RoHS

READ THE INSTRUCTION MANUAL BEFORE USING

INSTRUCTION MANUAL

MANOSTAR SWITCH

MS99

No. TR-MS99-E03

Manostar

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INTRODUCTION

Thank you very much for purchasing of "MANOSTAR SWITCH MS99".

⚠ Caution	To ensure your safety in using this instrument : ・Be sure to read the instruction manual carefully before using the instrument so that you can use it properly. Wrong use may result in failure of the instrument and lead to its damage and accident. This manual should be kept in a proper place so that you can refer to it any time you need.

Ⅰ. PRECAUTIONS

⚠ Warning

・Do not use the instrument where flammable gas is present.
The instrument is not explosion-proof. Do not use instruments in the circumstance where flammable gas is present. It may cause explosion.

・Do not use the instrument at the place where corrosive gas is present.
The instrument is not corrosion resistance construction. Measuring corrosive gas may corrode the receiving element and housing material of the instrument. It is expected that corrosive gas leaked out of the instrument will harm a person.

・Do not apply the pressure to the instrument more than it can withstand.
The diaphragm and the retainer are broken and cause of injury or accident, etc. disaster if the pressure exceeding withstanding pressure of the pressure receiving element is applied to the instrument. The case body and the transparent cover of the instrument are broken and cause of injury or accident, etc. disaster if the pressure exceeding withstanding pressure of the instrument body is applied to the instrument.

・The instrument is measurable for air and non-corrosive gas only.
The machine is exclusive use of dry air (90%RH or less). Using measuring the water or oil it may be damaged and causes the accident.

・Avoid using where the instrument is subject to many vibration and impact.
Using the instrument where intensified vibration and impact may be damaged the instrument. It is expected that gas leaks of the instrument which harms a parson.

・Do not exceed rated surrounding temperature, humidity and altitude in use.
Using the instrument by exceeding rated surrounding temperature and humidity and altitude it may be damaged and cause the accident.

・Do not disassemble or reconstruct the instrument.
It may void the warranty.

・Do not exceed rated voltage in using
Using the instrument by exceeding rated voltage may cause fire or electric shock.

・Wire correctly.
Incorrect wiring may cause fire.

⚠ Caution

・As to where to install and how to install this instrument, be sure to follow the instruction manual provided so as to ensure a proper method.

・Use the instrument indoors.

・In case of not being installed in dry and well-kept clean locations, the instrument must be enclosed in box.

・Do not use organic solvent for cleaning.
Use a cloth soaked with water-diluted neutral detergent to wipe the surface of a product. Using of organic solvent causes damage on the surface.

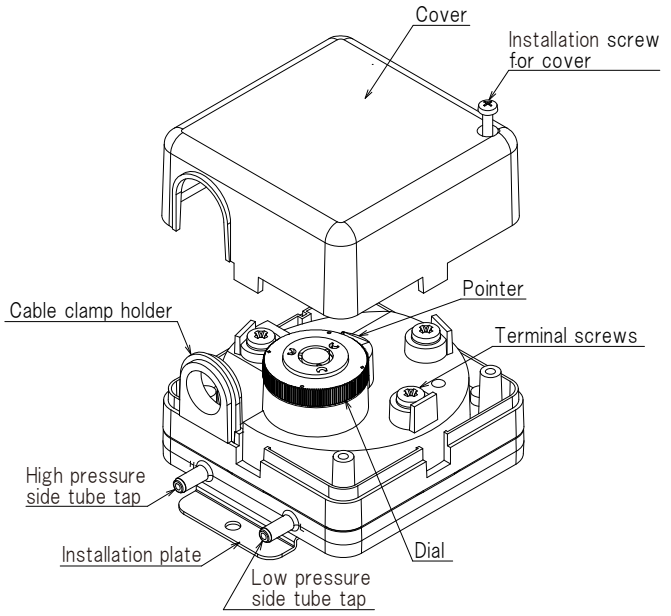
・Dropping the product.
Product is a precision instrument. If you drop the product, there is a possibility that the exterior, also the interior mechanism damage.

・Removal of the piping
Please do not pull the pipe with a strong force. There is a possibility that the pipe cap is broken.

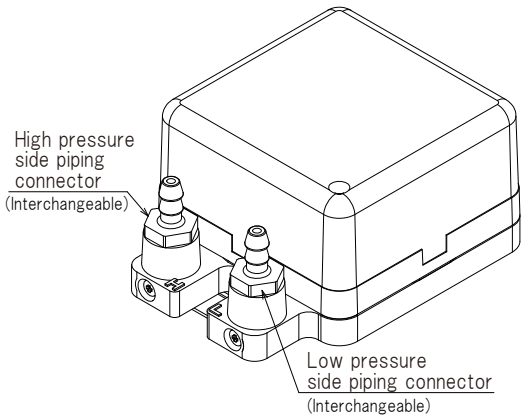
・MS99 acquires UL-approved as an open type enclosure.
For UL listing application, install MS99 in the system, and configure so that the entire system will be UL-approved.

Ⅱ. THE NAME OF EACH PART

・Type V



・Type C



(All except for the piping connector part is common with type V)

Ⅲ. INSTALLATION

Before using this instrument, make sure if it is the type that you requested and meets the demand of the environment, pressure and piping conditions where it is used, by specification.

1. Caution of service condition

a) 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.

b) Use under the medium and ambient temperature from − 10 to + 50 ℃.

c) The instrument is not waterproof. Do not use it in a place subjected to rain, or other splashing water. The product is equivalent to the protection class IP54, when mounted as below.

1) Use the cable clamp which matches the wire diameter of the wiring.

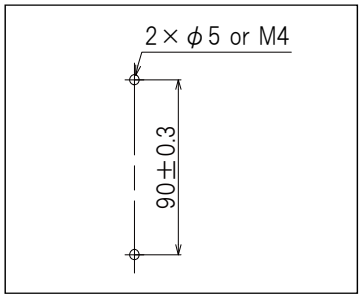
2) Please install it so that a gap doesn't occur between a cover and the body by a screw for cover installation of an accessory.

※Please refer to the item of p.3 ″5. Accessory for MS99″ about cable clamp.

d) In installing the instrument, select the place where the ground is smooth and flat.

2. Installation of MS99

Panel cut size

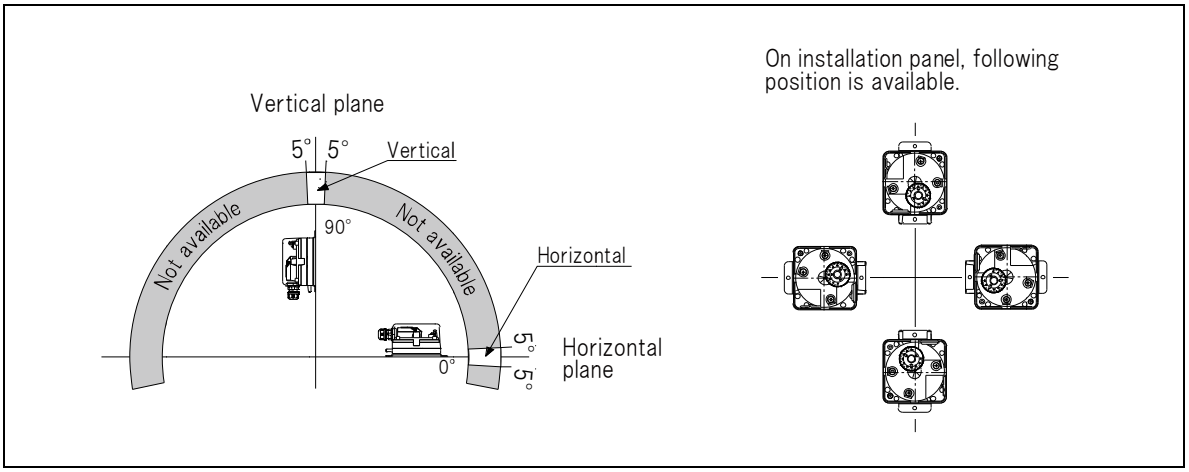


⚠ Caution	・The tightening torque of the screw is 1 N・m. ・Do not apply excessive torque more than stipulated value, otherwise it will damage the body of the instrument.

3. Installation position

Must be specified at time of order.

After inspection and adjustment in accordance with the specified installation position, and shipped.



⚠ Caution	Use of in a position other than the specified is out of accuracy warranty.

4. Wiring material

Choose the wiring material depending on the load. Terminal screw of the product is M4. Wire by performing the termination of the crimping terminal (O.D. less than ϕ8 which matches the general M4 screws.) The wiring direction can be changed by changing the direction of the cover.

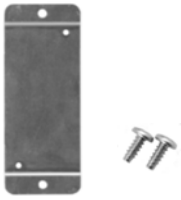
Further, an attachment point of the cable clamp receipt can be chosen from 2 points.

The wiring direction

(When cable clamp, which is sold separately, is installed.)

5. Accessory for MS99

Installation plate
aluminum, copper made [installed]



Product code
ADPL99-01

Used with the installation of the instrument body.

Cover
polycarbonate-made [installed]

Product code
TCA-99

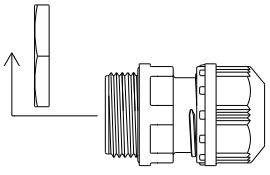
Cable clamp (produced by OHM ELECTRIC CO., LTD.)
nylon66, polypropylene, NBR made [option]

Product code	Suitable wire diameter
OA-W15M-04	ϕ2～4
OA-W15M-05	ϕ3～5
OA-W15M-07	ϕ5～7

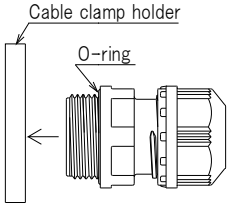
Use the cable clamp below so as to make it equivalent to the protection class IP54.

※When taking wiring out in the connector direction by type C, it can't be installed for a connector and cable clamp to intervene.

＜Installation＞



1.Remove the locknut. The locknut is not necessary to install the instrument.



2.The cable clamp screwed to it, by hand. At that time, O-ring of the cable clamp is compressed, and, parts are in contact (without a gap). Caution, parts may be damaged if too much tightening.

6. Accessory for type C

VT connector for vinyl or rubber tube reny-made [installed]	
	Product code
	KGA99VT

Be sure to use I.D.6 and thickness of 1mm or more. However, the vinyl or rubber tube with enough withstanding pressure (including vacuum pressure) is required when the instrument range or the line pressure is higher than 50 kPa.

VR connector for vinyl or rubber tube brass-made [option]		
	Product code	
	High pressure	Low pressure
	KGA81VR-H	KGA81VR-L

These connectors are rotary elbow type and can be connected to vinyl or rubber tube of I.D. 6.

PT connector for plastic tube PBT, brass-made [option]		
	Product code	
	High pressure	Low pressure
	KGA81PT-H	KGA81PT-L

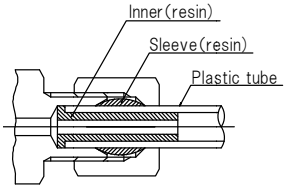
The joint installed tube is push-in type. Use the optional tube or the applicable tube (JIS B8381-1).

MTW connector stainless steel-made [option]		
	Product code	
	High pressure	Low pressure
	KGA81MTW-H-S	KGA81MTW-L-S

This is connector can be connected to stainless tube (O.D.6±0.1).

Inner sleeve set for plastic tube polypropylene-made [option]	
	Product code
	XIN6X4

You need this to connect plastic tube (O.D.6, I.D.4) to the connectors for metal tube. (the following figure)



MT connector for metal tube brass-made [option]		
	Product code	
	High pressure	Low pressure
	KGA81MT-H	KGA81MT-L

This connector can be connected to the metal tube (O.D.6 ±0.1) made from copper, aluminum and so on.
When this connector is connected to plastic tube (O.D.6, I.D.4), remove the brass-made sleeve and use the resinous inner sleeve set (XIN6×4) that is sold separately
(Please use the type MTW connector for the stainless steel pipe)

MR connector for metal tube brass-made [option]		
	Product code	
	High pressure	Low pressure
	KGA81MR-H	KGA81MR-L

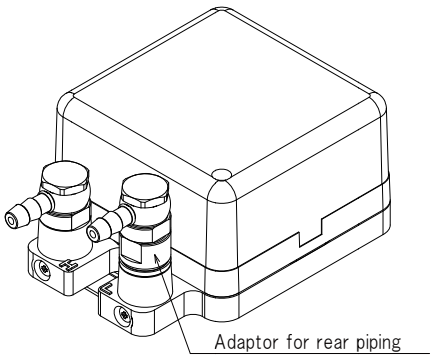
This connector is rotary elbow type and can be connected to the metal tube (made from copper and aluminum and so on). Applicable piping material is the same as MT connector.

PR connector for plastic tube PBT, brass-made [option]		
	Product code	
	High pressure	Low pressure
	KGA81PR-H	KGA81PR-H

The joint installed tube is push-in and rotary elbow type. Applicable piping material is the same as PT connector.

Adaptor for rear piping brass-made [option]		
	Product code	
	High pressure	Low pressure
	KGA81FBA-H	KGA81FBA-L

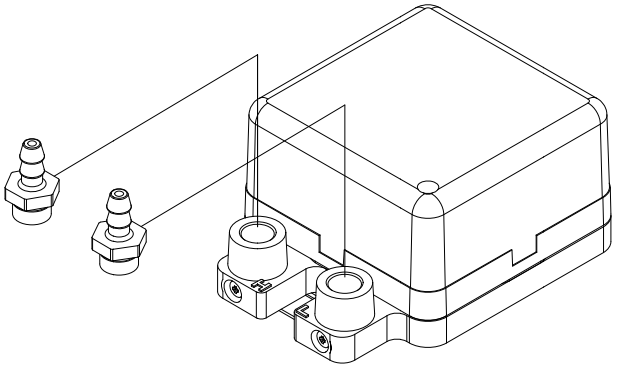
When using a revolving connector, it's possible to make difference in level so as not to interfere each pipe.
(the following figure)



⚠ Caution	Commercial products (connectors etc.) can't be used, because the structure is different. Please be sure to use a connector mentioned above.

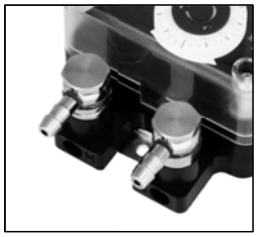
7. About an exchange of type C piping connector.

When exchanging a connector, remove a cap, and please install a cap of mentioning in p.4 ″6. Accessary for type C″.

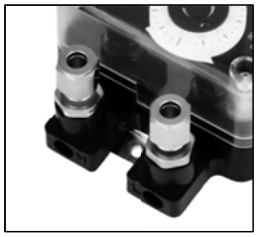


The example on which a connector was loaded

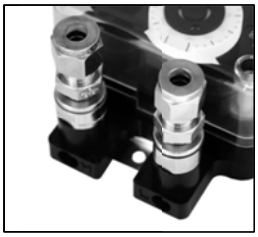
VR connector



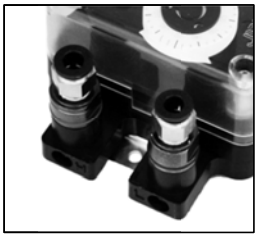
MT connector



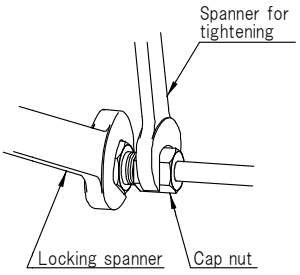
MTW connector



PT connector



⚠ Caution	・Even if this appliance replaces a connector, the polarity in a high pressure side and the low pressure side can't be changed. ・The part of connector piping is marking“ H” on high pressure side and“ L” on low pressure side. ・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. The tightening torque of the connector is 1Nm. The meter body is damaged for fastening beyond the stipulated value, so please be careful. ・Tightening with locking spanner Always use locking spanner to tighten the ring joints for MT connectors (for metal tube), MR connectors (rotating type for metal tube) and MTW connectors. Be careful not to apply the tightening torque directly to the instrument body.



8. Pressure of measurement and connection of piping

a) Measurement of positive pressure

Connect the tube to the high pressure side piping connector (H).
The lower pressure port (L) should opened to atmosphere, but do not remove the piping connector.

b) Measurement of negative pressure

Connect the tube to the low pressure side piping connector (L). The high pressure port (H) should be opened to atmosphere, but do not remove the piping connector.

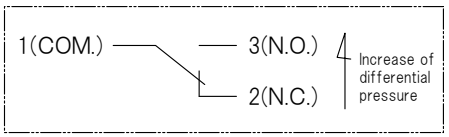
c) Measurement of differential pressure

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

Ⅳ. SETTING OF PRESSURE

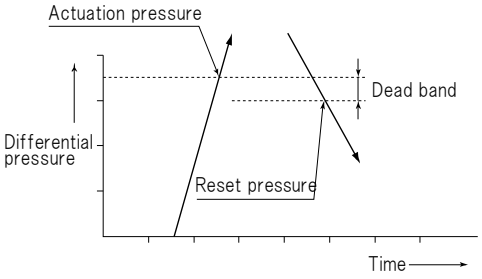
1. Switch contact configuration

- Composition of contact of this instrument is as shown on the right.
- If the instrument is not applied by differential pressure we call such "normal condition".
- At normal condition, the contact between 1(COM.) and 2(N.C.) is closed, and between 1(COM.) and 3(N.O.) is open.
- With increase of differential pressure and reaching the actuation pressure, the contact will be changed over ; between 1(COM.) and 2(N.C.) is opened and between 1(COM.) and 3(N.O.) is closed.



2. Setting of upper limit/ lower limit

- When differential pressure applied to the instrument is increased starting from zero and changes over the electric contact from N.C. (normal close) to N.O. (normal open), the pressure at this moment is called "**actuation pressure**".
- When this differential pressure decreases from the pressure higher than this actuation pressure activating electrical contact and returning the contact from N.O. (normal open) to N.C. (normal close), the pressure at this moment is called "**reset pressure**".



- There is certain difference between actuation pressure and reset pressure and this is called "**dead band**".
- There are two types of the instrument. One is called "**upper limit setting type**"type (H) whose scale of setting knob is adjusted on actuation pressure, the other is called "**lower limit setting type**"type (L) which is adjusted on reset pressure.
- Depending on the purpose of use, choose the instrument either "upper limit setting type"or "lower limit setting type"

Please confirm the following table about the respective movement.

In case of 1-10 kPa range with set value 1 kPa. (dead band is 0.7 kPa)

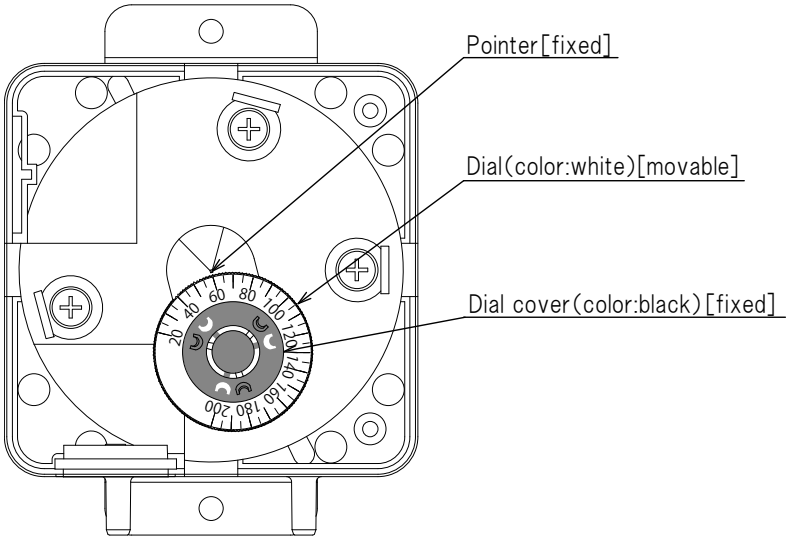
Setting of scale	Adjusting of scale	Movement of contact
Upper limit setting type	Adjusted in activating pressure	When the differential pressure increases, the circuit is closed between N.O. and COM. at 1 kPa. Then as the differential pressure decreases, the circuit is opened between N.O. and COM. at 0.3 kPa.
Lower limit setting type	Adjusted in reset pressure	When the differential pressure increases, the circuit is closed between N.O. and COM. at 1.6 kPa. Then as the differential pressure decreases, the circuit is opened between N.O. and COM. at 1 kPa.

⚠ Caution	It can't be changed from the lower limit setting to the upper limit setting or vice versa.

3. Setting the dial

Use the dial and pointer, when you set the “Activating pressure” or “Reset pressure”.

Set the ″Activating pressure″ for the upper limit setting.
Set the ″Reset pressure″ for the lower limit setting.



Set the tip of the pointer to the pressure you desire by knobbing the outer periphery of the dial to rotate the dial. Turning the pointer from the lower side (anti-clockwise) is recommended to set accurately with good reproducibility. Turning the pointer from the lower side (anti-clockwise) is recommended to set accurately with good reproducibility.

⚠ Caution	Do not turn the dial too much exceeding the upper bound or the lower bound of the scale. It causes performance deterioration and the failure.

4. 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.

Ⅴ. ABOUT BUILT-IN SWITCH

1. Material of contact

The product has been plated a gold layer on the point of contact to get the contact reliability of the point on the low electrical load.

The gold film is damaged when using by general use.

⚠ Caution	Once the product has been used for general load, it cannot be used for low electrical load.

2. About measured gas and contact failure

a) Corrosive gas

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.

b) Silicone gas

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.

c) Dust and organic gas

The film can be made to the switch part by the composition of the gas. 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.)

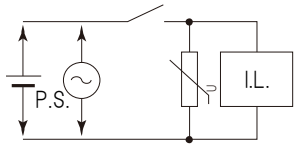
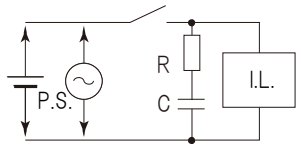
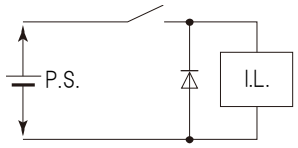
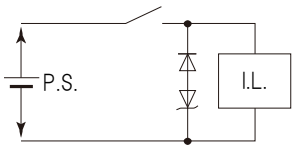
⚠ Caution	As the opening/ closing frequency of the contact increases, wear dust from the contact increases. This wear dust accumulates between the contacts to increase the contact resistance and causes the malfunction in the load circuit. In particular, the surrounding where there exists continuous vibration and impact will be most likely to cause contact failure due to worn powder.

3. Protection of contact of switch

・Contact protection circuit is used to extend the service life of contact. It reduces generation of noise at the time of switching on and off. It also minimizes carbide and nitric acid gas generated by arc. Use this circuit correctly, otherwise it will cause reverse effect, making the matter worse.

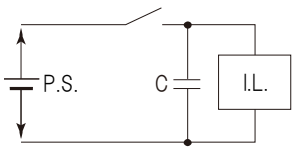
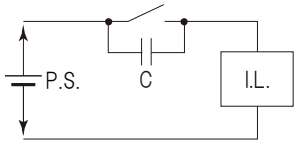
・In case of using contact protection circuit, pay attention the operating time is possibility of delaying a little. The following are typical examples of contact protection circuit.

a) Typical example of protective circuit

Example of circuit		Special remarks for application and selection
	Varistor method	This method is intended not to apply voltage beyond limit of varistor to in between contacts. It delays a little time to return inductive load such as relay. Select the most conformed rated model in terms of power supply voltage and load capacity in selected article by varistor maker.
	C・R method	It delays a little time to activate or return inductive load such as relay. As for CR value, to contact current and contact voltage, the estimate value is C : 0.5 μ F / A, R : 1.0 Ω / V. However, it differs according to the characteristics of load, therefore, be sure to confirm to select by experiment.
	Diode method	This method is intended to consume counter electromotive force of inductive load by diode and avoid to apply high voltage to in between the contacts. This method makes the return time of inductive load slower. Choose the diode rated current is more than load current and counter withstand voltage more than 10 times of power supply voltage.
	Diode＋ Zener diode method	Diode method proves to be effective when the return time takes too long for inductive load such as relay. When you choose zener voltage of zener diode, choose base on power supply voltage. Be careful with limitations having this method. Because load is too big, larger capacity zener diode is needed for reverse surge power.

P.S. : Power supply, I.L. : Inductive load

b) Example of wrong protection circuit

	Condenser method	This is very effective to remove arc at the time of off-contact, but this is likely to run charged current to condenser leading to contact sticking and short service life at the time on-contact.
		This is very effective to remove arc at the time of off-contact, but this is likely to run short circuit current accumulated in the condenser leading to contact sticking on contacting. This is likely to short service life at the time on-contact.

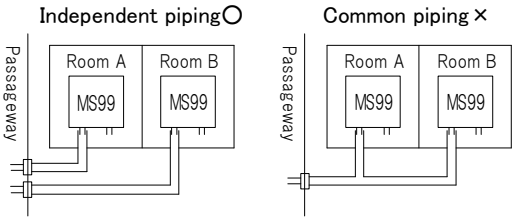
P.S. : Power supply, I.L. : Inductive load

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.

Ⅵ. GENERAL PRECAUTIONS

1. Prohibition of common piping

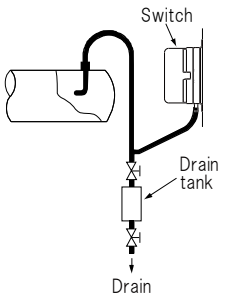
Piping each of pressure detectors and pressure receiving instruments tube exclusively dedicated for it, and do not connect the piping commonly with the adjacent system as shown in the right figure.
Common piping causes measurement error because the pressure of each system interferes.



2. Prevention of clogged piping due to drain

If drain remains within the line, it causes measurement error. Be sure to install the pressure receiving instrument above the pressure outlet port of the pressure detector and arrange the line so that the drain water should not remain in the slack piping.
If the arrangement mentioned above in not possible, install a drain tank 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.

Installation diagram of drain tank

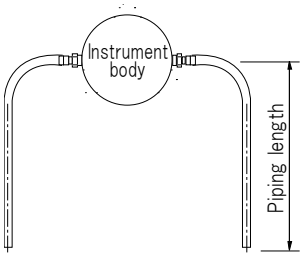


3. Measurement of high temperature gases

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.

4. Errors caused by long distance piping

The speed of response is delayed when the product is used for remote monitoring.
In such application, the I.D. of the connection tube should be as large as possible.
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.



Ⅶ. PERIODIC INSPECTION

Generally speaking, it is important not to exert external stress to keep life and reliability of the instrument for a long time.
Proper use of this instrument will ensure its faultless service over many years without any necessity of periodic lubrication.
However, it is recommended that it is subjected to periodic inspection (calibration) once a year.

Ⅷ. PRODUCT WARRANTY

Warranty Period

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

Coverage

If a product breaks down due to a reason for which we are responsible during the warranty period and you return the product to us, we will either repair or replace the product free of charge.
This warranty does not cover:

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

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

*This product warranty is only valid within Japan.

This document is a translation from the original Japanese version, and the original Japanese version has priority over this translation.
Be sure to refer to the original Japanese for the details of this warranty.

<Prior notice>

The specifications and description of the product explained in this instruction manual may be subject to change without prior notice because of modification and the like.