



INSTRUCTION MANUAL
FOR
DIGITAL PRESSURE GAUGE
MODEL ZT67

 NAGANO KEIKI CO., LTD.

MANUAL FOR ACCURATE AND SAFE OPERATION

SAFETY CHAPTER FOR DIGITAL PRESSURE GAUGE

To use these devices accurately and safely, carefully read this manual and the operation manual. Incorrect usage may cause malfunction and result in human injury, accidents, etc.

Be sure to keep this manual for reference after reading.

WARNING

1. Do not apply more than the maximum allowable pressure.
Human injury or damage to surroundings may result due to explosion or breakdown of the pressure elements.
2. Use with the unspecified power supply may cause fire hazard or electric shock.
3. Do not use these devices on measured objects which are corrosive to fluid or gas contacting areas.
Human injury or damage to surroundings may result due to explosion or breakdown of the pressure elements and exposure of dangerous measured objects.
4. Do not apply excessive weight, vibration or shock.
Human injury or damage to surroundings may result due to explosion or breakdown of these devices and exposure of dangerous measured objects.
5. This gauge does not have an explosion-proof construction.
Do not use in dangerous places with flammable gas or fluid liable to cause ignition and explosion.
6. Connect wiring accurately according to the wiring drawings or instructions in the operation manual.
Incorrect wiring may result in human injury or fire hazard.
7. Use with the instrument temperature range.
Use outside the instrument temperature range may cause human injury or damage to surroundings due to explosion or breakdown of the devices.
8. If the measured object is oxygen, use devices with anti-oil treatment.
Standard devices may possibly contain remaining oil, and there is danger of combustion and explosion if oil acts on oxygen.
9. Accurately install these devices according to the installation instructions in the operation manual.
10. Never attempt to reconstruct the main body of devices nor add any new function to the devices, etc. Contact us for repairs.
11. Accurately operate switches according to the operating method described in the operation manual. Incorrect operation may cause malfunction.
12. As this is a precise gauge, keep sources of noise as far away as possible.
Suppress noise with a noise suppressor, etc. When supplying power to this gauge.

Note : Inform us in advance when using these devices in a way that may result in fatal or serious injury due to malfunction or incorrect operation.

CONTENTS

1. General description	2
2. Features	2
3. Specifications	3
3-1.Common specifications of each grade	3
3-2.List of each grade	3
4. Drawing	4~6
4-1.UC Grade	4
4-2.BA Grade	5
4-3.Genelal use	6
5. Installation and storage	6~9
5-1.Connection to piping	6
5-2.Wiring	7
5-3.Cable specification	7
5-4.Connection of external instruments	8~9
(1) Example of open collector usage	8
(2) Example of analog output (factory shipment option) wiring	9
5-5. Precautions for storage	9
6. Precautions to handling	10
7. Modes and their functions	10~11
7-1. Panel functions	10
7-2. Modes and their functions	11
8. Function setting mode procedure	11~15
8-1.Comparator operation settings	12~13
8-2.User setting	14~15
9. Other functions	15~16
9-1.Zero point adjustment	15
9-2.Peak hold	15
9-3.Key lock	16
9-4.Setting value back-ups	16
10. Error display	16
11. Maintenance	17
11-1.Maitenance	17
11-2.About the influence by the noise	17
12. Others	17

1. General description

The ZT67 while being small-sized offers a large LED easy to see pressure display.

In addition to conforming to CE marking, with high levels of safety and reliability this digital pressure gauge was developed for the semiconductor industry. From UC grade to BA grade as well as general use, gauges for a wide variety of gases are available.

2. Features

- (1) It conforms to EN standards based on EMC directive.(CE marking)
- (2) The UC and BA grade gauges pressure sensitive part (diaphragm) use Co-Ni alloy sensor, which are extremely corrosion resistant in addition to having high safety and durability levels.
- (3) For UC grade products, the internal surface roughness of gas contact has sub-micron flatness. So it has maximum effect for reducing particles.
- (4) For BA grade products, the surface roughness is about Ry2.5 μ m to keep anti-corrosiveness and air tightness. It is an economy type suited for cost reduction for gas piping.
- (5) General use gauges are non-corrosive and are suitable for all process gases that do not require cleanness.
- (6) 2 outputs of comparators with various functions are mounted. Hysteresis and window comparator modes are available. Operation points for upper and lower limits and dead band can be set freely.
- (7) The display scaling function allows setting the value display from - 1999 to 1999.
- (8) Analog signal outputs for monitors are available as a factory shipment option.
- (9) Zero point adjustment is done in a state of atmosphere released with the zero adjust function.
- (10) The filter function allows suppressing the display fluctuation when pressure pulse occurs.
- (11) The peak hold display function allows maximum/minimum values of pressure to be recorded.
- (12) The 3 1/2 digits LED with 10mm high characters is bright and easy to read.
- (13) Supports all tube connection types, horizontal or vertical selection available. In addition, depending on the tube direction the horizontally installed T-type display can be moved, installation direction is chosen.

3. Specifications

3-1. Common specifications of each grade

Measurement fluid	Various kind of semiconductor process gas
Indication accuracy	±(1.0%F.S.+1digit)
Temperature coefficient (Zero,Span)	±0.1%F.S./°C
Pressure indication	3 1/2 digit LED display
Power source	12 to 24V DC±10%
Consumption current	30mA DC max.
Comparator output	NPN open collector × 2 output independent (Hysteresis, Window comparator) Maximum rating; 30V DC, 80mA DC Response speed; 2.5ms (Without filter) Protection circuit; Short circuit (Over current) conservation
Analog output (Option)	1to 5V DC (Load resistance 10kΩ min.) Accuracy:±3.0%F.S. Response speed: Less than 1ms
Operating temperature and humidity range	-10 to 50°C,35 to 85%RH (No freezing or condensation)
Storage temperature	-20 to 60°C (No freezing or condensation)
Cable length	2m
Weight	Approx.150g
Display scaling function	For rating range, it is range of -1999 to 1999 digit
Comparator mode function	Either Hysteresis mode or Window mode is selectable Dead band: Hysteresis mode: Changeable Window mode : 1%F.S. Fixed
Filter function	Off, 10ms, 50ms, 200ms, 600ms (Selectable)
Peak hold display function	Confirmation of Peak value, Bottom value, Reset
Zero adjust function	Zero with the ADJ key
Key lock function	Lock of operation key
CE marking *	Applicable Directive:2004/108/EC (EMC directive) Applicable Standards: EN61326-1 : 2006 ; EN61326-2-3 : 2006

*:Connect to indoor power distribution network which is not affected by lightning surge voltage or power system switching transients.

3-2. List of each grade

Grade	UC (Ultra Clean)	BA (Bright Annealing)	General use
Pressure range (Pressure indication)	-0.1 to 0.3 MPa (-.100 to .300) -0.1 to 0.5 MPa (-.100 to .500) -0.1 to 1 MPa (-.100 to 1.000) -0.1 to 2 MPa (-0.10 to 2.00) 0 to 0.3 MPa (.000 to .300) 0 to 0.5 MPa (.000 to .500) 0 to 1 MPa (.000 to 1.000) 0 to 2 MPa (0.00 to 2.00) 0 to 5 MPa (0.00 to 5.00) 0 to 10 MPa (0.00 to 10.00) 0 to 20 MPa (0.0 to 20.0)		-100 to 100 kPa (-100 to 100) -0.1 to 1 MPa(-.100 to 1.000) 0 to 1 MPa(.000 to 1.000)
Max. Allowable pressure	200% of rated pressure		
Surface roughness of gas contact	Less than Ry 0.7μm	Approx. Ry 2.5μm	Not specified
Gas contact material	Pressure sensor: Co-Ni alloy Joint: SUS316L		Pressure sensor: SUS630 (17-4PH) Joint: SUS316
Cleaning	UC treatment It depends on ultra clearance (cleaning)	Degreasing	Use no oil & water
Particle	Zero count for size 0.1μm or greater(In our inspection standard)	Not specified	
Leakage (He leak rate)	Less than 5×10 ⁻¹² Pa · m ³ /s		Less than 1×10 ⁻⁹ Pa · m ³ /s
Joint	1/4,3/8 UJR, VCR, JSK, CVC, etc.		1/4 VCR 1/4 SWAGELOK
Major use point Manufacturing process	Semiconductor materials gas and high purity supply system	Bulk gas system manufacturing process	Non-corrosive. Various process gas and vacuum pump units, which do not need such a high degree of cleanliness as, described above.

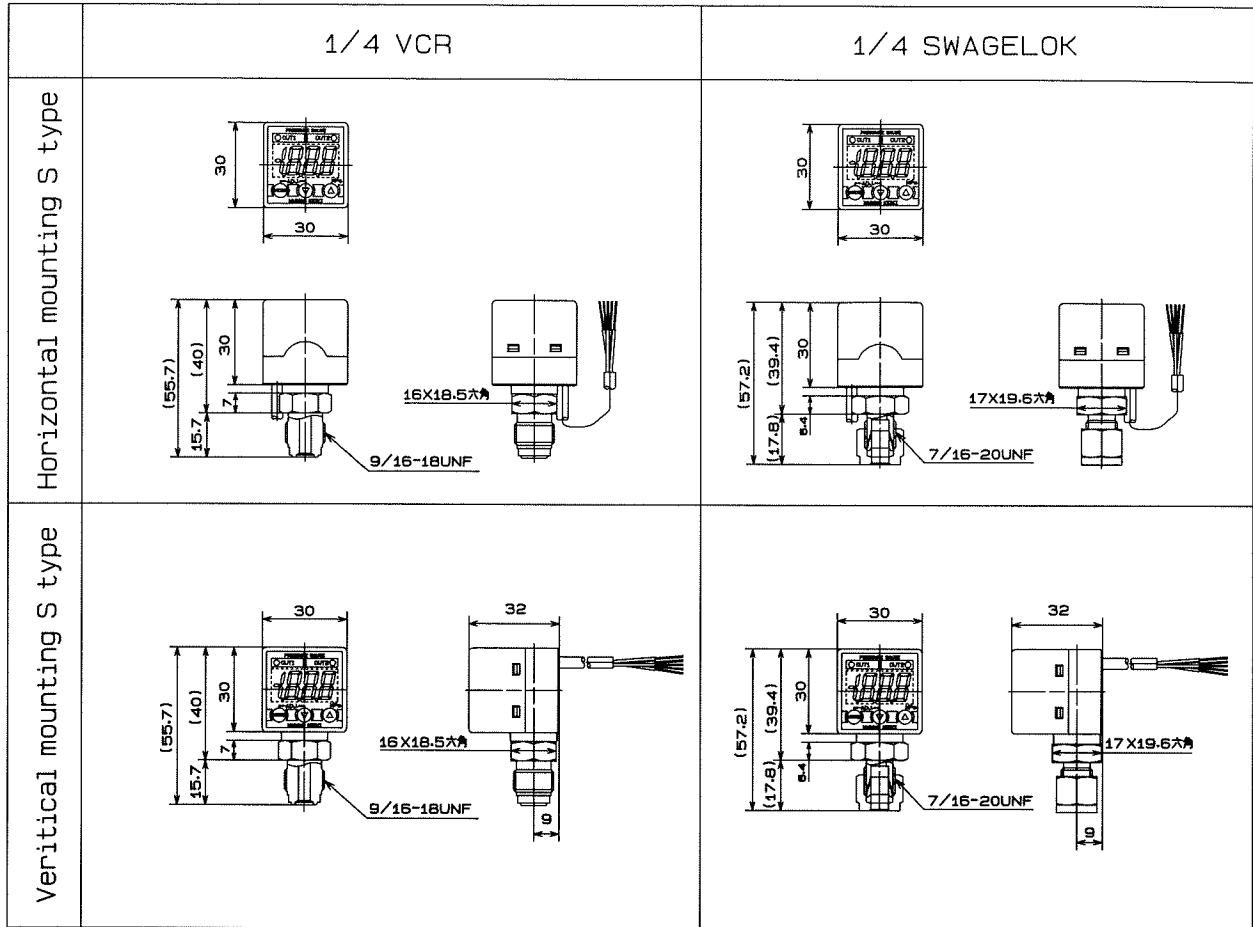
4. Drawing
4-1. UC Grade

	1/4 UJR	Compatible with 1/4 VCR
Horizontal mounting T type		
Horizontal mounting S type		
Vertical mounting S type		

4-2. BA Grade

	1/4 UJR	Compatible with 1/4 VCR
Horizontal mounting T type	<p>30 30 54 24 9/16-18UNF 9/16-18UNF 19X21.9HEX. 20</p>	<p>30 30 57.5 30 27.5 9/16-18UNF 9/16-18UNF 19X21.9HEX. 20 20 2XM3 Depth 5 15±0.1 15±0.1</p>
Horizontal mounting S type	<p>30 30 57.7 30 24.7 9/16-18UNF 19X21.9HEX. 10</p>	<p>30 30 56 30 16 7 9/16-18UNF 17X19.6HEX. 10</p>
Vertical mounting S type	<p>30 30 57.7 30 24.7 9/16-18UNF 19X21.9HEX. 32 10</p>	<p>30 30 56 30 16 7 9/16-18UNF 17X19.6HEX. 32 10</p>

4-3. General use



5. Installation and storage

5-1. Connection to piping

Open a sealed bag of the UC and BA grade gauges in clean environment. Do not expose gas contact part to moisture and dust.

Model ZT67 digital pressure gauge is designed for union connection such as UJR, VCR, JSK and CVC. Do not fail to use the specified gaskets for connection. When installing the unit on the pressure line, do not tighten the case with a pipe wrench, etc. Do not fail use the hexagonal part of the connecting joint or the rectangular (hexagonal) part of the body when installing.

Please be careful in the case of transportation and installation about the following.

Precautions

- This is a finely adjusted instrument. It may become unusable if dropped or if subjected to extreme vibration.
- For installation, select a location without thumping vibration, direct sunlight, and particles.
- Do not touch or breathe to the UC and BA grade of the gas contact parts of the UC and BA grade. Also, please be careful not to damage the sealing surface.
- Do not apply any excessive shock to the case at the time of installation.
- Do not use unreasonable force or bend the leads extending from the unit.
- Do not conduct snoop test to the sensor. It may deteriorate insulation resistance.
- It is recommended to purge the device with enough inert gas, to remove atmospheric compositions, particles, foreign materials and others are removed.

5-2. Wiring

Cable color is identified as follows

- (1) Standard (no analog output)
 - Brown Power source (+)
 - Blue Power source (-)
 - Black Open collector output (OUT1)
 - White Open collector output (OUT2)
- (2) Analog output (with 1 to 5V DC)
 - Brown Power source (+)
 - Blue COMMON
 - Black Open collector output (OUT1)
 - White Open collector output (OUT2)
 - Orange Analog output (+)

Keep the following in connecting work

Precautions

- Do not pull cables with excessive force. Do not bend cables excessively.
- When installing this gauge, determine the rating of power source device to be used after confirming the ratings in the specification.
- When soldering, make sure soldering iron does not touch cases and sheaths.
- When analog and comparator outputs are not used, please treat each wire so that it does not short-circuit.

5-3. Cable specifications

Specifications for connecting cables are as follows:

Use connectors which conform to the specification below.

- Conductor OD : Approx. 0.54mm (25AWG)
- Insulator OD : Wire sheaths (Brown, Blue, Black, White, Orange) ...Approx.0.86mm / Coat (Black) ...Approx.4.0mm

5-4. Connection of external instruments

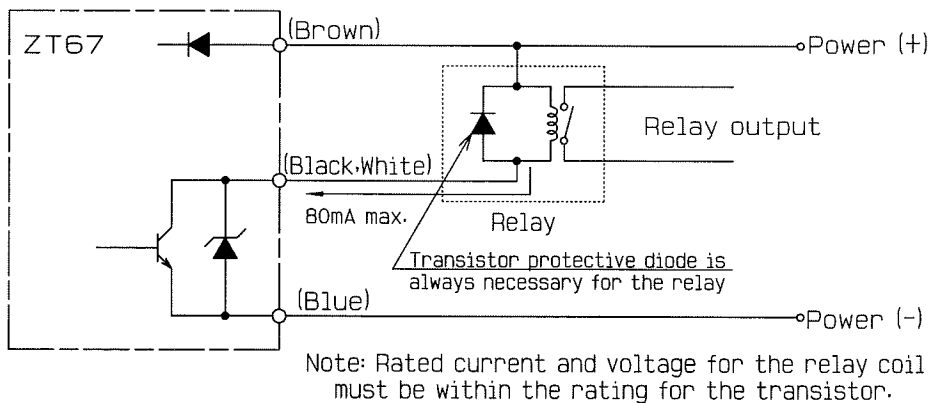
Output Type: The comparator output comprises open collector output. The analog output (factory shipment option) comprises 1 to 5V DC voltage output.

“Open collector” means that the collector of an output transistor is open for the user to use for any desired user defined application. Accordingly, the user is free to use the open collector output in any way. Three typical applications are described below.

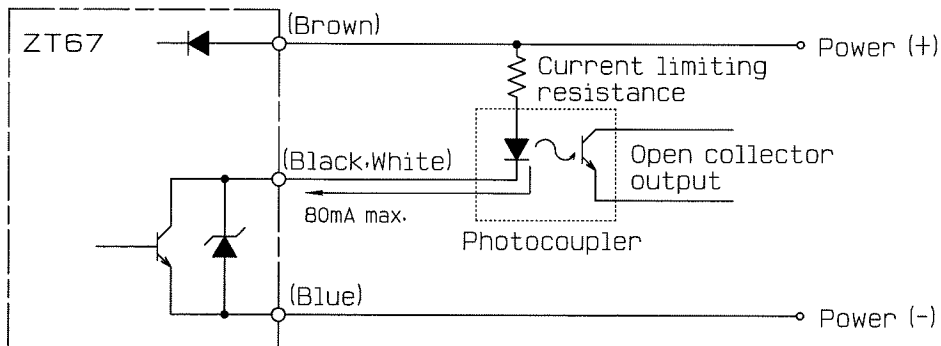
The output transistor is rated for 30V DC, 80mA. Be sure not to exceed this rating.

(1) Example of open collector usage

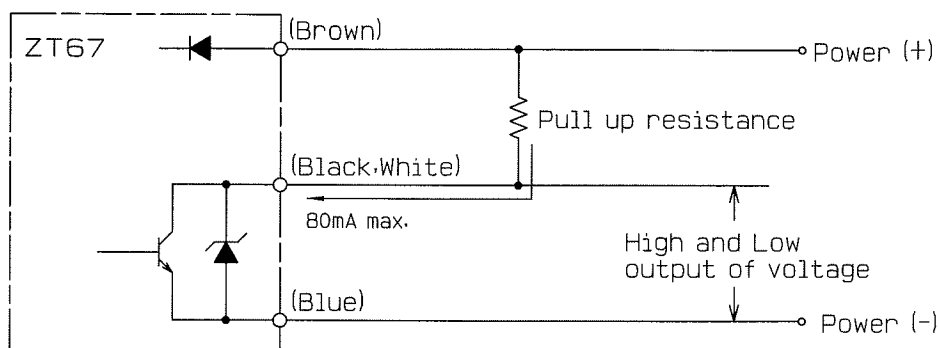
① Relay connection



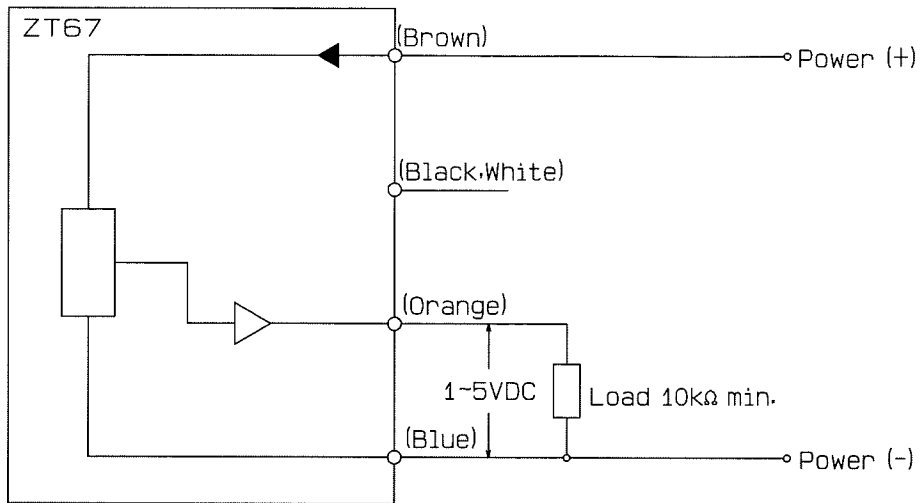
② Photocoupler connection




③ Voltage output



(2) Example of analog output (factory shipment option) wiring



5-5. Precautions for storage

 <p>Caution</p>	<p>Do not store this pressure gauge in the following place as damage may be caused.</p> <ul style="list-style-type: none">○ Exposed to water.○ Susceptible to air pressure, temperature, humidity, ventilation, sunlight, particles, salt or sulfur in the air.○ Exposed to inclination, vibration or shock (including transportation time).○ Exposed to chemicals (chemicals' storage area) or gas.○ Exposed to direct sunlight or high temperature.
--	---

6. Precautions to handling

Before power on the device, make sure the wire connection is correct and confirm voltage rating and current rating of power source device, and that the inner electrical resistance of externally connected devices does not exceed load resistance of the main body.

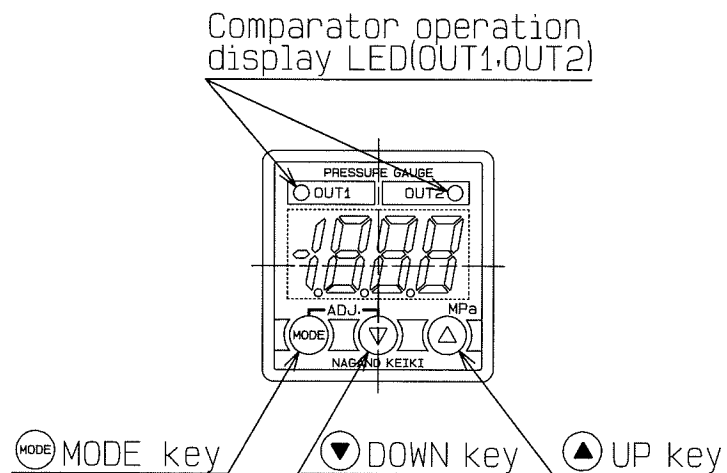
Power on and after **15 minutes or more warm-ups** in current-carrying status, perform zero adjustment then start main operation. Caution the followings during operation.

Precautions

- Do not increase pressure above the level displayed on the ZT67 label.
- The display of the horizontal mounting T type can be turned with 270°. Do not apply excessive force to turn without necessity.
- After using the unit for corrosive gas, do not fail to purge it with nitrogen gas, etc. before removing the unit for maintenance etc. If it is removed and left as it is with corrosive gas inside, the water content and oxygen in the air will generate strong acid and alkaline substances, which accelerate corrosion of the internal parts of the unit.
- To set pressure, refer to the comparator setting procedures on pages 12 to 13, and set the system to the desired level.

7. Modes and their functions

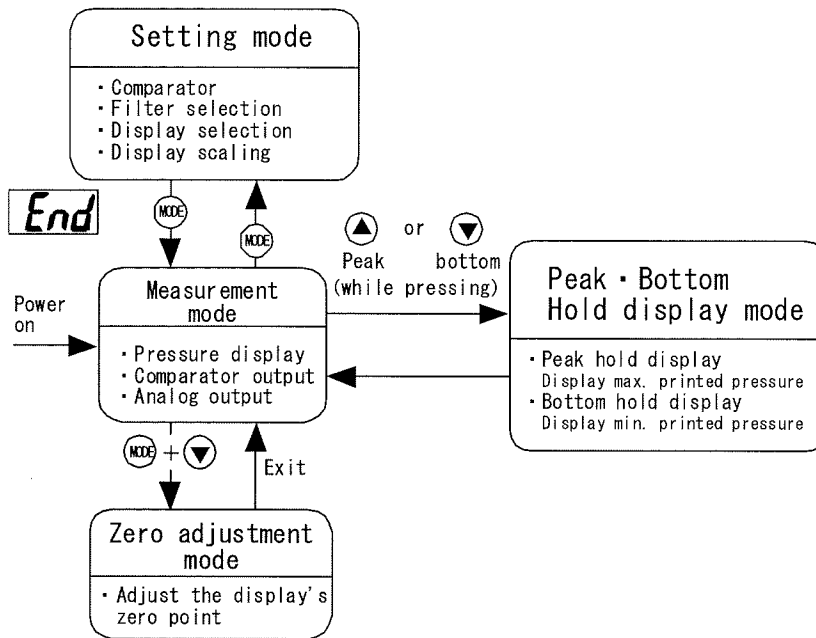
7-1. Panel functions



Precautions

- To avoid making a hole on the panel, make sure not to pose excessive force or to press keys with edged tools.

7-2. Modes and their functions

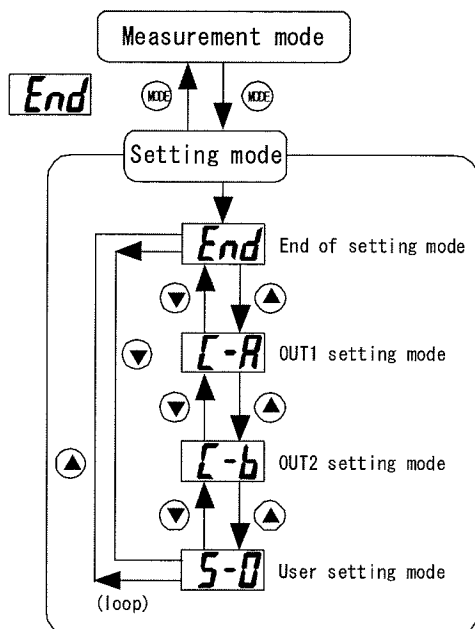


8. Function setting mode procedure

In measurement mode pressing the **MODE** key and releasing changes to setting mode.

The setting mode is used to select comparator output, pressure indicating unit, display scaling, and filter time constant.

In setting mode pressing the **▲** **▼** keys will display **【End of setting】** , **【OUT1 setting】** , **【OUT2 setting】** or **【User settings】** .



Basic Key Operations

In **【OUT1 setting】** , **【OUT2 setting】** , values are set with the **▲** **▼** keys. Use **▲** key to increase and **▼** key to decrease the value.

Pressure and keep the **▲** **▼** key pressed for more than 1sec., and the value increases or decreases at the high speed of 20 counts a second.

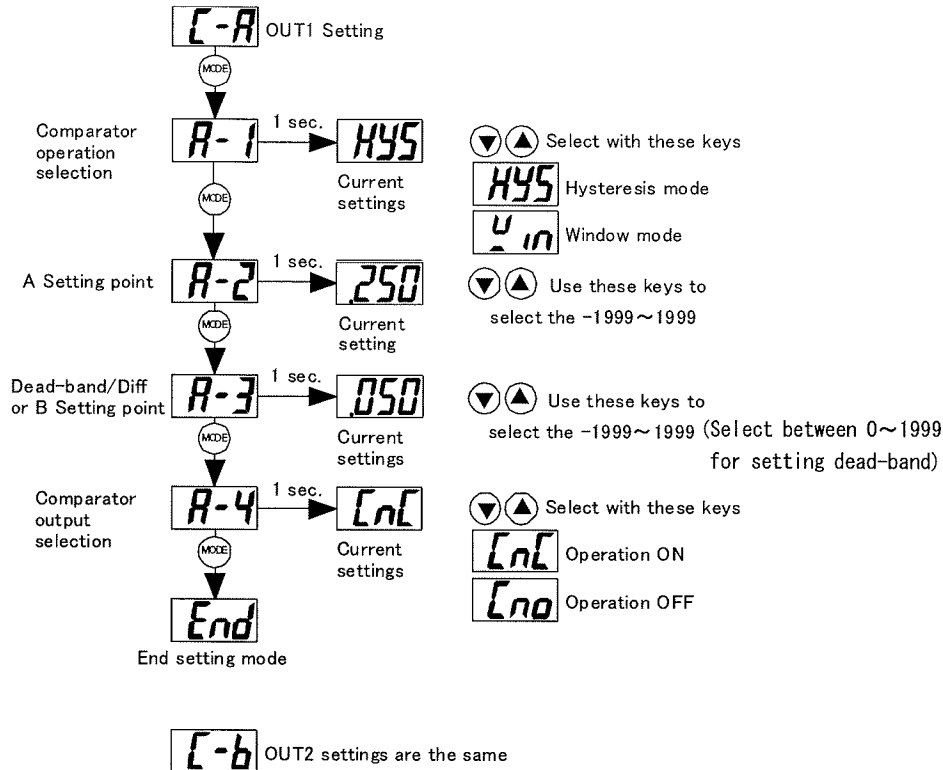
In **【User settings】** , values are set with the **▲** **▼** keys.

The **▲** **▼** keys are also used for unit ,filter and decimal place in the function setting mode.

8-1. Comparator operation settings

OUT1 and OUT2 are both internal in the comparator, and both hysteresis and window modes can be selected and set independently.

When the comparator's output conditions have been reached the outputs will turn ON and the comparator operation display LED OUT1 and OUT2 will light up.



(1) OUT1 settings

Using the ▲ ▼ keys set [OUT1]. Using the **MODE** key select [Comparator operation selection].

After **A-1** 1 sec. the current setting is displayed. Press the ▲ ▼ keys to switch between hysteresis and window mode. Next use the **MODE** key to select [A setting point]. After **A-2** is displayed for 1sec. the current setting is displayed. The numerical values entered here are the [Comparator operation selection] hysteresis and window mode's [A setting point].

Using the **MODE** key select [Dead-band / Diff or B setting point]. After **A-3** is displayed for 1sec. the current setting is displayed. The numerical values entered here are the [Comparator operation selection] hysteresis and window mode's [B setting point] or [Dead-band Diff/]. Using the **MODE** key select [compare to output selection]. After **A-4** is displayed for 1sec. the current setting is displayed.

Press the ▲ ▼ keys to switch operations ON or OFF.

(2) OUT2-setting

Using the ▲ ▼ keys set [OUT2].

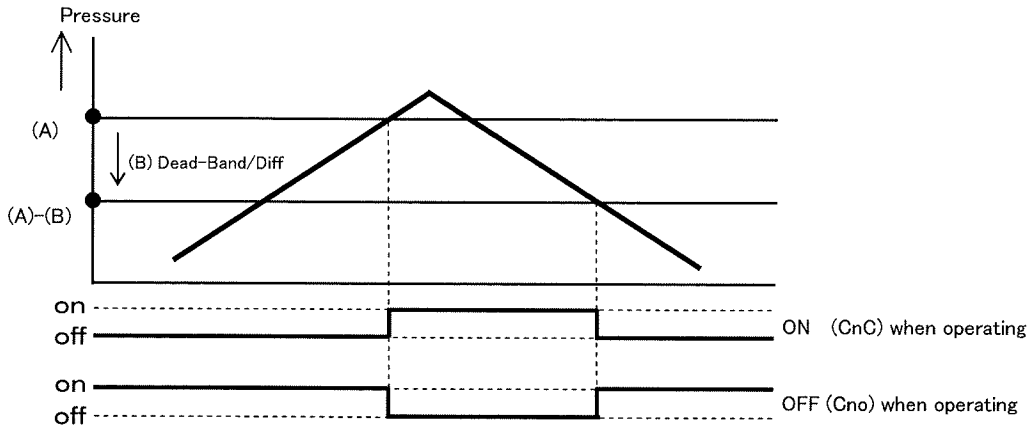
In the same manner as [OUT1 setting] the settings [Comparator operation selection], [A setting point], [B Setting point], and [Dead- band] are selected.

Caution: Please set the comparator value within the rated pressure range between -10 and 110%F.s.

(3) Comparator operation

① Hysteresis mode operations

The diagram below shows the comparator operation with value of setting point A as (A) and the Dead-band as (B). A can be set between -1999 and 1999, and B dead-band can be set between 0 and 1999.

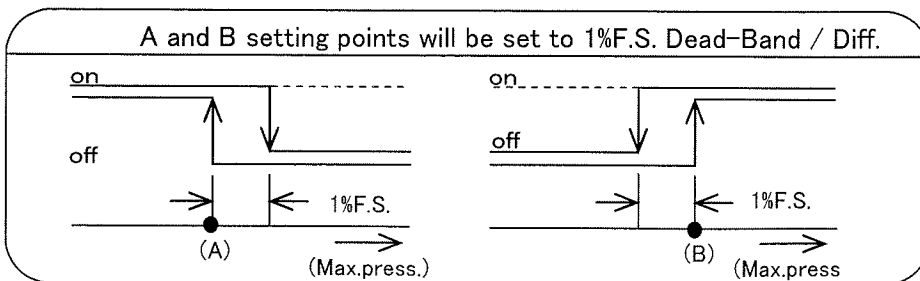
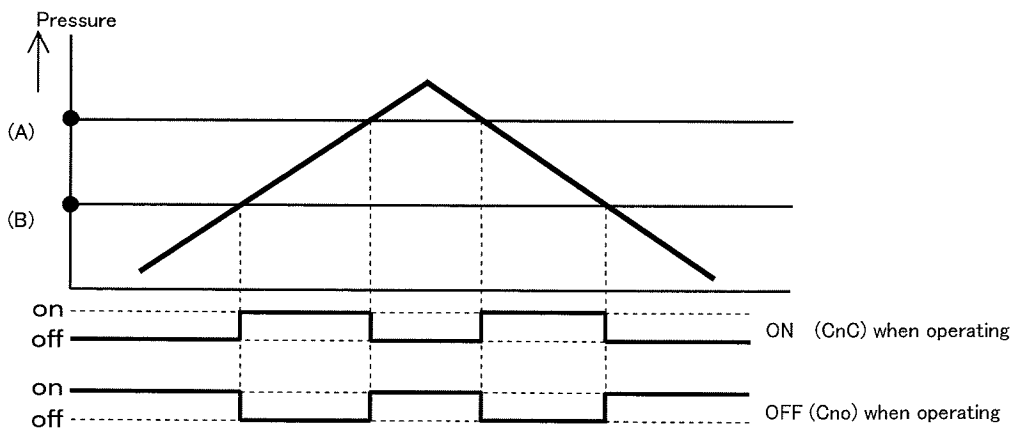


Precautions

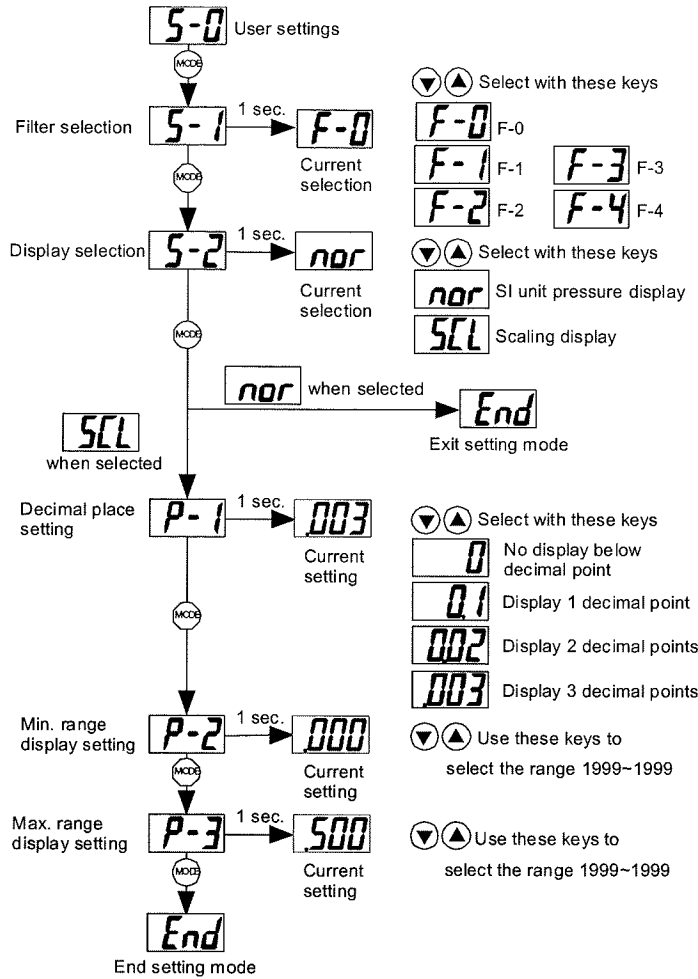
The comparator might start chattering when the pressure is showing unstable condition such as pulsation, and also when the setting of dead-band is small. In such case, take the system safety measures as well as using the filter function and the delay timer (on, off delay) function. When dead-band is set zero, the operation could get unstable. It is recommended to set the hysteresis more than 1%F.S.

② Window mode operation

The following diagram shows the comparator operation with value of setting point A as (A) and setting point B as (B). A and B can be between -1999 and 1999.



8-2. User setting



Using the **▲▼** keys set [User settings].

Using the **MODE** key select [Filter selection]. After **S-1** is displayed for 1 sec. the current setting is displayed. Press the **▲▼** keys to select the filter setting value. The ZT67 has 4 types of filters with time constants built in.

Use when there is intense pressure fluctuation. The selected filter's time constant influences the comparator output.

F-0	.....	Without filter
F-1	.....	Time constant 10ms
F-2	.....	Time constant 50ms
F-3	.....	Time constant 200ms
F-4	.....	Time constant 600ms

Next use the **MODE** key to select [Display selection]. After **S-2** is displayed for 1 sec. the current setting is displayed. Press the **▲▼** keys to choose between SI unit display (kPa or MPa) or scaling. When **SCL** is selected, the modulated pressure LED display value will be arbitrarily scaled. This function is for scaling the LED display of the pressure range Min. and Max. Values and does not influence the modulated pressure output and analog output.

When **SCL** is selected, press the **(MODE)** key to select [Decimal place selection].

After **P-1** is displayed for 1sec. the current setting is displayed. Press the **(▲)** **(▼)** keys to select the decimal place.

Next, press the **(MODE)** key to select [Min. range display setting]. After **P-2** is displayed for 1 sec. the current setting is displayed. Use **(▼)** key to select a digit, and use **(▲)** key to change the value. Any value between -1999 and 1999 is selected.

Next, press the **(MODE)** key to select [Max. range display setting]. After **P-3** is displayed for 1 sec. the current setting is displayed. The setting method is same as **P-2**.

The pressure range Min/Max. display value is a calculated coefficient in the internal memory. From this point on when **SCL** is selected this coefficient is used to scale the LED display.

Example:

For the pressure range 0 to 1MPa (0 to 100%F.S.), the gauge display 『0.000 to 1.000』 is changed to 『0.00 to 10.20 』 (0 to 100%F.S.).

· P-1	Decimal place (from the least significant digit)	:	.000	→	0.02
· P-2	Pressure range min. display value	:	.000	→	0.00
· P-3	Pressure range max. display value	:	1.000	→	10.20

9. Other functions

9-1. Zero point adjustment

In measurement mode air release the pressure coupler and with the **(MODE)** key pressed down, press **(▼)** the key. After releasing the keys the display value can be set to zero.

When a zero adjustment has made correctly, **Adj** is displayed.

When the pressure is modulated outside the pressure range of -5 to 5% F.S. the error **E-0** will display for 1 sec. and a zero adjustment will not be performed.

9-2. Peak/bottom hold

Max. and min. modulations in the internal memory as peak values and bottom values. Peak values and bottom values are displayed while pressing the **(▲)** and **(▼)** keys.

Peak and bottom values can be turning off the power or as follows

Peak value reset : While pressing the **(▲)** key, press the **(▼)** key.

Bottom values reset : While pressing the **(▼)** key, press the **(▲)** key.

9-3. Key lock

To avoid mistakenly overwriting existing settings there is a key lock setting. Once key lock is set, modes other than peak/bottom hold mode cannot be set.

The key lock state remains even after resetting the power and can only be turned off using the unlock procedure.

In measurement mode, while pressing the **(MODE)** key down press the **(▲)** key and **LoL** will display for 1 sec. indicating key lock mode.

Release is also activated in the same manner, while pressing the **(MODE)** key down press the **(▲)** key and **unL** will display for 1 sec. indicating unlocked mode.

9-4. Setting value back-ups

This device has built-in EEPROM. Main set value and operation status are maintained while power is off.

【Maintained contents while power is off】

- Stored set value : All set values of function and comparator setting modes.
- Stored status : keylock and unlock status.

10. Error display

During measurement mode if an error occurs the error message will alternate with the pressure display, or only the error will display.

Error display	Contact	What to do
FFF	Occurs when the pressure range modulates over 110% or the display passes 1999.	Return to proper rating.
-FFF	Occurs when the pressure range modulates below -10% or the display goes below -1999.	Return to proper rating.
E-1	Comparator 1 has overloaded. (Caution 1)	Set the load current to below 80mA. To recover, reset the power.
E-2	Comparator 2 has overloaded. (Caution 1)	
E12	Comparator 1 and 2 has both overloaded. (Caution 1)	
E-3	Needs to be examined by our service personnel.	Please contact our closest dealer or office.
E-4		

(Caution 1) : When an electrical overload is detected in comparator 1 or 2, output is shut off for 1 sec. and after processing the overload the non overloaded comparator will come back on.

11. Maintenance

11-1. Maintenance

Basically, this device does not have mis-adjustment. However, considering aging phenomena, it is recommended to implement regular check once in a half year. Also, please calibration in decided method or calibration organization. Refer following checklist for periodical inspection.

【Checklist for periodical inspection】

- External appearance.
- Insulation between each terminal and case (measure with 100MΩ or more/50 VDC or less).
- Leak test of piping connection part.
- Output check by standard pressure instrument.

11-2. About the influence by noise

Since there are various noises, it is difficult to take perfect measures against all noises.

If output values are fluctuated from time to time or wrong values are continuously displayed, it may be affected by noise.

To take measures against noise, it is necessary to identify the source, route and type of noise.

- To take countermeasure against the radiated noise from wireless devices such as transceiver, measures with ferritic core/metal conduit, or filter that has three-terminal capacitor/lead-through capacitor are effective.
- To take countermeasure against the inductive noise due to drawn cables, etc., separation of power line from signal wire or isolation by individual conduit, or use of twisted pair wire are effective.
- To take countermeasure against conductive noise such as switching power source or inverter, low-pass filter or filters with built-in common mode choke coil are effective.

These countermeasures can reduce the effect of noise for certain degrees but there may be some cases that the intended effect is not achieved.

Basically, to eliminate or keep away the source of noise is most effective.

12. Others

This manual cannot cover all details of the instrument or all other variations; nor does it aim to explain all details of installation, maintenance and all other subjects. If you need more information, please feel free to contact us. The contents of these instructions are subject to change without notice.