2st edition : July 1999

Digital Pressure Switch Operation Manual

Thank you for purchasing SMC Digital Pressure Switch Series ZSE40(F)/ISE40.
Please read this operation manual carefully and operate this product correctly.

SMC corporation P 5025-24-2

< Before Operation > Observe the safety instructions below since they are crucial for safety.

⚠ Warning, Caution and Danger

Handling
- Do not give excessive shock (1000 m/s^2) such as dropping and hitting during operation. Even if switch case body is not damaged, internal parts may be broken, and malfunction could be the result.
- Tensile strength of lead is 49N.Tension over this value will cause failure. Hold the body for handling.
- Do not put wire in pressure port. Pressure sensor will be damaged, and abnormal operation will be the result.

Wiring
- Wrong wiring will lead to breakage, failure or malfunction of the switch. Connect switch when the power OFF.
- Wiring for switch should be separated from power source line and high voltage line. If use in the same wiring circuit, malfunction could be the result due to noise. Use in the exclusive wiring circuit.
- Do not forget to earth FG terminal when use switching regulator on the market.
- When you connect switching regulator that is on market to use analog output, switching noise of switching regulator is superimposed on analog output, therefore, product spec is not satisfied. For the case, insert noise filter, such as ferrite and line noise filter, between this pressure switch and switching regulator. Alternatively, change switching regulator into series power supply.

Environment
- This pressure switch is not an explosion proof type. Do not use this switch in atomosphere containing explosive gases.
- In a location where water or dust splashes on switch, they may invade the inside of switch via air-relieving port. Insert ϕ4 tube (I.D. ϕ2.5) in the air-relieving port, and provide piping of the opposite side up to the safe position.
  Do not seal hole by bending tube in the middle.
  It interfers with correctmeasurement for pressure.
- Do not use in the place where splashed fluid is oil.

Others
- Use within the operating pressure range.
- Do no apply the pressure more than withstanding pressure. Pressure sensor gain damage, and switch do not perform normally.
- Use within the specifications range of power supply voltage.
- After power impress, initial drift such as ± 0.5% occurs. Warm up for 20 to 30 min. in order to detect minute pressure.
- Corrosive and inflammable gases or fluids are not applicable.
- Do not press each set button by thing with pointed head.
- Wipe off dirt with soft cloth. For heavy dirt, wipe with cloth rinsed in neutral detergent diluted with water and squeezed, afterwards then finish with dry cloth.

1. Specifications

		ZSE40F For compound	ZSE40 For vacuum	ISE40 For positive
Rated pressure range		−100.0 to 100.0 kPa	0.0 to −101.3 kPa	0.000 to 1.000MPa
Operating/setting pressure range		−100.0 to 100.0 kPa	10.0 to −101.3 kPa	−0.100 to 1.000MPa
Withstand pressure		500kPa		1.5 MPa
Set pressure resolution	kPa	0.1		—
	MPa	—		0.001
	kgf/cm^2	0.001		0.01
	bar	0.001		0.01
	psi	0.02	0.01	0.1
	mmHg	1		—
(*1)	inHg	0.1		—
Fluid		Air, Non-corrosive gases, Incombustible gases		
Power supply voltage		12 to 24VDC ± 10 %, Ripple (P-P) ≦ 10 %		
Current consumption		≦ 55mA		
Switch output		NPN or PNP open collector 2 outputs max. load current : 80mA, max. applied voltage : DC30V (NPN output), residual voltage : ≦ 1V (load current 80mA)		
Repeatability (Switch output)		≦± 0.2 % F.S. ± 1 digit		
Hysteresis	Hysteresis mode	variable		
	Window comparator mode	fixed (3 digit) (*4)		
Response time		≦ 2.5 ms (chattering-proof function working : 24ms, 192ms, 768ms selected)		
Overcurrent output protection		attached		
7 segment LED display		3 1/2 digit LED display (sampling rate : 5 times/1sec)		
Indicator accuracy		≦± 2 % F.S. ± 1 digit (at the ambient temprature 25 ± 3 ℃)		
Indicator		Green LED (OUT1 : Illuminate @ON), Red LED (OUT2 : Illuminate @ON)		
Analog output (*2) (within rated pressure range)		Output voltage : 1 to 5V ≦± 5 %F.S. linearlity : ≦± 1 % F.S. Output impedance :approx.1kΩ	Output voltage:1 to 5V ≦± 2.5 % F.S. linearlity : ≦± 1 % F.S. Output impedance : approx.1kΩ	
Auto shift input (*3)		Non-voltage input (reed or solid state), input ≧ 5ms		
Environment	Enclosure	IP65 (IEC standard)		
	Ambient temp. range	Operation : 0 to 50 ℃ , Storage : −10 to 60 ℃ (No condensation or freezing)		
	Ambient humidity range	Operation・Storage : 35 to 85 %RH (No condensation)		
	Withstand voltage	1000VAC, 1minute (between lead block and case)		
	Insulation resistance	50MΩ or more (@ 500VDC M) (between lead block and case)		
	Vibration proof	10 to 500Hz, smaller one of 1.5mm or 98m/s^2 double amplitude, two hours each in direction of X, Y and Z respectively (De-energizing)		
	Impact proof	980m/s^2, three times each in direction of X,Y and Z respectively (De-energizing)		
Temp. characteristic		≦± 2 % F.S. of detected pressure (25 ℃) at temp. range of 0 to 50 ℃		
Port size		01 : R(PT) 1/8, M5 ×0.8 C4 : ϕ4 with one-touch fitting	T1 : NPT1/8, M5 ×0.8 C6 : ϕ6 with one-touch fitting	W1 : Rc(PT) 1/8 M5 : M5 internal thread
Lead wire		5-core oil-resistance cabtyre cable		
Mass (weight)		01・T1 type : approx. 60g , W1 type : approx. 80g , C4・C6・M5 type : approx. 92g (each lead wire incl. 0.6m)		

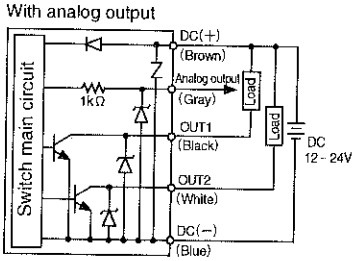
Notes

(*1) applicable type : ZSE40(F)/ISE40−※−(L) In case of unit-changing function attached
[Type without unit-changing function is fixed as SI unit (kPa or MPa)]

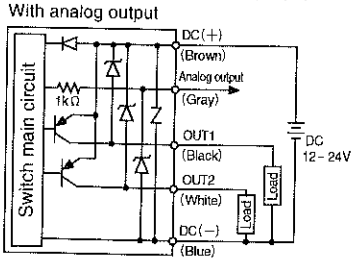
(*2) applicable type : ZSE40(F)/ISE40−※− 22/62(L) − (M)

2. Internal circuit and Wiring example

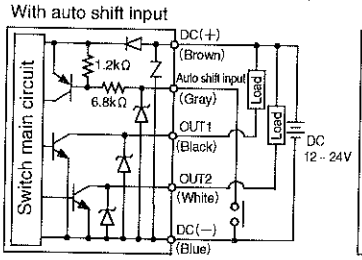
ZSE40(F)/ISE40－※－22(L)－(M)
With analog output



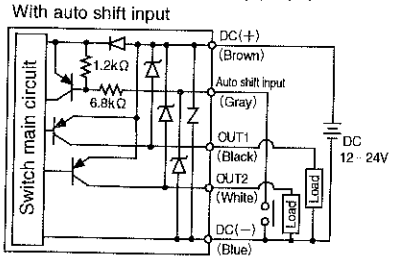
ZSE40(F)/ISE40－※－62(L)－(M)
With analog output



ZSE40(F)/ISE40－※－30(L)－(M)
With auto shift input

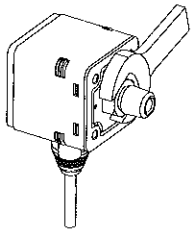


ZSE40(F)/ISE40－※－70(L)－(M)
With auto shift input

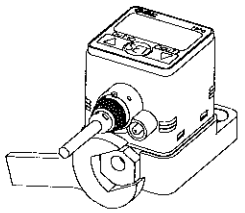


3. Piping and Mounting

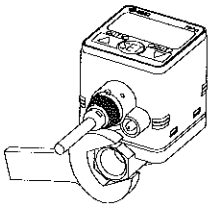
Standard type
In order to connect hexagon socket head plug or fitting on pressure port, give 12 mm wrench at pressure port hexagon part and fix, also mount tightening torque with ≦ 8.8 N·m.

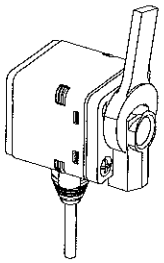


-01, -T1 Type



-M5 Type

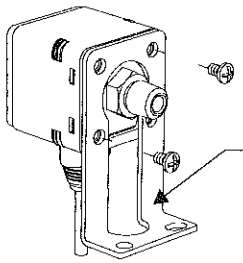




-W1 Type

-W1 Type : Pressure port base can be removed. Induction pressure direction can be changed by altering mounting direction.

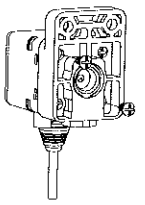
Attach mounting bracket
2-way mounting can be set depending on set place with mounting bracket.



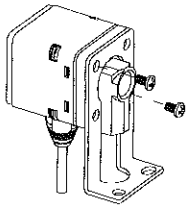
-01, -T1 Type

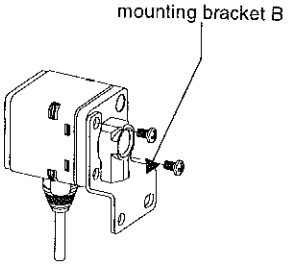
Mounting bracket A

In order to set mounting bracket on -01 and -T1 type, use SUS cross recessed head pan head machine screw : M3 × 5L (2pcs.). Ensure tightening torque of screw ≦ 0.98N·m.



-C4, -C6 , -M5 Type

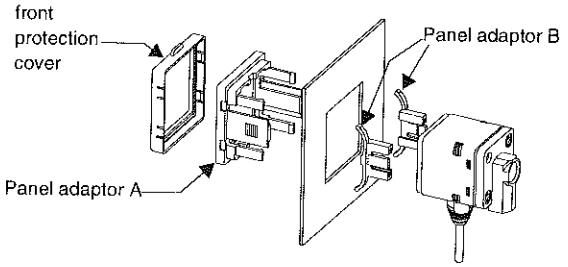




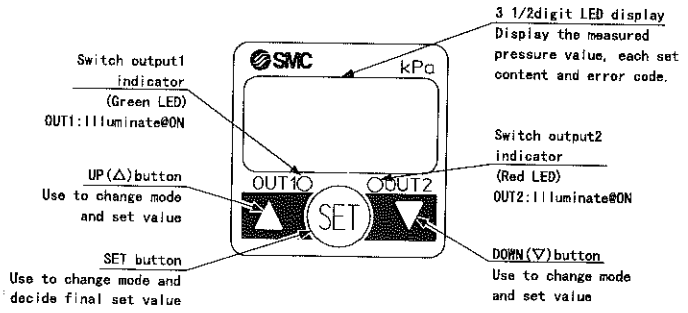
-W1 Type

In order to set mounting bracket on -C4, -C6, -M5 and -W1 type, use SUS cross recessed head pan head machine screw : M4 × 5L (2pcs.). Ensure tightening torque of screw ≦ 0.98N·m.

Panel mount



4. Name of each part

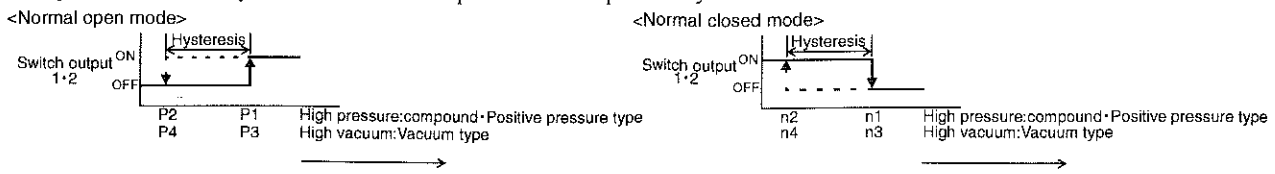


5. Error Display

Error name		Display of Error	Contents		Disposition
Over current error	OUT1	Er 1	Over 80mA load current of switch output flows.		Off the power, remove the output cause whitch brought over current, and re-input power.
	OUT2	Er2			
Residual pressure error		Er3	Performing zero reset, over±0.071 MPa to ambient pressure, and over ± 7.1kPa for compound pressure and for vacuum pressure are applied. After 3 sec., measurement mode recovers automatically.		After changing an applied pressure into ambient pressure, re-perform zero reset.
Applied pressure error		- - -	For positive pressure for compound pressure	Pressure over max. limit of set pressure range is applied.	Set back an applied pressure into within set pressure range.
			For vacuum pressure	Pressure over min. limit of set pressure range is applied.	
		- - - -	For positive pressure for compound pressure	Pressure over min. limit of set pressure range is applied.	
			For vacuum pressure	Pressure over max. limit of set pressure range is applied.	
System error		Er4	Internal data error cause this display.		Off the power, and re-input power. Non-recovery case needs our investigation (at our place according
		Er6	Internal system error cause this display.		
		Er0	Internal data error cause this		

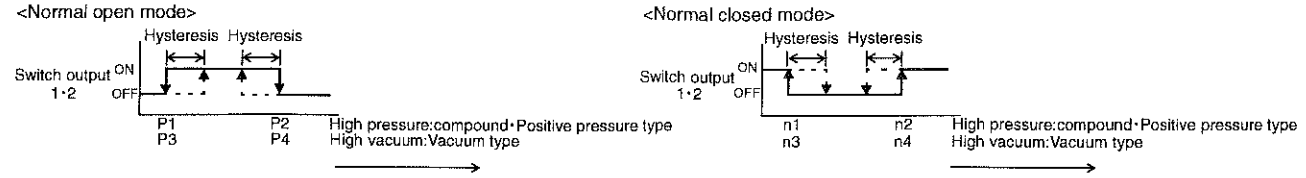
6 . Output type

6 − 1. Hysteresis mode : Hysteresis of switch output can be set specifically.



(note1) While Hysteresis is set in less than 2 digit, if input pressure vary around set point, switch output might cause chattering.

6 − 2. Window comparator mode : Switch output can be ON and OFF in pressure range set specifically.



(note2) Hysteresis : 3 digit fixed. For setting pressure, leave at least 6 digits.

7 . Auto preset mode

For use pressure switch to confirm absorption, this mode provide proper setting automatically by repeating absorption and non-absorption several times with work (object)

[calculation for set value]

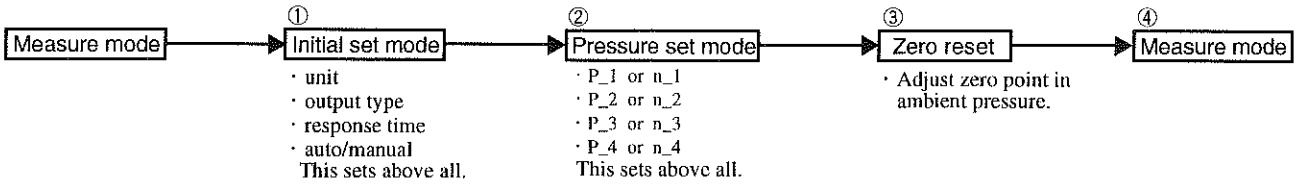
A = max.pressure value in auto preset mode

B = min.pressure value in auto preset mode

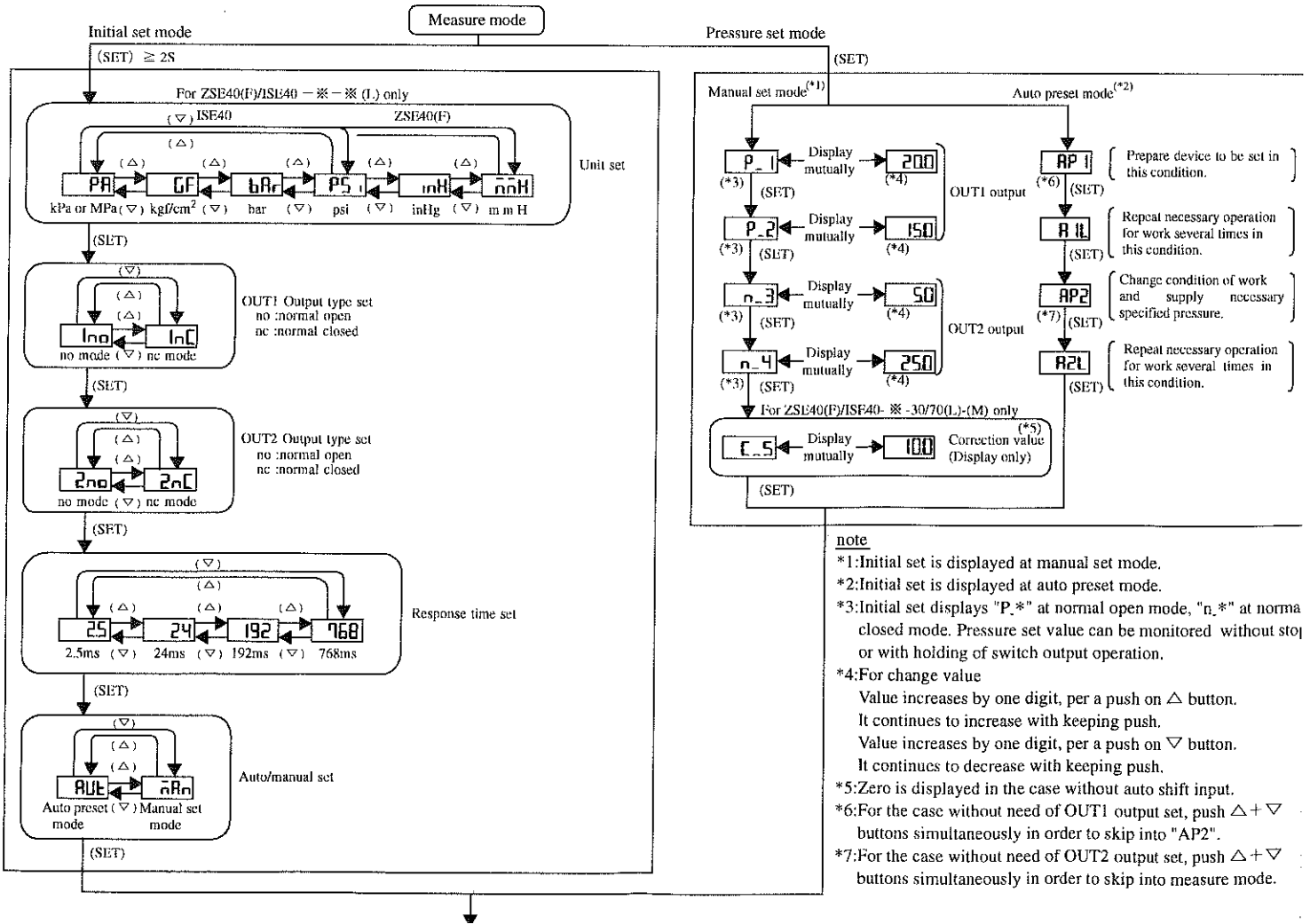
$$\text{P1 (n1)}\ \text{P3 (n3)} = A - \frac{A-B}{4} \qquad \text{P2 (n2)}\ \text{P4 (n4)} = B + \frac{A-B}{4}$$

8 . Setting

8 − 1. Set prosedure

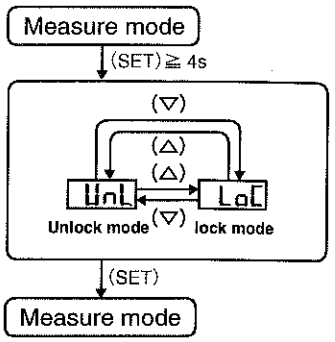


8 − 2. Initial set mode / Pressure set mode



8 – 3. Key lock mode

In measure mode, this can prevent from wrong operation indicated by operation button on the front of switch in advance.
Set lock mode in order not to accept button operation.



8 – 4. Peak display mode

While measuring, displayed value of max. pressure can be held. Keep pressing △ button for over 1sec. in order to change into peak display mode, so that displayed value turn on and off.
In order to release the hold, keep pressing △ button for over 1sec. once more. Measure mode recovers.

8 – 5. Bottom display mode

While measuring, displayed value of min. pressure can be held. Keep pressing ▽ button for over 1sec. in order to change into peak display mode, so that displayed value turn on and off.
In order to release the hold, keep pressing ▽ button for over 1sec. once more. Measure mode recovers.

8 – 6. Zero reset

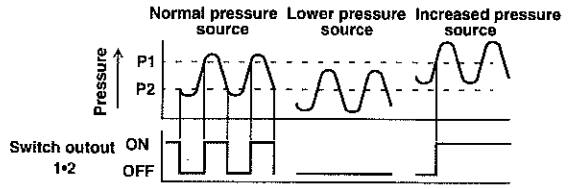
For measured pressure in ambient pressure and within the range of ± 70digit, displayed value can be adjusted as zero. Keep pushing " △ + ▽ " buttons simultaneously in order to reset displayed value as zero. Release these buttons in order to finish zero reset operation and recover measure mode.

9 . Auto shift function

While measured pressure becomes standard pressure value when auto shift input is received, this function correct set value (P_1) or (n_1) and (P_2) or (n_2) of switch output1, and set value (P_3) or (n_3) and (P_4) or (n_4) of switch output2.

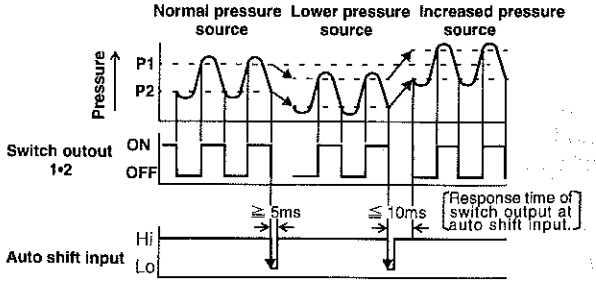
Without Auto shift

Change of pressure source can not bring correct decision.



With Auto shift

Set auto shift input as Lo at the time pressure source change, in order to memorize the pressure change and to correct pressure set value, so that correct decision emerge.



Conditions and explanations for auto shift function

- Keep constant pressure for ≧ 5ms from the fallen signal of auto shift input.
- At auto shift input, display indicates " ooo " for approx. 1sec. Pressure value at that time is memorized as corrected value " C_5 ".
- With corrected value which is memorized, set value " P_1 " to " P_4 " or " n_1 " to " n_4 " are corrected.
- Span is ≦ 10ms until switch output perform soon after auto shift input.
- When corrected set value exceed the accepted set range with auto shift input, corrected value is not memorized. The case exceeding high limit displays " UUU ", the case exceeding low limit displays " LLL ".
- Corrected value " C_5 " after auto shift input vanish when off the power.
- Corrected value " C_5 " for auto shift function is reset as zero (initial value) when re-supplied power.

(note1) no EEPROM in the memory of corrected value.

Using with auto shift input, accepted set range is like below.

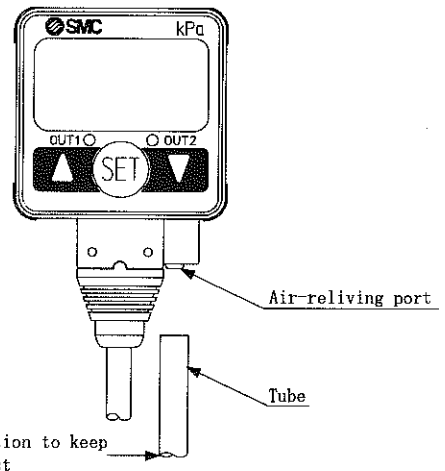
Set pressure range	Accepted set range
−100.0 to 100.0 kPa	−100.0 to 100.0 kPa
10.0 to −101.3 kPa	−101.3 to 101.3 kPa
−0.1 to −1.000MPa	−1.000 to 1.000MPa

10 . Preventive function for chattering

Pressure source bring sudden change at performance of large bore cylinder. Wrong operation such as chattering can be prevented by varying response time of switch output. Response time can be selected among 4 types. Switch output is performed with average of measured pressure value for the set response time.

11 . Coutions for operation

When this switch is used in the place where water and dust splashes on, insert tube in the air-relieving port, and provide piping of the opposite side up to the safe position to keep from water and dust.
(Refer to below)



※ Concerning tube, insert it in the air-relieving port at the root.
※ SMC TU0425 (material: Polyurethane, I.D. ϕ 2.5) suits to this product.