

Environment Resisting Type Digital Pressure Sensor AP-V80W Series Instruction Manual



SAFETY PRECAUTIONS

- Danger** Failure to follow instructions may lead to death or serious injury.
- Warning** Failure to follow instructions may lead to injury.
- Caution** Failure to follow instructions may lead to product damage (product malfunctions, etc.).

Danger

- Do not use the AP-V80 Series out of the specification ranges. Comply with the contents described in this instruction manual when using the product.
- Do not use the AP-V80 Series for applications that require safety, such as nuclear, railroad, aircraft, vehicle, or playground equipment.
- Do not modify the AP-V80 Series.
- The AP-V80 Series is not designed to sanitary specifications. Confirm the sanitation standards required for facilities.
- The AP-V80 Series is not designed to explosion-proof specifications. Do not use the product in an environment with flammable gas or something similar.

Operating Environments

Caution

- Use the AP-V80 Series within the withstanding pressure range.
- Use the AP-V80 Series within the detectable pressure range.

Handling

Caution

- Do not drop the AP-V80 Series, bang it against something, or apply excessive force. Handle the product by holding its body.
- Do not pull heavily on the cable.
- Do not use a sharply pointed object to press the setting keys.

Wiring

Danger

- Before wiring the AP-V80 Series, check the color of the wires.
- Use the AP-V80 Series within the rated range. Do not use a load that exceeds the allowable limit.

Caution

- Use an insulated stabilizing supply for the power supply.
- Do not apply excessive tensile force to the cable.
- Ensure that the cable tip does not soak in water during wiring work.
- Isolate the cable from power supply lines or power lines.
- Isolate the cable as far as possible from any source of noise.

Installation of Sensor Head

Caution

- Pressure ports differ depending on the models as follows.
 - AP-10S, 11S, 12S, 13S:R(PT) 1/8 male screws
 - 14S, 15S, 16S:R(PT) 1/4 male screws
 - AP-10SK, 11SK, 12SK, 13SK:NPT 1/8 male screws
 - 14SK, 15SK, 16SK:NPT 1/4 male screws
- Attach a sealing tape around the male threaded block in order to prevent leakage.
- Tightening torques are shown below.

AP-10S(K), 11S(K), 12S(K), 13S(K)	20 N·m or less
AP-14S(K), 15S(K), 16S(K)	60 N·m or less

- Be careful in using the sensor head in the environment where there is much noise, though the sensor head is earthed to its case via a condenser.

Connection

Caution

- When using a commercially available switching regulator, be sure to ground the frame ground terminals.
- Isolate the sensor's wiring from power lines or high-voltage lines; otherwise, the sensor may malfunction due to noise interference.

Others

Caution

- About a second after turning on the power is the power-on reset time. Note that no output is made during this period.
- Do not use the AP-80 Series for the detection of corrosive gases or liquid.
- Normal function cannot be achieved if the combination between the sensor head and the amplifier does not match.
- Correct detection cannot be performed if the hole for the pressure tube on the back is blocked.
- The AP-V80 Series is not designed to explosion-proof construction. Do not use the product for detecting the flammable gasses or liquids.
- The AP-V80 Series is not designed to sanitary specifications.
- Be careful with the surge pressure when detecting the liquid pressure or the fluid containing liquid.

Caution

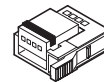
Connecting the sensor head other than the one specific to the AP-V80W Series may cause product breakdown. Be sure that the head type is AP-1xS(K) before connecting it.

ACCESSORIES

■ Sensor head

AP-10S(K) to AP-16S(K) (common)

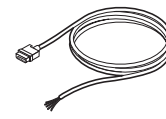
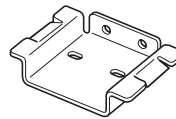
- Spare connector: 1



■ Amplifier

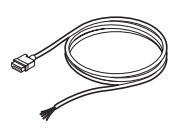
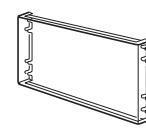
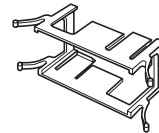
AP-V80W (P), AP-V82W (P) (DIN type)

- Mounting bracket: 1
- Power cable (2 m): 1
- Instruction Manual: 1
- Unit sticker: 1



AP-V85W (P), AP-V87W (P) (Panel type)

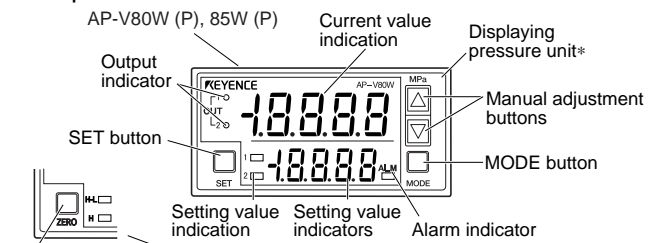
- Panel mounting bracket: 1
- Front protection cover: 1
- Power cable (2 m): 1



- Instruction Manual: 1
- Unit sticker: 1

PART NAMES AND FUNCTIONS

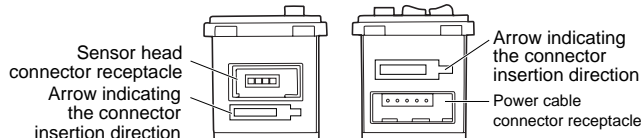
Amplifier



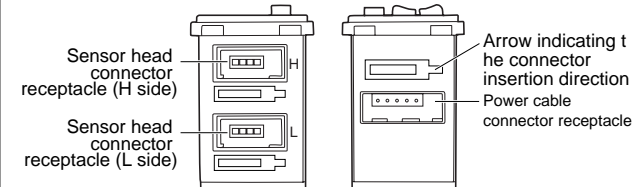
This part of AP-V82W (P) and 87W (P) is different from that of AP-V80W (P) and 85W (P).

- When "PA" is selected as unit, be sure to attach the supplied unit sticker "kPa" on AP-10S(K) to 12S(K).
- When "PA" is selected as unit and AP-13S(K) is operated in high-resolution mode, attach the supplied unit sticker "kPa".

Standard amplifier (AP-V80W (P) and 85W (P))



Differential pressure amplifier (AP-V82W (P) and 87W (P))

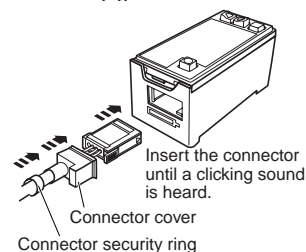


CONNECTING THE SENSOR HEAD CABLE AND POWER CABLE TO THE AMPLIFIER

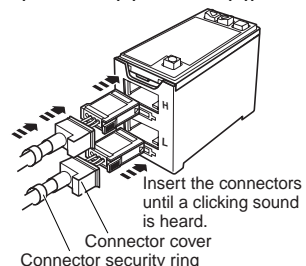
Sensor head cable

Connect the sensor head cable to the left side of the amplifier as shown. Insert the connector in the direction as shown by the arrow indicating the connector insertion direction.

Standard amplifier (AP-V80W (P) and 85W (P))



Differential pressure amplifier (AP-V82W (P) and 87W (P))



- Note**
- Use the sensor heads of the same type in the H side and the L side.
 - Install the H-side sensor on the high-pressure side and the L-side sensor on the low-pressure side.

* AP-10S(K) (compound pressure), AP-11S(K) (negative pressure): The higher negative pressure side is the H side, and the lower is the L side.

Note Insert the sensor head cable securely into the deep end of the connector. If incompletely inserted, the connector can be easily disconnected.

If the cable is cut into a shorter length, install the connector as follows:

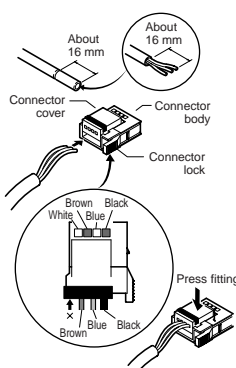
- 1 Cut the cable to an appropriate length and strip away about 16 mm of the outermost insulation.

Note It is not necessary to remove insulation from the core wires.

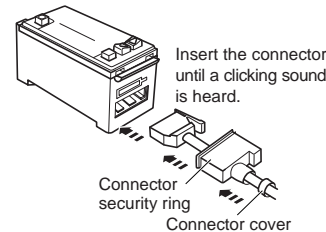
- 2 Insert the cables after aligning them with the colors on the seal on top of the connector body.

- 3 Press together the body and the connector cover into which the cables were inserted to make a connection. (Use a pair of pliers or similar tool to press them together.)

- * Do not make any connection to the white connection point.
- Never re-use the sensor head connector that has been once press fitted.



Power cable



Connect the power cable to the right side of the amplifier. Insert the connector in the direction as shown by the arrow indicating the connector insertion direction.

Note Insert the power cable securely into the deep end of the connector. If incompletely inserted, the connector can be easily disconnected.

* Connector cover

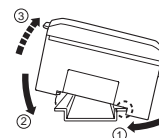
The sensor head cable, relay cable and power cable are equipped with the connectors respectively. After the connectors are inserted into the amplifier, lay the connector covers over the connectors. Finally, lock the root of the connector covers with the connector security rings.

INSTALLATION OF AMPLIFIER

AP-V80W (P) and 82W (P)

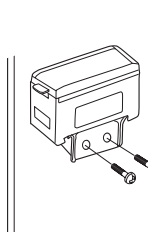
Mounting to a DIN rail

- 1 Align the claw at the bottom of the main body with the DIN rail. While pushing the main body in the direction of the arrow 1, slant it in the direction of the arrow 2.
- 2 To dismount the sensor, raise the main body in the direction of the arrow 3 while pushing the main body in the direction of the arrow 1.

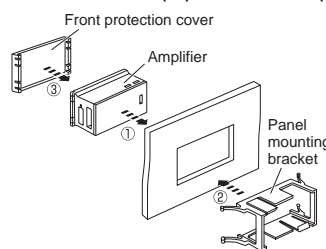


Mounting to a mounting bracket

Mount the sensor using the mounting bracket supplied as shown.



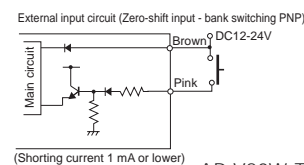
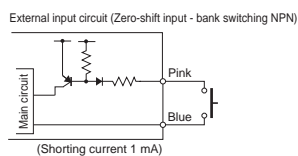
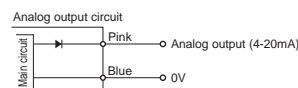
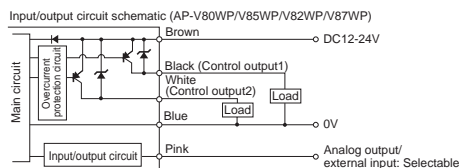
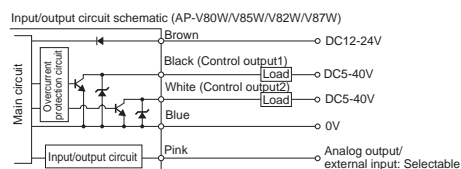
AP-V85W (P) and 87W (P)



- 1 Install the amplifier main body into the hole on the panel from the rear.
- 2 Face the panel mounting bracket in the direction as shown in the illustration, and mount the panel mounting bracket on the amplifier main body from the rear.
- 3 Install the front protection cover in the amplifier main body.

* To dismount the panel mounting bracket, insert the flat-head (-) screwdriver tip into the claw of the panel mounting bracket and dismount it.

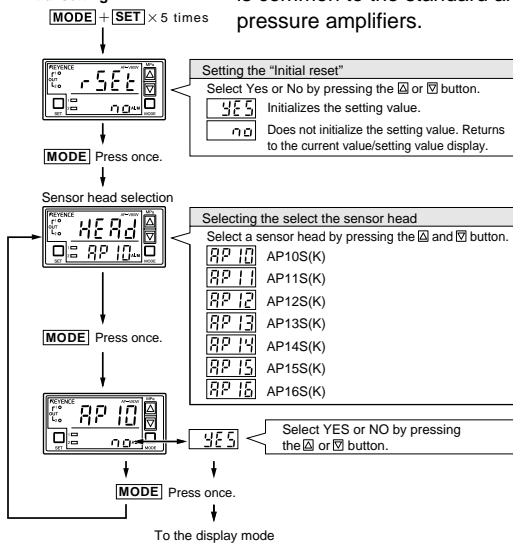
INPUT/OUTPUT CIRCUIT SCHEMATIC



SENSOR HEAD SELECTION

The sensor head selection screen appears only once when the power is turned on for the first time at the default state or after the initial reset.

- Initial setting
- * The operation of the sensor head selection is common to the standard and differential pressure amplifiers.



Note If you change the already selected sensor head to a different type, be sure to perform initial setting before setting the sensor head type to use.

DEFAULT MODE SETTINGS (INITIALIZATION)

Default settings when shipped from the factory

Detection mode	Func	F-1 General-purpose mode
High resolution mode	rESo	oFF
Output form	out	nono
Analog output mode	io	ShFt
Responsiveness (chattering prevention)	SPEd	5
Hysteresis setting	HYS	0.5% of F.S.
Hold mode	HoLd	HoLd
Eco mode	Eco	oFF

- How to reset to the default settings (Initial reset)

- 1 Press the [MODE] + [SET] buttons five times. "rSt/no" is displayed. Returns to the current value/setting value display the next time the MODE button is pressed.



- 2 Press the Δ button. The display changes to "rSt/YES".



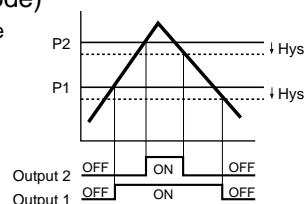
- 3 Press the [MODE] button to reset to the default settings, and the screen returns to the head selection screen.

DETECTION MODE OF STANDARD AMPLIFIERS AP-V80W (P) AND 85W (P)

The hysteresis margin is changeable in all detection modes. Perform the desired change in the mode setting.

■F-1 (General-purpose mode)

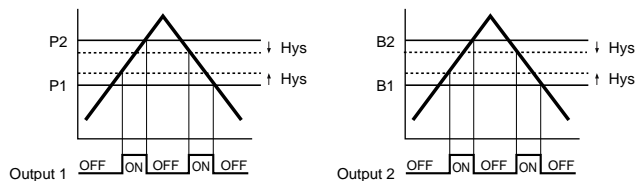
This is a mode where the pressure detection point can be specified at desired two points.



Output 1	Turns on when the pressure exceeds the setting value P1. It turns off if the hysteresis margin is subtracted from the setting value P1.
Output 2	Turns on when the pressure exceeds the setting value P2. It turns off if the hysteresis margin is subtracted from the setting value P2.

■F-2 (Double window mode)

This mode is used to judge whether the pressure value is within the range between the upper limit and lower limit values at the detection point.



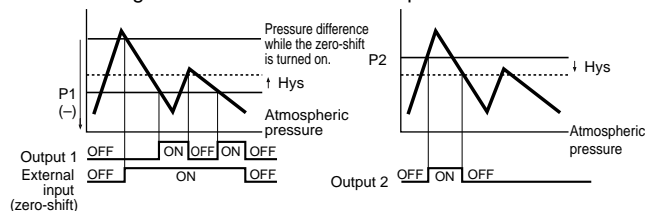
Output 1	Turns on within the range between the setting value P1 (lower limit value) and the setting value P2 (upper limit value). Turns off when the pressure is out of the range.
Output 2	Turns on within the range between the setting value B1 (lower limit value) and the setting value B2 (upper limit value). Turns off when the pressure is out of the range.

- * Set the values with the following condition: P1 (lower limit value) < P2 (upper limit value) < B1 (lower limit value) < B2 (upper limit value). Detection is not possible when it is set backward. The hysteresis faces inward of the range.

■F-3 (Leakage test specific mode)

This is a mode suitable for a leakage test.

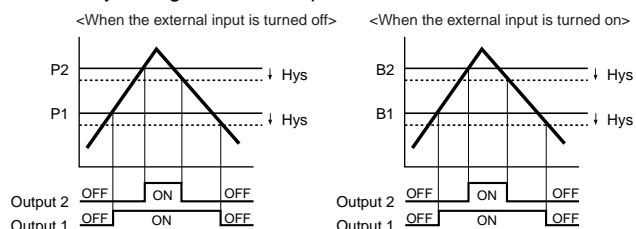
The pressure during the zero-shift input is displayed as zero in the current setting value while the zero-shift input is turned on.



Output 1	This is used for detecting a leakage pressure. It turns on when the pressure value goes lower than the setting value P1. It is valid only when the zero-shift is turned on. Set the setting value of P1 as follows according to the pressure during leakage. • Pressure lowers → Set the negative value. • Pressure goes higher → Set the positive value.
Output 2	This is used for detecting a filling pressure. It turns on when the pressure value exceeds the setting value P2. However, the pressure value at this time is detected without being influenced by the display shift (0) caused by the zero-shift input. * The reference value of P2 is always an air-released value regardless of zero-shift.

■F-4 (Bank switching mode)

This is a mode where the pressure detection point can be specified at desired two points as in the F-1 mode. The detection points can be switched by turning the external input on or off.



Output 1 (When the external input is turned off)	Turns on when the pressure exceeds the setting value P1. It turns off if the hysteresis margin is subtracted from the setting value P1.
Output 2 (When the external input is turned off)	Turns on when the pressure exceeds the setting value P2. It turns off if the hysteresis margin is subtracted from the setting value P2.
Output 1 (When the external input is turned on)	Turns on when the pressure exceeds the setting value B1. It turns off if the hysteresis margin is subtracted from the setting value B1.
Output 2 (When the external input is turned on)	Turns on when the pressure exceeds the setting value B2. It turns off if the hysteresis margin is subtracted from the setting value B2.

DETECTION MODE OF DIFFERENTIAL AMPLIFIERS AP-V82W (P) AND 87W (P)

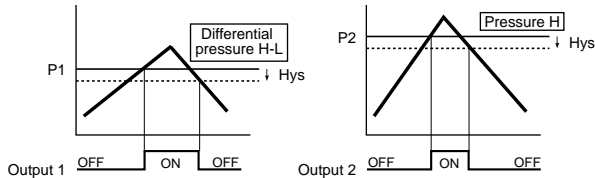
The hysteresis margin is changeable in all detection modes. Perform the desired change in the mode setting. The sensor inserted in the H side detects the higher pressure, and the one inserted in the L side detects the lower pressure. The pressure value in the H side is described as H, and the one in the L side is described as L.

* AP-10S(K) (compound pressure), AP-11S(K) (negative pressure):

The higher negative pressure side is the H side, and the lower is the L side.

F-1 (General-purpose mode)

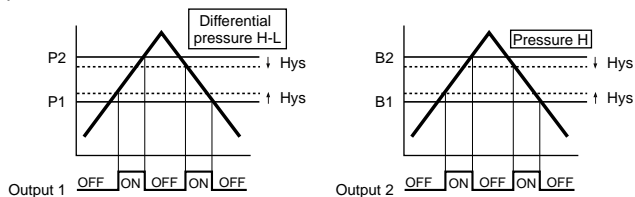
This is a mode where the pressure detection point can be specified at desired two points. The hysteresis margin is changeable in all modes setting.



Output 1	Detects the difference between the pressure value of the sensor inserted in the H (higher pressure value) side and the one inserted in the L (lower pressure value) side. It turns on when the pressure difference (H-L) exceeds the setting value P1.
Output 2	Detects the pressure value of the H (higher pressure value) side. It turns on when the pressure value exceeds the setting value P2.

F-2 (Double window mode)

This mode is used to judge whether the pressure value is within the range between the upper limit and lower limit values at the detection point.



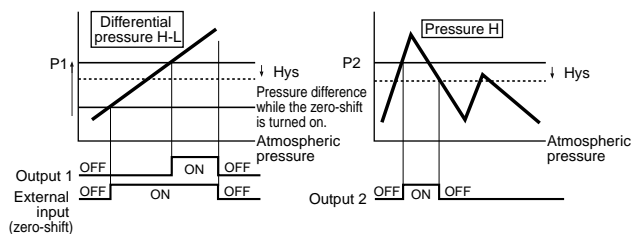
Output 1	Used for detecting the pressure difference (H-L). It turns on when the pressure difference is within the range between the setting value P1 (lower limit value) and the setting value P2 (upper limit value). It turns off when the pressure difference is out of the range.
Output 2	Detects the pressure value of the H (higher pressure value) side. It turns on within the range between the setting value B1 (lower limit value) and the setting value B2 (upper limit value). It turns off when the pressure value is out of the range.

* Set the values with the following condition: P1 (lower limit value) < P2 (upper limit value) < B1 (lower limit value) < B2 (upper limit value).

Detection is not possible when it is set backward. The hysteresis faces inward of the range.

F-3 (Leakage test specific mode)

This is a mode suitable for a leakage test using a master workpiece. The pressure difference during the zero-shift input is displayed as zero in the current setting value while the zero-shift input is turned on.

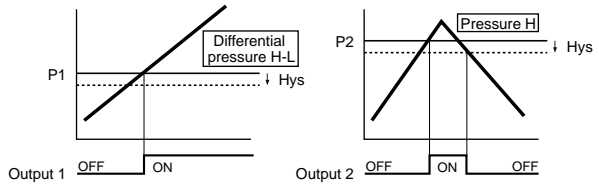


Output 1	This is used for detecting a pressure difference (H-L). It turns on when the pressure difference (H-L) goes lower than the setting value P1. It is valid only when the zero-shift is turned on. Set the setting value of P1 as follows according to the pressure during leakage. <ul style="list-style-type: none"> • Pressure lowers → Set the negative value. • Pressure goes higher → Set the positive value.
Output 2	Detects the pressure value of the H (higher pressure value) side. It turns on when the pressure value exceeds the setting value P2. However, the pressure value at this time is detected without being influenced by the display shift (0) caused by the zero-shift input. *P2 is always the atmospheric pressure reference value irrespective of the zero-shift.

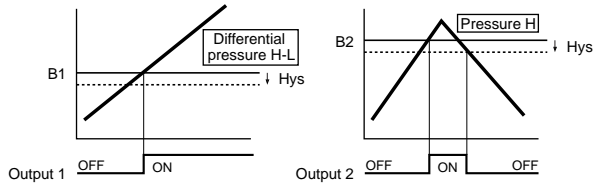
F-4 (Bank switching mode)

The two sets of pressure detection point can be specified at desired two points as in the F-1 mode. The detection points can be switched by turning the external input on or off.

<When the external input is turned off>



<When the external input is turned on>

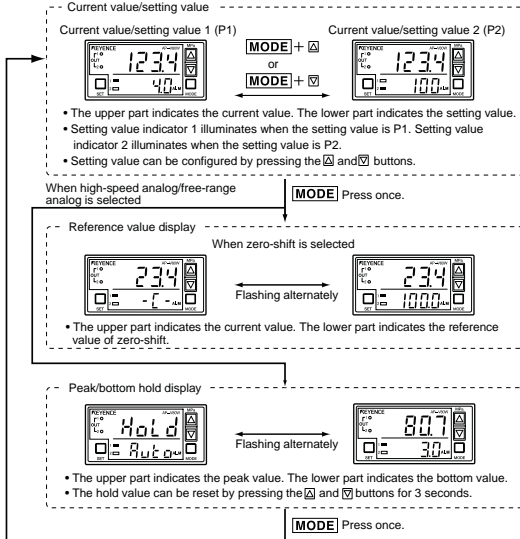


Output 1 (When the external input is turned off)	This is used for detecting a pressure difference (H-L). It turns on when the pressure difference (H-L) exceeds the setting value P1.
Output 2 (When the external input is turned off)	Detects the pressure value of H (higher pressure value) side. It turns on if the value exceeds the setting value P2.
Output 1 (When the external input is turned on)	This is used for detecting a pressure difference (H-L). It turns on when the pressure difference (H-L) exceeds the setting value B1.
Output 2 (When the external input is turned on)	Detects the pressure value of H (higher pressure value) side. It turns on if the value exceeds the setting value B2.

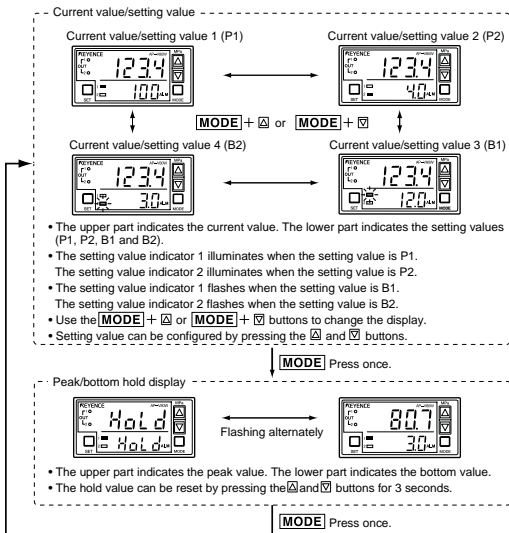
SETTING THE STANDARD AMPLIFIER

Switching the displays (display mode)/changing the setting value

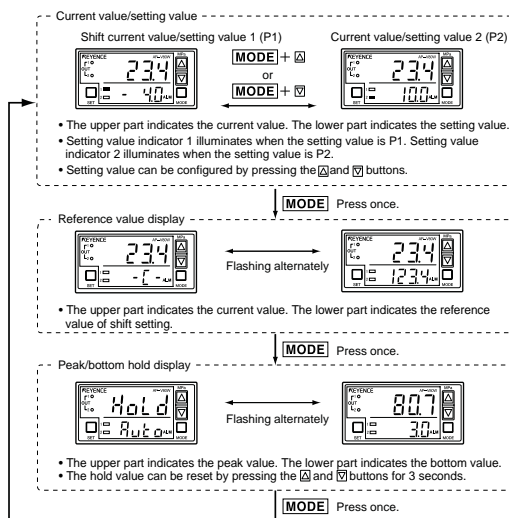
When F1 mode is selected.



When F-2/F-4 mode is selected



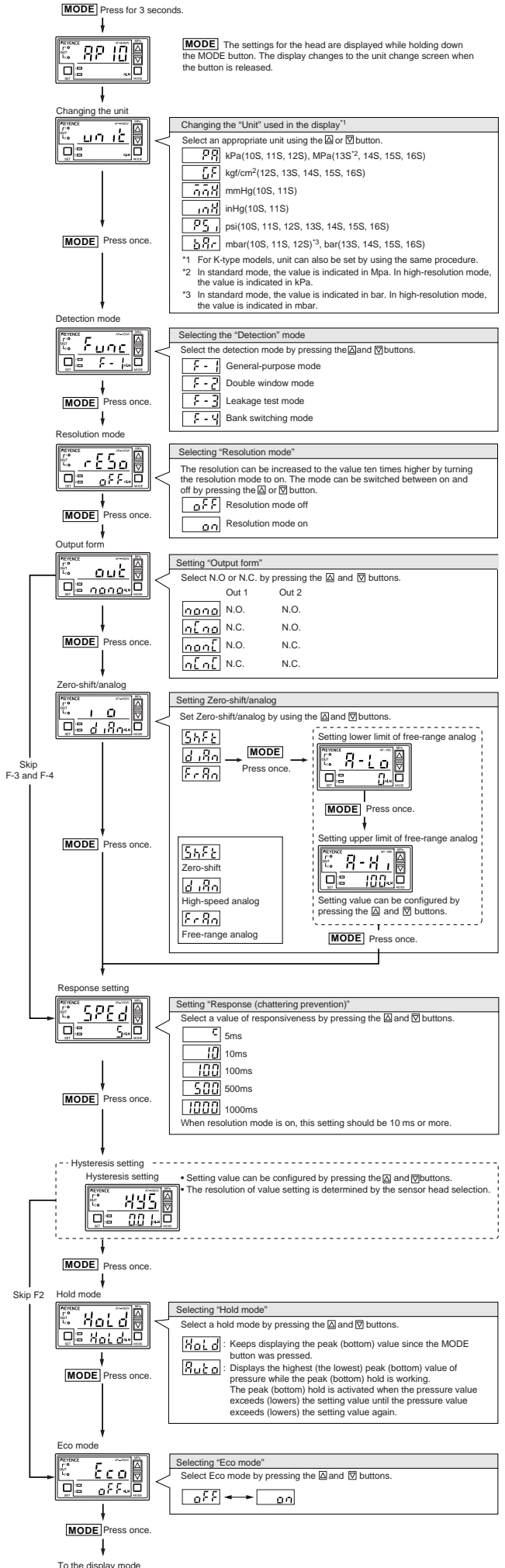
When F-3 mode is selected



* When F-3 mode is selected, peak/bottom values of the leak pressure and the filling pressure can be checked individually.

- Leak pressure: Select indicator 1 as a setting value. The peak/bottom value of leak pressure is displayed when inputting the zero-shift.
- Filling pressure: Select indicator 2 as a setting value. The peak/bottom value of filling pressure is displayed regardless of the zero-shift input.

Mode configuration



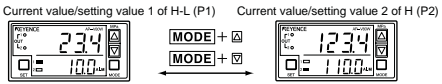
SETTING THE DIFFERENTIAL PRESSURE AMPLIFIER

Switching the displays (display mode)/changing the setting value
 There are two ways of displaying the current value/setting value and hold display shown as follows depending on which setting indicator is set (H-L or H).

Mode	Setting value indicator display	Displayed content of current value/setting value
F-1, F-3, F-4	H - L illuminates	Displaying the differential pressure (Displaying peak/bottom hold of the differential pressure)
F-4	H illuminates	Displaying the pressure value of the H side (Displaying peak/bottom hold of the H side)
F-2	Either H-L or H illuminates	Displaying the differential pressure (Displaying peak/bottom hold of the differential pressure)
	Either H-L or H flashes	Displaying the pressure value of the H side (Displaying peak/bottom hold of the H side)

When F1 mode is selected

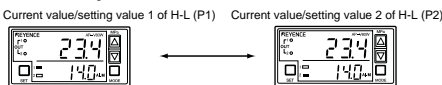
Current value/setting value



- The upper part indicates the current value. The lower part indicates the setting value.
- Setting value indicator H-L illuminates when the setting value is P1. Setting value indicator H illuminates when the setting value is P2.
- Setting value can be configured by pressing the [MODE] and [SET] buttons at once.

When F-2 mode is selected

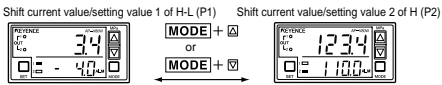
Current value/setting value



- The upper part indicates the current value. The lower part indicates the setting values (P1, P2, B1 and B2).
- The setting value indicator H-L illuminates when the setting value is P1. The setting value indicator H illuminates when the setting value is P2. The setting value indicator H-L flashes when the setting value is B1. The setting value indicator H flashes when the setting value is B2.
- Use the [MODE] + [MODE] or [MODE] + [SET] buttons to change the display.
- Setting value can be configured by pressing the [MODE] and [SET] buttons.

When F-3 mode is selected

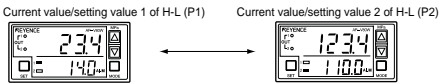
Current value/setting value



- The upper part indicates the current value. The lower part indicates the setting value.
- Setting value indicator H-L illuminates when the setting value is P1. Setting value indicator H illuminates when the setting value is P2.
- Setting value can be configured by pressing the [MODE] and [SET] buttons.

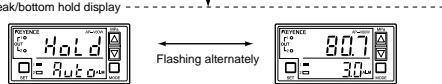
When F-4 mode is selected.

Current value/setting value



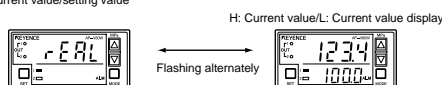
- The upper part indicates the current value. The lower part indicates the setting values (P1, P2, B1 and B2).
- The setting value indicator H-L illuminates when the setting value is P1. The setting value indicator H illuminates when the setting value is P2. The setting value indicator H-L flashes when the setting value is B1. The setting value indicator H flashes when the setting value is B2.
- Use the [MODE] + [MODE] or [MODE] + [SET] buttons to change the display.
- Setting value can be configured by pressing the [MODE] and [SET] buttons.

Peak/bottom hold display



- The upper part indicates the peak value. The lower part indicates the bottom value.
- The hold value can be reset by pressing the [MODE] and [SET] buttons for 3 seconds.

Current value/setting value



- The upper value is the current value on the H side. The lower value is the one on the L side.

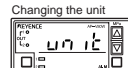
- When F-3 mode is selected, the differential of leak pressure (the leak pressure of H-L) and the peak/bottom value of the filling pressure (H) can be checked individually.
 - Differential of the leak pressure: Select indicator H-L as a setting value. (H-L) The peak/bottom value of the leak pressure is displayed while inputting zero-shift.
 - Filling pressure: Select indicator H as a setting value. (H) The peak/bottom value of filling pressure is displayed regardless of the zero-shift input.

Mode configuration

[MODE] Press for 3 seconds.

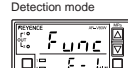


[MODE] The settings for the head are displayed while holding down the MODE button. The display changes to the unit change screen when the button is released.



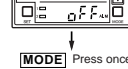
- ### Changing the "Unit" used in the display¹
- Select an appropriate unit using the [MODE] and [SET] buttons.
- Pa kPa(10S, 11S, 12S), MPa(13S², 14S, 15S, 16S)
 - kg/cm²(12S, 13S, 14S, 15S, 16S)
 - mmHg(10S, 11S)
 - inHg(10S, 11S)
 - psi(10S, 11S, 12S, 13S, 14S, 15S, 16S)
 - mbar(10S, 11S, 12S)³, bar(13S, 14S, 15S, 16S)
- ¹ For K-type models, unit can also be set by using the same procedure.
² In standard mode, the value is indicated in Mpa. In high-resolution mode, the value is indicated in kPa.
³ In standard mode, the value is indicated in bar. In high-resolution mode, the value is indicated in mbar.

[MODE] Press once.



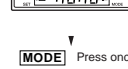
- ### Selecting the "Detection" mode
- Select the detection mode by pressing the [MODE] and [SET] buttons.
- F-1 General-purpose mode
 - F-2 Double window mode
 - F-3 Leakage test mode
 - F-4 Bank switching mode

[MODE] Press once.



- ### Selecting "Resolution mode"
- The resolution can be increased to the value ten times higher by turning the resolution mode to on. The mode can be switched between on and off by pressing the [MODE] and [SET] buttons.
- oFF Resolution mode off
 - oN Resolution mode on

[MODE] Press once.



- ### Setting "Output form"
- Select N.O or N.C. by pressing the [MODE] and [SET] buttons.
- | | | |
|-----|-------|-------|
| o1o | Out 1 | Out 2 |
| o1o | N.O. | N.O. |
| o1o | N.C. | N.C. |
| o1o | N.O. | N.C. |
| o1o | N.C. | N.C. |

[MODE] Press once.



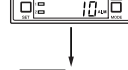
- ### Setting Zero-shift/analog
- Set Zero-shift/analog by using the [MODE] and [SET] buttons.
- 54FL Setting lower limit of free-range analog
 - d1Rn Press once.
 - F.r.Rn Press once.
 - 54FL Setting upper limit of free-range analog
 - d1Rn Press once.
 - F.r.Rn Press once.
- Setting value can be configured by pressing the [MODE] and [SET] buttons.

[MODE] Press once.



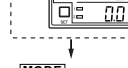
- ### Setting "Response (chattering prevention)"
- Select a value of responsiveness by pressing the [MODE] and [SET] buttons.
- 10 10ms
 - 100 100ms
 - 500 500ms
 - 1000 1000ms

[MODE] Press once.



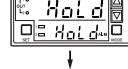
- ### Hysteresis setting
- Setting value can be configured by pressing the [MODE] and [SET] buttons. The resolution of value setting is determined by the sensor head selection.

[MODE] Press once.



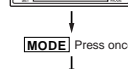
- ### Selecting "Hold mode"
- Select a hold mode by pressing the [MODE] and [SET] buttons.
- HOLD Keeps displaying the peak (bottom) value since the MODE button was pressed.
 - RLt Displays the highest (the lowest) peak (bottom) value of pressure while the peak (bottom) hold is working. The peak (bottom) hold is activated when the pressure value exceeds (lowers) the setting value until the pressure value exceeds (lowers) the setting value again.

[MODE] Press once.



- ### Selecting "Eco mode"
- Select Eco mode by pressing the [MODE] and [SET] buttons.
- oFF
 - oN

[MODE] Press once.



FUNCTION DESCRIPTION

High-speed analog output

The electric current corresponding to the pressure value is output.

Common among the AP-V80W Series

	4 mA to 20 mA
AP-10S(K)	100 kPa to -100 kPa
AP-11S(K)	Atmospheric pressure to -100 kPa
AP-12S(K)	Atmospheric pressure to 100 kPa
AP-13S(K)	Atmospheric pressure to 1 MPa
AP-14S(K)	Atmospheric pressure to 10 MPa
AP-15S(K)	Atmospheric pressure to 20 MPa
AP-16S(K)	Atmospheric pressure to 50 MPa

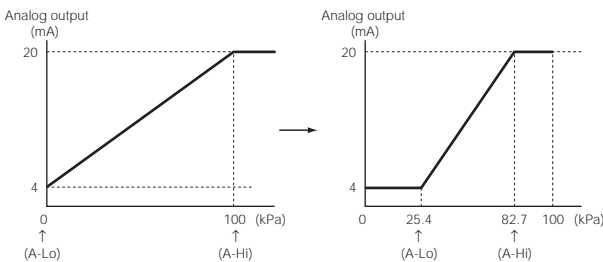
Atmospheric pressure correction is not reflected to the output.

* When using the differential pressure amplifier (AP-V82W(P)/V87W(P)), if the high-speed analog output is selected, the current pressure value (H) is output in the range of 4 to 20 mA as in the table above.

Free-range analog output

- The free-range analog output can be set in F-1/F-2 mode.
- Analog output is output in the range of 4 to 20 mA corresponding to the lower threshold (A-Lo) and upper threshold (A-Hi).
- Any value can be set in the A-Lo and A-Hi in the same matrix as that of the display resolution.
- Default values are A-Lo (0% of F.S.) and A-Hi (100% of F.S.).
- The atmospheric pressure correction is reflected to the analog output.

Example) When the lower limit is set to 25.4 kPa and the upper limit is to 82.7 kPa in AP-12S(K) (0 to 100 kPa)



* When using the differential pressure amplifier (AP-V82W(P)/V87W(P)), if free-range analog is selected, the value of differential pressure (H-L) is output in the range of 4 to 20 mA between A-Lo (the lower limit) and A-Hi (the upper limit). Any value can be set in the same matrix as that of the display resolution.

Functions that can be switched via pink wire

- The functions that can be selected in each mode via the pink wire are as follows.

AP-V80W (P), AP-V85W (P), AP-V82W (P) and AP-V87W (P) (Standard, differential pressure, and common)

F-1	Zero-shift input	High-speed analog output	Free-range analog
F-2	High-speed analog output	Free-range analog	
F-3	Zero-shift input		
F-4	Bank switching input		

Power-save

- Only one segment of the setting value indication flashes in Eco mode. The output indicator and the alarm indicator function normally.
- If any button is pressed in Eco mode, indicators return to the normal display. If no operations are made for 3 minutes in this state, indicators return to the Eco display again. (The button pressed at first on the Eco display will become invalid.)



Disconnection alarm indication

- Alarm indicator
The alarm indicator illuminates in the following case:
When [ErrH] is displayed (sensor head is unconnected or disconnected.)



Alarm indicator

Atmospheric pressure correction

AP-V80W(P) and V85W(P)

On the current value display, make an applied pressure air-released state and press the Δ + \square button for 3 seconds simultaneously. The sign "oFS" is displayed and the current value display will be set to zero. The value that has undergone atmospheric pressure correction is stored even if the power is turned off.

* The range of atmospheric pressure correction is within the range of $\pm 5\%$ of F.S.

AP-V82W(P) and V87W(P)

On the current value display, make an applied pressure air-released state and press the Δ + \square button for 3 seconds. The pressure difference (H-L) will be corrected to zero, and the current pressure value will be corrected to the atmospheric pressure state respectively. The value that has undergone atmospheric pressure correction is stored even if the power is turned off.

Pressure difference ZERO reset button

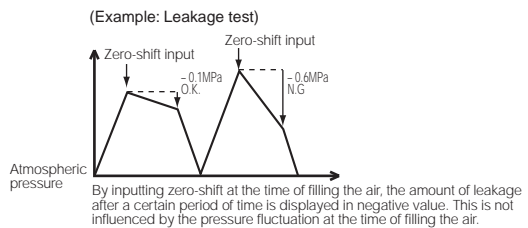
Pressing the ZERO reset button forcibly sets the pressure difference (H-L) at that time to zero. Unlike atmospheric pressure correction, it is not reflected to the current pressure value (H). The value that has undergone ZERO reset is stored even if the power is turned off.

Zero-shift

This is a function that sets the pressure at that time forcibly to zero by inputting an external signal.

This function is useful for detecting the pressure fluctuation larger than a certain amount without being influenced by the fluctuation of the air pressure.

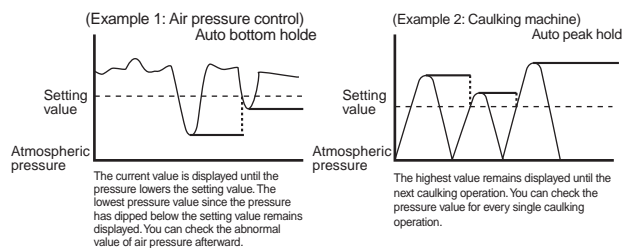
Input range: 0 to 100% of F.S.



The updated value (reference value) after zero-shift is input is cleared when the power is turned off.

Peak/bottom hold display

- Manual hold: Keeps displaying the highest (the lowest) measured value since the \square button was pressed and the display shows "HoLd". Press the \square button again and the display returns to the current value/setting value display.
- Auto hold: Displays the highest (the lowest) peak (bottom) value of pressure while the peak (bottom) hold is working. The peak (bottom) hold is activated when the pressure value exceeds (lowers) the setting value until the pressure value exceeds (lowers) the setting value again.



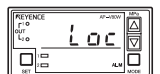
*Canceling the hold mode

- You can cancel the peak/bottom hold display by using the following procedures.
- Press the Δ and \square buttons for more than 3 seconds at the same time.
 - Turn off the power and back on again.

KEYLOCK

Keylock disables the key operations for any change of settings. Note that switching of the display remains valid.

To enable the keylock feature, press \square + Δ buttons (or \square + \square buttons) in the display mode for about 3 seconds. The "Loc" indication flashes on the flow rate indicator and the keylock feature is enabled.



To release the keylock feature, press \square + Δ buttons (or \square + \square buttons) in the keylocked state for about 3 seconds. The "unL" indication flashes on the setting value indicator and the keylock is released.



SPECIFICATIONS

Sensor head

Model	AP-10S(K)	AP-11S(K)	AP-12S(K)	AP-13S(K)	AP-14S(K)	AP-15S(K)	AP-16S(K)	
Rated pressure	100 to -100kPa	0 to -100kPa	0 to 100kPa	0 to 1MPa	0 to 10MPa	0 to 20MPa	0 to 50MPa	
Proof pressure	500kPa	500kPa	500kPa	2.0MPa	20MPa	40MPa	75MPa	
Fluid type	Gasses and liquids that do not corrode SUS304/630							
Pressure type	Gauge pressure							
Repeatability	± 0.5% of F.S. max							
Connection port diameter	AP-1 x S:R(PT)1/8 AP-1 x SK:NPT 1/8			AP-1 x S:R(PT)1/4 AP-1 x SK:NPT 1/4R (including throttle)				
Environmental resistance	Ambient temperature	-10 to +70°C (No freezing)					-20 to +100°C (No freezing)*	
	Relative humidity	35 to 85%RH (No condensation)						
	Vibration	10 to 55 Hz, 1.5 mm double amplitude in X, Y, and Z directions for 3 hours respectively						
	Shock	500 m/s ² in X, Y, and Z directions, 10 times respectively (Total: 60 times)						
Material	Diaphragm pressure port SUS630, Pressure port SUS 304 Throttle SUS 304 *(P-14S(K) to AP-16S(K))							
Weight	Approx.120 g	Approx.120 g	Approx.120 g	Approx.120 g	Approx.130 g	Approx.130 g	Approx.130 g	
Protective construction	IP67							
Accessories	Head connector: 1							

* The ambient temperature for the cable part is -20°C to 80°C.

Amplifier unit

Model	NPN type : AP-V80W/AP-V85W/AP-V82W/AP-V87W PNP type : AP-V80WP/AP-V85WP/AP-V82WP/AP-V87WP								
Power supply	DC12-24 V ripple (P-P)10% max.								
Current consumption	AP-V80W(P)/V85W(P)	12 V		24 V		AP-V82W(P)/V87W(P)	12 V		• Excluding analog output • Including head unit
		Normal	1380mW(115mA) max.	1920mW(80mA) max.	Normal		1680mW(140mA) max.	2520mW(105mA) max.	
		Eco mode	1020mW(85mA) max.	1200mW(50mA) max.	Eco mode		1200mW(100mA) max.	2160mW(90mA) max.	
Display	4 +1/2-digit, 7-segment LED-red, green 2 block display (Character height upper : F8mm, red lower : F5.7mm, green) Alarm indication...cred LED								
Display range	0 to 100% of F.S. (When the zero-shift is not turned on.)								
Action indicator	Red LED x 3 (Supporting Control output 1/Control output 2/Alarm indication)								
Display resolution	Standard	Unit: kPa·MPa	0.1kPa	0.1 kPa	0.1 kPa	0.001 MPa	0.01 MPa	0.1 MPa	0.1 MPa
		kgf/cm ²	None	None	0.001	0.01	0.1	1	1
		mmHg	1	1	None	None	None	None	None
		inHg	0.1	0.1	None	None	None	None	None
		psi	0.02	0.01	0.01	0.1	1	10	10
		bar	0.001	0.001	0.001	0.01	0.1	1	1
		psi	0.001	0.001	0.001	0.01	0.1	1	1
	High resolution	Unit: kPa·MPa	0.01 kPa	0.01 kPa	0.01 kPa	0.1 kPa	0.001 MPa	0.01 MPa	0.01 MPa
		kgf/cm ²	None	None	0.0001	0.001	0.01	0.1	0.1
		mmHg	0.1	0.1	None	None	None	None	None
		inHg	0.01	0.01	None	None	None	None	None
		psi	0.002	0.001	0.001	0.01	0.1	1	1
		bar(mbar)	0.1 mbar	0.1 mbar	0.1 mbar	0.001	0.01	0.1	0.1
Hysteresis	Variable (Standard 0.5% of F.S./High resolution 0.1% of F.S.)								
Responsiveness (Chattering prevention)	AP-V80W(P)/V85W(P) : F5, 10, 100, 500, 1000mS selectable AP-V82W(P)/V87W(P) : F10, 100, 500, 1000mS selectable								
Zero-shift/bank input	Zero-shift/bank input Non-voltage input (contact, solid-state) Input time : 20ms or more (analog output switchable)								
Control output	Control output NPN(PNP) open collector x 2ch (N.O./N.C. switchable) DC40V (30V) max. 100mA max. Residual voltage 1 V max.								
Analog output	Analog output 4 to 20 mA Maximum load resistance 260 Ω								
Environmental resistance	Ambient temperature	Environmental resistance Ambient temperature -10 to +50°C (No freezing)							
	Relative humidity	Relative humidity 35 to 85%RH (No condensation)							
	Vibration	10 to 55 Hz, 1.5 mm double amplitude in X, Y, and Z directions for 2 hours respectively							
Material	Main body and cover : polycarbonate, Key top : elastomer								
Weight	AP-V80W(P)/V85W(P) Approx.85 g AP-V82W(P)/V87W(P) : Approx.90 g								
Accessories	AP-V80W(P)/V82W(P) : DIN bracket, power cable, unit sticker AP-V85W(P)/V87W(P) : Panel mounting bracket, protection cover, power cable, unit sticker								

ERROR DISPLAYS AND CORRECTIVE ACTIONS

Error Displays and Corrective Actions

Error display	Cause	Solution
	Applied pressure of ±5% of F.S. or more is applied while correcting the atmospheric pressure.	Set the unit open to atmosphere and readjust sensitivity.
	<ul style="list-style-type: none"> Sensor head is not connected. The connection to the sensor head is broken. Pressure exceeding the displaying pressure range is applied. 	Check the connection or breakage of the sensor head and turn on the power again.
	Overcurrent is flowing in the control output.	Check the load and adjust it to the rated range.
	The pressure exceeds (or lowers) the setting/ displaying pressure range.	Adjust the pressure to the rated pressure range.
	The pressure lowers (or exceeds) the setting/ displaying pressure range.	Adjust the pressure to the rated pressure range.

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