1. Introduction

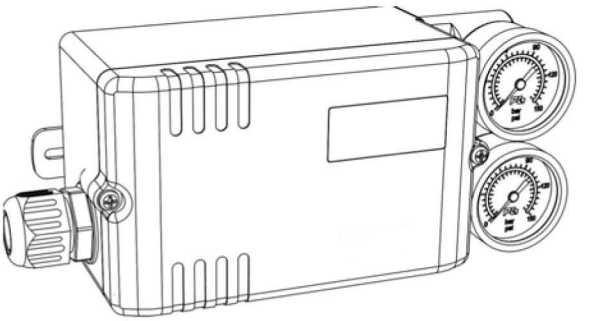
The SVP series is the intrinsically safe valve positioner that can be used with a control valve in a hazardous area (zone 0, 1) and operated by an electronic board and a relay torque motor with 4~20mA input signals @24VDC power supply.

⚠ Note that a power should be transmitted to the SVP series though a safety barrier.

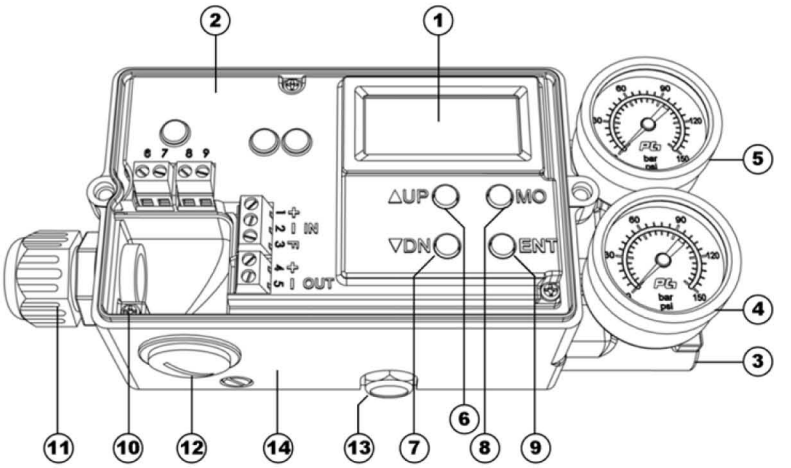
2. Overview of Structure

This product consists of the following parts.

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



Descriptions of internal parts without cover.



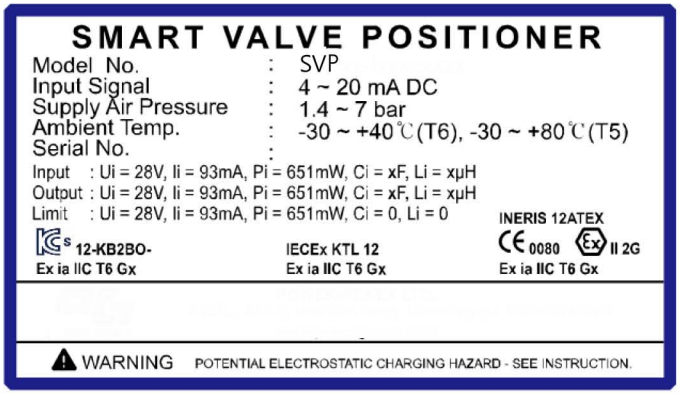
No.	Description
1	LCD
2	Board cover
3	Gauge block
4	Supply air gauge
5	Out 1 gauge
6	▲UP, Up button
7	▼DN, Down button
8	MO, Mode button
9	ENT, Enter button
10	Ground
11	Cable gland (or blind plug)
12	Blind plug (or cable gland)
13	Air venting hole
14	Body

3. Specifications

Input signal	4 - 20 mA @ 24 VDC	
Min. / Max. current	3.6 mA / 50mA	
Voltage drop (impedance)	8.7 VDC (435Ω @ 20mA)	
Intrinsic safety parameters	Input	Ui=28, Ii=93mA, Pi=0.651W, Ci≤23nF, Li =0
	Output	Ui=28, Ii=93mA, Pi=0.651W, Ci≤22nF, Li =0
	SPDT	Ui=28, Ii=93mA, Pi=0.651W, Ci=0, Li =0
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 Hysteresis < 0.2% F.S	Sensitivity < 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	-40℃ ~ +80℃ (-40 ~ +176℉)	
Pneumatic connections	Rc 1/4 or NPT 1/4	NPT 1/4
Electrical connections	G 1/2, NPT 1/2 or M20 x 1.5	NPT 1/2
Explosion proof / protection class	ATEX / IECEx-certified intrinsically safe Ex ia IIC T6/T5, IP66	
	T6 : -40 ~ +40℃, T5 : -40 ~ +80℃	
	Zone 1	Zone 0
Body material / painting	Aluminum die-cast / powder-painted	Stainless steel 316
Weight	1.6 kg	3.9 kg

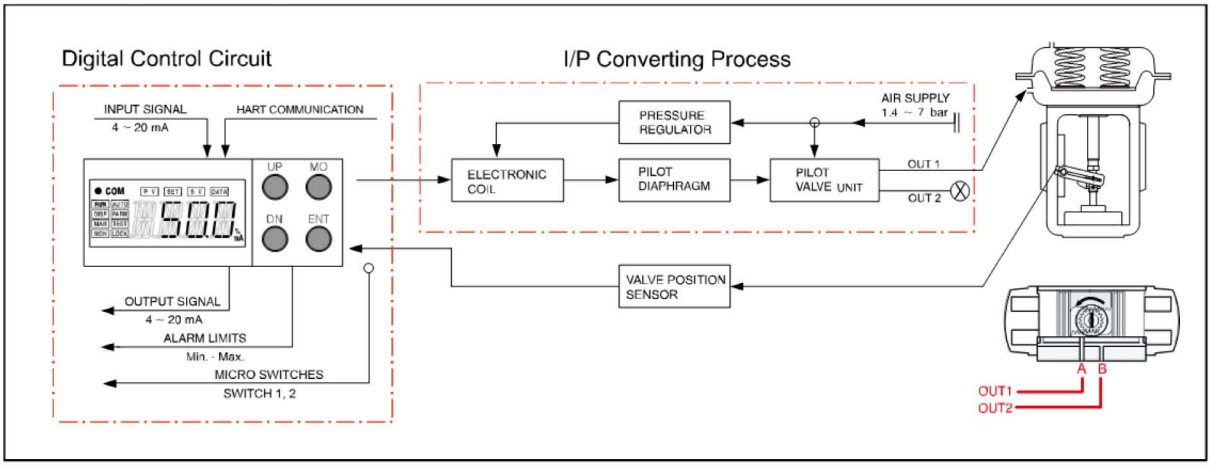
* For more than 200mm stroke on request

4.1. Descriptions on Nameplate



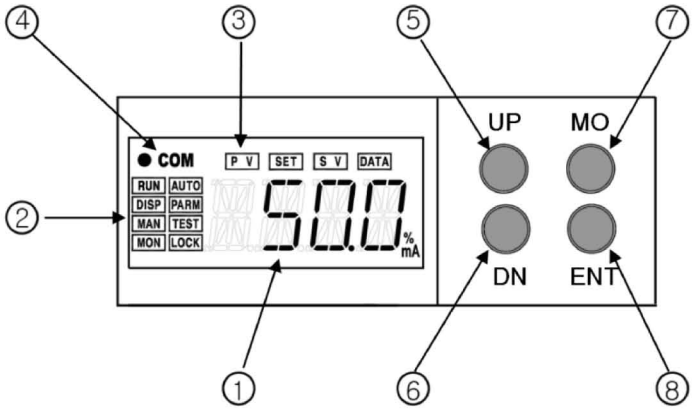
- Model No.: shows the model and the part number selected.
- Input signal: shows 4 – 20mA input signal with 2-wire.
- Ambient Temp.: shows the operating ambient temperate range.
- Serial No. / Date: shows the serial number and the production date.
- Input - Ui , Ii, Ri, Pi, Li, Ci : Intrinsic safety electrical parameters for input
  Output - Ui , Ii, Ri, Pi, Li, Ci : Intrinsic safety electrical parameters for output
  Limit - Ui , Ii, Ri, Pi, Li, Ci : Intrinsic safety electrical parameters for limit switches
- Protection class: shows the explosion proof classifications and approvals.
- Certificate No: shows the certification number.

5. Principle of Operation



If 4-20 mA input signal is supplied, the micro-processor compares input signal with position feedback and sends control signal to the I/P converting module. Pneumatic signal from the I/P converting module operates the valve and the valve stays at the desired position.

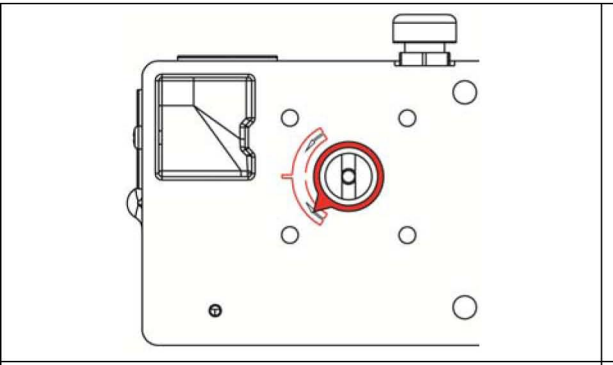
6. Descriptions of LCD display and Buttons



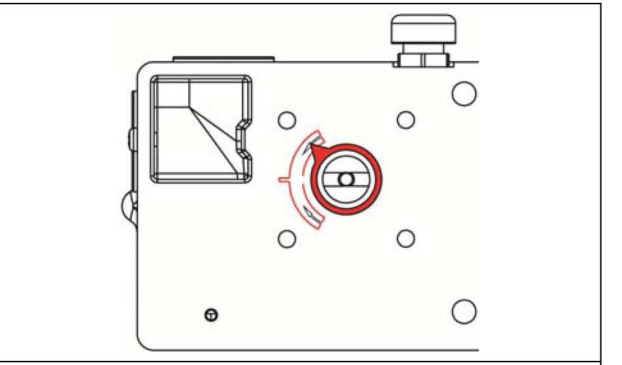
① Display of input or output
② Main parameters
③ mA, % display mode
④ Operation of HART
⑤ Up button
⑥ Down button
⑦ Mode button
⑧ Enter button

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

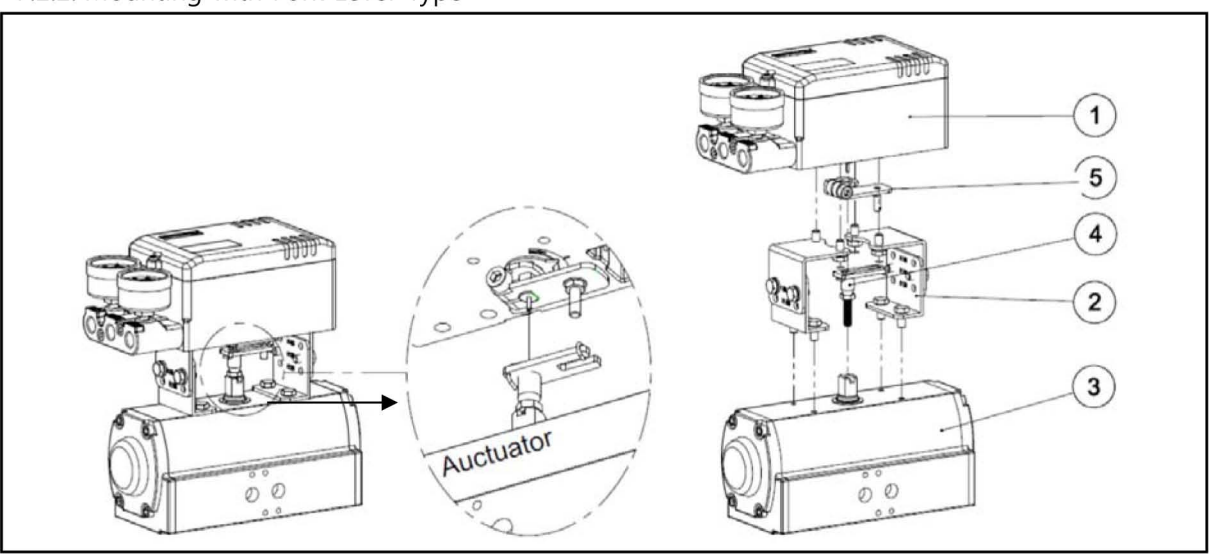


<Indicator position at 0% (or 100%)>



<Indicator position at 100% (0%)>

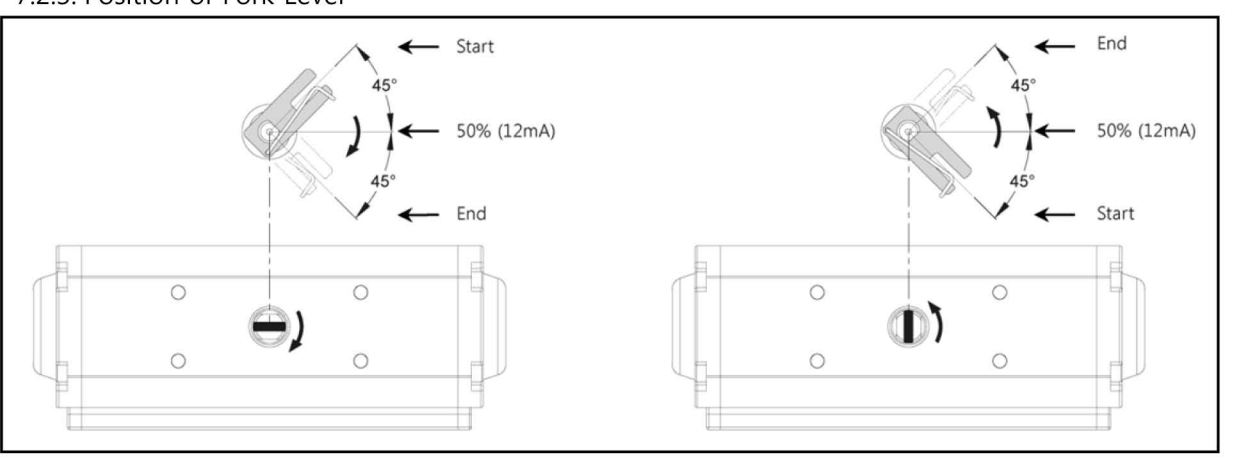
7.2.2. Mounting with Fork Lever Type



① SVP positioner ② Multi-size bracket ③ Rotary pneumatic actuator

④ Fork lever ⑤ Positioner feedback lever

7.2.3. Position of Fork Lever

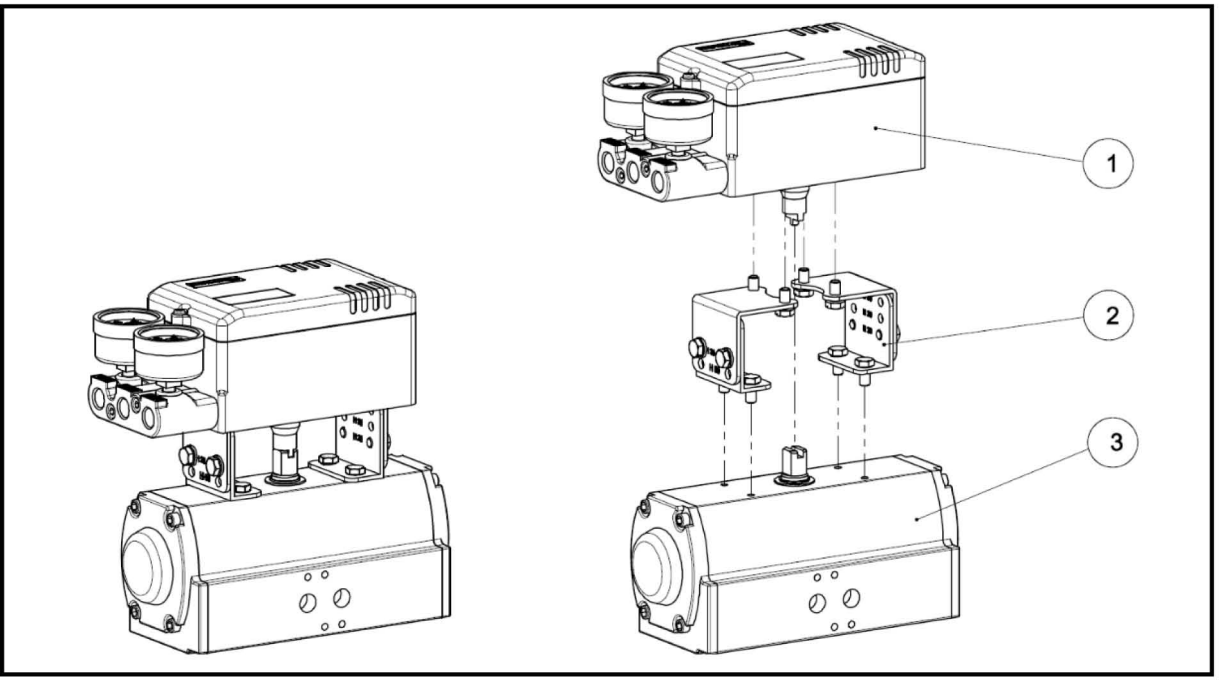


Clockwise movement Counter-clockwise Movement

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

7.2. Mounting onto Rotary Actuator

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



① SS2R positioner ② Multi-size bracket ③ Rotary pneumatic actuator

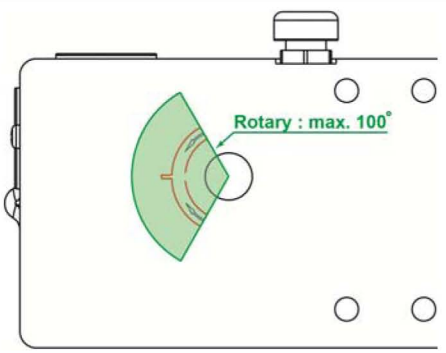
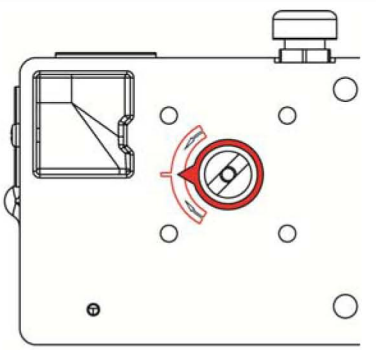
ⓐ Assemble the multi-size bracket to the SVP positioner with 4 pcs M6 screw. The multi-size bracket is assembled for 80x30x20mm as standard at the factory. If you have other size bracket, see '7.2.4 Re-assembling Multi-size Bracket according to Rotary Actuator'.

ⓑ Mount the SVP positioner onto the rotary pneumatic actuator with 4 pcs M5 screw.

ⓒ Connect air lines between the SVP positioner and the rotary pneumatic actuator.

ⓓ Perform auto-calibration by pushing MODE button for 5 seconds.

Make sure that the SVP 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.

	
<Maximum operating angle : 100°>	<Indicator position at 50%>

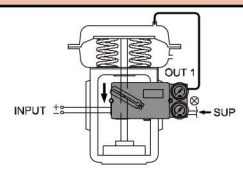
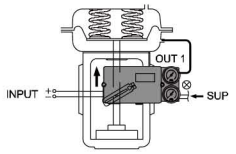
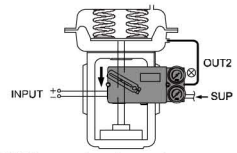
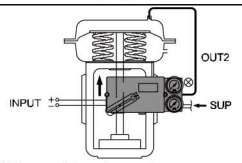
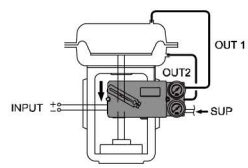
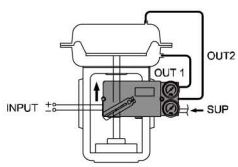
8. Air Connections

① Be sure to install the air filter regulator before the positioner.

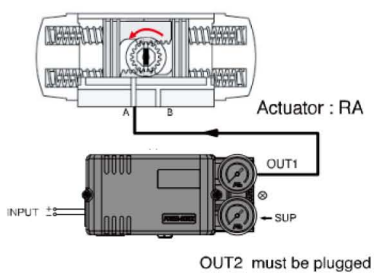
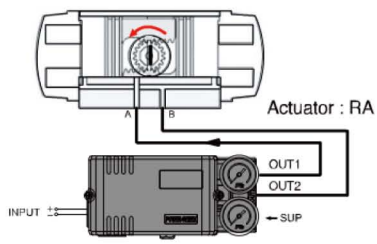
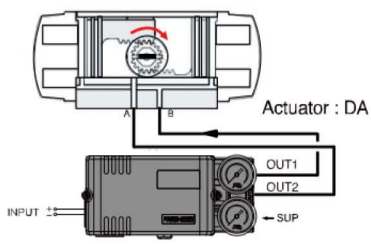
② Supply air should not contain water, oil or moisture.

③ It is recommended to set a supply air pressure 10% higher than the actual operating pressure of the actuator.

8.1. SS2L (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. SS2R (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

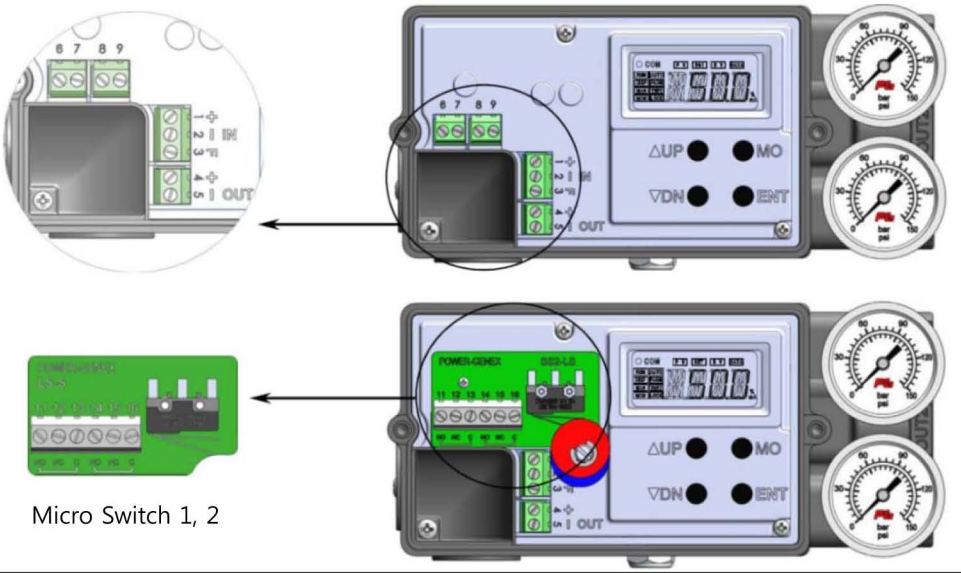
9. Electrical Connections

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	2	3	4	5	6	7	8	9	11	12	13	14	15	16
+	-	F	+	-	+	-	+	-	NO	NC	COM	NO	NC	COM

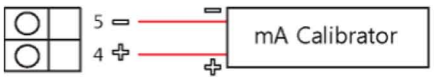
Input (Communication) — Ground — Output — Alarm limit 1 — Alarm limit 2 — Switch 1 — Switch 2

1	+ 4-20mA input signal	HART / Profibus PA / Fieldbus
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	

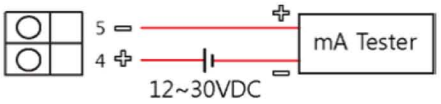
9	- Alarm limit 2
11	Switch 1 NO
12	Switch 1 NC
13	Switch 1 COM
14	Switch 2 NO
15	Switch 2 NC
16	Switch 2 COM

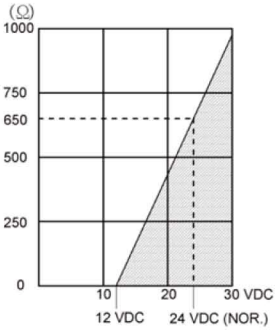
9.2. Measuring Output Signal

9.2.1. With mA loop calibrator



9.2.2. With multi-meter



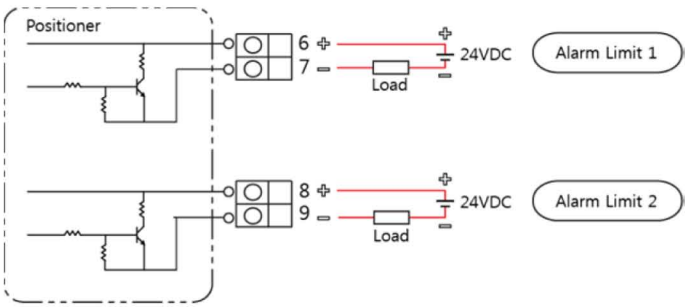


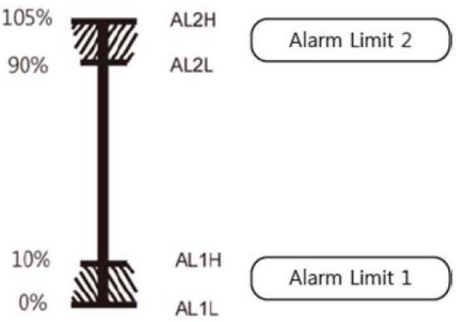
Transmitter Load Limitation

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℃

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

9.3. Wiring Alarm Limits (only weatherproof to IP66)





Alarm Limit Factory Setting

24VDC should be supplied for alarm limits.

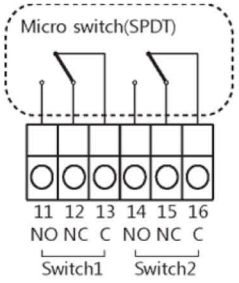
9.4. HART Connection

Note that wires for HART communication should be connected to terminals No. 1 and No. 2 together with wires for input signals. For reference, there is no distinction in + and – between HART wires.

9.5. Profibus PA / Fieldbus Connection

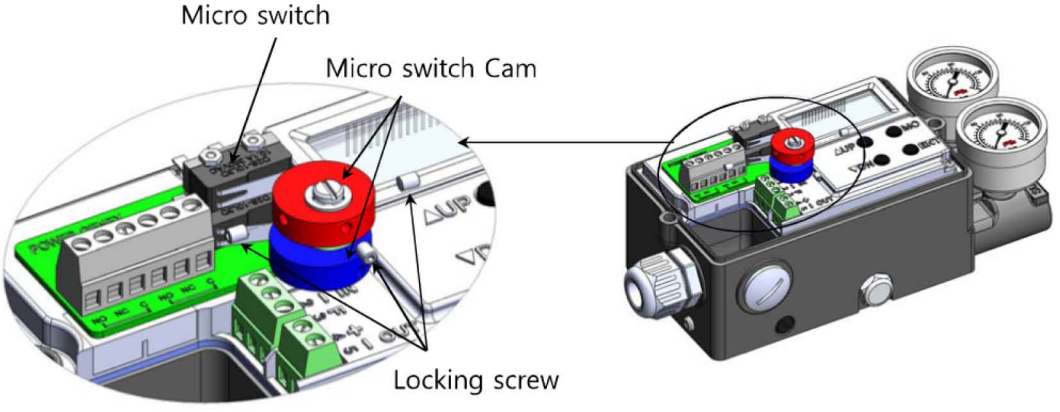
Make sure of + and – when connecting wires.

9.6. Wiring SPDT Micro Switches



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

9.7. 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.

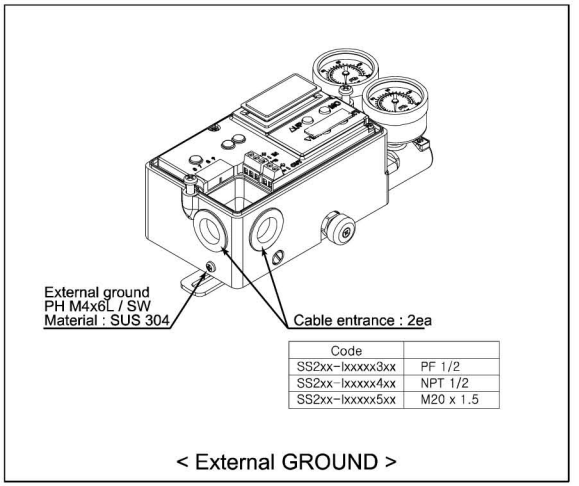
For reference, upper switch 1: No. 11, 12, 13 / lower switch 2: No. 14, 15, 16

9.8. Earthing

The earthing of enclosure is necessary to maintain Intrinsic safety because the insulation between an intrinsically safe circuit and a frame of the equipment is not capable of withstanding a 500V dielectric strength test. There are two earthing points on the equipment. One is provided ad an internal earthing point near terminal compartment inside the equipment. The other is provided as an external earthing point on the side of the enclosure.

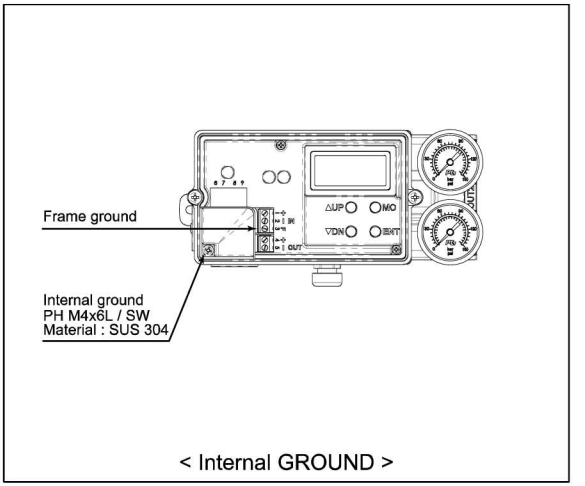
Their cross-sectional areas should be capable of carrying the maximum possible current of the equipment. (Generally, an insulated wire having a cross-sectional area of at least 4mm^2 is recommended)

To be suitable for securing of conductors, the cables should be fitted with ring spring lock washers to minimize the risk of self-loosening.



Code	
SS2xx-Ixxxxx3xx	PF 1/2
SS2xx-Ixxxxx4xx	NPT 1/2
SS2xx-Ixxxxx5xx	M20 x 1.5

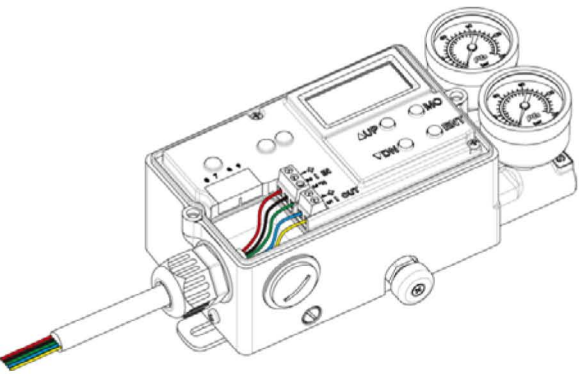
< External GROUND >

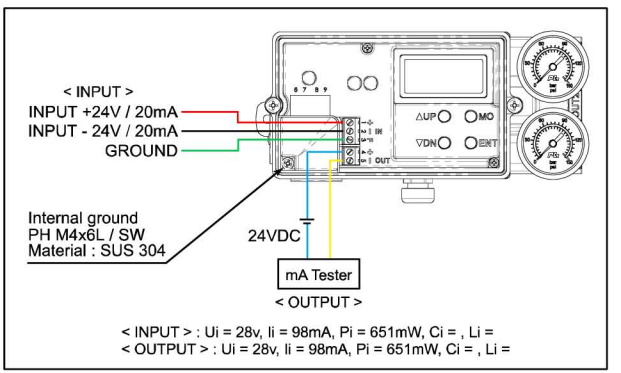


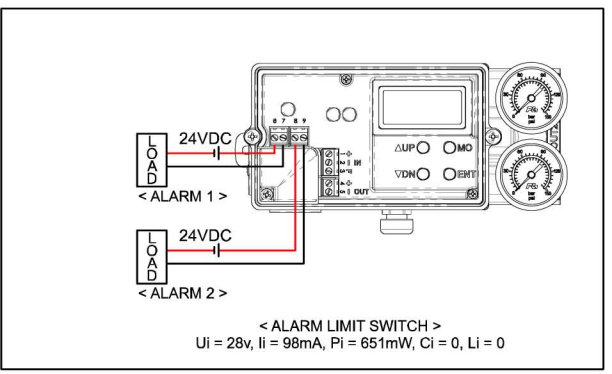
< Internal GROUND >

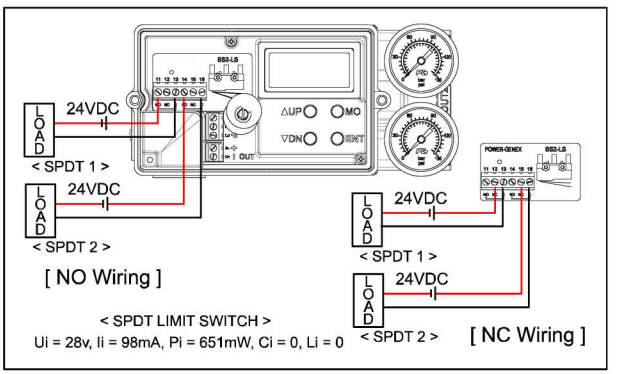
9.9. Wiring for Intrinsic Safety

The SVP 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 positioner can be affected by the electrical or magnetic energy from other electric products. So please make a note of the instructions below.









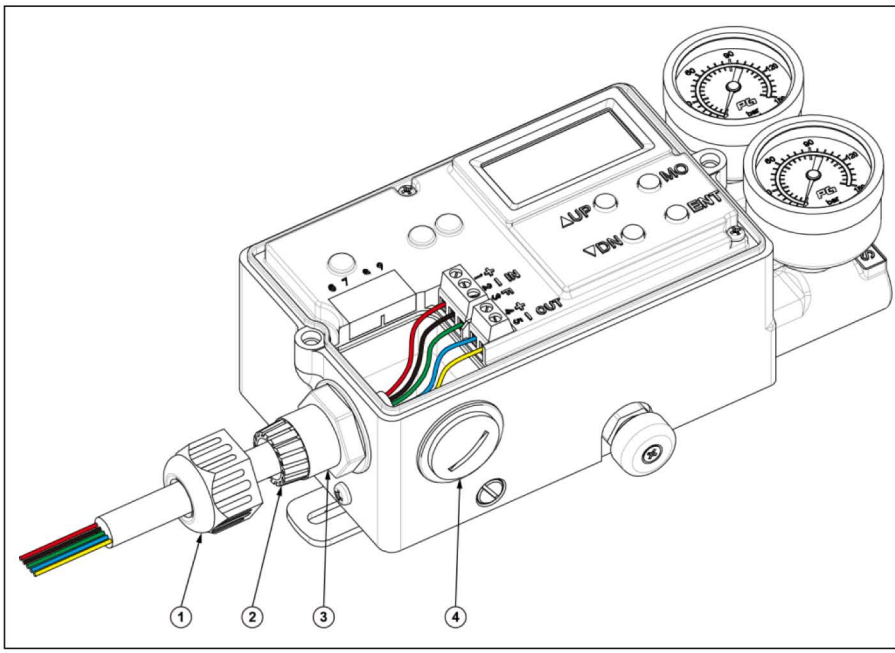
Input signal: 4~20mA@ 24VDC 2wire [red(+), black(-)]
Frame Ground: Green
Output signal: 24VDC 2wire [blue(+), yellow(-)]
2 x Alarm limit switch: 24VDC
2 x SPDT limit switch: 24VDC

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 positioner.
2) The 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 positioner as low as possible.(Ui, Ii, Ci, Li)
5) Be sure to install the safety barrier between the positioner and a power supply source.

9.10. Cable Gland / Blind Plug

9.10.1. 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.

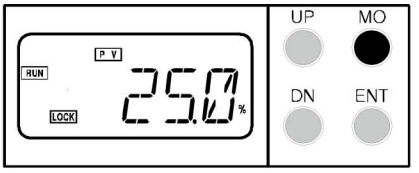
9.10.2. Blind Plug

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.



RA
DA

In case of a reverse acting actuator, RA is displayed and a countdown begins.

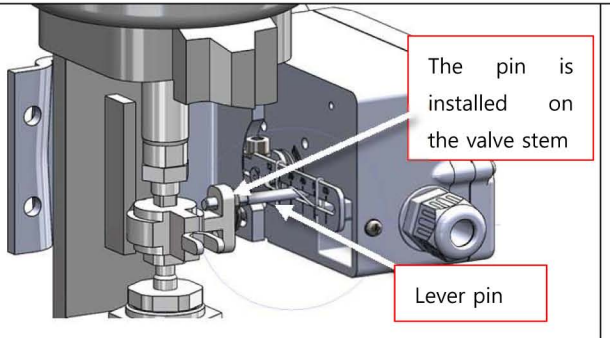
5→4→3→2→1→END→RUN (auto-calibration is completed)

In case of a direct acting actuator, DA is displayed and a countdown begins.

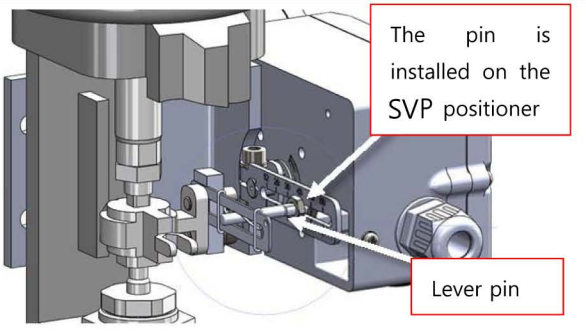
① It may take a longer time according to sizes of the control valve and the actuator. Generally, it will take 2 – 3 minutes with the standard size valve and actuator.

② If "MONT" is shown with the linear type SVP 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 SVP positioner again.

- In case of the linear type 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.



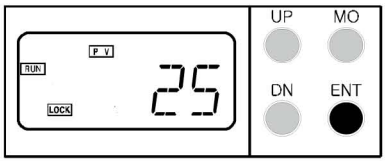
VALP (VALVE PIN)



POSP (POSITIONER PIN)

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.

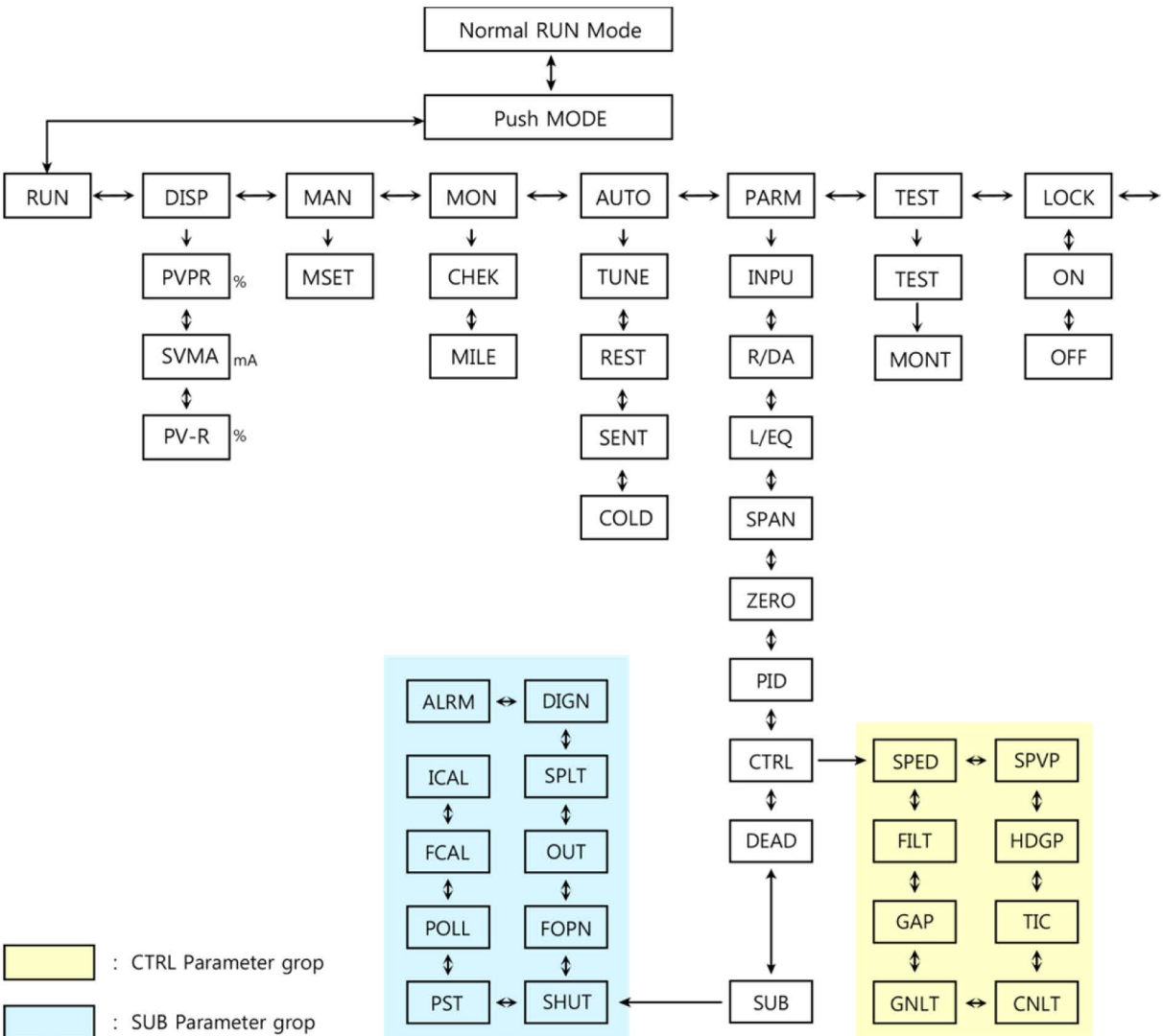
10.2. Checking the Ambient Temperature



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. Diagram of Parameters



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

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 %
	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

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

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
	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 (P. 33)	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 (P. 36)	INPU	Input signal	4...20mA or 20...4mA	4...20mA
11.5.2 (P. 36)	R / DA	RA / DA	Reverse acting or direct acting	RA
11.5.3 (P. 36)	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. 38)	SPAN	Span adjustment	0...100%	100%
11.5.5 (P. 38)	ZERO	Zero adjustment	0...99%	0%
11.5.6 (P. 39)	PID	P-GN / I-GN	Proportional / Integral	Auto-set

		/ D-GN	/ Differential gain value	
11.5.7 (P. 41)	CTRL	SPED / FILT / HYS / GAP / GNLT / CNLT / TIC / HDGP / SPUP	See 11.3.2 CTRL	•
11.5.8 (P. 42)	DEAD	Dead band	0...9.99%	0.5%
11.5.11 (P. 44)	SUB	Sub-Parameters	See 11.3.3 SUB	•

11.3.2. CTRL - Parameters (speed control adjustment)

Ref.	Parameter	Description	Function	Default
11.5.7.A (P. 41)	SPED	Response speed	1...1000	1000
	FILT	Radio frequency filter	On/off	Off
	GAP	Control limit of within ±0.6%	0 – 10%	100
	GNLT	Gap control limit	100...650	Auto-set
	CNLT	Control limit	50...1250	Auto-set
	TIC	Correction of hunting during auto-calibration	On/off	Off(auto-set)
	HDGP	Correction of dead zone	On/off	Auto-set
	SPUP	Response speed adjustment on big actuator	On/off	Off(auto-set)

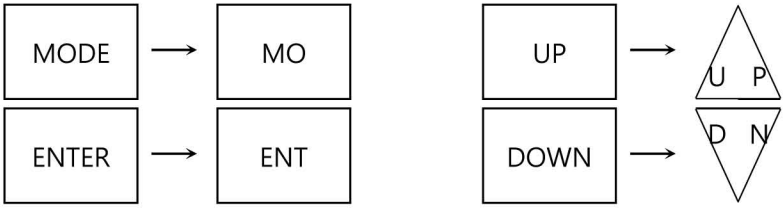
11.3.3. SUB - Parameter

Ref.	Parameter	Description	Function	Default
11.5.11.A (P. 44)	SHUT	Shut-off	0...9.9%	0.3%
11.5.11.B (P. 45)	FOPN	Full-open	0...9.9%	0.3%
11.5.11.C (P. 45)	OUT	Output signal	4...20mA or 20...4mA	4...20mA
11.5.11.D (P. 45)	SPLT	Split range	4...12mA or 12...20mA	4...20mA
11.5.11.E (P. 45)	LCD	Change of display position	FOR / REV	FOR
11.5.11.F (P. 46)	ALAM	Alarm limit low, high	AL1L / AL1H, AL2L / AL2H	0...10%, 90...105%
11.5.11.G (P. 48)	ICAL	IN4M / IN20	sets the values in accordance with 4~20mA input signals	Factory setting
11.5.11.H (P. 48)	FCAL	FB4M / FB20	sets the values in accordance with 4~20mA output signals	Factory setting
11.5.11.I (P. 49)	POLL	HART polling address	0...15	0
11.5.11.J (P. 49)	PST	Partial stroke testing	checks a valve status	OFF

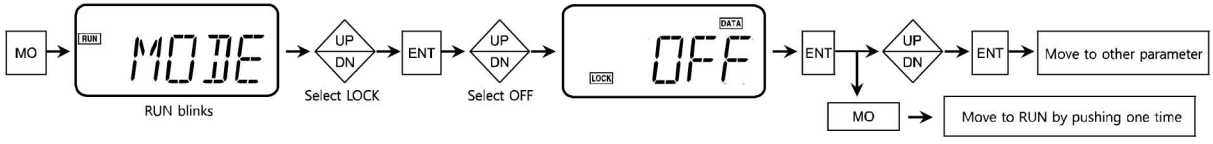
Note that the PST function (Partial Stroke Testing) is loaded at the factory on demand only when requested.

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.

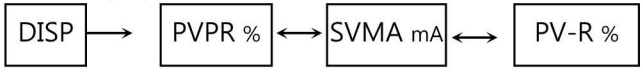
② LOCK OFF : Be sure to LOCK OFF when it is necessary to read or change the selected parameters and the saved setting values.

③ Quick auto-calibration, Span, P-Gain can be carried out without LOCK Off (see "10. Quick Auto-calibration")

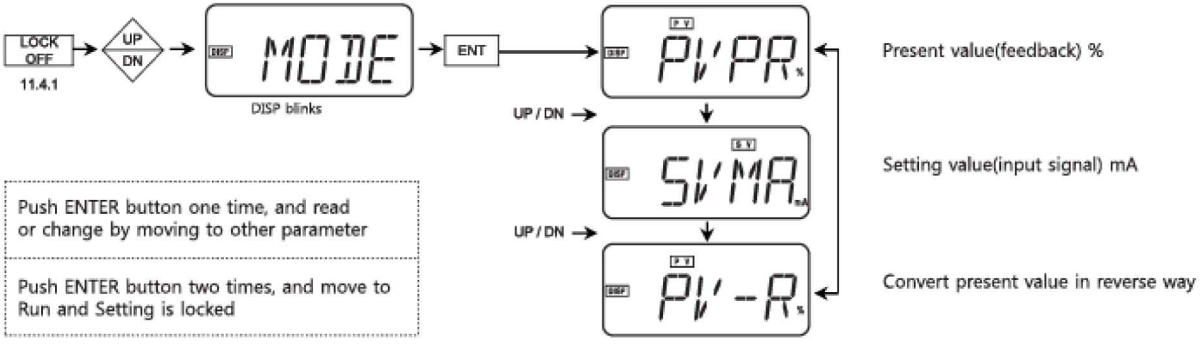
④ LOCK is on unless any input signal is not supplied.

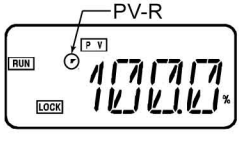
⑤ It is difficult to read or change under the condition that LOCK is ON.

11.4.2. Display Mode



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



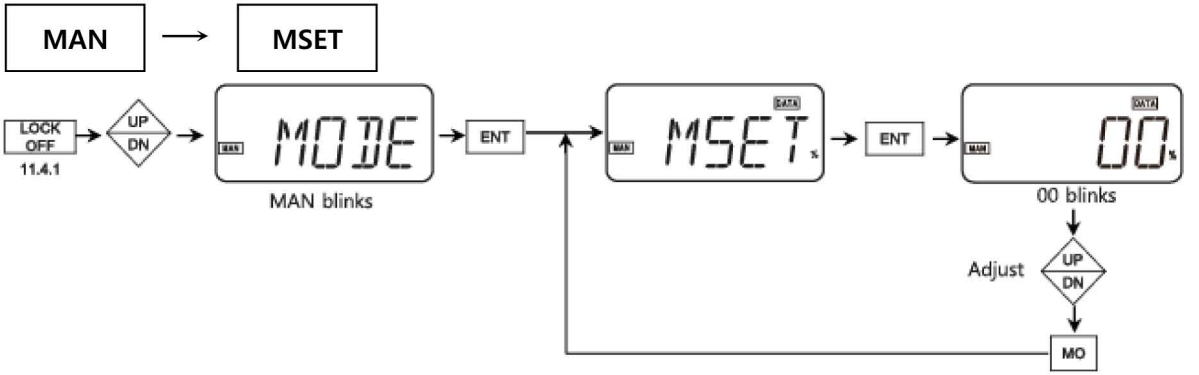


If PV-R is selected, the small point will blink as shown to the left.

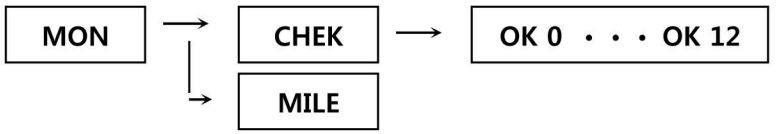
Present value(PV) or setting value(SV) is displayed with mA or %. Setting value stands for input signal. If a control valve is a direct acting type and it is necessary to see the feedback values in a reverse way, select PV-R.

11.4.3. Manual Mode (default: 0)

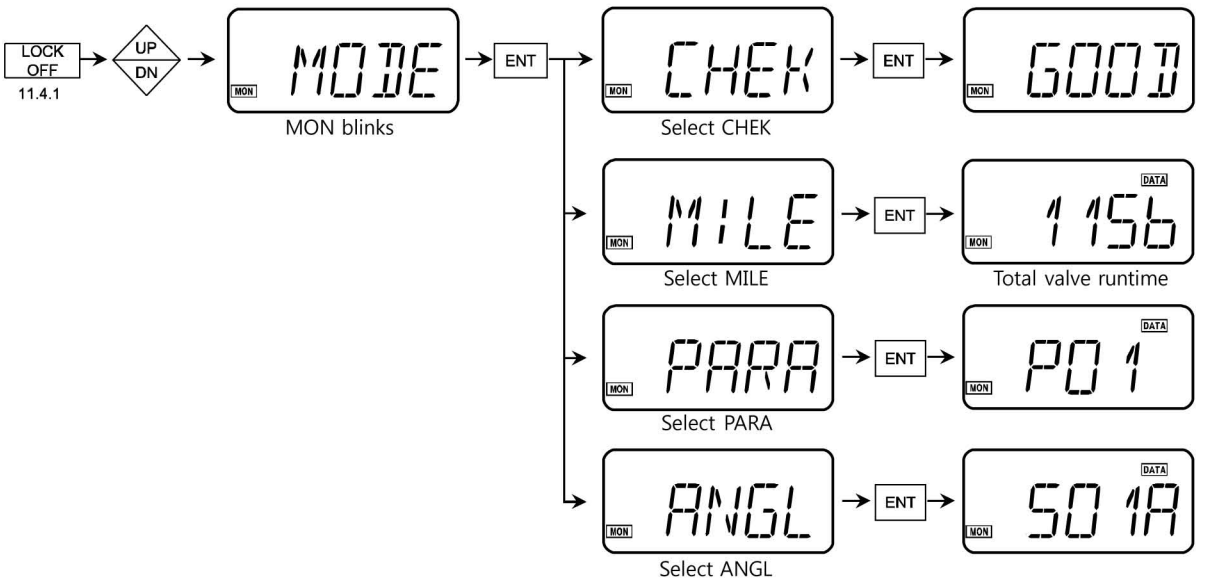
The valve can be moved to 0 – 100% manually.



11.4.4. Monitor Mode



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

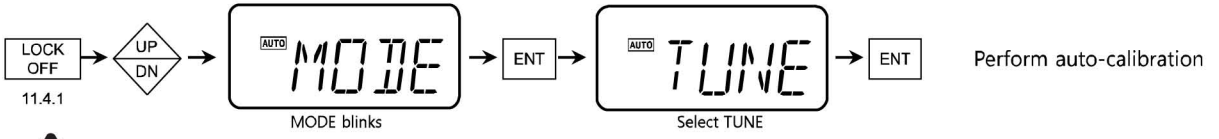


Number 1 in MILE corresponds to 10 hour. For example, if 1156 appears, it means that this valve has been working for 11,560 hours.

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



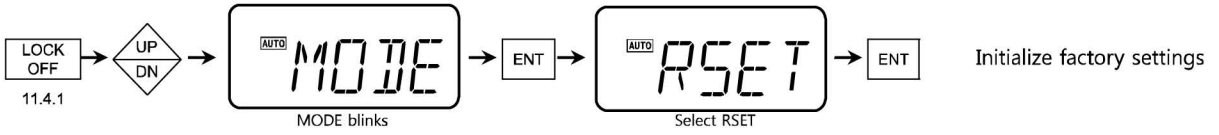
① Reverse acting (RA) is a standard factory setting. Even if air lines are connected wrongly by mistake, the SVP positioner detects automatically and performs auto-calibration for direct acting (DA).

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.



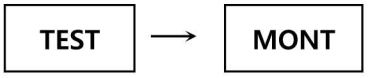
11.4.5.C. Re-adjustment of Zero & Span (STEN)

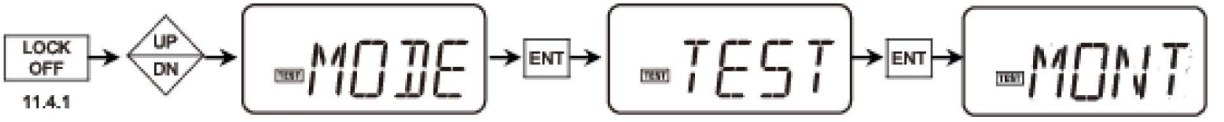
Only Zero and Span is re-set without changing other values set after auto-calibration.

11.4.5.D. COLD (Re-booting)

Restarts the program without changing any settings

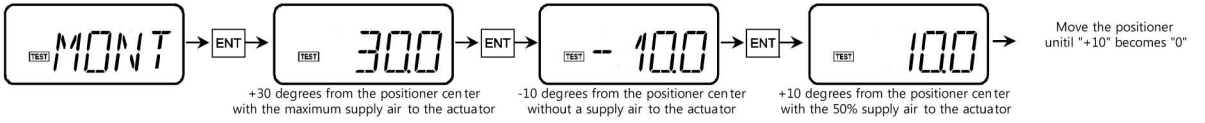
11.4.6. Self-Test Mode





• 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



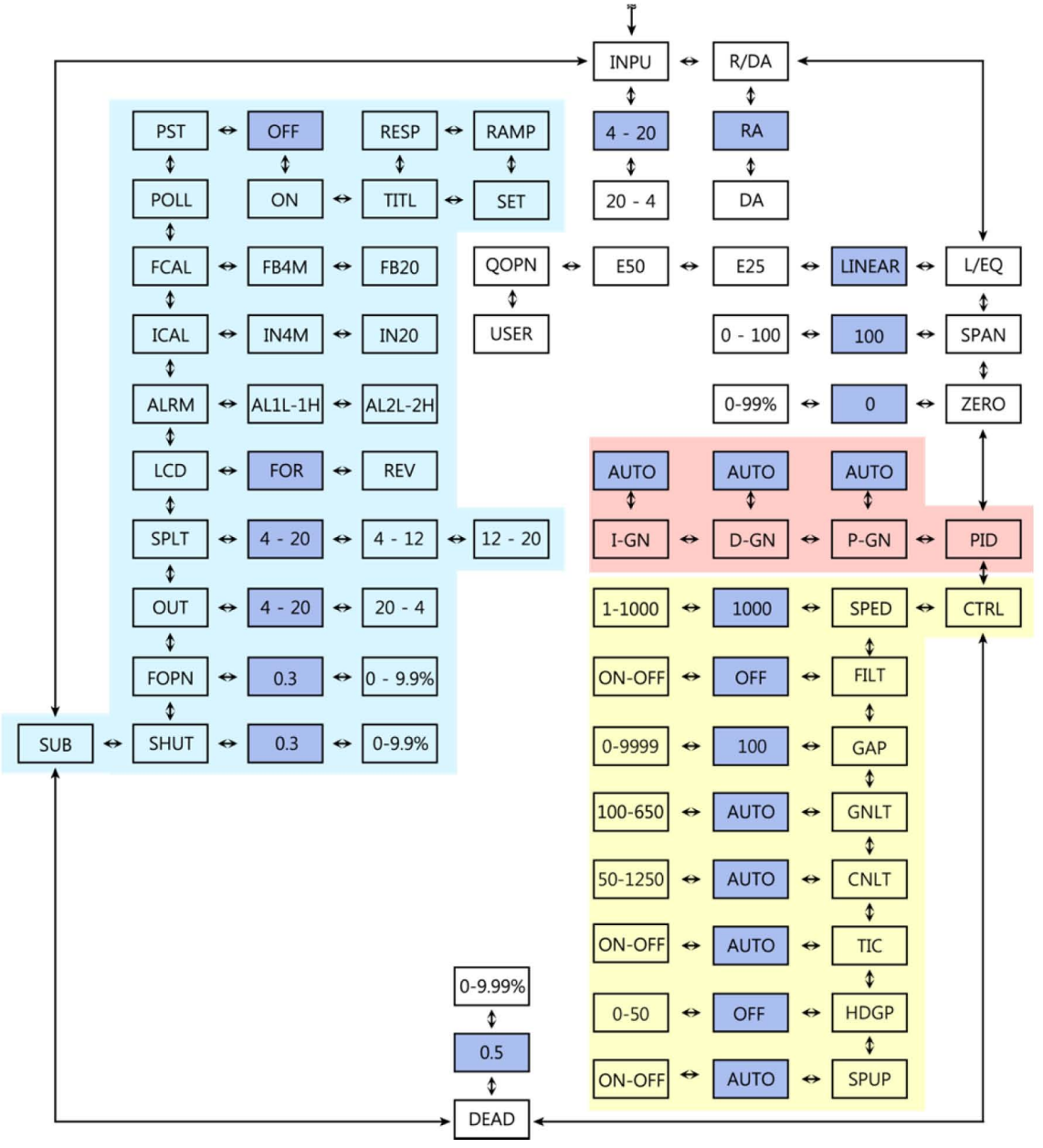
For information, on "MONT", the operating range (0~10kΩ) of the potentiometer is displayed.

- 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.

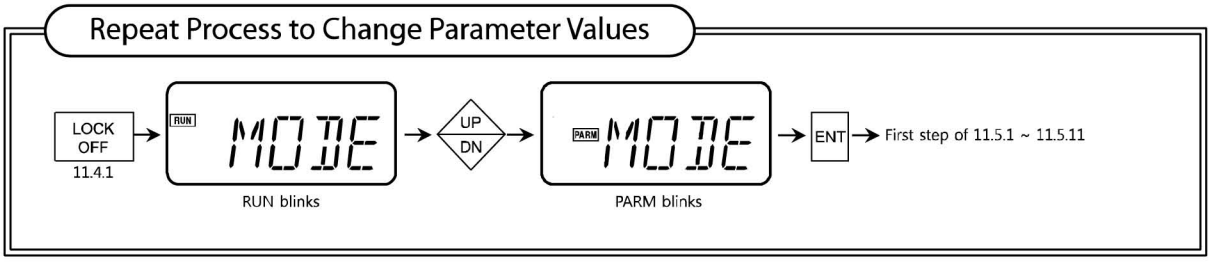
- Step 3: Push the ENT button one time, and the actual valve middle position angle will be shown. It shows the middle position angle between two ends (fully open and closed) measured through the above procedures of Step 1 and Step 2. Move the positioner upwards or downwards so that the valve position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

11.5. Parameters Flow Diagram

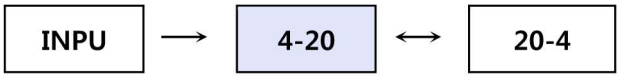


The colored cells stand for the standard factory settings.

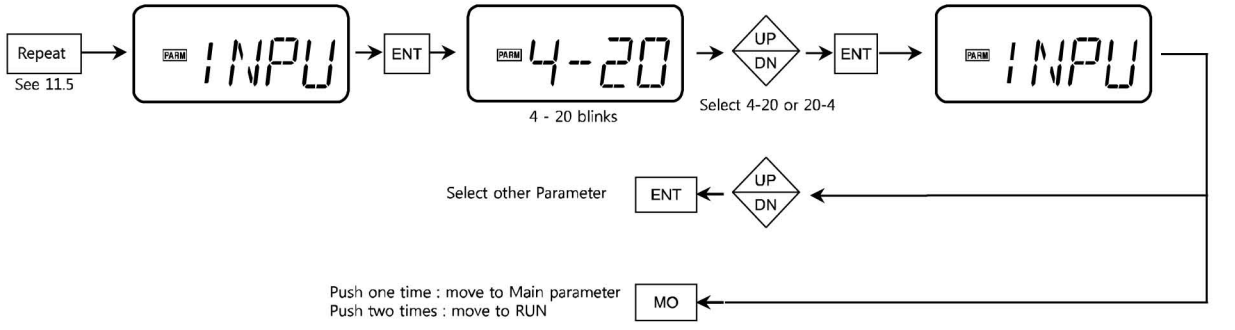
All setting values return to the standard factory settings if RESET begins.



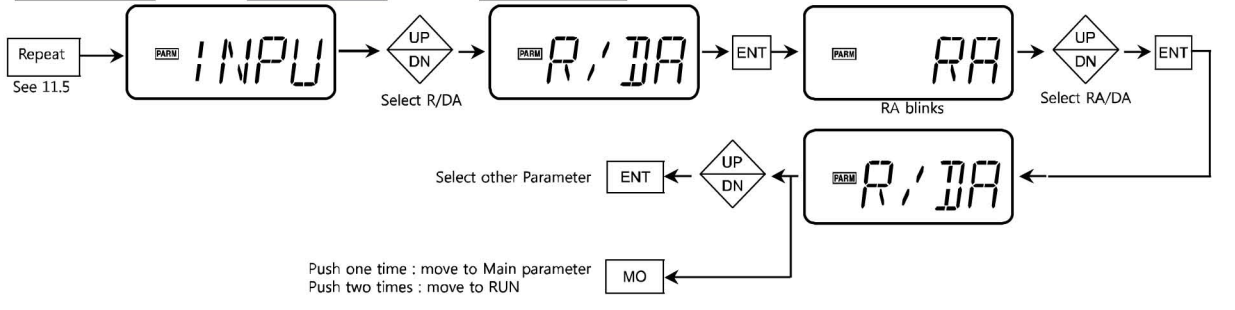
11.5.1. [INPU] Change of Input signal (default: 4-20mA)



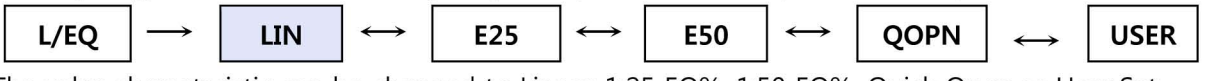
It is possible to make the positioner respond to 20-4mA input signals optionally even though 4-20mA input signals are supplied.



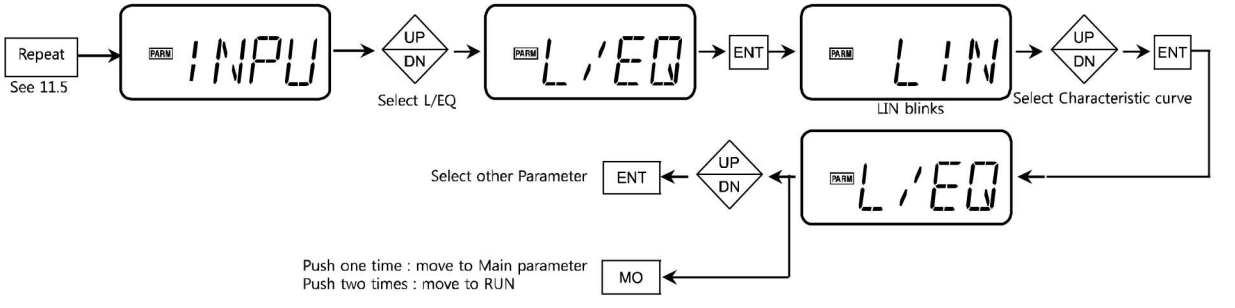
11.5.2. [R/DA] Selection of Direct Acting (DA) or Reverse Acting (RA) (default: RA)

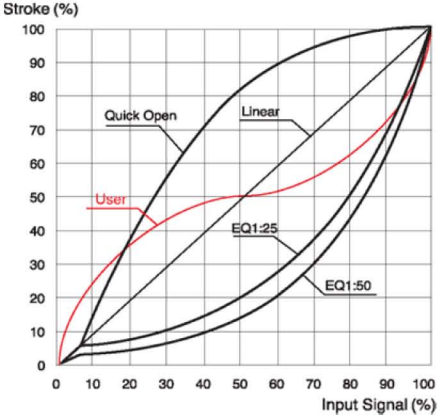


11.5.3. [L/EQ] Selection of Linear, E.Q.%, Quick Open or User Set (default: Linear)



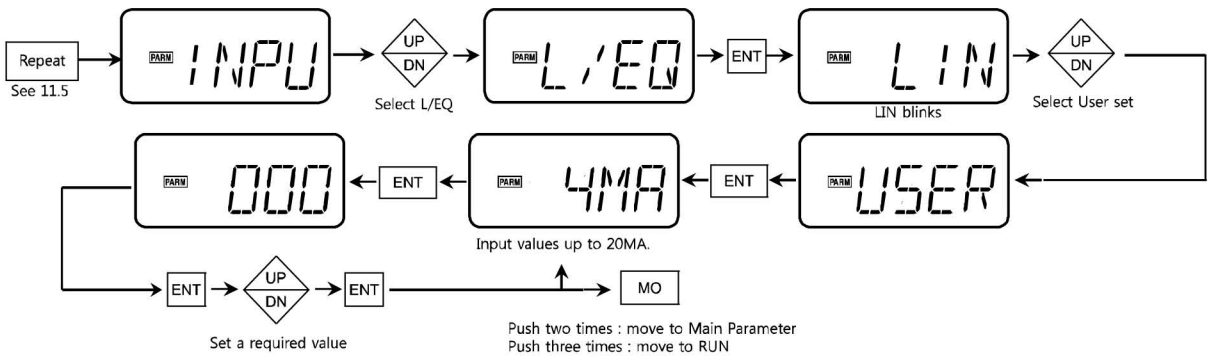
The valve characteristic can be changed to Linear, 1:25 EQ%, 1:50 EQ%, Quick Open or User Set.



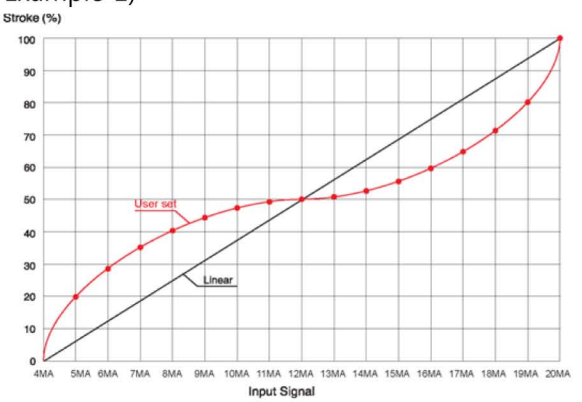


LIN	Linear
E25	EQ% (1 / 25)
E50	EQ% (1 / 50)
QOPN	Quick Open
USER	User set(17point)

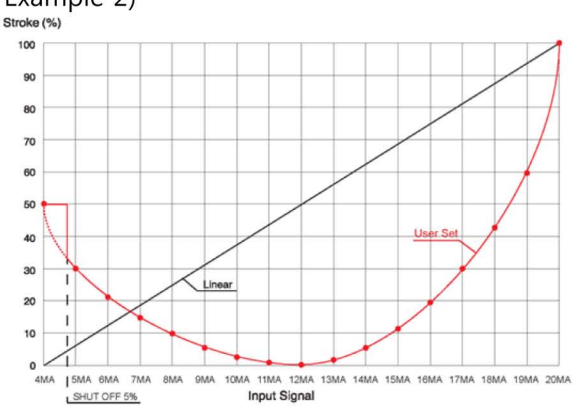
- For the user setting,



Example 1)



Example 2)



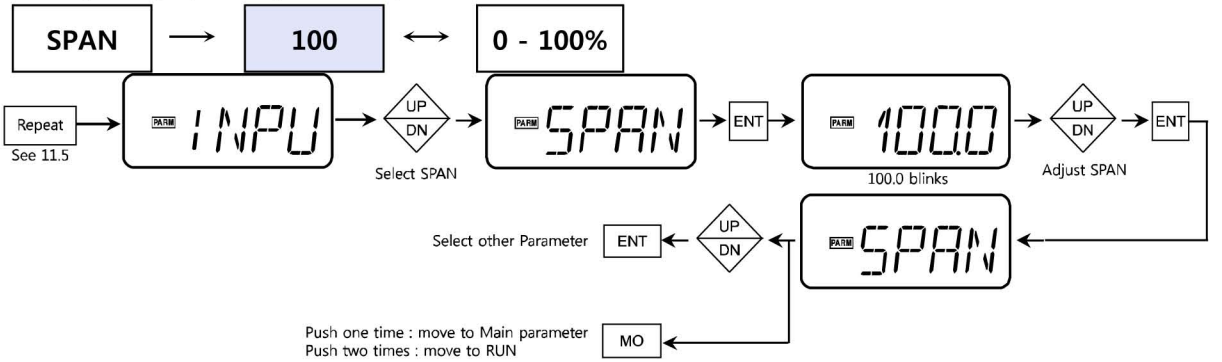
User Set Value			Ex-1	Ex-2
Point	Parameter	Input Signal (mA)	Valve Opening% (set value)	
1	4MA	4mA	0	50
2	5MA	5mA	20	30
3	6MA	6mA	29	20
4	7MA	7mA	35	15
5	8MA	8mA	40	10
6	9MA	9mA	45	6
7	10MA	10mA	48	4
8	11MA	11mA	49	2
9	12MA	12mA	50	0
10	13MA	13mA	51	3
11	14MA	14mA	52	7
12	15MA	15mA	55	11
13	16MA	16mA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

NOTES

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)

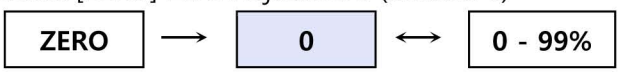


① Be sure to supply 20mA input signal before adjusting SPAN.

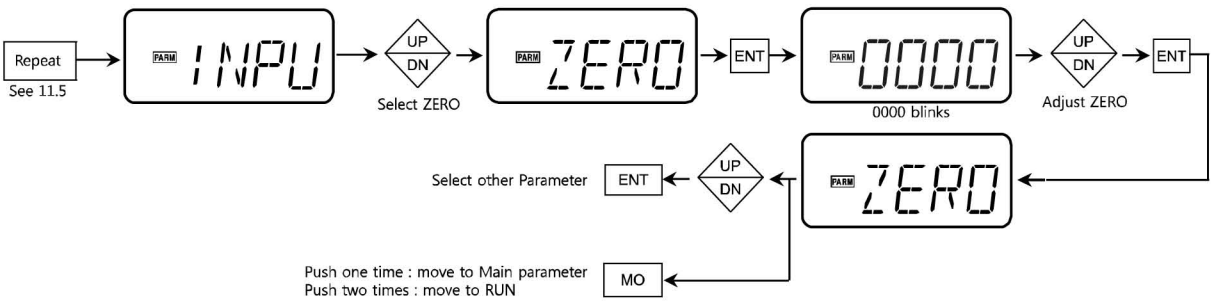
② Push ▼ DN button one time, Span will decrease by 0.1%. Keep pushing ▼ DN button, Span will decrease fast.

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

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

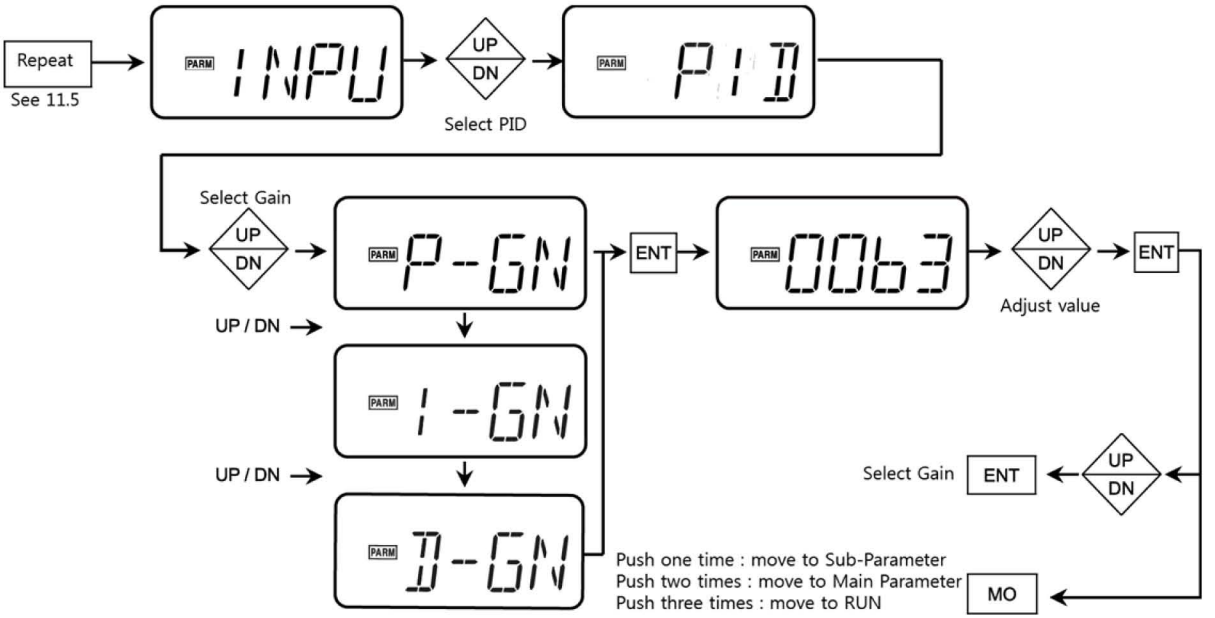


Zero can be adjusted to 0 – 99%.



11.5.6. PID-Gain

PID ⟶ **P-GN** ⟷ **I-GN** ⟷ **D-GN**



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)

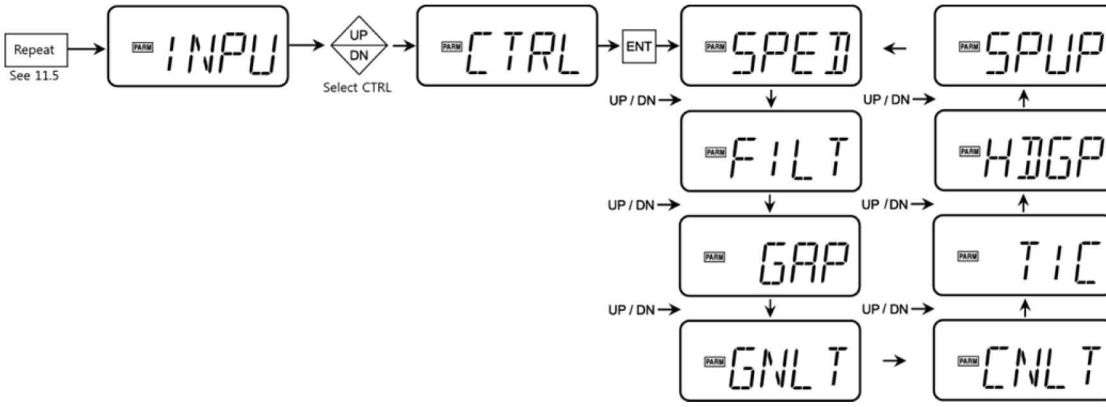
D-GN ⟶ **Auto Set**

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)

11.5.7. [CTRL] – Control Speed Adjustment

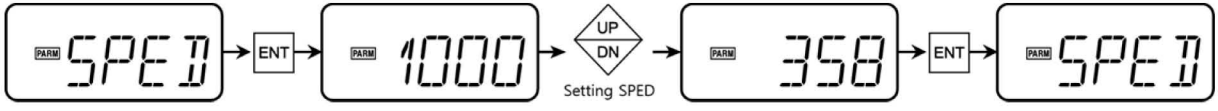
CTRL ⟶ **SPED** ⟷ **SWST** ⟷ **CNLT** ⟷ **GCNL** ⟷ **SRPS**



11.5.7.A. [SPED] – Response Speed Adjustment (default: 1000)

SPED ⟶ **1...1000**

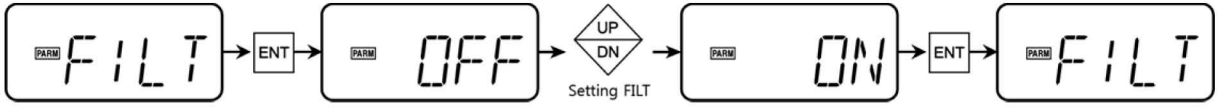
This is to adjust the response speed of the actuator. (Min: 1, Max: 1000)



11.5.7.B. [FILT] – Noise filter (default: Off)

FILT ⟶ **OFF** ⟷ **ON**

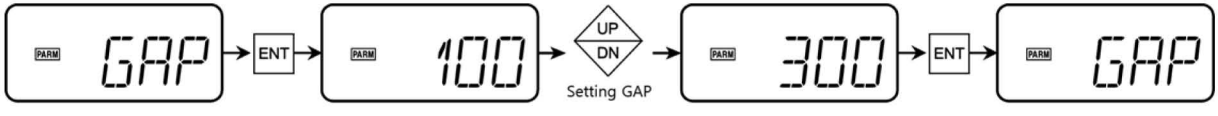
This is to activate the filter against radio frequency interference of surroundings.



11.5.7.C. [GAP] – (default: 100)

GAP ⟶ **100...999**

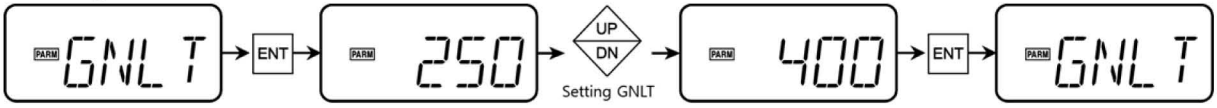
This is to secure a more stable control by adding more PID values.



11.5.7.D. [GNLT] – Gap Control Limit (default: automatically-set)

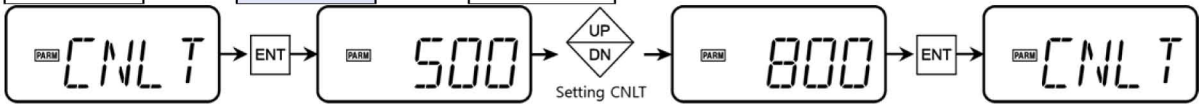
GNLT ⟶ **AUTO** ⟷ **100-650**

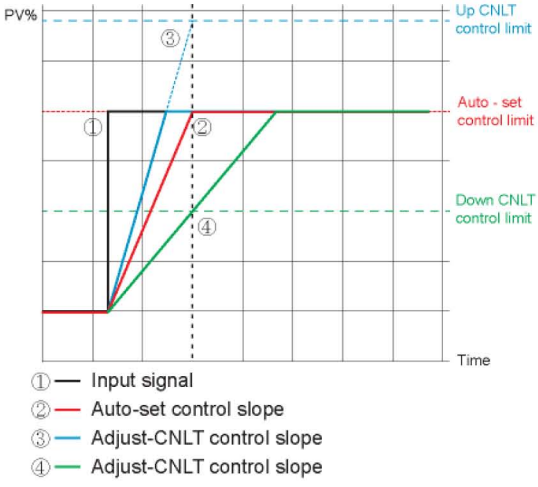
GNLT is to control a whole operating range. If the valve comes within ±3% of input signal, GNLT works with 1/2 value of CNLT for a safer control. In case that a hunting or oscillation problem happens around the position related to the input signal, a safer control can be accomplished by lowering GNLT.



11.5.7.E. [CNLT] – Control Limit (default: automatically-set)

CNLT ⟶ **AUTO** ⟷ **50-1250**





CNLT is to limit a control range and set automatically during an auto-calibration process. When 0% - 100% input signal is supplied, a recognition range of the positioner is settled according to CNLT.

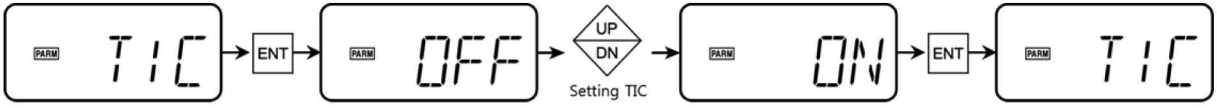
If CNLT is increased as shown in Graph 3, a control speed can become faster but a hunting problem can happen. If CNLT is decreased as shown in Graph 4, a control speed can become slower but the positioner works more stably.

CNTL can be adjusted by 100.

11.5.7.F. [TIC] – Correction of hysteresis during auto-calibration (default: Off)

TIC ⟶ **OFF** ⟷ **ON**

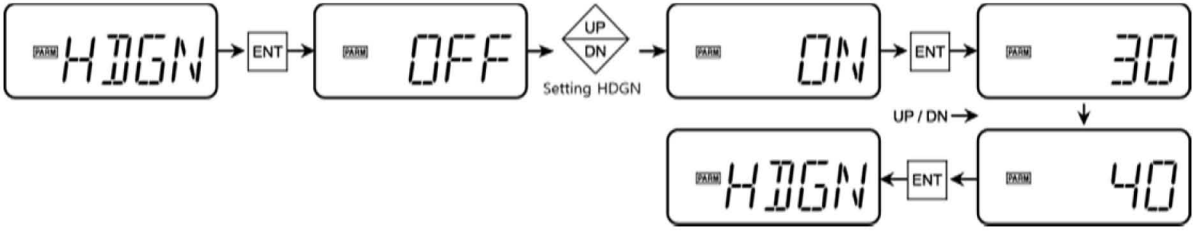
This is to secure a more stable control in case that the valve with a hard friction packing or a small actuator moves drastically.



11.5.7.G. [HDGP] – In case of a hard packing friction (default: Off)

HDGP	⟶	OFF	⟷	ON

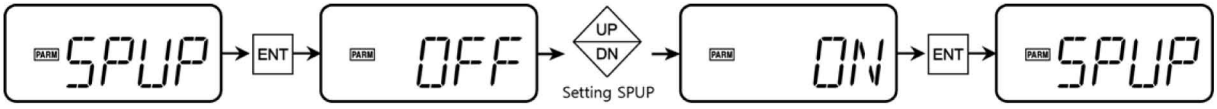
HDPG is helpful to eliminate a hunting problem with a hard packing friction.



11.5.7.H. [SPUP] – Speed Adjustment of Initial Response (default: Off)

SPUP	⟶	OFF	⟷	ON

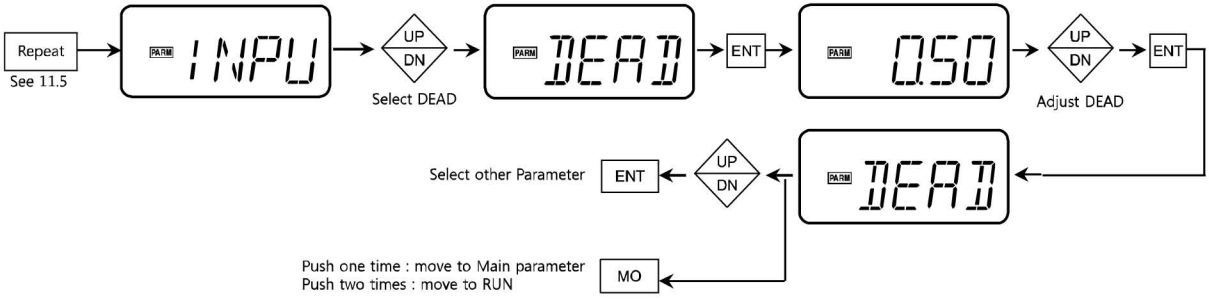
This is to solve a hunting problem during auto-calibration.



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

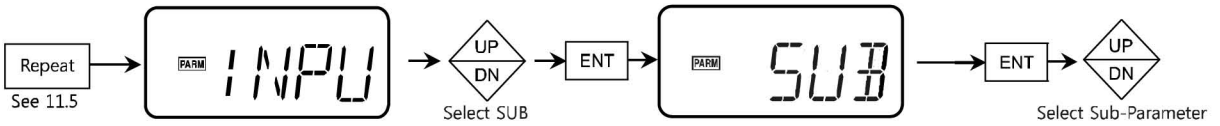
DEAD	⟶	0.5	⟷	0-9.99%

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. SUB Parameter



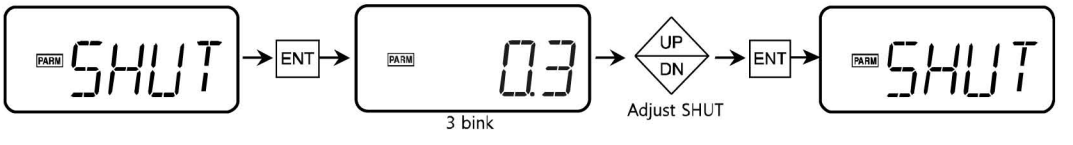
Ref.	Parameter	Description	Function	Default
11.5.9.A	PARM SHUT	Shut-off	0...9.9%	0.3%
11.5.9.B	PARM FOPN	Full-open	0...9.9%	0.3%
11.5.9.C	PARM OUT	Output signal	4...20mA or 20...4mA	4...20mA
11.5.9.D	PARM SPLT	Split range	4...12mA or 12...20mA	4...20mA
11.5.9.E	PARM LCD	Change of display position on LCD	Forward or reverse direction	FOR
11.5.9.F	PARM ALRM	Alarm limit low, high	AL1L/AL1H, AL2L/AL2H	0...10%, 90...105%
11.5.9.G	PARM ICAL	IN4M / IN20	sets to values relating to 4-20mA input signal	Factory setting
11.5.9.H	PARM FCAL	FB4M / FB20	sets to values relating to 4-20mA output signal	Factory setting
11.5.9I	PARM POLL	HART polling address	0...15	0
11.5.9J	PARM PST	Partial stroke testing	checks a valve status	OFF

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

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

SHUT → **0.3** ↔ **0-9.9**

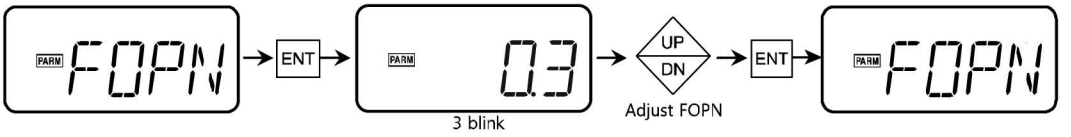
It is a safety function to close a valve completely. And it is possible to change 0% to 9.9%. For reference, 0.1% means that the positioner responds to 0.016mA. Therefore, the standard value of 0.3% means that a valve is closed at 4.048mA completely.



11.5.9.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.



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

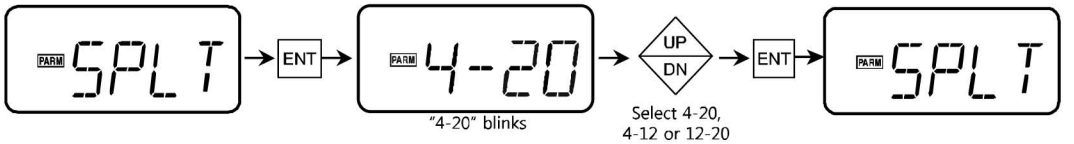
OUT ⟶ **4 - 20** ⟷ **20 - 4**

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)

SPLT ⟶ **4-20** ⟷ **4-12** ⟷ **12-20**

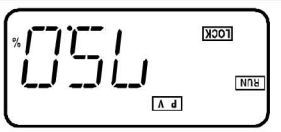
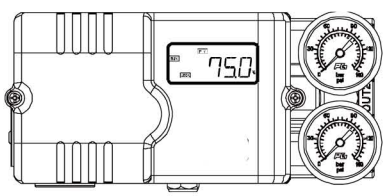
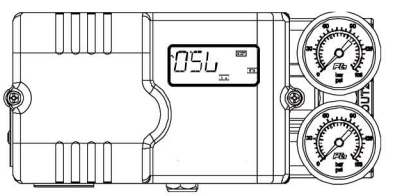
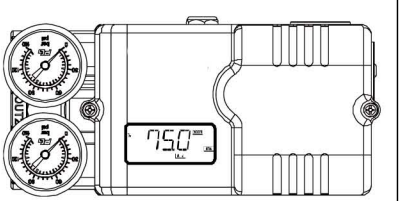
Split range can be set to 4-12mA or 12-20mA.



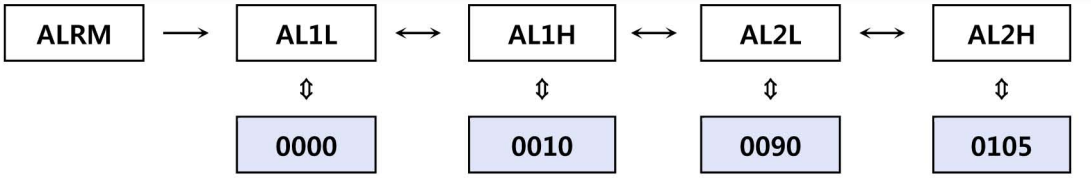
11.5.9.E. [LCD] Change of Display Position on LCD

LCD ⟶ FOR ⟷ **REV**

LCD is to change the display position on LCD in case that the positioner is installed upside down.

		
LCD : FOR	LCD : REV	LCD : REV
		

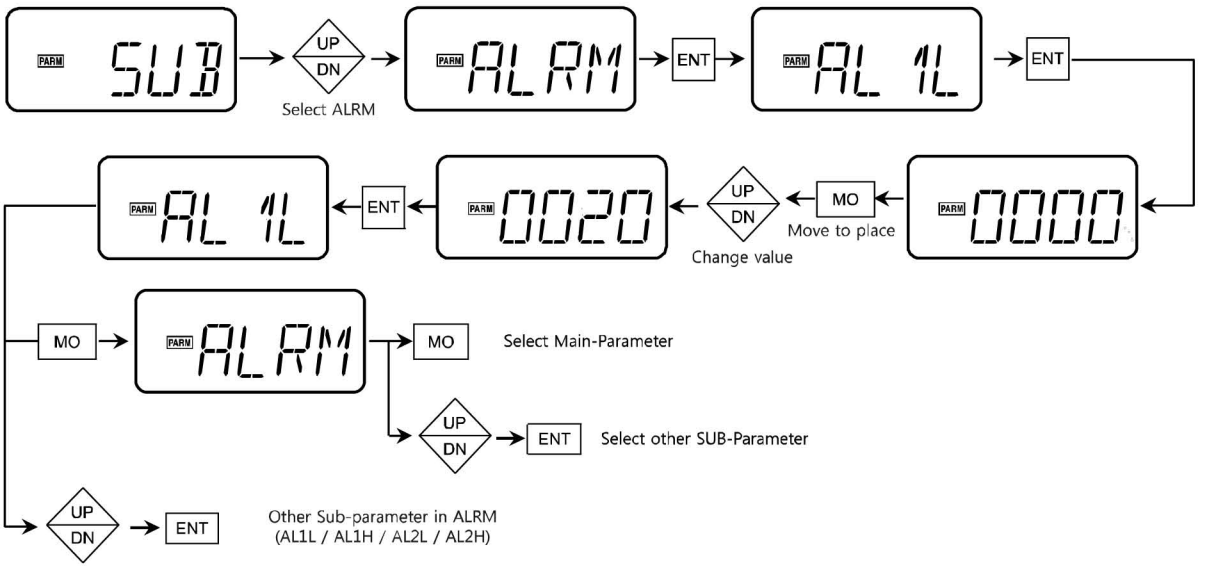
11.5.9.F. [ALRM] Setting of Alarm Limits (default: 0 – 10%, 90 – 105%)



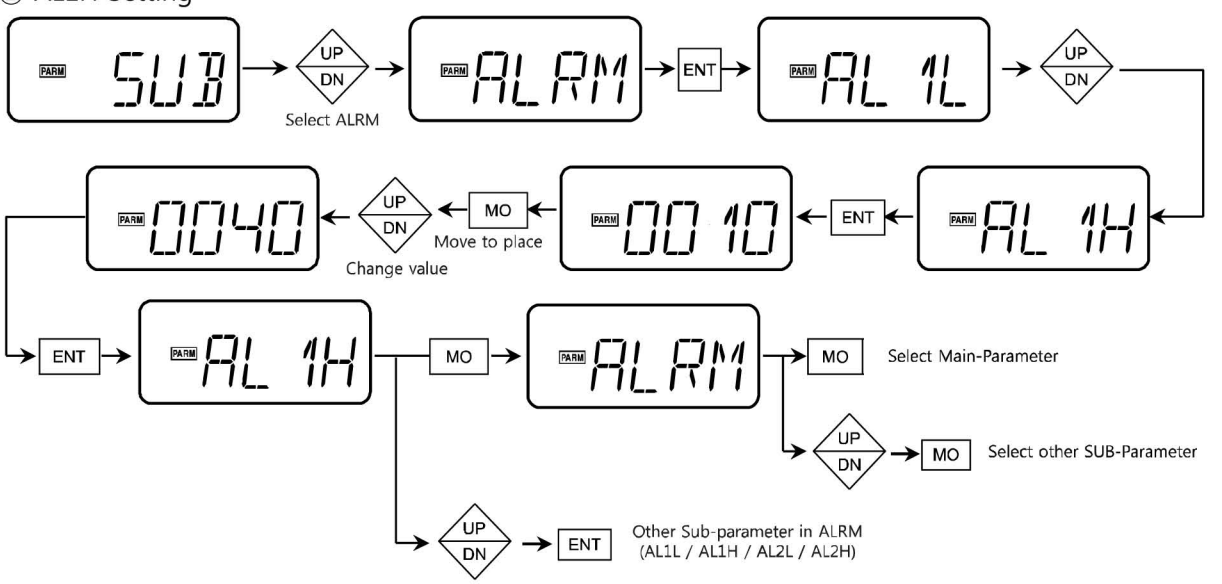
You can set an opening point or a closing point of a control valve. AL1 (L, H) is set to 0 – 10% and AL2 (L, H) is set to 90 – 105% from the factory as standard.

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

① AL1L Setting

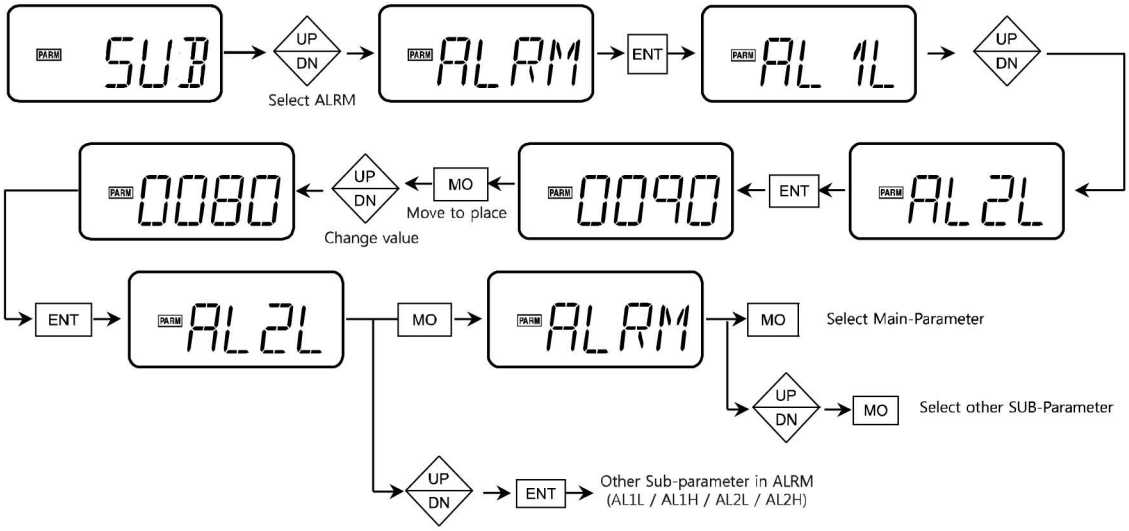


② AL1H Setting

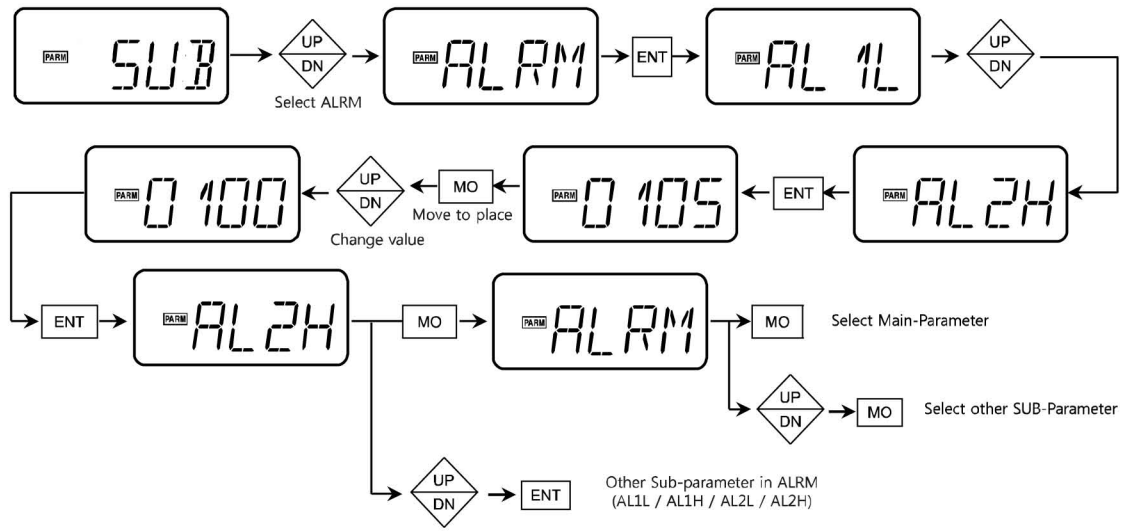


For example, see the below in order to re-set AL2 to 80 – 100%(AL2L = 80, AL2H = 100).

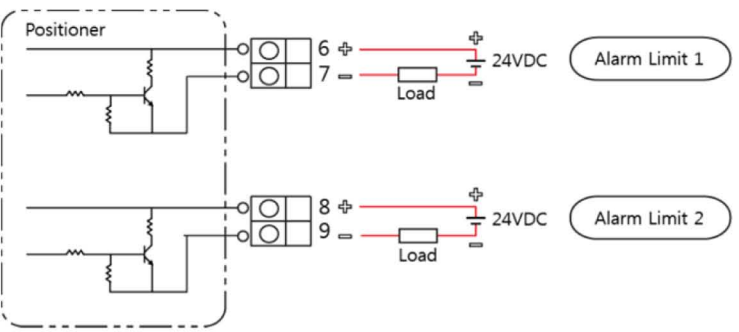
① AL2L Setting

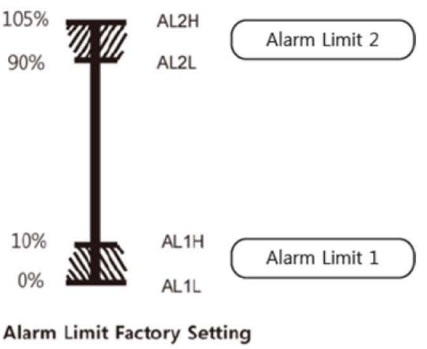


② AL2H Setting



How to wire the Alarm Limits





Alarm Limit Factory Setting

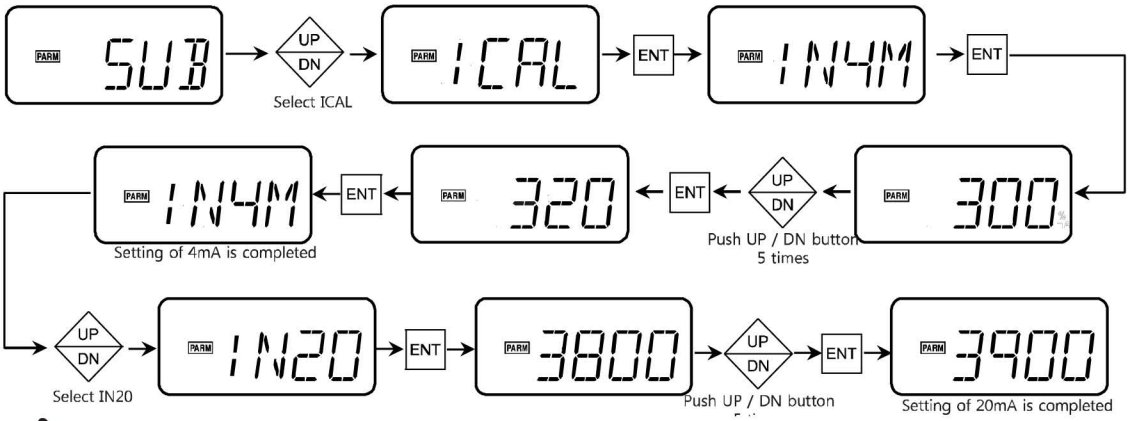
24VDC should be supplied for alarm limits.

11.5.9.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.

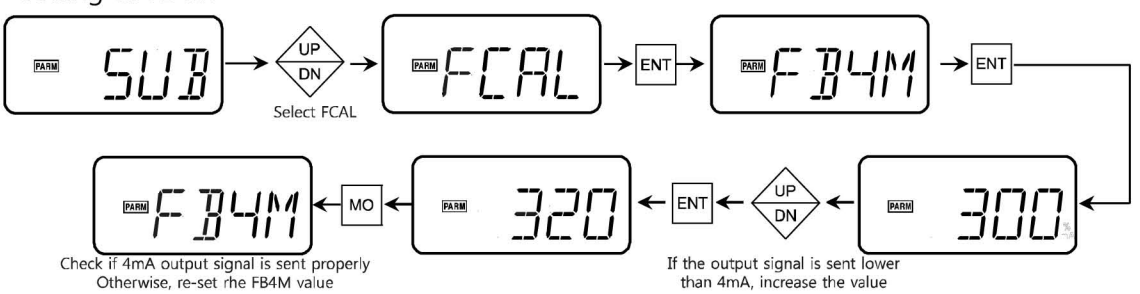
11.5.9.H. [FCAL] – Setting of Output Signal (default: factory setting)

FCAL ⟶ **FB4M** ⟷ **FB20**

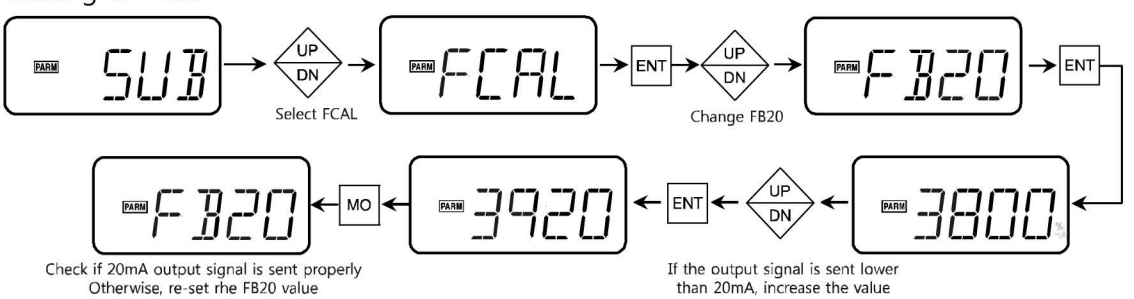
This is to re-set the 4 – 20mA output signals coming from the positioner.

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

<Setting of FB4M>



<Setting of FB20>



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

POLL ⟶ **0** ⟷ **0 ~ 15**

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.

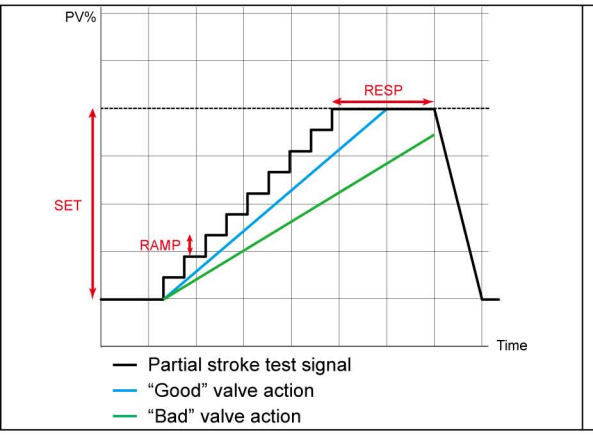
11.5.9.J. [PST] – Partial Stroke Testing (default: OFF)

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

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.

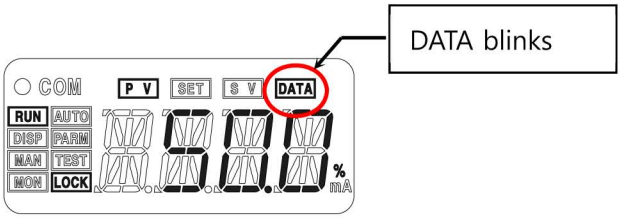
12.2. Module Parts

① RTQ Coil Assembly (spare part No. 12)
② Pilot Valve Assembly (spare part No. 5)
③ PCB Control Board Assembly (spare part No. 3)

13. Troubleshooting

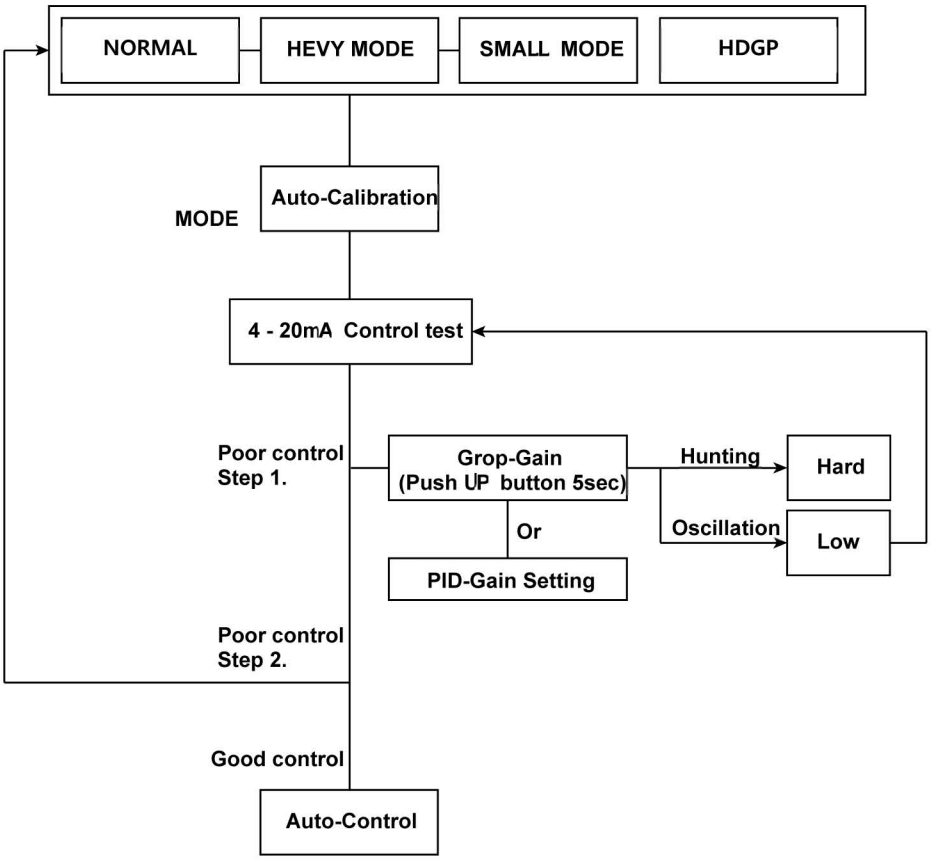
13.1. Error Codes and Recommended Actions

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



Error Code	Cause	Symton	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)		
IGMI	Down Speed Long	Slow operation	The actuator is too big. Use the air volume booster.
IGMX	Up Speed Long		
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.
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.
LOTT	Bias Low	The valve is not closed or moves slowly.	Loosen a valve packing.
HITT	Bias High	The valve is not open or moves slowly.	
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.
BAD	PST error	BAD is shown.	Check the valve or increase the response time of PST.
PONT	Potentiometer Error	Problem of potentiometer	Check the potentiometer (Potentiometer Ass'y, Board)
RTQ	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 → HEVY or SMALL → HEVY)

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 HEVY mode due to a very strong packing.	FDGN – Re-adjust	11.5.19
A valve moves too slowly in HEVY mode.	HBIS – Re-adjust	11.5.18
MONT is shown and auto-calibration fails to carry out.	Re-mount	7.1.7