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List of products
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EMT6
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Accessories
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WO81

Utility model registration No. 823971

RoHS

High-accuracy fine differential pressure gauge

- Boasting a wide variety, the product is also compatible with airflow rate and speed scales (refer to page 15).
- Easy-to-read wide angle scale (pointer rotation angle of 270°)
- Pipe connection port that facilitates polarity conversion
- Unique mechanism less subject to abnormal high pressure inrush
- High-performance silicone rubber diaphragm with small hysteresis
- Band-link mechanism that prevents the pointer from vibrating

Model WO81F
(surface type)

Model WO81PC
(round panel type)

Model WO81PR
(square panel type)

Example of selection of memory pointer

*Memory pointer can be set at an arbitrary position.

With single memory pointer

With double memory pointers

Product code

WO81 | F | N | 50 | D | V | (Example)

Pressure range code

Mounting orientation	V	Range for specification of vertical mounting
	H	Range for specification of horizontal mounting
	None	Range for arbitrary mounting
Unit	D	Pa
	E	kPa
Range	Maximum scale value (for ± range, provide "±" as well)	
Memory pointer	N	No memory pointer
	S	Single memory pointer
	T	Double memory pointers
External shape	F	Surface type
	PC	Round panel type
	PR	Square panel type

◆When making an inquiry or placing an order, specify the above product code.
◆For airflow rate/speed meter, refer to page 15.

<Main application fields>
- Nuclear facilities
- Food-related factory management equipment
- Air-conditioning control equipment in high-rise building
- Hospital and medical facilities
- Automotive manufacturing/ semiconductor manufacturing lines
- Control of air discharge pressure from coffee roaster

<Usage>
- Room pressure measurement in a clean room
- Detection of clogging of air filter
- Measurement of airflow rate/speed of ventilation/exhaust device and others

*(Refer to pages 114 to 117)

WO81

Specifications

Model	Main body / Memory pointer		Surface type	Round panel type	Square panel type
			F	PC	PR
	No memory pointer	N	**WO81FN**	**WO81PCN**	**WO81PRN**
	Single memory pointer (red)	S	**WO81FS**	**WO81PCS**	**WO81PRS**
	Double memory pointers (one each for red and green)	T	**WO81FT**	**WO81PCT**	**WO81PRT**

Pressure unit	Pa, kPa	**Compatible pipe**	• Vinyl pipe or rubber pipe (inner diameter of 6 mm) ……Base for resin vinyl pipe (already mounted on gauge) • Metallic pipe (outer diameter of 6 ± 0.1 mm) ……Separately sold base for metallic pipe is necessary. • Hard plastic pipe (outer diameter 6 mm × inner diameter 4 mm) ……Separately sold base for metallic pipe and inner sleeve set (refer to page 111) or push-in joint is necessary.
Pressure measurement method	Differential pressure method		
Pressure-receiving element	Diaphragm		
Measured gas	Air and noncorrosive gas (liquid cannot be measured)		
Scale indication angle	Wide-angle indication of approx. 270 degrees		
Operating ambient temperature	−10℃ to +50℃ (no freezing allowed)		
Operating ambient humidity	90% RH or below (no condensation allowed)	**Base polarity**	• Identification with red on high pressure side and blue on low pressure side • By exchanging the base on the high-pressure side with that on the low pressure side, it is possible to change the polarity.
Instrument body withstanding pressure	200 kPa (refer to page 118)		
Exterior material	Polycarbonate and polyamide		
Durable impact	100 m/s^2 (six times each for three axial directions)	**Mass**	Approx. 270 g
Durable vibration	5 to 10 Hz Amplitude of 10 mm, 10 to 50 Hz Acceleration of 39 m/s^2 (two hours each for three axial directions)		

Accessories	WO81F	WO81PC	WO81PR
	Mounting screw set	Two sets of mounting fittings (already mounted on gauge body)	Mounting nut set (already mounted on gauge body)

Pressure range code	Pressure range	Mounting orientation (Refer to page 18)	Accuracy (Note) (at 20℃)	Pressure-receiving element material	Withstanding pressure of pressure-receiving element (Refer to page 118)
50 DH	0–50 Pa	Horizontal (specification)	±5% FS	Silicone rubber	10 kPa
50 DV		Upright (specification)			
100 DH	0–100 Pa	Horizontal (specification)	±2.5% FS		
100 DV		Upright (specification)			
200 D	0–200 Pa	Between horizontal and upright Arbitrary mounting			
300 D	0–300 Pa		±1.5% FS		40 kPa
500 D	0–500 Pa				
1000 D	0–1000 Pa				
1 E	0–1 kPa				
2 E	0–2 kPa				
3 E	0–3 kPa				
5 E	0–5 kPa				
10 E	0–10 kPa				150 kPa
20 E	0–20 kPa				
30 E	0–30 kPa				
50 E	0–50 kPa				
100 E	0–100 kPa				
±50 DH	−50 to +50	Horizontal (specification)	±2.5% FS		10 kPa
±50 DV		Upright (specification)			
±100 D	−100 to +100 Pa	Between horizontal and upright Arbitrary mounting			
±200 D	−200 to +200 Pa		±1.5% FS		40 kPa
±300 D	−300 to +300 Pa				
±500 D	−500 to +500 Pa				
±1000 D	−1000 to +1000 Pa				
±1 E	−1 to +1 kPa				
±2 E	−2 to +2 kPa				
±3 E	−3 to +3 kPa				

(Note) Accuracy in full span (refer to page 121)

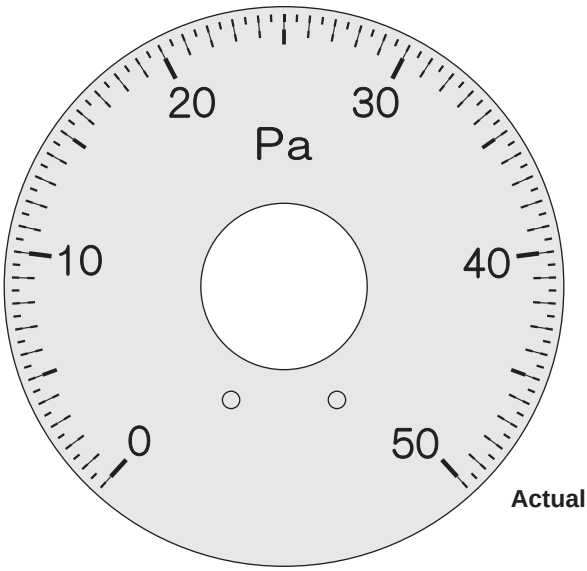
◆For biased pressure range, the polarity symbol "-" can be indicated for a fee. If the indication is necessary, make a request at the time of order placement.

◆For use environment, refer to page 118.

WO81 List of scales

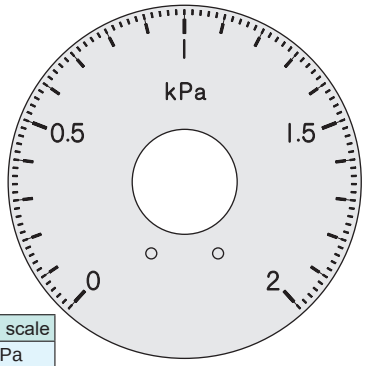
Biased pressure range

◆The polarity symbol "-" can be indicated for a fee. If the indication is necessary, make a request at the time of order placement.

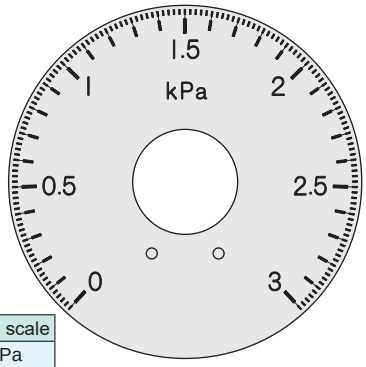


Actual size

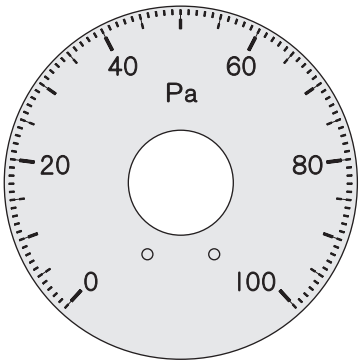
Pressure range	Minimum scale
0–50 Pa	0.5 Pa



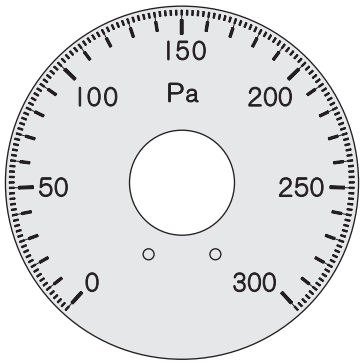
Pressure range	Minimum scale
0–2 kPa	0.02 kPa
0–20 kPa	0.2 kPa



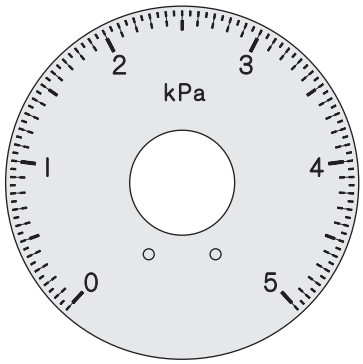
Pressure range	Minimum scale
0–3 kPa	0.02 kPa
0–30 kPa	0.2 kPa



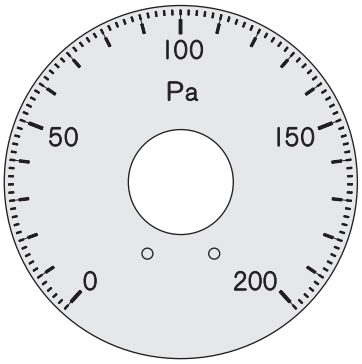
Pressure range	Minimum scale
0–100 Pa	1 Pa
0–1000 Pa	10 Pa
0–1 kPa	0.01 kPa



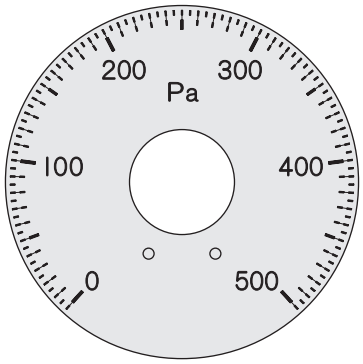
Pressure range	Minimum scale
0–300 Pa	2 Pa



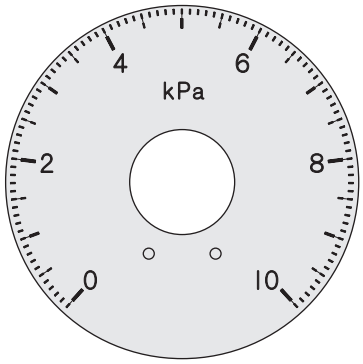
Pressure range	Minimum scale
0–5 kPa	0.05 kPa
0–50 kPa	0.5 kPa



Pressure range	Minimum scale
0–200 Pa	2 Pa



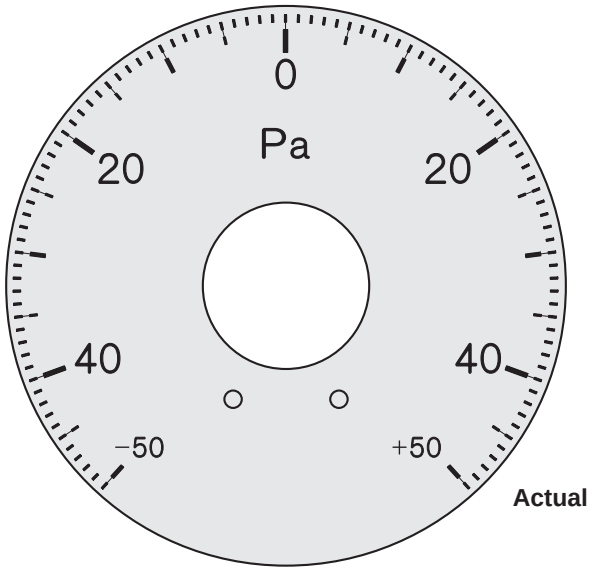
Pressure range	Minimum scale
0–500 Pa	5 Pa



Pressure range	Minimum scale
0–10 kPa	0.1 kPa
0–100 kPa	1 kPa

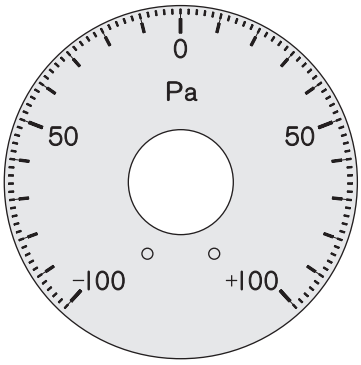
WO81 List of scales

Zero center range

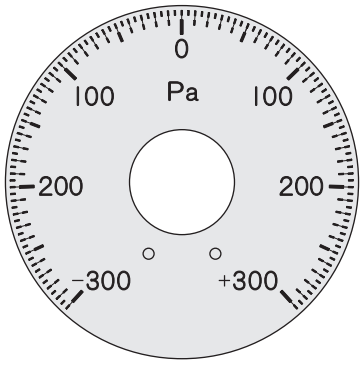


Actual size

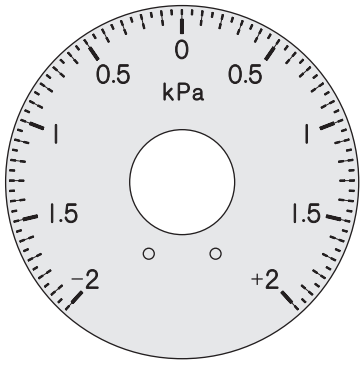
Pressure range	Minimum scale
−50 to +50 Pa	1 Pa



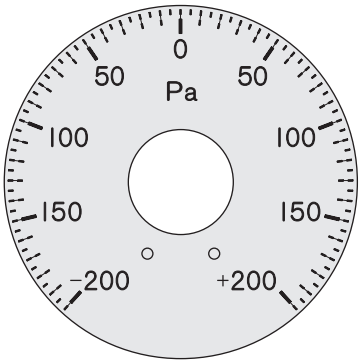
Pressure range	Minimum scale
−100 to +100 Pa	2 Pa
−1000 to +1000 Pa	20 Pa
−1 to +1 kPa	0.02 kPa



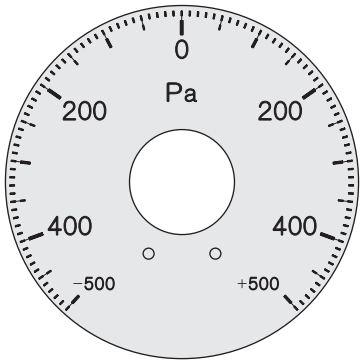
Pressure range	Minimum scale
−300 to +300 Pa	5 Pa



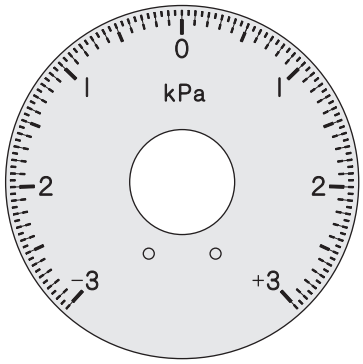
Pressure range	Minimum scale
−2 to +2 kPa	0.05 kPa



Pressure range	Minimum scale
−200 to +200 Pa	5 Pa



Pressure range	Minimum scale
−500 to +500 Pa	10 Pa



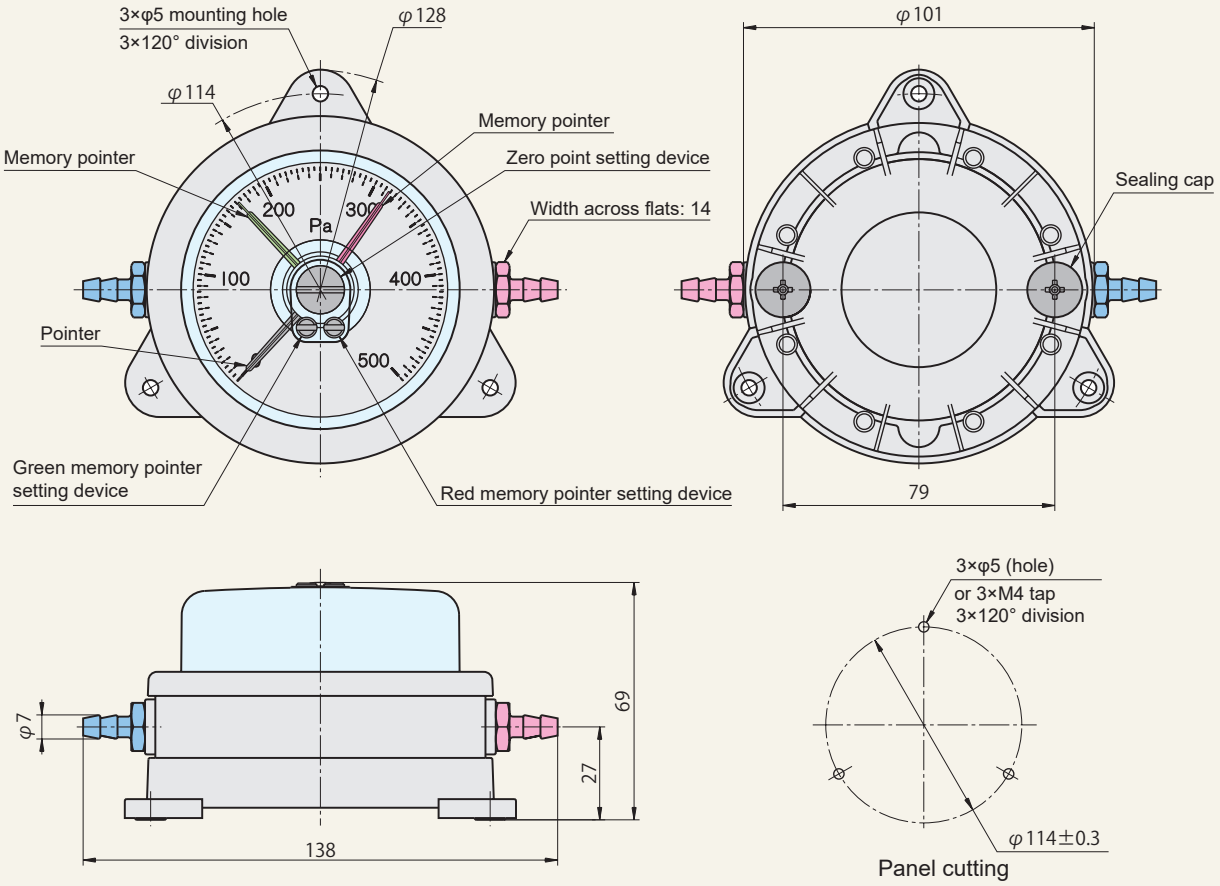
Pressure range	Minimum scale
−3 to +3 kPa	0.05 kPa

Model WO81F

External dimension drawing

Installation of base on side face.....(standard condition at time of shipment from factory)

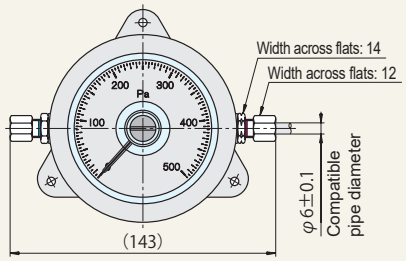
VT base (for vinyl pipe)



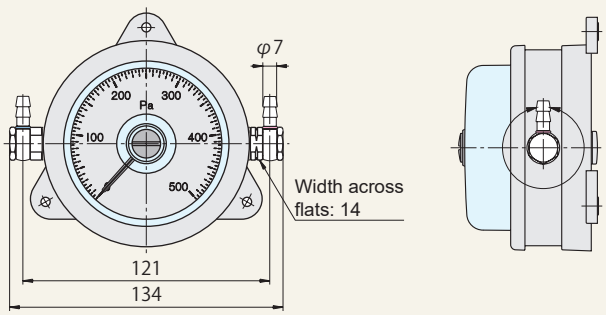
Example of base arrangement

Installation of base on side face

MT base (for metallic pipe)



VR base (rotary type for vinyl pipe)



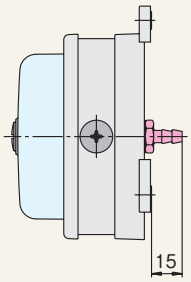
Caution

Base tightening torque: 1 N·m Sealing cap tightening torque: 0.5 N·m
Do not tighten to a torque that exceeds the specified value because doing so breaks the gauge body. (Refer to page 120.)

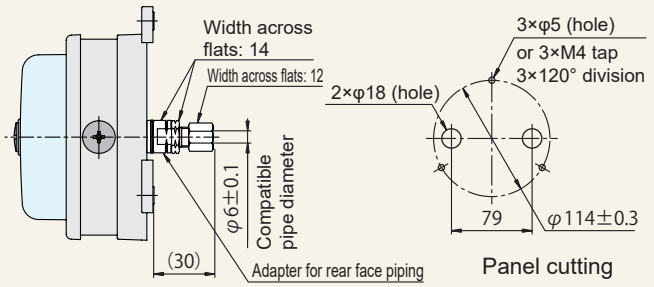
Model WO81F

Installation of base on rear face

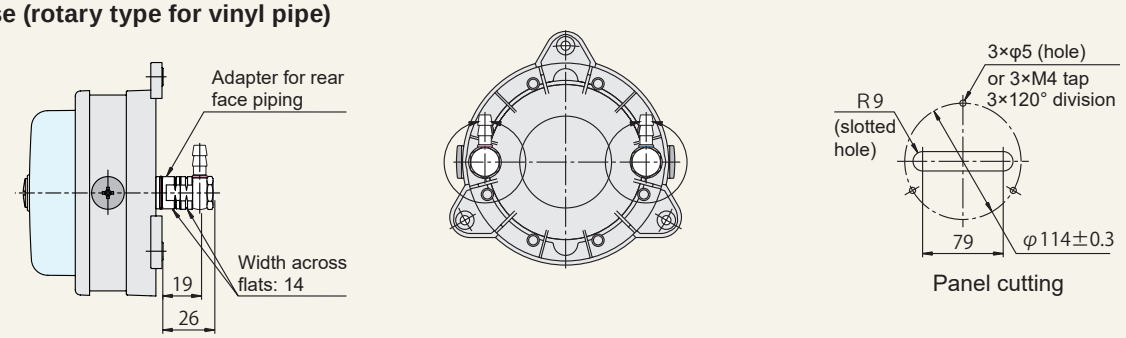
VT base (for vinyl pipe)



MT base (for metallic pipe)



VR base (rotary type for vinyl pipe)



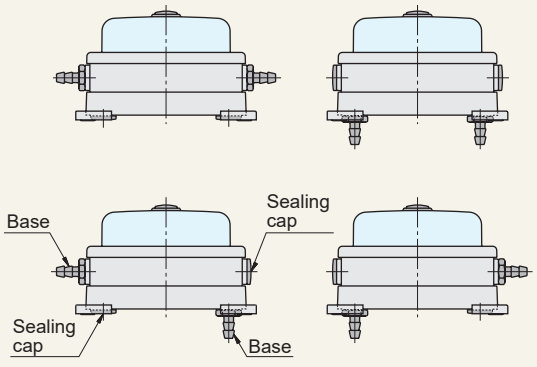
Change of base arrangement

The WO81F type has two base mounting holes on each of the side face and the rear face, allowing various base combinations depending on the piping conditions.

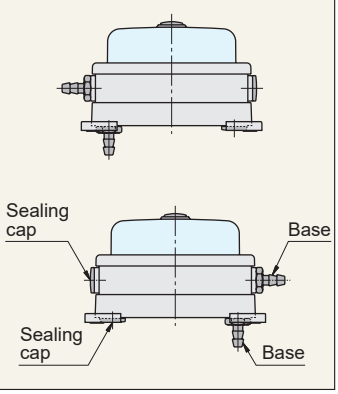
Caution

1. Be sure to use bases in the combination of one high-pressure side (red) base and one low-pressure side (blue) base.
2. There are impossible base arrangements as shown on the right.
3. At two mounting holes on the gauge body that are not installed with bases, be sure to attach the sealing caps.

Possible base arrangement



Impossible base arrangement



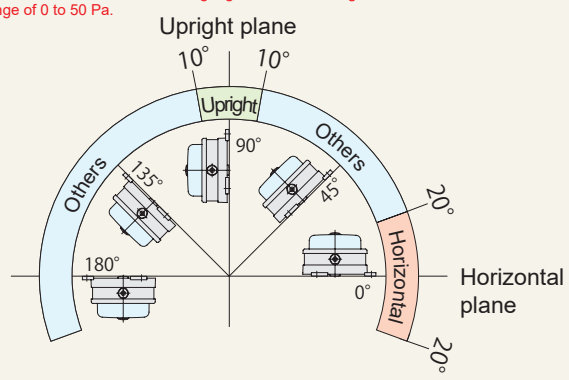
Mounting orientation and range

Range for the specification of horizontal and upright mounting

0 to 50Pa, 0 to 100Pa, −50 to +50Pa

It is necessary to specify the mounting orientation (horizontal, upright, and others) at the time of order placement.

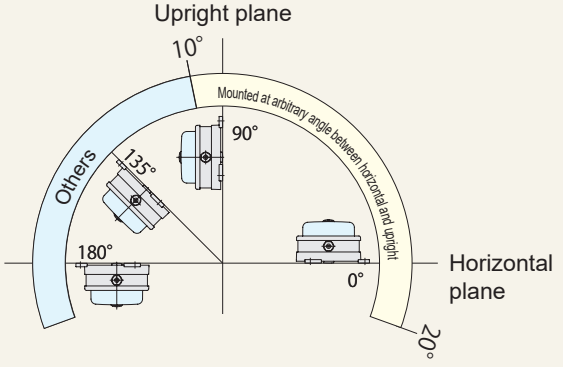
*It is not possible to manufacture such a gauge whose mounting orientation exceeds 135° for the range of 0 to 50 Pa.



Range for mounting orientation arbitrary mounting between horizontal and upright

Whole range other than on the left

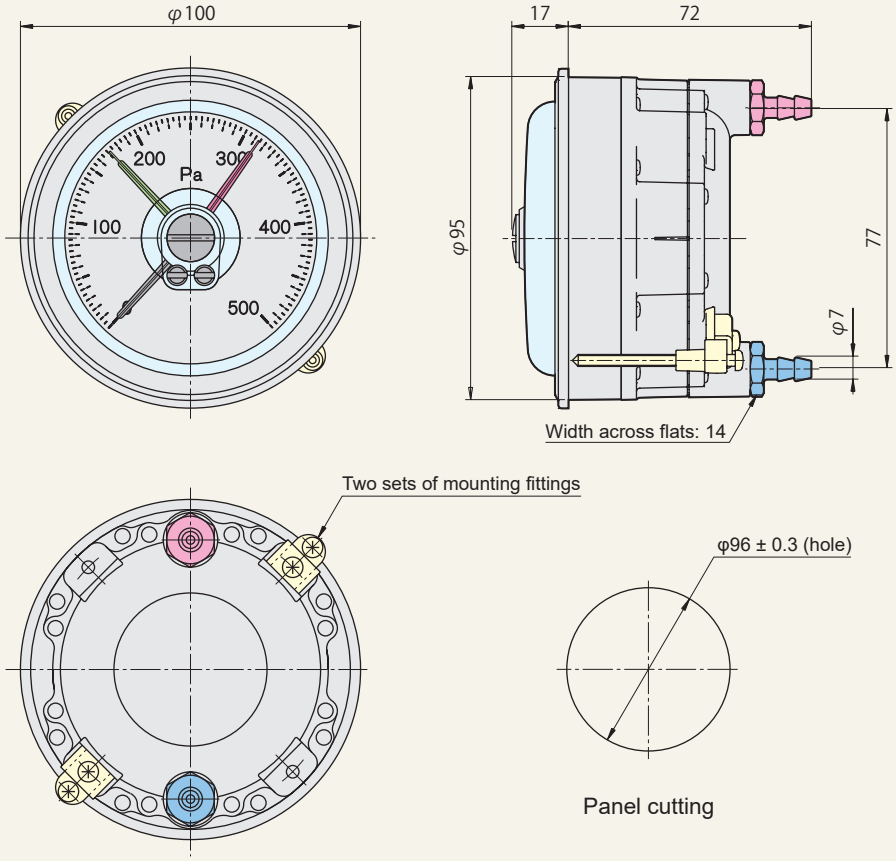
The gauge can be mounted at an arbitrary angle between horizontal and upright. For other mounting orientations, it is necessary to specify the orientation at the time of order placement.



Model WO81PC

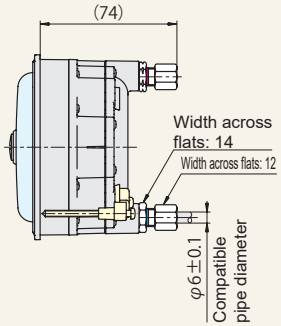
External dimension drawing

VT base (for vinyl pipe)

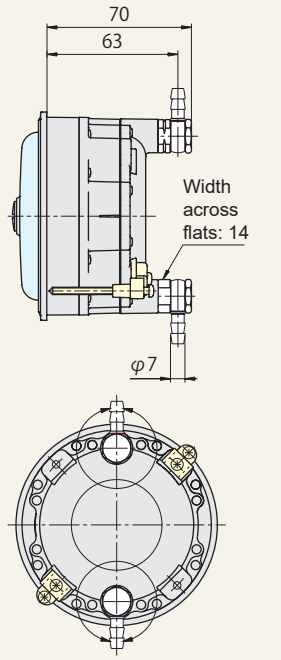


Example of base arrangement

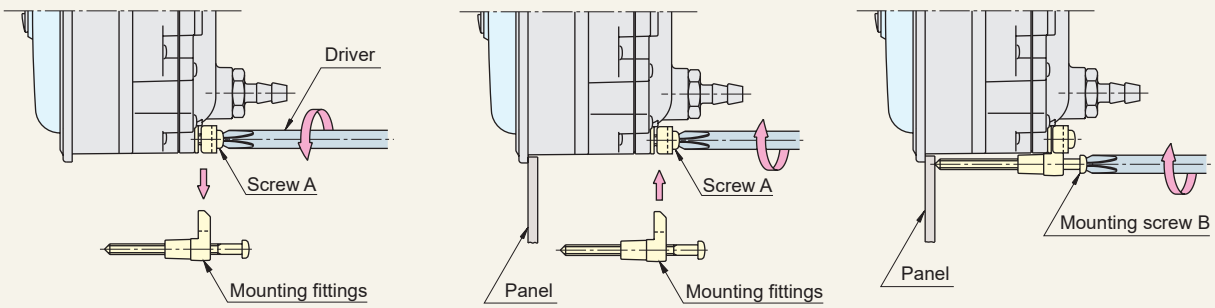
MT base (for metallic pipe)



VR base (rotary type for vinyl pipe)



Mounting method



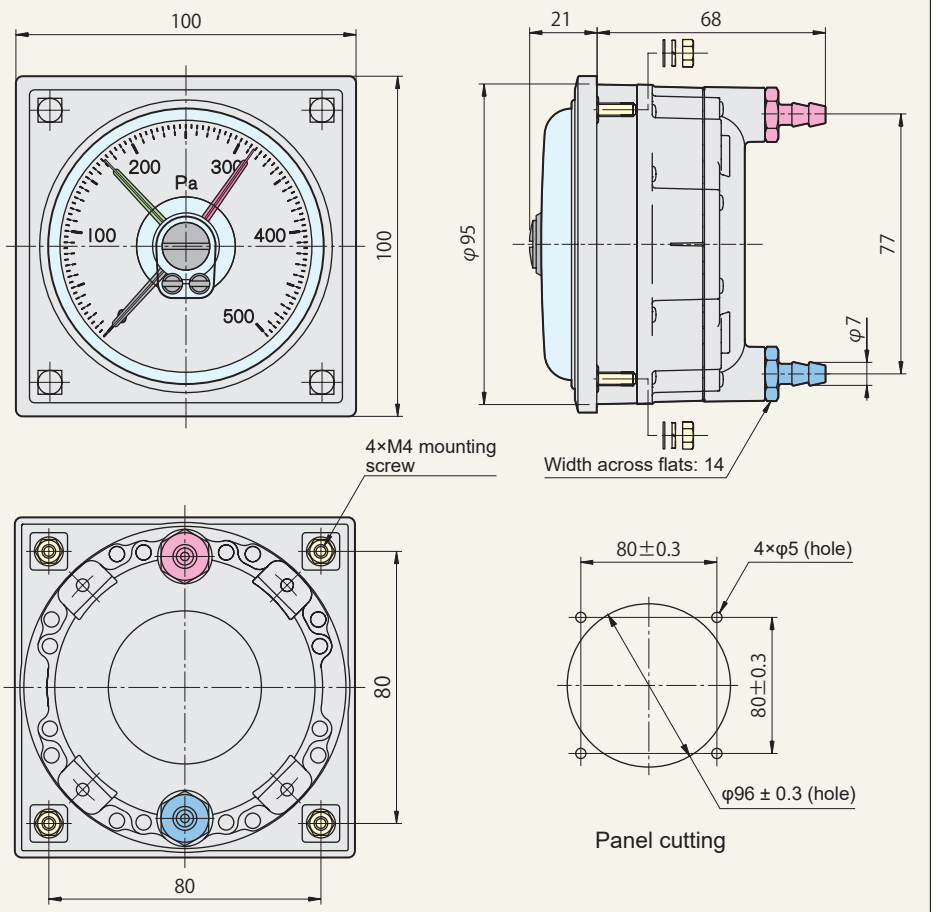
1. Loosen screw A, and remove both mounting fittings from the gauge body.
2. Fit the gauge to the front of the panel first, put two mounting fittings back, and tighten screw A to secure the gauge.
3. Alternately tighten little by little mounting screws B in two places to secure the gauge to the panel.

Caution: Mounting screw B tightening torque: 0.5 to 0.6 N·m
Do not tighten to a torque that exceeds the specified value because doing so breaks the gauge body.

Model WO81PR

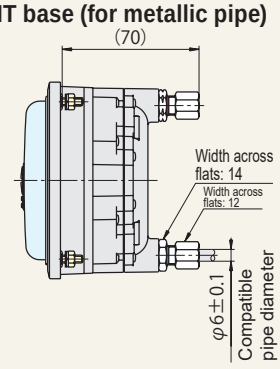
External dimension drawing

VT base (for vinyl pipe)

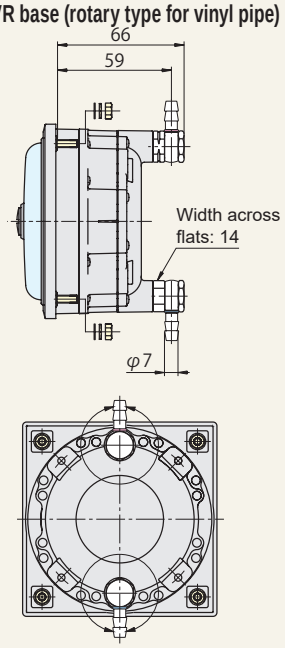


Panel cutting

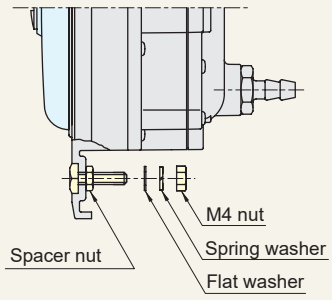
MT base (for metallic pipe)



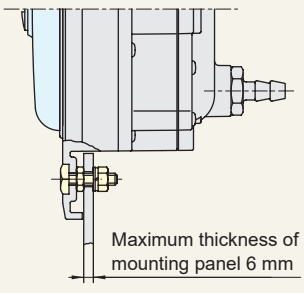
VR base (rotary type for vinyl pipe)



Mounting method



1. From four corners of the square gauge mounting frame, remove the M4 nuts, spring washers, and flat washers.
   (Be sure to install the gauge without removing the spacer nuts as shown in the figure.)
2. After installing the gauge in the panel, tighten the flat washers, spring washers, and M4 nuts in that order from the rear side.



Caution

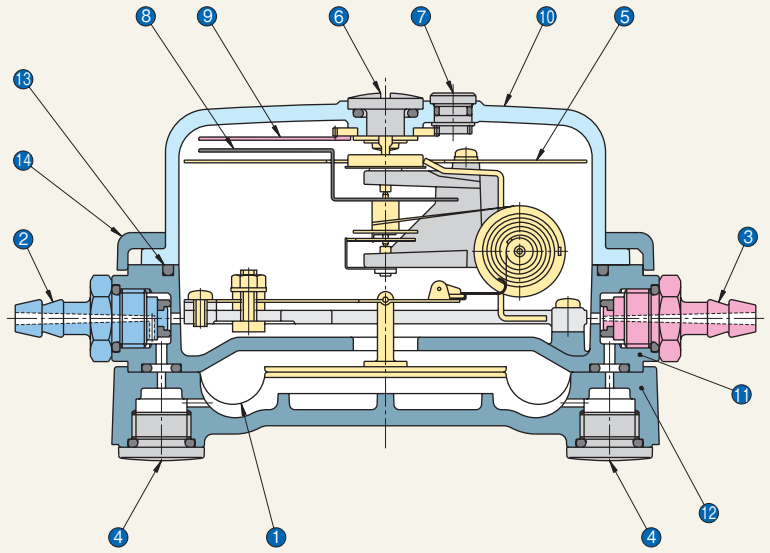
- If you install the gauge to the panel after removing the spacer nut, the gauge frame may break.
- M4 nut tightening torque: 1 N·m
  Do not tighten to a torque that exceeds the specified value because doing so breaks the gauge body.

Caution

Base tightening torque: 1 N·m
Do not tighten to a torque that exceeds the specified value because doing so breaks the gauge body. (Refer to page 120)

WO81

Overview of structure



Number	Name
1	Diaphragm
2	Low-pressure side base (blue)
3	High-pressure side base (red)
4	Sealing cap
5	Scale plate
6	Zero point setting device
7	Memory pointer setting device
8	Pointer
9	Memory pointer
10	Transparent cover
11	Housing
12	Base
13	Cover packing
14	Cover retention ring

Accessories dedicated to WO81 RoHS

Sealing cap

Dedicated to F type (Auxiliary item)

This is already installed when the gauge is purchased.

Item number	Material
KGA81PLG	Polypropylene

Mounting fitting set

Dedicated to PC type (Auxiliary item)

The combination of parts in the photograph constitutes one set.
On the gauge, two sets (for one gauge) are already installed as a standard accessory.

Item number	Material
TKA81PC	Aluminum die casting/steel

Portable box

Dedicated to F type

Item number	Material
PB-01	Steel

*Gauge body is not included.

Accessories for WO81 RoHS

VT base

High-pressure side (Auxiliary item)

Item number	Material
KGA81VT-H-P	Polypropylene

Low-pressure side (Auxiliary item)

Item number	Material
KGA81VT-L-P	Polypropylene

A vinyl pipe or rubber pipe with an inner diameter of 6 mm can be connected.
This is already installed when the gauge is purchased.

VR base

High-pressure side

Item number	Material
KGA81VR-H	Brass

Low-pressure side

Item number	Material
KGA81VR-L	Brass

This serves as an elbow whose tube mounting part rotates. A vinyl pipe or rubber pipe with an inner diameter of 6 mm can be connected.

WO81

Accessories for WO81 RoHS

PT base

High-pressure side

Item number	Material
KGA81PT-H	PBT/brass

Low-pressure side

Item number	Material
KGA81PT-L	PBT/brass

The tube mounting part is a push-in joint. For piping, use the separately sold tube (refer to page 112) or a tube compatible with JIS B 8381-1.
(Connectable tube outer diameter: 6 mm)

PR base

High-pressure side

Item number	Material
KGA81PR-H	PBT/brass

Low-pressure side

Item number	Material
KGA81PR-L	PBT/brass

The tube mounting part is a rotary elbow push-in joint. The piping is the same as that for the PT base. (Connectable tube outer diameter: 6 mm)

MT base

High-pressure side

Item number	Material
KGA81MT-H	Brass

Low-pressure side

Item number	Material
KGA81MT-L	Brass

A metallic pipe, such as copper pipe and aluminum pipe, with an outer diameter of 6 ± 0.1 mm can be connected. However, for stainless steel pipe, use an MTW base. When connecting with a plastic pipe (outer diameter 6 mm × inner diameter 4 mm), remove the brass sleeve and use the separately sold resin inner sleeve set (XIN6×4; refer to page 111).

MR base

High-pressure side

Item number	Material
KGA81MR-H	Brass

Low-pressure side

Item number	Material
KGA81MR-L	Brass

This serves as an elbow whose tube mounting part rotates.
The piping material is the same as that for the MT base. When connecting with a plastic pipe (outer diameter 6 mm × inner diameter 4 mm), remove the brass sleeve and use the separately sold resin inner sleeve set (XIN6×4; refer to page 111).

MTW base

High-pressure side

Item number	Material
KGA81MTW-H-S	Stainless steel

Low-pressure side

Item number	Material
KGA81MTW-L-S	Stainless steel

This is used to connect a stainless steel pipe with an outer diameter of 6 ± 0.1 mm.

Adapter for rear face piping

High-pressure side (Dedicated to F type rear face piping)

Item number	Material
KGA81FBA-H	Brass

Low-pressure side (Dedicated to F type rear face piping)

Item number	Material
KGA81FBA-L	Brass

When arranging an MT base on the rear face of the WO81F type, this adapter is required as a spacer for hooking a stabilizing wrench to the base at the time of pipe connection. This adapter is also required when arranging the VR base or MR base (excluding MTW base) on the rear face in order to avoid interference between the base and panel. When connecting an R1/8 joint, use an R1/8 base adapter.

R1/8 base adapter

High-pressure side

Item number	Material
KGA81R1/8AD-H	Brass

Low-pressure side

Item number	Material
KGA81R1/8AD-L	Brass

It is possible to connect an R1/8 joint.
*The specifications of this adapter differ from those of the adapter for rear face piping.

R1/8 base adapter (SUS)

High-pressure side

Item number	Material
KGA81R1/8AD-H-S	Stainless steel

Low-pressure side

Item number	Material
KGA81R1/8AD-L-S	Stainless steel

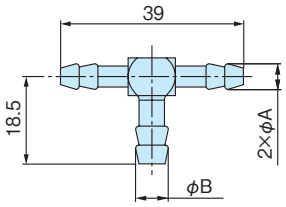
It is possible to connect an R1/8 joint.
*The specifications of this adapter differ from those of the adapter for rear face piping.

Conduit parts

RoHS

T joint

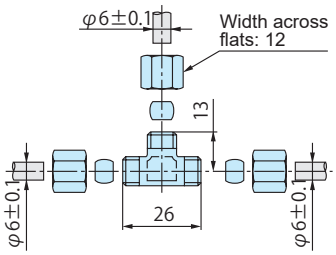
For vinyl pipe



Item number	A (mm)	B (mm)	Material
TVT6-6-6	7	7	Brass
TVT6-4-6	7	5.5	
TVT4-6-4	5.5	7	
TVT4-4-4	5.5	5.5	

For metallic pipe

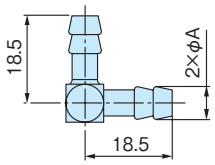
Noncompliant with RoHS



Item number	Material
TMT6-6-6	Brass

Elbow joint

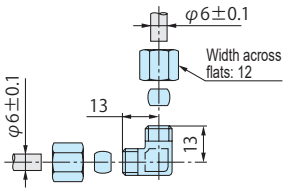
For vinyl pipe



Item number	A (mm)	Material
LVT6-6	7	Brass
LVT4-4	5.5	

For metallic pipe

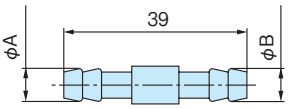
Noncompliant with RoHS



Item number	Material
LMT6-6	Brass

Straight joint

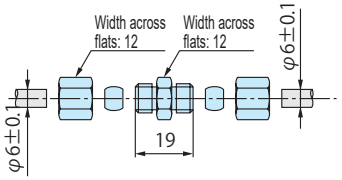
For vinyl pipe



Item number	A (mm)	B (mm)	Material
SVT6-6	7	7	Brass
SVT4-4	5.5	5.5	
SVT6-4	7	5.5	

For metallic pipe

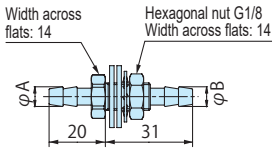
Noncompliant with RoHS



Item number	Material
SMT6-6	Brass

Panel penetration joint

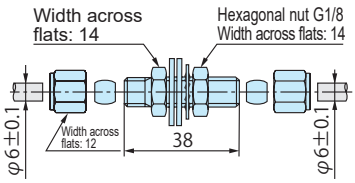
For vinyl pipe



Maximum applicable panel thickness: 6 mm

Item number	A (mm)	B (mm)	Material	Panel cutting
PVT6-6	7	7	Brass/steel	φ10.5
PVT4-4	5.5	5.5	Brass/steel	
PVT6-4	7	5.5	Brass/steel	

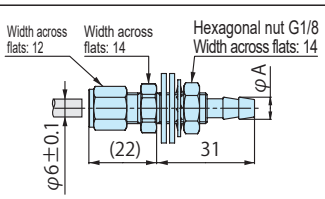
For metallic pipe



Maximum applicable panel thickness: 6 mm

Item number	Material	Panel cutting
PMT6-6	Brass/steel	φ10.5

For metallic/ vinyl pipe



Maximum applicable panel thickness: 6 mm

Item number	A (mm)	Material	Panel cutting
PMVT6-6	7	Brass/steel	φ10.5
PMVT6-4	5.5	Brass/steel	

Accessories

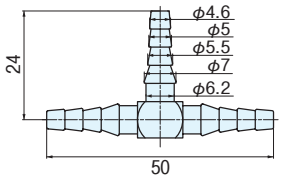
Conduit parts

RoHS

It is possible to connect soft tubes with an inner diameter of 4 to 6 mm.

T joint, four-step barb type

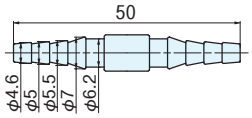
For soft tubes with an inner diameter of 4 to 6 mm.



Item number	Material
TVT-FB	Brass
TVT-FB-S	Stainless steel (316 L)

Straight joint, four-step barb type

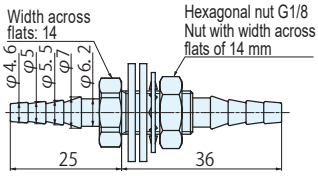
For soft tubes with an inner diameter of 4 to 6 mm.



Item number	Material
SVT-FB	Brass
SVT-FB-S	Stainless steel (316 L)

Panel penetration joint, four-step barb type

For soft tubes with an inner diameter of 4 to 6 mm.



Maximum applicable panel thickness: 6 mm

Item number	Material	Panel cutting
PVT-FB	Brass	φ10.5
PVT-FB-S	Stainless steel (316 L/304)	

Others

Hose band

This is used to secure (disconnection prevention) the connection part of vinyl pipe.

Use example

Item number	Applicable pipe outer diameter mm	Material
XHB6-S	6	Stainless steel
XHB8-S	8	
XHB6	6	Iron
XHB8	8	
XHB10	10	
XHB12	12	

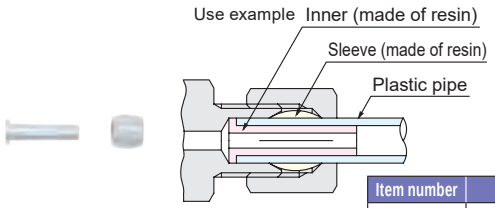
End cap

This is used to protect the VT base for a tube connection.

Item number	Inner diameter	Material
XBC8X6X15	6	Polyvinyl chloride

Inner sleeve set

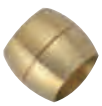
This is used to connect a plastic pipe (outer diameter 6 mm × inner diameter 4 mm) by using a base for metallic pipe.
Details of set: each one piece of inner and sleeve



Item number	Material
XIN6X4	Polypropylene

Part for metallic pipe Sleeve

(Auxiliary item)



Item number	Material
KGAMT-SLV	Brass
KGAMT-SLV-S	Stainless steel

Part for metallic pipe Nut

(Auxiliary item)

Item number	Material
KGAMT-NUT	Brass
KGAMT-NUT-S	Stainless steel

Conduit parts

RoHS

Vinyl tube

*Containing polyvinyl chloride

Urethane tube

- This is a transparent tube with high flexibility.

Urethane tube UF

- Excellent in mechanical strength and, in particular, wear resistance.
- Excellent in heat resistance and cold resistance. Operating ambient temperatures: −20°C to +60°C
- Equipped with high impact resilience.
- With a small bending radius, this model offers excellent workability.

Minimum bending radius: 14 mm

Nylon tube

- Excellent in mechanical strength and, in particular, pressure resistance, wear resistance, and resistance to fatigue from flexing.
- Excellent in heat resistance and cold resistance. Operating ambient temperatures: −20°C to +60°C
- Excellent in oil resistance and chemical resistance (alkali resistance in particular).
- There is no risk of elution of hazardous substances.
- Light in weight, this model offers excellent workability.

Minimum bending radius: 50 mm

Item number		Size mm		Standard length (m)*							Color	Connectability with push-in joint	Hardness
		Inner diameter	Outer diameter	1	2	5	10	20	50	100			
Vinyl	VT4-6	4	6	○	○	○	○	○	×	○	Clear	×	Soft ↕ Hard
	VT4-8	4	8	○	○	○	○	○	×	○		×	
	VT6-8	6	8	○	○	○	○	○	○	○		×	
	VT6-12	6	12	○	○	○	○	○	×	○		×	
Urethane	UT4-6	4	6	○	○	○	○	○	×	○		×	
	UT6-8	6	8	○	○	○	○	○	×	○		×	
Urethane UF	UF4-6	4	6	○	○	○	○	○	○	–	Black	○	
Nylon	NT4-6	4	6	○	○	○	○	○	×	○	Opaque white	○	

*If you desire a tube in a length other than above, contact us.

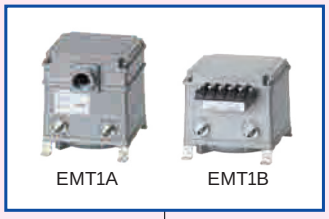
Caution

- Securely attach the connection part of the vinyl pipe with a hose band.
- On the base for vinyl pipe, use a vinyl pipe or rubber pipe with a wall thickness of 1 mm or higher. However, for a pressure range or line pressure of 50 kPa or higher, select a pipe with pressure resistance (including vacuum pressure), such as a vinyl pipe with a wall thickness of 2 mm or higher.
- On the base for the metallic pipe, it is possible to use both of copper pipe and aluminum pipe, but be sure to observe the outer diameter of 6 mm with a tolerance of ±0.1 mm.
- Tighten the cap nut for metallic pipe by 3/4 to 1 turn.

Combination

Combination with fine differential pressure transmitter

When you use a fine differential pressure transmitter in combination with a displaying instrument or other device, select them by referring to the combination table below.

Transmission method	Fine differential pressure transmitter	Relevant device		Displaying instrument
Two-wire type	 Intrinsically safe type EMT1H  Intrinsically safe circuit	Direct current power unit  HWS15A ~ If a DC power circuit is not incorporated into the receiving device, use the device in combination with this power unit.	Airflow rate measurement Square root calculator  EMRT1 ~ For airflow rate measurement, a square root calculation circuit is necessary. If a square root calculation circuit is not incorporated into the receiving device, use the device in combination with this calculator.	Receiving instrument  EMP5A ~ The receiving instrument EMP5A is incorporated with a DC power circuit and a square root calculation circuit. Adjustment meter ~ *We do not handle adjustment meters.
Four-wire type	 ~			

◆~: Represents power voltage of 100 V AC 50/60 Hz. (For the power voltage input range, refer to the page describing each product.)
◆Be sure to combine our receiving instrument with a fine differential pressure transmitter with the same pressure range as that on the nameplate attached to the body of the receiving instrument.
◆Please be advised that if a failure occurs because of the combination of our product with a device from another manufacturer, we shall assume no responsibility. Therefore, pay due attention to the functions and circuits of the device.
◆When installing a device as an intrinsically safe device, pay attention to hazardous and non-hazardous locations. (Refer to page 87)
◆When you use these products for airflow rate/airflow speed measurements, we need to obtain the specifications of the pressure detection side. Fill out the airflow rate/airflow speed specification document preparation sheet on page 15, and inform us of the data.

Use example

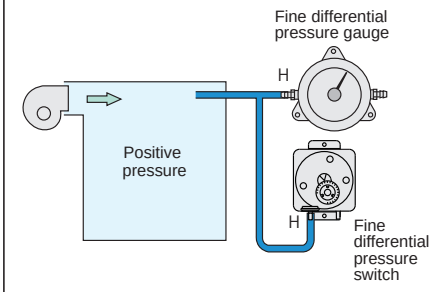
Static pressure measurement

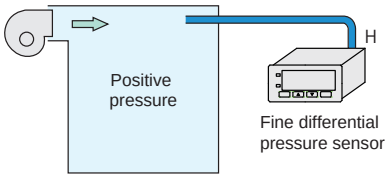
◆Measurement of static air　Monitoring of pressure inside room and alarm issuance

H: high pressure side　L: low pressure side

(1) Example of use in clean room

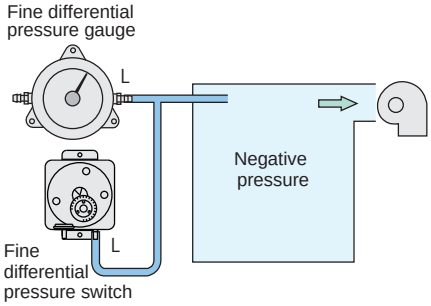
The instrument is used to monitor the positive pressure in a clean room. By keeping the clean room under positive pressure, inflow of air from the outside is prevented.

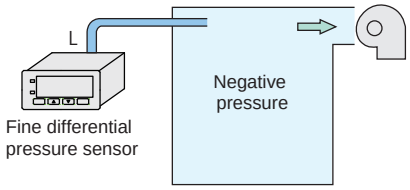




(2) Example of use at factory that handles hazardous substances

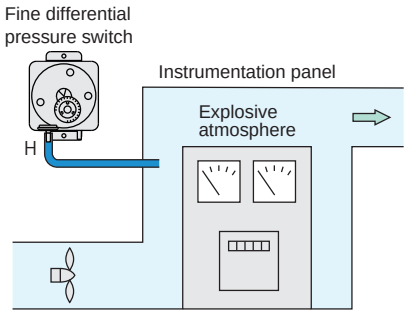
The instrument is used to monitor negative pressure. By keeping the inside of the factory under negative pressure, leakage of air in the factory to the outside is prevented.

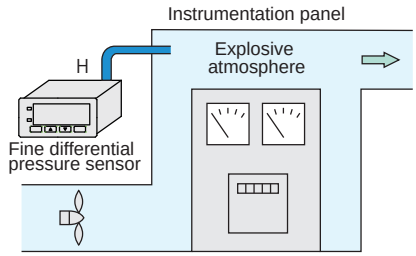




◆For internal pressure explosion-proof

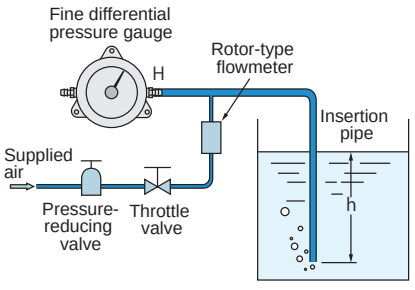
When devices are used in an explosive atmosphere, they are used after clean air is supplied for a certain time until the pressure stipulated by the relevant law or regulation is reached.

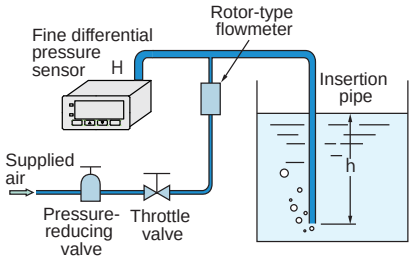




◆Liquid level gauge (air purge type)

A pipe is inserted into a tank, and a tiny amount of air is released from the tip of the pipe. At this point, as the pressure inside the pipe reaches [liquid level height × specific gravity of liquid], it is possible to know the liquid level height if the specific gravity of the liquid is known.





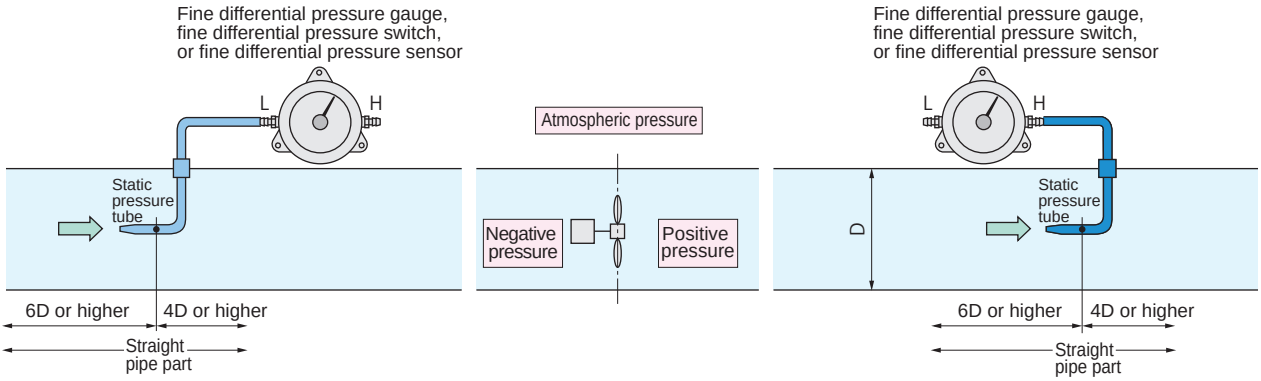
Caution　Select the base, piping material, and other components in accordance with the use environment.

Application

Use example

Static pressure measurement

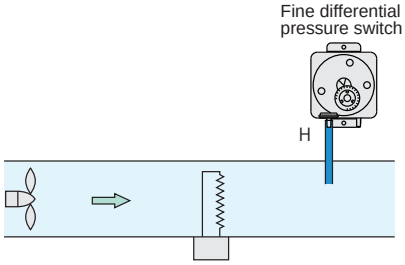
◆Measurement of flowing air **Monitoring of ventilation/exhaust device and alarm issuance** H: high pressure side L: low pressure side

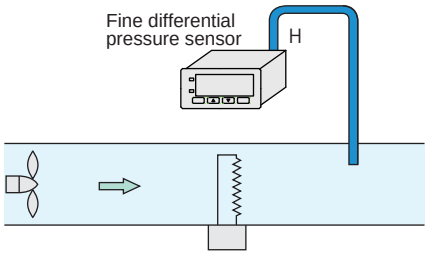


In measurements of static pressure inside a normal duct, because of turbulence, it may become difficult to read the value on a fine differential pressure gauge as the pointer pulsates, or the measurement value is subject to error. Therefore, be sure to attach a static pressure pipe to the straight pipe part with a determined length. Because the static pressure in the duct becomes positive pressure and negative pressure before and after the fan, be sure to connect pipes by paying attention to the polarities of the bases (high-pressure side, low-pressure side) of the fine differential pressure gauge, fine differential pressure switch, and fine differential pressure sensor.

(1) For prevention of burn accidents from an electric heater

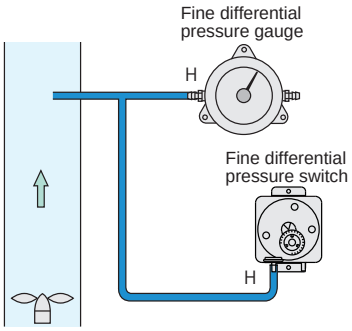
When the fan in an electric heater stops during energization of the heater, the fine differential pressure switch is activated to stop all devices and prevents temperature rises and fusing of the heater.

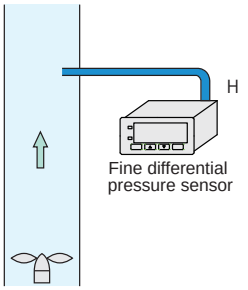




(2) For monitoring of flue exhaust/burner air supply

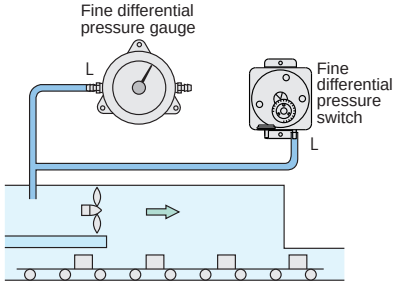
The fine differential pressure switch detects incomplete combustion due to insufficient exhaust and combustion stoppage due to a failure of the air blower, and issues an alarm.

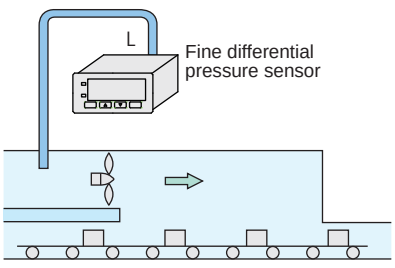




(3) For control of airflow rate in drying furnaces and tunnel ceramic kilns

To keep hot airflow in an optimum condition, the airflow is monitored via the fine differential pressure switch, and once the airflow condition worsens, an alarm is issued, or the hot airflow is shut off, and the device is stopped.





Caution

Select the base, piping material, and other components in accordance with the use environment. The dimensions on the upstream side and those on the downstream side differ depending on the duct shape. For details, refer to page 108.

Use example

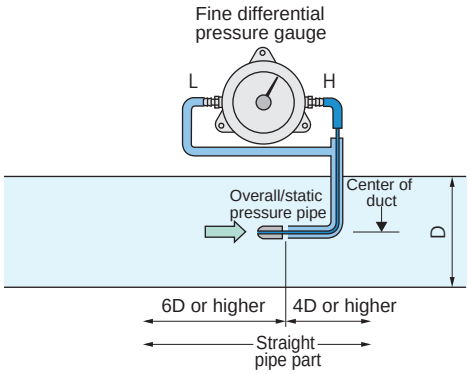
Measurement of airflow rate and airflow speed

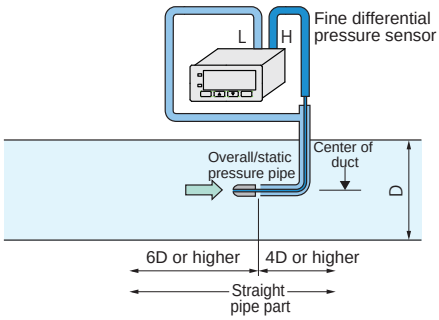
◆Example of use for detecting airflow rate in ducts

H: high pressure side L: low pressure side

(1) For Pitot tubes (overall/static pressure pipe)

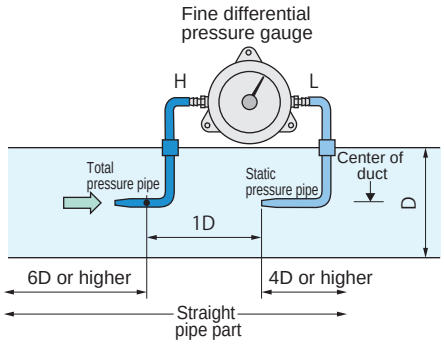
When the airflow speed is faster than 2 m/s, it is possible to detect the dynamic pressure by installing a overall/static pressure pipe and obtain the airflow speed by a calculation formula (refer to page107). When the maximum airflow speed at the center of the duct is obtained, it is possible to obtain the airflow rate by the formula [Maximum airflow speed × Duct cross section area × 0.9].

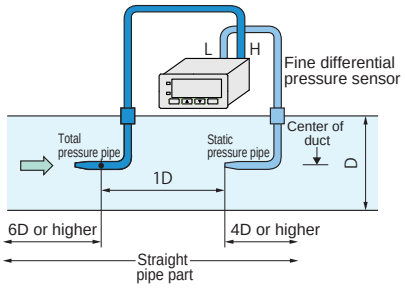




(2) For Pitot tubes (static pressure pipe + total pressure pipe)

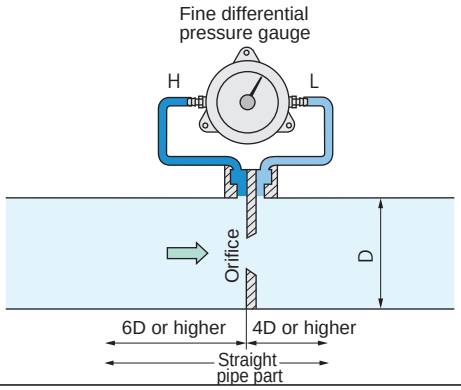
To obtain airflow rate/airflow speed simply and at a low cost, use the static pressure pipe and total pressure pipe as shown in the figure on the right.

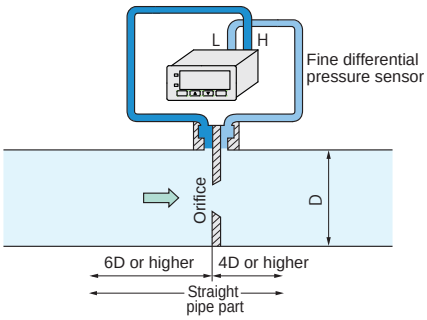




(3) For orifices

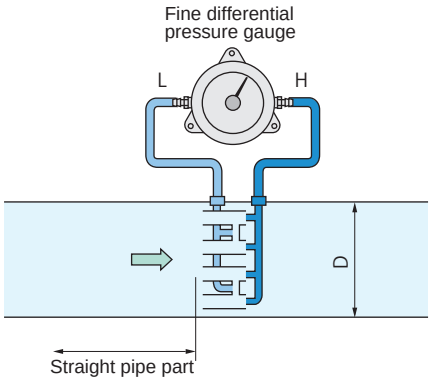
A device that throttles a conduit in which air flows by means of a circular plate with a round hole is called an orifice. Narrowly throttling the conduit increases the flow speed and reduces the static pressure. At this point, by measuring the differential pressure before and after the orifice, the airflow rate is calculated.
*We do not handle orifices.

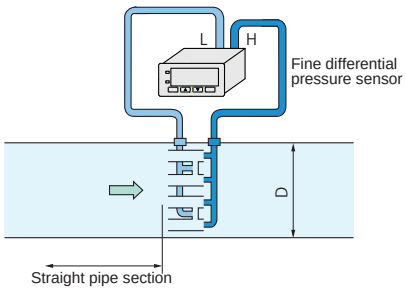




(4) For composite Pitot tubes

By equally dividing a duct cross section, installing a single Pitot tube at the center of each division, and by gathering the total pressures and static pressures, respectively, of those Pitot tubes, it is possible to extract the average total pressure and average static pressure at the same time.
*We do not handle composite Pitot tubes.
For details, make an inquiry to the composite Pitot tube manufacturer.





Caution

Select the base, piping material, and other components in accordance with the use environment. The dimensions on the upstream side and those on the downstream side differ depending on the duct shape. For details, refer to page 108.

Application

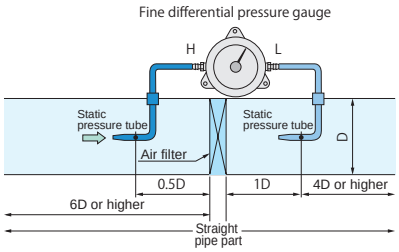
Use example

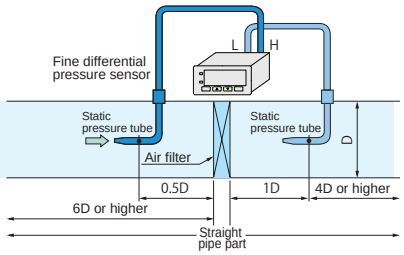
Measurement of pressure loss

◆For detection of clogging of filters

H: high pressure side L: low pressure side

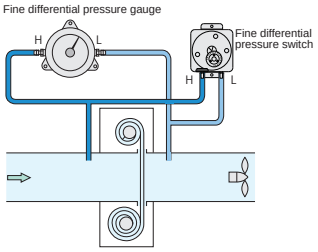
By installing two static pressure tubes, one each before and after the filter, and measuring the pressure loss, it is possible to know the degree of clogging of the filter. Generally, a pressure range with its maximum value ranging from 300 Pa to 1000 Pa is used.

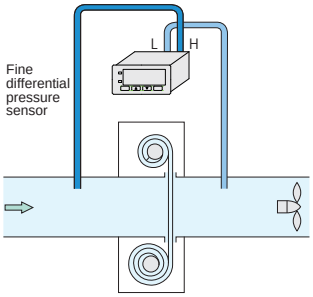




◆For transmission of the drive signal of automatic filters

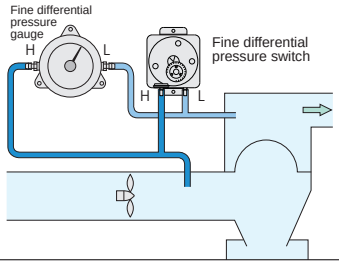
When the filter is clogged and the airflow rate decreases, the fine differential pressure switch is switched. Switching of the fine differential pressure switch energizes and starts the filter winding motor to feed a new filter.

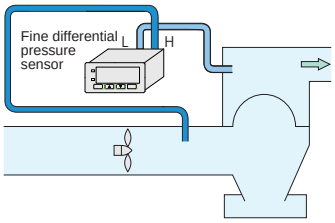




◆For bug filter dust collectors

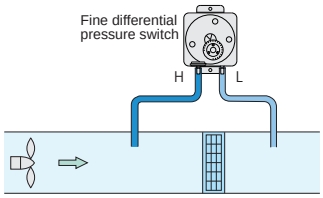
The fine differential pressure switch detects the dust collection amount in accordance with the clogging condition of the bug filter and the cycle, and operates the aeration device to clean the bug filter.

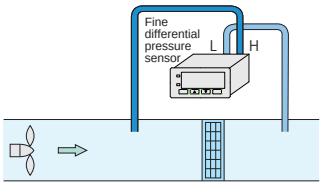




◆For detection of the defrosting cycle of cooling coil

In the cooling operation, to prevent attachment of frost on the cooling coil and decrease of its function, the fine differential pressure switch detects the frost attachment amount and issues a defrosting operation instruction.

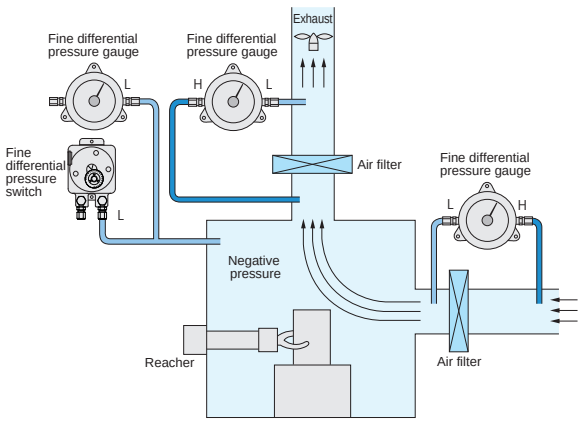




Measurement of static pressure and pressure loss

◆For glove boxes

Instruments are used to control the inner pressure, and the target object in the glove box is handled by means of a reacher. (The figure on the right illustrates a use example in which the pressure in the box interior is set to a negative pressure to prevent leakage from the inside.)



Caution

Select the base, piping material, and other components in accordance with the use environment. The dimensions on the upstream side and those on the downstream side differ depending on the duct shape. For details, refer to page 108.

⚠ Precautions common to instruments

Precautions on handling

- When pressure that exceeds the withstand pressure of a pressure-receiving element is applied to an instrument, the diaphragm and the surrounding portion will break.
- When pressure that exceeds the instrument body withstand pressure is applied to an instrument, the instrument case, transparent cover, and other parts will explode or break.
- When pressure that exceeds the withstand pressure of a pressure-receiving element is simultaneously applied to each of the high-pressure (H) side and low-pressure (L) side of an instrument, the arriving pressures may differ from each other depending on the difference in chamber capacity or piping capacity between the high-pressure (H) side and low-pressure (L) side of the instrument to cause a force that exceeds the withstand pressure of the pressure-receiving element, possibly leading to breakage or deformation of the diaphragm and its surrounding portion. When simultaneously applying pressure that exceeds the withstand pressure of a pressure-receiving element from the high-pressure (H) side and low-pressure (L) side, gradually increase the pressure by taking time. Also, when releasing the pressure, gradually decrease the pressure.

What is the withstand pressure of a pressure-receiving element?
This term refers to the maximum pressure (withstand pressure on one side) that a diaphragm can withstand so as not to break and deform, and it is the pressure to be applied to either one of the high-pressure (H) side or the low-pressure (L) side.

What is instrument body withstand pressure?
This term refers to the maximum pressure (withstand pressure on both sides) that an instrument body can safely withstand without breaking, and it is the pressure to be applied to both the high-pressure (H) side and the low-pressure (L) side. The term does not mean the pressure that guarantees the airtightness of an instrument.

- Manostar products are precision devices. If you drop a Manostar product, its exterior and the internal mechanism may break.
- Do not disassemble Manostar products.
- When removing dirt from a product surface, wipe the dirt off with a cloth moistened with mild neutral detergent. When an organic solvent is used on a Manostar product, its surface may corrode from the solvent, and the resin may crack.
- In the event of an overcurrent that exceeds the contact specification, the contact of a switch will be welded.
- Install such an instrument that requires a power source away from machines that generate strong high frequencies (high-frequency welder, high-frequency sealer, etc.) and strong drive power sources as much as possible.
- When a power supply is connected to a signal input and output terminal by mistake, the device interior will be burned.
- For current/voltage input and output signal lines, use wires with shielding in order to prevent induction problems. Do not put input and output signal lines close to a power line or pass them through the same conduit as that for a power line.

Use environment

- Avoid using a product in a location exposed to direct sunlight, strong vibrations or impacts, or with high humidity for many hours. In particular, vibrations and impacts shorten the service life of the instrument.
- Because our instruments are not waterproof, do not use them in locations directly exposed to rainwater and other liquids. Our instruments cannot be directly installed outdoors. When it is necessary to install an instrument at an outdoor location, house the instrument in a drip-proof housing for outdoor use.

Zero point setting

- After installing an instrument, adjust the zero point in the orientation in which the instrument is used.
- Be sure to conduct the zero-point setting after opening the high-pressure side and low-pressure side bases to the atmosphere or stopping the machine and then completely eliminating the residual pressure.

High-pressure side and low-pressure side polarities

- High-pressure side and low-pressure side polarities depend on the bases.
- On models WO81 and WO71 FS type/PS type (side face piping), it is possible to convert the polarity by exchanging the bases. The high-pressure and low-pressure sides are identified with the colors of red and blue, respectively.
- In a single pressure measurement, if a measurement is conducted by removing a base for which piping is not necessary, the gauge will not operate normally.

Precautions on use

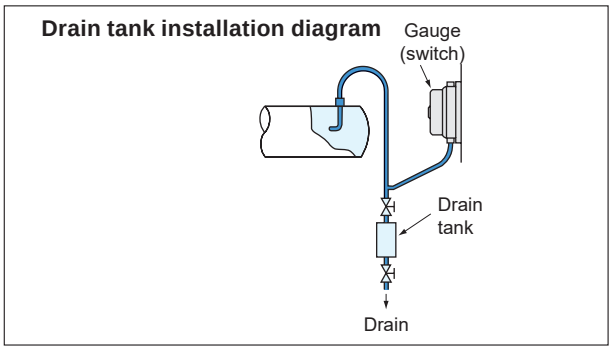
⚠ Precautions common to instruments

Measurement of single pressure (biased pressure)

○For Manostar products, “differential pressure” is indicated. “Absolute pressure” and “gauge pressure” are not indicated. Once either one of the bases on the high-pressure and low-pressure sides is opened to the atmosphere, the indication will be “gauge pressure.” This is called “single pressure (biased pressure)” in contrast to differential pressure.
○When conducting a single pressure measurement by opening one of bases, carefully check the duct internal pressure (line pressure) and use the gauge in a range suitable for the pressure.
○To measure positive pressure, connect a pipe to the high-pressure side base (red, or H). Although the low-pressure side is open to the atmosphere, do not remove the low-pressure side base (blue, or L).
○To measure negative pressure, connect a pipe to the low-pressure side base (blue, or L). Although the high-pressure side is open to the atmosphere, do not remove the high-pressure side base (red, or H).
○To measure a single pressure (biased pressure) with a zero center range instrument, connect a pipe to the high-pressure side base (red, or H). Do not remove the low-pressure side base, which will be open to the atmosphere. The significant value on the scale plate indicates the single pressure.

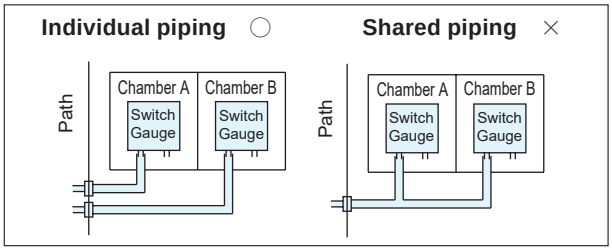
Prevention of clogging of pipe by drainage

○When drainage accumulates in the middle of a pipe, pressure measurements are subject to errors. Therefore, be sure to install an instrument at a location higher than the pressure extraction port of a pressure detector to prevent drainage from accumulating in part of the pipe.
○If this precaution cannot be observed out of necessity, install a drain tank in the middle of the pipe as shown on the right and periodically clean the tank.
○After cleaning, confirm that airtightness is positively maintained.



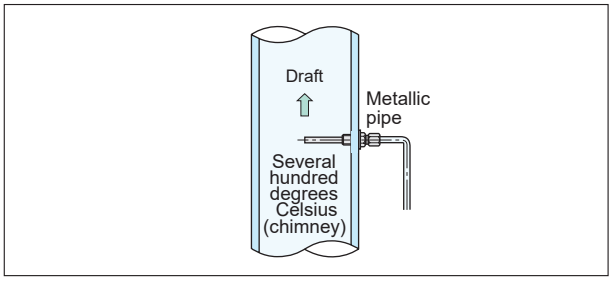
Prohibition of shared piping

○In piping with a pressure detector and an instrument, provide a single pipe for each system as shown on the right, and do not share the pipe with the neighboring system.
○When shared piping is made, the pressures of the respective systems interfere with each other, leading to errors.



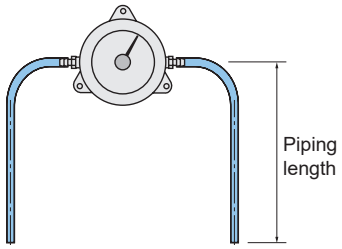
Measurement of pressure of high-temperature gas

○To measure the pressure of a high-temperature gas, use temperature-resistant metal (stainless steel, for example) in the pressure detector (Pitot tube), and connect to an instrument body with a metal pipe having a length necessary for cooling the high-temperature gas.



Error due to long-distance piping

○When the pipe of an instrument is long, the instrument’s response speed will be slower.
Make the size of the pipe in the middle as large as possible.
If the piping condition significantly differs between the high-pressure side and low-pressure side, the piping resistance also differs between the high-pressure side and low-pressure side, and there will be a difference in the pressure arrival time, making it impossible to accurately measure the differential pressure.



⚠ Precautions common to instruments

Installation of base

●Common

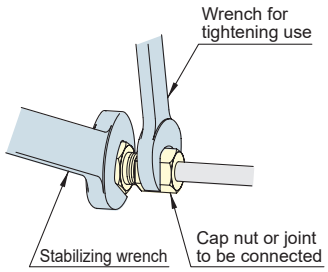
• Tightening torque

The airtightness between the base connection part of an instrument and the base and sealing cap is maintained by an O-ring. Install the bases and sealing caps to the following tightening torques. Do not tighten to a torque that exceeds the specified value because doing so breaks the instrument body.

- Base for metallic/vinyl pipe……1N·m
- Sealing cap ……0.5N·m
- Combined use of a stabilizing wrench

When tightening a cap nut on a base for metallic pipe, a joint to be connected to an adapter, or other part, positively secure the base or adapter body with a stabilizing wrench. If a cap nut or joint is tightened without securing the base or adapter, the instrument body or the base body will break.

Also, when loosening the cap nut or joint, a stabilizing wrench is necessary.



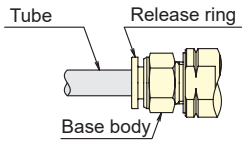
●PT base, PR base

• Connection of tube

Insert a tube whose end is cut at a right angle to the base all the way to the end.

• Disconnection of tube

Push the tube once, and then pull out the tube while pushing the release ring along the tube.

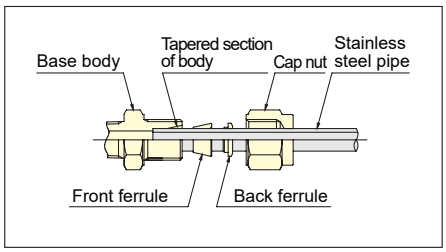


Although the operating ambient temperature of the PT base and PR base is 0°C to 60°C (no freezing allowed), do not use them in an environment where the ambient temperature exceeds the operating ambient temperature of the instrument. Failure to follow this instruction may lead to a failure or breakage of the instrument. Use a tube with a difference between its maximum outer diameter and minimum outer diameter of 0.2 mm or less and an exterior free of scratches.

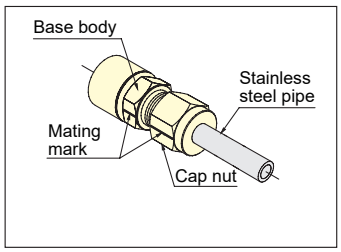
When a tube is going to be subject to repetitive connection and disconnection, cut off the tip of the tube by 3 mm or longer.

●MTW base

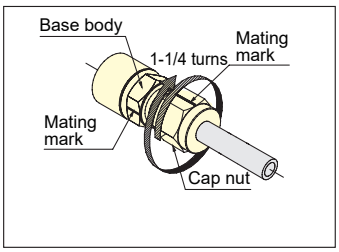
• Method to tighten pipe and base



1. Confirm whether the parts of a base fit as shown in the figure above, and then insert a stainless steel tube until its end makes contact with the back of the body.



2. After tightening the cap nut with the fingers up to the point where it does not turn any further, put a mating mark on each of the base body and the cap nut.



3. From this position, tighten the cap nut by turning it one and one-quarter turns with a wrench.

• Method to retighten pipe after a disconnection

1. Before connecting the pipe, confirm that no foreign substances, such as dirt, are attached to the tapered section of the body and the front ferrule.
2. Insert the pipe until the front ferrule makes contact with the tapered section of the body, and then tighten the cap nut with the fingers to the point where it does not turn any further.
3. Hook a stabilizing wrench to the base body, and tighten the cap nut by turning it one and one-quarter turns.

Precautions on use

⚠ Precautions for Manostar gauges

Accuracy of Manostar gauges

○For Manostar gauges, catalog accuracies are guaranteed throughout the whole range of the pressure span.

○JIS B 7505-1, which stipulates Bourdon tube pressure gauges among aneroid pressure gauges, specifies the tolerable errors on a scale range basis. Note, however, that Manostar gauges are not Bourdon tube pressure gauges. Because of the employment of a unique mechanism, for Manostar gauges, uniform accuracy is guaranteed throughout the whole range (0% to 100% FS) of the pressure span.

Tolerable accuracy specified by JIS B 7505-1.....The stipulation tolerates an accuracy of 1.5 times the specified accuracy in the 10% range each at both ends of the pressure span and the 5% range each before and after the zero point in the zero center range.

Pressure span .....This indicates the absolute value of the entire pressure span from the minimum value to the maximum value in the scale range.

Example: pressure span with 300 Pa range → [300 Pa]

pressure span with ± 300 Pa range → [600 Pa]

Connection of base for zero center range

○A Manostar gauge is a differential pressure gauge and is used to measure the difference between two pressures. When these pressure values change, the gauge indication fluctuates in both the positive direction and the negative direction. For measurements under such conditions, a zero center range is used.

○The polarities in the zero center range are determined by the following piping conditions.

(1) When the HIGH base is connected to the high-pressure side and the LOW base is connected to the low-pressure side, the pointer moves in the clockwise direction. On the scale plate for the zero center range of Manostar gauges, this direction is set as positive. (Pressure at HIGH side base > Pressure at LOW side base)

(2) When the indicator moves in the opposite direction, it is negative. (Pressure at HIGH side base < Pressure at LOW side base)

○In the use of the zero center range, assume that the use condition in (1) above is set as normal, and the use condition in (2) above is set as abnormal, for example. In the normal state under these conditions, connecting the high-pressure side to the HIGH base makes the pointer indicate a positive value. After connection, if the state turns into the abnormal state, the pointer indicates a negative value.

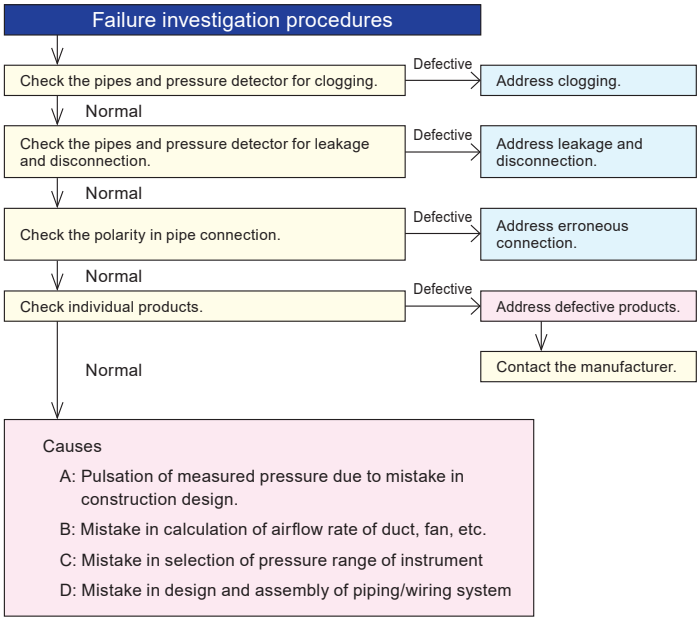
○If the high-pressure side and low-pressure side of a pressure detector are unknown, measure the pressure difference by using the zero center range, and then identify the polarity by the direction in which the pointer moves.

Maintenance

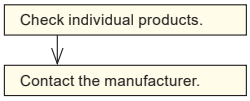
Actions to take in the event of failure and malfunctioning

○If a Manostar product (instrument) does not operate normally, by referring to the investigation procedures shown below, investigate the product yourself to see whether the malfunctioning has been caused by an instrument failure, pressure detector, or the piping system.

○If an investigation has made clear that the instrument has failed, contact us via the following.



○Actions to take concerning product returned to distributor or trading company that handles it



Contact for failure and malfunctioning
Manostar Shop Co., Ltd.
1-2-3, Nishi-shiriike-cho, Nagata-ku, Kobe,
Hyogo 653-0031 JAPAN
TEL. +81-78-621-7000 FAX. +81-78-621-7788

Periodical calibration of instrument

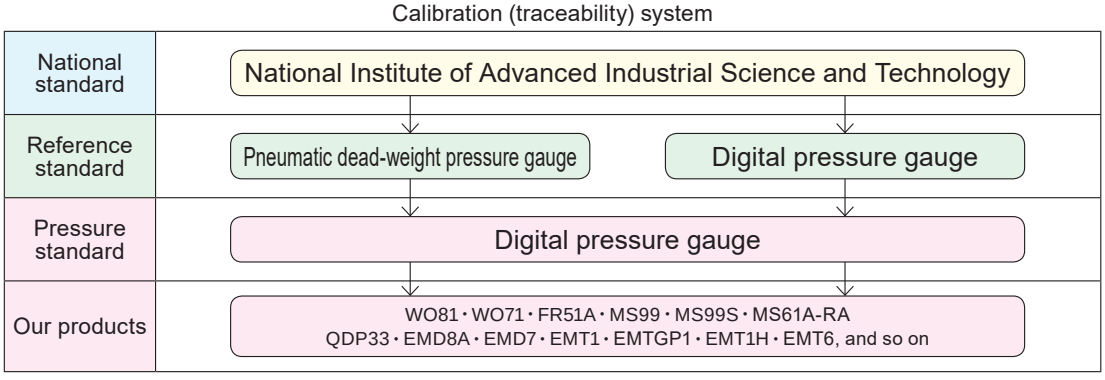
○In general, to retain the service life and reliability of an instrument for a long period, it is important to prevent stress due to external factors from being applied to the instrument. It is not necessary to conduct maintenance, lubrication in particular, as long as the instrument is appropriately used in accordance with the instruction manual. However, we recommend that you conduct periodic calibrations once a year. For periodic calibrations, contact the distributor or us.

○Please be advised that depending on the condition of the instrument, we may decline your request for calibration.

Accuracy maintenance

The calibration system for maintaining the accuracy of our pressure standards is shown below.

Calibration (traceability) system



Maintenance

Calibration service

○ In our calibration service, we conduct calibration of products and make optimum adjustments in accordance with the condition of each product.
We provide the services of maintaining the accuracy and reliability of instruments by returning them in good condition to customers.
*We provide calibration services for our products only.

Types of calibration service

- Standard calibration: We conduct calibration and optimum adjustment of the instrument.
- Speedy calibration: We conduct calibration and optimum adjustment of the instrument in a short period. (Speedy calibration requires an extra fee in addition to the fee for the standard calibration.)

What is optimum adjustment?

It refers to an adjustment conducted by us to make the instrument indicate values as close to the true values as possible regardless of whether the calibration result is within or outside the tolerable range.

When you want optimum adjustment:	We will conduct optimum adjustment regardless of whether the calibration result is within or outside the guaranteed accuracy range. (For instruments compliant with RoHS only) However, if a product that is to be adjusted is already in the optimum condition, we will not conduct optimum adjustment.
When you do not desire optimum adjustment:	We will not conduct optimum adjustment as long as the product is within the guaranteed accuracy range. If the product is out of the guaranteed accuracy range, we will contact you.

Documents to be issued

When optimum adjustment is conducted: We will issue inspection reports (two copies) listing data before adjustment and data after adjustment, respectively.
When optimum adjustment is not conducted: We will issue an inspection report of the calibrated data only.
*We will issue a calibration certificate and a standard calibration certificate, each for a fee. The expense for the inspection report is included in the calibration service fee.

Others

When a product is be calibrated but cannot be calibrated, we will contact the customer and report whether it can be repaired or not.

Repair service

○We will repair products requested to be calibrated that require repair, and products requested to be repaired.
*We provide a repair service for our products only.
*We cannot repair products not compliant with RoHS.

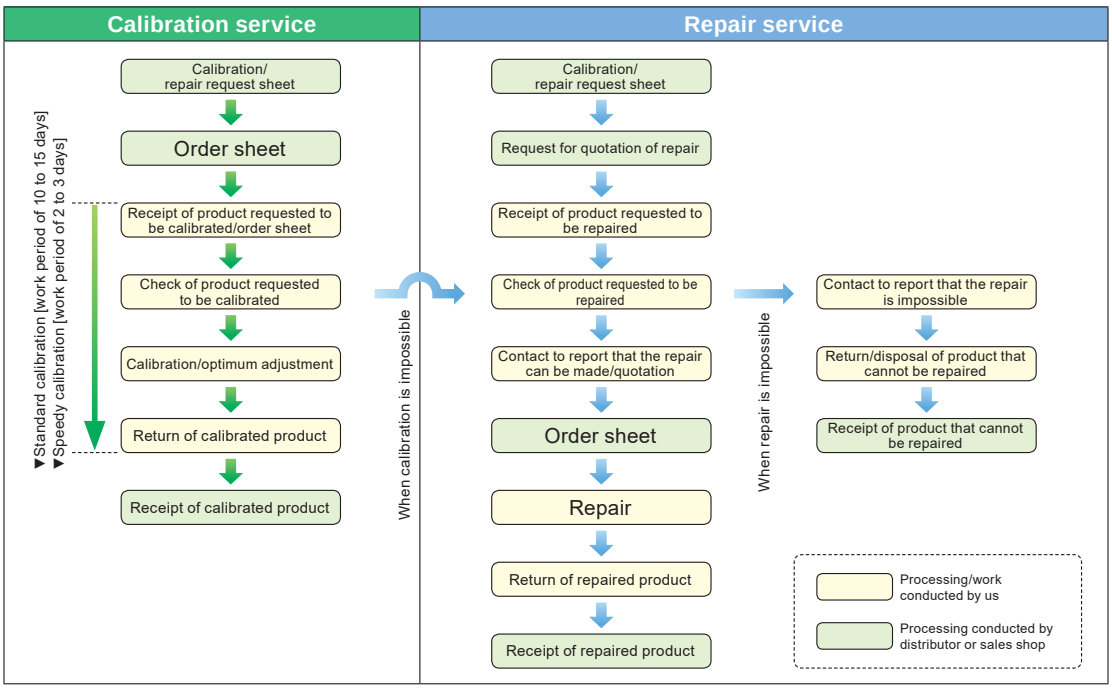
Documents to be issued

When we have conducted a repair, we will issue an inspection report after the repair (one copy).

Others

When a product is be repaired but cannot be repaired, we will contact the customer.

<Flow from request to return>



*The calibration/repair request sheet can be downloaded from our website.

Warranty

Warranty period

The warranty period for our product is one (1) year from delivery to the location specified by the orderer who makes a direct transaction with us.

Scope of warranty

If any failure or defect attributable to us becomes clear during the above warranty period, we will repair the product or supply a substitute product free of charge. However, even during the warranty period, we will exclude the product from the scope of the warranty if the failure or defect corresponds to any of the following:

(1) The failure or defect was caused by an unreasonable condition, environment, handling, or usage not mentioned in the instruction manual, specifications, and our product catalog.
(2) The failure or defect was caused by a factor other than our product.
(3) The failure or defect was caused by a modification or repair conducted by a party other than us.
(4) The failure or defect was caused by an event that could not be foreseen at the scientific and technical levels at the time of product shipment from us.
(5) The failure or defect was caused by an external factor not attributable to us, such as acts of God and disasters.

Please note that the warranty mentioned here means the warranty for our individual product, and damage provoked by a failure or defect of the product is excluded from the scope of the warranty.

*This warranty is valid only in Japan.

Application and usage

Our products are designed and manufactured as general-purpose instruments for general industries.
Therefore, our products are not intended for the following uses, and our products used in such a manner are outside the scope of application.

(1) Equipment that is anticipated to greatly affect lives and properties, such as nuclear power generation, aviation, railways, marine vessels, vehicles, and medical devices
(2) Utilities that include electricity, gas, and service water
(3) Use in outdoor locations and under similar conditions or environments other than those stipulated in the instruction manual
(4) Usage to which considerable safety consideration and attention equivalent to (1) and (2) above need to be given

Service

Scope of service

Because the product price does not include service expenses, such as the dispatch of engineers, we will separately charge for the expenses in the following cases:

(1) Instruction for installation and adjustment and a witnessed test run
(2) Maintenance inspection, adjustments, and repairs
(3) Technical guidance and technical education
(4) Witnessed inspections of products at our factory

<<Note>> The product specifications and information in this catalog are subject to change without prior notice for product improvement or other reasons.

●For order placement, contact