SP-2400 & 2410 series Positioner are the advanced smart valve positioners which provide easy installation and simple setting and offer the automation systems outstanding reliability in control performance

Features

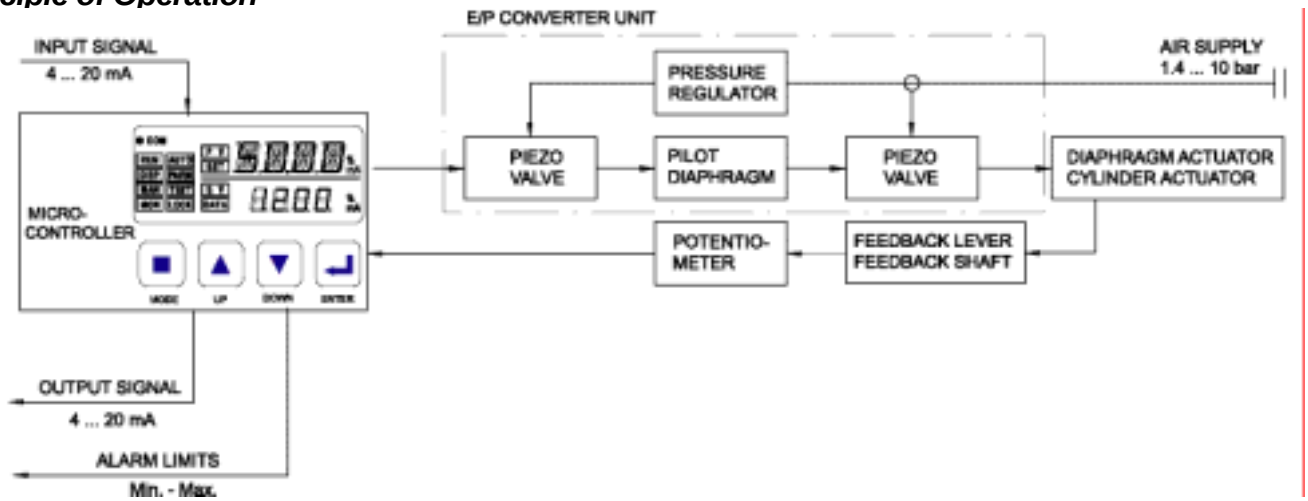
· Automation self-calibration
· Precise control performance and high dynamic response
· Easy operation with four-key pads and multi-bilingual full text graphical LCD
· Only one device version for linear and rotary actuators
· Selectable or freely-programmable characteristics
· Single and double acting
· Low air consumption due to electric microvalve
· Pressure regulator built in to eliminate variations in supply air pressure
· Problem-free characteristics on a very small actuator
· High resistance against shock and vibration
· Mounting on linear actuators according to IEC 534
· Mounting on rotary actuators according to VDI / VDE 3845

· Options available:
- HART communication (FSK)
- Position transmitter (4…20mA output)
- Two alarm limits (min, max)
- Gauge block with two stainless steel pressure gauges

Technical Data

Input	- 4…20mA, 2-wire - Split range configurable between 0…100% of 4…20mA - Power: 4…20mA current (no external power supply required) - Voltage drop: 8.5V DC max / 20mA (equivalent to 425Ω) - Minimum current: 3.6mA - Maximum current: 50mA
Output to actuator	- 0…100% of supply air pressure - Single or double action
Supply air pressure	- 1.4…7.0bar (20…100psi) - Free of oil, dust, and water
Shut-off value range	- 0…5% of positioning signal
Air consumption	- 0.08 N m^3/h at 1.4bar (20psi) supply
Humidity limits	- < 90% RH, non-condensing
Travel	- Linear type: 5…80mm (max. up to 150mm) - Rotary type: 10…100º angle - Min. and max. limits - Freely configurable within 0…100% of total travel
Adjustable speed range	- 0…200
Indication	- 4-digit LCD indicator, 2-line
Scan time	- 2 millisecond
Valve action	- Position 0…100% - Direct action (DA) - Reverse action (RA)
Characteristic curve	- Linear, equal percentage 1:25 of 1:50 - Linearity: <= 0.3% F.S - Sensitivity: <= 0.05% F.S - Hysteresis: <= 0.2% F.S
Temperature limits	- Operation: -20…+80℃ , Option : -40...120℃ - LCD display: -10…+60℃
Actual position sensing	- Potentiometer: 10 kΩ
Explosion protection	- Intrinsic safety Eex ia IIB T6
Case material	- Aluminum diecast - IP 65 protection
Electrical connections	- 2 threads PG 13.5 or 1/2 NPT
Pneumatic connections	- Threads G 1/4 or 1/4 NPT
Weight	1.6 kg (with gauge block)

Principle of Operation



1) Input signal (4…20mA) from the controller is supplied into the piezo microvalve by passing through the micro controller

2) Supply air (1.4…7.0bar) is supplied into the piezo microvalve by passing through the pressure regulator in E/P converting unit

3) Due to the piezo-electric effect, the piezo microvalve generates the pneumatic output signal in proportion to the voltage level coming from the micro controller

4) Pneumatic output signal is amplified by the pilot diaphragm and operates the spool in the pilot valve

5) Supply air (1.4…10bar) is supplied into the cylinder actuator by the movement of this spool

6) Position feedback from the feedback shaft goes into the potentiometer

7) Potentiometer generates the feedback signal, which goes into the micro controller

8) If the feedback signal equals the input signal, the cylinder actuator stops. If not, the micro controller supplies the piezo microvalve with the input signal until two signals become equal

9) As options, the built-in position transmitter generates the output signal (4…20mA) and the built-in limit switches generate the contact signals (open and close) with the feedback signal fed by the potentiometer

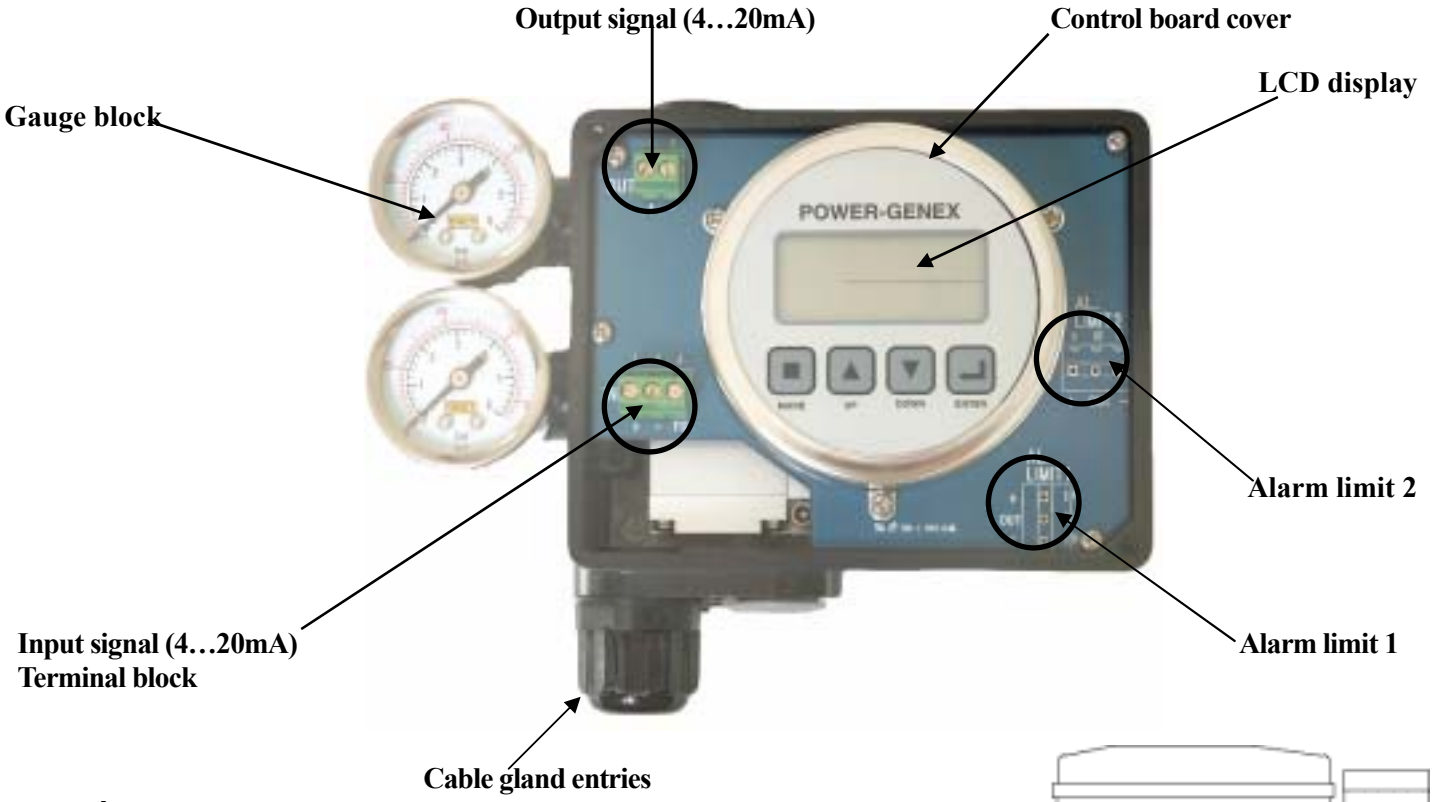
Order Information

SP-24	-	Actuator Operation	–	Feedback Lever Type	Pressure Gauge Block	Position Feedback	HART Communication	Mounting Bracket

Description	Order Code
Actuator Operation:	
- Linear type	00
- Rotary type	10
Feedback Lever:	
- Linear type	A: stroke (5…65mm) B: stroke (10…85mm) C: stroke (up to 150mm)
- Rotary type	A: NAMUR shaft
Pressure Gauge Block:	
	N: none 1: 6 bar (90psi) 2: 10 bar (150psi)

Description	Order Code
Position Feedback:	
	N: none O: position transmitter (output signal 4…20mA) L: two alarm limits M: O+L
HART Communication: (FSK)	N: none A: available
Mounting Bracket:	
	N: none 1: 80 ×30 ×20 (H) 2: 80 ×30 ×30 (H) 3. 130 ×30 ×30 (H) 4. DIN/IEC 534 (for SP-2400)

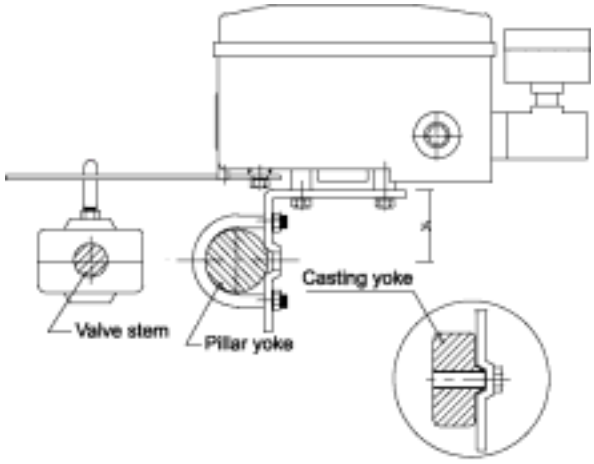
Internal View of SP-2400 & 2410 Positioner



Mounting

1. SP-2400 (linear type)

Lateral attachment is in accordance with IEC 534
(lateral attachment to Namur)

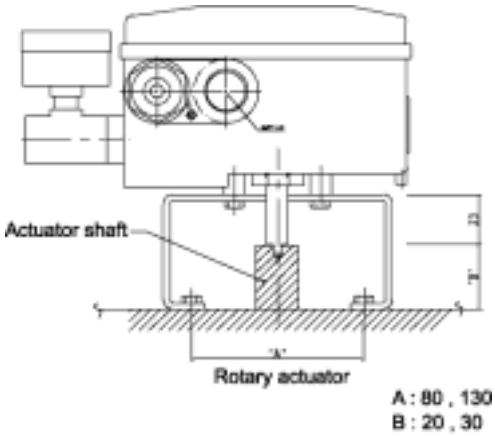


Mounting to linear actuators to IEC 534

2. SP-2410 (rotary type)

Attachment to rotary actuators is in accordance with VDI/VDE 3845

80 x 30 x 20 (H) 80 x 30 x 30 (H) 130 x 30 x 30 (H)



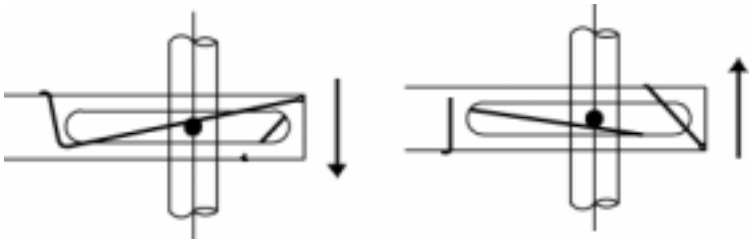
Mounting to rotary actuators to VDI/VDE 3845

Installations

1. SP-2400 (linear type)

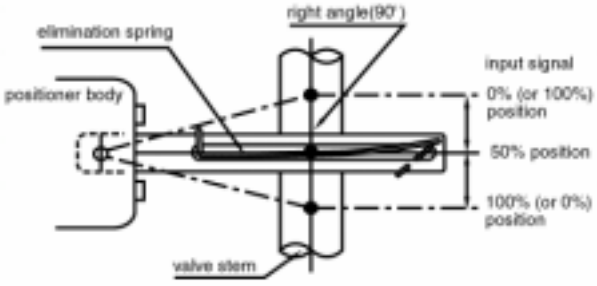
① Connect the feedback lever to the control valve stem at position where the angle between the valve stem and the feedback lever is 90 degrees as shown to the right below when the input signal is set to 12mA(50%). Be sure that the elimination spring should be installed as shown to the left below according to the actuator type (direct acting or reverse acting)

② The stroke range for the best performance should be 5 85mm and the operation angle of the feedback lever should be between Min. 5 degrees and Max. 45 degrees to carry out accuracy and linearity perfectly



valve stem moves downwards (DA) valve stem moves upwards (RA)

Elimination Spring Installation



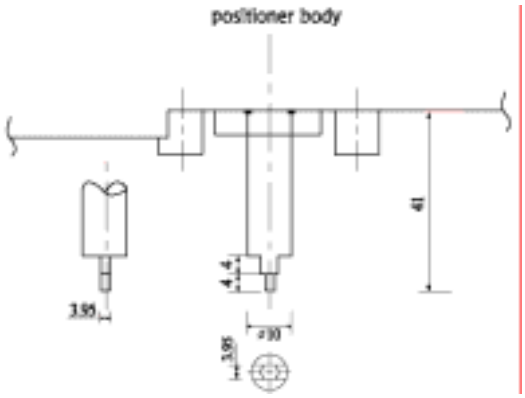
Feedback Lever Installation

2. SP- 2410 (rotary type)

① Mount the NAMUR bracket to the actuator

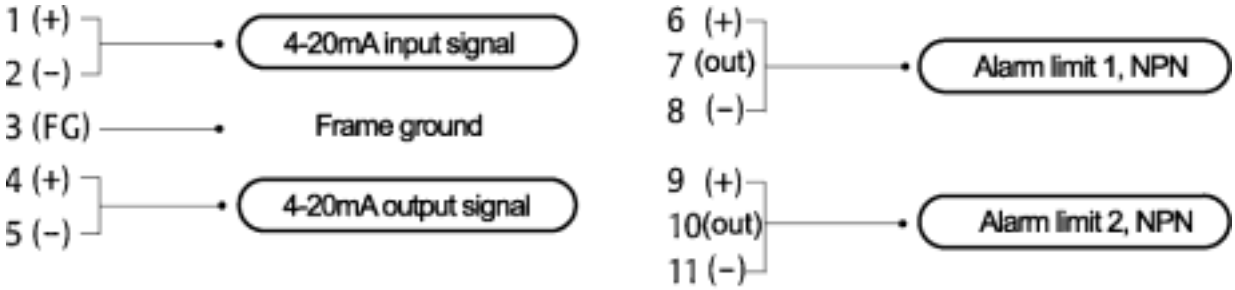
② Check the rotation direction (counter clockwise) of the actuator

③ Put the positioner feedback shaft into the actuator output shaft and fix the positioner to the bracket



NAMUR Shaft (SP-2410)

Electrical Connections

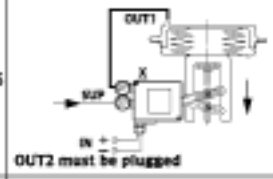
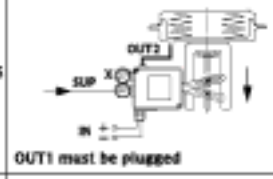
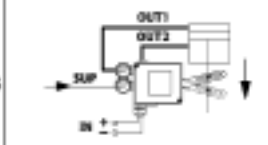


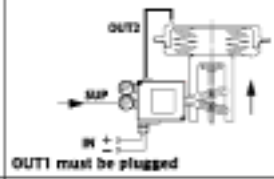
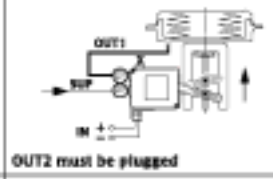
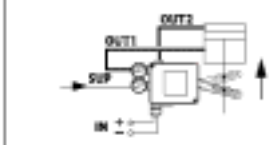
*** Position transmitter: two-wire type**
- Output signal: 4…20mA
- Power supply: 12…30V DC

*** Alarm limits**
- Supply voltage: 8…45V DC
- Current: Max. 0.5A

Air Connections

1. SP-2400 (linear type)

Direct Acting(DA)	
As the input signal increases, Valve stem moves downwards Actuator : **DA**	
As the input signal increases, Valve stem moves downwards Actuator : **DA**	
As the input signal increases, Valve stem moves downwards	

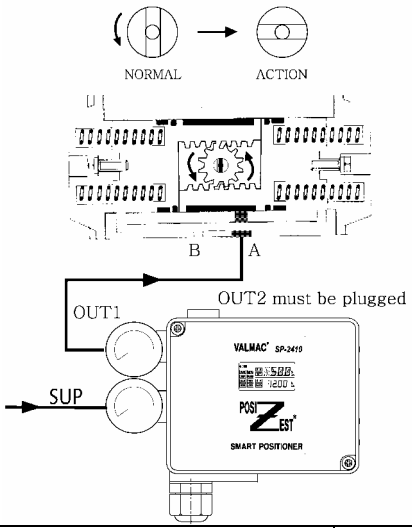
Reverse Acting(RA)	
As the input signal increases, Valve stem moves upwards Actuator : **RA**	
As the input signal increases, Valve stem moves upwards Actuator : **RA**	
As the input signal increases, Valve stem moves upwards	

2. SP-2410 (rotary type)

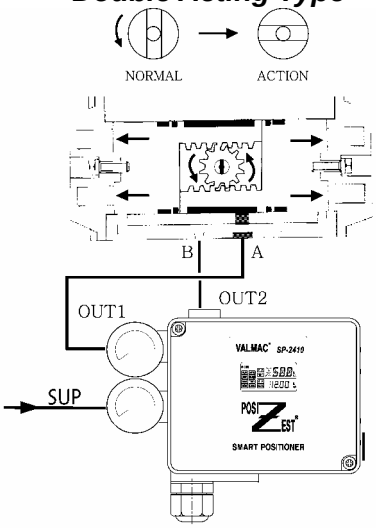
⚠ **Note that the rotating direction of the cylinder actuator should be 'counter clockwise' as shown at the upper view below. Actuator is a reverse acting (RA).**

As the input signal increases, the actuator stem rotates counter clockwise

Spring Return Type

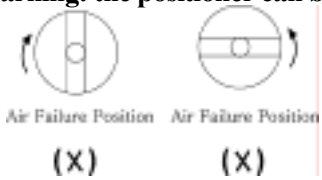


Double Acting Type



	Spring return	Double acting
Reverse acting	Out 1: piped, Out 2: plugged	Out 1: piped to Actuator port A, Out 2: piped to Actuator port B
Direct acting	Out 1: plugged, Out 2: piped	Out 1: piped to Actuator port B, Out 2: piped to Actuator port A

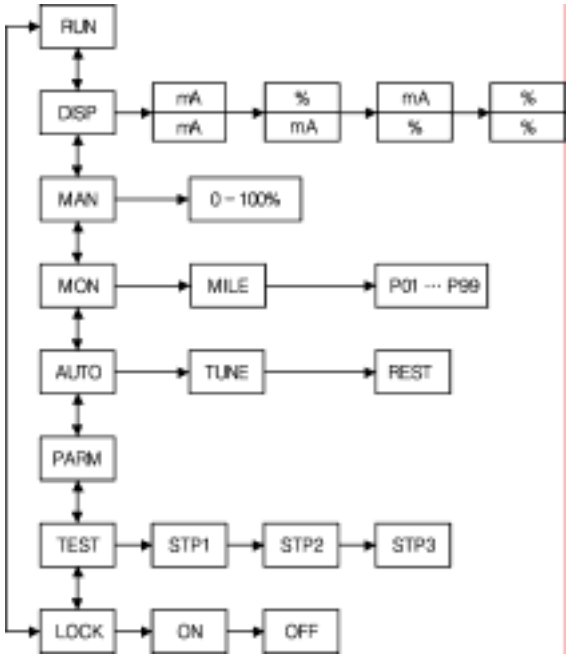
⚠ **Warning: the positioner can be damaged in case of the following rotating direction of the actuator**



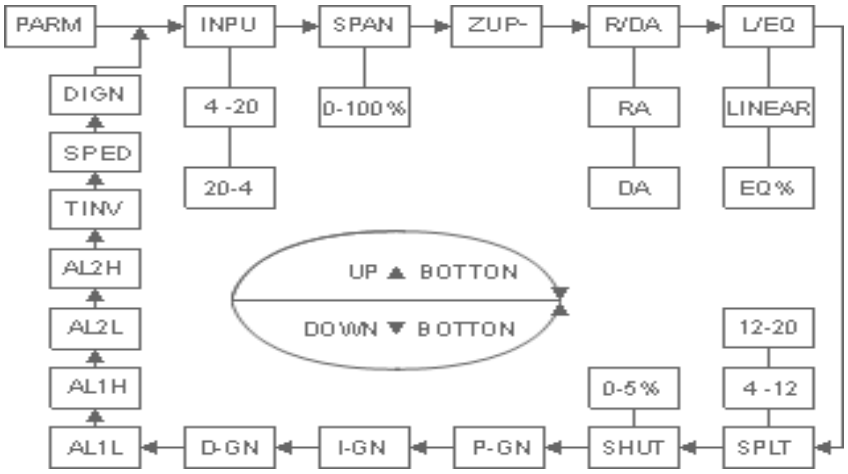
LCD Display and Parameters

1. Display Process on LCD

Display process	Function
RUN	Shows the operating situation of the positioner
DISP	Decides the display mode either mA or % on LCD
MAN	Converts to Manual Mode (0…100%)
MON	Shows the selected parameters
MILE	Shows the total valve running time
AUTO	Performs auto self-calibration
RESET	Resets all programmed values
PARM	See the table below
TEST	Tests in process of 2-step, 4-step, or 10 … 100%
LOCK	Lock the selected modes



2. Parameters



Parameter	Description	Function
INPU	Input signal	4…20mA or 20…4mA
SPAN	Span range	0…100% span adjustment
R/DA	RA/DA	Reverse or direct acting
L/E.Q	Linear/E.Q%	Linear, E.Q% (1:25 or 1:50)
SPLT	Split range	4…12mA or 12…20mA
SHUT	Shut-off	Shuts off the valve at 0…5%
P-GN	P-Gain	Proportional gain value
I-GN	I-Gain	Integral gain value
D-GN	D-Gain	Differential gain value
AL 1L	Alarm limit 1 low	First low alarm limit
AL 1H	Alarm limit 1 high	First high alarm limit
AL 2L	Alarm limit 2 low	Second low alarm limit
AL 2H	Alarm limit 2 high	Second high alarm limit
SPED	Speed control	Controls the actuator speed

Calibration – setting the parameter values

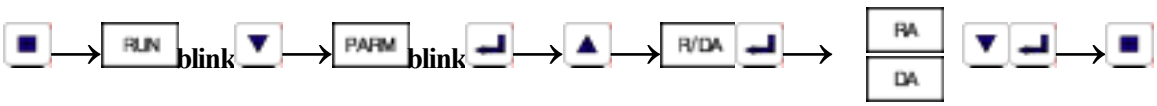
⚠ **Note that it is possible to input or re-set all parameter values while the selected parameter is 'blinking'**

1. Lock and Unlock [LOCK]

This process is required to input the new parameter values into the positioner before starting up or re-setting the positioner configuration. If LOCK is displayed on LCD, it is necessary to UNLOCK first and input the new parameter values. Once the new parameter values are set, it is necessary to LOCK the positioner configuration to prevent them from changing.

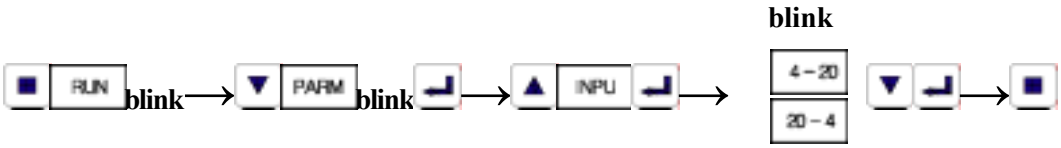
⚠ **Note that all parameter values cannot be input or re-set in LOCK**

2. Direct Action (DA) or Reverse Action (RA) according to actuator types [R/DA]



3. Input Signal [INPU]

4…20mA input signal is a default value but this can be changed or re-set to 20…4mA input signal by the following manipulation.



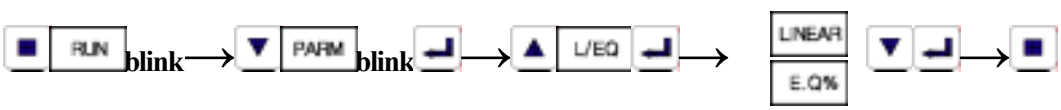
4. Span Adjustment [SPAN]

Basically the span is set to 0…100% after auto calibration process and a default valve is set to 100%. According to requirements, this value can be changed or re-set by the following manipulation.

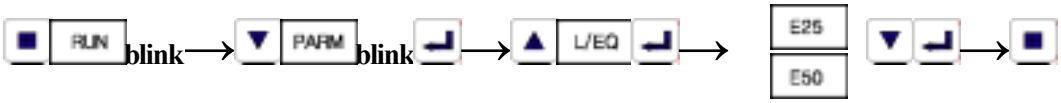
5. Control Characteristics (linear or E.Q. %) [L/EQ]

Linear characteristic is a default value but this can be changed or re-set to E.Q. % by the following manipulation.

1) Linear characteristic

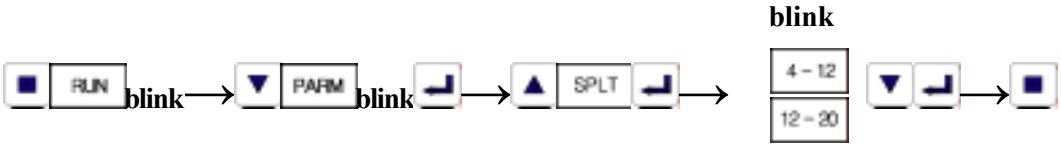


2) E.Q.% characteristic (E25: 1/25, E50: 1/50)



6. Spilt Range SPLT

4…20mA spilt range is a default value but this can be changed or re-set to 4…12mA or 12…20mA by the following manipulation.



7. Valve Shut-Off SHUT

0% deadband is the standard factory setting but this can be changed or re-set to 0…5% deadband to close the valve completely by the following manipulation.

8. Proportional Control P-GN

Auto calibration will find the proportional gain value (P-GN) suitable for the valve requirement. But if there happens hunting or overshooting with this P-GN, set this value to 10 or 20 below. This value can be changed or re-set by the following manipulation.

9. Integral Control I-GN

Auto calibration will find the integral gain value (I-GN) suitable for the valve requirement. Its default value is 120 and it is not necessary to change this value at the local system.

10. Differential Control D-GN

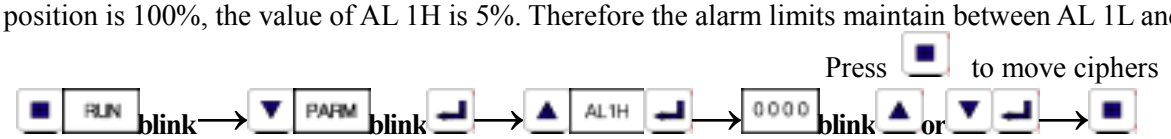
Auto calibration will find the differential gain value (D-GN) suitable for the valve requirement. Its default value is 16 and it is possible to adjust this value within from 6 to 20 by the following simple manipulation.

11. Alarm Limit 1 Low AL1L

Alarm Limit 1 Low (AL 1L) detects the low valve position. Its default value is 0%. For example, in case that the valve position is 100%, the value of AL 1L is 0%

12. Alarm Limit 1 High AL1H

Alarm Limit 1 High (AL 1H) detects the high valve position. Its default value is 0%. For example, in case that the valve position is 100%, the value of AL 1H is 5%. Therefore the alarm limits maintain between AL 1L and AL 1H.



13. Alarm Limit 2 Low AL2L

Alarm Limit 2 Low (AL 2L) detects the low valve position. Its default value is 0%. For example, in case that the valve position is 0…100%, the value of AL 2L is 95%.

Press ■ to move ciphers

14. Alarm Limit 2 High AL2H

Alarm Limit 2 High (AL 2H) detects the low valve position. Its default value is 0%. For example, in case that the valve position is 0…100%, the value of AL 2H is 100%.

Press ■ to move ciphers

15. Test Time Mode TINV

Test Time Mode sets the time to stop from step to step. Its default value is 15 seconds.

Press ■ to move ciphers

16. Speed Control SPED

This parameter sets the speed control of the control valve. Its default value is 200 but this value can be changed or re-set with the setting range of 20 to 50 by the following manipulation.

Press ■ to move ciphers

17. LCD Decimal Display DIGN

LCD can display the values down to one or two decimal places by this parameter.

18. Input Signal 20mA IN20

Input signal 20mA should be set in accordance with the parameter. As this value was already set at the factory, it is not necessary to change.

⚠ **Note that 20mA input signal should be set by the following method after resetting the positioner**

Press ■ to move ciphers

19. Input Signal 4mA IN4M

Input signal 20mA should be set in accordance with the parameter. As this value was already set at the factory, it is not necessary to change.

⚠ **Note that 20mA input signal should be set by the following method after resetting the positioner**

Press ■ to move ciphers

20. LCD Display Unit DISP

The default LCD display unit is mA but this can be changed or re-set to % by the following manipulation.

21. Manual Mode MAN

The control valve can be operated manually from the local control through this option.

22. Monitor Mode MON

The positioner records total running time of the control valve. It can be calculated by multiplying the recorded number (hour) to 10. This data is for reference only, that is, not modifiable.

23. Test Mode TEST

After the auto calibration process is finished, the testing can be performed automatically with various steps. All steps (1, 2, and 3) can carry out the same testing process. For reference, it takes 15 minutes to finish testing on each interval. This time can be adjusted as instructed at No. 15 Test Time Mode on page 9.

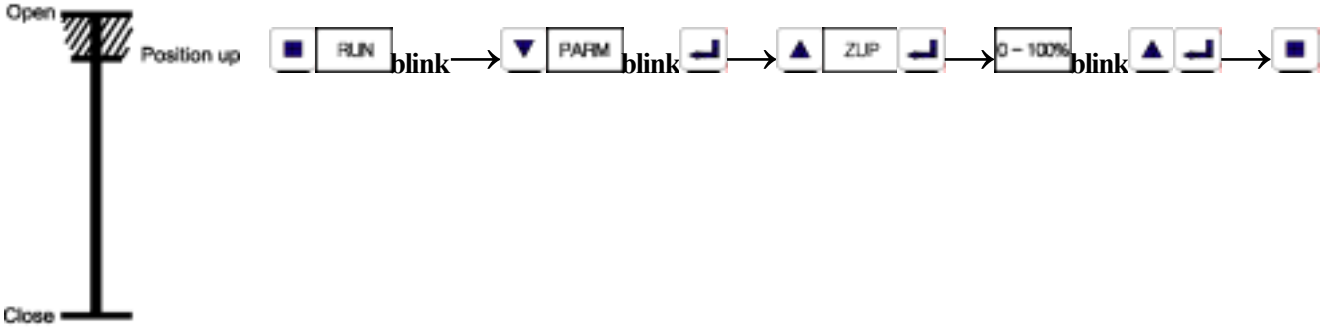
1) Step 1 : 0% → 50% → 100% → 50% → 0%…repeating

2) Step 2 : 0% → 25% → 50% → 75% → 100% → 75% → 50% → 25% → 0%…repeating

3) Step 3 : 0% → 10% …..100%…..10% → 0%…repeating

24. Zero-Up Mode ZUP

The span of zero point can increase to meet the requirement as shown to the left by the following manipulation.



25. Auto Calibration [AUTO]

TUNE is used to start up the positioner and RESET is used to initialize all values already set.

1) TUNE [TUNE]

This process can be fulfilled with any input signal within the range of 4 to 20mA by the following manipulation.

[■] → [RUN] **blink** [▼] → [AUTO] **blink** [↵] → [TUNE] [↵] → **counting 9…0 END** → [RUN] **operation**

⚠ **Note 1. it is necessary to re-adjust the span after TUNE process is finished**
2. if there happens a hunting after auto calibration, set as instructed in No. 8 on page 8

2) RESET [REST]

⚠ **Note that it is necessary to re-adjust IN 20 and IN 4M after RESET process is finished. Refer to page 8 for details**

⚠ **Do the following process after the auto calibration is finished**

a) SP-2400 (linear type)

As the positioner detects 100% to the safety position of the globe valve diaphragm actuator, push [▼] at SPAN mode slowly one by one (1%) and set the value at the position where the span indicator of the control valve reaches 100%.

b) SP-2410 (rotary type)

In case of a quarter turn actuator, as the auto calibration already set the span to 90°, it is not necessary to re-adjust the span. But if it is necessary to re-adjust the span for special requirements such as 60° or 80°, push [▼] at SPAN mode slowly one by one (1%) and set the desirable position

⚠ **In case that the auto calibration has failed, perform the auto calibration with MODE key [■] again or perform the auto calibration after disconnecting and re-connecting the input signal**

⚠ **The time required for the auto calibration is a little different according to the control valves but the auto calibration generally requires about 1~2 minutes**

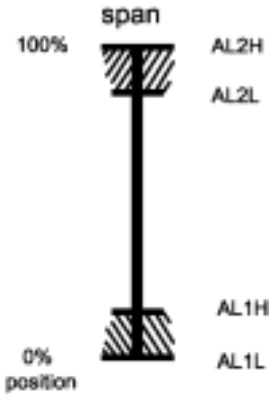
26. Calibrating Position Feedback (4…20mA output signal)

⚠ **Note that 4…20mA input signal should be provided to calibrate 4…20mA output signal**

1) Calibration with mA Loop Calibrator
Connect 4(+) and 5(--) and calibrate after selecting Measure in the loop calibrator

2) Calibration with Multi Meter Tester

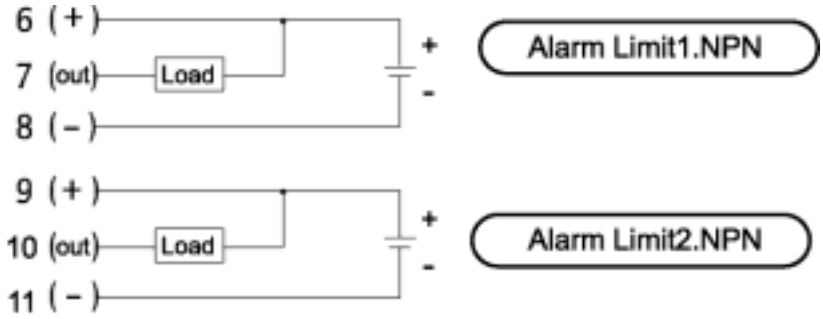
26. Setting Alarm Limits



1) Set low positions and high positions as shown to the right. Refer to No. 11~14 on page 8~9

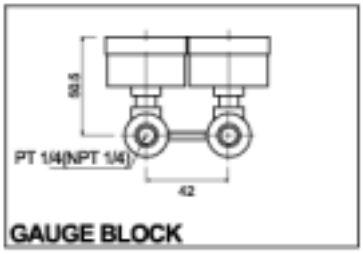
2) - Supply voltage: 8…45V DC
   - Current: Max. 0.5A

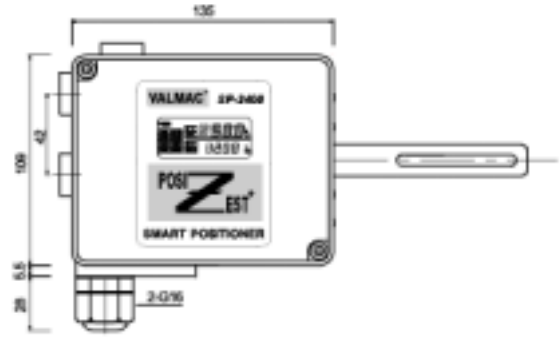
3) Electrical Connections

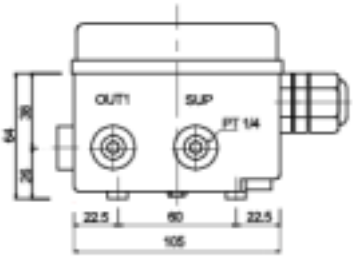


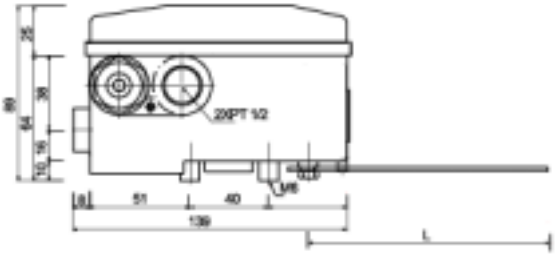
Dimensions

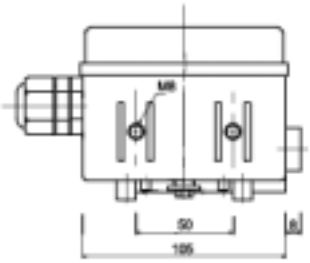
SP-2400 LINEAR TYPE



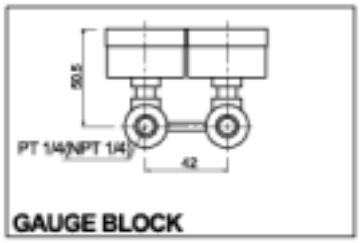


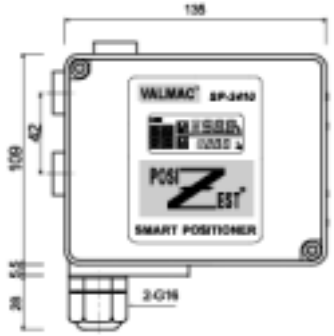


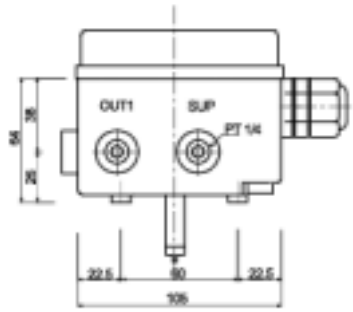


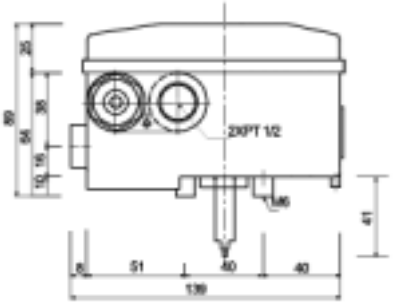


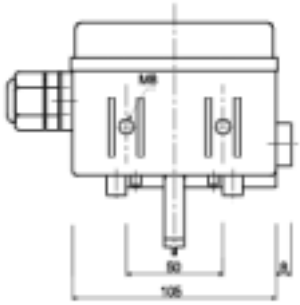
SP-2410 ROTARY TYPE











SEO JEON VALMAC Co., Ltd.

691, ORYU-DONG, SEO-GU, INCHEN, KOREA
Tel: +82-32-565-3121, Fax: +82-32-565-3124
E-mail: valmac@valmac.co.kr
Website: http://www.valmac.co.kr