



READ THE INSTRUCTION MANUAL BEFORE USING

INSTRUCTION MANUAL

MANOSTAR DIGITAL SENSOR

EMD7D3

No. TR-EMD7D3-E12

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Manostar



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INTRODUCTION

Thank you very much for purchasing of 「MANOSTAR DIGITAL SENSOR EMD7」.

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 48 × 48 size.

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

Red-colored seven segments LED, 10mm high character of high visibility, is used for four digits (max. three digits for pressure display)

- **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.

- **Conformed to EU directive**

- **UL recognized component**



Caution

To ensure your safety in using this instrument:

- Be sure to read the instruction manual carefully before using this instrument so that you can use it properly.

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.

I . PRECAUTIONS

Warning

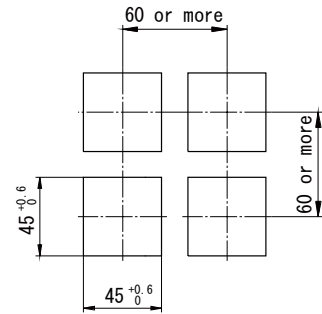
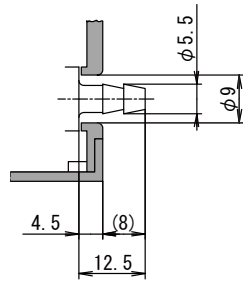
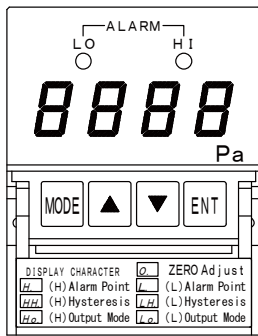
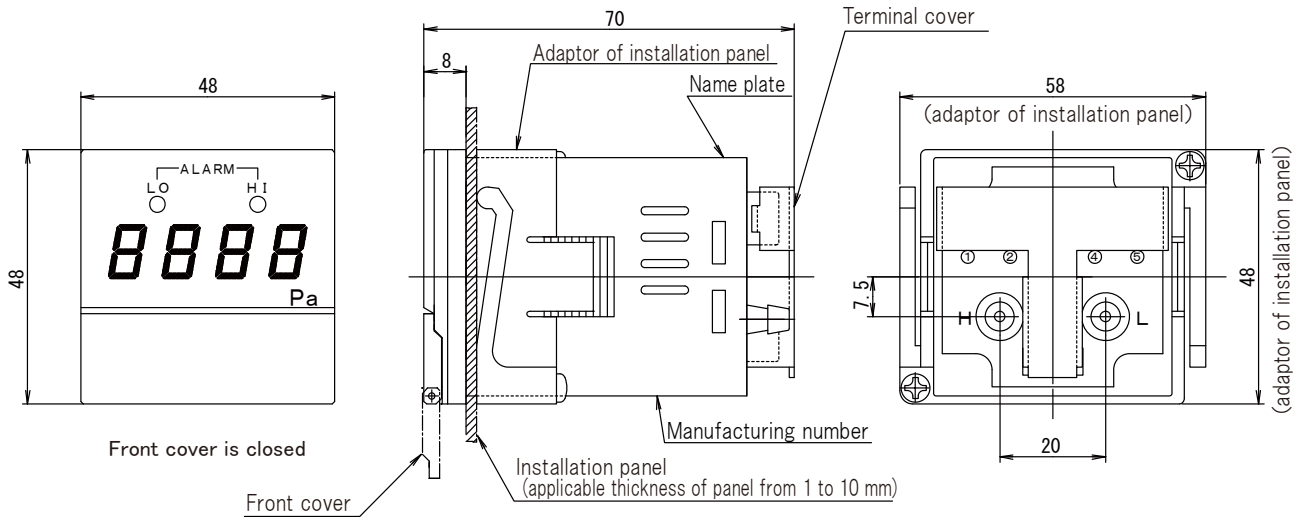
- **Do not use the instrument where flammable gas is present.**
The instrument is not explosion-proof. Do not use instruments in the circumstance where flammable gas is present. It may cause explosion.
- **Do not use the instrument at the place where corrosive gas is present.**
The instrument is not 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 24Vd.c. from SELV(Separated Extra-Low Voltage) circuit.**
- **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

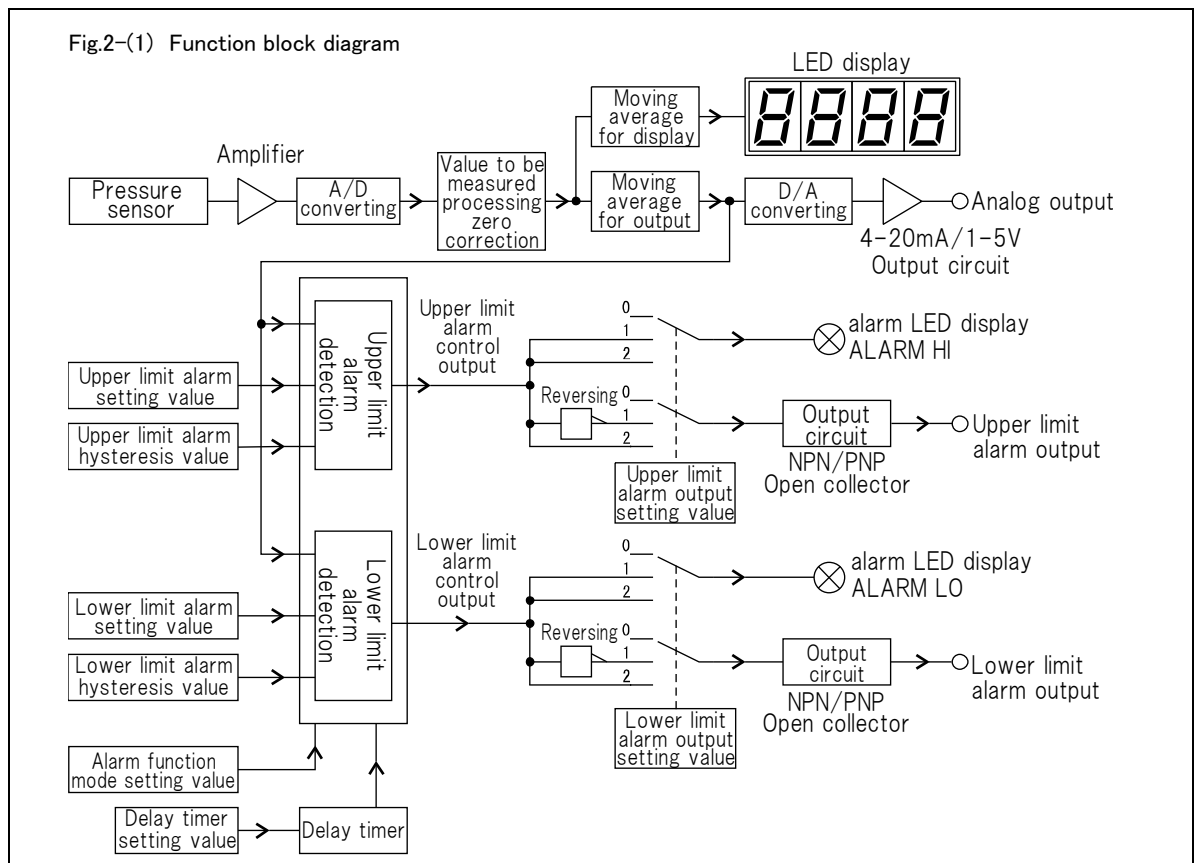
The number of the moving average is set in the display filter setting mode. When the change of the measurement pressure is large, the change of the display value can be reduced by enlarging the average number of the moving average function. The response is late according to large a set value of the filter mode. The alarm 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 "1".

Output filter mode		Average processing
Indicated value	0	High speed
	1	Standard speed
	2	Low speed 1
	3	Low speed 2

4) Overrange warning

The display pressure blinks and informs of the over range when pressure which exceeds the ratings pressure joins in this instrument. Blinks as well as the over range when the difference pressure is negative.

- The display blinking pressure : 110% or more and -10% 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.

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 alarm output

The alarm output equips with each of one system for the high and for the low, and can select the NPN open collector or the PNP open collector. (option when factory is shipped)

The operation of the alarm function can select the function by setting the alarm function mode. Moreover, when alarming, it is possible to set to open or close according to the warning output mode. It is possible to set individually and set these according to the usage, please. Please refer to Fig.2- (2)~2- (6) for the operation at each combination of the alarm function mode and the alarm output mode. When the alarm function is used, it is necessary to do the under mentioned setting.

1) Alarm function setting

Basic operation of the alarm function is set in the alarm function setting mode. When the instrument is shipped from our factory, mode is set to "0".

Alarm function mode	Alarm control operation	Operation explanation	
Indicated value	0	Upper and lower limit individual detection	The detection result of the upper and lower limit is individually output.
	1	Normality/Abnormal detection pressure (window comparator)	The judgment within range of regulations is output by one output.
	2	Upper limit alarm double step detection	The pressure rise is detected by two stages, and it is possible to output individually. The first step is used for warning, and the second step is used for the device stop etc.
	3	Lower limit alarm double step detection	The pressure decrease is detected by two stages, and it is possible to output individually. The first step is used for warning, and the second step is used for the device stop etc.
	4	Simple control	The output is turned on when falling below the lower limit. The output is turned off when exceeding the upper limit.

2) Upper and lower limit alarm value setting

Each warning operation pressure value is set in hi and low limit setting mode.

Set range 0 to 100% FS. Display value is displayed by the value of the pressure value.

3) Upper and lower hysteresis setting

Hysteresis value is set in upper and lower hysteresis setting mode.

Hysteresis means the difference between the alarm operation pressure and the alarm release pressure (operation space).

Set range 1 to 5% FS. Display value is displayed by the value of % FS.

4) Alarm output mode setting

Each output mode is set in upper and lower limit output setting mode.

The alarm output mode sets the alarm output and the output when the cutoff or warning can be set.

Alarm output mode	Open collector output circuit	Alarm light	
Display value	0	Always Opening (circuit OFF)	Always OFF
	1	Open at alarming	ON at alarming
	2	Closed at alarming	ON at alarming

5) 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, it is set to "1".

Output filter mode	Average processing	
Indicated value	0	High speed
	1	Standard speed
	2	Low speed 1
	3	Low speed 2

6) Delay timer setting

The low limit is compulsorily intercepted until specified time passes by the delay timer which works more immediately after the power supply turning on of this instrument.

When the power supply is turned on by using this function, the lower bound warning can be prohibited when pressure is low.

Please adjust a set value of the delay timer to "0" when the lower bound warning is necessary immediately after turning on of the power supply.

Alarm function mode	Alarm control operation	Influence on alarm operation with delay timer	
Indicated value	0	Upper and lower limit individual detection	Only the low alarm is prohibited while the timer is working. The hi alarm is not influenced.
	1	Normality/Abnormal detection pressure (window comparator)	Only the low alarm is prohibited while the timer is working. The hi alarm is not influenced.
	2	Upper limit alarm double step detection	The timer does not influence each state either.
	3	Lower limit alarm double step detection	It is prohibited with the 1st step and the 2nd step while the timer is working.
	4	Simple control	Even if the timer is working, It is not influenced.

2-4 Function of 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.

2-5 Function of delay timer

The time of the timer of the delay timer is set in the delay timer setting mode. When a set value is changed, this value becomes more effective to be going to turn on the power supply next time.

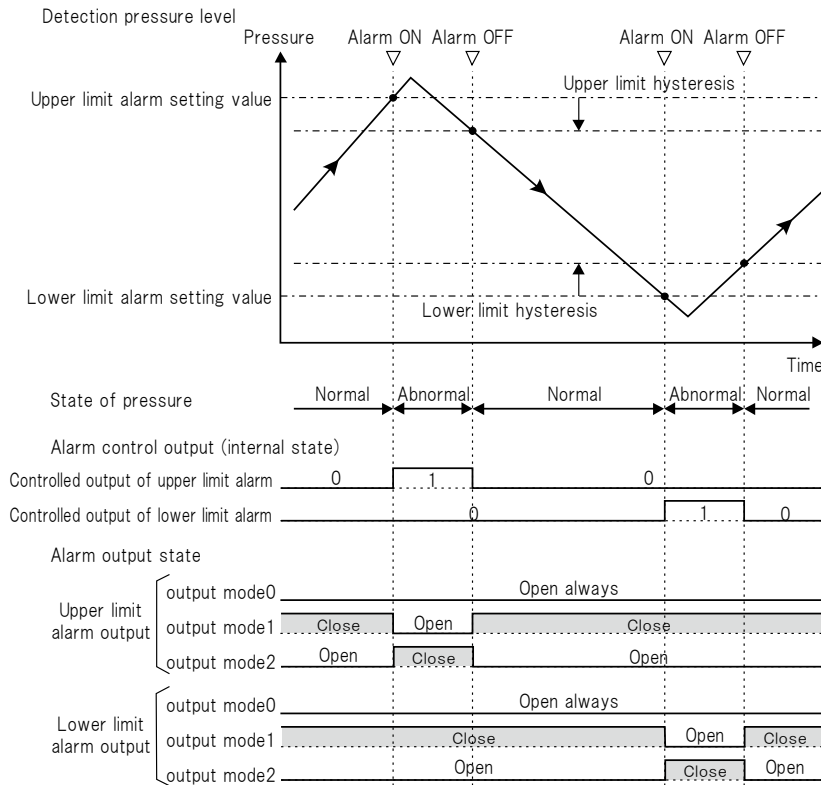
The delay timer is counted immediately after turning on of this instrument of the power supply and ends at set time. The lower bound warning is prohibited while the timer is operating. Moreover, when ending, the min. value memory is reset. The alarm function operates immediately after turning on of the power supply when the timer setting time is set to 「0」, and the min. value memory is reset immediately after turning on of the power supply. When the instrument is shipped from our factory, this value is set to "0".

set range : 0 to 20 minutes The display value is displayed by the amount.

2-6 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.

Fig.2-(2) Upper or lower limit alarm individual detection (alarm function Mode 0)



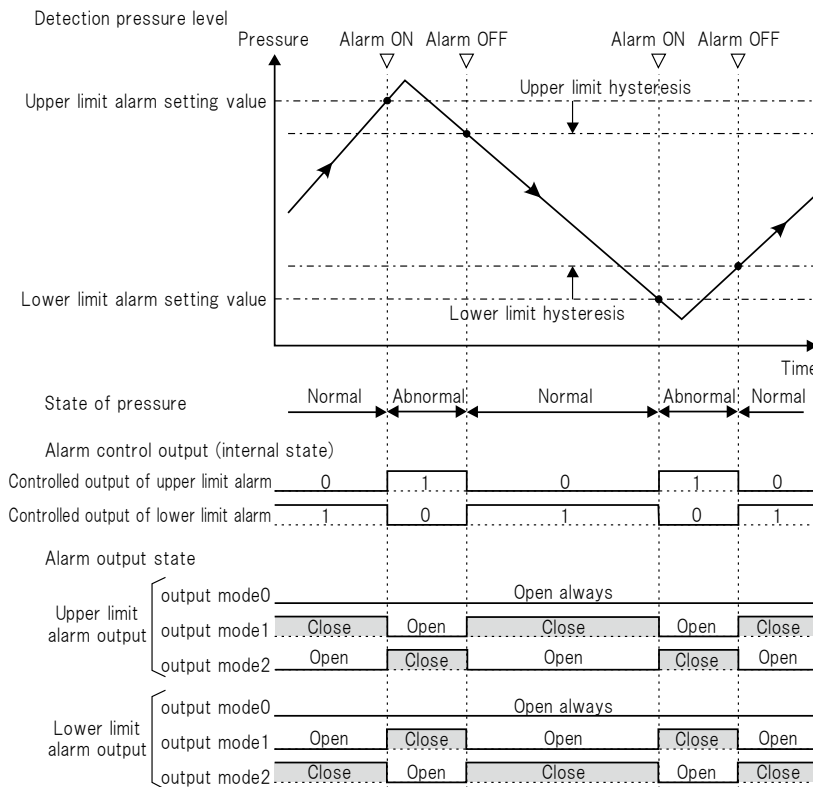
Explanation of operation

The detection result of the abnormal pressure decrease and rise is individually output. The lower limit alarm turns on when the upper limit alarming setting value is exceeded the upper limit value, and turns on when falling below the lower limit value.

Delay timer

The lower limit alarming output is prohibited while the delay timer is working.

Fig.2-(3) Alarm function of normal or abnormal detection (alarm function Mode 1)



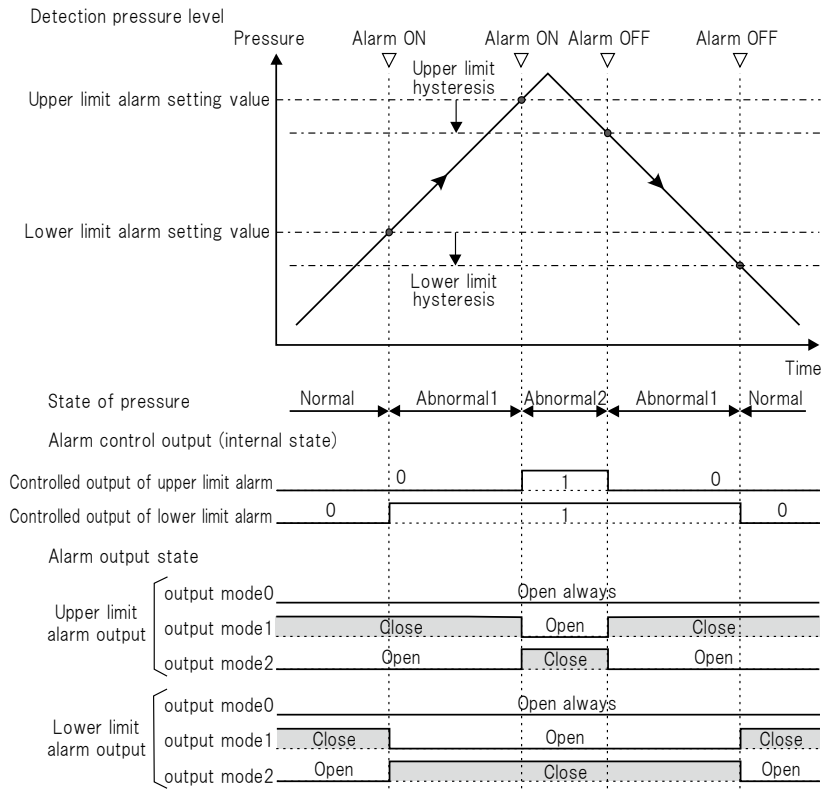
Explanation of operation

The one of output judges that it is within regulation range or out of regulation range. The other output judges the same way, because it is reversed state of detection.

Delay timer

Only the lower limit alarm side is prohibited while the delay timer is working.

Fig.2-(4) Alarm function Upper limit double step detection (alarm function Mode 2)



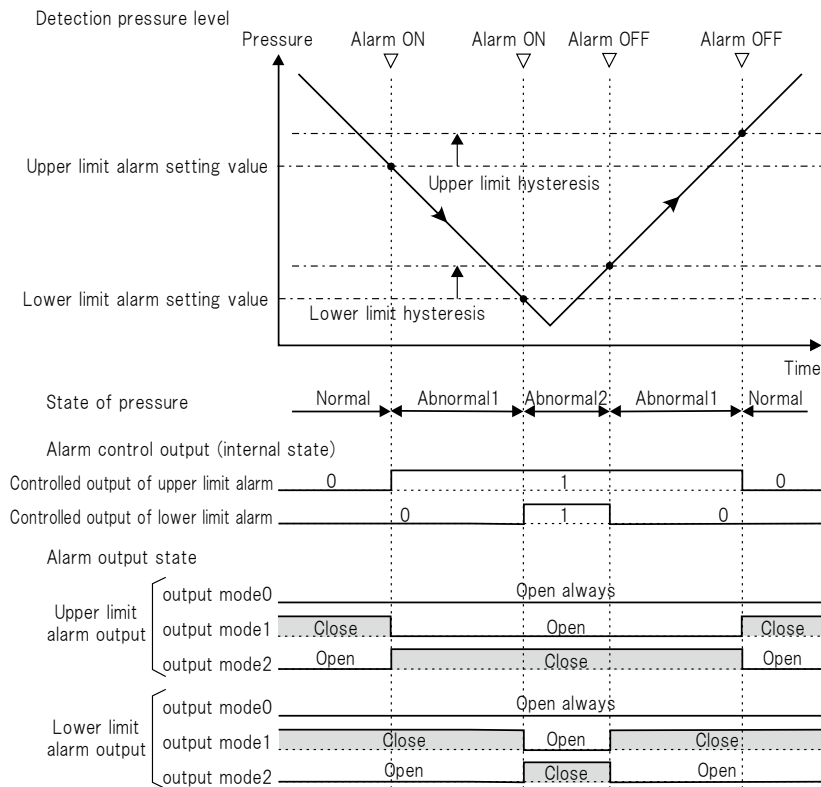
Explanation of operation

It is possible to use for warning of pressure increase by the first step, and for the device stop by second step.

Delay timer

Neither is prohibited while the delay timer is working.

Fig.2-(5) Alarm function Lower limit double step detection (alarm function Mode 3)



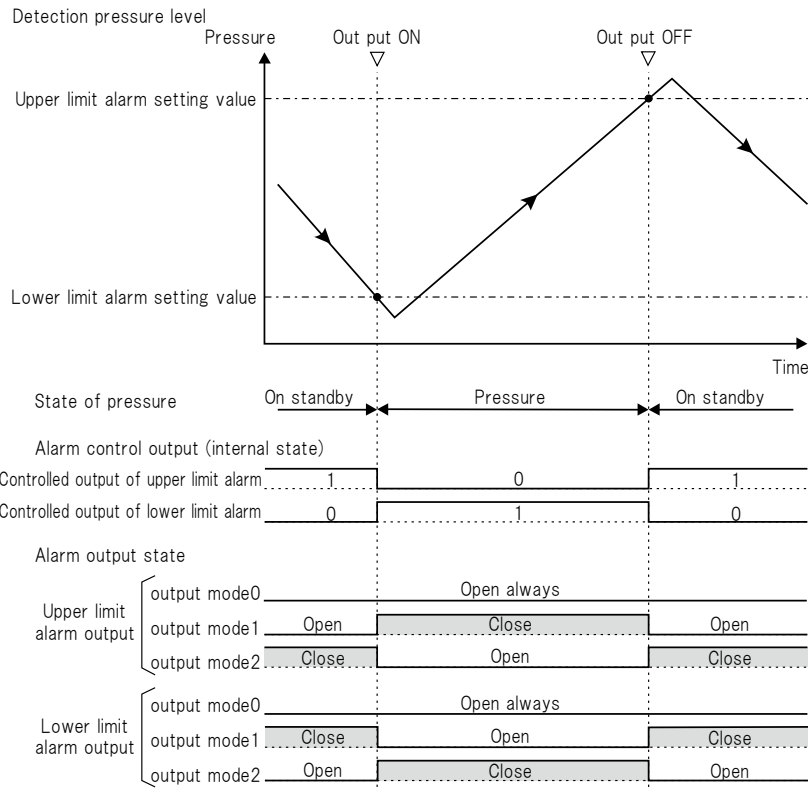
Explanation of operation

It is possible to use for warning of pressure decrease by first step, and for the device stop by second step.

Delay timer

Both the upper limit and the lower limit alarming are prohibited while the delay timer is working.

Fig.2-(6) Alarm function Simple control (alarm function Mode 4)



Explanation of operation

The one of output is turned on when falling below the lower limit. The output is turned off when exceeding the upper limit. The output of the other is reversed.

Delay timer

Each output is not influenced while the delay timer even is working.

Note

Each hysteresis setting is invalid.

III. INSTALLATION

1. Installation conditions

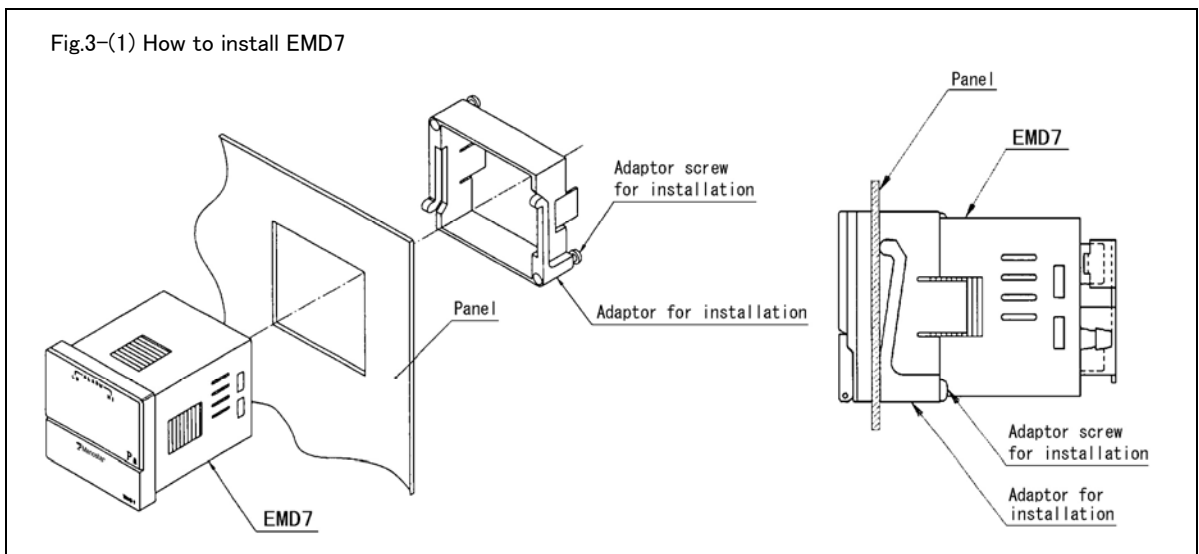
The following places should be avoided for installation of this unit.

- 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.

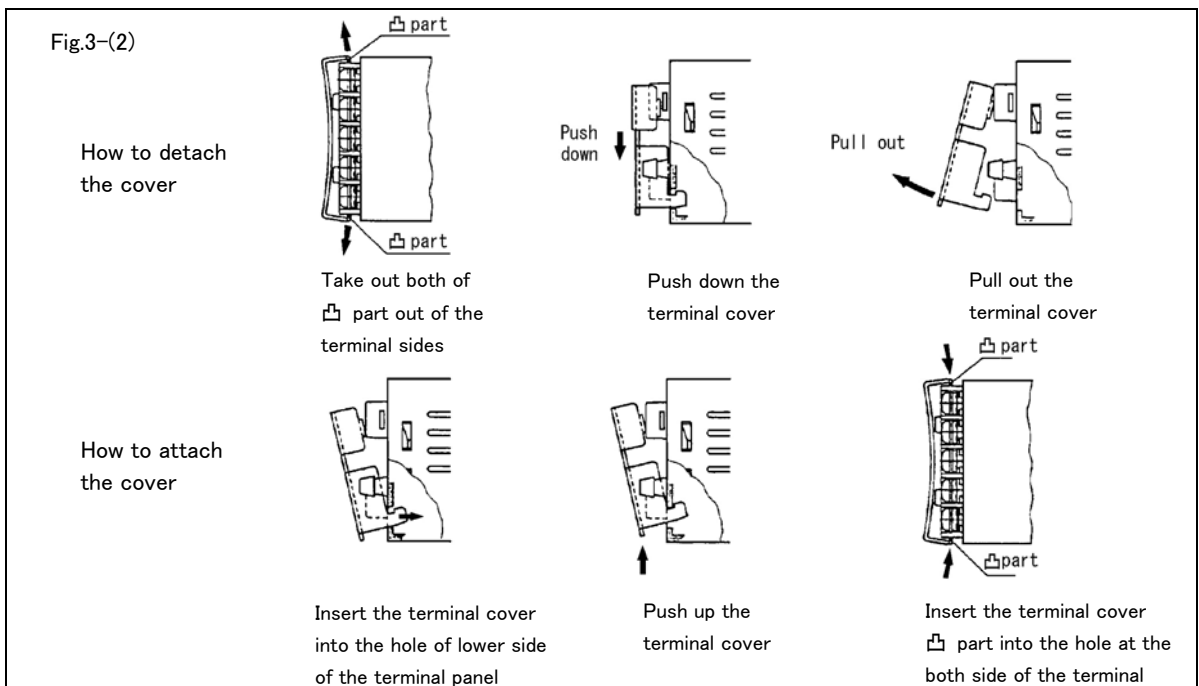
2. Installation of instrument (installation position: Vertical only)

2-1 How to install

- 1) As shown Fig.3-(1), insert EMD7 body into the hole of panel cut from the front side of panel. Holding the EMD7 body and insert Adaptor from the end of EMD7 until it hits the panel, watching carefully which side is front and back.
- 2) Tighten the screws of the adaptor one after the other and make sure that they are tight enough without any looseness. Too much tightening force will cause Adaptor to come off. In that case, untighten the screw and push that frame back and do the retightening.



2-2 How to attach and detach the terminal cover



3. Wiring

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

The following shows examples of connection for terminal layout as well as wiring of external devices.


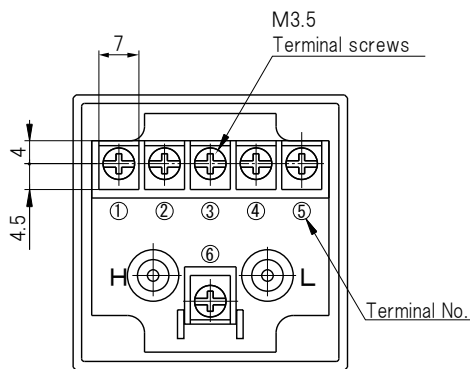
 Caution	<ul style="list-style-type: none"> • Do not let rating of each terminal go beyond the specifications. • When wiring, be sure to separate the wiring from the wiring of power supply. • Terminals for power supply 0 V and output common in this unit are internally connected. • Be sure to use diode and the like to prevent reverse voltage when you connect relays etc. • Make sure of the secured wiring by using crimp terminal and the like for connection. • Tighten the terminal screws with the torque of 0.7~1.0 N·m. Do not apply excessive torque more than necessary, otherwise it will damage the instrument body • Do not go beyond the following length of wiring. <table style="margin-left: 20px; border: none;"> <tr> <td>Power supply cable</td> <td>(terminal①②)</td> <td>: 10 m max.</td> </tr> <tr> <td>Signal cable</td> <td>(terminal③④⑤)</td> <td>: 30 m max.</td> </tr> </table> <p>If wiring goes beyond the limit, it may cause an error depending on the noise environment.</p>	Power supply cable	(terminal①②)	: 10 m max.	Signal cable	(terminal③④⑤)	: 30 m max.
Power supply cable	(terminal①②)	: 10 m max.					
Signal cable	(terminal③④⑤)	: 30 m max.					

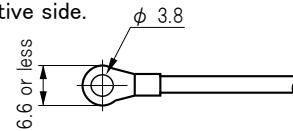
Fig.3-(3) Terminal connection diagram



- Terminal① Power supply positive side (12 to 24 V DC)
- Terminal② Power supply negative side (0 V)
- Terminal③ Alarm output COMMON / Analog output negative side
- Terminal④ Lower limit alarm output
- Terminal⑤ Upper limit alarm output
- Terminal⑥ Analog output positive side

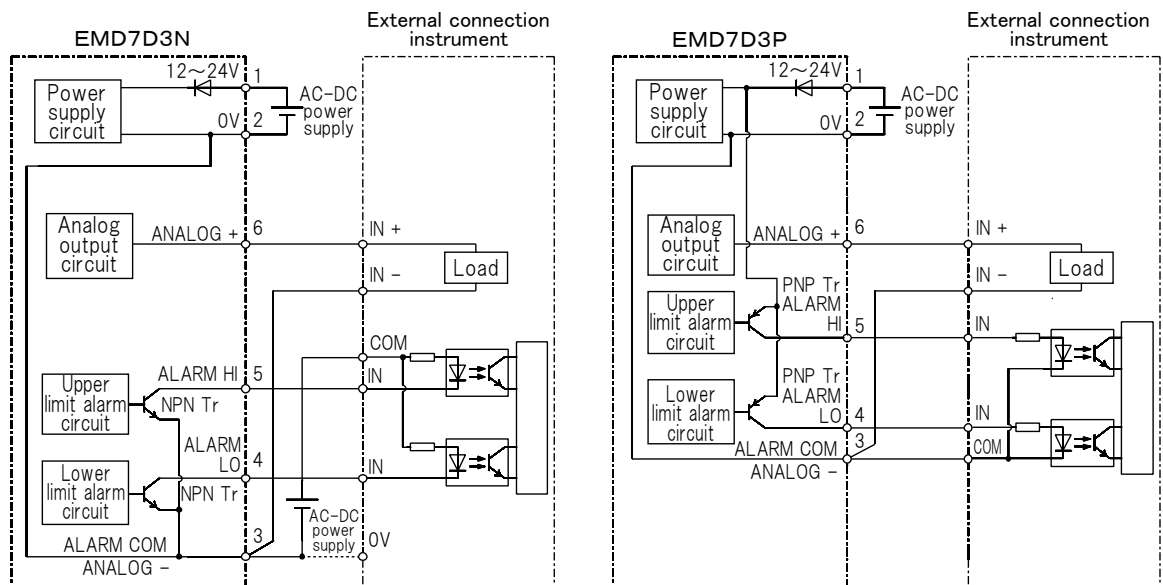
Note

Terminal③ is common use between Alarm output COMMON and Analog output negative side.



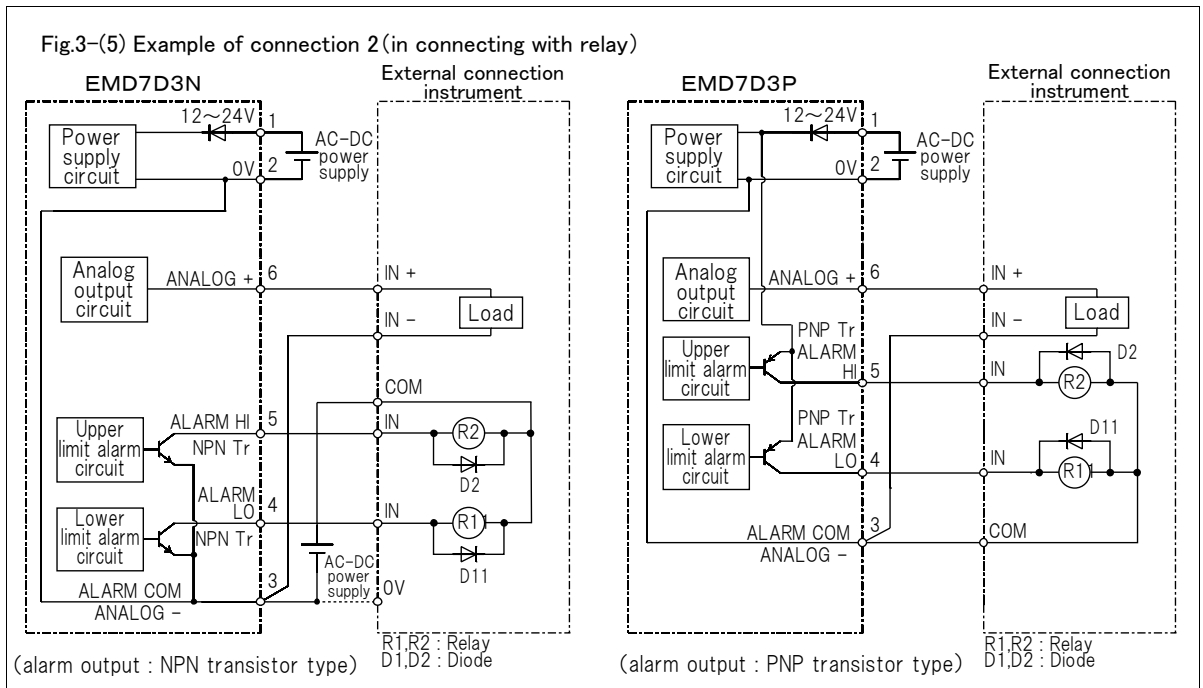
Applicable crimping terminal

Fig.3-(4) Example of connection 1 (in connecting with photo coupler)



(alarm output : NPN transistor type)

(alarm output : PNP transistor type)



4. Piping

The instrument, a differential pressure gage, is provided with taps at the rear side : one for high pressure (H) and the other for low pressure (L). Depending on the application and use, connect tubes as follows.

4-1 Pressure of measurement and connection of piping

• Measurement of positive pressure

Connect the tube to the high pressure side piping connector (indicated by red color or letter H). The lower pressure port (blue or L) should be opened to atmosphere, but do not remove the piping connector.

• Measurement of negative pressure

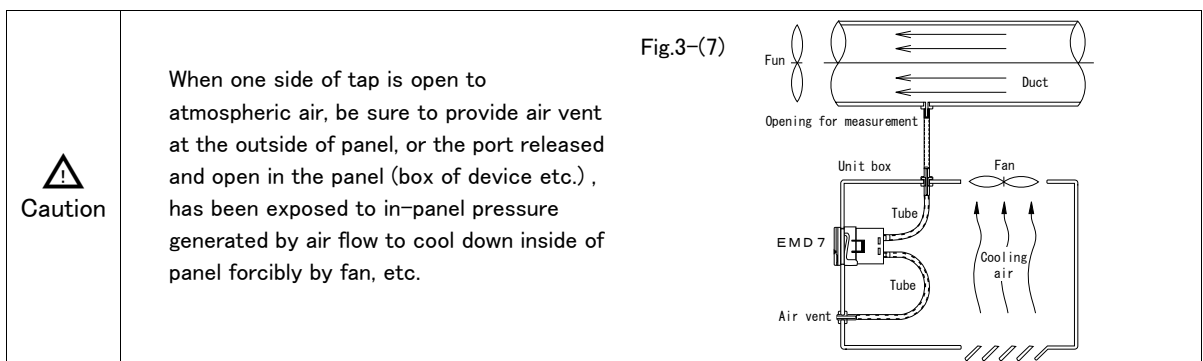
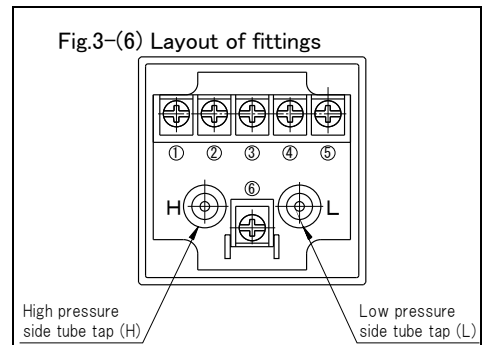
Connect the tube to the low pressure side piping connector (blue or L).

The high pressure port (red or H) should be opened to atmosphere, but do not remove the piping connector.

• Measurement of differential pressure

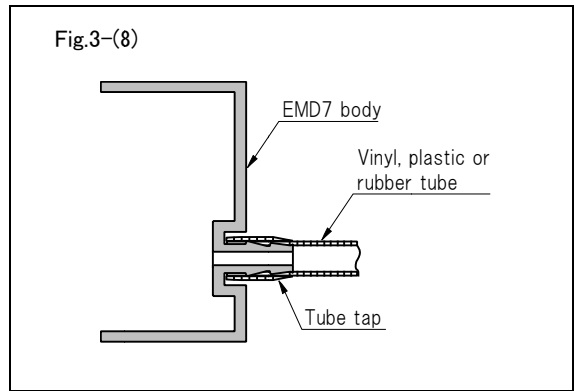
Connect the tube from the high pressure piping connector to the high pressure port (red or H) and from the low pressure piping connector to the low pressure port (blue or L).

In this case, minus (-) symbol is not indicated for pressure display of this instrument.



4-2 Piping material

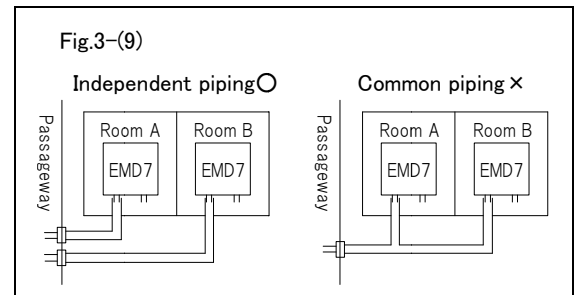
For tubing material used for taps of this unit, be sure to use tubing material of I.D. 4 as well as O.D. 6. It is desirable to use tube material made of silicon rubber and soft vinyl chloride. As shown in Fig.3-(8), when inserting the tube into the tap, be sure to push it in until the tube hit the bottom of tap.



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-(9). Common piping causes measurement error because the pressure of each system interferes.



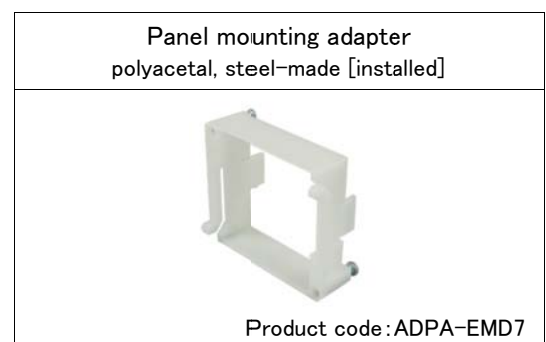
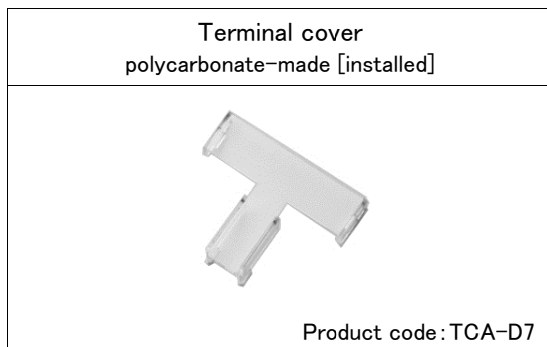
Errors caused by long distance piping

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 clogged piping due to 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 in 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.

5. Accessory for EMD7



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.

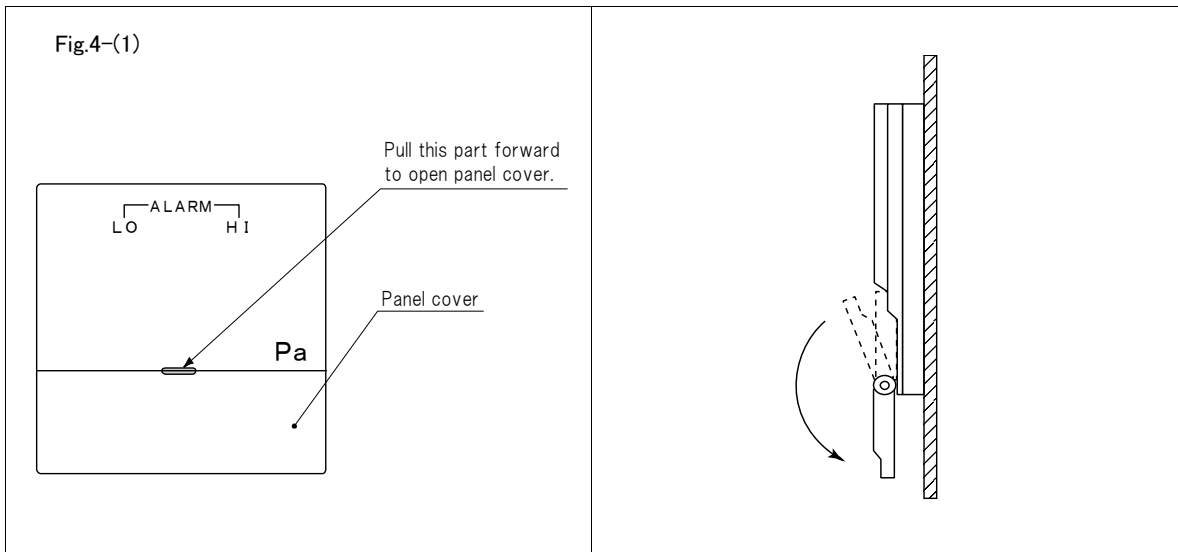
Supplying power with wrong wiring and piping may lead to instrument failure and accidents.

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 alarm circuit to work.

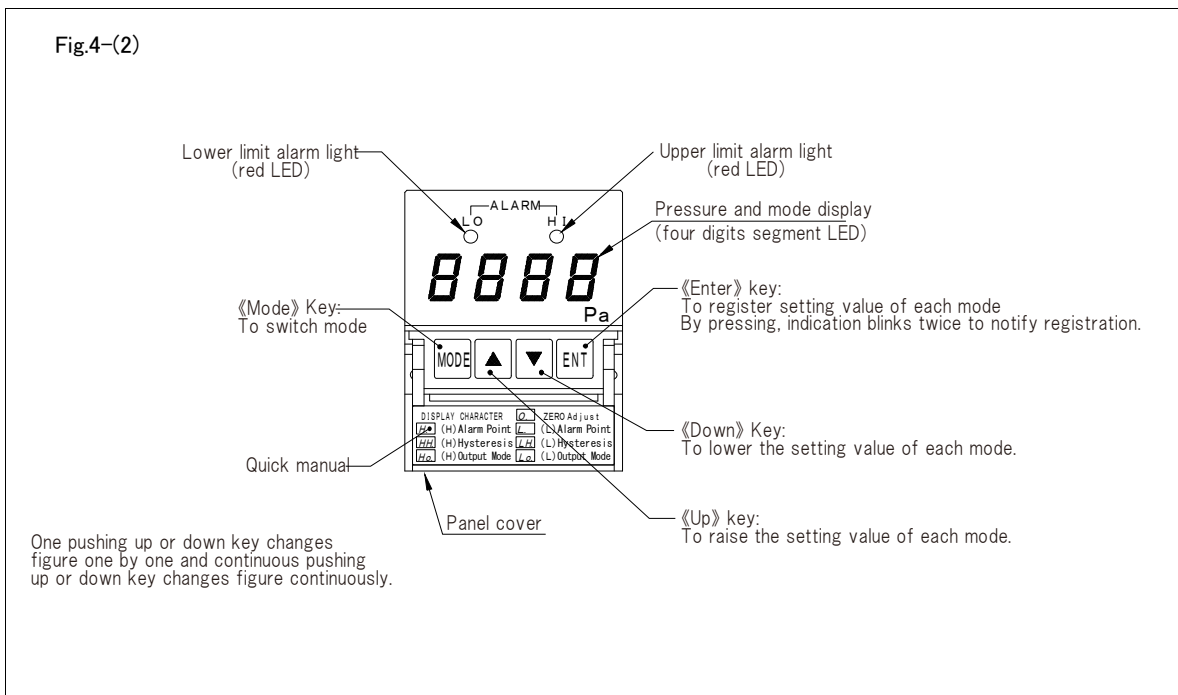
2. Operation panel

2-1 Opening and closing of panel cover

If you pull the center of the upper part of panel cover shown in Fig.4-(1), the panel cover opens. For closing the panel cover, return the panel cover back to the original position and push it lightly.



2-2 Display and key function

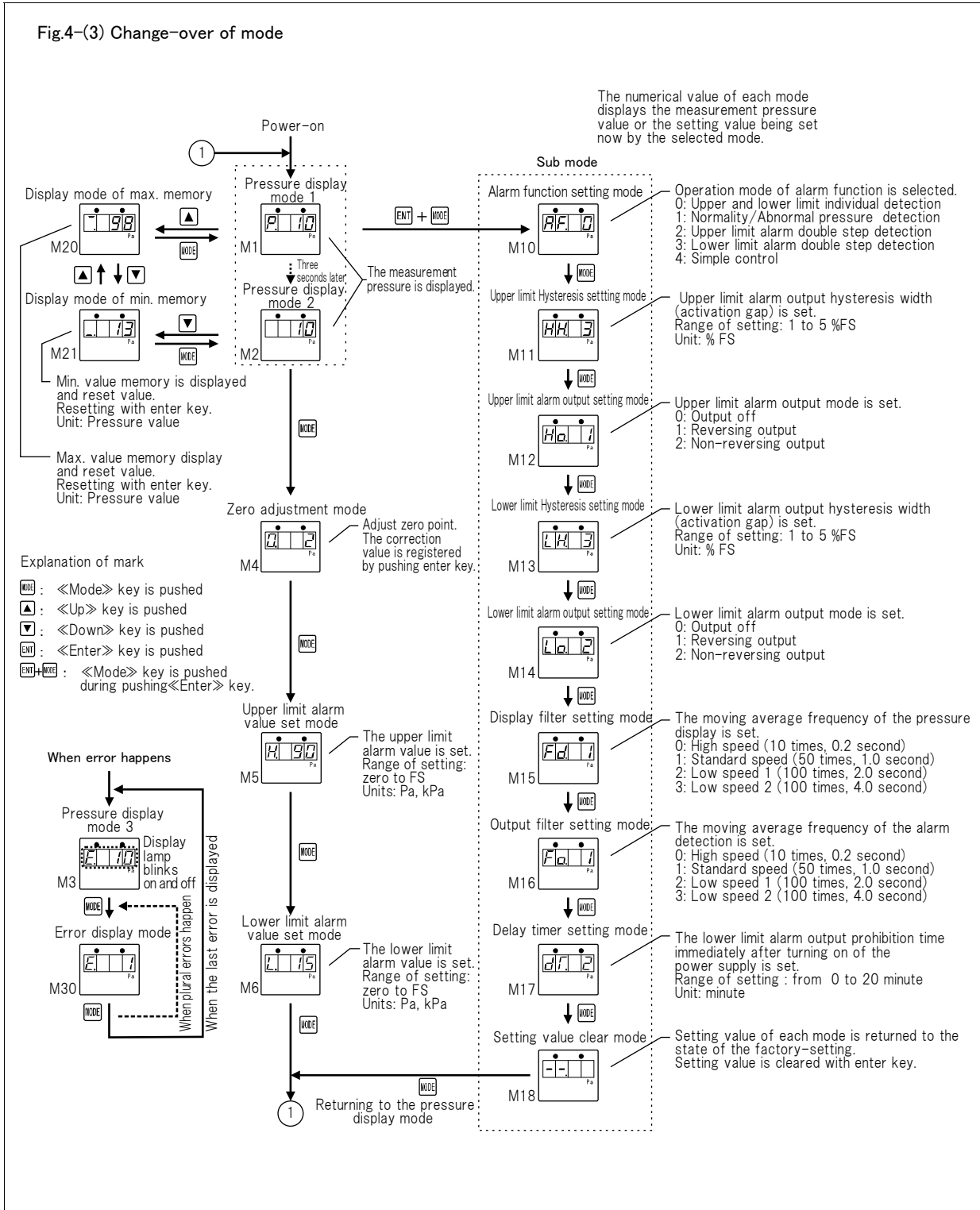


3. How to operate

3-1 Change-over procedure of mode

The change of the mode is switched one by one by the mode key operation as shown in the figure below. Moreover, the mode not frequently used is made to the group as a sub mode, and can be shifted by pushing M while pushing E in the sub mode. The mode automatically returns to the display mode in modes other than the display mode when there is no key input even if 15 seconds or more pass from the last key input.

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



3-2 Basic operation in each mode

All basic operations of each mode are united. Please refer to Fig.4- (3) for each mode display and the range of the setting.

1) Display

A present mode is displayed by using seven segments LED which one or two digit at the left of display of four digits. This is different in each mode.

Moreover, a set value in each mode is displayed in a right digit. As for a set value immediately after the change of the mode, the set value registered in the memory is displayed.

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. The range where a set value can be changed is different depending on each mode.

3) Registration of set value

When «Enter» key is pushed when changing to a set value of hope, the value is registered in the memory. At this time, the display blinks twice and the registration completion is shown. The value is not registered until «Enter» key is pushed even if a set value is changed. Please switch the mode as it is when you change a set value by mistake.

Moreover, the function of «Enter» key is as follows in the under mentioned mode.

- | | |
|--------------------------|--|
| Max. value display mode | : The max. value is reset. |
| Min. value display mode | : The min. value is reset. |
| Zero adjustment set mode | : Present pressure is registered as zero correction value. |
| Set value clear mode | : A set each value is returned to the state of the factory shipment. |

3-3 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.

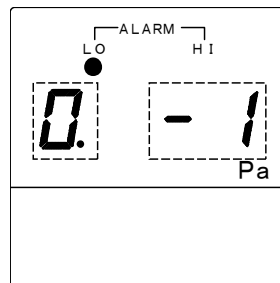
Internal processing is conducted with higher accuracy than displayed accuracy.

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」, changeover to zero adjustment mode. (refer to Fig.4-(4))
- 3) Hit «Enter»key. This makes display 「0」 and shows flickering twice, meaning that calibration for zero adjustment has been completed.
- 4) Reconnect tubes back to normal and this puts an end to operation.

Fig.4-(4) Example of zero adjustment mode



Caution

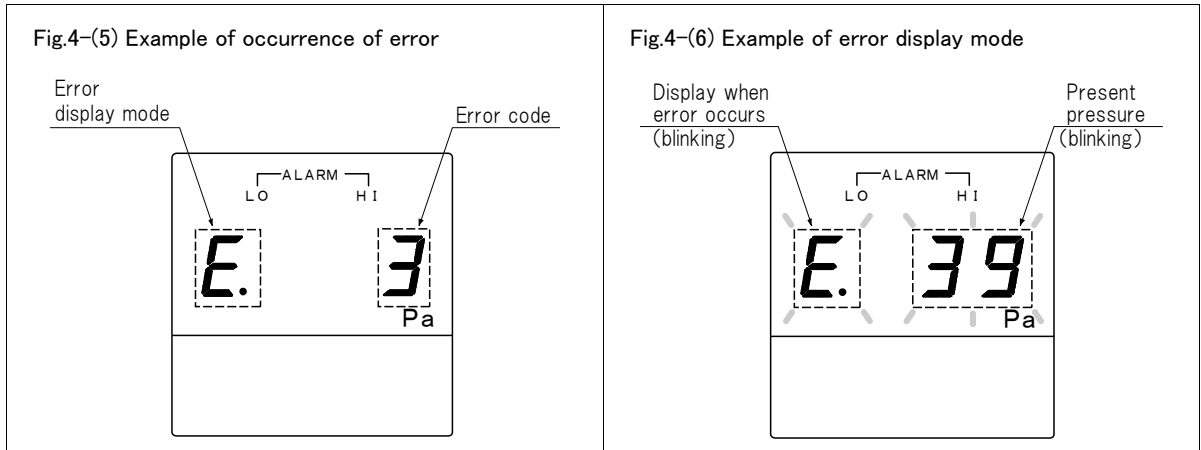
- To perform pressure measurement or zero adjustment, be sure to carry out after warming up the unit for 15 minutes approximately after power supply. This will help to obtain stable accuracy.
- To perform zero adjustment, leave pressure tubes open to atmospheric air on the H side as well as L side of 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, mode display shows 「E.」 and starting to flicker as shown in Fig.4-(5).
In such a case, refer to error code.

[Operation procedure]

- 1) At the status of error 「E.」 flickering, hit «Mode» key once. [Fig.4-(5)]
- 2) After making sure that displayed flickering stops with error code displayed at the least significant digit, record the value. [Fig.4-(6)]
- 3) Subsequently, hit «Mode» key once. If flickering of display stays stopped, more than on error is taking place. In such a case, go back to 2) and start again.
- 4) When the display starts to flicker, it means error display status of 1) is going on. Turn off power supply of this unit. Please get in touch with us to let us know the detail of error code, your type, pressure range, manufacturing number and how the problem happened.



V. PRODUCT WARRANTY

Warranty Period

This product warranty is valid for one year from the date of delivery to a place specified by an ordering party who has transacted directly with Yamamoto Electric Works Co., Ltd.

Coverage

If a product breaks down due to a reason for which we are responsible during the warranty period and you return the product to us, we will either repair or replace the product free of charge.

This warranty does not cover:

- (1) Usage of the product under any inappropriate conditions or environment contrary to what is described in our product catalog, specifications or manual.
Handling or usage of the product other than as described in our product catalog, specifications or manual.
- (2) Breakdown due to a reason other than a fault within our product.
- (3) Any product that has been modified or repaired by a party other than us.
- (4) Any breakdown due to a reason that was not foreseeable based on scientific and technical standards applied at the time of shipment.
- (5) Any breakdown due to a reason not attributable to us such as a natural calamity or other disaster.

These terms of warranty represent our entire liability with respect to the product, and we shall have no liability for any other loss arising in connection with a breakdown of the product.

*This product warranty is only valid within Japan.

This document is a translation from the original Japanese version, and the original Japanese version has priority over this translation.

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.