

INSTRUCTION MANUAL

SMART POSITIONER

SP760



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Shin Hwa Eng Co., Ltd

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1. Introduction

1-1 General Information for users

This manual include worker's safety, products system protection and safety installed in this products. In order to keep workers and system protection, please read this safety instruction of this manual carefully prior to installing, commissioning the products. For the safety, it is important to follow the instruction exactly in this manual. If not followed safety instruction exactly, manufacturer can not guarantee safety fully.

- ▶ Installation commissioning and maintenance of the products should be performed by trained specialist personnel who have been authorized accordingly.
- ▶ The manual should be provided to the end-user.
- ▶ SP760 Series hardware and software can be upgraded without any prior notice.
- ▶ For additional information or if there occur problems that are not stimulated on these manual, please contact to Shin Hwa Eng Co.,Ltd immediately.

1-2 Warranty

- * Manufacturer will not take responsible for the personal and physical damage caused by user's negligence and products modifying or repairing randomly.
If any alternations or modifications are required, please contact to Shin Hwa Eng Co.,Ltd
- * Quality warranty is valid during the warranty period stimulated in products warranty and shall be free cost during this period only.
- * Even though it is within quality warranty period, following conditions must be paid.
 - In case that customer shall maintain or repair products improper randomly.
 - In case of happening problems caused by improper movement and storage or dealing which has exceeded over design condition.
 - In case that products shall be used over the specification range.
 - In case that problems shall be caused by improper installation.
 - In case that it happens on fires, earthquakes, storms, floods, thunder, lightning other natural disasters, riot, war, radiation exposure, force of majeure situation .

1-3 Safety on installation

- * When installing or replacing positioner equipped with actuator ,following safety is required.
 - Stop completely valve, actuator and relative surrounding input signal, air pressure .
 - Separate by-pass valve or control valve so that overall system may not shut down .
 - Make sure that there is no remaining air pressure in actuator .
 - For enclosure covered with a non-conductive material, propagating brush discharges shall be avoided.

1-4 Safety on Piping Connection

- * Be care to select facility so that moisture, oil, other materials may not be mixed in pipe of air compressor and system .
- * Prevent to penetrate on moisture ,oil and different material with air regulator which is equipped filter or separated filter device in front of supplying port on SP760 series.

1-5 Supply pressure Condition

- * Use drying air with dew point of at least 10°C lower than ambient temperature.
- * Avoid extra material using filters less than 5 micron .
- * Avoid oil or lubrication oil .
- * SP 760 series supply pressure range is 1.4 ~7 kgf/cm² (140 - 700 kPa).
Do not use over usage range

1-6 Supply Pipe Condition

- * Check that different materials inside pipe must be erased before installing pipe .
- * Do not use pipe which is squeezed or damaged .
- * Pipeline should have more than 6 mm of inner diameter to maintain SP760 series flow rate.

1-7 Safety Contents on Electrical connection

- * Check that electric power is off before connecting terminal.
- * Please use ring terminal to protect against vibration or any other impact.
- * SP760 series positioner (except feed back signal internal type) uses 4-20mA DC.
In products operation minimum supplying current, the standard type positioner is 3.2mA and HART internal type positioner's minimum ampere of input signal is 3.8mA but maximum ampere of input signal should be 24mA or under.
- * In case there is feed back option in SP760 series, separated power must be supplied to feed back signal and supplying voltage must be 9-28V and not exceed into maximum 30V.
- * In order to protect products, positioner should be grounded.
- * Please do not install the cable near high noise equipments such as high-capacity transformer or motor.
- * Cable and cable glands suitable for at least 90°C shall be used.
- * Use fasteners with yield stress ≥ 626 MPa.
- * When installing a cable gland or blanking element, use an explosion-proof product rated IP66 or higher.

1-8 Safety to maintain Flame Explosion Proof in danger area

- * Check that explosion proof certification is valid in usage condition and must meet with condition .
- * SP760 positioner is using Flame Explosion Proof (Ex db IIC T6/T5 Gb, Ex tb IIIC T80°C/T90°C Db) code . It can be used in Zone 1,2 area.
- * In danger area which is exiting explosive gas, explosion proof type of cables or flame explosion proof packing type cable must be used. In case of using explosive proof cable ,it must be used by gasket and sealed completely.
- * When the power is connected, make sure that do not open SP760 power terminal box . Before opening terminal box, make sure that power is off completely and after erasing current and voltage completely, it must be opened.
- * SP760 series positioner have 2 ports for power connection. If one side of connection must be used when using explosive cable or flame explosion proof to packing plug in the other side should be used explosive blind plug in order to protect.(In case that the other items shall be required to use except our company's supplying plug blind approved resistance to explosion proof type structure shieling fitting or flame explosion proof type cable gland must be used when connecting power on.)
- * Ring terminal with surface area of more that 0.195 mm² with should be used ,and also M4 spring washer should be used to prevent failing out.
- * For external ground terminal, ring terminal with surface area of more than 5.5 m² should be used .
- * There will be risk of explosion due to electro-static charge. Static electricity charge may develop when cleaning the products with a dry cloth. It is imperative to avoid static electricity charge in the hazard area. If cleaning the surface of the products is required, please use wet clothes.

1-9 Safety Requirements



Caution : Failure to observe the notice may result in damage to the device or may degrade performance.



Warning : Failure to observe the is caution may result in damage to the device or personal injury.



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

 **Caution**

- ▶ Operating the products incorrectly may be lower the safety.
The well trained person who has proper knowledge and full experience on assembling and machinery operation should handle this products.
- ▶ Change or modification without permission may be exempt from the manufacturer's liability.
- ▶ Do not try to handle or disassemble the machine until the safety is firmly secured.
 1. Before maintenance or inspection of the machine, make sure that no moving objects fall or move.
 2. Before removing the products, check the safety such as taking safety action and cutting off the relative electric power and be well aware of the caution of products.
 3. When re-operating the machine, make sure that necessary safety action was taken and operated with safety.

 **Warning**

- ▶ Please observe the rule relative to safety regulation (National safety regulation) construction supervision rules and general rules of operation techniques.
- ▶ Please check whether the smart positioner is in proper area or not.
- ▶ Please check whether positioner specification is allowable and range of positioner is approved in explosion area or not.
- ▶ Please close unnecessary cable gland with approved locking screw in explosive parts.
- ▶ For enclosure covered with a non-conductive material, propagating brush discharges shall be avoided.

2. Products Description

2-1 General Introduction

The SP760 smart positioner series controls the valve stroke in responsive to an input signal of 4-20mA DC from the control room or DCS Built-in micro-processor optimize the positioner's performance and provides unique function such as Auto Calibration, PID control and HART communication and other excellent functions.

2-2 Main Features and Functions

- (1) Without opening cover, the LCD can be checked directly,so positioner condition can be checked visually.
- (2) Owing that 4 control buttons and button main function shall be adjusted in all mode of firmware interface, the using method is very simple.
- (3) The method of auto-calibration is very simple and even beginner can operate it easily.
- (4) Our positioner is compatible with most of controllers.
- (5) With HART Communication, Various information of valve and positioner can be checked and processed.(Option)
- (6) Analogue feedback output signal makes valve system stable.
- (7) Different valve characteristics can be modified -valve flow characteristics control mode such as Linear, Quick Open, Equal %.
- (8) Positioner's Operating temperature is -30 ~ +70°C(T6 or T80°C), -30 ~ +80°C(T5 or T90°C). (Please check "2.5" products specification in case of explosion proof ambient temperature)
- (9) Through self-diagnosis function, products reliability can be increased.
- (10) It has excellent IP66 enclosure grade.

2-3 Options

- (1) Position transmitter (4-20mA DC Feedback signal)
- (2) HART Communication
- (3) Limit Switch

2-4 Label Description

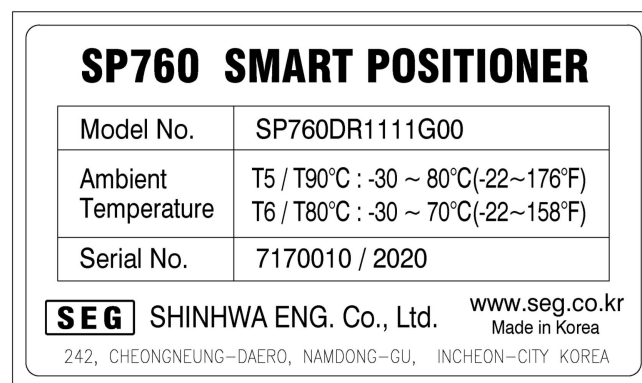


Fig 2-1 : SP760 sticker label

 ※ Caution

Please care not to touch volatile solvent (hardener of instant adhesive, acetone WD-40 etc) because it can be erased sticker label's print contents.



Fig 2-2 SP760 Metal Label

Items of Label	Description
Model No.	Indicate model No according to specification including option.
Ambient Temp.	Indicate ambient temperature valid in explosion proof certification.
Serial No.	Indicate products serial No.
Explosion Proof	Indicate products explosion proof grade.
Input Signal	Indicate the range of input electric signal.
Supply Air Press.	Indicate pressure range supplying to positioner.
Enclosure	Indicate enclosure grade of water proof and dust proof.

2-5 Products Specification

Model	SP760S		SP760D	
Acting Type	Single		Double	
Motion Type	Linear	Rotary	Linear	Rotary
Input Signal	4~20mA DC			
Minimum Current Signal	3.2mA(Standard), 3.8mA(HART Included)			
Impedance	Max.450Ω @ 20mA DC			
Air Connection	NPT 1/4, PT 1/4(KCs for only)			
Pres. Gauge Connection	NPT 1/8, PT 1/8			
Conduit Entry	NPT1/2, M20, PF(G)1/2(KCs for only)			
Stroke	10~160 mm	0~90°	10~160 mm	0~90°
Supply Pressure	0.14~0.7 MPa (1.4~7 bar)			
Flame Explosion Proof Grade	Ex d IIC T6/T5, Ex tb IIIC T80°C/T90°C (KCs) Ex db IIC T6/T5 Gb, Ex tb IIIC T80°C/T90°C Db (IECEX) II 2 G Ex db IIC T6/T5 Gb, II 2 D Ex tb IIIC T80°C/T90°C Db (ATEX) Ex db IIC T6/T5 Gb, Ex tb IIIC T80°C/T90°C Db (CCC)			
Enclosure	IP66			
Ambient Temperature	-30 ~ +70°C(T6 or T80°C), -30 ~ +80°C(T5 or T90°C)			
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	2 LPM Below (sup=0.14MPa), 3 LPM Below (sup.=0.7MPa)			
Cam Characteristic	Linear(L), Square(S), Square root(R), User Set (16 Point)			
Vibration	No Resonance 20Hz ~ 200Hz			
Humidity	5~95% RH at 40°C			
Communication(Optional)	HART Communication			
Feedback Signal (Option)	4~20mA (DC 10~30V)			
Material	Aluminum Die-casting			
Weight	3.2 kg (7.1 lb)			
Painting	Epoxy Polyester Powder Coating			
Color	Black			

2-6 Explosion Proof Certificate

▶ KCs

Type : Flame Proof Enclosure
Rating : Ex d IIC T6/T5, Ex tb IIIC T80°C/T90°C
Certification No : 20-KA2BO-0544X, 20-KA2BO-0545X
Ambient Temperature : -30 ~ +70°C(T6 or T80°C),
-30 ~ +80°C(T5 or T90°C)

▶ IECEX

Type : Flame Proof Enclosure
Rating : Ex db IIC T6/T5 Gb, Ex tb IIIC T80°C/T90°C Db
Certification No: KTL 20.0012X
Ambient Temperature : -30 ~ +70°C(T6 or T80°C),
-30 ~ +80°C(T5 or T90°C)

▶ ATEX

Type : Flame Proof Enclosure
Rating : II 2 G Ex db IIC T6/T5 Gb, II 2 D Ex tb IIIC T80°C/T90°C Db
Certification No : DEKRA 21ATEX0071X
Ambient Temperature : -30 ~ +70°C(T6 or T80°C),
-30 ~ +80°C(T5 or T90°C)

▶ CCC

Type : Flame Proof Enclosure
Rating : Ex db IIC T6/T5 Gb, Ex tb IIIC T80°C/T90°C Db
Certification No: : 2021122307114755
Ambient Temperature : -30 ~ +70°C(T6 or T80°C),
-30 ~ +80°C(T5 or T90°C)

▶ Certification-related standards

- IECEX : IEC 60079-0:2017, IEC 60079-1:2014, IEC 60079-31:2013
- ATEX : EN IEC 60079-0:2018, EN 60079-1:2014, EN 60079-31:2014
- KCs : Announcement No. 2020-33 of Ministry of Employment and Labor
- CCC : GB/T 3836-2021

※ Above all certification can be checked in homepage (www.seg.co.kr).

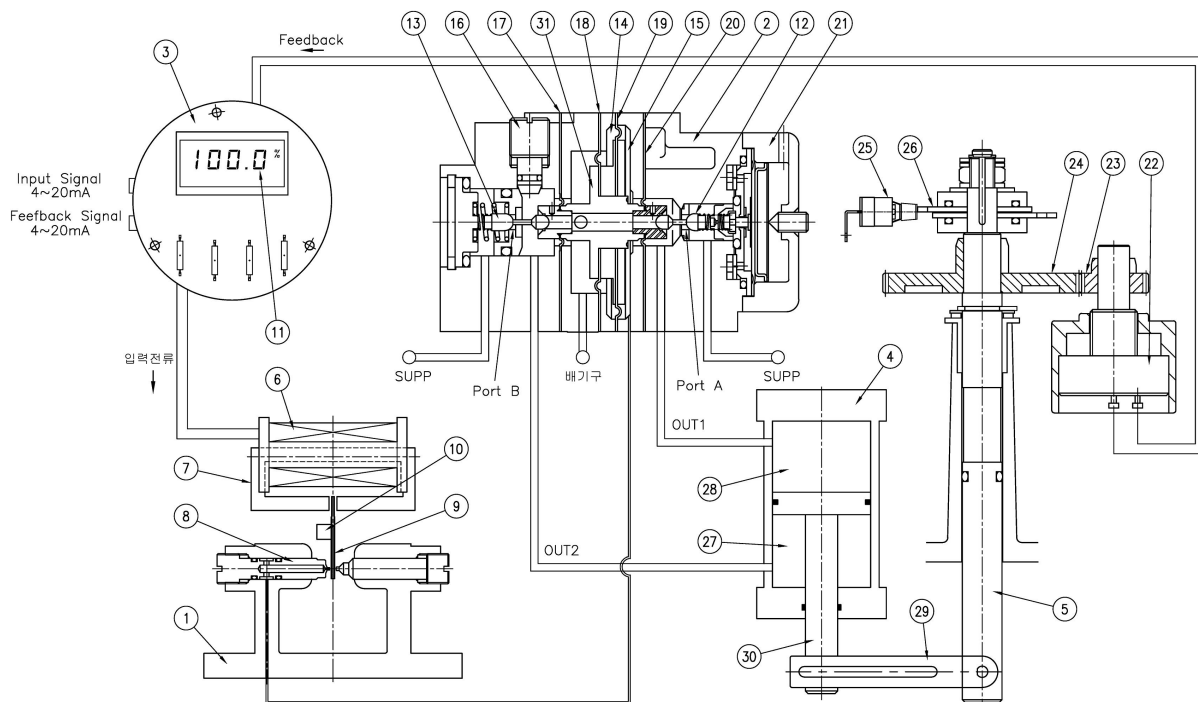
2-7 Products Code

Model	SP760								
Acting Type	Single	S							
	Double	D							
Motion Type	Linear	20~80 mm	L1						
		80~160mm	L2						
	Rotary Standard	R0							
	Fork lever	R1							
	Namur	R2							
Feedback	None		0						
	Position transmitter (4~20mA DC)		1						
Lock Condition	Fail safe			1					
	Fail Lock			2					
Explosion proof type	Non Explosive type (IP66)			0					
	FlameProof Type (dust proof)	Ex d IIC T6/T5 (Ex tb IIIC T80°C/T90°C)	(KCs)	1					
		Ex db IIC T6/T5 Gb (Ex tb IIIC T80°C/T90°C Db)	(IECEx)	2					
		II 2 G Ex db IIC T6/T5 Gb (II 2 D Ex tb IIIC T80°C/T90°C Db)	(ATEX)	3					
		Ex db IIC T6/T5 Gb (Ex tb IIIC T80°C/T90°C Db)	(CCC)	4					
Connection	Air - PT1/4, Conduit - G(PF)1/2				G				
	Air - NPT1/4, Conduit - NPT1/2				N				
	Air - NPT1/4, Conduit - M20				M				
Position L/S	None					0			
	(2×SPDT)					1			
Option	None						0		
	HART						H		

2-8 Principle of Operation

Once Control PCB(3) receives an input signal (4~20mA), the input current is delivered to coil(6) of Torque Motor(1) from which magnetic force is generated in core(7) and the force and polarity difference with a permanent magnet moves nozzle flapper(9) by which nozzle(8) and nozzle flapper(9) are far isolated, lowering the pressure of nozzle pressure chamber and finally generating the difference of pressure with the pressure chamber(14).Therefore, spool(31) pushes poppetA(12), opening port A : OUT 1 output

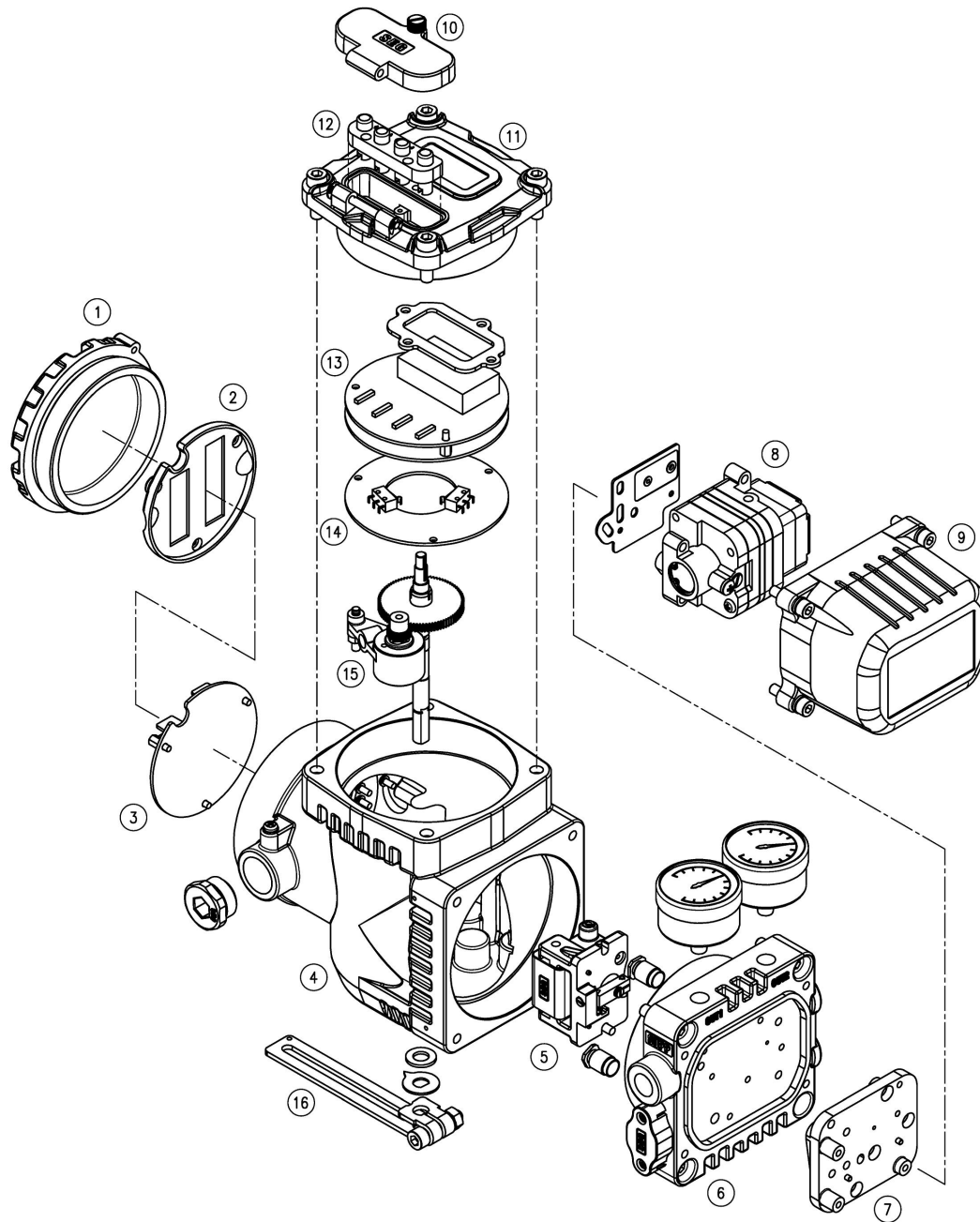
is connected to lower cylinder(28) while upper cylinder is connected to exhaust pipe raising piston rod(30) Lever(29) delivers a motion to output shaft (5) operating Pinion (23) and Gear(24) and rotating potentiometer(22) from which the resistance is fed back to control PCB(3). The feedback value is compared to the input value and calculated accordingly; if any difference is found, a changed input current is delivered to coil (6) of Torque motor(1) so to be properly located while repeating till it is balanced. On the contrary, if input current is lower, Nozzle Flapper(9) block Nozzel (8) so that the pressure in the nozzle pressure chamber(15) rises, spool (31) pushes poppet B (13) according to the difference of pressure, opening port B while OUT 2 output is connected to upper cylinder(27) and the lower cylinder(28) is connected to exhaust pipe, lowering piston rod (30). Likewise, lever(29) delivers a motion to shaft(5), operating pinion(23) and gear(24), rotating position transmitter (22) and finally delivering the resistance to control PCB(3).



1	Torque Motor	12	Poppet A	23	Pinion
2	Pilot Valve	13	Poppet B	24	Gear
3	Control PCB	14	Pressure Chamber	25	Limit S/W
4	Cylinder	15	Nozzle Pressure Chamber	26	Limit Cam
5	Output Shaft	16	Sheet Controller	27	Upper Cylinder
6	Coil	17	Diaphragm A	28	Lower Cylinder
7	Core	18	Diaphragm B	29	Feedback Lever
8	Nozzle	19	Diaphragm C	30	Piston Rod
9	Nozzle Flapper	20	Diaphragm D	31	Spool
10	Magnet	21	Pressure Regulator		
11	Display	22	Potentiometer		

Figure 2-3 Principle of operation

2-9 Structure



- | | |
|-----------------------|------------------------|
| 1. TERMINAL COVER | 9. PNEUMATIC COVER |
| 2. TERMINAL PCB COVER | 10. SWITCH COVER |
| 3. TERMINAL PCB | 11. FRONT COVER |
| 4. CASE | 12. SWITCH BUTTON BKT. |
| 5. TORQUE MOTOR ASS'Y | 13. MAIN PCB |
| 6. MID COVER | 14. HART & LIMIT PCB |
| 7. SUB PLATE | 15. POTENTIOMETER |
| 8. PILOT VALVE ASS'Y | 16. FEEDBACK LEVER |

Figure 2-4 : Schematic View

2-10 Products Dimension

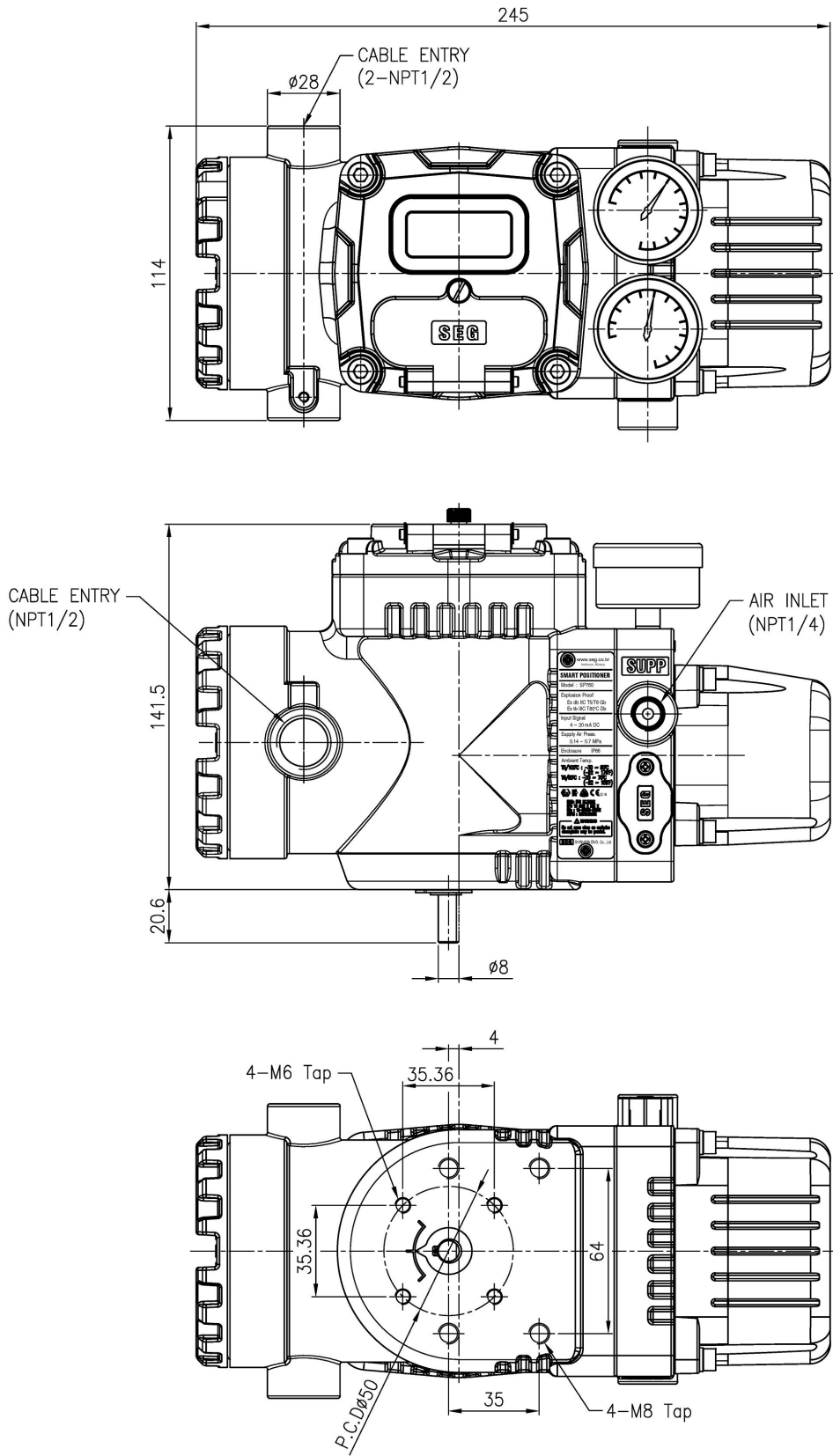


Figure2-5 : SP760 Standard

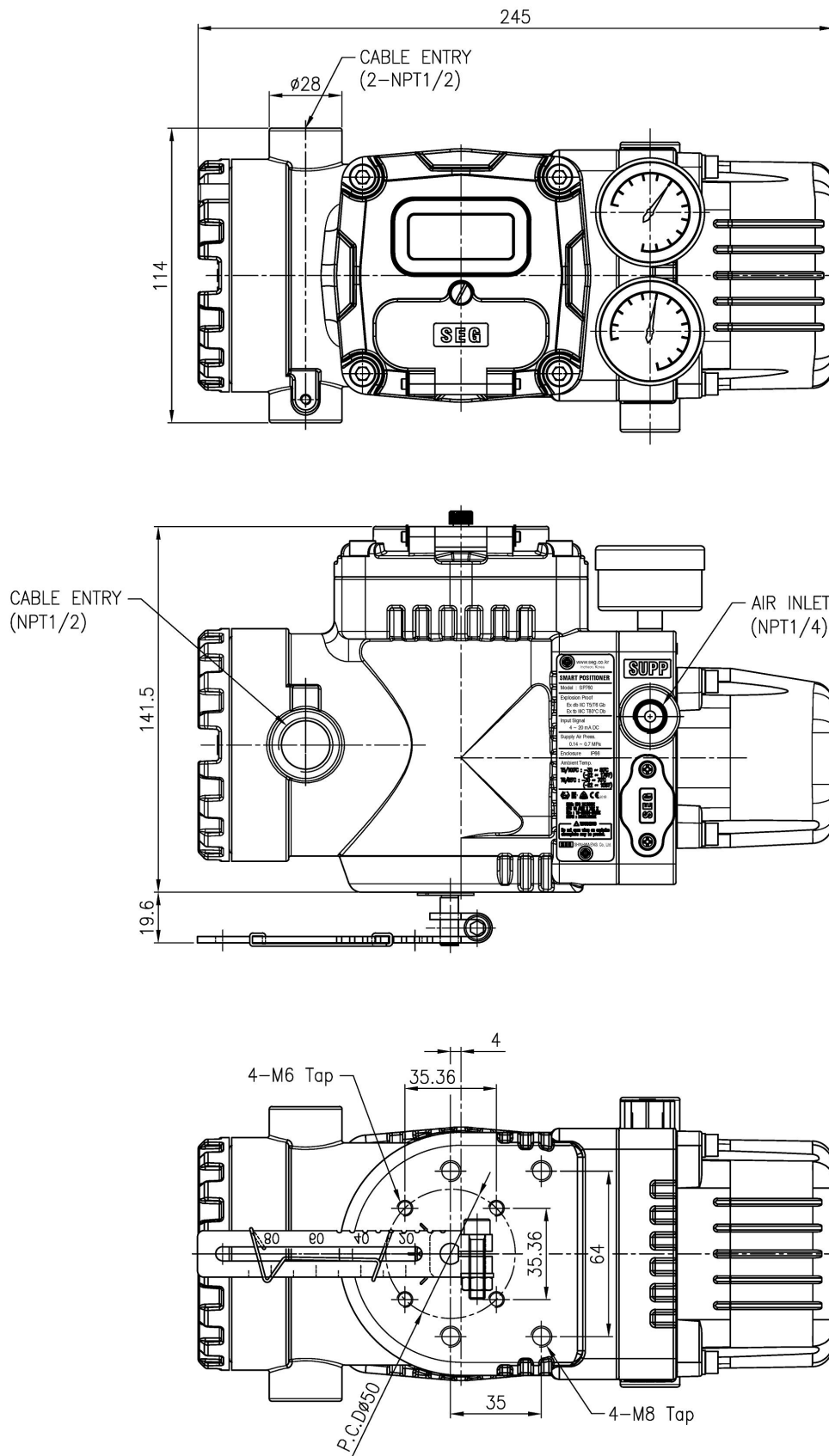


Figure 2-6 : SP760 Lever Type

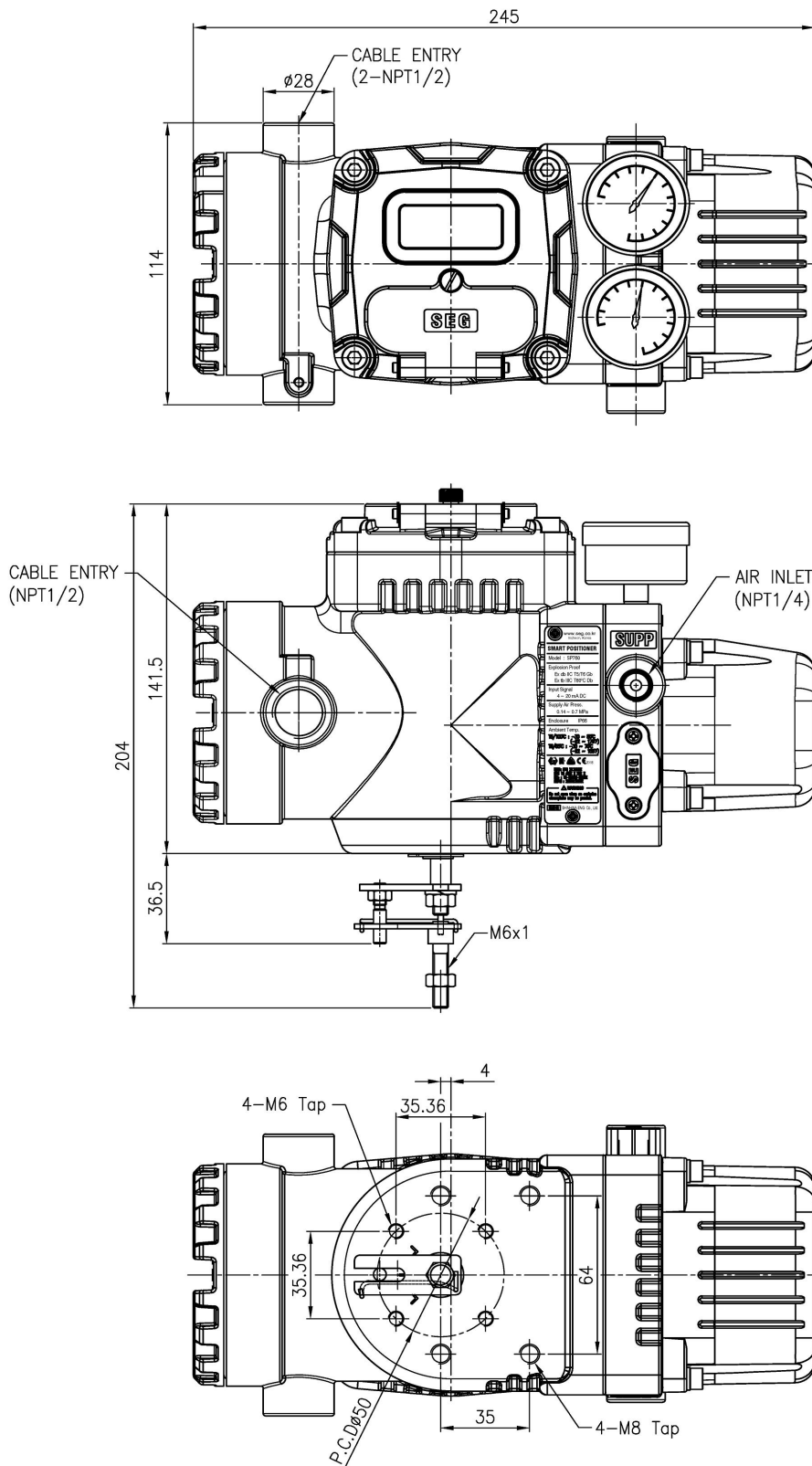


Figure 2-7 : SP760 Fork Lever Type

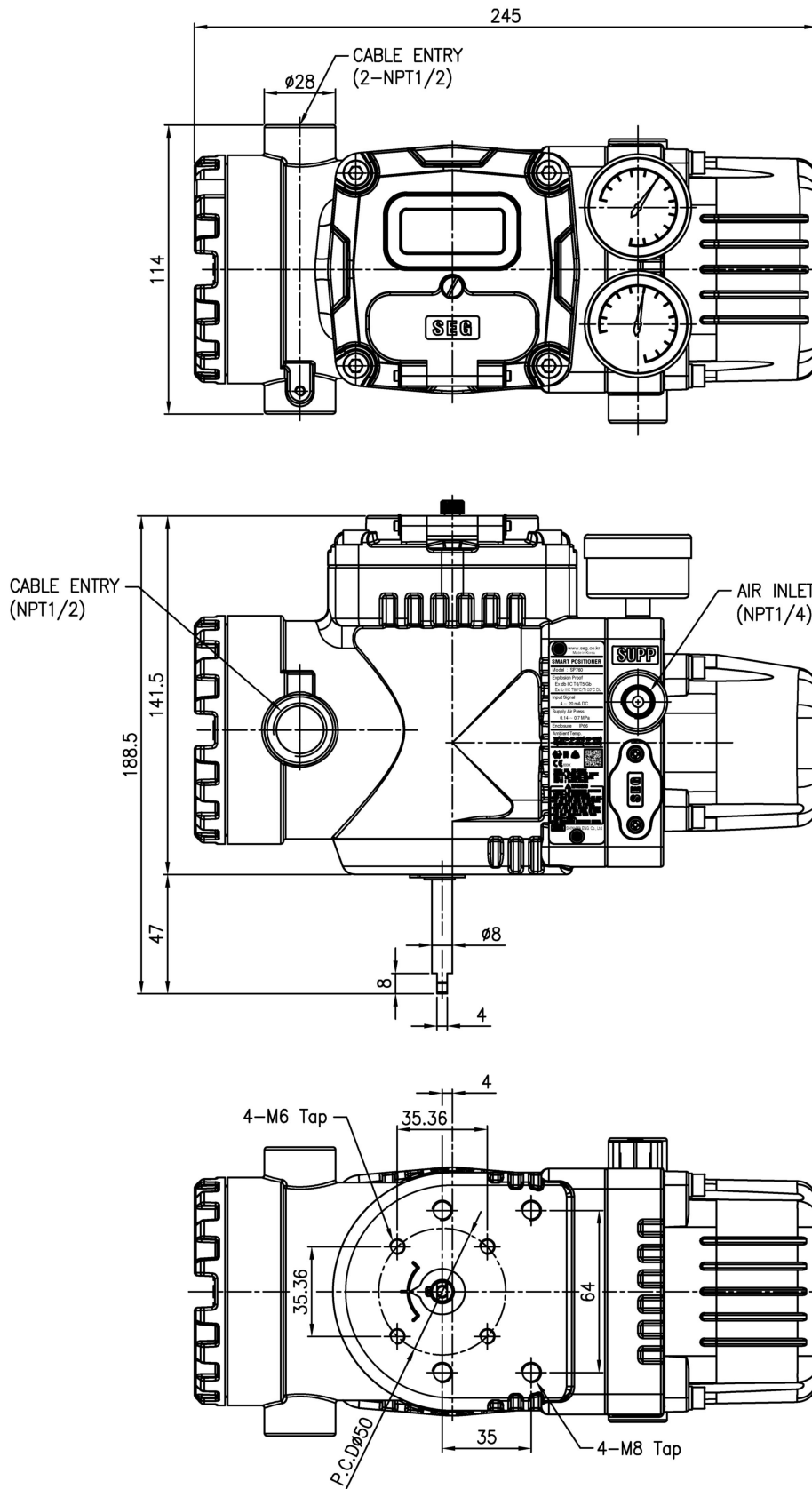


Figure 2-8 : SP760 Namur Type

3. Installation

3-1 Caution before installation

- * When installing or replacing positioner equipped in actuator, please follow safety instructions.



- Any input or supply pressure to valve, actuator and /or to other related devices must be turned off.
- Separate by-pass valve or other device from control valve so that total system may not be shut down.
- Make sure that there is no remaining pressure in actuator.
- Install filter regulator in positioner air supply line so that air pressure may be maintained properly and different material may not be inserted.
- Be alert that supplying air may not be mixed with oil, water and different material.
- When installing positioner, safety work is required after input signal and air pressure are shut down.

3-2 Tools for Installation

- Hex Wrench set
- (+) & (-) screw drivers
- Spanners for hexagonal-head bolts

3-3 Linear Positioner Installation

Linear positioner shall be installed and used on linear motion valves such as glove or gate valve type which uses spring return type diaphragm or piston actuators.

3-3-1 Caution on installation

- When fabricating bracket and connecting to connection bar ,following 2 kind of contents must be regulated.
- If following condition shall not be kept during the installation, it may be affected the performance of the products such as linearity function.



Caution

- ▶ When the valve opening is 50% ,the feedback lever should be horizontal.
- ▶ When valve opening is 50%, the stem connection pin should be located at the numeric position marked on the feedback lever that is corresponding to the valve stroke.

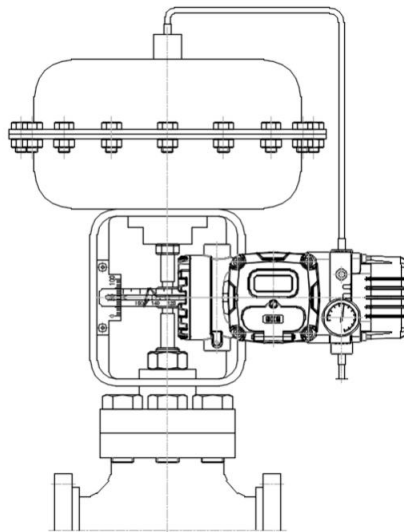


Figure 3-1 : SP760
Installation example

3-3-2 Standard lever type positioner installation steps

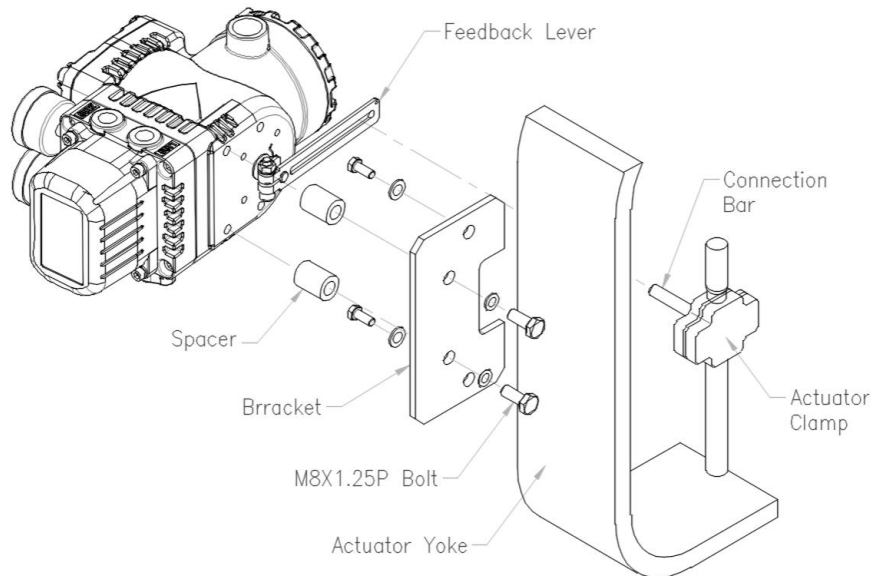


Figure 3-2 : SP760 positioner installation in actuator

- ① Assemble with the enclosed bracket and bolts.
- ② Connect a bracket onto actuator yoke with bolts.
Tighten bolts loosely so that they may be modified location easily.
- ③ Connect air filter regulator to an actuator temporarily.
And then decrease slowly supplying air pressure and valve stroke shall be reached into 50% position in overall stroke.

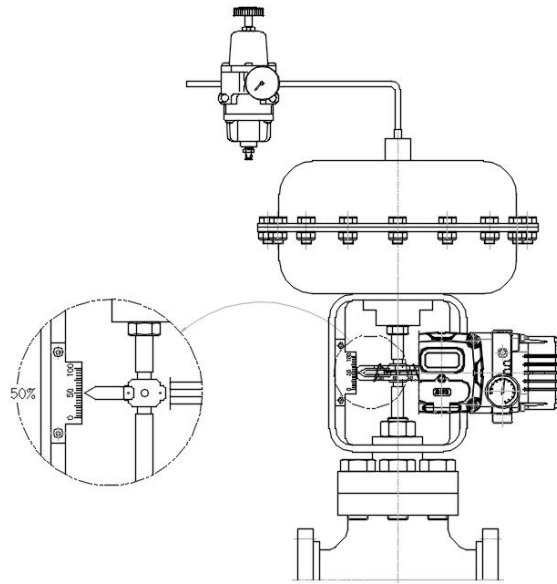


Figure 3-3 : SP760 positioner installation in actuator

- ④ Connection bar located on actuator clamp should be inserted into spring position on feed back lever's hole as seen as figure.

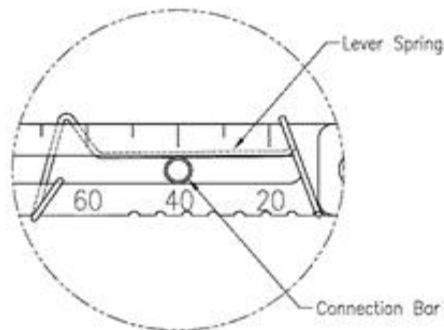


Figure 3-4 : Insert connection bar between lever and lever spring correctly.

- ⑤ Check whether positioner feedback lever is levelled at valve 50% stroke.
Unless it is levelled, adjust it horizontally after moving a bracket or positioner body.

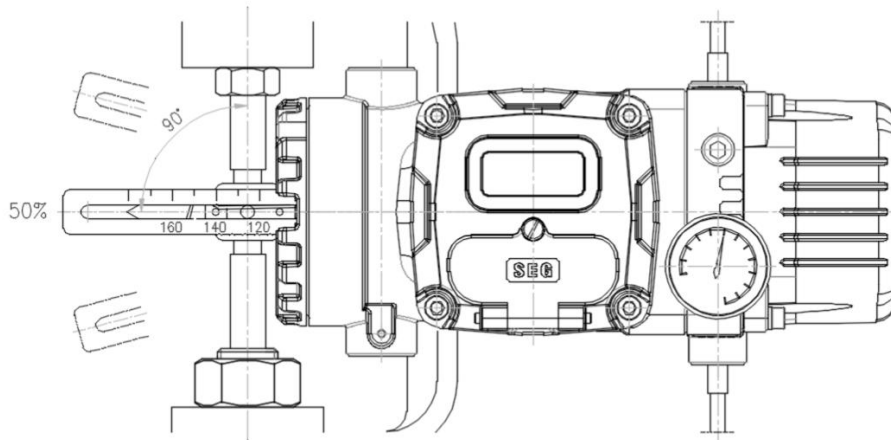


Figure 3-5 : Lever installed with vertically when valve stroke is 50%

- Ⓐ Check valve's full stroke.
- Ⓑ Make to correspondence connection bar in overall stroke value and feed back value's equal point.
- Ⓒ If positioner lever and actuator connection bar has not consistent, move and re-set positioner bracket or connection bar.

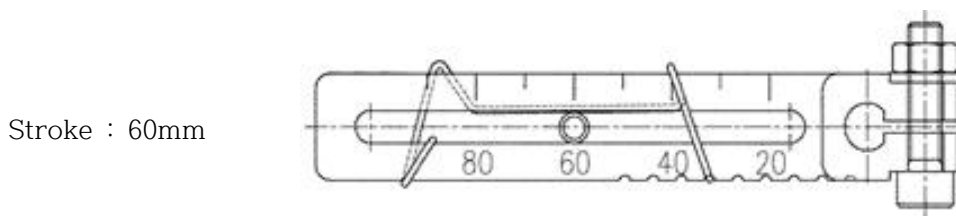


Figure 3-6 : Connection bar position when valve stroke is 60%

3-4 Rotary Positioner Installation

Rotary positioner should be installed on 90 degree rotary motion valve such as rack pinion, scotch type ,ball valve or butterfly valve. There are Fork lever type and Namur type.

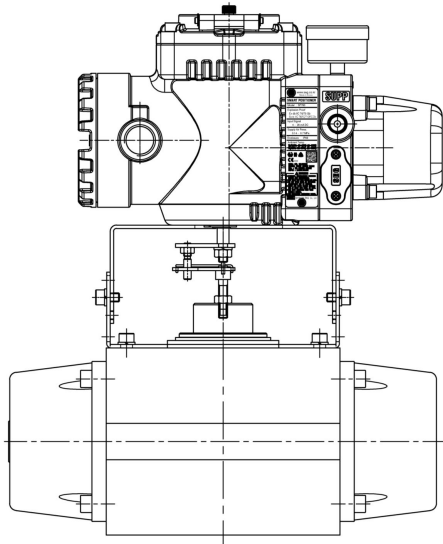


Figure 3-7 : Fork Lever type installation

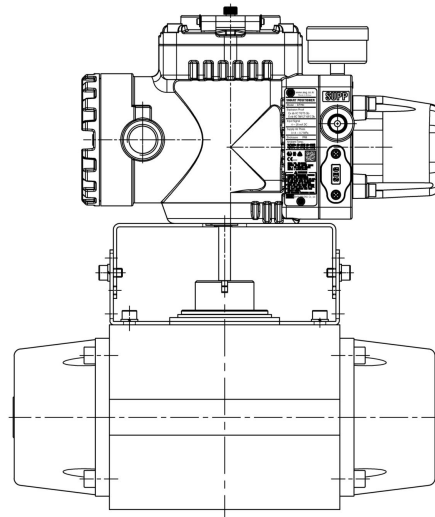
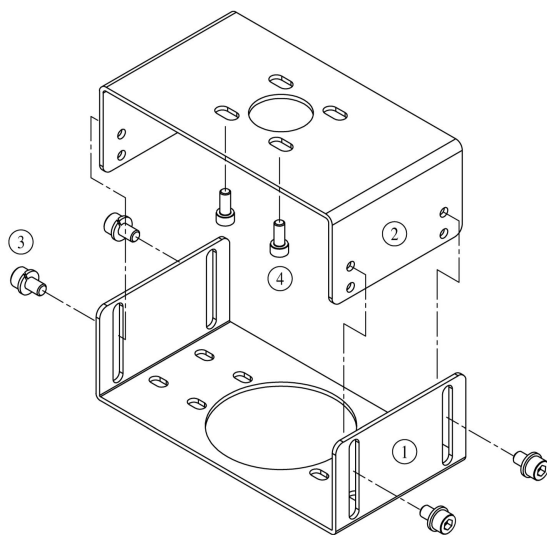


Figure 3-7 : Namur type installation

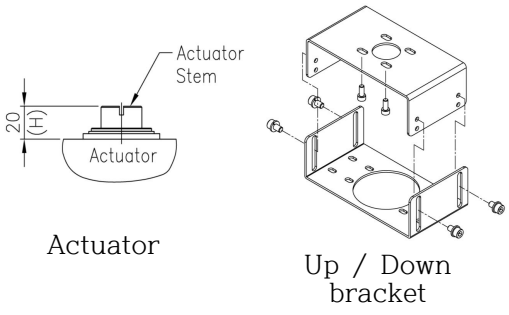
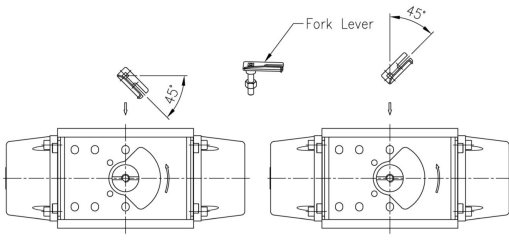
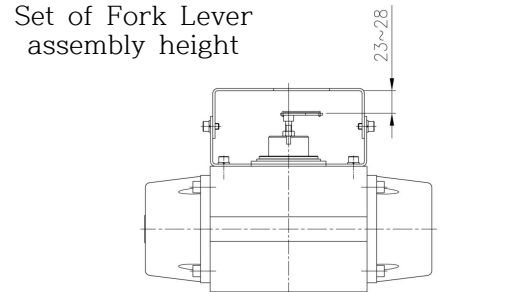
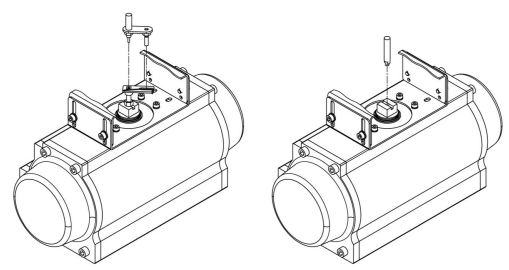
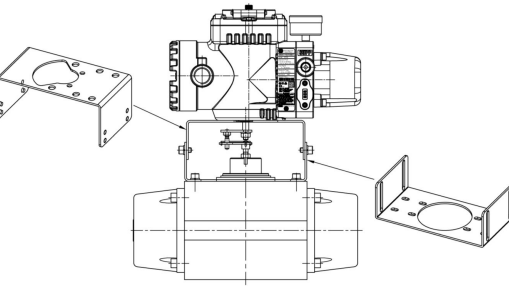
3-4-1 Bracket set for Rotary positioner installation



- ① Lower bracket (1 piece)
- ② Upper bracket (1 piece)
- ③ Bolts for upper/ lower bracket (M6)
(Wrench bolts S/W, P/W each 4 pcs)
- ④ Positioners bolts (M6)
(Wrench bolts S/W, P/W each 4 pcs)

Figure 3-9 : Bracket set for rotary positioner installation

3-4-2 Rotary Positioner installation steps

 <p>Actuator</p> <p>Up / Down bracket</p>	<p>① Connect up/down bracket assemblies onto an actuator with bolts. Note the positioner manufacturer does not supply bolts to fix an actuator.</p>
<p>Counter clock and clock direction</p>  <p>Fork Lever</p>	<p>② With an actuator's initial start point of 0%, install the fork lever as seen in figure according to the rotation direction of stem. Make sure the installation degrees of fork lever should be 45 degree from the horizontal line.</p>
<p>Set of Fork Lever assembly height</p> 	<p>③ If fork lever position is set, tighten the nuts, which is assembled with the lower parts of fork lever to an actuator stem firmly. At the moment, the fork lever upper side and the upper bracket's distance should be 19 to 25 mm each other.</p>
	<p>④ Attach the positioner onto upper bracket and fix it with bolts. At this moment, insert the pin on the lower part of the fork lever into the hole of fork lever so that it may be centered.</p>
	<p>When tightening bolts, do not connect one bolt firmly and after loosing 4 pcs of bolt slightly and after checking positioner's condition, connect bracket completely.</p>

4. Connection – Air

4-1 Supply Pressure condition

Caution

- ▶ Make sure that air filter regulator should be installed on the front of positioner.
- ▶ Supplying air should not be mixed with oil, moisture or impurities.
- ▶ Filter regulator pressure should be set 10% higher than actuator operation pressure or actuator spring operation pressure.

4-2 Connection – Piping with actuator

4-2-1 Single acting actuator

Single acting positioner should use OUT 1 port only.

Therefore, in case of using a single type spring return actuator, make sure to connect positioner's OUT1 port and actuator's supply pressure port.

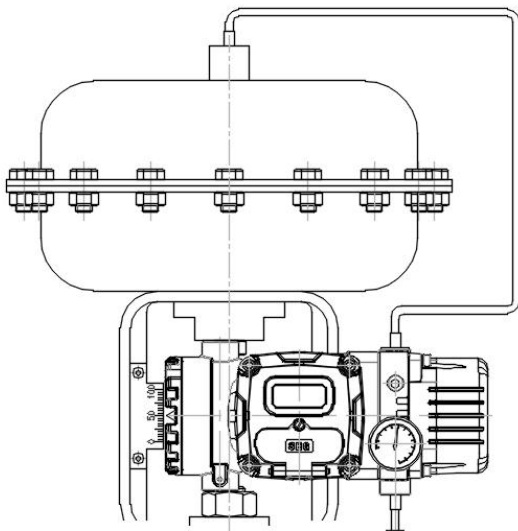


Figure 4-1 Single acting linear actuator

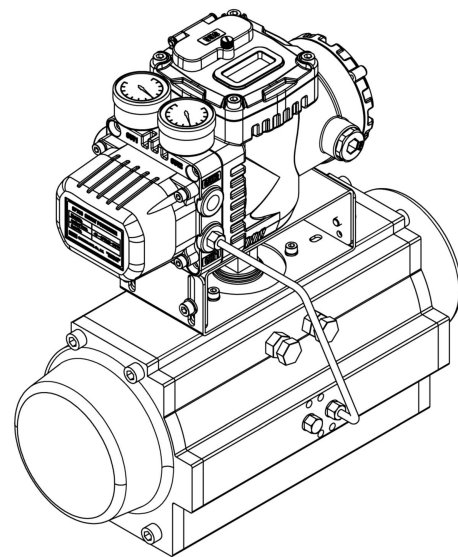


Figure 4-2 : Single acting rotary actuator

4-2-2 Double acting actuator

Double acting positioner uses both OUT1 and OUT2 ports.

If electric input signal shall be increased, air pressure is supplied from OUT1 port.

So after checking this point, please note this when installing pipe.

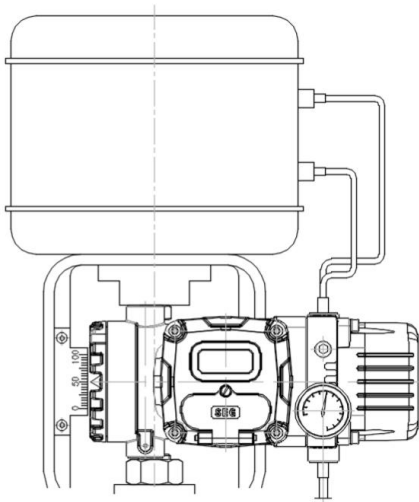


Figure 4-3 Double acting type linear actuator

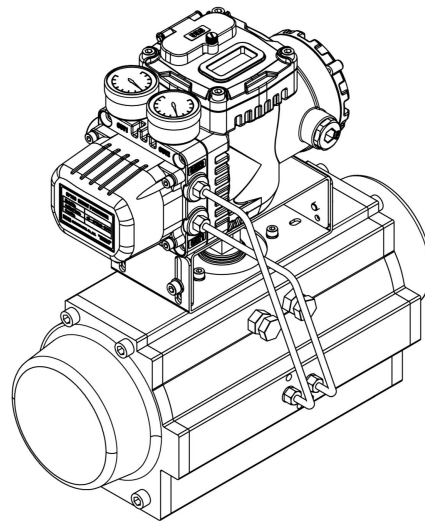


Figure 4-4 : Double acting type rotary actuator

5. Connection – Power

5-1 Safety

Caution

- ▶ Please check whether power is off before connecting terminal.
- ▶ Supply the lower than regulated current and voltage.
- ▶ Do not install cable on near equipments incurred by noises such as high capacity transformer or motor.

- Flame Explosion proof type cable and packing union must be used in danger area such as explosive gas zone and in case of using electric cable, gasket and shield should be used and they must be sealed completely. In case of using flame explosion proof packing union, it is required to select inside rubber packing size properly which meets on cable outside size.
- While power is on, do not open cover which is connected with parts such as PCB etc. Before opening cover, make sure that power is shut down and voltage must not be remained completely and after checking it, open the cover.

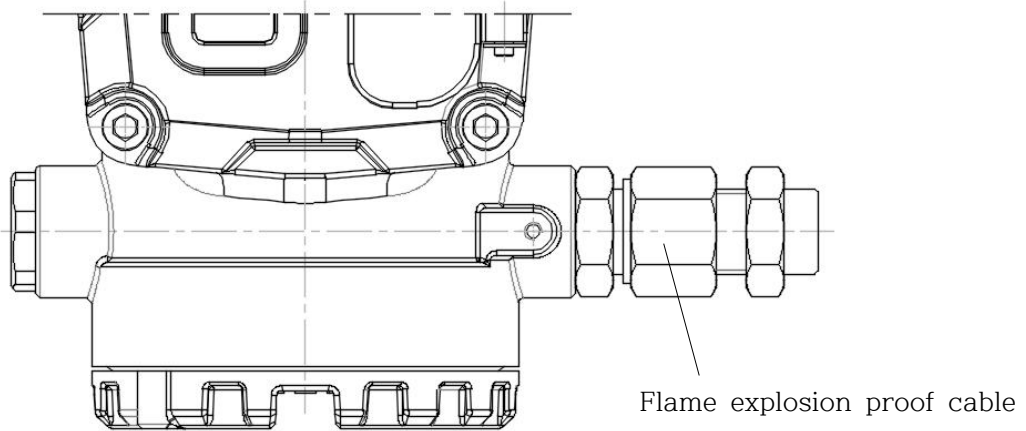
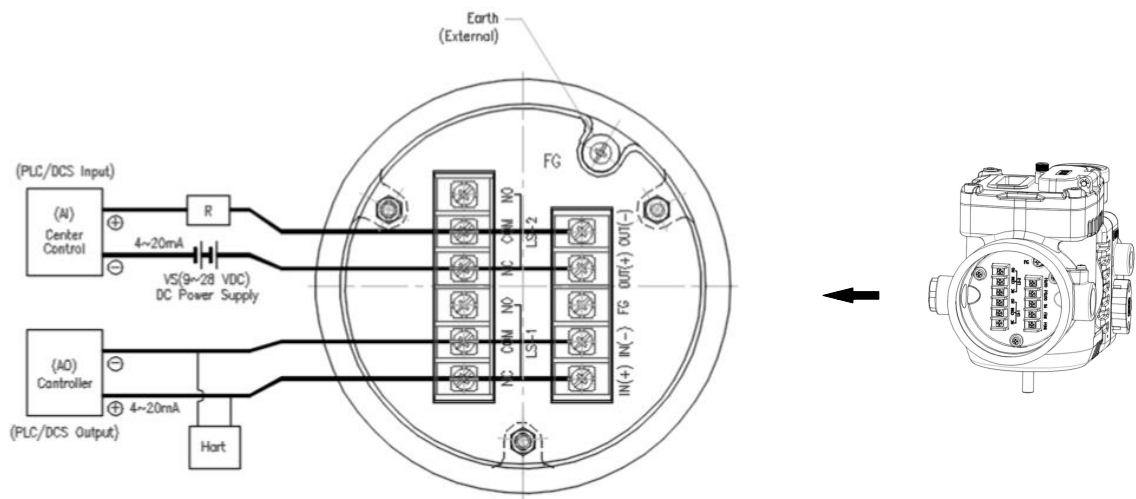


Figure 5-1 : Flame explosion proof cable

5-2 Terminal Connection



- IN(+) : Input signal (+)
- IN(-) : Input signal (-)
- FG : Frame ground
- OUT(+) : Feedback signal (+)
- OUT(-) : Feedback signal (-)
- AO : Analog Output
- AI : Analog Input
- VS : Voltage Source
- R : Load Resistance

Figure 5-2 Terminal connection map

5-3 Limit Switch Terminal

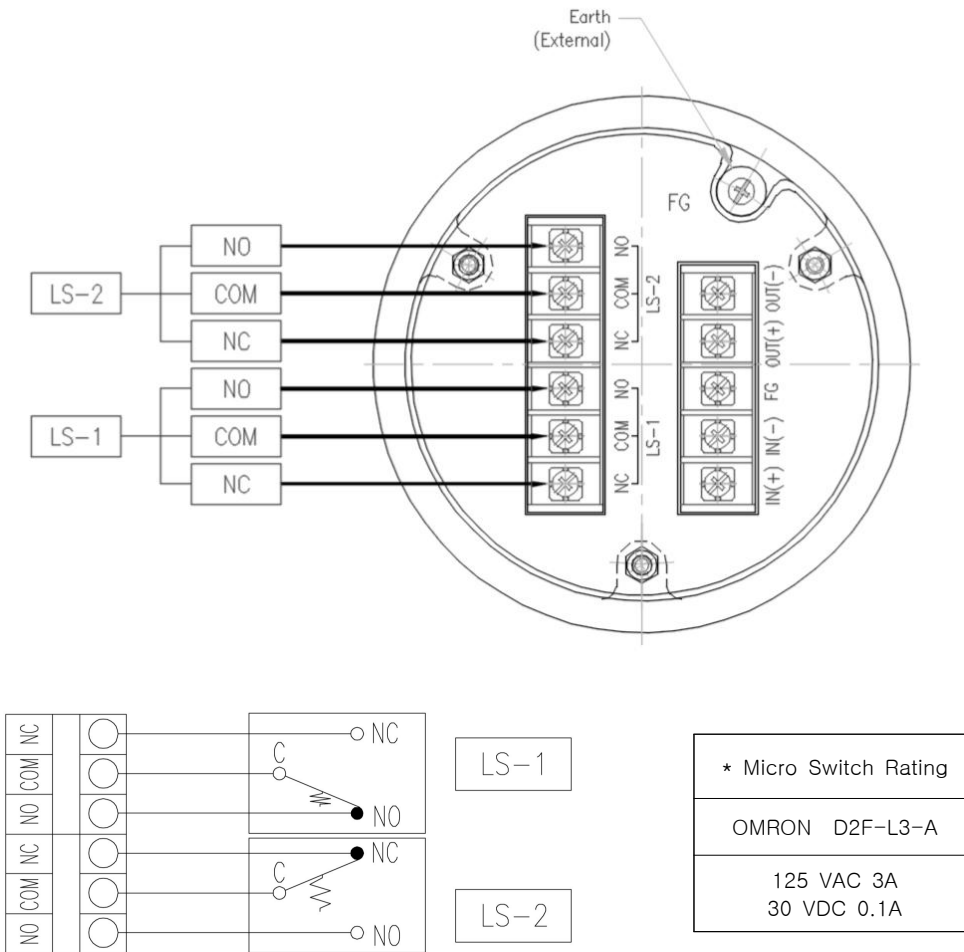


Figure 5-3 : Limit switch connection map

5-4 Ground

- Ground must be done for positioner and system safety.
- The ground terminal has each 1 ea / positioner internal and 1ea /positioner external They are assembled by M4 round head +bolt.
- Any ground terminal usage is possible but the electric resistance should be lower than 100Ω.

6. Adjustments

6-1 Limit Switch adjustment

To adjust the operation location of limit switch, loosen the CAM fixed screw, and after CAM position should be rotated to desirable position and then tighten with screw again and fix.

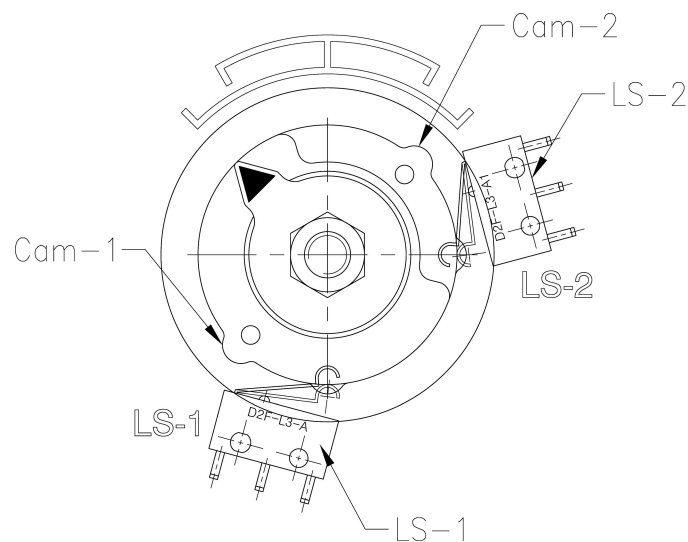


Figure 6-1 : Adjustment of limit switch operation

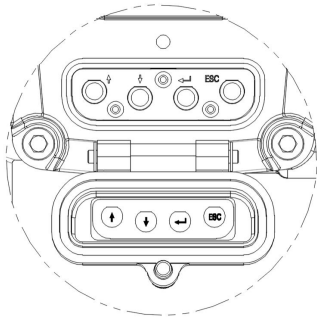
7. Auto Calibration & PCB Operation

7-1 Warning

Warning

- ▶ Before working auto calibration, make sure that they should have not influence on overall processes after separating valve and actuator from system completely.

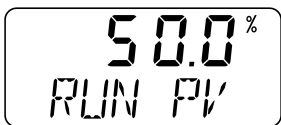
7-2 Button Description



- ↑ ↓ (UP&DOWN) : Movement to another menu or changing a parameter values in menu.
- ← (ENTER) : Enter into main menu or sub menu or designated parameter value.
- ESC (ESC) : Return from the current menu to higher one step menu.

7-3 Run Mode (RUN)

After connecting power to the positioner, run mode shall be appeared on positioner's LCD screen in after 10 seconds as described picture.



" RUN PV "stands for the current position of positioner. 50.0% indicates that the valve opening is 50 %.

There are six types of display message in " RUN " Mode.

1. RUNPV (%) : Process Value - Valve stroke, (%)
2. RUNSV (%) : Set Valve - Input signal, 0-100%
3. RUN SV (mA) : Set Valve - Input signal, 4-20mA DC
4. RUN VEL : Velocity - Current vale stem's velocity
5. RUN ERR : Error - Difference between SV and PV
6. RUN SV (mA) : Set Valve - Input signal, 4-20mA DC

7-4 Auto Calibration Mode (AUTO CAL)

When using AUTO CAL function, control position and function necessary to adjustment can be set automatically. 5-10 minutes are required and according to driving size, the requiring time can be increased or decreased.

	Zero Point	End Point	P,I,D	RA / DA	BIAS	V_O
AUTO PV	○	○	X	X	X	X
AUTO ALL	○	○	○	○	○	○

After setting Initially, execute ALL.

7-4-1 Auto PV Calibration (AUTO PV)

AUTO PV re-set Zero Point (0%) and End point (100%) only.

--> Execute AUTO CAL without changing existing parameter.

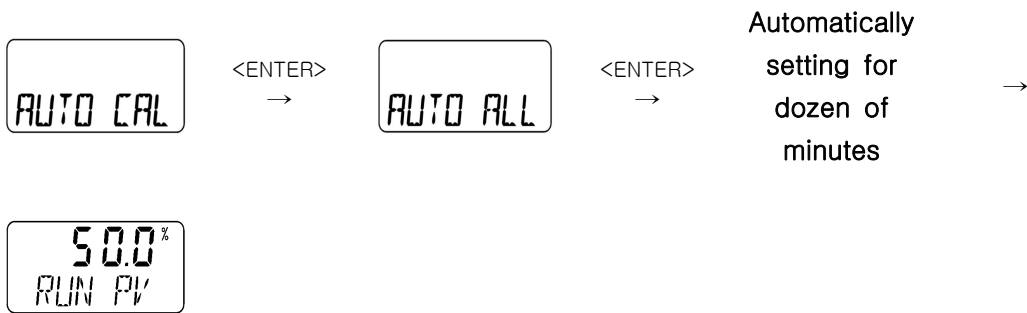
It is used when the positioner installation location is slightly required to modify.



Automatical
setting for
dozen
seconds

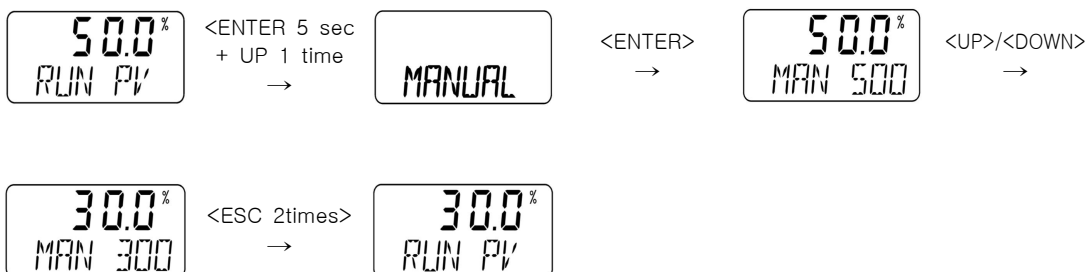


AUTO ALL : Set all parameter values suitable to Zero Point, End point,
and parameter value suitable to driving facility.



7-5 Manual Mode (MANUAL)

In case that signal (4-20mA DC) does not supply to positioner, actuator can be moved up and down voluntary by pressing <DOWN > or <UP> button in manual mode.



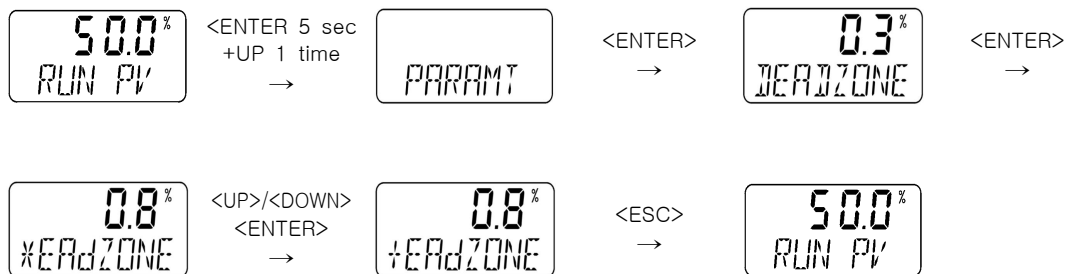
7-6 Parameter Mode (PARAMETER)

AUTO CAL optimizes most of the actuator control values. However in case of special setting, only AUTO Calibration may be difficult to optimize setting. if parameter set value shall be increased or decreased, it will be proper operation condition in current status.

7-6-1 Dead-Zone Mode (DEADZONE)

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

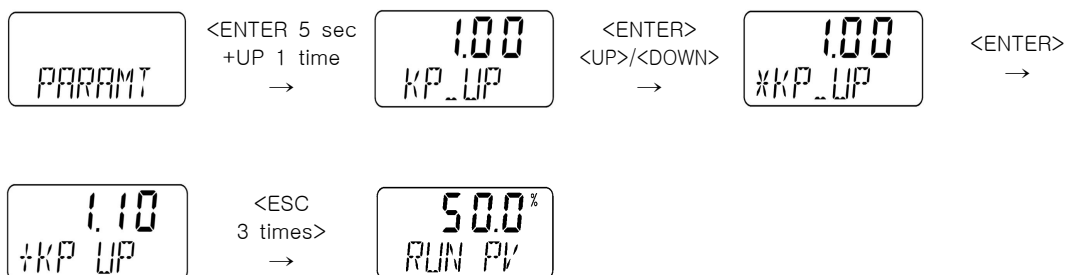
EX) If dead-zone setting is 0.5% or operation direction or position difference value is less than 0.5%, you may neglect .



※ If desirable value is between 0-20%,the default is set to 0.1%.

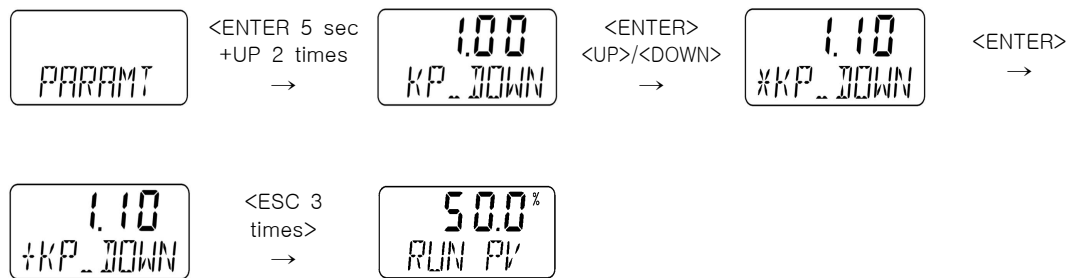
7-6-2 KP_UP Mode (KP_UP)

If increasing 0% ->100%, the operation velocity is adjusted to the target position. It is normally used when velocity is too far fast due to small actuator or when load friction shows down the rising velocity .



7-6-3 KP_DOWN Mode (KP_DOWN)

If increasing 100% ->0%, the operation velocity is adjusted to the target position. It is normally used when velocity is too far fast due to small actuator or when load friction shows down the lowering velocity .

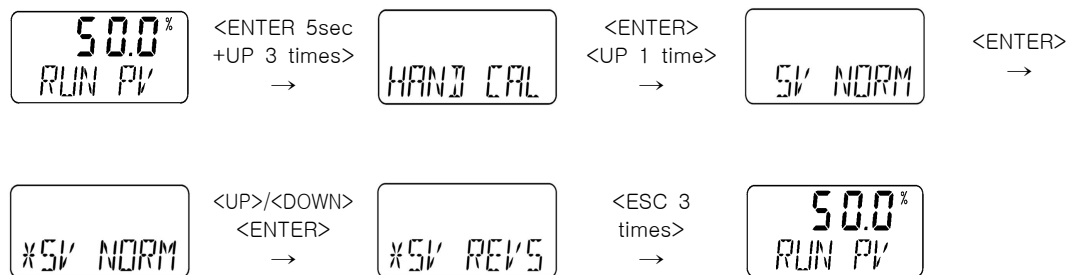


7-7 Hand Calibration Mode (HAND CALL)

HAND CAL mode is used to require on automatic set position or parameter value change after executing AUTO CAL mode. And also it is used when requiring to change into Zero point and End point.

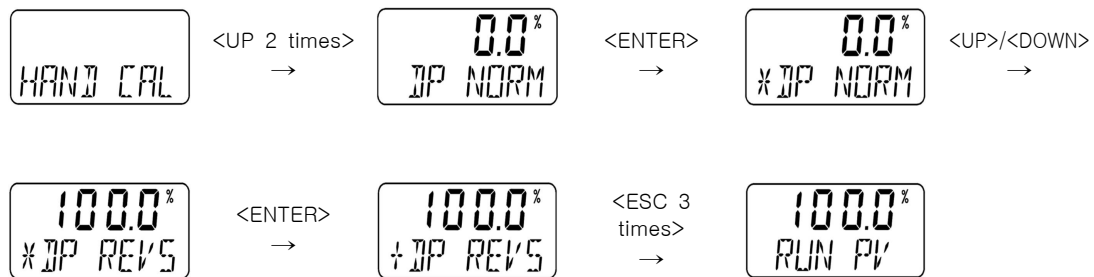
7-7-1 SV NORM

Positioner's SV values can be same or reverse output with the actual open. EX) if NORM input 4mA =0% open, If REV input 4mA =100% open.



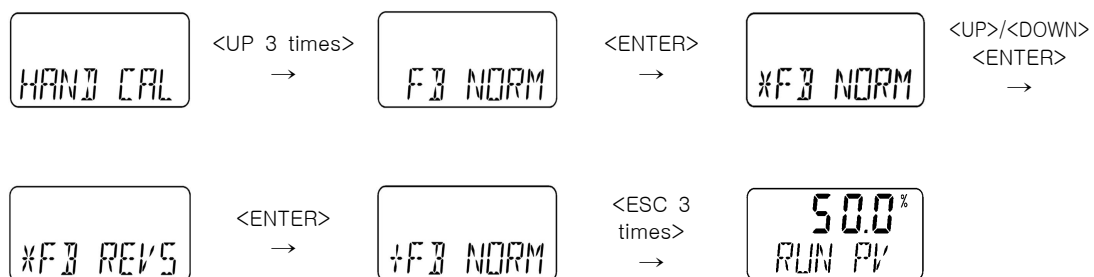
7-7-2 DP NORM

Positioner's PV values can be same or reversely output with the actual stroke.
 EX) NORM Mode current 0% shall be converted into 100% in case of REV.



7-7-3 FB NORM

FB NORM is mode to revise zero point and end point of positioner feedback value.
 EX) In case of NORM stroke 0% =4mA, if REV stroke 0% shall be converted into 20mA.



7-8 Valve Mode (VALVE)

VALVE Mode is various setting mode which can be useful to control valve operation.

7-8-1 Acting Adjustment (ACT DA / RA)

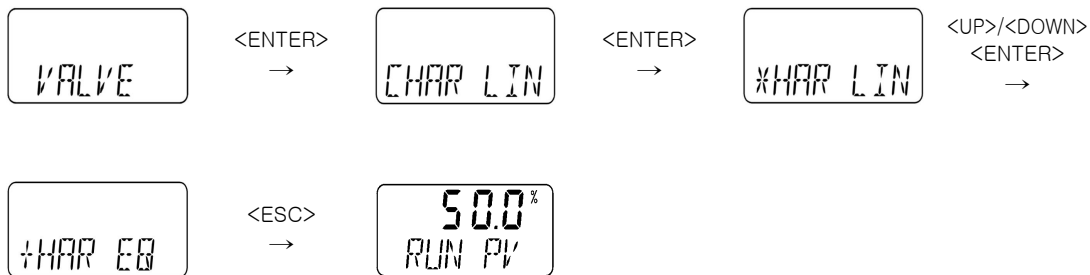
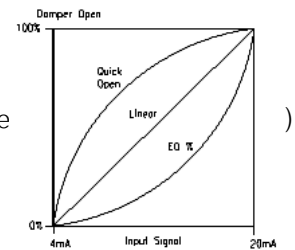
If executing auto calibration, valve operation direction can be set in Direct Action (DA) automatically. But if user wants to change Direct Action (DA) or Reverse Action (RA), it can be converted when using this function.



※ This work must be done after shut down air or 50% position condition.
In this time ,actuator shall be operated reversely .

7-8-2 Valve Flow characteristics Adjustment (CHAR LN)

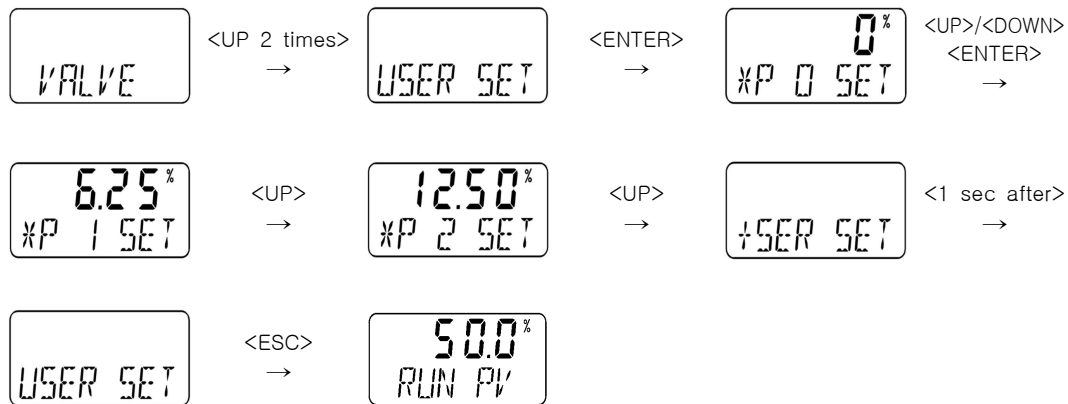
Valve flow characteristics adjustment can be changed.
Linear (LN) is default set but it can be changed to US
(User's setting), QO (Quick Open) or EQ (Equal Percentage



※ EX) Above procedure indicate a change from LINEAR to EQUAL PERCENTAGE.

7-8-3 User Defining Flow characteristics Adjustment (USER SET)

User can make user's defining flow characteristics curve. Total 18 point can be defined. Initially it is set to have PO (4mA) as valve stroke is 0%.P1 (5mA) as 6.25%..P16(20mA) as 100%. P17 (21mA) is standard setting point as 106.25%, this can be modified into another value %. All 16 points can be modified and they can be modified partially and to stop after saving a part of this point range, use < ESC > button.

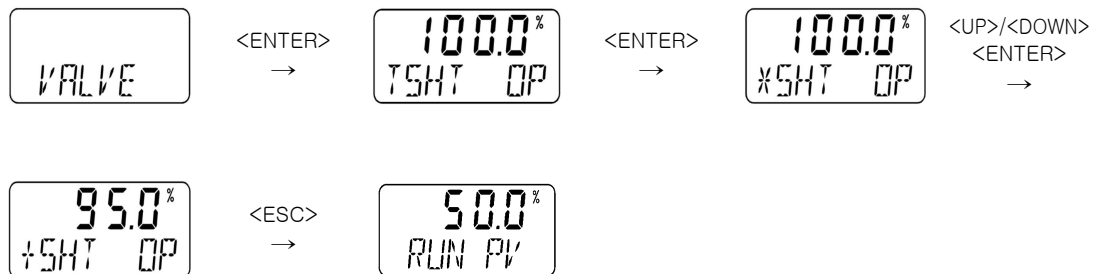


7-8-4 Tight Shut Open (TSHT OP)

Tight Shut Open mode indicates the setting point as %.

The Driving position shall be returned into 100% position if setting % value is input over setting value.

EX) If 95% value is set, every command higher than 95% will move into 100% position.



7-8-5 Tight Shut Close (TSHT CL)

Tight Shut Close mode indicates the setting point as %.

Tight Shut Open Value set 100% basically. When user change opening value, the driving position shall be returned into 0% position if setting % value is input below setting value.

EX) If 5% value is set, every command lower than 5% will move into 0% position.

Indication	Description
SP-760	Positioner model
SP-4MIS V1.1	Current positioner version.
4.18 0Y Od	It is total consumption time of products. But if power supply connection consumption time is below 1 minutes, it is not total calculated. 1st row : "3.11" --> Indicates 3 h 11 m. 2nd row : Oy od -->Indicates year(s) and day(s).
3.12 FULL OP	It is automatic saving value after executing auto calibration and it indicates total consumption time which valve takes from opening time to closing time.
2.97 FULL CL	It is automatic saving value after executing auto calibration. and it indicates total consumption time which valve takes from closing time to opening time.
ERROR	Indicates error and warning code occurred. Please refer to 14.1 or 14.2.
TEMP	Current temperature (°C)
W LOCK / W UNLOCK	It can be changed every parameter value including auto calibration function (W UNLOCK), or choose to lock (W LOCK) without amending. * It can be changed after putting < ENTER >.

8. Error and Warning Code

While using products, if there is any problems, Error Code can re-checked in LCD monitor directly and warning mode can be checked in VIEW mode.

8-1 Error Code

Error Code	Error contents and cause	Action
AIR CHK ERROR_01	Indicates that valve does not move even in FULL OPEN signal of the positioner in auto calibration mode. In Error happening , auto calibration will be stop and displays in Error code in LCD monitor use ESC button to release and take action steps.	Check that positioner's supplying air pressure is normal or not and take action whether they may be supplied normally or not.
AIR CHK ERROR_02	Indicates that the positioner's angle is small (AD value: below 500). In the error code case, Auto Calibration stops and the code is displayed on LCD, use ESC button when requiring release and take action steps.	Re-install the positioner's angle into normal degrees and execute AUTO PV.

<p>AIR CHK ERROR_03</p>	<p>Indicate that PV is set 100 and lower. In the error happening case, Auto Calibration stops and the code is displayed on LCD. To release, use ESC button and follow the action steps.</p>	<p>Re-install to maintain the positioner lever from 50% to horizontal and execute AUTO PV.</p>
<p>AIR CHK ERROR_04</p>	<p>Indicate that PV is set 400 and higher. In the error happening case, Auto Calibration stops and the code is displayed on LCD. To release, use ESC button and follow the action steps.</p>	

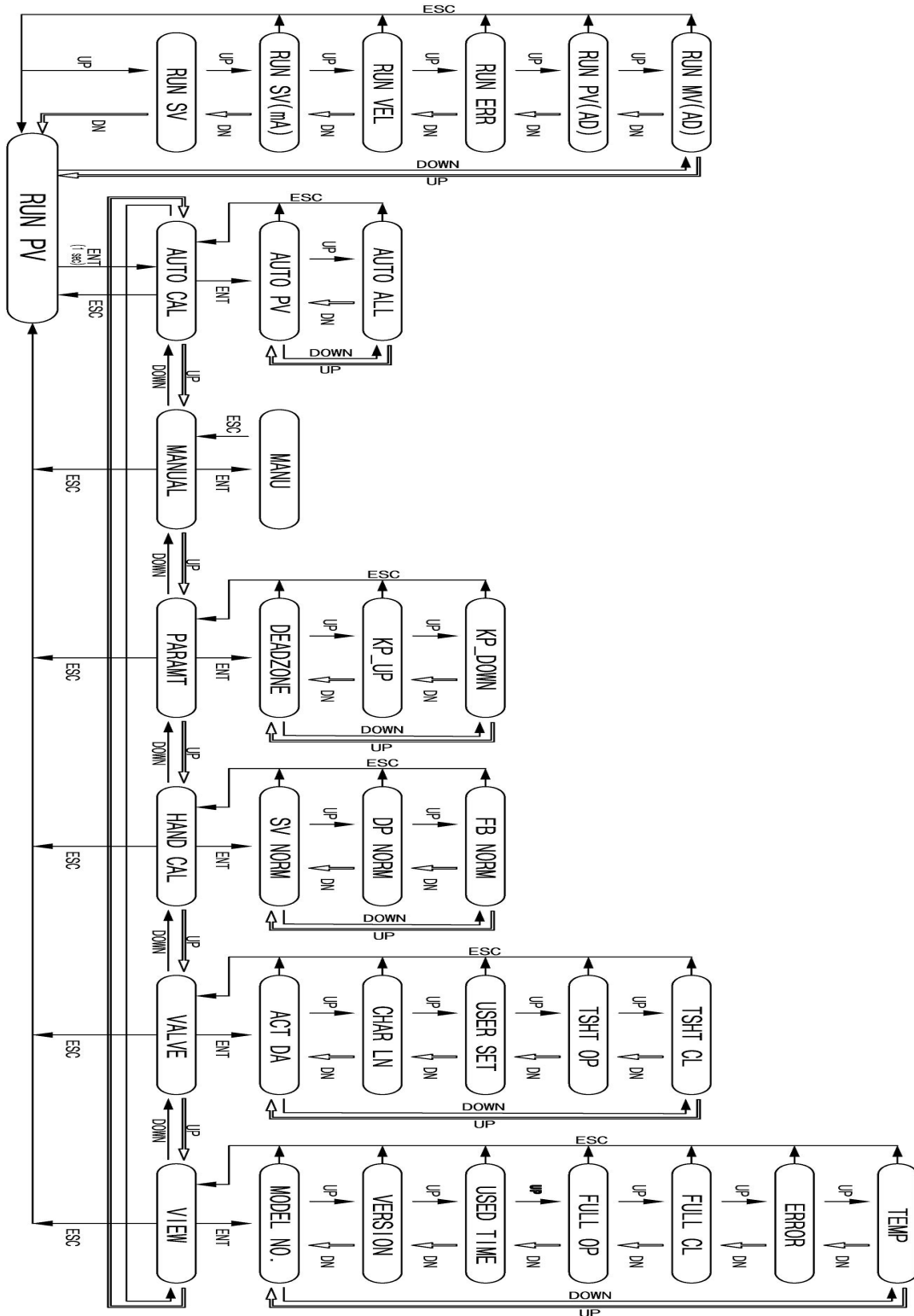
* An error code is immediately displayed on LCD and after releasing with ESC key the action should be taken as above table .

8-2 Warning Code

Warning Code	Warning contents and cause	Action
<p>ERROR_05</p>	<ul style="list-style-type: none"> ▶ Indicates that FULL OPEN / FULL CLOSE time is shorter than 0.8 second. ▶ Indicates that actuator size is small. 	<ul style="list-style-type: none"> ▶ Reduce a discharge air pressure through the orifice ▶ Replace with large actuator size.
<p>ERROR_06</p>	<ul style="list-style-type: none"> ▶ Indicates that SV and PV tolerance is over 5% and it continues over 3 minutes. ▶ Indicates that valve friction is too large or input pressure is too low . ▶ Check in the error item of VIEW Mode . 	<ul style="list-style-type: none"> ▶ Re -execute auto calibration ▶ Re-set air regulator setting pressure to normal pressure
<p>ERROR_07</p>	<ul style="list-style-type: none"> ▶ Indicates that PV is 1% and more far from the dead-zone or does not move and the state lasts a minutes and longer, 	<ul style="list-style-type: none"> ▶ Check air pressure status.
<p>ERROR_08</p>	<ul style="list-style-type: none"> ▶ Indicates that SV signal is LOW/HIGH .LOW :300M . HIGH :4000 and more 	<ul style="list-style-type: none"> ▶ Check signal generator out put and adjust it within the normal operation range.

* Check the error item in VIEW MODE.

9. LCD OPERATION MAP



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