



READ THE INSTRUCTION MANUAL BEFORE USING

INSTRUCTION MANUAL

MANOSTAR DIGITAL SENSOR

EMD8A□□7

No. TR-EMD8A□□7-E00

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Manostar



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INTRODUCTION

Thank you very much for purchasing of 「MANOSTAR DIGITAL SENSOR EMD8A」.

Features

- **Compact size**

This instrument is a compact digital micro differential pressure gage composed of the diaphragm type detection part and the alarming function part incorporated in 24 × 48 size.

- **Employing an easy-to-see large seven segments LED**

Red-colored seven segment LED, 12 mm high character of high visibility, is used for 3·1/2 digits.

- **Comparison output provided for two channels**

Function of giving alarm as output when unusually increased pressure is sensed. Moreover, many kinds of operation modes can be set by selecting the alarming function. When ordering, the alarming output can select NPN or PNP open collector.

- **Analog output provided**

Function giving pressure value as analog output.

- **Digitally-processed zero adjustment and comparator for alarm outputs**

Built-in micro-computer digitizes and processes calibration for zero adjustment as well as comparator for alarm outputs.

- **Simple operability**

This machine, designed for dedicated to pressure measurement, has simple operation set menu.

- **Low power consumption**

The electric power consumption is reduced by lowering the display luminance of LED.

- **Setting value protecting function**

It prevents a setting value to mistake by incorrect operation.

- **Test mode function**

The confirmation of the comparison power output and the analog output when setting up and checking actually becomes possible by setting simulative pressure as for the state that pressure is not applied.

- **Max. and min. value memory function**


Max and min. value of the measurement pressure are retained and it displays it. It is used for the reference value etc. in the comparison output set point etc. when operating it.

- **Function of sign reversal of display measured**

- **Function of analog output reversal**

- **Conformed to EU directive**

- **UL recognized component**

 Caution	<p>To ensure your safety in using this instrument:</p> <ul style="list-style-type: none">• Be sure to read the instruction manual carefully before using this instrument so that you can use it properly. <p>Wrong use may result in failure of this instrument and lead to its damage and accident. This manual should be kept in a proper place so that you can refer to it any time you need.</p>
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I . PRECAUTIONS

Warning

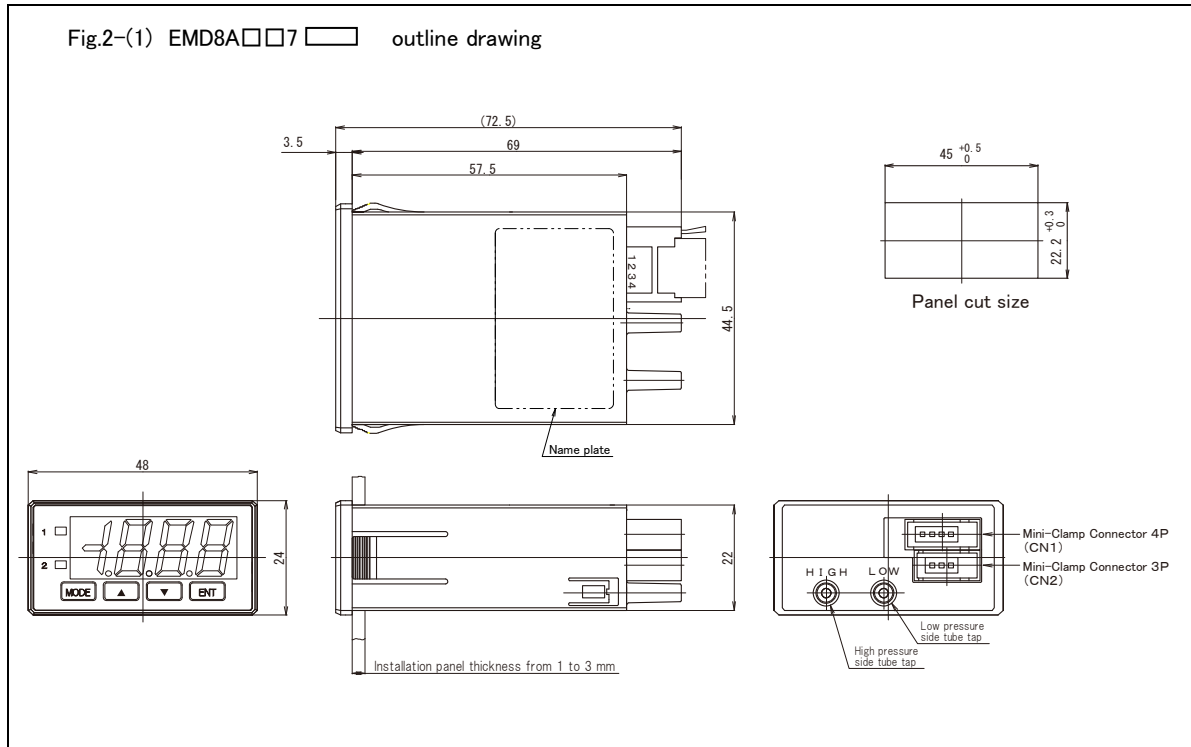
- **Do not use the instrument where flammable gas is present.**
The instrument is not explosion-proof. Do not use instruments in the circumstance where flammable gas is present. It may cause explosion.
- **Do not use the instrument at the place where corrosive gas is present.**
The instrument is not corrosion resistance construction. Measuring corrosive gas may corrode the receiving element and housing material of the instrument. It is expected that corrosive gas leaked out of the instrument will harm a person.
- **Do not apply the pressure to the instrument more than it can withstand.**
The diaphragm and the retainer are broken and cause of injury or accident, etc. disaster if the pressure exceeding withstanding pressure of the pressure receiving element is applied to the instrument. The case body and the transparent cover of the instrument are broken and cause of injury or accident, etc. disaster if the pressure exceeding withstanding pressure of the instrument body is applied to the instrument.
- **The instrument is measurable for air and non-corrosive gas only.**
The machine is exclusive use of dry air (85%RH or less). Using measuring the water or oil it may be damaged and causes the accident.
- **Avoid using where instrument is exposed to many vibration and impact.**
Using this instrument where intensified vibration and impact may be damaged instrument. It is expected that gas leaks of instrument which harms a parson.
- **Do not exceed rated voltage in using.**
Using this instrument by exceeding rated voltage may cause fire or electric shock.
- **Wire correctly.**
Incorrect wiring may cause fire.
- **Do not exceed rated surrounding temperature, humidity and altitude in use.**
Using this instrument by exceeding rated surrounding temperature and humidity and altitude it may be damaged and cause the accident.
- **Do not disassemble or reconstruct your instrument.**
It may void your warranty.

Caution

- **When pressing a push button, use your fingers.**
Using hard or sharp pointed object to press the push button will cause scratches on the surface, its damage or failure of this instrument.
- **As to where to install and how to install the instrument, be sure to follow the instruction manual provided so as to ensure a proper method.**
- **Use the instrument indoors.**
- **In case of not being installed in dry and well-kept clean locations, the instrument must be enclosed in box.**
- **If the instrument installed in strong electromagnetic field, it may cause the drift of accuracy display to be max. 4%FS.**
Keep away from the devices which generate strong electromagnetic field.
- **The power of this equipment shall be supplied with 12 to 24V.d.c. from a NEC Class 2 or Limited Power Source (LPS) power supply.**
- **Do not use organic solvent for cleaning.**
Use of organic solvent, such as thinner and benzene, to remove surface dirt and stain may cause melting and cracking on the surface. To remove dirt and stain, be sure to wipe them off with a wet cloth using diluted neutral cleanser.
- **Dropping the product.**
Product is a precision instrument. If you drop the product, there is a possibility that the exterior, also the interior mechanism damage.
- **Removal of the piping**
If you replace the old pipes, please do not pull the pipe with a strong force. There is a possibility that the pipe cap is broken.

II . SPECIFICATIONS

1. Outline drawing



2. Function

2-1 Display function

1) Pressure display

A pressure sensor of this instrument is designed to measure differential pressure. When pressure on H side is higher than L side, the pressure display indicates a positive value. After the moving average is processed by zero auto corrections after the signal from the sensor is converted in A/D and digitalizes, the pressure display is displayed in seven segments LED.

2) Zero correction

Zero points of the this instrument are adjusted in zero adjustment set mode with pressure not impressed.

3) Moving average filter

The number of the moving average is set in the display filter setting mode. When the change of the measurement pressure is large, the change of the display value can be reduced by enlarging the average number of the moving average function. The response is late according to large a set value of the filter mode. The comparison operation can be set to operate quickly though gradually displays because the moving average filter of this instrument can be individually set for the display and for the output. When the instrument is shipped from our factory, is set to standard "1.0 sec.".

Display filter mode		Average processing (Response time)
Display value	F0.2	High speed (0.2 sec.)
	F1.0	Standard speed (1.0 sec.)
	F2.0	Low speed 1 (2.0 sec.)
	F4.0	Low speed 2 (4.0 sec.)

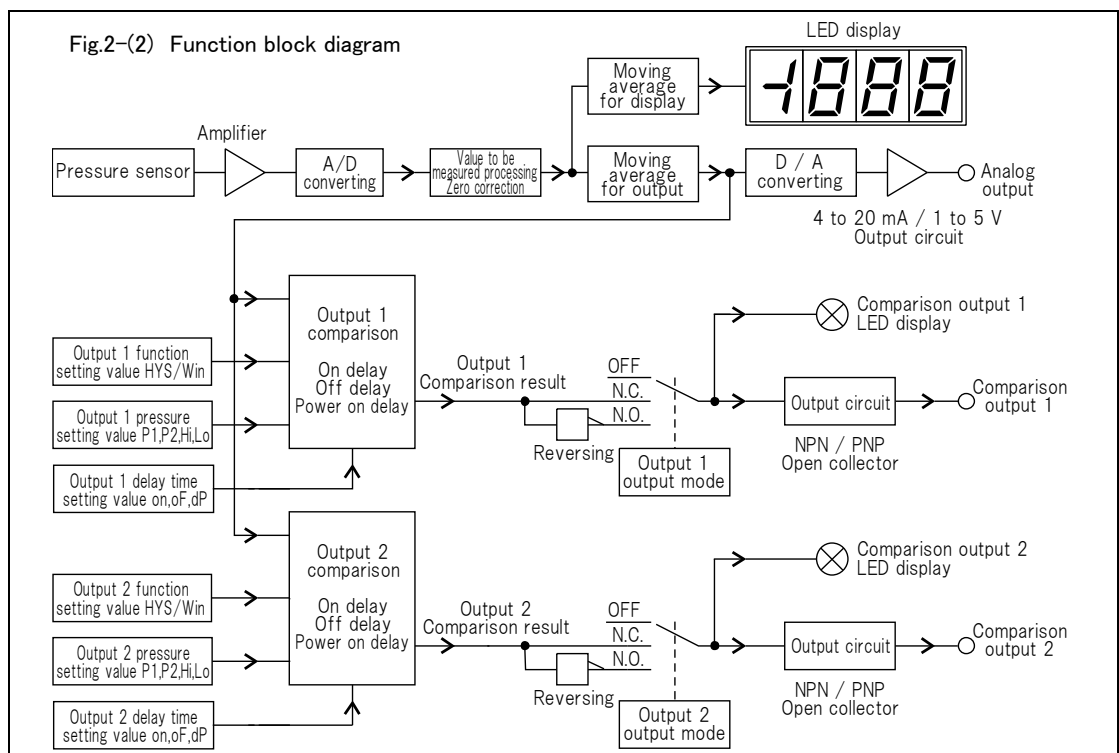
4) Overrange warning

The display pressure "FFF" and informs of the over range when pressure which exceeds the ratings pressure joins in this instrument. The display pressure "-FFF" when the difference pressure is negative.

• Over range pressure

Mono (single) pressure range : 110% or more and -10% or less of the ratings pressure.

Zero center (+-) pressure range : 60% or more and -60% or less of the ratings pressure.



2-2 Max. and min. value memory function

Each value is displayed and the max. value and the min. value of the pressure measurement value can be reset in the max. value memory display mode or the min. value display mode. The min. value memory and the max. value memory have been always updated immediately after the power supply turning on of this machine. However, the min value memory synchronizes with the delay timer, and when the time set with the delay timer immediately after turning on of the power supply passes, is reset automatically. When two system power on delay setting is different, the min. value memory are reset in one with long set time.

Introduces the application example. After regulated pressure reaches, the min value memory is reset when the time of the delay timer is set at time when reaches regulated pressure. Because min value after regulated pressure reaches can be memorized thus even when pressure is low when the power supply of this instrument is turned on, the time frequently reset can be saved.

As for min. value and the max. value memory, the value must not be maintained when you intercept the power supply of this instrument. Moreover, the delay timer prohibits the lower alarm output and decide time in balance with the alarm operation, please.

2-3 Function of comparison output

The comparison output possesses quite the same function that operates independently by two systems. The name in each system is "1" and "2". Each system has one-transistor power output LED one for the power output monitor. Each system can set the parameter of the operation mode etc. by independent operation. The parameter is shown as follows.

- (1) Comparison pressure setting point (At the hysteresis mode: P1•P2. At the window mode : Hi•Lo).
- (2) Comparison mode (hysteresis mode and window mode)
- (3) Output mode (OFF , N.O. , N.C.)
- (4) Output-on delay time
- (5) Output-off delay time
- (6) Power supply-on delay time

The operation of the comparison function can switch the function by setting the comparison mode. Moreover, it can set OPEN or CLOSE when the relation condition is approved by the comparison output mode. In addition, it can set the delay time of ON and OFF of the output. It is possible to set in an individual each system and set these according to the usage, please. Please refer to Fig.2- (3)~2- (6) for the operation at each combination of the comparison mode and the output mode. Moreover, please refer to Fig.2- (7) for the operation of the delay time.

1) Setting of comparison mode

The basic action of the comparison function is set in the comparison setting mode. When the instrument is shipped from our factory, it is set to the hysteresis mode.

Comparison function mode		Comparison operation	Operation explanation
Display value	HYS	Hysteresis	It operates by comparison pressure set point P1 and P2. This mode is set when using it as an upper bound and a low alarm.
	Win	Window	It operates by comparison pressure set point Hi and Lo. It operates as a window comparator of the pressure region that set point Hi and Lo show.

2) Comparison pressure setting point (at the hysteresis mode : P1,P2)

P1 operates as a comparison set point, and P2 operates as a hysteresis set point.

It becomes high alarm operation whose normal region is P1 or less at P1>P2. Refer to Fig.2- (3)

It becomes low alarm operation whose normal region is P1 or more at P1<P2. Refer to Fig.2- (4)

3) Comparison pressure setting point (at the window mode : Hi,Lo)

It becomes comparison operation for the region (window) that set point Hi and Lo show. The hysteresis at each set point operates by 1%FS fixation.

It becomes comparison operation in the normal region where Lo becomes a lower bound point by the Hi upper bound point at Hi>Lo. The hysteresis point becomes 1%FS in the region. Refer to Fig.2- (5)

It becomes the comparison operation of the malfunction region where Hi becomes a lower bound point by the Lo upper bound point at Hi<Lo. The outside in the region becomes a normal region. The hysteresis point becomes 1%FS outside of the region. Refer to Fig.2- (6)

4) Setting of comparison output mode

Each output mode is set by the comparison output mode setting mode. The output mode can set the mode of which it turns off always the output and the output state assumed turning on or turning off when it is normal.

comparison output mode		Open collector output circuit
Display value	oFF	Always Opening(circuit OFF)
	nC	Close when it is normal (Normal Close)
	no	Open when it is normal (Normal Open)

5) Setting of comparison output on/off delay

Each system of the comparison output can independently set on and off delay time. The delay time of on of the transistor of the output (CLOSE) and off (OPEN) is set regardless of setting (N.C.,N.O.) of the comparison output mode.

The on delay function delays timing that the set output transistor at time is changed from the state of off (OPEN) into the state of on (CLOSE).

The off delay function delays timing that the set output transistor at time is changed from the state of on (CLOSE) into the state of off (OPEN).

Please adjust the setting to 「d0.0」 (0.0 seconds) when the function is unnecessary. Refer to Fig.2- (7).

6) Setting of power on/off delay

The delay timer that works more immediately after the power supply turning on of the instrument compulsorily turns off the comparison output transistor until set time passes. Refer to Fig.2- (7).

Prohibiting the abnormal output when it doesn't reach regulated pressure when the power supply is turned on by using this function becomes possible.

Please adjust a set value of the delay timer to 「d00」(0 minutes) when usually operating is necessary immediately after turning on of the power supply.

7) Output filter setting

This instrument is processing the moving average to the measurement pressure. The calculation frequency of the moving average processing used for a warning output and an analog output is set in the output filter setting mode. The response is late according to large the figure of the filter mode. This filter setting value is shared with alarm output and analog output.

When the instrument is shipped from our factory, is set to standard "1.0 sec.".

Output filter mode		Average processing (response time)
Display value	F0.2	High speed (0.2 sec.)
	F1.0	Standard speed (1.0 sec.)
	F2.0	Low speed 1 (2.0 sec.)
	F4.0	Low speed 2 (4.0 sec.)

2-4 Function of analog output

1) Analog output

The digitalized pressure measurement value is output as an analog value. As for this value, zero corrections and the moving average filter processing are done at the stage of a digital value. The change of an analog output can be reduced by slowing down the setting of the filter for the output when there is large change of the measurement pressure.

2) Function of analog output reversal

The value of the analog output rises when the measured differential pressure rises usually. However, opposite operation is done by turning on the analog output reversal function.

Function of analog output reversal AnA		Analog output
Display value	oFF	Usually (differential pressure rises 4 → 20mA or 1 → 5V)
	on	Reversal (differential pressure rises 20 → 4mA or 5 → 1V)

2-5 Function of display low cut

It is a mode that compulsorily sets the indicated value to 0 when the measurement pressure indicated value is about 0. When setting value is 「CT2」 (2%FS), the value of less than $\pm 2\%FS$ becomes 0 displays. Please set CT0 (0%FS) when you do not use the function. Comparison outputs 1 and 2 are influenced by this setting. The analog output is not influenced.

2-6 Function of sign reversal of display measured

The sign of the display of the pressure display mode and the max. and the min. value display mode is inverted. The influence of this function is not received about the comparison function, the analog output function, and other functions. This function is used to invert the sign when negative pressure is measured. Please refer to p.13「4-1 Measured pressure and connection of piping」 for the usage of this function.

2-7 Function of low power consumption

The electric power consumption is reduced by lowering the display luminance of LED. It is not influenced about other functions at all. The display luminance only at the pressure display mode falls and other program modes etc. become usual luminance's when the function is on.

2-8 Function of test mode

This function tests whether the parameter setting is correctly set when the device is set up and checked. In this mode, simulative pressure can operate the device without applying actual pressure. When the simulative pressure is changed and the operation of the comparison function and the analog output is confirmed, this function is used. The simulative-pressure-value is automatically set to present-pressure-value at the time of shifting to test-mode. A simulative setting pressure is not preserved. The display blinks for the test mode recognition when shifting to the test mode. It is recognized that the blinking display is not a pressure display mode. The pressure display mode by the passage of 15 seconds in the no operation time doesn't return in this mode automatically.

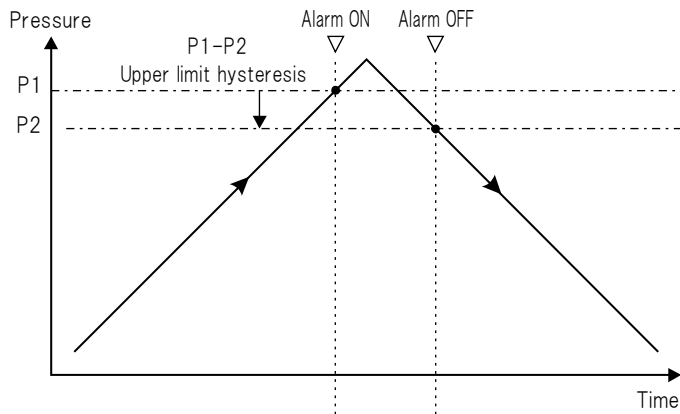
2-9 Function to clear set value

When a set value of each mode is shipped in the factory in the mode by which a set value is cleared, it is possible to return. However, please note that the set value set to clear once on the user side is deleted.

2-10 Function of set value protecting

It becomes impossible to change set value by each program mode when set value protecting is set. It prevents a set mistake by the miss operation etc. etc. Please release protecting only when the setting change is necessary.

Fig.2-(3) Comparison function Hysteresis mode : Upper limit setting ($P1 > P2$)



Operation explanation

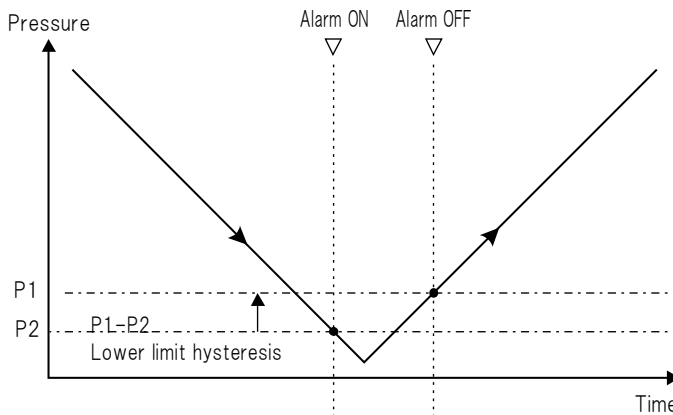
On detecting the abnormal pressure rise, the comparison output is operated. In the state to setting output mode to 「N.C.」, when pressure exceeds the setting value $P1$, output becomes Open (OFF). When it falls below $P2$, output becomes Close (ON).

Power supply on delay timer

Comparison output compulsorily becomes Open (OFF) while the timer is working.

Pressure state	Normal	Abnormal	Normal
Comparison output state	Open (OFF) always	Open (OFF)	Close (ON)
Output mode			
OFF	Open (OFF) always	Open (OFF)	Close (ON)
N.C.	Close (ON)	Open (OFF)	Close (ON)
N.O.	Open (OFF)	Close (ON)	Open (OFF)

Fig.2-(4) Comparison function Hysteresis mode : Lower limit setting ($P1 < P2$)



Operation explanation

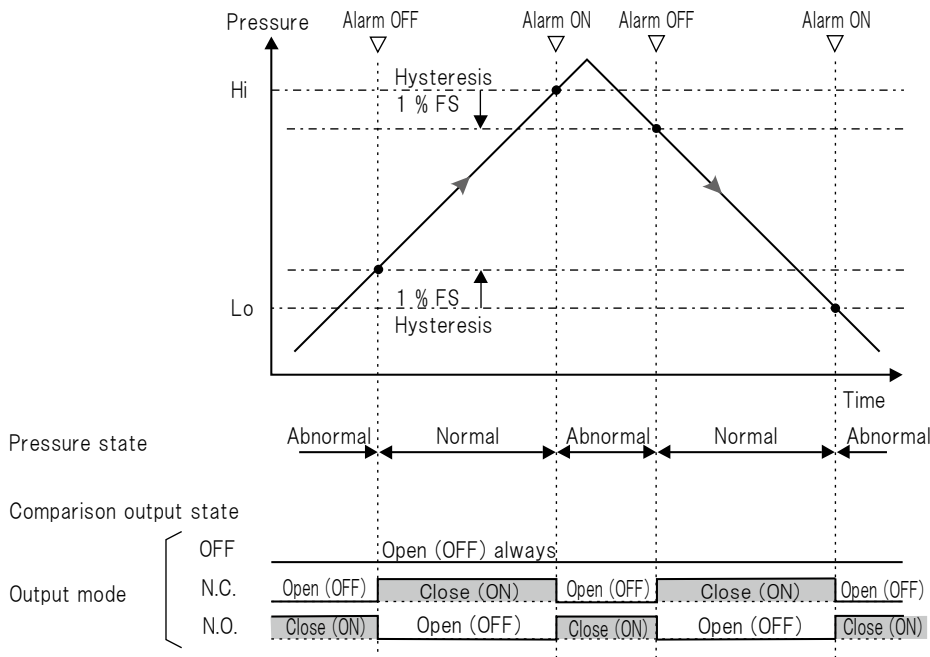
It compares the outside out of pressure area from Hi to Lo (window). In the state to setting output mode to 「N.C.」, when pressure comes off from the area (window), output becomes Close(ON). When it enters within the area, output becomes Open (OFF).

Power supply on delay timer

Comparison output compulsorily becomes Open (OFF) while the timer is working.

Pressure state	Normal	Abnormal	Normal
Comparison output state	Open (OFF) always	Open (OFF)	Close (ON)
Output mode			
OFF	Open (OFF) always	Open (OFF)	Close (ON)
N.C.	Close (ON)	Open (OFF)	Close (ON)
N.O.	Open (OFF)	Close (ON)	Open (OFF)

Fig.2-(5) Comparison function Window mode : Inside area (Hi>Lo)



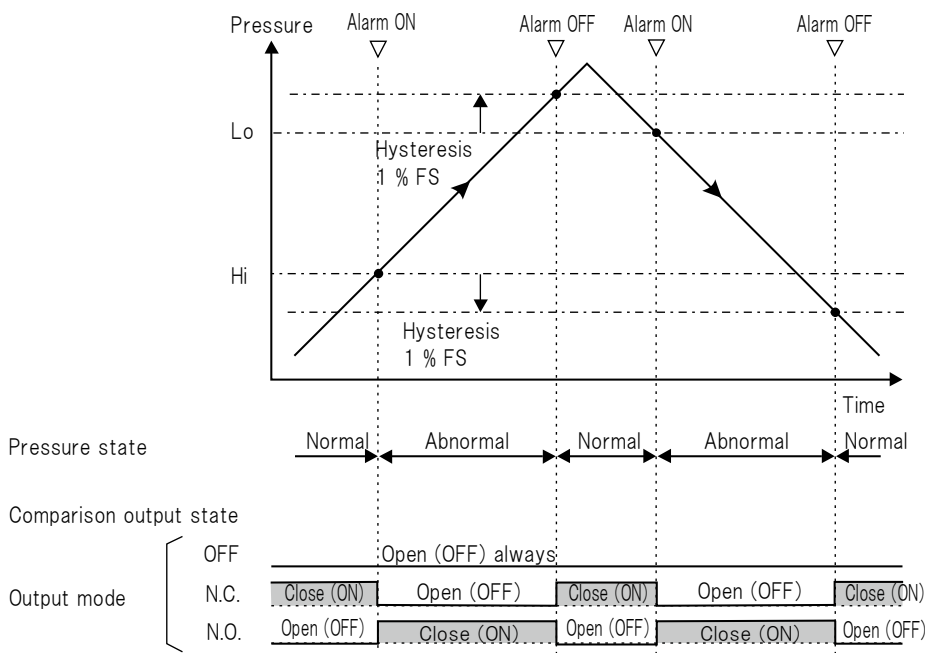
Operation explanation

It compares the setting areas from Lo to Hi (window). In the state to setting output mode to 「N.C.」, when pressure enters while it is an area (window), the output becomes Close(ON). When it comes off from the area, output becomes Open (OFF).

Power supply on delay timer

Comparison output compulsorily becomes Open (OFF) while the timer is working.

Fig.2-(6) Comparison function Window mode : Outside area (Hi<Lo)

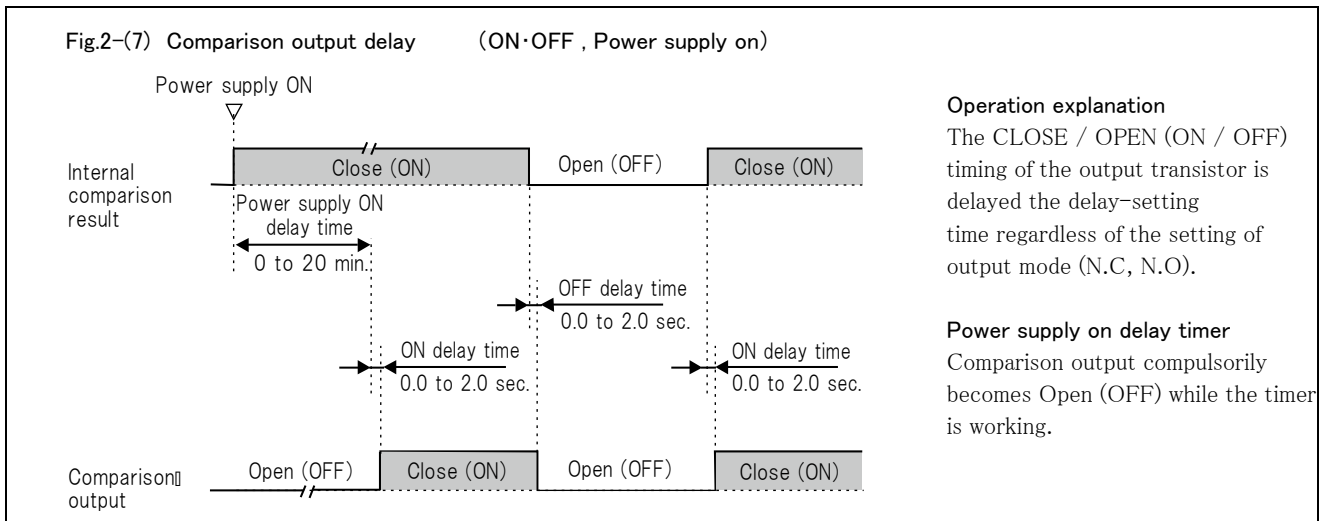


Operation explanation

It compares the outside out of pressure area from Hi to Lo (window). In the state to setting output mode to 「N.C.」, when pressure comes off from the area (window), output becomes Close(ON). When it enters within the area, output becomes Open (OFF).

Power supply on delay timer

Comparison output compulsorily becomes Open (OFF) while the timer is working.



III . INSTALLATION

1. Installation conditions

The following places should be avoided for installation of this unit.

- Don't install where there are intense vibration and impact are applied to this unit.
- Don't install where there is sudden fluctuation of surrounding temperature or place where this unit is exposed to direct sunlight.
- Don't install where high humidity exists, where water or oil splashes over the unit or where there is much dust.
- Don't install where corrosive gas or flammable gas is generated.

2. Installation of instrument (installation position : Vertical only)

Insert EMD8A body into the panel hole and press the flange of EMD8A enough against the panel so that it hits the panel surface.

3. Wiring

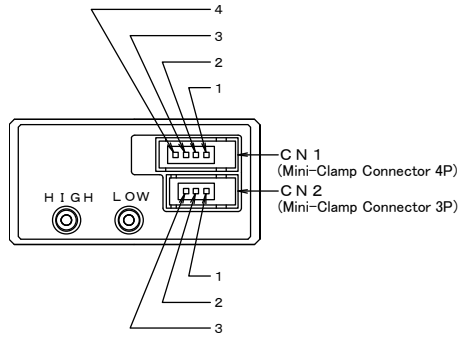
Connectors compliant with e-CON are used. Select a connector for the wiring side after confirming the specifications of the wire to be used (conductor cross-sectional area and finished outer diameter).

Please keep in mind the following matters when you do the wiring.

External connection diagram is shown in Fig.3- (1). The connection example when an external equipment is connected is shown in Fig.3- (2)~3- (3).

 Caution	<ul style="list-style-type: none"> •Do not let rating of each terminal go beyond the specifications. •When wiring, be sure to separate the wiring from the wiring of power supply. •Be sure to use diode and the like to prevent reverse voltage when you connect relays etc. •Do not go beyond the following length of wiring. <ul style="list-style-type: none"> Power supply cable : 30 m max. Signal cable : 30 m max. <p>If wiring goes beyond the limit, it may cause an error depending on the noise environment.</p>
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Fig.3-(1) External connection diagram EMD8A□□7 □ type



- CN1-1 Power supply +(12~24VDC)
- CN1-2 Comparison output 1
- CN1-3 Comparison output 2
- CN1-4 Power supply -(0V)

- CN2-1 NC (unused)
- CN2-2 Analog output +
- CN2-3 Analog output -

Note) Terminal CN1-4 and CN2-3 are internally connected in this unit.

Fig.3-(2) Example of connection EMD8A N□7 □ type (connecting with photocoupler)

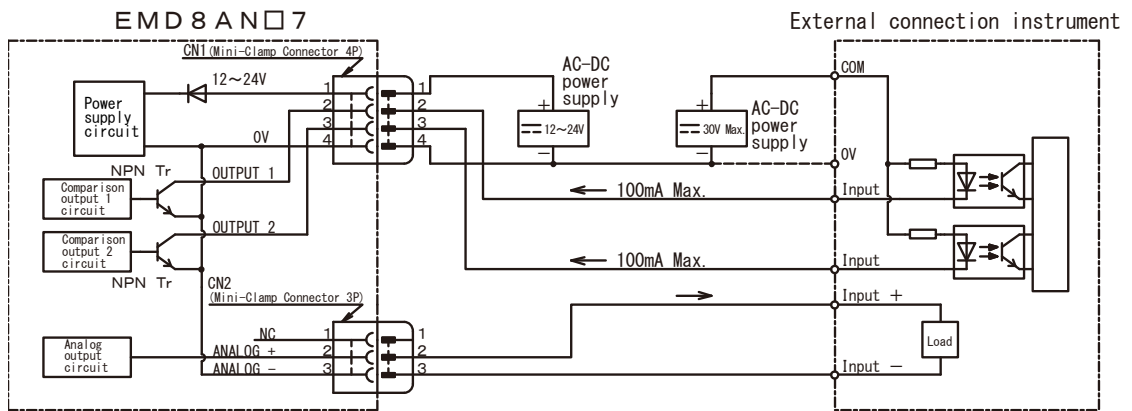
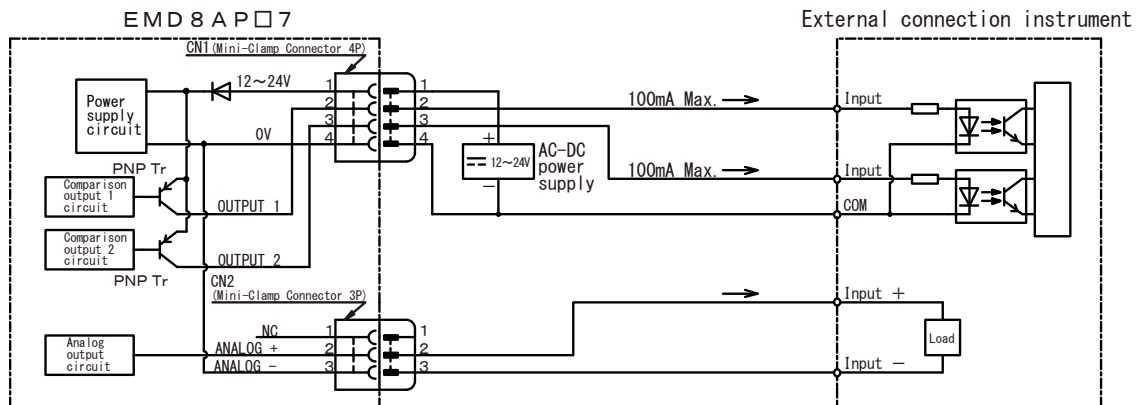


Fig.3-(3) Example of connection EMD8A P□7 □ type (connecting with photocoupler)



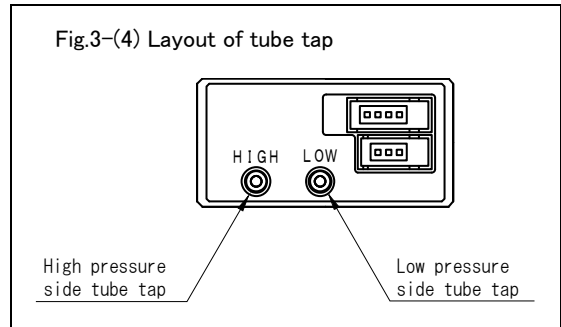
4. Piping

The instrument, a differential pressure gage, is provided with taps at the rear side : one for high pressure (HIGH) and the other for low pressure (LOW).

Depending on the application and use, connect piping as follows.

4-1 Measured pressure and connection of piping

Please connect the piping shown in the table below according to the measured pressure, and set the function of inverting sign of measurement display.



Measurement pressure		Differential pressure	Gage pressure	
Usage		Differential pressure measurement	Positive pressure measurement	Negative pressure measurement
Piping	High pressure side tube tap HIGH	Measurement pressure (high)	Measurement pressure (positive pressure)	Open to atmosphere
	Low pressure side tube tap LOW	Measurement pressure (low)	Open to atmosphere	Measurement pressure (negative pressure)
Function sign reversal of display measured		oFF	oFF	on

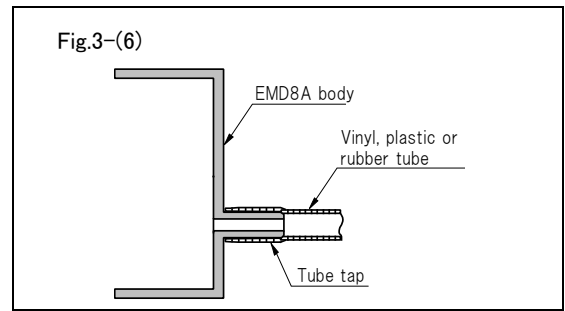
 Caution	<p>For gage pressure measurement with the instrument of zero-center range (+ -), connect piping to high pressure tap in order to match symbol on the display (+, -) and the actual polarity inside the tubing pressure.</p> <p>Please make the function of inverting sign of measurement display off (oFF) for zero-center (+ -) range as long as there is no special reason.</p>
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 Caution	<p>When one side of tap is open to atmospheric air, be sure to provide air vent at the outside of panel, or the port released and open in the panel (box of device etc.), has been exposed to in-panel pressure generated by air flow to cool down inside of panel forcibly by fan, etc.</p>
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Fig.3-(5)

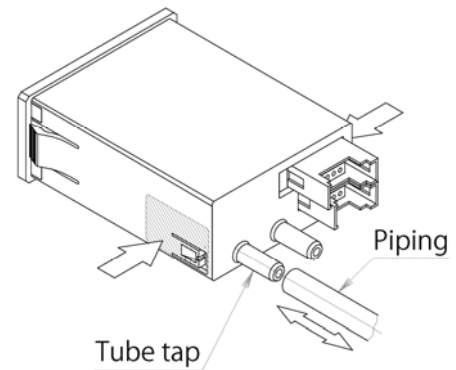
4-2 Piping material

For tubing material used for taps of this unit, be sure to use tubing material of I.D. 4.
 Vinyl or rubber tubes are suitable.
 As shown in Fig.3-(6), when inserting the piping into the tap, be sure to push it in until the piping hit the bottom of tap.



 Caution	<p>When connecting or disconnecting the piping to the tube tap, please be sure to grasp the sides of case (the shaded area in Fig.3-(7)) firmly with your fingers. Do not apply strong force to either the top or bottom surfaces of the case.</p>
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Fig.3-(7)

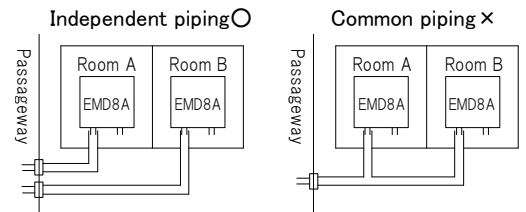


4-3 Caution of piping

Prohibition of common piping

Piping each of pressure detectors and pressure receiving instruments tube exclusively dedicated for it, and do not connect the piping commonly with the adjacent system as shown in Fig.3-(8).
 Common piping causes measurement error because the pressure of each system interferes.

Fig.3-(8)



Errors caused by long distance piping

The speed of response is delayed when the product is used for remote monitoring.
 In such application, the I.D. of the connection tube should be as large as possible.
 If the piping conditions of the high and low pressure side are significantly different, the difference in the piping resistance between high and low pressure side causes the difference in pressure transmission time, and the measurement becomes inaccurate.

Prevention of clogging at tubes caused by drain

- If drain remains within the line, it causes measurement error. Be sure to install the pressure receiving instrument above the pressure outlet port of the pressure detector and arrange the line so that the drain water should not remain in the slack piping.
- If the arrangement mentioned above is not possible, install a drain tank and clean it once in a while.
- After the cleaning of the tank, check that the air tightness is fully kept.

IV. OPERATION

1. Before trial running

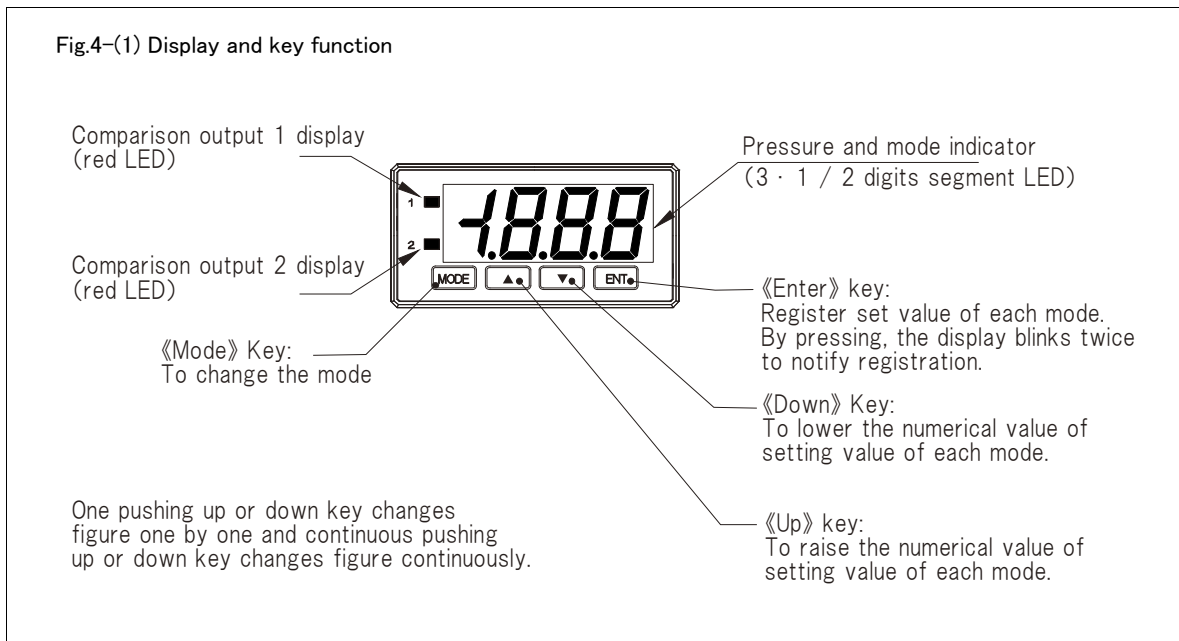
Before supplying power to this unit for the first time after installation, take care of the following matters.

1) Make sure again of the followings and see if they are correct: location of installation, environment and how the instrument is installed, wiring and piping etc.

Supplying power with wrong wiring and piping may lead to instrument failure and accidents.

2) Before supplying power, make sure that equipment having other devices and units together with this instrument will not be affected by alarm circuit even when this instrument causes comparison circuit to work.

2. Operation panel



3. How to operate

3-1 Change-over procedure of mode

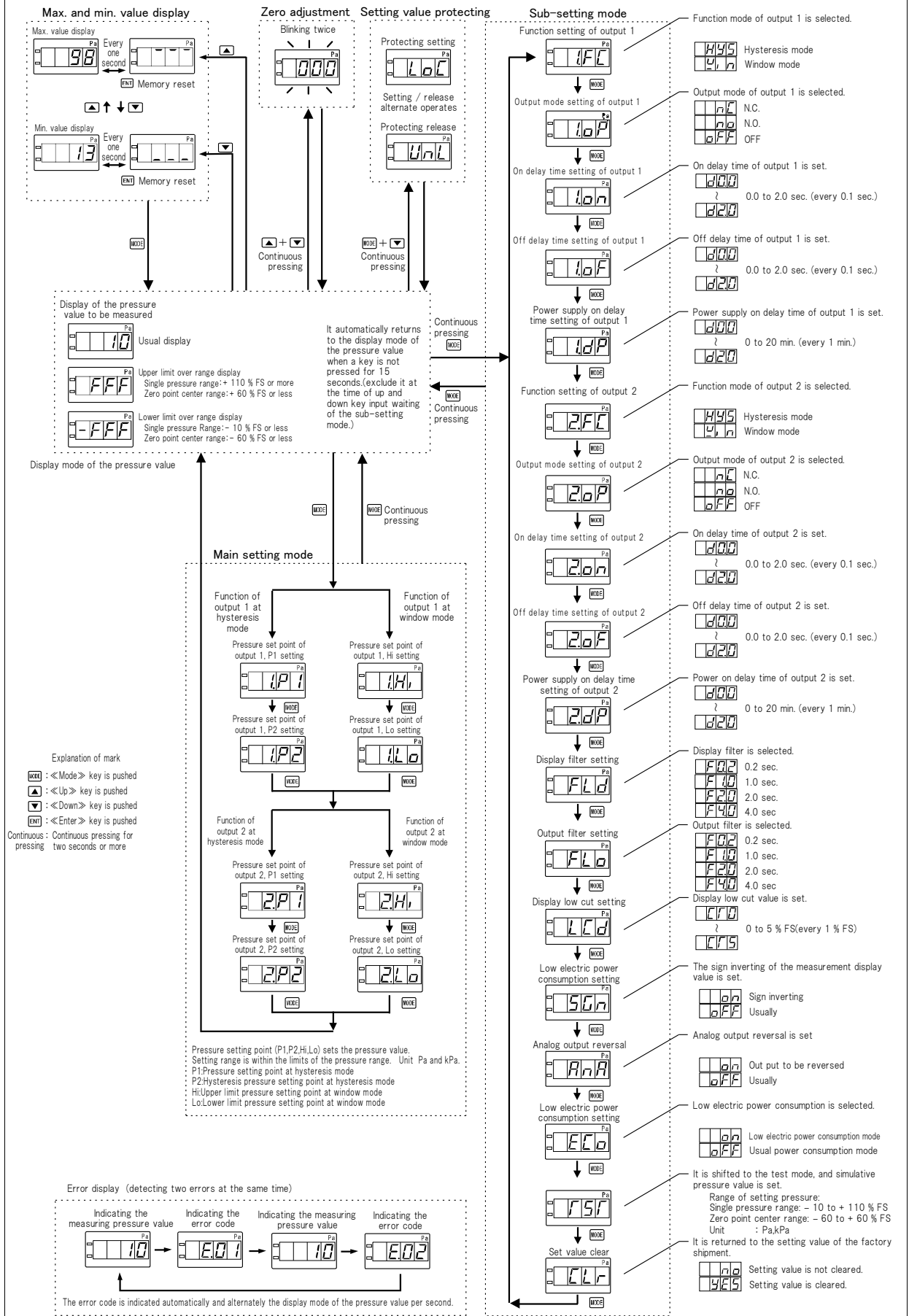
Please switch to each mode one by one by «Mode» key operation as shown in the Fig.4-(2). Moreover, the mode not frequently used is made a group as a sub mode. It is possible to shift by continuously pressing «Mode» key for two seconds or more (thereafter, mark LP) in the sub mode.

It automatically returns to the pressure display mode in modes other than the pressure display mode when there is no key input even if 15 seconds or more pass from the last key input. However, it excludes «Up»«Down» key input waiting state of sub mode.

Even if the power supply is intercepted, a set value of each mode is maintained excluding the max. and the min. value memory, and the test mode.

Please refer to the mode table for the factory default setting.

Fig.4-(2) Change-over of mode (Please refer to p.18 for a basic operation in each mode.)



Mode table







Mode type	Mode name	Mode display	Factory default setting			Setting range	
			Display	Set value	Unit		
Pressure display	Usually	□□10	—	—	Pa/kPa	—	
	Upper limit over range	□FFF	—	—	—	—	
	Lower limit over range	□-FFF	—	—	—	—	
Quick	Zero adjustment	□000	—	No zero corrections	—	—	
	Setting value protecting	—	□UnL	Protecting release	—	UnL/LoC	
	Max. value display	□□□□	—	—	Pa/kPa	—	
	Min. value display	□□□□	—	—	Pa/kPa	—	
Main setting	Comparison output 1	Hysteresis mode set point P1	□1P1	—	Mono:90%FS ±:+40%FS	Pa/kPa	Mono: 0~100%FS ± : -50~+50%FS
		Hysteresis mode set point P2	□1P2	—	Mono:89%FS ±:+39%FS	Pa/kPa	
		Window mode set point Hi	□1Hi	—	Mono:90%FS ±:+40%FS	Pa/kPa	
		Window mode set point Lo	□1Lo	—	Mono:10%FS ±:-40%FS	Pa/kPa	
	Comparison output 2	Hysteresis mode set point P1	□2P1	—	Mono:10%FS ±:-40%FS	Pa/kPa	
		Hysteresis mode set point P2	□2P2	—	Mono:11%FS ±:-39%FS	Pa/kPa	
		Window mode set point Hi	□2Hi	—	Mono:80%FS ±:+30%FS	Pa/kPa	
		Window mode set point Lo	□2Lo	—	Mono:20%FS ±:-30%-FS	Pa/kPa	
Sub setting	Comparison output 1	Comparison function mode	□1FC	□HYS	Hysteresis mode	—	HYS/Win
		Output mode	□1oP	□nL	N.C.	—	OFF/N.C./N.O.
		On delay time	□1oN	□d00	0.0 seconds	seconds	0.0~2.0 seconds (every 0.1 seconds)
		Off delay time	□1oF	□d00	0.0 seconds	seconds	
		Power supply on delay time	□1dP	□d00	0 minutes	minutes	0~20 minutes (every 1 minutes)
	Comparison output 2	Comparison function mode	□2FC	□HYS	Hysteresis mode	—	HYS/Win
		Output mode	□2oP	□nL	N.C.	—	OFF/N.C./N.O.
		On delay time	□2oN	□d00	0.0 seconds	seconds	0.0~2.0 seconds (every 0.1 seconds)
		Off delay time	□2oF	□d00	0.0 seconds	seconds	
		Power supply on delay time	□2dP	□d00	0 minutes	minutes	0~20 minutes (every 1 minutes)
	Filter	Display	□FLd	□F10	Response time 1.0 seconds	seconds	0.2sec/1sec/2sec/4sec
		Output	□FLo	□F10	Response time 1.0 seconds	seconds	
		Display low cut	□LCD	□CF2	±2%FS	±%FS	0~5%FS (every 1%FS)
		Sign reversal of display measured	□SGn	□oFF	Off	—	on/oFF
		Analog output reversal	□AnA	□oFF	Off	—	on/oFF
		Low power consumption	□ECO	□oFF	Off	—	on/oFF
		Test mode	□FSF	—	—	—	Mono: -10~110%FS ± : -60~+60%-FS
		Set value clear	□CLR	□no	(factory default setting)	—	—
Error display		□E□	—	—	—	—	

※All setting value are set to the factory default setting in the clear mode.

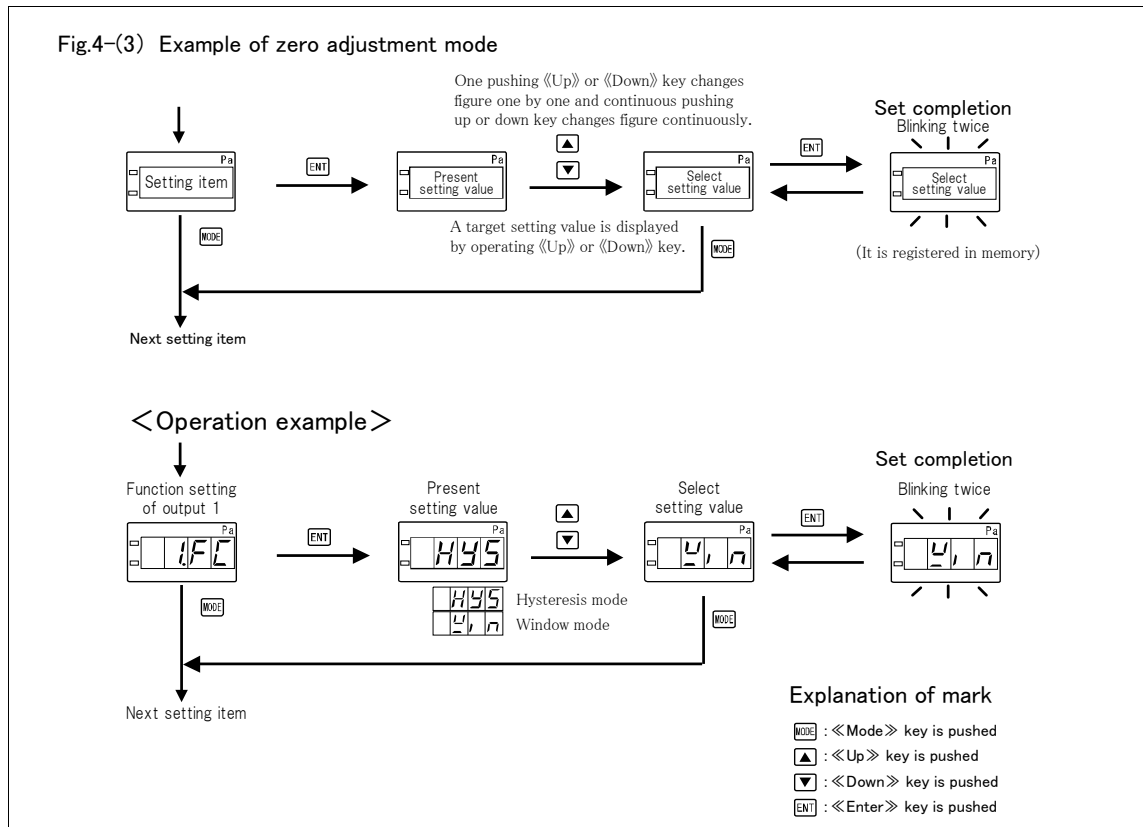
3-2 Basic operation in each mode

Please refer to Fig.4- (2) for the order of shifting each mode etc. As for the following items, it is executable from the pressure display mode according to a quick operation. All basic operations of other each program mode are united as shown in Fig.4- (3).

Quick operation

 +  + LP	Zero adjustment
 +  + LP	Setting value protecting
	Max. value display
	Min. value display

LP: Continuous pressing for two seconds or more







1) Registration of set value

It moves from the pressure display mode to each mode one by one by «Mode» key operation. When «Enter» key is pressed with becoming the display of a target mode, present value is displayed, and state moves in the state of value input. Next, after the display value is adjusted to a target set value by operating «Up» «Down» key, «Enter» key is pushed. Then, the display blinks twice and registration to the memory is completed. It is not registered until «Enter» key is pushed even if setting display value is changed.

2) Operation of set value

When a set value is changed in each mode, a set value grows if «Up» key is pushed, and if «Down» key is pushed, a set value becomes small. It becomes a lower bound if «Up» key is pushed when the indicated value is an upper limit, and if «Down» key is pushed at the lower bound, it becomes an upper limit. The value increases and decreases continuously when press and hold a key (key repeat operation). The range which can be set is different depending on each mode.

3) Error and command protecting when setting is operated

When an illegal value is registered, the display becomes  and registration becomes invalid. Moreover, the display becomes  and registration becomes invalid at the time of the command protecting. The setting and release alternately change into the setting value protecting at each quick operation ( +  + LP).

4) Clearness of the Max. and Min. value

It becomes the following with «Enter» key in the following mode.

Max. value display mode : The max.value is reset.

Min. value display mode : The min.value is reset.

5) Set value clear mode : A set each value is returned to the state of the factory shipment.

When「YES」is selected in set value clear mode and«Enter»key is pressed, all set values are restored in the state of factory shipment. When「no」is selected, clearness is not executed. Default is「no」so as not to clear by mistake.

3-3 Operation of test mode

The measurement pressure value immediately before is set as simulative pressure value immediately after the shift of the test mode. And, the state becomes a test mode at once. Even if«Enter»key is not pressed, the increase and decrease of value with«Up»«Down»key becomes effective at once.

3-4 Calibration for Zero adjustment

When this unit is set for the first time or zero point is changed wrong, be sure to perform calibration for zero adjustment.

To perform zero adjustment, be sure to carry out after warming up the unit for 15 minutes approximately after power supply. This will help to obtain stable accuracy.


Internal processing is conducted with higher accuracy than displayed accuracy.


Therefore, with no pressure applied and 「0」 is indicated as its pressure, there could be minor deviation that is too small to be displayed. This is corrected by zero adjustment. Also analog output zero point is automatically corrected at the same time.

[Operation procedure]

- 1) Leaving pressure tubes open to atmospheric air on the H side as well as L side, let this unit have no pressure applied.
- 2) In accordance with p.15「3-1 Change-over procedure of mode」,return to the pressure display mode.
- 3) Press«Up»key and«Down»key at the same time for two seconds or more. The display informs of zero adjustment completion by the display's becoming「000」and blinking twice.
- 4) Reconnect tubes back to normal and this puts an end to operation.

Note)

When the pressure display value shifts by $\pm 20\%$ or more to the factory shipment, zero adjustment can not to be done. At this time, the display shows .

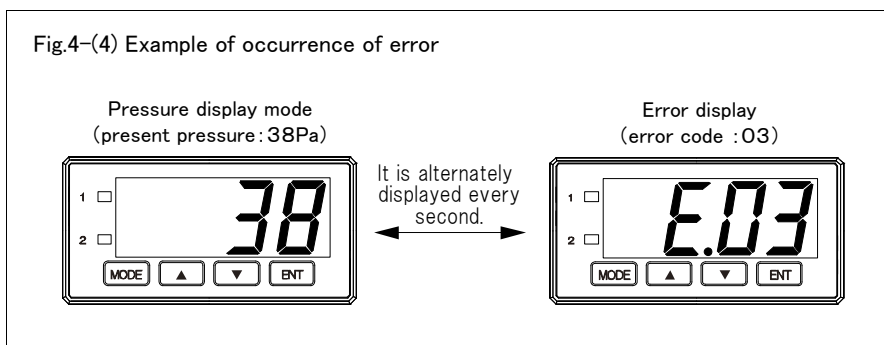
 Caution	•To perform zero adjustment, leave pressure tubes open to atmospheric air on the H side as well as L side of this unit so that there will be no pressure applied. Upon completion of this operation, be sure to reconnect tubes back to normal.
------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

4. If error happens

If error happens, pressure display mode and error display change alternately as shown in Fig.4- (4).In such a case, please confirm error code.

[Solution procedure]

- 1) The error code is displayed to two lower digits. Please record the value. Two or more errors might occur.
- 2) Please turn off the power supply of this machine after recording the error code.
- 3) Please treat it referring to the error code table.



Error code table

Error code		Cause	Solution
display value	E.01	The overcurrent occurs in comparison output 1.	Turn off the power supply of this instrument, confirm an external connection of comparison output 1, and confirm whether there are miss-wiring or breakdown of connected equipment, etc. Refer to ※2.
	E.02	The overcurrent occurs in comparison output 2.	Turn off the power supply of this instrument, confirm an external connection of comparison output 2, and confirm whether there are miss-wiring or breakdown of connected equipment, etc. Refer to ※2.

※1. Please inquire about error display「E.□□」other than the above of us. Please report the error code, the model code, the pressure range, the manufacturer's serial number, and the situation of the occurrence.

※2. The overcurrent detecting function doesn't completely protect this instrument. This machine might work according to the state of external wiring and the failure work.

V. PRODUCT WARRANTY

Warranty Period

The warranty period shall be for one year from the date that the product has been delivered to the location specified by the purchaser.

Warranty Scope

In the event of any failure or defect in the product or non-conformity of specifications due to the reasons solely attributable to Yamamoto Electric Works, Yamamoto Electric Works shall remedy such malfunctioning or defective product at its own cost in one of the following ways to be selected by Yamamoto Electric Works:

- i) repair such product, ii) replace such product.

However, this Warranty shall not cover the damages or defects that arise due to any of the following reasons.

- (1) Any failure resulting from improper conditions, improper environments, improper handling, or improper usage other than described in the instruction manual or the specifications arranged between the purchaser and Yamamoto Electric Works.
- (2) Any failure resulting from factors other than a defect of our product, such as the purchaser's equipment or the design of the purchaser's software.
- (3) Any failure resulting from modifications or repairs carried out by any person other than Yamamoto Electric Works' staff.
- (4) Any failure caused by a factor that cannot be foreseen at a scientific/technical level at the time when the product has been shipped from Yamamoto Electric Works.
- (5) Any disaster such as fire, earthquake, and flood, or any other external factor, such as abnormal voltage, for which we are not liable.

Yamamoto Electric Works specifically disclaims all implied warranties of merchantability and/or fitness for a particular use or purpose, as well as liability for incidental, special, indirect, consequential or other damages relating to the product.

*This product warranty is only valid within Japan.

Product Applicability

Our products are designed and manufactured as general-purpose products for general industries. Therefore, our products are not intended for the applications below and are not applicable to them.

- (1) Facilities where the product may greatly affect human life or property, such as nuclear power plants, aviation, railroads, ships, motor vehicles, or medical equipment
- (2) Public utilities such as electricity, gas, or water services
- (3) Usage outdoors, under similar conditions or in similar environments

This document has been translated from the original Japanese version, and the original Japanese version takes first priority. Be sure to refer to the original Japanese for the details of this warranty.

<Prior notice>

The specifications and description of the product explained in this instruction manual may be subject to change without prior notice because of modification and the like.