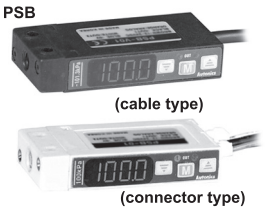
Autonics

DIGITAL PRESSURE SENSOR
PSA/PSB SERIES
M A N U A L

PSA

PSB



(cable type)

(connector type)

Thank you very much for selecting Autonics products.
For your safety, please read the following before using.

■ Caution for your safety

※Please keep these instructions and review them before using this unit.

※Please observe the cautions that follow;
⚠**Warning** Serious injury may result if instructions are not followed.
⚠**Caution** Product may be damaged, or injury may result if instructions are not followed.

※The following is an explanation of the symbols used in the operation manual.
⚠ caution: Injury or danger may occur under special conditions.

⚠ Warning

1. **In case of using this unit with machinery (Ex: nuclear power control, medical equipment, ship, vehicle, train, airplane, combustion apparatus, safety device, crime/disaster prevention equipment, etc) which may cause damages to human life or property, it is required to install fail-safe device.**
   It may cause a fire, human injury or damage to property.
2. **Do not use it in flammable gas because it does not have an explosion proof construction.**
   It may cause explosion.

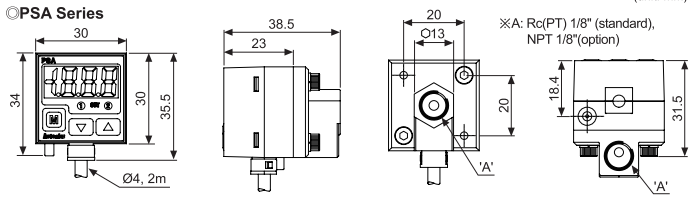
⚠ Caution

1. **Do not apply the pressure beyond rated pressure.**
   It may cause damage to this unit.
2. **Do not use it beyond power supply.**
   It may cause damage to this unit.
3. **Do not make a short circuit for the load.**
   It may cause damage to this unit.
4. **Do not wire incorrectly in power polarity etc.**
   It may cause damage to this unit.
5. **Do not use corrosive gas or liquid as it is only for non-corrosive gas.**
   It may cause damage to this unit.
6. **Do not supply power to its case or twist the case strongly.**
   It may cause damage to this unit.
7. **This unit shall not be used outdoors.**
   It may shorten the life cycle of the product or cause electric shock. This unit is produced only for the indoor environment.

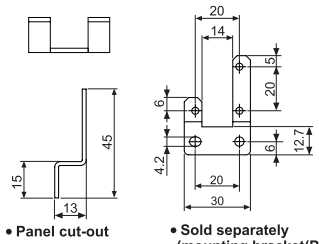
■ Dimensions

(unit: mm)

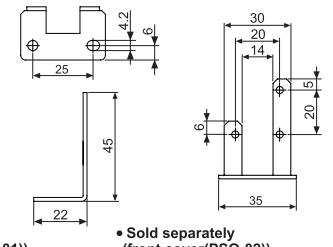
◎**PSA Series**



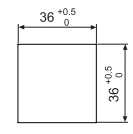
• **Bracket A**



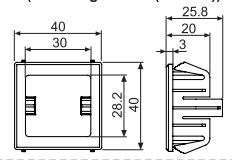
• **Bracket B**



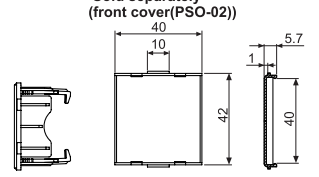
• **Panel cut-out**



• **Sold separately (mounting bracket(PSO-01))**

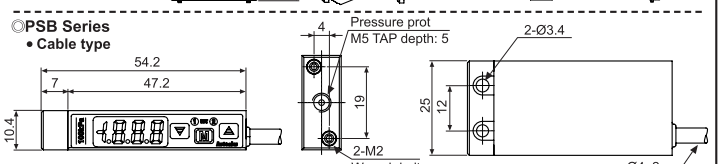


• **Sold separately (front cover(PSO-02))**

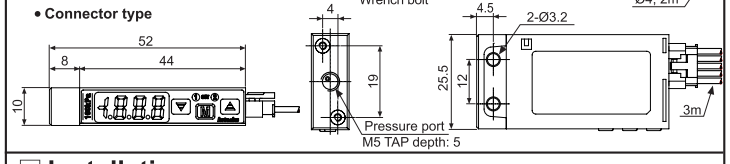


◎**PSB Series**

• **Cable type**



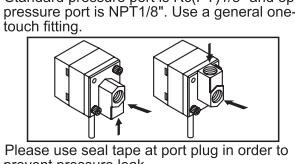
• **Connector type**



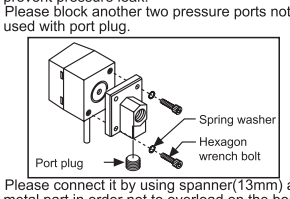
■ Installation

◎**PSA Series**

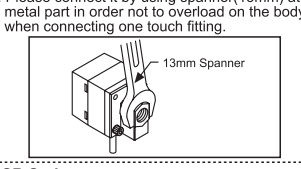
1. When installing pressure port it is able to bring pressure from 3 directions by changing the mounting direction of the pressure port.
2. Standard pressure port is Rc(PT)1/8" and option pressure port is NPT1/8". Use a general one-touch fitting.



3. Please use seal tape at port plug in order to prevent pressure leak.
4. Please block another two pressure ports not used with port plug.



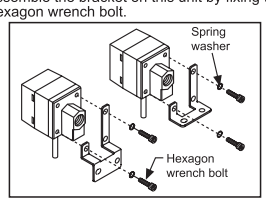
5. Please connect it by using spanner(13mm) at the metal part in order not to overload on the body when connecting one touch fitting.



⚠**Caution**

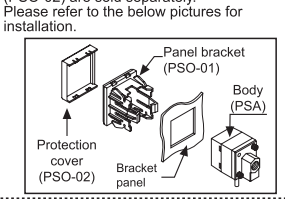
The tightening torque of one touch fitting should be Max. 100kgf cm.
It may cause mechanical trouble.

6. PSA Series has 2 kinds of brackets so it is able to install it in two different ways.
7. At first, please unscrew hexagon wrench bolt and assemble the bracket on this unit by fixing the hexagon wrench bolt.



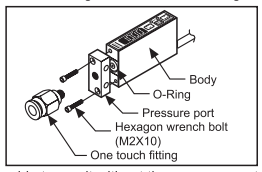
In this case, tightening torque of hexagon wrench should be max. 30kgf·cm.
It may cause mechanical trouble.

8. Bracket(PSO-01) and front protection cover (PSO-02) are sold separately.
   Please refer to the below pictures for installation.

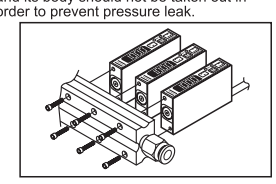


◎**PSB Series**

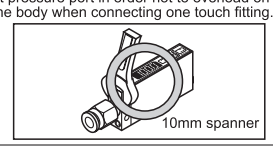
1. Pressure port is M5.
   It is able to use general one touch fitting.



2. It is able to use it without the pressure port according to environment.
   In this case O-Ring between pressure port and its body should not be taken out in order to prevent pressure leak.

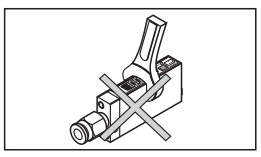


3. Please connect it by using spanner(10mm) at pressure port in order not to overload on the body when connecting one touch fitting.



⚠**Caution**

The tightening torque of one touch fitting and hexagon wrench should be Max. 50kgf cm and 20kgf cm. It may cause mechanical trouble. Please do not use spanner to install as it may cause mechanical trouble.



※The above specifications are subject to change and some models may be discontinued without notice.

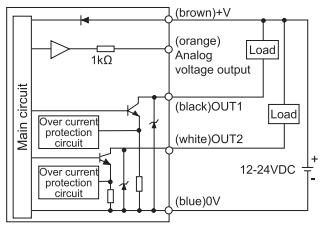
■ Specifications

Pressure type		Gauge pressure			
		Negative pressure type	Standard pressure type		Compound pressure type
Model※1	NPN open collector output	PSA-V01-□ PSB-V01-□ PSB-V01C-□	PSA-01-□ PSB-01-□ PSB-01C-□	PSA-1-□ PSB-1-□ PSB-1C-□	PSA-C01-□ PSB-C01-□ PSB-C01C-□
	PNP open collector output	PSA-V01P-□ PSB-V01P-□ PSB-V01CP-□	PSA-01P-□ PSB-01P-□ PSB-01CP-□	PSA-1P-□ PSB-1P-□ PSB-1CP-□	PSA-C01P-□ PSB-C01P-□ PSB-C01CP-□
Rated pressure range		0.0 to -101.3kPa	0.0 to 100.0kPa	0 to 1,000kPa	-100.0 to 100.0kPa
Display pressure range		5.0 to -101.3kPa	-5.0 to 110.0kPa	-50 to 1,100kPa	-101.2 to 110.0kPa
Max. pressure range		2 times of rated pressure		1.5 times of rated pressure	2 times of rated pressure
Applicable fluid		Air, Non-corrosive gas			
Power supply		12V-24VDC ±10%(Ripple P-P: max. 10%)			
Current consumption		Max. 50mA			
Control output		NPN or PNP open collector output • Load voltage: Max. 30VDC • Load current: Max. 100mA • Residual voltage -NPN: Max. 1V, PNP: Max. 2V			
	Hysteresis※2	1digit fixed(2digits for psi unit)			2digits fixed
	Repeat error	±0.2% F.S. ±1digit			±0.2% F.S.±2digits
	Response time	Selectable 2.5ms, 5ms, 100ms, 500ms			
	Short circuit protection	Built-in			
Analog output		• Output voltage: 1V-5VDC ±2% F.S. • Linear: Within ±2% F.S. • Zero point: Within 1VDC ±2% F.S. • Span: Within 4VDC ±2% F.S. • Resolution: Approx. 1/200 • Output impedance: 1kΩ			
Display digit		3½ digit LED			
Display method		7 Segment LED			
Min. display interval		1digit(psi unit: 2 digits are fixed)			2digits
Pressure unit		kPa, kgf/cm², bar, psi, mmHg, mmH₂O, inHg	kPa, kgf/cm², bar, psi		kPa, kgf/cm², bar, psi, mmHg, mmH₂O, inHg
Display accuracy		0 to 50°C: Max. ±1% F.S., -10 to 0°C: Max. ±2% F.S.			
Vibration		1.5mm amplitude at frequency of 10 to 55Hz in each of X, Y, Z directions for 2 hours			
Environment	Ambient temperature	-10 to 50, Storage: -20 to 60°C			
	Ambient humidity	35 to 85%RH, Storage: 35 to 85%RH			
Material		• PSA - Case: PC, Pressure port: die-cast (Zn) • PSB - Case, Pressure port, Cover: IXEF • PSB-C - Case, Pressure port, Cover: IXEF			
Protection		IP40(IEC standard)			
Cable	Cable type	Ø4mm, 5-wire, Length: 2m(AWG 24, core diameter: 0.08mm, number of cores: 40, insulation diameter: Ø1mm)			
	Connector type	5-wire, Length: 3m(AWG 24, insulation diameter: Ø1.4mm)			
Weight※3		PSA : Approx. 200g(approx. 120g), PSB : Approx. 160g(approx. 70g), PSB-C : Approx. 160g (approx. 70g)			

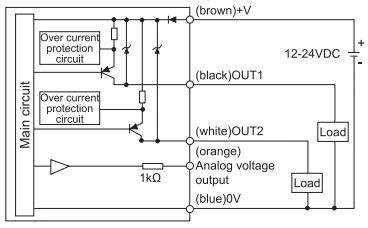
※1: □ is pressure port type. Rc1/8: PT1/8" model (PSA standard), NPT1/8: NPT1/8" model (PSA option), M5(PSB standard)
※2: In hysteresis output mode, detection difference is variable.
※3: The weight is with packaging and the weight in parentheses is only unit weight.
※F.S.: Rated pressure. ※There may be ±1digit error in hysteresis by pressure unit calculation error.
※The specification of pressure port for PSA Series is marked on the upper part of the case.
※Environment resistance is rated at no freezing or condensation.

■ Input/Output circuit and connection diagram

• **NPN open collector output type**

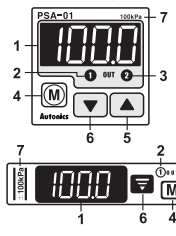


• **PNP open collector output type**



※There is no over current protection circuit in analog voltage output type.
Do not connect this unit to power source or capacitive load directly.
※Please observe input impedance of connected equipment when using analog voltage output.
And be sure with voltage drop by resistance of extended wire.

■ Front panel identification and function



1. **3½ digit LED display(red)**:
   Displays sensing pressure, every setting value and display error
2. **1 output indicator(red)**: Output 1 is ON, LED will be ON
3. **2 output indicator(PSA: red, PSB: green)**: Output 2 is ON, LED will be ON
4. **Mode key**: Enter to parameter or preset setting mode, and save setting value
5. **Up key**: Sets the setting value to upper step in preset setting or pressure unit, output mode, response time, analog output scale, key lock, peak hold value, bottom hold value display in parameter setting
6. **Down key**
   :Sets setting value to lower step in preset setting or pressure unit, output mode, response time, analog output scale, key lock, peak hold, bottom hold display in parameter setting.
7. **Range of rating pressure**: It is possible to change the pressure unit in pressure sensor. Please use different unit label for your application.

■ Functions

◎**Pressure unit change**
PS□-V01(C)(P) and PS□-C01(C)(P) has 7 kinds of pressure unit and PS□-01(C)(P) and PS□-1(C)(P) has 4 kinds of pressure unit. Please select the proper unit for application.
• PS□-V01(C)(P), PS□-C01(C)(P) : kPa, kgf/cm², bar, psi, mmHg, inHg, mmH₂O
• PS□-01(C)(P), PS□-1(C)(P) : kPa, kgf/cm², bar, psi
※When using mmH₂O unit, multiply display value by 100.

◎**Output mode change**
There are 6 kinds of control output mode in order to provide the various detection.
Select a mode for your proper application.
• Hysteresis mode[F-1] : When variable hysteresis is required for pressure detection.
• Automatic sensitivity setting mode[F-2]: When it is required to set detecting sensitivity automatically at proper position.
• Independent 2 output mode[F-3, F-4, F-5]: When it is required to detect pressure from two positions with one product.
• Window comparison output mode[F-6] : When it is required to detect pressure in a certain area.

◎**Response time change (chattering prevention)**
It can prevent chattering of control output by changing response time. It is able to set 4 kinds of response time (2.5, 5, 100, 500ms) and if the response time is getting longer, the sensing will be more stable by increasing the number of digital filter.

◎**Analog output scale setting**
It is not fixed the analog output(1-5VDC) scale as the rated pressure range but this is a function to change properly for user's application. When the position [A-1] for 1VDC output and the position [A-5] for 5VDC output are set, the pressure range of A-1 to A-5 is to 1-5VDC analog output.

◎**Key lock**
This unit has 2 kinds of key lock function in order to prevent wrong operation.
• LoC : All keys are locked, it is impossible to change any parameter setting/preset, zero point adjustment, peak hold and bottom hold. (enables to change PEY mode only)
• PAL : It is impossible to change parameter setting/preset, zero point adjustment. (Enables to check peak hold and bottom hold, and to change PEY mode)
• UnL : All of the setting is available, all keys are unlocked.

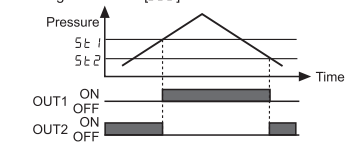
◎**Zero point adjustment**
This function is to set the display value of pressure at zero when port is opened to atmospheric pressure. Zero point adjustment affects analog output voltage.

◎**Peak hold and bottom hold function**
This function is to diagnosis malfunction of the system caused by parasitic pressure or to check through memorizing the max./min. pressure that occurred in the system.

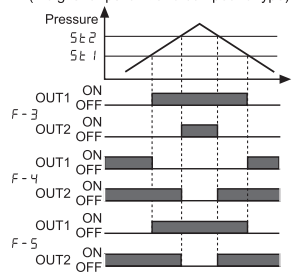
■ Output operation mode

※PSA/PSB Series has 6 kinds of output operation mode, please use proper output operation mode in accordance with sensing.

• **Hysteresis mode[F-1]**
It can be set for pressure sensing level [St1] and sensing differences [St2].

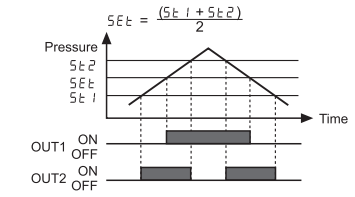


• **Independent 2 output mode[F-3, F-4, F-5]**
①St1 and St2 can be set independently within display pressure range. One is for control, the other is for alarm or optional control.
②The sensing hysteresis is fixed in 1digit.
(2 digits for psi unit and compound type)

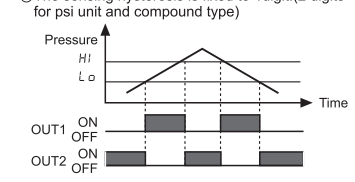


• **Automatic sensitivity setting mode[F-2]**
①This function is to set pressure sensing level to the proper position automatically. It is set by received pressure from two positions[St1, St2].
②The sensing hysteresis is fixed in 1digit.
(2 digits for psi unit and compound type)
③The pressure sensing level [SEt] is shown in the following calculation.

$$SEt = \frac{(St1 + St2)}{2}$$



• **Window comparison output mode[F-6]**
①It is able to set High-limit value[HI], Low limit value [Lo] of pressure sensing level in this mode.
②The sensing hysteresis is fixed to 1digit.(2 digits for psi unit and compound type)

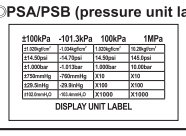


■ Error

Error display	Description	Countermeasures
Er1	If external pressure applied, when adjusting Zero point	Please try again after external pressure removing
Er2	When overloaded on control output	Remove overload
Er3	When the setting condition is not matched at automatic sensitivity setting mode	Set proper setting value after checking setting condition
HHH	When the applied pressure exceeds the upper display pressure range up	Apply pressure within display pressure range
LLL	When the applied pressure exceeds the lower display pressure range down	

■ Accessory

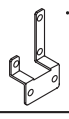
◎**PSA/PSB (pressure unit label)**



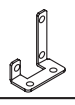
◎**Only for PSA Series**

• Port plug

• Bracket A



• Bracket B



■ Setting

RUN mode

Press [M] key over 3sec. → Parameter setting: Display unit setting → Output operation mode setting → Response time setting → Analog output scale setting (1VDC) → Analog output scale setting (5VDC) → Key lock setting

Press [M] key → Preset value setting: Sensing level 1 setting (St1, Lo) → Sensing level 2 setting (St2, HI)

Press [▲] key over 3sec. → Peak hold: Peak hold → Bottom hold

Press [▼]+[▲] key over 1sec. → Zero point adjustment: Zero point adjustment

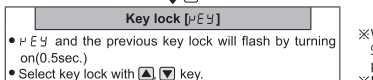
◎**Zero point adjustment**
1. In state of atmospheric pressure during RUN mode, press [▼] key and [▲] key at the same time for over 1sec.
2. When the zero point adjustment is completed, it will display 00 and return to RUN mode automatically.

※If executing zero point adjustment when external pressure has been applied, Er1 will be flashing. Please execute zero point again in state of atmospheric pressure.
※Please execute zero point adjustment regularly.

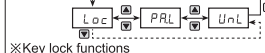
◎**Parameter setting**
1. Set to pressure display unit, output operation mode, response time(chattering prevention), analog output scales or key lock.
2. Please set parameter after unlocking key lock function when key lock function is set.
   (please see below key lock setting)

RUN mode
↓ Press [M] key over 3 sec.

Display unit [Unt]
• Unt and previously set unit will flash in turn every 0.5 sec.
• Press [▲] or [▼] key to select the unit.
※Negative pressure, compound pressure:

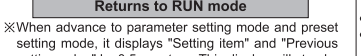


※Standard pressure



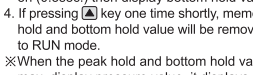
(Press [M] key momentarily, the unit will be saved, then move to the next mode.)
※For using mmH₂O unit, multiply display value by 100.
↓ [M]

Output operation mode [oUt]
• oUt and previous output operation mode will flash by turning on.(0.5sec.)
• Select the output operation mode with [▲], [▼] key.



(Press [M]key momentarily, the response time will be saved, then move to the next mode.)
↓ [M]

Response time [SPd]
• SPd and the previous response time will flash by turning on.(0.5sec.)
• Select the response time with [▲], [▼] key.



(Press [M] key momentarily, the response time will be saved, then move to the next mode.)
↓ [M]

Analog output scale (1VDC) [A-1]
• A-1 and the previous pressure will flash by turning on.(0.5sec.)
• Set the pressure which will output 1VDC with [▲], [▼] key.
• Set range : Min. value of rated pressure ≤ [A-1] ≤ 90% of rated pressure

(Press [M] key momentarily, the selected pressure is set as 1VDC scales, then move to the next mode.)
↓ [M]

Analog output scale (5VDC) [A-5]
• A-5 and the previous pressure will flash by turning on.(0.5sec.)
• Set the pressure which will output 5VDC by [▲], [▼] key.
• Set range: [A-1]+10% of rated pressure ≤ [A-5]≤Max. value of rated pressure

(Press [M] key momentarily, the selected pressure is set as 5VDC scales, then move to the next mode.)
↓ [M]

Key lock [PEY]
• PEY and the previous key lock will flash by turning on(0.5sec.)
• Select key lock with [▲], [▼] key.

※Key lock functions
• Loc : Disable to change preset value and parameter value (Enable to change PEY mode only)
• PAL : Disable to change parameter setting/preset, zero point adjustment. (Enables to check peak hold and bottom hold, and to change PEY mode)
• UnL : Enable to change preset value and parameter value(Lock off)

↓ Press [M] key over 3 sec.

Returns to RUN mode

※When advance to parameter setting mode and preset setting mode, it displays "Setting item" and "Previous setting value" by 0.5 sec. turn. This display will stop by pressing [▼] or [▲] key(Display setting value), if any key is untouched for over 1 sec., it will display old value by 0.5sec. turn again.
※When [M] key is pressed for 3sec. during setting, it will return to RUN mode with memorizing on EEPROM. However, when there is any key is untouched for 60sec., it turns to RUN mode with keeping the previous setting value not current setting value.
※There is memory protection by EEPROM, but life cycle of EEPROM is 100,000 times.

◎**Peak hold and bottom hold check**
1. Press [▲] key for over 3sec. in RUN mode.
2. PEH and memorized max. pressure(Negative pressure type is for max. negative pressure) will flash by turning on (0.5sec.) then display peak hold value.
3. boH and memorized min. pressure(Negative pressure type is for min. negative pressure) will flash by turning on (0.5sec.) then display bottom hold value.
4. If pressing [▲] key one time shortly, memorized peak hold and bottom hold value will be removed then return to RUN mode.

※When the peak hold and bottom hold value is over the max. display pressure value, it displays HHH. On the opposite, it displays LLL. Please remove peak hold and bottom hold value by using [▲] key.

◎**Preset value setting**
1. Set the pressure sensing level.
2. Set preset value after unlocking key lock when key lock function is set.
   (please refer to the key lock setting)
3. Be sure that the setting method is different by each output operation mode.

■ **When hysteresis mode [F-1] and independent 2 output mode [F-3, F-4, F-5]**

RUN mode
↓ [M]

Pressure sensing level 1
• St1 and previous set sensing level 1 flash in 0.5sec. by turns.
• Set the pressure sensing level 1 by [▲] or [▼] key.
• Set range: Min. display pressure < St1 ≤ Max. display pressure

(Press [M] key momentarily, sensing level 1 will be saved, then move to the next mode.)
↓ [M]

Pressure sensing level 2
• St2 and previous set sensing level 2 flash in 0.5sec. by turns.
• Set the pressure sensing level 2 by [▲] or [▼] key.
• Set range: Hysteresis mode → Min. display pressure ≤ St2 < St1
  Independent 2 output mode → Min. display pressure < St2 ≤ Max. display pressure

(Press [M] key momentarily, sensing level 2 will be saved, then move to the next mode.)
↓ [M]

Returns to RUN mode

■ **Automatic sensitivity setting mode [F-2]**

RUN mode
↓ [M]

Pressure sensing level 1
• St1 and previous set sensing level 1 flash in 0.5sec. by turns.
• Apply the required pressure[St1] within the rated pressure.
• Press [▲] key shortly one time, current sensing pressure is set as sensing level 1. St1 and the set sensing level1 flash by turn (0.5sec.).
• Set range: Min. display pressure < St1 ≤ Max. display pressure-1%of rated pressure

↓ [M]

Pressure sensing level 2
• St2 and previous set sensing level 2 flash in 0.5sec. by turns.
• Apply the required pressure[St2] within the rated pressure.
• Press [▲] key shortly one time, current sensing pressure is set as sensing level 2. St2 and the set sensing level1 flash by turn (0.5sec.).
• Set range:St1 +1% of rated pressure ≤ St2 ≤Max. display pressure

※If differences of between St1 and sensing level are not enough, Er3 flashes 3 times then retruns to St2 setting. Please re-execute the setting for the condition.
※It is possible to set repeatedly by [▲] key, the last setting is set as the sensing level 2.

↓ [M]

Automatic sensitivity and fine adjustment
• St2 and sensing level [SEt] flash in 0.5sec. by turns.
$SEt = \frac{(St1 + St2)}{2}$
• Adjust sensing level [SEt] by [▲], [▼] key, when fine adjustment of the sensing level [SEt] is required. (adjustment range: between St1 and St2)

↓ [M]

Returns to RUN mode

※When checking the value of sensing level 1, 2 [St1, St2] and automatic sensitivity setting value[SEt], press [M] key shortly and continuously.
※Example of the setting in automatic sensitivity setting mode (to check absorption of component by vacuum pressure): The state of removed target is St1 and the state of absorbing target is St2. By [▲] key, sensing level [SEt] value is set in the between St1 and St2 automatically.

■ **Window comparison output mode [F-6]**

RUN mode
↓ [M]

Pressure sensing level 1
• Lo and previous set sensing level 1 flash in 0.5sec. by turns.
• Set the pressure sensing level 1 by [▲] or [▼] key.
• Set range: Min. display pressure ≤ Lo < Max. display pressure

(Press [M] key momentarily, sensing level 1 will be saved, then move to the next mode.)
↓ [M]

Pressure detecting level 2
• HI and previous set sensing level 1 flash in 0.5sec. by turns.
• Set the pressure sensing level 2 by [▲] or [▼] key.
• Set range: Lo < HI ≤ Max. display pressure

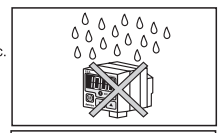
(Press [M] key momentarily, sensing level 1 will be saved, then move to the next mode.)
↓ [M]

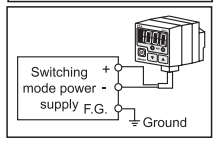
Returns to RUN mode

※If no key is touched for 60sec., it will return to RUN mode. [Automatic sensitivity setting mode [F-2] is exception)
※When changing the display unit, preset value will be calculated according to the display unit.
※Whenever key touched one time, it is increased(decreased) as 1 digit(2 digits for psi unit and compound pressure) but it will be continuously increasing(decreasing) by pressing [▲] ([▼]) key constantly.

■ Caution for using

1. Do not insert any sharp or pointed object into pressure port.
   It could not operate normally due to mechanical trouble.
2. Be sure that this unit must avoid direct touch with water, oil, thinner etc.
3. Be sure to avoid transient time(within 3sec.) after initial power on.
4. When a switching moving regulator is used for power supply, frame ground (F.G.) terminal of its switching mode power supply part must be grounded.
5. Avoid wiring with power line or high voltage line.
   It may cause malfunction by noise.
6. When moving this unit from cold place to warm place, please remove the humidity on the cover then use it.
7. Do not press the setting button with sharp or pointed object.
8. Do not apply over 30N tensile strength on connection part or load.
9. When using mmH₂O unit, multiply display value by 100.
10. Installation environment
    ① It shall be used indoor ② Altitude Max. 2,000m
    ③ Pollution Degree 2 ④ Installation Category III





※It may cause malfunction if above instructions are not followed.

■ Main products

■ Photoelectric sensors ■ Temperature controllers
■ Fiber optic sensors ■ Temperature/Humidity transducers
■ Door sensors ■ SSR/Power controllers
■ Door side sensors ■ Counters
■ Area sensors ■ Timers
■ Proximity sensors ■ Panel meters
■ Pressure sensors ■ Tachometer/Pulse(Rate)meters
■ Rotary encoders ■ Display units
■ Connector/Sockets ■ Sensor controllers
■ Switching mode power supplies
■ Control switches/Lamps/Buzzers
■ I/O Terminal Blocks & Cables
■ Stepper motors/drivers/motion controllers
■ Graphic/Logic panels
■ Field network devices
■ Laser marking system(Fiber, CO_2, Nd:YAG)
■ Laser welding/soldering system

Autonics Corporation
http://www.autonics.com
Satisfiable Partner For Factory Automation

■ **HEAD QUARTERS:**
18, Bansong-ro 513beon-gil, Haeundae-gu, Busan, Korea
■ **OVERSEAS SALES:**
#402-404, Bucheon Techno Park, 655, Pyeongcheon-ro, Wonmi-gu, Bucheon, Gyeonggi-do, Korea
TEL: 82-32-610-2730 / FAX: 82-32-329-0728
■ **E-mail:** sales@autonics.com

EP-KE-77-0001N