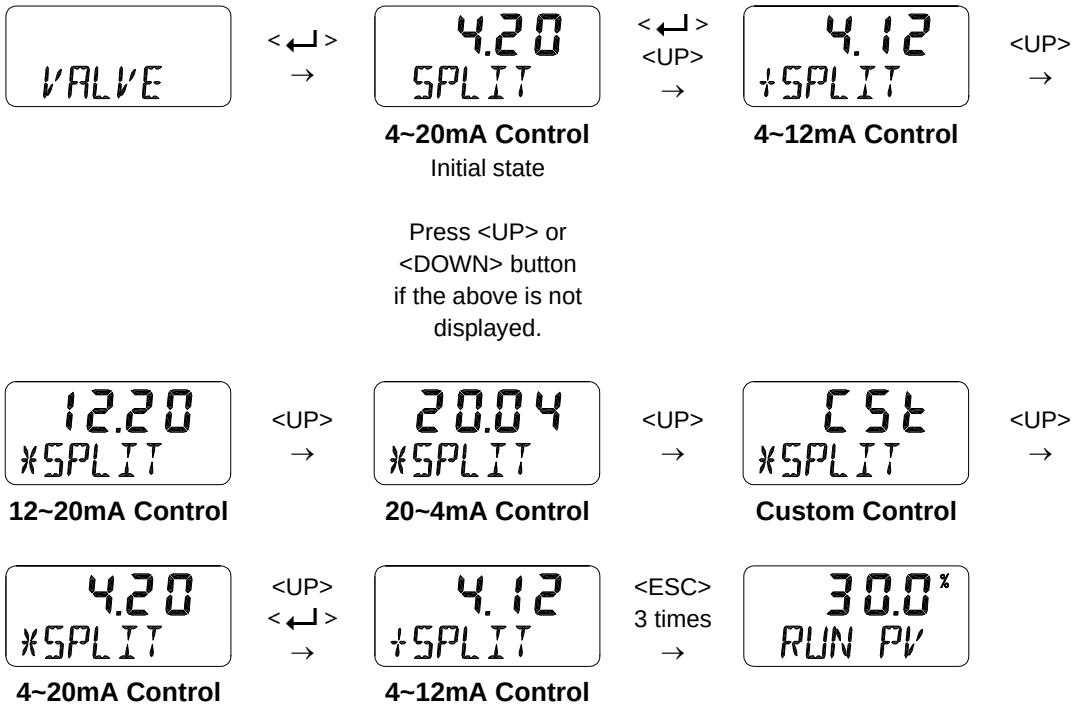
9.8.5 Tight Shut Close (TSHUT CL)

Tight shut close shows the current value in percentage (%). Input current of 4mA is 0%, 20mA is 100%. If temporary Tight shut close value (≤100%) is set and input current value is below the set % value, the valve's position is immediately moved to 0%. For example, if rotary actuator is used and the valve's closing direction is 0% and input value of the current is above Tight shut open set value, it will release all the remaining pressure from Out1 of the actuator which will have the return spring power of the actuator or Out2 pressure to close the valve and keep it from any leakage.



9.8.6 Split Range Mode (SPLIT)

This is used to set the range of the input signal to control the entire stroke of the valve. You can select one of the five input signals that consists of 4-20 mA, 4-12 mA, 12-20 mA, 20-4 mA, and user settings (Custom, CSt). 4-20 mA is the factory setting.

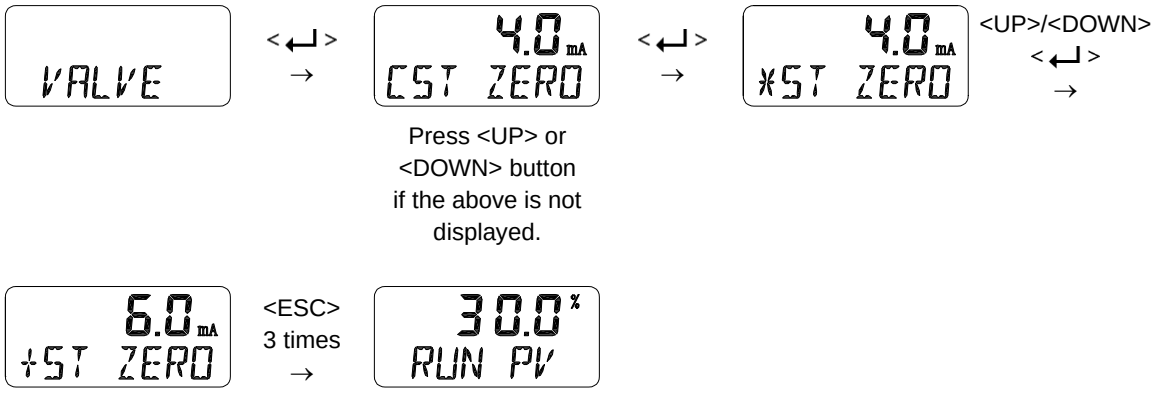


9.8.7 Custom Zero Setting Mode of Split Range (CST ZERO)

From the initial 4~20mA control settings of valve stroke from 0~100%, this mode allows the user to change the zero point to (≥4) mA instead of 4mA.

For example, the user could change the control settings of the valve stroke from 4~20mA to 7~20mA for 0~100% stroke.

However, please note that the "Zero" and "End" points' deviation current value must be above 4mA.



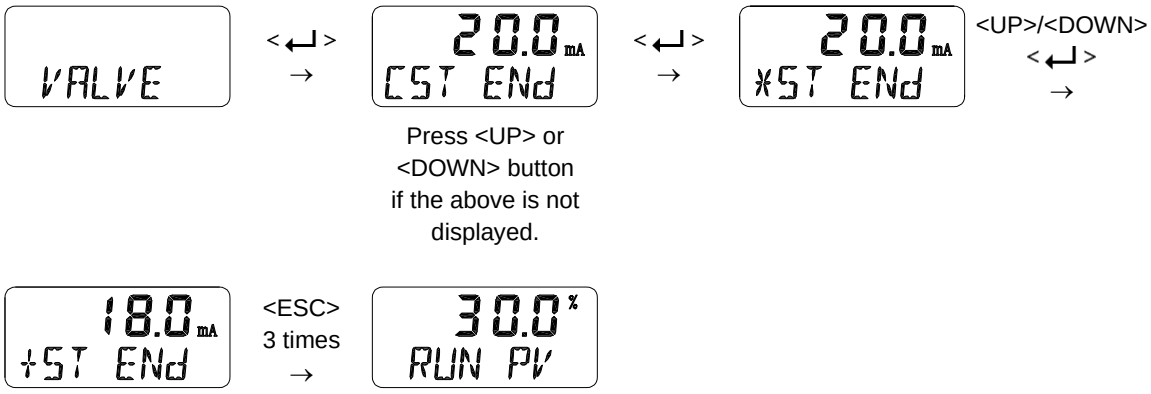
This function is activated by saving the Split Range Mode (SPLIT) of above Section 9.8.6 as "CSt".

9.8.8 Custom End Setting Mode of Split Range (CST ENd)

From the initial 4~20mA control settings of valve stroke from 0~100%, this mode allows the user to change the end point to (≤20) mA instead of 20mA.

For example, the user could change the control settings of the valve stroke from 4~20mA to 4~16mA for 0~100% stroke.

However, please note that the "Zero" and "End" points' deviation current value must be above 4mA.

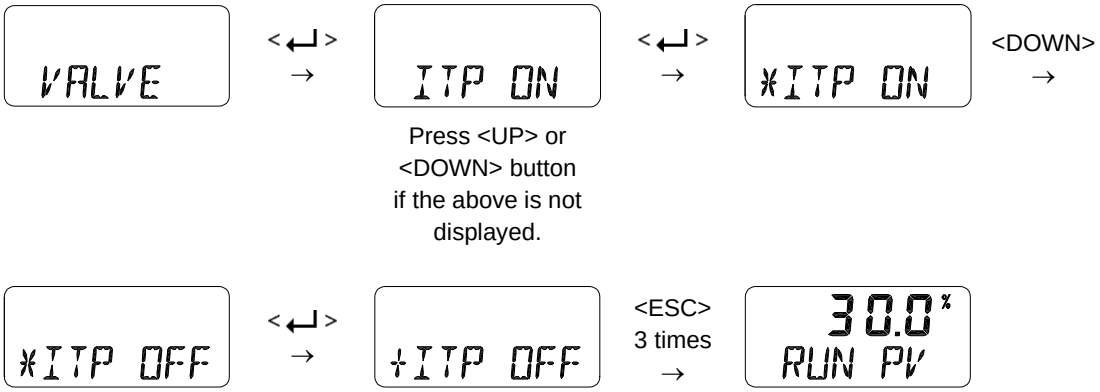


This function is activated by saving the Split Range Mode (SPLIT) of above Section 9.8.6 as "CSt".

9.8.9 Interpolation Mode (ITP ON/OFF, ITP USER SET)

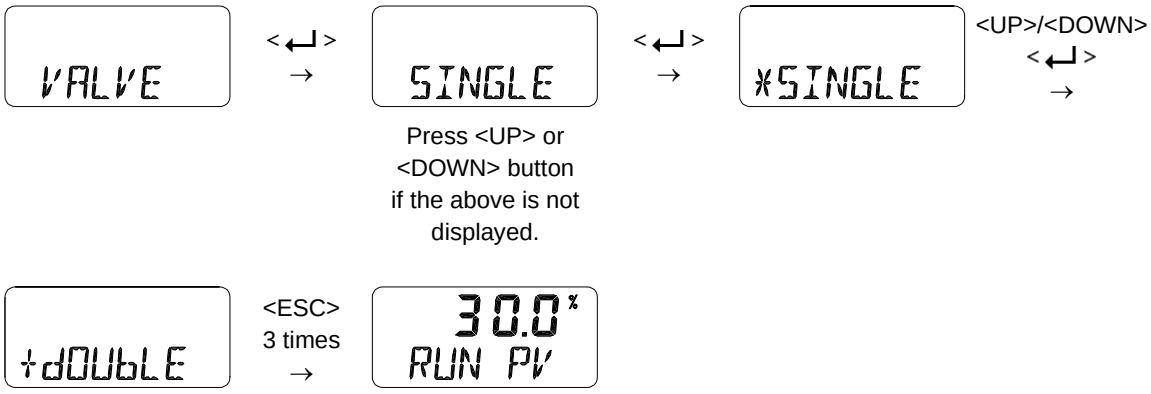
In case of linear positioner, the error of accuracy occurs when the linear motion of actuator changes into the rotary motion of feedback lever. After the auto calibration, the positioner turns on ITP function with an appropriate value of interpolation automatically. The user can manually turn on or off the ITP function, also can set any value of the interpolation. (in ITP USER mode)

※ The below shows that the user manually change ITP ON into OFF.



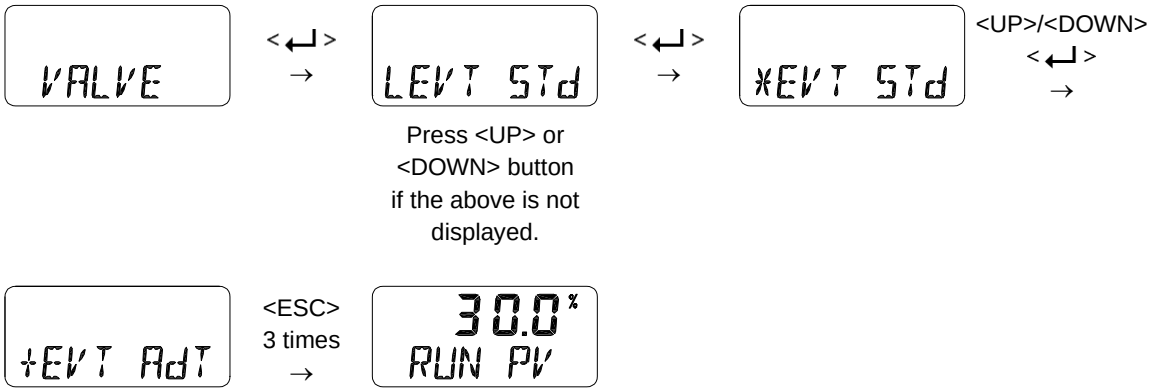
9.8.10 Acting Type (SINGLE / dOUBLE)

Displays or changes actuator's current acting type.



9.8.11 Lever Type (STd / AdT)

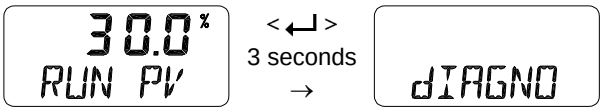
Displays or changes current lever type into standard type or adapter type. If the Lever type mode is set correctly, the accuracy will be worse at ITP ON than at ITP OFF.



9.9 Diagnostic (dIAGNO)

Below are the list of functions which could be set from Diagnostic mode.

1) PST Introduction
2) PST Mode
3) PST Configuation (PST CFG)
   A. Start Position (START PO)
   B. Target 1 (TARGET 1)
   C. Target 2 (TARGET 2)
   D. Interval (NTERVAL)
   E. Tolerance (TOL)
   F. Limit Time (LIMIT TM)
   G. Latency (LATENCY)
4) PST Result (PST RSLT)



Press <UP> or <DOWN> button if the above is not displayed.

9.9.1 PST Introduction

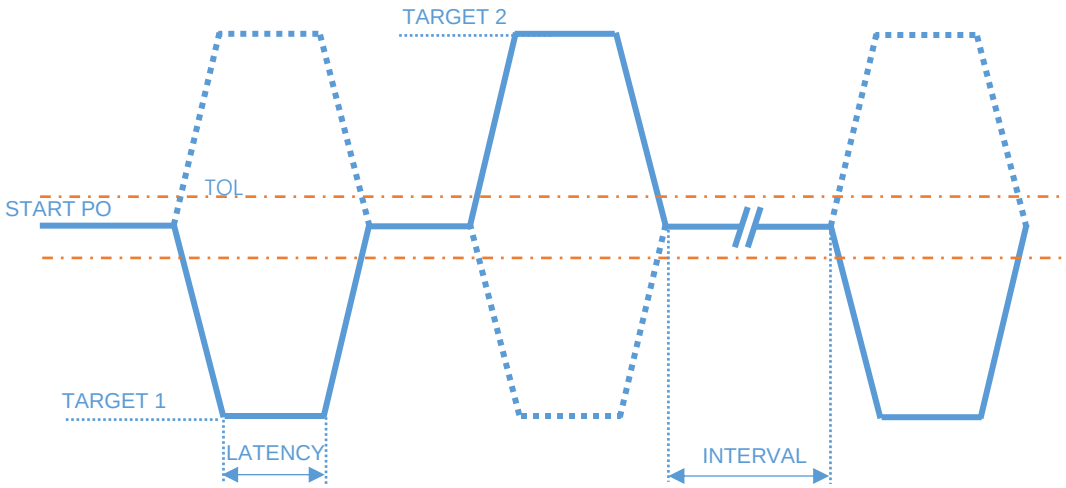
Unlike FST (Full Stroke Test) where a valve such as an emergency shutoff valve is physically closed and opened in full,

PST(Partial Stroke Test) is a method used to test a percentage of the possible failure of the valve by slightly closing and opening the valve when testing.

Rather than only performing FST regularly, PST is alternately applied with FST which could reduce the overall cost and risk.

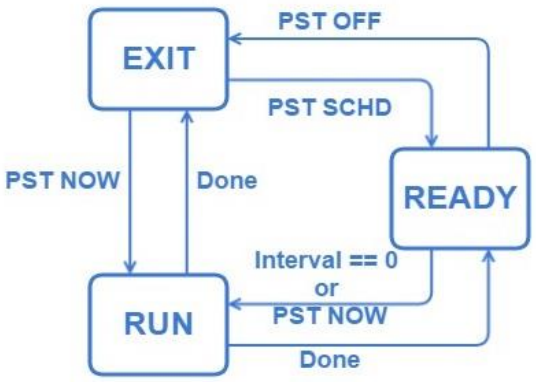
The positioner includes PST function and it could operate while offline without any other software.

Also, PST function and results could be set and checked through HART communication.



When **PST** runs by **PST NOW** or **SCHD,** if valve position is in the range of **TOL** from **START PO**, Positioner supply or vent air until the valve reach the **TARGET 1, 2.** But **PST** test will stop if valve position goes out of the **TOL** or doesn't reach **TARGET1, 2** within the **LIMIT TM**. After the valve position reach the **TARGET 1, 2,** the valve will pause during the **LATENCY** and move back to the **START PO**. The valve will be under ready state during the **INTERVAL** time after completing 1 cycle of **PST** in the **SCHD** mode.

9.9.2 PST Mode (PST)



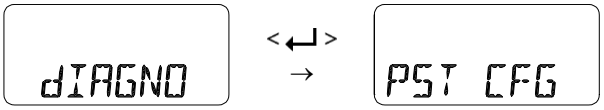
To run **PST**, select a **PST** mode. There are 3 mode for running PST.

Mode	Description
PST OFF	Stop PST Schedule. It's a default mode
PST SCHD	Run PST immediately. After PST complete, it turns back to the previous mode
PST NOW	PST runs repeatedly by interval value

Press <UP> or <DOWN> button if the above is not displayed.

9.9.3 PST Configuration (PST CFG)

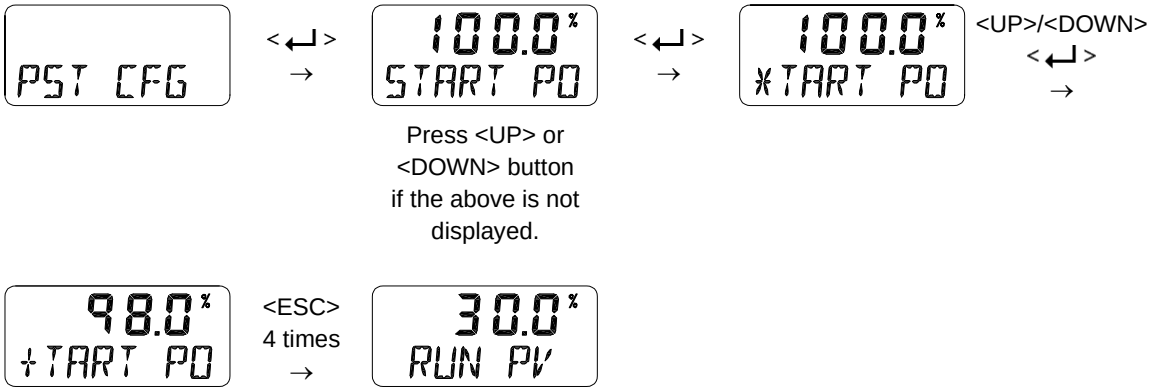
Check PST parameter values and configuration



Press <UP> or <DOWN> button if the above is not displayed.

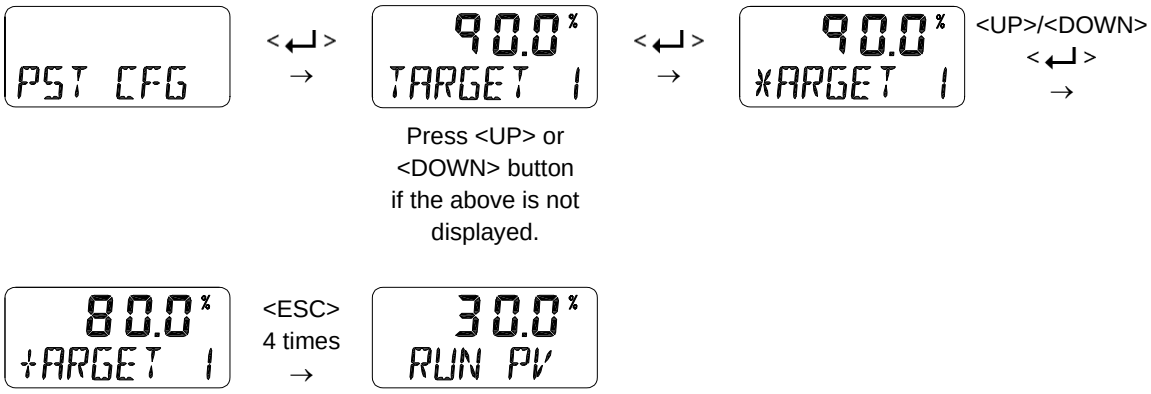
9.9.3.1 Start Position (START PO)

Sets start position when PST initiates. The position must be in between 0 and 100%, and default value is 100%.



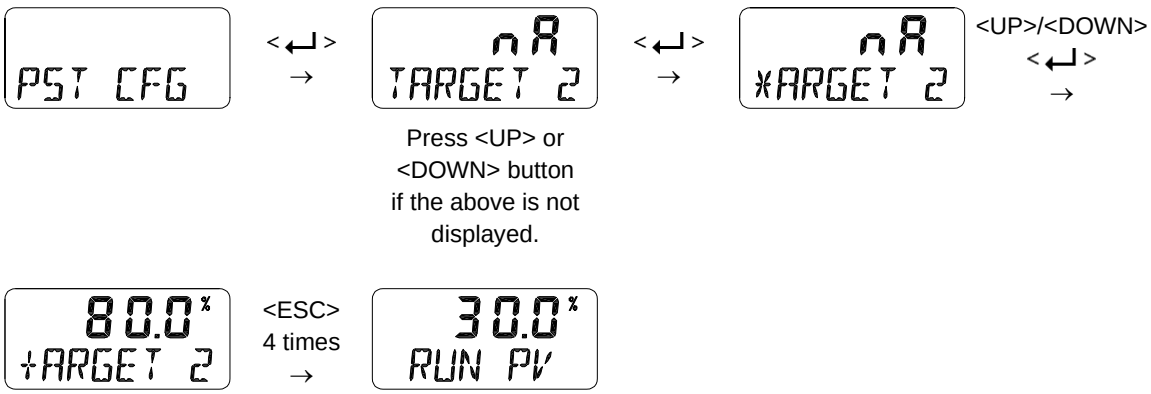
9.9.3.2 Target 1 (TARGET 1)

Sets 1st target position of PST. The position must be in between 0 and 100%, and default value is 90%.



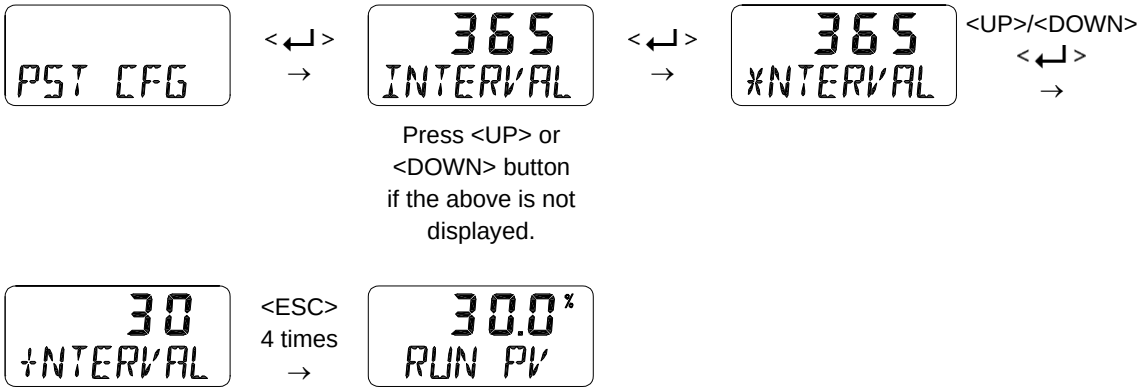
9.9.3.3 Target 2 (TARGET 2)

Sets 2nd target position of PST. The position must be in between 0 and 100%, and default value is nA(Not Application).



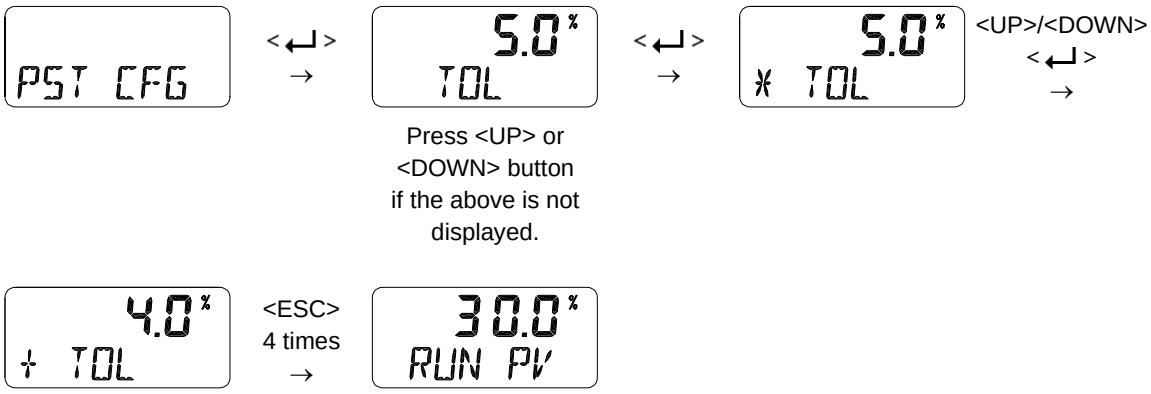
9.9.3.4 Interval (INTERVAL)

Interval time (days) between 1st PST and the next PST. The value must be between 1 ~ 365, and default value is 365 (days).



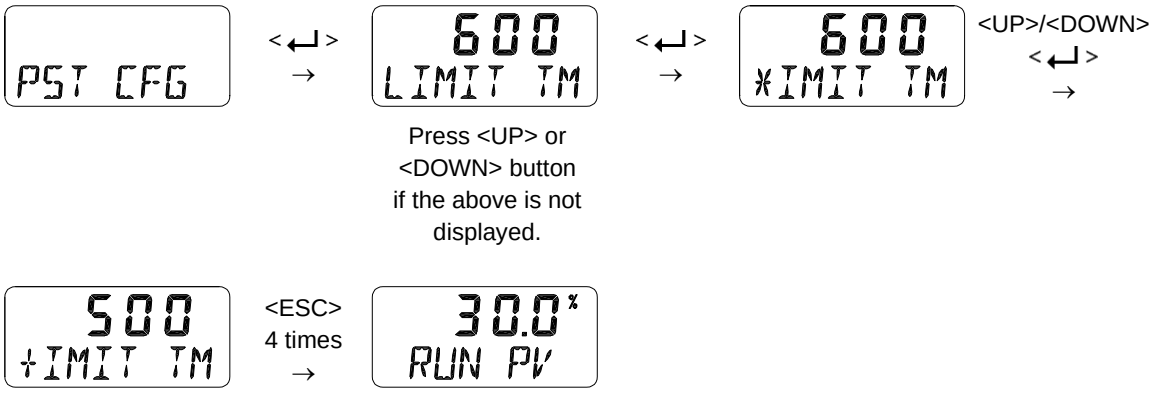
9.9.3.5 Tolerance (TOL)

Tolerance level of the start position when PST runs. The value must be between 0.1 ~ 10%, and default value is 5%.



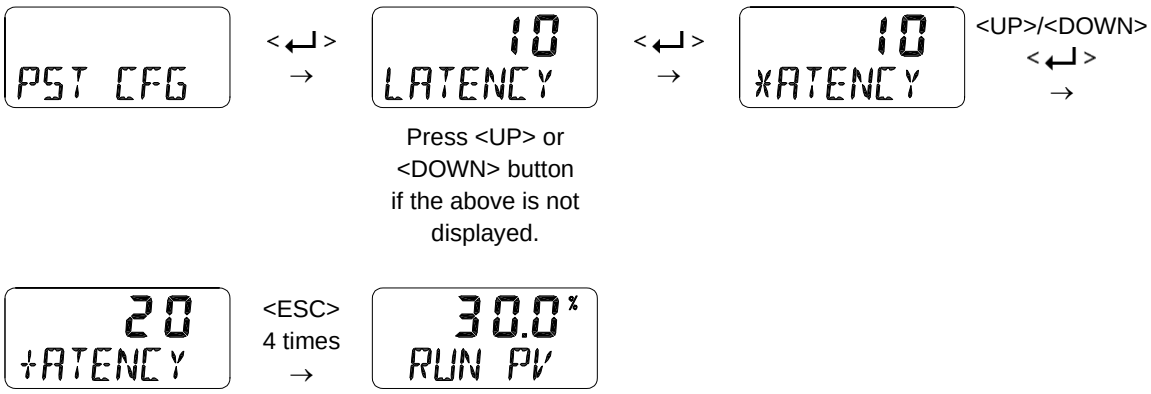
9.9.3.6 Limit Time (LIMIT TM)

Limit the stroke time between start position and Target 1 and 2. The value must be between 0~600 sec, and default value is 600 (sec).



9.9.3.7 Latency (LATENCY)

Latency for next movement after valve move. The value must be between 1~60 sec, and default value is 10 (sec).

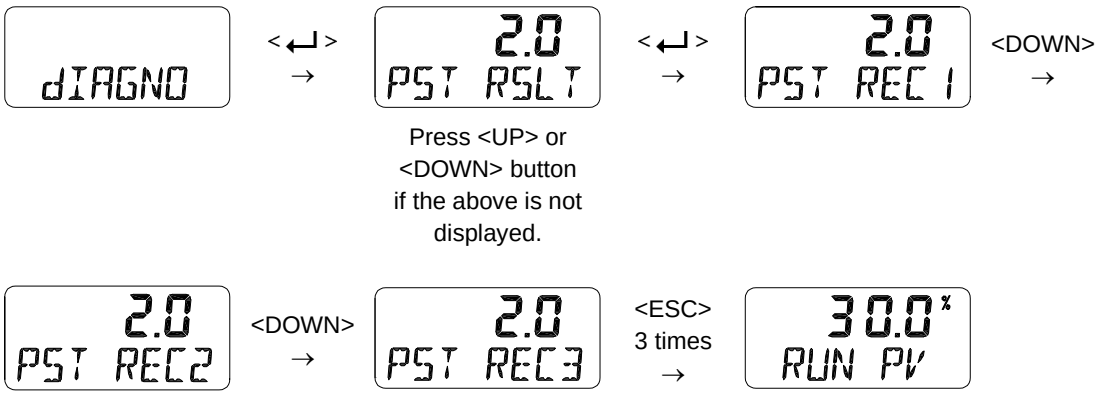


9.9.4 PST Result (PST RSLT)

It will record or memorize maximum three **PST** results. The longest stroke time from **START PO** to the **TARGET 1, 2** or Error messages will be recorded

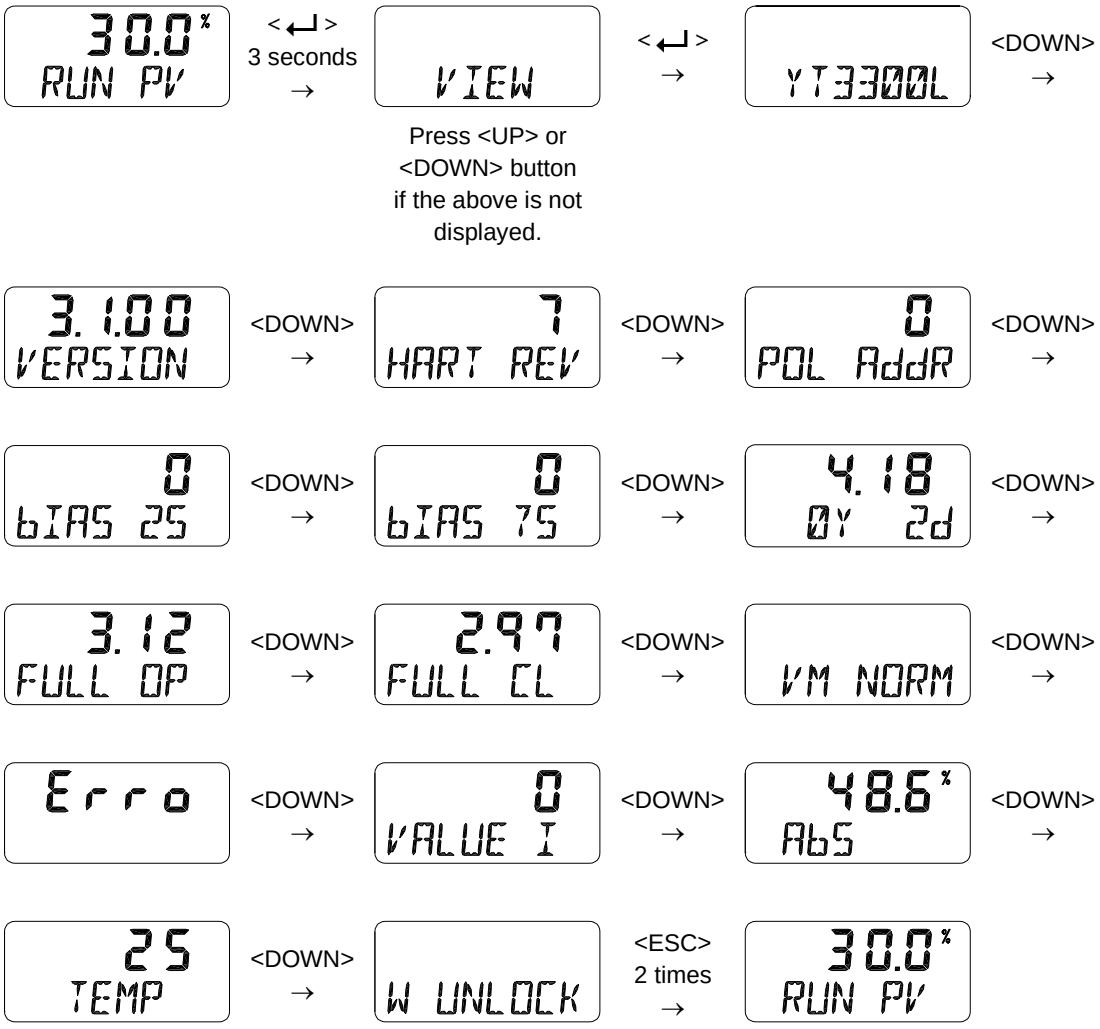
NAME	VALUE	DEFAULT
PST REC1	OOT,LTO,NR, 0 ~ 600(sec)	0
PST REC2	OOT,LTO,NR, 0 ~ 600(sec)	0
PST REC3	OOT,LTO,NR, 0 ~ 600(sec)	0

Error	Message
OOT	When the valve position is out of tolerance(**TOL**) from Start Position(**START PO**)
LTO	When the valve doesn't reach to the target position within the Limit Time(**LIMIT TM**)
NR	When the valve doesn't move



9.10 View Mode (VIEW)

Displays various information of the positioner.



ITEM	Description
YT-3300L	Positioner model.
3.1.00 VERSION / 2020DC31	1'st row→version number of firmware. 2'nd row→VERSION: Main software version / 2020-12(DC)-31: loading date of software. (January JA, February FB, March MR, April AR, May MY, June JN, July JL, August AG, September SP, October OT, November NV, December DC) ※ You can toggle them, pushing <↵>.
HART REV	HART protocol version
POL AddR	HART protocol channel address. ※ You can change it, pushing <↵>.
bIAS 25	BIAS value when valve position is at 25%
bIAS 75	BIAS value when valve position is at 75%
4.18 0Y 0d	Total used time duration. If a unit was used less than 1 hour, the time will not accumulate. 1'st row→"4.18" means 4hours and 18minutes. 2'nd row→0Y: years, 0d: days
3.12 FULL OP	Time required (seconds) to fully open the current valve from the closed state. Saved after AUTO 2 / AUTO 3 / AUTO HF Calibration.
2.97 FULL CL	Time required (seconds) to fully close the current valve from the opened state. Saved after AUTO 2 / AUTO 3 / AUTO HF Calibration.
VM NORM / VM REVS/ VM dIZ	Display types of valve stroke on LCD. VM NORM : View Mode Normal. 4mA → 0%, 20mA → 100% display. VM REVS : View Mode Reverse. 4mA → 100%, 20mA → 0% display. VM dIZ : Raw data. ※ You can change it, pushing <↵>.
Erro	Error code(C, D) or warning code(B, F, G, H). Refer to 10.3 or 10.4 sections
VALUE I	Current accumulated value of I
AbS	Absolute resistance value.
SERVICE	Check the valve usage and overcurrent count value. TRV ACUM: Displays the position value moved to the present in Percent (%). FULL OP: This is the value that counts the Full Open (100%) operation to date. FULL CL: It is the value that counts the operation of Full Close (0%) up to now. CYC CNT: This is a count that counts when the valve's trajectory has changed. OVCR CNT: This is the value counted when overcurrent is input.
Temp	Current Temperature. (°C)
W LOCK / W UNLOCK	When W UNLOCK, you can change all parameters including auto calibration function. When W LOCK, cannot. You can change it, pushing <↵>.

10 Error and Warning Code

Error or Warning code occur if there is a problem during Auto calibration or using the product.

- Error code : These are indicated if the positioner cannot be controlled, malfunctions or becomes imprecise.
- Warning code : These are indicated when the positioner can be controlled, but there is a possibility of malfunctioning or degree of precision has dropped.

10.1 Error code which is displayed during Auto calibration

Error Code	Code Description and Cause	Action
MT ERR L	➢ Indicates that due to wrong positioning and installation of the positioner, there is a chance that the feedback lever and the positioner's stopper could collide when the lever is at 0% during auto calibration. ➢ when this error is detected, auto calibration is aborted and this message is indicated immediately on the LCD display.	➢ Set the feedback lever horizontally when at 50%. ➢ Re-adjust the position of the positioner by referring to the following effective range of the feedback lever's angle Linear : 30 degree Rotary : 90 degree.
MT ERR H	➢ Indicates that due to wrong positioning and installation of the positioner, there is a chance that the feedback lever and the positioner's stopper could collide when the lever is at 100% during auto calibration. ➢ when this error is detected, auto calibration is aborted and this message is indicated immediately on the LCD display.	
CHK AIR	➢ Indicated when the valve is not moving despite the positioner has given "Full Open" signal during auto calibration. ➢ when this error is detected, auto calibration is aborted and this message is indicated immediately on the LCD display.	➢ Check if pressure is being supplied normally to the positioner.

RNG ERR	➢ Indicated when the feedback lever's angle used is excessively small during auto calibration. ➢ when this error is detected, auto calibration is aborted and this message is indicated immediately on the LCD display.	➢ Re-install the positioner by moving it towards the actuator stem so that the angle use of the feedback lever becomes larger.

10.2 Error code which is displayed while using the product

Error Code	Code Description and Cause	Action
OVER CUR	➢ When 24mA or more current is detected to the demand input terminal and this message is indicated immediately on LCD display. ➢ Buttons will not work while this error message is displayed.	➢ Check the connection status to the demand input terminal (miswiring, overcurrent input, etc.)
ROM ERR	➢ When the product is powered on, the program runs a memory test and this message in indicated immediately on the LCD when the value stored in the memory is out of range.	➢ Press any key, to automatically solve the memory error and then it returns to "RUN PV" mode.
	➢ This symbol is shown in from of RUN PV when the usage range of PV is exceeded.	➢ Ensure that the feedback lever does not touch the positioner stopper when installing the product.

10.3 Error code which can be checked from View mode

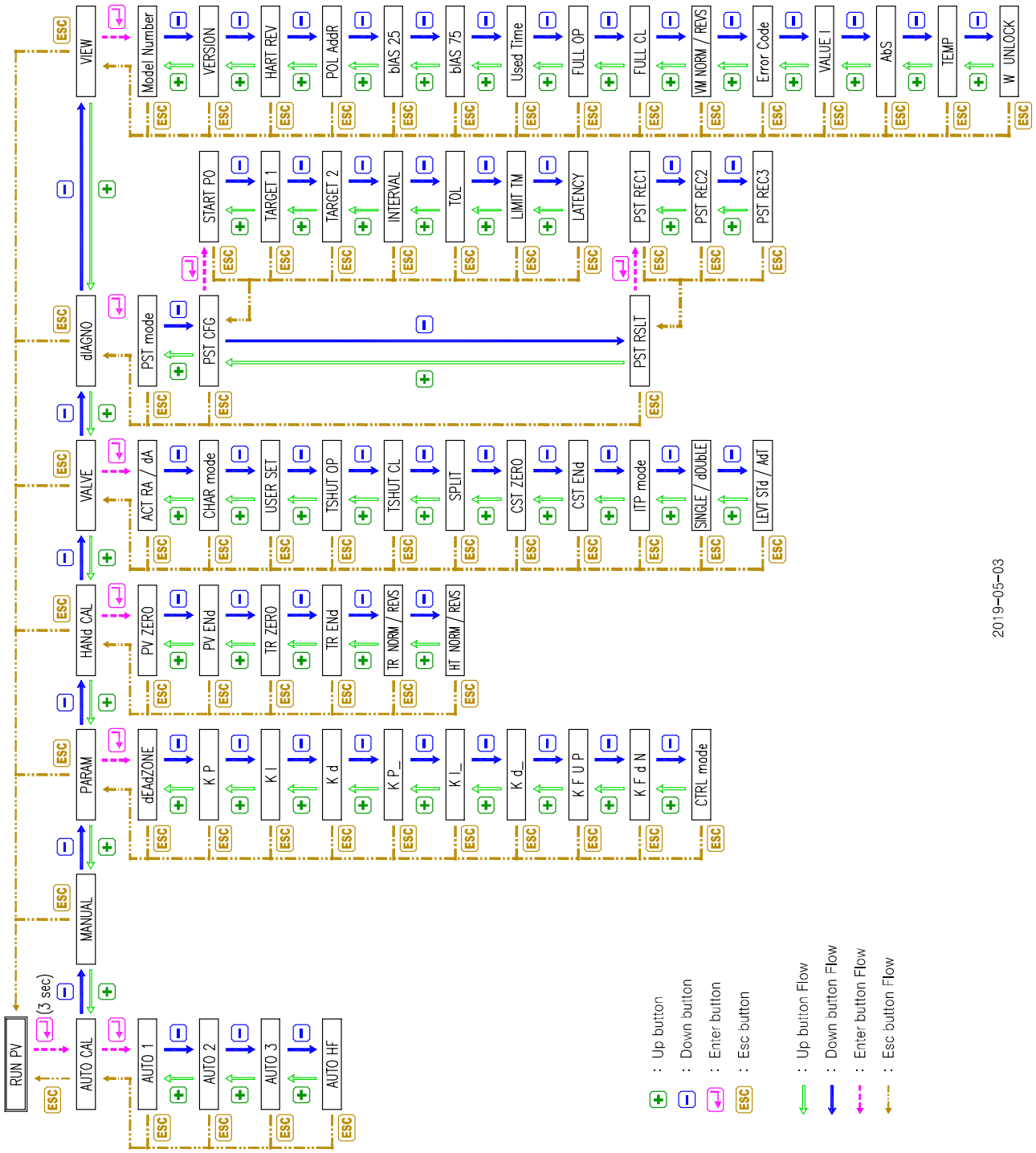
Error Code	Code Description and Cause	Action
C	➢ Indicated if the deviation between SV and PV is above 10% and is continued for over one minute. ➢ Indicated when the valve does not operate, friction is extremely high or when the air regulator's set pressure is too low. ➢ Can be checked from "Error" category in View mode. (Refer to section 9.10)	➢ Re-perform auto-calibration. ➢ Check air regulator's set pressure and re-adjust to appropriate pressure.

D	➢ Accumulated I value is I max or min's limit. ➢ Degree of precision is low. ➢ Indicated if valve's friction is extremely high or set pressure of air regulator has been changed. ➢ Can be checked from "Error" category in View mode. (Refer to section 9.10)	➢ Re-perform auto-calibration ➢ Check air regulator's set pressure and re-adjust to appropriate pressure.

10.4 Warning code which can be checked from View mode

Warning Code	Code Description and Cause	Action
B	➢ PV Span – PV Zero range is below 500. ➢ Feedback lever's angle use is too low. ➢ Can be checked from "Error" category in View mode. (Refer to section 9.10)	➢ Re-position the positioner so that the angle use of the feedback lever is larger than current angle. Then, perform AUTO1 calibration.
F	➢ Full open & Full close time is less than 1 second. ➢ Size of the actuator is too small. ➢ Can be checked from "Error" category in View mode. (Refer to section 9.10)	➢ Use orifice and lower the flow rate. ➢ Or replace the actuator with bigger size.
G	➢ PV is set below 100. ➢ Feedback lever's angle use is set too high. ➢ Can be checked from "Error" category in View mode. (Refer to section 9.10)	➢ Re-position the positioner so that the angle use of the feedback lever is smaller than current angle. Then, perform AUTO1 calibration.
H	➢ PV is set above 4000. ➢ Feedback lever's angle use is set too high. ➢ Can be checked from "Error" category in View mode. (Refer to section 9.10)	

11 Main Software Map



Manufacturer: Rotork YTC Limited

Address: 81, Hwanggeum-ro, 89 Beon-gil, Yangchon-eup, Gimpo-si, Gyeonggi-do, South Korea

Postal code: 10048

Tel: +82-31-986-8545

Fax: +82-70-4170-4927

Email: ytc.sales@rotork.com

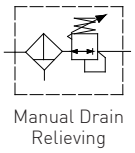
Homepage : http://www.ytc.co.kr

Issued : 2021-04-21

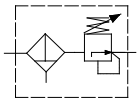
Aluminum alloy 1/4"NPT Filter Regulator – FR serie

Filtro Regolatore da 1/4"NPT in lega di alluminio – serie FR

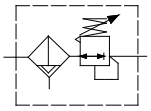
- **Suitable for automation equipment to onshore, offshore, pharmaceutical, medical and food applications**
- **Full material traceability**
- **Excellent stability and repeatibility**
- **Accurate adjustement and high flow capacity**
- **ATEX 2014/34/UE - II2GD c IICT6 X / IP66**
- **& approved / SIL - IEC 61508**
- Adatto per automazione in applicazioni marine, petrolchimiche, farmaceutiche, medicali e alimentari
- Completa rintracciabilità dei materiali
- Eccellente stabilità e ripetibilità
- Precise regolazioni ed elevate portate
- ATEX 2014/34/UE - 2GD c IICT6 X / IP66
- Approvato ed / SIL - IEC 61508



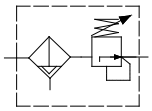
Manual Drain Relieving



Manual Drain Non Relieving



Automatic Drain Relieving



Automatic Drain Non Relieving

Media / Fluido	**Compressed air, inert gases, sweet and sour gases**
Port thread / Connessioni	**1/4"NPT**
Gauge Connection Connessione manometro	**1/8"NPT (1/4"NPT option)**
Max inlet pressure Pressione massima di ingresso	**25bar**
Filtering element Elemento filtrante	**5 micron in ss316 std (25 & 40 micron in st. st. 316 available)**
Drain valve / Scarico condensa	**Manual or automatic**
Flow Rate (@10 bar inlet, 6bar regulated, delta P=1bar)/ Portata	**940dm3/min Cv=0.9**
Working Temperature Temperatura di esercizio	**-20°C up to 80°C (NBR); -25°C up to 90°C (FKM); -40°C up to 80°C (EPDM) ***
Regulated pressure Pressioni regolate	**0/2, 0/4, 0/8, 0/10bar**

Air supply must be dry enough to avoid ice formation at temperatures below +2°C (+35°F).

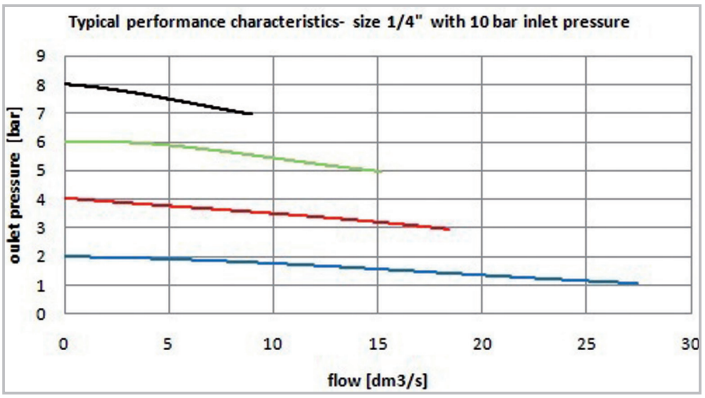
***Special version available for -55°C up to 90°C**

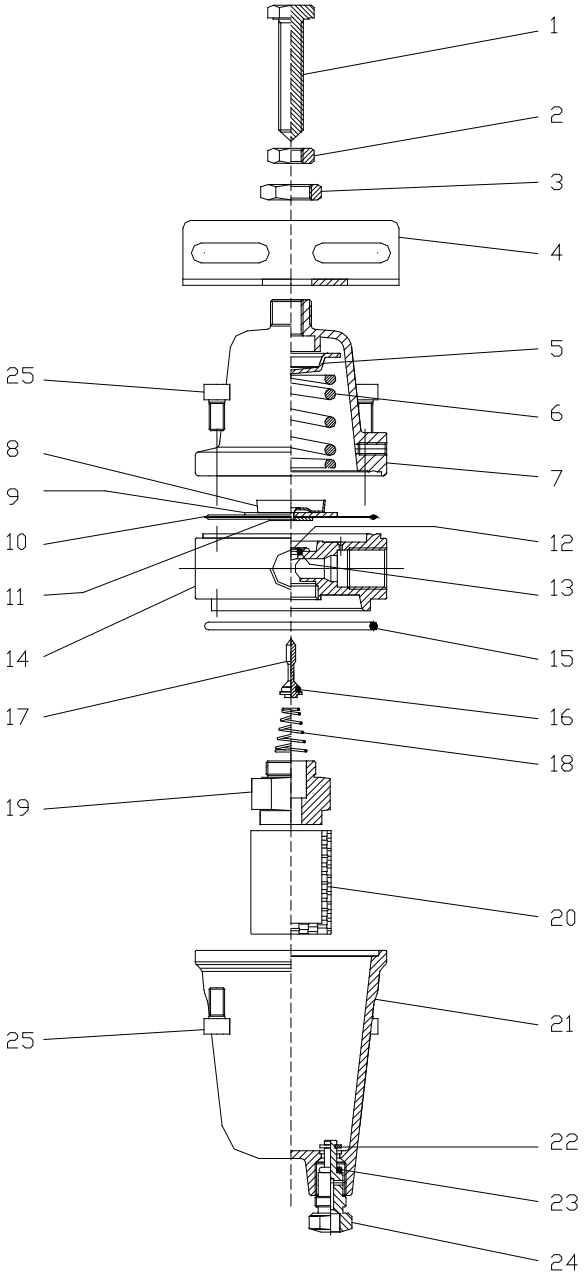
It provides excellent regulation and filtering for a wide range of applications. Rugged and corrosion-resistant – made of aluminum alloy and SS AISI304/316. Compact small package size / Permette un'accurata regolazione e filtraggio per una vasta gamma di applicazioni. Robusto e resistente alla corrosione – Costruito lega di alluminio ed AISI316 - Dimensioni di ingombro ridotte

BUILDING MATERIALS	Materiali costruttivi
Body, bonnet, bowl in tropicalized copper free aluminum alloy, internals in stainless steel AISI304/316	Corpo, coperchio, tazza in lega di alluminio esente rame tropicalizzata, particolari interni in AISI304/316
Bracket, lock and panel nuts, fixing screws in AISI316 stainless steel or galvanized steel	Vite di regolazione, staffa, dadi di bloccaggio e pannello, viti di fissaggio in acciaio inossidabile AISI316 od acciaio galvanizzato
Diaphragm and valve assembly in elastomer and AISI316 stainless steel	Assieme diaframma ed assieme valvola in elastomero ed acciaio inossidabile AISI316
5, 25&40micron filtering element in sinterized AISI316 ss; Coalescing filtering element in bonded micro-fibre	Elementi filtranti da 5, 25 e 40micron in AISI316 sinterizzato; elemento filtrante a coalescenza in micro-fibra
Valve spring, adjustment spring in AISI316SS or galvanized steel	Molle valvola e di regolazione in AISI316 od acciaio galvanizzato
Elastomeric seals	Guarnizioni elastomeriche

Item description
Descrizione item

Pos. Description - Descrizione
1. Adjusting screw / Vite di regolazione
2. Lock nut / Dado bloccaggio vite
3. Panel nut / Dado staffa
4. Bracket / Staffa
5. Upper spring rest / Sede superiore molla
6. Spring / Molla di regolazione
7. Bonnet / Coperchio
8. Lower spring guide / Guida molla inferiore
9. Lower spring rest / Sede inferiore molla
10. Diapraghm / Diaframma
11. Valve seat / Sede valvola
12. Ring / Arresto
13. O'ring valve steam / O'ring guida valvola
14. Body Corpo
15. O'ring (bowl) / O'ring tazza
16. O'ring (valve) / O'ring valvola
17. Valve / Corpo valvola
18. Spring valve / Molla valvola
19. Filter element support / Supporto elemento filtrante
20. Element / Elemento filtrante
21. Bowl / Tazza
22. Ring / Anello benzin
23. O'ring (drain) / O'ring rubinetto
24. Manual drain / Rubinetto di scarico
25 Screw (M5x8) Vite di fissaggio M5x8





Accessories and repair kit
Accessori e ricambi

Maintenance kit / Kit manutenzione [1/4"]	Items K-FR04-*-AL-**
Pressure gauge DN40mm, SS case, Bar+psi+kpa range / Manometro DN40mm, cassa inox, scala Bar+psi+kpa	0-2bar MBSNP4S2PN3S 0-4bar MBSNP4S2PN05 0-10bar MBSNP4S2PN07
Bracket and lock nut / Staffa e Dado	SQ-FR04

* Refers to filter element option: 1→5 micron 2→25 micron 3→40 micron 4→coalescing
** Refers to seals type:
FK→FKM NB→NBR LT→EPDM FL→Low temperature compound HN→HNBR

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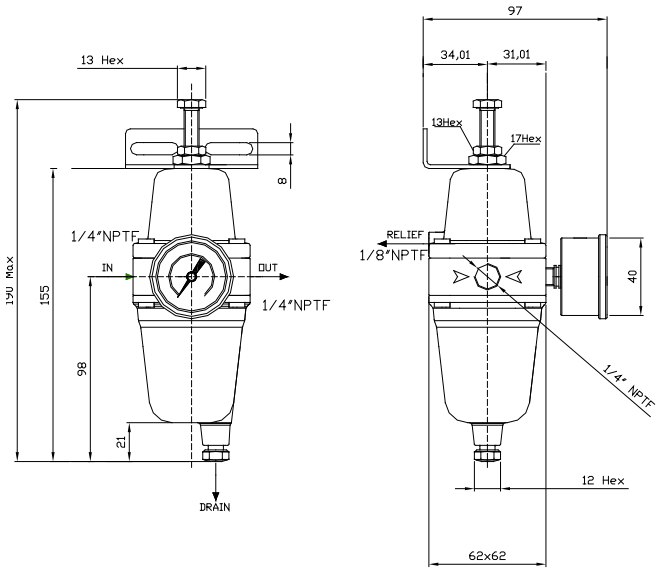
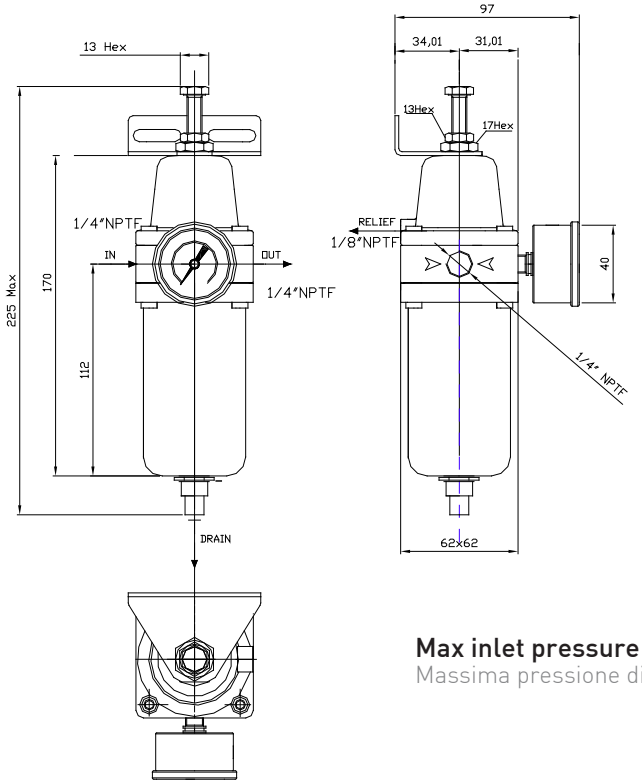
Overall dimension
Dimensioni di ingombro

Manual drain
Scarico manuale



Automatic drain
Scarico automatico



Max inlet pressure for automatic drain 16bar
Massima pressione di ingresso con scarico automatico 16bar

BT-FR4ALC16C

SITECNA® Flow Control Technologies

Ordering information
Come ordinare

TYPE
F= Filter
FR= Filter Regulator
R= Regulator
FM= Mini-filter*
TF= Tee Filter*
BP= Back Pressure*
SV= Switch Valve 2/2*
S3= Switch Valve 3/2*
* (only ¼"NPT)

SIZE
04= 1/4" NPT*
06= 3/8" NPT
08= 1/2" NPT
12= 3/4" NPT
16= 1" NPT
20= 1" 1/4"NPT
24= 1" 1/2"NPT
32= 2"NPT

RANGE
0= None
1= 0.2-2 bar
2= 0.2-4 bar
3= 0.4-8 bar
4= 0.4-10 bar
6= 4-25 bar
7= 4-35 bar

ACCESSORIES
0= None
2= SS bracket kit
3= Panel nut&handwheel
4= Customised Tag
5= SS bracket kit + nut&hanwheel
6= SS bracket kit+custom.Tag
8= CS bracket kit

Specials

FR	06	3	1	1S	5	6	SS	FK	2	#	#

FILTER ELEMENT
0= None
1= 5 micron
2= 25 micron
3= 40 micron
4= coalescing

PRESSURE GAUGE
0= None
1S= AISI316 case (SS316 connection)
1B= AISI304 case (brass connection)

OPTION
00= None
05= No relieving
06= 1/4" gauge port
07= Automatic drain
56= No relieving 1/4" gauge port
57= No relieving Automatic drain
67= 1/4" gauge port Automatic drain
X= Special

DIAPHRAGM & SEALS MATERIAL
FK= FKM (WT-25° +90°C)
NB= NBR (WT-20° +80°C)
LT= EPDM (WT-40° +80°C)
FL= Special compound (WT-55°+90°C)
HN= HNBR (WT from -55°) suitable for gas

MATERIAL
SS= 316-316L Stainless steel
AL= Copper free aluminum alloy
SP= Special

CODE EXAMPLES

FR	06	3	3	1S	0	7	SS	FK	2	

3/8"NPT, SS316, 0 to 8 bar range, filter regulator, with 40 micron filtering element, relieving, SS pressure gauge, automatic drain, ss bracket kit and FKM diaphragm & seals

Filtro regolatore da 3/8"NPT in AISI316, range regolato 0/8 bar, elemento filtrante da 40 micron, manometro tutto inox, relieving, scarico condensa automatico,staffa inox, diaframma e tenute in FKM

FR	06	3	1	00	0	0	SS	FK	0	

3/8"NPT, SS316, 0 to 8 bar range, filter regulator, with 5 micron filtering element, relieving and FKM diaphragm & seals

Filtro regolatore da 3/8"NPT in AISI316, range regolato 0/8 bar, elemento filtrante da 5 micron, relieving, diaframma e tenute in FKM

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