

Instruction and Operating Manual

Smart Valve Positioner SS5L / SS5R Series (Fail freeze function)



<Software Version 7.11D>

Power-Genex Ltd.



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1. Safety Instructions



Safety Instructions 1

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “**Caution**,” “**Warning**” or “**Danger**.” They are all important notes for safety and must be followed in addition to International Standards (IEC)^{Note 1)}, and other safety regulations.

Note 1) IEC 60079-0 : 2007
IEC 60079-11 : 2006



Caution

Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.



Warning

Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



Danger

Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.



Warning

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment. The product specified here may become unsafe if handled incorrectly.

The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Contact POWER-GENEX beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalogue.
3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.



Safety Instructions 2



Caution

1. The product is provided for use in manufacturing industries.

The product herein described is basically provided for peaceful use in manufacturing industries. If considering using the product in other industries, consult POWER-GENEX beforehand and exchange specifications or a contract if necessary. If anything is unclear, contact your nearest sales branch.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”. Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered. Note 2)

Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided. This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.

3. Prior to using POWER-GENEX products, please read and understand the warranty terms and disclaimers noted in the specified catalogue for the particular products.

Note 2) Vacuum pads are excluded from this 1 year warranty.

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

1. The use of POWER-GENEX products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.

2. The exports of POWER-GENEX products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a POWER-GENEX product to another country, assure that all local rules governing that export are known and followed.



Precautions 1

Be sure to read before handling.

Operation



Warning

1. Do not operate the positioner outside the specified range as this may cause problems. (Refer to the specifications.)
2. Design the system to include a safety circuit to avoid the risk of danger should the positioner suffer failure.
3. Be sure that exterior lead-in wiring to the terminal box is based on the guidelines for explosion-protection of manufactory electric equipment when being used as a flame proof, explosion proof construction.
4. Do not remove terminal cover in a hazardous location while the power is on.
5. Covers for the terminal and body should be in place while operating.
6. When using as an intrinsically safe explosion-proof product, do not wire in a hazardous location while the power is on.



Caution

1. Do not touch the actuator or valve's oscillating section when supply pressure has been added, as this is dangerous.
2. Make sure fingers do not get caught when mounting and aligning the cam.
Cut off the pressure supply and always release the compressed air inside the positioner and actuator before performing this work.
3. Always use with the body cover unit mounted.
Moreover, the positioner may not meet degrees of protection IP66 depending on the body cover mounting conditions. In order to meet degrees of protection IP66, tighten threads using the proper tightening torques (2.8 to 3.0 N·m).
4. Always flush the pipe's inside before piping to ensure foreign objects such as machining chips do not enter the positioner.
5. The actuator opening may become unstable when using the booster relay.
6. Always use a ground connection to prevent noise from the input current and to prevent damage because of static electricity.
7. Use the pressure reading on the supplied pressure gauge as an indication.
8. The supplied pressure gauge's needle will malfunction if the pressure supply to the internal mechanism or positioner freezes. Ensure that the pressure gauge's internal parts do not freeze if using the pressure gauge in an operating environment with an ambient temperature of less than 0°C.

For users



Caution

1. Assemble, operate and maintain the positioners after reading the operation manual thoroughly and understanding the content.



Precautions 2

Be sure to read before handling.

Handling



Caution

1. Avoid excessive vibration or impact to the positioner body and any excessive force to the armature, as these actions may cause damage to the product. Handle carefully while transporting and operating.
2. If being used in a place where vibration occurs, using a binding band is recommended to prevent broken wires because of the vibration.
3. When exposed to possible moisture invasion, please take the necessary measures. For example, if the positioner is left onsite for long periods, a plug should be put in the piping port and a body cover unit fitted to avoid water penetration.
Take measures to avoid dew condensation inside the positioner if exposed to high temperature and humidity. Take enough measures against condensation especially when packing for export.
4. Keep magnetic field off the positioner, as this affects its characteristics.

Air Supply



Caution

1. Use only dehumidified and dust extracted clean compressed air as the air supply.
2. Use only dehumidified and dust extracted clean compressed clean air as the positioner contains extrafine orifices such as restrictor and nozzle.
Do not use a lubricator.
3. Do not use compressed air containing chemicals, organic solvents, salinity or corrosive gases, as this may cause malfunction.
4. When operating below the freezing point, protect the positioner from freezing.

Operating Environment



Caution

1. Do not operate in locations with an atmosphere of corrosive gases, chemicals, sea water, or where these substances will adhere to the regulator.
2. Do not operate out of the indicated operation temperature range as this may cause damage to electronic parts and seal materials to deteriorate.
3. Do not operate in locations where excessive vibration or impact occurs.
4. If the body cover is being installed in a place where the body cover is exposed to direct sunlight, the use of a standard body cover without the LCD window is recommended.



Precautions 3

Be sure to read before handling.

Maintenance



Warning

1. **After installation, repair or disassembly, connect compressed air and conduct tests to confirm appropriate function and leakage.**

Do not use the positioner when noise from the bleeder sounds louder compared with the initial state, or when it does not operate normally. If these occur, check immediately if assembled and mounted correctly.

Never modify electrical construction to maintain explosion-proof construction.



Warning-Potential electrostatic charging hazard

1. **The non-metallic parts incorporated in the enclosure of this equipment may generate an ignition capable level of electrostatic charge. Therefore particularly when it used for applications that specifically require Group IIC, SS5 Ga equipment, the equipment shall not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. Additionally, the equipment shall only be cleaned with a damp cloth.**
2. **The enclosure contains aluminium and is considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction.**



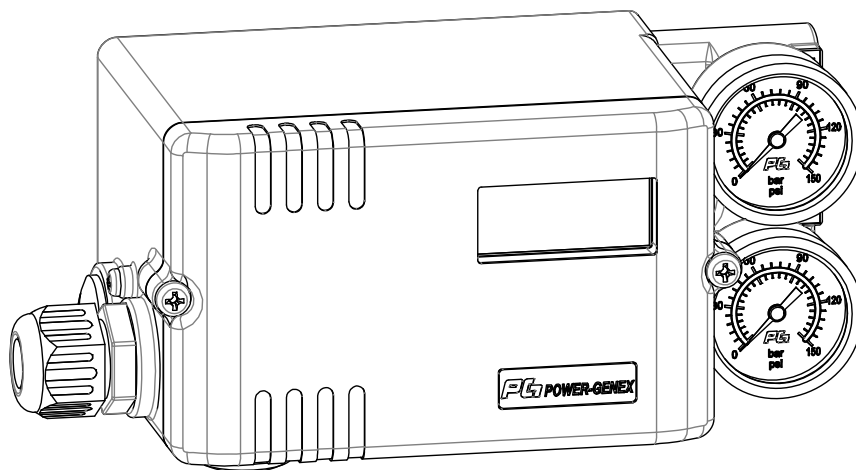
Caution

1. **Confirm whether the compressed air is clean.**
Dust, oil, or moisture mixed within the equipment may result in malfunction and positioner problems. Perform periodic inspection of the air preparation equipment to ensure clean air is always supplied.
2. **Improper handling of compressed air is dangerous. Not only observing the product specifications, but also replacement of elements and other maintenance activities should be conducted by personnel having sufficient knowledge and experience pertaining to instrumentation equipment.**
3. **Perform annual inspections of the positioner.**
Replace badly damaged seals and units such as diaphragm and O-ring during the inspection. When used in tough environmental and/or service conditions such as seaside locations, replacements should be undertaken more frequently.
4. **When performing inspections, demounting the positioner, or replacing the elements with the positioner still in its mounted position, first, stop the compressed air, then exhaust the residual pressure before undertaking operation.**
5. **Check air leakage from pipes that pass compressed air and connecting parts.**
Air leakage from air piping results in reduced operational performance and a decline of characteristics, etc. It is structurally necessary for air to be released from the bleeder, it is not abnormal as long as the air consumption is within the specified range.

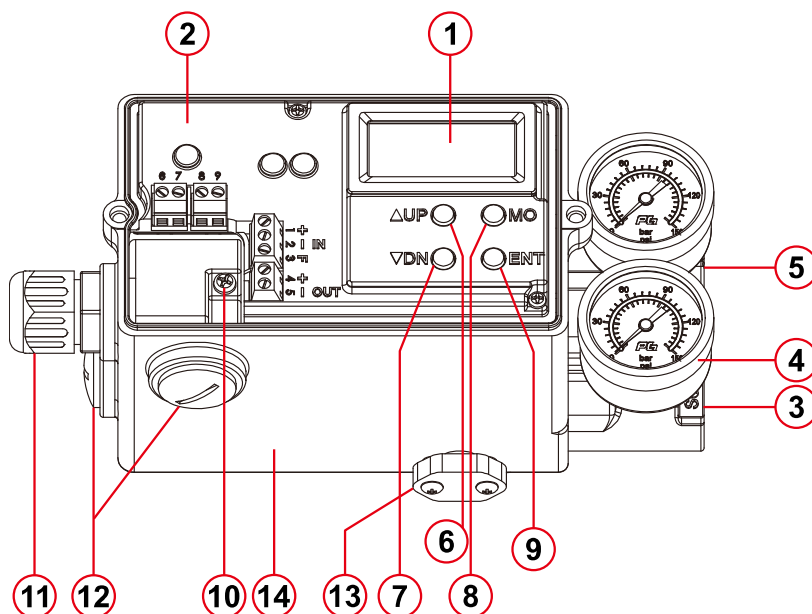
2. Overview of Structure

This product consists of the following parts.

- Electronic card comprised of microprocessor, HART modem and LCD
- Potentiometer for position feedback
- Gauge block



The followings are descriptions of internal parts without cover.



No.	Description
1	LCD
2	Board cover
3	Gauge block
4	Supply air gauge
5	Out 1 gauge
6	▲UP, Up button
7	▼DN, Down button
8	MO, Mode button
9	ENT, Enter button
10	Ground
11	Cable gland (or blind plug)
12	Blind plug (or cable gland)
13	Air venting hole
14	Body

3. Specifications

Input signal	4 - 20 mA @ 24 VDC
Min. / Max. current	3.6 mA / 50mA
Voltage drop (impedance)	Without HART : 8.7 VDC (435Ω @ 20mA) With HART : 9.4 VDC (470Ω @ 20mA)
Operating angle/ stroke	Linear type: 5 - 130mm * Rotary type: 25 - 120°
Supply air pressure	1.4 - 6.5 bar (20 - 100 psi)
Output pressure range	0 - 100% of supply air
Air flow capacity	80 ℓ/min = 4.8 Nm ³ /h = 2.8 scfm (Sup = 1.4 bar) 233 ℓ/min = 14 Nm ³ /h = 8.2 scfm (Sup = 6 bar)
Air consumption	2.8 ℓ/min = 0.17 Nm ³ /h = 0.1 scfm (Sup = 1.4 ~ 6 bar)
Characteristic	Linearity < ±0.3% F.S Sensitivity < 0.2% F.S Hysteresis < 0.2% F.S Repeatability < 0.2% F.S
Operating characteristic	Linear, EQ%, Quick open, User set (17 points)
LCD display	4-digit
Response speed	1 - 1000 (Min. 1, Max. 1000)
Scan time	2 ms
Shut-off value	0 - 10%
Valve action	Direct acting (DA) / reverse acting (RA)
Operating temperature	-30°C ~ +80°C (-22 ~ +176°F) **
Pneumatic connections	Rc 1/4 or NPT 1/4
Electrical connections	G 1/2, NPT 1/2 or M20 x 1.5
Body material / painting	Aluminum die-cast
Weight	2 kg

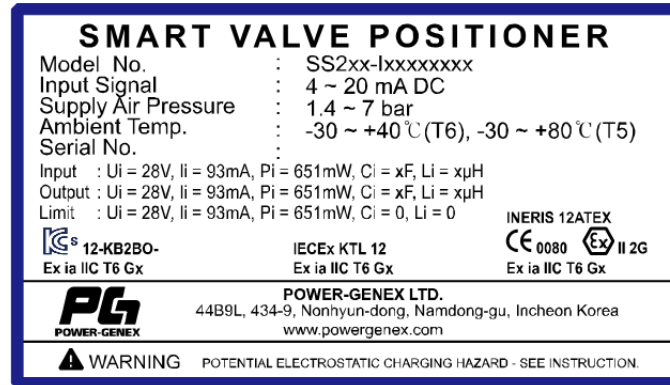
* For more than 200mm stroke on request

** Operating temperature of -40°C on request

4. Part Numbering System (order code)

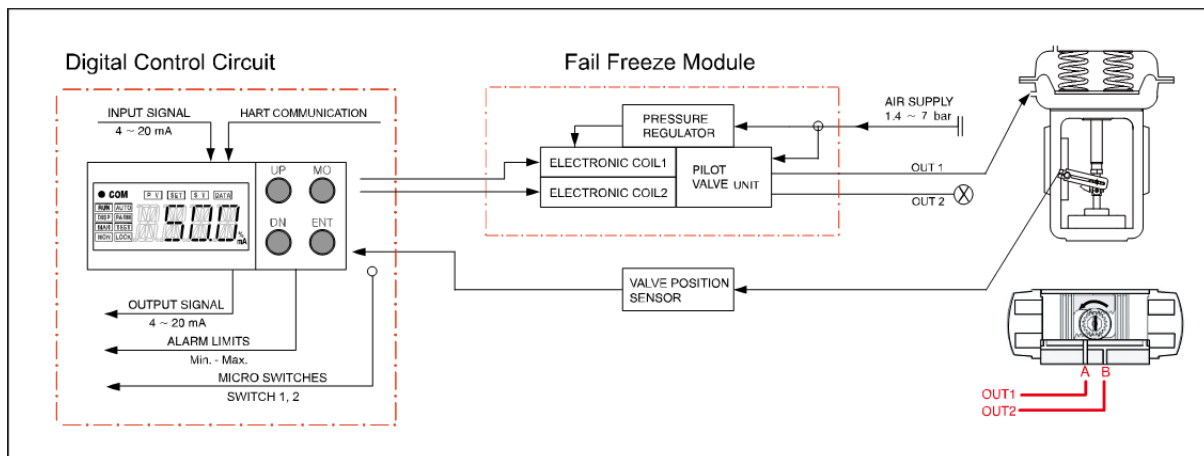
		SS5	x	—	x	x	x	x	x	x	x	x	x
Actuator action	Linear type	L											
	Rotary type	R											
Protection class	Intrinsically safe (Exia IIC T6)	I											
	Weatherproof to IP66	W											
Feedback lever	Linear type	5 ~ 30mm stroke	A										
		5 ~ 70mm stroke	B										
		5 ~ 130mm stroke	C										
		80 ~ 200mm stroke	D										
	Rotary type	Fork lever	F										
		NAMUR shaft (direct mounting)	N										
Pressure Gauge	Not included					0							
	6 bar (90psi)					1							
	10 bar (150psi)					2							
Position feedback	Not included					N							
	Position transmitter (4~20mA output)					O							
	2 x alarm limit					L							
	2 x micro switch (SPDT)					S							
	O + L					M							
	O + S					Q							
Communication	Not included						N						
	HART communication						H						
Pneumatic – electrical connections	Rc 1/4 - G 1/2 (standard)							3					
	NPT 1/4 - NPT 1/2							4					
	Rc1/4 - M20x1.5							5					
Mounting bracket	Not included									N			
	IEC 60534-6-1 (for SS5L									L			
	IEC 60534-6-2(VDI/VDE 3845)(for SS5R)									R			
Feedback pin guide	Not included											0	
	Included											1	

4.1. Descriptions on Nameplate



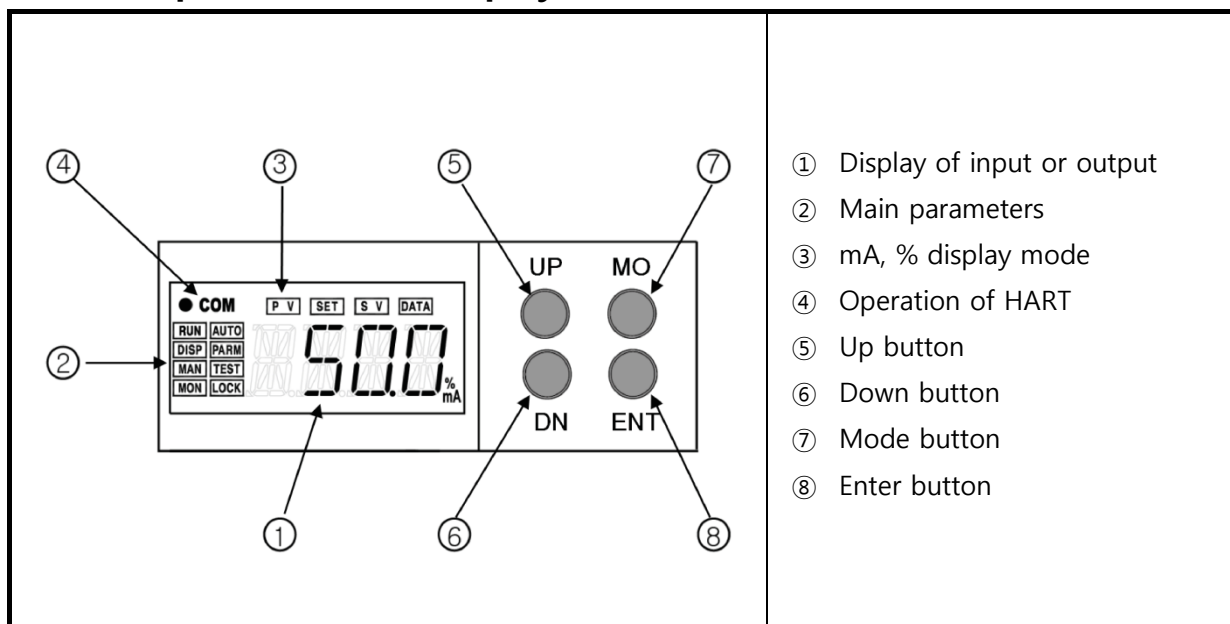
- .. Model No.:
The product model and options selected are described.
- .. Input signal:
4 – 20mA input signal with 2-wire is described.
- .. Ambient Temp.:
The ambient temperate range for operation is described.
- .. Serial No. / Date: Serial number and production date are described.
- .. Input - U_i , I_i , R_i , P_i , L_i , C_i : Intrinsic safety electrical parameters for input are described.
output - U_o , I_o , R_o , P_o , L_o , C_o : Intrinsic safety electrical parameters for output are described.
Limit - U_i , I_i , R_i , P_i , L_i , C_i : Intrinsic safety electrical parameters for alarm or switch are described.
- .. Protection class: Explosion proof classifications approved are described.
- .. Certificate No: Certification number is described.

5. Principle of Operation



If 4-20mA input signal is supplied, the microprocessor compares the input signals and the feedback values and send the control signals to the I/P converter. A supply air is converted to the pneumatic signals by two electronic coils and moves the pilot valve until the control valve reaches the desired position. In case of a signal failure or a supply air failure, a venting air is blocked inside of the pilot valve and the valve stays at the last position because of an existing supply air pressure between the positioner and the actuator.

6. Descriptions of LCD display and Buttons

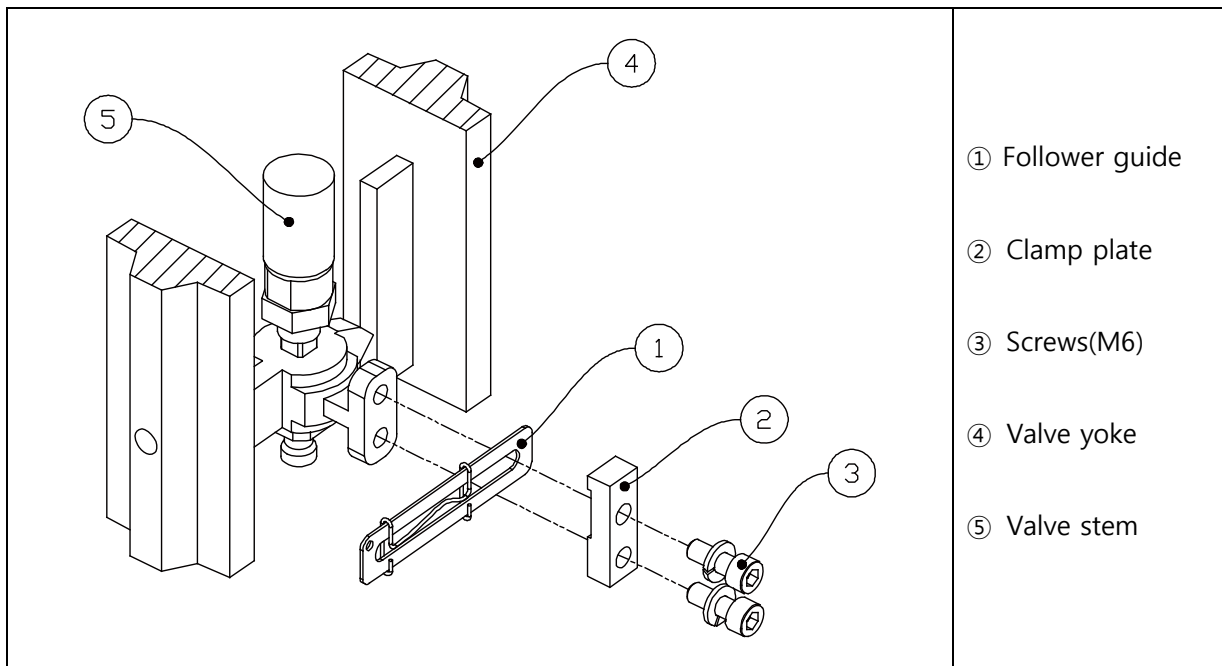


Press "Mode" button for 5 seconds	• Quick auto-calibration
Press "Up(▲)" button for 5 seconds	• GROP-gain adjustment
Press "Down(▼)" button for 5 seconds	• Span adjustment
Press "Enter" button	• Ambient temperature (°C)
① Display of input or output	• mA, %
② Main parameters	<div style="text-align: center;"> MODE ↔ RUN ↔ DISP ↔ MAN ↔ MON ↔ AUTO ↗ ↖ LOCK ↔ TEST ↔ PARM </div>
③ Display mode	• Selection of mA, % or in reverse way with values shown (Ex. Reverse : 20% shown → 80% shown)
④ HART communication	• HART communication
⑤ Up (▲)	• UP button
⑥ Down (▼)	• DOWN button
⑦ MO (Mode)	<ul style="list-style-type: none"> • Selection of running mode • Selection of parameter group or parameter
⑧ ENT(Enter)	• Save of setting values

7. Installation

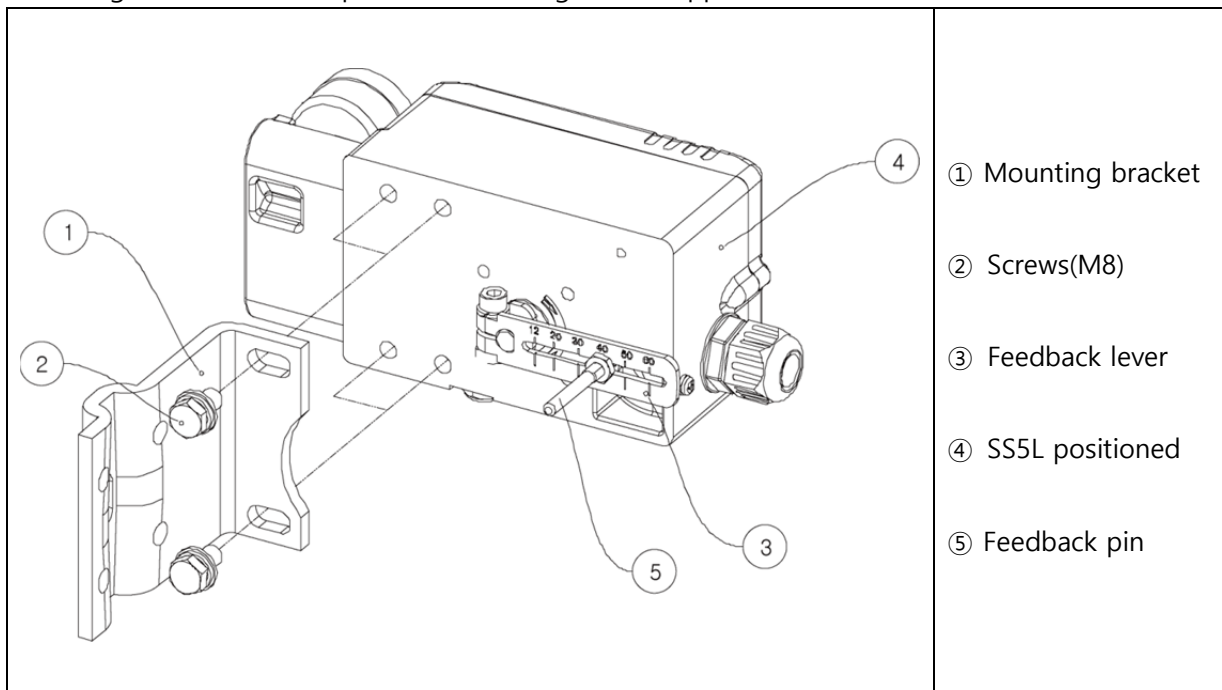
7.1. Mounting onto Linear Actuator

7.1.1. Installation of Follower Guide



7.1.2. Installation of Feedback Lever and Mounting Bracket

Mounting bracket for SS5L positioned is designed to support IEC 60534-6-1.



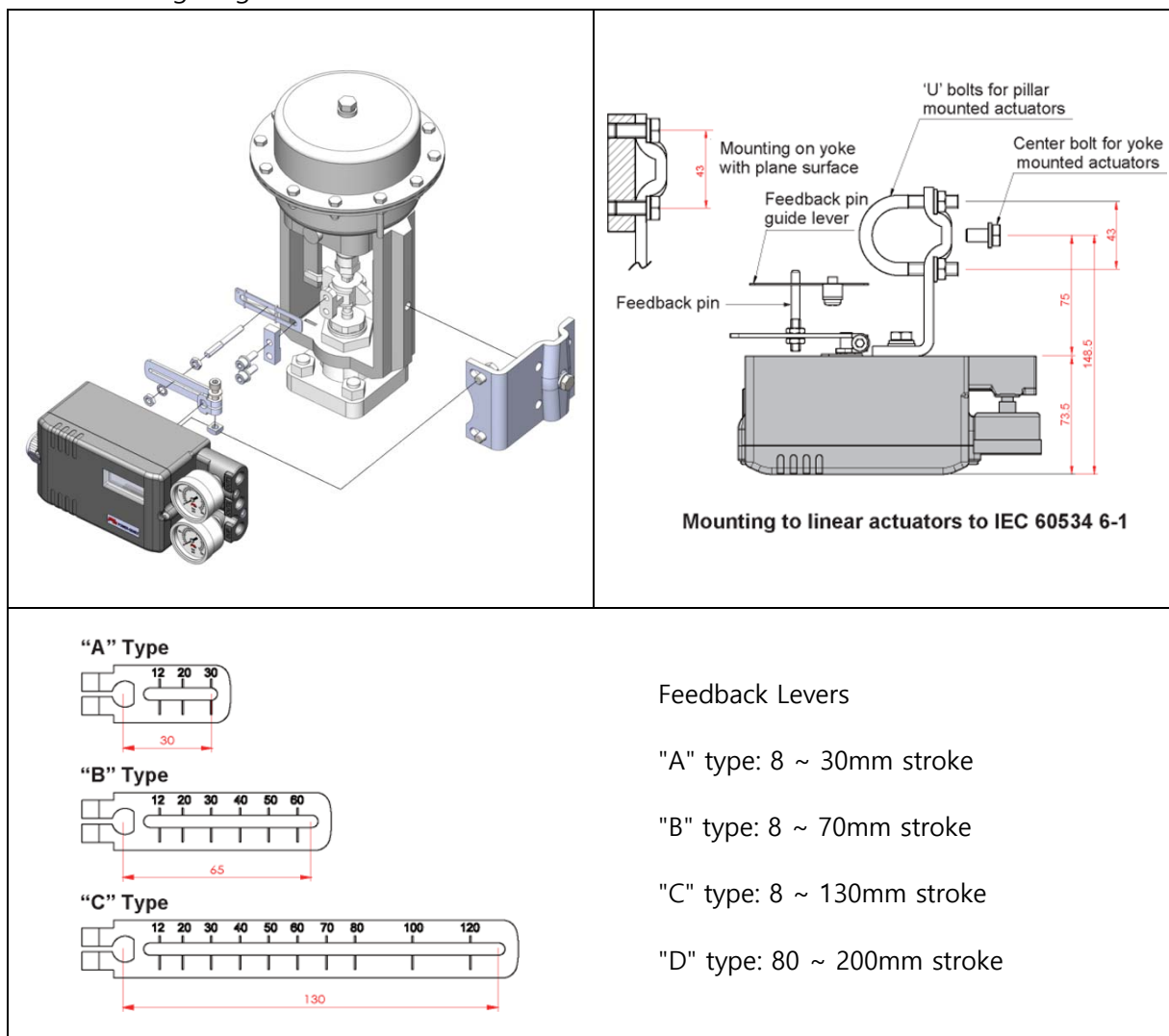
7.1.3. Mounting onto Cast Yoke or Pillar Yoke

< Cast yoke type >	< Pillar yoke type >	
		<ul style="list-style-type: none"> ① Cast yoke ② Mounting bracket ③ Screws(M8) ④ U-bolts ⑤ Pillar yoke

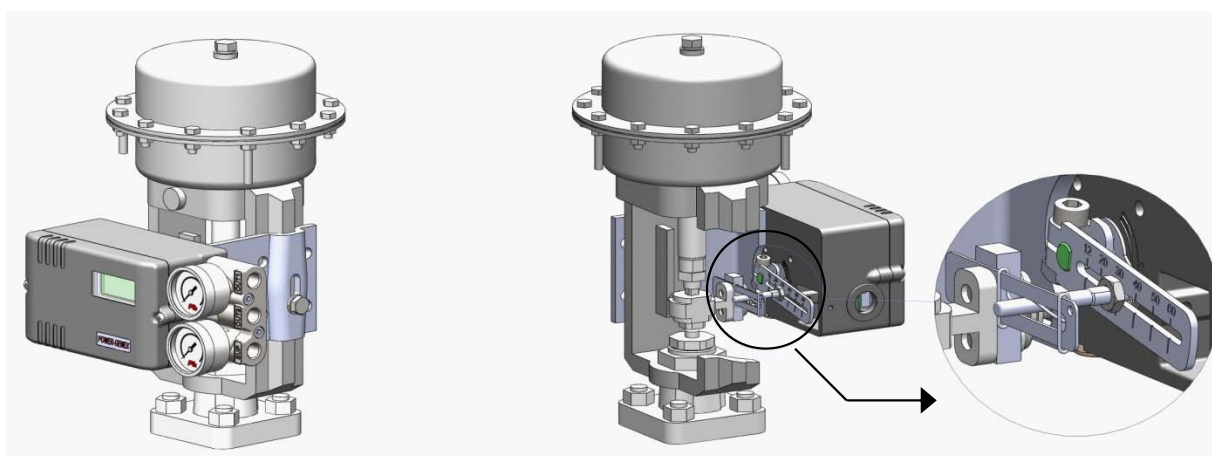
7.1.4. Mounting onto Other Kind of Cast Yoke

	<ul style="list-style-type: none"> ① Cast yoke ② Mounting bracket ③ Screws(M8)
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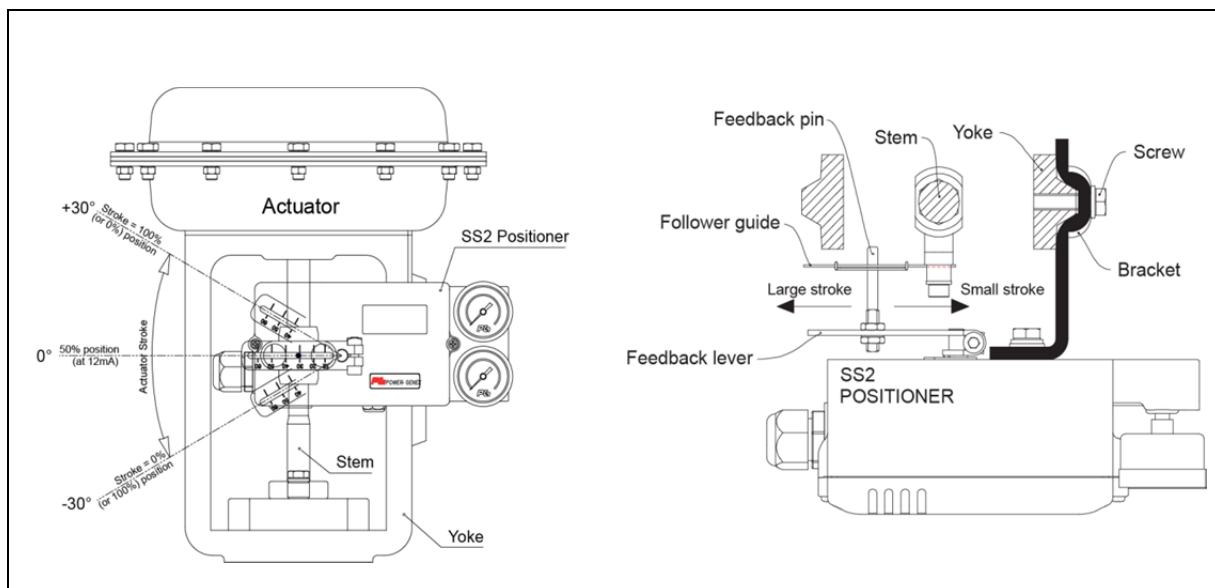
7.1.5. Mounting Diagram



7.1.6. Installation of Feedback Pin Follower Guide



7.1.7. Standard Installation



- ① Supply air directly to the actuator, adjust the air filter regulator and set air when the valve reaches to 50% stroke.
- ② Install the feedback pin at around 30% higher point of the stroke indicated on the feedback lever than the required stroke of the control valve and fix with a screw tightly. For example,

Control valve stroke	Stroke indicated on feedback lever
15mm	20mm
20mm	25mm
30mm	40mm

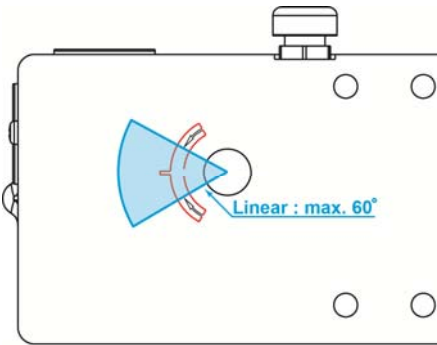
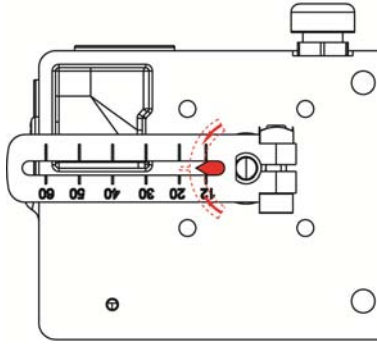
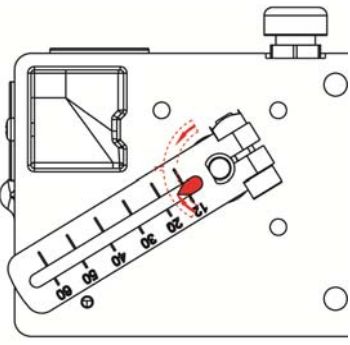
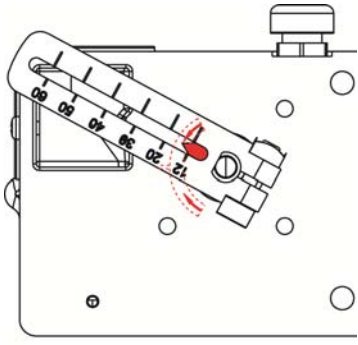
- ③ Install the feedback lever horizontally at 50% stroke position.
- ④ If the feedback lever is not installed horizontally, move the mounting bracket up and down little by little so that it can be positioned horizontally.
- ⑤ Fix the mounting bracket with screws (M8).
- ⑥ Connect air lines between the position and the actuator and supply air to the positioned and perform auto-calibration by pushing Mode button for 5 seconds.
- ⑦ The operating angle from 0% to 100% stroke should be within the range of 30°. In case of the over-range of 30°, move the valve stem pin left and right and make the operating angle stay within 30°.



- ① Be sure to install the air filter regulator before the positioned and check a supply air pressure required to move the valve.
- ② If the operating angle of the SS5L positioner is out of the range of -30° to +30°, MONT is shown on LCD during auto-calibration. Take action as advised in the above ⑦ and get the SS5L feedback lever positioned horizontally at 12mA (50%). See 11.4.6. MONT.

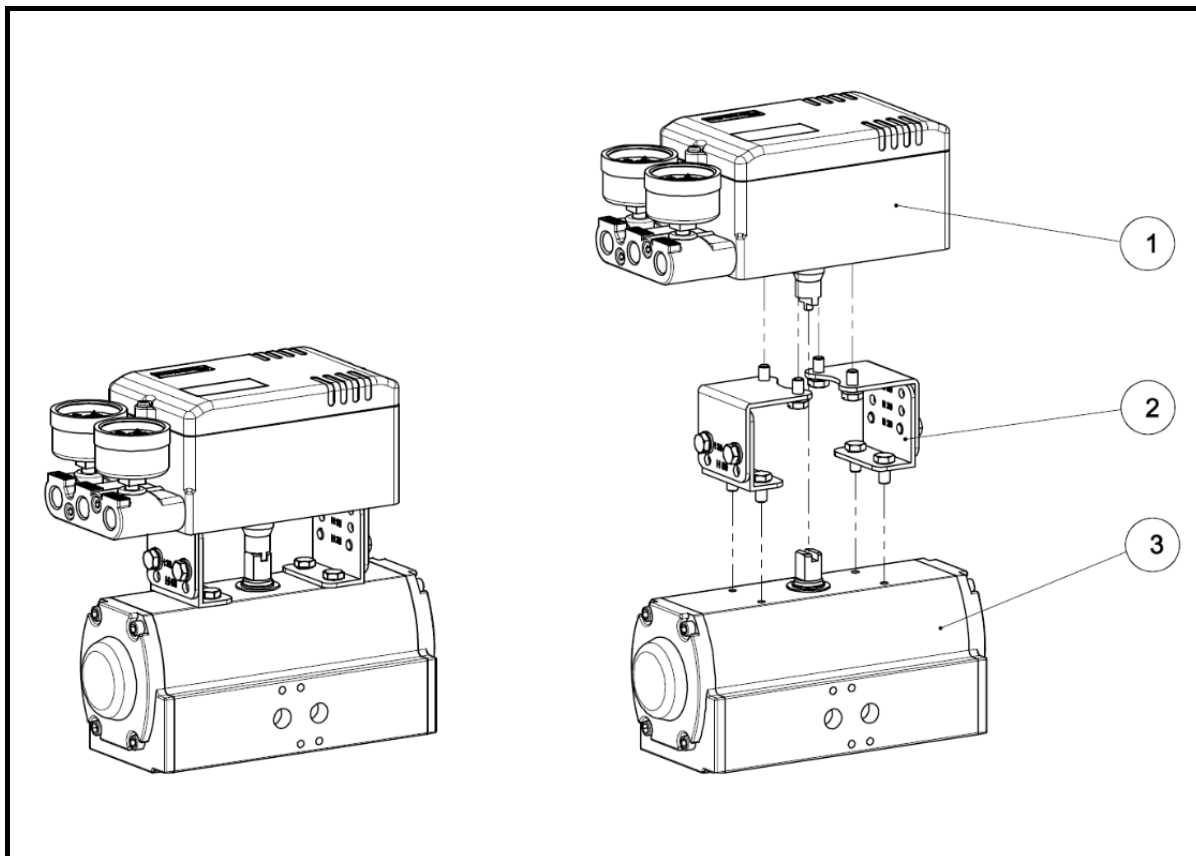


Make sure that the SS5L positioner works within the operating range of $\pm 30^\circ$. See the below pictures. Otherwise, the error message of 'MONT' appears on LCD and the auto-calibration process fails. Take action as advised in the above ⑦ and get the SS5L positioner feedback lever positioned horizontally at 12mA (50%).

	
<p><Maximum operating angle : 60°></p>	<p><Indicator position at 50%></p>
	
<p><Indicator position at 0% (100%)></p>	<p><Indicator position at 100% (0%)></p>

7.2. Mounting onto Rotary Actuator

7.2.1. The SS5R positioned supports NAMUR mounting standard (VDI/VDE 3835, IEC 60534-6-2).



① SS5R positioner

② Multi-size bracket

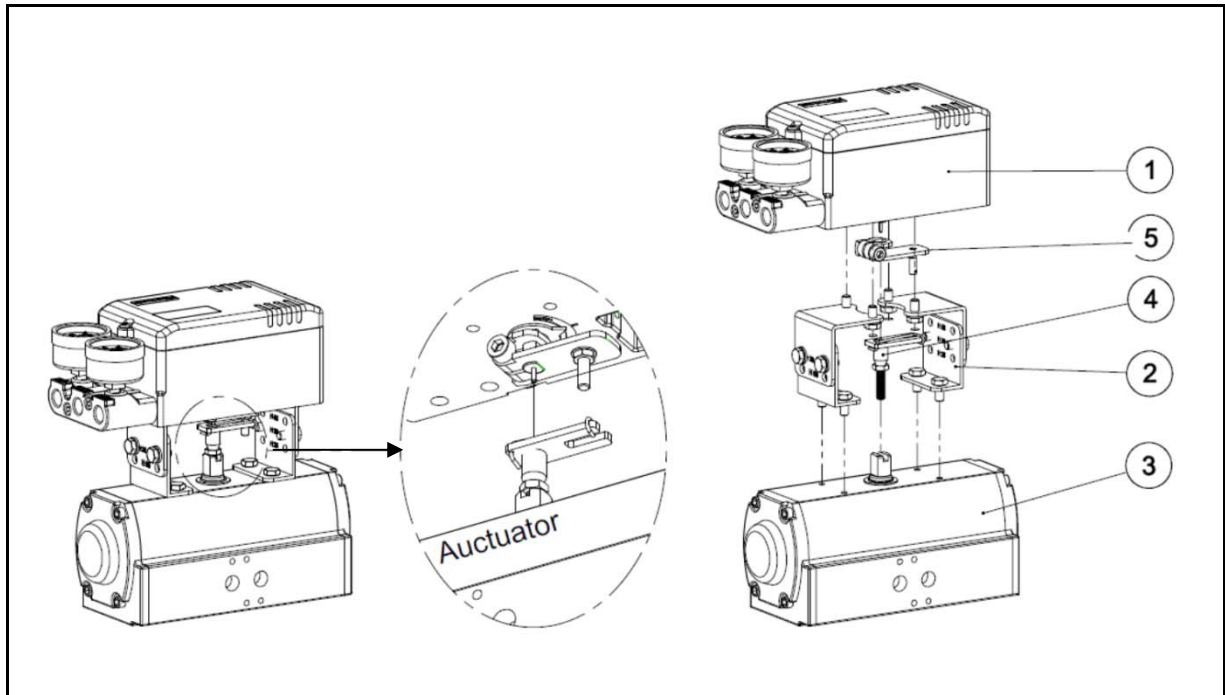
③ Rotary actuator

- Ⓐ Assemble the multi-size bracket to the positioner with 4 pcs M6 screw.
- Ⓑ Mount the positioned onto the actuator with 4 pcs M5 screw.
- Ⓒ Connect air lines between the positioned and the actuator.
- Ⓓ Perform auto-calibration by pushing MODE button for 5 seconds.



Be sure to install the air filter regulator before the positioned and check a supply air pressure required to move the valve.

7.2.2. Mounting with Fork Lever Type

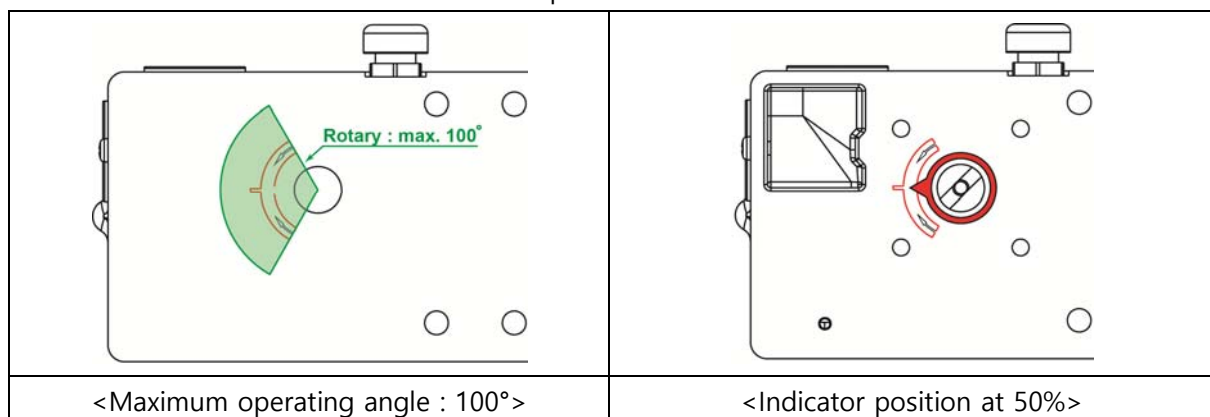


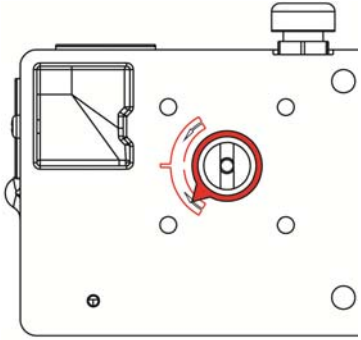
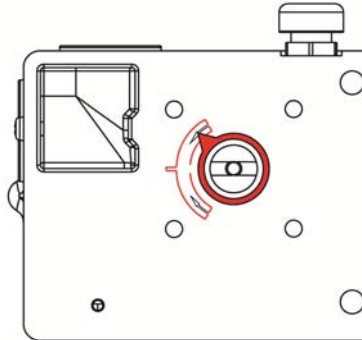
- ① SS5R positioner ② Multi-size bracket ③ Rotary actuator
- ④ Fork lever ⑤ Positioner feedback lever

- Ⓐ Assemble the multi-size bracket to the SS5R positioner with 4 pcs M6 screw. The multi-size bracket is assembled for 80x30x20mm as standard at the factory. If you have other size bracket, see '7.2.4 Re-assembling Multi-size Bracket according to Rotary Actuator'.
- Ⓑ Mount the SS5R positioner onto the rotary pneumatic actuator with 4 pcs M5 screw.
- Ⓒ Connect air lines between the SS5R positioner and the rotary pneumatic actuator.
- Ⓓ Perform auto-calibration by pushing MODE button for 5 seconds.

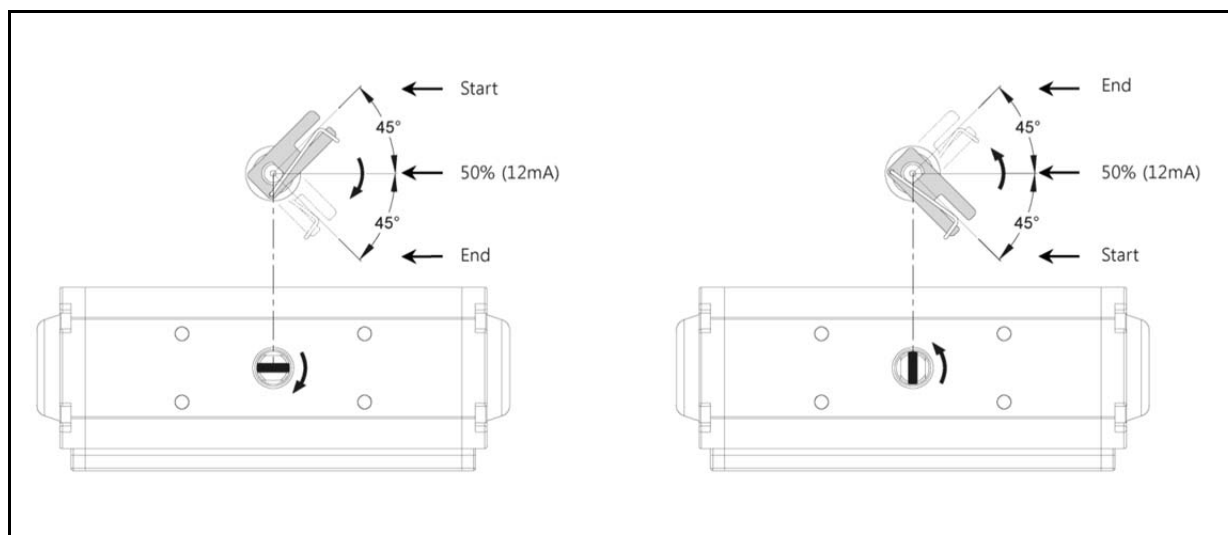


Make sure that the SS5R positioner works within the operating range indicated on the bottom. See the below pictures. Otherwise, the error message of 'MONT' appears on LCD and the auto-calibration process fails.



	
<Indicator position at 0% (or 100%)>	<Indicator position at 100% (0%)>

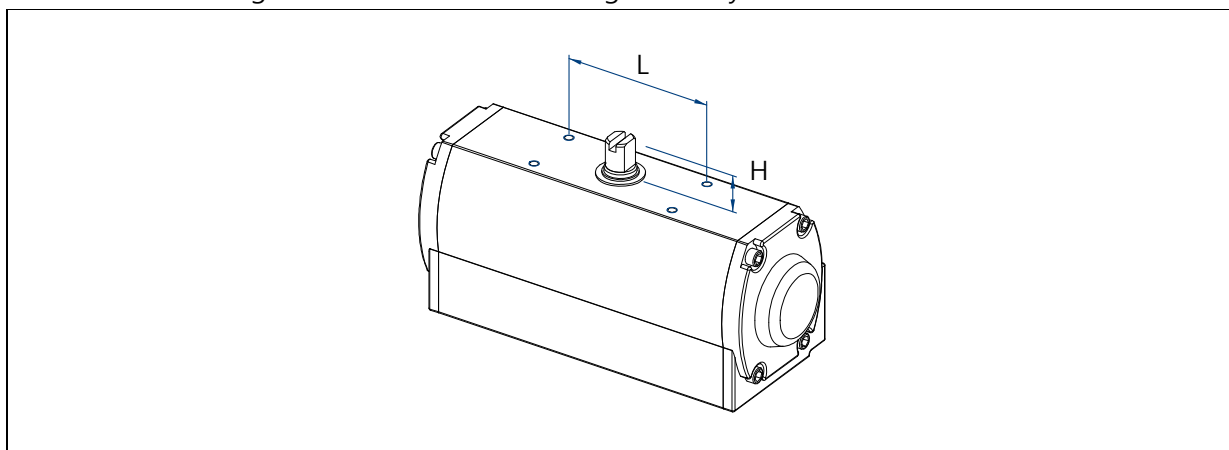
7.2.3. Position of Fork Lever



Clockwise movement

Counter-clockwise Movement

7.2.4. Re-assembling Multi-size Bracket according to Rotary Actuator



L (mm)	H (mm)	
80	20	
80	30	
80	50	

L (mm)	H (mm)	
130	20	
130	30	
130	50	



Check L and H on the actuator and re-assemble the multi-size bracket to fit your actuator mounting configuration.

8. Air Connections



- ① Be sure to install the air filter regulator before the positioner.
- ② Supply air should not contain water, oil or moisture.
- ③ It is recommended to set a supply air pressure 10% higher than the actual operating pressure of the actuator.

8.1. SS5L (linear type)

Direct Acting (DA)		Reverse Acting (RA)	
<p>DA 1</p> <p>As the input signal increases, Valve stem moves downwards</p> <p>Actuator : DA</p>	<p>OUT2 must be plugged</p>	<p>RA 1</p> <p>As the input signal increases, Valve stem moves upwards</p> <p>Actuator : RA</p>	<p>OUT2 must be plugged</p>
<p>DA 2</p> <p>As the input signal increases, Valve stem moves downwards</p> <p>Actuator : DA</p>	<p>OUT1 must be plugged</p>	<p>RA 2</p> <p>As the input signal increases, Valve stem moves upwards</p> <p>Actuator : RA</p>	<p>OUT1 must be plugged</p>
<p>DA 3</p> <p>As the input signal increases, Valve stem moves downwards</p>		<p>RA 3</p> <p>As the input signal increases, Valve stem moves upwards</p>	

8.2. SS5R (rotary type)

Spring Return	Double Acting	Double Acting
<p>Actuator : RA</p> <p>OUT2 must be plugged</p>	<p>Actuator : RA</p>	<p>Actuator : DA</p>
As the input signal increases, Actuator shaft rotates counter-clockwise	As the input signal increases, Actuator shaft rotates counter-clockwise	As the input signal increases, Actuator shaft rotates clockwise

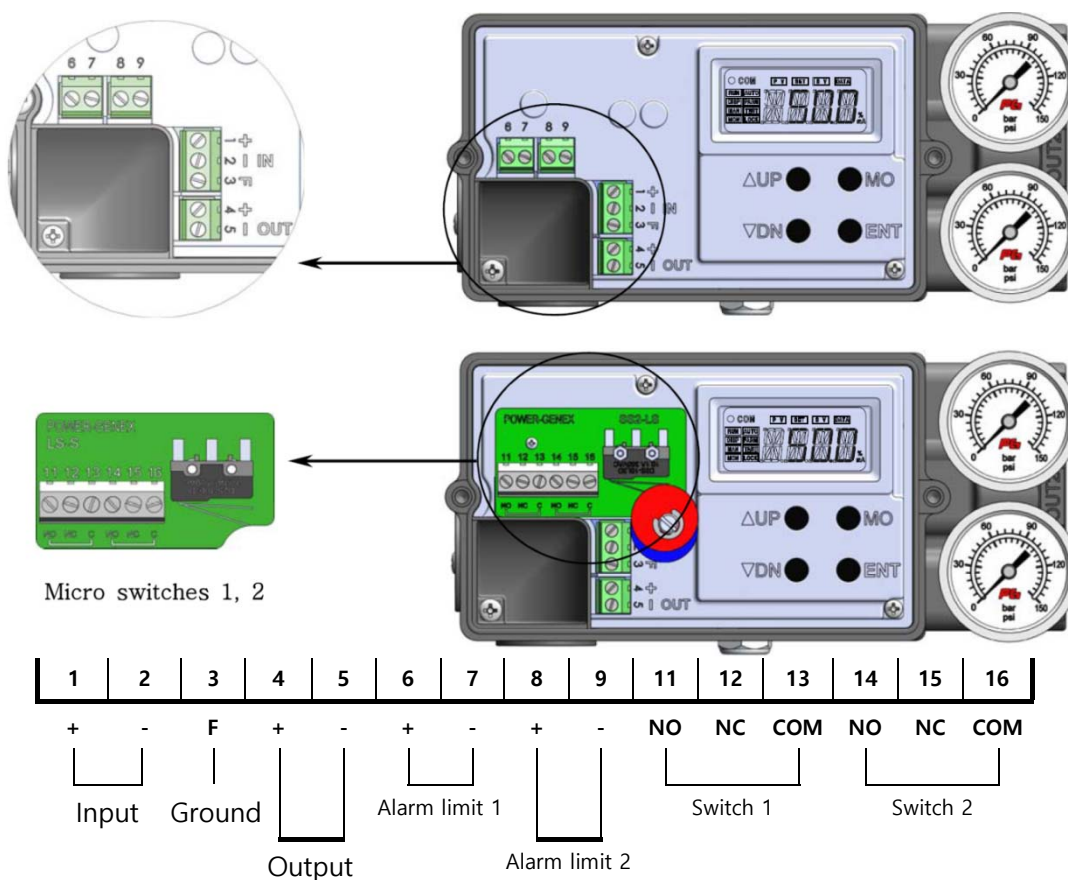
	Spring Return	Double Acting
Reverse Acting	Out 1 : piped, Out2 : plugged	Out 1 : piped to Actuator port A, Out2 : piped to Actuator port B
Direct Acting	Out1 : plugged, Out2 : piped	Out 1 : piped to Actuator port B, Out2 : piped to Actuator port A

9. Electrical Connections



- ① Be sure to supply the rated voltage and current stated on this manual. Otherwise, it may cause a serious damage or malfunctions.
- ② Check polarity of + and – exactly and connect wires.
- ③ When it is necessary to open the positioner cover at a humid place, more attention is required. It may cause a serious damage or malfunctions.

9.1. Terminal Block



1	+	4-20mA input signal
2	-	4-20mA input signal
3		Ground
4	+	4-20mA output signal
5	-	4-20mA output signal
6	+	Alarm limit 1
7	-	Alarm limit 1
8	+	Alarm limit 2

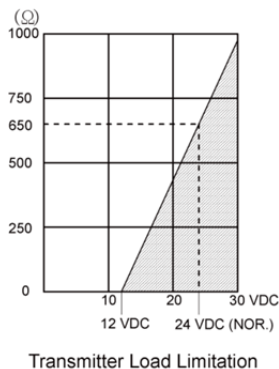
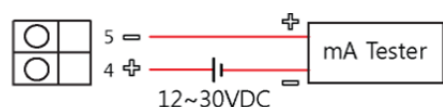
9	-	Alarm limit 2
11		Switch 1 NO
12		Switch 1 NC
13		Switch 1 COM
14		Switch 2 NO
15		Switch 2 NC
16		Switch 2 COM

9.2. Measuring Output Signal

9.2.1. With mA loop calibrator



9.2.2. With multi-meter

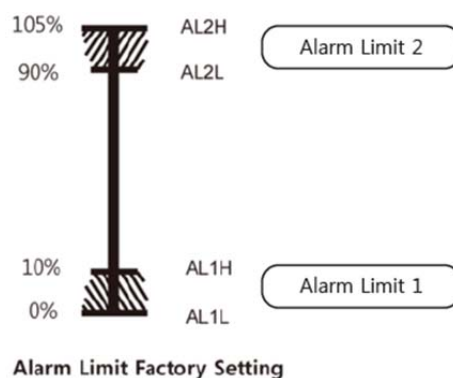
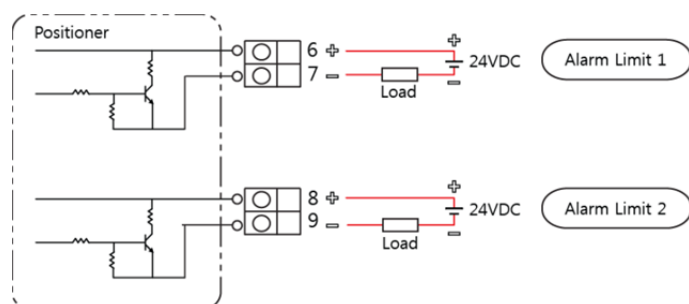


Position Transmitter Specifications	
Output signal	4 – 20mA, 2-wire
Power supply	12 – 30 VDC
Output current limit	30mA DC
Linearity	±0.75% F.S
Operating temperature	-20 ~ +80°C



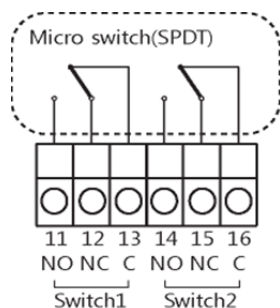
Zero and span of position feedback (4-20mA output signal) are set automatically during auto-calibration process.

9.3. Wiring Alarm Limits



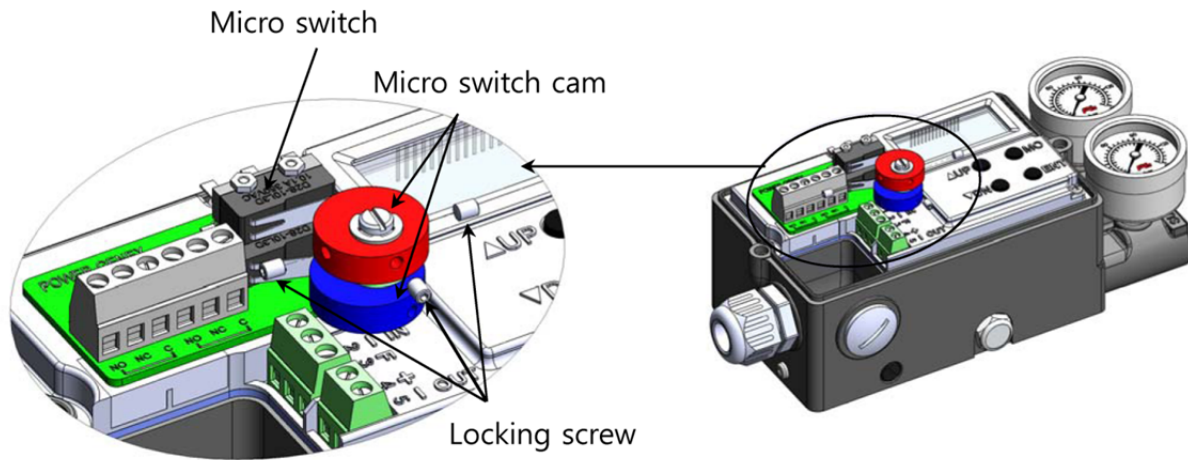
24VDC should be supplied for alarm limits.

9.4. Wiring SPDT Micro Switches



Micro Switch Specifications	
Type	SPDT
Rating code	10.1A @ 250 VAC
Operating temperature	-25 ~ +85°C

9.5. Setting Micro Switches

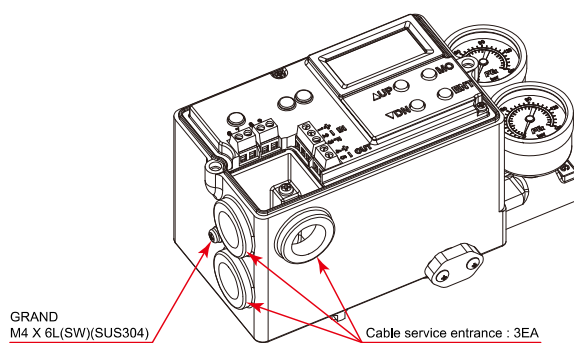


After auto-calibration process, turn the micro switch cams clockwise slowly and check the contact points.

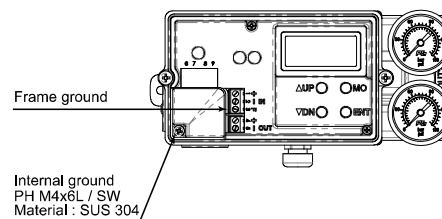
After checking the contact points of the micro switches at a desired position, fix with screws.

For reference, upper switch 1: No. 11, 12, 13
lower switch 2: No. 14, 15, 16

9.6. Earthing



< External Ground >

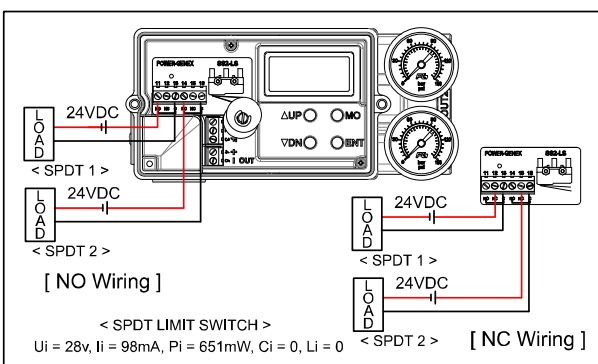
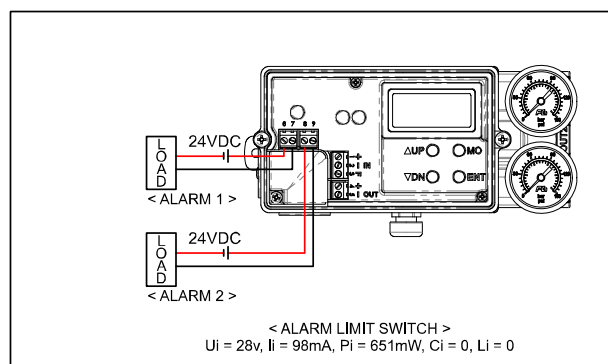
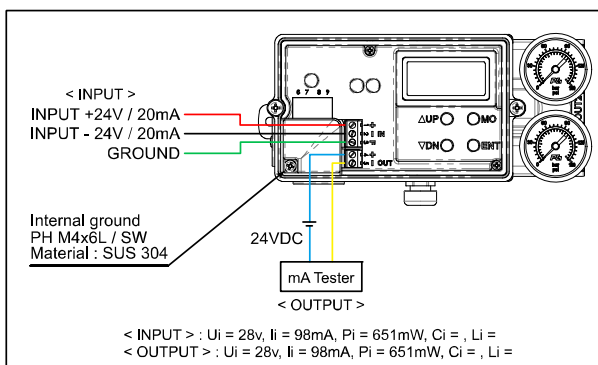
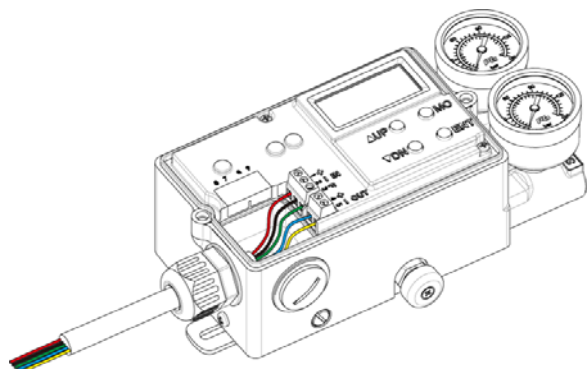


< Internal Ground >

9.7. Wiring for Intrinsic Safety



The SS5L / SS5R positioner is designed to meet the intrinsic safety standards of IEC/EN 60079-0, IEC/EN 60079-11, EN 13463-1, EN 13463-5. But the SS5L / SS5R positioner can be affected by the electrical or magnetic energy from other electric products. So please make a note of the instructions below.



Input signal : 4~20mA@ 24VDC 2wire [red(+), black(-)]

Frame Ground : Green

Output signal: 24VDC 2wire [blue(+), yellow(-)]

2 x Alarm limit switch : 24VDC

2 x SPDT limit switch : 24VDC

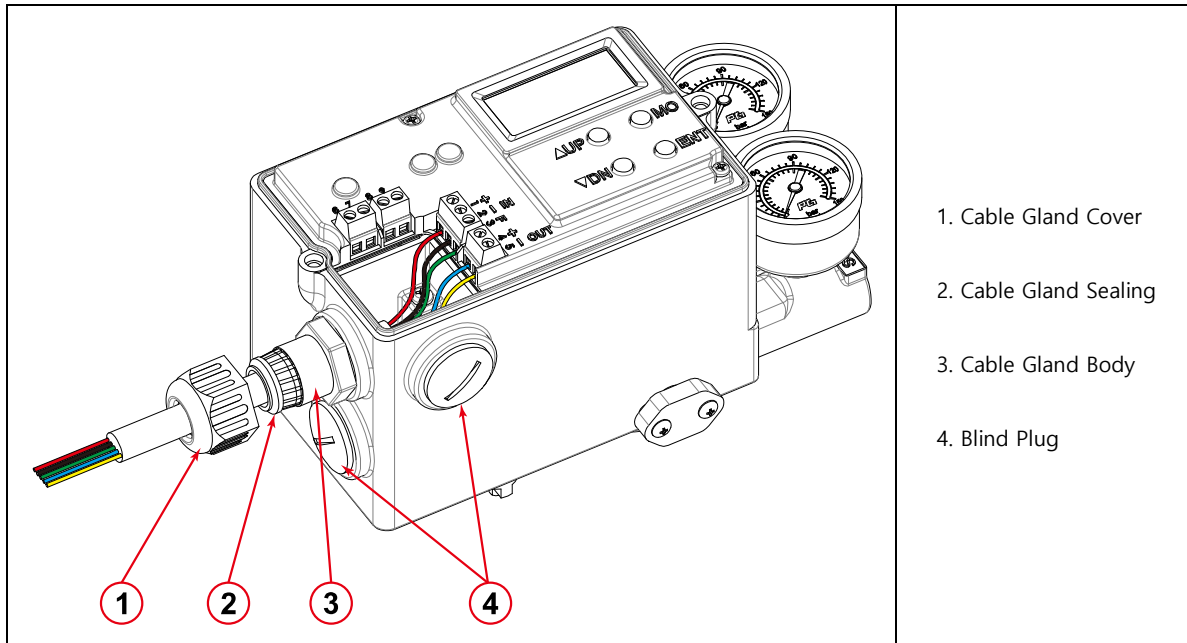
1. Distinguish the intrinsic safety circuit and the non-intrinsic safety circuit, and separate the intrinsic safety circuit from other electrical circuit.
2. Install the proper safety device to block the static or electromagnetism.
3. If possible, minimize inductance and capacitance of wires. If the operating conditions are specified, try to keep inductance and capacitance as low as possible.
4. Protect wires from the external damage.
5. Ground in order to meet the operating regulations of the installation area.



- 1) The electronic card and the internal coils can be damaged in case of the input signals improper to the specifications of the SS5L / SS5R positioner.
- 2) The SS5L / SS5R positioner doesn't work in case of a wrong connection of '+' and '-'. Be sure to check the proper terminals before connection.
- 3) Ground internally and externally, if possible.
- 4) Try to keep the intrinsic safety parameters of the SS5L / SS5R positioner as low as possible. (U_i , I_i , C_i , L_i)
- 5) Be sure to install the safety barrier between the SS5L / SS5R positioner and a power supply source.

9.8. Cable Gland / Blind Plug

9.8.1. Cable Gland



1. The cable gland is installed as above before delivery. Change the positions of the cable gland and the blind plug for installation on other side.
2. Turn the cover of the cable gland counter-clockwise to open, and insert wires.
3. Connect wires to terminals and tighten the cable gland.



- 1) Use the cable with diameter of Max. Ø 12.5 to Min. Ø 9.
- 2) Be sure to disconnect a power supply before the above process.

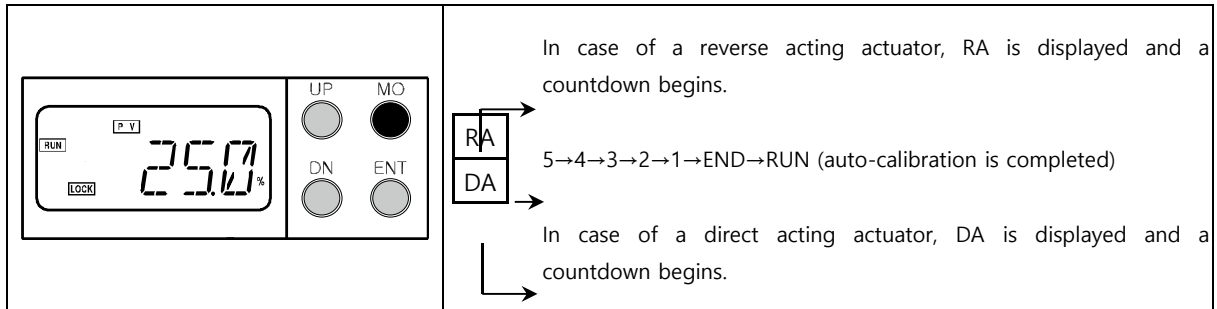
9.8.2. Blind Plug

1. Use the blind plug for the cable entry not used.
2. Install or dis-install the blind plug with the "–" screw driver.

10. Quick Auto-Calibration

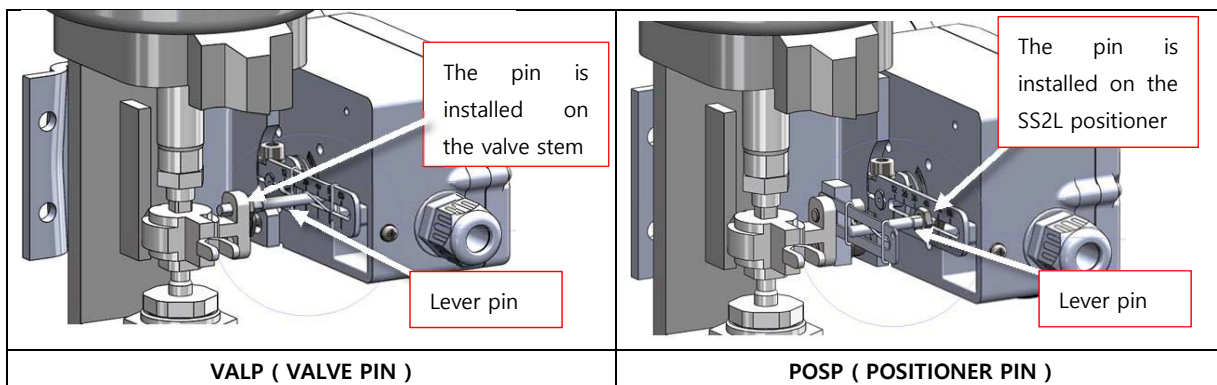
10.1. Quick Auto-Calibration

Supply 4-20mA input signal and push the MODE button for 5 seconds, the auto-calibration process will start.



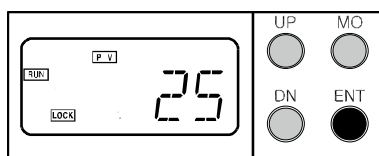
- ① It may take a longer time according to sizes of the control valve and the actuator. Generally, it will take 2 – 3 minutes with the standard size valve and actuator.
- ② If "MONT" is shown with the linear type SS2L positioner during an auto-calibration process, please make sure that the feedback lever is positioned horizontally at 50% open or close (See 11.4.6). Otherwise, please mount the SS2L positioner again.

- In case of the linear type SS2L positioner, "VALP / POSP" is shown as below. Please choose either VALP or POSP within 6 seconds by pushing the UP/DN button. Otherwise, "VALP" is set as standard.



Note that if there is a difference between a selection of "VALP" or "POSP" and an actual installation of pin, it may cause a poor linearity.

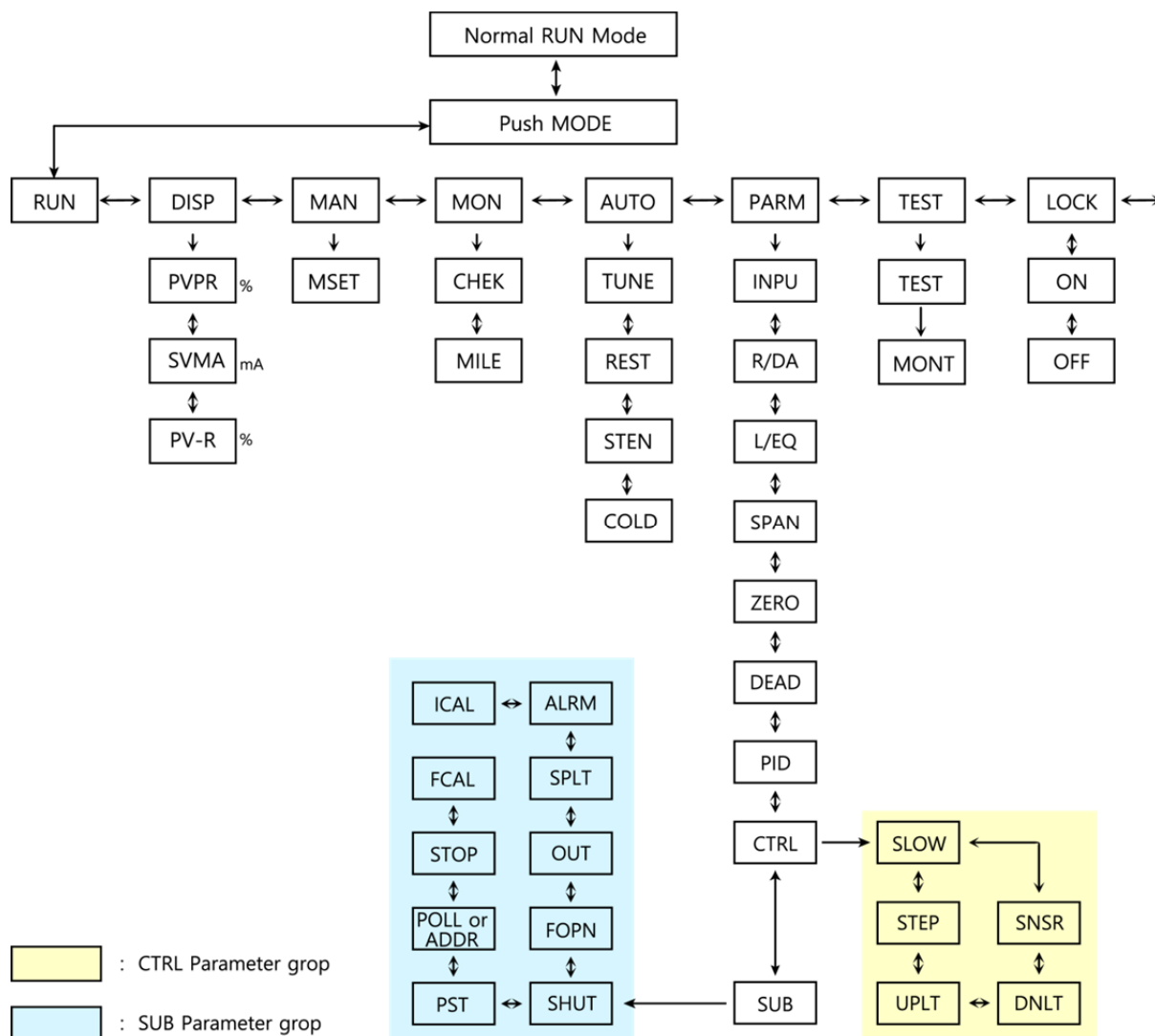
10.2. Checking the Ambient Temperature



Keep pushing ENTER button, an ambient temperature surrounding the positioned will appear. Note that this ambient temperature appears only while pushing ENTER button.

11. Description of Parameters Flow

11.1. Parameters Flow Diagram



11.2. Main Parameters

Ref.	Parameter	Description	Function
11.4.2	DISP	DISPLAY	changes the LCD display mode
	PVPR	PV % value	shows the current position by %
	SVMA	Input signal mA value	shows the input signal by mA
	PV-R	PV % value (reversed value)	shows the current position by % in a reverse way (Ex. PVPR – 10% → PV-R – 90%)

Ref.	Parameter	Description	Function
11.4.3	MAN	MANUAL	operates the valve manually
	MSET	MANUAL-SET	operates the valve manually

Ref.	Parameter	Description	Function
11.4.4	MON	MONITOR	checks the current status of the positioner
	CHEK	ERROR CHEK	checks the errors occurred to the positioner
	MILE	Runtime	checks the total valve runtime

Ref.	Parameter	Description	Function
11.4.5	AUTO	AUTO-SET	performs auto-calibration and return to the factory settings
	TUNE	Auto-calibration	performs auto-calibration
	REST	RESET	returns to the factory settings
	STEN	START - END	re-sets the position of Zero and Span
	COLD	COLD START	re-boots the positioner

Ref.	Parameter	Description	Function
11.4.6	PARM	Sub-parameters	Please see the parameters on next page

Ref.	Parameter	Description	Function
11.4.7	TEST	TEST MODE	tests the positioner
	MONT	Checking of mounting status	confirms the mounting status of the positioner

11.3. Parameters

11.3.1. Main Parameters

Ref.	Parameter	Description	Function	Default
11.5.1	INPU	Input signal	4...20mA or 20...4mA	4...20mA
11.5.2	R / DA	RA / DA	Reverse acting or direct acting	RA
11.5.3	L / E.Q	Characteristic	Linear, E.Q. % (1:25 or 1:50), Quick open or User set (17points)	Linear
11.5.4	SPAN	Span adjustment	0...100%	100%
11.5.5	ZERO	Zero adjustment	0...99%	0%
11.5.6	PID	P-GN / I-GN / D-GN		Auto-set
11.5.7	CTRL	Control paraeters	See 11.3.2 CTRL	•
11.5.8	DEAD	Signal dead band	0...9.99%	0.0%
11.5.11	SUB	Sub-Parameters	See 11.3.3 SUB	•

11.3.2. CTRL - Parameters

Ref.	Parameter	Description	Function	Default
11.5.7.A	SLOW	SLOW CONTROL		OFF
11.5.7.B	STEP	150 – 800	SWITCHING TIME	AUTO
11.5.7.C	UPLT(CCW)	0 – 100	UP(CCW) LIMIT	AUTO
11.5.7.D	DNLT(CW)	0 – 100	DONW(CCW) LIMIT	AUTO
11.5.7.E	SNSR		EXPA / POSP / VALP / NONE	EXPA

11.3.3. SUB - Parameter

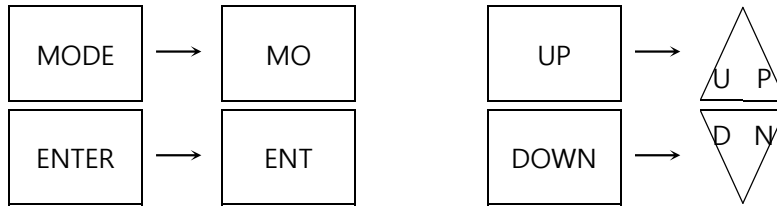
Ref.	Parameter	Description	Function	Default
11.5.9.A	SHUT	Shut-off	0...9.9%	0.3%
11.5.9.B	FOPN	Full-open	0...9.9%	0.3%
11.5.9.C	OUT	Output signal	4...20mA or 20...4mA	4...20mA
11.5.9.D	SPLT	Split range	4...12mA or 12...20mA	4...20mA
11.5.9.E	STOP	ON/OFF	FREEZE TEST	OFF
11.5.9.F	ALAM	Alarm limit low, high	AL1L / AL1H, AL2L / AL2H	0...10%, 90...105%
11.5.9.G	ICAL	IN4M / IN20	sets the values in accordance with 4~20mA input signals	Factory setting
11.5.9.H	FCAL	FB4M / FB20	sets the values in accordance with 4~20mA output signals	Factory setting
11.5.9.I	POLL	HART polling address	0...15	0
11.5.9.J	PST	Partial stroke testing	checks a valve status	OFF
11.5.9.K	ADDR	PROFIBUS address	0...125	126



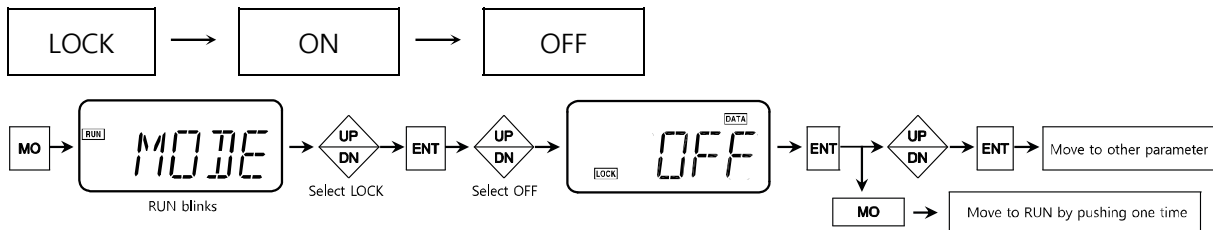
Note that the PST function (Partial Stroke Testing) is loaded at the factory on demand only when requested.

11.4. Setting of Main Parameters

The following abbreviations will be used hereafter.

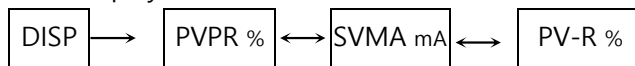


11.4.1. LOCK ON / OFF

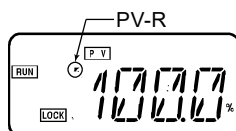
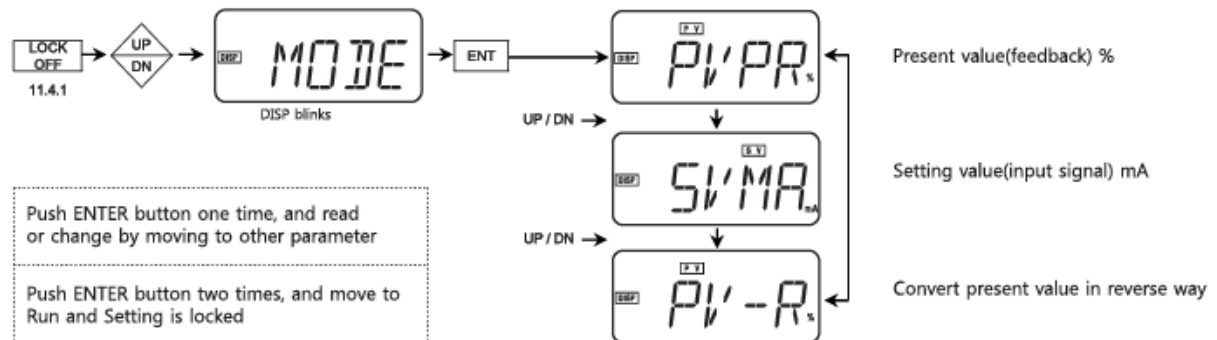


- ① LOCK ON : Saves all setting values.
- ② LOCK OFF : Be sure to LOCK OFF when it is necessary to read or change the selected parameters and the saved setting values.
- ③ Quick auto-calibration, Span, P-Gain can be carried out without LOCK Off (see "10. Quick Auto-calibration")

11.4.2. Display Mode



Selection of mA, % or in reverse way with values as shown

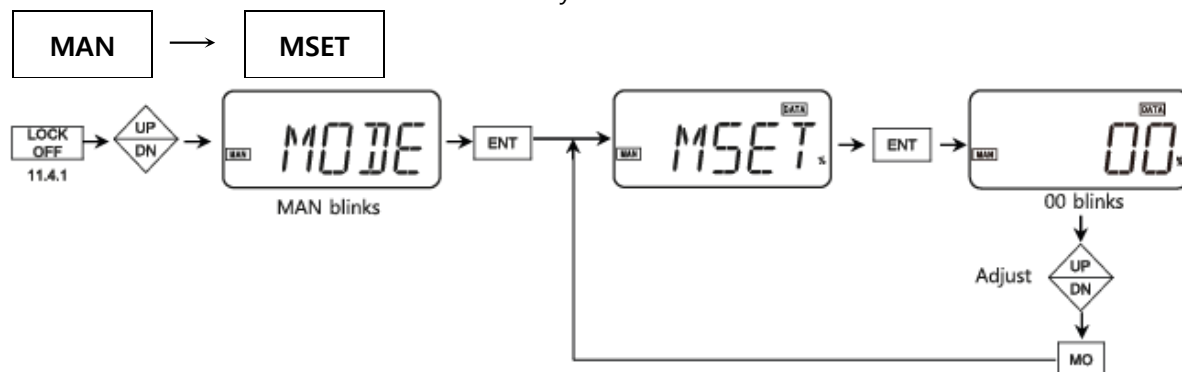


If PV-R is selected, the small point will blink as shown to the left.

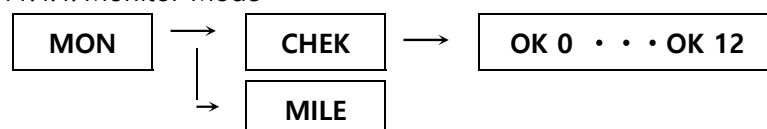
Present value(PV) or setting value(SV) is displayed with mA or %. Setting value stands for input signal. If a control valve is a direct acting type and it is necessary to see the feedback values in a reverse way, select PV-R.

11.4.3. Manual Mode (default: 0)

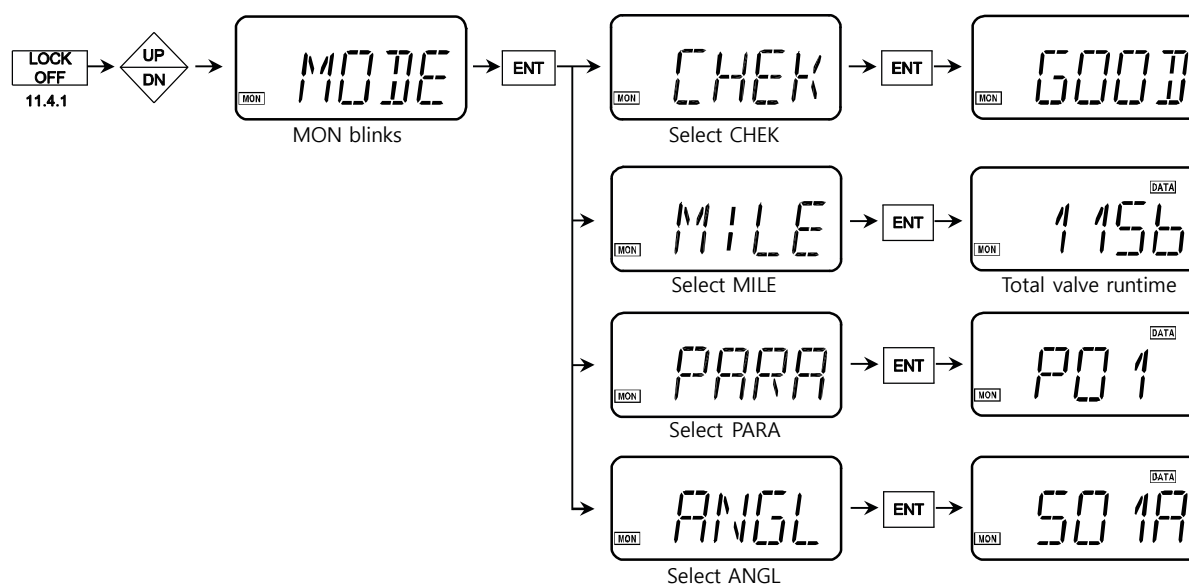
The valve can be moved to 0 – 100% manually.



11.4.4. Monitor Mode



You can check the error codes and a total valve runtime.



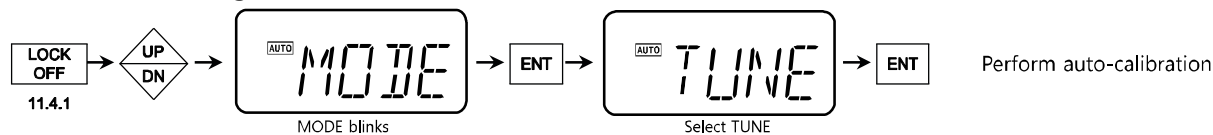
Number 1 in MILE corresponds to 10 hour. For example, if 1156 appears, it means that this valve has been working for 11,560 hours.

11.4.5. Auto-Calibration Mode



If necessary, initialize all setting values to the original values set after auto-calibration or return them to the factory setting values.

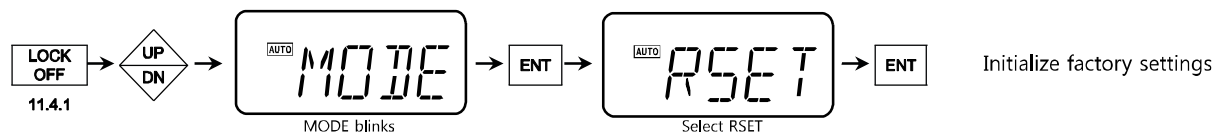
11.4.5.A. Performing Auto-Calibration



- ① Reverse acting (RA) is a standard factory setting. Even if air lines are connected wrongly by mistake, the SS2 positioner detects automatically and performs auto-calibration for direct acting (DA).
- ② If the actuator doesn't work with 4-20mA input signal properly, change air lines of OUT1 and OUT2 with each other and perform auto-calibration again.
- ③ For a reverse acting type (RA), a countdown will begin like RA-5-4-3-2-1-END.
For a direct acting type (DA), a countdown will begin like 5-RA-DA-4-3-2-1-END.

11.4.5.B. Initializing Setting Values (RESET)

All setting values return to the standard factory setting values.



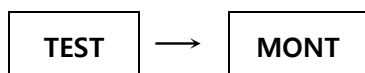
11.4.5.C. Re-adjustment of Zero & Span (STEN)

Only Zero and Span is re-set without changing other values set after auto-calibration.

11.4.5.D. COLD (Re-booting)

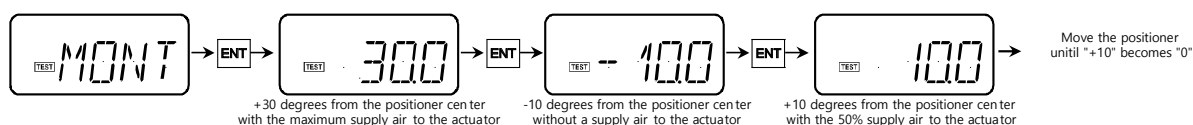
Restarts the program without changing any settings

11.4.6. Self-Test Mode



- The current valve mounting situation is shown. If the value is far away from 0, the valve will suffer from a poor linearity and hysteresis. Move the positioner and try to reach closer to 0 for the best linearity and hysteresis.

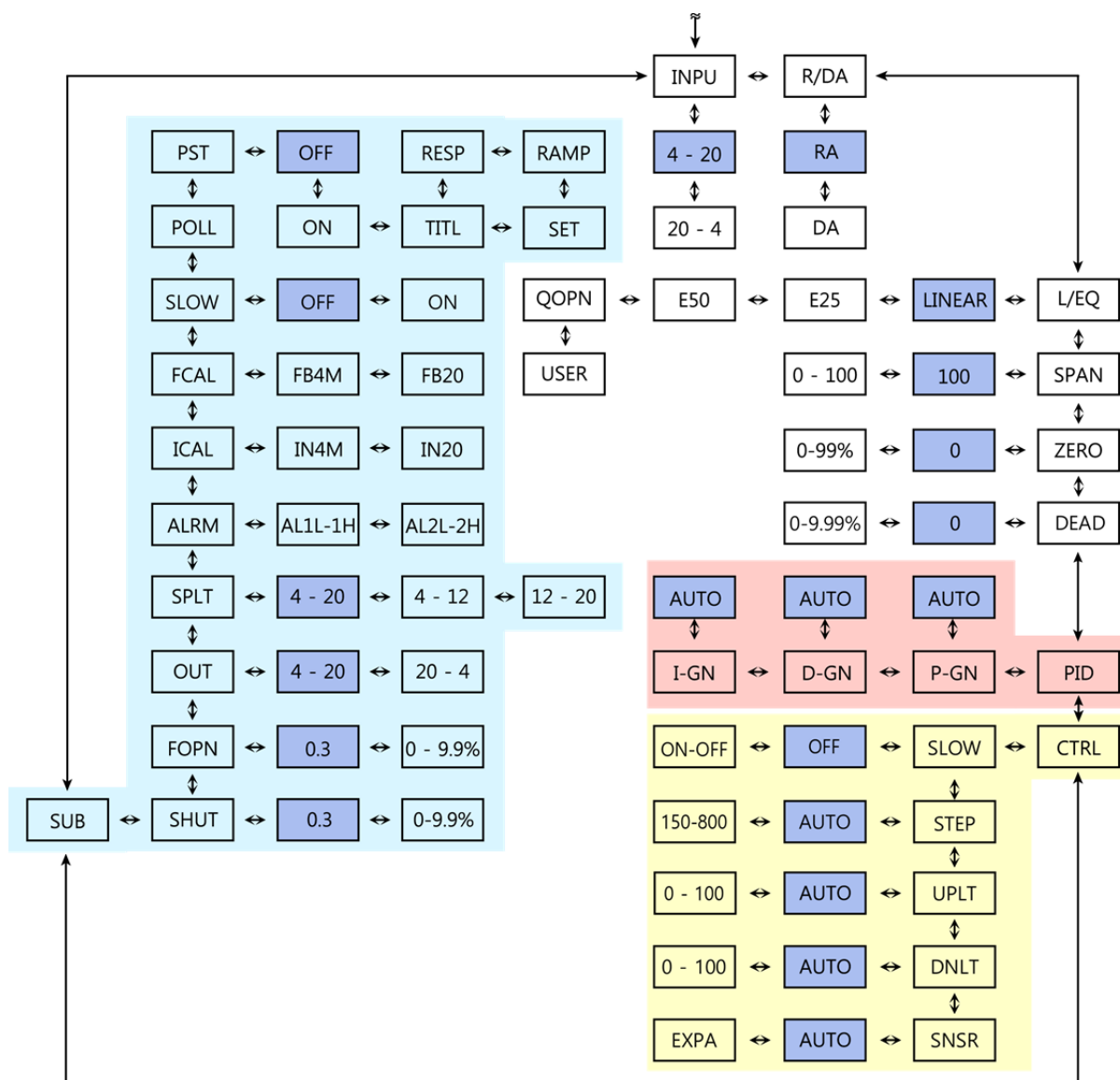
- How to set MONT



For information, on "MONT", the operating range (0~10kΩ) of the potentiometer is displayed.

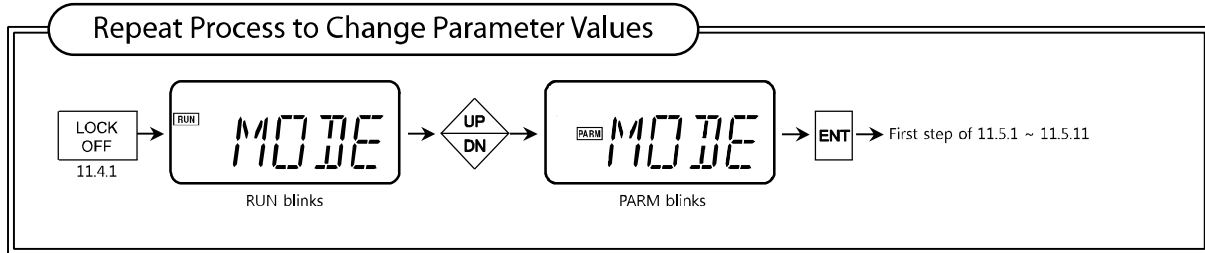
- Step 1: Select MONT and push the ENT button one time, and the valve will be fully open or closed and also the actual valve position angle will be shown.
- Step 2: Push the ENT button one time, and the valve will be fully open or closed and also the actual valve position angle will be shown.
- Step 3: Push the ENT button one time, and the actual valve middle position angle will be shown. It shows the middle position angle between two ends (fully open and closed) measured through the above procedures of Step 1 and Step 2. Move the positioner upwards or downwards so that the valve position angle can reach closer to 0. And fix the mounting bracket tightly.

11.5. Parameters Flow Diagram



The colored cells stand for the standard factory settings.

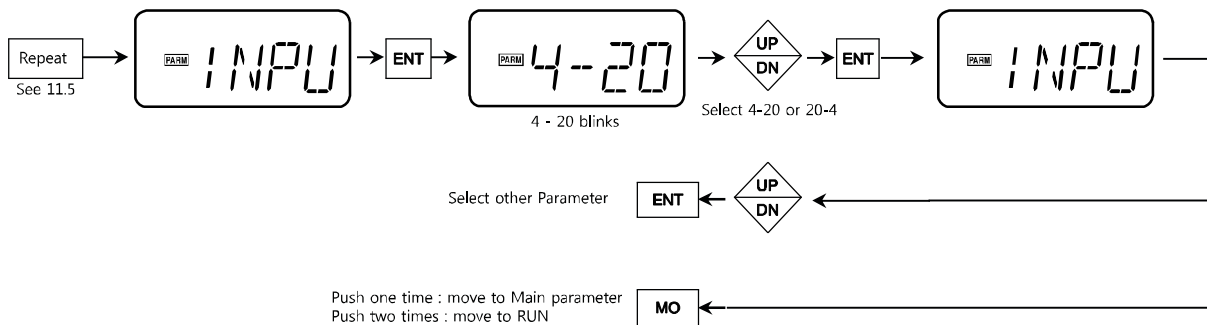
All setting values return to the standard factory settings if RESET begins.



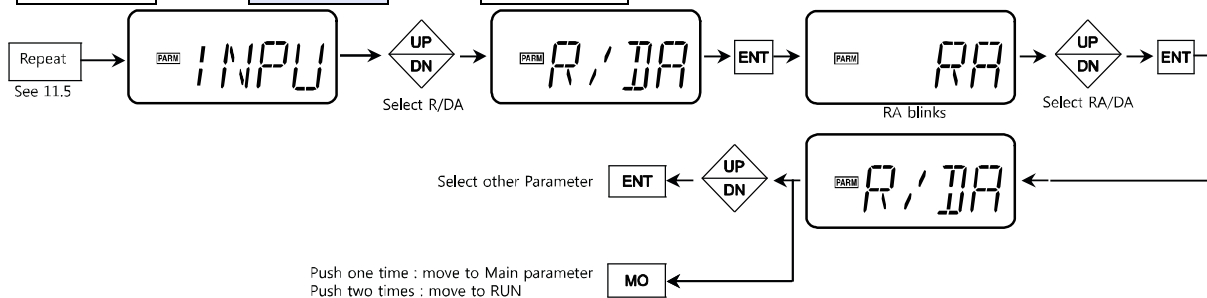
11.5.1. [INPU] Change of Input signal (default: 4-20mA)



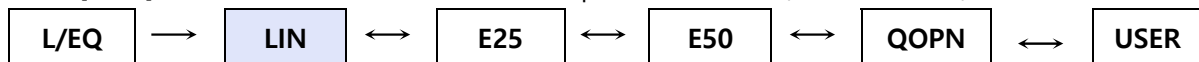
It is possible to make the positioner respond to 20-4mA input signals optionally even though 4-20mA input signals are supplied.



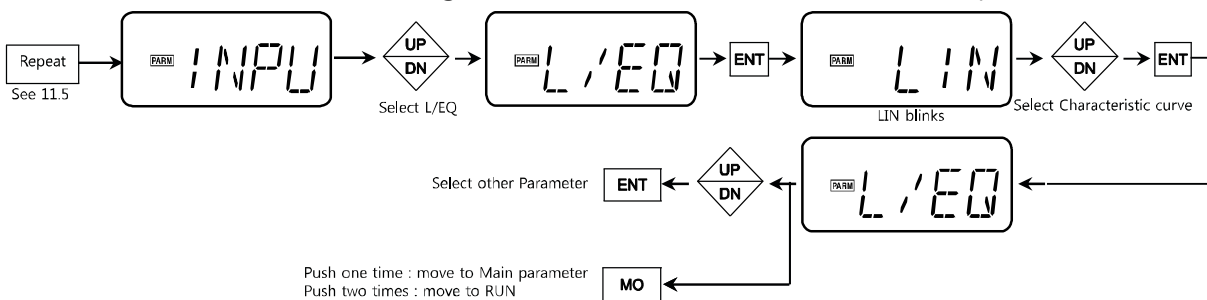
11.5.2. [R/DA] Selection of Direct Acting (DA) or Reverse Acting (RA) (default: RA)

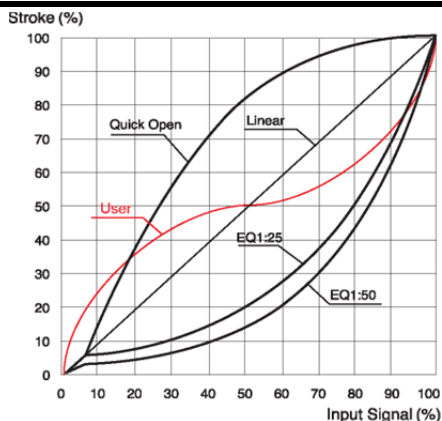


11.5.3. [L/EQ] Selection of Linear, E.Q%, Quick Open or User Set (default: Linear)



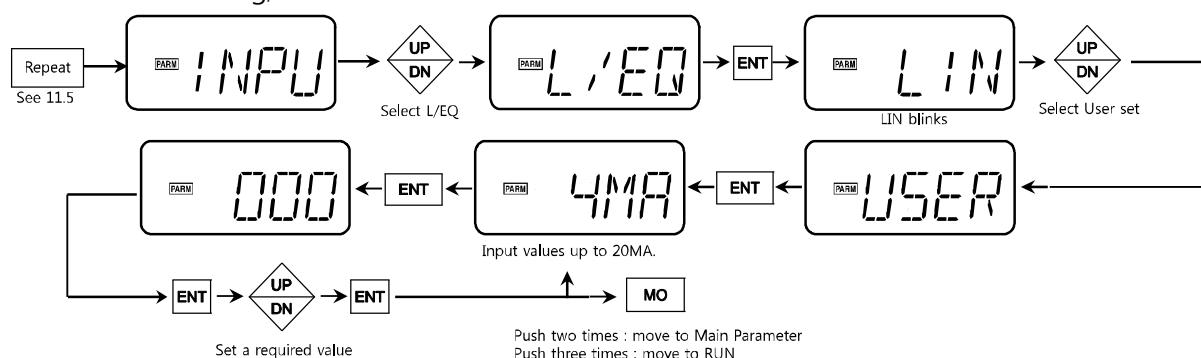
The valve characteristic can be changed to Linear, 1:25 EQ%, 1:50 EQ%, Quick Open or User Set.



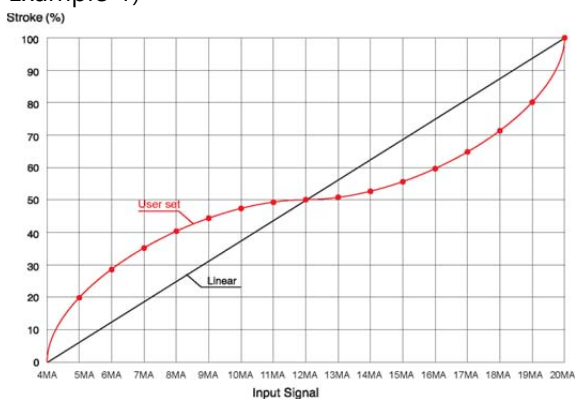


OUT LIN	Linear
PAR E25	EQ% (1 / 25)
PAR E50	EQ% (1 / 50)
OUT QOPN	Quick Open
OUT USER	User set(17point)

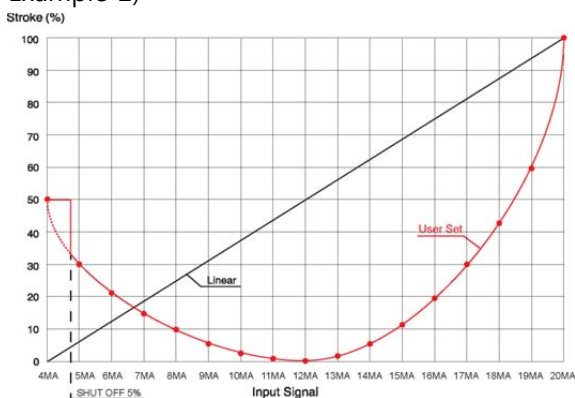
- For the user setting,



Example 1)



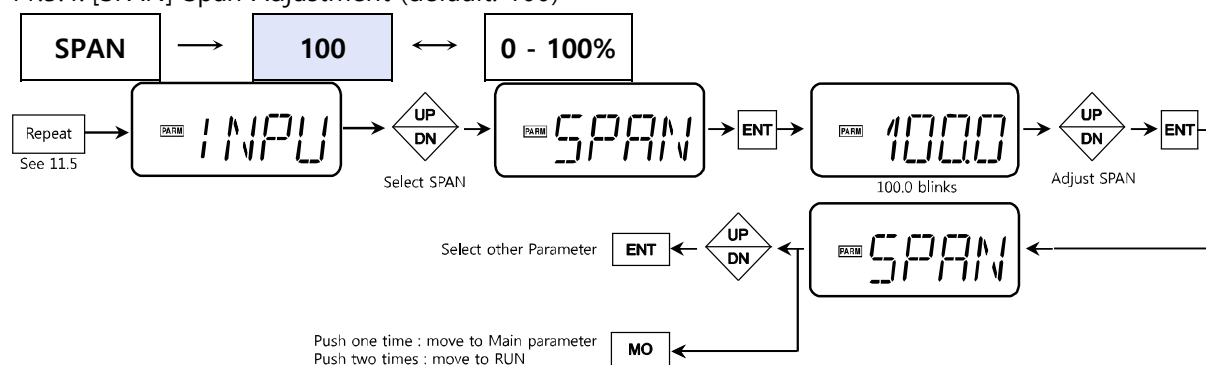
Example 2)



User Set Value			Ex-1	Ex-2
Point	Parameter	Input Signal (mA)	Valve Opening% (set value)	
1	4MA	4mA	0	50
2	5MA	5mA	20	30
3	6MA	6mA	29	20
4	7MA	7mA	35	15
5	8MA	8mA	40	10
6	9MA	9mA	45	6
7	10MA	10mA	48	4
8	11MA	11mA	49	2
9	12MA	12mA	50	0
10	13MA	13mA	51	3
11	14MA	14mA	52	7
12	15MA	15mA	55	11
13	16MA	16mA	60	20
14	17MA	17mA	65	30
15	18MA	18mA	71	43
16	19MA	19mA	80	60
17	20MA	20mA	100	100

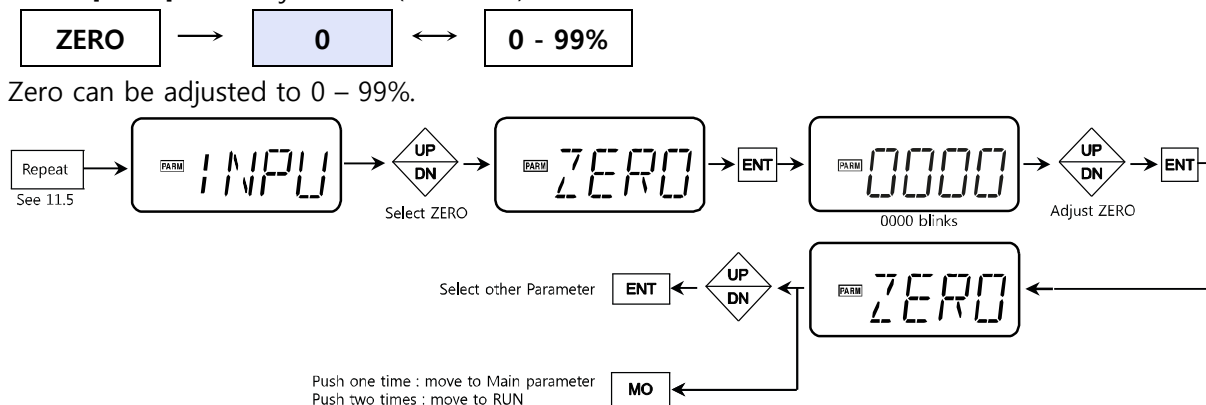
NOTES
<p>1. This user setting has a linear characteristic as standard.</p> <p>2. 5MA means % corresponding to 5mA.</p> <p>3. Input all 4mA to 20mA for a required user set characteristic curve.</p> <p>※ If Shut Off option is set, the set value at 4mA is maintained during interval of the Shut Off setting value as shown in Example 2).</p> <p>The curve goes according the user set value after interval of the Shut Off setting value. (0.3% is the default value of Shut Off.)</p> <p>As Shut-Off is set to 5% in Example 2), the curve maintains by 50% from 4 to 4.8mA and moves forward according to the user set.</p>

11.5.4. [SPAN] Span Adjustment (default: 100)

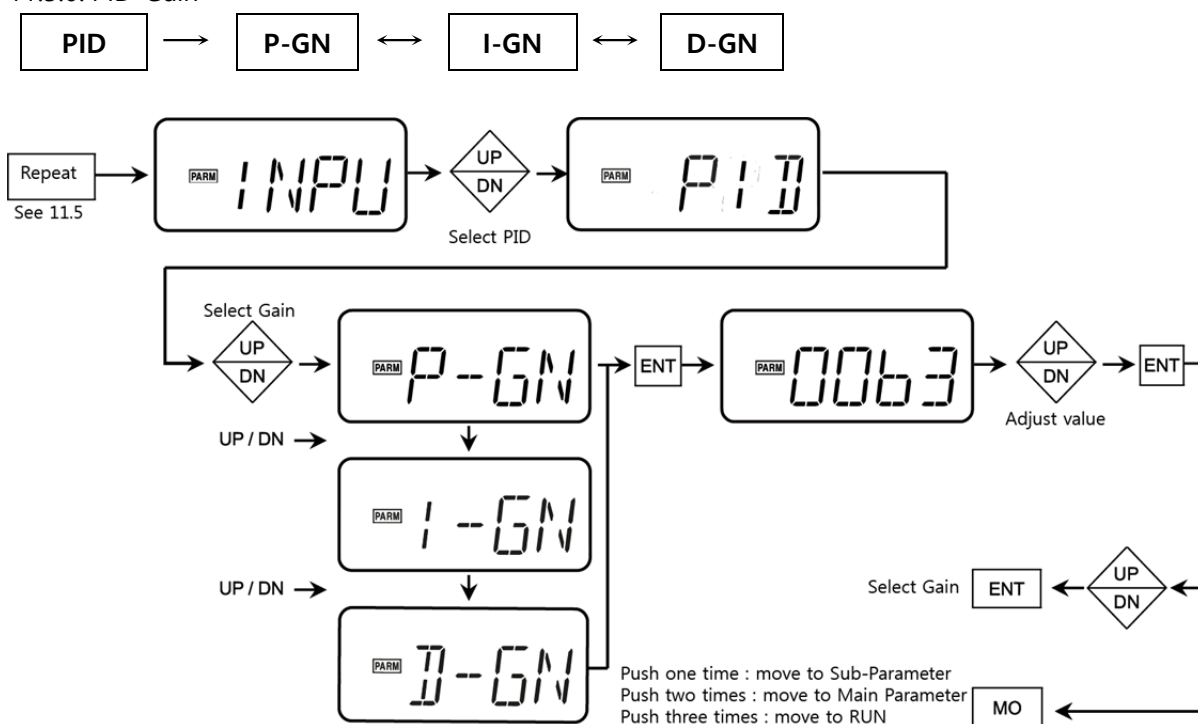


- ① Be sure to supply 20mA input signal before adjusting SPAN.
- ② Push ▼ DN button one time, Span will decrease by 0.1%. Keep pushing ▼ DN button, Span will decrease fast.
- ③ For a quick Span setting, push ▼ DN button for 5 seconds. (see 10.2)

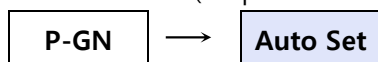
11.5.5. [ZERO] Zero Adjustment (default: 0)



11.5.6. PID-Gain

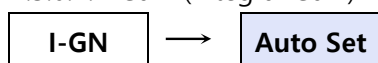


11.5.6.A. P-Gain (Proportional Gain)



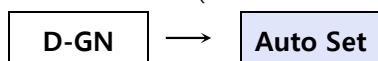
The micro-processor calculates P-Gain value during auto-calibration process in consideration of sizes of the valve and the actuator. If a hunting problem happens, decrease P-Gain value. If an oscillation problem happens, increase P-Gain value. P-Gain values are different according to the working conditions. In case of a small actuator, increase or decrease 5 to 10. In case of a big actuator, increase or decrease by 20 to 30.

11.5.6.B. I-Gain (Integral Gain)



As I-Gain is set automatically during auto-calibration process, it is not necessary to change manually.

11.5.6.C. D-Gain (Differential Gain)

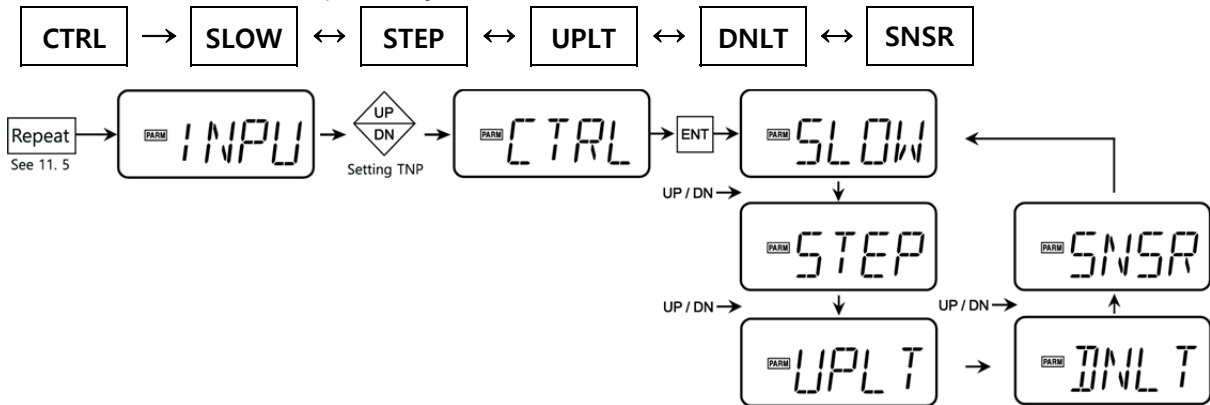


As D-Gain is set automatically during auto-calibration process, it is not necessary to change manually.

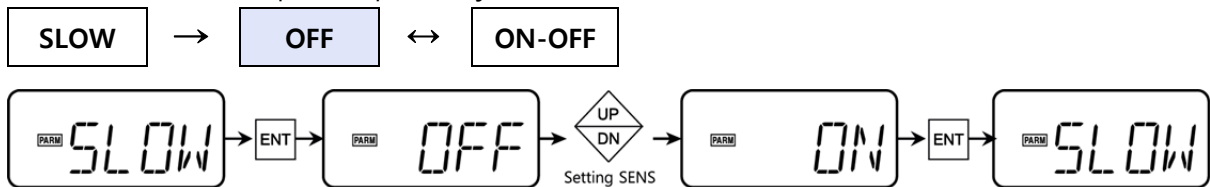


- ① Push MO button one time in order to move to ten figures or hundred figures.
- ② For a quick P-Gain setting, push UP button for 5 seconds. (see 10.3)

11.5.7. [CTRL] - Control Speed Adjustment

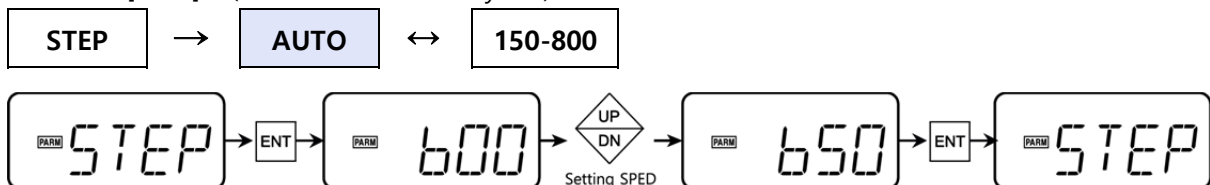


11.5.7.A. [SLOW] – Response Speed Adjustment (default: OFF)



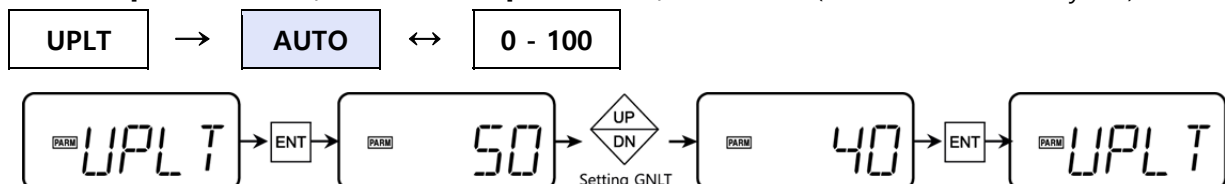
If SLOW is set to ON, the response speed is controlled by UP/DOWN LIMIT in a whole operating range. Over-shooting and under-shooting can be reduced but also the middle control speed can be reduced as well.

11.5.7.B. [STEP] - (default: automatically-set)



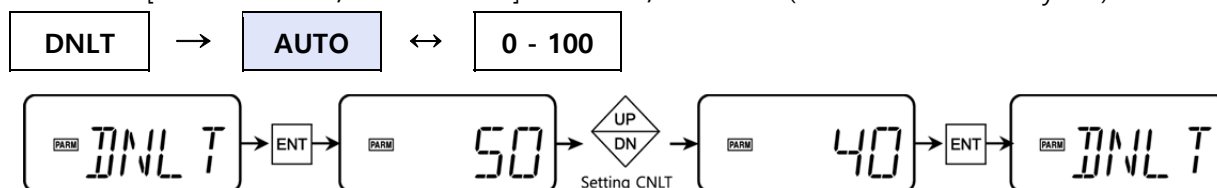
It is to adjust the switching time of COIL 1 and COIL 2. If STEP is decreased, switching of coils is done slowly and the positioner responds slowly. If STEP is increased, switching of coils is done fast and the positioner responds minutely.

11.5.7.C. [UPLT for SS5L / CCW for SS5R] – UP Limit / CCW Limit (default: automatically-set)



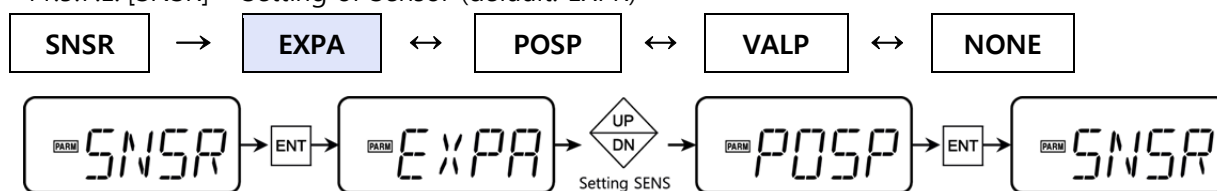
It is to adjust the increasing range while COIL 1 and COIL 2 are switched. If UPLT (CCW) is increased, the positioner moves up more. If UPLT (CCW) is decreased, the positioner moves down less.

11.5.7.D. [DNLT for SS5L / CW for SS5R] – DOWN / CW Limit (default: automatically-set)







It is to adjust the decreasing range while COIL 1 and COIL 2 are switched. If DNLT (CW) is increased, the positioner moves down more. If DNCL (CW) is decreased, the positioner moves down less.

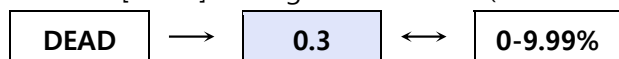
11.5.7.E. [SNSR] – Setting of Sensor (default: EXPR)



This is to change the setting of linear type feedback lever connection to the valve.

	Default		In case that the feedback pin guide lever is connected to the positioner feedback lever
	No setting change		In case that the valve stem pin is connected to the positioner feedback lever

11.5.8. [DEAD] Setting of Dead Band (default: 0.3)

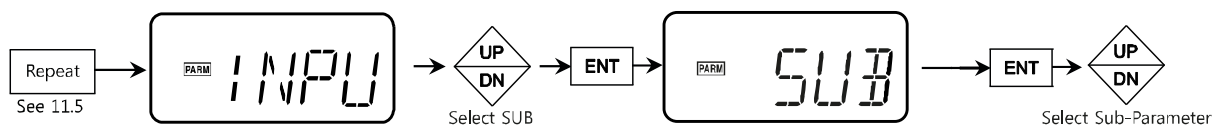


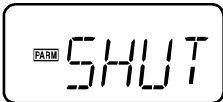




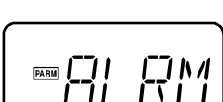

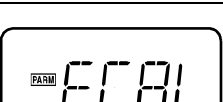
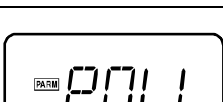
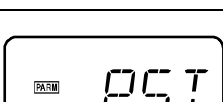
If there is a difference between Setting Value(SV) and Present Value(PV), adjust Dead Band to 0 - 9.99%.



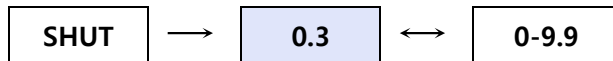
0.3% is a standard factory setting. For reference, 0.30 corresponds to 0.3% and the maximum value is 9.99 % (9.99).

11.5.9. SUB Parameter

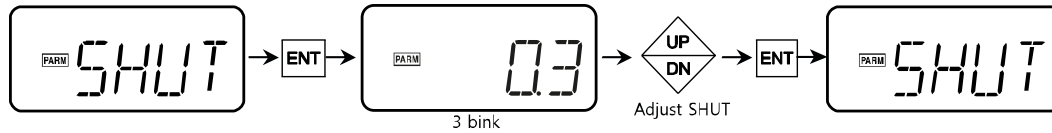


Ref.	Parameter	Description	Function	Default
11.5.9.A		Shut-off	0...9.9%	0.3%
11.5.9.B		Full-open	0...9.9%	0.3%
11.5.9.C		Output signal	4...20mA or 20...4mA	4...20mA
11.5.9.D		Split range	4...12mA or 12...20mA	4...20mA
11.5.9.E		FREEZE TEST	FREEZE Function Test	OFF
11.5.9.F		Alarm limit low, high	AL1L/AL1H, AL2L/AL2H	0...10%, 90...105%
11.5.9.G		IN4M / IN20	sets to values relating to 4-20mA input signal	Factory setting
11.5.9.H		FB4M / FB20	sets to values relating to 4-20mA output signal	Factory setting
11.5.9.I		HART polling address	0...15	0
11.5.9.J		Partial stroke testing	checks a valve status	OFF

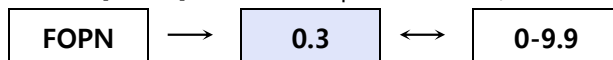
11.5.9.A. [SHUT] Valve Shut-off Control (default: 0.3)



It is a safety function to close a valve completely. And it is possible to change 0% to 9.9%. For reference, 0.1% means that the positioner responds to 0.016mA. Therefore, the standard value of 0.3% means that a valve is closed at 4.048mA completely.



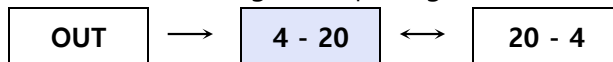
11.5.9.B. [FOPN] Valve Full Open Control (default: 0.3)



The valve can be fully open manually. And it is possible to change 0% to 9.9%. For reference, 0.1% means that the positioner responds to 0.016mA. Therefore, the standard value of 0.3% means that a valve is fully open at 19.952mA.



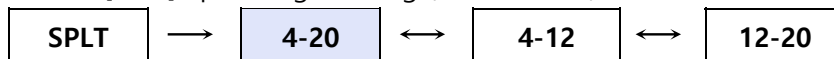
11.5.9.C. [OUT] Setting of Output Signal (default: 4 - 20mA)



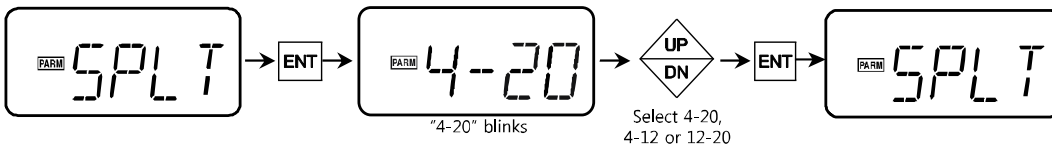
4 - 20mA is a standard factory setting. It's available to change to 20 - 4mA reversely.



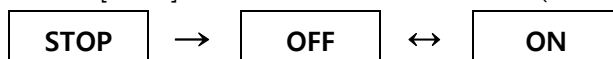
11.5.9.D. [SPLT] Split Range Setting (default: 4-20)



Split range can be set to 4-12mA or 12-20mA.

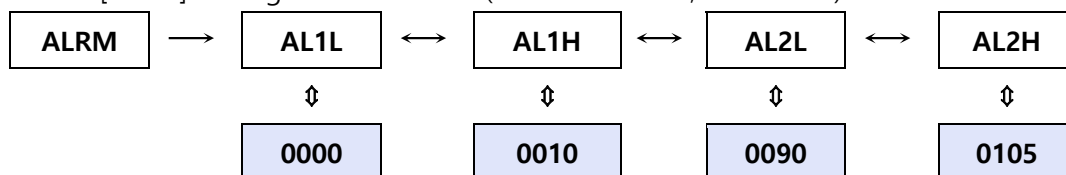


11.5.9.E. [STOP] – Fail – Freeze Function Test (default: OFF)



Fail – Freeze Function Test

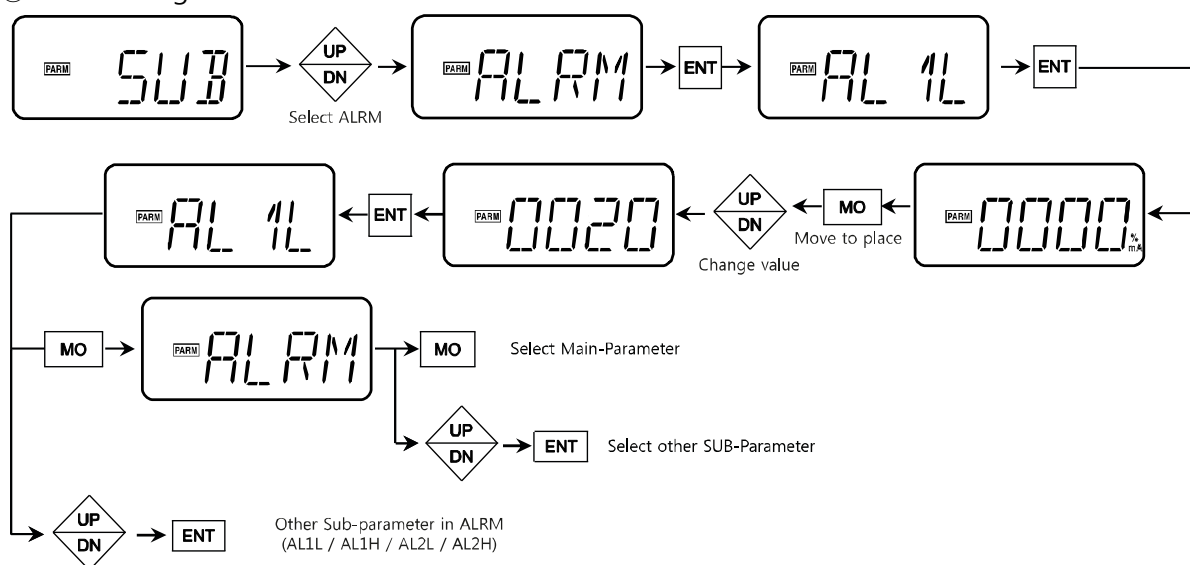
11.5.9.F. [ALRM] Setting of Alarm Limits (default: 0 – 10%, 90 – 105%)



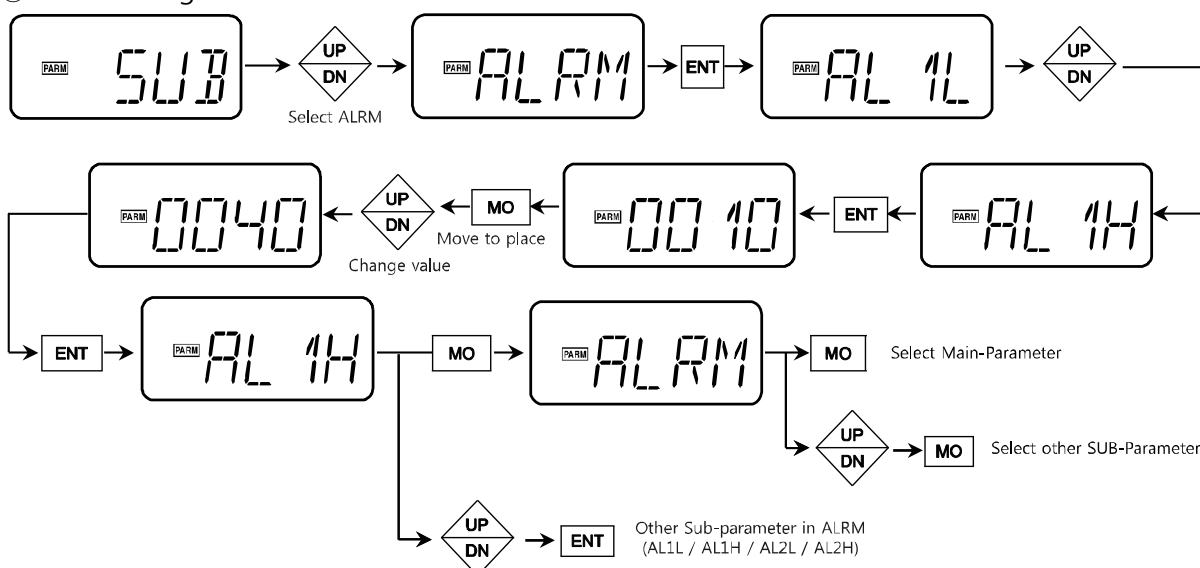
You can set an opening point or a closing point of a control valve. AL1 (L, H) is set to 0 – 10% and AL2 (L, H) is set to 90 – 105% from the factory as standard.

For example, see the below in order to re-set AL1 to 20 – 40% (AL1L = 20, AL1H = 40).

① AL1L Setting

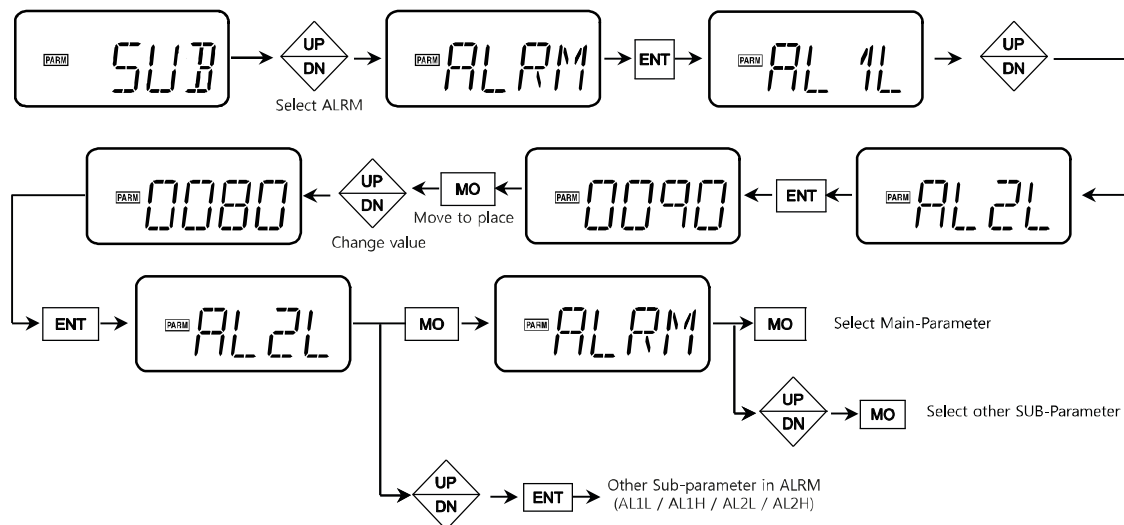


② AL1H Setting

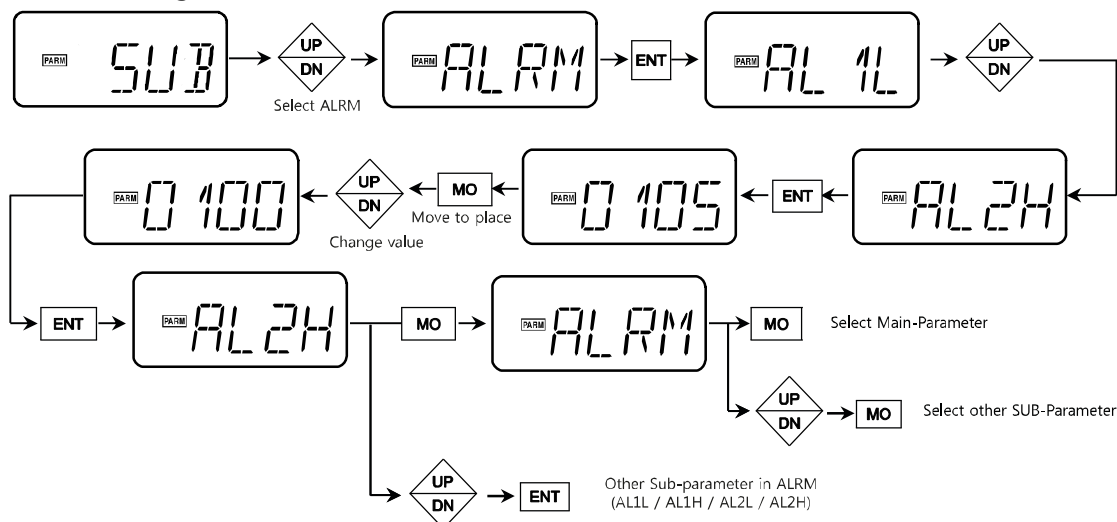


For example, see the below in order to re-set AL2 to 80 – 100%(AL2L = 80, AL2H = 100).

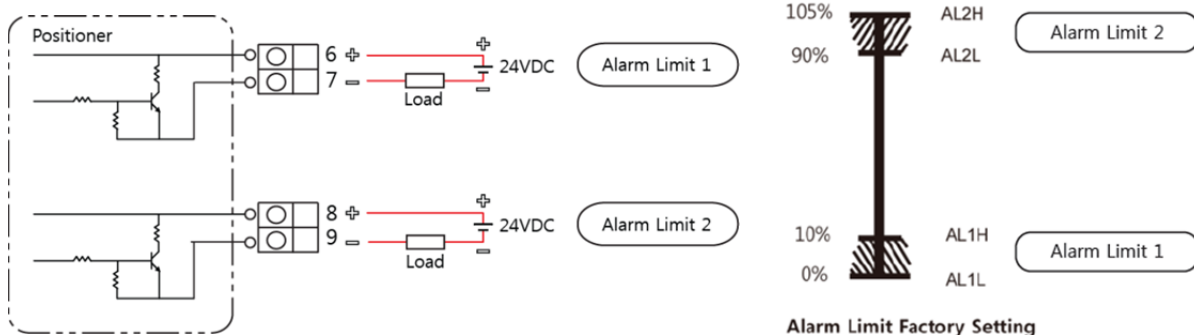
① AL2L Setting



② AL2H Setting

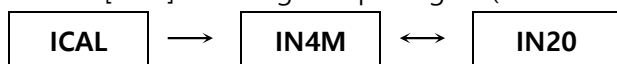


How to wire the Alarm Limits



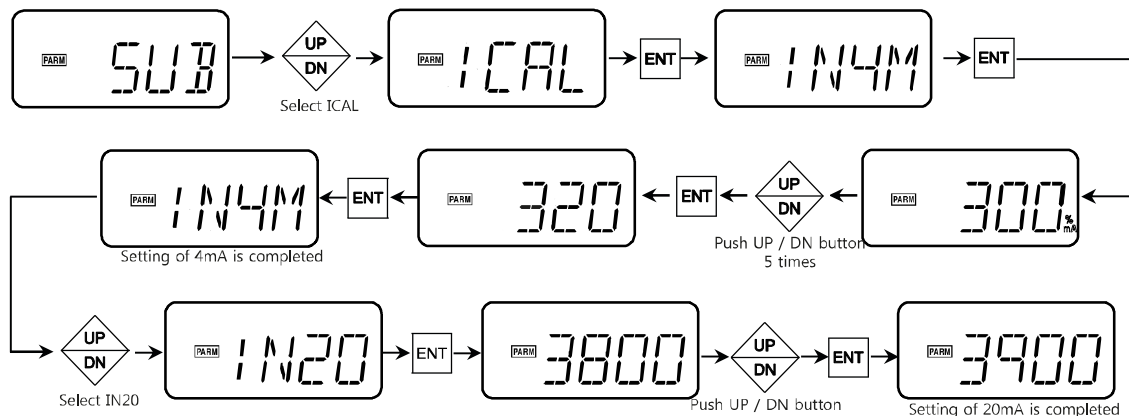
24VDC should be supplied for alarm limits.

11.5.9.G. [ICAL] – Setting of Input Signal (default: factory setting)



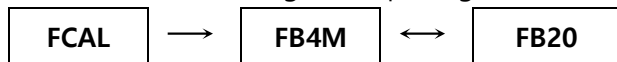
This is to match 4mA and 20mA input signals from a signal calibrator with the internal setting 0% and 100% of the positioner and save onto memory.

If 4mA output signal is measured as 4.2mA and 20mA output signal as 19.8mA with a signal calibrator on site, 4.2mA can be recognized as 0% and 19.8mA as 100% by re-setting with ICAL.



If ICAL is set at 4mA and 20mA, the middle output signals between 4mA and 20mA are set automatically. See [11.5.3 L/EQ] if it is necessary to change other characteristic curve.

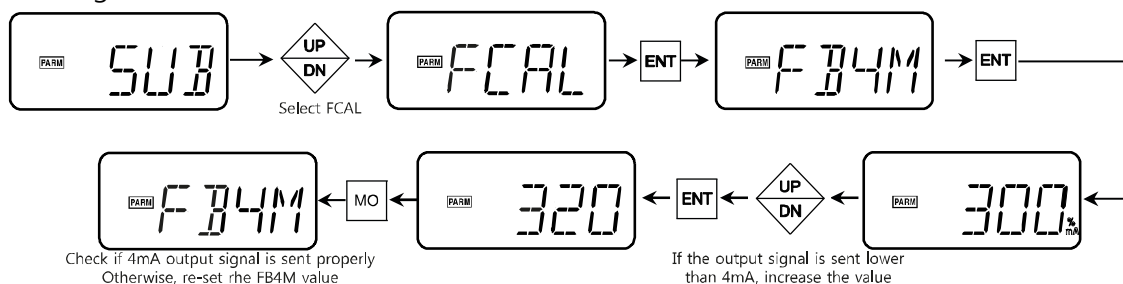
11.5.9.H. [FCAL] – Setting of Output Signal (default: factory setting)



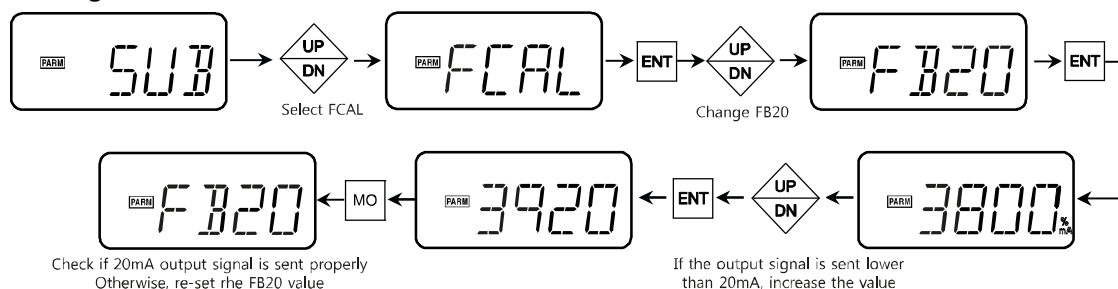
This is to re-set the 4 – 20mA output signals coming from the positioner.

The factory setting is that 4mA is sent at 0% and 20mA is sent at 100%.

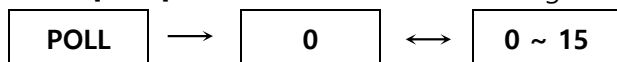
<Setting of FB4M>



<Setting of FB20>



11.5.9.I. [POLL] – HART Communication Polling Address (default: 0)



This is to select one of HART communication polling address (0 ~ 15) on site. The default address is "0".

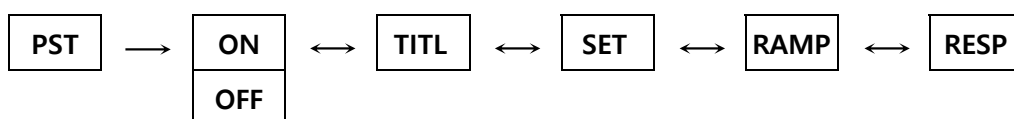


As an unexpected problem can happens during communication, try to select after disconnecting HART communication.

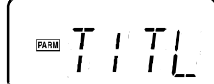
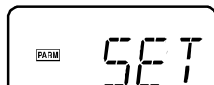
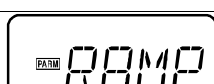

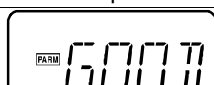
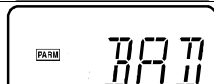
11.5.9.J. [PST] – Partial Stroke Testing (default: OFF)

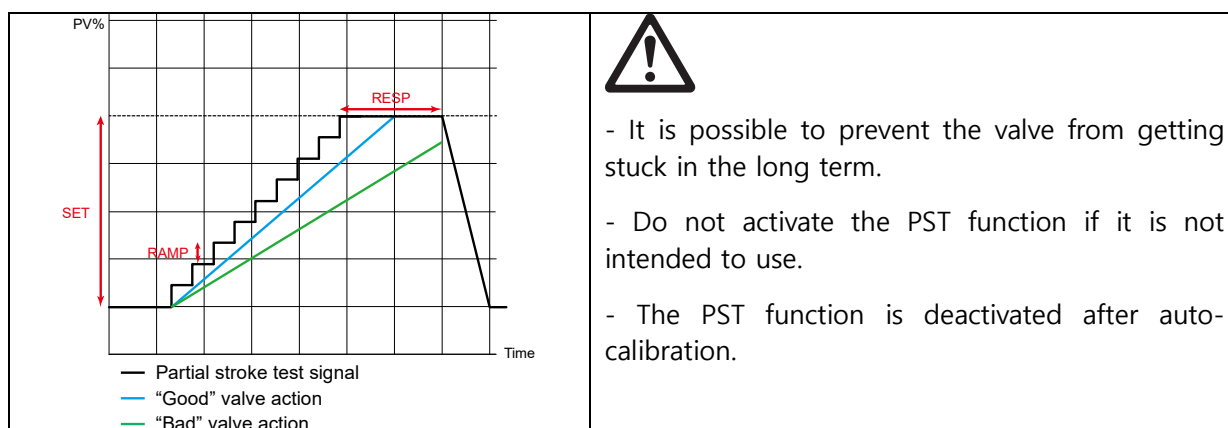


Note that the PST function (Partial Stroke Testing) is loaded at the factory on demand only when requested.



This is to move the valve periodically regardless of input signals and check the valve status.

	<ul style="list-style-type: none"> - to set the TEST time interval (default: '0024' – 24 hours) - Setting of '0000' shows the PST working status every 1 minute.
	<ul style="list-style-type: none"> - to set the moving point by % during TEST (default: 10%) - Valve position > 50% : move to the decreasing direction - Valve position < 50% : move to the increasing direction
	<ul style="list-style-type: none"> - to adjust a moving range per second (default: 1.0%/sec) - One of 1.0, 0.5, 0.25, 0.12, or 0.06%/sec can be selected.
	<ul style="list-style-type: none"> - to adjust a waiting time that the valve follows after the test signal (default: '10' seconds)
Even though 'Good' is shown, if RESP is set too long, the judgment point will not be good for the next comparison. Also, if 'Bad' is shown, RESP is set too low. Adjust RESP.	
	to show that there is no problem if the valve reaches Dead zone of the set position.
	to show that it is necessary to check the valve status if the valve fails to reach Dead zone of the set position.



12. Maintenance / Service

12.1. Preliminary Check Points

12.1.1. Voltage

- The positioner commonly requires 4-20mA @ 24VDC for operation.
- Voltage drop (impedance): Without HART – 8.7VDC (435Ω @ 20mA)
With HART – 9.4VDC (470Ω @ 20mA)

12.1.2. Electrical Connections

Check polarities (+, -) of 4-20mA input signal definitely and make the electrical connections.

12.1.3. Pneumatic Connections (see 8.1, 8.2)

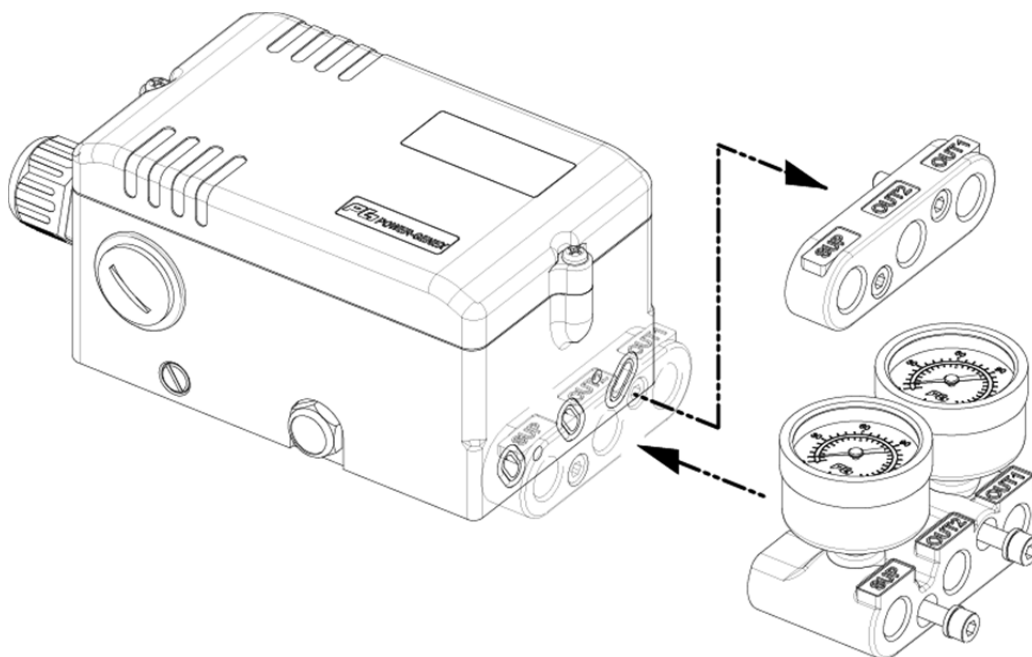
12.1.4. Supply Air Quality

A supply air should be definitely clean and compressed free of water, moisture or oil in conformance with IEC 770 and ISA-7.0.01.

12.2. Module Parts

- ① Fail free module Assembly (spare part No. 12)
- ② PCB Control Board Assembly (spare part No. 3)

12.3. Structure of Gauge Block



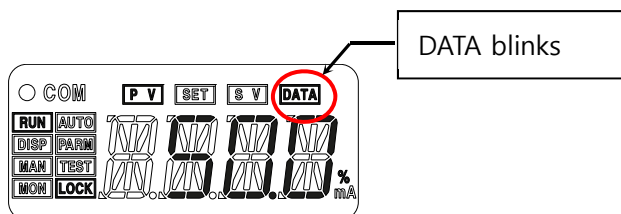
12.4. Re-setting of Potentiometer (spare part No. 14a, 14b)

It is necessary to adjust a setting of potentiometer as below when a gear position is moved due to user's carelessness. For reference, 0~10k Ω potentiometer is installed into the SS5 positioner.

- ① Dis-install the electronic card from the SS5 positioner and make the markings on two gears match with each other.
- ② Move the feedback lever to 50% position and adjust a potentiometer so that it can reach nearly 5k Ω .
- ③ Re-install the SS5 positioner onto the valve and re-perform auto-calibration.

13. Troubleshooting

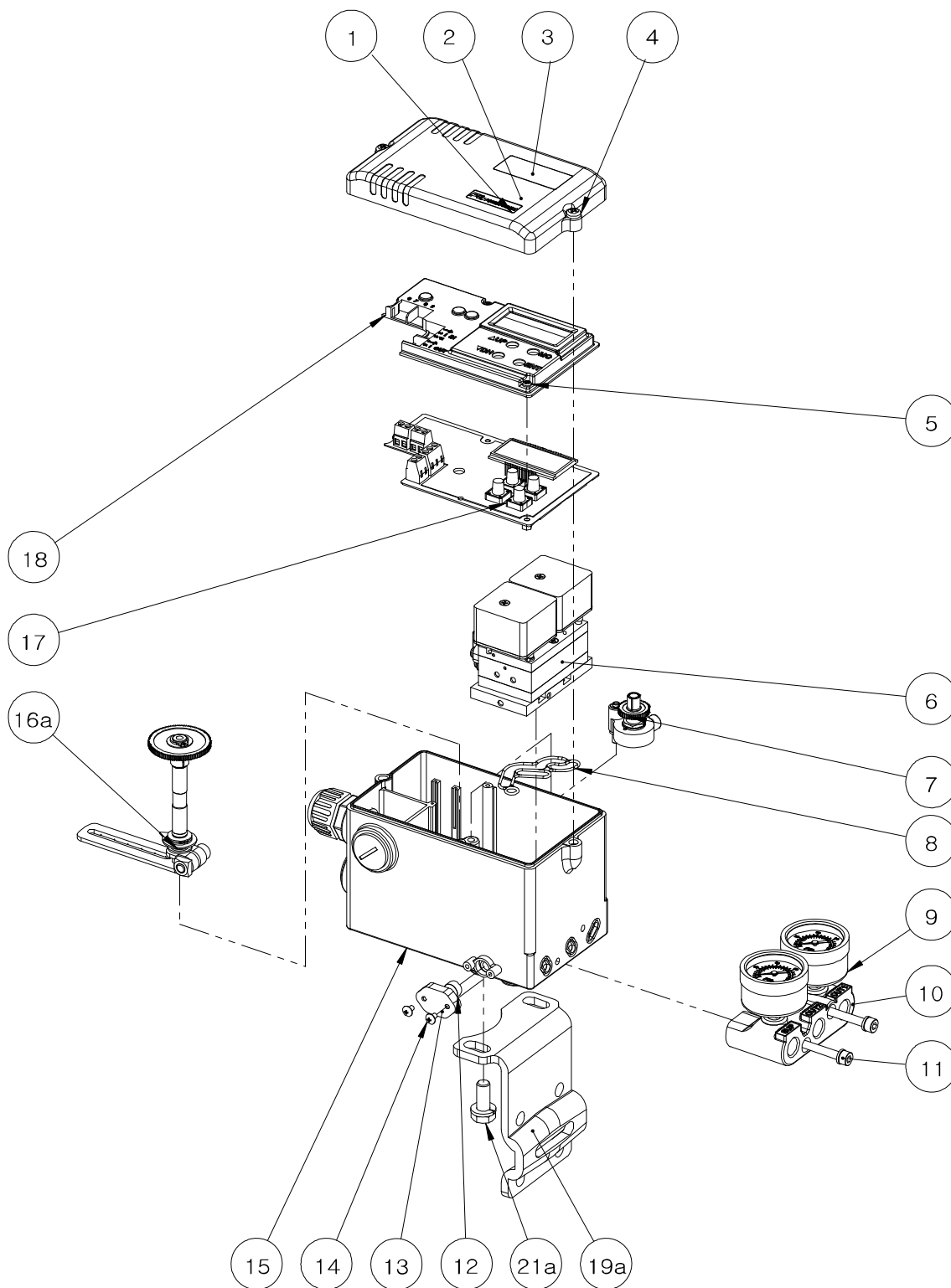
If the positioner doesn't work properly and **DATA** on LCD blinks, try to take action as below.



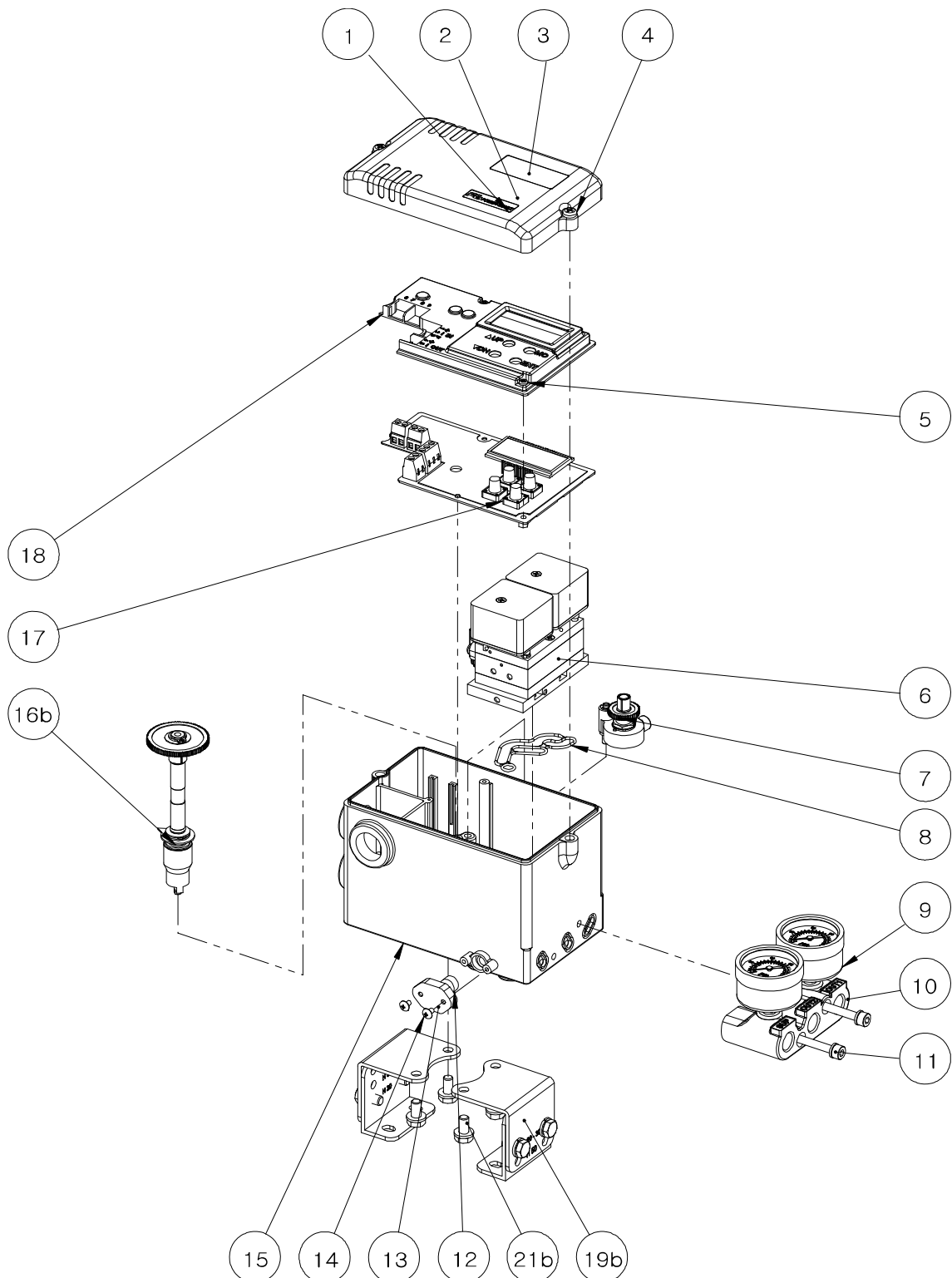
	Cause	Symptom	Action
CMLO	Low input current (3.7mA)	Data on LCD are shown too dim or too bright.	Re-check 4 – 20mA input signals.
CMHI	High input current(20.5mA)		
FBFT	Feedback error (0 - 1%)	PM00 is shown at step 4 and an auto-calibration is finished without completion.	Defectiveness of potentiometer socket contact or PCB board
FBSM	Feedback error (2 - 9%)	The operating stroke is too small and the valve doesn't work smoothly.	Re-install the potentiometer and increase the operating angle of the feedback lever.
MONT	Operating angle out of range	MONT is shown during step 4 and an auto-calibration process is finished without completion.	Re-install the SS2L / SS2R positioner.
H/RX	HART Rx error	HART signal failure	Re-set and re-connect will be done after 2.5 seconds, but it is necessary to check the communication system in case of a continuous error.
BAD	PST error	BAD is shown.	Check the valve or increase the response time of PST.
LN01	Coil No.1 Bias Low	Valve is not closed or open and moves slowly.	Loosen a valve packing.
HN01	Coil No.1 Bias High		
LN02	Coil No.2 Bias Low		
HN02	Coil No.2 Bias High		
PONT	Potentiometer error	Problem of potentiometer	Check the potentiometer (Potentiometer Ass'y, Board)
RTQ	Coil error	Problem of coil	Check the coil assembly.

14. Spare Parts

14.1. SS5L



14.2. SS5R

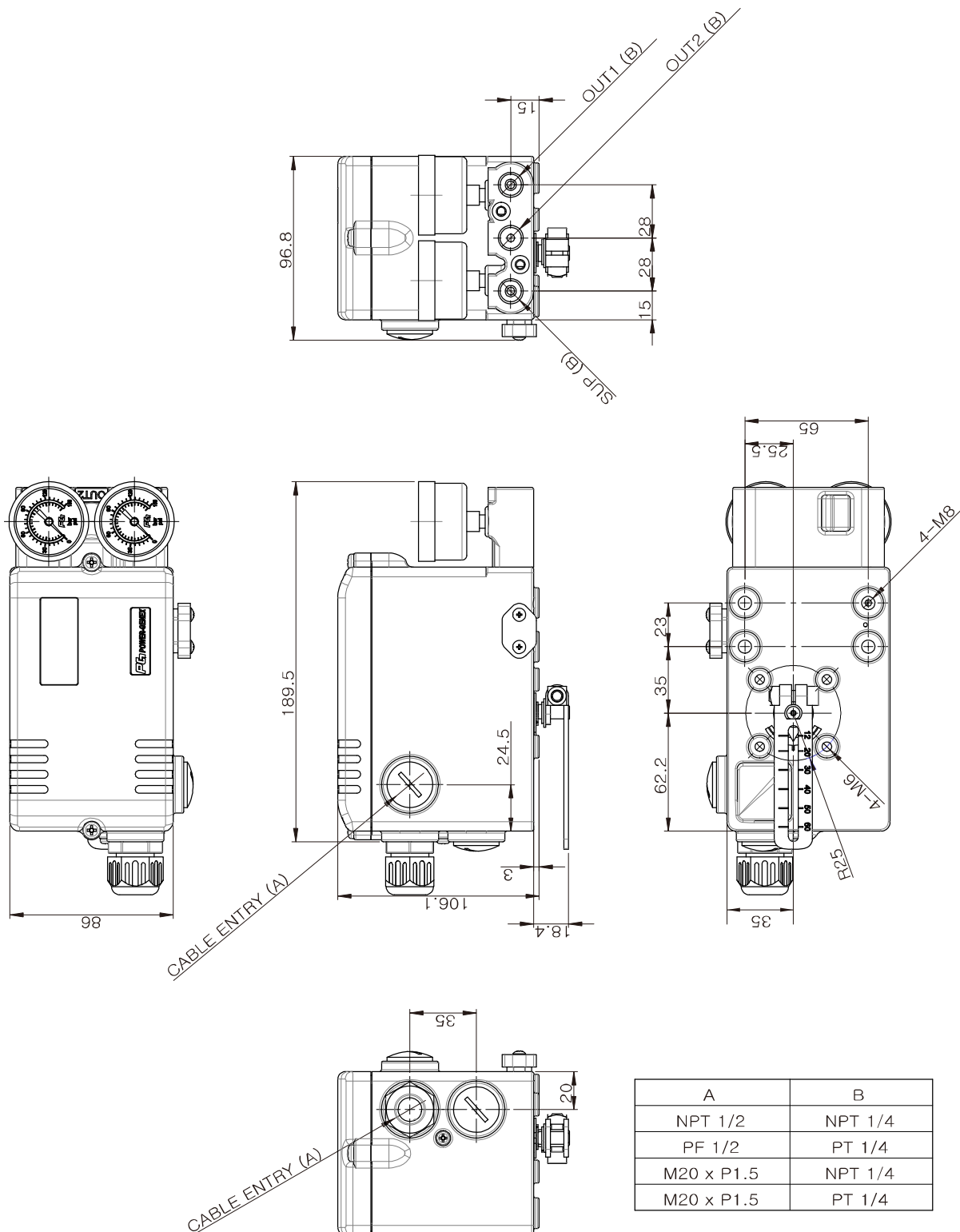


List of Spare Parts

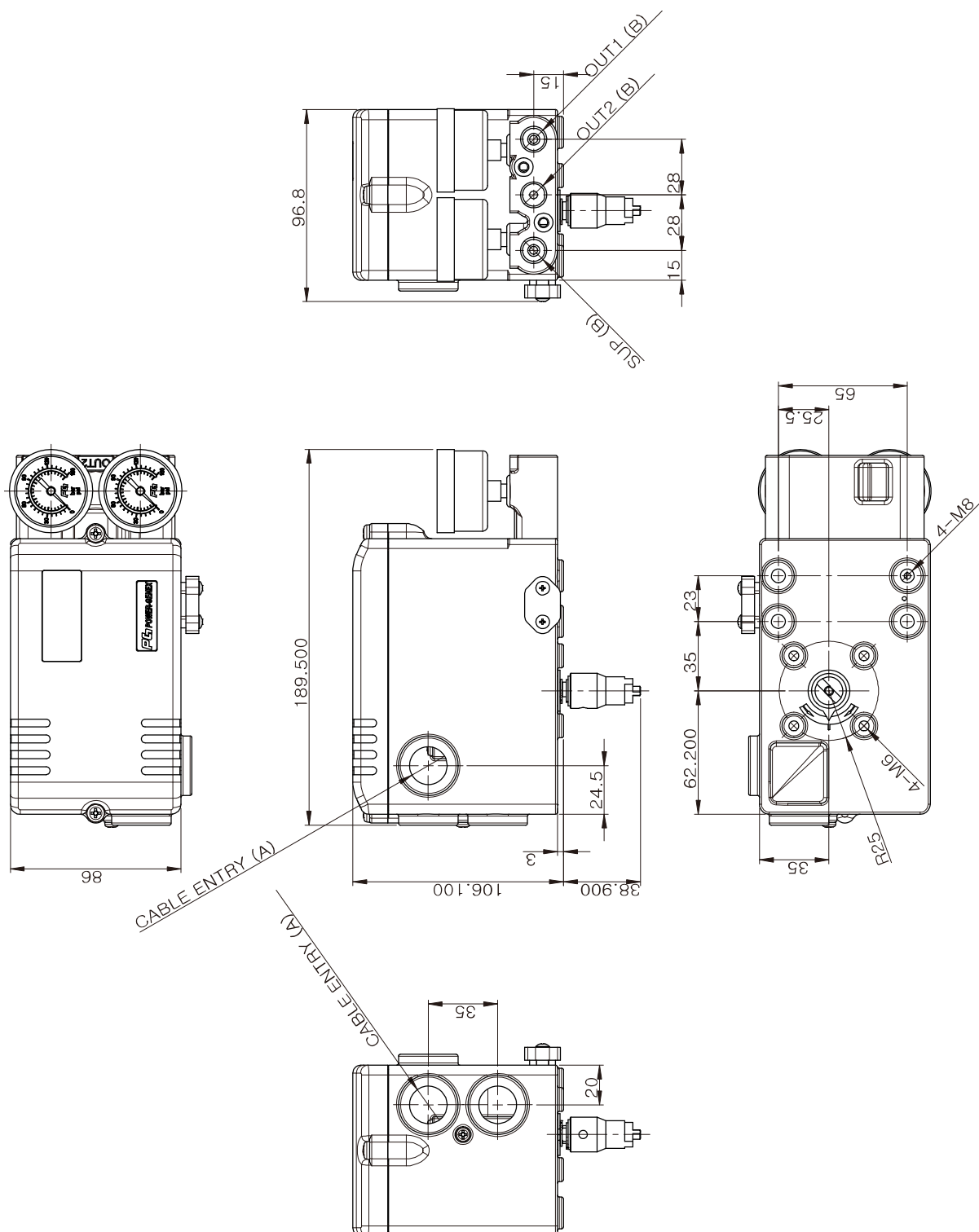
No.	Part No.	Description
1	PG-SS5-01	PG nameplate
2	PG-SS5-02	Cover
3	PG-SS5-03	LCD display window
4	PG-SS5-04	Cover bolt
5	PG-SS5-05	Board cover bolt
6	PG-SS5-06	Fail freeze module
7	PG-SS5-07	Potentiometer
8	PG-SS5-08	Air line gasket O-ring
9	PG-SS5-09	Gauge
10	PG-SS5-10	Gauge block
11	PG-SS5-11	Gauge block bolt
12	PG-SS5-12	Vent filter
13	PG-SS5-13	Vent cover
14	PG-SS5-14	Vent cover bolt
15	PG-SS5-15	SS5 body
16A	PG-SS5-16A	Feedback lever (L)
16B	PG-SS5-16B	Feedback shaft (R)
17	PG-SS5-17	SS5 board
18	PG-SS5-18	Board cover
19A	PG-SS5-19A	Linear bracket
19B	PG-SS5-19B	Rotary bracket
21	PG-SS5-21	Bracket bolt

15. Dimensions

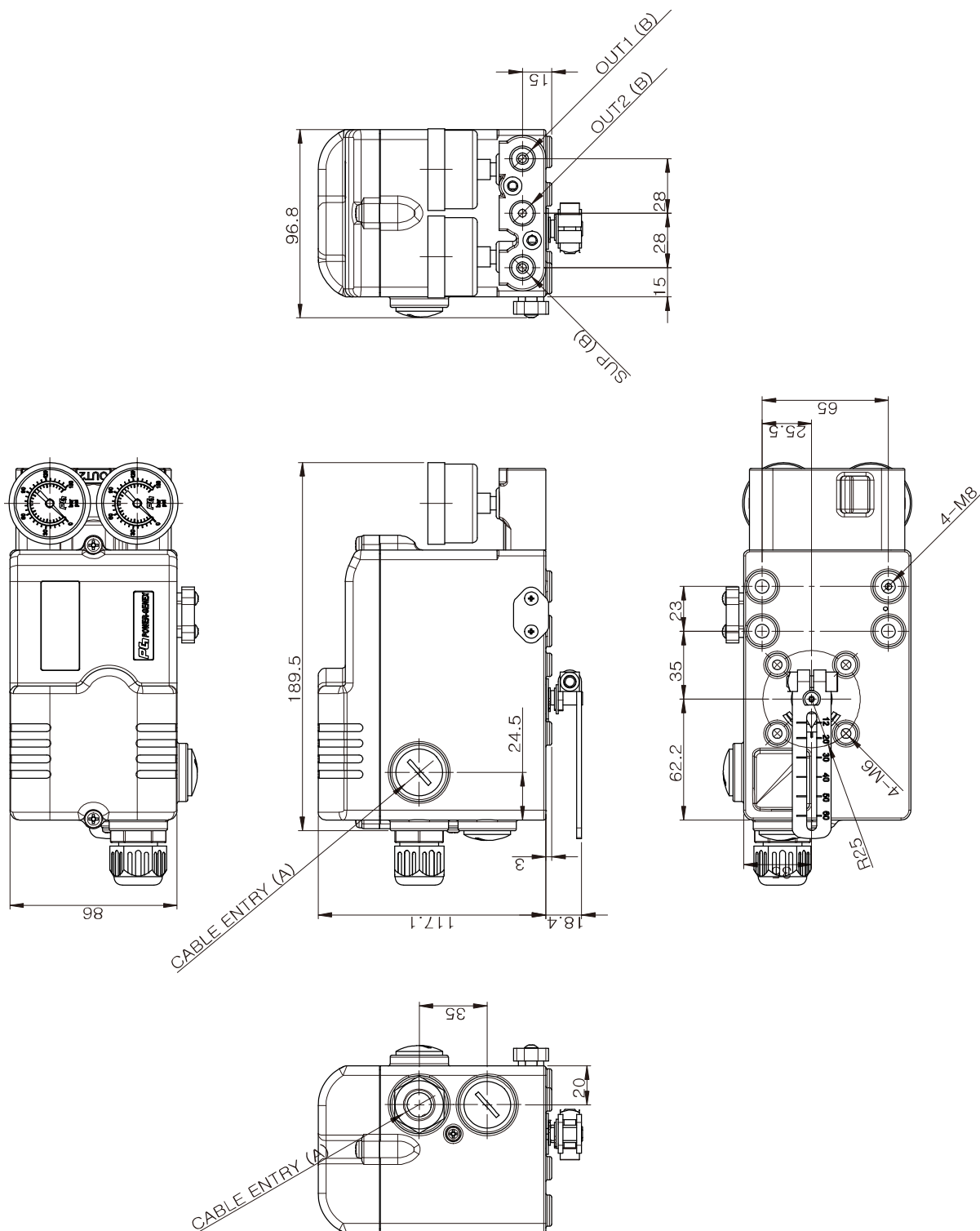
15.1. SS5L (Liner type)



15.2. SS5R (Rotary type)



15.3. SS5R (2 x SPDT Limit switch)





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