RoHS

READ THE INSTRUCTION MANUAL BEFORE USING

INSTRUCTION MANUAL

MANOSTAR DIGITAL SENSOR

QDP33

No. TR-QDP33-E04

Manostar

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TABLE OF CONTENTS

Introduction

Thank you very much for purchasing the Manostar Digital Sensor, Type QDP33.

Features of this product

- Compact
  This product is a compact differential pressure sensor in which a capacitance type pressure sensor and display/output functions are incorporated into a 30 mm square.

- Large 12-segment LCD
  A 12-segment LCD with a character height of 9 mm is used on the display part of the main screen.

- White backlight
  A white LED with good visibility is used for the display backlight of the main screen. It is also possible to switch the backlight to that of a red LED.

- Sub-screen display
  This product is equipped with a sub-screen to display mode names etc.

- 2 system comparison output
  This instrument contains a comparison output function that can detect pressure drops and pressure rises. Each system has one transistor output and one output monitor LCD. By using output mode settings and/or delay functions, this instrument can flexibly correspond to the specification of an externally connected device.

- Analog output
  This instrument contains an analog output function according to the pressure indication value.

- Display filter function
  This function can reduce the fluctuations in the display value.

- Output filter function
  This function can reduce the fluctuations in the output value.

- Low-power consumption mode function
  Power consumption during operation can be reduced.

- Setting value protection function
  This function prevents setting mistakes due to erroneous operations.

- Test mode function
  Even when pressure is not actually applied, the comparison output and analog output at times of installation and inspection can be checked by setting a simulated pressure.

- Max./min. value retention function
  It is possible to retain and display the max./min. values of the measurement pressure.

- Measurement display sign inversion function
  It is possible to invert the sign of the pressure display value.

- Analog output inversion function
  Although the analog output value rises along with pressure rises, it is possible to realize the reverse action by turning on the analog output inversion function.

- Sub-screen display setting function
  It is possible to set any characteristic string in the sub-screen.

- RoHS Directive conforming product

- UL-approved product

⚠ Caution	For safety use – Before using this instrument, read this instruction manual thoroughly to ensure proper and safe use. Incorrect use may lead to a failure, damage, or accident. – Keep this instruction manual in a safe place.

I. Cautions

⚠ Warning

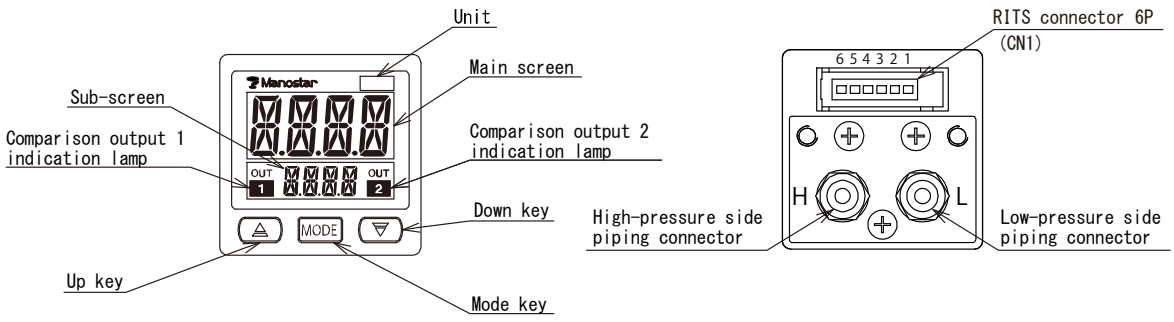
- **Do not use this instrument for pressure measurement of combustible gas or in an atmosphere of combustible gas.**
  This instrument is not explosion-proof. If it is used for pressure measurement of combustible gas or in an atmosphere of combustible gas, there is a risk of ignition.
- **Do not use this instrument for pressure measurement of corrosive or toxic gases.**
  This instrument is not of a corrosion resistance construction. If it is used for pressure measurement of corrosive or toxic gases, the internal mechanism may corrode and the gas may release, and there may be a risk of harm to humans.
- **Do not apply more pressure than the withstand pressure of the instrument.**
  If more pressure than the withstand pressure of the pressure receiving element is applied, the pressure receiving part may be damaged, and this may cause injury and/or disaster.
  If more pressure than the withstand pressure of the instrument body is applied, the body may be damaged, and this may cause injury and/or a disaster.
- **Do not use this instrument for pressure measurement of gases other than air and inert gases.**
  If it is used for pressure measurement of water or oil, it may fail, and this may cause injury and/or a disaster.
- **Do not use this instrument in places subject to extreme vibration and shock.**
  If it is used in places subject to extreme vibration and shock, it may lead to performance degradation or failure, and this may cause injury or a disaster.
- **Avoid using this instrument in places exposed to rainwater or other liquids.**
  This instrument is not of waterproof construction. If it is exposed to rainwater or other liquids, it may fail, and this may cause injury and/or a disaster.
- **Use the power supply within the specified rated voltage.**
  If a power supply outside the specified rating, this may cause fire or electric shock.
- **Connect the external wiring correctly.**
  Incorrect wiring may cause injury or a disaster.
- **Use this instrument within the service temperature and humidity.**
  If it is used outside the service temperature and/or humidity, it may fail, and this may cause injury or a disaster.
- **Do not disassemble or modify this instrument.**
  Disassembly or modification may not only void the warranty, but also may lead to performance degradation or failure, and this may cause injury or a disaster.

⚠ Caution

- **As to where to install and how to install this instrument, be sure to follow this instruction manual.**
- **Use this instrument in indoor, dry, and clean places.**
  If it is used in places subject to direct sunlight or humidity, this may cause deterioration or failure.
- **Keep this instrument away from any device generating a strong electromagnetic field as much as possible.**
  The surrounding strong electromagnetic field can affect the pressure indication accuracy of this instrument.
- **When conforming this instrument to UL standards, use a National Electrical Code (NEC) Class 2 or LPS (Limited Power Source) power supply for the DC power supply connected to this instrument.**
- **Operate the switches with your fingers.**
  Using a hard or sharp object to press it may damage the surface, and this may cause breakage or failure.
- **Do not allow a sharp object to contact with the printed surface.**
  This may cause the printing to peel off.
- **To remove dirt on the display surface, use adhesive tape or a lens cloth.**
  Using chemicals, such as detergents, on the display surface may make the display surface opaque or damage the surface.
- **To remove dirt other than that on the display surface, wipe off using a cloth soaked with a mild neutral detergent.**
  Using an organic solvent may corrode the surface, and this may cause cracks in the resin.
- **Pay attention to dropping of this product.**
  The Manostar product is a precision instrument. If it is dropped, the internal mechanism and the exterior may be damaged.
- **Do not pull the tube forcibly.**
  Pulling the tube forcibly may damage the pressure port.

II. Names of Parts

Fig.2-(1). Names of Parts



※ Comparison output indication lamp

ON: contact condition is “close”

OFF: contact condition is “open”

III. Installation

Before using this instrument, check that the product type is correct or that the operating environment, pressure, and tubing conditions meet the product specifications as listed on the specification sheet.

1. Installation location

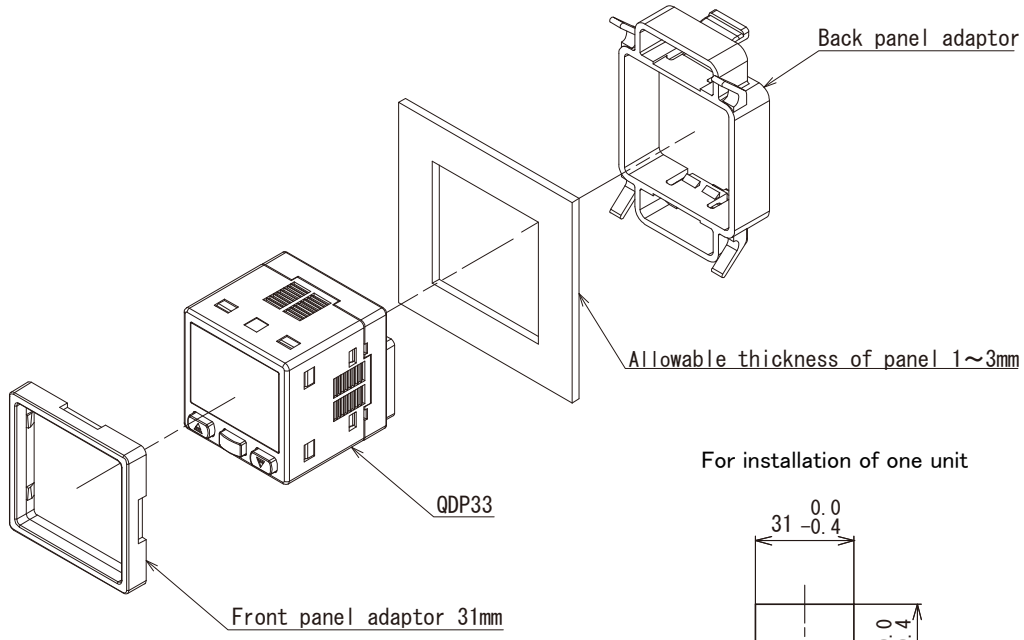
When installing this instrument, avoid the following places.

- Places with extreme vibration or shock, or places subject to continuous vibration or shock
- Places subject to sudden changes in ambient temperature or places subject to direct sunlight
- Humid places, places subject to water/oil, or dusty places
- Places where corrosive gas or combustible gas is generated

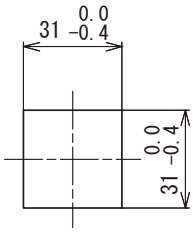
2. Instrument installation (Be sure to install this instrument on a vertical surface.)

Install the body to the panel by using the front panel adaptor and the back panel adaptor or the metal bracket set.

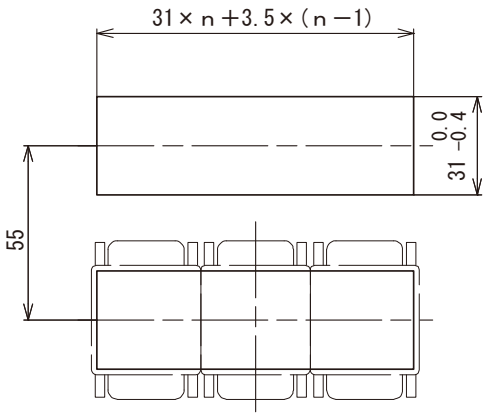
Fig.3-(1-1). Panel Installation Drawing and Panel Cut Dimension Panel cut 31mm



For installation of one unit



For installation of n units horizontally



For installation of n units vertically

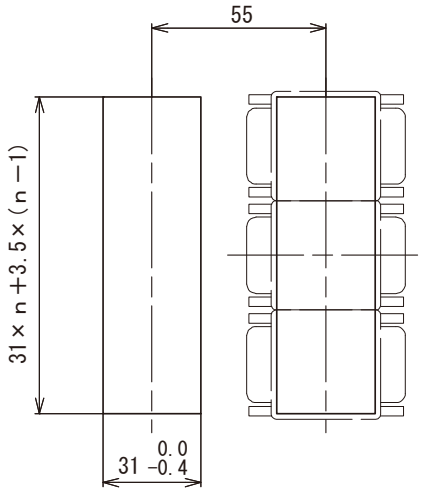
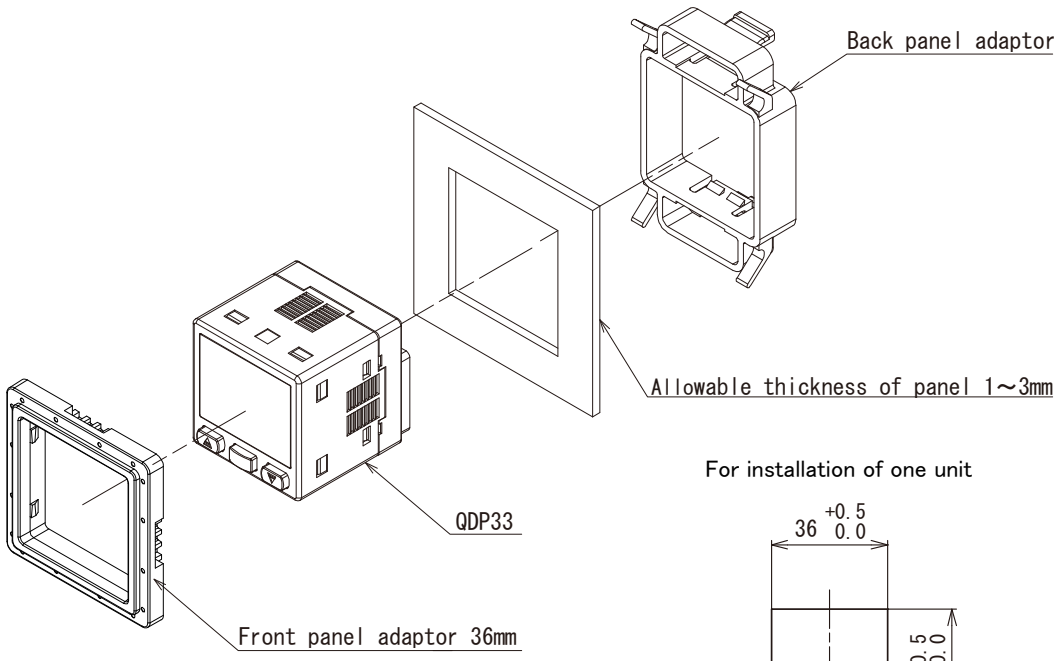
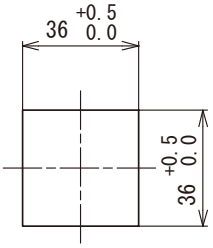


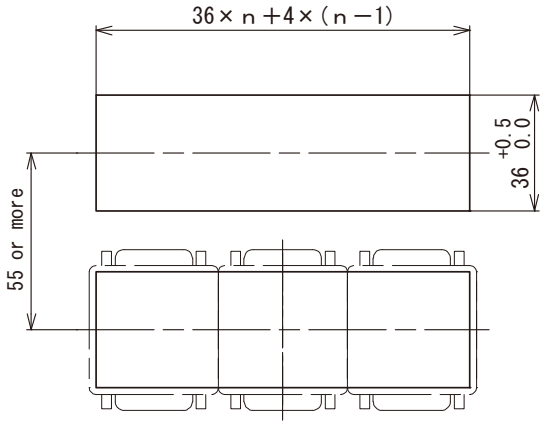
Fig.3-(1-2). Panel Installation Drawing and Panel Cut Dimension Panel cut 36mm



For installation of one unit



For installation of n units horizontally



For installation of n units vertically

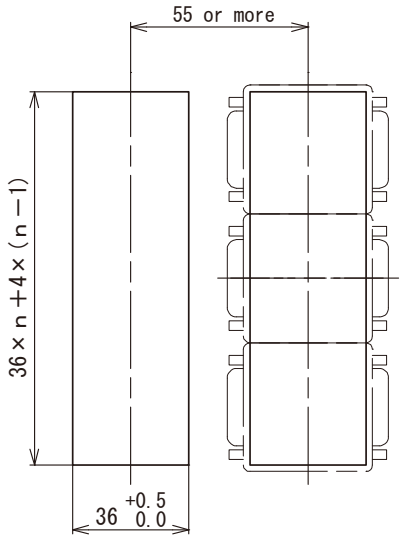
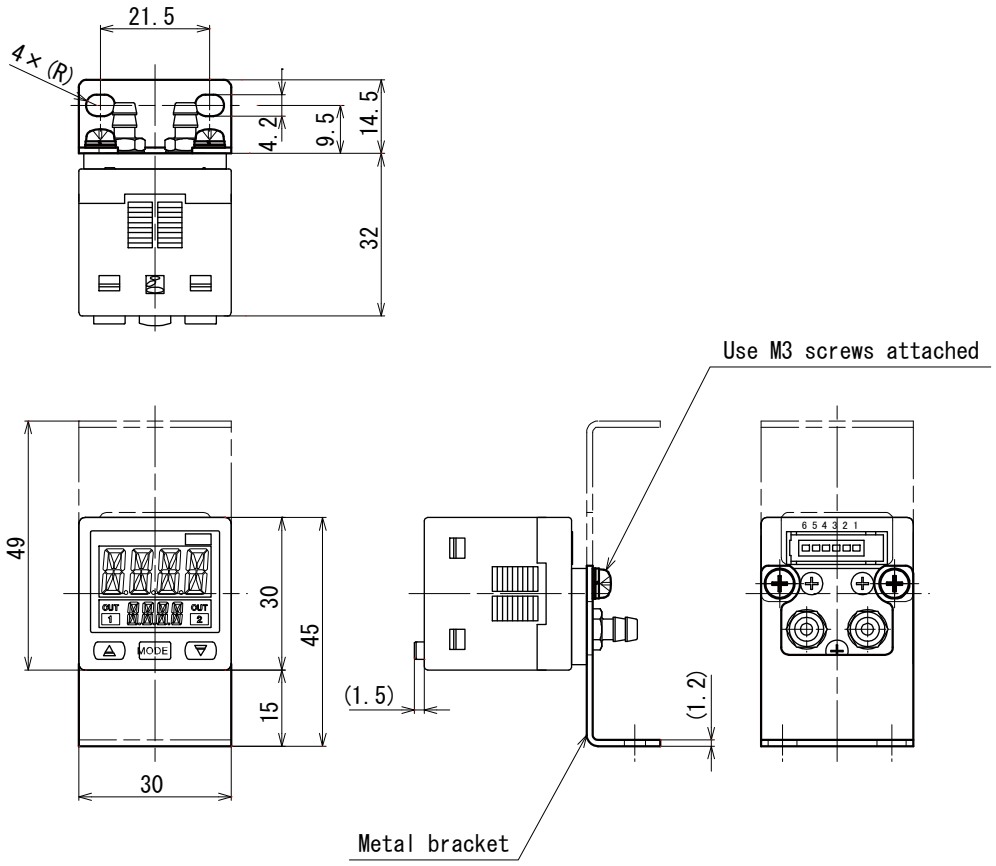
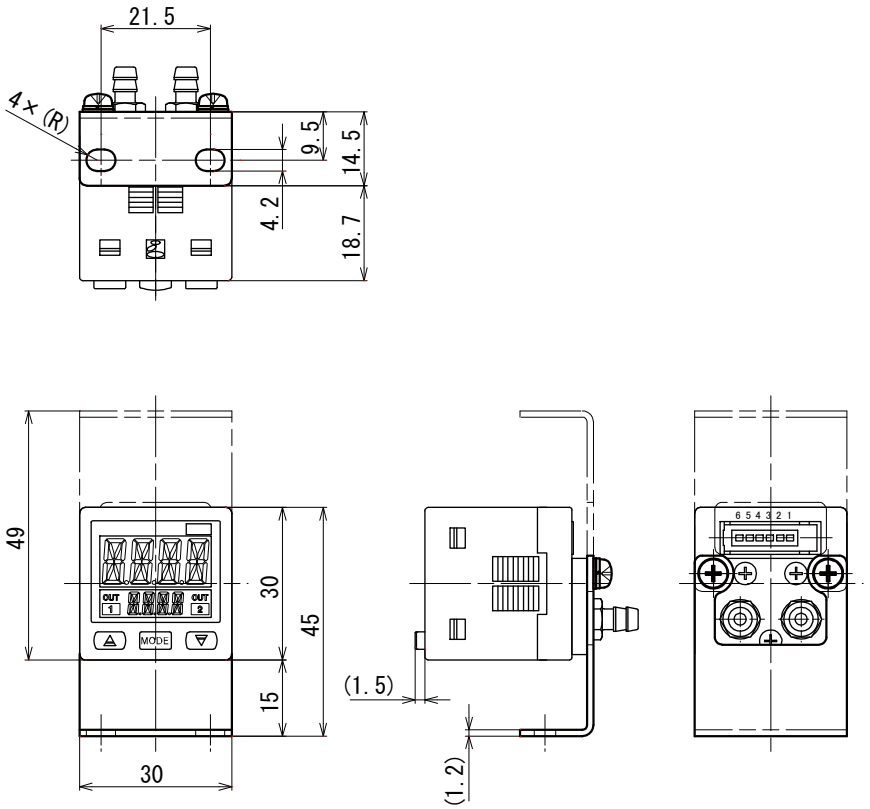


Fig.3-(1-3). Metal bracket set　Installation drawing

Install Direction 1:



Install Direction 2:

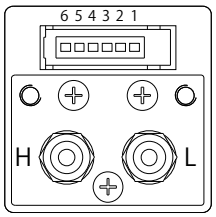


3. Wiring

Pay attention to the following points when wiring. Fig.3-(2) shows the terminal layout drawing and Fig. 3-(3) shows a connection example for connecting an external device.

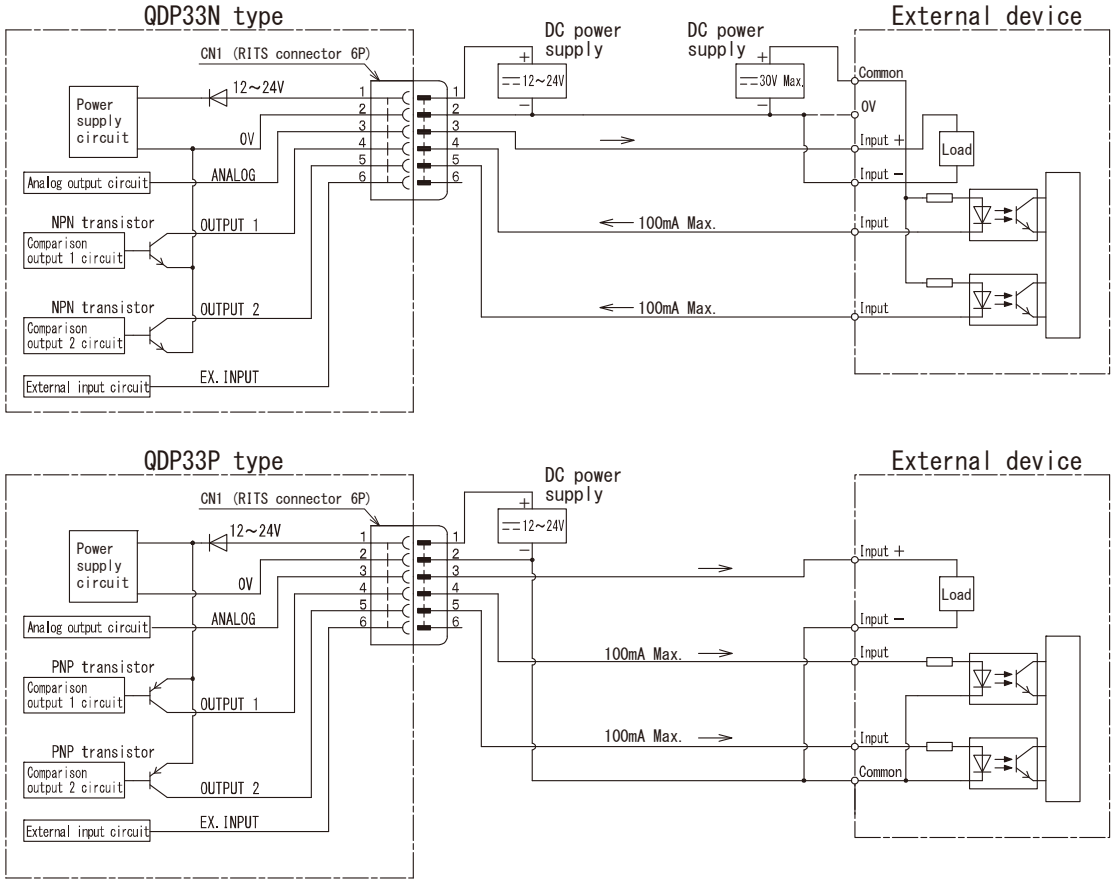
⚠ Caution	– Press in the connector until it clicks. – Make sure that each terminal does not exceed the rating shown in the specification. – Keep the wiring away from the power wiring. – The power supply 0 V terminal and output common terminal of this instrument are internally connected. – Pin 6 is an unused terminal; and do not use it because doing so may cause failure. – Be sure to use a diode for reverse voltage prevention or the like when connecting a relay. – Wiring should not exceed the length shown below. Power supply system cable: 30 m Signal system cable: 30 m When wiring exceeding the cable length limit as shown above is used, a malfunction may occur depending on the noise environment of the installation location.

Fig.3-(2). Terminal Layout Drawing



Pin 1: Power supply + (12 – 24 V DC)
Pin 2: Power supply – (0 V)
Pin 3: Analog output +
Pin 4: Comparison output 1
Pin 5: Comparison output 2
Pin 6: NC (Unused terminal)

Fig.3-(3). Connection Example



4. Tubing

This instrument is a differential pressure gage and has high-pressure side (H) and low-pressure side (L) pressure ports on the back of the instrument.
Additionally, connect the tubes as follows according to the application.

⚠ Caution	– Tighten the connector with a torque of 1.0～1.2 N·m . When it is tightened with a torque exceeding the specified value, the instrument meter body and internal thread may be damaged. – Be sure to install packing to the connector to use it.

4-1 Measurement pressure and tube connection

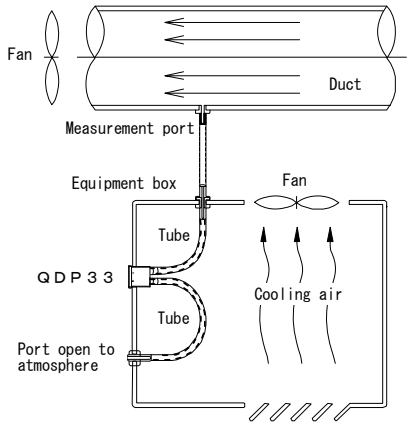
Connect the tubes as shown in the following table according to the pressure to be measured. In case of negative pressure measurement, – (minus) display is possible by turning ON the measurement display sign inversion function.

Measurement pressure		Differential pressure	Gage pressure	
Application		Differential pressure measurement	Positive pressure measurement	Negative pressure measurement
Tubing	High-pressure side pressure port (H)	Measurement pressure (High)	Measurement pressure (Positive pressure)	Open to atmosphere
	Low-pressure side pressure port (L)	Measurement pressure (Low)	Open to atmosphere	Measurement pressure (Negative pressure)
Measurement display sign inversion function		OFF	OFF	ON

⚠ Caution	– When measuring the gage pressure using an instrument with a zero center (+ –) range, connect the tube to the high-pressure side (H) in order to match the polarity of the display sign (+ or –) with that of the actual pressure in the tube. – In case of the zero center (+ –) range, turn OFF the measurement display sign inversion function unless there is a special reason.

⚠ Caution	When opening one connector to the atmosphere, pressure in the panel is applied to the pressure port opened in the panel (equipment box). When the inside of the panel is forcibly air-cooled using a fan, be sure to provide a port open to the atmosphere outside the panel.

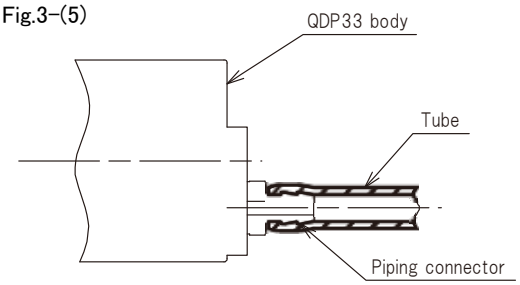
Fig.3-(4)



4-2 Piping material

For tubing material used for piping connectors of this unit, be sure to use tubing material of I.D. 4.
Vinyl or rubber tubes are suitable.
As shown in Fig.3-(5), when inserting the tube into the piping connector, be sure to push it in until the tube hit the bottom of piping connector.

Fig.3-(5)

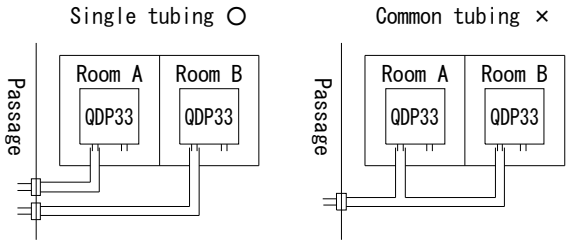


4-3 Cautions for tubing

Prohibition of common tubing

As shown in Fig.3- (5), the tubes between the detector and the instrument should be single tubing for each system, and common tubing with the adjacent system should not be used. When common tubing is used, the pressures of the systems may interfere with each other, and this may result in an error.

Fig.3-(6)



Error due to long distance tubing

When the instrument is used for remote monitoring, the response speed will be low. The intermediate tubes should be as thick as possible. When the tubing conditions of the high-pressure and low-pressure sides differ significantly, the tubing resistances of the high-pressure side and the low-pressure side also differ. This leads to a pressure transmission time difference, and an accurate differential pressure cannot be measured.

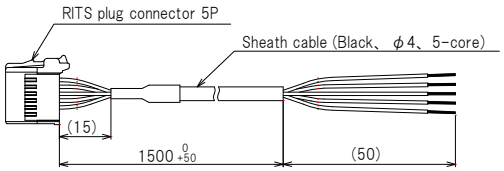
Prevention of tube clogging by drain

When the drain accumulates in the middle of the tubing, a measurement error of the pressure occurs. Therefore, be sure to install the instrument above the pressure extraction port of the pressure detector so that the drain does not accumulate in the slack formed in the tubing.
If it is unavoidable, install a drain tank in the middle of the tubing and clean it periodically. Check if airtightness is maintained securely after cleaning.

5. Cautions before power-on

Before powering on this instrument for the first time after installation, pay attention to the following points.
(1) Check again the installation location, environment, installation method, wiring, and tubing for any errors.
Turning on the power with incorrect wiring or tubing may cause a failure of this instrument or a disaster.
(2) Before turning on the power, check that there is no problem with other devices or the equipment to which this instrument is incorporated even if the comparison circuit of this instrument operates.

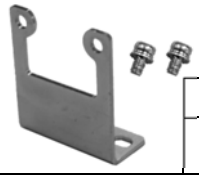
6. Accessory for QDP33

RITS 5P cable with connector				
Product code	Color of cover	Color of Insulator	Number of terminal	
CAB-RITS5-15	Yellow	Brown	①	
		Blue	②	
		Pink	③	
		Black	④	
		White	⑤	

RITS plug connector 5P (TE Connectivity)				
Product code	Color of cover	Applied cable		
		Nominal cross-sectional areas	O.D of the wire cover	
1473562-5	Yellow	0.1～0.5mm^2	1.0～1.15mm	

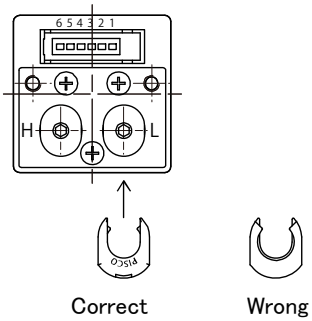
VT connector for vinyl or rubber tube brass-made [installed] (Nihon Pisco Co., Ltd.)	PT connector for plastic tube PBT、NBR brass-made [option] (Nihon Pisco Co., Ltd.)	PR connector for plastic tube PBT、NBR brass-made [option] (Nihon Pisco Co., Ltd.)
 Product code: KGAVT-M5	 Product code: KGAPT-M5	 Product code: KGAPR-M5
This connector can be connected to vinyl or rubber tube (I.D.4).	The joint installed tube is push-in type. Use the optional tube or the applicable tube (JIS B8381-1). Hex wrench (hex.2.5) is needed to install.	The joint installed tube is push-in and rotary elbow type. Applicable piping material is the same as PT connector. Hex wrench (hex.3) is needed to install.

Front panel adaptor 31mm Polypropylene-made [option]	Front panel adaptor 36mm Polypropylene-made [option]	Back panel adaptor Polypropylene-made [option]
 Product code: ADP33-31	 Product code: ADP33-36	 Product code: ADP33-B
Panel cut 31×31mm. This is used with the back panel adaptor when installing the body.	Panel cut 31×31mm. This is used with the back panel adaptor when installing the body.	Panel cut 31×31mm. This is used with the back panel adaptor when installing the body.

Metal bracket set Steel-made [option]	Color cap for PT connector/PR connector Polyacetal-made [option] (Nihon Pisco Co., Ltd.)	
 Product code: BRKT-QDP	 Product code	
	High pressure (red): KGACAPM6-H	Low pressure (blue): KGACAPM6-L
This is used when installing to floor or ceiling surface.	This is used to recognize high and low pressure by its color and to prevent tube from coming out accidentally.	

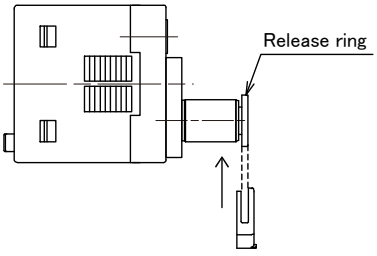
⚠ Caution

- Tighten the connector with a torque of 1.0～1.2 N･m .
  When it is tightened with a torque exceeding the specified value, the instrument meter body and internal thread may be damaged.
- Be sure to install packing to the connector to use it.
- RITS 5P cable with connector is not UL certified product.
- For crimping wire to connector, a specific RITS plug connector (TE Connectivity), product number 1729940-1, must be used.
- For crimping wire to connector, a RITS plug connector must be used.
- RITS plug connector is not compatible to other manufacturer's connector because it is not compliant with the industry standard "e-CON". (The standard "e-CON" is only used in Japan.)
- For further inquiry on the detail of RITS plug connector and the other tools, please contact TE Connectivity directly.
- Direction of color cap for PT connector /PR connector



Correct

Wrong



Be sure to install the color cap to the release ring with the correct direction.

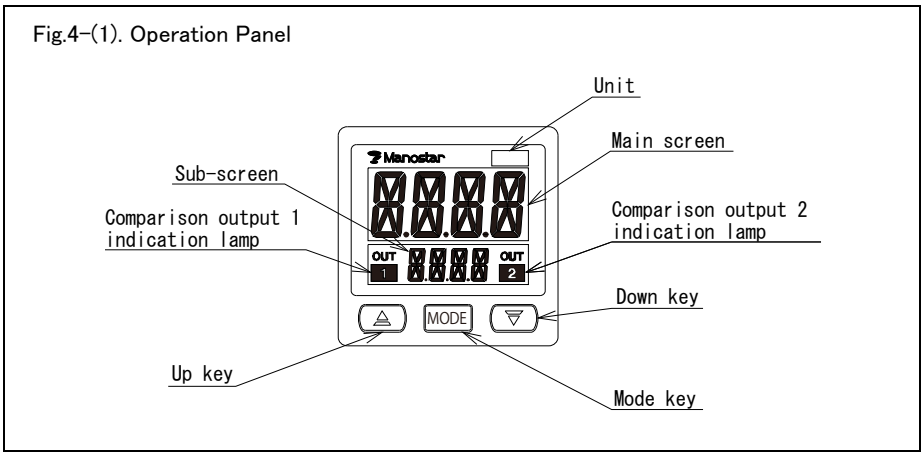
IV. Operation

1. When operating this instrument

Be sure to perform zero adjustment when this instrument is installed for the first time or when the zero point fluctuates. Refer to “2-1 Zero adjustment” on page 16.

2. Operation panel

Fig.4-(1). Operation Panel



3. Operation method

Description of operation switches

MODE Use this key to switch modes.

Use this key to increase the numeric value. Pressing the key continuously increases the value continuously.

Use this key to decrease the numeric value. Pressing the key continuously decreases the value continuously.

1) Operation of setting value

The item name is displayed on the sub-screen, and the current setting value is displayed on the main screen. Use the and keys to change the setting value. Pressing the key at the upper limit value returns the value to the lower limit value and pressing the key at the lower limit value returns the value to the upper limit value. The range in which setting value can be changed varies depending on each mode.

2) Registration of setting value

When the mode is switched with the MODE key, the setting value is registered in memory at the same time, and it is retained even after the power is turned off. Note that the setting value is not registered by just operating the set value, but pressing and holding the MODE key for 2 seconds registers the value at the same time as transition to the pressure display.

* Refer to Fig.4- (2) on page 12 and Fig.4- (3) on page 13 for the order of mode switching.

Fig.4-(2). Mode Switching (1)

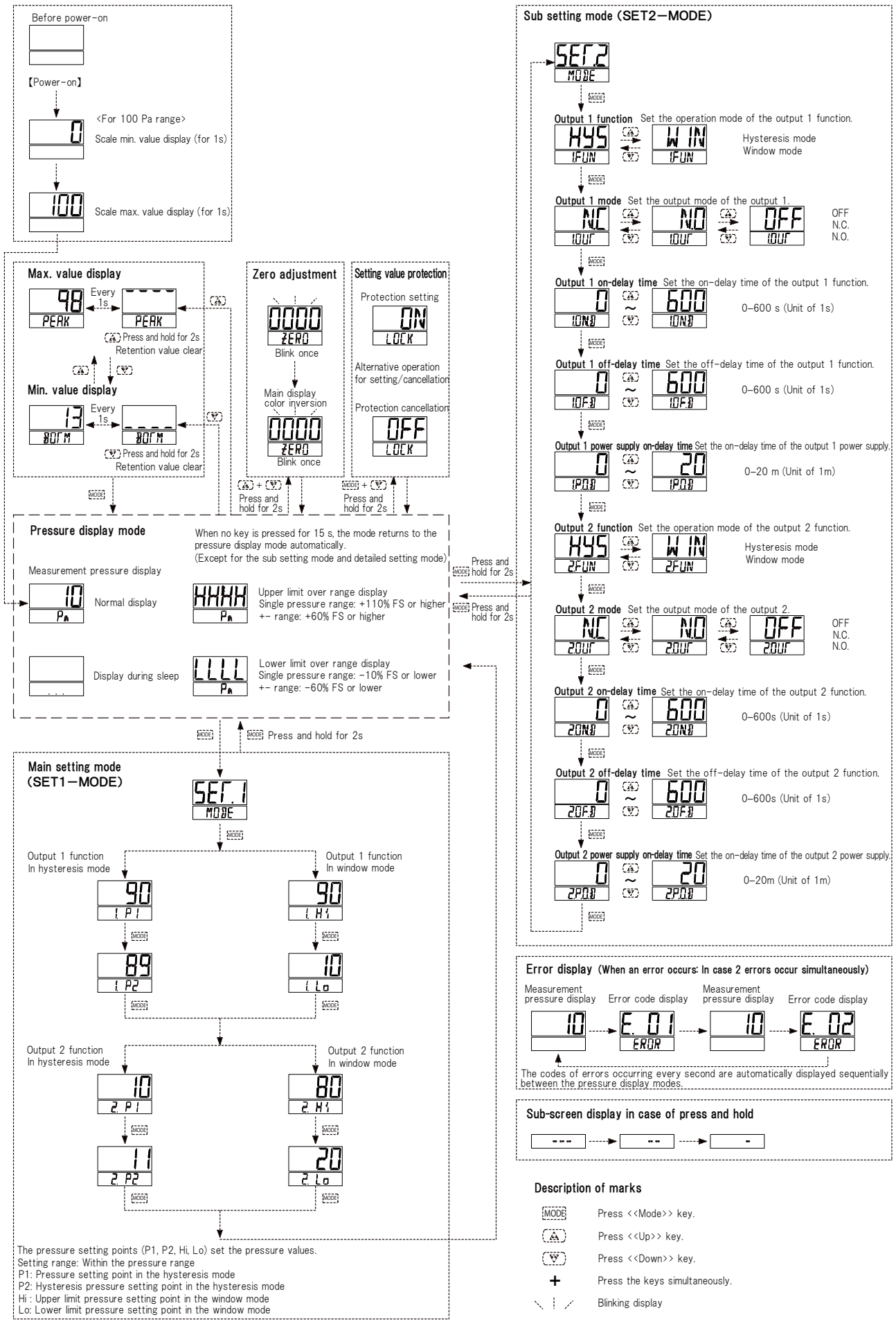
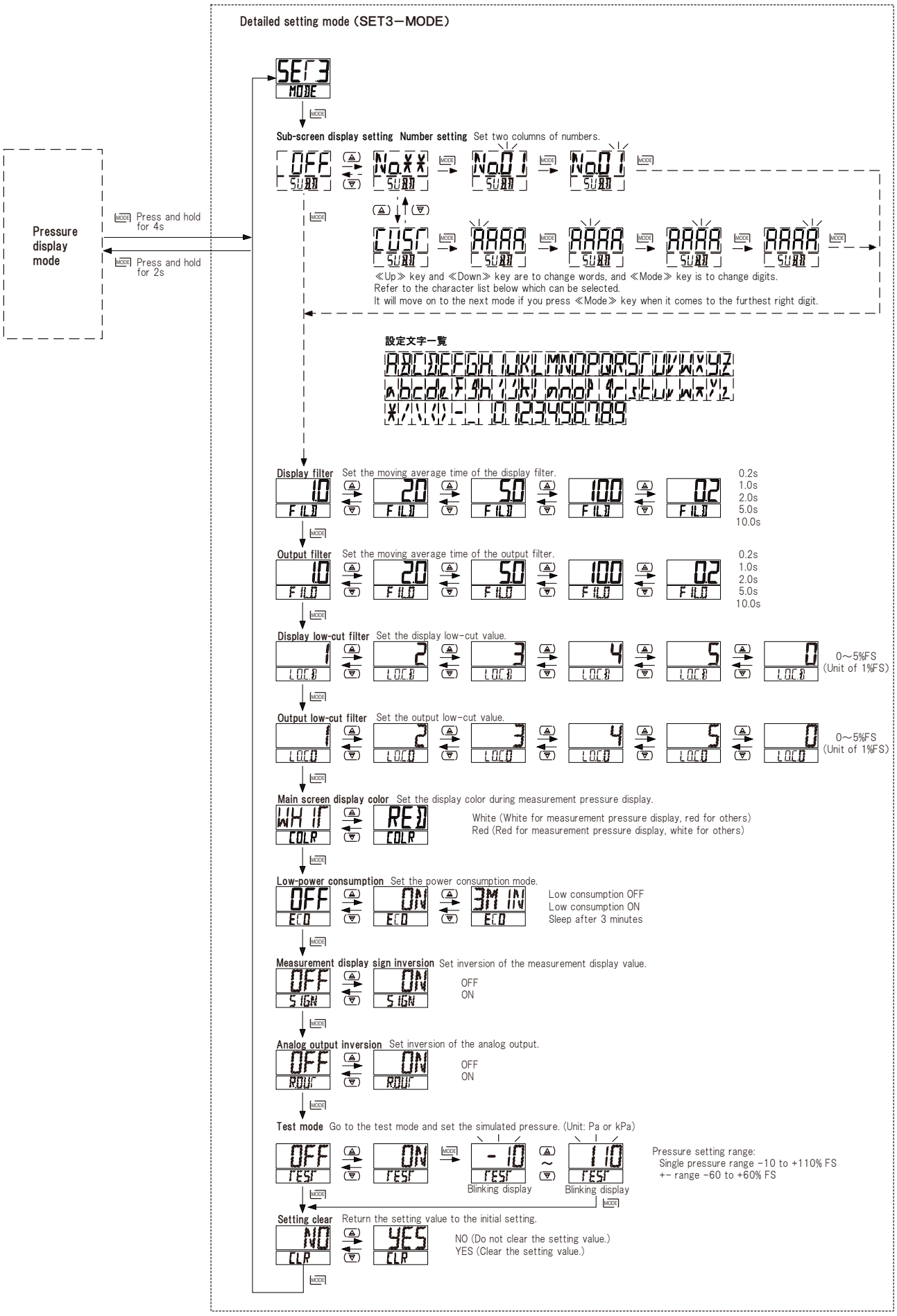


Fig.4-(3). Mode Switching (2)



Mode List

Mode type	Name		Sub-screen	Initial setting			Setting range	Page
				Main screen	Setting value	Unit		
Pressure display	Normal display			10	—	Pa/kPa	—	P. 16
	Upper limit over range display			HHHH	—	Pa/kPa	—	
	Lower limit over range display			LLLL	—	Pa/kPa	—	
	Display during sleep				—	—	—	
Quick setting	Zero adjustment		ZERO	0000	Without zero adjustment	—	−20 to +20% FS	P. 16
	Setting value protection		LOCK	OFF	OFF	—	OFF/ON	
	Max. value display		PEAK	—	—	Pa/kPa	—	P. 17
	Min. value display		BOTM	—	—	Pa/kPa	—	
Main setting	Comparison output 1	Hysteresis mode setting point P1	1.P1	—	Single pressure: 90% FS ±: +40% FS	Pa/kPa	Single pressure: 0 to 100% FS ±: −50 to +50% FS	P. 18
		Hysteresis mode setting point P2	1.P2	—	Single pressure: 89% FS ±: +39% FS	Pa/kPa		
		Window mode setting point Hi	1.Hi	—	Single pressure: 90% FS ±: +40% FS	Pa/kPa		P. 19
		Window mode setting point Lo	1.Lo	—	Single pressure: 10% FS ±: −40% FS	Pa/kPa		
	Comparison output 2	Hysteresis mode setting point P1	2.P1	—	Single pressure: 10% FS ±: −40% FS	Pa/kPa		P. 18
		Hysteresis mode setting point P2	2.P2	—	Single pressure: 11% FS ±: −39% FS	Pa/kPa		
		Window mode setting point Hi	2.Hi	—	Single pressure: 80% FS ±: +30% FS	Pa/kPa		P. 19
		Window mode setting point Lo	2.Lo	—	Single pressure: 20% FS ±: −30% FS	Pa/kPa		
Sub setting	Comparison output 1	Output 1 function	1FUN	HYS	Hysteresis mode	—	HYS/WIN	P. 20
		Output 1 mode *	1OUT	NC	N.C.	—	OFF/N.C./N.O.	
		Output 1 on-delay time	1OND	0	0	Sec.	0 to 600 sec (Unit of 1 sec)	
		Output 1 off-delay time	1OFD	0	0	Sec.		
		Output 1 power supply on-delay time	1POD	0	0	Min.	0 to 20 min (Unit of 1 min)	
	Comparison output 2	Output 2 function	2FUN	HYS	Hysteresis mode	—	HYS/WIN	
		Output 2 mode	2OUT	NC	N.C.	—	OFF/N.C./N.O.	
		Output 2 on-delay time	2OND	0	0	Sec.	0 to 600 sec (Unit of 1 sec)	
		Output 2 off-delay time	2OFD	0	0	Sec.		
		Output 2 power supply on-delay time	2POD	0	0	Min.	0 to 20 min (Unit of 1 min)	
Detailed setting	Sub-screen display	Display setting	SUBD	OFF	OFF	—	OFF/No.**/CUST	P. 21
		Display setting (number)	SUBD	No.01	No.01	—	No.00～No.99	
		Display setting(character)	SUBD	AAAA	AAAA	—	Refer to character list	
	Display filter		FILD	1.0	1.0	Sec.	0.2/1.0/2.0/5.0/10.0 sec	
	Output filter		FILD	1.0	1.0	Sec.		
	Display low-cut		LOCD	1	1	% FS	0 to 5% FS (Unit of 1% FS)	
	Output low-cut		LOCO	1	1	% FS		
	Main screen display color		COLR	WHIT	White	—	WHIT/RED	P. 22
	Low-power consumption		ECO	OFF	OFF	—	OFF/ON/3MIN	
	Measurement display sign inversion		SIGN	OFF	OFF	—	OFF/ON	
	Analog output inversion		AOUT	OFF	OFF	—	OFF/ON	
	Test mode		TEST	—	—	Pa/kPa	Single pressure: −10 to 110% FS ±: −60 to +60% FS	
	Setting clear		CLR	NO	—	—	NO/YES	
Error display			EROR	—	—	—	—	P. 15

*1: All the setting values are set to the initial setting by the setting clear mode.

*2: Refer to the respective page for the description of each mode.

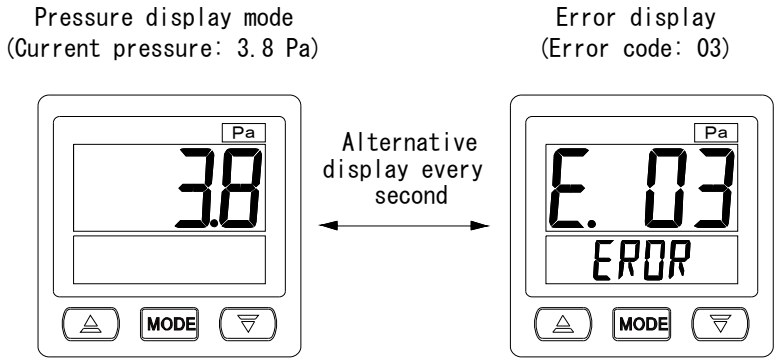
4. When an error occurs

If an error occurs in this instrument, the pressure display mode and the error display mode are switched alternately as shown in Fig.4– (4). When this happens, check the error code.

[Coping procedure]

1) Since the error code is displayed in the lower two digits, record the numeric value. There may be multiple errors occurring.
2) After recording the error code, turn off the power to this instrument.
3) Refer to the error code table below and take the appropriate action.

Fig.4–(4). Example of Error



* When multiple errors occur simultaneously, the numeric values of the error display switch sequentially.

Error Code Table

Error code		Cause	Measure
Display value	E. 01	Overcurrent occurs in comparison output 1	Turn off the power to this instrument, check the external connection of comparison output 1, and check for incorrect wiring or failure of connected devices. Refer to *2.
	E. 02	Overcurrent occurs in comparison output 2	Turn off the power to this instrument, check the external connection of comparison output 2, and check for incorrect wiring or failure of connected devices. Refer to *2.

*1: Please contact us for the error displays “E. XX” other than the above. Let us know the error code and format, pressure range, serial number, and situation.

*2: The overcurrent detection function does not completely protect this instrument. Depending on the condition of the external wiring, the instrument may fail.

V. Description of Modes

1. Pressure display mode

For the operating method of the pressure display mode, refer to "Fig.4-(2) Mode Switching (1)" on page 10.

1-1 Normal display

Pressure display is performed. When the pressure of the H side is higher than that of the L side, the pressure display indicates a positive value.

1-2 Over range display

When a pressure exceeding the rated pressure range is applied, the display pressure becomes "HHHH" to report the over range. When the differential pressure is negative, the display pressure becomes "LLLL".
- Over range pressure
Single pressure range: 110% or higher and -10% or lower of the rated pressure range
Zero center (+ -) range: 60% or higher and -60% or lower of the rated pressure range

※ When sign inversion is on; LLLL: pressure difference is positive, HHHH: pressure difference is negative
Refer to "5-8 Measurement display sign inversion" on page 22.

1-3 Display during sleep

When the setting value in "5-7 Low-power consumption" on page 22 is set to "3MIN", the display goes to sleep after 3 minutes and performs the display during sleep.

2. Quick setting mode

The following items can be executed from the pressure display mode by quick operation.

Quick operation

△ + ▽ : Press and hold for 2 sec.		Zero adjustment
MODE + ▽ : Press and hold for 2 sec.		Setting value protection
△		Max. value display
▽		Min. value display

2-1 Zero adjustment

With the current pressure display value as reference, zero adjustment of the display and analog output is performed automatically. Zero adjustment is possible if the current pressure display value is within the range of -20% FS to 20% FS. When zero adjustment is requested for a value outside the range, "EROR" is displayed on the sub-screen and the operation is ignored.
Since zero adjustment processes internal data with higher accuracy than pressure display, it functions even if the pressure display is "0". Also analog output zero point is automatically corrected at the same time.

[Operation procedure]

1) Open the pressure tubes on the H and L sides to the atmosphere so that no pressure is applied to this instrument.
2) In the pressure display mode, press △ and ▽ keys simultaneously for 2 s or longer. "0000" is displayed on the main screen, and "ZERO" is displayed on the sub screen. The numbers and characters flash twice to inform that zero adjustment is performed.
3) Reinstate the tubes to complete the procedure.

⚠ Caution	- When performing zero adjustment, warm up the instrument for more than 20 minutes after turning on the power. - Perform zero adjustment in the correct installation position. Be sure to apply no pressure on both the H and L sides (open to the atmosphere) or stop the machine to zero the residual pressure before performing zero adjustment. - Be sure to reinstate the tubes after completion of zero adjustment.

2-2 Setting value protection

When the setting value protection is turned ON, the setting value cannot be changed in each setting mode, and setting mistakes due to erroneous operations can be prevented. If the setting value is changed while the protection is ON, "LOCK" is displayed on the main screen, and the operation is ignored.

2-3 Max./min. value display

The max. and min. values of pressure measurement after power-on are displayed.

(▲) Key: Max. value display
(▽) Key: Min. value display

To clear the max. or min. value, press and hold (▲) or (▽) for 2 seconds or longer.

Press and hold (▲) for 2 seconds or longer: Max. value clear
Press and hold (▽) for 2 seconds or longer: Min. value clear

Note that the max./min. values are reset when the power supply of this instrument is cut off.

The max./min. values are always updated immediately after power-on of this instrument, but the min. value is interlocked with "4-4 Power supply on-delay time" on page 20. Therefore, the min. value will be reset automatically when the setting time has elapsed.

⚠ Caution	When the "power supply on-delay times" of the two systems are different, the min. value is reset with the longer setting time.

3. Main setting mode

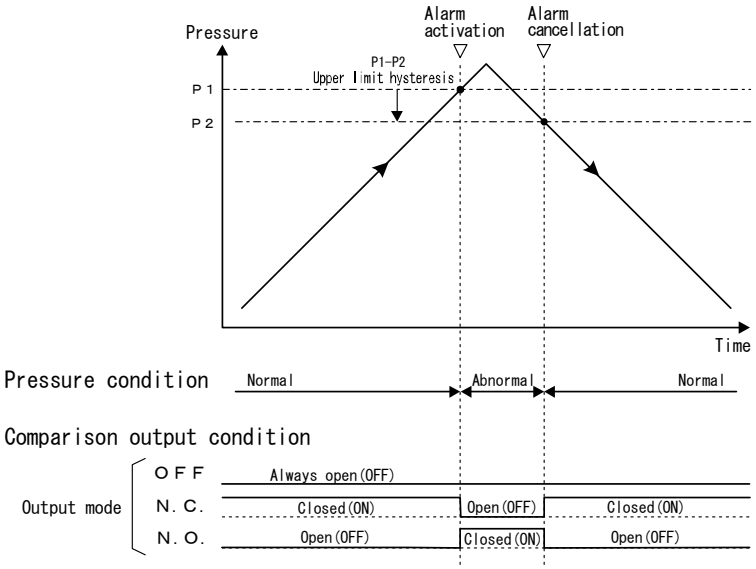
The pressure setting points of each system for comparison output can be set. For the setting method, refer to "3. Operation method" on page 11 and "Fig.4-(2) Mode Switching (1)" on page 12.

3-1 Pressure setting points (P1, P2)

When "4-1 Output function" on page 20 is set to the hysteresis mode, P1 acts as the setting point and P2 acts as the hysteresis setting point.

When P1 > P2, the upper limit alarm operation with the normal region equal to or lower than P1 is performed.

Fig.5-(1). Comparison Function, Hysteresis Mode: Upper Limit Setting (P1 > P2)

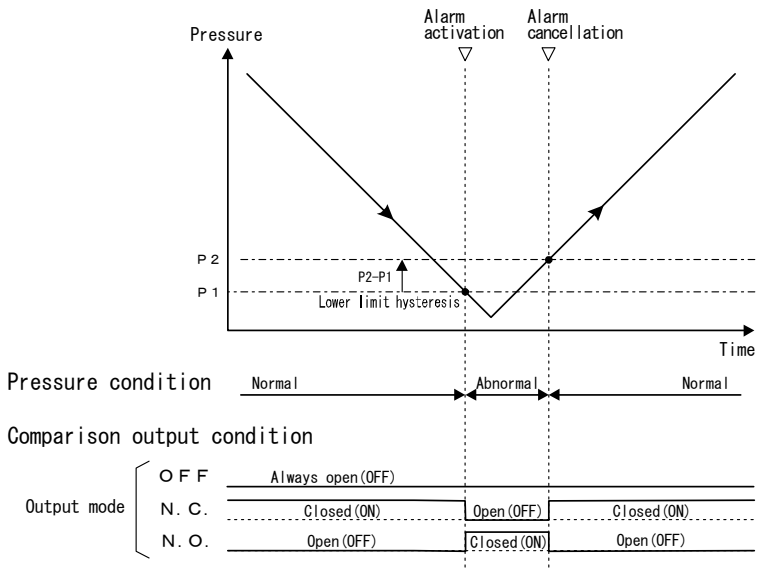


Operation explanation
Abnormal pressure rise is detected to activate the comparison output.
When "4-2 Output mode" on page 20 is set to "N.C.", the output is open (OFF) when the applied pressure exceeds the setting value P1 and the output is closed (ON) when the pressure falls below P2.

Power supply on-delay timer
During timer operation, the comparison output is open (OFF) forcibly. (Refer to "4-4 Power on-delay time" on page 20.)

When P1 < P2, the lower limit alarm operation with the normal region equal to or higher than P1 is performed.

Fig.5-(2). Comparison Function, Hysteresis Mode: Lower Limit Setting (P1 < P2)



Operation explanation
Abnormal pressure drop is detected to activate the comparison output.
When "4-2 Output mode" on page 20 is set to "N.C.", the output is open (OFF) when the applied pressure falls below the setting value P1 and the output is closed (ON) when the pressure exceeds P2.

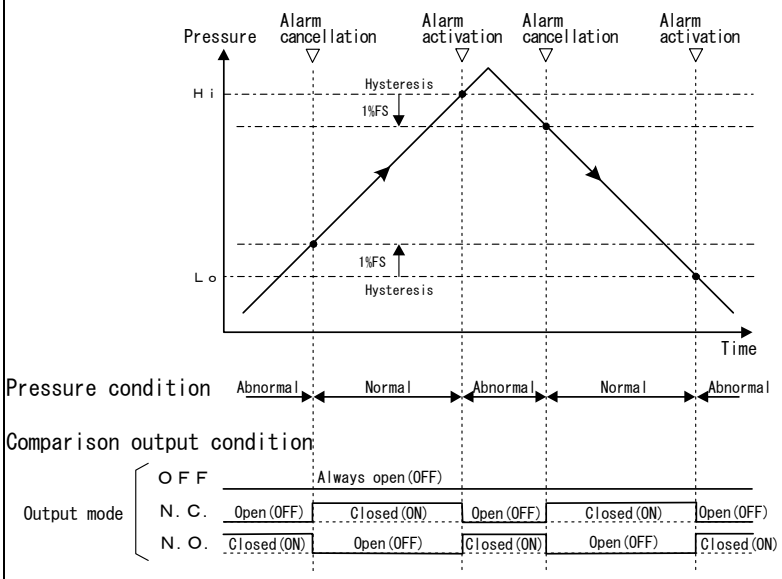
Power supply on-delay timer
During timer operation, the comparison output is open (OFF) forcibly. (Refer to "4-4 Power on-delay time" on page 20.)

3-2 Pressure setting points (Hi, Lo)

When “4-1 Output function” on page 20 is set to the window mode, Hi acts as the upper limit pressure setting point and Lo acts as the lower limit pressure setting point. The comparison operation is performed for the region (window) indicated by the setting points Hi and Lo. The hysteresis of each setting point is fixed 1% FS.

When Hi > Lo, the comparison operation with the normal region where Hi is the upper limit point and Lo is the lower limit point is performed. The hysteresis point is 1% FS inside the region.

Fig.5-(3). Comparison Function, Window Mode: Inside Region (Hi > Lo)



Operation explanation

The comparison operation is performed for the range (window) of the set pressure region (Lo to Hi).

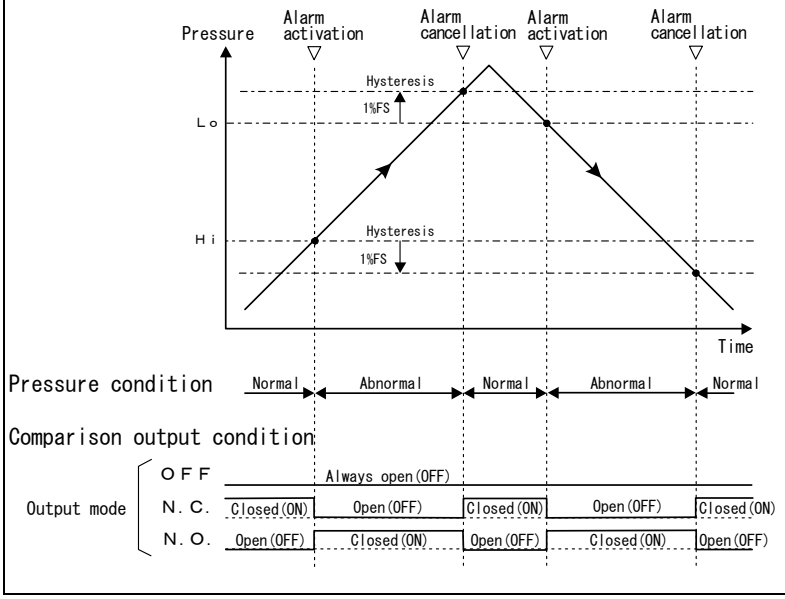
When “4-2 Output mode” on page 20 is set to “N.C.”, The output is closed (ON) when the applied pressure is within the range (window) and the output is open (OFF) when the pressure is outside the range.

Power supply on-delay timer

During timer operation, the comparison output is open (OFF) forcibly. (Refer to “4-4 Power on-delay time” on page 20.)

When Hi < Lo, the comparison operation with the abnormal region where Lo is the upper limit point and Hi is the lower limit point is performed. The hysteresis point is 1% FS outside the region.

Fig.5-(4). Comparison Function, Window Mode: Outside Region (Hi < Lo)



Operation explanation

The comparison operation is performed for the range (window) of the set pressure region (Lo to Hi).

When “4-2 Output mode” on page 20 is set to “N.C.”, the output is open (OFF) when the applied pressure is within the range (window) and the output is closed (ON) when the pressure is outside the range.

Power supply on-delay timer

During timer operation, the comparison output is open (OFF) forcibly. (Refer to “4-4 Power on-delay time” on page 20.)

4. Sub setting mode

The functions of each system for comparison output can be set. For the setting method, refer to “3. Operation method” on page 11 and “Fig.4-(2) Mode Switching (1)” on page 12.

4-1 Output function

The output function of the comparison output can be set. Select the output function from the following operation modes.

Main screen display	Operation mode	Description of operation
HYS	Hysteresis mode	The function is activated by the comparison pressure setting points P1 and P2. Set this mode when using them as the upper and lower limit alarms.
WIN	Window mode	The function is activated by the comparison pressure setting points Hi and Lo. It acts as a window comparator in the pressure region indicated by the setting points Hi and Lo.

4-2 Output mode

The output mode of the comparison output can be set.

Main screen display	Output mode	Open collector output circuit
OFF	Always OFF	Always Open (OFF)
N.C	Normal ON	Normal Close
N.O	Normal OFF	Normal Open

4-3 On-delay/off-delay time

When the on-delay/off-delay time is set, the operation of the comparison output transistor according to the internal comparison result is delayed.

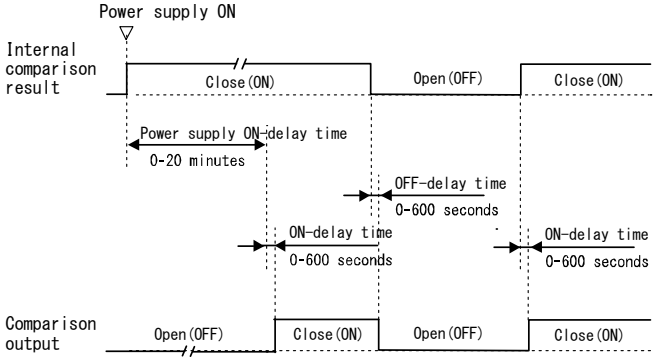
On-delay time: The time to delay ON (close) of the comparison output transistor
Off-delay time: The time to delay OFF (open) of the comparison output transistor

When the set delay time has elapsed with the internal comparison result (ON or OFF) retained, the comparison output transistor is turned ON or OFF. Conversely, when the internal comparison result is not retained during the delay time, the result becomes invalid.
The delay time is set regardless of the setting state of the output mode (N.C. or N.O.). When the delay is not necessary, set the setting value to “0” (0 sec). Refer to Fig.5-(5).

4-4 Power supply on-delay time

When the power supply on-delay time is set, the comparison output transistor is turned OFF forcibly until the specified time has elapsed with the delay timer that starts immediately after power-on of this instrument. By using this function, it is possible to prevent the comparison output from operating so as not to perform abnormal output until the specified pressure is reached from power-on.
Note that, when the normal operation is required immediately after power-on, set the setting value of the delay timer to “0” (0 min.). Refer to Fig.5-(5).

Fig.5-(5). Comparison Output Delay (ON/OFF, Power Supply ON)



Operation explanation
Regardless of the setting for “4-2 Output mode” on page 20 (N.C. or N.O.), the timing of closed/open (ON/OFF) of the output transistor is delayed by the delay setting time.

Power supply on-delay timer
During timer operation, the comparison output is open (OFF) forcibly.

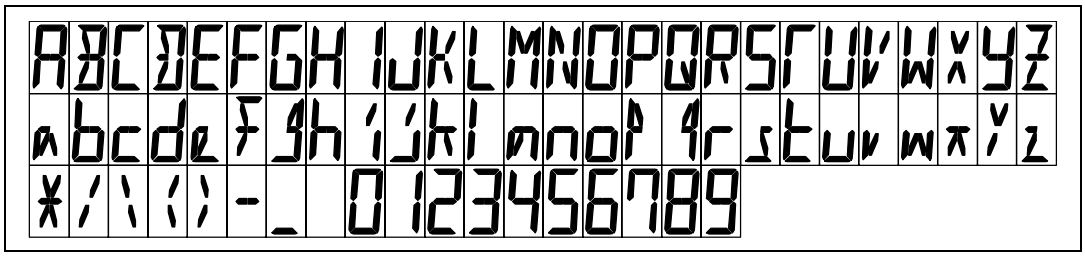
5. Detailed setting mode

Display and output can be set in detail. For the setting method, refer to “3. Operation method” on page 11 and “Fig.4-(3) Mode Switching (2)” on page 13.

5-1 Sub-screen display setting

Display contents of the sub-screen can be set while the measurement pressure is displayed. Numbers (No.00～No.99) or any characters can be selected in the sub-screen. Refer to the following numbers, alphabets and characters which can be selected.

Character list



5-2 Display filter

The display filter performs moving average processing. When the fluctuation of the measurement pressure is large, the fluctuation of the display value can be reduced by increasing the moving average time, but the response becomes slow.

Main screen display	Moving average time	Number of moving average
0.2	High speed (0.2s)	10
1.0	Standard (1.0s)	50
2.0	Low speed 1 (2.0s)	100
5.0	Low speed 2 (5.0s)	250
10.0	Low speed 3 (10.0s)	500

5-3 Output filter

The output filter performs moving average processing. When the fluctuation of the measurement pressure is large, the fluctuation of the output value can be reduced by increasing the moving average time, but the response becomes slow. The comparison outputs 1 and 2 and the analog output share the output filter.

Main screen display	Moving average time	Number of moving average
0.2	High speed (0.2s)	10
1.0	Standard (1.0s)	50
2.0	Low speed 1 (2.0s)	100
5.0	Low speed 2 (5.0s)	250
10.0	Low speed 3 (10.0s)	500

5-4 Display low-cut

When the pressure display value is equal to or less than the setting value, the display value is forcibly set to zero. When the setting value is set to 2 (2% FS), the value less than ± 2% FS is displayed as zero. When this function is not used, set the setting value to 0 (0% FS).

5-5 Output low-cut

When the analog output value is equal to or less than the setting value, the output value is forcibly set to zero. When this function is not used, set the setting value to 0 (0% FS).

5-6 Main screen display color

The main screen display color during measurement pressure display can be selected. For the display other than the measured pressure display, it is displayed in the reverse color.

Main screen display	Main screen display color
WHIT	White for measurement pressure display, red for others
RED	Red for measurement pressure display, white for others

5-7 Low-power consumption

The display brightness of the LCD can be changed to reduce power consumption. Other functions are not affected. When the setting value is set to “ON”, the brightness of the LCD is reduced. When the setting value is set to “3MIN”, the LCD goes to sleep after 3 minutes.

5-8 Measurement display sign inversion

The signs of the display values of the pressure display and max./min. value displays are inverted to display the values. The comparison output, analog output, and other functions are not affected. This function is used to invert the sign in negative pressure measurement. For the application of this function, refer to “4-1 Measurement pressure and tube connection” on page 8.

5-9 Analog output inversion

Although the analog output value usually rises when the differential pressure under measurement rises, the reverse action is realized by turning ON the analog output inversion function.

Main screen display	Analog output
OFF	Normal (When differential pressure rises: 4 → 20 mA)
ON	Inverted (When differential pressure rises: 20 → 4 mA)

5-10 Test mode

You can check whether the parameter setting is set correctly at the time of instrument installation or inspection. The pressure set in this mode acts as the simulated applied pressure even if the pressure is not actually applied. This function is used when checking the operation of the comparison output and analog output by changing the simulated applied pressure.

Immediately after transition to test mode, the pressure value just before the transition is automatically set to the simulated applied pressure. When the power supply of this product is cut off, the simulated setting pressure value is not saved. Additionally, the display value of the simulated setting pressure flashes during the test mode.

[Operation in test mode]

Immediately after transition to the test mode, the measurement pressure value just before the transition is set to the simulated pressure value and the instrument is in the immediate test mode. The immediate setting value becomes valid by increasing or decreasing of the setting value using the △ or ▽ key.

5-11 Setting value clear

The setting value of each mode can be restored to the initial setting. However, note that it is cleared once, the content set in each mode cannot be restored. For the initial setting, refer to the “Mode List” on page 14.

VI. Periodic Calibration

Generally, in order to keep the life and reliability of an instrument for a long time, it is important not to stress the instrument due to external factors. No special maintenance is required for this instrument when it is used properly according to this instruction manual. However, we recommend periodic calibration once a year. For periodic calibration, please contact your distributor or us.

VII. Product Warranty

Warranty period

The warranty period of this product shall be one year after delivery to the designated place of the ordering party with direct dealing with us.

Warranty scope

If any failure or defect due to our responsibility becomes clear during the warranty period described above, we shall repair the product or supply a replacement free of charge. However, even within the warranty period, if the failure or defect falls under the following, we shall exclude it from the scope of this warranty.

(1) When the failure or defect is due to unreasonable conditions, environment, handling, usage method other than those described in the instruction manual, specifications, our product catalog, etc.

(2) When the cause of the failure or defect is due to any reason other than our product

(3) When the failure or defect is due to modification or repair by other than us

(4) When the failure or defect is due to any reason that could not be foreseen with the scientific/technical level at the time of shipment by us

(5) When the failure or defect is due to any other external factor, such as a natural disaster or casualty, which is not our responsibility

In addition, the warranty mentioned here means the warranty for our product alone, therefore any damage induced by the failure or defect of the product shall not be covered by this warranty.

* This product warranty is only valid within Japan.

Applicable application

Our products are designed and manufactured as general-purpose products for general industries.
Therefore, uses in the following applications are not intended and shall be exempted from the applicable applications.

(1) Equipment expected to have a great impact on human life and/or property, such as nuclear power generation, aviation, railway, ship, vehicle, and medical device

(2) Utilities such as electricity, gas, and water services

(3) Outdoor use, and equivalent uses in conditions/environments equivalent not specified in the instruction manual

(4) Applications equivalent to (1) and (2) described above that require sophisticated considerations and attentions regarding safety

VIII. Service

Scope of service

Since the service fees such as dispatching engineer etc. are not included in the price of the product, we shall separately charge the fees in the following cases.

1) Installation adjustment guidance and commissioning witnessing
2) Maintenance/inspection, adjustment and repair
3) Technical guidance and technical education
4) Witness inspection of the product at our factory

<Notice>

Please understand beforehand that the specifications and contents of the product described in this instruction manual may be changed for improvements without notice.