INSTRUCTION MANUAL

SMART POSITIONER
SP740 Series

SEG SHINHWA ENG. CO., LTD.

IECEx HART FIELD COMMUNICATIONS PROTOCOL CE INNOBIZ

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Manual ver. : BA-6-6-SP740/2024

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1. Introduction

1.1 General Information for users

In order to use our products effectively and exactly , please use this products after understanding this manual completely prior to install and operate.

- ☞ Installation , commissioning and maintenance of this products may be perforemed by trained specialist personnel who have been authorized by the site operator accordingly.
- ☞ The manual should be provided to the actual end-user.
- ☞ SP740 Series hardware and software version may be upgraded without prior notice.
- ☞ For additional information or if there occur problems that are not stimulated on this manual, Please contact to Shinhwa Eng Co., Ltd. Immediately.

1.2 Safety Requirements

This manual contains several observation in order to ensure you personal safety including prevention from your property damage.
The manual describes the cautions required to keep your safety and properties. To classify the level of severity or urgency of risk, it is divided into 3 levels like 『 Caution 』『 Warning 』『 Danger 』 for the safety, please follow the safety guide.

Caution	indicates a situation which, if not avoided, will result in trouble or low performance of the products.
Warning	indicates a situation which, if not avoided, will result in trouble or injury.
Danger	indicate a situation which, if not avoided, will result in death or serious injury.

Caution

- ☞ **Operating the product incorrectly may lower the safety.**
  The well trained person who has proper knowledge and full experience on assembling and machinery operation should handle this products.
- ☞ **Changes or modifications 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 product, check the safety such as taking safety measures and cutting off the relative eletric power and be well aware of the cautions of products.**
3. **When re-operating the machine, make sure that the necessary safety action was taken.**

- ☞ **This products's explosure is aluminum material , therefore , it can be happened from ignition danger when installing , please avoid friction and impact.**
- ☞ **Please make sure to install so that it may not to affect on outside moisture and static condition.**

1.3 Basic safety instruction for using in explosion proof area

To prevent the the risk of explosion , it is necessary to install the product according to the basic safety instruction to operate in Exi area and national or the regional explosion proof regulations and to prepare proper safety barrier when organizing the system.

⚠ Warning

- ☞ **Please observe the rule relative to safety regulation (National safety regulation) construction supervision rules and general 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 bland with approved locking screw in explosive area.**

1.4 Conditions to maintain the Intrinsic Safety (EX i)

⚠ Danger

- ☞ **In instrinsic safety current only , please connect instrinsic safety protection devices.**
- ☞ **Please observe contents which are stimulated in certificaton and electric data of technical specification .**

1.5 Certification

☞ **IECEx (International Electrotechnical Commission Explosive)**

Explosion proof structure : Intrinsic safety
Explosion proof class : Ex ia IIC T5/T6 Ga
Certificate number : IECEx KTL 19.0042X
Ambient temperature : T5 : -30℃ ~ +60℃
T6 : -30℃ ~ +40℃
Certification basis : IEC 60079-0:2017
IEC 60079-11:2011

☞ **KCs (Korea Certification for Safefy)**

Explosion proof structure : Intrinsic safety
Explosion proof class : Ex ia IIC T5/T6
Certificate number : 20-KA2BO-0479X
Ambient temperature : T5 : -30℃ ~ +60℃
T6 : -30℃ ~ +40℃
Certification basis : Republic of Korea Ministry of Employment and Labor Notice No. 2020-33

☞ **ATEX (Atmosphere Explosible_European Directive 2014/34/EU)**

Explosion proof structure : Intrinsic safety
Explosion proof class : II 1 G Ex ia IIC T5/T6 Ga
Certificate number : DEKRA 21ATEX0070 X
Ambient temperature : T5:-30 ~ 60°C(-22 ~ 140°F)
T6:-30 ~ 40°C(-22 ~ 104°F)
Certification basis : EN IEC 60079-0:2018
EN 60079-11:2012

☞ **CCC(China Compulsory Certification)**

Explosion proof structure : Intrinsic safety
Explosion proof class : Ex ia IIC T5/T6 Ga
Certificate number : 2021122307114754
Ambient temperature : T5:-30 ~ 60°C(-22 ~ 140°F)
T6:-30 ~ 40°C(-22 ~ 104°F)
Certification basis : GB/T 3836. 1-2021
GB/T 3836. 4-2021

2. Product Description

2.1 General Introduction

Smart Positioner SP740 series are I/P converter type positioner operating kinds of actuators and valves by converting 4 to 20mA DC signal to pneumatic output proportionally.
The product has acquired IECEx certificate according to "IEC60079-0:2017, IEC60079-11:2011" standard of IECEx Scheme, and also Intrinsic Safety explosion proof certification (option) applicable for explosive zone 0.
When applying for an explosive zone, every power supplying to the product should be connected through a barrier limiting the electrical specification higher than described in the above 2.8.
Besides, installation and wiring should be carried by keeping the relative manual.

2.2 Features

- ☞ It can be applied to various kind of control valve systems
- ☞ Simple and convenient operation
- ☞ Modularization of the internal parts and easy maintenance.
- ☞ Enclosure IP66
- ☞ Built-in Self diagnostic function
- ☞ Various information about positioner can be processed by HART communication.
- ☞ The function of Auto Calibration is very simple and beginer is available to use .

2.3 Options

Option function can be added by using simple module operaton only.

- ☞ Position transmitter(4~20mA DC feedback signal)
- ☞ HART communication
- ☞ Limit switch
- ☞ Intrinsic safety explosion proof

2.4 Label Description

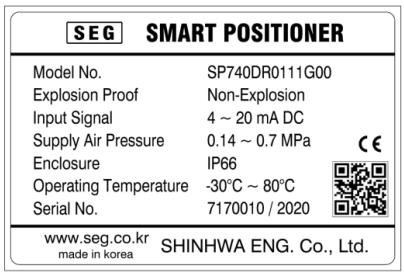


Fig.2-1-1: SP740 Non-Explosion Proof sticker label

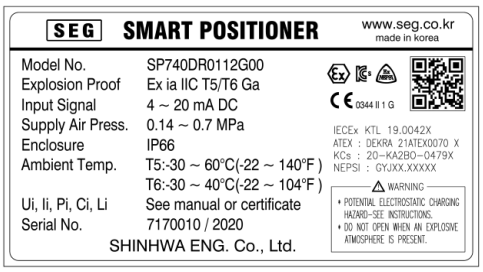


Fig. 2-2-1: SP740 IECEx Intrinsic safety explosion proof sticker label

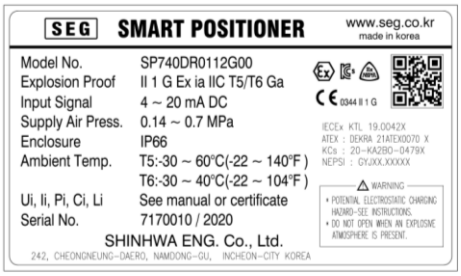


Fig. 2-2-1: SP740 ATEX Intrinsic safety explosion proof sticker label

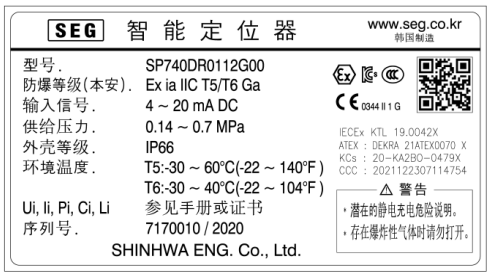


Fig. 2-2-1: SP740 CCC Intrinsic safety explosion proof sticker label

Items of label	Description
Model No.	Indicate model number according to specification inlcuding option.
Instrinsic safety / Non-explosion grade	Indicate Instrinstic Safety proof
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(IPXX) .
Ambient Temp.	Indicate ambient temperature valid in explsoinon proof certification
Ui, Ii, Pi, Ci, Li	Indicate the electrical data required to instrinc safety (Ex ia) 's wire diagram
Serial No	Indicate products serial No.

2.5 Products code

SP740 / [1] [2] [3] [4] [5] [6] [7] [8]

[1]	Acting type	S : Single D : Double
[2]	Lever Type	
	Linear	L1 : 20 ~ 80 mm L2 : 80 ~ 160 mm
	Rotary	R0 : Standard R1 : Fork lever R2 : Namur
[3]	Feedback signal	0 : None 1 : Position transmitter(4~20mA DC)
[4]	Lock condition	1 : Fail Safe * Fail Lock
[5]	Explosion proof	1 : Non explosion (IP66) 2 : Intrinsic safety (Ex ia IIC T5/T6)
[6]	Connection	G : Air - PT1/4", Conduit - G(PF)1/2" N : Air - NPT1/4", Conduit - NPT1/2"
[7]	Position L/S	0 : None 1 : 2XSPDT
[8]	HART Communication	0 : None 1 : HART

2.6 Products Specification

Model	SP740S		SP740D	
Acting Type	Single		Double	
Motion type	Linear	Rotary	Linear	Rotary
Input Signal	4 ~ 20mA DC			
Minimum Current Signal	2.8mA(Standard), 3.8mA (HART Included)			
Impedance	Max. 450Ω @ 20mA DC			
Air Connection	PT 1/4, NPT 1/4			
Pres. Gauge Connection	PT 1/8, NPT 1/8			
Conduit Entry	PF(G) 1/2(Standard), NPT1/2(Option)			
Stroke	10~150 mm	0 ~ 90˚	10~150 mm	0 ~ 90˚
Supply Pressure	0.15~0.7 Mpa (1.5~7 bar)			
Explosion Proof Grade	Ex ia IIC T5/T6 Ga			
Enclosure	IP66			
Ambient Temperature	-30 ~ 80℃			
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	1.8 LTM and lower (sup = 0.14MPa)			
LCD Operating Temp	-30 ~ 85℃ (-22 ~ 180℉)			
Cam Characteristic	Linear(L), Sqare(S), Sqare root(R), User Set (10 Point)			
Communication (Option)	HART Communication			
Feedback Signal (Option)	4~20mA (DC 12~28V)			
Material	Aluminum Diecasting			
Weight	1.8kg			
Painting	Epoxy Polyestere Powder Coating			
Color	Black			

2.7 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 poppet A(12), opening port A; OUT1 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 contraray, if input current is lower, Nozzle Flapper(9) blocks Nozzle(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 OUT2 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(240), rotating position transmitter(22) and finally delivering the resistance to control PCB(3)

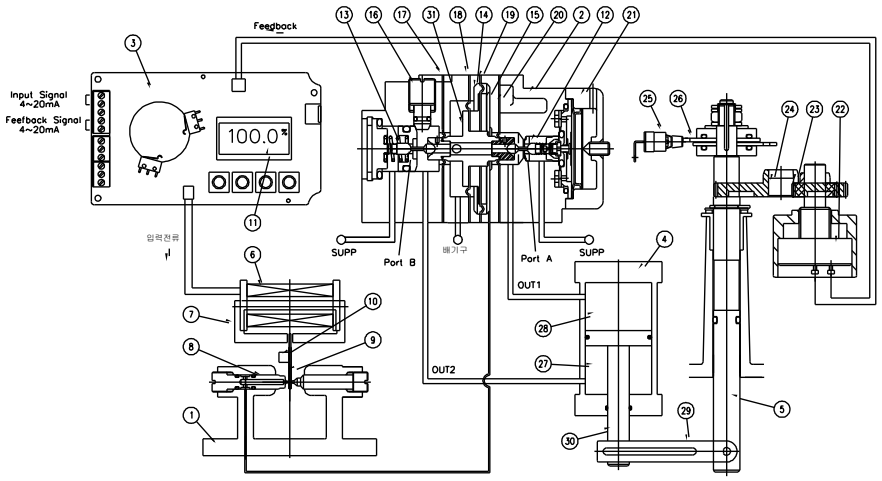


Fig : 2-3 Principle of operation

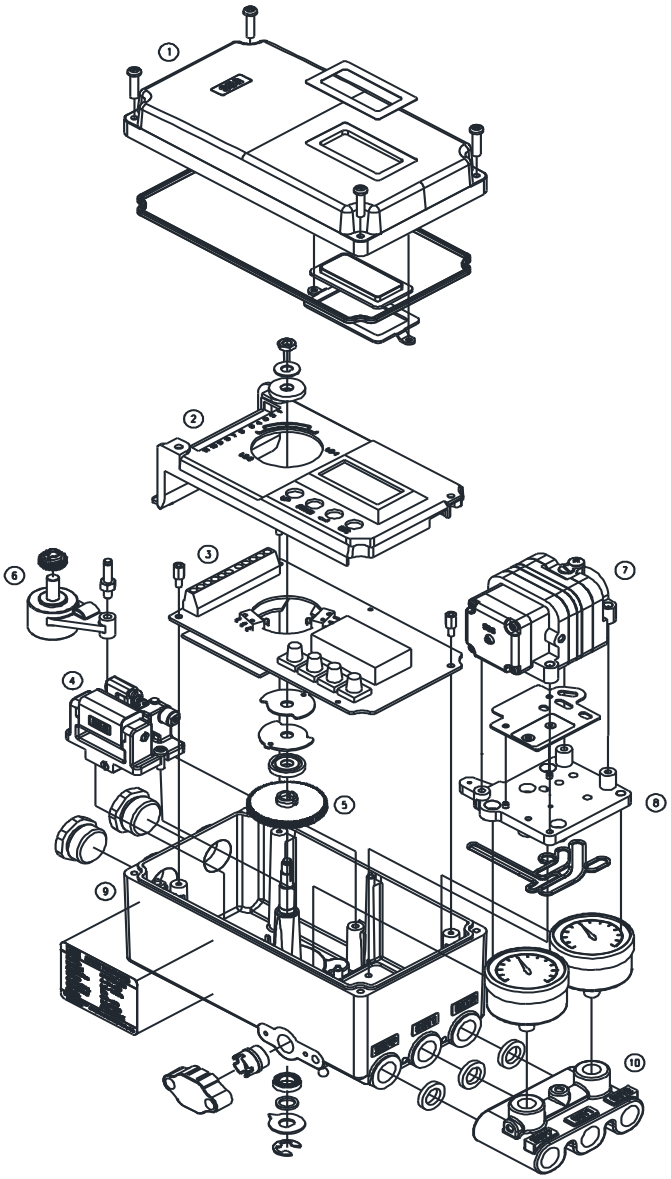
1	Torque Motor	12	Poppet A	23	Pinion
2	Pilot Valve	13	Poppet B	24	Gear
3	Control PCB	14	Pressure chamber	25	Limit S/W
4	Cylinder	15	Nozzle pressure chamber	26	Limit Cam
5	Shaft	16	Adjustment screw	27	Upper cylinder
6	Torque Coil	17	Diaphragm A	28	Lower cylinder
7	Core	18	Diaphragm B	29	Lever
8	Nozzle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

2.8 Explosion proof specifications of Intrinsic Safety

Intrinsic Safety Explosion proof regulations	IEC 60079-0:2017 IEC 60079-11:2011 Republic of Korea Ministry of Employment and Labor Notice No. 2020-33 GB/T 3836. 1-2021, GB/T 3836. 4-2021				
Intrinsic safety explosion proof class	Ex ia IIC T5/T6 Ga				
Barrier specifications	Ui	Ii	Pi	Ci	Li
Main power	28V	93mA	651mW	20nF	35uH
Feedback signal power	28V	93mA	651mW	20nF	35uH
Limit switch (Dry contact type)	28V	93mA	651mW	0nF	0uH

Note : For more details , please note relative certificate

2.9 Structure



SP740 Series Schematic View

①COVER	⑥Potention meter
② PCB Cover	⑦Pilot
③Control PCB	⑧Pilot Valve
④Torque Motor	⑨Base Body
⑤ Main Shaft	⑩Cage Block

Fig 2-4 Schematic View

2.10 Products Dimension

2.10.1 SP740 Standard Type

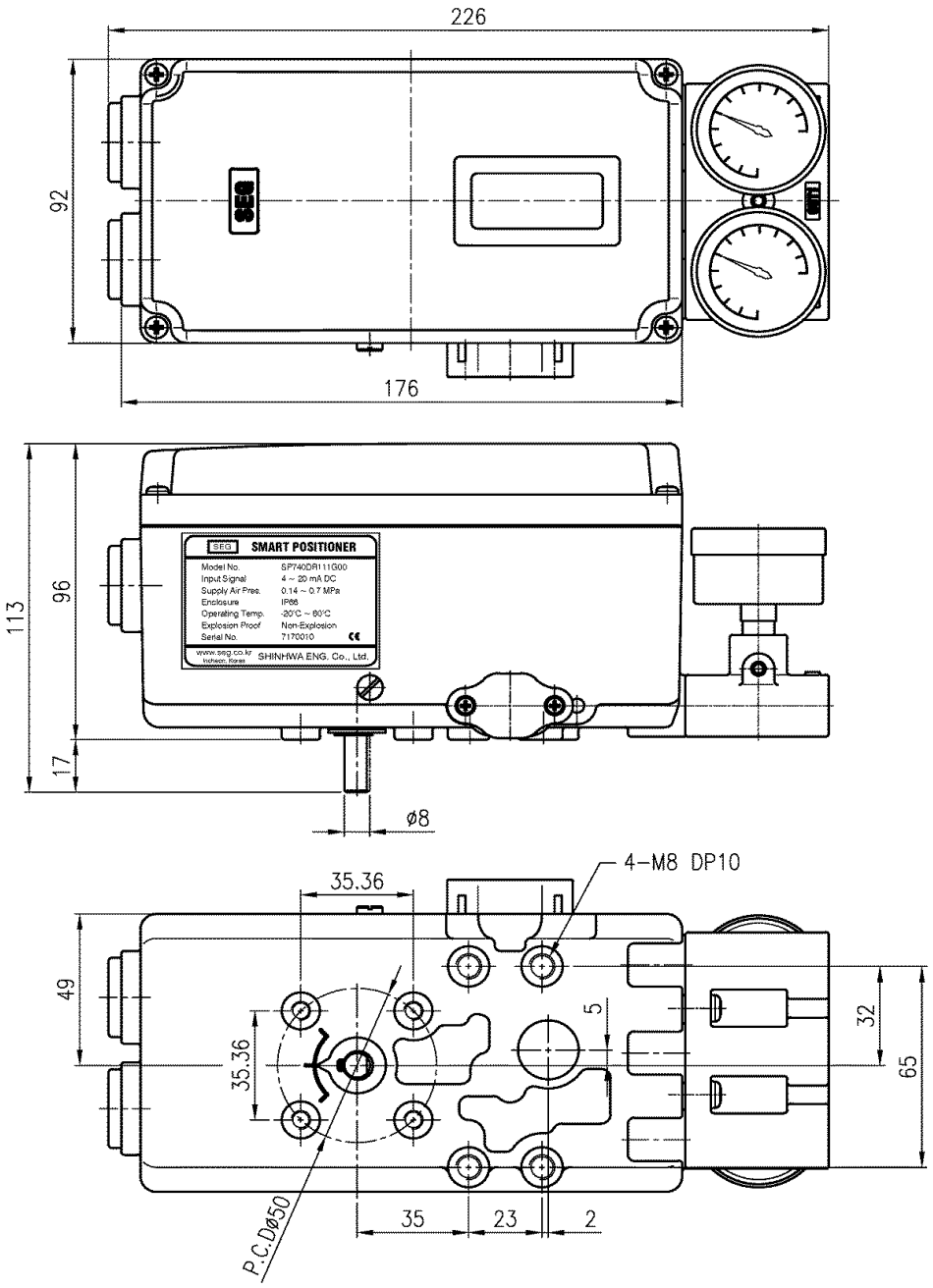


Fig 2-5 : SP740 Standard Type

2.10.2 SP740 Lever Type

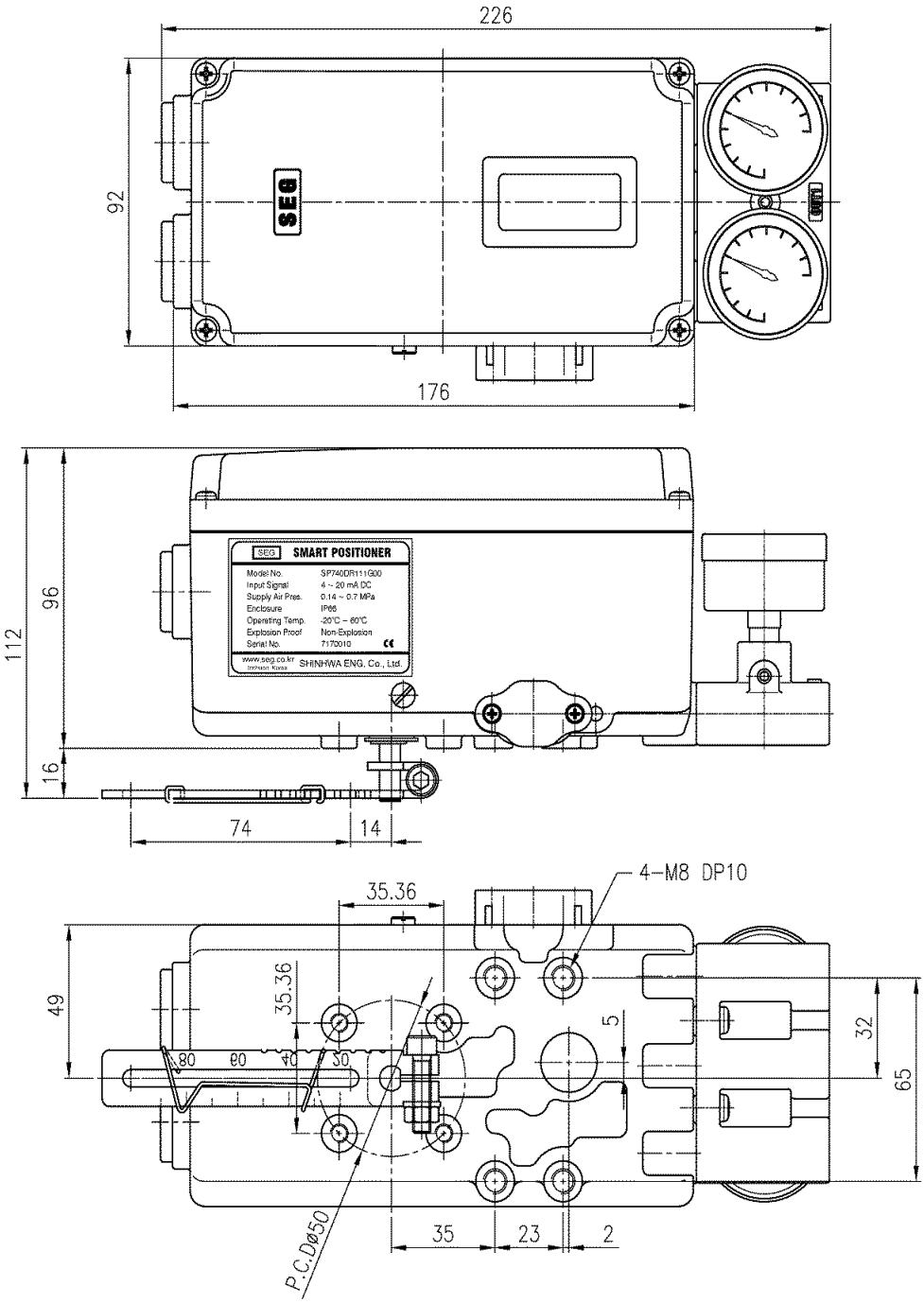


Fig 2-6 : SP740 Lever Type

2.10.3 SP740 Fork Lever Type

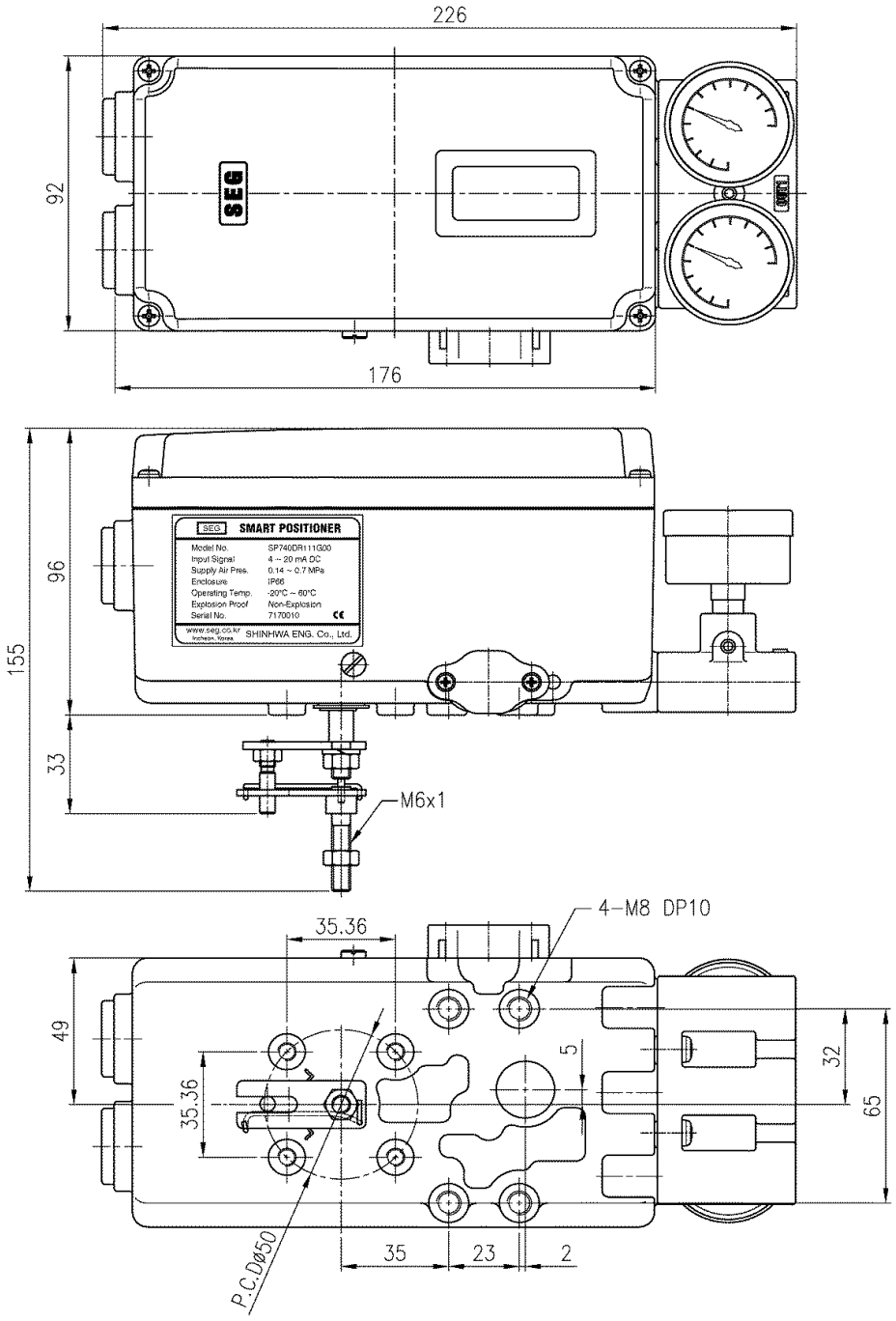


Fig 2-7 : SP740 Fork Lever Type

2.10.4 SP740 Namur Type

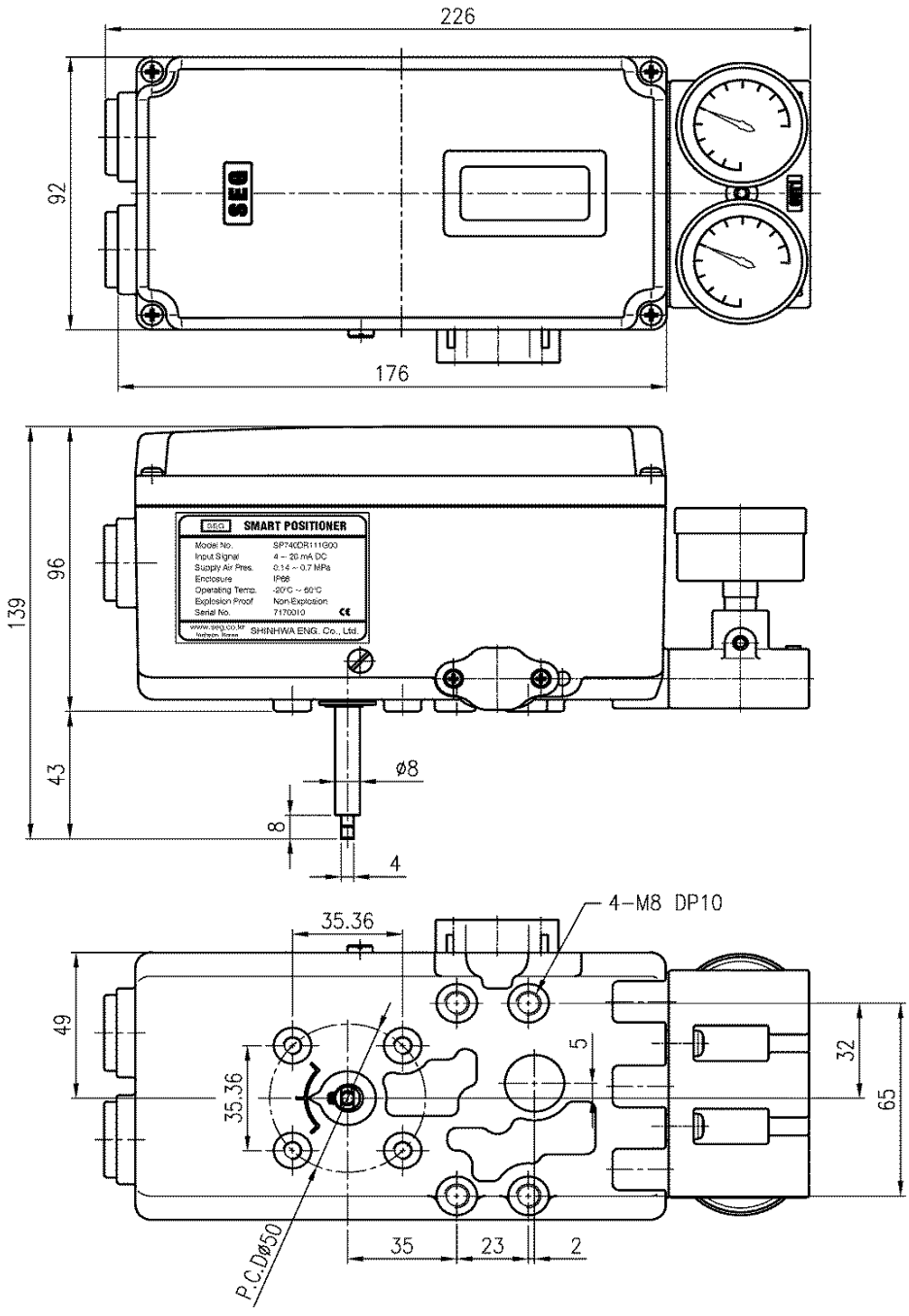


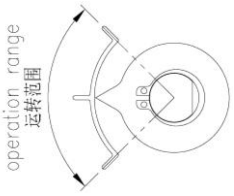
Fig 2-8 : SP740 Namur Type

3. Installation

3.1 Caution before Installation

Warning

- ☞ **Maintain proper air pressure and prevent to insert alien substrance and install filter regulator in Positioner inside air supply line .**
- ☞ **Air should be supplied free from oil, moisture and impurities.**
- ☞ **When installing the positioner, make sure to block input signal and air pressure so that it can be properly operated.**
- ☞ **Unless it is properly installed, SP740 control condition may be degraded.**
- ☞ **When installing the positioner, the direction of the instructions on the bottom of the positioner must indicate the operating range.**



3.2 Tools for installation

- ☞ Hex wrench set
- ☞ (+) & (-) Screw drivers
- ☞ Spanners for hexagonal-head bolts

3.3 Linear positioner Installation

3.3.1 Caution on Installation

* When fabricating bracket and connecting lever to actuator , the followings 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 valve opening is 50%, feedback lever should be horizontal.**
- ☞ **When valve opening is 50% , the stem connection pin should be located at the numeiric position makered on the feedback lever that is corresponding to the valve stroke.**

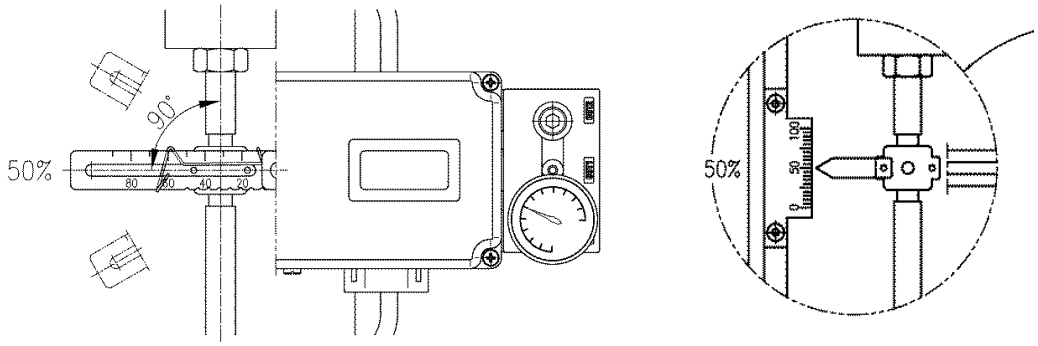
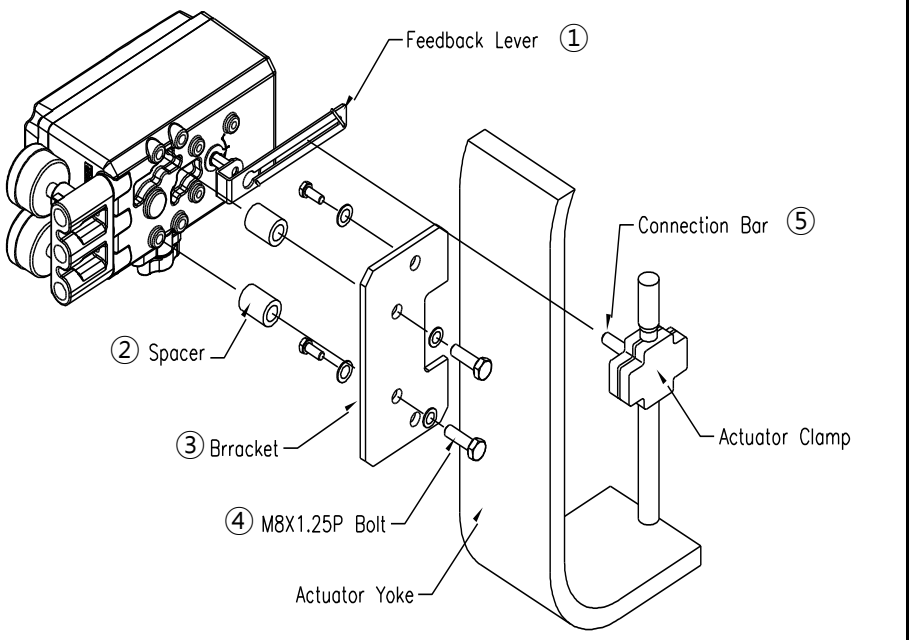


Fig3-1 : Lever installed with vertically when vale stroke is 50%

3.3.2 Standard Lever Type Positioner installation steps



① Feedback lever

② Spacer

③ Bracket

④ Bolt(M8)

⑤ Connection bar

Figure 3-2: SP740 Standard lever type

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 overal stroke.

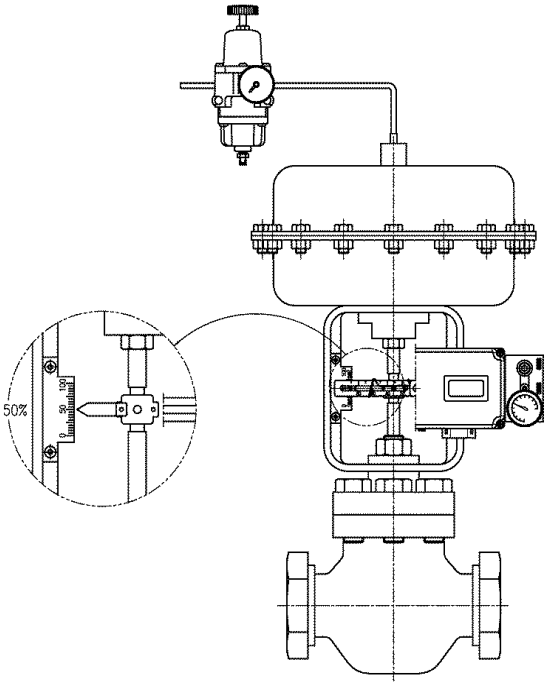


Figure 3-3 : SP740 (standard lever type)

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

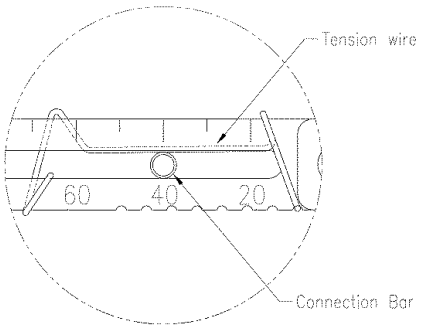
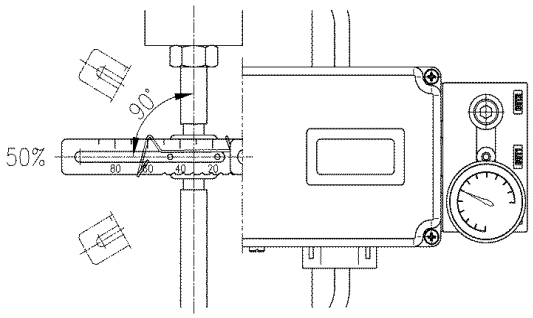


Figure 3-4 : Insert connection bar between lever and lever spring correctly.

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



ⓐ Check a 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.

Stroke : 60mm

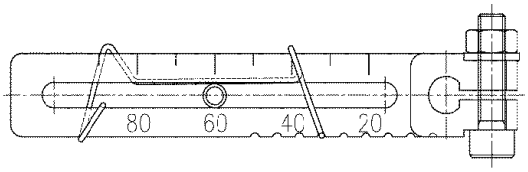


Fig3-5 Connection bar position when valve stroke is 60mm

3.4 Rotary positioner Installation

Rotary positioner is used for 90˚ rotating valve.
There are fork lever type and namur type

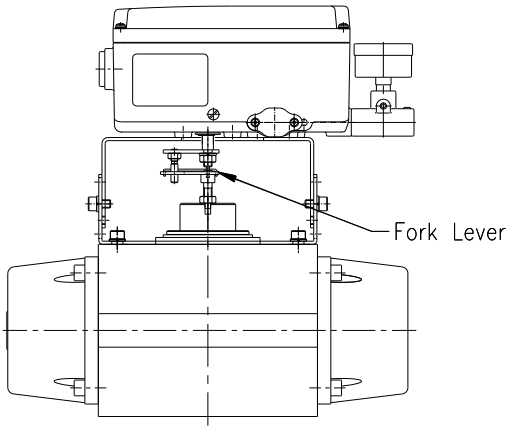


Fig3-6 : SP740 Fork lever type

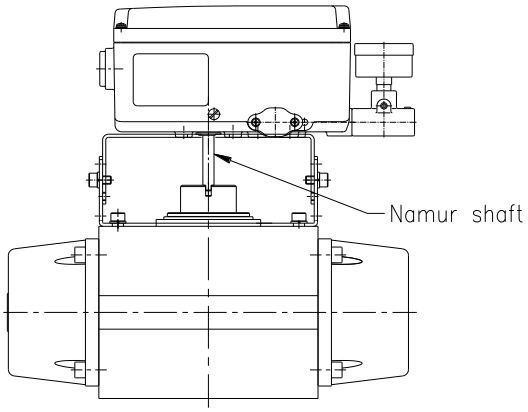


Fig 3-7 : SP740 Namur type

3.4.1 Bracket Set for Rotary Positioner Installation

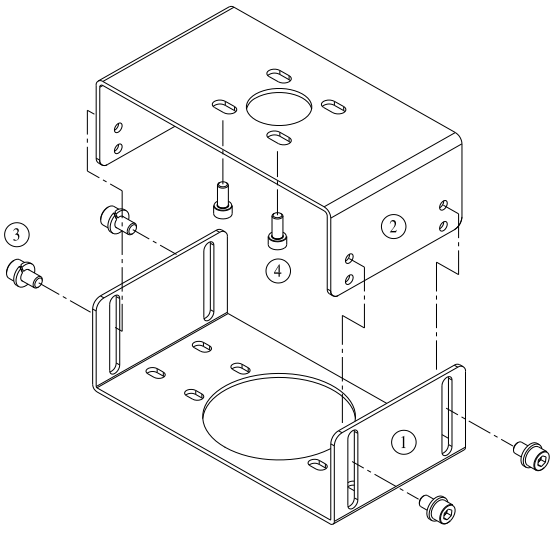


Fig 3-8 Bracket set for rotary positioner installation

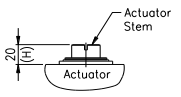
① Lower bracket (1 pcs)

② Upper bracket (1 pcs)

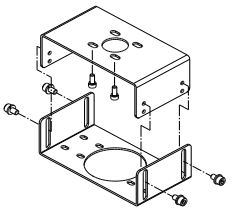
③ Bolts for upper/lower brackets(M6)
(wrench bolts,S/W,P/W each 4 pcs)

④ Positioner bolts(M6)
(wrench bolts,S/W,P/W each 4 pcs)

3.4.2 Rotary Positioner Installation Step



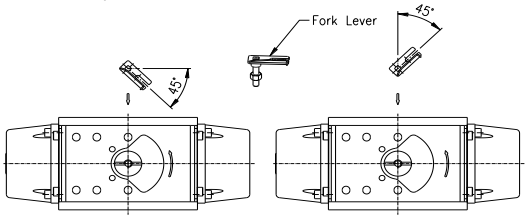
Actuator



Lower/upper bracket

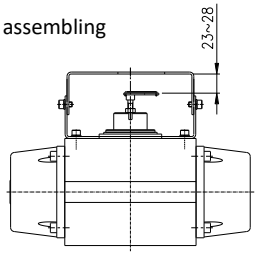
① Connect upper/lower bracket assemblies onto an actutor with bolts. Note the positioner manufacturer does not supply bolts to fix an actuator.

Clockwise / counterclockwise

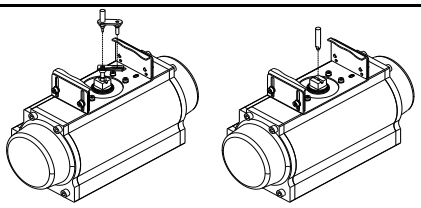


② With an actuator's initial start point of 0%, install the fork lever as seen in figure according to the rotation direction of stem.
Make sure the installation degrees of fork lever Should be 45 degrees from the horizontal line.

Fork lever assembling

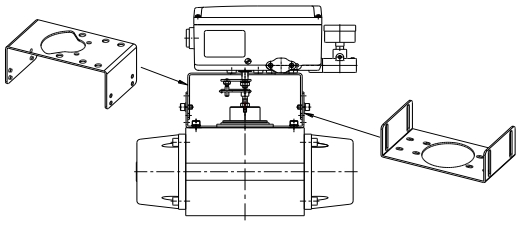


③ If fork lever position is setting , tighten the nuts, which is assembled with the lower part of fork lever, to an actuator stem firmly. At the moment, fork lever upper side and the upper bracket's distance should be 19 to 25 mm each other.



FORK LEVER TYPE NAMUR TYPE

④ Attach the positioner onto upper bracket and fix it with bolts.
At the moment, insert the pin on the lower part of the fork lever into the hole of fork lever so to be centered.
When tightening bolts, do not tighten ane bolt firmly and instead and after loosing 4 pcs of bolt slightly and after checking positioner's connection, connect bracket completely.



※Namur type installation is very simple because there is sufficient length and end of shaft is machined so that it may be insert into actuator stem pin directly.

4. Connection - Air

4.1 Supply Pressure Conditions

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 spring operation pressure.**

4.2 Connection - Piping with actuator

4.2.1 Single acting actuator

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

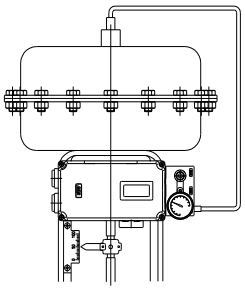


Fig: 4-1 Single acting linear actuator

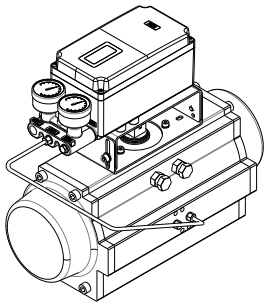


Fig:4-2 Single acting rotary actuator

4.2.2 Double acting Actuator

Double acting positioner uses both OUT1 and OUT2 ports.
If electric input siginal shall be increased , air pressure is suppliedd from OUT1 port .
so after checking this point, please note tha when installing pipe.

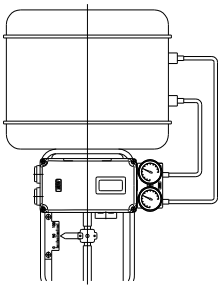


Fig: 4-3 Single acting rotary actuator

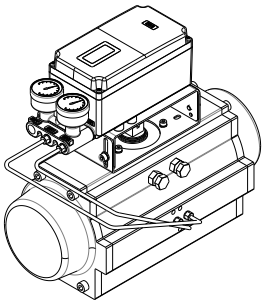


Fig 4-4 Double acting rotary actuator

5. Connection - Power

5.1 Safety

Warning

- ☞ **Please check whether power is disconnected before connecting terminals.**
- ☞ **Supply the lower than described currenct and votlage**
- ☞ **Do not install cable on near equipments incurred by noise such as high capacity transformer or motor.**

5.2 Terminal Connection

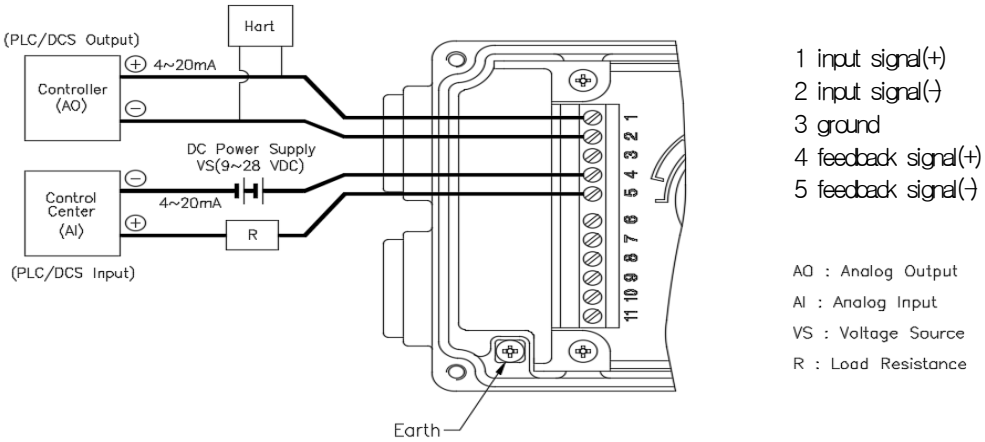


Fig 5-1 : Terminal Connection

5.3 Limit Switch Terminal

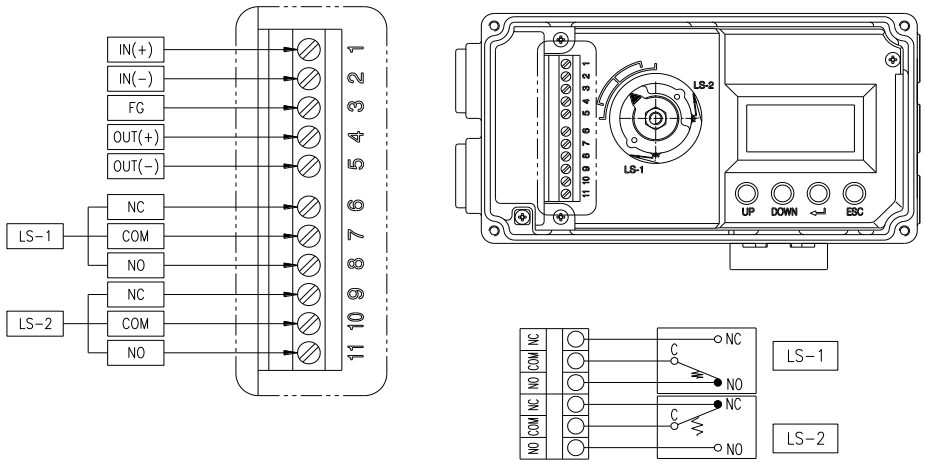


Fig 5-2 : Limit Switch Terminal

5.4 Instrinsic safety's parts terminal Connection

- ☞ Make sure to separate the circuit of intrinsic safety device from general circuit .
- ☞ Maintain the electrical parameters(U, I, P) lower than values indicated on the Ex certificate using IS barriers.
- ☞ Ground it properly in installation place and maintain the ground resistance as equal as the product and barrier.

Standard P.C.B Board or
Standard P.C.B Board +
Hart

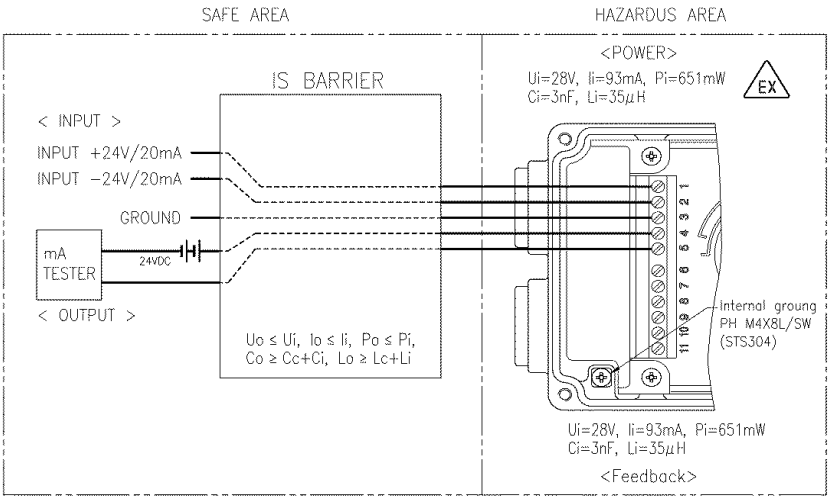


Fig 5-3 : Instrinsic safety parts terminal connection

+ Limit Switch Type

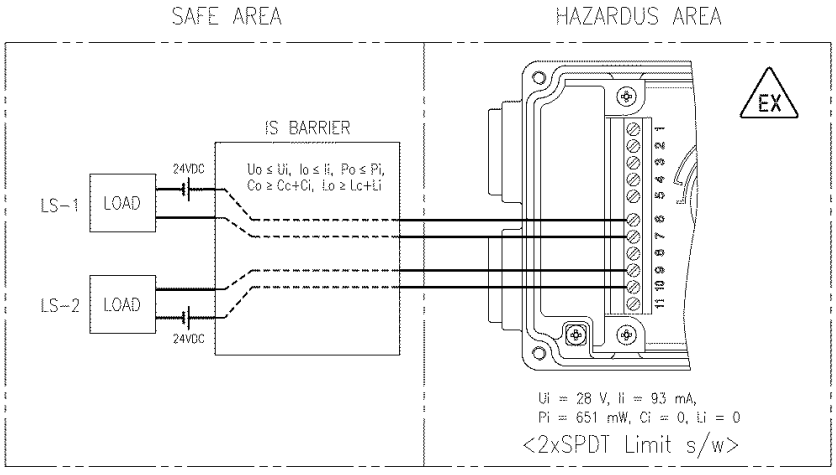


Fig 5-4 : Limit Switch terminal connection. (normal close)

5.5 Ground

- ☞ Ground must be done for positioner and system safety.
- ☞ The ground terminal has each 1ea /positioner internal and 1 ea / positioner external.
  They are assemblyed by M4 round head +bolt.
  Terminal type is " O " type and prevent to fall but the resistance should be lower than 100Ω.

6. Adjustments

6.1 Limit Switch Adjustment

To adjust the operation location of a limit switch, looseen the CAM fixed screw, rotate it to a desirable position and tighten it again.

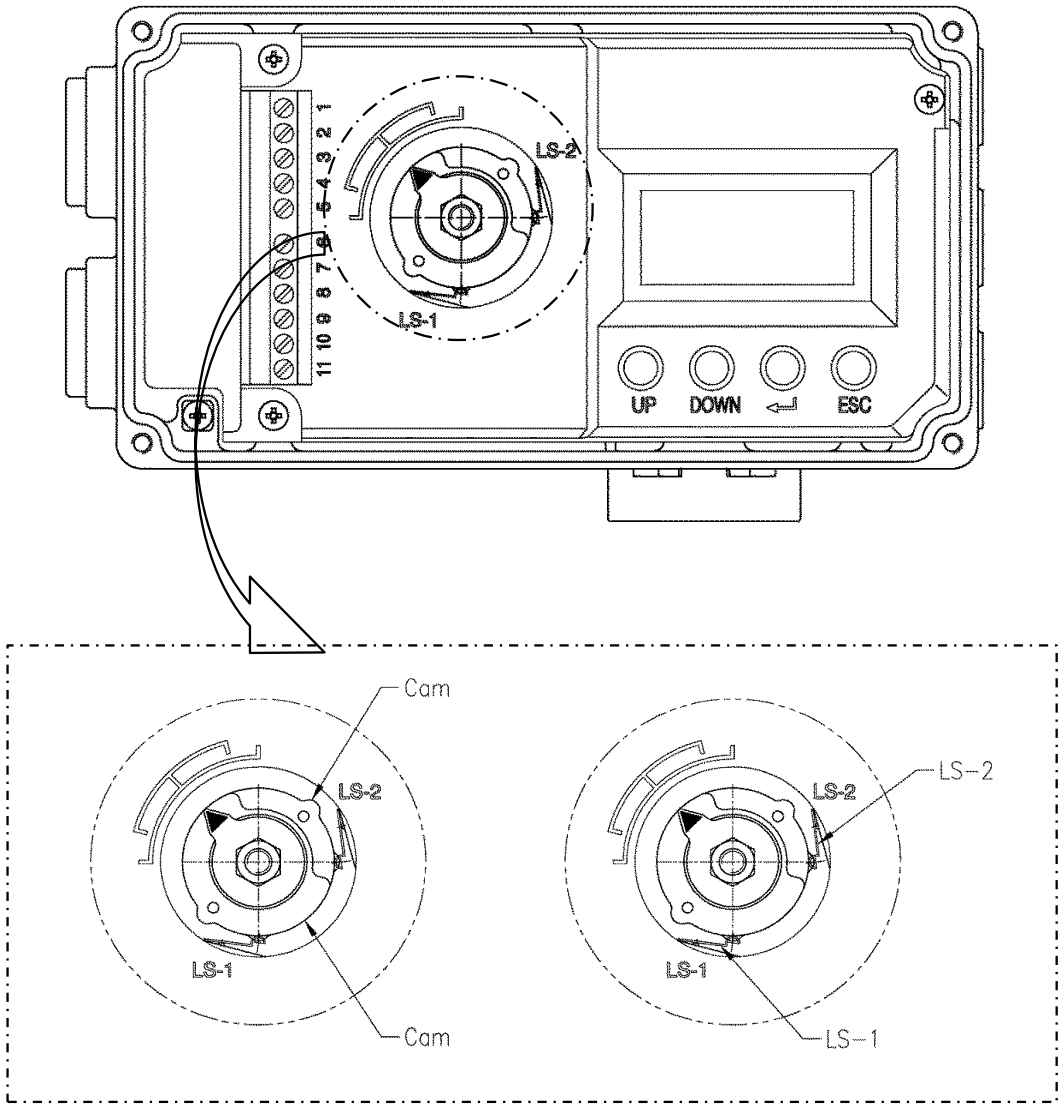


Fig : 6-1 Adjusting the operation location of a mechanical limit switch

7. PCB board Type - Option

Position transmitter(PTM) and HART communication can be easily mounted
There are four type PCB as followings.

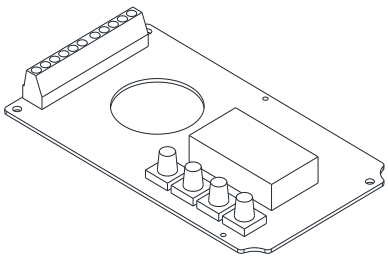


Fig 7-1 : Standard PCB board

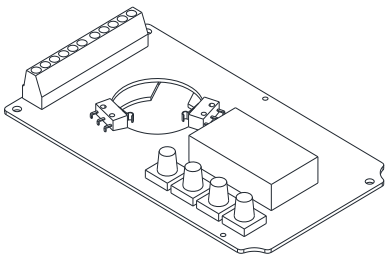


Fig 7-2 : Standard PCB board + limit switch type

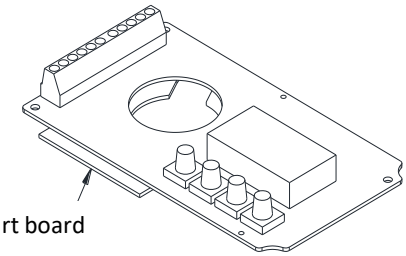


Fig 7-3 : <Standard PCB board + Hart PCB board type>

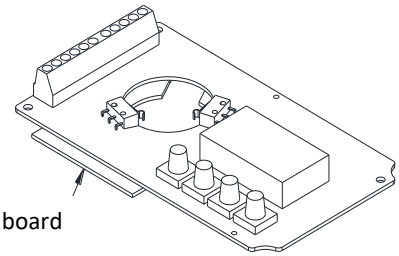


Fig 7-4 <Standard PCB board + limit switch + Hart PCB board type>

Types of PCB (Option)

8. Auto Calibration & PCB Operation

8.1 Warning

Warning

Before working auto calibration , make sure that they have not influence on overal process after saparating valve and actuator in system completely.

8.2 Button Description

The positioner has four(4) buttons.

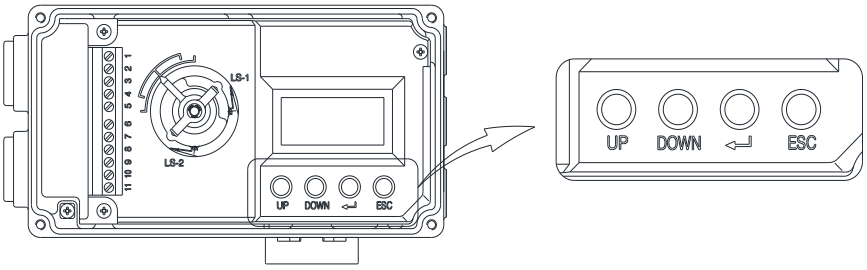


Fig 8-1 Button

<UP> & <DOWN> : Movement to another menu or changing a parameter value in a menu
<ENTER> : Enter into main menu or sub menu, or designated parameter value
<ESC> : Return from the current menu to a higher one step menu

8.3 Run Mode(RUN)

After connecting power to the positioner, run mode shall be appeared on positioner's LCD monitor after 10 seconds as described picture. " RUN PV " stands for the current position of positioner.
"50.0%" indicates the valve opening is 50%.

In "RUN" mode, 6 kinds can be indicated as follows.

1. RUN PV (%) : Process Value - valve stroke. %
2. RUN SV (%) : Set Valve - input signal, 0~100%
3. RUN SV (mA) : Set Valve - input signal, 4~20mA DC
4. RUN VEL : Velocity - current valve stem's velocity.
5. RUN ERR : Error - difference between SV and PV
6. RUN PV : Current Position's digital value
7. RUN MV : Torque Motor's digital control value

8.4 Auto Calibration Mode (AUTO CAL)

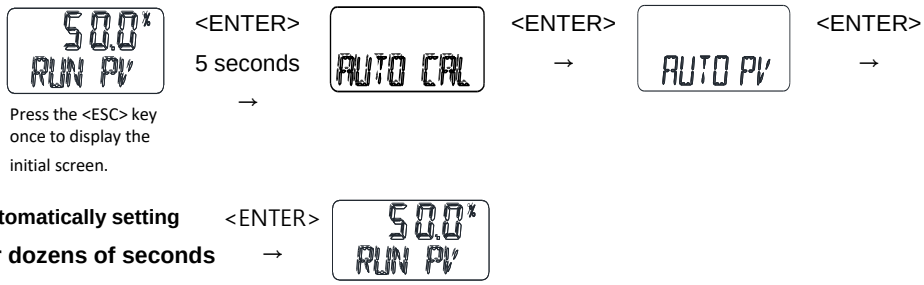
When using AUTO CAL function , control position and function necessary to adjustment can be set automatically. 5-10 minutes are required and according to driving size, the requiring time can increased or decreased.

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

Enter the input current signal 12 mA and execute ALL after initial installation.

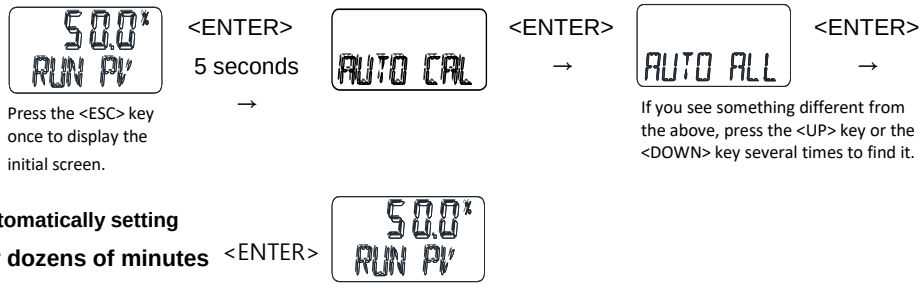
8.4.1 Auto PV Calibaration (AUTO PV)

AUTO PV re-set Zero Point (0%) and End Point (100%) only.
→ Execute AUTO CAL without existing parmeter changed.
It is used when the positioner's installation location is slightely changed.



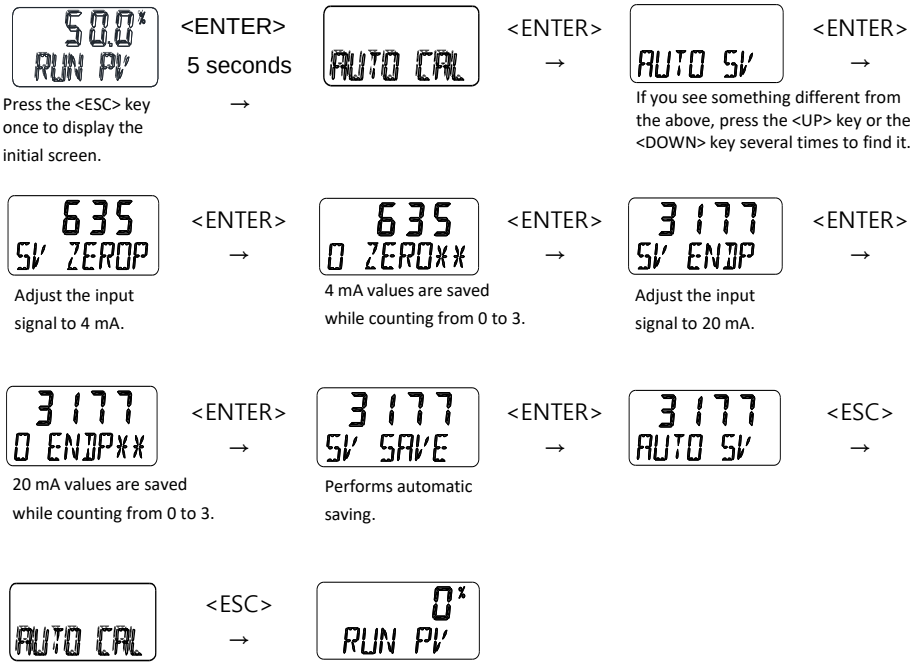
8.4.2 AUTO ALL

Set all parameter values suitable to Zero Point, End Point, and parameter value suitable to driving facility.



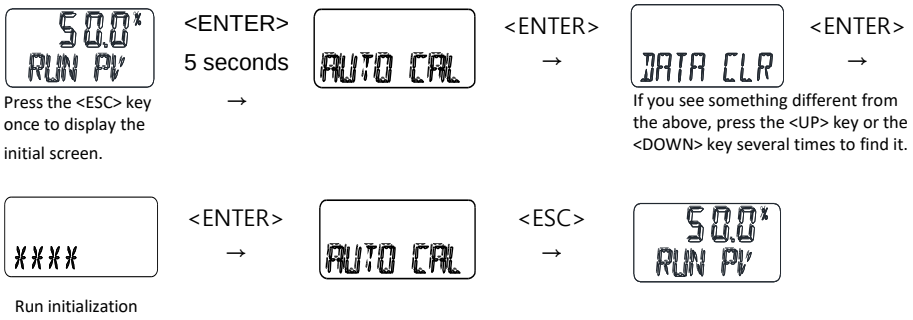
8.4.3 AUTO SV

A mode that allows you to change when the external input signal and the positioner have different RUN SV(mA) values.



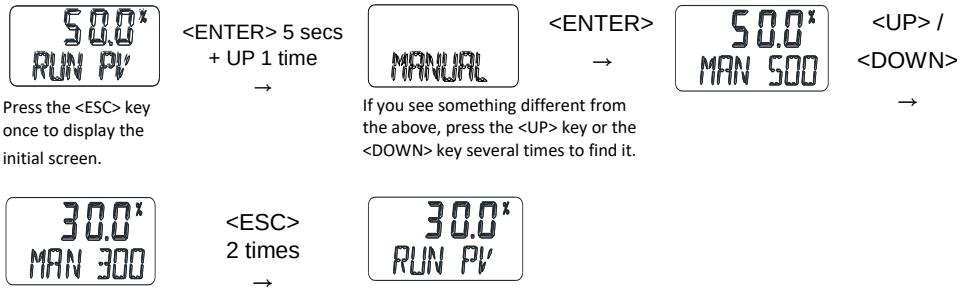
8.4.4 DATA CLEAR

Use to initialize all data that you have changed so far.



8.5 Manual Mode (MANUAL)

Manual mode is a mode that checks for mechanical interference and problems when the positioner and valve are first installed. With the AIR and command signals (4-20 mA DC) supplied to the positioner, press the <UP> and <DOWN> buttons to ensure there is no mechanical interference.
Press <ESC> twice to return to RUN PV mode, the positioner is controlled by the input current signal again.



The numbers of the 2nd row indicates the target position and MAN 300 shows 30.0 % in the captioned picture.

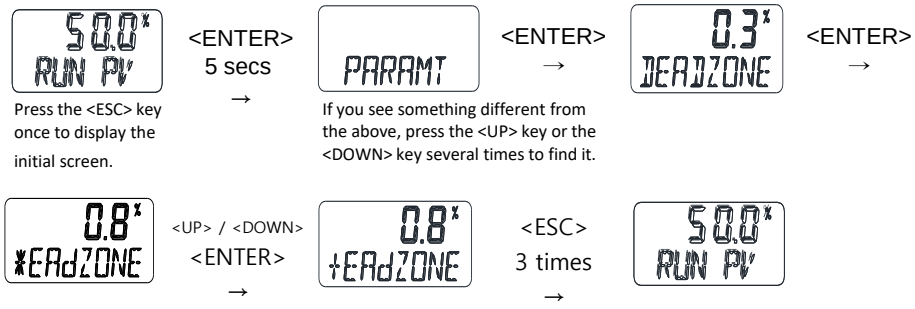
8.6 Parameter Mode (PARAMETER)

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

8.6.1 Dead-Zone Mode (DEADZONE)

If friction load increase and hunting or oscillation happen , dead zone value must be increased and make desirable control condition .

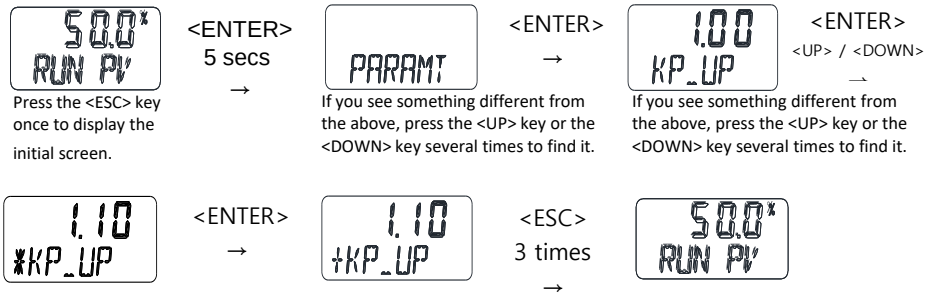
i.e.) If deadzone setting is 0.5%, you may negelect operation direction or position difference value's less than 0.5%.



※ DEAD ZONE Value is possible within 0-20 % and standard value is set with 0.1%.

8.6.2 KP_UP

In case that movement increase within 0--> 100% , adjust operation velocity until instruction position. It is used when driving facilities are so small or when friction load is too high , the increasing velocity is too slow.



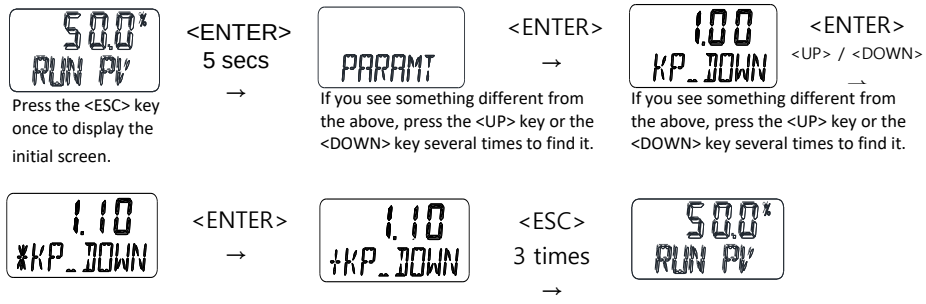
Press the <ESC> key once to display the initial screen.

If you see something different from the above, press the <UP> key or the <DOWN> key several times to find it.

If you see something different from the above, press the <UP> key or the <DOWN> key several times to find it.

8.6.3 KP_DOWN (KP_DOWN)

In case that movement decrease within 100 → 0%, adjust operation velocity until instruction position. It is used when driving facilities are so small or when friction load is too high, the decreasing velocity is too slow.



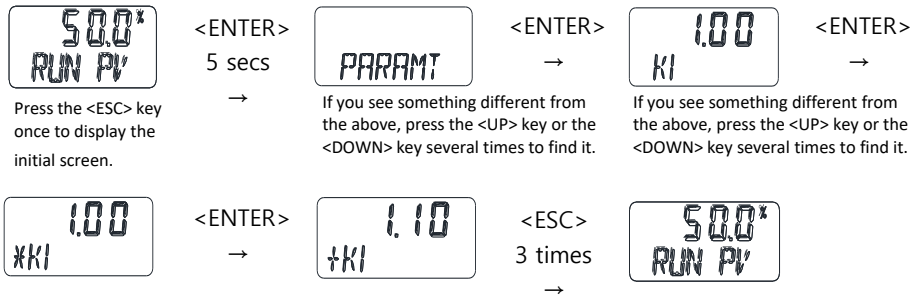
Press the <ESC> key once to display the initial screen.

If you see something different from the above, press the <UP> key or the <DOWN> key several times to find it.

If you see something different from the above, press the <UP> key or the <DOWN> key several times to find it.

8.6.4 KI

When the target value is quickly reached by KP, the KI value narrows the remaining small deviations and settles more accurately.



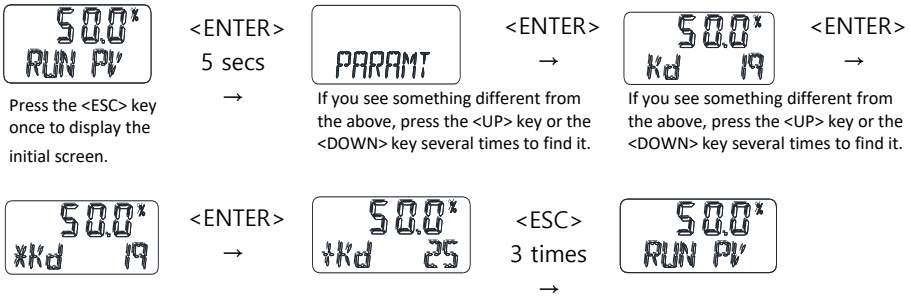
Press the <ESC> key once to display the initial screen.

If you see something different from the above, press the <UP> key or the <DOWN> key several times to find it.

If you see something different from the above, press the <UP> key or the <DOWN> key several times to find it.

8.6.5 Kd

When the value of D increases, hunting is likely to occur, and when it decreases, moldability or dynamic properties can deteriorate.



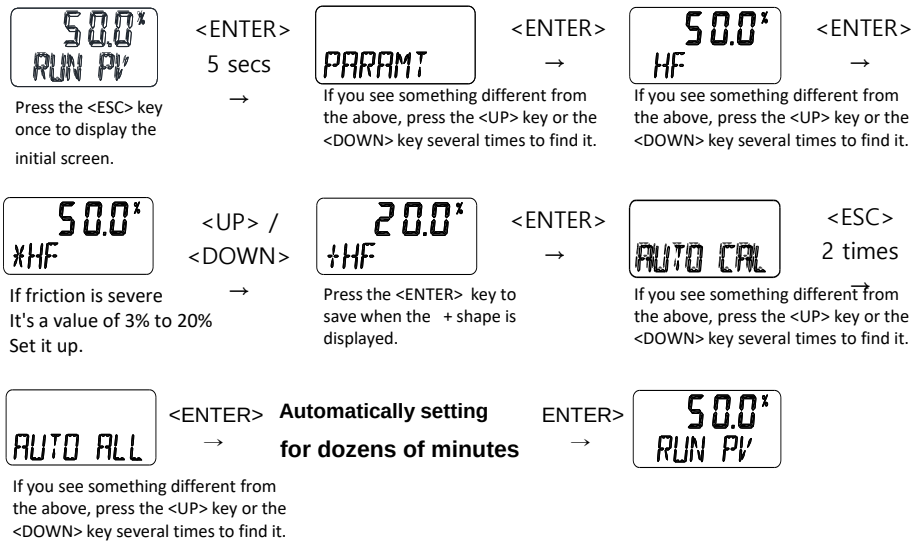
Press the <ESC> key once to display the initial screen.

If you see something different from the above, press the <UP> key or the <DOWN> key several times to find it.

If you see something different from the above, press the <UP> key or the <DOWN> key several times to find it.

8.6.6 HF

The HF value is used when the valve has very high friction and reduces hunting.
Responsiveness slows down a bit.



Press the <ESC> key once to display the initial screen.

If you see something different from the above, press the <UP> key or the <DOWN> key several times to find it.

If you see something different from the above, press the <UP> key or the <DOWN> key several times to find it.

If friction is severe
It's a value of 3% to 20%
Set it up.

Press the <ENTER> key to save when the + shape is displayed.

If you see something different from the above, press the <UP> key or the <DOWN> key several times to find it.

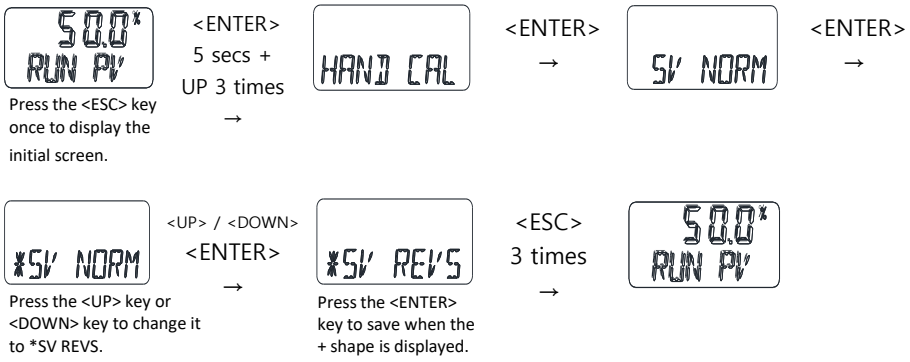
If you see something different from the above, press the <UP> key or the <DOWN> key several times to find it.

8.7 Hand Calibration Mode (HAND CAL)

HAND CAL mode is executed when automatic setting position , parameter value is required to modify after executing AUTO CAL mode .
And it is also executed when requiring to modify Zero point and End point position .

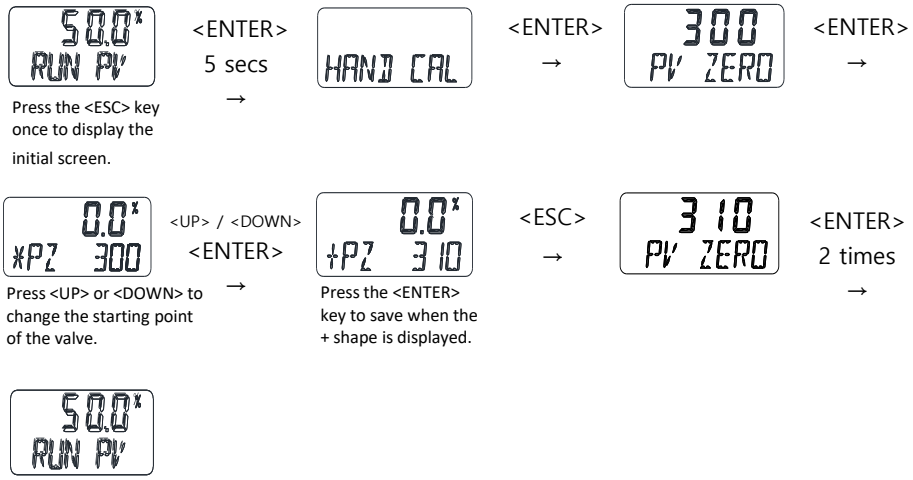
8.7.1 SV NORM

Positioner's SV value can be output with same open value or reverse value.
i.e.) if NORM input 4mA = 0% open, 20mA = 100% open in REV.



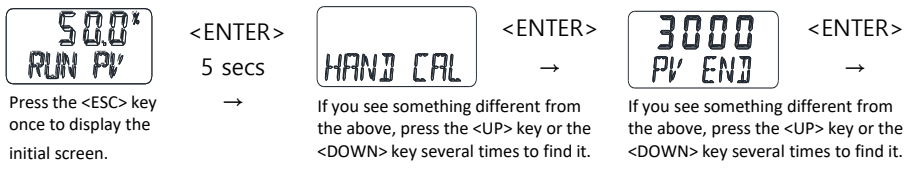
8.7.2 PV ZERO

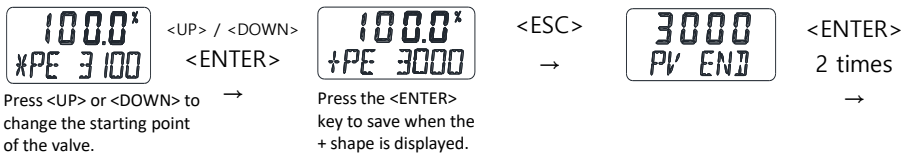
PV ZERO mode is a mode in which the starting point of the valve can be changed.



8.7.3 PV END

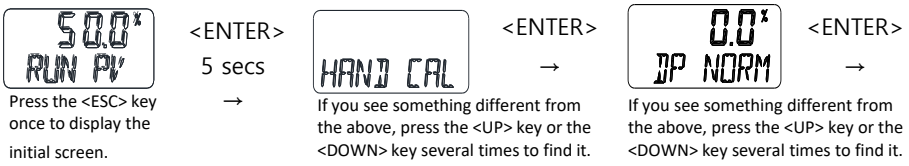
PV END mode is a mode that allows you to change the end point of the valve.





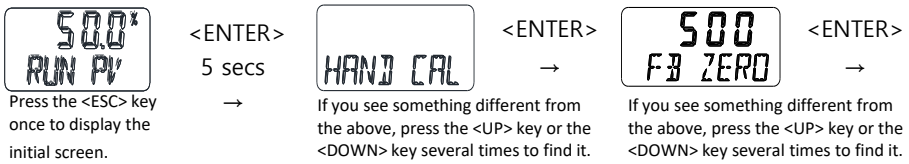
8.7.4 DP NORM

Positioner's PV value can be output with same open value or reverse value.
i.e.) In NORM , current 0% shall be converted into 100% in REV .



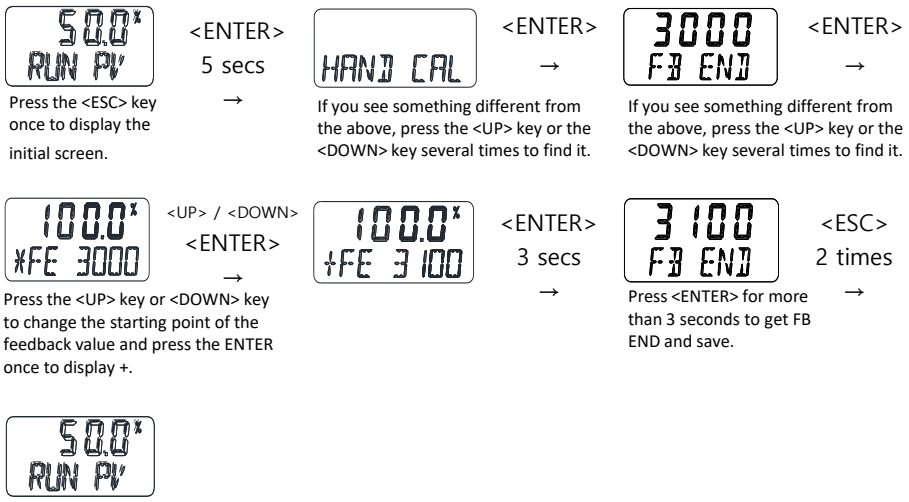
8.7.5 FB ZERO

FB ZERO mode is a mode that allows you to change the starting point of the positioner feedback value.



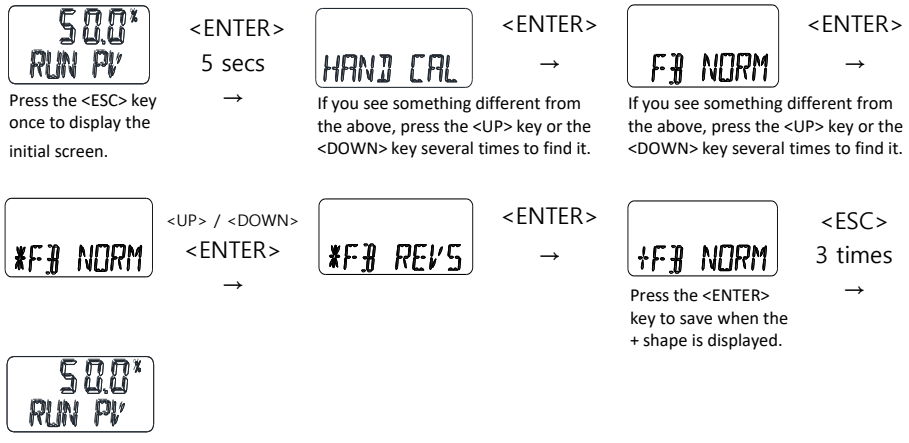
8.7.6 FB END

FB END mode is a mode that allows you to change the end point of the PV value.



8.7.7 FB NORM

FB NORM mode is a mode that reverses the start and end points of the positioner feedback value.
i.e.) 0% opening at NORM = 4 mA and 0% opening at REV = 20 mA conversion.

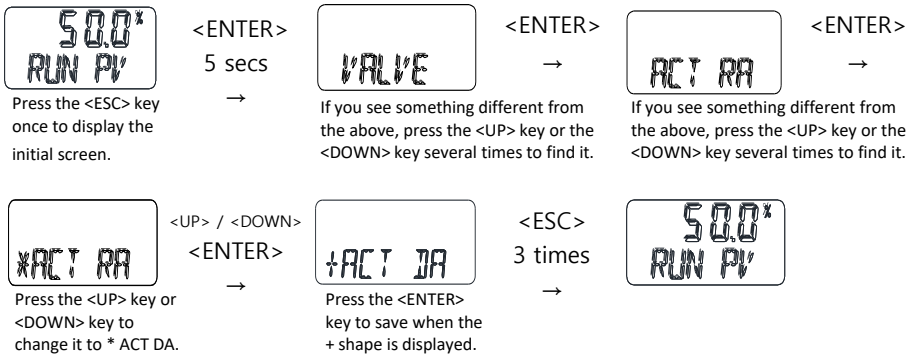


8.8 Valve Mode (VALVE)

VALVE mode is mode which can be set various function on control valve's operation .

8.8.1 Valve's operation direction setting mode (ACT DA / RA)

If Auto Calibration executes , valve's operation direction set into direct action (DA) automatically.
But when users want to modify Direct Action (DA) and reverse action (RA)
it can be converted when using this function.



Press the <ESC> key once to display the initial screen.

If you see something different from the above, press the <UP> key or the <DOWN> key several times to find it.

If you see something different from the above, press the <UP> key or the <DOWN> key several times to find it.

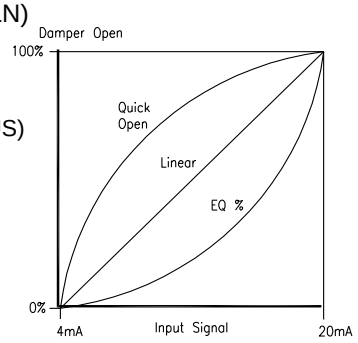
Press the <UP> key or <DOWN> key to change it to * ACT DA.

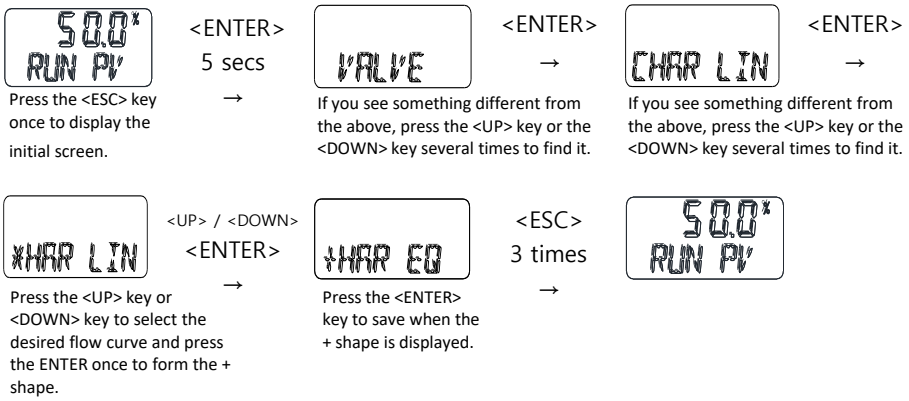
Press the <ENTER> key to save when the + shape is displayed.

※ It should be used with air blocked or 50% position condition. Actuator will be operated reversely.

8.8.2 Valve Flow Characterization Curve mode (CHAR LN)

Valve's flow chararics curve mode can be changed.
Base is Linear (LN) , it can be changed to user setting (US)
Quick Open (QO) or Equal Percentage (EQ).





Press the <ESC> key once to display the initial screen.

If you see something different from the above, press the <UP> key or the <DOWN> key several times to find it.

If you see something different from the above, press the <UP> key or the <DOWN> key several times to find it.

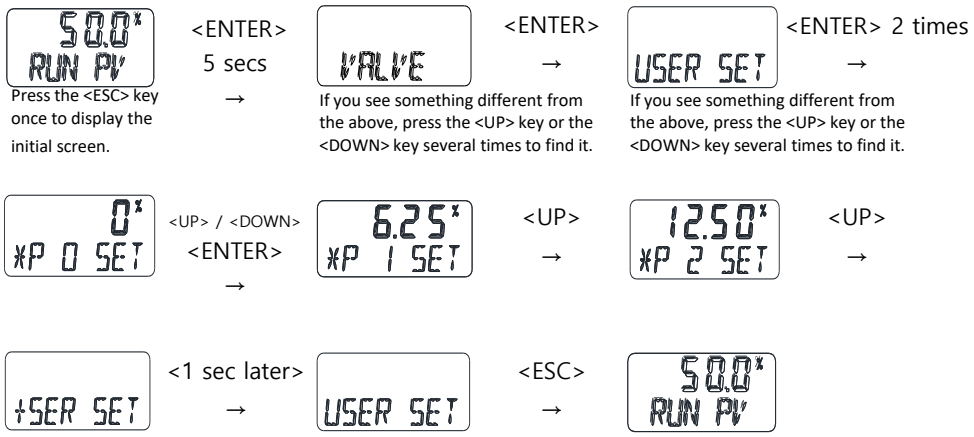
Press the <UP> key or <DOWN> key to select the desired flow curve and press the ENTER once to form the + shape.

Press the <ENTER> key to save when the + shape is displayed.

※ The above procedure indicate a change from LINEAR to EQUAL PERCENTAGE, for instance.

8.8.3 User Defining Flow Characterics Curve mode (USER SET)

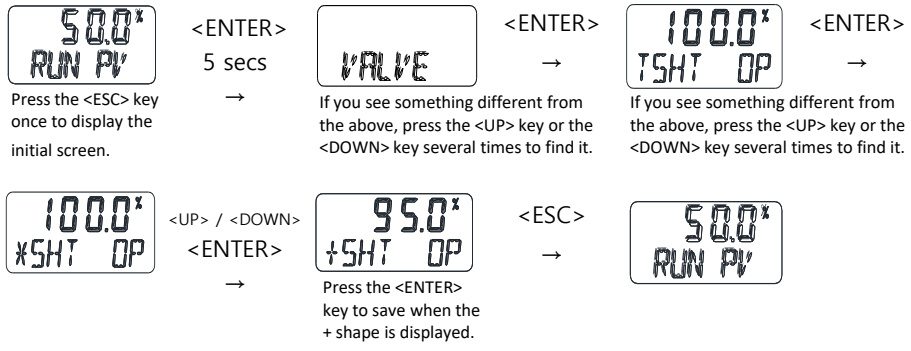
Users can make flow charerics cusrve randomly and use it.
Total 10 point can be defined and can be used.
In initail time PO (4mA) is valve stroke (0%), PI (5.6mA) is 6.00 % … P10(20mA) is 100% as basic setting mode . . They can be modified into other % value . 8 point can be chnaged totally and partially . If some of parts should be changed and others are remain , it can be escaped in < ESC > during setting .



※ SET POINT 0 and 10 can not be changed.

8.8.4 Tight Shut Open (TSHT OP)

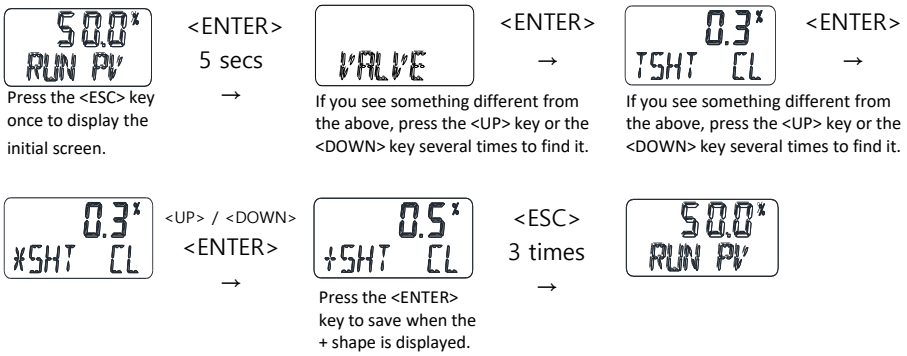
Tight Shut Open indicates the setting position as %.
Tight Shut Open value is set as standard 100% .
If setting value % value input ovver setting value , the driving position return into 100% immediatley .
i.e.) if 95% value is set , every command higher than 95% will move into 100% position.



8.8.5 Tight Shut Close (TSHT CL)

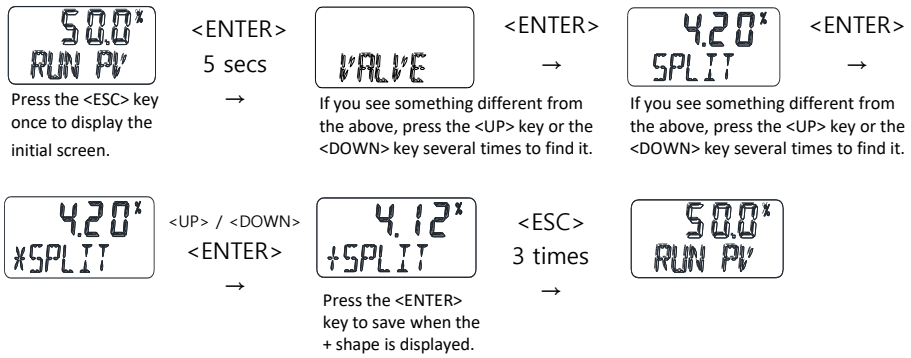
Tight Shut Close indicates the setting position as %.
Tight Shut Close value set as 0% basically . When user want to change opening value

if rhe instruction value is input below setting % value, the driving position return into 0% immediately.
i.e.) if 5%value is set , every command lower than5% will move to 0% position.



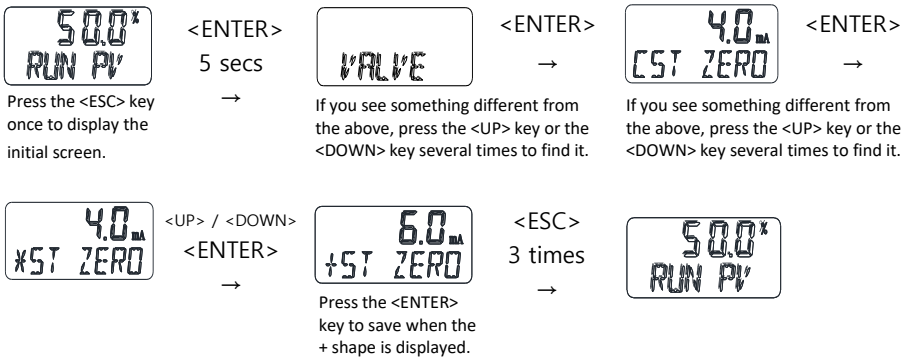
8.8.6 SPLIT

It is a mode that can control the entire stroke of the valve with 4-12 mA or 12-20 mA input signals rather than the usual 4-20 mA input signals.



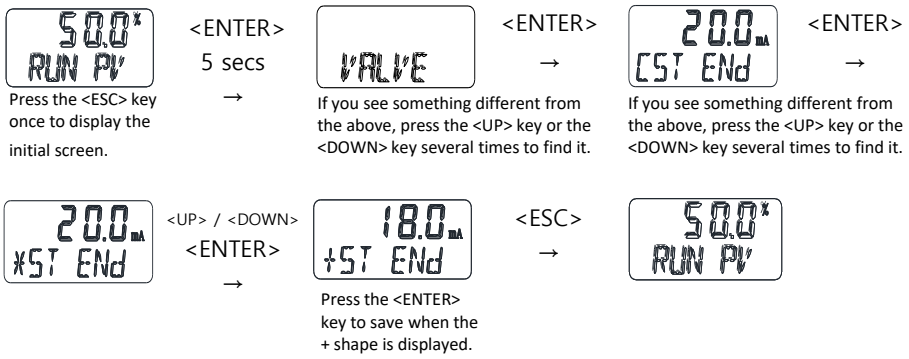
8.8.7 CST ZERO

A mode that allows the user to change the valve opening from 0 to 100% control with 4 to 20 mA to another mA instead of 4 mA at the origin.
You can change it to control 0-100%.



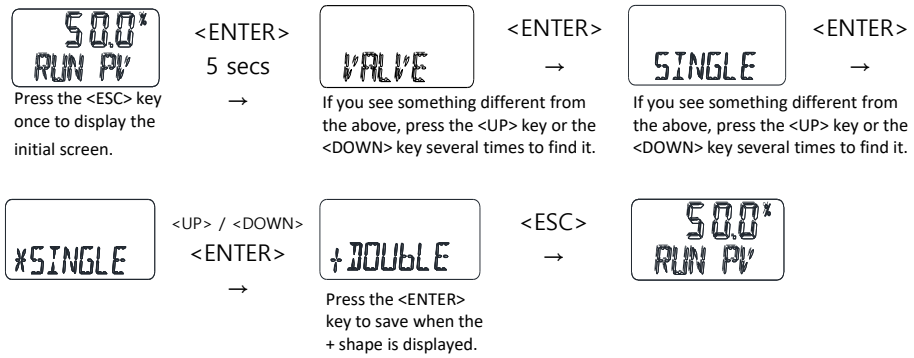
8.8.8 CST END

A mode that allows the user to change the valve opening from 0 to 100% control with 4 to 20 mA to another mA instead of the final point of 20 mA.



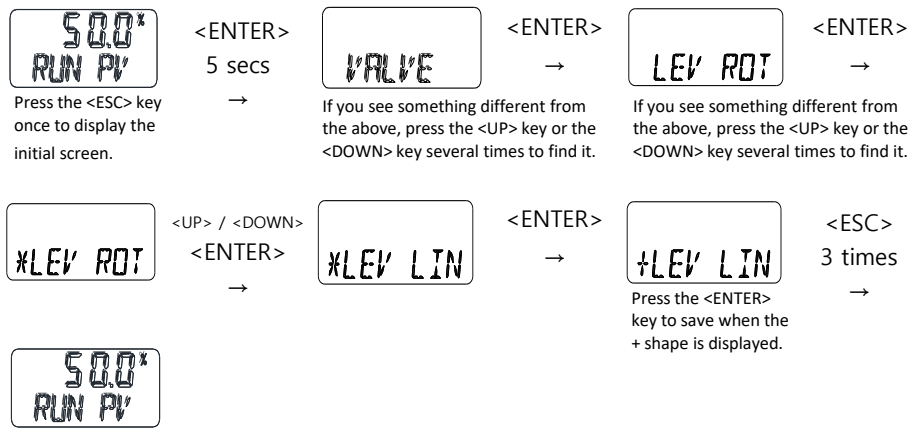
8.8.9 SINGLE/DOUBLE

You can set it according to the actuator's single or double action.
DOUBLE: Double-acting / SINGLE: Single-acting



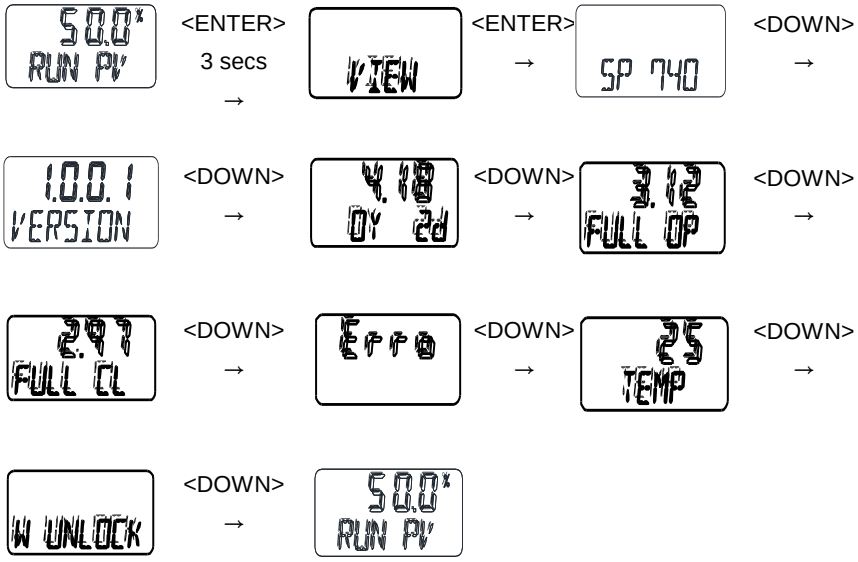
8.8.10 LEVER ROTARY(ROT) / LINEAR(LIN)

Depending on the valve and actuator type, it can be set to LIN or Rotary (ROT).



8.9 View Mode (VIEW)

VIEW mode delivers diverse information of positioner.



Indication	Description
SP-740	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 calculated to the total use time. 1st row: "3.11" → indicates 3 hour 11 minutes 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(℃)
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 >

9. Error and Warning Code

While using products , it there is any problems, Error code can be checked in LCD monitior and warning code can be checked in VIEW mode.

9.1 Error code

It is indicated when positioner's control is imposssible or any incorrect operation is expected.

Error Code	Error contents and cause	Action
AIR CHK ERROR_01	It is displayed when the valve does not move even at the Full Open signal during auto-calibration of the positioner. When an error occurs, auto-calibration is stopped and the error code is displayed immediately on the LCD window. Release it with the ESC key and take action according to the troubleshooting action.	Check that positioner's supplying air pressure is normal or not and take action that they may be supplied normally .
ERR RNG 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 to normal degrees and execute AUTO PV.
ERR RNGL ERROR_03	Indicate that PV is set 100 and lower. In the error happending case, Auto Calibration stops and the code is displayed on LCD. To release, use ESC button and take action steps.	Re-install to maintain the positioner lever from 50% to horizontal and execute AUTO PV.
ERR RNGH ERROR_04	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 take action steps.	

* An error code is immediately displayed on LCD and the measures should be taken after releasing an error with ESC button.

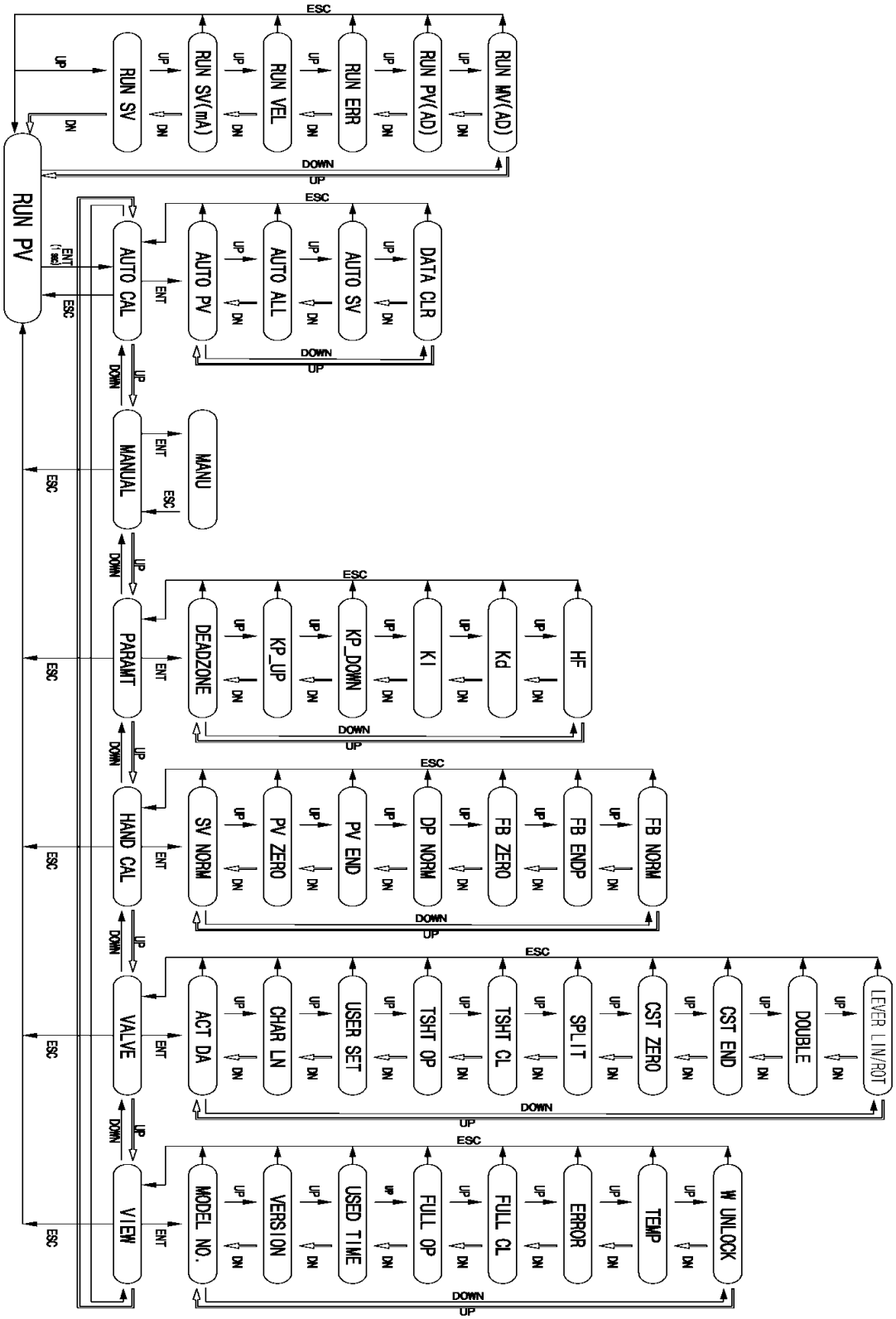
9.2 Warning code

Control is possible but it indicates when it can be happened abnormal operation or precsion degree can be degraded.

Warning Code	Warning contents and cause	Action
ERROR_05	▶ Indicates that FULL OPEN / FULL CLOSE time is shorter than 0.8 second. ▶ Indicates that actuator size is small.	▶ Reduce discharge air pressure through the orifice . ▶ Replace with large actuator size .
ERROR_06	▶ 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 of View Mode	▶ Re-execute auto calibration. ▶ Re-set air regulator setting pressure to normal pressure.
ERROR_07	▶ Indicates that PV is 1% and more far from the deadzone or does not move and the state lasts a minute and longer .	▶ Check air pressure status.
ERROR_08	▶ It is displayed when the SV signal is LOW / HIGH. LOW : 1.8 mA or less HIGH : over 23.9 mA	▶ Check the output of the signal generator and adjust it to the normal operation range.
*	It is displayed when an error code or warning code occurs.	▶ Take an action for error codes and warning codes.

* Select the ERROR in VIEW MODE to check the warning code when above Asterisk(*) is displayed.

10. LCD Operation Map



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