

# Caution for using

WO81

## ⚠ General cautions common to all the instruments

WO70

### Caution of service condition

- Do not use the instrument in a place subjected to direct sunlight, vibration or shock, or excessive moisture. In particular, vibration and shock to the instrument should shorten its life.
  - The instrument is not waterproof. Do not use it in a place subjected to rain, or other splashing water.
- The instrument cannot be installed outdoors without an appropriate protection. If outdoor installing is required, the instrument should be housed in a box of drip-proof type for outdoor use.

FR51A

### Zero point setting

- Set the zero point of the gage or the pressure transmitter by turning the zero adjuster, after installing them in the position which they are used.
- Before setting the zero point, be sure to open the high and low pressure piping connector to atmosphere, or stop the equipment to run low the residual pressure to zero.

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### Measurement of single pressure

- Manostar products do not indicate absolute pressure and gage pressure but differential pressure. However, if either high or low pressure piping connector port is opened to atmosphere, the instrument display the gage pressure. The indicated pressure is called single pressure in contrast with differential pressure
- When measuring single pressure by opening one port to atmosphere, the gage pointer may be taken a fullswing. Because the inner pressure of the duct is usually higher (or lower) than the differential pressure. Check the inner pressure of the duct (line pressure) and select an applicable gage for the pressure.
- Measurement of positive pressure  
Connect the tube to the high pressure side piping connector (indicated by red color or letter H). The lower pressure port (blue or L) should be opened to atmosphere, but do not remove the piping connector.
- Measurement of negative pressure  
Connect the tube to the low pressure side piping connector (blue or L). The high pressure port (red or H) should be opened to atmosphere, but do not remove the piping connector.
- Measurement of single pressure using an instrument with zero point center range.  
Connect the tube to the high pressure side piping connector (red or H). In this case again, leave the piping connector attached to the low pressure side, which is opened to atmosphere. The single pressure is as displayed on a zero point center scale (+-).

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### Polarity of an error

- A measurement error has a polarity of positive or negative. If the reading on the standard instrument (considered as the true value) is larger than that on the instrument concerned, the error is regarded as negative, and as positive in the opposite case.

Indicating on instrument concerned	Reading on standard instrument	Error of instrument concerned
1000 Pa	1013 Pa	-13 Pa
1000 Pa	985 Pa	+15 Pa

EMTGPI

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### Effect of pulsating protector

- The pulsating protector is used to restrict the pulsation to the degree at which the indication or the output signal can be read on the gages or pressure transmitters, or for the switches to the degree at which they function without problem. It does not completely eliminate the pulsation.
- The product code and the applicable ranges of the pulsating protector are listed in p.91 of this catalogue. The ranges specified in the list are only the guideline for the selection.
- The anti-pulsation unit becomes more effective as the pulsation frequency becomes higher. It functions for the frequency of more than two pluses in one second. It does not work for the frequency less than one pulse in one second, which is rather waving than pulsation. It is possible to measure the pulsation of such low frequency using the unit of high applicable range, but the response time becomes very slow and the gage does not indicate an accurate average value but only an approximate value.
- The anti-pulsation units are bidirectional, and it can be connected in either direction in the line.

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### Effect of corrosive gas absorber

- It is not known whether the gas absorber is effective for every gas or not. The corrosive gas absorber contains activated carbon, and this activated carbon determines the effect of the absorber. There are numerous kinds of gases which corrode the Manostar gages, switches, and pressure transmitters, and also the absorbing performance of the absorber amount of change depending on the concentration of the gas. However, the pressure receiving inner chamber has a dead end structure so that a large volume of gas does not come into instrument. This contributes to extend the service life of the activated carbon.
- Upon your request, we will send you the instruction manual of the corrosive gas absorber unit and reference materials on activated carbon for your study. Also purchasing and actually examining the unit is another way for the evaluation.

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### Effect of instrument air filter

- The filter is only effective for coarse particles such as flour and sand dust and so on. The dead end structure of the pressure receiving inner chamber does not allow a large volume of air to come into the instrument and the inside of the gages is kept relatively clean. However, the filter is not effective enough for the Manostar switches since the microscopic particles adhered to the contacts may cause contact failure.
- Only high performance filter used in MS65F type is effective for Manostar switches.

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# Caution for using

## ⚠ Caution of Manostar gages

### Setting of flag pointer

- The flag pointer is used for indicating a predicted values or a limit values. Set it at the predicted or limit values.
- Do not move the flag pointer off the scale, exceeding the zero or full scale point.

### Exclusive piping connector

- The piping connector of Manostar gages WO81, WO80, and WO70 are not compatible with each other.
- General purpose piping connectors be available on the market have the different configuration and do not fit this gage. If used, the gages do not function properly.
- If the connector is needed to be changed, please contact us.

### Polarity of high and low pressure side

- The polarity of the high and low pressure side is determined by the piping connector attached. In the model WO81 and WO70, the polarity can be inverted by switching the piping connector each other. The high pressure side and the low pressure side are identified with red and blue color respectively.
- In case of measuring the single pressure, the gage does not work if the piping connector needed to be connected to tube is removed from the port.

### Tightening piping connector

- Tightening torque

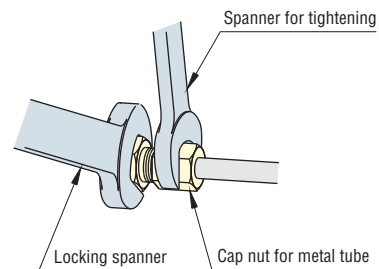
The plug sealing between the piping connector port of the instrument, the piping connector, and the sealing plug is achieved by O-rings. Apply the tightening torque specified below when tightening the piping connector and sealing plug. The instrument body will be broken if excessive torque is applied.

○Piping connector for vinyl or plastic tube and metal tube ...1 N·m

○Sealing plugs.....0.5 N·m

- Tightening with locking spanner

Always use locking spanner to tighten the ring joints for MT connectors (for metal tube) or MR connectors (rotating type for metal tube) and be careful not to apply the tightening torque directly to the instrument body.



### Polarity displayed on the scale

- Manostar gages are for differential pressure, because the polarity is not displayed on the scale except the gages with zero point center range.

○In case that the line pressure is positive: Example: 200 Pa - 150 Pa = 50 Pa

○In case that the line pressure is negative: Example: -150 Pa - (-200 Pa) = 50 Pa

As described in the examples above, the polarity on the scale only indicates that the pressure applied to the high pressure side is higher than the low pressure side, so indication of the polarity is meaningless. However, in the single pressure measurement of the chamber inner pressure compared positive and negative compared to the outside pressure, the polarity indication on the scale is convenient. Upon customer's request, we provide the customer with the products with the scale on positive and negative (+-) polarity indication by extra charge.

### Piping connector connection of the instruments with zero point center range

- Manostar gage is for differential pressure. It measures the difference between two pressures, and the pointer moves in the positive or negative direction according to the pressure fluctuation. A zero point center scaled gage is used in such measurement.
- The polarity of the zero point center range is determined by following a condition of piping.
  - 1) When the high pressure line is connected to "HIGH" piping connector, the pointer moves in clockwise direction. This direction must be designated as positive. ("LOW" piping connector is connected to the low pressure line.) The scale of the zero point center range is considered this directive to be the plus sign (+).  
(pressure of "HIGH" piping connector side > pressure of "LOW" piping connector side)
  - 2) Naturally, the opposite direction becomes negative.  
(pressure of "HIGH" piping connector side < pressure of "LOW" piping connector side)
- If it is determined that the use of above description "1)" is normal and the use of is abnormal, on the condition when the use is normal, the pointer is indicated positive by connecting the high pressure line with the high side pressure piping connector port. After connecting, if the connection is abnormal, the pointer is indicated negative.
- When high or low pressure side of the pressure detector is not known, the gage with a center zero point identify according to the pointer direction to be measured the differential pressure.

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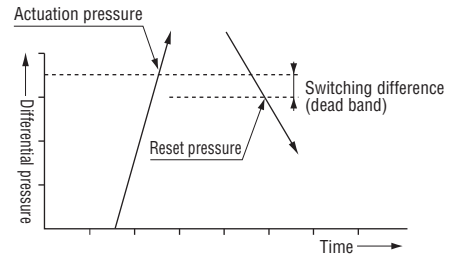
# Caution for using

WO81

## ⚠ Caution for Manostar switches

### Switching difference ΔP (dead band)

- Activating pressure: The values of differential pressure applied to the Manostar switches, at which the pressure increases to the value from zero and the electrical contact of the switch is activated.
- Reset pressure: The values of differential pressure, at which the pressure decrease from the set pressure to the electrical contact of the switch is returned to its original position.
- Switching difference ΔP (dead band): The values of activating pressure and reset pressure are not the same, and the difference between them is called switching difference pressure (dead band)



Explanatory diagram of switching difference pressure (dead band)

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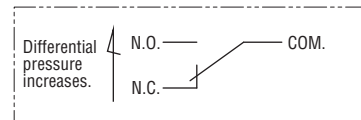
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### Setting of upper limit/ lower limit

- There are two types of Manostar switches, on one of which the scale of the setting knob is calibrated in set pressure, and on another type in reset pressure.

### Switch contact configuration



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- Upper limit setting type Adjusted in activating pressure
- Lower limit setting type Adjusted in reset pressure

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### Name plate of upper limit type



### Name plate of lower limit type



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### Reset time

- The reset time means the time needed for the differential pressure to decline to the reset pressure from the activating pressure (i.e., the electrical contact is reset) when the differential pressure is sharply reduced to zero. It is about three seconds at 20 Pa, and one second at more than 50 Pa for Manostar switches. (This value is only for the instrument itself and does not include the effect of piping.) Therefore, a response quicker than this value is not possible.

### Range of setting scale

- Manostar switches have their range if scale limited due to its construction so that the min scale value can be a fraction of the max. scale at the finest. Therefore, it is impossible to manufacture the switches of wide range such as from 0 to 300 Pa.
- It is also impossible to manufacture the switches with zero point center range.

### Rated contact

- If the load is larger than the specified contact capacity, use a secondary relay. In general, the load voltage and the current is too less to the life of contact is longer. However, this does not expect for a low electrical load. Manostar switches cannot directly shut off the circuit of 250 V AC or more.

### Gas to be measured

- If the gas to be measured contains corrosive gases (nitric acid, hydrogen sulfide, sulfurous acid, ammonia, chlorine, and so on.), they may cause electrical contact failure or corrosion of internal mechanism, which leads to malfunction of the switch. Do not use the switch for the gases containing high humid air because in such gases, the arc generated by opening/ closing the contact produces nitric acid, and it may also cause electrical contact failure or malfunction of switches.
- If the gas to be measured contains silicon produced from silicon (contained in oil, grease, filling agent, and so on.), the gas produced by arc, generates by opening/ closing the contact, accumulates on the contact surface and causes contact failure. Take corrective measures such as the removal of the gas source or arc suppression.

- The switch from 1 to 6 kPa range as an example, the switching difference pressure (dead band) is 0.6 kPa. When the activating pressure is set to 2 kPa;

#### ○ In case of upper limit setting type

When the differential pressure increases, the circuit is closed between N.O. and COM. at 2 kPa. Then as the differential pressure decreases, the circuit is opened between N.O. and COM. at 1.4 kPa.

#### ○ In case of lower limit setting type

When the differential pressure increases, the circuit is closed between N.O. and COM. at 2.6 kPa. Then as the differential pressure decreases, the circuit is opened between N.O. and COM. at 2 kPa.

- The scale of the setting knob is adjusted for both upper and lower limit setting type at our factory before shipping. It is not allowed for customers to convert from the upper limit setting to the lower limit setting or vice versa.
- Be careful about the difference between the upper and lower limit setting switched and also understand the relation between the pressure increase/ decrease and the contact composition before designing the operational sequence.

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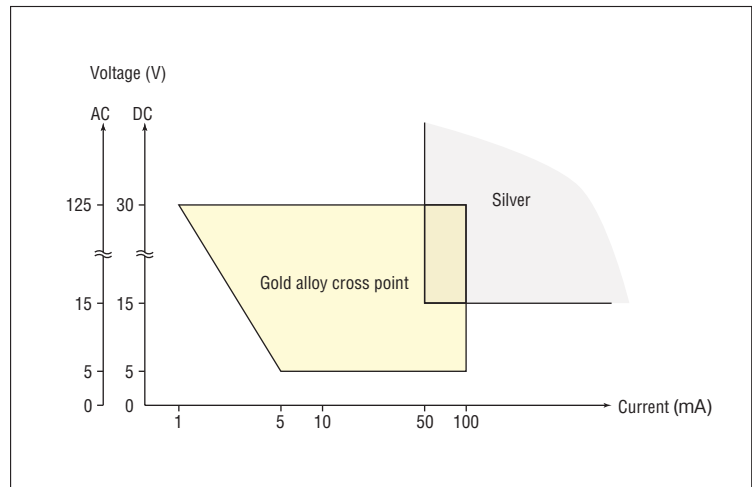
## ⚠ Caution of Manostar switch

### Gold contact specification for low electrical load

- Contact material and applicable mechanism for low voltage and low current circuit

The schematic diagram in the right explains the proper range of load voltage and current for which silver or gold alloy contact is generally used when the contact is used for opening or closing the low voltage and low current circuit with a micro switch. When referring to the diagram, keep the following points in mind.

The working range for each contact may actually be depending on the kind of micro switch, contact pressure, working condition, environmental condition, and the kind of load, and so on. In general, the contact should be selected based on the required level of contact reliability.

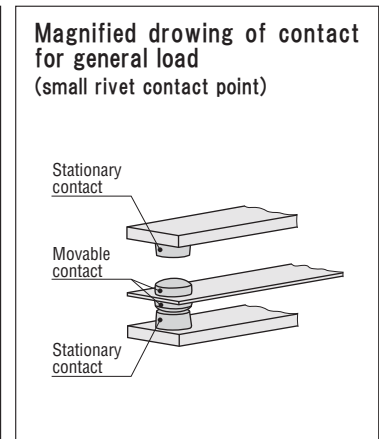
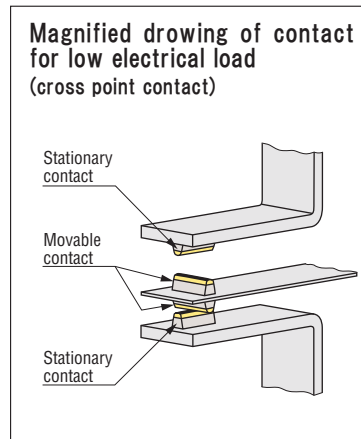


- Geometry of contacts

Cross point contact

Advantages

- High reliability obtained by high contact pressure per unit area
- Stable contact resistance with gold alloy contacts
- Cross point contacts are most suitable for switching low electrical load.



- Gold alloy contacts

Stable contact performance is expected since oxidizing or sulphidizing film is not easily formed on gold alloy contacts. However, they are not suitable for switching the load of high capacity. If used for such applications, the contacts are rapidly damaged due to sticking and blowout

The max. rating of our Manostar switch having gold alloy contact for micro load is 100 mA, 30 V DC, resistive load. Use the switches within the limits of the max. rating and the min. rating.

- Silver or silver alloy contacts

In general, the contacts having silver as the main material, which is easy to form surface oxide film and, particularly, sulfide film, contacts work fine in the early stage, but thereafter, on low electrical load such as 10 mA, 24 V DC the film cannot break. It tends to occur contact failure by the film.

When the current or voltage applied to the contact is high enough to break the oxide/ sulfide film, is broken and the contact is kept good contact.

- The micro switch used in a Manostar switch is installed in the positive pressure measurement chamber. The gas to be measured can easily flows into the chamber, thus, the composition of the gas largely affects the formation of the film. In addition, the dust contained in the gas to be measured can adhere to the contact surface and be changed into carbide caused the contact failure by the arc generated when the contact is opened or closed. Therefore, pay attention to the measurement environment as well. (Even with gold alloy contact, be careful about the dust.)

- As the opening/ closing frequency of the contact increases, wear dust from the contact increases. This wear dust accumulates between the contacts to increase the contact resistance and causes the malfunction in the load circuit.

- Arc suppression is required for inductive load (such as a control relay) to prevent the contact from sticking or burning. Refer to section of "switch contact protection" in p.32.

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## Tube connection

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### General tube connection

- Use vinyl, plastic or rubber tube with the wall thickness of 1 mm or more for the vinyl or plastic tube with piping connector. However, the vinyl or plastic tube (2 or more wall thickness) with enough withstanding pressure (including vacuum pressure) is required when the instrument range or the line pressure is higher more than 50 kPa.
- Copper and aluminum tube are both available for the metal tube piping connector, but either O.D. must be 6 with the tolerance of  $\pm 0.1$  mm.
- It is also possible to use plastic tube (O.D.6  $\times$  I.D.4) for the metal tube connector if the inner sleeve set sold as an option is used as shown in the right figure.
- The bent radius of vinyl or plastic tube should be at least 50mm.
- Fasten the piping connector of vinyl or plastic tube by the fittings with house clamps.

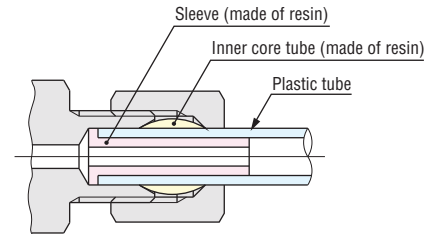
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### Inner sleeve type plastic piping



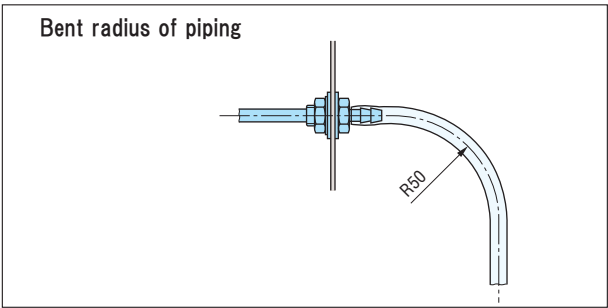
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### Use of tube clamp



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### Prevention of clogged piping due to drain

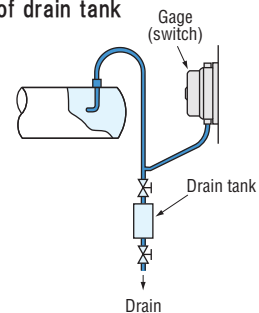
- If drain remains within the line, it causes measurement error. Be sure to install the pressure receiving instrument above the pressure outlet port of the pressure detector and arrange the line so that the drain water should not remain in the slack piping.
- If the arrangement mentioned above is not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

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### Installation diagram of drain tank



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### Prohibition of common piping

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

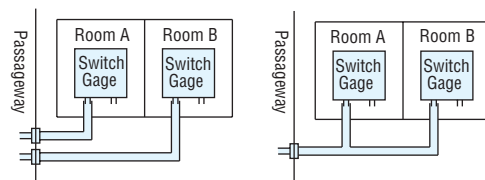
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### Independent piping ○

### Common piping ×

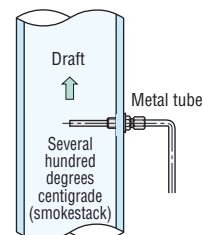


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### Measurement of high temperature gases

- In the pressure measurement of high temperature gas, use the pressure detector (pitot tube) made of the heat-proof metal (such as stainless steel), and connect it with the pressure receiving instrument through a metal tube which is long enough to cool down the high temperature gas. Since high temperature gas does not enter the inside of the instrument itself (closed circuit), it is possible to measure the pressure of high temperature gas reaching several hundred degrees centigrade without problem.

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## Piping

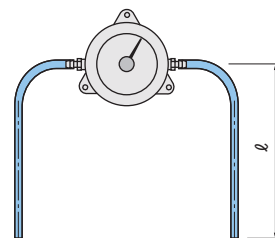
### Length of piping

The speed of response is delayed when the product is used for remote monitoring.

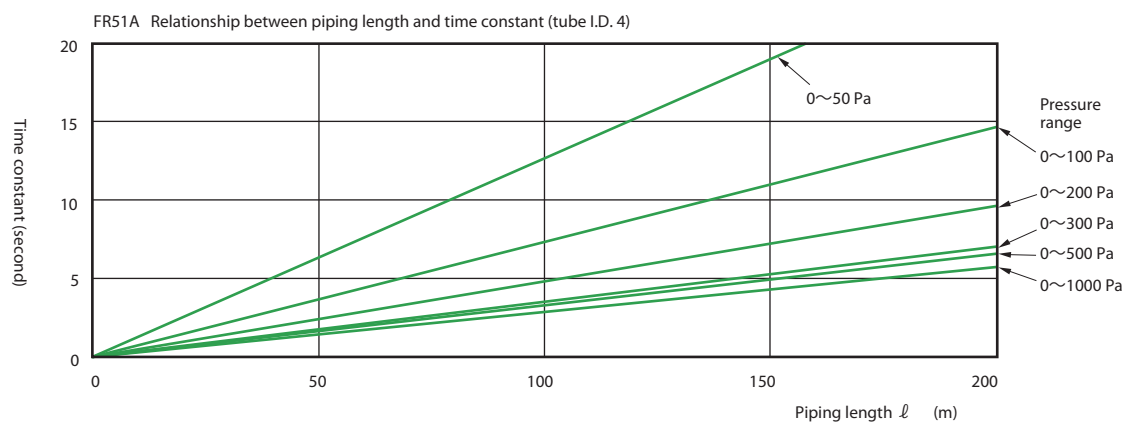
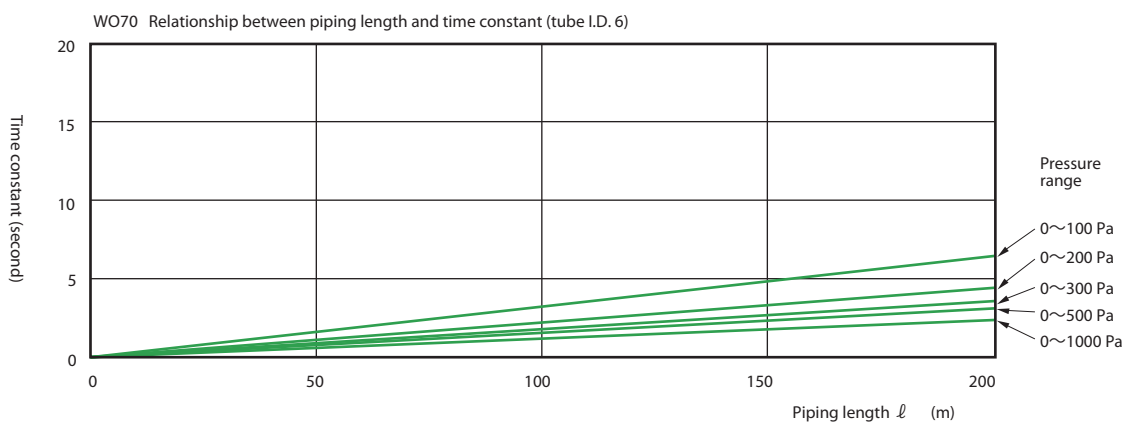
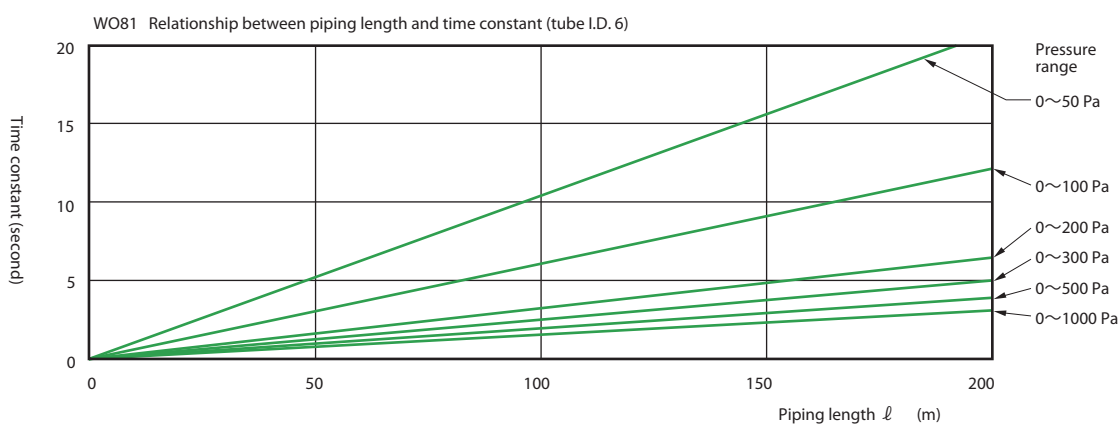
In such application, the I.D. of the connection tube should be as large as possible.

The time constant is almost inversely proportional to the inner cross sectional area of the piping. (refer to the diagram below.)

If the piping conditions of the high and low pressure side are significantly different, the difference in the piping resistance between high and low pressure side causes the difference in pressure transmission time, and the measurement becomes inaccurate.



Time constant: The time required that the indication of an instrument reaches about 63 % of the full scale.



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## Product Warranty

### Warranty Period

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

### Coverage

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

This warranty does not cover:

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

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

\*This product warranty is only valid within Japan.

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

Be sure to refer to the original Japanese for the details of this warranty.



Caution

The Japanese original document shall always take precedence over the translated versions.

You should be sure to refer to the Japanese original document.

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