Instruction and Operating Manual

Smart Valve Positioner

SS5L / SS5R Series

(Fail freeze function)

<Software Version 2.07>

Contents

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 TRIAC 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 TRIAC 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 TRIAC 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 TRIAC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.

2. The exports of TRIAC 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 TRIAC 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 conductive 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 aluminum 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.**

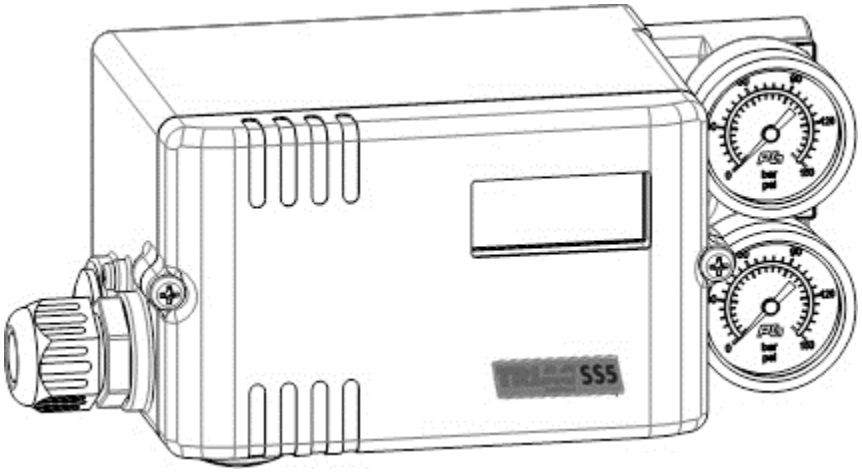
Caution

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.

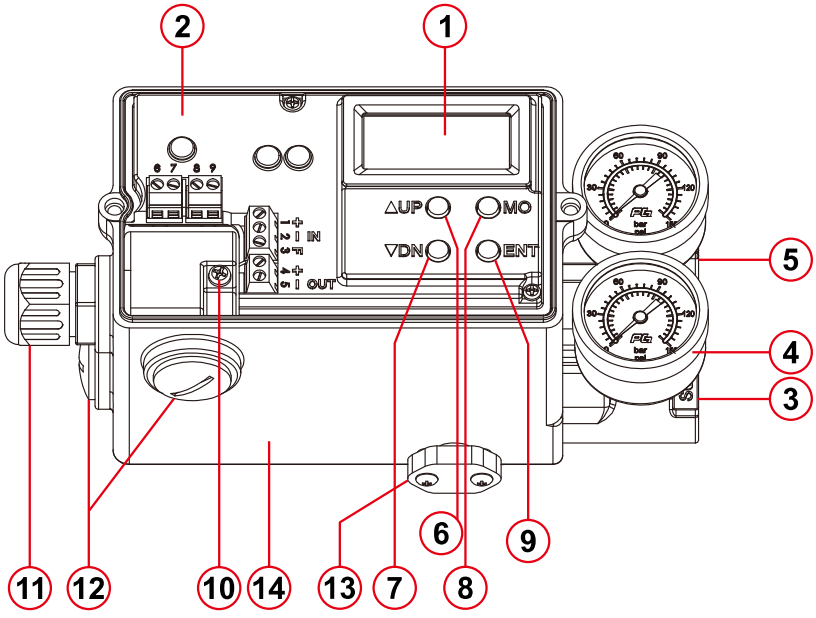
2. Overview of Structure

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
12	Blind plug
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 - 7.0 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℃ ~ +80℃ (-22 ~ +176℉) **
Pneumatic connections	Rc 1/4 or NPT 1/4
Electrical connections	G 1/2, NPT 1/2 or M20 x 1.5
Explosion proof / protection class	Intrinsically safe (Exia IIC T6) / IP66
	Zone 1
Body material / painting	Aluminum die-cast
Weight	2 kg

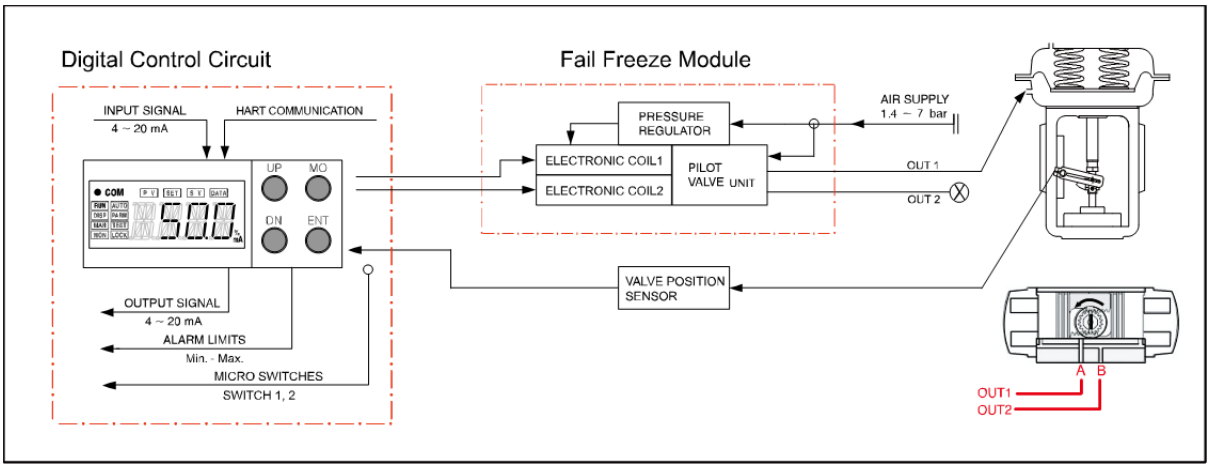
* For more than 200mm stroke on request

** Operating temperature of -40℃ on request

4. Descriptions on Nameplate

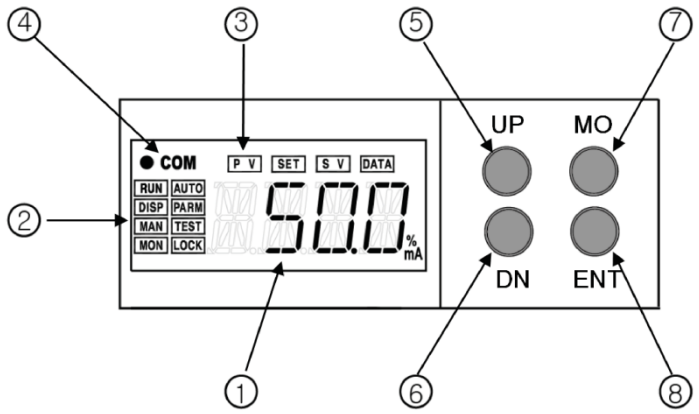
- Model No.:
  The product model and options selected are described.
- Input signal:
  4 – 20mA input signal with 2-wire is described.
- Ambient Temp.:
  The ambient temperate range for operation is described.
- Serial No. / Date: Serial number and production date are described.
- Input - Ui , Ii, Ri, Pi, Li, Ci : Intrinsic safety electrical parameters for input are described.
  output - Ui , Ii, Ri, Pi, Li, Ci : Intrinsic safety electrical parameters for output are described.
  Limit - Ui , Ii, Ri, Pi, Li, Ci : 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



① Display of input or output
② Main parameters
③ mA, % display mode
④ Operation of HART
⑤ Up button
⑥ Down button
⑦ Mode button
⑧ Enter button

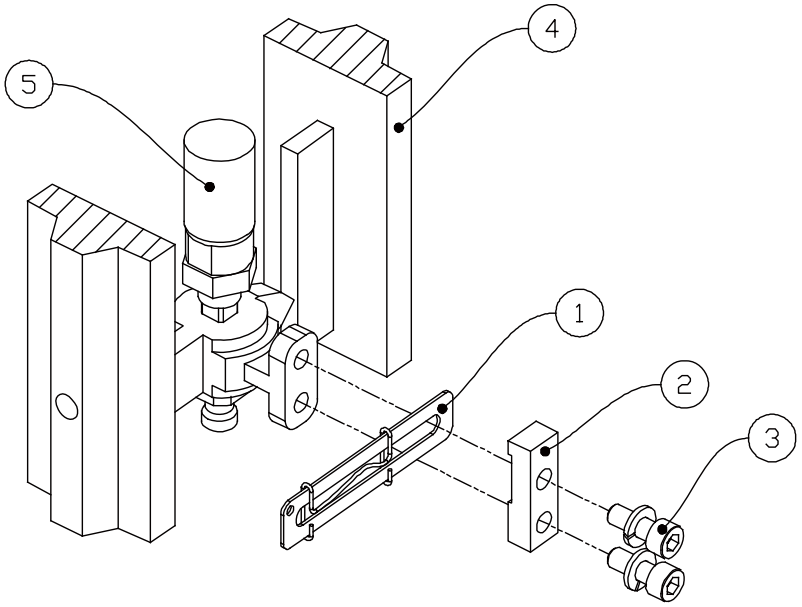
Press "Mode" button for 5 seconds	• Quick auto-calibration
Press "Up(▲)" button for 5 seconds	• GROP-gain adjustment
Press "Down(▼)" button for 5 seconds	• Span adjustment
Press "Enter" button	• Ambient temperature (℃)

① Display of input or output	• mA, %
② Main parameters	MODE ↔ RUN ↔ DISP ↔ MAN ↔ MON ↔ AUTO ↳ LOCK ↔ TEST ↔ PARM ↰
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)	• 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

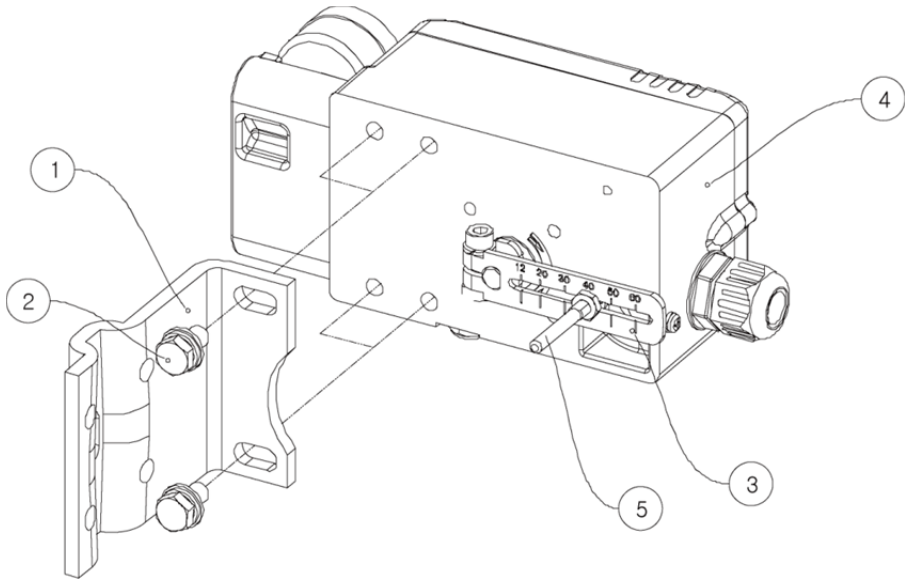
7.1.1 Installation of Follower Guide



① Follower guide
② Clamp plate
③ Screws(M6)
④ Valve yoke
⑤ Valve stem

7.1.2 Installation of Feedback Lever and Mounting Bracket

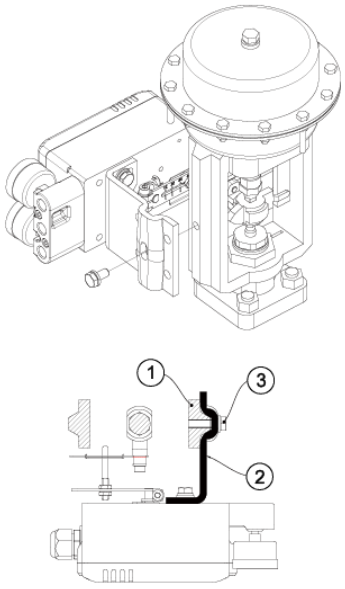
Mounting bracket for SS5L positioned is designed to support IEC 60534-6-1.



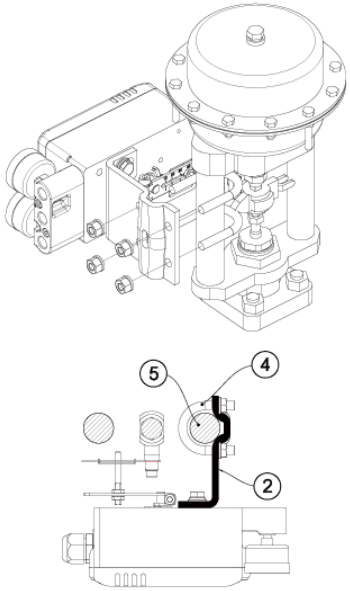
① Mounting bracket
② Screws(M8)
③ Feedback lever
④ SS5L positioned
⑤ Feedback pin

7.1.3 Mounting onto Cast Yoke or Pillar Yoke

< Cast yoke type >



< Pillar yoke type >



① Cast yoke

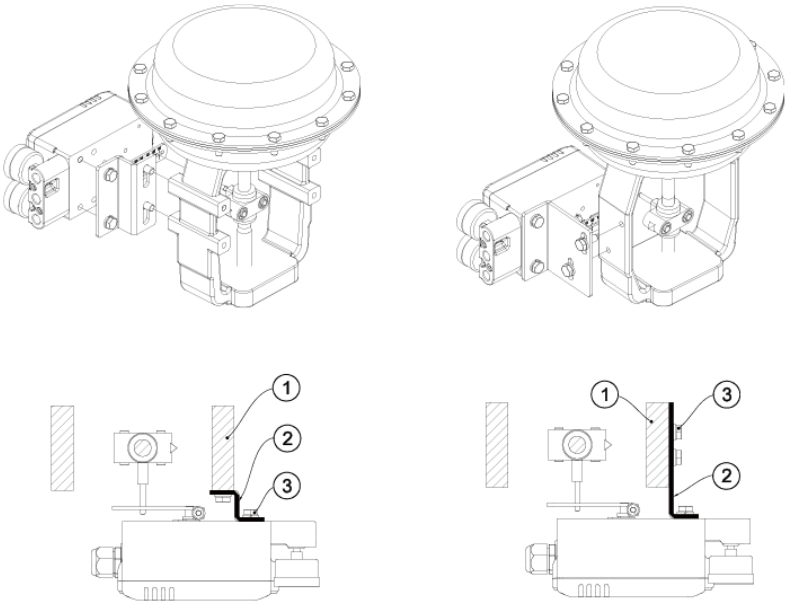
② Mounting bracket

③ Screws(M8)

④ U-bolts

⑤ Pillar yoke

7.1.4 Mounting onto Other Kind of Cast Yoke

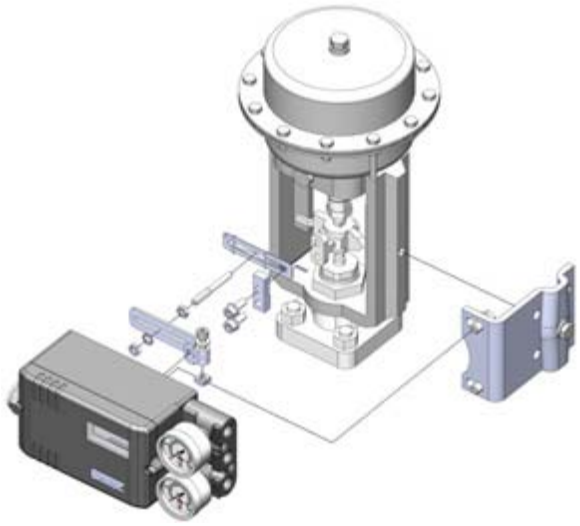


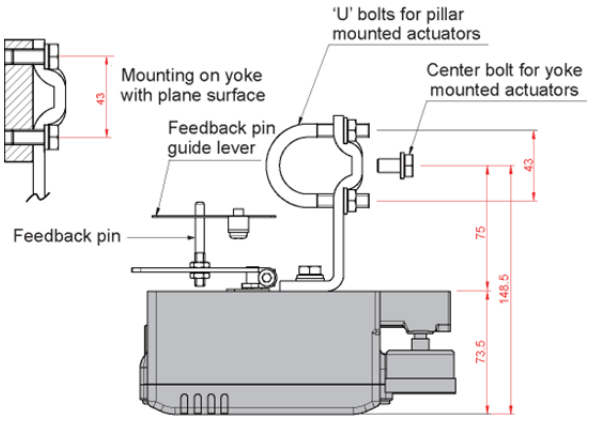
① Cast yoke

② Mounting bracket

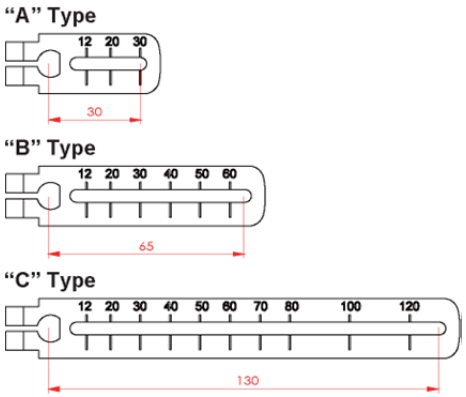
③ Screws(M8)

7.1.5. Mounting Diagram





Mounting to linear actuators to IEC 60534 6-1



Feedback Levers

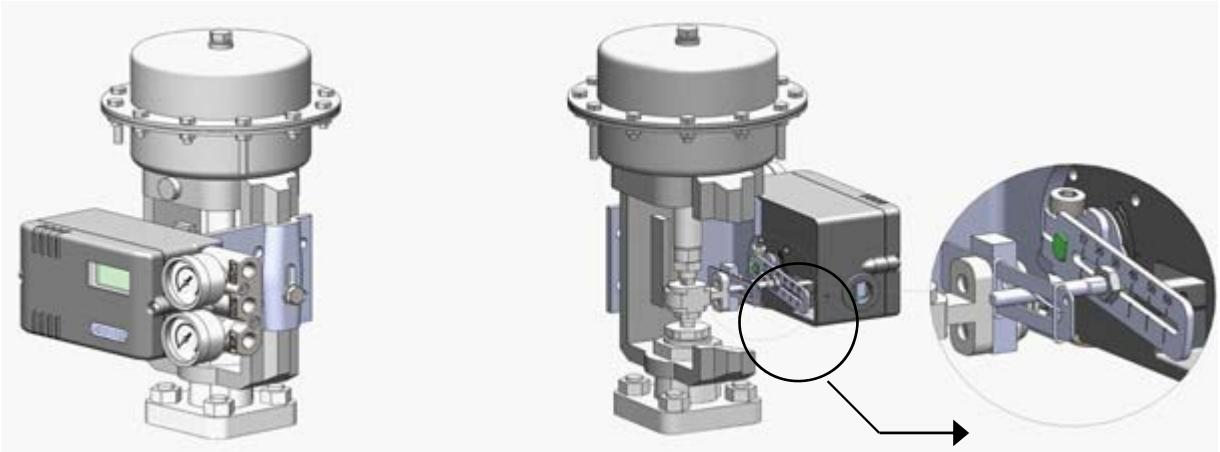
"A" type: 8 ~ 30mm stroke

"B" type: 8 ~ 70mm stroke

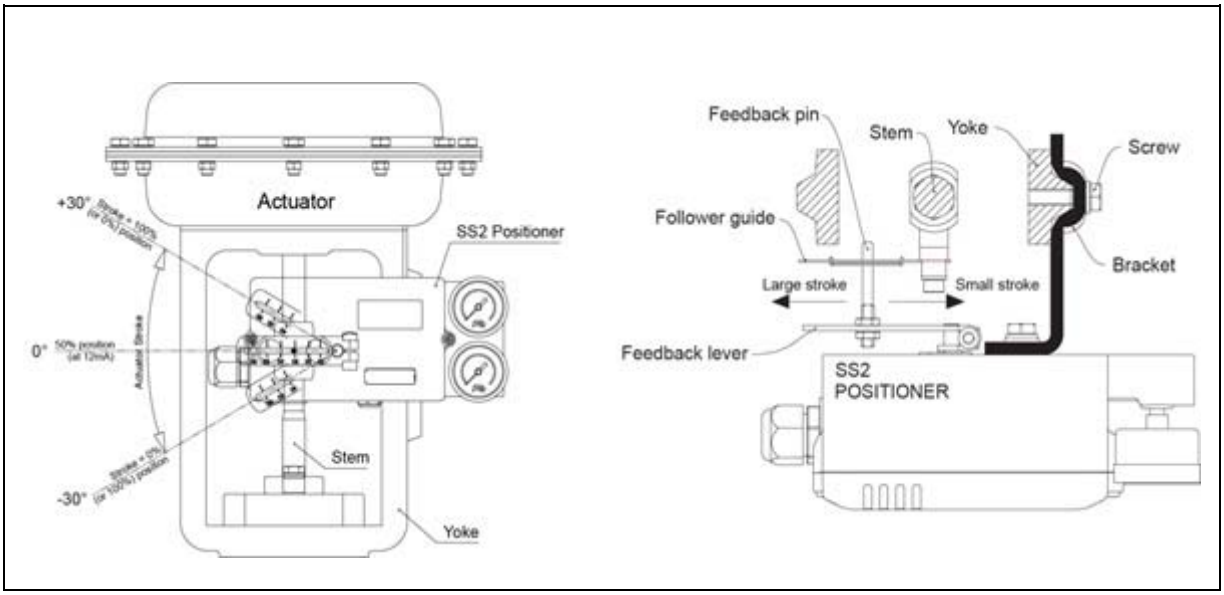
"C" type: 8 ~ 130mm stroke

"D" type: 80 ~ 200mm stroke

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.

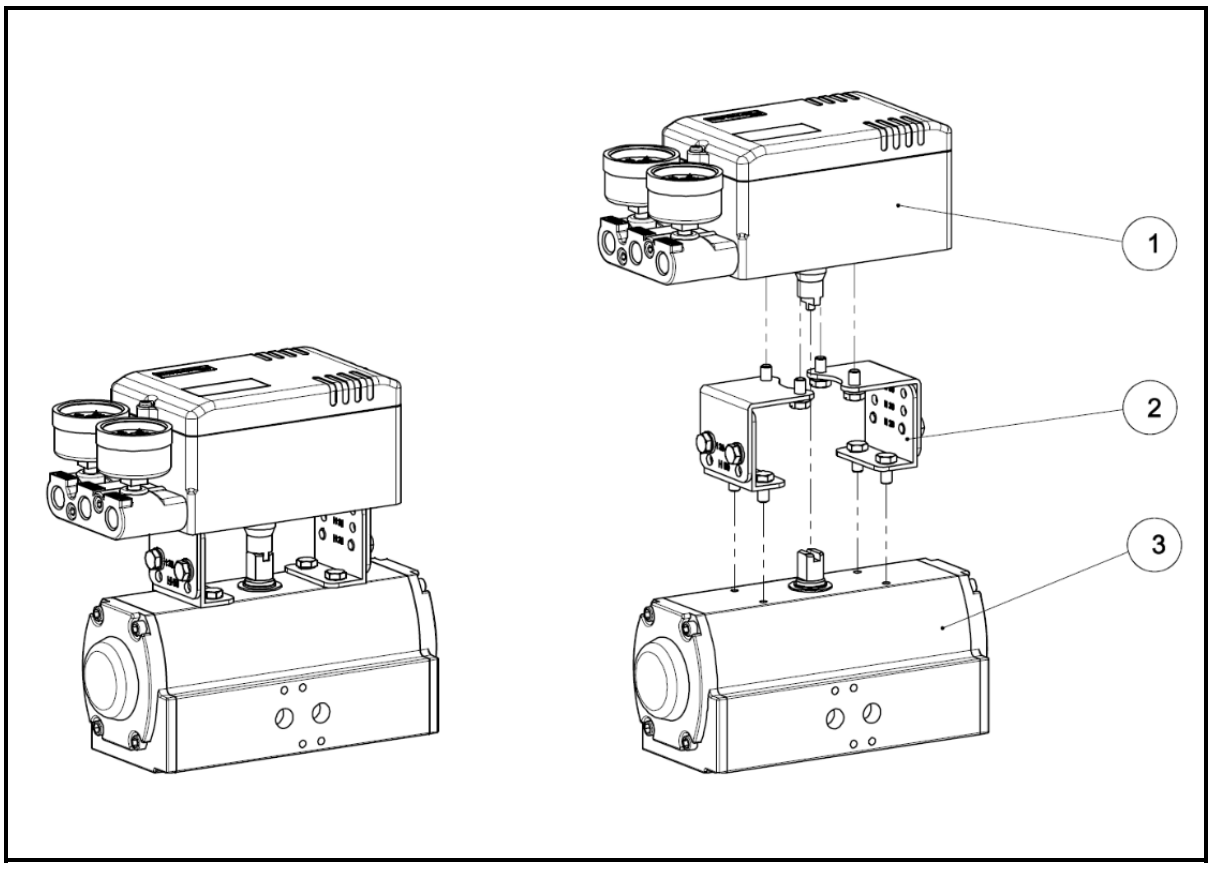
⑦ The operating angle from 0% to 100% stroke should be within the range of 30°. In case of the over-range of 30°, move the valve stem pin left and right and make the operating angle stay within 30°.

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.

7.2 Mounting onto Rotary Actuator

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

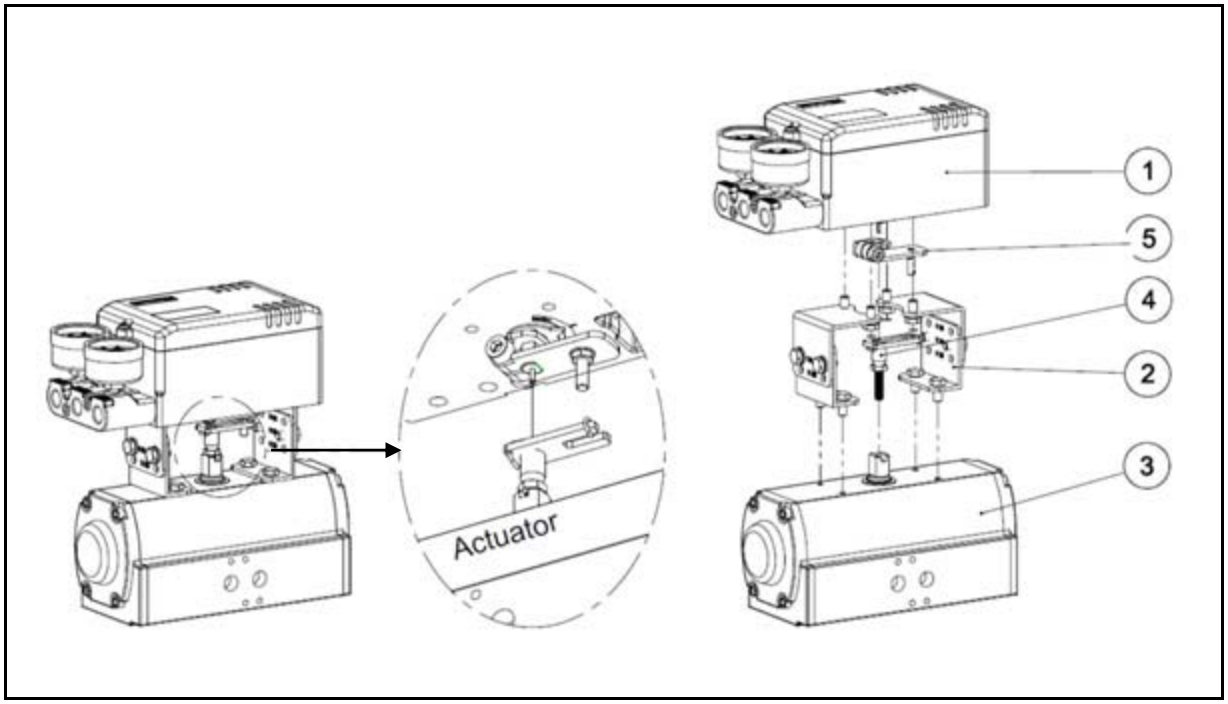


① SS5R positioner ② Multi-size bracket ③ Rotary actuator

ⓐ 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.

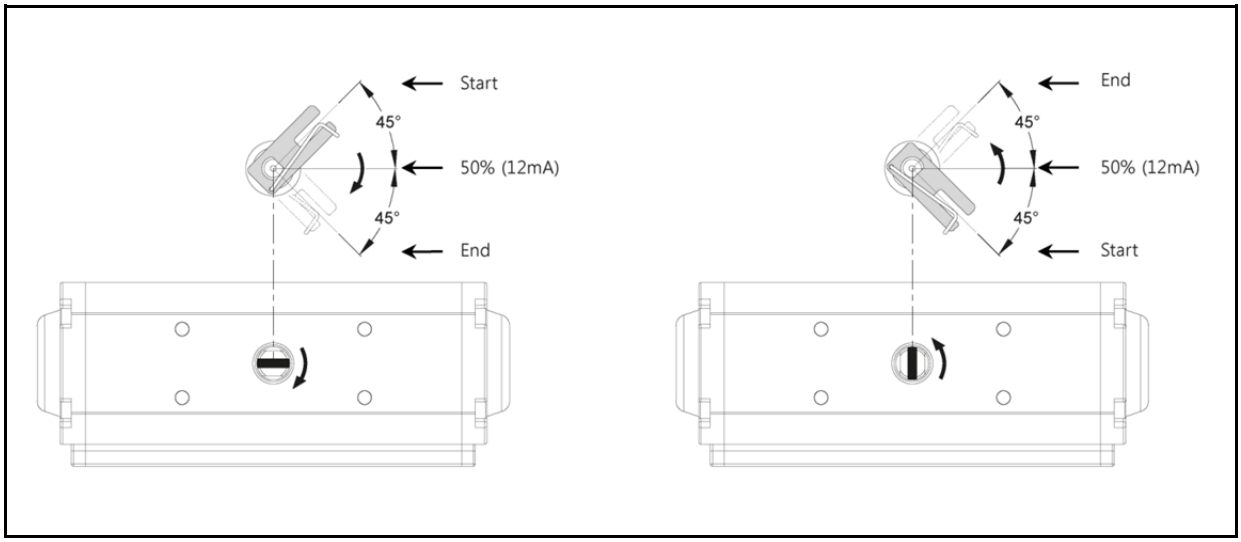
7.2.2 Mounting with Fork Lever Type



① SS5R positioner ② Multi-size bracket ③ Rotary actuator

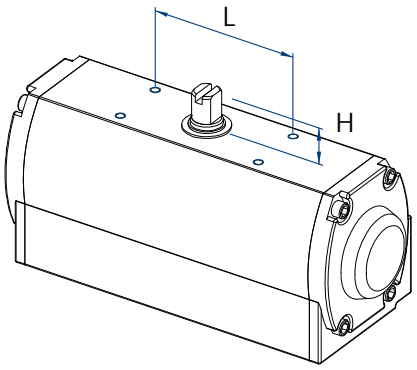
④ Fork lever ⑤ Positioner feedback lever

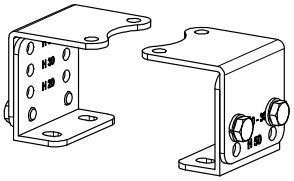
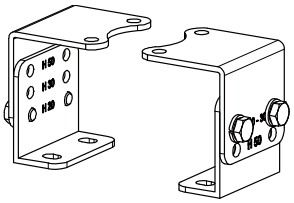
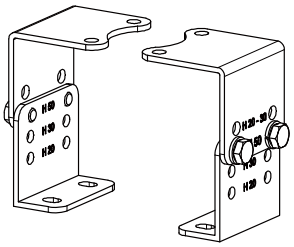
7.2.3 Position of Fork Lever

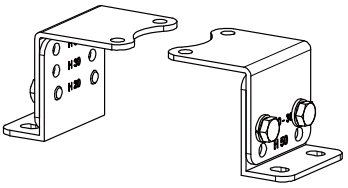
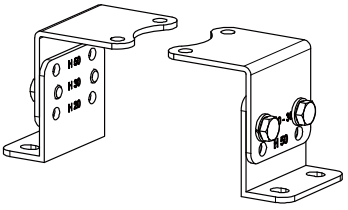
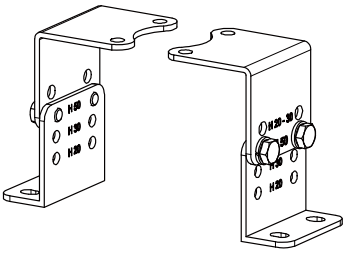


Clockwise movement Counter-clockwise Movement

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



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

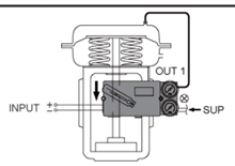
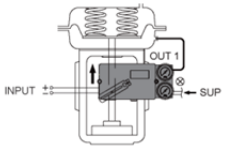
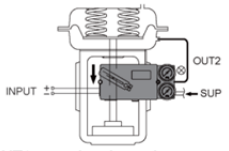
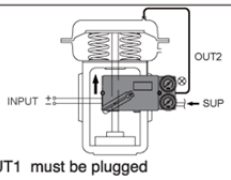
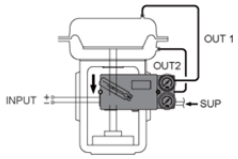
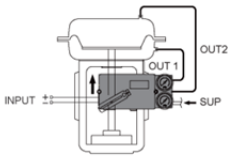
L (mm)	H (mm)	
130	20	
130	30	
130	50	

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

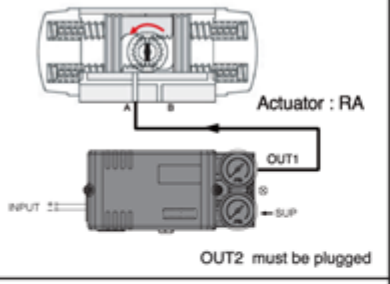
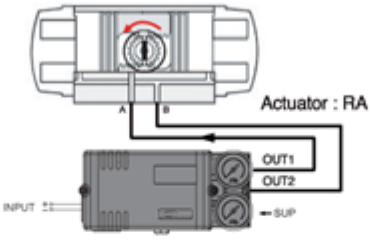
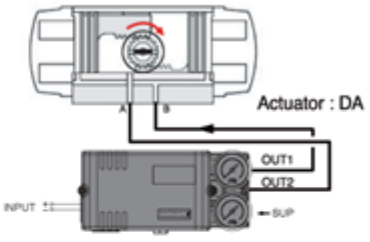
8. Air Connections

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)	
DA 1 As the input signal increases, Valve stem moves downwards Actuator : DA	 OUT2 must be plugged	RA 1 As the input signal increases, Valve stem moves upwards Actuator : RA	 OUT2 must be plugged
DA 2 As the input signal increases, Valve stem moves downwards Actuator : DA	 OUT1 must be plugged	RA 2 As the input signal increases, Valve stem moves upwards Actuator : RA	 OUT1 must be plugged
DA 3 As the input signal increases, Valve stem moves downwards		RA 3 As the input signal increases, Valve stem moves upwards	

8.2 SS5R (rotary type)

Spring Return	Double Acting	Double Acting
 OUT2 must be plugged		
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	Out1 : piped, Out2 : plugged	Out1 : piped to Actuator port A, Out2 : piped to Actuator port B
Direct Acting	Out1 : plugged, Out2 : piped	Out1 : piped to Actuator port B, Out2 : piped to Actuator port A

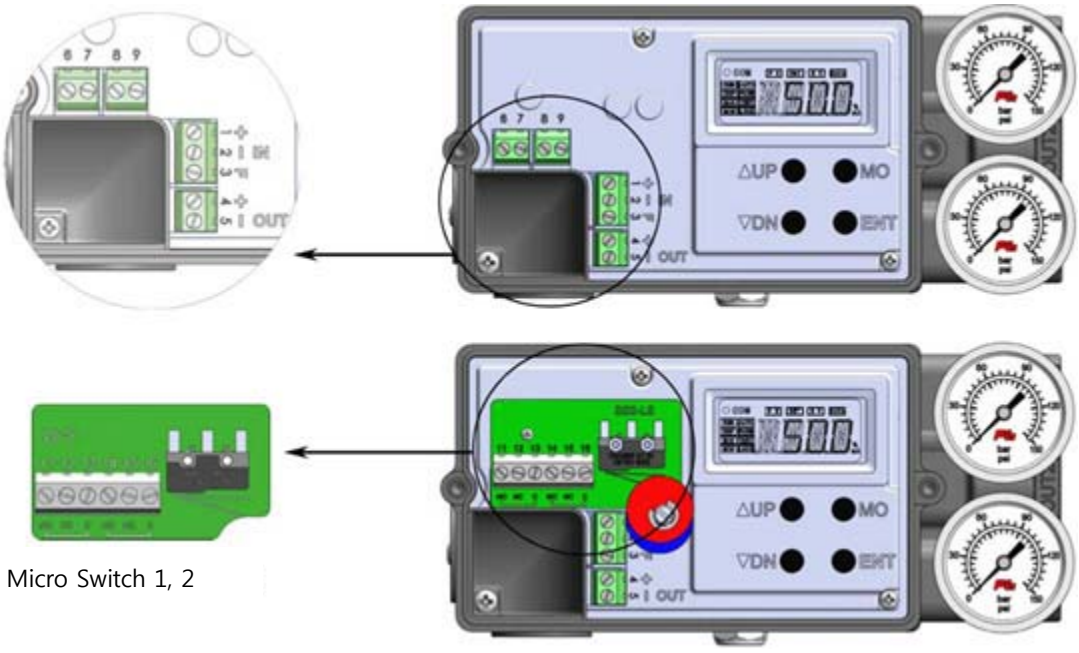
9. Electrical Connections

① Be sure to supply the rated voltage and current stated on this manual. Otherwise, it may cause a serious damage or malfunctions.

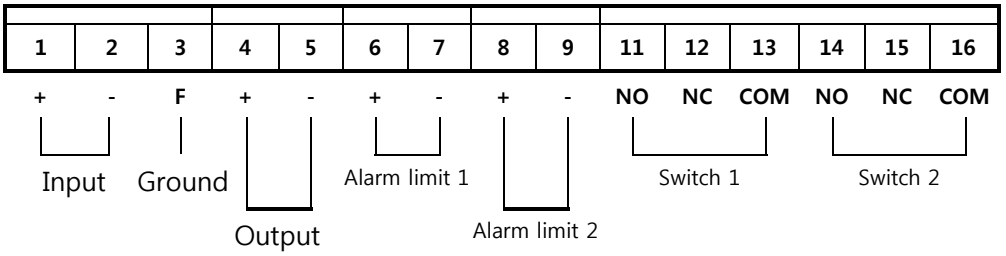
② Check polarity of + and – exactly and connect wires.

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



Micro Switch 1, 2

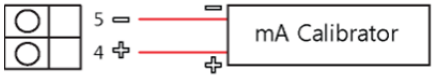


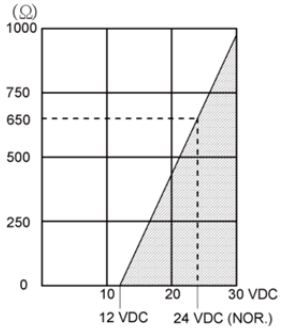
1	+	4-20mA input signal
2	-	4-20mA input signal
3		Ground
4	+	4-20mA output signal
5	-	4-20mA output signal
6	+	Alarm limit 1
7	-	Alarm limit 1
8	+	Alarm limit 2

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

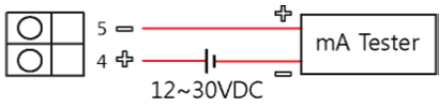




Transmitter Load Limitation

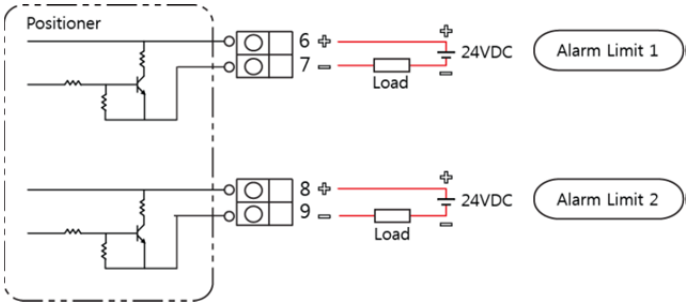
Position Transmitter Specifications	
Output signal	4 – 20mA, 2-wire
Power supply	12 – 30 VDC
Output current limit	30mA DC
Linearity	±0.75% F.S
Operating temperature	-20 ~ +80℃

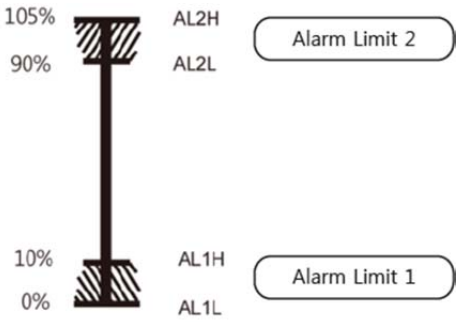
9.2.2 With multi-meter



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

9.3 Wiring Alarm Limits

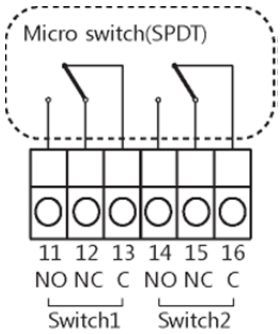




Alarm Limit Factory Setting

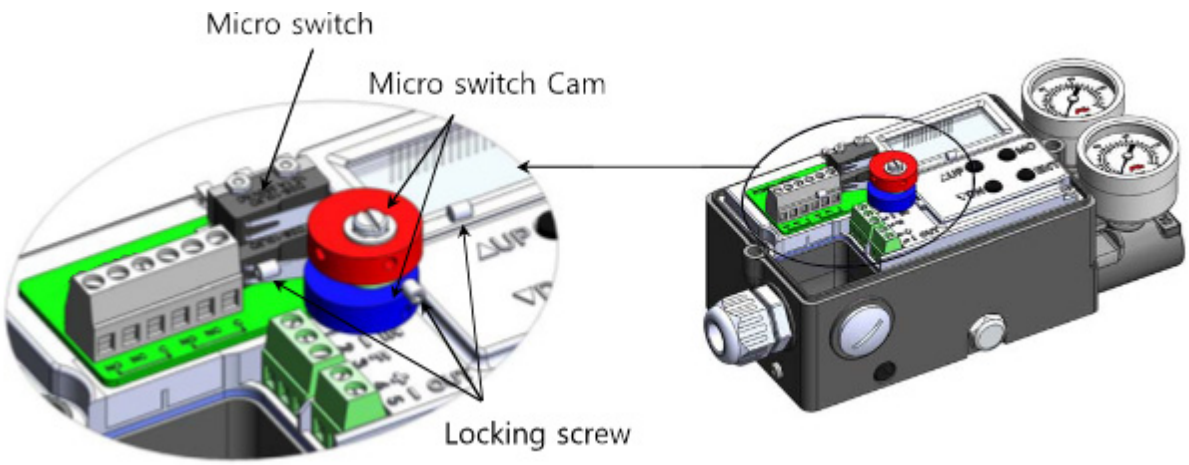
24VDC should be supplied for alarm limits.

9.4 Wiring SPDT Micro Switches



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

9.5 Setting Micro Switches

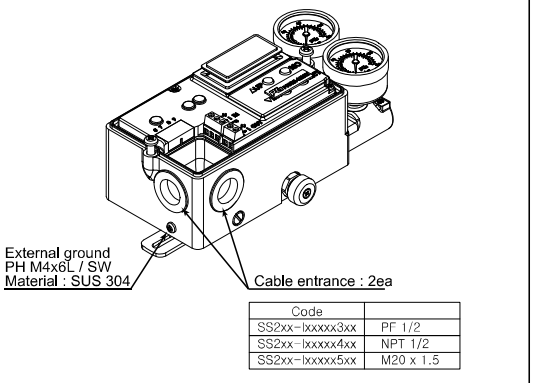


After auto-calibration process, turn the micro switch cams clockwise slowly and check the contact points.

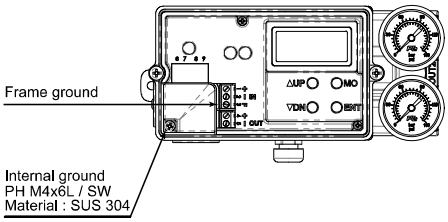
After checking the contact points of the micro switches at a desired position, fix with screws.

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

9.6 Earthing



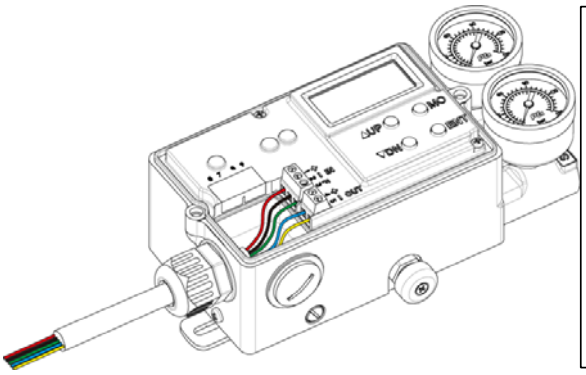
< External GROUND >

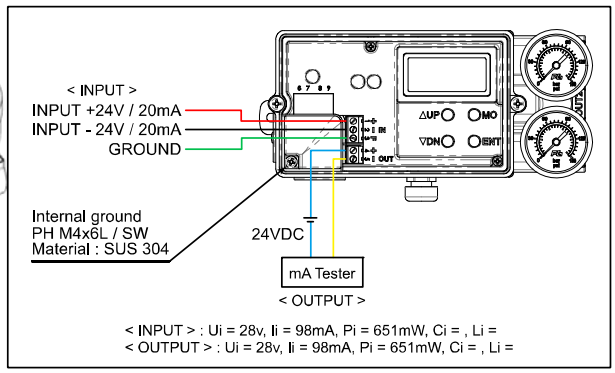


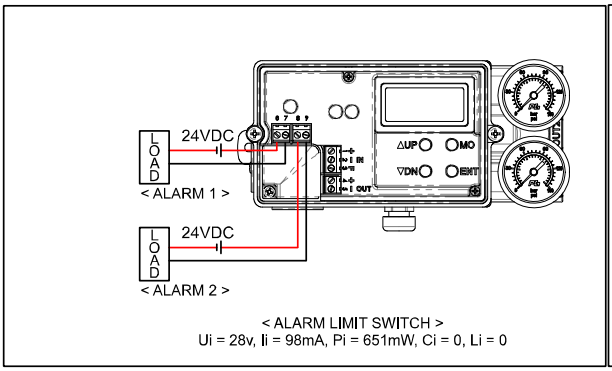
< Internal GROUND >

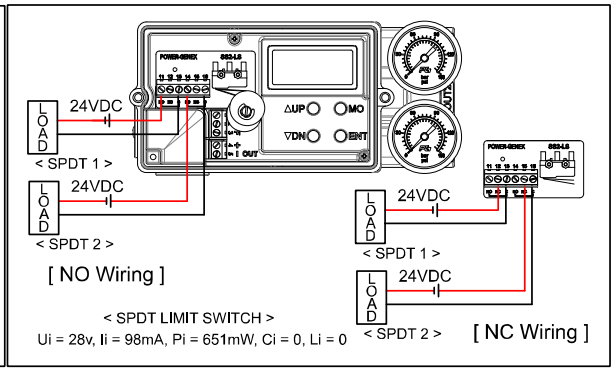
9.7 Wiring for Intrinsic Safety

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.









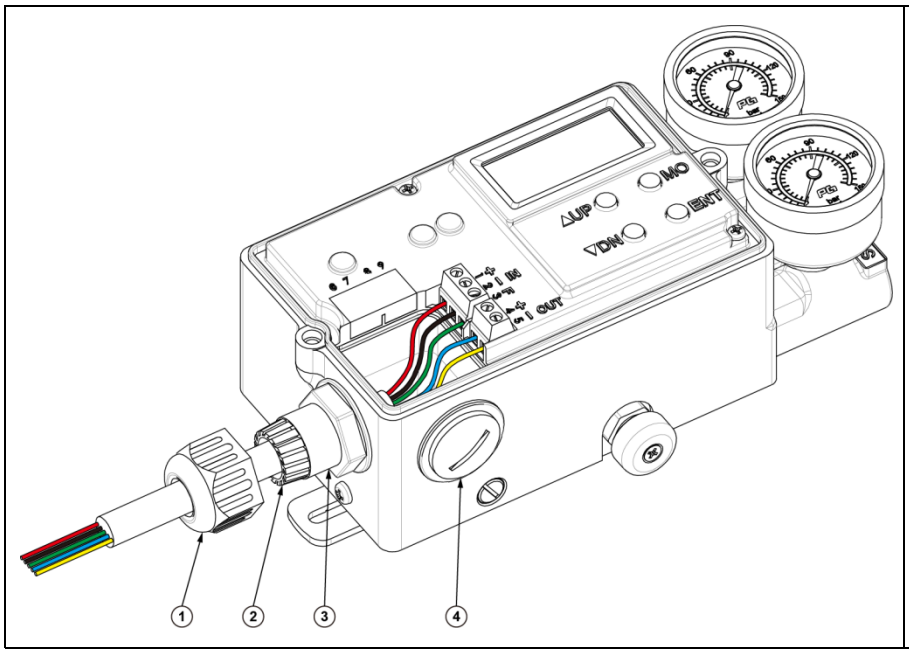
Input signal : 4~20mA@ 24VDC 2wire [red(+), black(-)]
Frame Ground : Green
Output signal: 24VDC 2wire [blue(+), yellow(-)]
2 x Alarm limit switch : 24VDC
2 x SPDT limit switch : 24VDC

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.(Ui, Ii, Ci, Li)
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. Cable Gland Cover
2. Cable Gland Sealing
3. Cable Gland Body
4. Blind Plug

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.

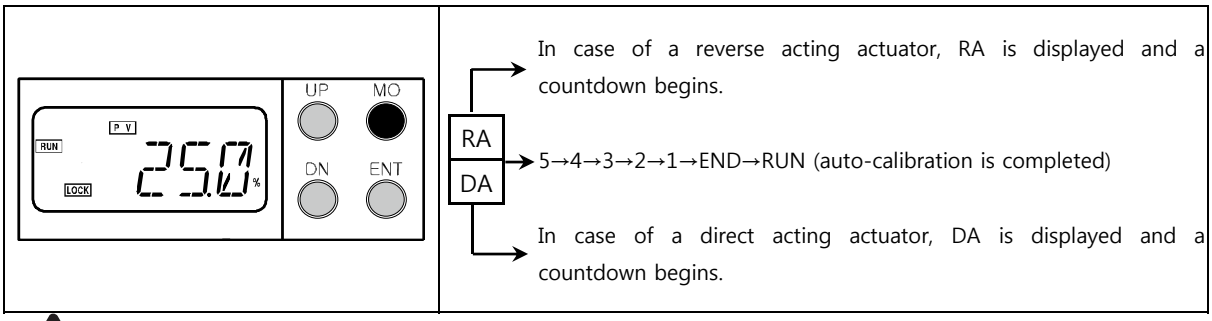
10. Quick Auto-Calibration

10.1 Quick Auto-Calibration

Supply 4-20mA input signal and push MODE button for 5 seconds, 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.

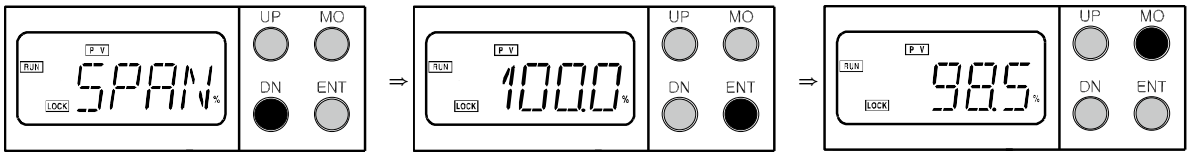
② If "DATA" on LCD blinks after auto-calibration process, see the error codes on page 21.



If MONT is shown during step 4 and an auto-calibration process is finished without completion, it means that the current mounting angle is out of the range. Please install the positioner properly. (See 7.1.7 Standard Installation on page 12)

10.2 Span Adjustment (SPAN)

Span is set automatically after auto-calibration process. But it can be re-set manually as below, if necessary.



Push DN button for 5 seconds, SPAN will appear.

Push ENT button, 100 will blink. Push UP or DN button, change the current value and push ENT button for a memory saving.

If SPAN reaches a desired point, push MODE button. RUN mode will start.

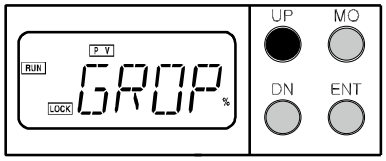
The above is just an example to help understand how to set Span to 98.5%.

Keep pushing UP/DN button, SPAN will increase or decrease fast. 0.1% will increase or decrease by **pushing** a button one time.

10.3 P-Gain Adjustment (P-GN)

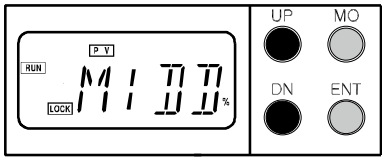
Select LOW, MIDD or HIGH in GROP-Gain after selecting NORM, SMAL, or HARD in Control Mode.

If a hunting or an oscillation happens after auto-calibration, select a control mode (NORM, SMAL, or HARD) proper for a valve working condition and perform auto-calibration again. Change to HIGH from MIDD in GROP in case of a hunting problem. Change to LOW from MIDD in case of an oscillation problem. If a hunting or an oscillation still continues to happen, select other control mode and set in GROP again.



Keep pushing UP button for 5 seconds, GROP will appear. Push ENT.

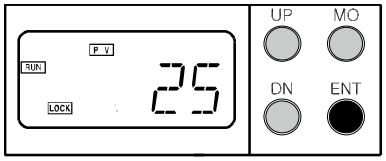
⇒



Select HIGH or LOW by pushing UP or DN button.

Parameter	Status	Description
MIDD		Standard parameter
HIGH	Hunting is happening	Change to Hard mode in case of a hunting problem (by rapid under or overshooting)
LOW	Oscillation is happening	Change to Low mode in case of an oscillation problem (by slow under or overshooting)

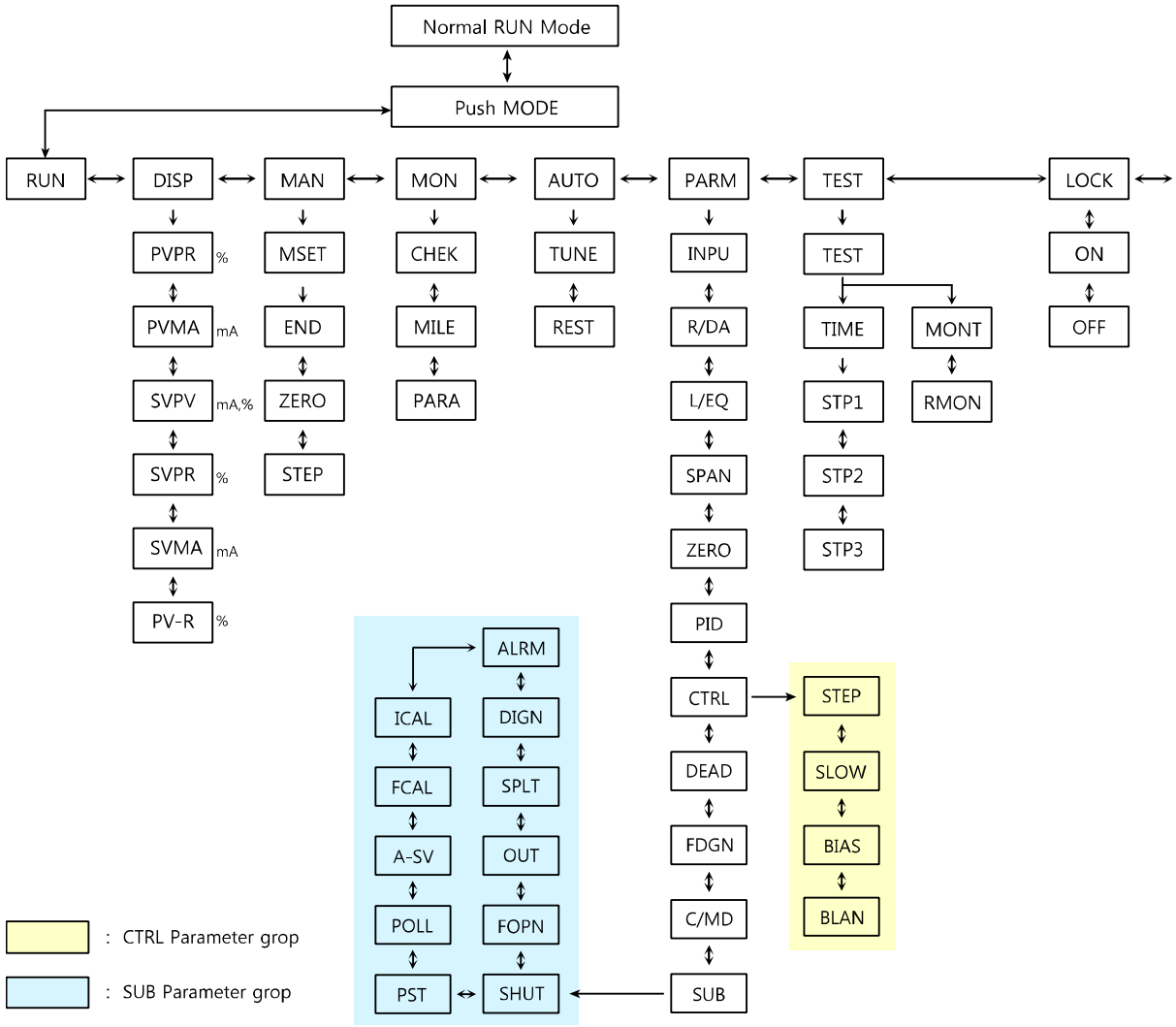
10.4 Checking Ambient Temperature



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 (P. 30)	DISP	DISPLAY	changes the LCD display mode
	PVPR	PV % value	shows the current position by %
	PVMA	PV mA value	shows the current position by mA
	SVPV	PVPR-SVPR (automatic turn)	shows the current position by % and mA by turns at intervals of 1 second
	SVPR	Input signal % value	shows the input signal 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 (P. 31)	MAN	MANUAL	operates the valve manually
	MSET	MANUAL-SET	operates the valve manually
	END	Move to 100%	moves a valve to 100% regardless of input signals
	ZERO	Move to 0%	moves a valve to 0% regardless of input signals
	STEP	Move by 1%	moves a valve by 1% regardless of input signals

Ref.	Parameter	Description	Function
11.4.4 (P. 32)	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
	PARA	Registry memory values	checks the registry records in memory

Ref.	Parameter	Description	Function
11.4.5 (P. 33)	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

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

Ref.	Parameter	Description	Function
11.4.6 (P. 33)	TEST	TEST MODE	tests the positioner
	TIME	Interval time	sets the testing interval time
	STP1	STEP1	0% → 50% → 100% → 50% → 0% → Repeat
	STP2	STEP2	0% → 25% → 50% → 75% → 100% → 75% → 50% → 25% → 0% → Repeat
	STP3	STEP3	1% → 10% → 20% … 90% → 100% → 90% … 20% → 10% → 0% → Repeat

11.3 Parameters

11.3.1 Main Parameters

Ref.	Parameter	Description	Function	Default
11.5.1 (P. 37)	INPU	Input signal	4...20mA or 20...4mA	4...20mA
11.5.2 (P. 37)	R / DA	RA / DA	Reverse acting or direct acting	RA
11.5.3 (P. 37)	L / E.Q / QOPN/USER	Characteristic	Linear, E.Q. % (1:25 or 1:50),Quick open or User set (17points)	Linear
11.5.4 (P. 39)	SPAN	Span adjustment	0...100%	100%
11.5.5 (P. 39)	ZERO	Zero adjustment	0...99%	0%
11.5.6 (P. 40)	PID	P-GN / I-GN / D-GN	Proportional / Integral / Differential gain value	Auto-set
11.5.7 (P. 42)	CTRL	SPED / SWST / CNLT / GCNL	See 11.3.2 CTRL	-
11.5.8 (P. 43)	DEAD	Dead band	0...9.99%	0.5%
11.5.9 (P. 44)	FDGN	D-gain setting for hard mode	D-Gain setting for hard mode	Auto-set
11.5.10 (P. 44)	C/MD	NORM / HARD / SMAL	Standard actuator, strong valve packing friction, small actuator or angle seat valve	NORM
11.5.11 (P. 45)	SUB	Sub-Parameters	See 11.3.3 SUB	-

11.3.2 CTRL – Coil Control Parameters

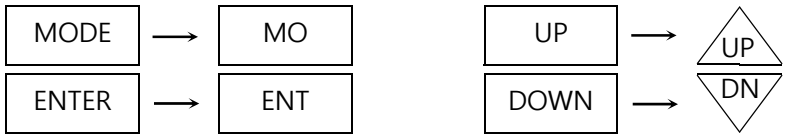
Ref.	Parameter	Description	Function	Default
11.5.7.A (P. 41)	STEP	Coil control value	Setting of standard coil control speed	0
11.5.7.B (P. 41)	SLOW	Slow control	PWM control during all range	OFF
11.5.7.C (P. 42)	BIAS	Coil bias	Control of coil bias value	0
11.5.7.D (P. 42)	BLAN	Coil balance	Control of UP / DOWN speed balance	0

11.3.3 SUB - Parameter

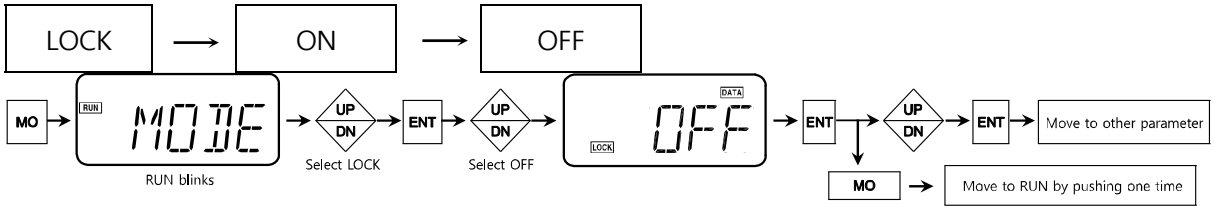
Ref.	Parameter	Description	Function	Default
11.5.11.A (P. 45)	SHUT	Shut-off	0...9.9%	0.3%
11.5.11.B (P. 46)	FOPN	Full-open	0...9.9%	0.3%
11.5.11.C (P. 46)	OUT	Output signal	4...20mA or 20...4mA	4...20mA
11.5.11.D (P. 46)	SPLT	Split range	4...12mA or 12...20mA	4...20mA
11.5.11.E (P. 46)	DIGN	Display place	Movement to one or two decimal places	1
11.5.11.F (P. 47)	ALAM	Alarm limit low, high	AL1L/AL1H, AL2L/AL2H	0...10%, 90...105%
11.5.11.G (P. 49)	ICAL	IN4M / IN20	Setting of values in accordance with 4~20mA input signals	Factory setting
11.5.11.H (P. 49)	FCAL	FB4M / FB20	Setting of values in accordance with 4~20mA output signals	Factory setting
11.5.11I (P. 48)	A-SV	Air save	Reduction of air consumption	OFF
11.5.11J (P. 50)	POLL	HART polling address	0...15	0
11.5.11.K (P. 50)	PST	Partial stroke test	Checking of valve status	OFF

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")

④ LOCK is on unless any input signal is not supplied.

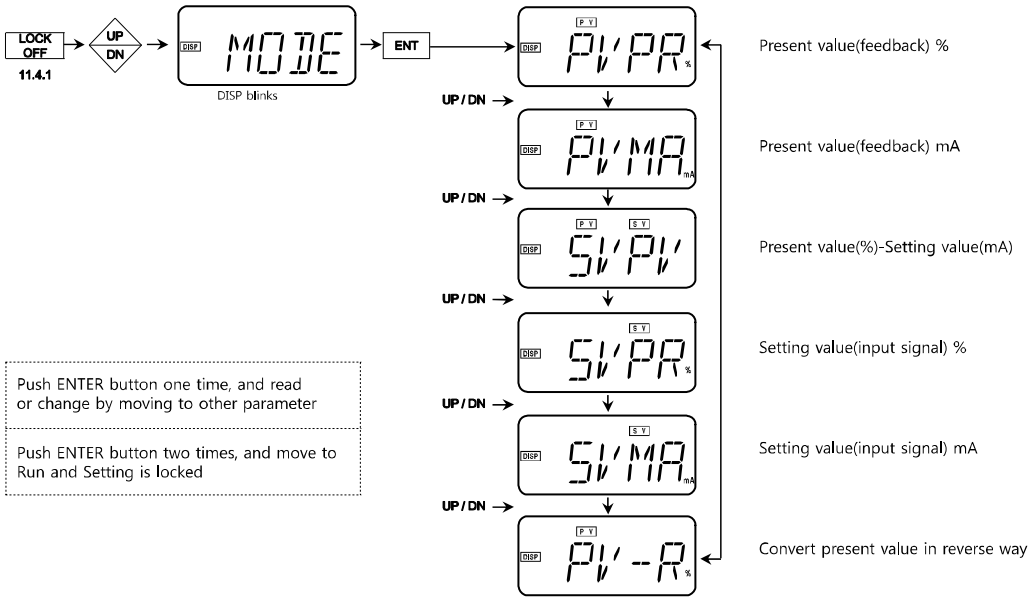
⑤ It is difficult to read or change under LOCK ON situation.

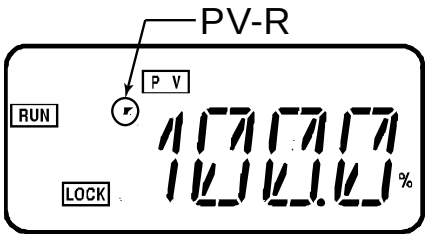
11.4.2 Display Mode

DISP ⟶ PVPR % ⟷ PVMA mA ⟷ SVPV %/mA ⟷ SVPR % ⟷ SVMA mA ⟷ PV-R %

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

(Ex. Reverse : 20% shown → 80% shown)



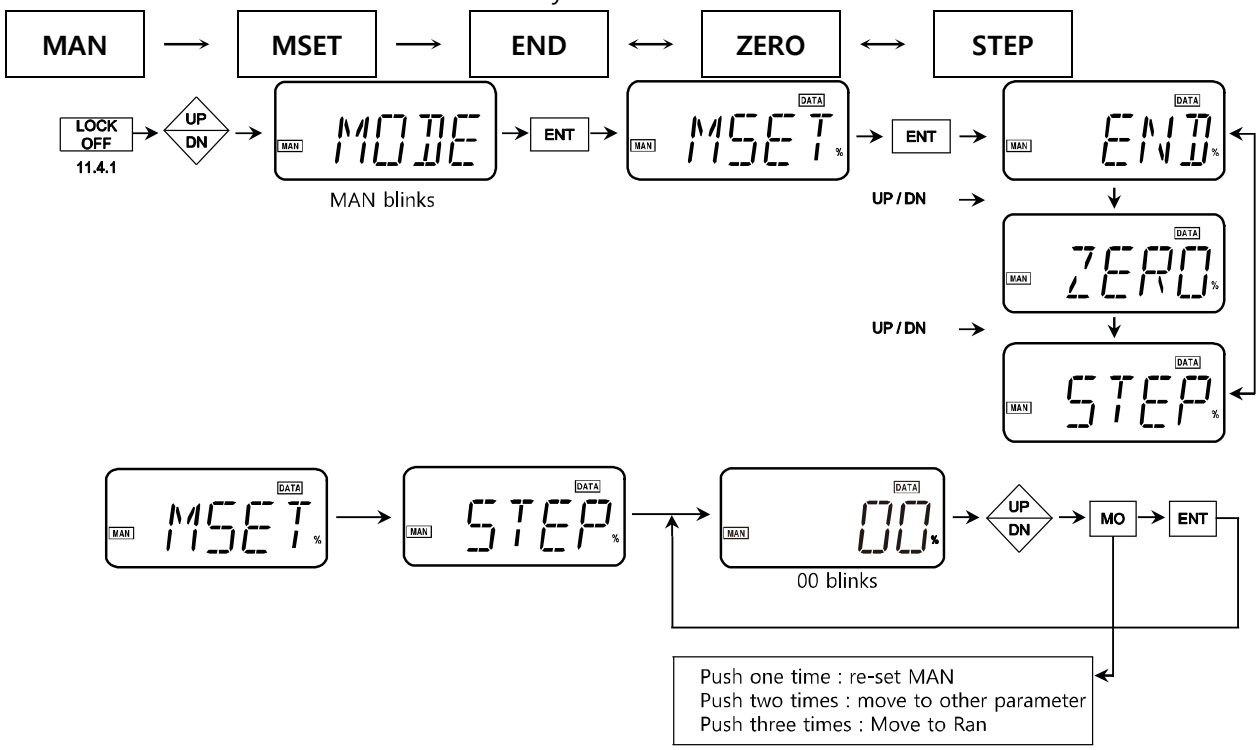


If PV-R is selected, the small point will blink as shown to the left.

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.

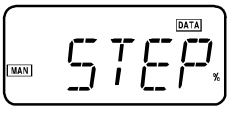
11.4.3 Manual Mode (default: 0)

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



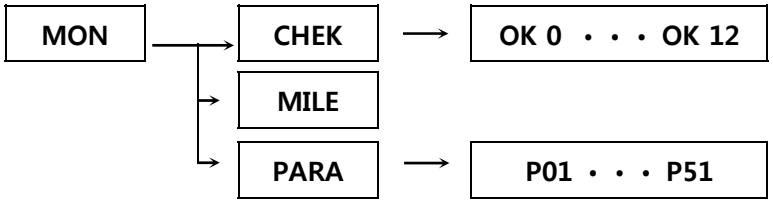
If END is set, the actuator will move to 100%.

If ZERO is set, the actuator will move to 0%.

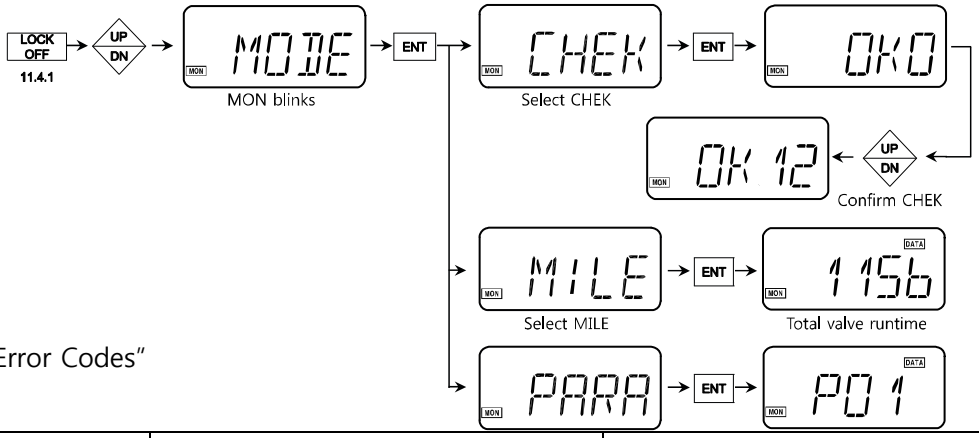


If STEP is selected and UP/DN is pushed, the actuator will move to 1% by 1%

11.4.4 Monitor Mode



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



Meanings of "Error Codes"

	Cause	Symptom	Action
ER0	Low input current (3.7mA)	Data on LCD are shown too dim or too bright.	Re-check 4 – 20mA input signals.
ER1	High input current(20.5mA)		
ER2	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
ER3	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.
ER4	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.
ER5	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.
ER6	PST error	BAD is shown.	Check the valve or increase the response time of PST.
ER7	Coil No.1 Bias Low	Valve is not closed or open and moves slowly.	Loosen a valve packing.
ER8	Coil No.1 Bias High		
ER9	Coil No.2 Bias Low		
ER10	Coil No.2 Bias High		
ER11	Potentiometer Error	Problem of potentiometer	Check the potentiometer (Potentiometer Ass'y, Board)
ER12	Coil Error	Problem of coil	Check the coil assembly.

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

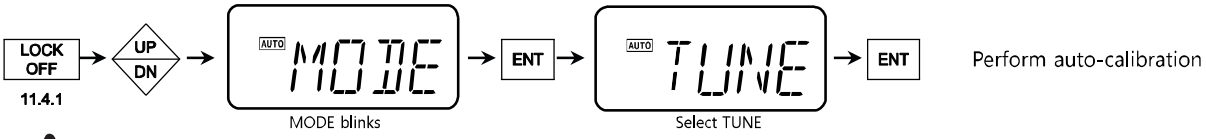
② P01 to P51 are just for a factory setting and only for reference

11.4.5 Auto-Calibration Mode

AUTO ⟶ TUNE ⟷ RSET

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



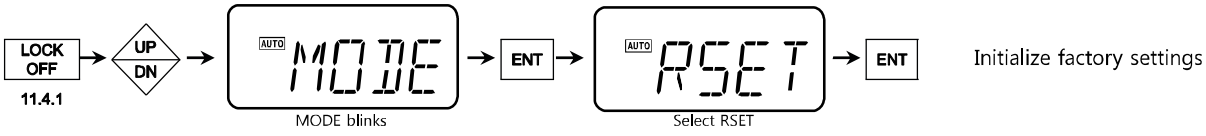
① Reverse acting (RA) is a standard factory setting. Even if air lines are connected wrongly by mistake, the SS5 positioner detects automatically and performs auto-calibration for direct acting (DA).

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.



11.4.6 Self-Test Mode

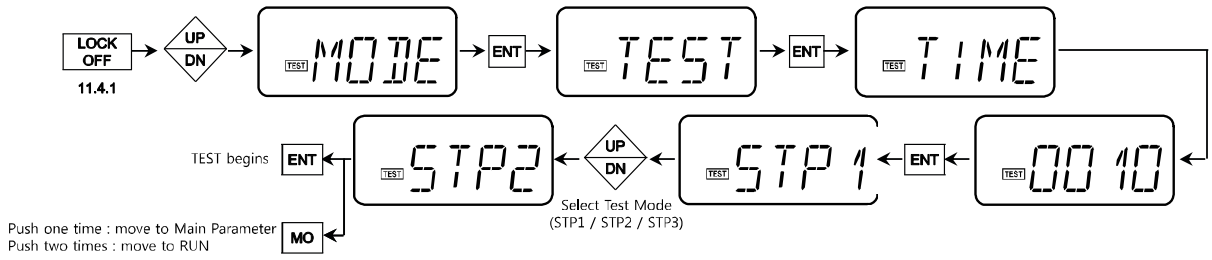
TEST ⟶ TIME ⟶ STP1 ⟷ STP2 ⟷ STP3

11.4.6.A Check the valve working status by moving regardless of input signals.

① STP1: 0% → 50% → 100% → 50% → 0% → Repeat

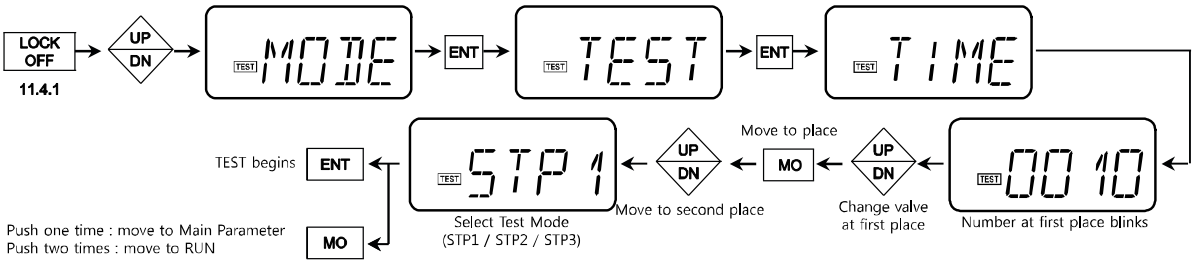
② STP2: 0% → 25% → 50% → 75% → 100% → 75% → 50% → 25% → 0% → Repeat

③ STP3: 1% → 10% → 20% … 90% → 100% → 90% … 20% → 10% → 0% → Repeat

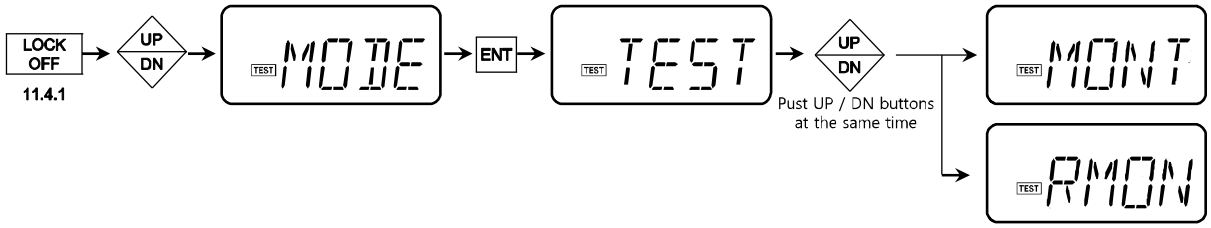


11.4.6.B Test Time Setting for Each Step (default: 10)

Each test step advances at interval of 10 seconds as a standard factory setting.



11.4.6.C Modifications of Internal Settings



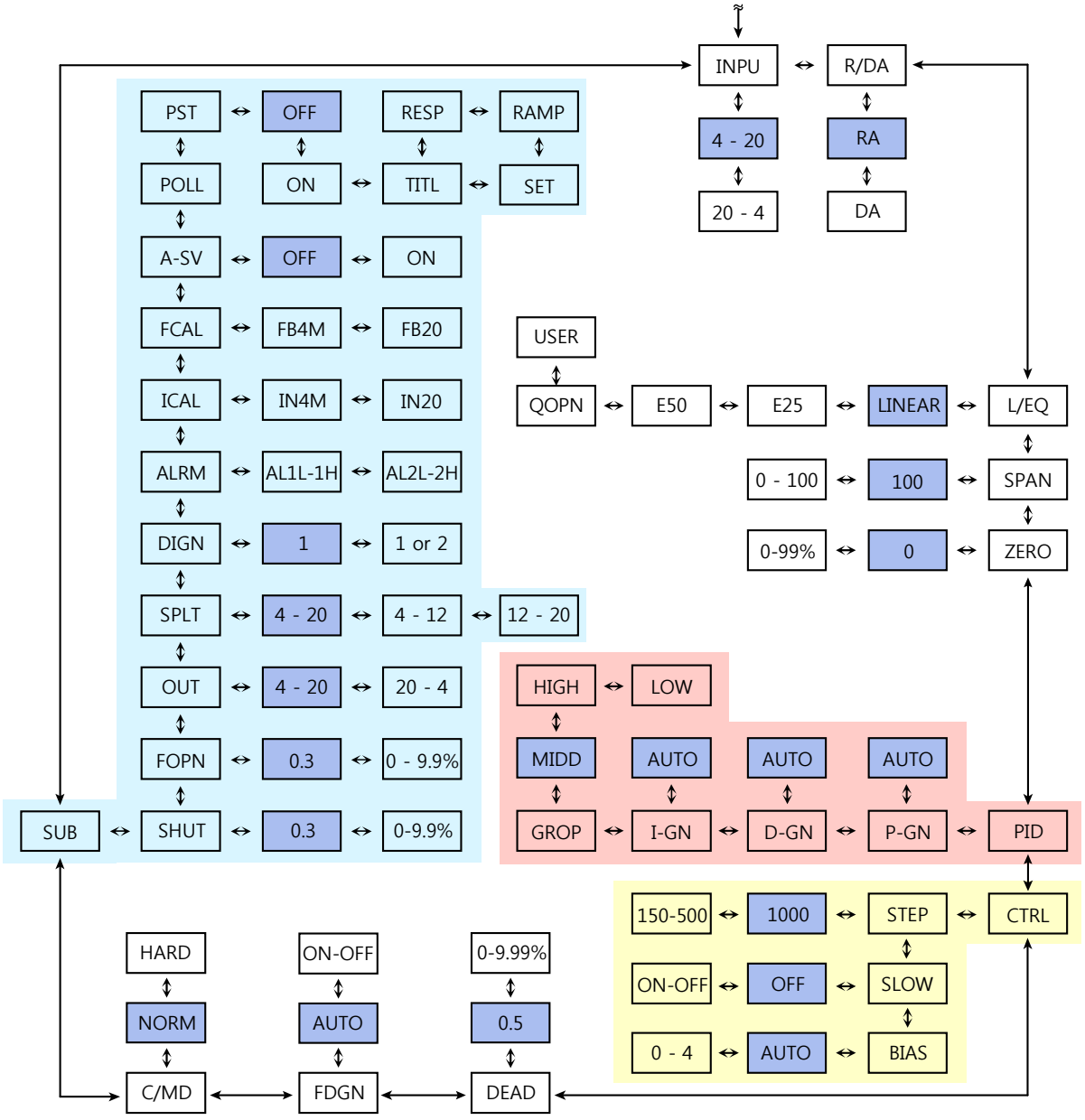
• The current valve mounting situation is shown. If the value is far away from 50, the valve will suffer from a poor linearity and hysteresis. Move the positioner and try to reach closer to 50 for the best linearity and hysteresis.

- How to set MONT

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

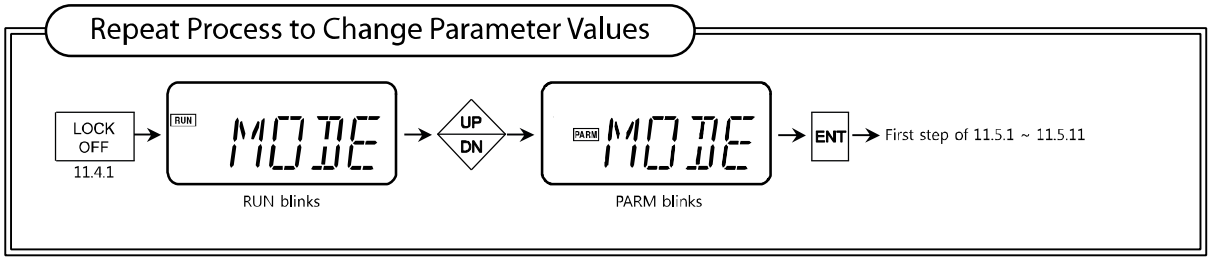
- Step 1: Select MONT, and the valve will be fully open or closed and also the actual valve position will be shown as %. If the valve doesn't move any longer, push the ENT button.
- Step 2: If the ENT button is pushed on Step 1, the valve will be fully open or closed and also the actual valve position will be shown as %. If the valve doesn't move any longer, push the ENT button.
- Step 3: If the ENT button is pushed on Step 2, the actual valve position is shown as % in case of the 12mA input signal (50%) by using the actual valve positions got on the above Step 1 and Step 2. The positioner can get the best linearity at the actual valve position of 50%. Move the positioner up or down so that the valve position shown can reach closer to 50 and fix the mounting bracket tightly.

11.5 Parameters Flow Diagram



The colored cells stand for the standard factory settings.

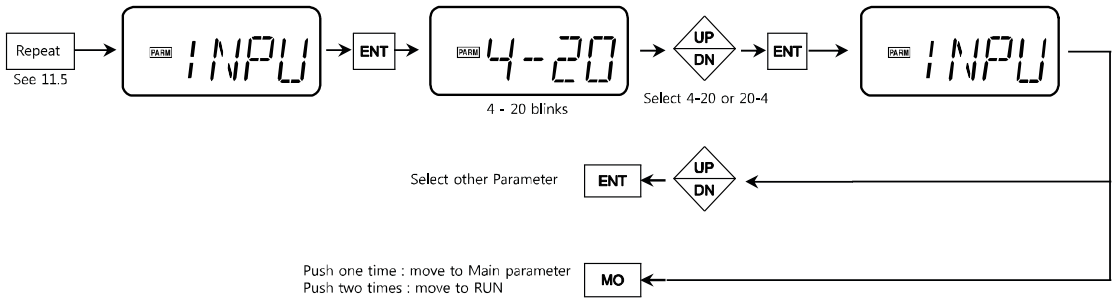
All setting values return to the standard factory settings if RESET begins.



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

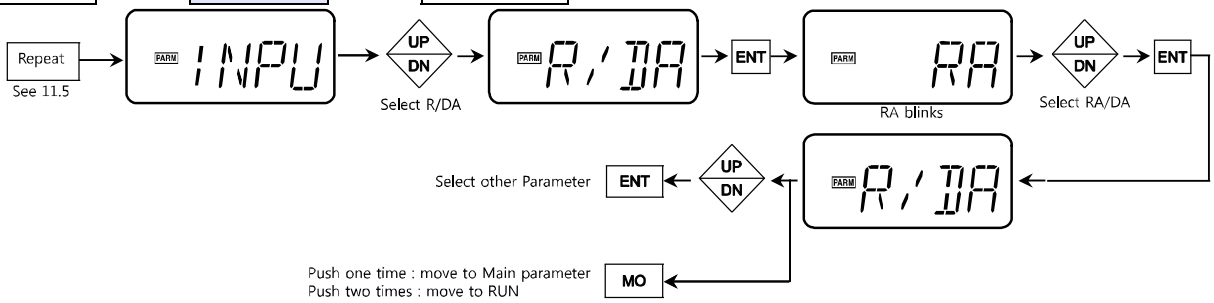
INPU ⟶ **4-20** ⟷ **20-4**

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)

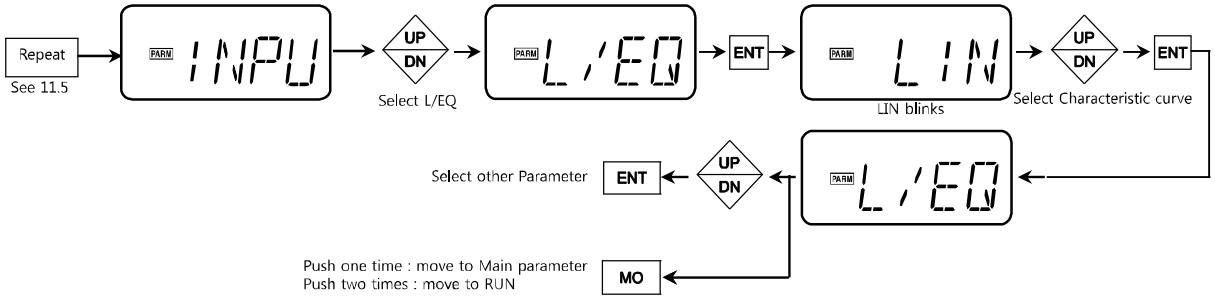
R/DA ⟶ **R A** ⟷ **D A**

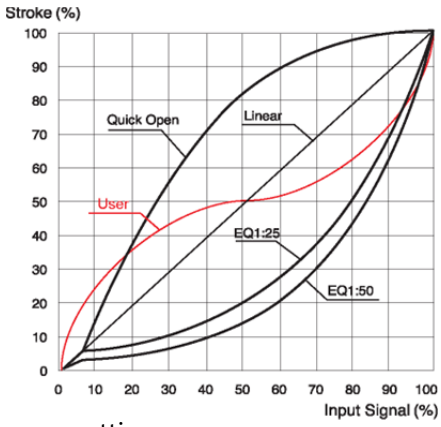


11.5.3 [L/EQ] Change of Linear, E.Q.%, Quick Open or User Set (default: Linear)

L/EQ ⟶ **LIN** ⟷ **E25** ⟷ **E50** ⟷ **QOPN** ⟷ **USER**

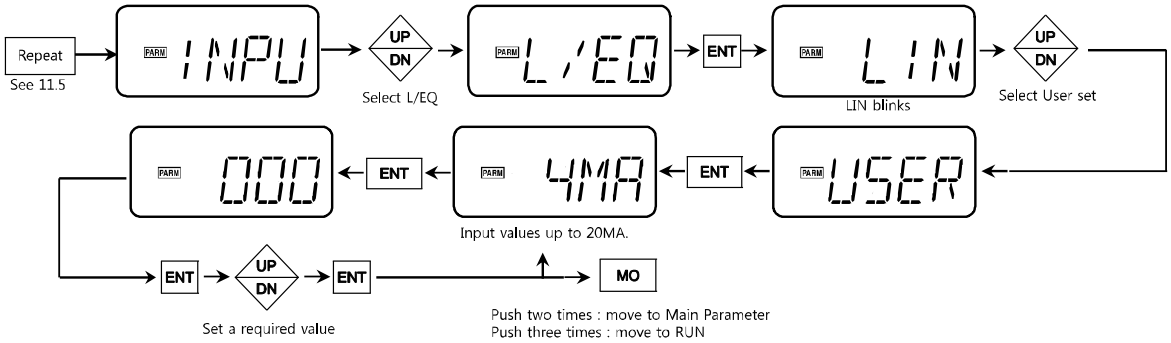
The valve characteristic can be changed to Linear, 1:25 EQ%, 1:50 EQ%, Quick Open or User Set.



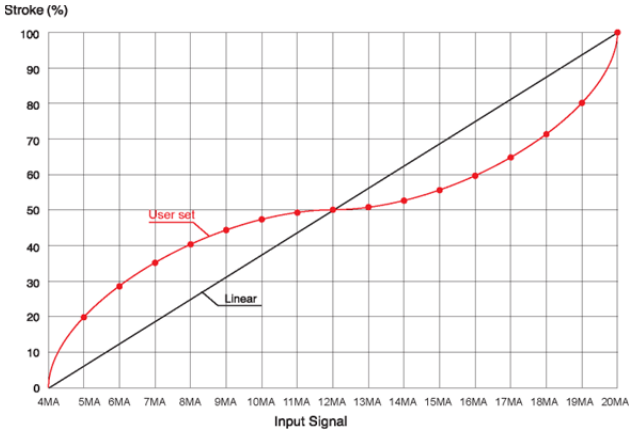


LIN	Linear
E25	EQ% (1 / 25)
E50	EQ% (1 / 50)
QOPN	Quick Open
USER	User set(17point)

- For the user setting,

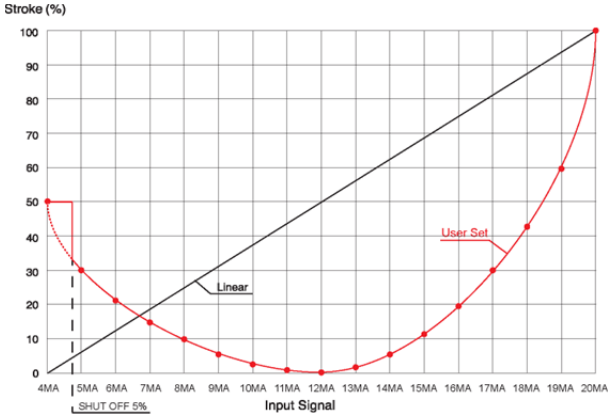


Example 1)



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

Example 2)

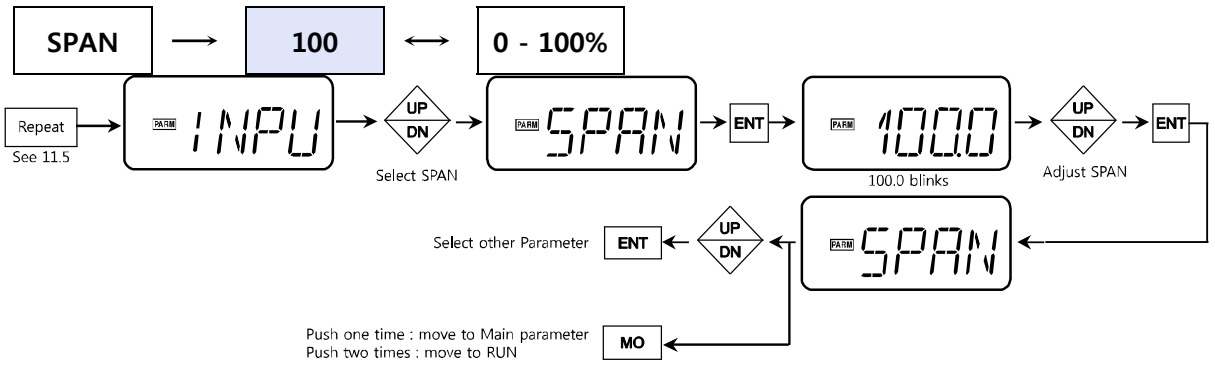


NOTES

1. This user setting has a linear characteristic as standard.
2. 5MA means % corresponding to 5mA.
3. Input all 4MA to 20MA for a required user set characteristic curve.

※ 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).
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.)
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.

11.5.4 [SPAN] Span Adjustment (default: 100)



① Be sure to supply 20mA input signal before adjusting SPAN.

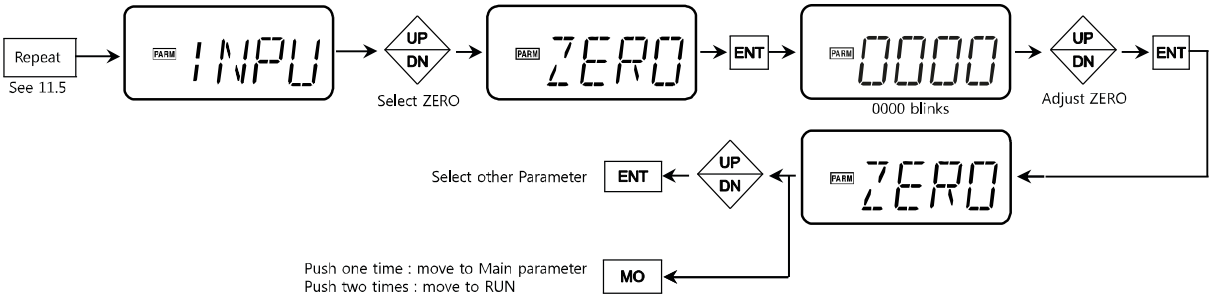
② Push ▼ DN button one time, Span will decrease by 0.1%. Keep pushing ▼ DN button, Span will decrease fast.

③ For a quick Span setting, push ▼ DN button for 5 seconds. (see 10.2)

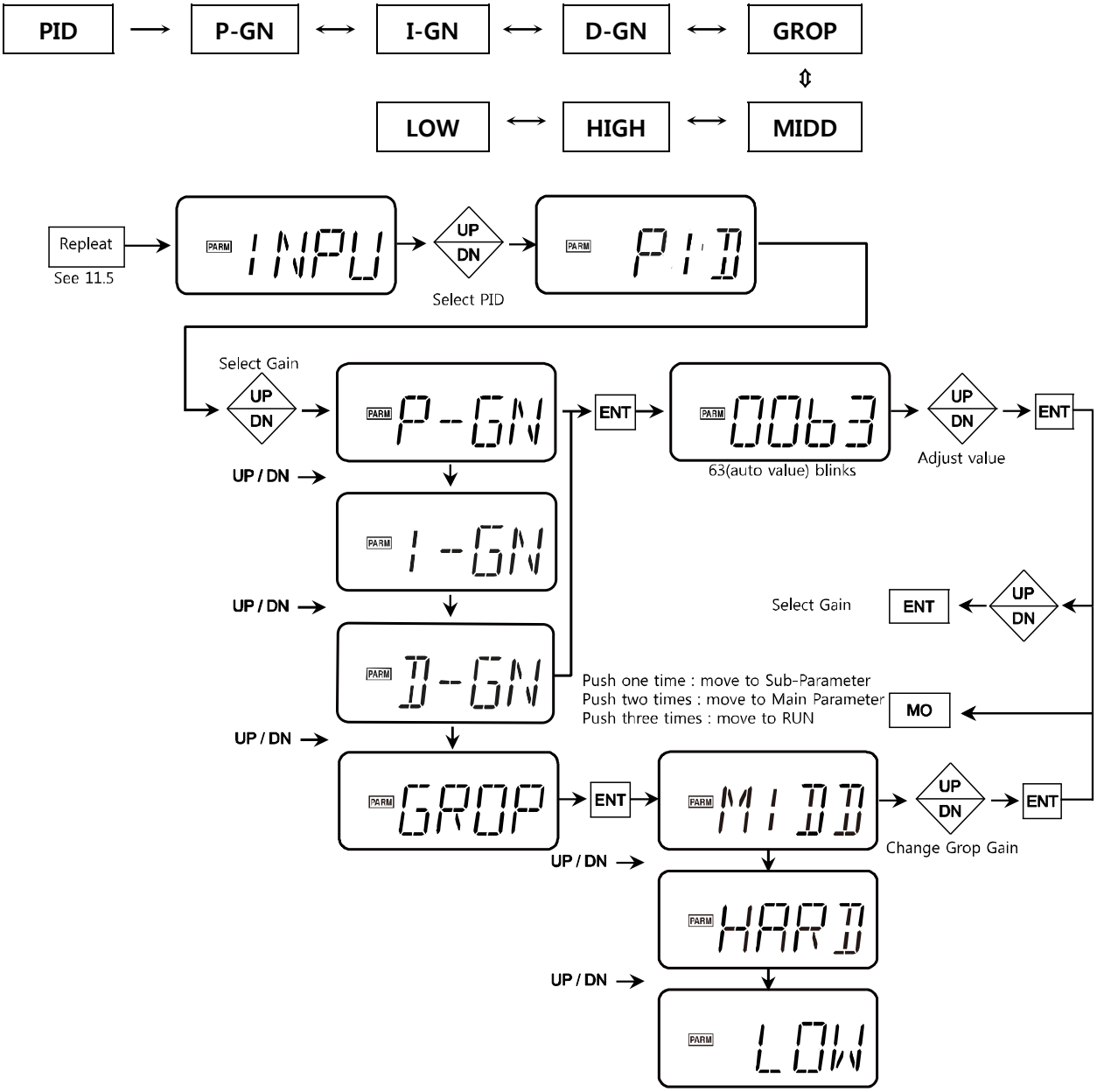
11.5.5 [ZERO] Zero Adjustment (default: 0)

ZERO	⟶	0	⟷	0 - 99%

Zero can be adjusted to 0 – 99%.



11.5.6 PID-Gain



11.5.6.A P-Gain (Proportional Gain)

P-GN ⟶ **Auto Set**

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)

I-GN ⟶ **Auto Set**

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)

D-GN ⟶ **Auto Set**

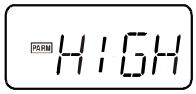
As D-Gain is set automatically during auto-calibration process, it is not necessary to change manually.

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)

11.5.6.D GROP-Gain Adjustment (GROP)

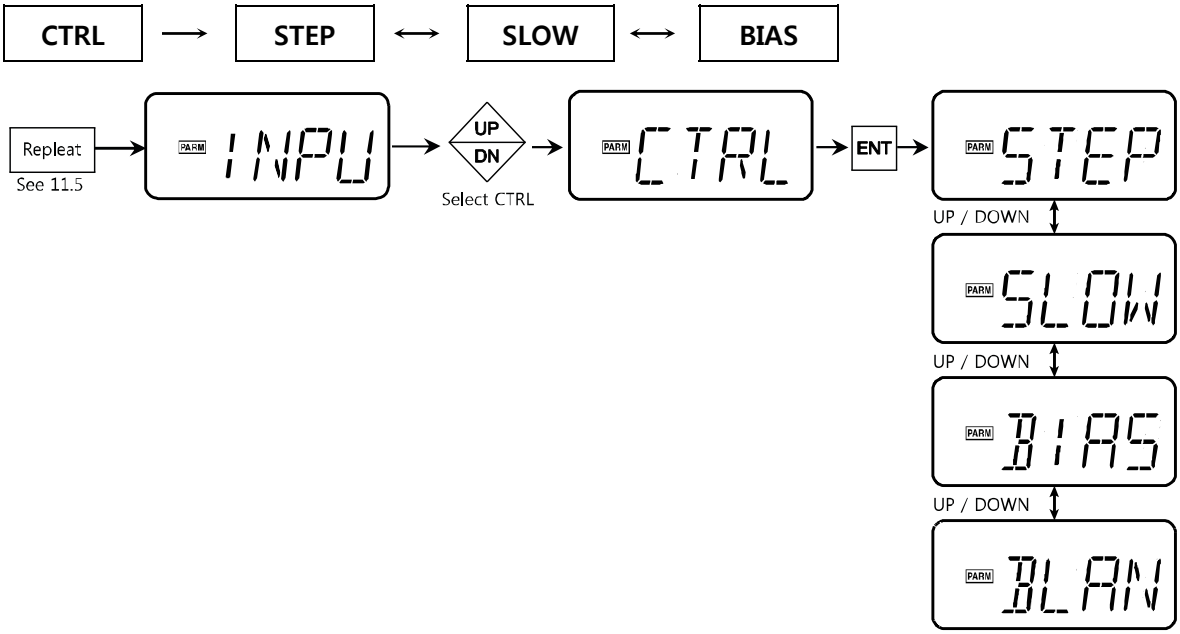
GROP ⟶ **MIDD** ⟷ **HARD** ⟷ **LOW**

GROP consists of 3 kinds of gain according to Control Mode (NORM, HARD, SMAL). Most hunting or oscillation problems can be solved by selecting HARD or SMAL in Control Mode. But if it is necessary to adjust PID values, MIDD, HARD, LOW can be selected without a full understanding of PID control.

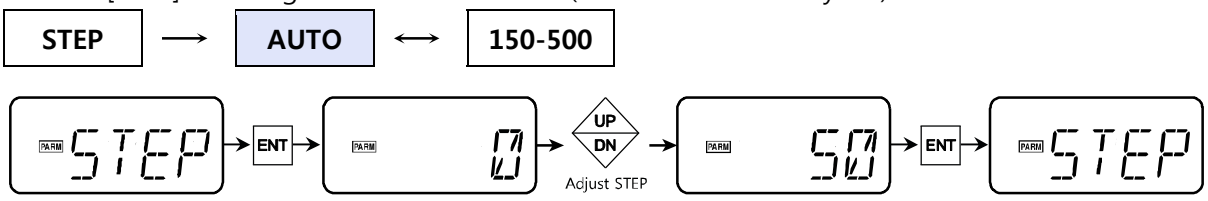
Parameter	Status	Description
		Standard parameter
	Hunting is happening	Change to Hard mode in case of a hunting problem (by rapid under or overshooting)
	Oscillation is happening	Change to Low mode in case of an oscillation problem (by slow under or overshooting)

Keep pushing UP button for 3 seconds and move to GROP.

11.5.7 [CTRL] – Group of Coil Control Parameters

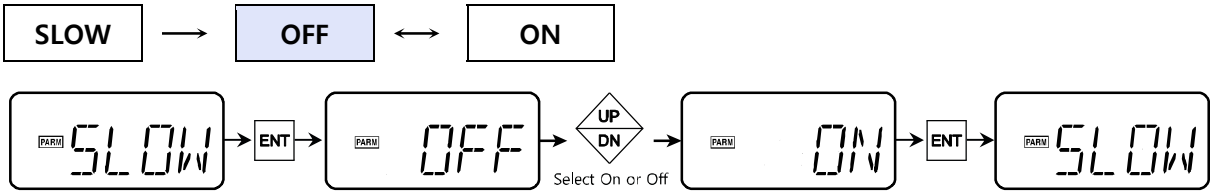


11.5.7.A [STEP] – Setting of Coil Control Value (default: automatically set)



This is to change a speed(frequency) that controls coils. In case of a hunting problem, increase STEP for a more precise and reliable control. Note that it takes the valve more time to reach a desired position due to a change of STEP.

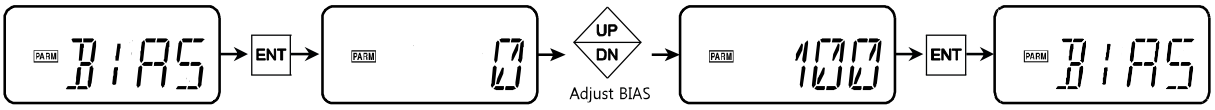
11.5.7.B [SLOW] – Slow control (default: OFF)



If it is set to ON, PWM control is activated during all strokes. It is useful for a good control with a small actuator or an angle seat valve(Y-valve).

11.5.7.C [BIAS] – Control of Coil Bias (default: automatically set)

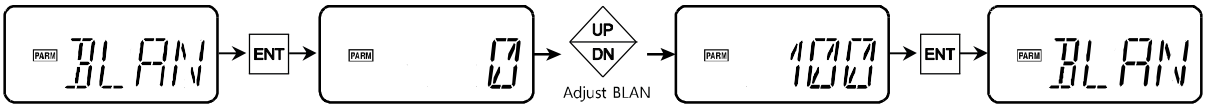
BIAS	⟶	AUTO	⟷	0-4



In case of the overshooting problem (moving up higher than a desired position and moving down), set Bias low. On the contrary, if the valve stops lower than a desired position, increase Bias.

11.5.7.D [BLAN] – Control of UP / DONW Speed Balance (default: 0)

BLAN	⟶	0	⟷	±300

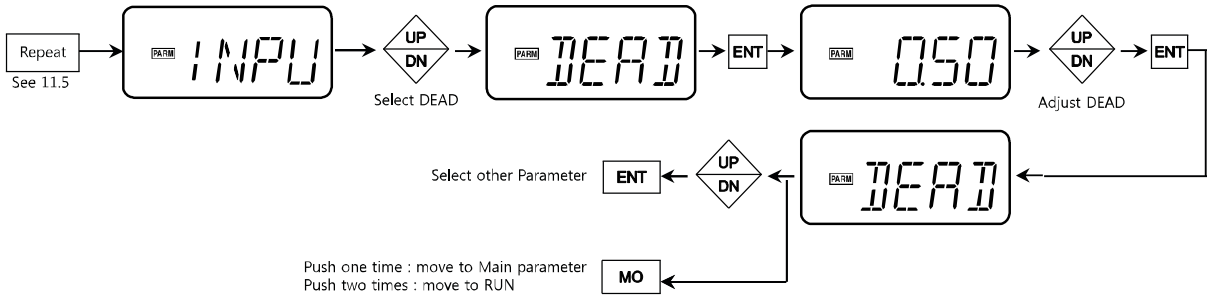


This is to correct the mechanical speed difference between two coils and set in the range of Min. -300 to Max. +300. Make the speed faster by increasing to '+' and slower by decreasing to '-'.

11.5.8 [DEAD] Setting of Dead Band (default: 0.5)

DEAD	⟶	0.5	⟷	0-9.99%

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



0.5% is a standard factory setting. For reference, 0.50 corresponds to 0.5% and the maximum value is 9.99 % (9.99).

11.5.9 [FDGN] HARD Mode FAST D-Gain

FDGN ⟶ **AUTO** ⟷ **0 - 50**

HARD mode BIOS is available only when Control Mode is set to HARD. It is not available with setting of NORM.

FDGN is used for a more stable valve control and set automatically during auto-calibration. The user can re-set the FDGN value manually.

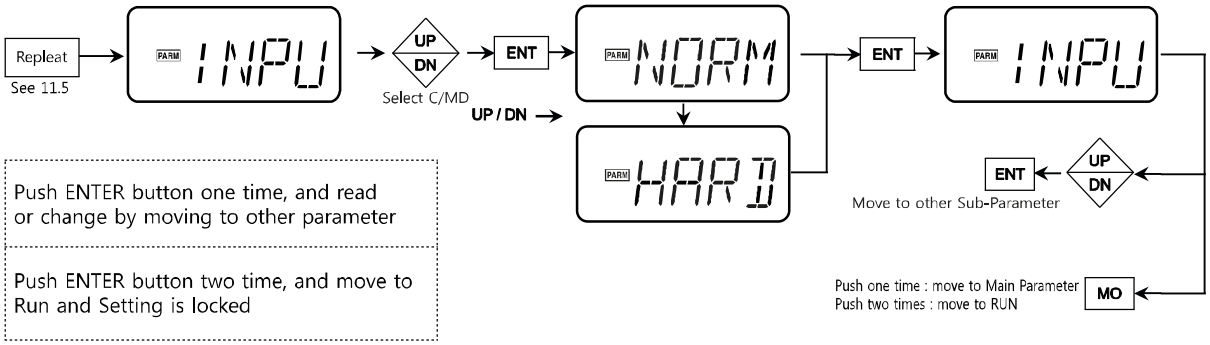
More power (pneumatic torque) is required to move a valve with a strong friction packing and it can cause a hunting or overshooting problem by inertia. By way of prevention, when the positioner reaches to a desired position, air is charged or discharged momentarily for a more stable valve control.

The FDGN value stands for the volume of air charged or discharged. If the FDGN value is set too high, a hunting problem can happen. If too small, FDGN will not be effective.

11.5.10 Control Mode according to Valve Working Condition

C/MD ⟶ **NORM** ⟷ **HARD**

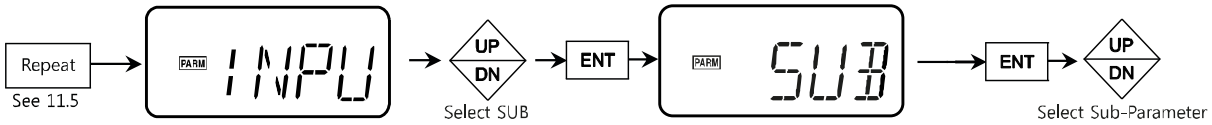
Control Mode is set automatically during auto-calibration. But it can be set manually for the current valve working condition in case of a hunting problem or an overshooting problem.



PARM NORM	In case of normal actuator
PARM HART	In case of strong valve packing friction

Carry out auto-calibration again in case that it is changed to HART from NORM

11.5.11 SUB Parameter

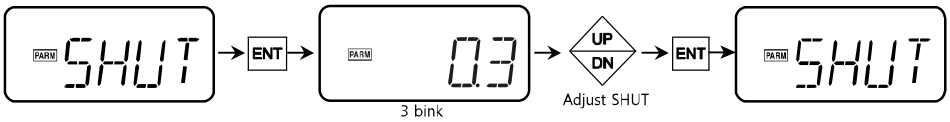


Ref.	Parameter	Description	Function	Default
11.5.11.A	PARM SHUT	Shut-off	0...9.9%	0.3%
11.5.11.B	PARM FOPN	Full-open	0...9.9%	0.3%
11.5.11.C	PARM OUT	Output signal	4...20mA or 20...4mA	4...20mA
11.5.11.D	PARM SPLT	Split range	4...12mA or 12...20mA	4...20mA
11.5.11.E	PARM DIGN	Display place	Movement to one or two decimal places	1
11.5.11.F	PARM ALRM	Alarm limit low, high	AL1L/AL1H, AL2L/AL2H	0...10%, 90...105%
11.5.11.G	PARM ICAL	IN4M / IN20	Setting of values relating to 4-20mA input signal	Factory setting
11.5.11.H	PARM FCAL	FB4M / FB20	Setting of values relating to 4-20mA output signal	Factory setting
11.5.11.I	TEST A-SV	A-SV	Reduction of air consumption	OFF
11.5.11.J	PARM POLL	HART Polling Address	Change of HART polling address	0
11.5.11.K	PARM PST	Partial Stroke Test	Checking of valve status	OFF

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

SHUT	⟶	0.3	⟷	0-9.9

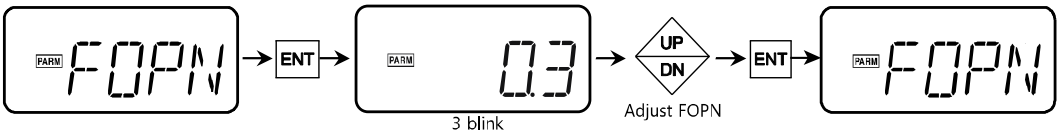
It is a safety function to close a valve completely. And it is possible to change 0% to 9.9%. For reference, 0.1% means that the positioner responds to 0.016mA. Therefore, the standard value of 0.3% means that a valve is closed at 4.048mA completely.



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

FOPN	⟶	0.3	⟷	0-9.9

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.



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

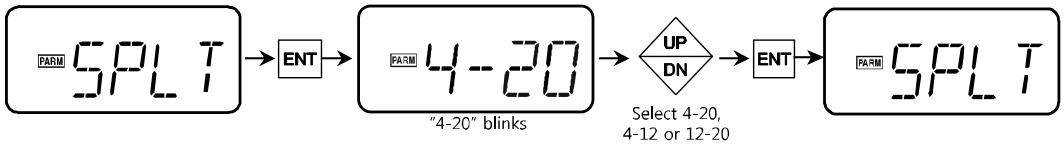
OUT	⟶	4 - 20	⟷	20 - 4

4 – 20mA is set as a standard factory setting. It is possible to change to 20 – 4mA.

11.5.11.D [SPLT] Spilt Range Setting (default: 4-20)

SPLT	⟶	4-20	⟷	4-12	⟷	12-20

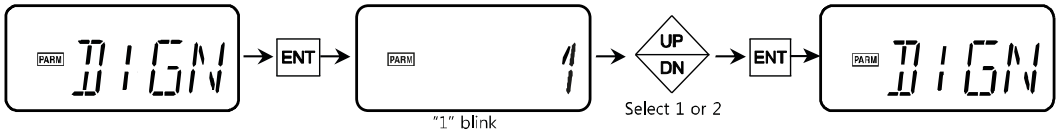
Split range can be set to 4-12mA or 12-20mA.



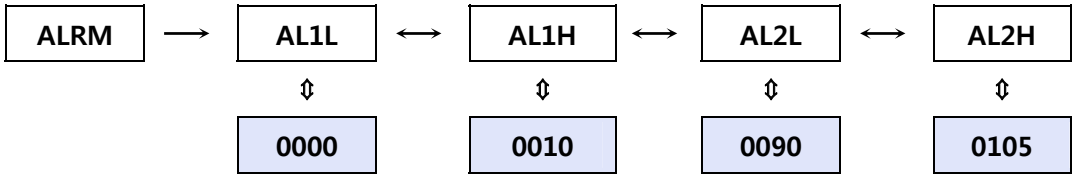
11.5.11.E [DIGN] Change of Decimal Display

DIGN	⟶	1	⟷	1 or 2

Setting value (SV) is displayed by the first decimal place as standard. It is possible to display by the second decimal place. For reference, only mA values can be displayed by the second decimal place. In case of % value, it is limited to display by the first decimal place.



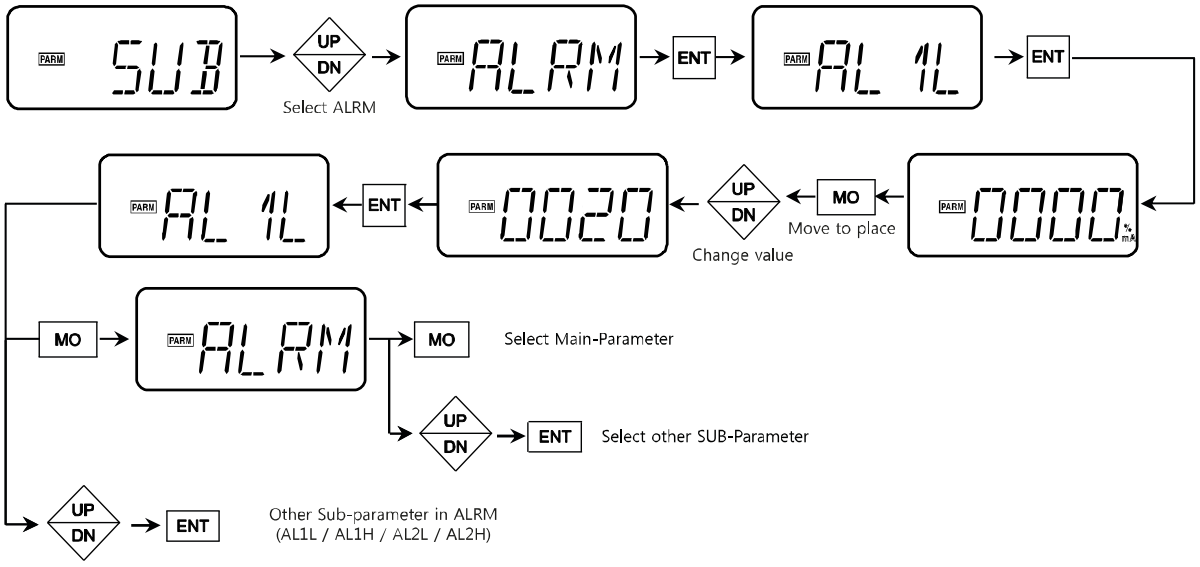
11.5.11.F [ALRM] Setting of Alarm Limits (default: 0 – 10%, 90 – 105%)



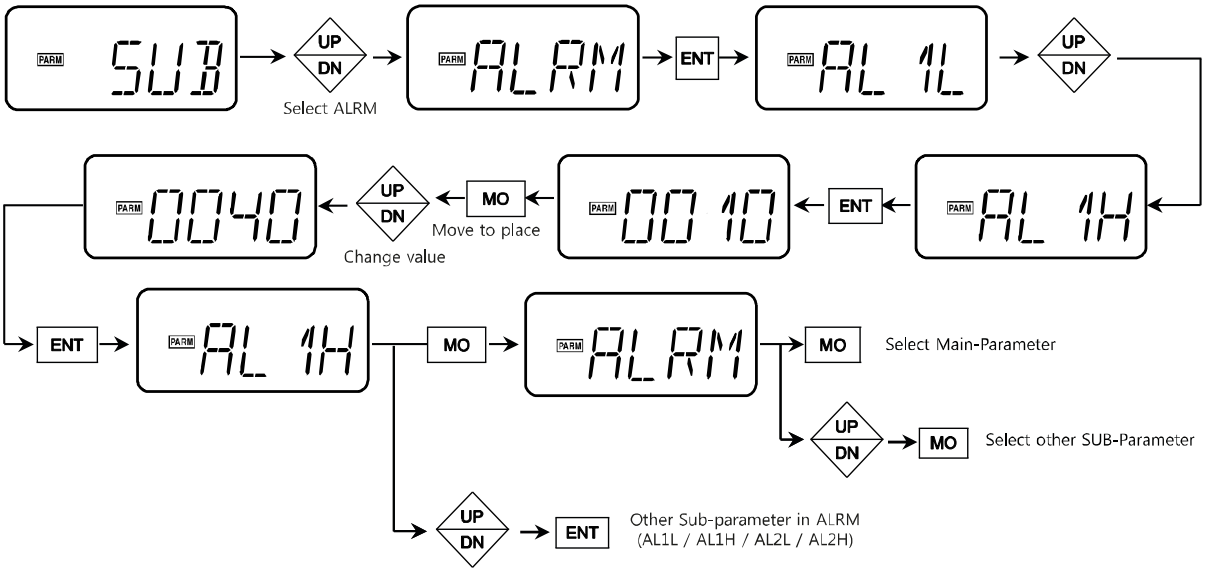
You can set an opening point or a closing point of a control valve. AL1 (L, H) is set to 0 – 10% and AL2 (L, H) is set to 90 – 105% from the factory as standard.

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

① AL1L Setting

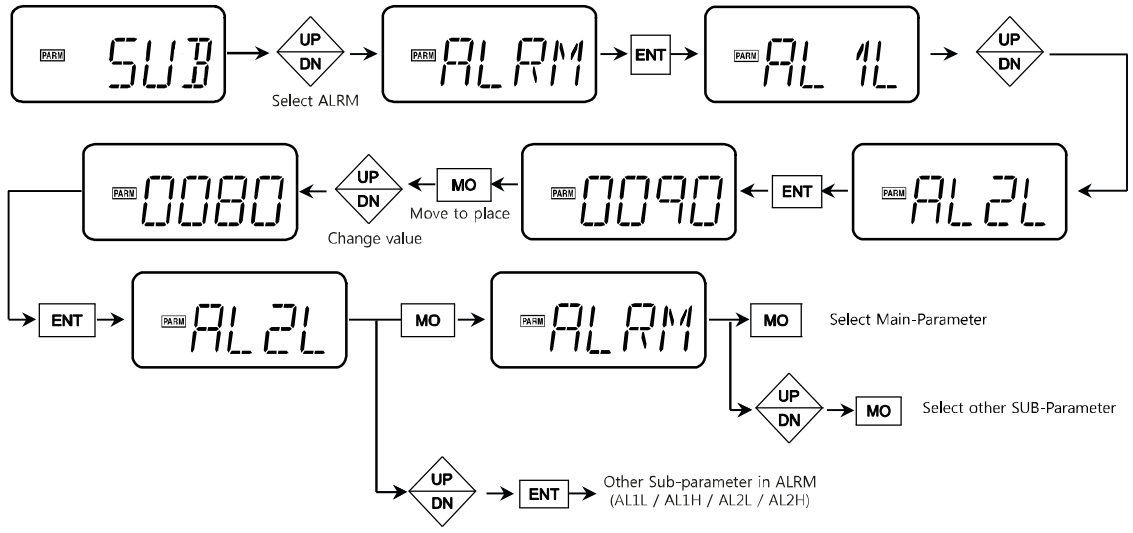


② AL1H Setting

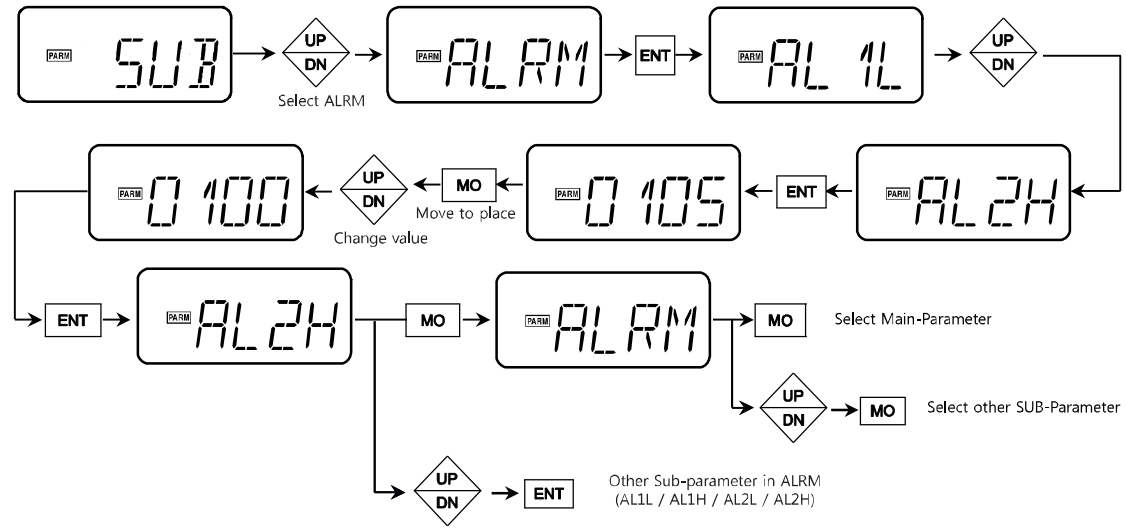


For example, see the below in order to re-set AL2 to 80 – 100%(AL2L = 80, AL2H = 100).

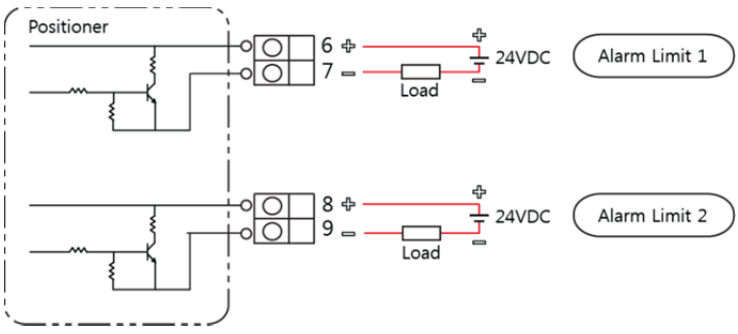
① AL2L Setting

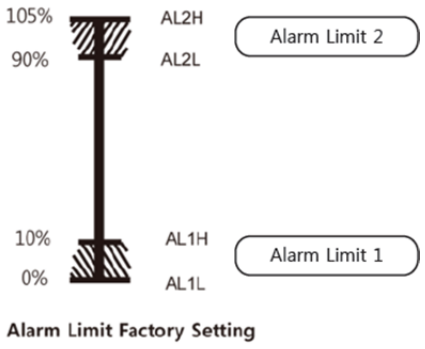


② AL2H Setting



How to wire the Alarm Limits





Alarm Limit Factory Setting

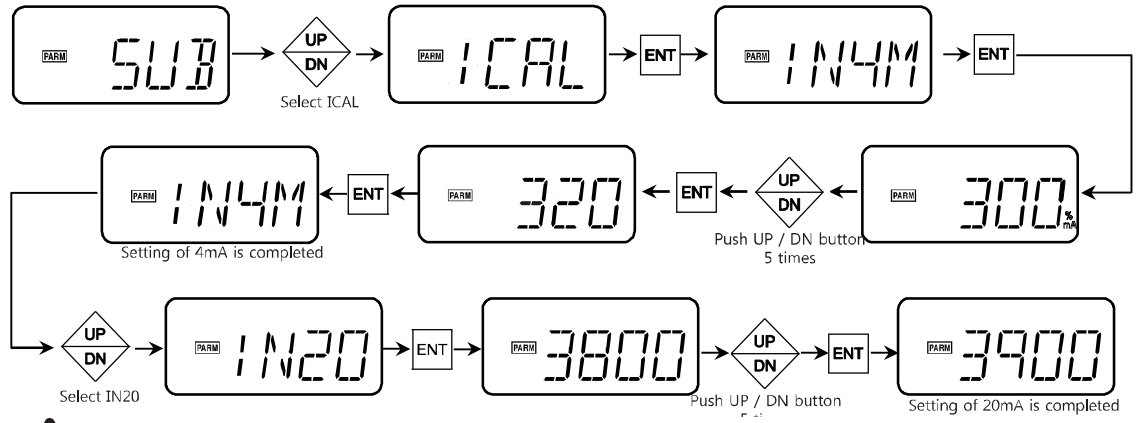
⚠ 24VDC should be supplied for alarm limits.

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

ICAL ⟶ **IN4M** ⟷ **IN20**

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.

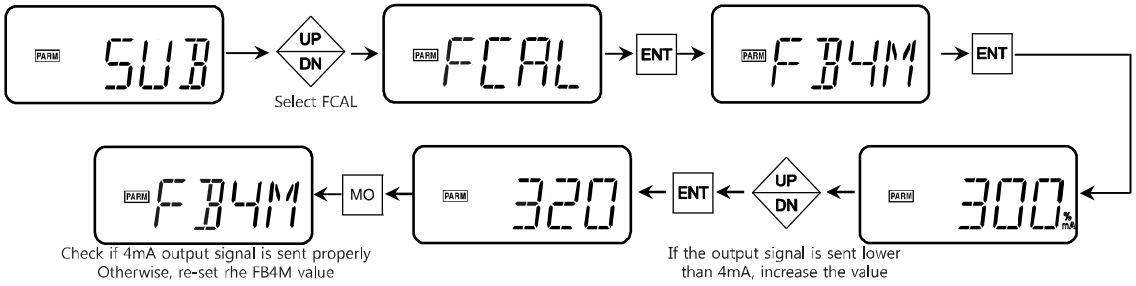
11.5.11.H [FCAL] – Setting of Output Signal (default: factory setting)

FCAL ⟶ **FB4M** ⟷ **FB20**

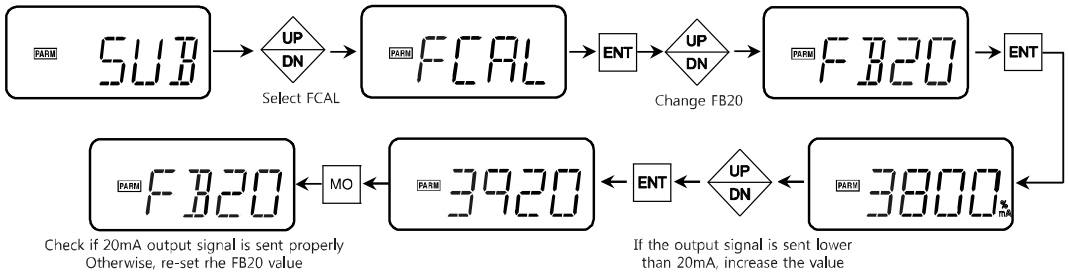
This is to re-set the 4 – 20mA output signals coming from the positioner.

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

<Setting of FB4M>



<Setting of FB20>



11.5.11.I [A-SV] – Air Save (default: OFF)

A-SV ⟶ **OFF** ⟷ **ON**

If A-SV is activated, when the valve reaches almost 100%, the pressure to the output port of the positioner is blocked so that the pressure used for the valve can be minimized and the diaphragm of the valve cannot be over-pressurized. This can help the lifetime of the valve extend longer.

Also, on the contrary, when the valve reaches almost 0%, the pressure to the output port of the positioner is blocked and the valve can respond faster at the next movement because a very small quantity air still exists inside of the actuator. If the valve is open due to an existing air, the SS5 positioner automatically makes the valve closed completely.

Off is set after auto-calibration.

11.5.11.J [POLL] – HART Communication polling address (default: 0)

POLL ⟶ **0** ⟷ **0 ~ 15**

This is to modify the HART communication polling address to 0 – 15.

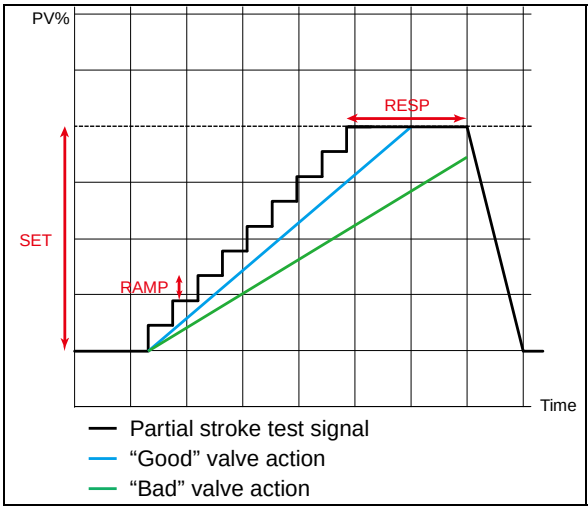
If an unexpected problem happens during HART communication, be sure to disconnect communication and try to modify POLL.

11.5.11.K [PST] – Partial Stroke Test (default: OFF)

PST ⟶ ON / OFF ⟷ TITL ⟷ SET ⟷ RAMP ⟷ RESP

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

PARM TITL	- to set the TEST time interval (default: '0024' – 24 hours) - Setting of '0000' shows the PST working status every 1 minute.
PARM SET	- to set the moving point by % during TEST (default: 10%) - Valve position > 50% : move to the deceasing direction - Valve position < 50% : move to the increasing direction
PARM RAMP	- 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.
PARM RESP	- 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.	
PARM GOOD	to show that there is no problem if the valve reaches Dead zone of the set position.
PARM BAD	to show that it is necessary to check the valve status if the valve fails to reach Dead zone of the set position.



⚠

- It is possible to prevent the valve from getting stuck in the long term.
- Do not activate the PST function if it is not intended to use.
- The PST function is deactivated after auto-calibration.

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

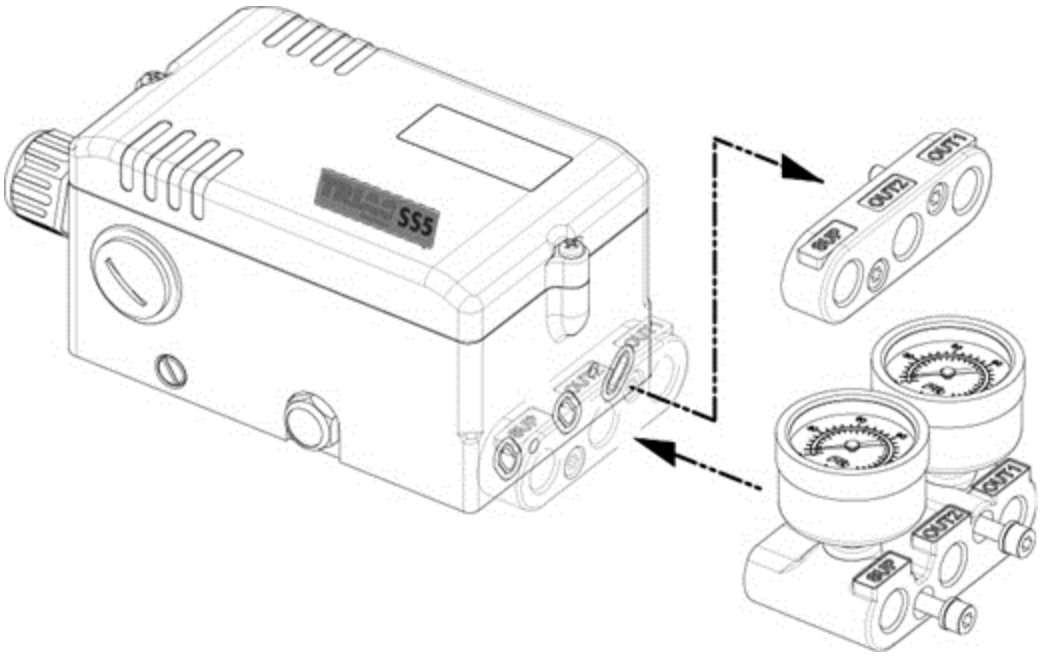
A supply air should be definitely clean and compressed free of water, moisture or oil in conformance with IEC 770 and ISA-7.0.01.

12.2 Module Parts

① Fail freeze 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, 0~10kΩ 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.

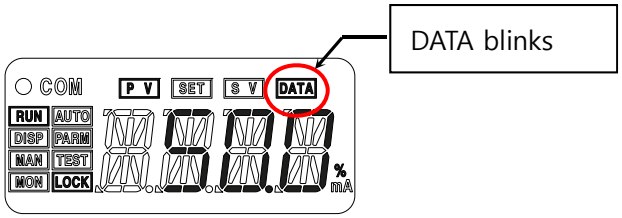
② Move the feedback lever to 50% position and adjust a potentiometer so that it can reach nearly 5kΩ.

③ Re-install the SS5 positioner onto the valve and re-perform auto-calibration.

13. Troubleshooting

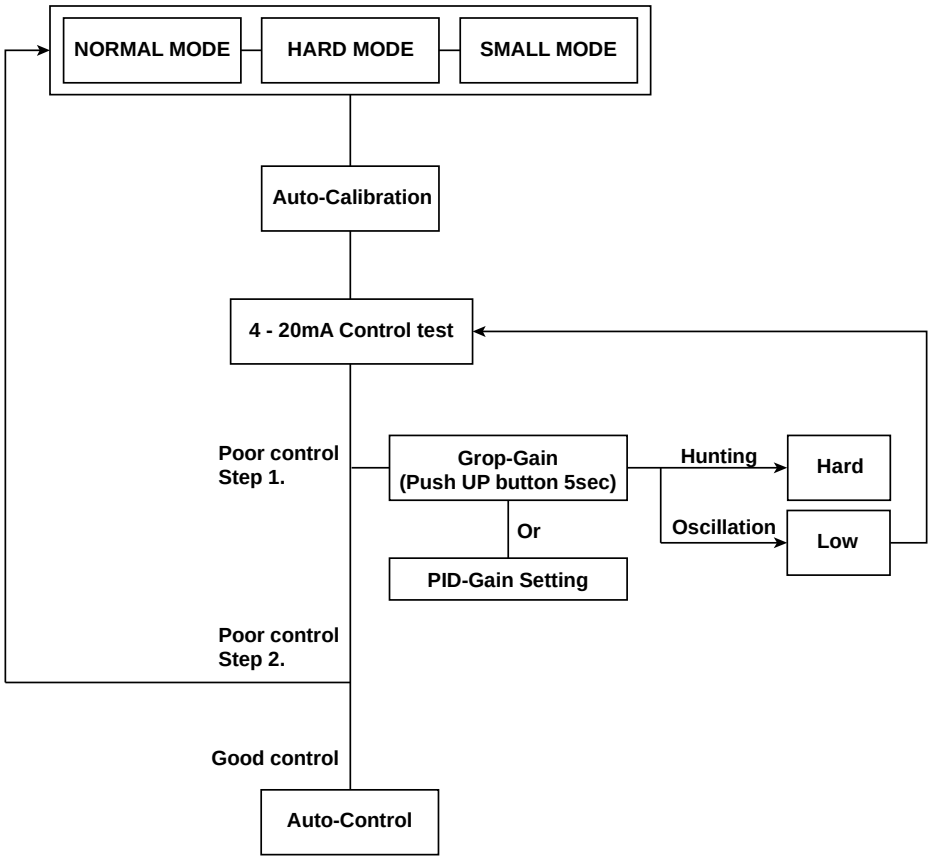
13.1 Error Codes and Recommended Actions

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



	Cause	Symptom	Action
ER0	Low input current (3.7mA)	Data on LCD are shown too dim or too bright.	Re-check 4 – 20mA input signals.
ER1	High input current(20.5mA)		
ER2	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
ER3	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.
ER4	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.
ER5	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.
ER6	PST error	BAD is shown.	Check the valve or increase the response time of PST.
ER7	Coil No.1 Bias Low	Valve is not closed or open and moves slowly.	Loosen a valve packing.
ER8	Coil No.1 Bias High		
ER9	Coil No.2 Bias Low		
ER10	Coil No.2 Bias High		
ER11	Potentiometer error	Problem of potentiometer	Check the potentiometer (Potentiometer Ass'y, Board)
ER12	Coil error	Problem of coil	Check the coil assembly.

13.2 Checking Diagram for Stable Valve Control



13.2.1 Judgment of Valve Specifications

– Set in Control Mode considering a strength degree of packing and a size of actuator. (C/MD–11.5.20)

13.2.2 Judgment of Control Status

– Check operation with 4-20mA input signals after auto-calibration.

– In case of poor control (hunting / oscillation),

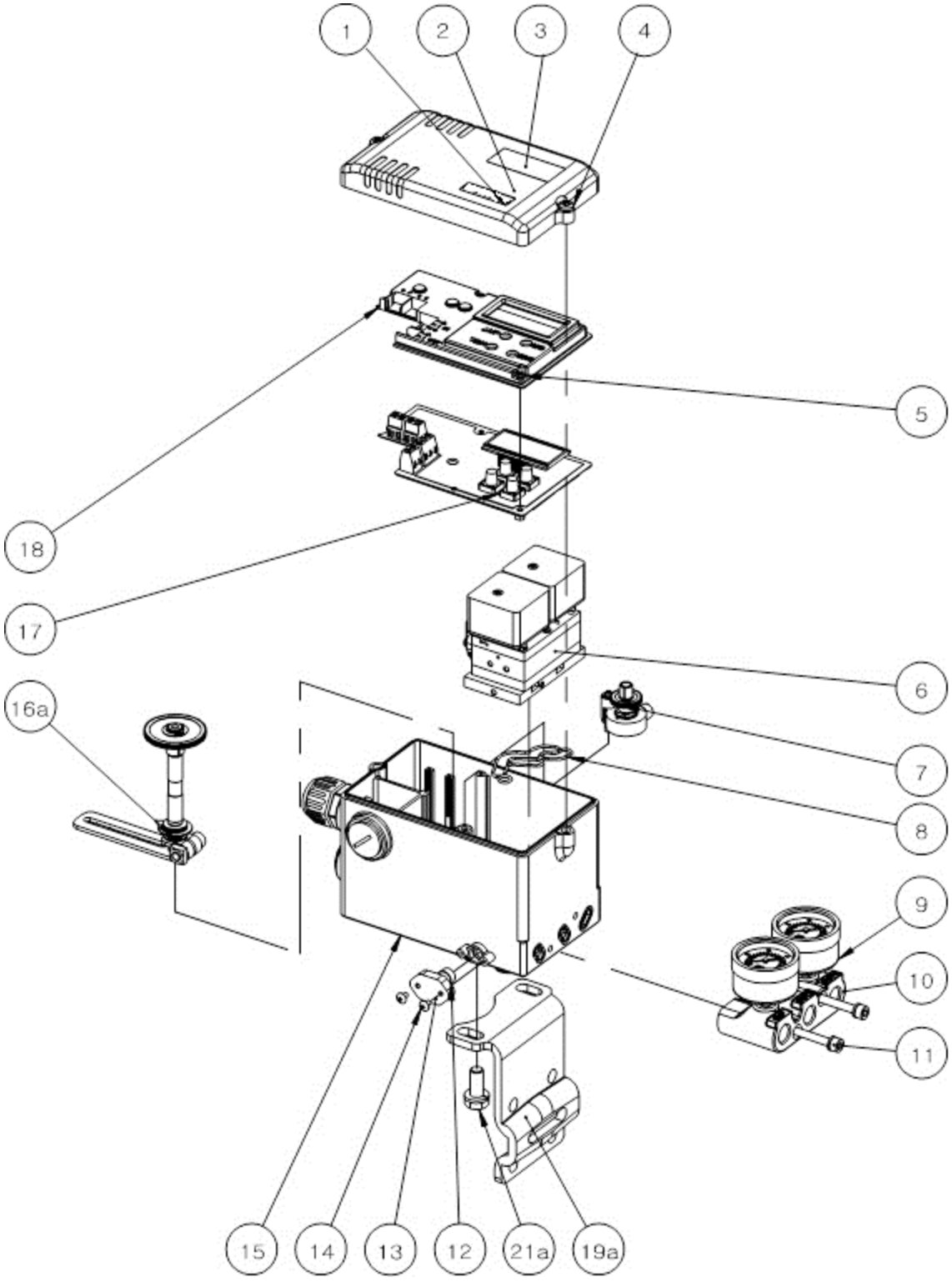
1) Adjust the valve by using Grop-Gain or PID-Gain as shown at Step 1. (PID–11.5.9)
(Keep pushing the UP button for 3 seconds to advance into "GROP")

2) If the valve doesn't work properly, try to set in Control Mode and change to other valve working condition again.
(Note that it is necessary to perform auto-calibration again in case of change of Normal → Hard or Small → Hard)

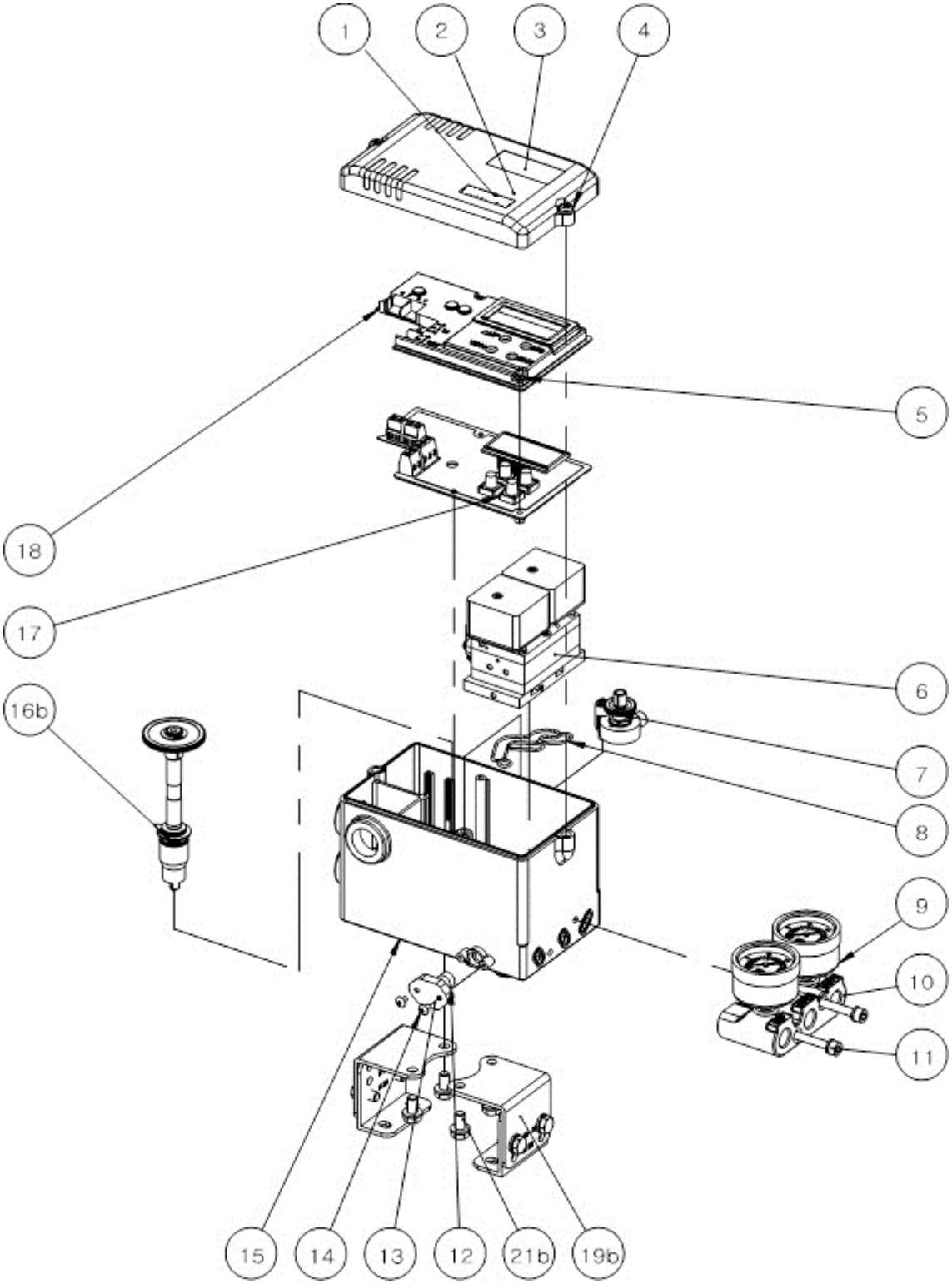
Status	Action	
An actuator is small and responds fast. And a hunting problem happens.	SWST – ON SPED – Adjust	11.5.12 11.5.11
A valve doesn't move smoothly even in HARD mode due to a very strong packing.	FDGN – Re-adjust	11.5.19
A valve moves too slowly in HARD mode.	HBIS – Re-adjust	11.5.18
MONT is shown and auto-calibration fails to carry out.	Re-mount	7.1.7

14. Spare Parts

14.1 SS5L



14.2 SS5R

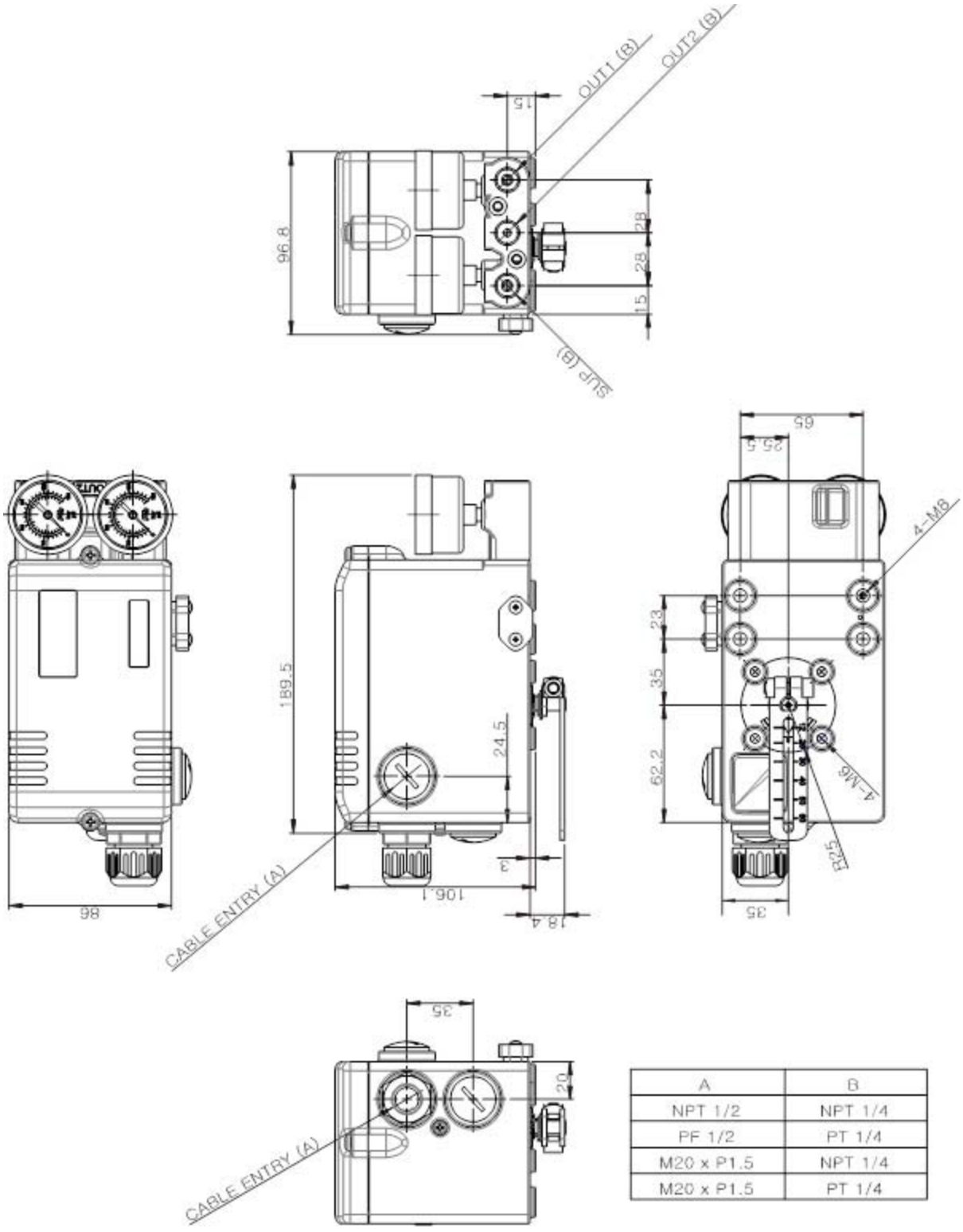


14.3 List of Spare Parts

No.	Part No.	Description
1	PG-SS5-01	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

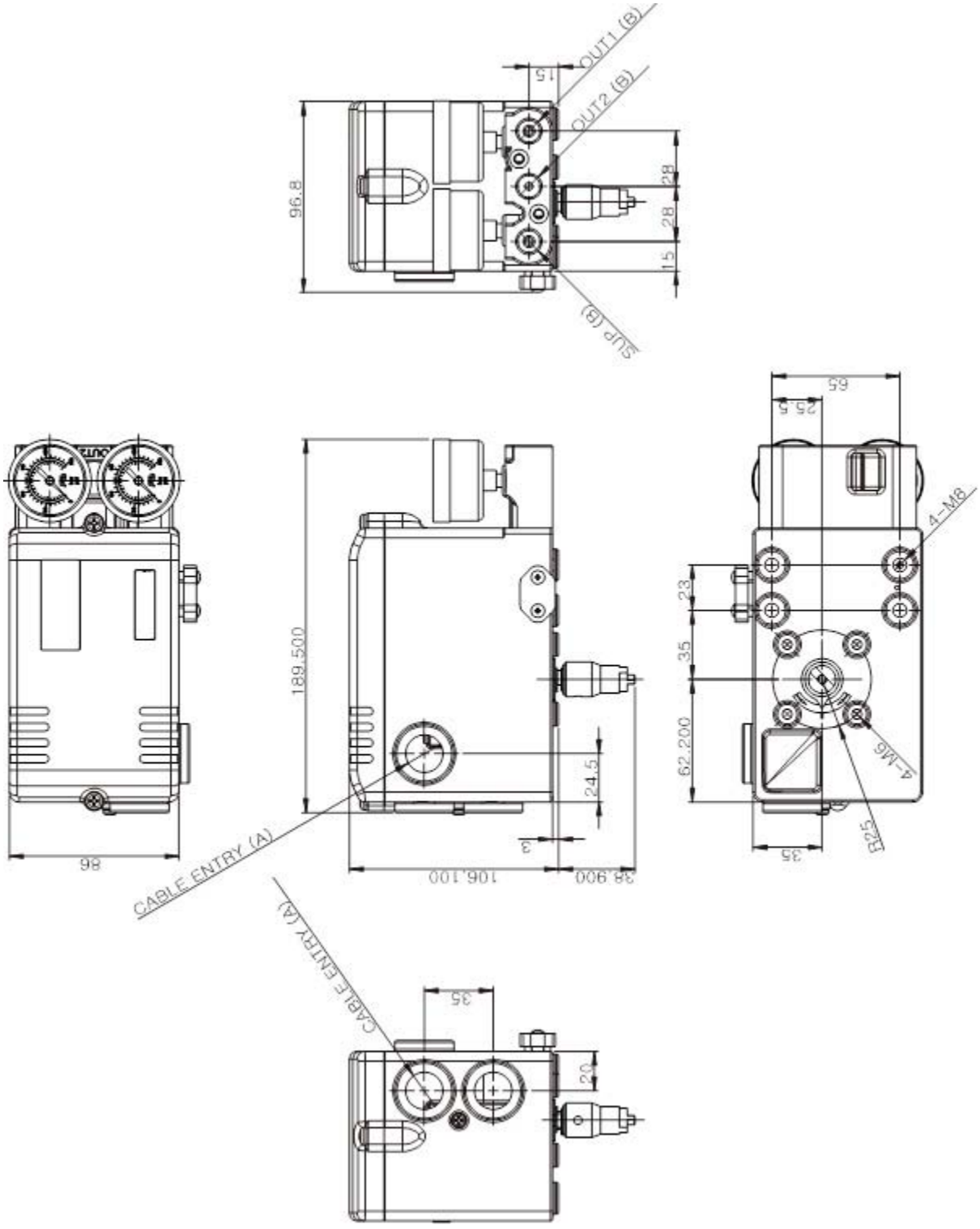
15. Dimensions

15.1 SS5L (Liner type)

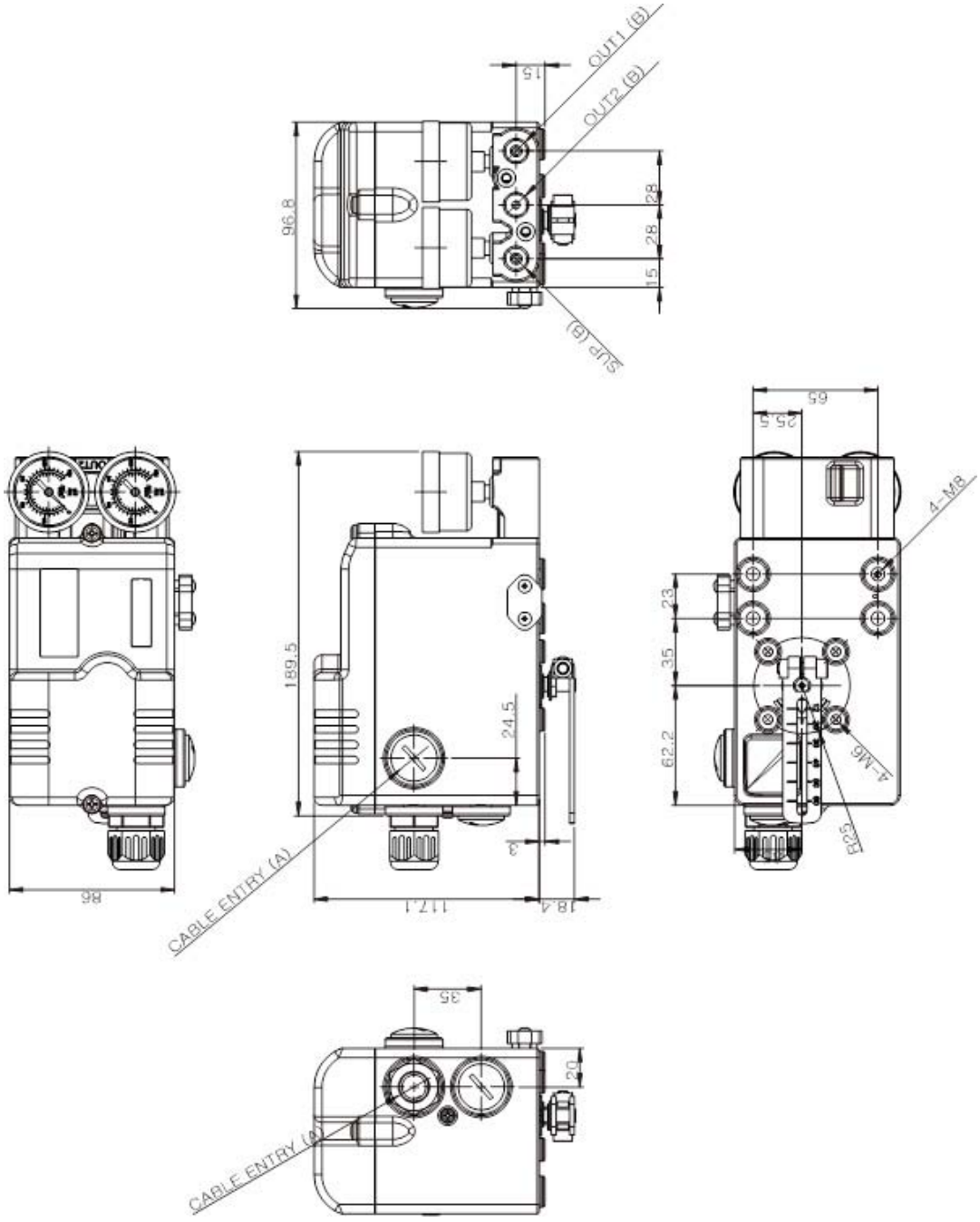


A	B
NPT 1/2	NPT 1/4
PF 1/2	PT 1/4
M20 x P1.5	NPT 1/4
M20 x P1.5	PT 1/4

15.2 SS5R (Rotary type)



15.3 SS5R (2 x SPDT Limit switch)



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