



# Manostar

## Manostar General Catalog



 Manostar





# CONTENTS

<b>List of products in catalog</b> .....		pp. 3–10	
<b>Manostar gauge</b>	 <b>WO81</b>	[High-accuracy fine differential pressure gauge] Wide range variation Compatible with airflow rate and airflow speed scales as well	pp. 11–22
	 <b>WO71</b>	[Flat-type fine differential pressure gauge] Thin type Equipped with rotary base as standard	pp. 23–30
	 <b>FR51A</b>	[Edgewise fine differential pressure gauge] Small-size and lightweight type Standard lineup of products with color-coded scale	pp. 31–34
<b>Manostar switch</b>	 <b>MS99</b>	[Fine differential pressure switch] High accuracy Wide setting range	pp. 35–42
	 <b>MS99S</b>	[Intrinsically safe fine differential pressure switch] Explosion-proof performance Ex ia IIC T6 Ga	pp. 43–46
	 <b>MS61A-RA</b>	[Small-sized fine differential pressure switch] Small-size and lightweight type With built-in lead switch	pp. 47–50
<b>Manostar digital sensor</b>	 <b>NEW QDP33</b>	[30×30 type digital fine differential pressure sensor] High sensitivity, high accuracy Compatible with ultra-low pressure range (10 Pa) as well	pp. 51–62
	 <b>EMD8A</b>	[24×48 type digital fine differential pressure sensor] Connector connection type	pp. 63–70
	 <b>EMD7</b>	[48×48 type digital fine differential pressure sensor] Terminal connection type	pp. 71–76
<b>Manostar transmitter</b>	 <b>EMT1</b>	[High-accuracy fine differential pressure transmitter] Wide range variation	pp. 77–80
	 <b>EMTGP1</b>	[Anticorrosion type fine differential pressure transmitter] Dedicated to negative pressure measurement	pp. 81–84
	 <b>EMT1H</b>	[Intrinsically safe fine differential pressure transmitter] Explosion-proof performance Ex ia IIC T4 Ga	pp. 85–88
	 <b>EMT6</b>	[Small-sized fine differential pressure transmitter] Lightweight type	pp. 89–90
<b>Receiving instrument</b>	 <b>EMP5A</b>	[Receiving instrument] Capable of displaying pressure, airflow rate, and airflow speed Equipped with square root calculation function	pp. 91–96
<b>Square root calculator</b>	 <b>EMRT1</b>	[Square root calculator] Use for measurement of airflow rate and airflow speed	pp. 97–98
<b>Direct current power unit</b>	 <b>HWS15A</b>	[Direct current power unit] Capable of supplying 24 V DC power to up to 15 devices	pp. 99–100
<b>Accessories</b>	 <b>AC</b>	Pitot tube, joint, vinyl tube, etc.	pp. 101–112
<b>Application</b> .....		pp. 114–117	
<b>Precautions on use</b> .....		pp. 118–121	
<b>Maintenance</b> .....		pp. 122–123	

# List of products in catalog [Manostar gauge]






- List of products
- WO81
- WO71
- FR51A
- MS99
- MS99S
- MS61A-RA
- QDP33
- EMD8A
- EMD7
- EMT1
- EMTGP1
- EMT1H
- EMT6
- EMP5A
- EMRT1
- HWS15A
- Accessories
- Application
- Precautions
- Maintenance

Model	WO81			WO81 airflow rate/airflow speed meter		
						
Page showing details	RoHS pp. 11–			RoHS pp. 15–		
Pressure (airflow rate/speed) range Accuracy Withstanding pressure of pressure-receiving element	Pressure range	Accuracy (at 20°C)	Withstanding pressure of pressure-receiving element	Airflow rate/airflow speed range	Accuracy (at 20°C)	Withstanding pressure of pressure-receiving element
	0–50 Pa	±5% FS	10 kPa	*To procure an airflow rate/speed meter, it is necessary to first prepare an airflow rate/speed scale specification document. For details, refer to page 15.		
	0–100 Pa	±2.5% FS				
	0–200 Pa					
	0–300 Pa	±1.5% FS	40 kPa			
	0–500 Pa					
	0–1000 Pa					
	0–1 kPa					
	0–2 kPa					
	0–3 kPa					
	0–5 kPa	±1.5% FS	150 kPa			
	0–10 kPa					
	0–20 kPa					
	0–30 kPa					
	0–50 kPa					
	0–100 kPa					
	±50 Pa	±2.5% FS	10 kPa			
	±100 Pa					
	±200 Pa	±1.5% FS	40 kPa			
	±300 Pa					
±500 Pa						
±1 kPa						
±2 kPa						
±3 kPa						
Pressure unit	Pa, kPa, airflow rate, airflow speed					
Pressure measurement method	Differential pressure method					
External shape	Surface type, round panel type, square panel type					
Memory pointer	None, one piece, two pieces					
Pressure-receiving element	Diaphragm (silicone rubber)					
Measured gas	Air and noncorrosive gas (liquid cannot be measured)					
Mounting method	Surface mounting, panel mounting					
Mounting orientation	Horizontal, upright, others					
Scale indication angle	Wide-angle indication of approx. 270 degrees					
Operating ambient temperature	–10°C to +50°C (no freezing allowed)					
Operating ambient humidity	90% RH or below (no condensation allowed)					
Instrument body withstanding pressure	200 kPa					
Exterior material	Polycarbonate and polyamide					
Compatible pipe	Vinyl pipe or rubber pipe (inner diameter of 6 mm), separately sold accessories available					
Base polarity	Changeable					
Mass	Approx. 270 g					





# List of products in catalog [Manostar switch]

- List of products
- WO81
- WO71
- FR51A
- MS99
- MS99S
- MS61A-RA
- QDP33
- EMD8A
- EMD7
- EMT1
- EMTGP1
- EMT1H
- EMT6
- EMP5A
- EMRT1
- HWS15A
- Accessories
- Application
- Precautions
- Maintenance

Model	MS99			MS99S			MS61A-RA		
	 Page showing details RoHS  (for 30 V DC and lower specification only)  pp. 35–	Intrinsically safe type Ex ia IIC T6 Ga RoHS			 pp. 43–	 RoHS pp. 47–			
Pressure range Scale setting accuracy Maximum operating pressure difference	Pressure range	Scale setting accuracy (at 23°C)		Maximum operating pressure difference	Pressure range	Scale setting accuracy (at 20°C)	Maximum operating pressure difference		
	20–120 Pa	±5.0 Pa		25.0 Pa	20–120 Pa	±5.0 Pa	37.5 Pa		
	20–200 Pa	±9.0 Pa		25.0 Pa					
	30–300 Pa	±13.5 Pa		30.0 Pa					
					50–300 Pa	±15 Pa	60 Pa		
	50–500 Pa	±22.5 Pa		45.0 Pa					
	100–1000 Pa	±45 Pa		70 Pa	100–600 Pa	±25 Pa	120 Pa		
					0.2–1.2 kPa	±0.050 kPa	0.240 kPa		
	0.3–3 kPa	±0.135 kPa							
				0.300 kPa	0.5–3 kPa	±0.15 kPa	0.60 kPa		
	0.5–5 kPa	±0.225 kPa		0.450 kPa					
					1–6 kPa	±0.30 kPa	1.20 kPa		
	1–10 kPa	±0.45 kPa		0.70 kPa					
	3–30 kPa	±1.35 kPa							
			3.00 kPa						
Pressure unit	Pa, kPa				Pa, kPa				
Pressure measurement method	Differential pressure method				Differential pressure method				
Contact specification	Common to standard load and minute load				Minute load/single-pole normally open sealed type				
Scale setting	Upper limit setting, lower limit setting				Upper limit setting, lower limit setting				
Pressure-receiving element	Diaphragm (silicone rubber)				Diaphragm (silicone rubber)				
Measured gas	Air and noncorrosive gas (liquid cannot be measured)				Air and noncorrosive gas (liquid cannot be measured)				
Mounting posture	Upright, horizontal				Mounted at arbitrary angle between horizontal and upright				
Wiring method	Terminal				Terminal				
Operating ambient temperature	–10°C to +60°C (no freezing allowed)				–10°C to +50°C (no freezing allowed)				
Operating ambient humidity	90% RH or below (no condensation allowed)				90% RH or below (no condensation allowed)				
Instrument body withstanding pressure	10 to 50 kPa				100 kPa				
Withstanding pressure of pressure-receiving element	10 to 50 kPa				20 kPa				
Exterior material	Polycarbonate and polyamide				Polyamide				
Compatible pipe	Vinyl pipe or rubber pipe (inner diameter of 4 or 6 mm) Separately sold accessories available				Vinyl pipe or rubber pipe (inner diameter of 4 mm)				
Mass	Approx. 170 to 190 g				Approx. 140 g				
Opening/closing capability	Load	Rated voltage	Resistance load	Induction load	Rating	Opening/closing voltage	Opening/closing current	Opening/closing power	
		30 V DC	0.8 A	150 mA (time constant: 7 ms)					
Standard specification	Standard load	100 V AC	5 A	60 mA (power factor: 0.6)	0.1–30 V DC	100 V DC (maximum)	0.25 A DC (maximum)	10 W DC (maximum)	
		250 V AC	5 A	—					
		Minute load	30 V DC 125 V AC	100 mA					—
30 V DC and lower specification	Standard load	30 V DC	0.8 A	150 mA (time constant: 7 ms)					
	Minute load		100 mA	—					
Intrinsically safe type	—	12 V DC	30 mA	—					

# List of products in catalog [Manostar digital sensor]

Model	QDP33 [ultra-low pressure range]			QDP33		
	30x30 type <b>NEW</b>					
Page showing details	RoHS					
Pressure range Accuracy Output method	Pressure range	Accuracy (at 23°C)	Output method	Pressure range	Accuracy (at 23°C)	Output method
	0–10 Pa	±1.5% FS	<b>Analog output</b> Output type: 4 to 20 mA (biased pressure: 0 to FS, ±: at pressure of -50 to +50% FS) Load resistance: 0 to 250 Ω  <b>Comparison output</b> Output type: 1 to 5 V (biased pressure: 0 to FS, ±: at pressure of -50 to +50% FS) Load resistance: 10 kΩ or higher	0–50 Pa	±1.0% FS	<b>Analog output</b> Output type: 4 to 20 mA (biased pressure: 0 to FS, ±: at pressure of -50 to +50% FS) Load resistance: 0 to 250 Ω  <b>Comparison output</b> Output type: NPN open collector or two systems of PNP open collector
	0–25 Pa			0–100 Pa		
				0–200 Pa		
				0–300 Pa		
				0–500 Pa		
				0–1000 Pa		
				0–1 kPa		
				0–2 kPa		
	±10 Pa			±50 Pa		
	±25 Pa			±100 Pa		
				±200 Pa		
				±300 Pa		
				±500 Pa		
				±1000 Pa		
	±1 kPa					
	±2 kPa					
Pressure unit	Pa, kPa			Pa, kPa		
Measured gas	Air and noncorrosive gas (liquid cannot be measured)			Air and noncorrosive gas (liquid cannot be measured)		
Pressure-receiving element	Diaphragm (silicone)			Diaphragm (silicone)		
Mounting method	Panel mounting, bracket mounting			Panel mounting, bracket mounting		
Mounting orientation	Upright			Upright		
Wiring method	Connector (6P)			Connector (6P)		
Operating ambient temperature	0°C to 50°C (no freezing allowed)			0°C to 60°C (no freezing allowed)		
Operating ambient humidity	35% to +85% RH (no condensation allowed)			35% to +85% RH (no condensation allowed)		
Instrument body withstanding pressure	10 kPa			10 kPa		
Withstanding pressure of pressure-receiving element	10 kPa			10 kPa		
Display	Main display: 12-segment LCD (white/red), four digits Sub display: 12-segment LCD (orange), four digits			Main display: 12-segment LCD (white/red), four digits Sub display: 12-segment LCD (orange), four digits		
Power voltage	12 to 24 V DC ± 10% (ripple of 10% or below)			12 to 24 V DC ± 10% (ripple of 10% or below)		
Protection level	Standard: IEC 60529 Grade code: IP40			Standard: IEC 60529 Grade code: IP40		
Exterior material	PBT and polyamide			PBT and polyamide		
Compatible pipe	Vinyl pipe or rubber pipe (inner diameter of 4 mm)			Vinyl pipe or rubber pipe (inner diameter of 4 mm)		
Mass	Approx. 30 g			Approx. 30 g		

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories











Application

Precautions

Maintenance



# List of products in catalog [Manostar digital sensor]

- List of products
- WO81
- WO71
- FR51A
- MS99
- MS99S
- MS61A-RA
- QDP33
- EMD8A
- EMD7
- EMT1
- EMTGP1
- EMT1H
- EMT6
- EMP5A
- EMRT1
- HWS15A
- Accessories
- Application
- Precautions
- Maintenance

	EMD8A			EMD7		
	Model	24x48 type 			48x48 type 	
Page showing details	RoHS     pp. 63–			RoHS     pp. 71–		
Pressure range Accuracy Output method	Pressure range	Accuracy (at 20°C)	Output method	Pressure range	Accuracy (at 20°C)	Output method
	0–50 Pa	±1.5% FS	<b>Analog output</b> <b>Output type:</b> 4 to 20 mA (biased pressure: 0 to FS, ±: at pressure of –50 to +50% FS) Load resistance: 0 to 250 Ω  <b>Output type:</b> 1 to 5 V (biased pressure: 0 to FS, ±: at pressure of –50 to +50% FS) Load resistance: 10 kΩ or higher  <b>Comparison output</b> <b>Output type:</b> NPN open collector or two systems of PNP open collector	0–100 Pa	±1.5% FS	<b>Analog output</b> <b>Output type:</b> 4 to 20 mA (at pressure of 0 to FS) Load resistance: 0 to 250 Ω 1 to 5 V (at pressure of 0 to FS) Load resistance: 10 kΩ or higher  <b>Alarm output</b> <b>Output type:</b> NPN open collector or PNP open collector One each for upper limit and lower limit
	0–100 Pa			0–200 Pa		
	0–200 Pa			0–300 Pa		
	0–300 Pa			0–500 Pa		
	0–500 Pa			0–1000 Pa		
	0–1000 Pa			0–1 kPa		
	0–2 kPa			0–2 kPa		
	0–3 kPa			0–3 kPa		
	0–5 kPa			0–5 kPa		
	±50 Pa					
	±100 Pa					
	±200 Pa					
	±300 Pa					
	±500 Pa					
Pressure unit	Pa, kPa			Pa, kPa		
Measured gas	Air and noncorrosive gas (liquid cannot be measured)			Air and noncorrosive gas (liquid cannot be measured)		
Pressure-receiving element	Diaphragm (silicone rubber)			Diaphragm (silicone rubber)		
Mounting method	Panel mounting			Panel mounting		
Mounting orientation	Upright			Upright		
Wiring method	Connector (6P)			Terminal		
Operating ambient temperature	0°C to 60°C (no freezing allowed)			0°C to 50°C (no freezing allowed)		
Operating ambient humidity	35% to +85% RH (no condensation allowed)			35% to +85% RH (no condensation allowed)		
Instrument body withstanding pressure	10 kPa			20 kPa		
Withstanding pressure of pressure-receiving element	10 kPa			20 kPa		
Display	7-segment LED, red 3-1/2 digits			7-segment LED, red four digits		
Power voltage	12 to 24 V DC ± 10% (ripple of 10% or below)			12 to 24 V DC ± 10% (ripple of 10% or below)		
Protection level	Standard: IEC 60529 Grade code: IP40 (front panel)			Standard: IEC 60529 Grade code: IP41		
Exterior material	Polycarbonate			ABS resin		
Compatible pipe	Vinyl pipe or rubber pipe (inner diameter of 4 mm)			Vinyl pipe or rubber pipe (inner diameter of 4 mm; however, the outer diameter must be 6 mm or lower)		
Mass	Approx. 60 g			Approx. 130 g		



# List of products in catalog [Manostar transmitter]

Model	EMT1			EMTGP1					
	Page showing details	 <p>RoHS pp. 77–</p>			 <p>Corrosion-resistant type Dedicated to negative pressure measurement RoHS pp. 81–</p>				
Pressure range Accuracy Output and transmission method	Pressure range	Accuracy (at 20°C)	Output and transmission method	Pressure range	Accuracy (at 20°C)	Output and transmission method			
	0–10 Pa	±2% FS	Two-wire type: Output signal of 4 to 20 mA DC (load resistance of 500 Ω or lower) Power voltage of 24 V DC ± 10% (ripple of 0.2 V P-P or lower)		±2.5% FS	Two-wire type: Output signal of 4 to 20 mA DC (load resistance of 500 Ω or lower) Power voltage of 24 V DC ± 10% (ripple of 0.2 V P-P or lower)			
	0–15 Pa								
	0–20 Pa								
	0–30 Pa								
	0–50 Pa	±1% FS		Four-wire type: Output signal of 4 to 20 mA DC (load resistance of 500 Ω or lower) Power voltage of 100 V AC ± 10%, 50/60 Hz, approx. 2 VA					
	0–75 Pa								
	0–100 Pa								
	0–150 Pa								
	0–200 Pa							0 to –200 Pa	
	0–300 Pa							0 to –300 Pa	
	0–500 Pa							0 to –500 Pa	
	0–750 Pa								
	0–1000 Pa							0 to –1000 Pa	
	0–2 kPa			0 to –2 kPa					
	0–3 kPa								
	0–5 kPa								
	0–10 kPa								
	0–20 kPa								
	0–30 kPa								
	0–50 kPa								
	±10 Pa	±2% FS							
	±20 Pa								
±30 Pa									
±50 Pa	±1% FS								
±100 Pa									
±200 Pa									
±300 Pa									
±500 Pa									
±1000 Pa									
±2 kPa									
±3 kPa									
±5 kPa									
Pressure unit	Pa, kPa			Pa, kPa					
External shape	Indoor drip-proof type, exposed terminal type			Indoor drip-proof type, exposed terminal type					
Measured gas	Air and noncorrosive gas (liquid cannot be measured)			Corrosive gas (sulfuric acid gas cannot be measured; for details, contact us)					
Pressure-receiving element	Diaphragm (silicone rubber)			Diaphragm (PEEK film)					
Mounting orientation	Horizontal			Horizontal					
Operating ambient temperature	0°C to 50°C (no freezing allowed)			10°C to 40°C					
Operating ambient humidity	90% RH or below (no condensation allowed)			90% RH or below (no condensation allowed)					
Instrument body withstanding pressure	500 kPa			—					
Withstanding pressure of pressure-receiving element	10 kPa to 150 kPa			–10 kPa					
Exterior material	Aluminum die casting			Aluminum die casting and PEEK					
Compatible pipe	Vinyl pipe or rubber pipe (inner diameter of 6 mm), metallic pipe (inner diameter of 6 ± 0.1 mm), separately sold accessories available			Internal thread for general U.S. pipes 1/4-18NPT					
Mass	Indoor drip-proof type: approx. 1100 g Exposed terminal type: approx. 960 g			Indoor drip-proof type: approx. 980 g Exposed terminal type: approx. 860 g					

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories



Application

Precautions


Maintenance

# List of products in catalog [Manostar transmitter]


- List of products
- WO81
- WO71
- FR51A
- MS99
- MS99S
- MS61A-RA
- QDP33
- EMD8A
- EMD7
- EMT1
- EMTGP1
- EMT1H
- EMT6
- EMP5A
- EMRT1
- HWS15A
- Accessories
- Application
- Precautions
- Maintenance







Model	EMT1H			EMT6			
	Intrinsically safe type EX ia IIC T4 Ga						
Page showing details	RoHS pp. 85–			RoHS pp. 89–			
Pressure range Accuracy Output and transmission method	Pressure range	Accuracy (at 20°C)	Output and transmission method	Pressure range	Accuracy (at 20°C)	Output and transmission method	
	0–10 Pa	±2% FS	Two-wire type: Output signal of 4 to 20 mA DC (load resistance of 250 Ω or lower) Power voltage of 24 V DC ± 10% (ripple of 0.2 V P-P or lower)		±2.5% FS	Two-wire type: Output signal of 4 to 20 mA DC (load resistance of 500 Ω or lower) Power voltage of 24 V DC ± 10% (ripple of 0.2 V P-P or lower)	
	0–15 Pa						
	0–20 Pa						
	0–30 Pa						
	0–50 Pa	±1% FS					0–50 Pa
	0–75 Pa						
	0–100 Pa						
	0–150 Pa						
	0–200 Pa						
	0–300 Pa						
	0–500 Pa						
	0–750 Pa						
	0–1000 Pa						
	0–1 kPa						
	0–2 kPa						
	0–3 kPa						
	0–5 kPa						
	0–10 kPa						
	0–20 kPa						
	0–30 kPa						
	0–50 kPa						
	0–100 kPa						
	±10 Pa	±2% FS					
±20 Pa							
±30 Pa							
±50 Pa	±1% FS						
±100 Pa							
Pressure unit	Pa, kPa			Pa, kPa			
External shape	Indoor drip-proof type			Exposed terminal type			
Measured gas	Air and noncorrosive gas (liquid cannot be measured)			Air and noncorrosive gas (liquid cannot be measured)			
Pressure-receiving element	Diaphragm (silicone rubber)			Diaphragm (silicone rubber)			
Mounting orientation	Horizontal			Horizontal, upright, others			
Operating ambient temperature	0°C to 40°C (no freezing allowed)			0°C to 50°C (no freezing allowed)			
Operating ambient humidity	90% RH or below (no condensation allowed)			90% RH or below (no condensation allowed)			
Instrument body withstanding pressure	500 kPa			50 kPa			
Withstanding pressure of pressure-receiving element	10 kPa to 100 kPa			10 kPa			
Exterior material	Aluminum die casting			Polyamide			
Compatible pipe	Vinyl pipe or rubber pipe (inner diameter of 6 mm), metallic pipe (inner diameter of 6 ± 0.1 mm), separately sold accessories available			Vinyl pipe or rubber pipe (inner diameter of 4 mm)			
Mass	Approx. 1100 g			Approx. 110 g			

## List of products in catalog [receiving instrument]

		EMP5A		
Model				
Page showing details	RoHS	pp. 91–		
Pressure range Display accuracy Output method	Pressure range	Display accuracy	Output method	
	0–10 Pa	±0.2% FS ±1digit	<b>Alarm output</b> <b>Output type:</b> <b>Relay contact of 1x2</b> <b>Electric service life of 100,000 times</b>  <b>Contact capacity (resistance load):</b> <b>MAX. 3 A 250 V AC, 3 A 30 V DC</b> <b>MIN. 100 mA 5 V DC (reference value)</b>	
	0–15 Pa			
	0–20 Pa			
	0–30 Pa			
	0–50 Pa			
	0–75 Pa			
	0–100 Pa			
	0–150 Pa			
	0–200 Pa			
	0–300 Pa			
	0–500 Pa			
	0–750 Pa			
	0–1000 Pa			
	0–2 kPa			
	0–3 kPa			
	0–5 kPa			
	0–10 kPa			
	0–20 kPa			
	0–30 kPa			
	0–50 kPa			
	0–100 kPa			
	±10 Pa			
	±20 Pa			
	±30 Pa			
	±50 Pa			
	±100 Pa			
±200 Pa				
±300 Pa				
±500 Pa				
±1000 Pa				
±2 kPa				
±3 kPa				
±5 kPa				
*To procure an airflow rate/speed meter, it is necessary to first prepare an airflow rate/speed scale specification document. For details, refer to page 15.				
Pressure display unit	Pa, kPa, airflow rate, airflow speed			
Mounting method	Panel mounting			
Display	Digital 4-1/2 digits (–2000 to 10000) PV (current value) red SV (setting value) green			
Sampling frequency	0.125 seconds			
Input signal	4 to 20 mA DC (with built-in 50 Ω input resistor) On the airflow rate/speed meter, the maximum value varies depending on the range.			
Output signal	4 to 20 mA DC (load resistance of 550 Ω or lower) 0 to 5 V DC (load resistance of 500 Ω or higher) However, output signals from the airflow rate/speed meter are those obtained through square root calculation of input signals. Output accuracy of ± 0.3% FS			
Power supply to two-wire type transmitter	24 V DC ± 10% (load current of 4 to 20 mA) ripple voltage of 200 mV, maximum load current of 30 mA DC			
Power voltage	100 to 240 V AC, 50/60 Hz (tolerable variation range: 85 to 264 V AC)			
Operating ambient temperature	0°C to 50°C (no freezing allowed)			
Operating ambient humidity	35% to +85% RH (no condensation allowed)			
Exterior material	Fire-retardant resin			
Protection level	IP66 (front panel)			
Mass	Approx. 300 g			
Accessories	One set of thread-type mounting fittings, one piece of short-circuiting wire for two-wire type transmitter			

## List of products in catalog [relevant devices]

		Square root calculator	
		EMRT1	
Model			
Page showing details	RoHS	pp. 97–	
Mounting method	Rail mounting (applicable rail: 35-mm wide DIN rail)		
Input signal	4 to 20 mA DC (input resistance of 50 Ω)		
Output signal	4 to 20 mA DC (load resistance of 500 Ω or lower)		
Square root output cut point	15% FS or below		
Accuracy	± 1% FS (at 20°C) However, at output signal range of 15 to 100% FS		
Temperature characteristics	± 0.01% FS/°C (at 0°C to 40°C)		
Power voltage	100 V AC ± 10%, 50/60 Hz, approx. 3.5 VA		
Operating ambient temperature	0°C to 50°C (no freezing allowed)		
Operating ambient humidity	90% RH or below (no condensation allowed)		
Insulation resistance	Between terminal and case: 20 MΩ or higher (500 V DC megger)		
Withstand voltage	Between power terminal and case: 1000 V AC, 50/60 Hz, for one minute		
Exterior material	Polycarbonate and ABS resin		
Mass	Approx. 300 g		

		Direct current power unit	
		HWS15A	
Model			
Page showing details	RoHS	    	pp. 99–
Input voltage	85 to 265 V AC (47 to 63 Hz) or 120 to 370 V DC		
Output voltage	24 V DC		
Maximum output current	0.65 A		
Output variation at operating ambient temperature	0.02%/°C or lower		
Overcurrent protection	0.68 A and higher		
Operating ambient temperature	–10°C to +70°C (–10°C to +50°C: 100%, +60°C: 80%, +70°C: 60%)		
Operating ambient humidity	30% to 90% RH (no condensation allowed)		
Insulation resistance	100 MΩ or higher (Between output and FG: 500 V DC, 25°C, 70% RH)		
Withstand voltage	Between input and FG: 2 kV AC (20 mA), between input and output: 3 kV AC (20 mA) Between output and FG: 500 V AC (100 mA), each for one minute		
Mass	Approx. 210 g		

◆The "RoHS" mark attached to a product means that the product does not contain substances subject to restriction by the RoHS directive at the threshold level or higher.

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

### 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)



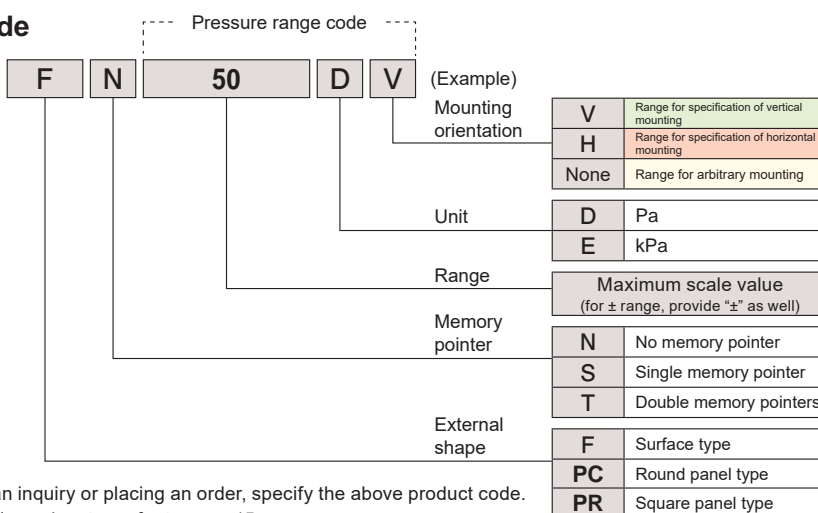
**Example of selection of memory pointer**

\*Memory pointer can be set at an arbitrary position.

**With single memory pointer**      **With double memory pointers**

### Product code

WO81



#### <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)

◆When making an inquiry or placing an order, specify the above product code.

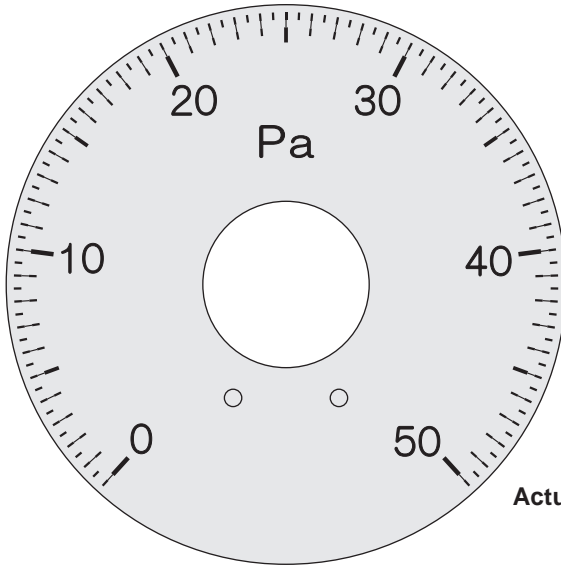
◆For airflow rate/speed meter, refer to page 15.



## WO81 List of scales

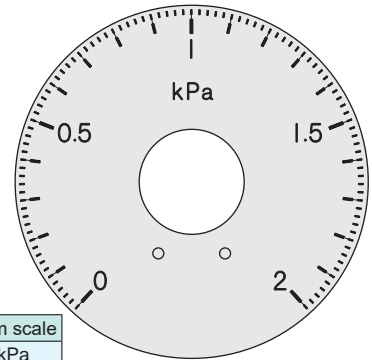
### Biased pressure range

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

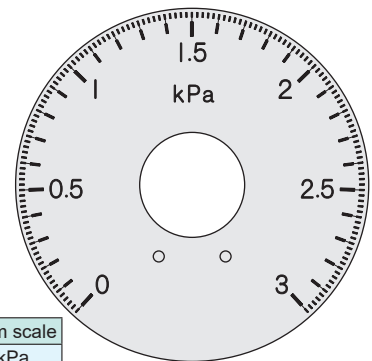


Pressure range	Minimum scale
0-50 Pa	0.5 Pa

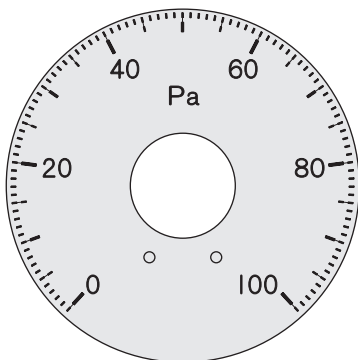
Actual size



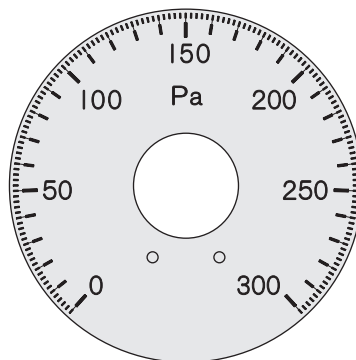
Pressure range	Minimum scale
0-2 kPa	0.02 kPa
0-20 kPa	0.2 kPa



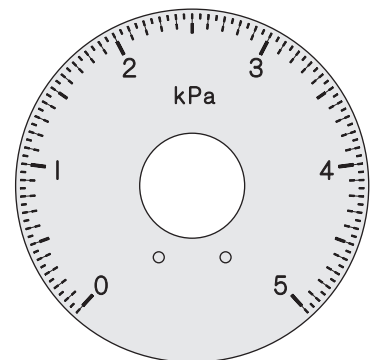
Pressure range	Minimum scale
0-3 kPa	0.02 kPa
0-30 kPa	0.2 kPa



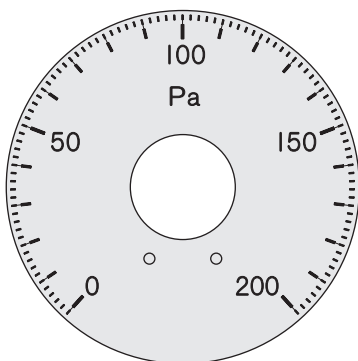
Pressure range	Minimum scale
0-100 Pa	1 Pa
0-1000 Pa	10 Pa
0-1 kPa	0.01 kPa



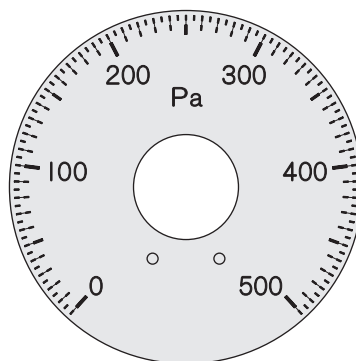
Pressure range	Minimum scale
0-300 Pa	2 Pa



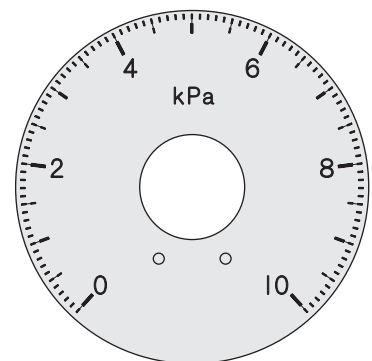
Pressure range	Minimum scale
0-5 kPa	0.05 kPa
0-50 kPa	0.5 kPa



Pressure range	Minimum scale
0-200 Pa	2 Pa

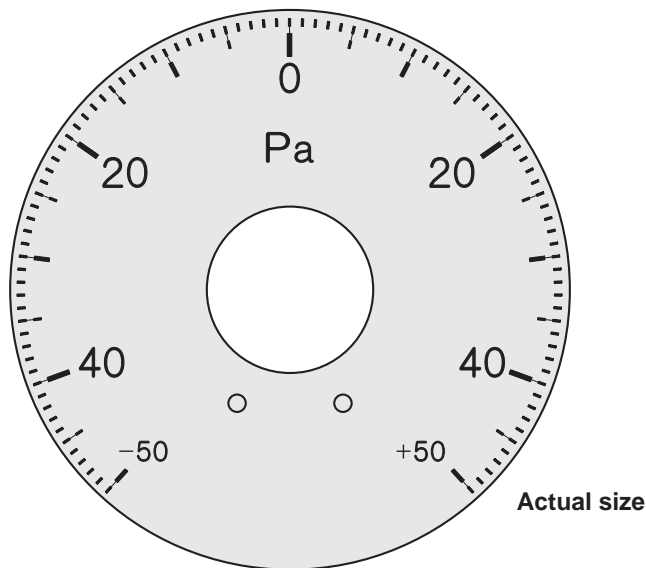


Pressure range	Minimum scale
0-500 Pa	5 Pa

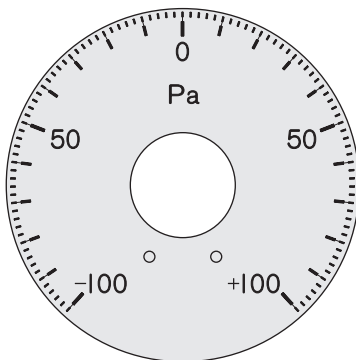


Pressure range	Minimum scale
0-10 kPa	0.1 kPa
0-100 kPa	1 kPa

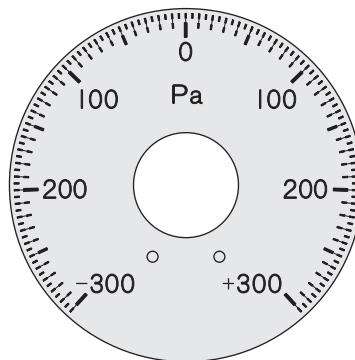
### Zero center range



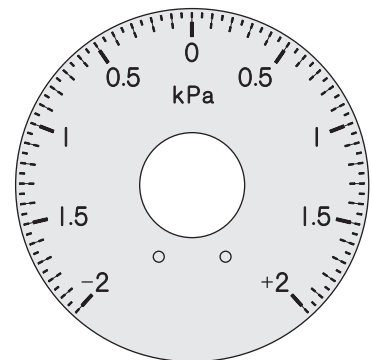
Pressure range	Minimum scale
-50 to +50 Pa	1 Pa



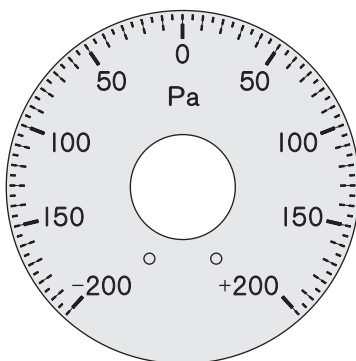
Pressure range	Minimum scale
-100 to +100 Pa	2 Pa
-1000 to +1000 Pa	20 Pa
-1 to +1 kPa	0.02 kPa



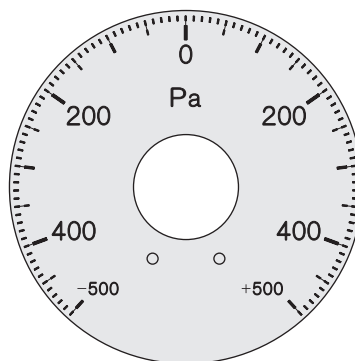
Pressure range	Minimum scale
-300 to +300 Pa	5 Pa



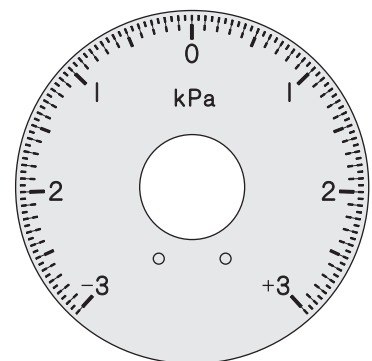
Pressure range	Minimum scale
-2 to +2 kPa	0.05 kPa



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

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

## WO81 Airflow rate/airflow speed meter

RoHS



This page and the following page introduce the WO81 airflow rate/airflow speed meters. For WO81 fine differential pressure gauges, refer to page 11.

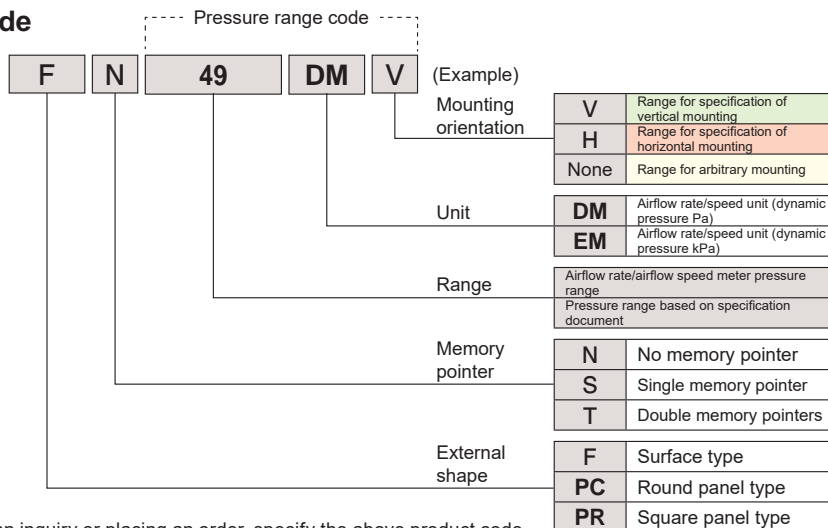
### Display units

Airflow rate meter				Airflow speed meter
m <sup>3</sup> /h	m <sup>3</sup> /h (nor)	m <sup>3</sup> /min	m <sup>3</sup> /min (nor)	m / s
m <sup>3</sup> /h x10	m <sup>3</sup> /h x10 (nor)	m <sup>3</sup> /min x10	m <sup>3</sup> /min x10 (nor)	
m <sup>3</sup> /h x1000	m <sup>3</sup> /h x1000 (nor)	m <sup>3</sup> /min x1000	m <sup>3</sup> /min x1000 (nor)	
m <sup>3</sup> /h x10000	m <sup>3</sup> /h x10000 (nor)	m <sup>3</sup> /min x10000	m <sup>3</sup> /min x10000 (nor)	

WO81 airflow rate meter

### Product code

WO81



◆When making an inquiry or placing an order, specify the above product code.

To procure an airflow rate/speed meter, it is necessary to first prepare a specification document and check it. Because we will prepare a specification document, please fill in (1) or (2) in the sheet below and let us know the specifications.

### Airflow rate/airflow speed specification document preparation sheet

	Pressure detector *Select any of the following.	Duct size *Select any of the following, and enter the desired values in the squares below.	Specified airflow rate (speed) *Indicate the unit as well.	Measured gas density *Select any of the following, and enter the desired values in the squares below.
①	<b>Procuring device based on use conditions</b> <input type="checkbox"/> Overall/static pressure tube (Pitot tube) <input type="checkbox"/> Total pressure tube + static pressure tube <input type="checkbox"/> Composite Pitot tube (Aero eye, etc.)	<input type="checkbox"/> Round type Inner diameter: <input type="text"/> mm <input type="checkbox"/> Square type <input type="text"/> x <input type="text"/> mm	Normal flow rate (speed) value: <input type="text"/> Maximum flow rate (speed) value: <input type="text"/>	<input type="checkbox"/> Standard air density: 1.198 kg/m <sup>3</sup> <input type="checkbox"/> Mixed gas density: <input type="text"/> kg/m <sup>3</sup> <input type="checkbox"/> When gas density is unknown Measured gas temperature: <input type="text"/> °C Measured gas humidity: <input type="text"/> % RH Static pressure at measurement point: <input type="text"/> Pa
②	<b>Procuring device based on relationship between airflow rate (speed) and pressure</b>	When the airflow rate (speed) is <input type="text"/> , the airflow rate (speed) up to <input type="text"/> is measured with the conversion condition of dynamic pressure of <input type="text"/> Pa.		

◆The maximum airflow rate/speed scale value is applied after rounding it to our scale value.



### Specifications

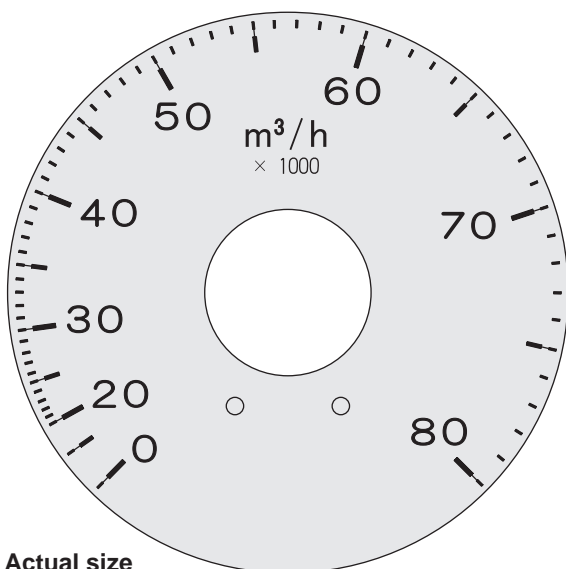
Model	Main body		Surface type	Round panel type	Square panel type	
	Memory pointer		F	PC	PR	
	No memory pointer	N	WO81FN	WO81PCN	WO81PRN	
	Single memory pointer (red)	S	WO81FS	WO81PCS	WO81PRS	
	Double memory pointers (one each for red and green)	T	WO81FT	WO81PCT	WO81PRT	
<b>Unit</b>	Airflow rate/airflow speed		<b>Compatible pipe</b>	<ul style="list-style-type: none"> <li>Vinyl pipe or rubber pipe (inner diameter of 6 mm)</li> <li>.....Base for resin vinyl pipe (already mounted on gauge)</li> <li>Metallic pipe (outer diameter of 6 ± 0.1 mm)</li> <li>.....Separately sold base for metallic pipe is necessary.</li> <li>Hard plastic pipe (outer diameter 6 mm × inner diameter 4 mm)</li> <li>.....Separately sold base for metallic pipe and inner sleeve set (refer to page 111) or push-in joint is necessary.</li> </ul>		
<b>Pressure measurement method</b>	Differential pressure method					
<b>Pressure-receiving element</b>	Diaphragm		<b>Base polarity</b>	<ul style="list-style-type: none"> <li>Identification with red on high pressure side and blue on low pressure side</li> <li>By exchanging the base on the high-pressure side with that on the low pressure side, it is possible to change the polarity.</li> </ul>		
<b>Measured gas</b>	Air and noncorrosive gas (liquid cannot be measured)					
<b>Scale indication angle</b>	Wide-angle indication of approx. 270 degrees		<b>Mass</b>	Approx. 270 g		
<b>Operating ambient temperature</b>	-10°C to +50°C (no freezing allowed)					
<b>Operating ambient humidity</b>	90% RH or below (no condensation allowed)					
<b>Instrument body withstanding pressure</b>	200 kPa (refer to page 118)					
<b>Exterior material</b>	Polycarbonate and polyamide					
<b>Durable impact</b>	100 m/s <sup>2</sup> (six times each for three axial directions)					
<b>Durable vibration</b>	5 to 10 Hz Amplitude of 10 mm, 10 to 50 Hz Acceleration of 39 m/s <sup>2</sup> (two hours each for three axial directions)					
<b>Accessories</b>	WO81F		WO81PC		WO81PR	
	Mounting screw set		Two sets of mounting fittings (already mounted on gauge body)		Mounting nut set (already mounted on gauge body)	
<b>Pressure range code</b>	<b>Airflow rate/airflow speed range</b>	<b>Mounting orientation (Refer to page 18)</b>	<b>Accuracy (Note) (at 20°C)</b>	<b>Pressure-receiving element material</b>	<b>Withstanding pressure of pressure-receiving element (Refer to page 118)</b>	
49 DMH	Depends on airflow rate/airflow speed scale specification document.	Horizontal (specification)	Within ± 5% FS	Silicone rubber	10 kPa	
49 DMV		Upright (specification)				
70 DMH		Horizontal (specification)				
70 DMV		Upright (specification)				
100 DMH		Horizontal (specification)				
100 DMV		Upright (specification)				
130 DMH		Horizontal (specification)	Within ± 2.5% FS			
130 DMV		Upright (specification)				
180 DMH		Horizontal (specification)				
180 DMV		Upright (specification)				
250 DM		Between horizontal and upright Arbitrary mounting				Within ± 1.5% FS
300 DM						
400 DM						
580 DM						
1000 DM						
1.8 EM						
3.2 EM					40 kPa	
4.5 EM						
8.5 EM						
10 EM				150 kPa		

(Note) [Value]: Arbitrary (to be rounded), [magnification]: ×10, ×1000, ×10000, [units]: m<sup>3</sup>/h, m<sup>3</sup>/min, m<sup>3</sup>/h (nor), m<sup>3</sup>/min (nor), m/s

(Note) Accuracy at full span of pressure value (refer to page 121)

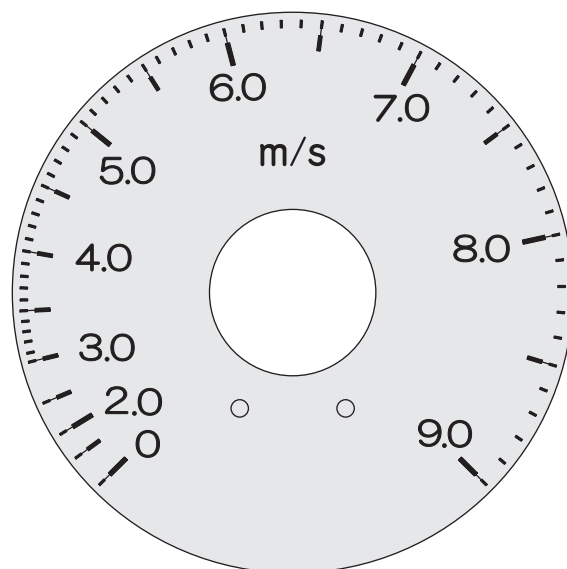
◆For use environment, refer to page 118.

### Airflow rate/airflow speed range (scale example)



Actual size

Airflow rate scale



Airflow speed scale

## Model WO81F

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

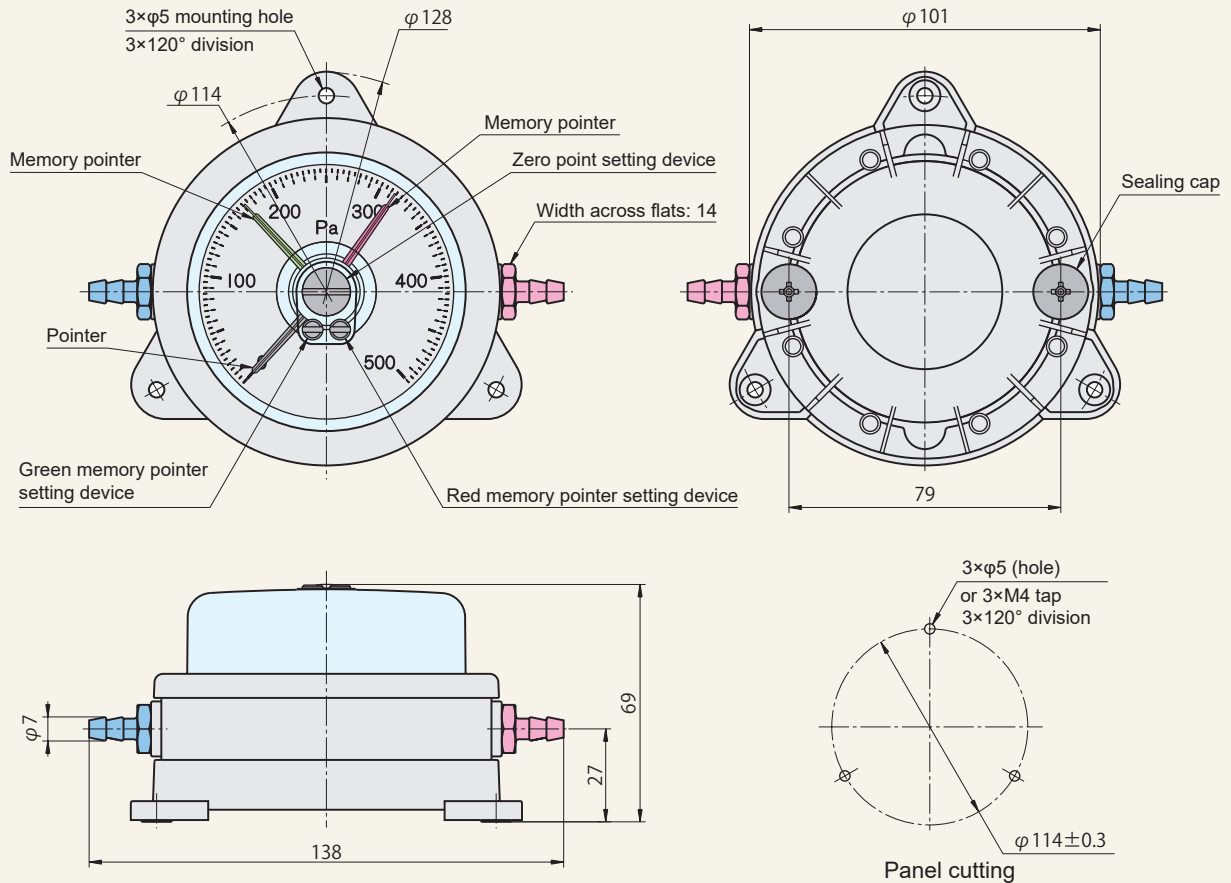
Precautions

Maintenance

### External dimension drawing

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

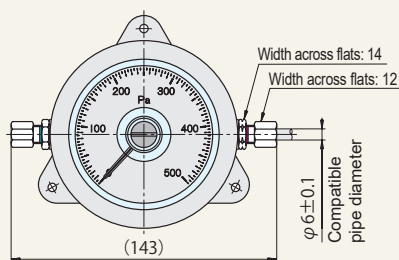
#### VT base (for vinyl pipe)



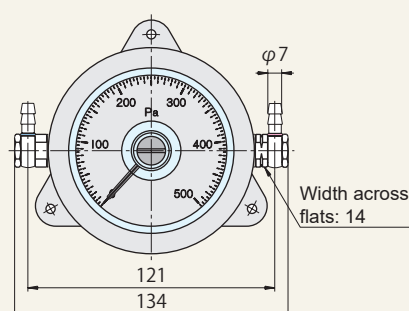
### Example of base arrangement

Installation of base on side face

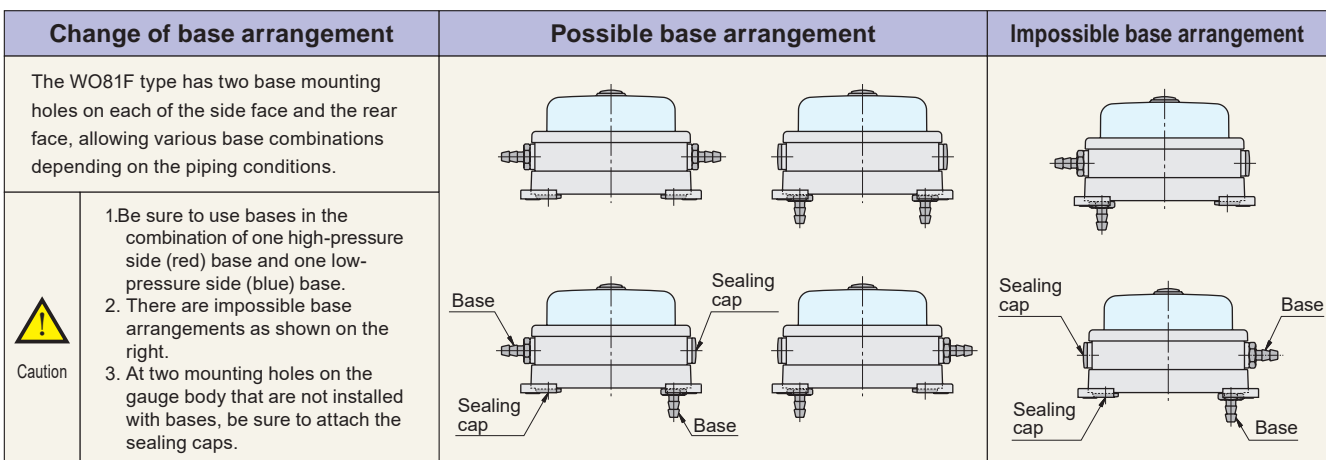
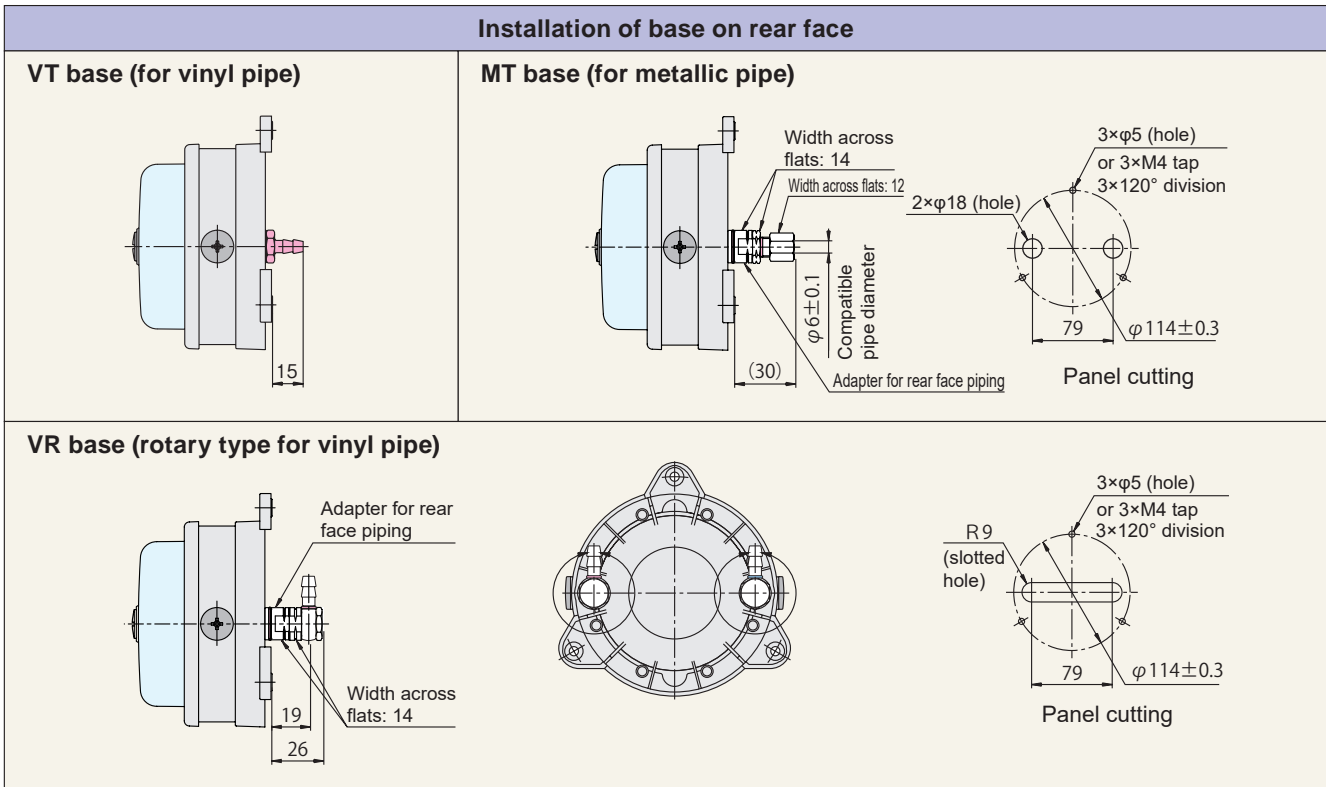
#### MT base (for metallic pipe)



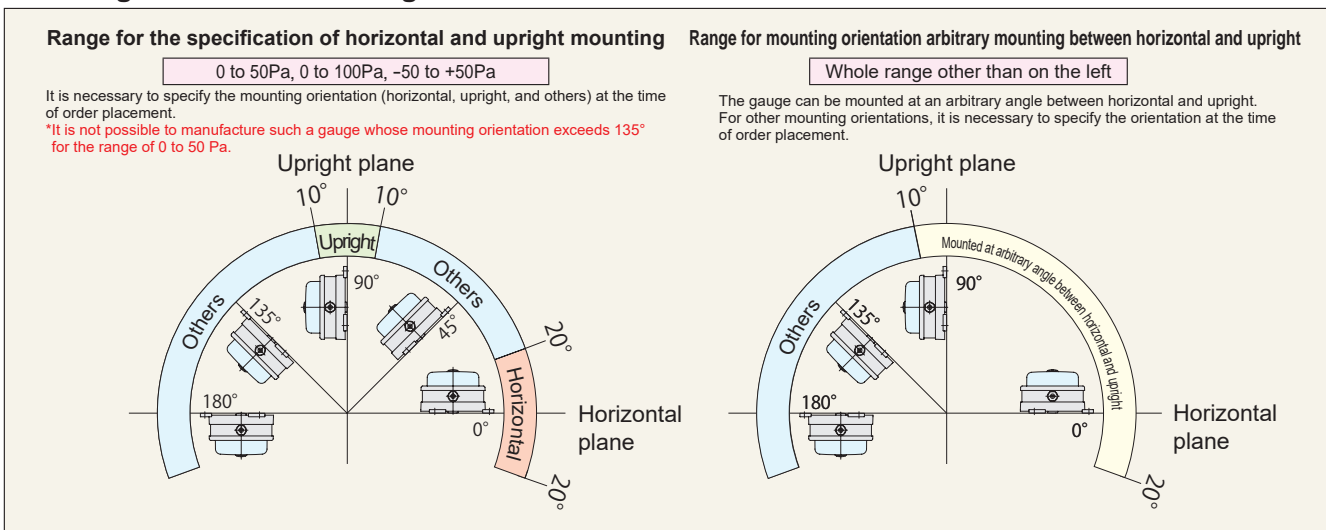
#### VR base (rotary type for vinyl pipe)



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.)



### Mounting orientation and range



## Model WO81PC

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

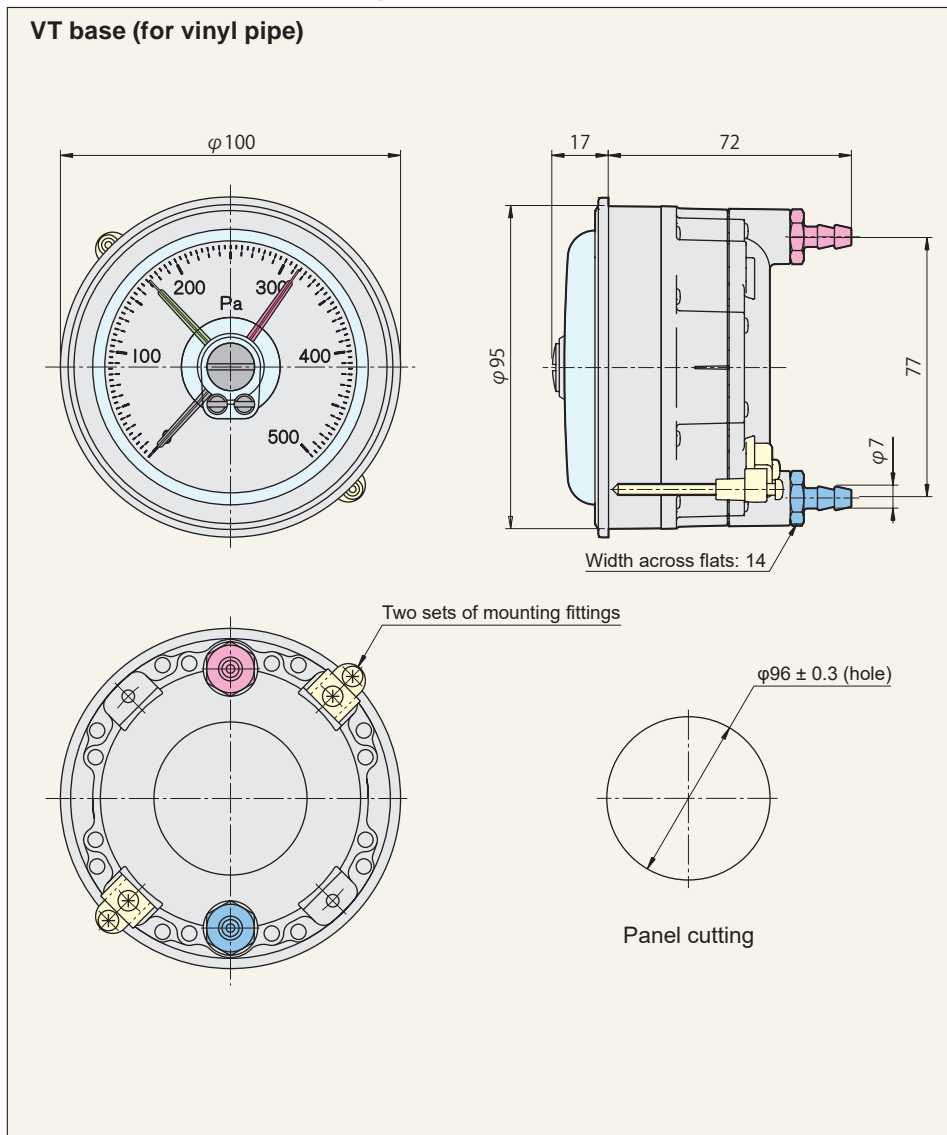
Accessories

Application

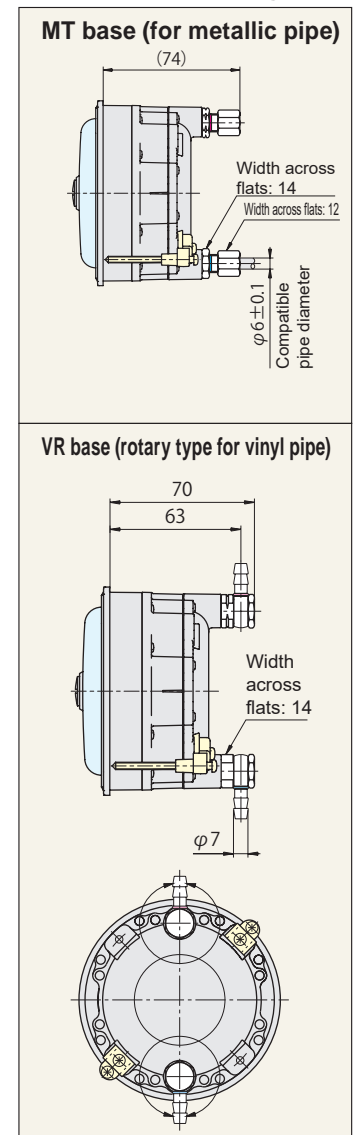
Precautions

Maintenance

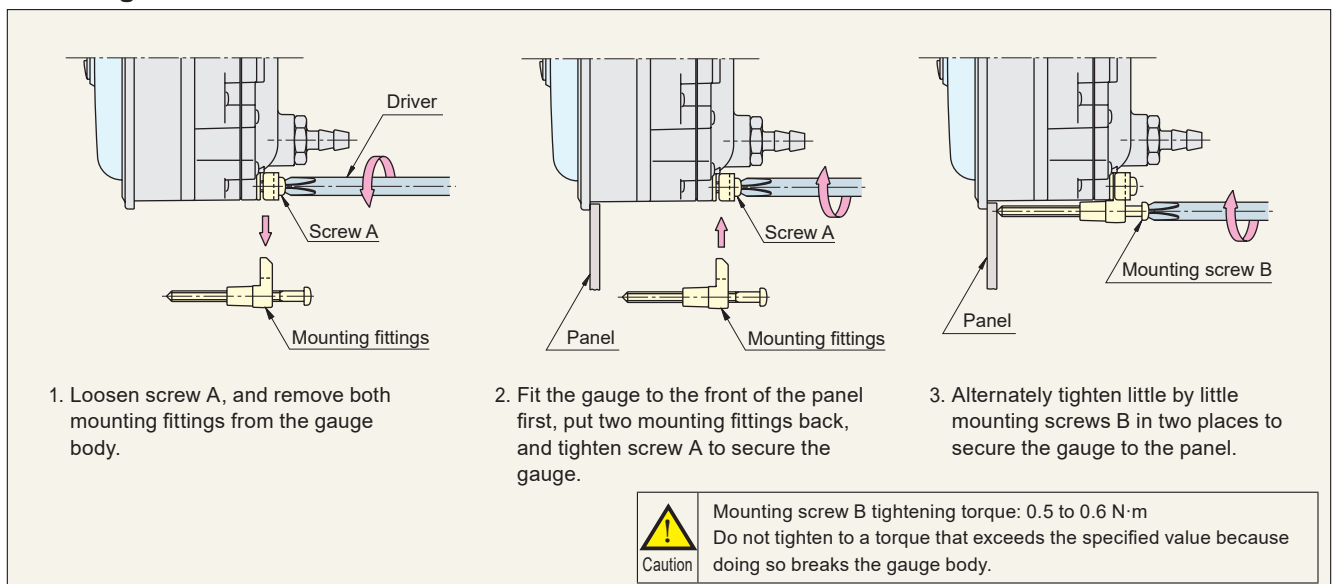
### External dimension drawing



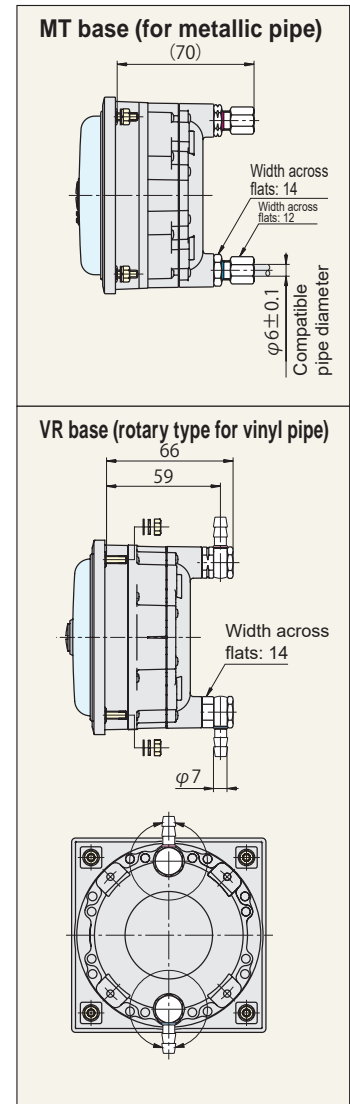
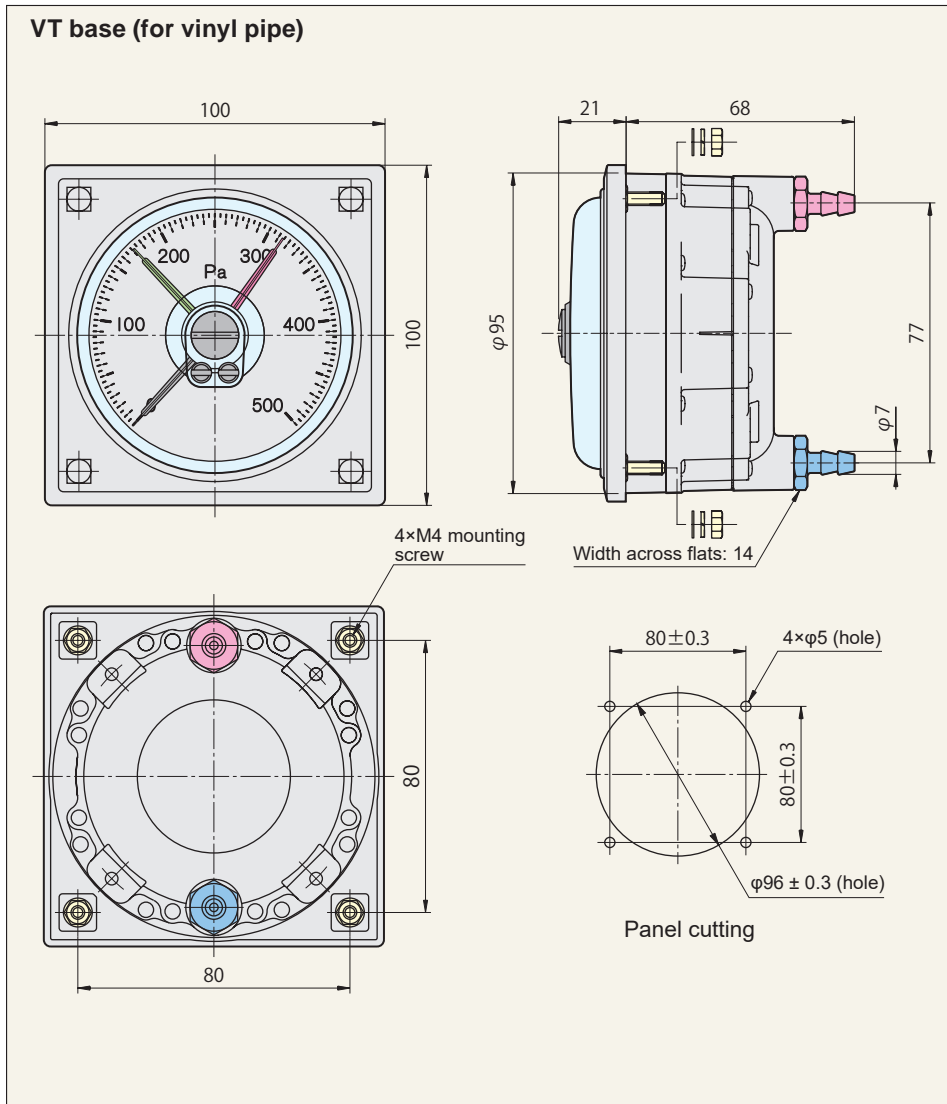
### Example of base arrangement



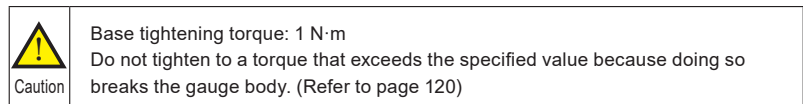
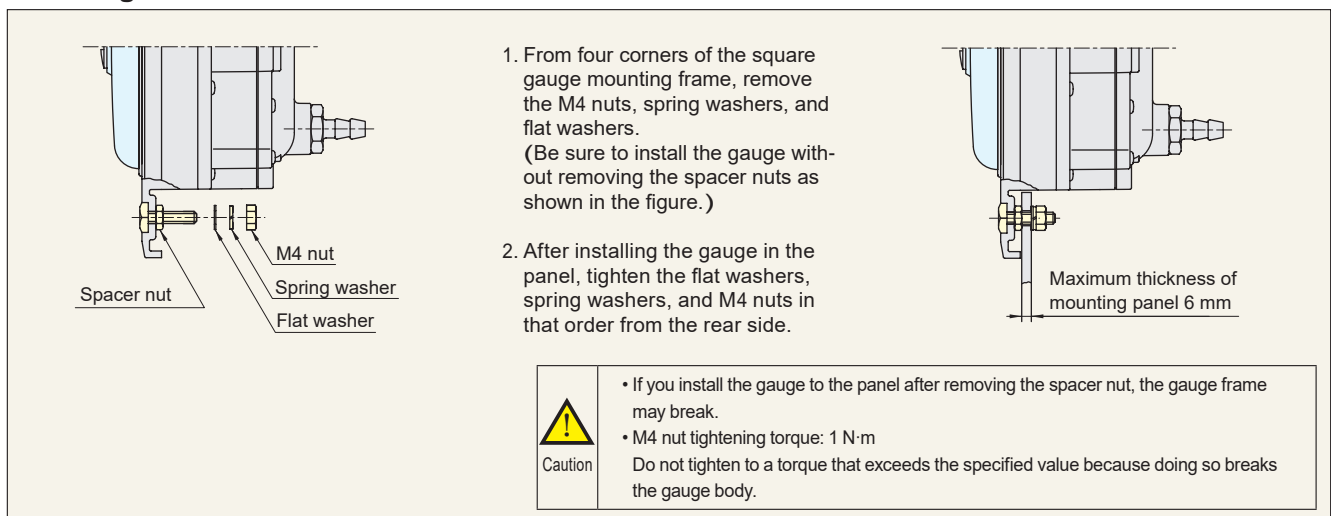
### Mounting method



### External dimension drawing

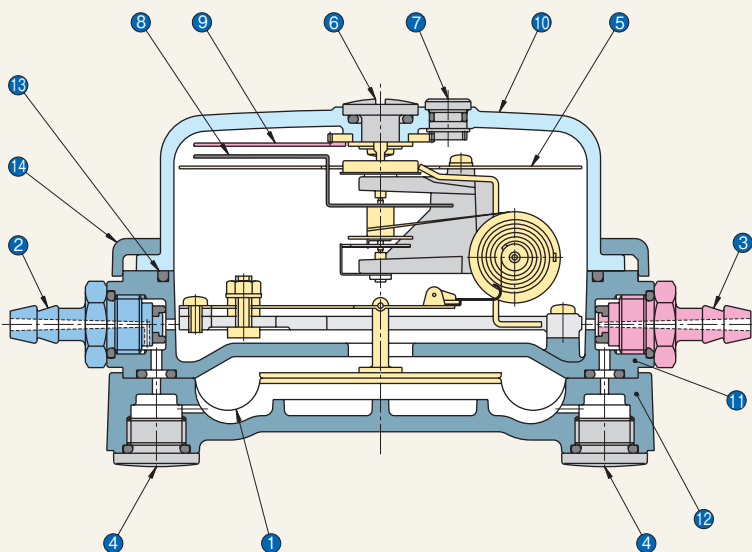


### Mounting method



## 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.



### Accessories for WO81 RoHS



PT base																			
High-pressure side		Low-pressure side																	
																			
<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81PT-H</td><td>PBT/brass</td></tr></table>	Item number	Material	KGA81PT-H	PBT/brass	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81PT-L</td><td>PBT/brass</td></tr></table>	Item number	Material	KGA81PT-L	PBT/brass	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81PT-L</td><td>PBT/brass</td></tr></table>	Item number	Material	KGA81PT-L	PBT/brass	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81PT-L</td><td>PBT/brass</td></tr></table>	Item number	Material	KGA81PT-L	PBT/brass
Item number	Material																		
KGA81PT-H	PBT/brass																		
Item number	Material																		
KGA81PT-L	PBT/brass																		
Item number	Material																		
KGA81PT-L	PBT/brass																		
Item number	Material																		
KGA81PT-L	PBT/brass																		
<p>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)</p>																			



PR base																			
High-pressure side		Low-pressure side																	
																			
<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81PR-H</td><td>PBT/brass</td></tr></table>	Item number	Material	KGA81PR-H	PBT/brass	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81PR-L</td><td>PBT/brass</td></tr></table>	Item number	Material	KGA81PR-L	PBT/brass	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81PR-L</td><td>PBT/brass</td></tr></table>	Item number	Material	KGA81PR-L	PBT/brass	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81PR-L</td><td>PBT/brass</td></tr></table>	Item number	Material	KGA81PR-L	PBT/brass
Item number	Material																		
KGA81PR-H	PBT/brass																		
Item number	Material																		
KGA81PR-L	PBT/brass																		
Item number	Material																		
KGA81PR-L	PBT/brass																		
Item number	Material																		
KGA81PR-L	PBT/brass																		
<p>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)</p>																			



MT base																			
High-pressure side		Low-pressure side																	
																			
<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81MT-H</td><td>Brass</td></tr></table>	Item number	Material	KGA81MT-H	Brass	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81MT-L</td><td>Brass</td></tr></table>	Item number	Material	KGA81MT-L	Brass	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81MT-L</td><td>Brass</td></tr></table>	Item number	Material	KGA81MT-L	Brass	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81MT-L</td><td>Brass</td></tr></table>	Item number	Material	KGA81MT-L	Brass
Item number	Material																		
KGA81MT-H	Brass																		
Item number	Material																		
KGA81MT-L	Brass																		
Item number	Material																		
KGA81MT-L	Brass																		
Item number	Material																		
KGA81MT-L	Brass																		
<p>A metallic pipe, such as copper pipe and aluminum pipe, with an outer diameter of <math>6 \pm 0.1</math> mm can be connected. However, for stainless steel pipe, use an MTW base. When connecting with a plastic pipe (outer diameter 6 mm <math>\times</math> inner diameter 4 mm), remove the brass sleeve and use the separately sold resin inner sleeve set (XIN6<math>\times</math>4; refer to page 111).</p>																			

MR base																			
High-pressure side		Low-pressure side																	
																			
<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81MR-H</td><td>Brass</td></tr></table>	Item number	Material	KGA81MR-H	Brass	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81MR-L</td><td>Brass</td></tr></table>	Item number	Material	KGA81MR-L	Brass	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81MR-L</td><td>Brass</td></tr></table>	Item number	Material	KGA81MR-L	Brass	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81MR-L</td><td>Brass</td></tr></table>	Item number	Material	KGA81MR-L	Brass
Item number	Material																		
KGA81MR-H	Brass																		
Item number	Material																		
KGA81MR-L	Brass																		
Item number	Material																		
KGA81MR-L	Brass																		
Item number	Material																		
KGA81MR-L	Brass																		
<p>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 <math>\times</math> inner diameter 4 mm), remove the brass sleeve and use the separately sold resin inner sleeve set (XIN6<math>\times</math>4; refer to page 111).</p>																			

MTW base																			
High-pressure side		Low-pressure side																	
																			
<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81MTW-H-S</td><td>Stainless steel</td></tr></table>	Item number	Material	KGA81MTW-H-S	Stainless steel	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81MTW-L-S</td><td>Stainless steel</td></tr></table>	Item number	Material	KGA81MTW-L-S	Stainless steel	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81MTW-L-S</td><td>Stainless steel</td></tr></table>	Item number	Material	KGA81MTW-L-S	Stainless steel	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81MTW-L-S</td><td>Stainless steel</td></tr></table>	Item number	Material	KGA81MTW-L-S	Stainless steel
Item number	Material																		
KGA81MTW-H-S	Stainless steel																		
Item number	Material																		
KGA81MTW-L-S	Stainless steel																		
Item number	Material																		
KGA81MTW-L-S	Stainless steel																		
Item number	Material																		
KGA81MTW-L-S	Stainless steel																		
<p>This is used to connect a stainless steel pipe with an outer diameter of <math>6 \pm 0.1</math> mm.</p>																			

Adapter for rear face piping																			
High-pressure side (Dedicated to F type rear face piping)		Low-pressure side (Dedicated to F type rear face piping)																	
																			
<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81FBA-H</td><td>Brass</td></tr></table>	Item number	Material	KGA81FBA-H	Brass	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81FBA-L</td><td>Brass</td></tr></table>	Item number	Material	KGA81FBA-L	Brass	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81FBA-L</td><td>Brass</td></tr></table>	Item number	Material	KGA81FBA-L	Brass	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81FBA-L</td><td>Brass</td></tr></table>	Item number	Material	KGA81FBA-L	Brass
Item number	Material																		
KGA81FBA-H	Brass																		
Item number	Material																		
KGA81FBA-L	Brass																		
Item number	Material																		
KGA81FBA-L	Brass																		
Item number	Material																		
KGA81FBA-L	Brass																		
<p>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.</p>																			

R1/8 base adapter																			
High-pressure side		Low-pressure side																	
																			
<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81R1/8AD-H</td><td>Brass</td></tr></table>	Item number	Material	KGA81R1/8AD-H	Brass	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81R1/8AD-L</td><td>Brass</td></tr></table>	Item number	Material	KGA81R1/8AD-L	Brass	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81R1/8AD-L</td><td>Brass</td></tr></table>	Item number	Material	KGA81R1/8AD-L	Brass	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81R1/8AD-L</td><td>Brass</td></tr></table>	Item number	Material	KGA81R1/8AD-L	Brass
Item number	Material																		
KGA81R1/8AD-H	Brass																		
Item number	Material																		
KGA81R1/8AD-L	Brass																		
Item number	Material																		
KGA81R1/8AD-L	Brass																		
Item number	Material																		
KGA81R1/8AD-L	Brass																		
<p>It is possible to connect an R1/8 joint. *The specifications of this adapter differ from those of the adapter for rear face piping.</p>																			

R1/8 base adapter (SUS)																			
High-pressure side		Low-pressure side																	
																			
<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81R1/8AD-H-S</td><td>Stainless steel</td></tr></table>	Item number	Material	KGA81R1/8AD-H-S	Stainless steel	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81R1/8AD-L-S</td><td>Stainless steel</td></tr></table>	Item number	Material	KGA81R1/8AD-L-S	Stainless steel	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81R1/8AD-L-S</td><td>Stainless steel</td></tr></table>	Item number	Material	KGA81R1/8AD-L-S	Stainless steel	<table border="1" style="width: 100%;"><tr><th>Item number</th><th>Material</th></tr><tr><td>KGA81R1/8AD-L-S</td><td>Stainless steel</td></tr></table>	Item number	Material	KGA81R1/8AD-L-S	Stainless steel
Item number	Material																		
KGA81R1/8AD-H-S	Stainless steel																		
Item number	Material																		
KGA81R1/8AD-L-S	Stainless steel																		
Item number	Material																		
KGA81R1/8AD-L-S	Stainless steel																		
Item number	Material																		
KGA81R1/8AD-L-S	Stainless steel																		
<p>It is possible to connect an R1/8 joint. *The specifications of this adapter differ from those of the adapter for rear face piping.</p>																			

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

### Small-sized fine differential pressure gauge FS type/PS type

- A memory pointer, which is convenient for setting of index for planned differential pressure value or limit value, is equipped as standard.
- Allows various pipe connections.
- Only by exchanging the base on the high-pressure side with that on the low pressure side, it is possible to change the polarity. \*For side face piping only

### Flat-type fine differential pressure gauge N type/R type

- The lowest master gauge thickness of 29.2 mm has been achieved.
- Thin design and standard equipment of rotary base make it possible to conduct smart piping.



**Model WO71FS**

(surface type w/VT base and memory pointer)



**Model WO71PS**

(square panel type w/VT base and memory pointer)



**Model WO71N**

(surface type/round panel type w/rotary base)



**Model WO71R**

(square panel type w/rotary base)

#### <Main application fields>

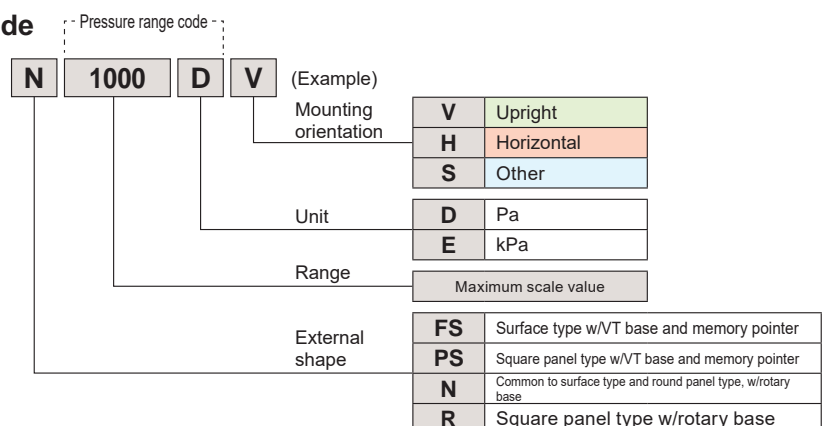
- General factory management equipment
- Negative pressure for dust collector/differential pressure of air conditioner
- Filter pressure loss management
- Precision machine manufacturing line
- Building air conditioning control equipment

#### <Usage>

- Detection of clogging of air filter
- Room pressure measurement in a clean room
- Measurement of clogging of bug filter
- Measurement of dynamic pressure at ventilation/exhaust device

#### Product code

WO71



\*(Refer to pages 114 to 117)

◆When making an inquiry or placing an order, specify the above product code.





## Model WO71FS

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

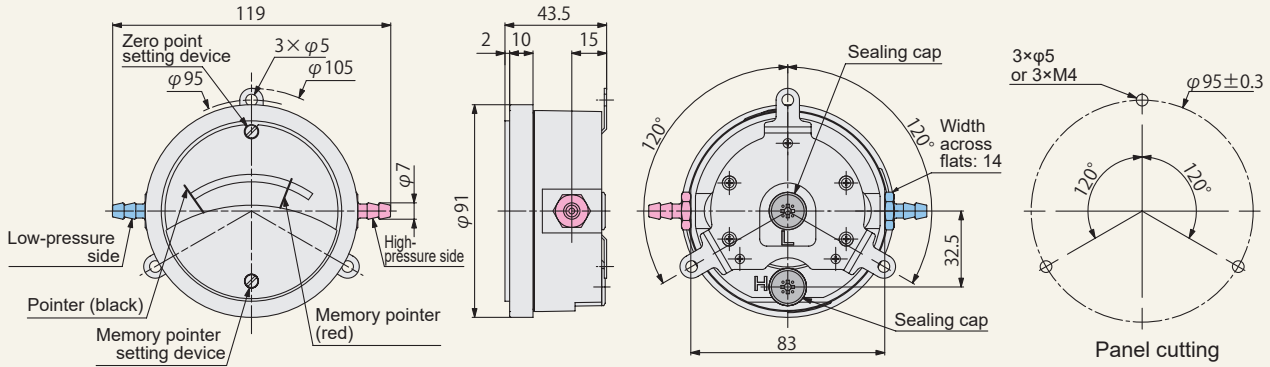
Precautions

Maintenance

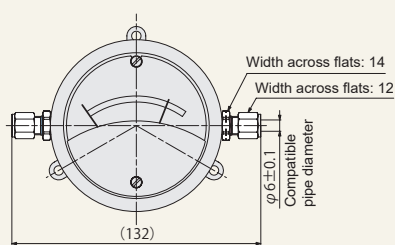
### External dimension drawing

#### Installation of base on side face

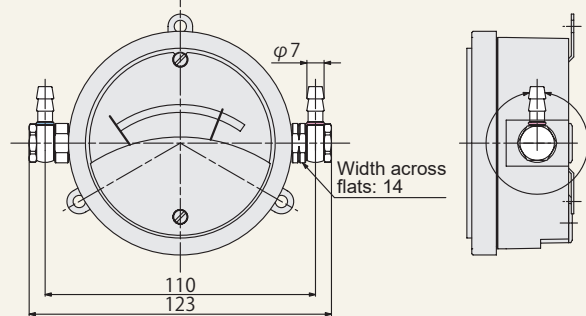
##### VT base (for vinyl pipe)



##### MT base (for metallic pipe)

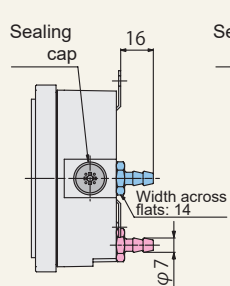


##### VR base (rotary type for vinyl pipe)

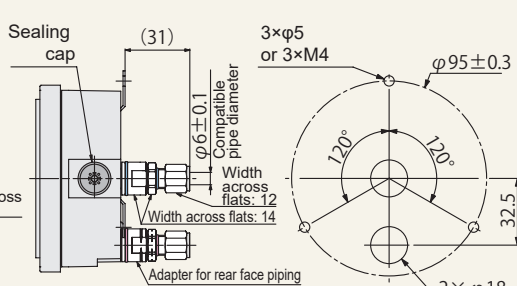


#### Installation of base on rear face

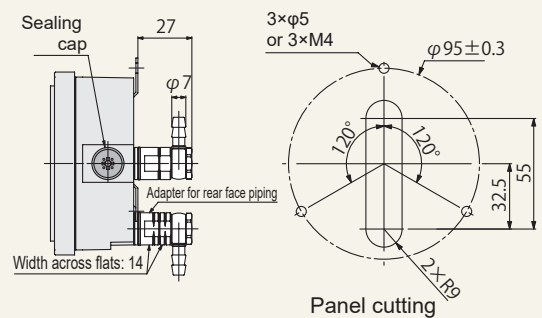
##### VT base (for vinyl pipe)



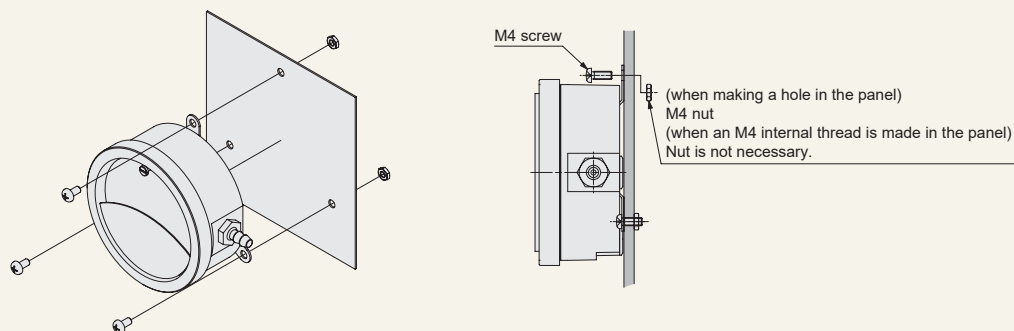
##### MT base (for metallic pipe)



##### VR base (rotary type for vinyl pipe)

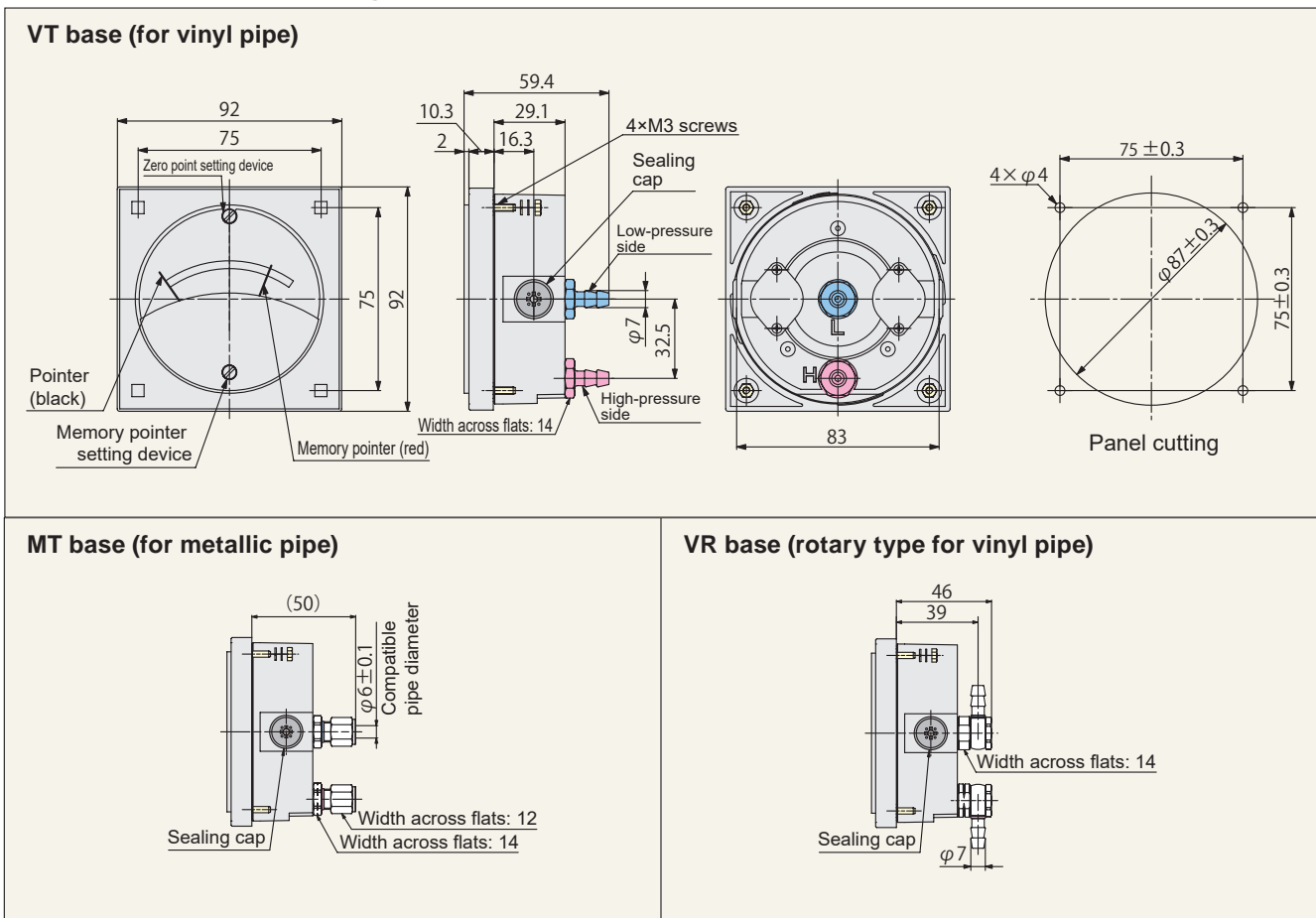


### Mounting method

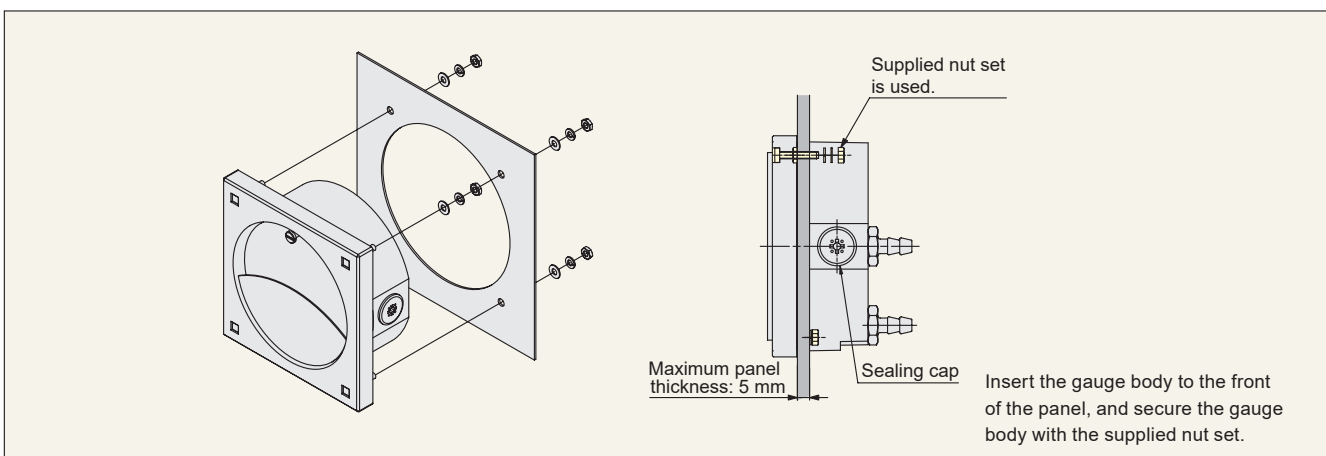


\*Mounting screw set is not supplied.

### External dimension drawing



### Mounting method



Caution

- Tighten the screws and nuts to a torque of 0.8 N·m.
- Do not tighten to a torque that exceeds the specified value because doing so breaks the gauge body.

## Model WO71N

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

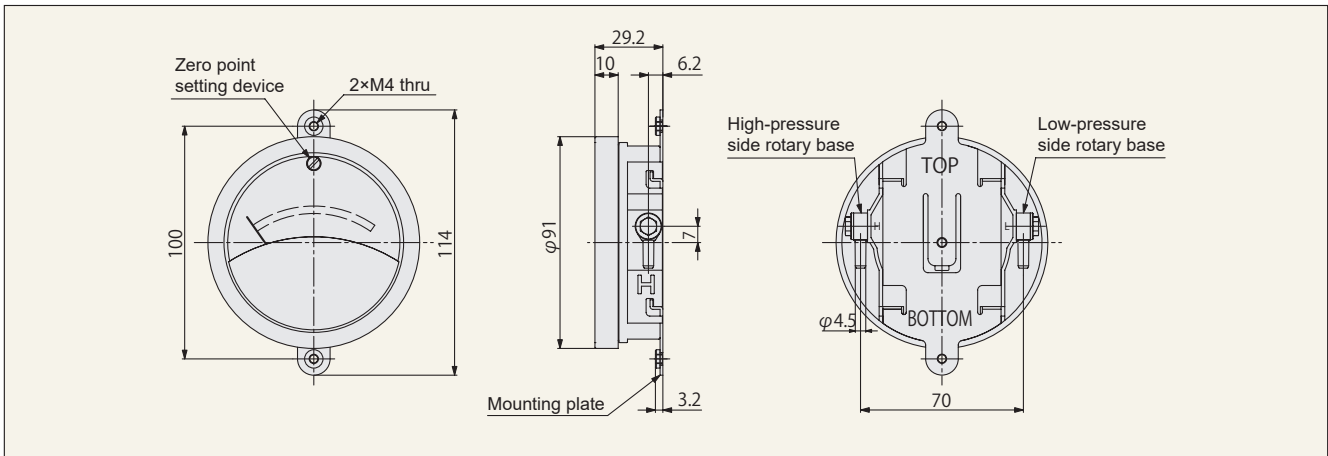
Accessories

Application

Precautions

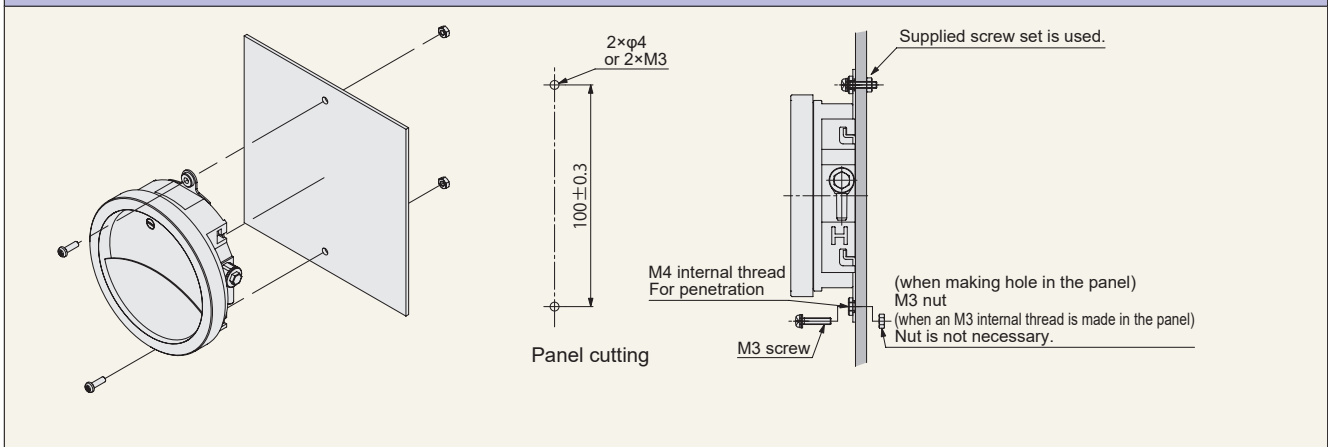
Maintenance

### External dimension drawing

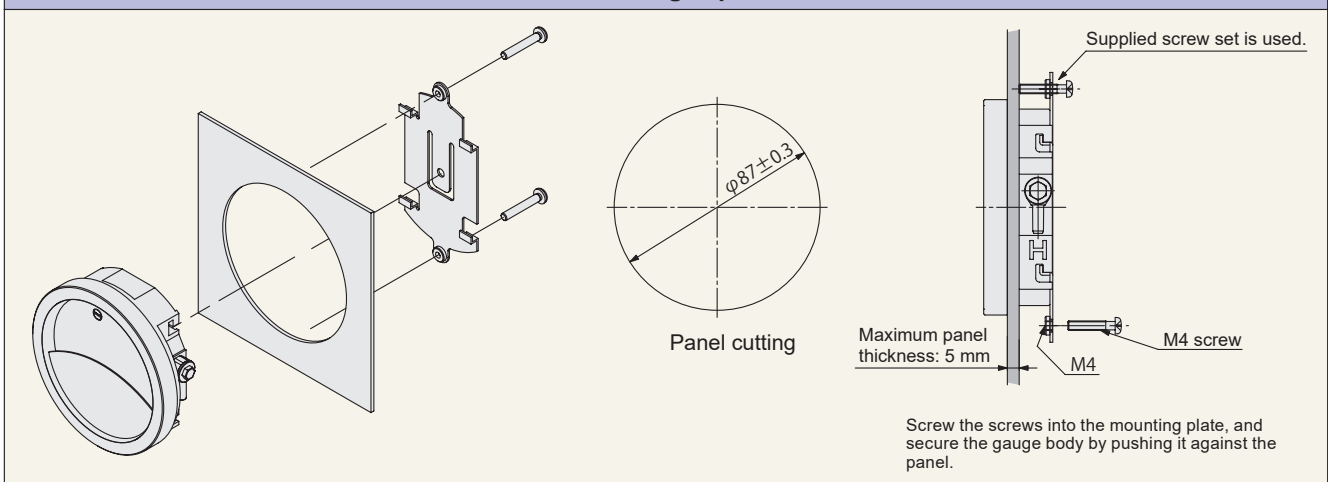


### Mounting method

#### Wall surface mounting

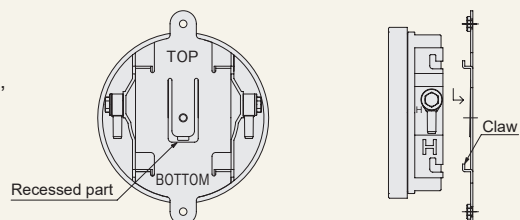


#### Embedding in panel

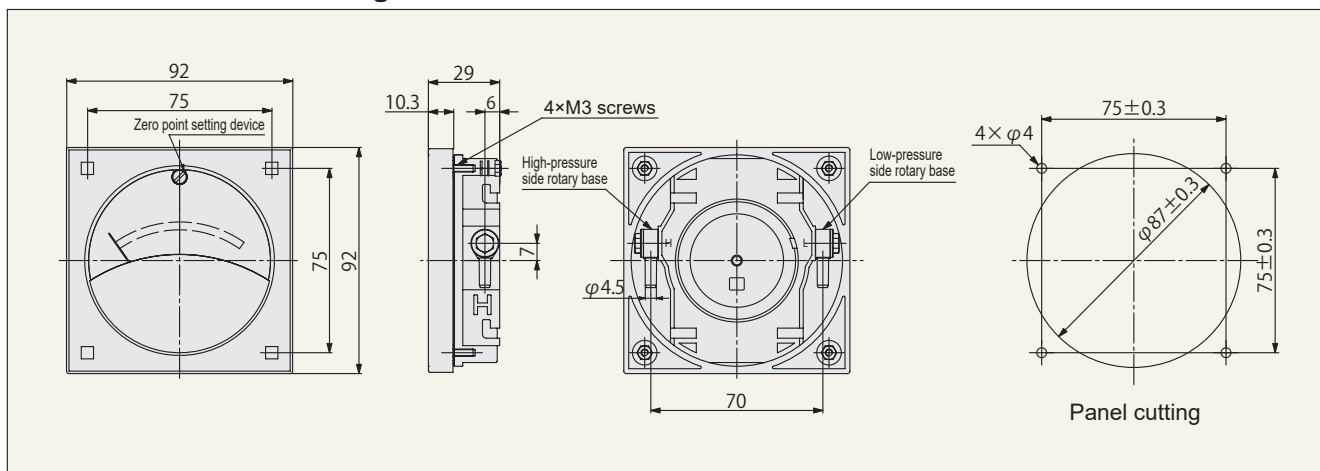


#### <Mounting panel mounting/dismounting method>

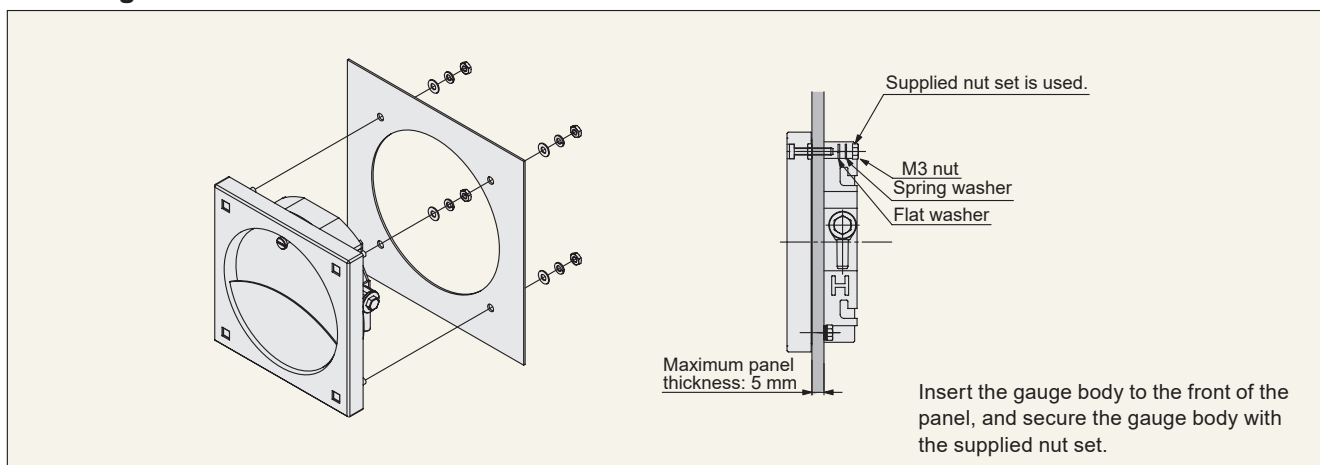
The claw is designed to hook the gauge body. Insert a flat-blade screwdriver into the recessed part in the figure on the right, and push it down while lifting the mounting plate to remove the mounting plate. To mount the mounting plate, fit the gauge body in the mounting plate by aligning the claw with the recessed part, and push the mounting plate upward.



### External dimension drawing



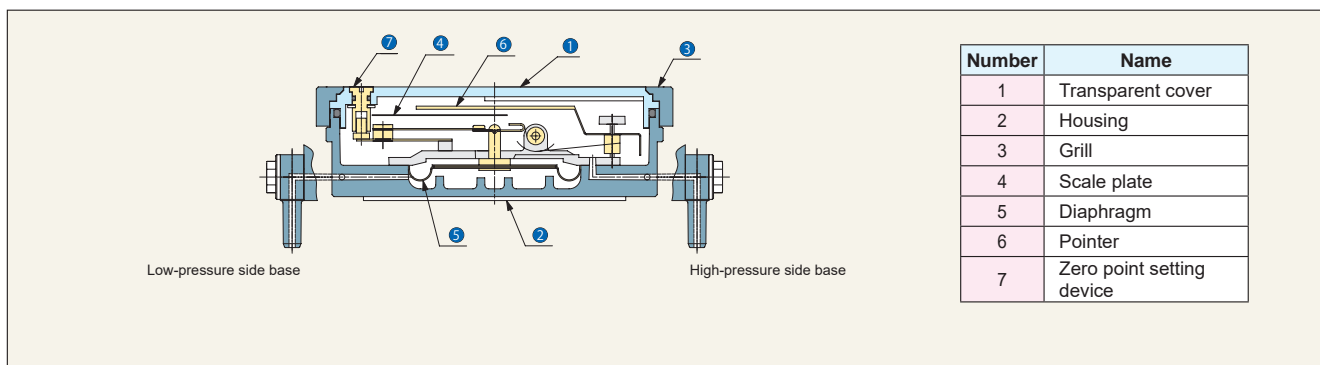
### Mounting method



Caution

- Tighten the screws and nuts to a torque of 0.8 N·m.
- Do not tighten to a torque that exceeds the specified value because doing so breaks the gauge body.

### Overview of structure



## WO71 List of scales

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

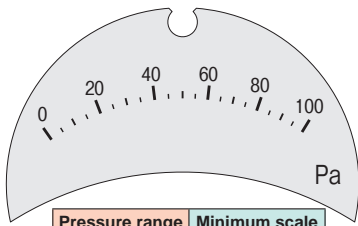
HWS15A

Accessories

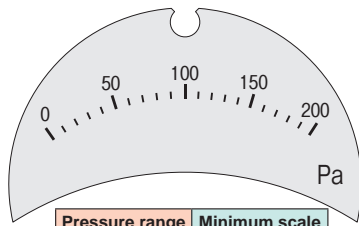
Application

Precautions

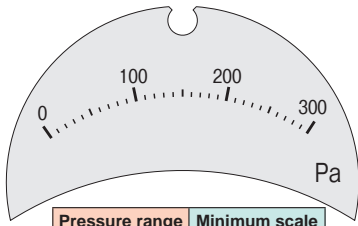
Maintenance



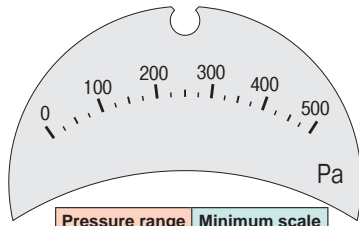
Pressure range	Minimum scale
0-100 Pa	5 Pa



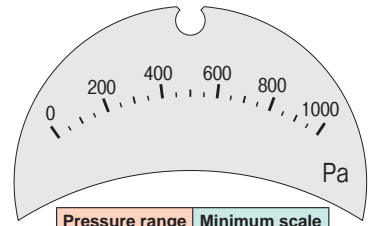
Pressure range	Minimum scale
0-200 Pa	10 Pa



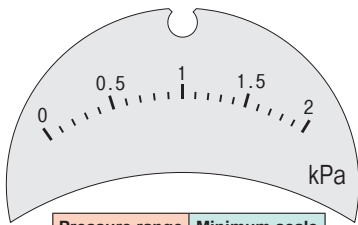
Pressure range	Minimum scale
0-300 Pa	10 Pa



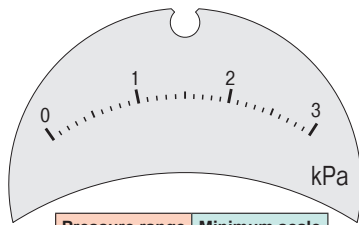
Pressure range	Minimum scale
0-500 Pa	25 Pa



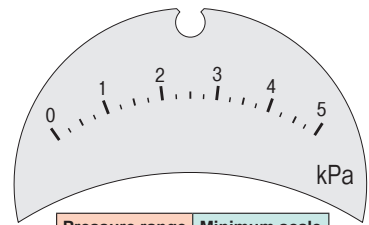
Pressure range	Minimum scale
0-1000 Pa	50 Pa



Pressure range	Minimum scale
0-2 kPa	0.1 kPa



Pressure range	Minimum scale
0-3 kPa	0.1 kPa



Pressure range	Minimum scale
0-5 kPa	0.25 kPa

### Accessories dedicated to WO71 RoHS

#### Custom seal (Auxiliary item)

(Example of customization)

Item number	Material
SEAL-WO71	Polyester film

It is possible to freely attach the seal on the gauge body to color-code the scale and indicate the planned differential pressure value and limit value.

#### VR base (Auxiliary item)

Dedicated to N type and R type

Item number	Material
KGA71VR	Polycarbonate/aluminum

This serves as an elbow whose tube mounting part rotates. A vinyl pipe or rubber pipe with an inner diameter of 4 mm can be connected. This is already installed when the gauge is purchased.

**Caution**

- There are no high-pressure side and low-pressure side polarities.
- As the structure allows the O-ring (2 pieces) to drop, pay attention not to lose the O-ring at the time of removal of the base.

#### Mounting plate (Auxiliary item)

Dedicated to N type

Item number	Material
ADPL71	Steel

This is used for mounting the gauge body.



#### Sealing cap (Auxiliary item)

Item number	Material
KGA71PLG	Polypropylene



This is already installed when the gauge is purchased.

RoHS



### Accessories for FS type and PS type

VT base			
<b>High-pressure side</b> (Auxiliary item) 		<b>Low-pressure side</b> (Auxiliary item) 	
Item number	Material	Item number	Material
KGA81VT-H-P	Polypropylene	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			
<b>High-pressure side</b> 		<b>Low-pressure side</b> 	
Item number	Material	Item number	Material
KGA81VR-H	Brass	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.

PT base			
<b>High-pressure side</b> 		<b>Low-pressure side</b> 	
Item number	Material	Item number	Material
KGA81PT-H	PBT/brass	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			
<b>High-pressure side</b> 		<b>Low-pressure side</b> 	
Item number	Material	Item number	Material
KGA81PR-H	PBT/brass	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			
<b>High-pressure side</b> 		<b>Low-pressure side</b> 	
Item number	Material	Item number	Material
KGA81MT-H	Brass	KGA81MT-L	Brass



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

MR base			
<b>High-pressure side</b> 		<b>Low-pressure side</b> 	
Item number	Material	Item number	Material
KGA81MR-H	Brass	KGA81MR-L	Brass



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

MTW base			
<b>High-pressure side</b> 		<b>Low-pressure side</b> 	
Item number	Material	Item number	Material
KGA81MTW-H-S	Stainless steel	KGA81MTW-L-S	Stainless steel



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

Adapter for rear face piping			
<b>High-pressure side</b> (Dedicated to FS type rear face piping) 		<b>Low-pressure side</b> (Dedicated to FS type rear face piping) 	
Item number	Material	Item number	Material
KGA81FBA-H	Brass	KGA81FBA-L	Brass

When arranging an MT base on the rear face of the WO71FS 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			
<b>High-pressure side</b> 		<b>Low-pressure side</b> 	
Item number	Material	Item number	Material
KGA81R1/8AD-H	Brass	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)			
<b>High-pressure side</b> 		<b>Low-pressure side</b> 	
Item number	Material	Item number	Material
KGA81R1/8AD-H-S	Stainless steel	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.

### Edgewise type fine differential pressure gauge

- Small-size/lightweight type that can be installed anywhere you like
- 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 FR51AHV**  
(Horizontal scale type)



**Model FR51AVV**  
(Vertical scale type)



**Model FR51ACV**  
(Color-coded horizontal scale type)

**<Main application fields>**

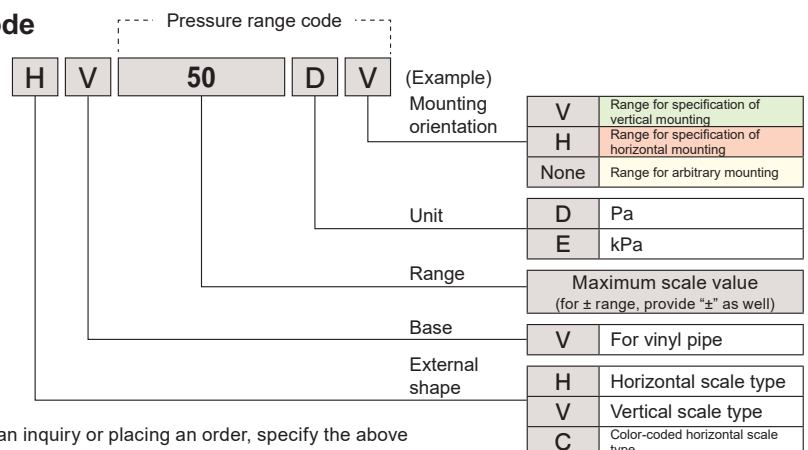
- Part of semiconductor manufacturing equipment
- Negative pressure for dust collector/differential pressure of air conditioner
- Filter pressure loss management
- Precision machine manufacturing line
- General factory management equipment

**<Usage>**

- Measurement of internal pressure of indoor device
- Detection of clogging of air filter
- Measurement of clogging of bug filter
- Measurement of dynamic pressure at ventilation/exhaust device
- Room pressure measurement in a clean room

### Product code

**FR51A**



\*(Refer to pages 114 to 117)

◆When making an inquiry or placing an order, specify the above product code.

- List of products
- WO81
- WO71
- FR51A
- MS99
- MS99S
- MS61A-RA
- QDP33
- EMD8A
- EMD7
- EMT1
- EMTGP1
- EMT1H
- EMT6
- EMP5A
- EMRT1
- HWS15A
- Accessories
- Application
- Precautions
- Maintenance



## Specifications

Model	Horizontal scale type		Vertical scale type		Color-coded horizontal scale type	
	FR51AHV		FR51AVV		FR51ACV	
<b>Pressure unit</b>	Pa, kPa		<b>Exterior material</b>	Polycarbonate		
<b>Pressure measurement method</b>	Differential pressure method		<b>Durable vibration</b>	5 to 10 Hz, amplitude of 10 mm, 10 to 50Hz, acceleration of 39 m/s <sup>2</sup> (two hours each for three axial directions)		
<b>Pressure-receiving element</b>	Diaphragm		<b>Durable impact</b>	100 m/s <sup>2</sup> (six times each for three axial directions)		
<b>Measured gas</b>	Air and noncorrosive gas (liquid cannot be measured)		<b>Compatible pipe</b>	Vinyl pipe or rubber pipe (inner diameter of 4 mm)		
<b>Scale shape</b>	Edgewise shape (scale length: approx. 45 mm)		<b>Base part</b>	Integrated with main body		
<b>Operating ambient temperature</b>	-10°C to +50°C (no freezing allowed)		<b>Base polarity</b>	Indicating high-pressure side and low-pressure side with "H" and "L" marks, respectively, at base part.		
<b>Operating ambient humidity</b>	90% RH or below (no condensation allowed)		<b>Mass</b>	Approx. 90 g		
<b>Instrument body withstanding pressure</b>	50 kPa (refer to page 118)					
<b>Accessories</b>	Mounting nut set					
<b>Pressure range code</b>	<b>Pressure range</b>	<b>Mounting orientation</b> (Refer to below)	<b>Accuracy (Note)</b> (at 23°C)	<b>Pressure-receiving element material</b>	<b>Withstanding pressure of pressure-receiving element</b> (Refer to page 118)	
50 DH	0-50 Pa	Horizontal (specification)	±2.5% FS	Silicone rubber	20 kPa	
50 DV		Upright (specification)				
100 DH	0-100 Pa	Horizontal (specification)				
100 DV		Upright (specification)				
200 D	0-200 Pa 0-300 Pa 0-500 Pa 0-1000 Pa	From horizontal through upright to downward and horizontal				
300 D						
500 D						
1000 D						
2 E						0-2 kPa
3 E	0-3 kPa					
5 E	0-5 kPa					
+ - 50 DH	-50 to +50 Pa	Horizontal (specification)				
+ - 50 DV		Upright (specification)				
+ - 100 D	-100 to +100 Pa	From horizontal through upright to downward and horizontal Arbitrary mounting				

(Note) Accuracy in full span (refer to page121)

◆For use environment, refer to page 118.

## Mounting orientation and range

**Range for the specification of horizontal and upright mounting**

0 to 50 Pa, 0 to 100 Pa, -50 to +50 Pa

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

**Range for mounting orientation arbitrary mounting in the range from horizontal through upright to downward and horizontal**

Whole range other than on the left

Can be arbitrarily mounted at an angle in the range from horizontal through upright to downward and horizontal.

## FR51A

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

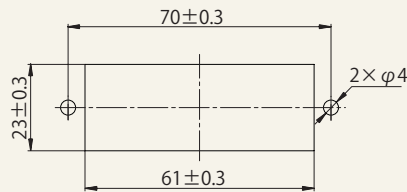
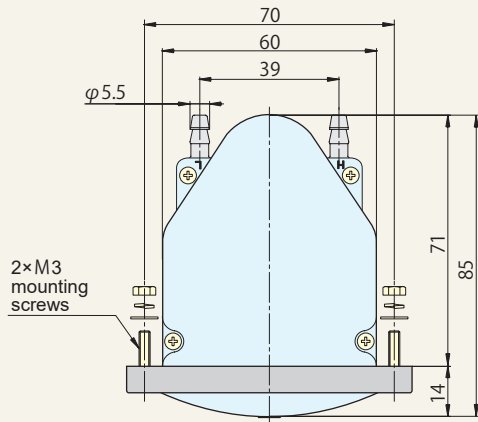
Application

Precautions

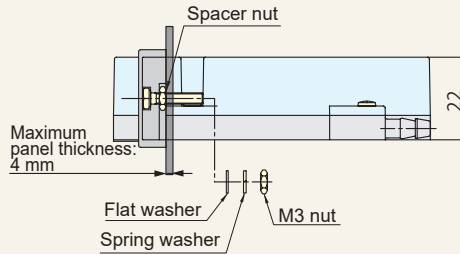
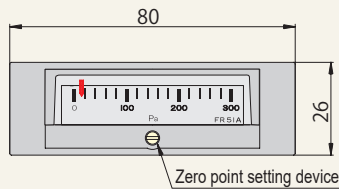
Maintenance

### External dimension drawing

#### Model FR51AHV (horizontal scale type)



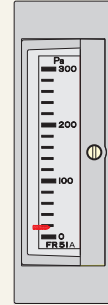
Panel cutting



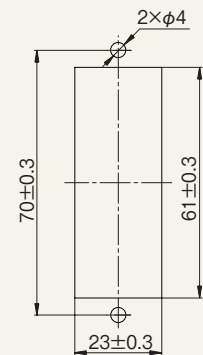
Caution

- Do not remove the spacer nut because doing so may break the gauge.
- M3 nut tightening torque: 0.8 N·m
- Do not tighten to a torque that exceeds the specified value because doing so breaks the instrument body.

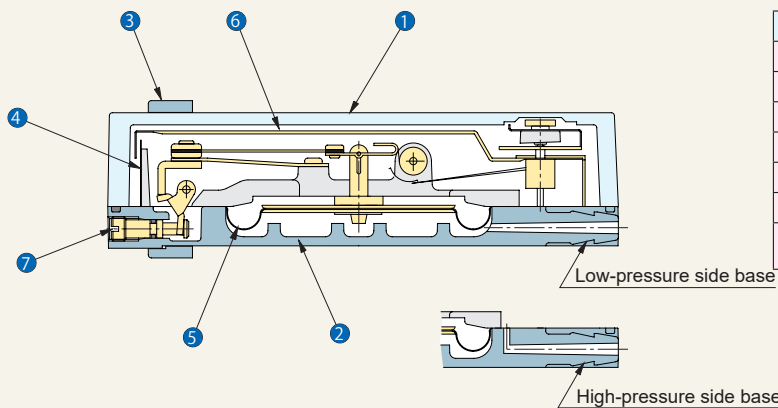
#### Model FR51AVV (vertical scale type)



The external dimensions of model FR51AVV are same as those of model FR51AHV.



### Overview of structure

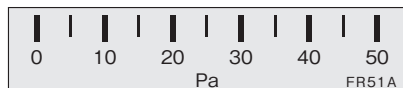


Number	Name
1	Transparent cover
2	Base
3	Grill
4	Scale plate
5	Diaphragm
6	Pointer
7	Zero point setting device

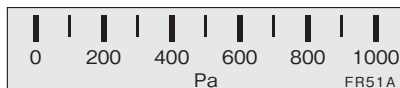
## FR51A List of scales

### Model FR51AHV/CV (horizontal scale type)

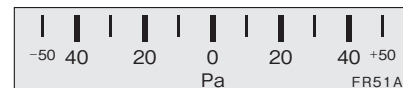
#### Biased pressure range



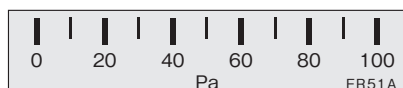
Pressure range	Minimum scale
0-50 Pa	5 Pa



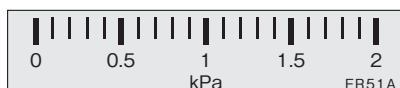
Pressure range	Minimum scale
0-1000 Pa	100 Pa



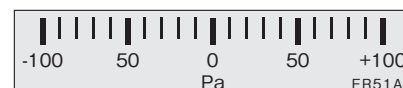
Pressure range	Minimum scale
-50 to +50 Pa	10 Pa



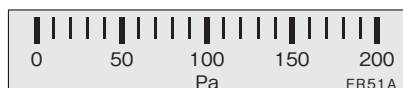
Pressure range	Minimum scale
0-100 Pa	10 Pa



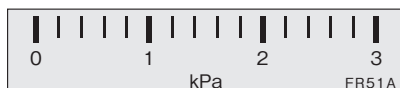
Pressure range	Minimum scale
0-2 kPa	0.1 kPa



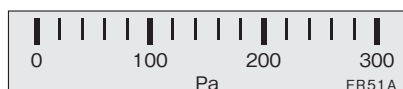
Pressure range	Minimum scale
-100 to +100 Pa	10 Pa



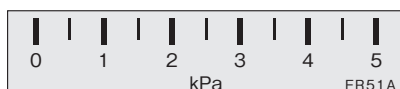
Pressure range	Minimum scale
0-200 Pa	10 Pa



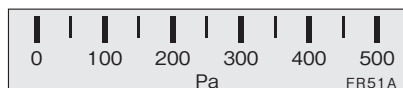
Pressure range	Minimum scale
0-3 kPa	0.2 kPa



Pressure range	Minimum scale
0-300 Pa	20 Pa



Pressure range	Minimum scale
0-5 kPa	0.5 kPa



Pressure range	Minimum scale
0-500 Pa	50 Pa

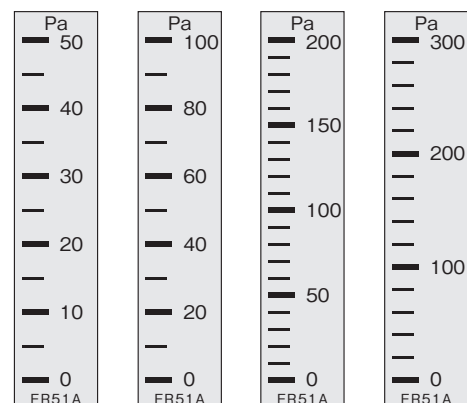
#### Color-coded horizontal scale



Pressure range	Color coding
Biased pressure range target	Green 0 50%FS Yellow 75%FS Red

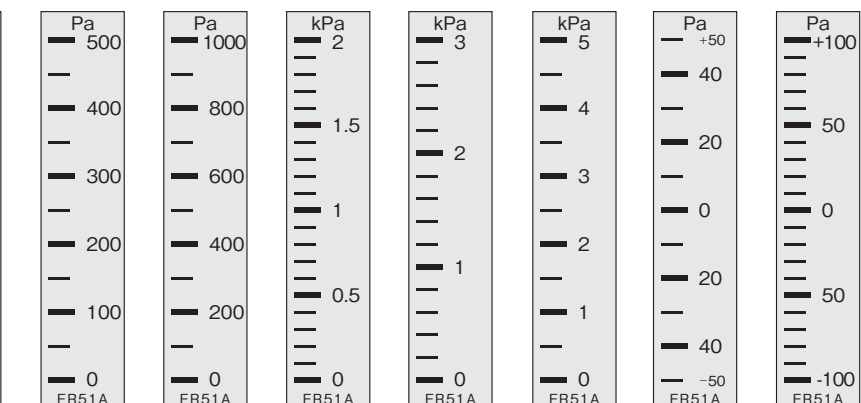
### Model FR51AVV (vertical scale type)

#### Biased pressure range



Pressure range	Pressure range	Pressure range	Pressure range	Pressure range	Pressure range
0-50 Pa	0-100 Pa	0-200 Pa	0-300 Pa	0-500 Pa	0-1000 Pa

#### Zero center range



Pressure range	Pressure range
-50 to +50 Pa	-100 to +100 Pa

- List of products
- WO81
- WO71
- FR51A
- MS99
- MS99S
- MS61A-RA
- QDP33
- EMD8A
- EMD7
- EMT1
- EMTGP1
- EMT1H
- EMT6
- EMP5A
- EMRT1
- HWS15A
- Accessories
- Application
- Precautions
- Maintenance

## MS99



30 V DC and lower rated voltage specification only



### Fine differential pressure switch

- Wide setting range due to employment of multi-start thread.
- Standardization of the contact has eliminated the need to specify the normal load and fine load.
- High accuracy has been achieved.
- Exchange of base makes it possible to connect various pipes (for exchangeable base type only).
- Products compatible with EC directive (CE marking) are also available (30 V DC and lower rated voltage specification).



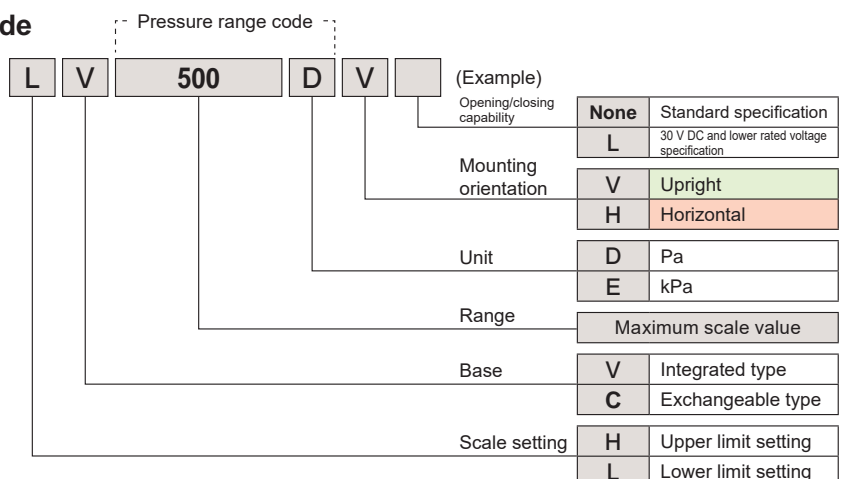
**Model MS99 V**  
(Integrated base type)



**Model MS99 C**  
(Exchangeable base type)

### Product code

**MS99**



**<Main application fields>**

- General factory management equipment
- Negative pressure for dust collector/differential pressure of air conditioner
- Filter pressure loss management
- Precision machine manufacturing line
- Building air conditioning control equipment

**<Usage>**

- Detection of clogging of air filter
- Room pressure measurement in a clean room
- Measurement of clogging of bug filter
- Measurement of dynamic pressure at ventilation/exhaust device

\*(Refer to pages 114 to 117)

◆When making an inquiry or placing an order, specify the above product code.

- List of products
- WO81
- WO71
- FR51A
- MS99
- MS99S
- MS61A-RA
- QDP33
- EMD8A
- EMD7
- EMT1
- EMTGP1
- EMT1H
- EMT6
- EMP5A
- EMRT1
- HWS15A
- Accessories
- Application
- Precautions
- Maintenance

### Specifications

Model	Integrated base type, for upper limit setting	Integrated base type, for lower limit setting	Exchangeable base type, for upper limit setting	Exchangeable base type, for lower limit setting
	MS99HV	MS99LV	MS99HC	MS99LC
<b>Pressure unit</b> <b>Pressure measurement method</b> <b>Pressure-receiving element</b> <b>Contact material</b> <b>Measured gas</b> <b>Pressure setting method</b> <b>Mounting orientation</b> <b>Operating ambient temperature</b> <b>Operating ambient humidity</b> <b>Exterior material</b> <b>Durable vibration</b> <b>Durable impact</b> <b>Insulation resistance</b> <b>Withstand voltage</b>	Pa, kPa Differential pressure method Diaphragm Silver alloy/gold plating Air and noncorrosive gas (liquid cannot be measured) Setting by dial with scale Upright or horizontal -10°C to +60°C (no freezing allowed) 90% RH or below (no condensation allowed) Model V Polycarbonate Model C Polycarbonate and polyamide 5 to 10 Hz, amplitude of 10 mm, 10 to 50 Hz, acceleration of 39 m/s <sup>2</sup> (two hours each for three axial directions) 100 m/s <sup>2</sup> (six times each for three axial directions) Between terminal and case: 20 MΩ or higher (500 V DC megger) Between terminal and case: 1500 V AC, 50/60 Hz, for one minute	<b>Compatible pipe</b> <b>Terminal screw size</b> <b>Base polarity</b> <b>Mass</b> <b>Accessories</b> <b>Conforming standards</b> <b>Protection level</b> <b>Cable clamp mounting screw size</b>	Model V • Vinyl pipe or rubber pipe (inner diameter of 4 mm) Model C • Vinyl pipe or rubber pipe (inner diameter of 6 mm) Base for resin vinyl pipe (already mounted on instrument) • Metallic pipe (outer diameter of 6 ± 0.1 mm) Separately sold base for metallic pipe is necessary. • Hard tube (outer diameter 6 × inner diameter 4 mm) Separately sold base for metallic pipe and inner sleeve set (refer to page 95) or push-in joint is necessary. M4 (mountable terminal: outer diameter of φ8 or below) Indicating high-pressure side and low-pressure side with "H" and "L" marks, respectively, at the piping connection base part. Model V Approx. 170 g Model C Approx. 190 g None (cable clamp is separately sold) UL standard UL and C-UL recognition component Requirement standard No. .... UL508 File No. .... E240648 *Acquired as open-type enclosure. RoHS directive Equivalent to IP54 (at time of acquisition of cable clamp) M15 P=1	

Pressure range code	Pressure range	Mounting orientation <small>*It is necessary to specify the orientation at the time of order placement for all ranges.</small>	Scale setting accuracy (at 23°C)	Repeatability	Maximum operating pressure difference	Pressure-receiving element material	Withstanding pressures of instrument body and pressure-receiving element (Refer to page 118)
120 D	20–120 Pa	Horizontal or Upright	±5.0 Pa	±2.0 Pa	25.0 Pa	Silicone rubber	10 kPa
200 D	20–200 Pa		±9.0 Pa	±2.0 Pa	25.0 Pa		
300 D	30–300 Pa		±13.5 Pa	±3.0 Pa	30.0 Pa		
500 D	50–500 Pa		±22.5 Pa	±5.0 Pa	45.0 Pa		
1000 D	100–1000 Pa		±45 Pa	±10 Pa	70 Pa		
3 E	0.3–3 kPa		±0.135 kPa	±0.030 kPa	0.300 kPa		20 kPa
5 E	0.5–5 kPa		±0.225 kPa	±0.050 kPa	0.450 kPa		
10 E	1–10 kPa		±0.45 kPa	±0.10 kPa	0.70 kPa		
30 E	3–30 kPa		±1.35 kPa	±0.30 kPa	3.00 kPa		

◆For use environment, refer to page 118.

### Opening/closing capability [standard specification]

Load	Rated voltage	Specifications	Resistance load	Induction load
Standard load	30 V DC	Contact configuration SPDT (single-pole double-throw) Electric service life 100,000 times or more	0.8 A	150 mA (Time constant 7 ms)
	100 V AC		5 A	60 mA (Power factor 0.6)
	250 V AC		5 A	—
Minute load	30 V DC 125 V AC		100 mA	—

### Rating certified with safety standard (UL) [Standard specification]

Rating
125 V DC–0.5 A RES 250 V AC–5 A RES

### Opening/closing capability [30 V DC and lower rated voltage specification]


Load	Rated voltage	Specifications	Resistance load	Induction load
Standard load	30 V DC	Contact configuration SPDT (single-pole double-throw) Electric service life 100,000 times or more	0.8 A	150 mA (Time constant 7 ms)
Minute load			100 mA	—

### Rating certified with safety standard (UL) [30 V DC and lower rated voltage specification]

Rating
30 V DC–0.5 A RES

\*To enhance the contact reliability of the contact under minute load condition, gold plating is applied to the contact surface. If the instrument is used with a voltage or current exceeding the rating at the time of use of minute load, the gold plating will be broken and the contact reliability of the contact under minute load condition will be degraded.

Under minute load conditions, do not use such a product that has been used any number of times under normal load conditions.

 Caution	<ul style="list-style-type: none"> <li>In an induction load circuit, such as a relay, there is a possibility of contact problems with a contact due to back electromotive force or inrush current at the time of opening or closing. Therefore, be sure to insert a protective circuit for surge absorption, such as a diode and varistor.</li> <li>If silicone gas or organic gas is contained in the measured gas, such an organic substance that may lead to defective contact of a contact that is caused by arc energy at the time of contact opening/closing. If offensive gas is contained in the measured gas, malfunctioning due to defective contact of a contact or corrosion of the internal mechanism may occur. If any of the above gases exist in the measured gas or surrounding environment, discuss the use of a model with the built-in lead switch MS61A-RA, whose contact is less subject to the external atmosphere.</li> </ul>
--	---

## MS99

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

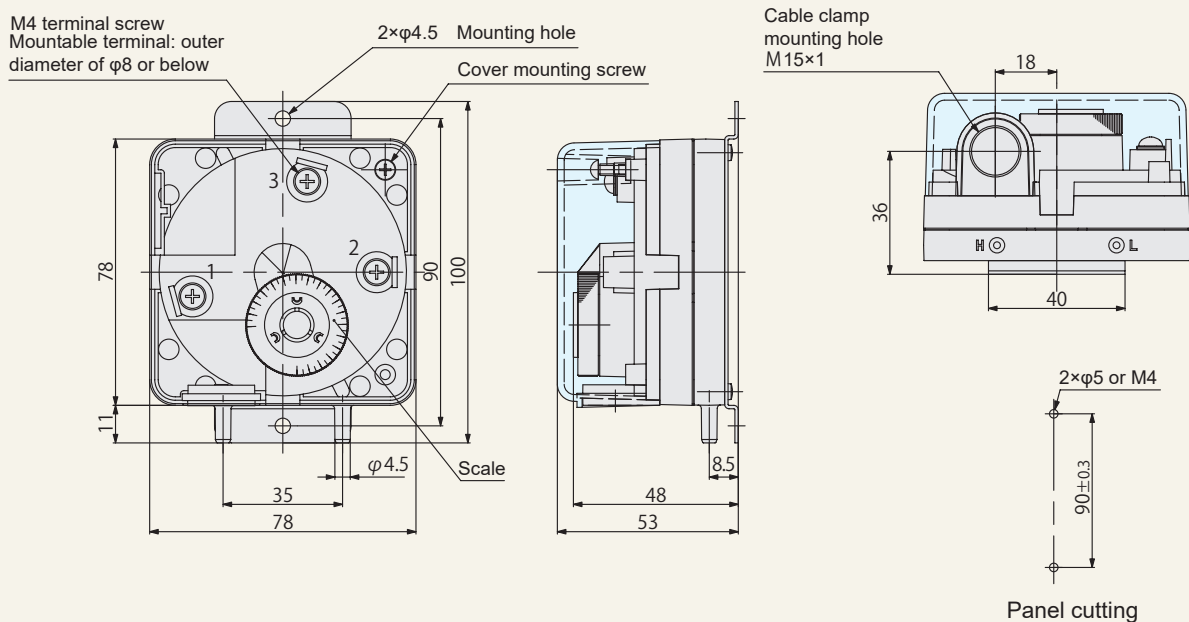
Application

Precautions

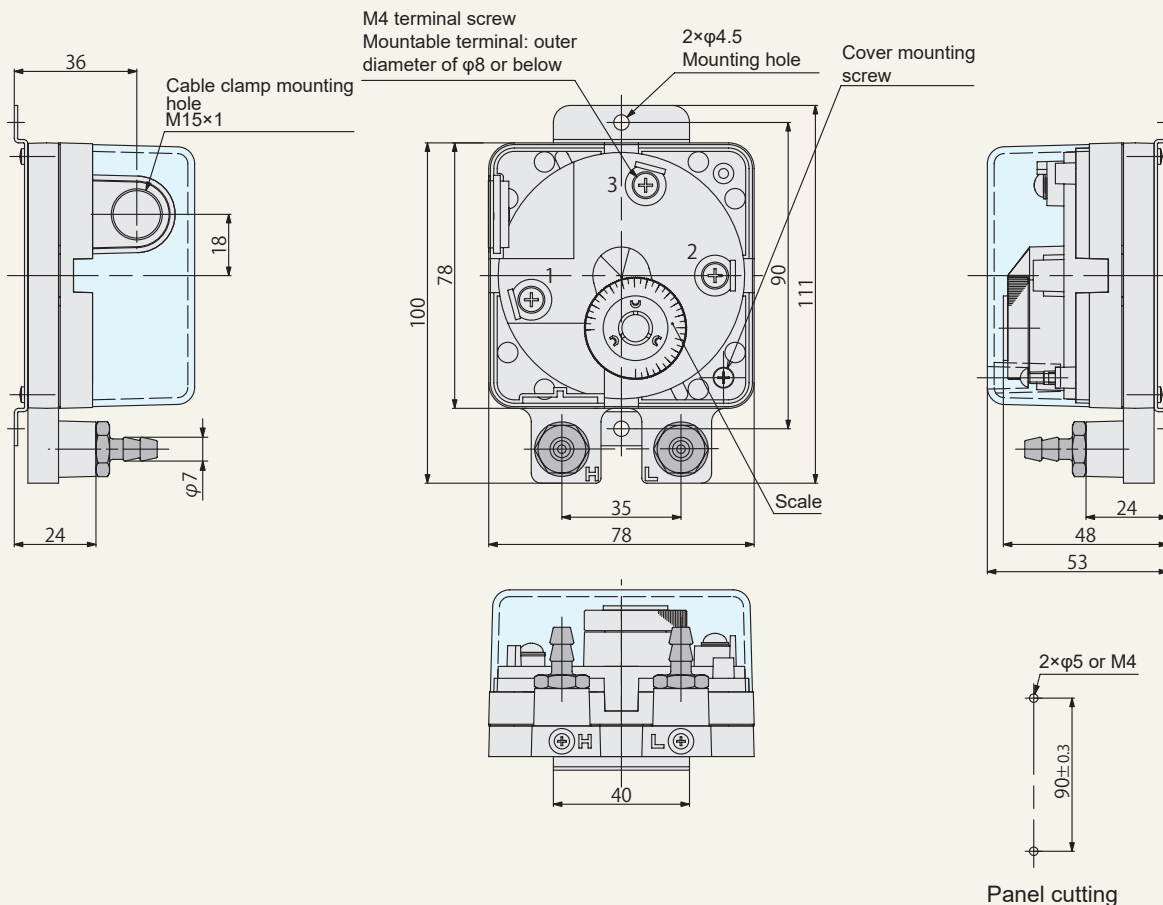
Maintenance

### External dimension drawing

#### Model MS99 V (integrated base type)



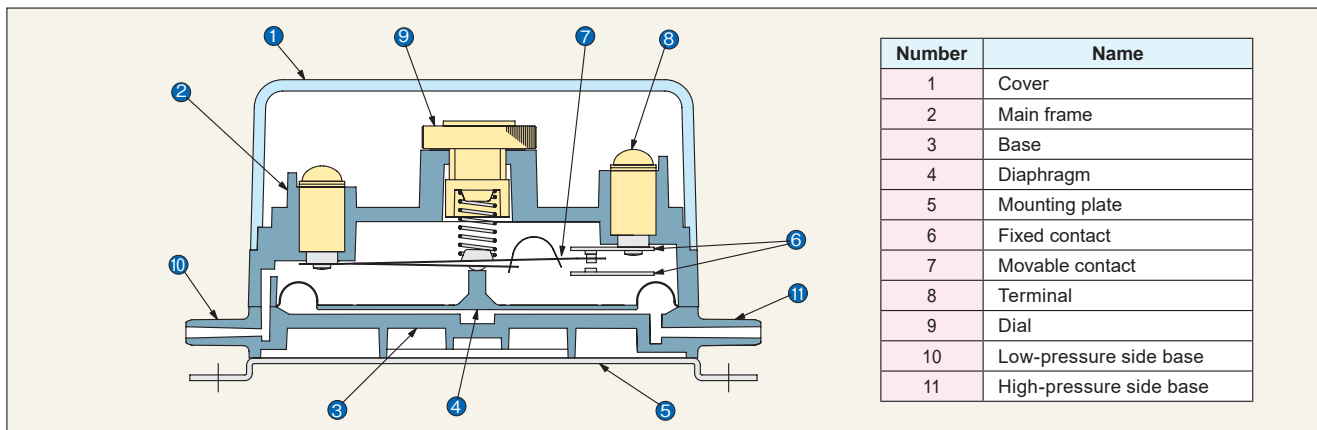
#### Model MS99 C (exchangeable base type)



Caution

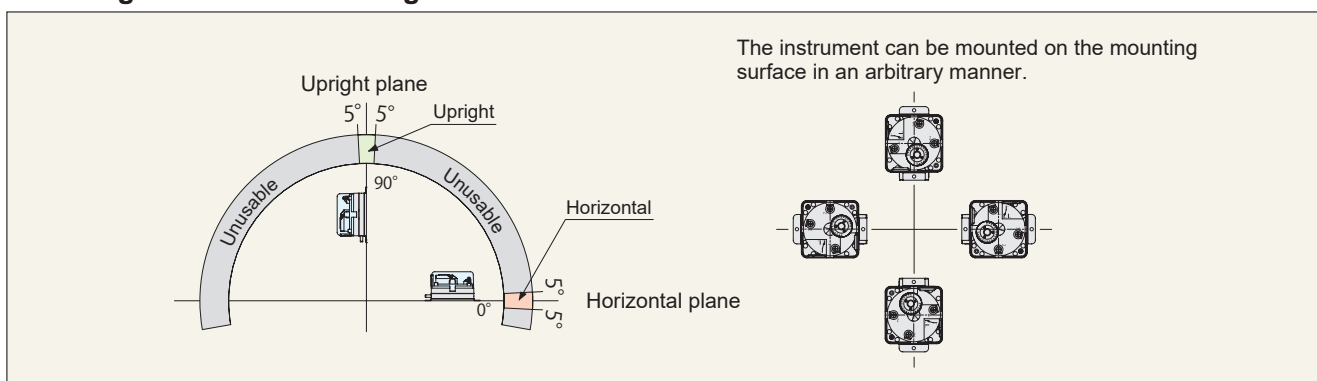
Base tightening torque: 1 N·m  
 Terminal screw tightening torque: 0.7 to 1.0 N·m  
 Do not tighten to a torque that exceeds the specified value because doing so breaks the instrument body. (Refer to page 120)

### Overview of structure



### Mounting orientation and range

It is necessary to specify the orientation at the time of order placement for all ranges.



### Accessories dedicated to MS99

RoHS

#### Mounting plate

(Auxiliary item)

Dedicated to V type and C type

This is already installed at the time of purchase of the instrument.  
This cannot be used for Model MS99S.

Item number	Material
ADPL99-01	Aluminum/steel

#### Cover

(Auxiliary item)

This is already installed at the time of purchase of the instrument.

Item number	Material
TCA-99	Polycarbonate/steel

#### Cable clamp holder

(Auxiliary item)

This is already installed at the time of purchase of the instrument.

Item number	Material
ADPA-MS99	Polycarbonate

#### Cable clamp (Ohm Electric Co., Ltd.)

Mounting hole diameter:  $\phi 15$   
Mounting screw: M15 P=1

[External dimension at time of mounting]

[Schematic figure of mounted cable clamp]

Only by changing the orientation of the transparent cover, it is possible to change the wiring direction.

At time of mounting of cable clamp, protection level is equivalent to IP54.

Item number	Compatible electric wire diameter	Material
OA-W15M-04	$\phi 2-4$	Nylon 66
OA-W15M-05	$\phi 3-5$	Polypropylene
OA-W15M-07	$\phi 5-7$	NBR

**Caution**

- In mounting of the cable clamp to the instrument body, the supplied locknut is not used.
- When extracting the wire in the base direction on Model MS99 C (exchangeable base type), the installation is disabled because the base and the cable clamp interfere with each other.

## MS99

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A


Accessories



Application



Precautions



Maintenance



### Accessories for C type RoHS



VT base									
(Auxiliary item)									
									
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA99VT</td> <td style="text-align: center;">Polyamide</td> </tr> </tbody> </table>	Item number	Material	KGA99VT	Polyamide	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA99VT</td> <td style="text-align: center;">Polyamide</td> </tr> </tbody> </table>	Item number	Material	KGA99VT	Polyamide
Item number	Material								
KGA99VT	Polyamide								
Item number	Material								
KGA99VT	Polyamide								
<p>A vinyl pipe or rubber pipe with an inner diameter of 6 mm can be connected. This is already installed at the time of purchase of the instrument.</p>									



VR base																			
High-pressure side		Low-pressure side																	
																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81VR-H</td> <td style="text-align: center;">Brass</td> </tr> </tbody> </table>	Item number	Material	KGA81VR-H	Brass	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81VR-H</td> <td style="text-align: center;">Brass</td> </tr> </tbody> </table>	Item number	Material	KGA81VR-H	Brass	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81VR-L</td> <td style="text-align: center;">Brass</td> </tr> </tbody> </table>	Item number	Material	KGA81VR-L	Brass	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81VR-L</td> <td style="text-align: center;">Brass</td> </tr> </tbody> </table>	Item number	Material	KGA81VR-L	Brass
Item number	Material																		
KGA81VR-H	Brass																		
Item number	Material																		
KGA81VR-H	Brass																		
Item number	Material																		
KGA81VR-L	Brass																		
Item number	Material																		
KGA81VR-L	Brass																		
<p>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.</p>																			



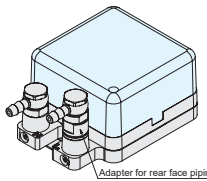
PT base																			
High-pressure side		Low-pressure side																	
																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81PT-H</td> <td style="text-align: center;">PBT/brass</td> </tr> </tbody> </table>	Item number	Material	KGA81PT-H	PBT/brass	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81PT-H</td> <td style="text-align: center;">PBT/brass</td> </tr> </tbody> </table>	Item number	Material	KGA81PT-H	PBT/brass	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81PT-L</td> <td style="text-align: center;">PBT/brass</td> </tr> </tbody> </table>	Item number	Material	KGA81PT-L	PBT/brass	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81PT-L</td> <td style="text-align: center;">PBT/brass</td> </tr> </tbody> </table>	Item number	Material	KGA81PT-L	PBT/brass
Item number	Material																		
KGA81PT-H	PBT/brass																		
Item number	Material																		
KGA81PT-H	PBT/brass																		
Item number	Material																		
KGA81PT-L	PBT/brass																		
Item number	Material																		
KGA81PT-L	PBT/brass																		
<p>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)</p>																			

PR base																			
High-pressure side		Low-pressure side																	
																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81PR-H</td> <td style="text-align: center;">PBT/brass</td> </tr> </tbody> </table>	Item number	Material	KGA81PR-H	PBT/brass	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81PR-H</td> <td style="text-align: center;">PBT/brass</td> </tr> </tbody> </table>	Item number	Material	KGA81PR-H	PBT/brass	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81PR-L</td> <td style="text-align: center;">PBT/brass</td> </tr> </tbody> </table>	Item number	Material	KGA81PR-L	PBT/brass	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81PR-L</td> <td style="text-align: center;">PBT/brass</td> </tr> </tbody> </table>	Item number	Material	KGA81PR-L	PBT/brass
Item number	Material																		
KGA81PR-H	PBT/brass																		
Item number	Material																		
KGA81PR-H	PBT/brass																		
Item number	Material																		
KGA81PR-L	PBT/brass																		
Item number	Material																		
KGA81PR-L	PBT/brass																		
<p>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)</p>																			

MT base																			
High-pressure side		Low-pressure side																	
																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81MT-H</td> <td style="text-align: center;">Brass</td> </tr> </tbody> </table>	Item number	Material	KGA81MT-H	Brass	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81MT-H</td> <td style="text-align: center;">Brass</td> </tr> </tbody> </table>	Item number	Material	KGA81MT-H	Brass	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81MT-L</td> <td style="text-align: center;">Brass</td> </tr> </tbody> </table>	Item number	Material	KGA81MT-L	Brass	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81MT-L</td> <td style="text-align: center;">Brass</td> </tr> </tbody> </table>	Item number	Material	KGA81MT-L	Brass
Item number	Material																		
KGA81MT-H	Brass																		
Item number	Material																		
KGA81MT-H	Brass																		
Item number	Material																		
KGA81MT-L	Brass																		
Item number	Material																		
KGA81MT-L	Brass																		
<p>A metallic pipe, such as copper pipe and aluminum pipe with an outer diameter of <math>6 \pm 0.1</math> mm, can be connected. However, for stainless steel pipe, use an MTW base. When connecting with a plastic pipe (outer diameter 6 mm <math>\times</math> inner diameter 4 mm), remove the brass sleeve and use the separately sold resin inner sleeve set (XIN6<math>\times</math>4; refer to page 111).</p>																			

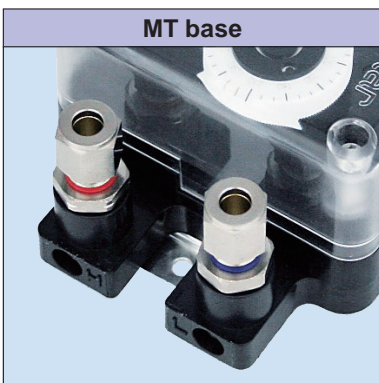
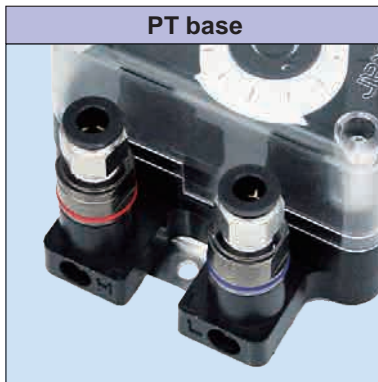
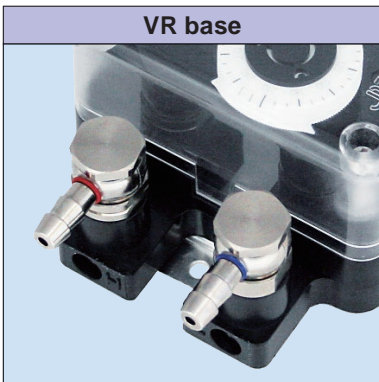
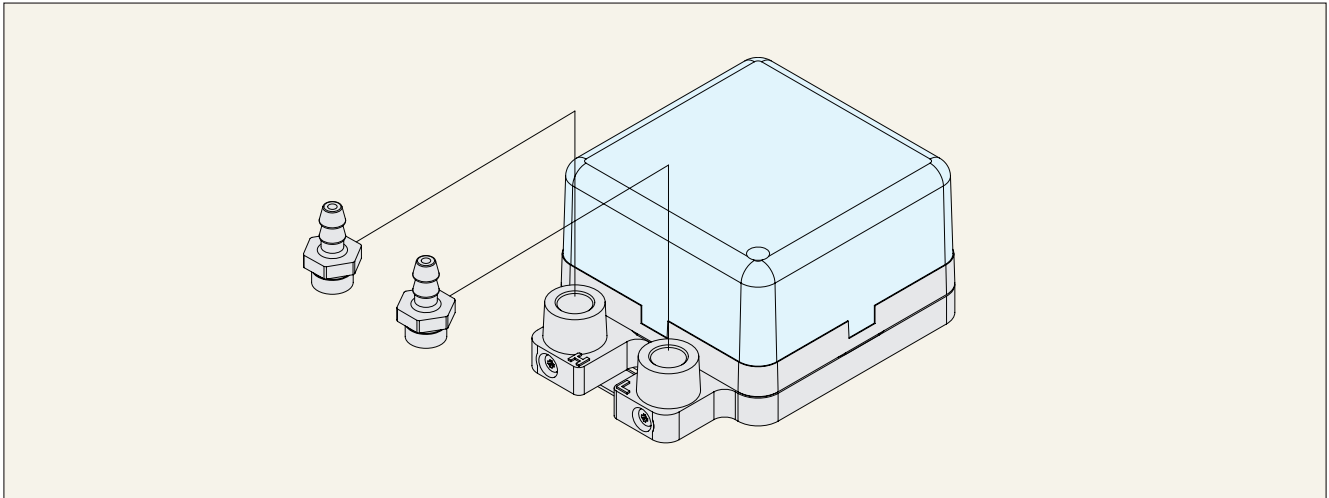
MR base																			
High-pressure side		Low-pressure side																	
																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81MR-H</td> <td style="text-align: center;">Brass</td> </tr> </tbody> </table>	Item number	Material	KGA81MR-H	Brass	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81MR-H</td> <td style="text-align: center;">Brass</td> </tr> </tbody> </table>	Item number	Material	KGA81MR-H	Brass	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81MR-L</td> <td style="text-align: center;">Brass</td> </tr> </tbody> </table>	Item number	Material	KGA81MR-L	Brass	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81MR-L</td> <td style="text-align: center;">Brass</td> </tr> </tbody> </table>	Item number	Material	KGA81MR-L	Brass
Item number	Material																		
KGA81MR-H	Brass																		
Item number	Material																		
KGA81MR-H	Brass																		
Item number	Material																		
KGA81MR-L	Brass																		
Item number	Material																		
KGA81MR-L	Brass																		
<p>This serves as an elbow whose tube mounting part rotates. The piping material is the same as that of the MT base. When connecting with a plastic pipe (outer diameter 6 mm <math>\times</math> inner diameter 4 mm), remove the brass sleeve and use the separately sold resin inner sleeve set (XIN6<math>\times</math>4; refer to page 111).</p>																			

MTW base																			
High-pressure side		Low-pressure side																	
																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81MTW-H-S</td> <td style="text-align: center;">Stainless steel</td> </tr> </tbody> </table>	Item number	Material	KGA81MTW-H-S	Stainless steel	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81MTW-H-S</td> <td style="text-align: center;">Stainless steel</td> </tr> </tbody> </table>	Item number	Material	KGA81MTW-H-S	Stainless steel	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81MTW-L-S</td> <td style="text-align: center;">Stainless steel</td> </tr> </tbody> </table>	Item number	Material	KGA81MTW-L-S	Stainless steel	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81MTW-L-S</td> <td style="text-align: center;">Stainless steel</td> </tr> </tbody> </table>	Item number	Material	KGA81MTW-L-S	Stainless steel
Item number	Material																		
KGA81MTW-H-S	Stainless steel																		
Item number	Material																		
KGA81MTW-H-S	Stainless steel																		
Item number	Material																		
KGA81MTW-L-S	Stainless steel																		
Item number	Material																		
KGA81MTW-L-S	Stainless steel																		
<p>This is used to connect a stainless steel pipe with an outer diameter of <math>6 \pm 0.1</math> mm.</p>																			

Adapter for rear face piping																			
High-pressure side		Low-pressure side																	
																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81FBA-H</td> <td style="text-align: center;">Brass</td> </tr> </tbody> </table>	Item number	Material	KGA81FBA-H	Brass	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81FBA-H</td> <td style="text-align: center;">Brass</td> </tr> </tbody> </table>	Item number	Material	KGA81FBA-H	Brass	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81FBA-L</td> <td style="text-align: center;">Brass</td> </tr> </tbody> </table>	Item number	Material	KGA81FBA-L	Brass	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a7ebb; color: white;"> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">KGA81FBA-L</td> <td style="text-align: center;">Brass</td> </tr> </tbody> </table>	Item number	Material	KGA81FBA-L	Brass
Item number	Material																		
KGA81FBA-H	Brass																		
Item number	Material																		
KGA81FBA-H	Brass																		
Item number	Material																		
KGA81FBA-L	Brass																		
Item number	Material																		
KGA81FBA-L	Brass																		
<p>When a rotary base is used, it is possible to provide a step so that pipes do not contact each other even when they cross each other. (Figure on the right)</p>																			
																			



### Example of mounting of type C base



**Caution**

- Even when the bases are exchanged with each other, the high-pressure side and low-pressure side polarities cannot be changed. The base polarities are indicated with an "H" mark on the high-pressure side and an "L" mark on the low-pressure side at their respective base mounting parts.
- 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 instrument body. (Refer to page 120)

### Protection of switch contact

- To reduce the noise generated at the time of opening/closing of the load and lengthen the service life of the contact by decreasing the generation of nitric acid gas and carbide, a contact protection circuit is used. However, it will have an opposite effect if it is not used correctly.
- When a contact protection circuit is used, the operation time of the load may be slightly delayed. Representative examples of a contact protection circuit are provided below.

### Representative examples of a contact protection circuit

Circuit example		Applicable power source		Points to note when applying/selecting circuit
		DC	AC	
	Varistor method	○	○	<ul style="list-style-type: none"> <li>○ This method prevents a voltage equal to or exceeding the varistor's limit voltage from being applied between the contacts. In this method, the return time of the induction load on the relay is slightly delayed.</li> <li>○ From the selection materials from varistor manufacturers, select a varistor with a rating that matches the power voltage and load capacity.</li> </ul>
	C/R method	○	○	<ul style="list-style-type: none"> <li>○ In this method, the operation/return time is slightly delayed if the load is an induction load such as relay.</li> <li>○ The CR values should be around C: 0.5 μF/A and R: 1.0 Ω/V with respect to the contact current and contact voltage, respectively, as a guide. However, as these values vary depending on the property of the load and other conditions, check the values through experiment and select an appropriate model.</li> </ul>
	Diode method	○	✗	<ul style="list-style-type: none"> <li>○ In this method, the back electromotive force of the induction load is canceled by the load resistance through a diode to prevent high voltage from being applied between contacts. In this method, the return time of induction load is more delayed compared to the varistor type and CR method.</li> <li>○ Select a diode whose rating current is equal to or greater than the load current and whose reverse breakdown voltage is 10 times the power voltage or greater.</li> </ul>
	Diode + Zener diode method	○	✗	<ul style="list-style-type: none"> <li>○ The diode method is effective when the return time of the induction load on the relay is excessively delayed. Select a Zener diode whose Zener voltage is almost equal to the power voltage as a guide. However, if the load increases, a Zener diode whose reverse surge power is great is required. Therefore, this method has a limit, and attention needs to be paid when selecting this method.</li> </ul>

### Examples of bad contact protection circuit

	Condenser method	<ul style="list-style-type: none"> <li>○ This method is very effective for extinction of an arc at the time of release of the contact, but the charging current flows to the condenser when contacting the contact, making the contact likely to be welded and shortening the contact service life.</li> </ul>
		<ul style="list-style-type: none"> <li>○ This method is very effective for extinction of an arc at the time of release of the contact, but short-circuit current in power storage capacity stored in the condenser flows when contacting the contact, making the contact likely to be welded and shortening the contact service life.</li> </ul>

### Notes on contact material

To enhance the contact reliability of the contact under minute load condition, gold plating is applied to the contact surface. If the instrument is used with a voltage or current exceeding the rating at the time of use of minute load, the gold plating may break, and the contact reliability of the contact under minute load conditions may degrade.



Under minute load conditions, do not use such a product that has been used any number of times under normal load conditions.

### Configuration of switch contact

- The contact configuration of this instrument is as shown on the right.
- The state in which the differential pressure (pressure) is not applied to the instrument is referred to as normal condition.
- In the normal condition, the section between contact 1 (COM.) and contact 2 (N.C.) is closed, and the section between contact 1 (COM.) and contact 3 (N.O.) is open.
- When the differential pressure increases and reaches the set pressure, the contact is switched, the section between contact 1 (COM.) and contact 2 (N.C.) turns to be open, and the section between contact 1 (COM.) and contact 3 (N.O.) turns to be closed.

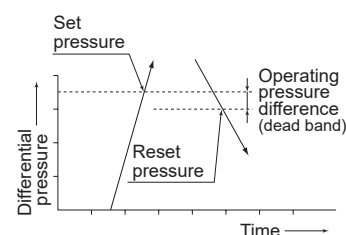
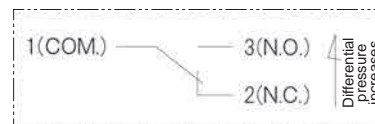


Figure for explanation of operating pressure difference

### Upper limit setting and lower limit setting

The pressure at which the electric contact of the switch is triggered as the differential pressure (pressure) applied to the instrument has increased from zero is referred to as the set pressure.

Then, the pressure at which the contact has returned to the former state as the differential pressure has decreased from the use condition at a pressure greater than the set pressure and the electric contact has been triggered is referred to as the reset pressure.

The set pressure and reset pressure mentioned above are not the same values but are slightly different from each other. This difference is referred to as the operating pressure difference (dead band).

This instrument has two variations: one with the scale of setting dial set to the set pressure; and the other with the scale set to the reset pressure.

This instrument with the scale set to the set pressure is referred to as the instrument for upper limit setting and the instrument with the scale set to the reset pressure is referred to as the instrument for lower limit setting.

When the setting pressure is set to 1 kPa in the pressure range of 1 to 10 kPa as an example (the operating pressure difference is assumed to be 0.7 kPa)

Scale setting	Setting dial scale adjustment	Contact action
<b>Instrument for upper limit setting</b>	Adjustment is made by means of set pressure.	When the differential pressure increases, the section between 3 (N.O.) and 1 (COM.) closes at 1 kPa. Then, when the differential pressure decreases, the section between 3 (N.O.) and 1 (COM.) opens at 0.3 kPa.
<b>Instrument for lower limit setting</b>	Adjustment is made by means of reset pressure.	When the differential pressure increases, the section between 3 (N.O.) and 1 (COM.) closes at 1.7 kPa. Then, when the differential pressure decreases, the section between 3 (N.O.) and 1 (COM.) opens at 1 kPa.



It is not possible to change from the upper limit setting to the lower limit setting and vice versa.

### Reset time

Reset time refers to the time it takes to reach the reset pressure (the electric contact is reset) when the differential pressure is suddenly reduced to zero from the set pressure. In this instrument, the reset time is approx. 3 seconds at 20 Pa and approx. 1 second at 50 Pa and greater. (However, the reset time is for the instrument body only, not including the pipe.) Therefore, a response faster than this time is impossible.

### Contact rating

If the contact capacity in the specification is exceeded, additionally connect the secondary relay. In general, the smaller the voltage and current are, the longer the contact service life is. A Manostar switch cannot directly shut off a circuit whose voltage exceeds 250 V AC.

### Measured gas

If offensive gas (nitric acid, hydrogen sulfide, sulfurous acid, ammonia, chlorine, etc.) is contained in the measured gas, malfunctioning due to defective contact of a contact or corrosion of the internal mechanism may occur. If the measured gas is highly humid, nitric acid may be produced due to an arc at the time of opening/closing of the contact, which may lead to similar defective contact or malfunctioning. Therefore, avoid the use of highly humid measured gas.

If the measured gas contains silicone gas generated from silicone (oil, grease, filler, etc.), silicone oxide may be generated and accumulated at the contact due to an arc at the time of opening/closing of the contact, which may lead to defective contact of a contact. Therefore, remove the silicone gas generation source or implement arc suppression measures.

## MS99S

Type examination pass No. TC22339X

RoHS

### Intrinsically safe fine differential pressure switch

<b>Explosion-proof performance</b>	<b>Ex ia IIC T6 Ga</b>
------------------------------------	------------------------

Intrinsically safe refers to a model with a structure designed in consideration of the necessary safety factor so that combustible gas will not be ignited because of an electric spark generated under normal conditions or in the event of an accident or temperature rise, whose explosion-proof safety has been verified through tests or by other means by an official organization.

Be sure to use this instrument in combination with a safety holder (relay barrier). (Refer to page 45)



**Model MS99S**  
(Integrated base type)

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

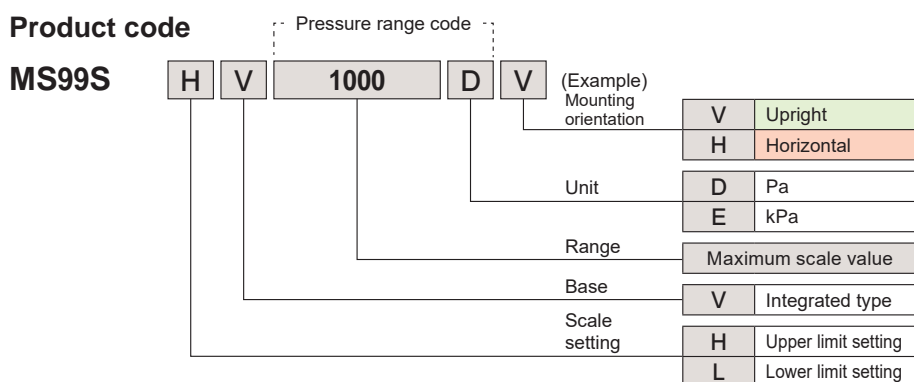
**<Main application fields>**

- General factory management equipment
- Negative pressure for dust collector/differential pressure of air conditioner
- Filter pressure loss management
- Precision machine manufacturing line
- Building air conditioning control equipment

**<Usage>**

- Detection of clogging of air filter
- Room pressure measurement in a clean room
- Measurement of clogging of bug filter
- Measurement of dynamic pressure at ventilation/exhaust device

\*(Refer to pages 114 to 117)



- ◆When making an inquiry or placing an order, specify the above product code.
- ◆There is no intrinsically safe fine differential pressure switch of the exchangeable base type.

### Specifications

Specifications	Integrated base type, for upper limit setting		Integrated base type, for lower limit setting	
	MS99SHV		MS99SLV	
<b>Pressure unit</b>	Pa, kPa	<b>Insulation resistance</b>  <b>Withstand voltage</b>  <b>Compatible pipe</b> <b>Terminal screw size</b> <b>Base polarity</b>  <b>Mass</b> <b>Accessories</b>  <b>Conforming standard</b> <b>Precautions</b>	Between terminal and case	20 MΩ or higher (500 V DC megger)
<b>Pressure measurement method</b>	Differential pressure method		Between terminal and case	1500 V AC 50/60 Hz for one minute
<b>Pressure-receiving element</b>	Diaphragm		Vinyl pipe or rubber pipe (inner diameter of 4 mm)	
<b>Contact material</b>	Silver alloy/gold plating		M4 (mountable terminal: outer diameter of φ8 or below)	
<b>Measured gas</b>	Air and noncorrosive gas (liquid cannot be measured)		Indicating high-pressure side and low-pressure side with "H" and "L" marks, respectively, at the piping connection base part.	
<b>Pressure setting method</b>	Setting by dial with scale			
<b>Mounting orientation</b>	Upright or horizontal		Approx. 190 g	
<b>Operating ambient temperature</b>	-10°C to +60°C (no freezing allowed)		Cable clamp (already installed on main body), rubber bushing (two types)	
<b>Operating ambient humidity</b>	90% RH or below (no condensation allowed)		RoHS directive	
<b>Exterior material</b>	Polycarbonate		When using this product in a combustible gas atmosphere, its structure must be intrinsically safe.	
<b>Durable vibration</b>	5 to 10 Hz, amplitude of 10 mm, 10 to 50 Hz, acceleration of 39 m/s <sup>2</sup> (two hours each for three axial directions)	When using this product, be sure to mount it by attaching the cover, cable clamp, and DIN rail mounting plate.		
<b>Durable impact</b>	100 m/s <sup>2</sup> (six times each for three axial directions)			

### Explosion-proof specifications

<b>Explosion-proof performance</b>	Intrinsically safe structure (Ex ia IIC T6 Ga)	<b>Internal inductance (Li)</b>	Ignorable value
<b>Applicable guidance</b>	Technical Guideline 2015 compliance with international standard JNIO SH-TR-46-1:2015 JNIO SH-TR-46-6:2015	<b>Internal capacitance (Ci)</b>	Ignorable value
<b>Intrinsically safe circuit tolerable voltage (Ui)</b>	14.4 V	<b>Equipment protection level (EPL)</b>	Ga
<b>Intrinsically safe circuit tolerable current (Ii)</b>	30 mA	<b>Protection level</b>	IP20
<b>Intrinsically safe circuit tolerable power (Pi)</b>	0.11 W	<b>Hazardous locations where this product can be installed*</b>	Special hazardous location Class I hazardous location Class II hazardous location

\*In all hazardous locations, positively prevent generation of spark, which could be an ignition source, due to impact or friction on this instrument.

Pressure range code	Pressure range	Mounting orientation <small>*It is necessary to specify the orientation at the time of order placement for all ranges.</small>	Scale setting accuracy (at 23°C)	Repeatability	Maximum operating pressure difference	Pressure-receiving element material	Withstanding pressures of instrument body and pressure-receiving element (Refer to page 118)
120 D	20–120 Pa	Horizontal or Upright	±5.0 Pa	±2.0 Pa	25.0 Pa	Silicone rubber	10 kPa
200 D	20–200 Pa		±9.0 Pa	±2.0 Pa	25.0 Pa		
300 D	30–300 Pa		±13.5 Pa	±3.0 Pa	30.0 Pa		
500 D	50–500 Pa		±22.5 Pa	±5.0 Pa	45.0 Pa		
1000 D	100–1000 Pa		±45 Pa	±10 Pa	70 Pa		
3 E	0.3–3 kPa		±0.135 kPa	±0.030 kPa	0.300 kPa		20 kPa
5 E	0.5–5 kPa		±0.225 kPa	±0.050 kPa	0.450 kPa		
10 E	1–10 kPa		±0.45 kPa	±0.10 kPa	0.70 kPa		
30 E	3–30 kPa		±1.35 kPa	±0.30 kPa	3.00 kPa		

◆For an overview of the structure, refer to page 38.

◆For contact and other materials, refer to page 42.

◆For the use environment, refer to page 118.

### Opening/closing capability

Rated voltage	Specifications	Resistance load
12 V DC	Contact configuration SPDT (single-pole double-throw) Electric service life 100,000 times or more	30 mA



### Accessories dedicated to MS99

RoHS

#### Cable clamp holder

(Auxiliary item)



This is already installed at the time of purchase of the instrument.

Item number	Material
ADPA-MS99	Polycarbonate

#### Cable clamp (Ohm Electric Co., Ltd.)

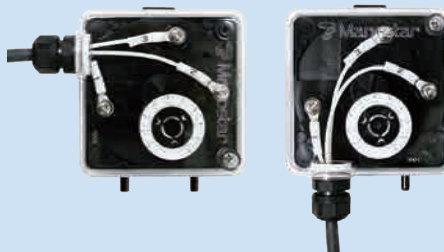
Mounting hole diameter:  $\phi 15$   
Mounting screw: M15 P=1

[Schematic figure of mounted cable clamp]

Only by changing the orientation of the transparent cover is it possible to change the wiring direction.



On the model MS99S, the OA-W15M-05 is equipped as standard, and rubber bushings OA-W15M-04 and OA-W15M-07 are attached as one each.



Item number	Compatible electric wire diameter	Material
OA-W15M-04	$\phi 2-4$	Nylon 66
OA-W15M-05	$\phi 3-5$	Polypropylene
OA-W15M-07	$\phi 5-7$	NBR



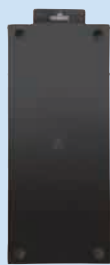
In mounting of the cable clamp to the instrument body, the supplied locknut is not used.

### Accessories dedicated to S type

RoHS

#### DIN rail mounting plate

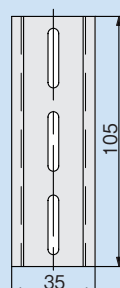
(Auxiliary item)



This is already installed at the time of purchase of the instrument.

Item number	Material
ADPL99S-DIN	Polyacetal/steel

#### DIN rail set



[Schematic figure of mounted DIN rail]



Item number	Material
DIN-99S	Aluminum/steel

## MS61A-RA

RoHS

### Small-size fine differential pressure switch

- Small-size/lightweight type that can be installed anywhere you like
- The operating pressure can be set only by adjusting the scale knob with one action.
- Unique mechanism less subject to abnormal high pressure inrush
- High-performance silicone rubber diaphragm with small hysteresis



**MS61A-RA**  
With built-in lead switch  
(single-pole normally open sealed type)

\*Model MS61A-RA, which came to be resold in September 2019, is not compliant with the UL standard.

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

#### <Main application fields>

- Part of semiconductor manufacturing equipment
- Negative pressure for dust collector/differential pressure of air conditioner
- Filter pressure loss management
- Precision machine manufacturing line
- General factory management equipment

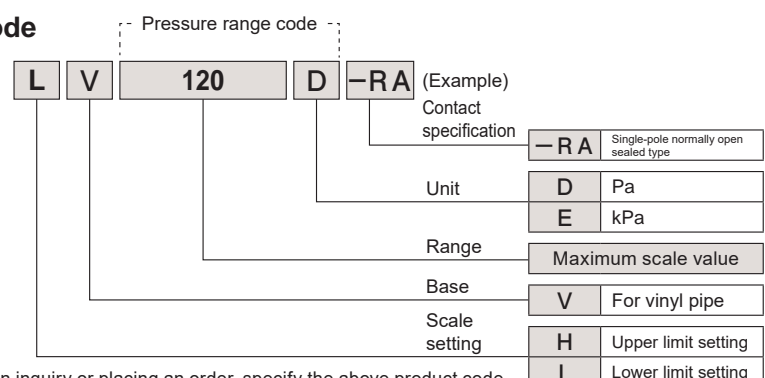
#### <Usage>

- Measurement of internal pressure of indoor device
- Detection of clogging of air filter
- Measurement of clogging of bug filter
- Measurement of dynamic pressure at ventilation/exhaust device
- Room pressure measurement in a clean room

\*(Refer to pages 114 to 117)

#### Product code

MS61A





### Specifications

Model	Instrument for upper limit setting		Instrument for lower limit setting	
	MS61AHV		MS61ALV	
Pressure unit	Pa, kPa	Durable vibration Durable impact Insulation resistance Withstand voltage Compatible pipe Terminal screw size Base polarity Mass Mounting screw size	5 to 10 Hz, amplitude of 10 mm, 10 to 50 Hz, acceleration of 39 m/s <sup>2</sup> (two hours each for three axial directions) 100 m/s <sup>2</sup> (six times each for three axial directions) Between terminal and case 20 MΩ or higher (500 V DC megger) Between terminal and case 500 V AC 50/60 Hz for one minute Vinyl pipe or rubber pipe (inner diameter of 4 mm) M3.5 outer diameter of φ8 or below Indicating high-pressure side and low-pressure side with "H" and "L" marks, respectively, at the piping connection base part. Approx. 140 g M4	
Pressure measurement method	Differential pressure method			
Pressure-receiving element	Diaphragm (silicone rubber)			
Measured gas	Air and noncorrosive gas (liquid cannot be measured)			
Pressure setting method	Setting by knob with scale			
Standard mounting orientation	Mounted at arbitrary angle between horizontal and upright			
Operating ambient temperature	-10°C to +50°C (no freezing allowed)			
Operating ambient humidity	90% RH or below (no condensation allowed)			
Instrument body withstanding pressure	100 kPa (refer to page 118)			
Withstanding pressure of pressure-receiving element	20 kPa (refer to page 118)			
Exterior material	Polyamide			
Pressure range code	Pressure range	Scale setting accuracy (at 20°C)	Maximum operating pressure difference	
120 D*	20–120 Pa	±5.0 Pa	37.5 Pa	
300 D	50–300 Pa	±15 Pa	60 Pa	
600 D	100–600 Pa	±25 Pa	120 Pa	
1.2 E	0.2–1.2 kPa	±0.050 kPa	0.240 kPa	
3 E	0.5–3 kPa	±0.15 kPa	0.60 kPa	
6 E	1–6 kPa	±0.30 kPa	1.20 kPa	

\*Instrument for upper limit setting cannot be manufactured.

- ◆ If you desire to procure a model with a mounting orientation other than above, such as downward and horizontal mounting and mounting orientation 135°, let us know in advance because adjustment needs to be made before shipment from the factory.
- ◆ For use environment, refer to page 118.

### Opening/closing capability

Contact type	Specifications	Rating	Opening/closing voltage	Opening/closing current	Opening/closing power
Single-pole normally open sealed type	Contact configuration: SPST (Single Pole Single Throw) N.O. Electric service life: 100,000 times or more Contact structure: Lead switch	0.1 A–30 V DC	100 V DC (maximum)	0.25 A DC (maximum)	10 W DC (maximum)



The product may malfunction from the influence of the external magnetic field. Install the product at a sufficient distance from the circuit with high voltage and large current, apply a magnetism shield as necessary, and use the product after sufficiently checking its operation.

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

## MS61A-RA

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

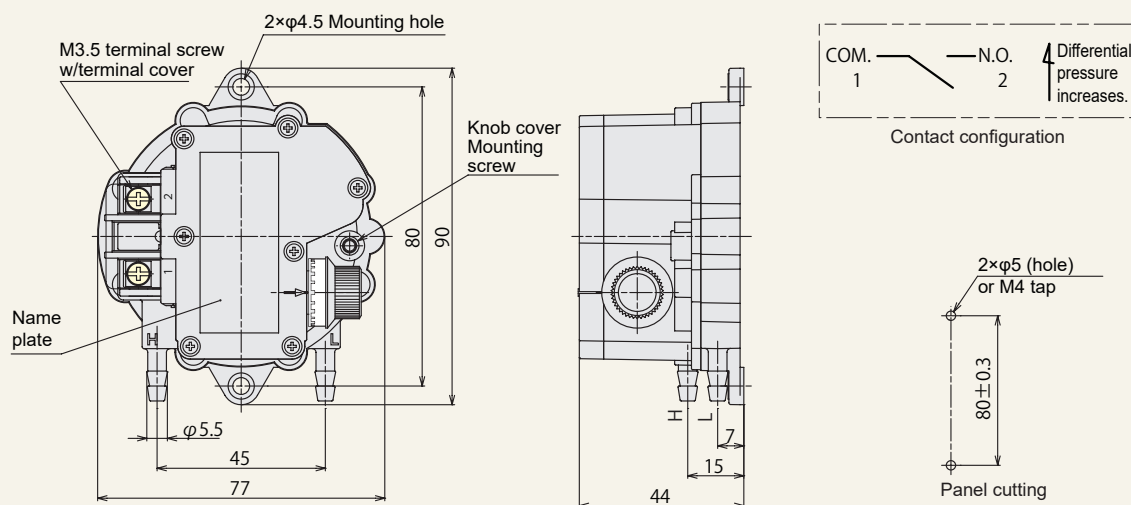
Application

Precautions

Maintenance

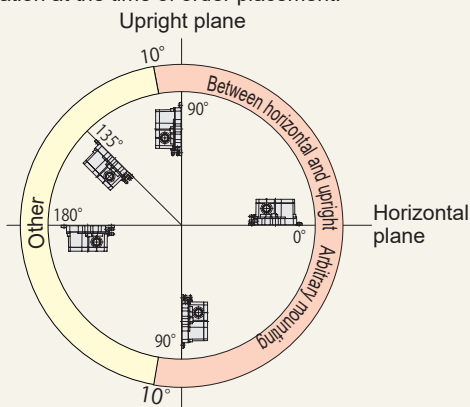
### External dimension drawing

MS61A-RA w/built-in lead switch (single-pole normally open sealed type)

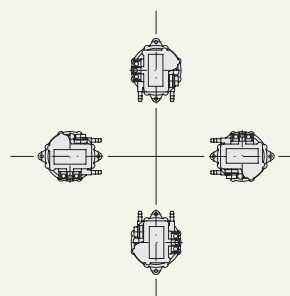


### Mounting orientation and range

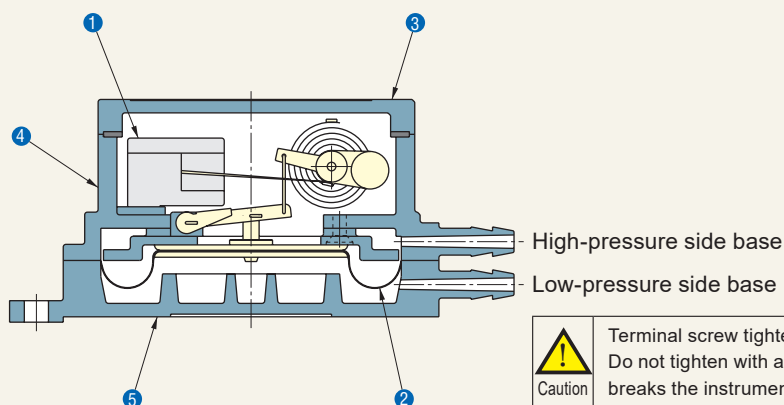
The switch can be mounted at arbitrary angle between horizontal and upright. For other mounting orientations, it is necessary to specify the orientation at the time of order placement.



The instrument can be mounted on the mounting panel in an arbitrary manner.



### Overview of structure



Number	Name
1	Microswitch
2	Diaphragm
3	Cover
4	Housing
5	Base




Caution

Terminal screw tightening torque: 0.7 to 1.0 N·m  
Do not tighten with a greater force than necessary because doing so breaks the instrument body.

### Accessories dedicated to MS61A

RoHS


**Knob cover set**



This is to protect the scale knob for setting use from inadvertent turning after setting.

Item number	Material
TCVRA-61	Brass/steel

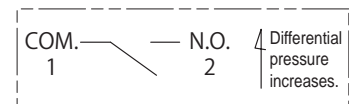
**Terminal cover**  
(Auxiliary item)



Item number	Material
TCA-61A	Polycarbonate

### Configuration of switch contact

- The contact configuration of this instrument is as shown on the right.
- When no differential pressure (pressure) is applied to the instrument, the section between COM. (1) and N.O. (2) is open.
- When the differential pressure increases and reaches the set pressure, the contact is switched and the section between COM. (1) and N.O. (2) turns to be closed.



### Upper limit setting and lower limit setting

The pressure at which the electric contact of the switch is triggered as the differential pressure (pressure) applied to the instrument has increased from zero is referred to as the set pressure.

Then, the pressure at which the contact has returned to the former state as the differential pressure has decreased from the use condition at a pressure greater than the set pressure, and the electric contact has been triggered is referred to as the reset pressure.

The set pressure and reset pressure mentioned above are not the same values, but are slightly different from each other. This difference is referred to as the operating pressure difference (dead band).

This instrument has two variations: one with the scale of setting dial set to the set pressure; and the other with the scale set to the reset pressure.

This instrument with the scale set to the set pressure is referred to as the instrument for upper limit setting, and the instrument with the scale set to the reset pressure is referred to as the instrument for lower limit setting.

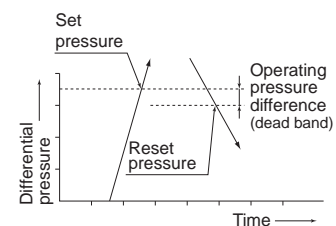


Figure for explanation of operating pressure difference

When the setting pressure is set to 100 Pa in the pressure range of 50 to 300 Pa for example (operating pressure difference is assumed to be 60 Pa)

Scale setting	Setting dial scale adjustment	Contact action
<b>Instrument for upper limit setting</b>	Adjustment is made by means of set pressure.	When the differential pressure increases, the section between N.O. (2) and COM. (1) closes at 100 Pa. Then, when the differential pressure decreases, the section between N.O. (2) and COM. (1) opens at 40 Pa.
<b>Instrument for lower limit setting</b>	Adjustment is made by means of reset pressure.	When the differential pressure increases, the section between N.O. (2) and COM. (1) closes at 160 Pa. Then, when the differential pressure decreases, the section between N.O. (2) and COM. (1) opens at 100 Pa.



It is not possible to change from the upper limit setting to the lower limit setting and vice versa.

## QDP33

**NEW**



RoHS

### 30×30 type digital fine differential pressure sensor

- Mounted with our originally developed electrostatic capacity type pressure sensor.
- Industry's smallest size with a sensor, a display, and output function incorporated in 30 mm square size.
- Close-contact mounting is possible.
- Employs easily visible large 12-segment LCD.
- Product compliant with UL standard and EU directive.
- An ultra-low pressure range product is newly added to the product lineup. Product with 0 to 10 Pa range is optimum for room pressure measurement of clean rooms compliant with the CDC guideline and negative pressure rooms.



QDP33

### Installation example



Horizontal connection



Vertical connection

#### <Main application fields>

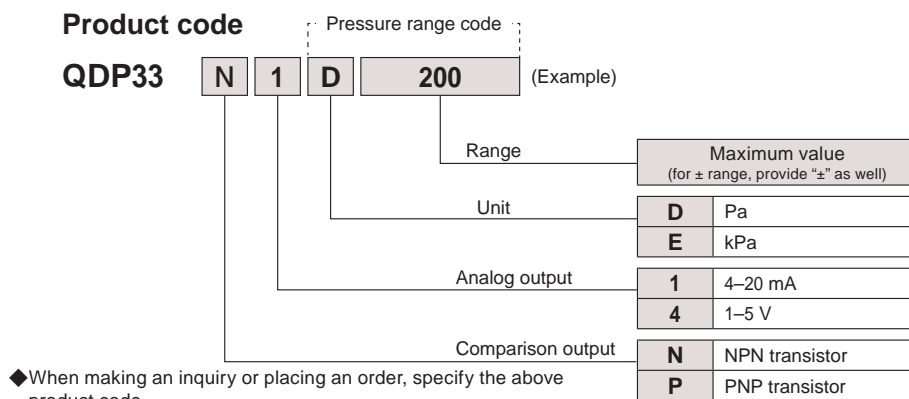
- General factory management equipment
- Negative pressure for dust collector/differential pressure of air conditioner
- Filter pressure loss management
- Precision machine manufacturing line
- Building air conditioning control equipment

#### <Usage>

- Detection of clogging of air filter
- Room pressure measurement in a clean room
- Measurement of clogging of bug filter
- Measurement of dynamic pressure at ventilation/exhaust device

#### Product code

QDP33 **N** **1** **D** **200** (Example)



\*(Refer to pages 114 to 117)

### Specifications

Model	QDP33	
<b>Pressure unit</b>	Pa, kPa	
<b>Pressure measurement method</b>	Differential pressure method	
<b>Measured gas</b>	Air and noncorrosive gas (liquid cannot be measured)	
<b>Sensor method</b>	Electrostatic capacity type	
<b>Pressure-receiving element</b>	Diaphragm (silicone)	
<b>Mounting orientation</b>	Mounting on vertical surface	
<b>Operating ambient temperature</b>	D10, D25, D ± 10, D ± 25: 0°C to 50°C (no freezing allowed) Other pressure range codes: 0°C to 60°C (no freezing allowed)	
<b>Operating ambient humidity</b>	35% to 85% RH or below (no condensation allowed)	
<b>Instrument body withstanding pressure</b>	10 kPa (refer to page 118)	
<b>Withstanding pressure of pressure-receiving element</b>	10 kPa (refer to page 118)	
<b>Display</b>	Main display 12-segment LCD (white/red), four digits Sub display 12-segment LCD (orange), four digits Accuracy D10, D25, D ± 10, and D ± 25: ± 1.5% FS ± 1 digit (at 23°C) Other pressure range codes: ± 1.0% FS ± 1 digit (at 23°C) Temperature characteristics ± 0.15% FS/°C (zero + span)	
<b>Zero adjustment method</b>	Push-type automatic zero return (The displayed value and analog output are adjusted to zero at the same time.)	
<b>Comparison output</b>	Setting method: push-type digital setting Output display Red LCD × 2 Output type • QDP33N Two systems of NPN open collector Maximum load current: 100 mA or lower (per output) Maximum load voltage: 30 V DC or lower Output saturated voltage: 1 V DC or lower (at load current of 100 mA) • QDP33P Two systems of PNP open collector Maximum load current: 100 mA or lower (per output) Maximum load voltage: 30 V DC or lower Output saturated voltage: 2 V DC or lower (at load current of 100 mA)	
<b>Analog output</b>	Accuracy Pressure range codes D10, D25, D ± 10, and D ± 25: ± 1.5% FS (at 23°C) Other pressure range codes: ± 1.0% FS (at 23°C) Temperature characteristics ± 0.15% FS/°C (zero + span) Output type • QDP33□1 4 to 20 mA (biased pressure: 0 to FS, ±: at pressure of -50 to +50% FS) Load resistance: 0 to 250 Ω • QDP33□4 1 to 5 V (biased pressure: 0 to FS, ±: at pressure of -50 to +50% FS) Load resistance: 10 kΩ or higher	
<b>Power voltage</b>	12 to 24 V DC ± 10% (ripple of 10% or below)	
<b>Maximum consumption current</b>	Normal mode 25 mA (at power voltage of 24 V) Low power consumption mode 20 mA (at power voltage of 24 V) *Excluding consumption currents in analog output and comparison output	
<b>Insulation resistance</b>	Between terminal and case 10 MΩ or higher (500 V DC megger)	
<b>Withstand voltage</b>	Between terminal and case 500 V AC, 50/60 Hz, for one minute	
<b>Installation category</b>	Standard IEC 60664 level II (However, this product must be connected to the secondary side of a safety insulation transformer, such as DC switching power.)	
<b>Operating altitude</b>	Altitude of 2000 m or below	
<b>Protection level</b>	Standard: IEC 60529 Grade code: IP40	
<b>Degree of contamination</b>	Standard: IEC 60664 Grade code: 2 (If it is not possible to install this product at a dry clean location, house it in a housing.)	
<b>Durable vibration</b>	5 to 10 Hz, amplitude of 10 mm 10 to 50 Hz, acceleration of 39 m/s <sup>2</sup> (two hours each for three axial directions)	
<b>Durable impact</b>	100 m/s <sup>2</sup> (six times each for three axial directions)	
<b>Exterior material</b>	PBT and polyamide	
<b>Pressure port</b>	M5 internal thread Metallic barb fitting (already installed on main body) Applicable tube size: internal diameter of 4 mm	
<b>Base polarity</b>	Indicating high-pressure side and low-pressure side with "H" and "L" marks, respectively, at pressure port.	
<b>Connector</b>	RITS Connector 6P (TE Connectivity)	
<b>Mass</b>	Approx. 30 g	
<b>Accessories</b>	None (wiring-side connector and mounting parts are sold separately)	

Pressure range code	Rating pressure range	LCD display	Comparison output	Analog output
D 10	0-10 Pa	0.00-10.00		
D 25	0-25 Pa	0.00-25.00		
D 50	0-50 Pa	0.0-50.0		
D 100	0-100 Pa	0.0-100.0		
D 200	0-200 Pa	0-200		
D 300	0-300 Pa	0-300		
D 500	0-500 Pa	0-500		
D 1000	0-1000 Pa	0-1000		
E 1	0-1 kPa	0.00-1.00	NPN transistor	4-20 mA
E 2	0-2 kPa	0.00-2.00	or	or
D +- 10	-10 to +10 Pa	-10.00 to 10.00	PNP transistor	1-5 V
D +- 25	-25 to +25 Pa	-25.0 to 25.0		
D +- 50	-50 to +50 Pa	-50.0 to 50.0		
D +-100	-100 to +100 Pa	-100 to 100		
D +-200	-200 to +200 Pa	-200 to 200		
D +-300	-300 to +300 Pa	-300 to 300		
D +-500	-500 to +500 Pa	-500 to 500		
D +-1000	-1000 to +1000 Pa	-1000 to 1000		
E +-1	-1 to +1 kPa	-1.00 to 1.00		
E +-2	-2 to +2 kPa	-2.00 to 2.00		

◆ For use environment, refer to page 118.

<p><b>Conforming standards</b></p> <p>1. EU directive This product is compliant with the EMC directive of EU. EMC directive basic requirements Standard No. ....EN 61326-1 This product in combination with HWS15A-24/A (TDK-Lambda Corporation) is confirmed to be compliant with the EMC directive. When using this product with other power unit, have the final system go through the EMC test.</p> <p>2. UL standard This product is certified as an UL standard recognition part. It is also certified with Canada Standard (C-UL). However, use this product in accordance with the installation conditions shown in (3) below. (1) Requirements standard No.....UL 61010-1 (2) File No. ....E220685 (3) Installation condition .....As the DC power source to be connected to this product, use the NEC (National Electrical Code) Class 2 power source or LPS (Limited Power Source) power source.</p>
---

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

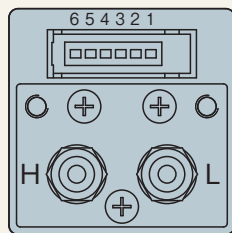
Application

Precautions

Maintenance



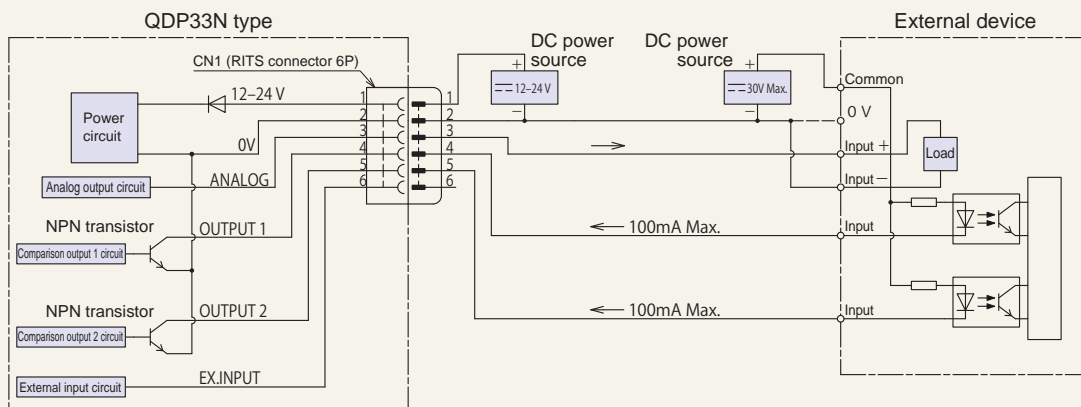
### Terminal arrangement drawing



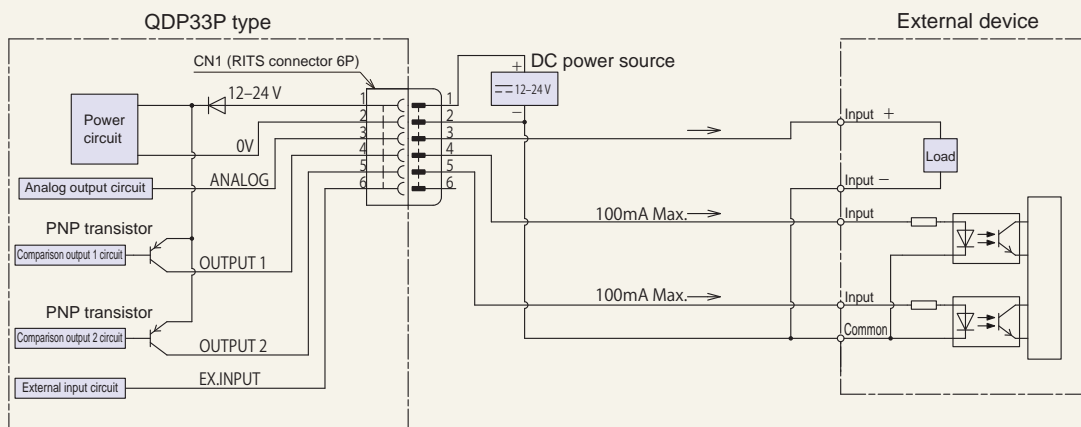
- Pin 1: Power + (12 to 24 V DC)
- Pin 2: Power - (0 V)
- Pin 3: Analog output +
- Pin 4: Comparison output 1
- Pin 5: Comparison output 2
- Pin 6: NC (unused terminal)

### Connection example

#### Comparison output: NPN transistor type



#### Comparison output: PNP transistor type



## QDP33

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

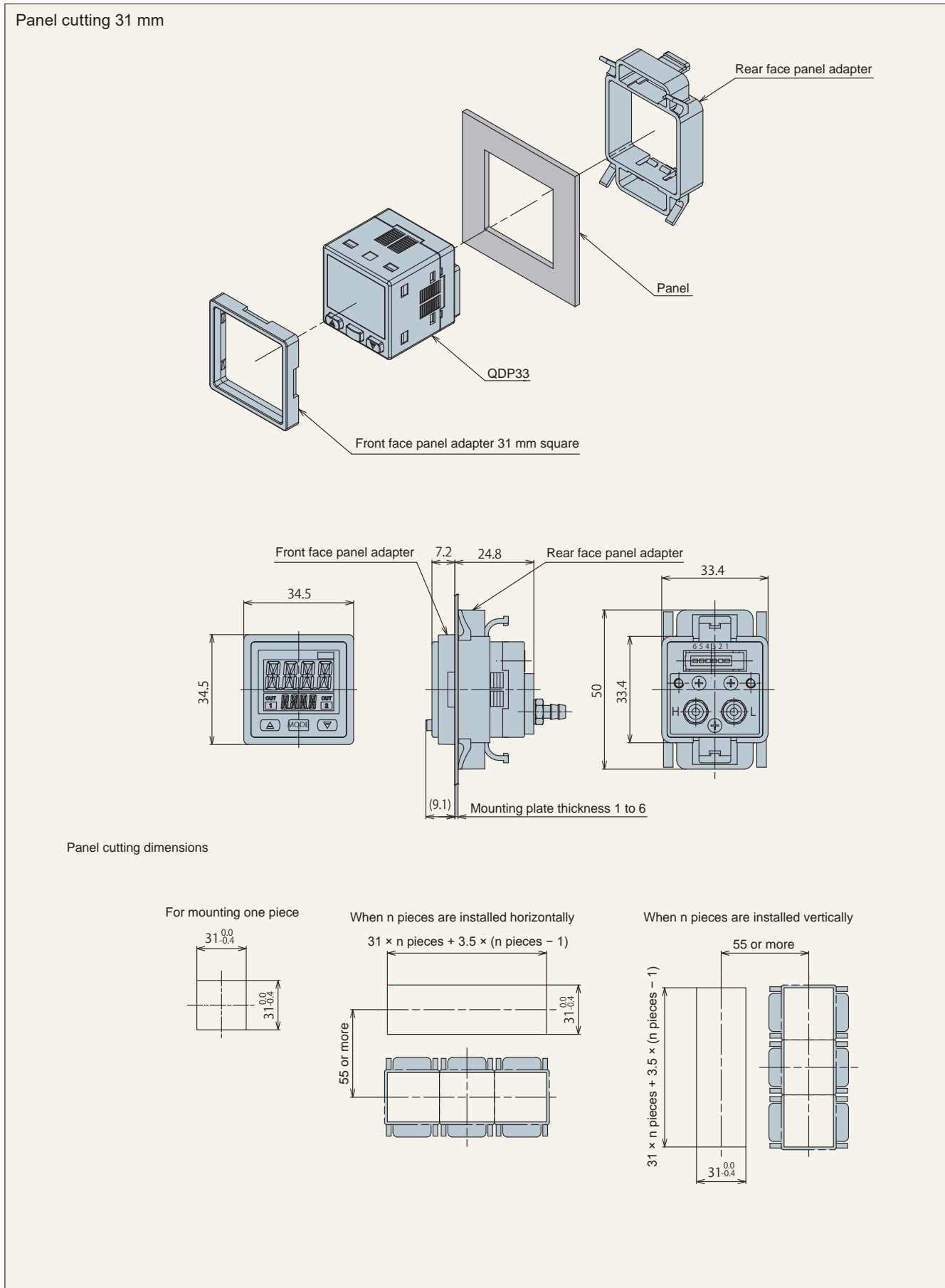
Accessories

Application

Precautions

Maintenance

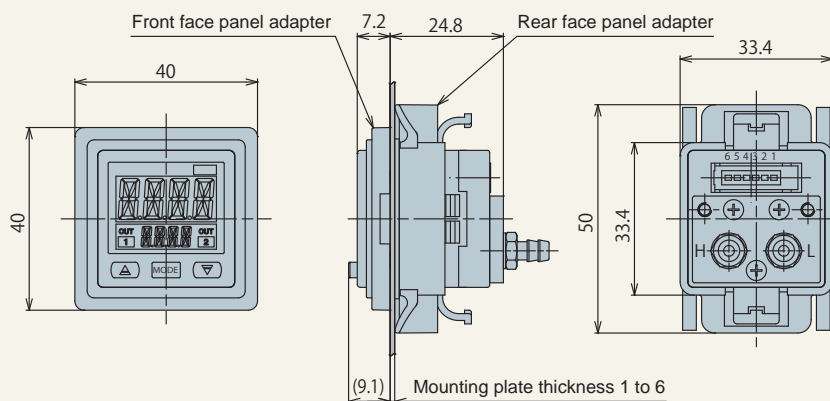
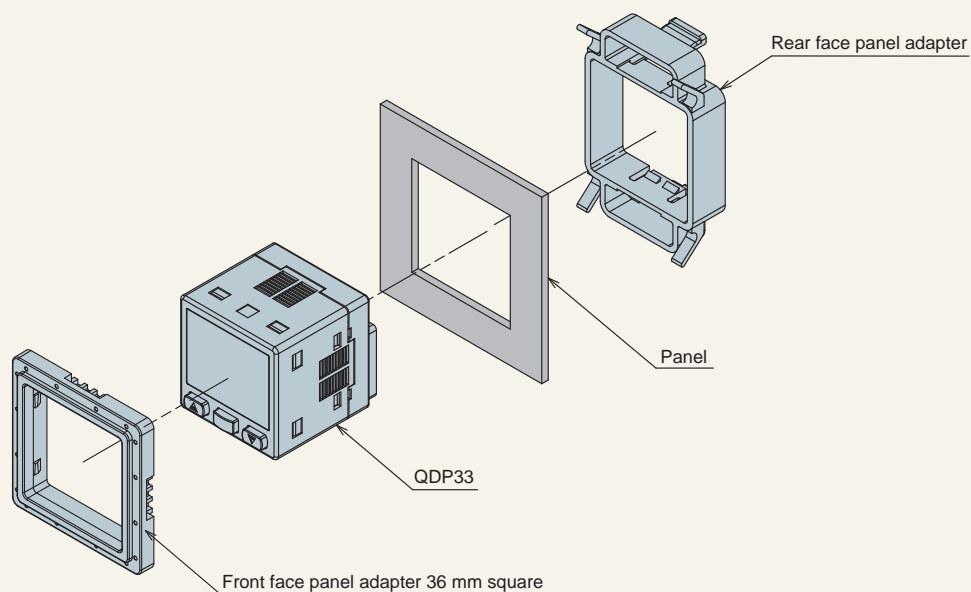
### Panel mounting diagram and panel cutting dimensions





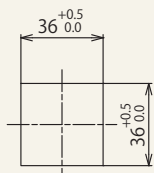
### Panel mounting diagram and panel cutting dimensions

Panel cutting 36 mm

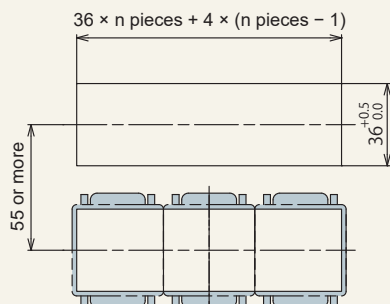


Panel cutting dimensions

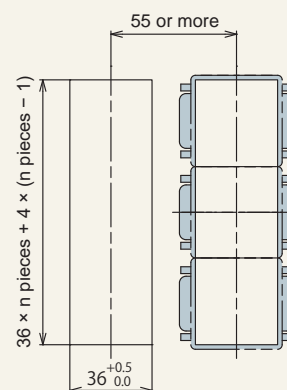
For mounting one piece



When n pieces are installed horizontally



When n pieces are installed vertically



List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

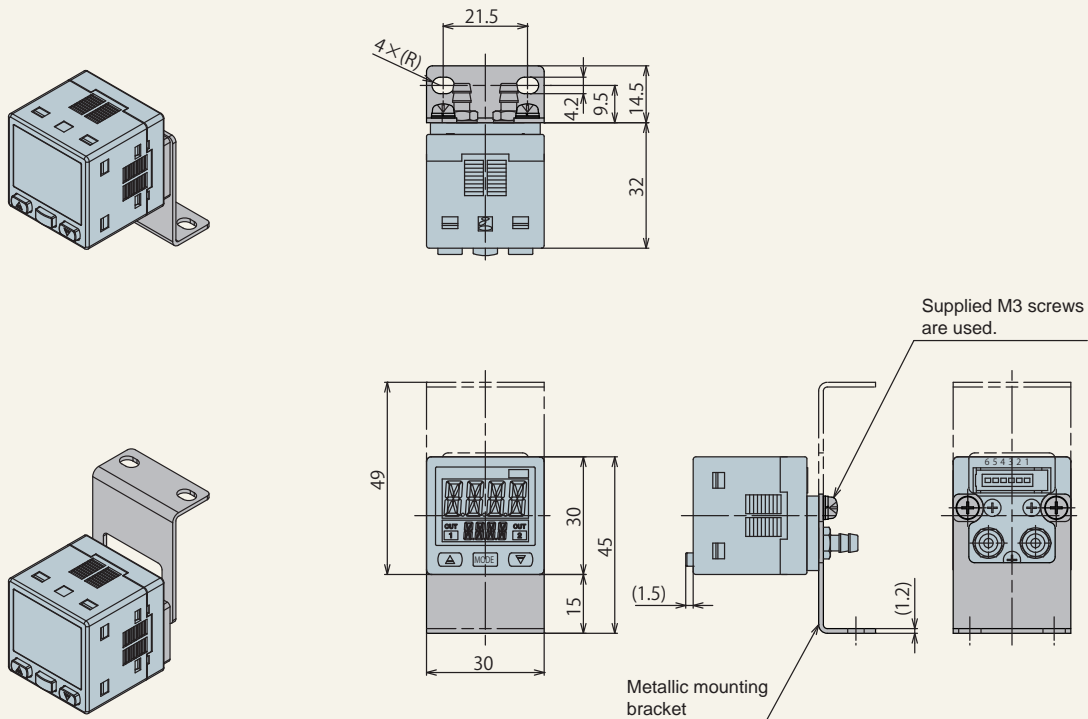
Application

Precautions

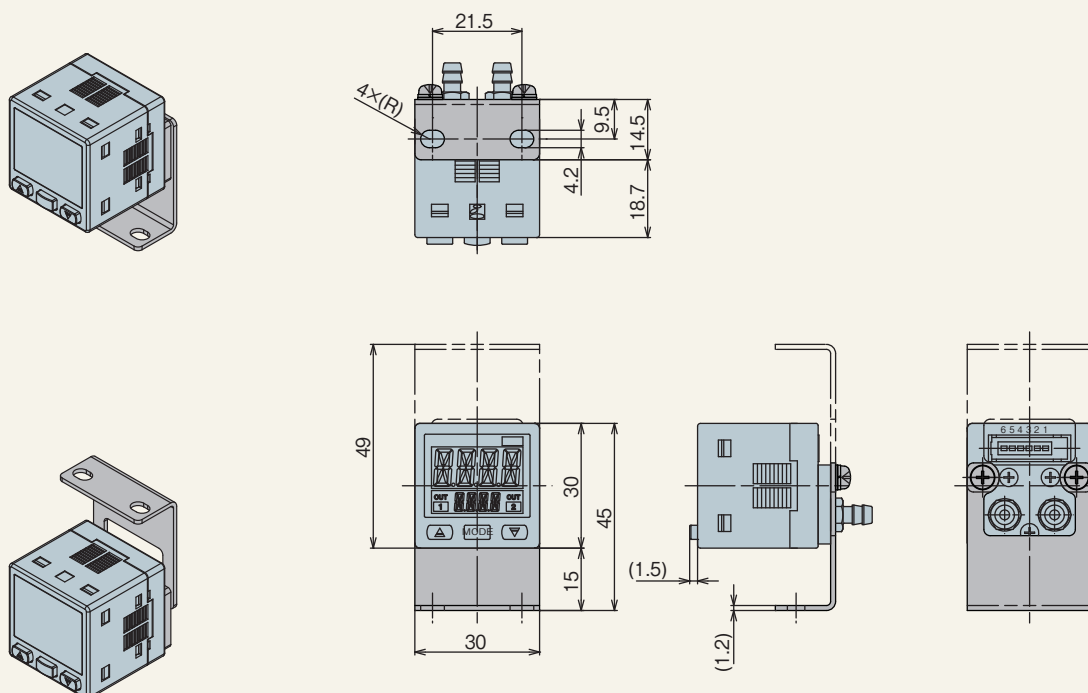
Maintenance

### Metallic bracket set for mounting use (separately sold) Installation diagram

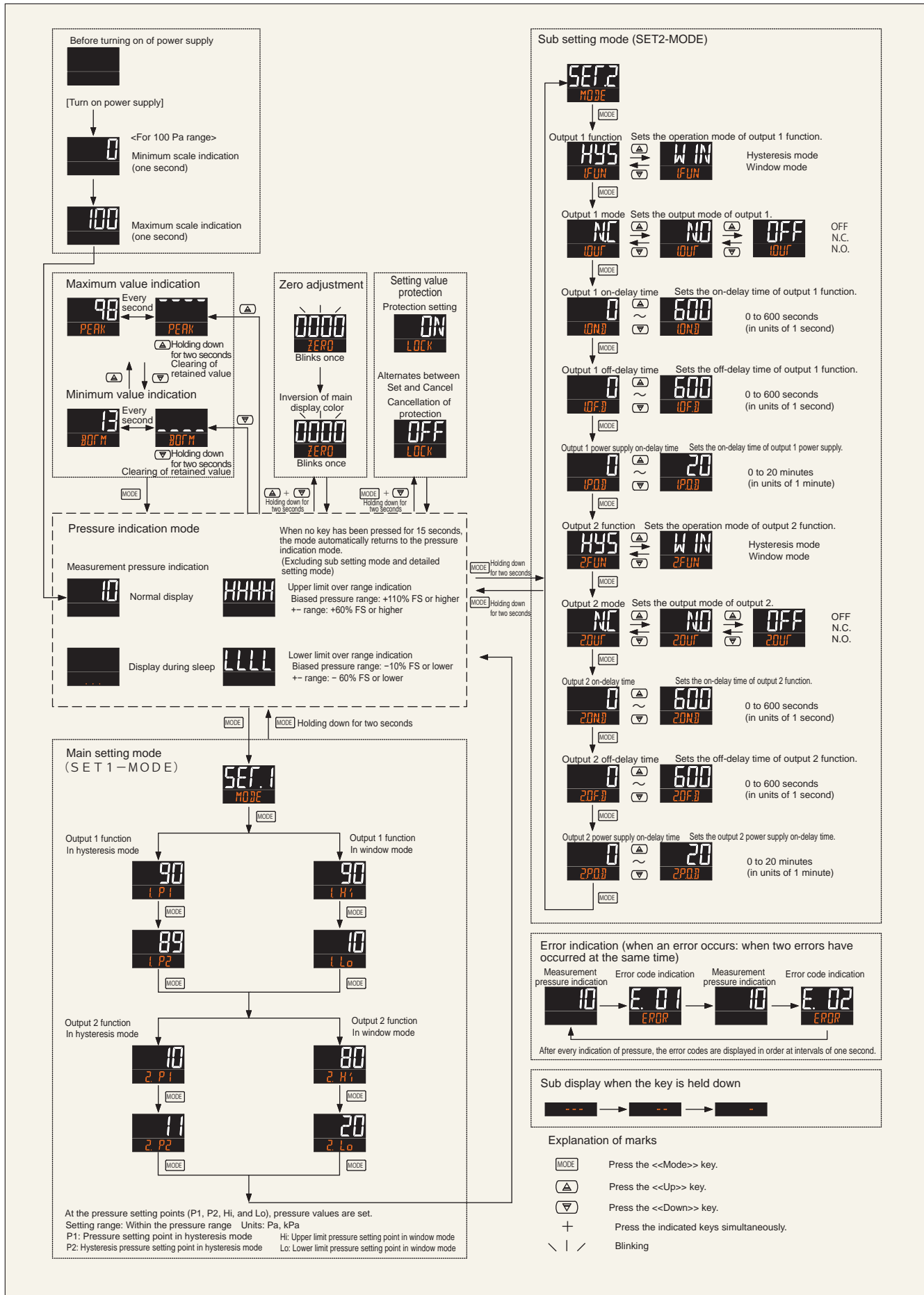
Installation direction pattern 1



Installation direction pattern 2



### Mode changeover (1)



## QDP33

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

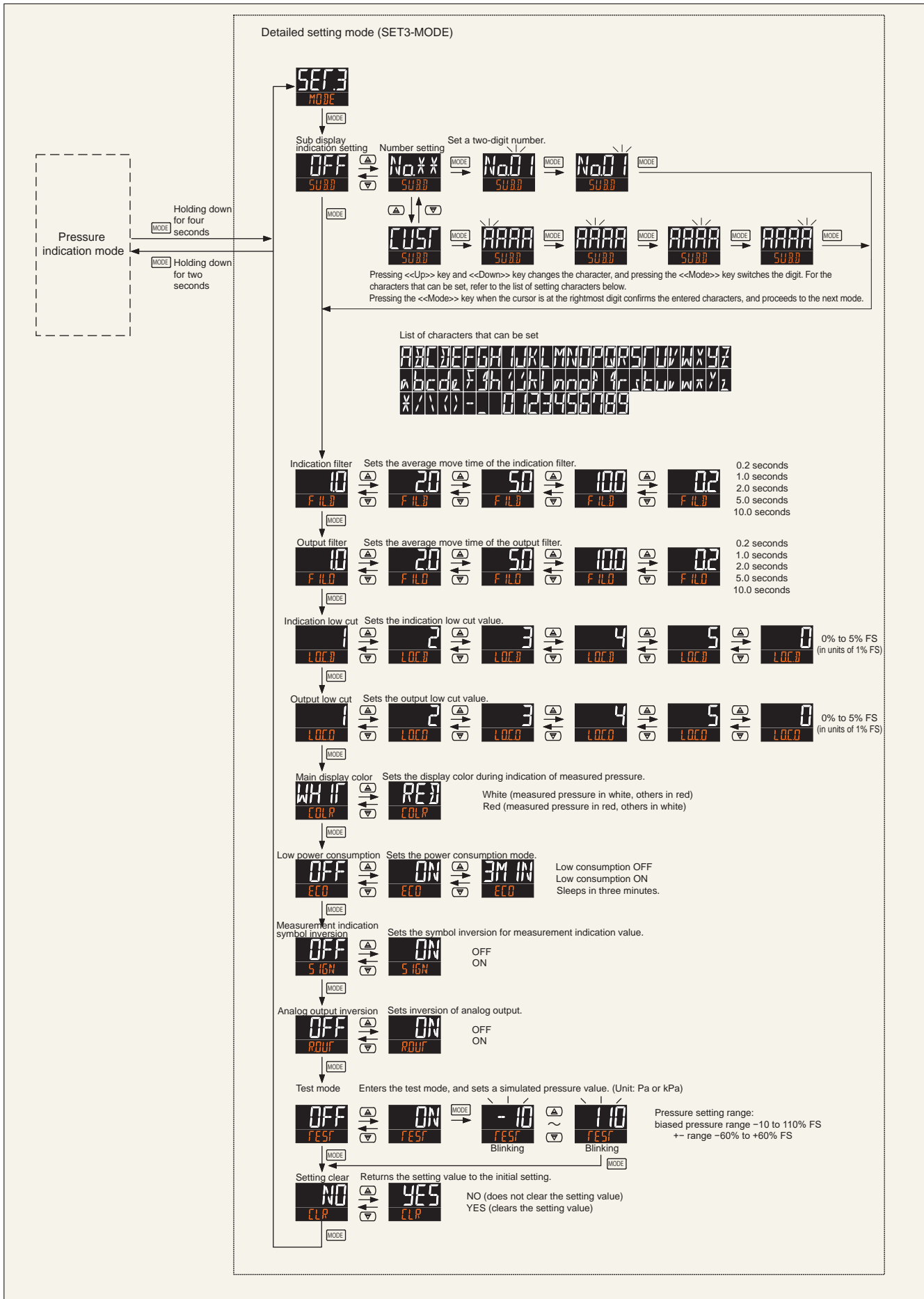
Accessories

Application

Precautions

Maintenance

### Mode changeover (2)



### Comparison function operation diagrams

**Comparison function**  
Hysteresis mode: upper limit setting ( $P1 > P2$ )

Pressure condition: Normal → Abnormal → Normal

**Comparison output condition**

Output mode	OFF	Normally open (OFF)		
N.C.	Close (ON)	Open (OFF)	Close (ON)	Close (ON)
N.O.	Open (OFF)	Close (ON)	Open (OFF)	Open (OFF)

**Operation explanation:** Detects an abnormal pressure rise, and activates comparison output. When the output mode is set to N.C., the output will open (OFF) when the applied pressure exceeds the setting value P1, and will close (ON) when the pressure falls below P2.

**Power on-delay timer:** During the operation of the timer, the comparison output will forcefully open (OFF).

**Comparison function**  
Hysteresis mode: lower limit setting ( $P1 < P2$ )

Pressure condition: Normal → Abnormal → Normal

**Comparison output condition**

Output mode	OFF	Normally open (OFF)		
N.C.	Close (ON)	Open (OFF)	Close (ON)	Close (ON)
N.O.	Open (OFF)	Close (ON)	Open (OFF)	Open (OFF)

**Operation explanation:** Detects an abnormal pressure drop, and activates comparison output. When the output mode is set to N.C., the output will open (OFF) when the applied pressure falls below the setting value P1, and will close (ON) when the pressure exceeds P2.

**Power on-delay timer:** During the operation of the timer, the comparison output will forcefully open (OFF).

**Comparison function**  
Window mode: internal area ( $Hi > Lo$ )

Pressure condition: Abnormal → Normal → Abnormal → Normal → Abnormal

**Comparison output condition**

Output mode	OFF	Normally open (OFF)				
N.C.	Open (OFF)	Close (ON)	Open (OFF)	Close (ON)	Open (OFF)	Close (ON)
N.O.	Close (ON)	Open (OFF)	Close (ON)	Open (OFF)	Close (ON)	Open (OFF)

**Operation explanation:** The comparison operation is performed in the range of the set pressure area from Lo to Hi (window). When the output mode is set to N.C., the output will close (ON) when the applied pressure is within the range (window) and will open (OFF) when the pressure is out of the range.

**Power on-delay timer:** During the operation of the timer, the comparison output will forcefully open (OFF).

**Comparison function**  
Window mode: external area ( $Hi < Lo$ )

Pressure condition: Normal → Abnormal → Normal → Abnormal → Normal

**Comparison output condition**

Output mode	OFF	Normally open (OFF)				
N.C.	Close (ON)	Open (OFF)	Close (ON)	Open (OFF)	Close (ON)	Open (OFF)
N.O.	Open (OFF)	Close (ON)	Open (OFF)	Close (ON)	Open (OFF)	Close (ON)

**Operation explanation:** The comparison operation is performed in the range outside the set pressure area from Hi to Lo. When the output mode is set to N.C., the output will close (ON) when the applied pressure is out of the range, and will open (OFF) when the pressure is within the range.

**Power on-delay timer:** During the operation of the timer, the comparison output will forcefully open (OFF).

**Comparison output delay (On, Off, Power supply on)**

**Comparison output**: Open (OFF) → Close (ON) → Open (OFF) → Close (ON)

**Operation explanation:** Regardless of the output mode setting (N.C., N.O.), the close and open (ON and OFF) timings of output transistor are delayed by the set delay time.

**Power on-delay timer:** During the operation of the timer, the comparison output will forcefully open (OFF).

## QDP33

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

### QDP33 accessories

RoHS

RITS 5P cable w/connector			
<p>This is a cable with connector used for connection with QDP33. In the sheath cable and other constituting parts of this product, vinyl chloride is not intentionally used. RITS plugs and connectors are products of TE Connectivity.</p>			
Item number	Cover color	Core wire insulation sheath color	Terminal number
CAB-RITS5-15	Yellow	Brown	①
		Blue	②
		Pink	③
		Black	④
		White	⑤
<p>This product is not UL-certified.</p>		<p>Core wire sheath outer diameter: 1.0 mm Standard: AWG#24</p>	

RITS plug/connector 5P (TE Connectivity)			
<p>This is a wiring side plug/connector used on QDP33.</p>			
Item number	Color	Applicable wiring	
		Nominal cross-section area	Finish outer diameter
1473562-5	Yellow	0.1–0.5 mm <sup>2</sup>	1.0–1.15 mm
<p>When crimping of connector is performed, use the dedicated tool (item number: 1729940-1 from TE Connectivity). For other RITS connectors and details, contact TE Connectivity.</p>		<p>*Cable is not supplied.</p>	

### QDP33 accessories

RoHS

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

#### VT base (Nihon Pisco Co., Ltd.)



Item number	Material
KGAVT-M5	Brass

It is possible to connect a vinyl pipe or rubber pipe with an inner diameter of 4 mm. This is already installed at the time of purchase of the instrument.

#### PT base (Nihon Pisco Co., Ltd.)



Item number	Material
KGAPT-M5	Brass, PBT, NBR

The tube mounting part is a push-in joint. For piping, use the separately sold tube or a tube compliant with JIS B 8381-1. (Outer diameter of connectable tube: 6 mm) For mounting, a hex wrench with a width across flats of 2.5 mm is necessary.

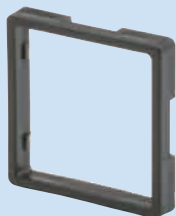
#### PR base (Nihon Pisco Co., Ltd.)



Item number	Material
KGAPR-M5	Brass, PBT, NBR

The tube mounting part is a rotary elbow push-in joint. The piping is same as that for PT base. For mounting, a hex wrench with a width across flats of 3 mm is necessary.

#### Front face panel adapter 31 mm square



Item number	Material
ADP33-31	Polypropylene

For panel cutting 31×31 mm  
When installing the instrument body in a panel, this product is used in combination with the rear face panel adapter.

#### Front face panel adapter 36 mm square



Item number	Material
ADP33-36	Polypropylene

For panel cutting 36×36 mm  
When installing the instrument body in a panel, this product is used in combination with the rear face panel adapter.

#### Rear face panel adapter



Item number	Material
ADP33-B	Polypropylene

When installing the instrument body in a panel, this product is used in combination with the front face panel adapter.

#### Metallic bracket set for mounting use



Item number	Material
BRKT-QDP	Steel

This is used when installing the instrument body on a floor surface or ceiling surface.

#### Color cap for PT base/PR base (Nihon Pisco Co., Ltd.)

##### High-pressure side



Item number	Material
KGACAPM6-H	Polyacetal

##### Low-pressure side



Item number	Material
KGACAPM6-L	Polyacetal

This helps identify the high-pressure side and low-pressure side and prevents the tube from being disconnected because of an erroneous operation.

## EMD8A



RoHS

### 24×48 type digital fine differential pressure sensor

- Product compliant with the UL standard and the EU directive
- Designed with consideration for ease of incorporation into the device, such as employment of RITS connector and snap-in type panel mounting method
- The displacement sensor employs a high-performance diaphragm and a differential inductance method.
- Variation of fourteen ranges in total, including five zero center range types
- Easily visible 12 mm high red LED display
- Equipped with a variety of functions that include a movement average filter, maximum/minimum value memory, and comparison output
- Sign inversion function convenient for negative pressure measurement (negative value indication is possible)



EMD8A

\*The wiring side connector and cable are not supplied. If they are necessary, use the RITS plug/connector 5P (refer to page 70).

#### <Main application fields>

- Semiconductor manufacturing equipment
- Negative pressure for dust collector/differential pressure of air conditioners
- Filter pressure loss management
- Precision machine manufacturing line
- General factory management equipment

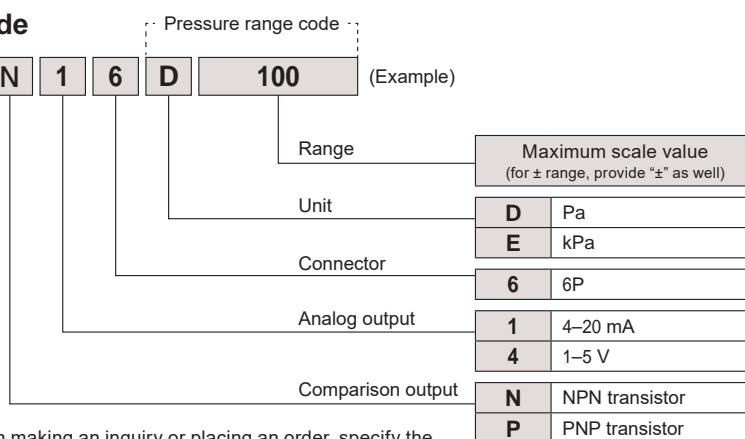
#### <Usage>

- Measurement of internal pressure of indoor device
- Detection of clogging of air filter
- Measurement of clogging of bug filter
- Measurement of dynamic pressure at ventilation/exhaust device
- Room pressure measurement in a clean room

\*(Refer to pages 114 to 117)

#### Product code

EMD8A N 1 6 D 100 (Example)



◆When making an inquiry or placing an order, specify the above product code.

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance



### Specifications

Model	EMD8A			
Pressure unit	Pa, kPa	Analog output	Accuracy $\pm 1.5\%$ FS (at 20°C) Temperature characteristics $\pm 0.15\%$ FS/°C (zero + span) Output type • EMD8A□1 4 to 20 mA (biased pressure: 0 to FS, $\pm$ : at pressure of -50% to +50% FS) Load resistance: 0 to 250 $\Omega$ • EMD8A□4 1 to 5 V (biased pressure: 0 to FS, $\pm$ : at pressure of -50% to +50% FS) Load resistance: 10 k $\Omega$ or higher	
Pressure measurement method	Differential pressure method	Power voltage	12 to 24 V DC $\pm 10\%$ (ripple of 10% or below)	
Measured gas	Air and noncorrosive gas (liquid cannot be measured)	Maximum consumption current	• EMD8AN (comparison output: NPN transistor type) Total consumption: 100 mA (internal consumption only) • EMD8AP (comparison output: PNP transistor type) Internal consumption: 100 mA Total consumption: 300 mA (including load current for comparison output of 100 mA $\times$ 2)	
Pressure-receiving element	Diaphragm (silicone rubber)	Insulation resistance	Between terminal and case: 10 M $\Omega$ or higher (500 V DC megger)	
Mounting orientation	Mounting on vertical surface	Withstand voltage	Between terminal and case: 500 V AC, 50/60 Hz, for one minute	
Operating ambient temperature	0°C to 60°C (no freezing allowed)	Installation category	Standard IEC 60664 level II (However, this product must be connected to the secondary side of a safety insulation transformer such as DC switching power.)	
Operating ambient humidity	35% to 85% RH (no condensation allowed)	Operating altitude	Altitude of 2000 m or below	
Instrument body withstanding pressure	10 kPa (refer to page 118)	Protection level	Standard: IEC 60529 Grade code: IP40 (front panel)	
Withstanding pressure of pressure-receiving element	10 kPa (refer to page 118)	Degree of contamination	Standard: IEC 60664 Grade: 2 (If it is not possible to install this product in a dry clean location, house it in a housing.)	
Exterior material	Polycarbonate	Durable vibration	5 to 10 Hz Amplitude of 10 mm, 10 to 50 Hz Acceleration of 39 m/s <sup>2</sup> (two hours each for three axial directions)	
Electric signal conversion method	Variable inductance	Durable impact	100 m/s <sup>2</sup> (six times each for three axial directions)	
Display	Display section 7-segment LED, red 3-1/2 digits Accuracy $\pm 1.5\%$ FS $\pm 1$ digit (at 20°C) Temperature (characteristics) $\pm 0.15\%$ FS/°C (zero + span)	Compatible pipe	Vinyl pipe or rubber pipe (inner diameter of 4 mm)	
Zero adjustment method	Push-type automatic zero return (The displayed value and analog output are adjusted to zero at the same time.)	Base polarity	Indicating high-pressure side and low-pressure side with "HIGH" and "LOW" marks, respectively, at piping connection base part.	
Comparison output	Setting method Push-type digital setting Output display Red LED $\times 2$ Output type • EMD8AN Two systems of NPN open collector Maximum load current: 100 mA or lower (per output) Maximum load voltage: 30 V DC or lower Output saturated voltage: 1 V DC or lower (at load current of 100 mA) • EMD8AP Two systems of PNP open collector Maximum load current: 100 mA or lower (per output) Maximum load voltage: 30 V DC or lower Output saturated voltage: 2 V DC or lower (at load current of 100 mA)	Connector	RITS Connector 6P (TE Connectivity) For the connector on the wiring side, use the separately sold accessory (refer to page 70).	
		Mass	Approx. 60 g	
Pressure range code	Rating pressure range	LED display	Comparison output	Analog output
D 50	0-50 Pa	0.0-50.0	NPN transistor or PNP transistor	4-20 mA or 1-5 V
D 100	0-100 Pa	0.0-100.0		
D 200	0-200 Pa	0-200		
D 300	0-300 Pa	0-300		
D 500	0-500 Pa	0-500		
D 1000	0-1000 Pa	0-1000		
E 2	0-2 kPa	0.00-2.00		
E 3	0-3 kPa	0.00-3.00		
E 5	0-5 kPa	0.00-5.00		
D +- 50	-50 to +50 Pa	-50.0 to 50.0		
D +-100	-100 to +100 Pa	-100 to 100		
D +-200	-200 to +200 Pa	-200 to 200		
D +-300	-300 to +300 Pa	-300 to 300		
D +-500	-500 to +500 Pa	-500 to 500		

◆ For the use environment, refer to page 118.

<p><b>Conforming standards</b></p> <p>1. EU directive This product is compliant with the EMC directive of EU. EMC directive basic requirements Standard No. .... EN 61326-1 This product in combination with HWS15A-24/A (TDK-Lambda Corporation) is confirmed to be compliant with the EMC directive. When using this product with other power unit, have the final system go through the EMC test.</p> <p>2. UL standard This product is certified as an UL standard recognition part. It is also certified with Canada Standard (C-UL). However, use this product in accordance with the installation conditions shown in (3) below. (1) Requirements standard No. .... UL 61010-1 (2) File No. .... E220685 (3) Installation condition ..... As the DC power source to be connected to this product, use NEC (National Electrical Code) Class 2 power source or LPS (Limited Power Source) power source.</p>
--

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

## EMD8A

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

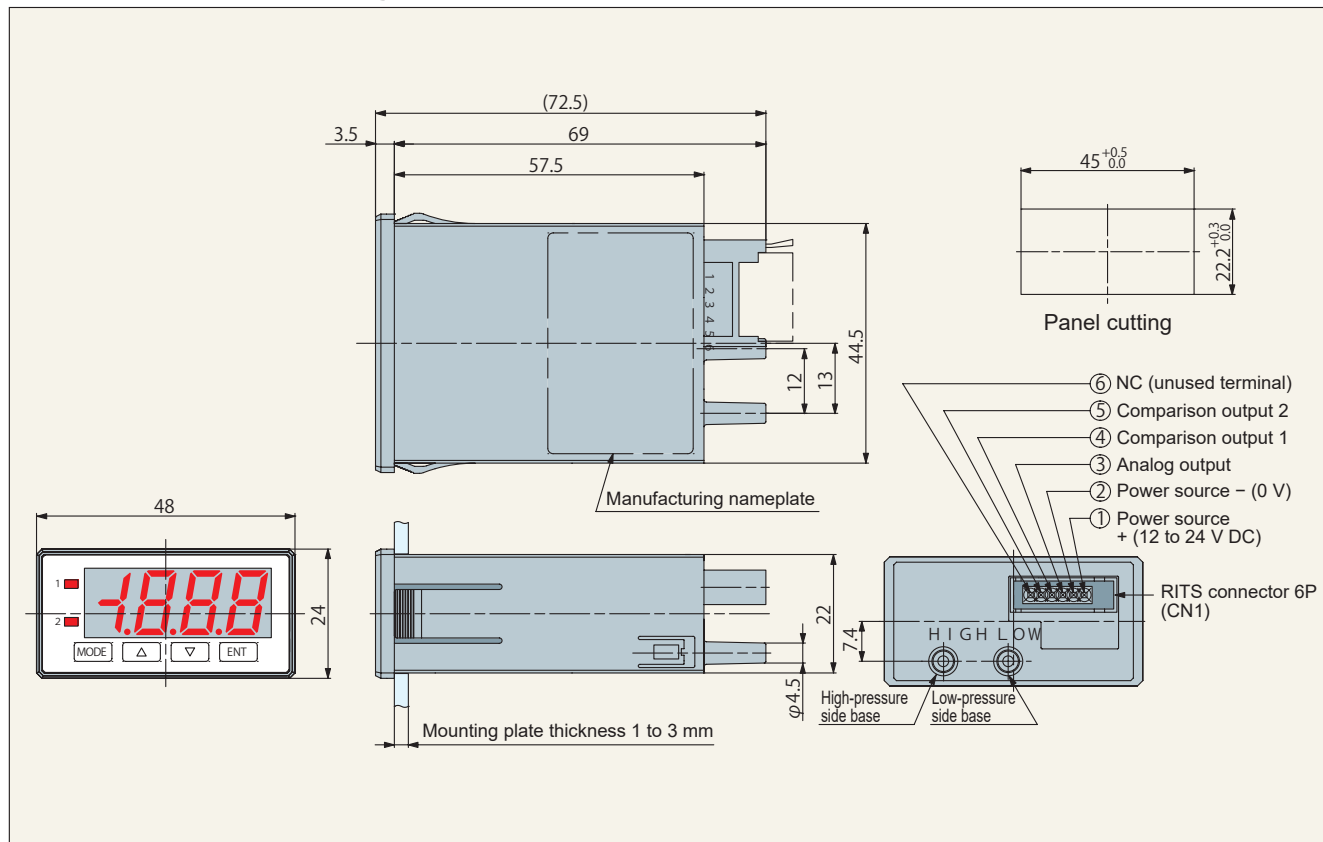
Accessories

Application

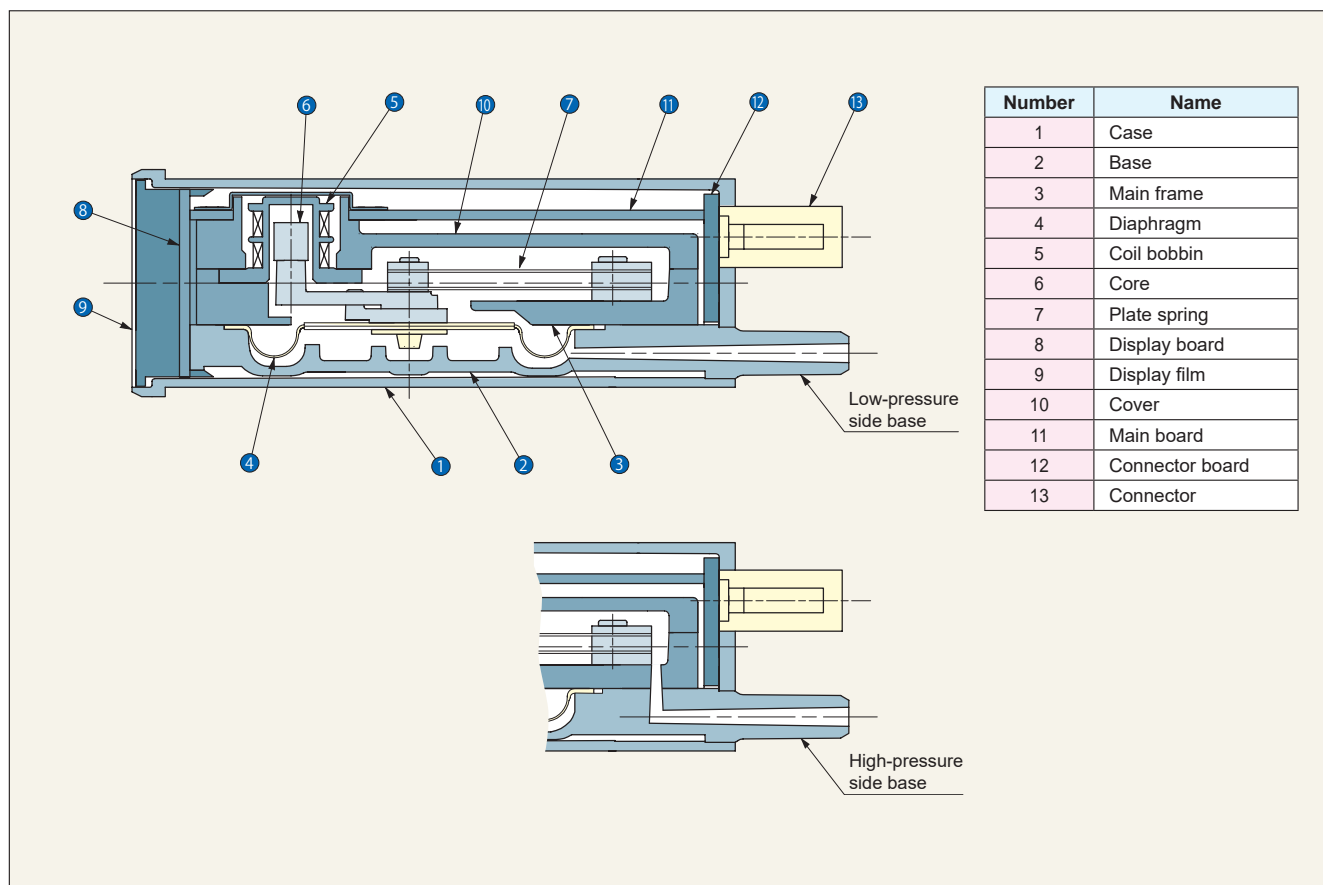
Precautions

Maintenance

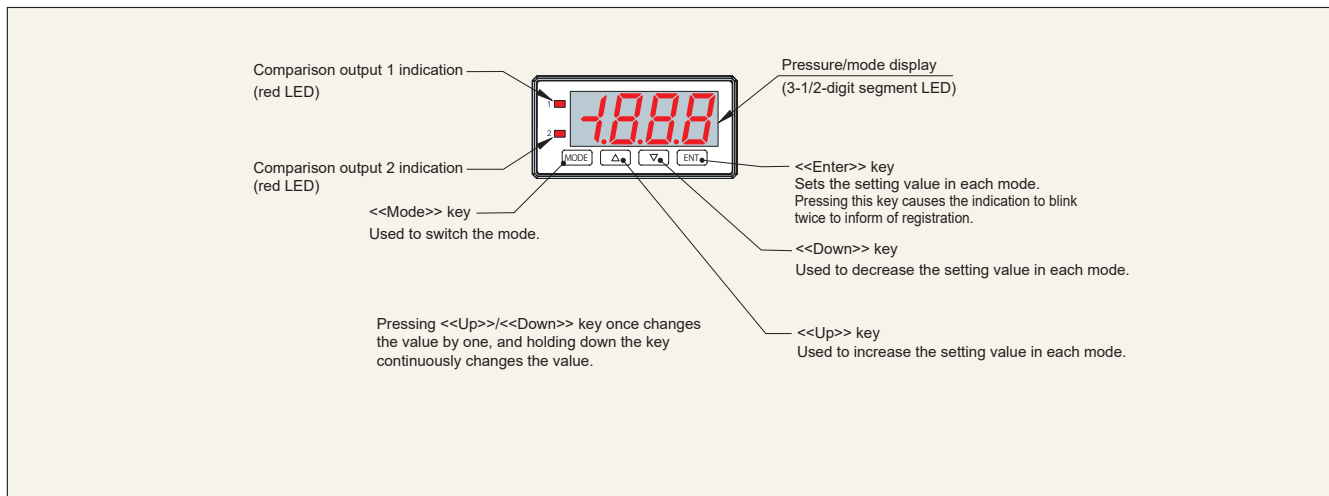
### External dimension drawing



### Overview of structure



### Operation panel



### Functions of EMD8A▶▶▶▶

#### ▶ Display function

- Pressure indication  
Easily visible 12 mm high seven-segment red LED display
- Push type automatic zero reset  
Zero-resets the pressure indication and analog output at the same time.
- Movement average filter (for indication use)  
When the measured pressure greatly fluctuates, this function increases the response time to alleviate the fluctuation of display value.
- Maximum value/minimum value memory function  
Memorizes and displays the maximum pressure and minimum pressure during measurement.

#### ▶ Comparison output function (NPN or PNP transistor output)

- Equipped with two systems of the exact same function, each of which operates independently.  
(Transistor output and output monitor red LED are equipped for each system.)
- By changing the following parameter settings, it is possible to use this instrument for various applications.
  1. Comparison mode (hysteresis mode or window mode)
  2. Comparison pressure setting point
  3. Output mode (OFF, N.O., N.C.)
  4. Output on-delay time
  5. Output off-delay time
  6. Power supply on-delay time

#### ▶ Analog output function

- Analog output (4 to 20 mA or 1 to 5 V)  
This function performs zero setting and movement average filter processing of a digital pressure measurement value, and then performs D/A conversion of the value and outputs it as an analog value.
- Movement average filter (for output use)  
When the measured pressure greatly fluctuates, this function increases the response time to alleviate the fluctuation of analog output.

#### ▶ Other functions

- Test mode function  
It is possible to check the setting value and operation without applying pressure.
- Display low cut function  
When the measurement pressure is near zero, the pressure indication can be forcefully set to zero.
- Measurement indication symbol inversion function  
The indication values in the pressure indication mode and maximum/minimum indication mode are displayed with their symbols inverted.
- Analog output inversion function  
Under normal conditions, when the differential pressure being measured rises, the analog output value also rises. However, turning on the analog output inversion function makes an opposite action.
- Low power consumption function  
Reduces the power consumption by decreasing the LED display brightness.
- Setting protection function  
Protects setting values in various setting modes from erroneous operation and others.
- Setting clear function  
This function can revert the setting values in all setting modes to the factory default state.

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

## EMD8A

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

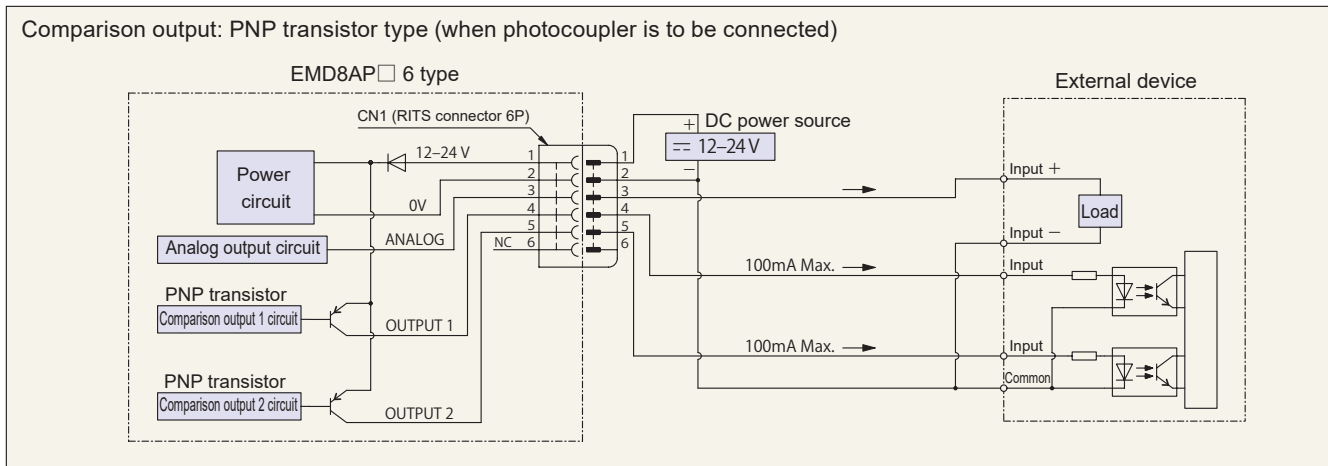
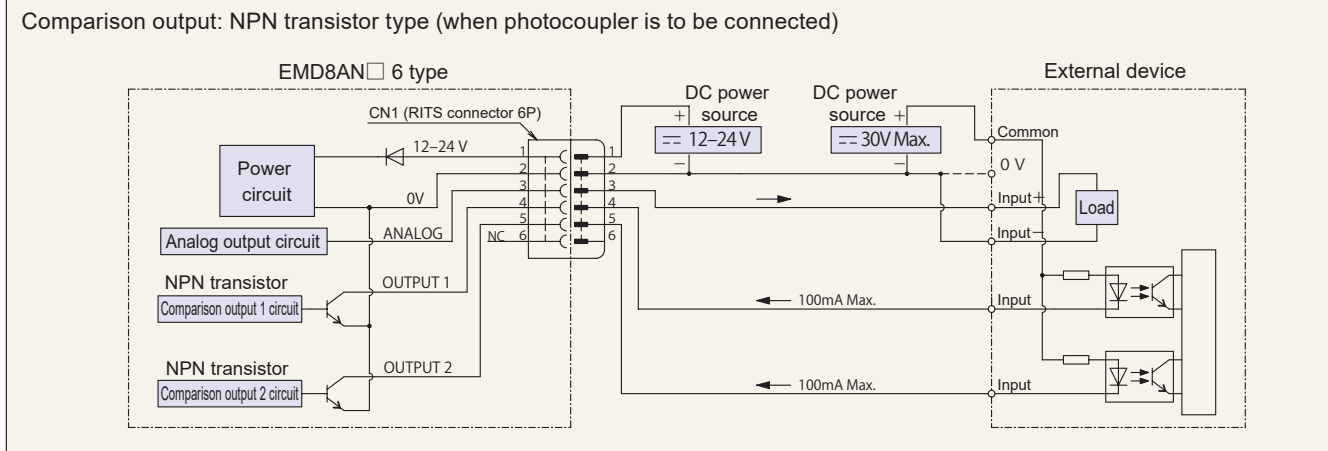
Accessories

Application

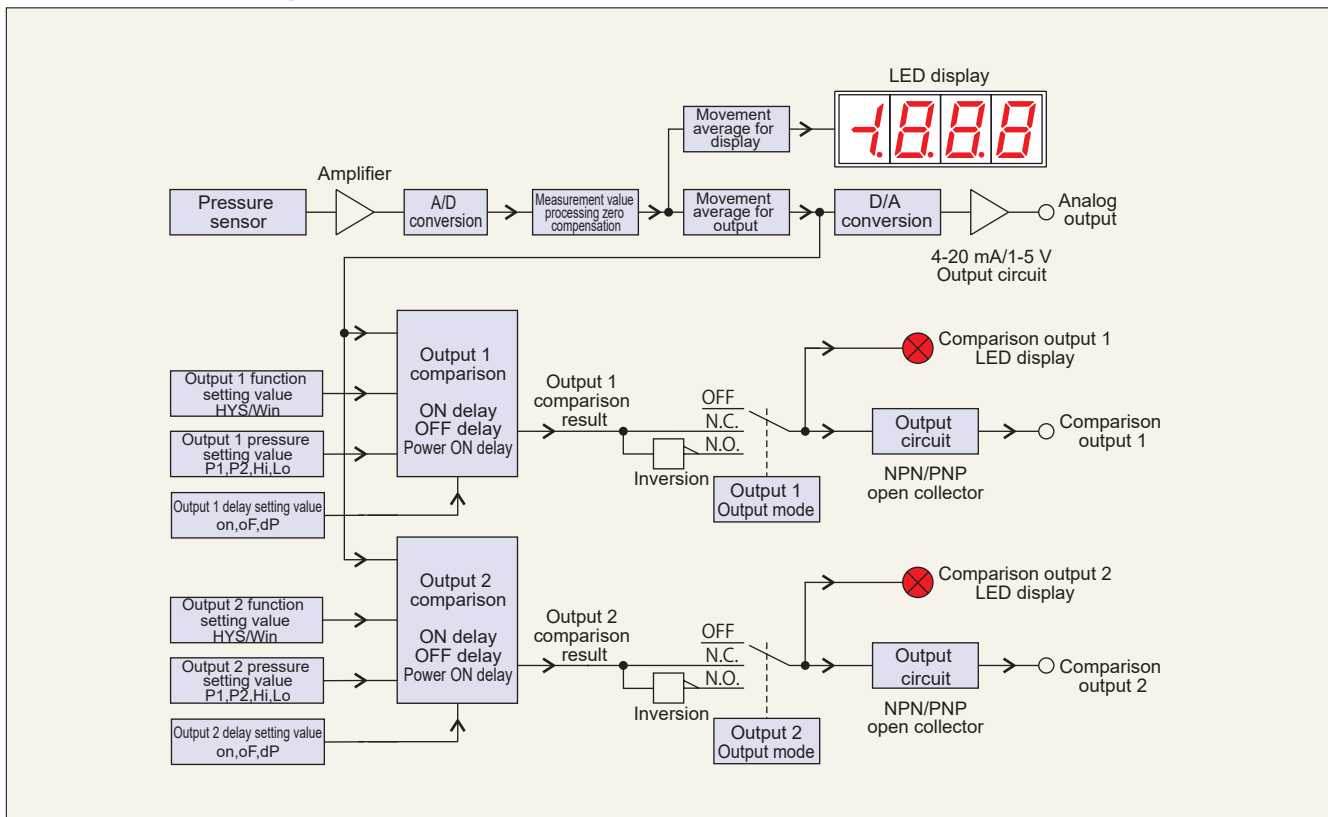
Precautions

Maintenance

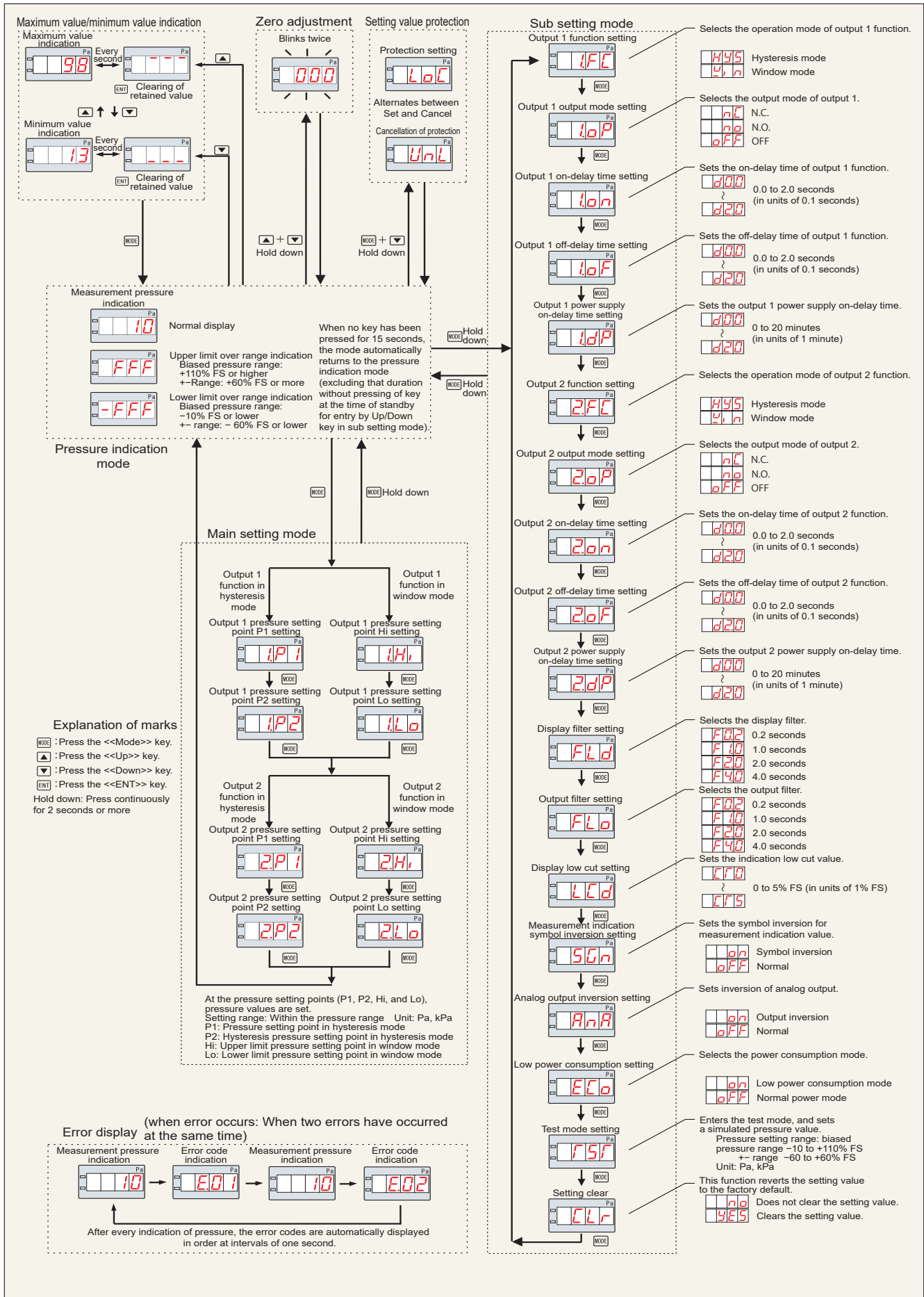
### Wiring



### Functional block diagram



### Mode changeover



## EMD8A

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

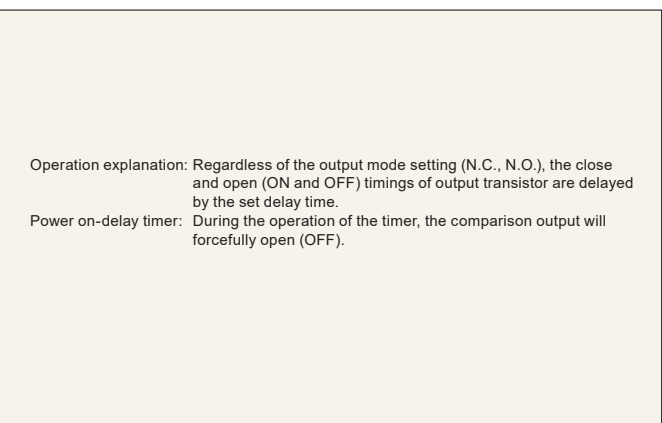
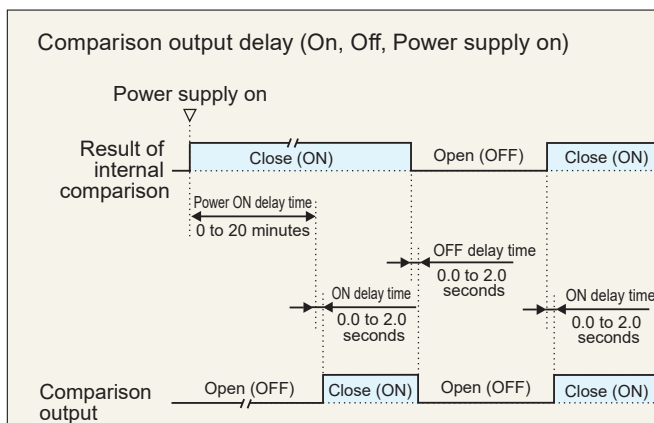
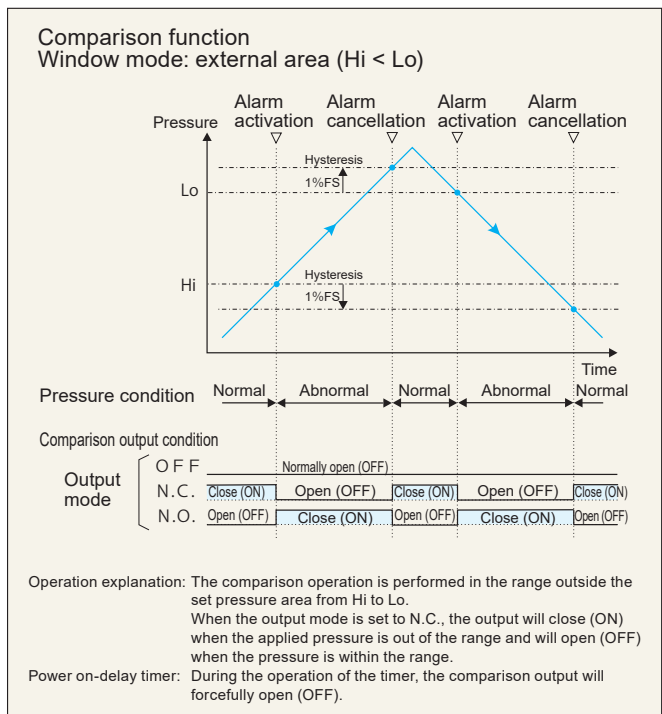
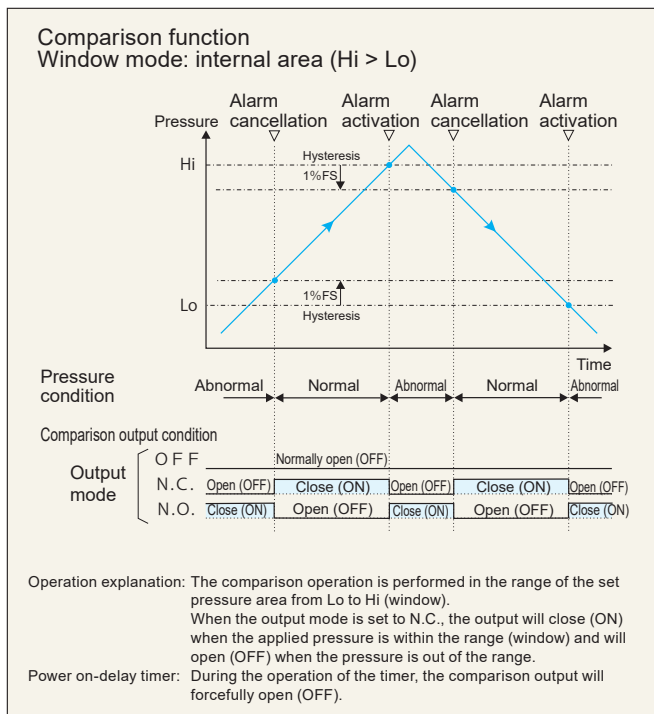
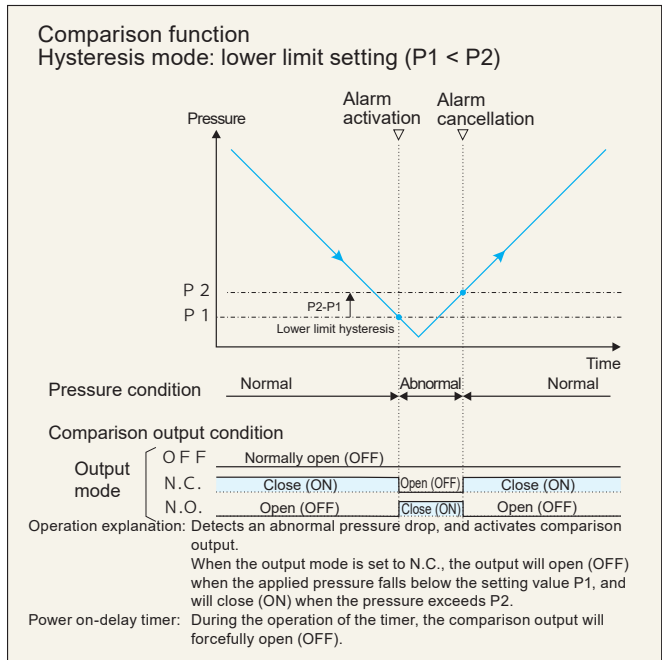
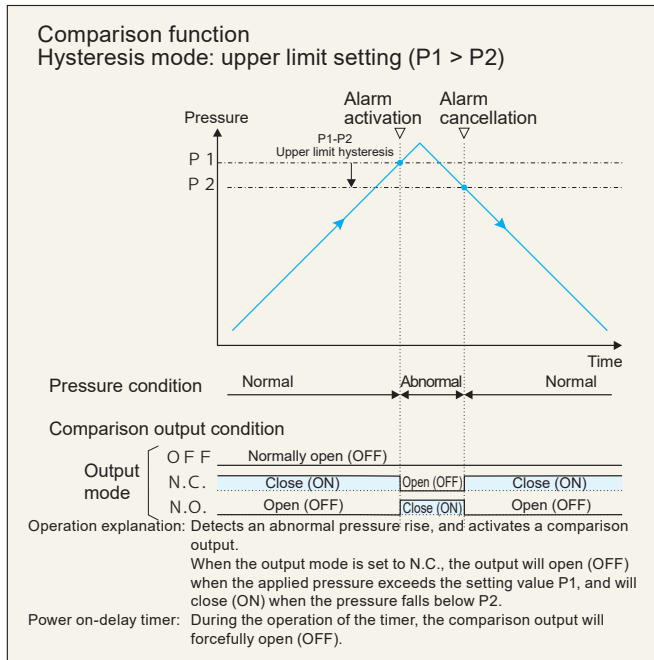
Accessories

Application

Precautions

Maintenance

### Comparison function operation diagrams



### EMD8A accessories

RoHS

RITS 5P cable w/connector			
<p>This is a cable with connector used for connection with EMD8A.</p> <p>In the sheath cable and other constituting parts of this product, vinyl chloride is not intentionally used.</p> <p>RITS plugs and connectors are products of TE Connectivity.</p>			
Item number	Cover color	Core wire insulation sheath color	Terminal number
CAB-RITS5-15	Yellow	Brown	①
		Blue	②
		Pink	③
		Black	④
		White	⑤
This product is not UL-certified.		Core wire sheath outer diameter: 1.0 mm Standard: AWG#24	

RITS plug/connector 5P (TE Connectivity)			
<p>This is a wiring side plug/connector used on EMD8A.</p>			
Item number	Color	Applicable wiring	
		Nominal cross-section area	Finish outer diameter
1473562-5	Yellow	0.1–0.5 mm <sup>2</sup>	1.0–1.15 mm
<p>*Cable is not supplied.</p>			
When crimping of the connector is performed, use the dedicated tool (item number: 1729940-1 from TE Connectivity). For other RITS connectors and details, contact TE Connectivity.			

### Connectability of the RITS connector

<p>&lt;EMD8A main body 6P&gt;</p>	<p>○ ... Connectable                  × ... Non-connectable</p>	<p>&lt;RITS plug/connector 5P&gt;                  Item number: 1473562-5                  Without contact pin</p>
<p>&lt;EMD8 main body 5P&gt;                  Discontinued product</p>		<p>&lt;RITS plug/connector 6P&gt;                  With contact pin</p>
As the connector on the wiring side, be sure to use the RITS plug/connector from TE Connectivity. As the RITS connector is not compliant with e-CON, it is not compatible with connectors from other manufacturers.		

- List of products
- WO81
- WO71
- FR51A
- MS99
- MS99S
- MS61A-RA
- QDP33
- EMD8A
- EMD7
- EMT1
- EMTGP1
- EMT1H
- EMT6
- EMP5A
- EMRT1
- HWS15A
- Accessories
- Application
- Precautions
- Maintenance



RoHS

### 48×48 type digital fine differential pressure sensor

- Selectable from eight ranges including 0 to 100 Pa and 0 to 5 kPa
- It is possible to select analog output function in the range of 4 to 20 mA or 1 to 5 V.
- It is possible to select the alarm output type from NPN open collector or PNP open collector.
- Compatible with 12 to 24 V DC power source
- Equipped with abundant additional functions for differential pressure measurement including movement average filter, maximum/minimum value memory, and delay timer
- It is possible to set the alarm function mode in accordance with the usage.
- Product compliant with the EU directive and UL standard



EMD7D3

#### <Main application fields>

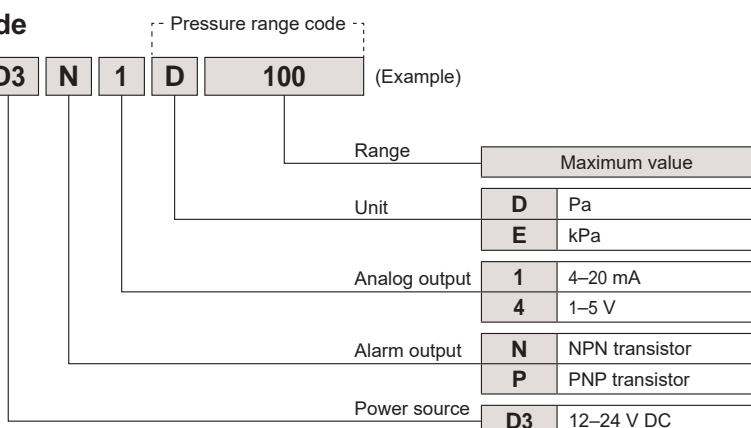
- Part of semiconductor manufacturing equipment
- Negative pressure for dust collector/differential pressure of air conditioners
- Filter pressure loss management
- Precision machine manufacturing line
- General factory management equipment

#### <Usage>

- Measurement of internal pressure of indoor device
- Detection of clogging of air filter
- Measurement of clogging of bug filter
- Measurement of dynamic pressure at ventilation/exhaust device
- Room pressure measurement in a clean room

#### Product code

EMD7 **D3** **N** **1** **D** **100** (Example)



\*(Refer to pages 114 to 117)

◆When making an inquiry or placing an order, specify the above product code.



### Specifications

Model	EMD7D3			
<b>Pressure unit</b>	Pa, kPa		<b>Alarm output</b>	Output type • EMD7D3N NPN open collector One each for upper limit and lower limit Maximum load current: 100 mA (per output) Maximum load voltage: 30 V DC or lower Output saturated voltage: 1 V DC or lower • EMD7D3P PNP open collector One each for upper limit and lower limit Maximum load current: 100 mA (per output) Maximum load voltage: 30 V DC or lower Output saturated voltage: 2 V DC or lower Setting range Upper limit: 0 to 100% FS Lower limit: 0 to 100% FS Hysteresis width can be set in the range of 1 to 5% FS. Setting method      Push-type digital setting Output display        Red LED × 2 Output type • EMD7D3□1 4 to 20 mA (at pressure of 0 to FS) Load resistance: 0 to 250 Ω • EMD7D3□4 1 to 5 V (at pressure of 0 to FS) Load resistance: 10 kΩ or higher Accuracy                ± 1.5% FS (at 20°C) Temperature characteristics    ± 0.15% FS/°C (zero + span) • EMD7D3N (alarm output: NPN transistor type) Total consumption: 100 mA (internal consumption only) • EMD7D3P (alarm output: PNP transistor type) Internal consumption: 100 mA Total consumption: 300 mA (including load current for alarm output of 100 mA × 2) 12 to 24 V DC ± 10% (ripple of 10% or below) Approx. 130 g (including terminal cover and adapter for panel mounting) 5 to 10 Hz, amplitude of 10 mm, 10 to 50 Hz, acceleration of 39 m/s <sup>2</sup> (two hours each for three axial directions) 100 m/s <sup>2</sup> (six times each for three axial directions)
<b>Pressure measurement method</b>	Differential pressure method		<b>Analog output</b>	
<b>Electric signal conversion method</b>	Variable inductance			
<b>Measured gas</b>	Air and noncorrosive gas (liquid cannot be measured)			
<b>Pressure-receiving element</b>	Diaphragm (silicone rubber)			
<b>Mounting orientation</b>	Mounting on vertical surface			
<b>Instrument body withstanding pressure</b>	20 kPa (refer to page 118)			
<b>Withstanding pressure of pressure-receiving element</b>	20 kPa (refer to page 118)			
<b>Operating ambient temperature</b>	0°C to 50°C (no freezing allowed)			
<b>Operating ambient humidity</b>	35% to 85% RH (no condensation allowed)			
<b>Compatible pipe</b>	Vinyl pipe or rubber pipe (inner diameter of 4 mm; however, the outer diameter must be 6 mm or lower)			
<b>Base polarity</b>	Indicating high-pressure side and low-pressure side with "H" and "L" marks, respectively, at piping connection base part.			
<b>Display</b>	Display section    Seven-segment LED, four red digits Pressure indication/alarm setting indication, three digits at maximum (The highest digit indicates the mode.) Accuracy            ± 1.5% FS ± 1 digit (at 20°C) Temperature characteristics    ± 0.15% FS/°C (zero + span)			
<b>Zero adjustment method</b>	Push-type automatic zero return (The displayed value and analog output are adjusted to zero at the same time.)			
<b>Insulation resistance</b>	Between terminal and case 10 MΩ or higher (500 V DC megger)			
<b>Withstand voltage</b>	Between terminal and case 500 V AC, 50/60 Hz, for one minute			
<b>Exterior material</b>	ABS resin (color: ivory)			
<b>Operating altitude</b>	Altitude of 2000 m or below			
<b>Protection level</b>	Standard: IEC 60529 Grade code: IP41			
<b>Degree of contamination</b>	Standard: IEC 60664 Grade: 2 (If it is not possible to install this product in a dry clean location, house it in a housing.)			
<b>Accessories</b>	Adapter for panel mounting, terminal cover (already mounted on instrument body)			
<b>Pressure range code</b>	Pressure range	LED display	Alarm output	Analog output
D 100	0-100 Pa	0-100	NPN transistor or PNP transistor	4-20 mA or 1-5 V
D 200	0-200 Pa	0-200		
D 300	0-300 Pa	0-300		
D 500	0-500 Pa	0-500		
E 1	0-1 kPa	0.00-1.00		
E 2	0-2 kPa	0.00-2.00		
E 3	0-3 kPa	0.00-3.00		
E 5	0-5 kPa	0.00-5.00		

◆ For the use environment, refer to page 118.

<p><b>Conforming standards</b></p> <p>1. EU directive                      This product is compliant with the EMC directive of EU.                      EMC directive basic requirements Standard No.                      (1) EMI (electromagnetic emission) standard .....EN 61000-6-3                      (2) EMS (electromagnetic immunity) standard .....EN 61000-6-2</p> <p>2. UL standard                      This product is certified as an UL standard recognition part. It is also certified with Canada Standard (C-UL). However, use this product in accordance with the installation conditions shown in (3) below.                      (1) Requirements standard No. ....UL 61010-1                      (2) File No. ....E220685                      (3) Installation condition ..... As the DC power source to be connected to this product, use NEC (National Electrical Code) Class 2 power source.</p>
--

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

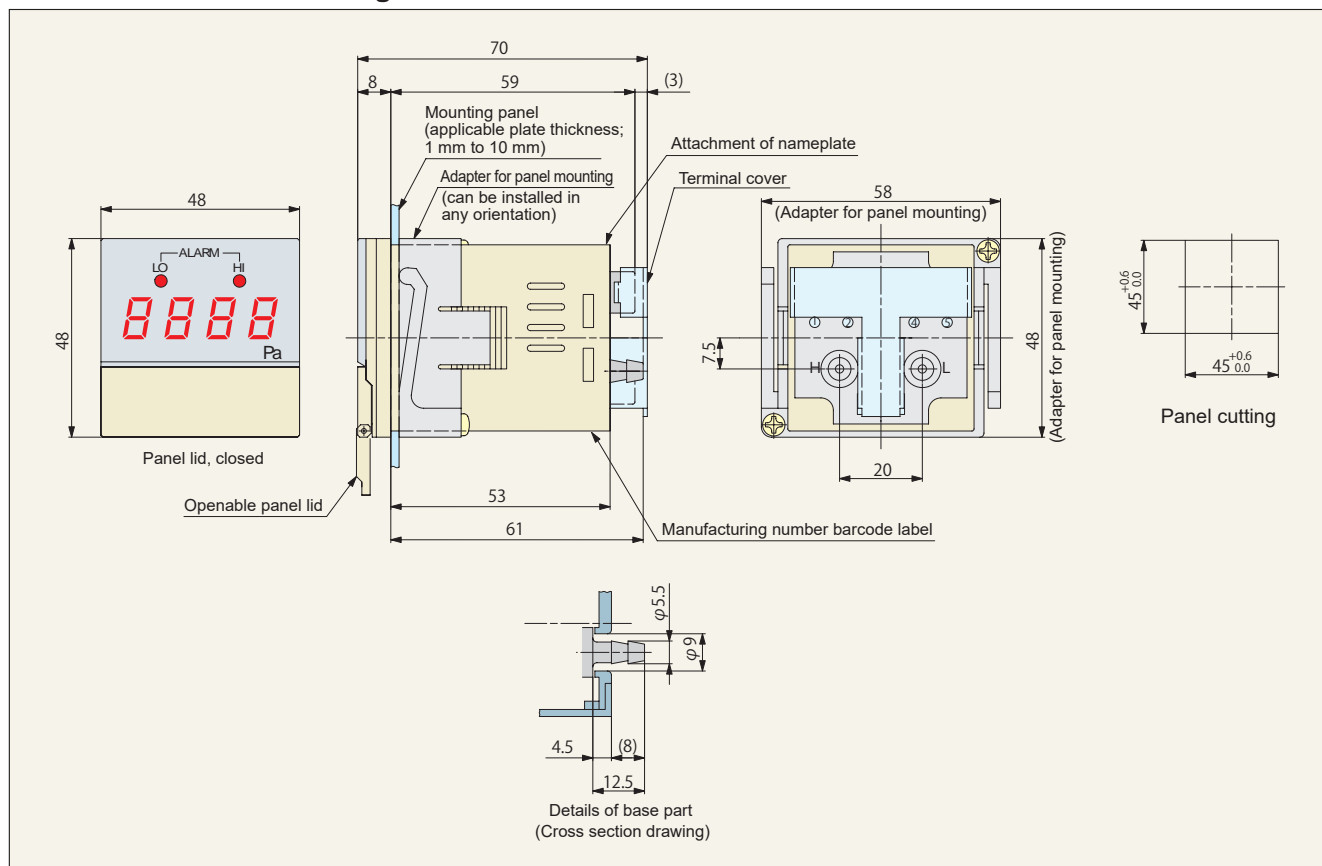
Accessories

Application

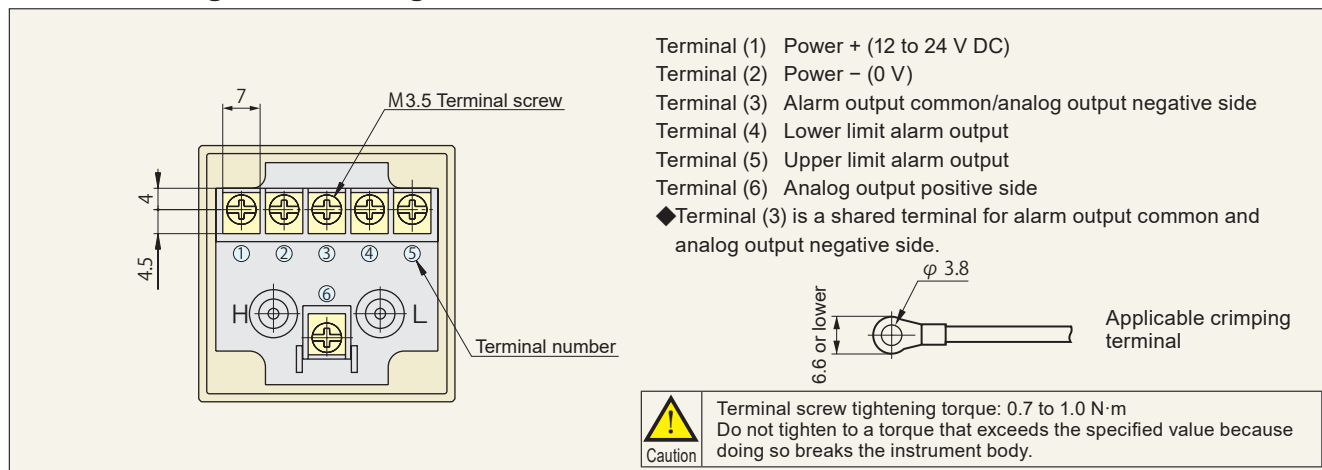
Precautions

Maintenance

### External dimension drawing



### Terminal arrangement drawing



### Accessories dedicated to EMD7

RoHS

**Terminal cover**  
(Auxiliary item)

This is already installed at the time of purchase of the instrument.

Item number	Material
TCA-D7	Polycarbonate

**Adapter for panel mounting**  
(Auxiliary item)

Item number	Material
ADPA-EMD7	Polyacetal/steel



## EMD7

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

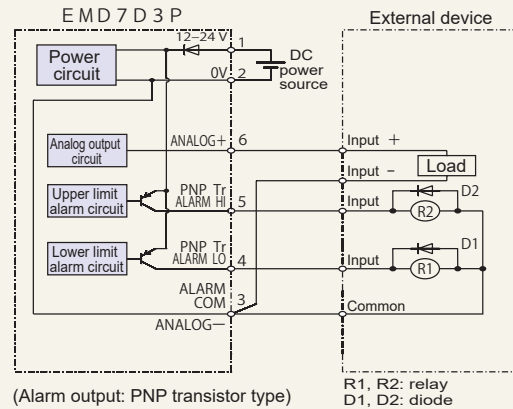
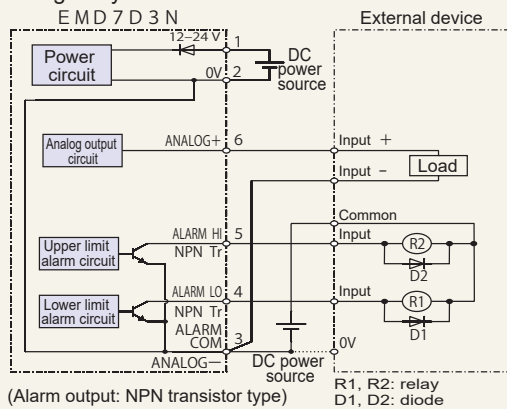
Application

Precautions

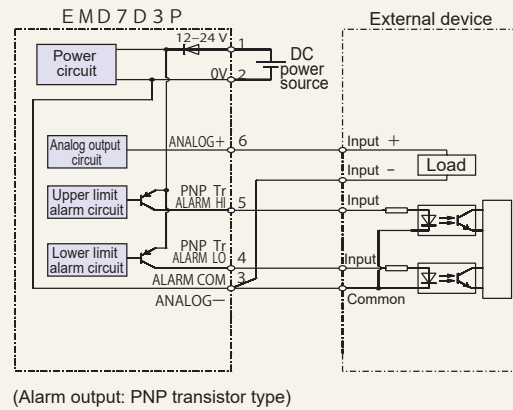
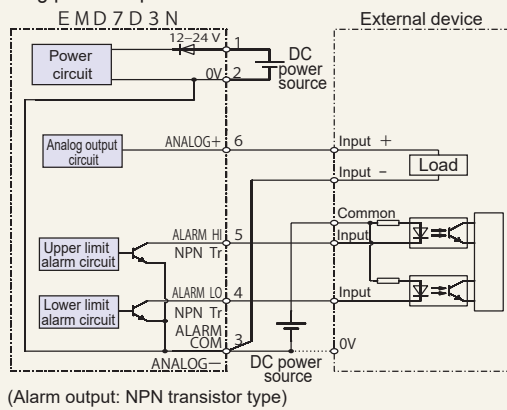
Maintenance

## Wiring

When connecting relays

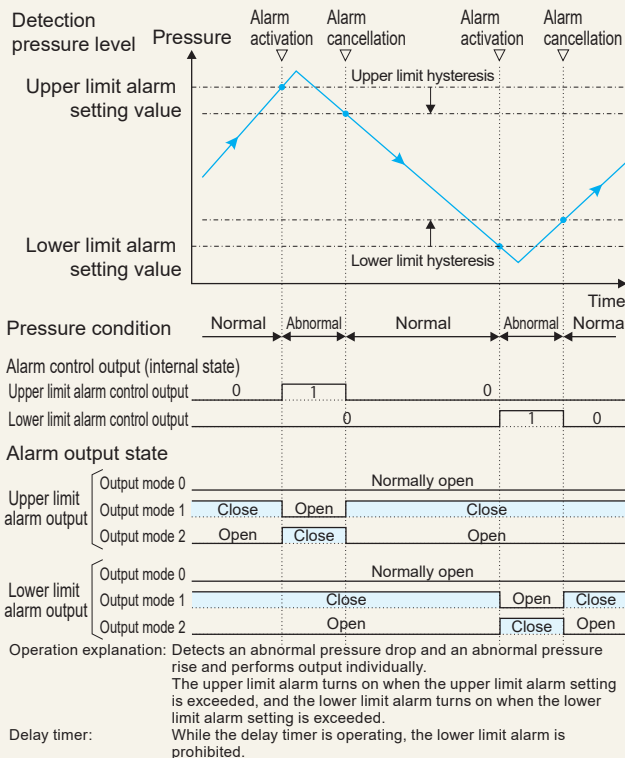


When connecting photocouplers

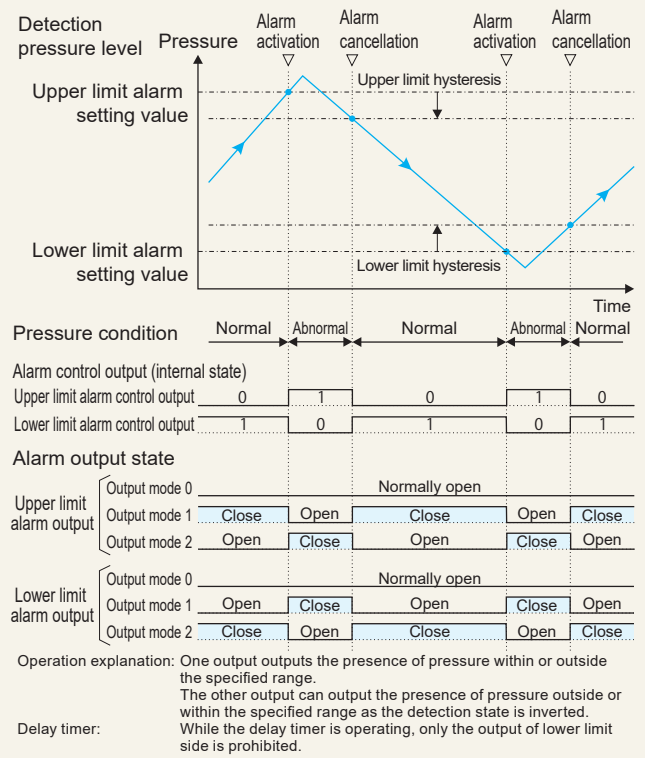


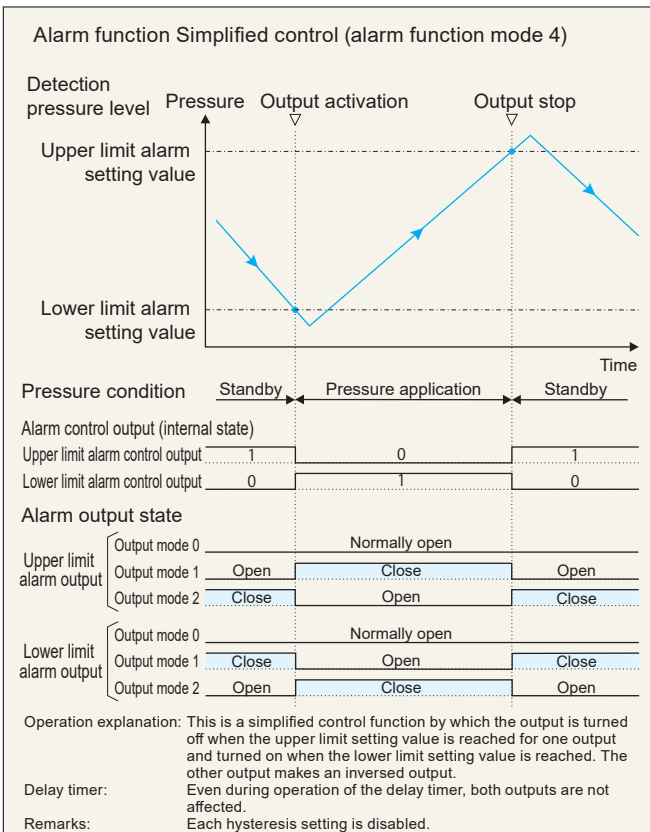
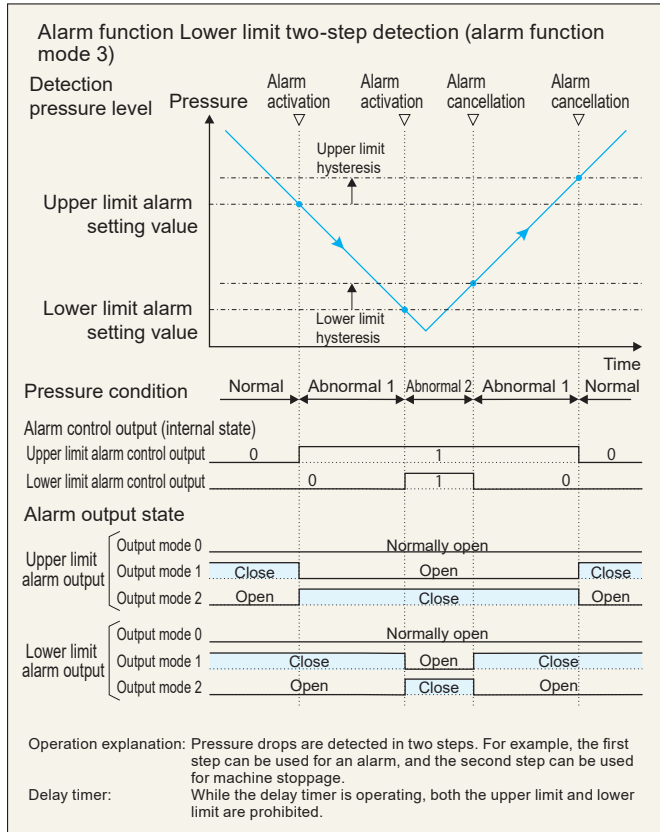
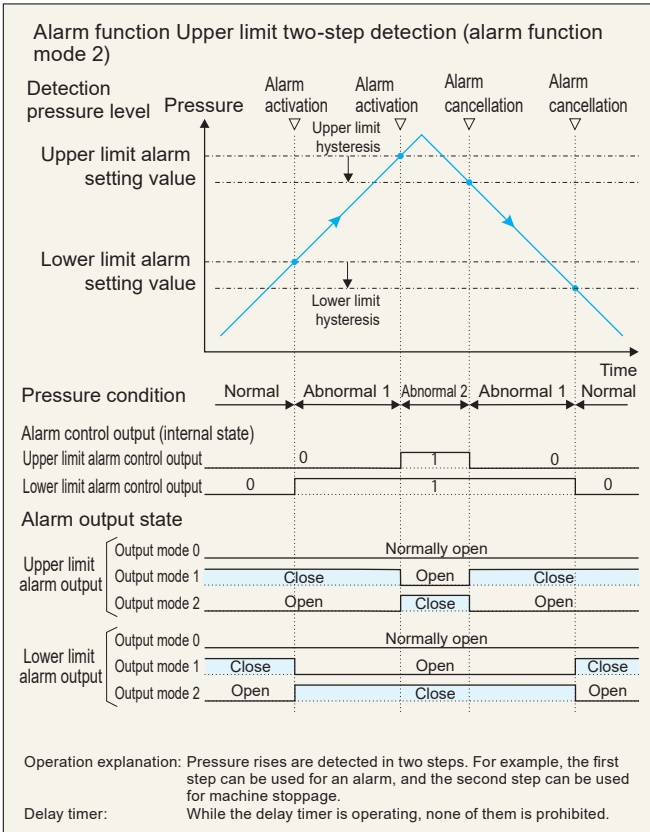
## Alarm operation diagram

Alarm function Upper limit/lower limit individual detection (alarm function mode 0)

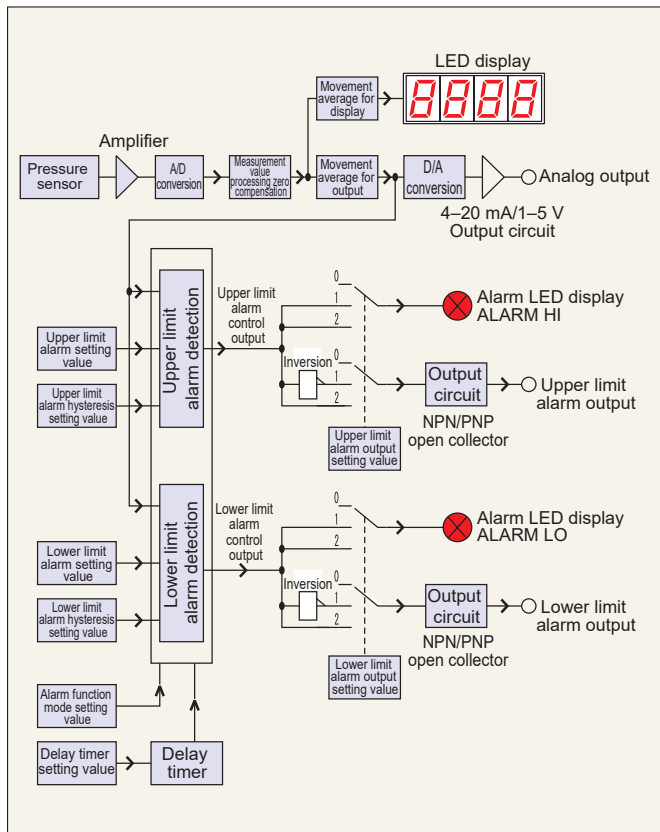


Alarm function Normal/abnormal detection (alarm function mode 1)





## Functional block diagram



## EMT1

RoHS

### High-accuracy fine differential pressure transmitter

- Thirty-three variations in the ranges of 10 Pa to 100 kPa and  $\pm 10$  Pa to  $\pm 5$  kPa
- The displacement sensor employs a high-performance diaphragm and a differential inductance method.
- Frequently delivered to a highly advanced differential pressure control field, this product has achieved a good track record.



**EMT1A type**  
(Indoor drip-proof type)



**EMT1B type**  
(Exposed terminal type)

#### Product code

EMT1 A 0 FM D 100 (Example)

Pressure range code

(Example)

#### <Main application fields>

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

#### <Usage>

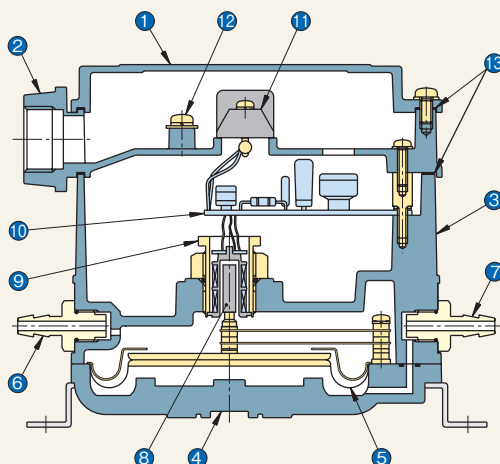
- Room pressure measurement in a clean room
- Detection of clogging of air filters
- Measurement of airflow rate/speed of ventilation/exhaust device and others

\*(Refer to pages 114 to 117)

Range	Maximum value (for $\pm$ range, provide " $\pm$ " as well)
Unit	<b>D</b> Pa <b>E</b> kPa
Base	<b>FV</b> For vinyl pipe <b>FM</b> For metallic pipe
Output	<b>0</b> Two-wire type 4–20 mA DC <b>1</b> Four-wire type 4–20 mA DC <b>2</b> Four-wire type 0–1 mA DC (non-standard model) <b>3</b> Four-wire type 0–5 V DC (non-standard model) <b>4</b> Four-wire type 1–5 V DC (non-standard model)
External shape	<b>A</b> Indoor drip-proof type <b>B</b> Exposed terminal type

- ◆ When making an inquiry or placing an order, specify the above product code.
- ◆ When you use this product 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.

### Overview of structure



Number	Name
1	Cover
2	Terminal box
3	Housing
4	Base
5	Diaphragm
6	High-pressure side base
7	Low-pressure side base
8	Core
9	Coil bobbin
10	Substrate
11	Terminal block
12	Grounding terminal screw
13	Cover packing



## EMT1

List of products

WO81

### External dimension drawing

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

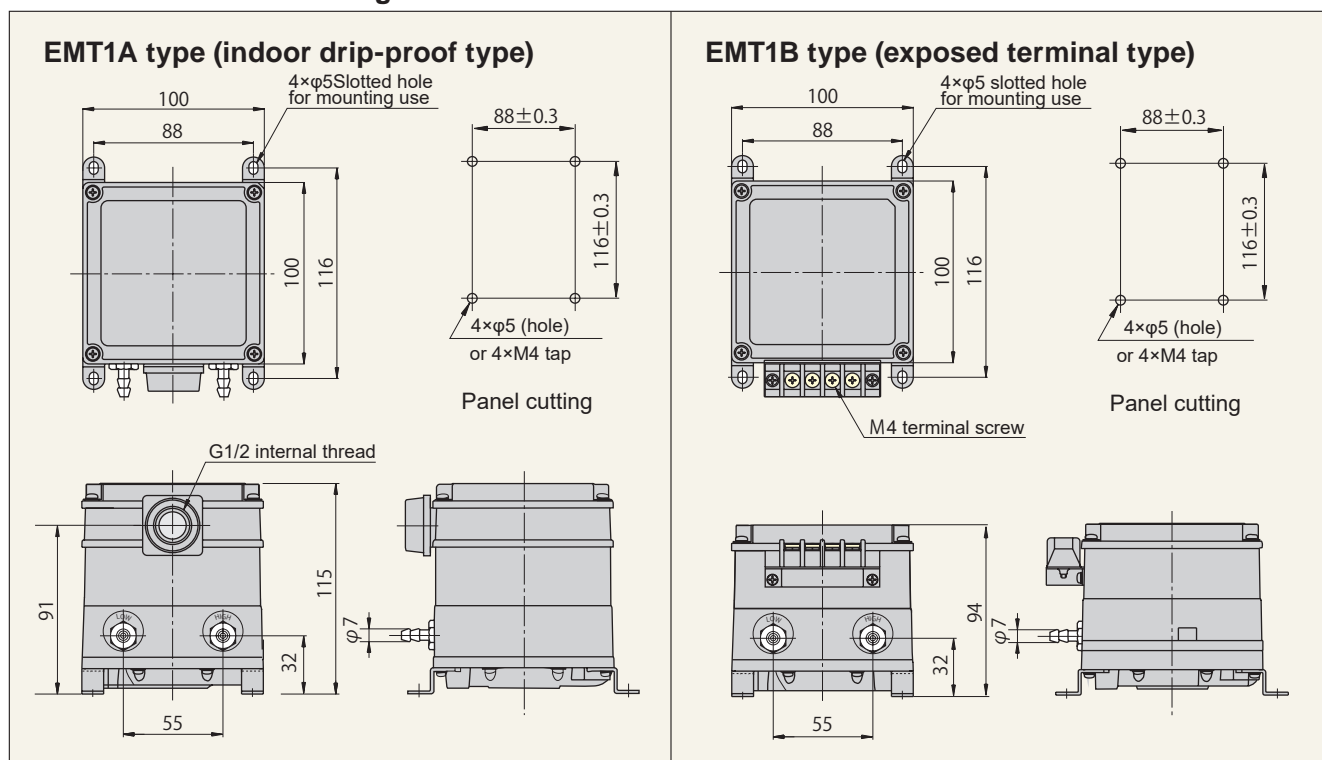
HWS15A

Accessories

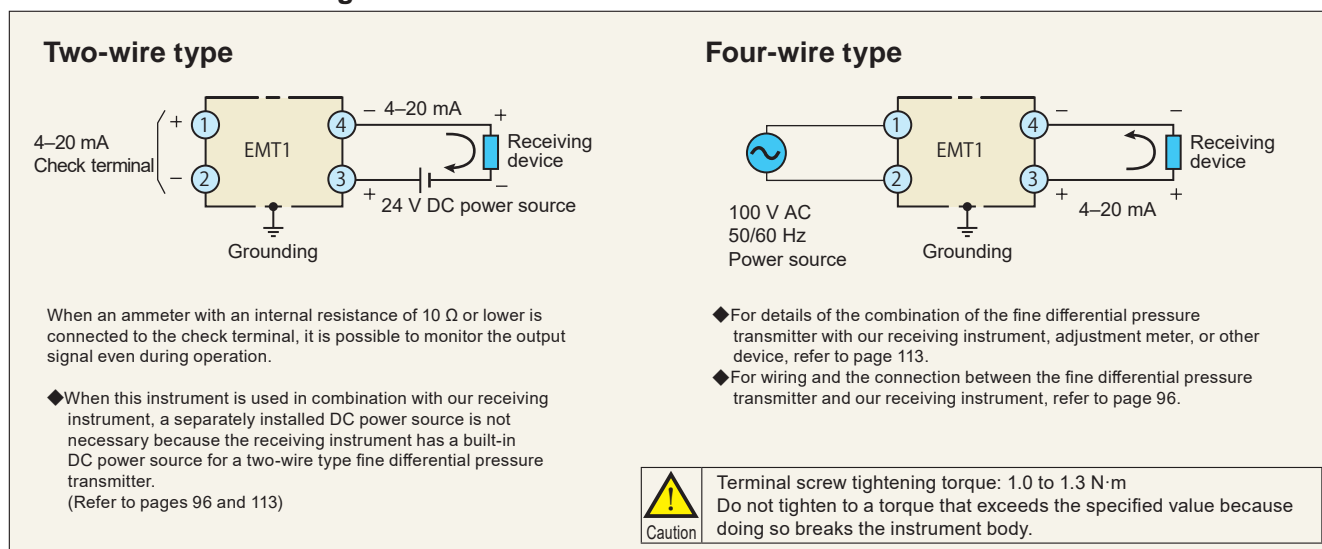
Application

Precautions

Maintenance

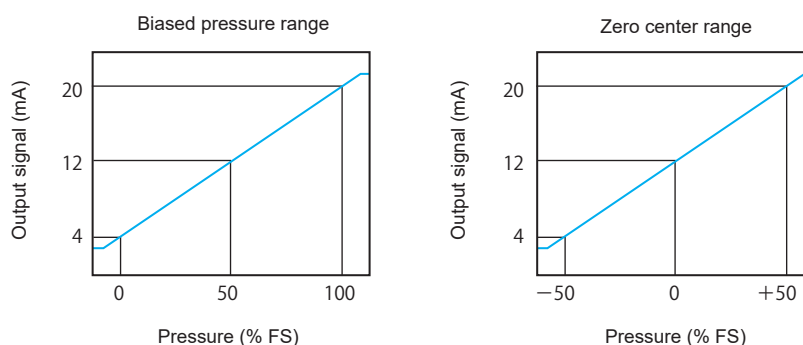


### Terminal connection diagram








### Transmission output diagram (pressure-output signal)

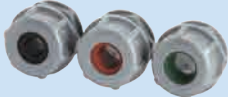
- Output signal of 4 to 20 mA DC

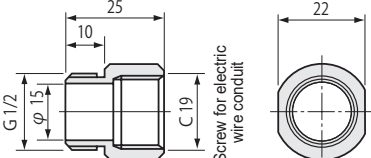




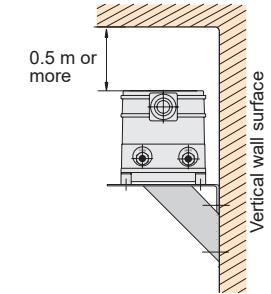
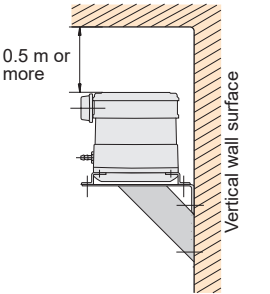
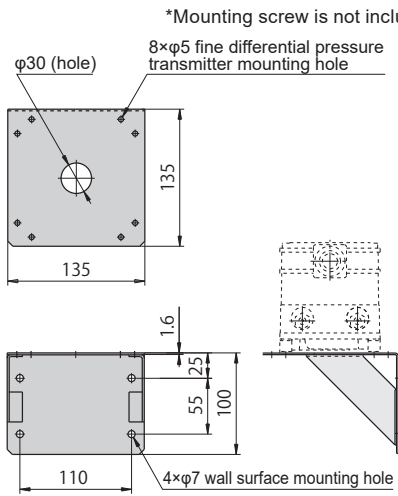


### EMT1 accessories RoHS

VT base		MT base		MTW base		Terminal cover set	
(Auxiliary item)		(Auxiliary item)					
							
<b>Item number</b>	<b>Material</b>	<b>Item number</b>	<b>Material</b>	<b>Item number</b>	<b>Material</b>	<b>Item number</b>	<b>Material</b>
KGAT1VT	Brass	KGAT1MT	Brass	KGAT1MTW-S	Stainless steel	TCA-T1	Polycarbonate/brass
<p>A vinyl pipe or rubber pipe with an inner diameter of 6 mm can be connected.</p> <p>This is already installed at the time of purchase of the FV type.</p>		<p>A metallic pipe, such as steel pipe and aluminum pipe, with an outer diameter of <math>6 \pm 0.1</math> mm can be connected.</p> <p>When connecting with a plastic pipe (outer diameter 6 mm <math>\times</math> inner diameter 4 mm), remove the brass sleeve and use the separately sold resin inner sleeve set (XIN 6 <math>\times</math> 4; refer to page 111).</p> <p>This is already installed at the time of purchase of MT type.</p>		<p>This is used to connect a stainless steel pipe with an outer diameter of <math>6 \pm 0.1</math> mm.</p>		<p>This is used to protect the terminal screw of EMT1B type (exposed terminal type).</p>	
						<p>Base tightening torque: 1.2 N·m</p> <p>Do not tighten to a torque that exceeds the specified value because doing so breaks the instrument body.</p>	

Plastic gland (Ace Service Co., Ltd.)									
<p>This is used when the wiring of the fine differential pressure transmitter is conducted with instrumentation cables. By paying attention to the finish outer diameter of the cable to be used, select a plastic gland from the table on the right in a size that allows the rubber bushing to retain the cable outer diameter when the cap nut is tightened.</p>	<b>Item number</b>	<b>Material</b>	<b>Color of rubber bushing</b>	<b>Outer diameter of compatible electric wire (mm)</b>					
				AC4-2T	Polyacetal		Black	6.5	9.0
				AC4-3T			Red	8.5	11.0
				AC4-4T			Green	10.0	12.5

Adapter for conduit		
<p>When conducting wiring to the fine differential pressure transmitter by passing the wire through the thin steel electric wire conduit with a nominal size of 19 or a metallic flexible electric wire conduit, because the service entrance of the transmitter has a G1/2 internal thread and a different size, use the adapter for the conduit shown in the figure on the right.</p>		
<b>Item number</b>	<b>Material</b>	
ADPA-EMT1	Brass	

Bracket for mounting on vertical wall surface	
<p>Be sure to install the fine differential pressure transmitter in a horizontal orientation (at inclination angle of 5° or less). When the mounting surface is vertical, mount the instrument horizontally by using the bracket for mounting on vertical wall surface. For the purpose of adjustment and maintenance, secure a space of 0.5 m at minimum above the fine differential pressure transmitter.</p>	
<p>When the orientation of the base of the fine differential pressure transmitter is in parallel to the wall surface</p>	<p>When the orientation of the base of the fine differential pressure transmitter is orthogonal to the wall surface</p>
	
<p>*Mounting screw is not included.</p>	
	
<b>Item number</b>	<b>Material</b>
BRKT-T1GP1	Steel

\*For quality improvement or for another reason, part of the specifications may be subject to change without prior notice.

- List of products
- WO81
- WO71
- FR51A
- MS99
- MS99S
- MS61A-RA
- QDP33
- EMD8A
- EMD7
- EMT1
- EMTGP1
- EMT1H
- EMT6
- EMP5A
- EMRT1
- HWS15A
- Accessories
- Application
- Precautions
- Maintenance

## EMTGP1 <Dedicated to negative pressure measurement>

RoHS

### Anti-corrosion type fine differential pressure transmitter

This is an anti-corrosion type fine differential pressure transmitter dedicated to negative pressure measurement. This is mainly suitable for the monitoring of static pressure (negative pressure) at the exhaust duct for gas containing corrosive gas in a production factory.



**EMTGP1A type**  
(Indoor drip-proof type)



**EMTGP1B type**  
(Exposed terminal type)

#### <Main application fields>

- General factory management equipment
- Negative pressure for dust collector/differential pressure of air conditioners
- Filter pressure loss management
- Precision machine manufacturing line
- Building air conditioning control equipment

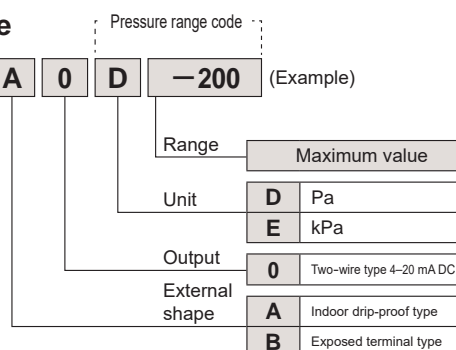
#### <Usage>

- Detection of clogging of air filter
- Room pressure measurement in a clean room
- Measurement of clogging of bug filter
- Measurement of dynamic pressure at ventilation/exhaust device

\*(Refer to pages 114 to 117)

#### Product code

EMTGP1 **A** **0** **D** **-200** (Example)



◆When making an inquiry or placing an order, specify the above product code.

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

### Specifications

Model	Indoor drip-proof type			Exposed terminal type	
	EMTGP1A			EMTGP1B	
<b>Pressure unit</b>	Pa, kPa				
<b>Pressure measurement method</b>	Single pressure type (negative pressure measurement)				
<b>Measured gas</b>	Corrosive gas (sulfuric acid gas cannot be measured; for details, contact us)				
<b>Pressure-receiving element</b>	Diaphragm				
<b>Mounting orientation</b>	Horizontal (inclination angle of within $\pm 5^\circ$ )				
<b>Operating ambient temperature</b>	10°C to 40°C				
<b>Operating ambient humidity</b>	90% RH or below (no condensation allowed)				
<b>Material of gas-contacting part</b>	Diaphragm PEEK film and molded item Base PEEK molded item				
<b>Exterior material</b>	Main body: aluminum die casting, painting on exterior (paint color: gray)				
<b>Electric signal conversion method</b>	Variable inductance				
<b>Output and transmission method</b>	Output signal of 4 to 20 mA DC (load resistance of 500 $\Omega$ or lower) Power voltage of 24 V DC $\pm 10\%$ (ripple of 0.2 V P-P or lower)				
<b>Insulation resistance</b>	Between terminal and case: 20 M $\Omega$ or higher (500 V DC megger)				
<b>Durable impact</b>	5 to 10 Hz, amplitude of 10 mm, 10 to 50 Hz, acceleration of 39 m/s <sup>2</sup> (two hours each for three axial directions)				
<b>Durable vibration</b>	100 m/s <sup>2</sup> (six times each for three axial directions)				
<b>Base mounting screw size</b>	Internal thread for general U.S. pipes 1/4-18NPT				
<b>Mass</b>	EMTGP1A type: approx. 980 g EMTGP1B type: approx. 860 g				
Pressure range code	Pressure range	Accuracy (at 20°C)	Temperature characteristics (each for zero and span) at 10°C to 40°C	Pressure-receiving element material	Withstanding pressure of pressure-receiving element (Refer to page 118)
D - 200	0 to -200 Pa	±2.5% FS	±0.15% FS/°C	PEEK film	-10 kPa
D - 300	0 to -300 Pa				
D - 500	0 to -500 Pa				
D - 1000	0 to -1000 Pa				
E - 2	0 to -2 kPa				

- ◆ This instrument cannot measure combustible gas.
- ◆ Do not install this product in an explosion hazard area.
- ◆ Although this product is corrosion resistant, it may not be used depending on the type or concentration of the corrosive gas and the use environment. Before using this product, be sure to conduct evaluation in actual usage conditions and confirm that there is no problem.
- ◆ For the use environment, refer to page 118.

## EMTGP1

List of products

WO81

### External dimension drawing

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

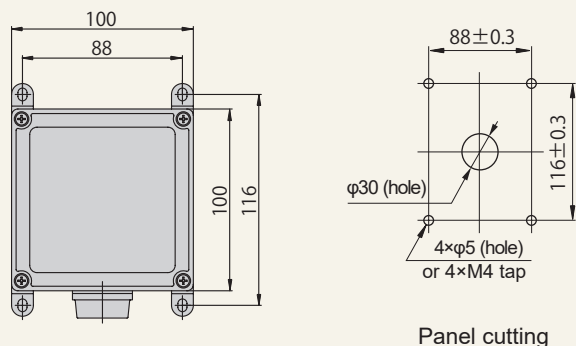
Accessories

Application

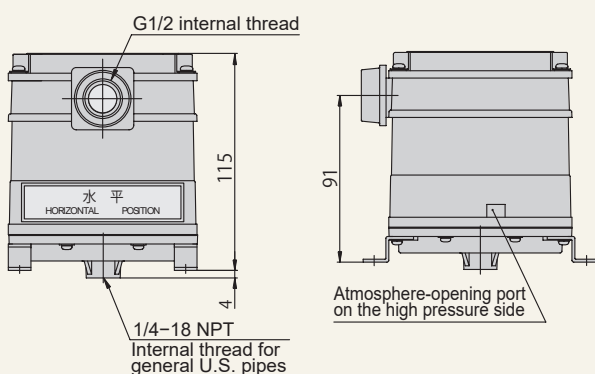
Precautions

Maintenance

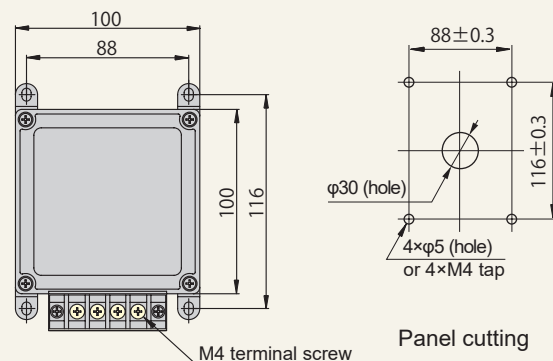
#### EMTGP1A type (indoor drip-proof type)



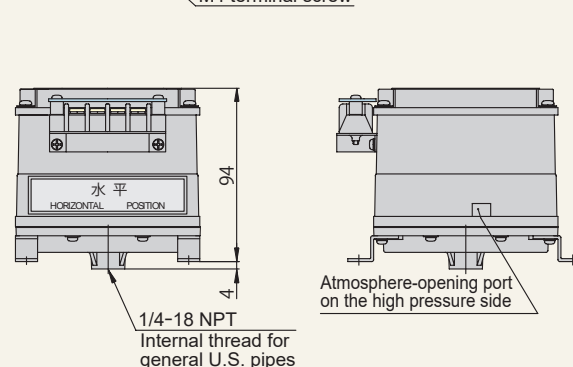
Panel cutting



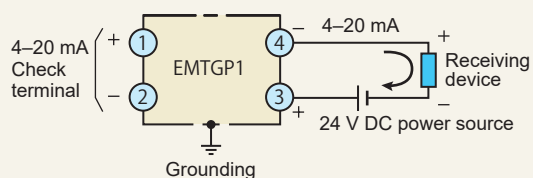
#### EMTGP1B (exposed terminal type)



Panel cutting



### Terminal connection diagram



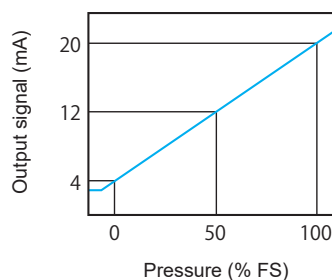
When an ammeter with an internal resistance of 10 Ω or lower is connected to the check terminal, it is possible to monitor the output signal even during operation.

◆When this instrument is used in combination with our receiving instrument, a separately installed DC power source is not necessary because the receiving instrument has a built-in DC power source for a two-wire type fine differential pressure transmitter. (Refer to page 96)



**Caution** Terminal screw tightening torque: 1.0 to 1.3 N·m  
Do not tighten to a torque that exceeds the specified value because doing so breaks the instrument body.

### Transmission output diagram (pressure-output signal)

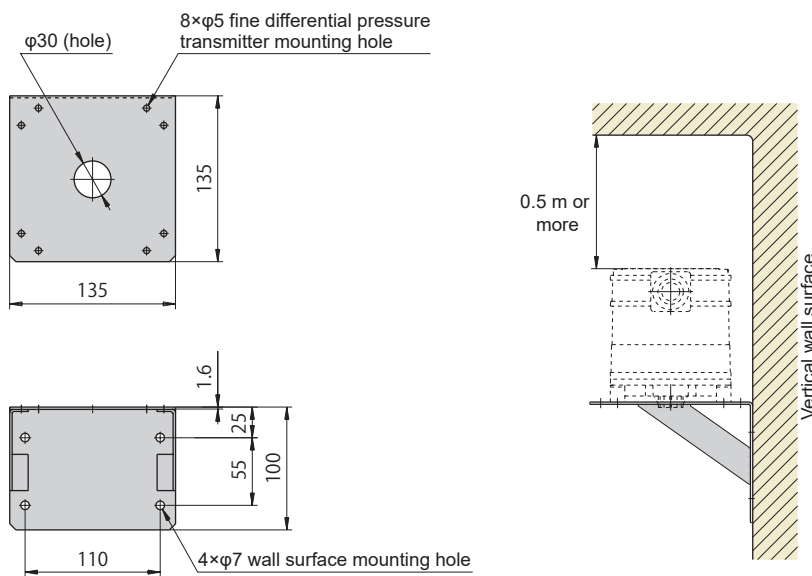


### Accessories dedicated to EMTGP1 RoHS

Terminal cover set	Plastic gland (Ace Service Co., Ltd.)	Adapter for conduit																												
(Auxiliary item)																														
<table border="1"> <thead> <tr> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td>TCA-T1</td> <td>Polycarbonate/brass</td> </tr> </tbody> </table>	Item number	Material	TCA-T1	Polycarbonate/brass	<table border="1"> <thead> <tr> <th rowspan="2">Item number</th> <th rowspan="2">Material</th> <th rowspan="2">Color of rubber bushing</th> <th colspan="2">Outer diameter of compatible electric wire D (mm)</th> </tr> <tr> <th>Minimum</th> <th>Maximum</th> </tr> </thead> <tbody> <tr> <td>AC4-2T</td> <td rowspan="3">Polyacetal</td> <td>Black</td> <td>6.5</td> <td>9.0</td> </tr> <tr> <td>AC4-3T</td> <td>Red</td> <td>8.5</td> <td>11.0</td> </tr> <tr> <td>AC4-4T</td> <td>Green</td> <td>10.0</td> <td>12.5</td> </tr> </tbody> </table>	Item number	Material	Color of rubber bushing	Outer diameter of compatible electric wire D (mm)		Minimum	Maximum	AC4-2T	Polyacetal	Black	6.5	9.0	AC4-3T	Red	8.5	11.0	AC4-4T	Green	10.0	12.5	<table border="1"> <thead> <tr> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td>ADPA-EMT1</td> <td>Brass</td> </tr> </tbody> </table>	Item number	Material	ADPA-EMT1	Brass
Item number	Material																													
TCA-T1	Polycarbonate/brass																													
Item number	Material	Color of rubber bushing	Outer diameter of compatible electric wire D (mm)																											
			Minimum	Maximum																										
AC4-2T	Polyacetal	Black	6.5	9.0																										
AC4-3T		Red	8.5	11.0																										
AC4-4T		Green	10.0	12.5																										
Item number	Material																													
ADPA-EMT1	Brass																													
<p>This is used to protect the terminal screw of EMTGP1B type (exposed terminal type). This is already installed at the time of purchase of the instrument.</p>	<p>This is used when the wiring of fine differential pressure transmitter is conducted with instrumentation cables. By paying attention to the finish outer diameter of the cable to be used, select a plastic gland in a size that allows the rubber bushing to retain the cable outer diameter when the cap nut is tightened.</p>	<p>When conducting wiring to the fine differential pressure transmitter by passing the wire through the thin steel electric wire conduit with a nominal size of 19 or a metallic flexible electric wire conduit, because the service entrance of the transmitter has a G1/2 internal thread and a different size, use an adapter for the conduit.</p>																												

### Bracket for mounting on vertical wall surface (horizontal mounting)

\*Mounting screw is not included.



Item number	Material
BRKT-T1GP1	Steel

\*For quality improvement or for another reason, part of the specifications may be subject to change without prior notice.

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

## EMT1H

Type examination pass No. CML 19JPN2072X

RoHS

### Intrinsically safe fine differential pressure transmitter

**Explosion-proof performance**    **Ex ia IIC T4 Ga**

Intrinsically safe refers to a model with a structure designed in consideration of the necessary safety factors so that combustible gas will not be ignited because of an electric spark generated under normal conditions or in the event of an accident or temperature rise, whose explosion-proof safety has been verified through tests or by other means by an official organization.



**EMT1H**  
(Manostar transmitter + safety barrier)

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

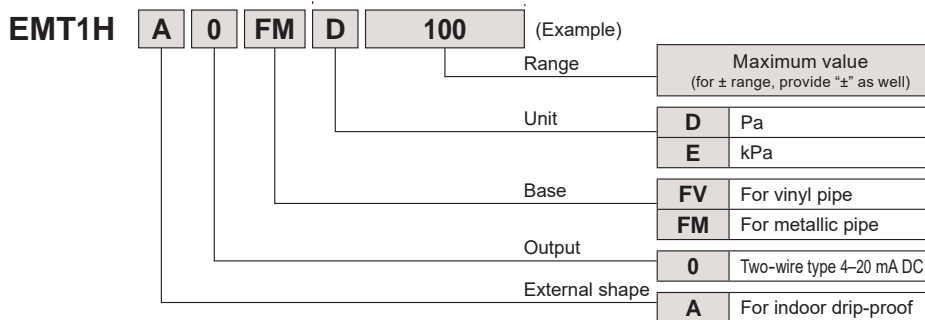
**<Main application fields>**

- General factory management equipment
- Negative pressure for dust collector/differential pressure of air conditioners
- Filter pressure loss management
- Precision machine manufacturing line
- Building air-conditioning control equipment

**<Usage>**

- Detection of clogging of air filter
- Room pressure measurement in a clean room
- Measurement of clogging of bug filter
- Measurement of dynamic pressure at ventilation/exhaust device

### Product code



- ◆ When making an inquiry or placing an order, specify the above product code.
- ◆ The above product code is for the set of fine differential pressure transmitter and safety barrier.
- ◆ When you use this product 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.

\*(Refer to pages 114 to 117)

### System specifications

<b>Model</b>	EMT1H						
<b>Configuration</b>	Manostar transmitter EMT1H + safety barrier MTL7787+						
<b>Explosion-proof type</b>	Intrinsically safe structure						
<b>Target gas</b>	Ex ia IIC T4 Ga						
<b>Intrinsically safe circuit</b>	Conditions for wiring in the section between EMT1H and safety barrier (MTL7787+) Capacitance (CC): 0.05 μF or lower    Wiring resistance: 10 Ω or lower Inductance (Lc): 2.00 mH or lower    Cross section area of electric wire conductor: 0.5 to 2.5 mm <sup>2</sup>						
<b>EMT1H</b>							
<b>Pressure unit</b>	Pa, kPa	<b>Durable vibration</b>	5 to 10 Hz, amplitude of 10 mm, 10 to 50 Hz, acceleration of 39 m/s <sup>2</sup> (two hours each for three axial directions)				
<b>Pressure measurement method</b>	Differential pressure method	<b>Durable impact</b>	100 m/s <sup>2</sup> (six times each for three axial directions)				
<b>Measured gas</b>	Air and noncorrosive gas (liquid cannot be measured)	<b>Compatible pipe</b>	<ul style="list-style-type: none"> <li>• Vinyl pipe or rubber pipe (inner diameter of 6 mm)                             <ul style="list-style-type: none"> <li>.....Compatible with base for vinyl pipe</li> </ul> </li> <li>• Metallic pipe (outer diameter of 6 ± 0.1 mm)                             <ul style="list-style-type: none"> <li>.....Compatible with base for metallic pipe</li> </ul> </li> <li>• Hard tube (outer diameter 6 × inner diameter 4 mm)                             <ul style="list-style-type: none"> <li>.....Separately sold inner sleeve set (XIN 6 × 4; refer to page 111) is necessary for the base for metallic pipe.</li> </ul> </li> </ul>				
<b>Pressure-receiving element</b>	Diaphragm (silicone rubber)	<b>Mass</b>	Approx. 1100 g				
<b>Exterior material</b>	Aluminum die casting    Painting on exterior (paint color: gray)						
<b>Instrument body withstanding pressure</b>	500 kPa (refer to page 118)						
<b>Mounting orientation</b>	Horizontal (inclination angle of within ± 5°)						
<b>Electric signal conversion method</b>	Variable inductance						
<b>Insulation resistance</b>	Between power terminal and grounding terminal: 20 MΩ or higher (500 V DC megger)						
<b>Withstand voltage</b>	Between power terminal and grounding terminal: 500 V AC, 50/60 Hz, for one minute, 1 mA or lower						
<b>Operating ambient temperature</b>	0°C to 40°C (no freezing allowed)						
<b>Operating ambient humidity</b>	90% RH or below (no condensation allowed)						
<b>MTL7787 +</b>							
<b>Intrinsically safe circuit maximum voltage</b>	28 V	<b>Non-intrinsically safe circuit Tolerable voltage</b>	250 V AC, 50/60 Hz, 250 V DC				
<b>Intrinsically safe circuit maximum current</b>	93 mA						
<b>Intrinsically safe circuit maximum power</b>	0.65 W						
<b>Mass</b>	Approx. 140 g						
<b>Pressure range code</b>	<b>Pressure range</b>	<b>Accuracy (at 20°C)</b>	<b>Temperature characteristics (zero + span) at 0°C to 40°C</b>	<b>Withstanding pressure of pressure-receiving element</b>	<b>Output and transmission method</b>		
D 10 D 15 D 20 D 30	0–10 Pa 0–15 Pa 0–20 Pa 0–30 Pa	±2% FS	±0.2% FS/°C	10 kPa	Two-wire type: Output signal of 4 to 20 mA DC (load resistance of 250 Ω or lower *1) Power voltage of 24 V DC ± 10% (ripple of 0.2 V P-P or lower)		
D 50 D 75 D 100 D 150 D 200 D 300 D 500 D 750 D1000	0–50 Pa 0–75 Pa 0–100 Pa 0–150 Pa 0–200 Pa 0–300 Pa 0–500 Pa 0–750 Pa 0–1000 Pa						
E 1	0–1 kPa	±1% FS	±0.1% FS/°C			40 kPa	*1 Resistance value of connectable load when combined with the supplied safety barrier
E 2 E 3 E 5 E 10 E 20	0–2 kPa 0–3 kPa 0–5 kPa 0–10 kPa 0–20 kPa						
E 30 E 50	0–30 kPa 0–50 kPa						
E 100	0–100 kPa						
D+ – 10 D+ – 20 D+ – 30	–10 to +10 Pa –20 to +20 Pa –30 to +30 Pa						
D+ – 50 D+ – 100	–50 to +50 Pa –100 to +100 Pa	±1% FS	±0.1% FS/°C				

◆ Use of this product in a mounting orientation other than horizontal orientation is impossible.

◆ For the use environment, refer to page 118.

## EMT1H

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

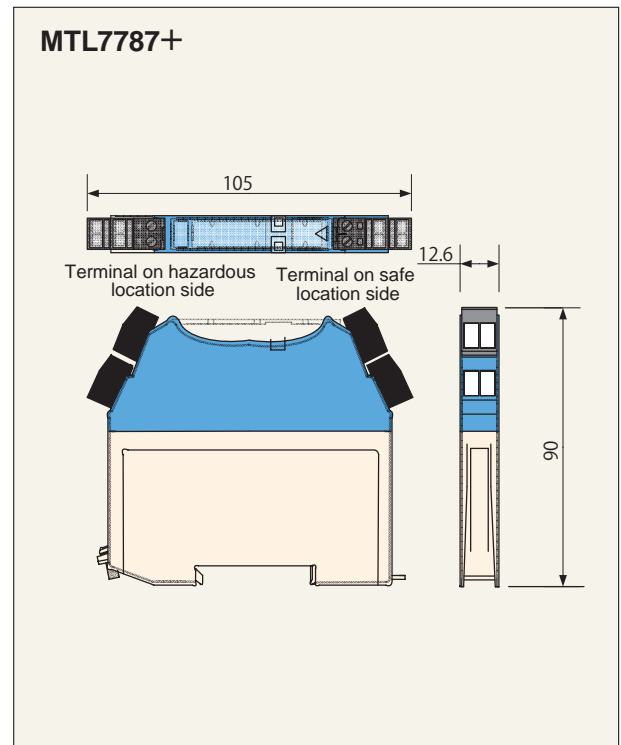
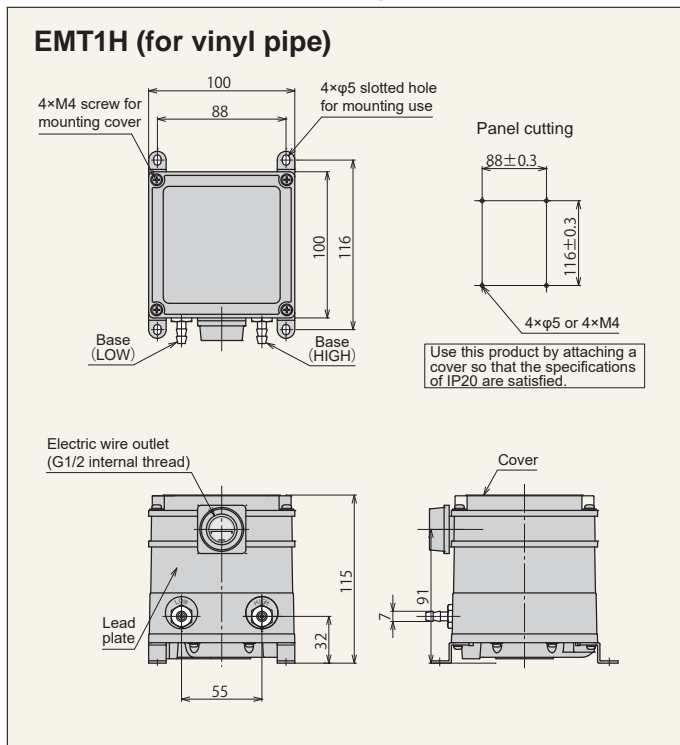
Accessories

Application

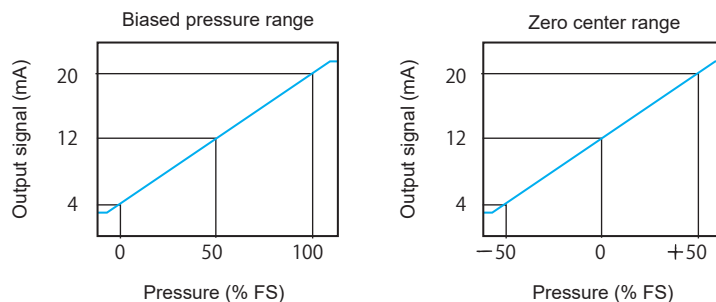
Precautions

Maintenance

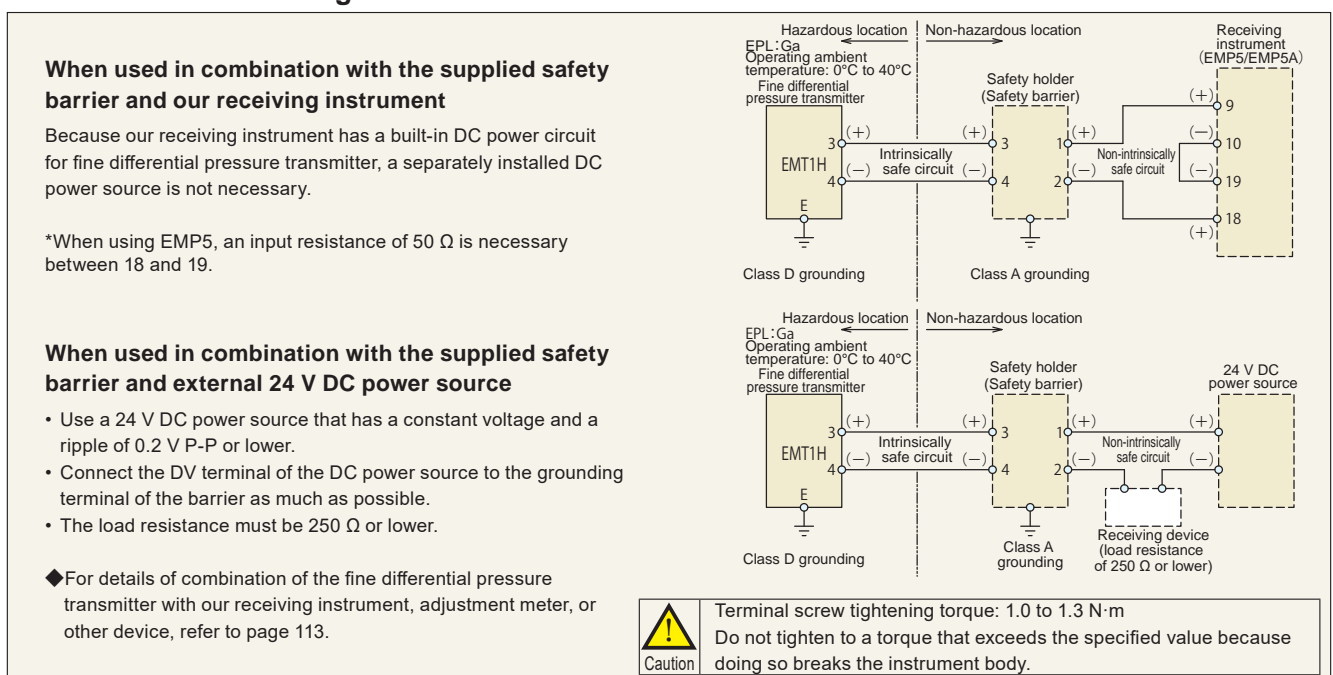
### External dimension drawing



### Transmission output diagram (pressure-output signal)



### Terminal connection diagram





### Notes on use

- Never change the constituting parts and the circuit.
- This instrument has an intrinsically safe structure. The intrinsically safe structure has a higher reliability compared to other explosion-proof structures, but failure to follow the preconditions for the explosion-proof structure significantly decreases the reliability and makes it impossible to maintain the explosion-proof performance. When using this instrument, be sure to observe the following precautions.
- For details of explosion-proof properties, refer to the following reference documents.

### Reference documents

- Recommended Practices for Explosion-protected Electrical Installations in General Industries JNIOHS-TR-46-1: 2015, published by the Technology Institution of Industrial Safety
- Recommended Practices for Explosion-protected Electrical Installations in General Industries JNIOHS-TR-46-6: 2015, published by the Technology Institution of Industrial Safety
- USERS' GUIDELINES for Installations for Explosive Atmospheres in General Industry JNIOHS-TR-NO.44, published by the Technology Institution of Industrial Safety
- Be sure to house the safety barrier in a container with a totally closed structure, and place it at a non-hazardous location.

### Grounding

- Solely conduct grounding of the safety barrier in accordance with the Class A grounding work.
- Conduct grounding of the fine differential pressure transmitter body in accordance with the Class D grounding work.
- In actual grounding work, refer to "Recommended Practices for Explosion-Protected Electrical Installations in General Industries."

### Wiring

The electric circuit of this instrument has restricted capacitances and inductances so as not to accumulate energy, which could serve as an ignition source. However, because the capacitance and inductance generated in the wiring (intrinsically safe circuit) from the instrument to the safety barrier vary depending on the installation environment, they need to be restricted to the tolerance value or lower by the user.

Conditions for wiring in the section between EMT1H and safety barrier (MTL7787+)

- Capacitance (Cc): 0.05  $\mu$ F or lower
- Inductance (Lc): 2.00 mH or lower
- Wiring resistance: 10  $\Omega$  or lower
- Cross section area of electric wire conductor: 0.5 to 2.5 mm<sup>2</sup>

\*Because it is difficult to adjust a wiring cable after it has been wired, we recommend that you actually measure the capacitance and inductance of the cable to be used in advance to obtain the approximate conditions for the cable, and then conduct the work.

- Conduct wiring as per terminal connection diagram, and after the wiring, be sure to make sure that there is no wrong wiring.
- For wiring and piping, use highly reliable parts.
- Concerning wiring, refer to "USERS' GUIDELINES for Installations for Explosive Atmospheres in General Industry NIOSH-TR-NO.44" as it provides detailed explanations in accordance with the installation environment.



Warning

## EMT1H accessories

DIN rail set for safety barrier		Metallic cable gland (made of ZDC or FCD)																				
<p>Item number DIN-T1H</p>		<p>Non-compliant with RoHS</p> <table border="1"> <thead> <tr> <th rowspan="2">Item number</th> <th rowspan="2">Color of rubber bushing</th> <th colspan="2">Outer diameter of compatible electric wire (mm)</th> </tr> <tr> <th>Minimum</th> <th>Maximum</th> </tr> </thead> <tbody> <tr> <td>SC4-1T</td> <td>Gray</td> <td>3.5</td> <td>7.0</td> </tr> <tr> <td>SC4-2T</td> <td>Black</td> <td>6.5</td> <td>9.0</td> </tr> <tr> <td>SC4-3T</td> <td>Red</td> <td>8.5</td> <td>11.0</td> </tr> </tbody> </table>			Item number	Color of rubber bushing	Outer diameter of compatible electric wire (mm)		Minimum	Maximum	SC4-1T	Gray	3.5	7.0	SC4-2T	Black	6.5	9.0	SC4-3T	Red	8.5	11.0
Item number	Color of rubber bushing	Outer diameter of compatible electric wire (mm)																				
		Minimum	Maximum																			
SC4-1T	Gray	3.5	7.0																			
SC4-2T	Black	6.5	9.0																			
SC4-3T	Red	8.5	11.0																			
<p>Use this DIN rail set to solely conduct grounding of the attached safety barrier in accordance with the Class A grounding work. It is possible to install up to five safety barriers.</p>		<p>This is used when the wiring of fine differential pressure transmitter is conducted with instrumentation cables. By paying attention to the finish outer diameter of the cable to be used, select a metallic cable gland in a size that allows the rubber bushing to retain the cable outer diameter when the cap nut is tightened. Use a cable equipped with shield.</p>																				

Schematic figure of mounted DIN rail



◆EMT1H accessories are shared with EMT1.

## Bracket for mounting on vertical wall surface (horizontal mounting)

<p>8<math>\times</math><math>\phi</math>5 fine differential pressure transmitter mounting hole</p> <p><math>\phi</math>30 (hole)</p> <p>135</p> <p>135</p> <p>110</p> <p>1.6</p> <p>25</p> <p>55</p> <p>100</p> <p>4<math>\times</math><math>\phi</math>7 wall surface mounting hole</p>		<p>*Mounting screw is not included.</p> <p>0.5 m or more</p> <p>Vertical wall surface</p>
Item number	Material	
BRKT-T1GP1	Steel	

\*For quality improvement or for another reason, part of the specifications may be subject to change without prior notice.

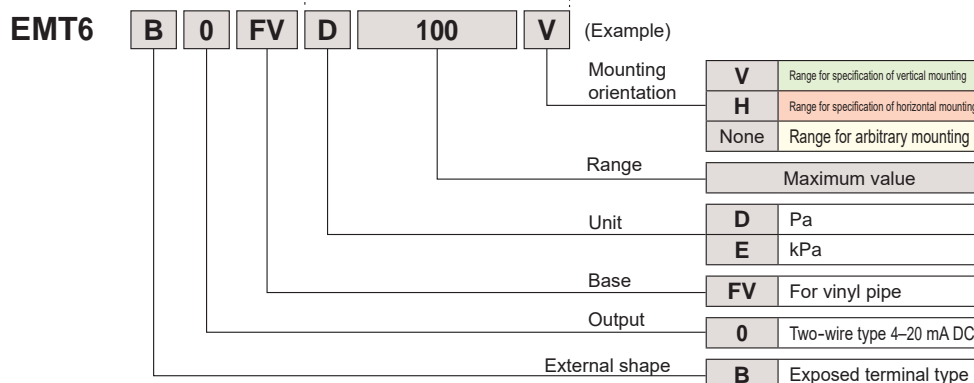
### Small-sized fine differential pressure transmitter

- This is a small-sized/light-weight type fine differential pressure transmitter.
- A silicone rubber piece with small hysteresis is used in the sensor part.
- The zero adjustment trimmer provided on top facilitates zero adjustment as of after installation.



EMT6

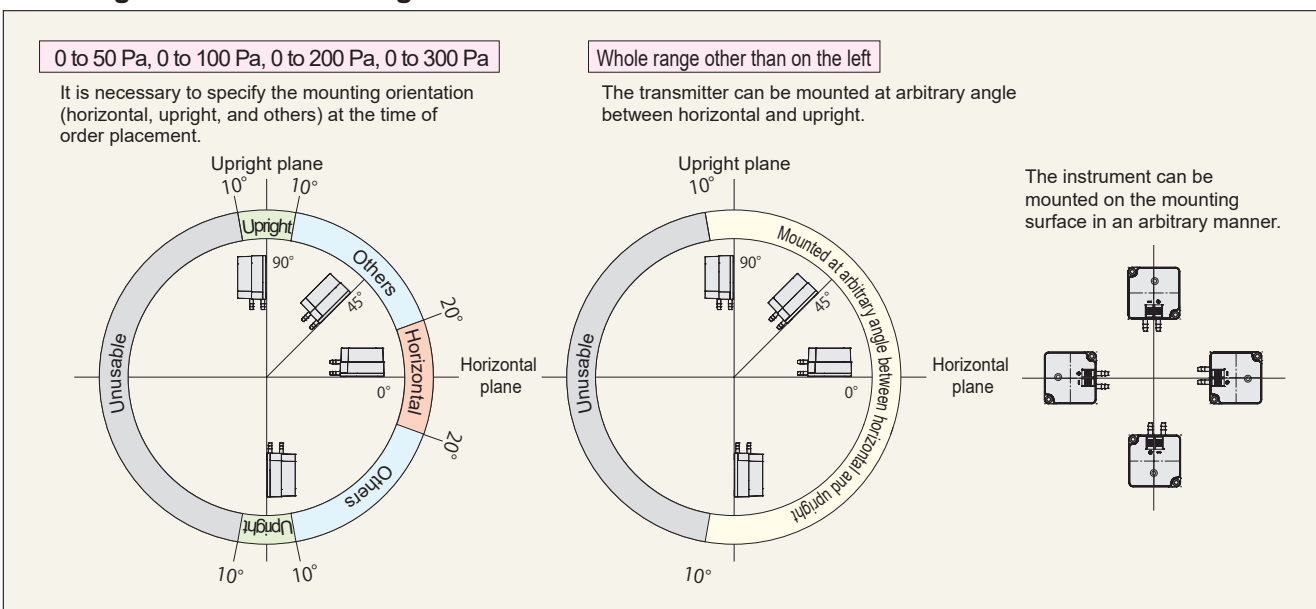
### Product code



- ◆ When making an inquiry or placing an order, specify the above product code.
- ◆ When you use this product 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.

\*(Refer to pages 114 to 117)

### Mounting orientation and range

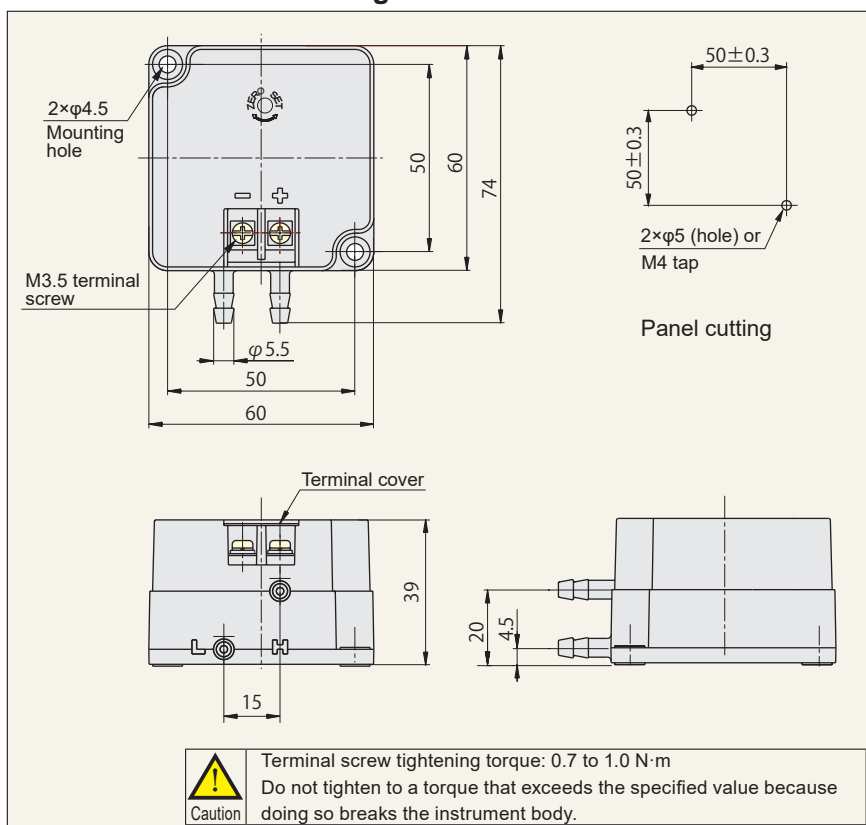


## Specifications

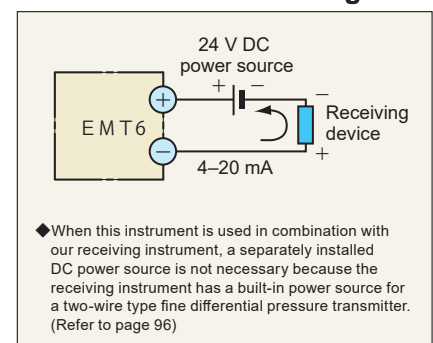
Model	EMT6				
Pressure unit	Pa, kPa		Operating ambient humidity	90% RH or below (no condensation allowed)	
Pressure measurement method	Differential pressure method		Durable vibration	5 to 10 Hz, amplitude of 10 mm, 10 to 50 Hz, acceleration of 39 m/s <sup>2</sup> (two hours each for three axial directions)	
Measured gas	Air and noncorrosive gas (liquid cannot be measured)		Durable impact	100 m <sup>2</sup> (six times each for three axial directions)	
Pressure-receiving element	Diaphragm (silicone rubber)		Compatible pipe	Vinyl pipe or rubber pipe (inner diameter of 4 mm)	
Withstanding pressure of pressure-receiving element	10 kPa (refer to page 118)		Base polarity	Indicating high-pressure side and low-pressure side with "H" and "L" marks, respectively, at piping connection base part.	
Instrument body withstanding pressure	50 kPa (refer to page 118)		Mass	Approx. 110 g	
Exterior material	Polyamide				
Electric signal conversion method	Variable inductance				
Insulation resistance	Between terminal and case: 20 MΩ or higher (500 V DC megger)				
Operating ambient temperature	0°C to 50°C (no freezing allowed)				
Pressure range code	Pressure range	Mounting orientation	Accuracy (at 20°C)	Temperature characteristics (zero + span) at 0°C to 50°C	Output and transmission method
D 50 H D 100 H D 200 H D 300 H	0-50 Pa 0-100 Pa 0-200 Pa 0-300 Pa	Horizontal (specification)	±2.5% FS	±0.15% FS/°C	Two-wire type: Output signal of 4 to 20 mA DC (load resistance of 500 Ω or lower) Power voltage of 24 V DC ± 10% (ripple of 0.2 V P-P or lower)
D 50 V D 100 V D 200 V D 300 V	0-50 Pa 0-100 Pa 0-200 Pa 0-300 Pa	Upright (specification)			
D 500 D 1000 E 2 E 3 E 5	0-500 Pa 0-1000 Pa 0-2 kPa 0-3 kPa 0-5 kPa	Between horizontal and upright Arbitrary mounting			

- ◆ When using this product in a combustible gas atmosphere, use the intrinsically safe type EMT1H described on page 85.
- ◆ For the use environment, refer to page 118.

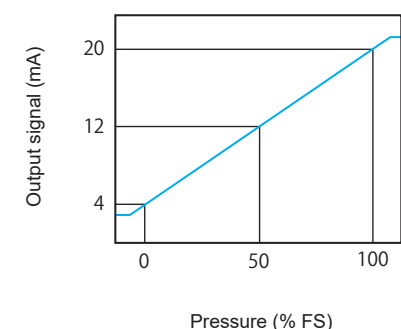
## External dimension drawing



## Terminal connection diagram



## Transmission output diagram (pressure-output signal)



## EMP5A

RoHS

### Receiving instrument

When this instrument is used in combination with a fine differential pressure transmitter, it is possible to measure pressure, airflow rate, and airflow speed.

- Incorporated with a DC power source for two-wire type fine differential pressure transmitter.
- Equipped with two alarm outputs for which the action can be selected in accordance with the usage.
- Incorporated with a square root calculation function (for airflow rate/airflow speed receiving instrument only).
- Front panel with IP66 structure



EMP5A

### Product code

EMP5A **D 2 1 1 D 300** (Example)

Range	Maximum value (for ± range, provide "±" as well)	
Unit	<b>D</b>	Pressure Pa
	<b>E</b>	Pressure kPa
	<b>F</b>	Airflow rate m <sup>3</sup> /min
		Airflow rate m <sup>3</sup> /h (nor)
	Airflow rate m <sup>3</sup> /h (nor)	
	Airflow speed m/s	
Output signal	<b>1</b>	4–20 mA DC
Input signal	<b>3</b>	0–5 V DC (non-standard model)
Alarm output	<b>2</b>	Two circuits (2 × 1a contact)
Display	<b>D</b>	Digital indication

#### <Main application fields>

- General factory management equipment
- Negative pressure for dust collector/differential pressure of air conditioner
- Filter pressure loss management
- Precision machine manufacturing line
- Building air conditioning control equipment

#### <Usage>

- Detection of clogging of air filter
- Room pressure measurement in a clean room
- Measurement of clogging of bug filter
- Measurement of dynamic pressure at ventilation/exhaust device

- ◆ When making an inquiry or placing an order, specify the above product code.
- ◆ When you use this product for airflow rate/airflow speed measurements, we need to obtain the specifications of the pressure detection side.
- ◆ This product has been adjusted to measure pressure, airflow rate, and airflow speed by combining the digital indicator JIR-301-M, BK, P24 T2917 manufactured by Shinko Technos Co., Ltd. with a fine differential pressure transmitter.
- ◆ Some constituting parts of this instrument contain polyvinyl chloride.

\*(Refer to pages 114 to 117)

## Specifications

Model	EMP5A		
<b>Display</b>	Digital 4-1/2 digits (-2000 to 10000) ± 0.2% FS ± 1 digit	PV (current value) red SV (setting value) green	Character dimensions 16 × 7.2 mm (height × width) Character dimensions 10 × 4.8 mm (height × width)
<b>Sampling frequency</b>	0.125 seconds		
<b>Input signal</b>	4 to 20 mA DC (with built-in 50 Ω input resistor) On the airflow rate/speed meter, the maximum value varies depending on the range.		
<b>Output signal</b>	4 to 20 mA (load resistance of 550 Ω or lower) 0 to 5 V DC (load resistance of 500 kΩ or higher) Output signals from the airflow rate/speed meter are those obtained through square root calculation of input signals.		
<b>Output signal accuracy</b>	± 0.3% FS		
<b>Power supply to two-wire type transmitter</b>	24 V DC ± 10% (load current of 4 to 20 mA) Ripple voltage of 200 mV, maximum load current of 30 mA DC		
<b>Alarm output</b>	Output type Relay contact of 1a × 2 Contact capacity (resistance load)	Electric service life 100,000 times MAX. 3 A 250 V AC, 3 A 30 V DC MIN. 100 mA 5 V DC (reference value)	
<b>Power voltage</b>	100 to 240 V AC, 50/60 Hz (tolerable variation range: 85 to 264 V AC)		
<b>Power consumption</b>	Approx. 8 VA		
<b>Insulation resistance</b>	10 MΩ or higher (500 V DC) Each section between terminals (power terminal, grounding terminal, input terminal, and output terminal)		
<b>Withstand voltage</b>	1.5 kV AC for one minute Each section between terminals (power terminal, grounding terminal, input terminal, and output terminal) However, section between input terminal and output terminal is excluded.		
<b>Operating ambient temperature</b>	0°C to 50°C (no freezing allowed)		
<b>Operating ambient humidity</b>	35% to 85% RH (no condensation allowed)		
<b>Exterior material</b>	Fire-retardant resin (colors: panel in dark gray, case in black)		
<b>Mass</b>	Approx. 300 g		
<b>Protection level</b>	IP66 (front panel unit)		
<b>Accessories</b>	One set of screw-type mounting fittings, one piece of short-circuiting wire for two-wire type transmitter		
Pressure range code	Pressure range	LED display	Output signal
D 10	0–10 Pa	0.00–10.00	4 to 20 mA DC (load resistance of 550 Ω or lower) 0 to 5 V DC (load resistance: 500 kΩ or higher) Output signals from the airflow rate/speed meter are those obtained through square root calculation of input signals.
D 15	0–15 Pa	0.00–15.00	
D 20	0–20 Pa	0.00–20.00	
D 30	0–30 Pa	0.00–30.00	
D 50	0–50 Pa	0.00–50.00	
D 75	0–75 Pa	0.00–75.00	
D 100	0–100 Pa	0.0–100.0	
D 150	0–150 Pa	0.0–150.0	
D 200	0–200 Pa	0.0–200.0	
D 300	0–300 Pa	0.0–300.0	
D 500	0–500 Pa	0.0–500.0	
D 750	0–750 Pa	0.0–750.0	
D 1000	0–1000 Pa	0–1000	
E 2	0–2 kPa	0.000–2.000	
E 3	0–3 kPa	0.000–3.000	
E 5	0–5 kPa	0.000–5.000	
E 10	0–10 kPa	0.00–10.00	
E 20	0–20 kPa	0.00–20.00	
E 30	0–30 kPa	0.00–30.00	
E 50	0–50 kPa	0.00–50.00	
E 100	0–100 kPa	0.0–100.0	
D +- 10	-10 to +10 Pa	-10.00 to 0.00 to 10.00	
D +- 20	-20 to +20 Pa	-20.0 to 0.0 to 20.0	
D +- 30	-30 to +30 Pa	-30.0 to 0.0 to 30.0	
D +- 50	-50 to +50 Pa	-50.0 to 0.0 to 50.0	
D +- 100	-100 to +100 Pa	-100.0 to 0.0 to 100.0	
D +- 200	-200 to +200 Pa	-200 to 0 to 200	
D +- 300	-300 to +300 Pa	-300 to 0 to 300	
D +- 500	-500 to +500 Pa	-500 to 0 to 500	
D +- 1000	-1000 to +1000 Pa	-1000 to 0 to 1000	
E +- 2	-2 to +2 kPa	-2.00 to 0.00 to 2.00	
E +- 3	-3 to +3 kPa	-3.00 to 0.00 to 3.00	
E +- 5	-5 to +5 kPa	-5.00 to 0.00 to 5.00	
<b>Airflow rate/airflow speed range code</b>	<b>Airflow rate/airflow speed range (Note 1)</b>		
-	0 to <input type="text" value="Value"/> <input type="text" value="Magnification"/> <input type="text" value="Units"/>	-	

(Note 1) : arbitrary (to be rounded), : ×10, ×100, ×1000, ×10000, : m<sup>3</sup>/h, m<sup>3</sup>/min, m<sup>3</sup>/h (nor), m<sup>3</sup>/min (nor), m/s

For the purpose of manufacturing of airflow rate/airflow speed meter, fill out the airflow rate/airflow speed specification document preparation sheet on page 15, and inform us of the data.

◆For use environment, refer to page 118.

## EMP5A

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

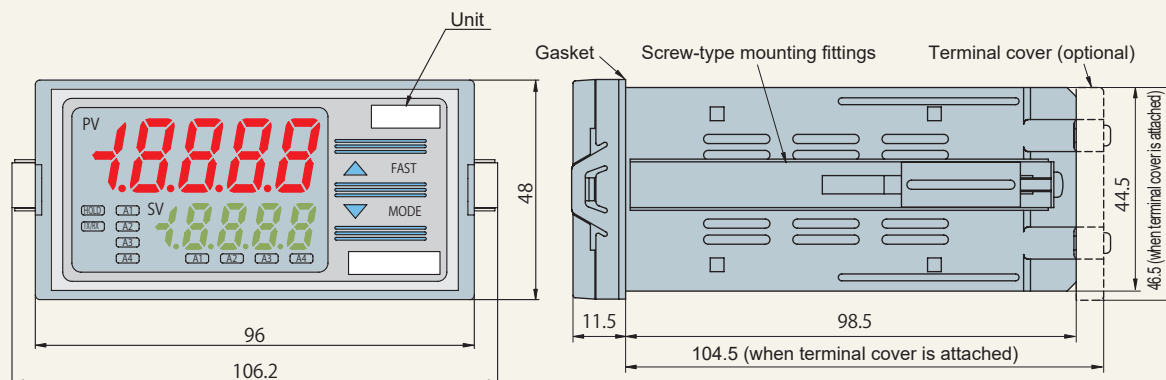
Accessories

Application

Precautions

Maintenance

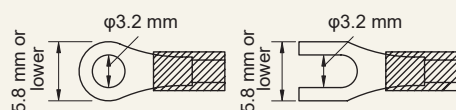
### External dimension drawing



### Notes on lead wire crimping terminal

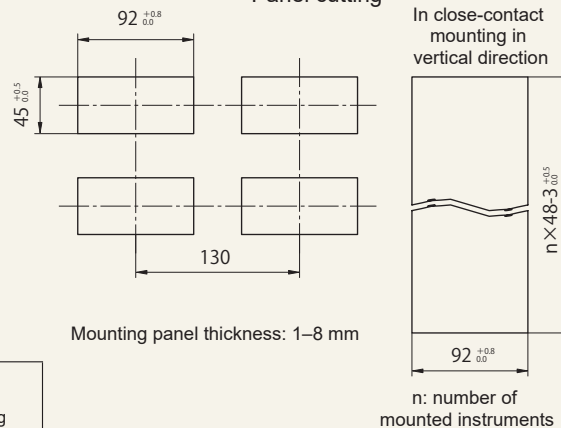
Use a crimping terminal with insulation sleeve that is compatible with M3 screw as shown below.

Crimping terminal	Manufacturer	Model name
Y-shape type	NICHIFU Co., Ltd.	TMEV1.25Y-3
	J.S.T. Mfg. Co., Ltd.	VD1.25-B3A
Round type	NICHIFU Co., Ltd.	TMEV1.25-3
	J.S.T. Mfg. Co., Ltd.	V1.25-3

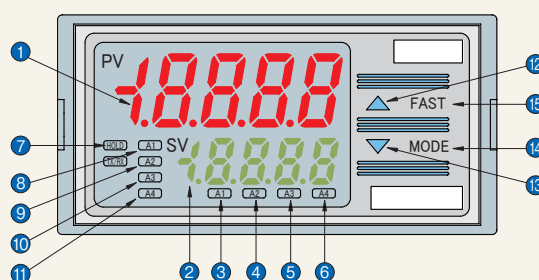


Terminal screw tightening torque: 0.6 to 1.0 N·m  
Recommended mounting screw tightening torque: approx. 0.12 N·m  
Do not tighten to a torque that exceeds the specified value because doing so breaks the instrument body.

### Panel cutting

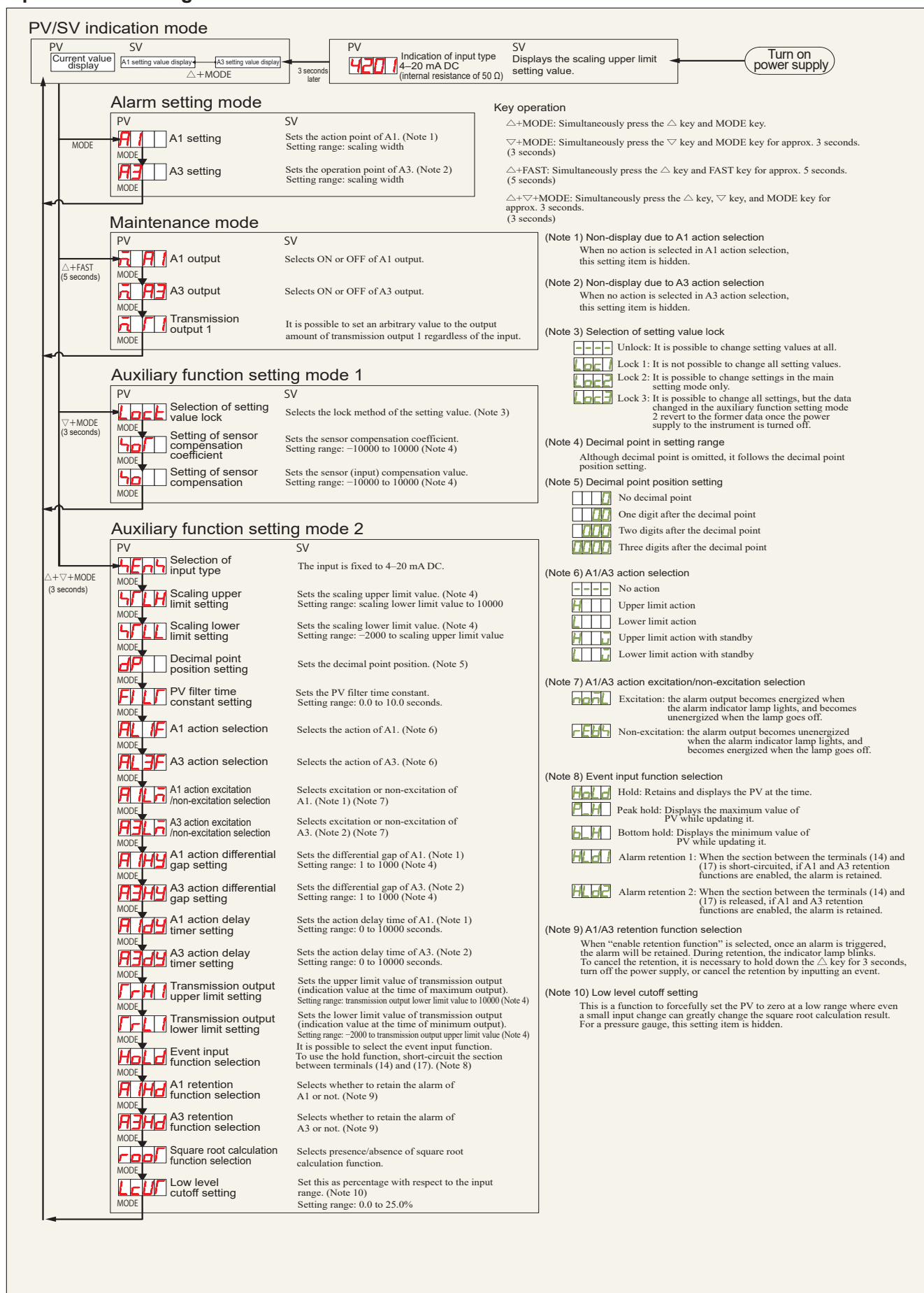


### Operation panel



- ① PV display : Displays the input value in the red display.
- ② SV display : Displays the A1 setting value, A2 setting value, and A3 setting value in the green display.
- ③ A1 indication lamp : The red indicator lamp is lit when the A1 output is turned on.
- ④ A2 indication lamp : The red indicator lamp is lit when the A2 output is turned on. (This is not used in EMP5A.)
- ⑤ A3 indication lamp : The red indicator lamp is lit when the A3 output is turned on.
- ⑥ A4 indication lamp : The red indicator lamp is lit when the A4 output is turned on. (This is not used in EMP5A.)
- ⑦ HOLD indicator lamp : The yellow indicator lamp is lit when the PV hold (hold, peak hold, bottom hold) output is turned on.
- ⑧ A1 setting indicator lamp : The green indicator lamp is lit when the A1 setting is displayed.
- ⑨ A2 setting indicator lamp : The green indicator lamp is lit when the A2 setting is displayed. (This is not used in EMP5A.)
- ⑩ A3 setting indicator lamp : The green indicator lamp is lit when the A3 setting is displayed.
- ⑪ A4 setting indicator lamp : The green indicator lamp is lit when the A4 setting is displayed. (This is not used in EMP5A.)
- ⑫ Up key : Increases the setting value.
- ⑬ Down key : Decreases the setting value.
- ⑭ Mode key : Switches the setting mode, and registers the setting value.  
(To register setting value and selected value, press the Mode key.)
- ⑮ Fast key : Simultaneously pressing the Up key or Down key and the Fast key increases the speed of setting value increase/decrease.

### Operation flow diagram



## EMP5A

List of products

WO81

### Input-output relationship diagrams

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

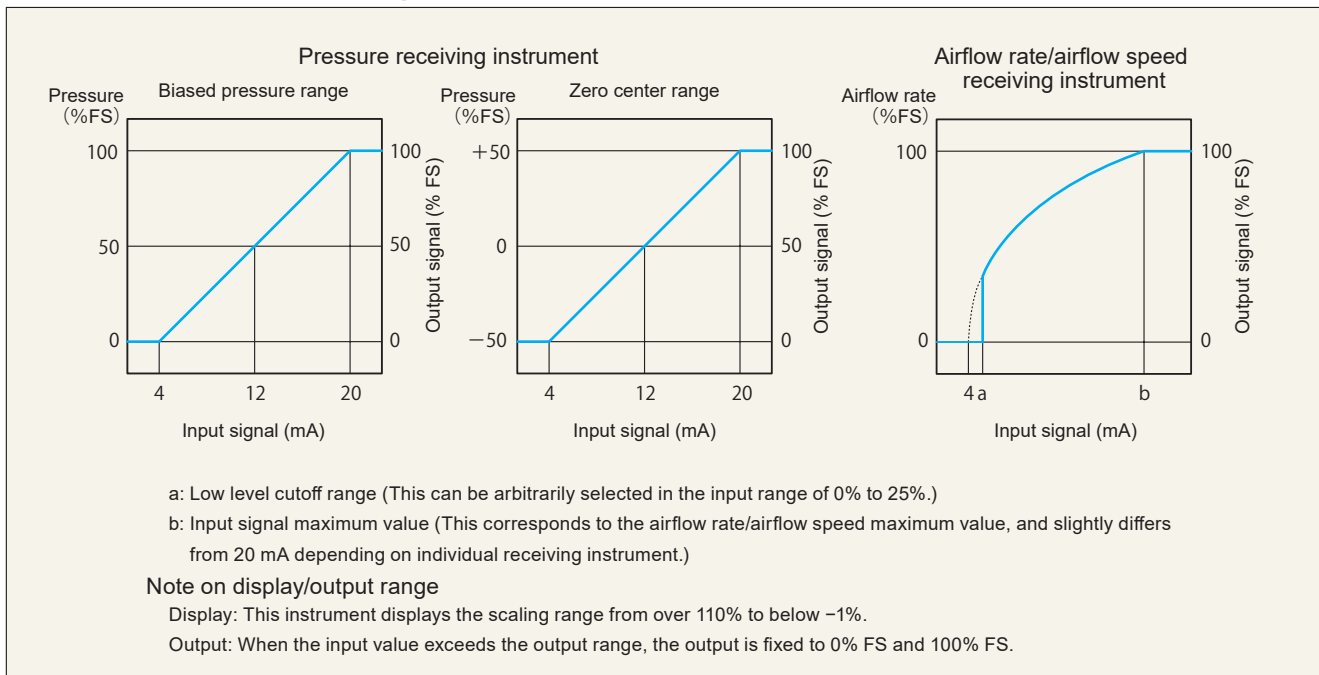
HWS15A

Accessories

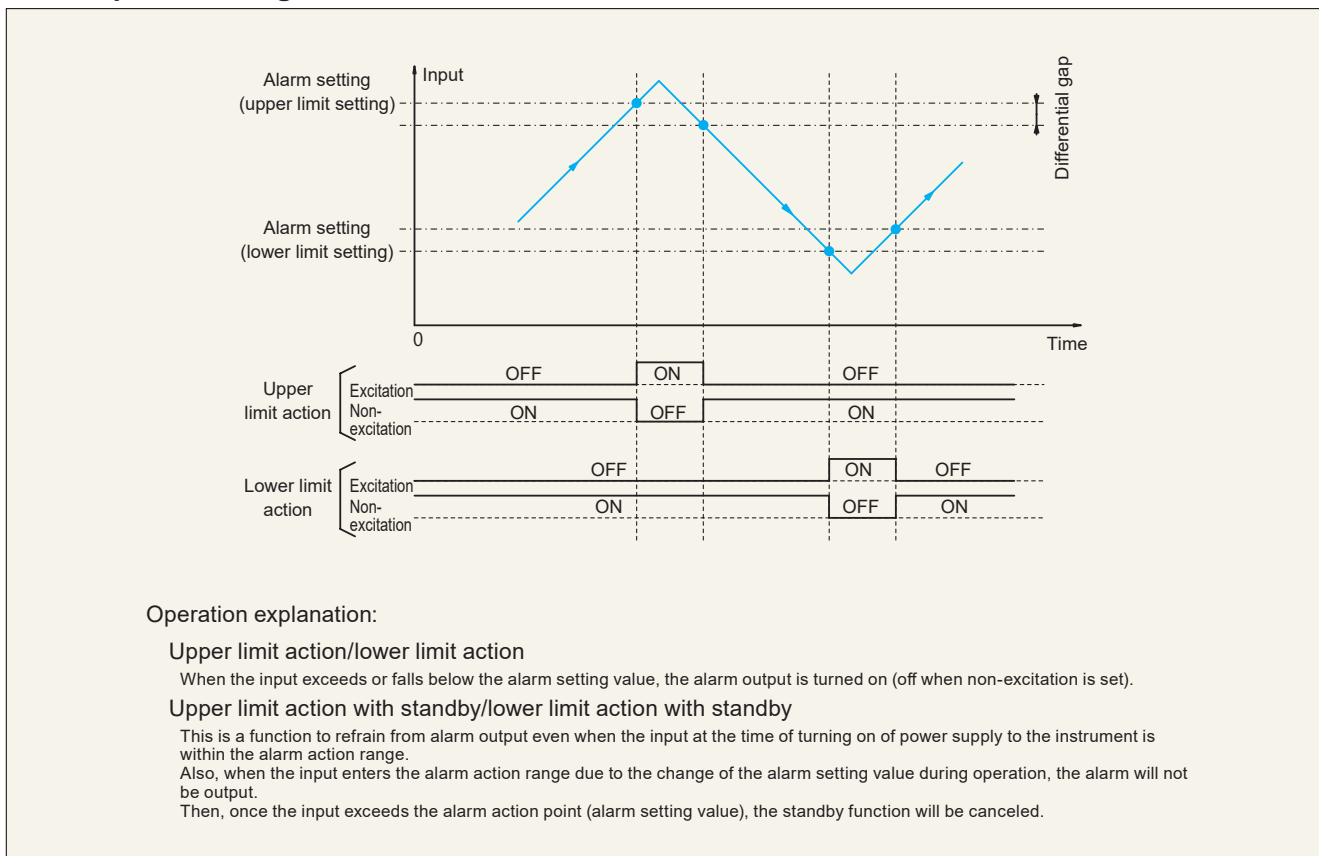
Application

Precautions

Maintenance



### Alarm operation diagram







## EMRT1

RoHS

### Square root calculator

This instrument performs square root calculation of an electric signal that is in proportion to the input pressure and outputs a current signal that is in proportion to the airflow rate.

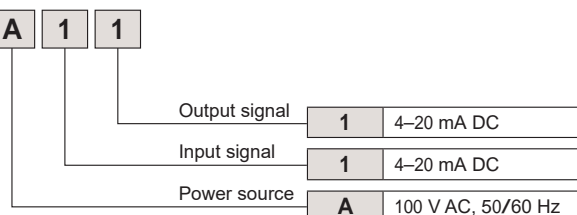
The input signal and the output signal are electrically insulated from each other.



EMRT1

### Product code

EMRT1 A 1 1



- ◆When making an inquiry or placing an order, specify the above product code.
- ◆When you use this product for airflow rate/airflow speed measurements in combination with an adjustment meter, 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.

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

### Specifications

Model	EMRT1
<b>Input signal</b>	4 to 20 mA DC (input resistance of 50 Ω)
<b>Output signal</b>	4 to 20 mA DC (load resistance of 500 Ω or lower)
<b>Square root output cut point</b>	15% FS or below
<b>Accuracy</b>	±1% FS (at 20°C) However, at output signal range of 15 to 100% FS
<b>Temperature characteristics</b>	±0.01% FS/°C (at 0°C to 40°C)
<b>Power voltage</b>	100 V AC ± 10%, 50/60 Hz, approx. 3.5 VA
<b>Exterior material</b>	Polycarbonate and ABS resin
<b>Operating ambient temperature</b>	0 to 50°C (no freezing allowed)
<b>Operating ambient humidity</b>	90% RH or below (no condensation allowed)
<b>Insulation resistance</b>	Between terminal and case: 20 MΩ or higher (500 V DC megger)
<b>Withstand voltage</b>	Between power terminal and case: 1000 V AC, 50/60 Hz, for one minute
<b>Mounting method</b>	Rail mounting (applicable rail: 35 mm wide DIN rail)
<b>Mass</b>	Approx. 300 g

◆For use environment, refer to page 118.

### Square root output cut point

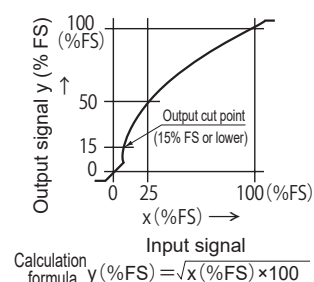
This refers to the point where output is cut so as not to perform square root output of the output signal in the range of 0% to 15% of FS. The results of comparison of input signals and output signals are shown in the table on the right. Since the input value becomes extremely small as the output value decreases, and then enters an action range out of the scope of the accuracy of the calculator, the cut point is set. In this instrument, the value range of 15% FS and below, which does not affect the actual use, is cut off.

### Square root calculation input/output comparison table

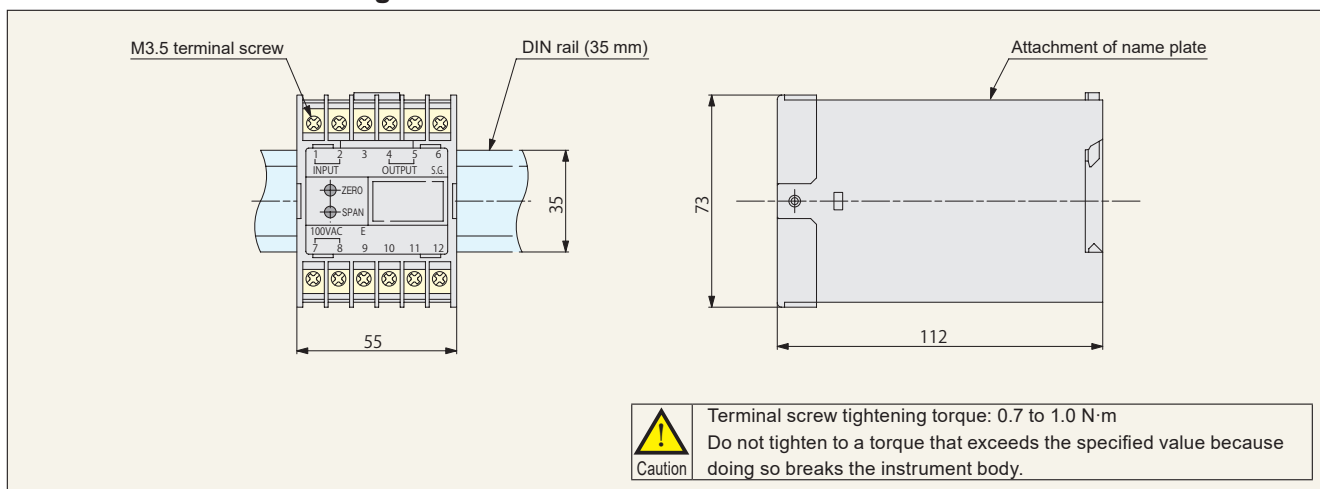
Output value	Input value
50%	$(0.5)^2 \times 100\% = 25\%$
20%	$(0.2)^2 \times 100\% = 4\%$
15%	$(0.15)^2 \times 100\% = 2.25\%$
10%	$(0.1)^2 \times 100\% = 1\%$
5%	$(0.05)^2 \times 100\% = 0.25\%$

### Table for output signal

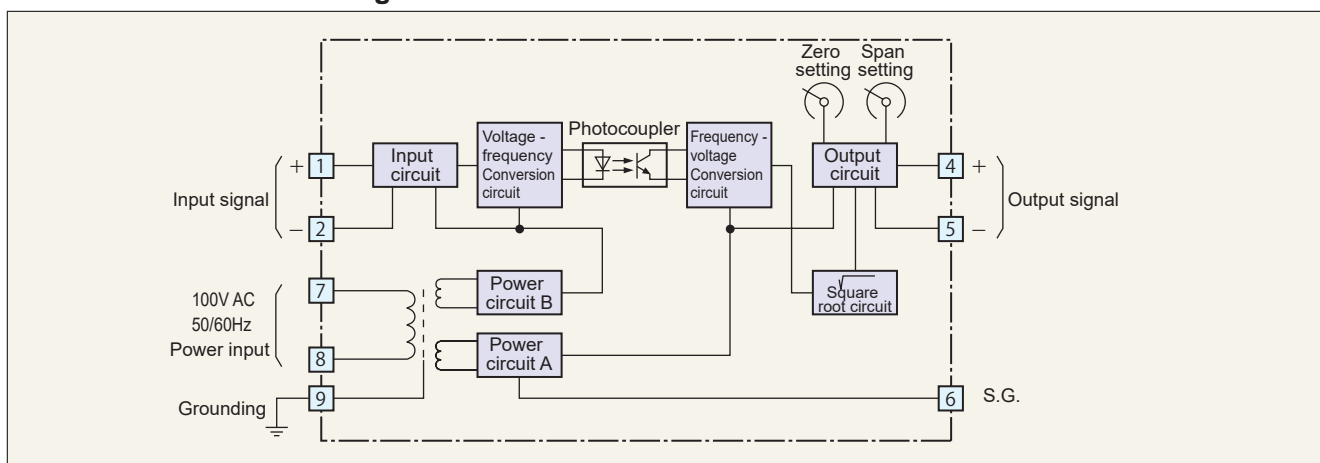
Input signal 4–20 mA DC	Output signal 4–20 mA DC	
4 mA	Zero point	4.0 mA
8 mA	1/2 span point	12.0 mA
20 mA	Span point	20.0 mA



### External dimension drawing



### Electronic circuit block diagram



# Direct current power unit

# HWS15A

## HWS15A



RoHS

### Direct current power unit

This instrument is used to drive a fine differential pressure sensor or fine differential pressure transmitter with 12 to 24 V DC power specification.



HWS15A

### Product code

**HWS15A-24/A**

- ◆When making an inquiry or placing an order, specify the above product code.
- ◆The DC power device HWS15A is a product manufactured by TDK-Lambda Corporation.

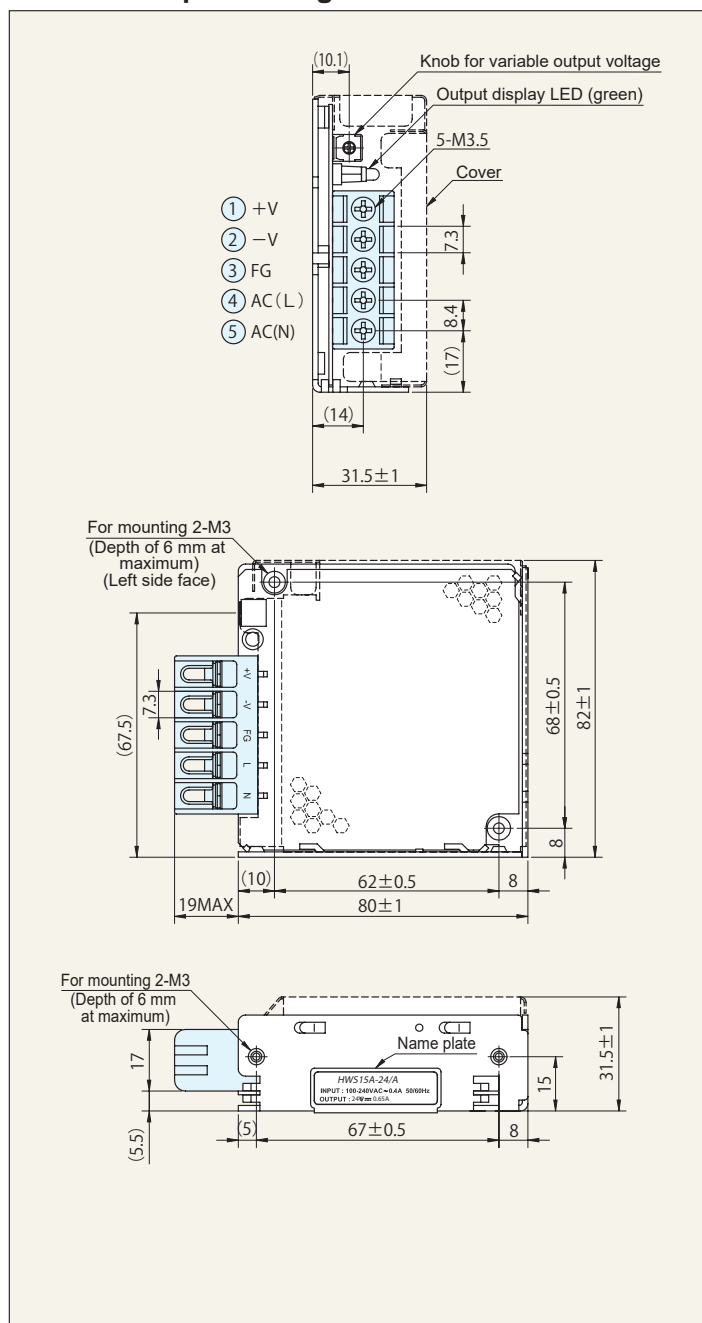
- List of products
- WO81
- WO71
- FR51A
- MS99
- MS99S
- MS61A-RA
- QDP33
- EMD8A
- EMD7
- EMT1
- EMTGP1
- EMT1H
- EMT6
- EMP5A
- EMRT1
- HWS15A**
- Accessories
- Application
- Precautions
- Maintenance

## Specifications

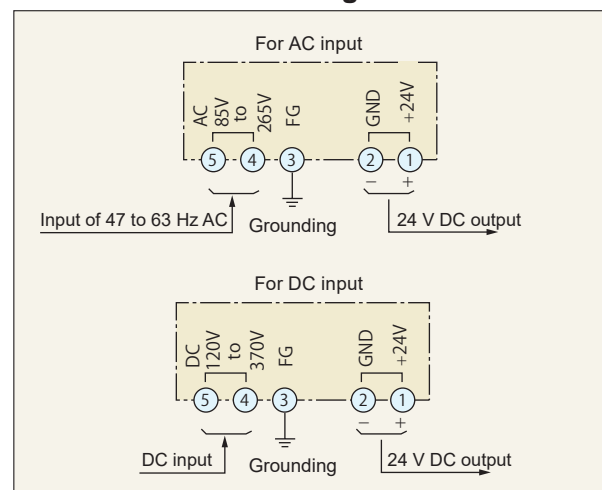
Model	HWS15A-24/A
Input voltage	85 to 265 V AC (47 to 63 Hz) or 120 to 370 V DC
Output voltage	24 V DC
Maximum output current	0.65 A
Output variation at operating ambient temperature	0.02%/°C or lower
Overcurrent protection	0.68 A and higher
Operating ambient temperature	-10°C to +70°C (-10°C to +50°C: 100%, +60°C: 80%, +70°C: 60%)
Operating ambient humidity	30% to 90% RH (no condensation allowed)
Withstand voltage	Between input and FG: 2 kV AC (20 mA), between input and output: 3 kV AC (20 mA) Between output and FG: 500 V AC (100 mA), each for one minute
Insulation resistance	100 MΩ or higher (between output and FG: 500 V DC, 25°C, 70% RH)
Mass	Approx. 210 g

◆For use environment, refer to page 118.

## External shape drawing

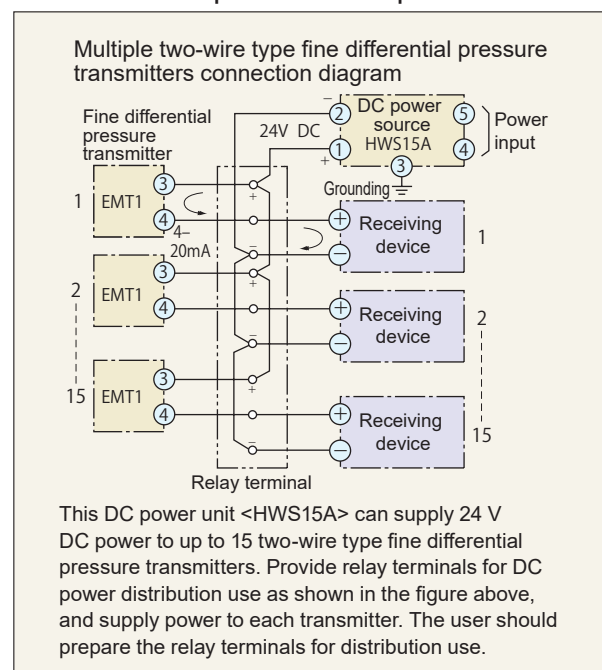


## Terminal connection diagram



**Caution** Terminal screw tightening torque: 1.6 N·m  
Do not tighten to a torque that exceeds the specified value because doing so breaks the instrument body.

## When there are multiple fine differential pressure transmitters



This DC power unit <HWS15A> can supply 24 V DC power to up to 15 two-wire type fine differential pressure transmitters. Provide relay terminals for DC power distribution use as shown in the figure above, and supply power to each transmitter. The user should prepare the relay terminals for distribution use.

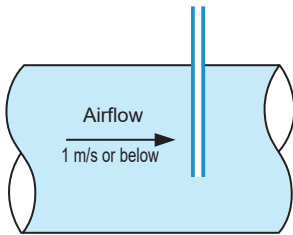
# Accessories

## Pitot tube

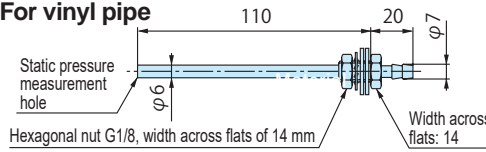
RoHS

**Simplified model** For measurement of static air pressure at indoor location, etc.

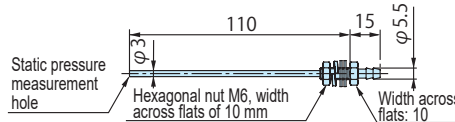
### Simplified Pitot tube (simplified static pressure pipe)



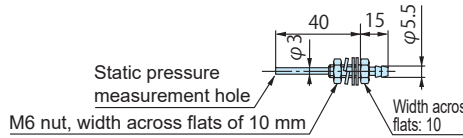
### For vinyl pipe



Item number	Material	Panel cutting
PTK—VT6—110	Brass/steel	φ10.5
PTK—VT6—110—S	Stainless steel	

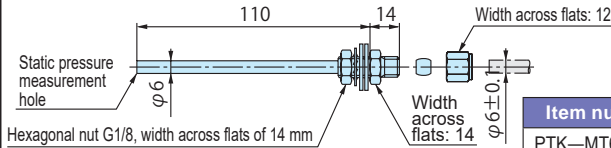


Item number	Material	Panel cutting
PTK—VT4—110	Brass/phosphor bronze	φ6.5



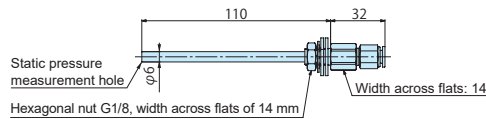
Item number	Material	Panel cutting
PTK—VT4—40	Brass/phosphor bronze	φ6.5

### For metallic pipe



Item number	Material	Panel cutting
PTK—MT6—110	Brass/steel	φ10.5
PTK—MT6—110—S	Stainless steel	

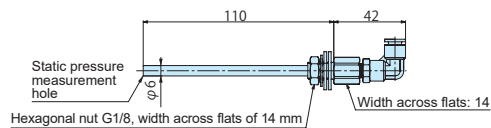
### PT base



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)

Item number	Material	Panel cutting
PTK—PT6—110	PBT, brass, steel	φ10.5

### PR base



The tube mounting part is a rotary elbow 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)

Item number	Material	Panel cutting
PTK—PR6—110	PBT, brass, steel	φ10.5

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

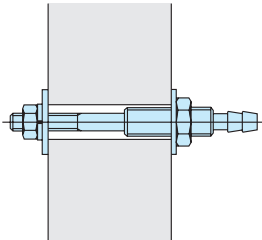
Maintenance

## Pitot tube

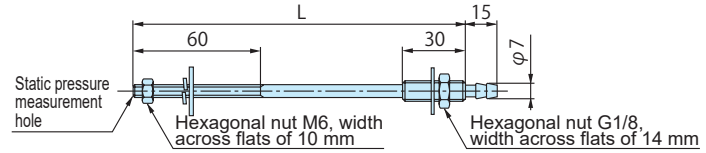
RoHS

**Simplified model** For measurement of static air pressure at indoor location.

### Pitot tube for wall (static pressure pipe for wall)

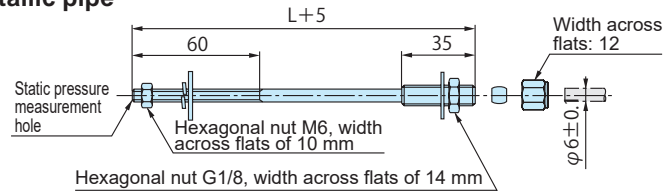


### For vinyl pipe



Item number	L ( mm )	Applicable wall thickness	Material	Panel cutting
PTW-VT6-100	100	10–80	Brass/steel	φ10.5
PTW-VT6-150	150	60–130		
PTW-VT6-200	200	110–180		
PTW-VT6-250	250	160–230		
PTW-VT6-300	300	210–280		

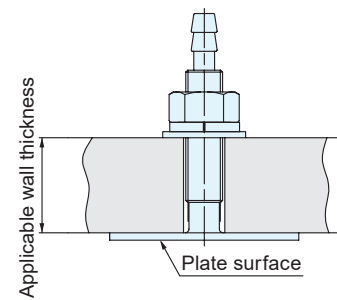
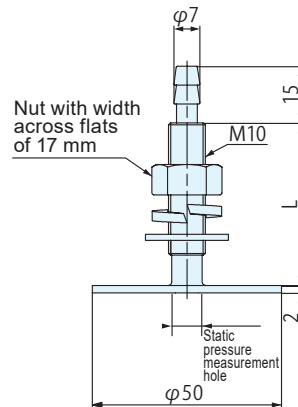
### For metallic pipe



Item number	L ( mm )	Applicable wall thickness	Material	Panel cutting
PTW-MT6-100	100	10–80	Brass/steel	φ10.5
PTW-MT6-150	150	60–130		
PTW-MT6-200	200	110–180		
PTW-MT6-250	250	160–230		
PTW-MT6-300	300	210–280		

### Decorative Pitot tube (decorative static pressure pipe)

For ceiling and wall (for clean room)



### Photograph for comparison of reflection on finished plate surface



Item number	L ( mm )	Applicable wall thickness	Plate surface finish	Material	Panel cutting
PTC-VT6-30-S	43	10–30	Cutting finish	Stainless steel	φ10.5
PTC-VT6-30-SMF	43	10–30	Mirror surface finish		
PTC-VT6-55-S	68	10–55	Cutting finish		
PTC-VT6-55-SMF	68	10–55	Mirror surface finish		

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

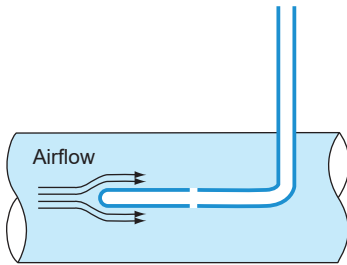
Maintenance

# Accessories

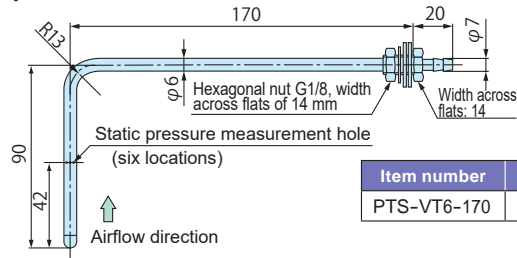
## Pitot tube

RoHS

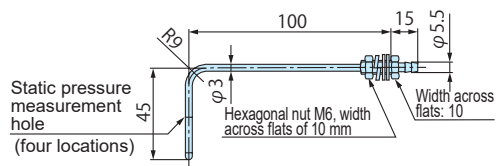
**Static pressure tube** For static pressure measurement in measurement of airflow rate/airflow speed (dynamic pressure) in pipes



### For vinyl pipe

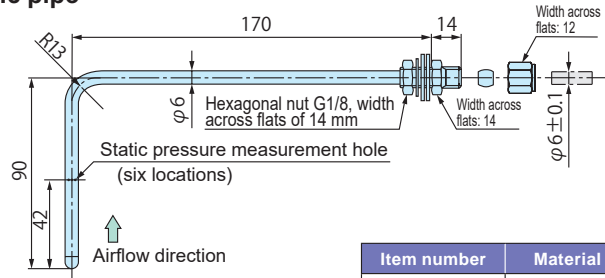


Item number	Material	Panel cutting
PTS-VT6-170	Brass/steel	φ10.5



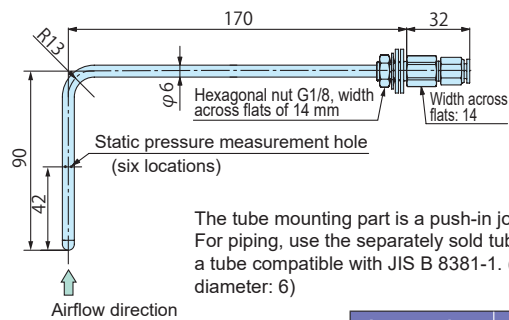
Item number	Material	Panel cutting
PTS-VT4-100	Brass/phosphor bronze	φ6.5

### For metallic pipe



Item number	Material	Panel cutting
PTS-MT6-170	Brass/steel	φ10.5

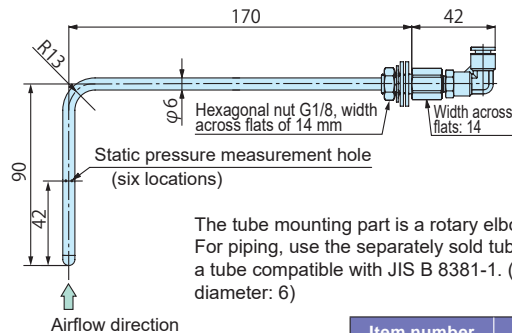
### PT base



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)

Item number	Material	Panel cutting
PTS-PT6-170	PBT, brass, steel	φ10.5

### PR base



The tube mounting part is a rotary elbow 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)

Item number	Material	Panel cutting
PTS-PR6-170	PBT, brass, steel	φ10.5



List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions


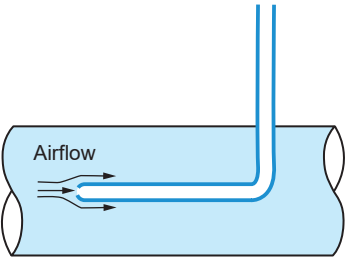
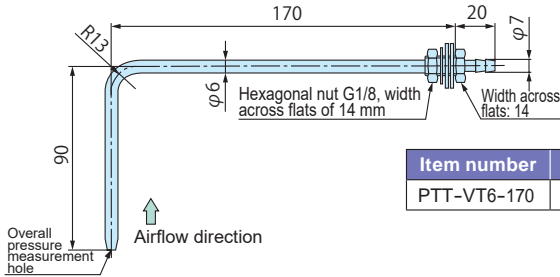
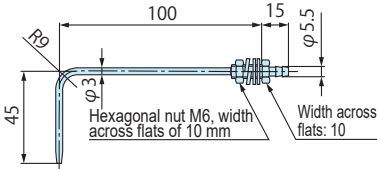

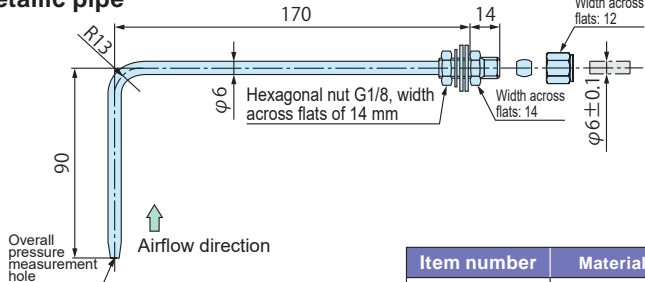

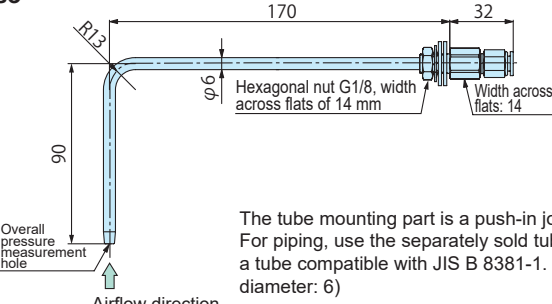
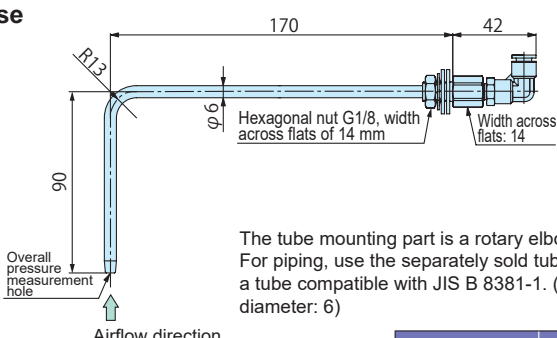
Maintenance



## Pitot tube

RoHS

**Total pressure pipe** For total pressure measurement in measurement of airflow rate/airflow speed (dynamic pressure) in pipes

 	<p><b>For vinyl pipe</b></p>  <table border="1" data-bbox="1093 533 1465 600"> <thead> <tr> <th>Item number</th> <th>Material</th> <th>Panel cutting</th> </tr> </thead> <tbody> <tr> <td>PTT-VT6-170</td> <td>Brass/steel</td> <td>φ10.5</td> </tr> </tbody> </table>  <table border="1" data-bbox="1093 913 1465 972"> <thead> <tr> <th>Item number</th> <th>Material</th> <th>Panel cutting</th> </tr> </thead> <tbody> <tr> <td>PTT-VT4-100</td> <td>Brass/phosphor bronze</td> <td>φ6.5</td> </tr> </tbody> </table>	Item number	Material	Panel cutting	PTT-VT6-170	Brass/steel	φ10.5	Item number	Material	Panel cutting	PTT-VT4-100	Brass/phosphor bronze	φ6.5
Item number	Material	Panel cutting											
PTT-VT6-170	Brass/steel	φ10.5											
Item number	Material	Panel cutting											
PTT-VT4-100	Brass/phosphor bronze	φ6.5											
	<p><b>For metallic pipe</b></p>  <table border="1" data-bbox="1093 1243 1465 1301"> <thead> <tr> <th>Item number</th> <th>Material</th> <th>Panel cutting</th> </tr> </thead> <tbody> <tr> <td>PTT-MT6-170</td> <td>Brass/steel</td> <td>φ10.5</td> </tr> </tbody> </table>	Item number	Material	Panel cutting	PTT-MT6-170	Brass/steel	φ10.5						
Item number	Material	Panel cutting											
PTT-MT6-170	Brass/steel	φ10.5											
	<p><b>PT base</b></p>  <p>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)</p> <table border="1" data-bbox="1093 1646 1465 1704"> <thead> <tr> <th>Item number</th> <th>Material</th> <th>Panel cutting</th> </tr> </thead> <tbody> <tr> <td>PTT-PT6-170</td> <td>PBT, brass, steel</td> <td>φ10.5</td> </tr> </tbody> </table> <p><b>PR base</b></p>  <p>The tube mounting part is a rotary elbow 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)</p> <table border="1" data-bbox="1093 2042 1465 2096"> <thead> <tr> <th>Item number</th> <th>Material</th> <th>Panel cutting</th> </tr> </thead> <tbody> <tr> <td>PTT-PR6-170</td> <td>PBT, brass, steel</td> <td>φ10.5</td> </tr> </tbody> </table>	Item number	Material	Panel cutting	PTT-PT6-170	PBT, brass, steel	φ10.5	Item number	Material	Panel cutting	PTT-PR6-170	PBT, brass, steel	φ10.5
Item number	Material	Panel cutting											
PTT-PT6-170	PBT, brass, steel	φ10.5											
Item number	Material	Panel cutting											
PTT-PR6-170	PBT, brass, steel	φ10.5											

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

# Accessories

## Pitot tube

RoHS

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

### Flange set to be mounted on Pitot tube

**Details of flange set**

Name	Material	t	Q'ty
Flange	Steel	t1.6	1
Flange packing	NBR	t1.0	1
Pitot tube packing	NBR	t1.0	1

Item number	Applicable Pitot tube
PTF-6	PTK-□□6
	PTS-□□6
	PTT-□□6
PTF-4	PTK-VT4
	PTS-VT4
	PTT-VT4

### Overall/static pressure pipe For overall/static pressure measurement in measurement of airflow rate/airflow speed (dynamic pressure) in pipes

**For vinyl pipe**

The length can be adjusted by moving the flange.

Item number	L (mm)	Material	Panel cutting
PTTS-VT6-300-S	300	Stainless steel	φ10.5
PTTS-VT6-500-S	500		
PTTS-VT6-800-S	800		

**For metallic pipe**

The length can be adjusted by moving the flange.

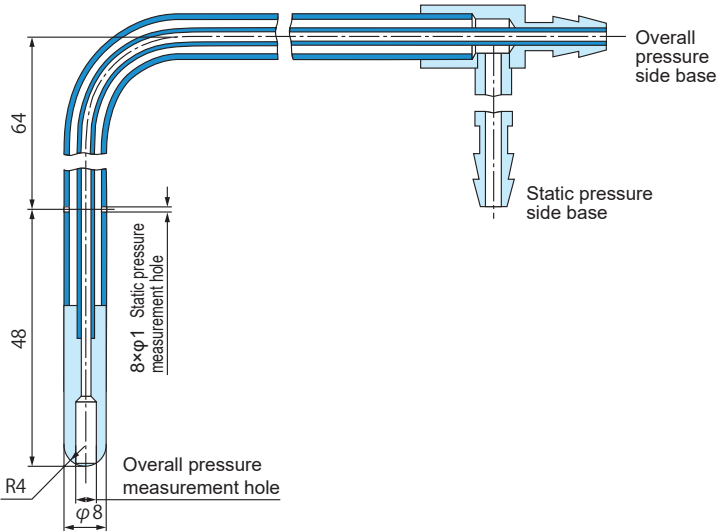
Item number	L (mm)	Material	Panel cutting
PTTS-MT6-300-S	300	Stainless steel	φ10.5
PTTS-MT6-500-S	500		
PTTS-MT6-800-S	800		

## Pitot tube

RoHS

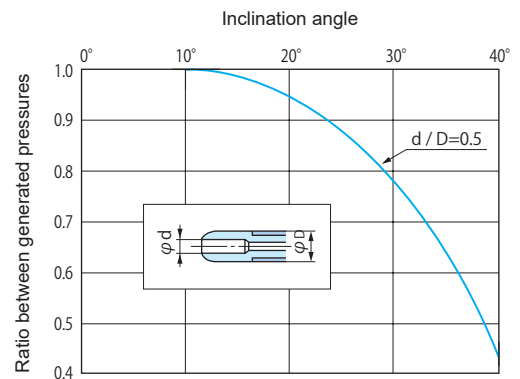
**Overall/static pressure pipe** For overall/static pressure measurement in measurement of airflow rate/airflow speed (dynamic pressure) in pipes

### Dimension drawing



### Characteristics brought by inclination of overall/static pressure pipe

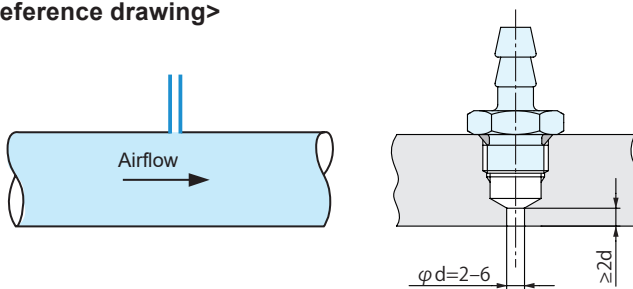
The ratio between the pressure generated when the tip straight pipe part of the overall/static pressure pipe is set in parallel to the airflow and the pressure generated when it is inclined against the flow direction is shown in the figure below. When the inclination angle is  $10^\circ$  or less, the pipe can be used without problems.



## Pressure detector

### Static pressure hole (construction at the customer)

#### <Reference drawing>



- Static pressure hole is a hole orthogonally made in the pipe wall.
- As the hole diameter is greater than the static pressure pipe diameter, this hole is useful for air with a lot of dust and when the pipe diameter is small.
- Although the structure is simple, it is inappropriate if the pipe wall is thin.

### ⚠ Precautions on use of pressure detector

- Install the static pressure pipe, total pressure pipe, and overall/static pressure pipe (Pitot tube) such that the tip straight pipe part is in parallel ( $10^\circ$  or less) to the airflow direction.
- If a pressure detector is used for measurement of thin corrosive mixed gas, use such a pressure detector that is made of stainless steel or other materials capable of withstanding those gases because the materials to be corroded differ depending on the type of the gas.
- When installing a pressure detector, provide the necessary straight pipe parts in the forward and/or rearward flow directions in the duct.
- In airflow rate/speed measurements, conduct design and calculation such that the necessary detection airflow speed is over 2 m/s, and then check the actual airflow speed. As the detection pressure to be generated at an airflow speed of 2 m/s is approx. 2.5 Pa, it is difficult to measure an airflow speed of 2 m/s or below at a high accuracy. If the airflow speed falls below 2 m/s, narrow the duct cross section until the airflow speed at the pressure detection part reaches the necessary value.
- All pressure detectors are not suitable for detection with air containing much dirt and dust and air containing oily mist. If a pressure detector needs to be used with such air out of necessity, occasionally dismount the detector and clean it.

# Accessories

## How to use the Pitot tube

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

### Measurement method of static pressure and dynamic pressure

#### Measurement method of static pressure

1. Method using static pressure pipe
2. Method using a static pressure hole, which is a smooth hole made along duct inner wall so that no protrusion into the duct is made
3. Method using pipe (simplified Pitot tube) at an orthogonal angle to the duct inner wall. However, to use this method, the flow speed must be 1 m/s or below. If the flow speed is higher than that, the error will be greater because of the influence of the dynamic pressure.

#### Measurement method of dynamic pressure

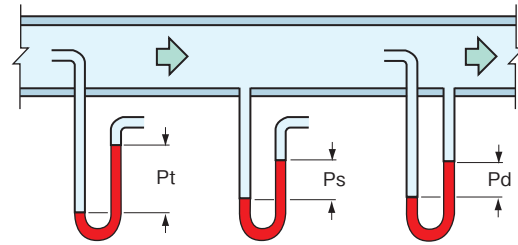
To know a flow speed, only measuring the dynamic pressure of the flow obtains it. However, the dynamic pressure cannot be directly measured. Therefore, use the formula below.

$$\text{Total pressure} - \text{Static pressure} = \text{Dynamic pressure}$$

The dynamic pressure can be obtained from the differential pressure between the pressure at the total pressure pipe and that at the static pressure pipe.

1. Method of installing static pressure pipe and total pressure pipe at a distance D between them. (Refer to page 116)
2. Method of installing overall/static pressure pipe

Diagram for explanation of total pressure, static pressure, and dynamic pressure



$$P_t \text{ (total pressure)} = P_s \text{ (static pressure)} + P_d \text{ (dynamic pressure)}$$

### Measurement method of static pressure and dynamic pressure

The measurement method for flow speed using the Pitot tube is relatively simple and highly reliable, but as the airflow speed decreases, the detection pressures (total pressure, static pressure) and the differential pressure (dynamic pressure) between them also decrease, and accurate measurement is disabled at an airflow speed of 2 m/s or lower.

#### Calculation formula of flow speed by means of the Pitot tube

$$V \text{ (m/s)} = \sqrt{\frac{2}{\rho} (P_t - P_s)}$$

Where,

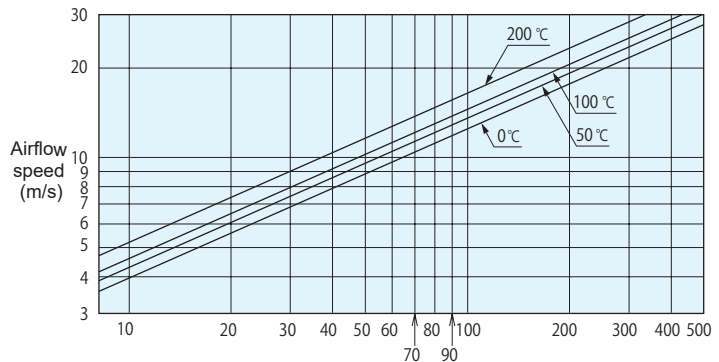
$\rho$ : Fluid density (kg/m<sup>3</sup>)

$P_t$ : Total pressure (Pa)

$P_s$ : Static pressure (Pa)

Density of dry air at 0°C and one atmosphere  $\rho = 1.293 \text{ kg/m}^3$

Airflow speed - dynamic pressure relationship table

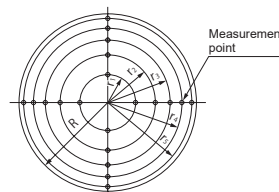


Total pressure - Static pressure = Dynamic pressure (Pa)

### Measurement of airflow rate by means of the Pitot tube

- Set the tip straight pipe part of the Pitot tube in parallel to the flow. As the measurement points, set the 10 points on each of two diameter lines that cross each other at the right angle on the measurement pipe cross section, 20 points in total, as shown in the formula on the right. However, as this method requires substantial time and effort, it is not suitable for commercial use.
- Use of a composite Pitot tube, in which Pitot tubes in large number are used, is convenient.
- Method to obtain approximate flow rate by measuring the maximum airflow speed at the center of pipe with a single Pitot tube  
Flow rate = Maximum airflow speed × Pipe cross section area × 0.9

#### Measurement points in Pitot tube



- $r_1 = 0.316R$
- $r_2 = 0.548R$
- $r_3 = 0.707R$
- $r_4 = 0.837R$
- $r_5 = 0.949R$

#### Composite Pitot tube




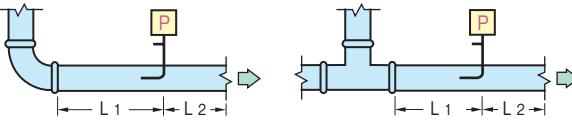
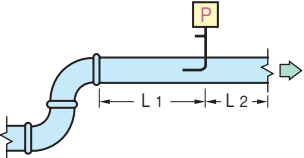
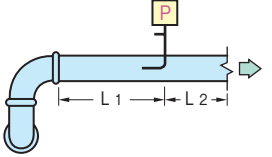
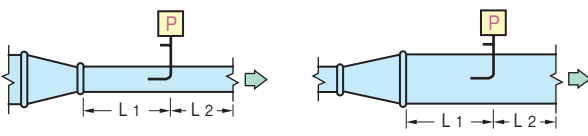
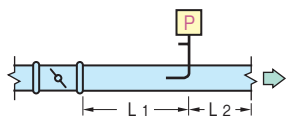
#### NEW AEROEYE

\*NEW AEROEYE is a product manufactured and sold by Wetmaster Co., Ltd.

## How to use the Pitot tube

### Guide for Pitot tube installation location

Depending on the pipe layout, the flow may be disturbed, which may affect the measurement accuracy. Therefore, when installing a Pitot tube, we recommend securing a sufficient straight pipe length equal to or greater than the corresponding value in the table below.

 Pitot tube installation location D: Duct diameter Round duct D = duct inner diameter Square duct D = (duct inner width + height) / 2	Dimension on upstream side (L1)	Dimension on downstream side (L2)
	Without flow straightener	
 <p>90° bend or single tee</p>	6D	4D
 <p>Two or more 90° bends on the same plane</p>	10D	4D
 <p>Two or more 90° bends on different planes (There must be a distance of 5D or greater between two bends.)</p>	19D	4D
 <p>Shrinking pipe or expanding pipe</p>	6D	4D
 <p>Gate valve, fully open</p>	12D	4D

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

# Accessories

## Conduit parts

RoHS

### Pulsation prevention device

This is used when the turbulence of the air to be measured is strong or the indication or output fluctuates. Install a pulsation prevention device that suites the pressure range of the instrument.

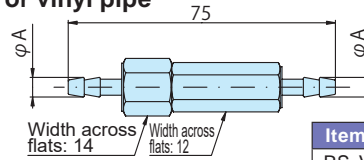


Caution

- This can be installed in any orientation.
- The purpose of use is to suppress the pulsation to the extent that the operation is not obstructed, and the effect becomes greater as the pulsation increases, but it does not completely eliminate pulsation.
- The effect varies depending on the use environment.

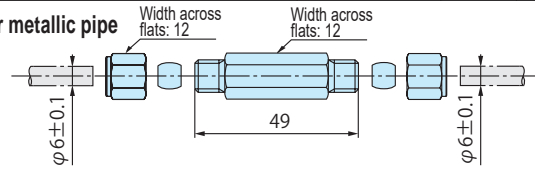
Item number		Applicable pressure range	
For vinyl pipe	For metallic pipe		
RS-VT6-02	RS-VT4-02	RS-MT6-02	200 Pa or below
RS-VT6-03	RS-VT4-03	RS-MT6-03	300 to 1000 Pa
RS-VT6-04	RS-VT4-04	RS-MT6-04	2 to 10 kPa
RS-VT6-06	-	RS-MT6-06	20 kPa or higher

#### For vinyl pipe



Item number	A (mm)	Material
RS-VT4-□□	5.5	Brass
RS-VT6-□□	7	

#### For metallic pipe



Item number	Material
RS-MT6-□□	Brass

### Corrosive gas absorber

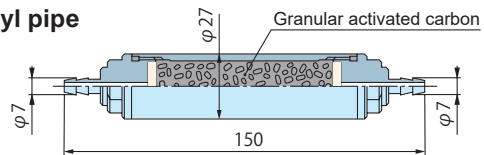
This is used to measure the gas that corrodes the materials (aluminum alloy, copper alloy, iron, steel, etc.) used in the instrument.



Caution

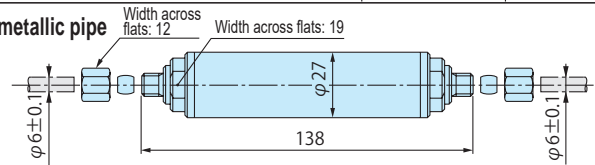
- This can be installed in any orientation.
- The effect varies depending on the use environment and the gas to be measured.

#### For vinyl pipe



Item number	Material
FG-VT6-S	Stainless steel

#### For metallic pipe



Item number	Material
FG-MT6-S	Stainless steel

### Air filter for instrument

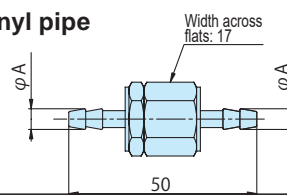
This is used to measure air containing much dirt and dust.



Caution

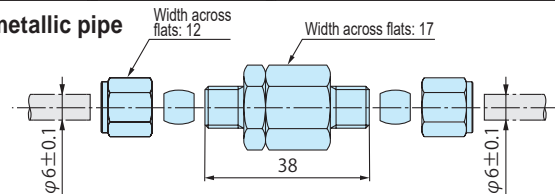
- This can be installed in any orientation.
- The effect varies depending on the use environment and the gas to be measured.

#### For vinyl pipe



Item number	A (mm)	Material
AF-VT4	5.5	Brass
AF-VT6	7	

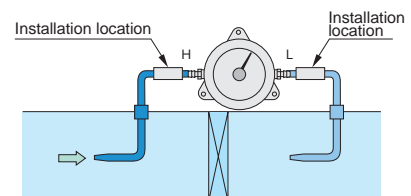
#### For metallic pipe



Item number	Material
AF-MT6	Brass

### Mounting method


Install each one piece of pulsation prevention device, corrosive gas absorber, and air filter for instrument on each of high-pressure (H) side and low-pressure (L) side in the middle of the pipe between the pressure detector and the instrument as shown in the figure on the right.



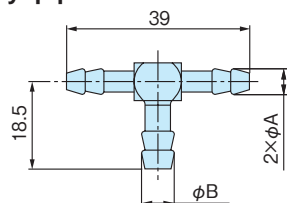
## Conduit parts

RoHS

**T joint**

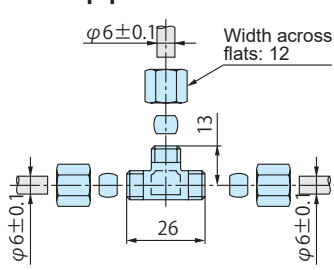


**For vinyl pipe**




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

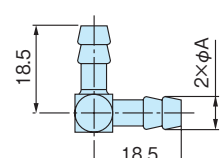


Item number	Material
TMT6-6-6	Brass

**Elbow joint**

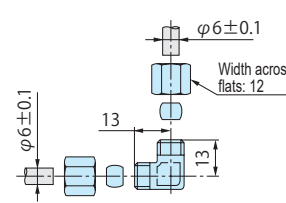


**For vinyl pipe**




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

**For metallic pipe** Noncompliant with RoHS

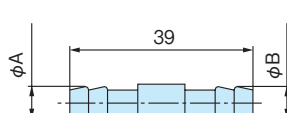


Item number	Material
LMT6-6	Brass

**Straight joint**

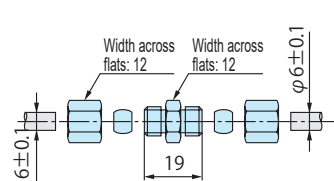


**For vinyl pipe**




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

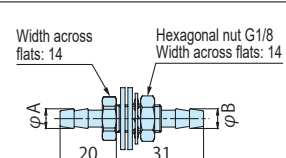


Item number	Material
SMT6-6	Brass

**Panel penetration joint**



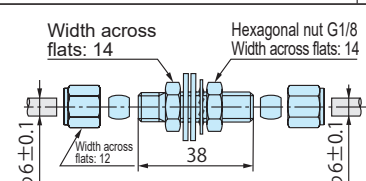
**For vinyl pipe**



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	

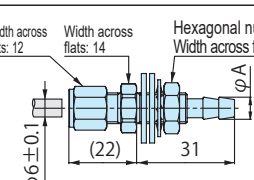
**For metallic pipe**



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	

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

# Accessories

## Conduit parts

RoHS

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A


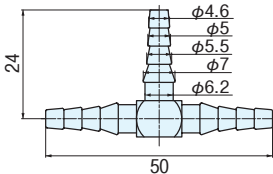
Accessories


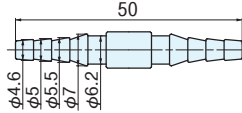
Application


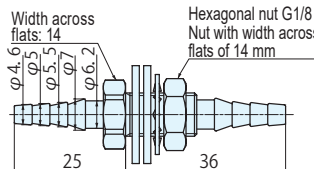
Precautions

Maintenance


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


<p><b>T joint, four-step barb type</b></p> 	<p>For soft tubes with an inner diameter of 4 to 6 mm.</p>  <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td>TVT-FB</td> <td>Brass</td> </tr> <tr> <td>TVT-FB-S</td> <td>Stainless steel (316 L)</td> </tr> </tbody> </table>	Item number	Material	TVT-FB	Brass	TVT-FB-S	Stainless steel (316 L)
Item number	Material						
TVT-FB	Brass						
TVT-FB-S	Stainless steel (316 L)						

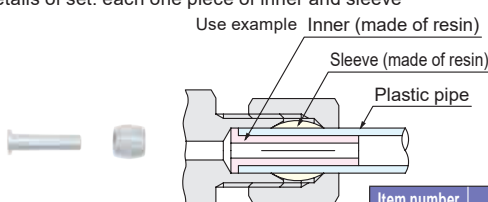
<p><b>Straight joint, four-step barb type</b></p> 	<p>For soft tubes with an inner diameter of 4 to 6 mm.</p>  <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td>SVT-FB</td> <td>Brass</td> </tr> <tr> <td>SVT-FB-S</td> <td>Stainless steel (316 L)</td> </tr> </tbody> </table>	Item number	Material	SVT-FB	Brass	SVT-FB-S	Stainless steel (316 L)
Item number	Material						
SVT-FB	Brass						
SVT-FB-S	Stainless steel (316 L)						


<p><b>Panel penetration joint, four-step barb type</b></p> 	<p>For soft tubes with an inner diameter of 4 to 6 mm.</p>  <p>Maximum applicable panel thickness: 6 mm</p> <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th>Item number</th> <th>Material</th> <th>Panel cutting</th> </tr> </thead> <tbody> <tr> <td>PVT-FB</td> <td>Brass</td> <td rowspan="2">φ10.5</td> </tr> <tr> <td>PVT-FB-S</td> <td>Stainless steel (316 L/304)</td> </tr> </tbody> </table>	Item number	Material	Panel cutting	PVT-FB	Brass	φ10.5	PVT-FB-S	Stainless steel (316 L/304)
Item number	Material	Panel cutting							
PVT-FB	Brass	φ10.5							
PVT-FB-S	Stainless steel (316 L/304)								


### Others

<p><b>Hose band</b></p> <p>This is used to secure (disconnection prevention) the connection part of vinyl pipe.</p> 	<b>Item number</b>	<b>Applicable pipe outer diameter mm</b>	<b>Material</b>
	XHB6-S	6	Stainless steel
	XHB8-S	8	
	XHB6	6	Iron
	XHB8	8	
	XHB10	10	
	XHB12	12	

<p><b>End cap</b></p> <p>This is used to protect the VT base for a tube connection.</p> 	<table border="1" style="width: 100%;"> <thead> <tr> <th>Item number</th> <th>Inner diameter</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td>XBC8X6X15</td> <td>6</td> <td>Polyvinyl chloride</td> </tr> </tbody> </table>	Item number	Inner diameter	Material	XBC8X6X15	6	Polyvinyl chloride
Item number	Inner diameter	Material					
XBC8X6X15	6	Polyvinyl chloride					

<p><b>Inner sleeve set</b></p> <p>This is used to connect a plastic pipe (outer diameter 6 mm × inner diameter 4 mm) by using a base for metallic pipe.</p> <p>Details of set: each one piece of inner and sleeve</p> 	<table border="1" style="width: 100%;"> <thead> <tr> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td>XIN6X4</td> <td>Polypropylene</td> </tr> </tbody> </table>	Item number	Material	XIN6X4	Polypropylene
Item number	Material				
XIN6X4	Polypropylene				

<p><b>Part for metallic pipe Sleeve</b></p> <p>(Auxiliary item)</p> 	<table border="1" style="width: 100%;"> <thead> <tr> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td>KGAMT-SLV</td> <td>Brass</td> </tr> <tr> <td>KGAMT-SLV-S</td> <td>Stainless steel</td> </tr> </tbody> </table>	Item number	Material	KGAMT-SLV	Brass	KGAMT-SLV-S	Stainless steel
Item number	Material						
KGAMT-SLV	Brass						
KGAMT-SLV-S	Stainless steel						

<p><b>Part for metallic pipe Nut</b></p> <p>(Auxiliary item)</p> 	<table border="1" style="width: 100%;"> <thead> <tr> <th>Item number</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td>KGAMT-NUT</td> <td>Brass</td> </tr> <tr> <td>KGAMT-NUT-S</td> <td>Stainless steel</td> </tr> </tbody> </table>	Item number	Material	KGAMT-NUT	Brass	KGAMT-NUT-S	Stainless steel
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:  $-20^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$
- 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:  $-20^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$
- 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	○	Hard
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  $\pm 0.1$  mm.
- Tighten the cap nut for metallic pipe by 3/4 to 1 turn.

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application







Precautions

Maintenance

# 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	 <p>EMT1A EMT1B EMT6 EMTGP1A EMTGP1B</p>	<p>Direct current power unit</p>  <p>HWS15A</p>	<p>Airflow rate measurement</p> <p>Square root calculator</p>  <p>EMRT1</p>	<p>Receiving instrument</p>  <p>EMP5A</p>
	<p>Intrinsically safe type</p>  <p>EMT1H</p> <p>Intrinsically safe circuit</p> <p>*Installation at hazardous locations</p>	<p>If a DC power circuit is not incorporated into the receiving device, use the device in combination with this power unit.</p>	<p>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.</p>	<p>The receiving instrument EMP5A is incorporated with a DC power circuit and a square root calculation circuit.</p> <p>Adjustment meter</p> <p>*We do not handle adjustment meters.</p>
Four-wire type	 <p>EMT1A EMT1B</p>			

- ◆⊖: 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.

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

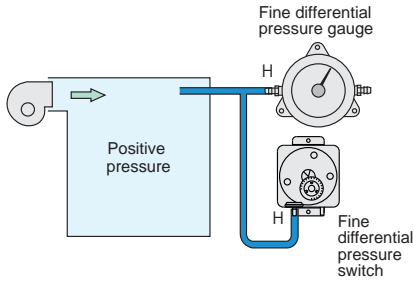
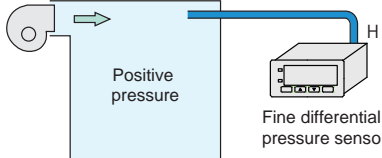
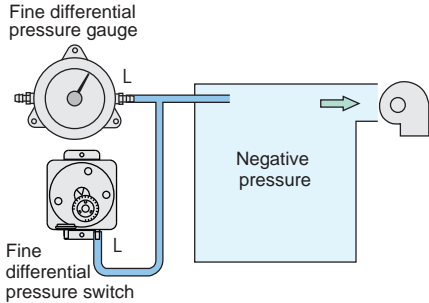
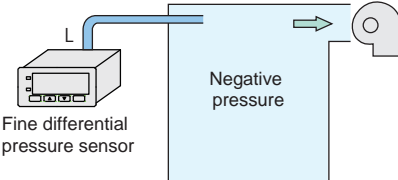
Maintenance

## Use example

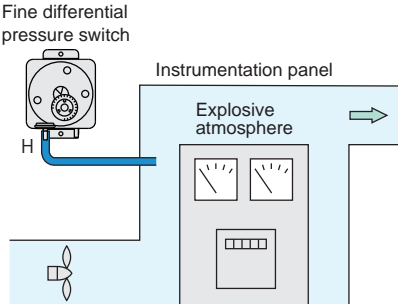
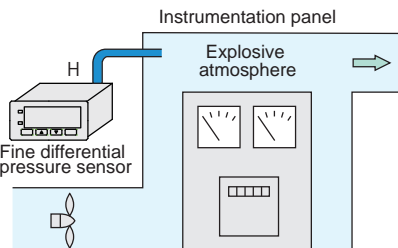
### Static pressure measurement

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

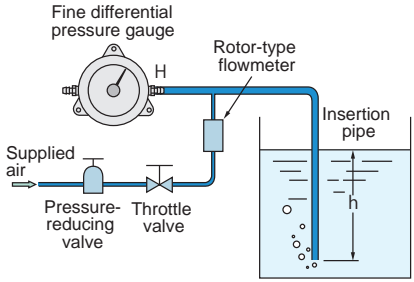
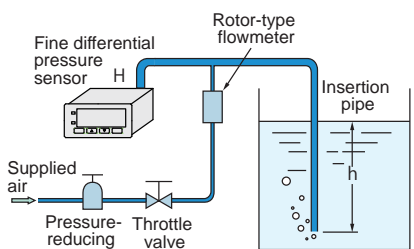
H: high pressure side L: low pressure side

<p><b>(1) Example of use in clean room</b></p> <p>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.</p>	 <p>The diagram shows a clean room under positive pressure. A fine differential pressure gauge is connected to the room (H) and the outside (L). A fine differential pressure switch is also connected to the same points.</p>	 <p>The diagram shows a clean room under positive pressure. A fine differential pressure sensor is connected to the room (H) and the outside (L).</p>
<p><b>(2) Example of use at factory that handles hazardous substances</b></p> <p>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.</p>	 <p>The diagram shows a factory under negative pressure. A fine differential pressure gauge is connected to the outside (L) and the factory (H). A fine differential pressure switch is also connected to the same points.</p>	 <p>The diagram shows a factory under negative pressure. A fine differential pressure sensor is connected to the outside (L) and the factory (H).</p>

#### ◆ For internal pressure explosion-proof

<p>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.</p>	 <p>The diagram shows an instrumentation panel in an explosive atmosphere. A fine differential pressure switch is connected to the atmosphere (H) and a clean air supply (L).</p>	 <p>The diagram shows an instrumentation panel in an explosive atmosphere. A fine differential pressure sensor is connected to the atmosphere (H) and a clean air supply (L).</p>
---	--	--

#### ◆ Liquid level gauge (air purge type)

<p>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.</p>	 <p>The diagram shows a tank with an insertion pipe. A fine differential pressure gauge is connected to the pipe (H) and a clean air supply (L). A rotor-type flowmeter is also connected to the pipe.</p>	 <p>The diagram shows a tank with an insertion pipe. A fine differential pressure sensor is connected to the pipe (H) and a clean air supply (L). A rotor-type flowmeter is also connected to the pipe.</p>
---	---	--



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

# Application

## Use example

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

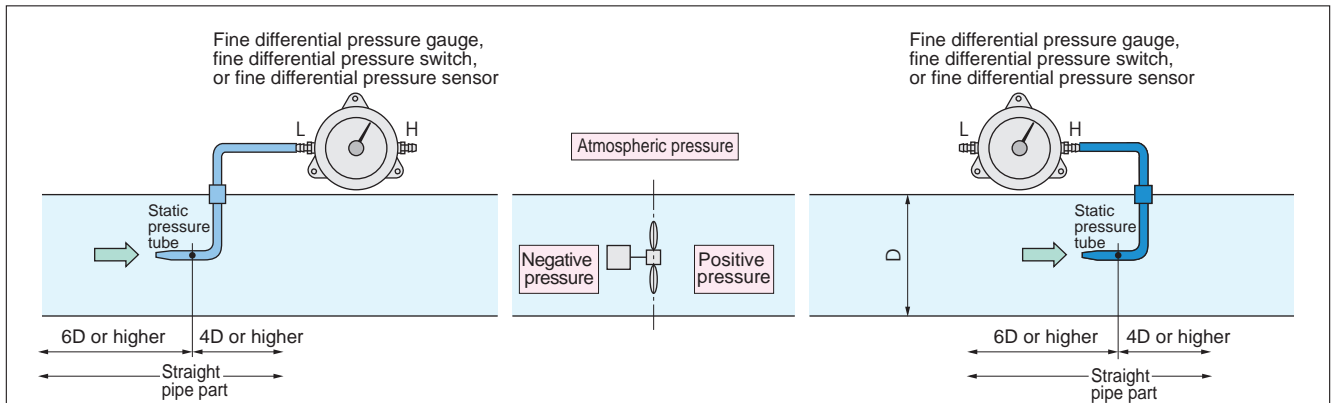
Application

Precautions

Maintenance

### 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.

<p><b>(1) For prevention of burn accidents from an electric heater</b></p> <p>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.</p>		
<p><b>(2) For monitoring of flue exhaust/burner air supply</b></p> <p>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.</p>		
<p><b>(3) For control of airflow rate in drying furnaces and tunnel ceramic kilns</b></p> <p>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.</p>		

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

<p><b>(1) For Pitot tubes (overall/static pressure pipe)</b></p> <p>When the airflow speed is faster than 2 m/s, it is possible to detect the dynamic pressure by installing an 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].</p>		
<p><b>(2) For Pitot tubes (static pressure pipe + total pressure pipe)</b></p> <p>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.</p>		
<p><b>(3) For orifices</b></p> <p>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.</p>		
<p><b>(4) For composite Pitot tubes</b></p> <p>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.</p>		



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

List of products

WO81

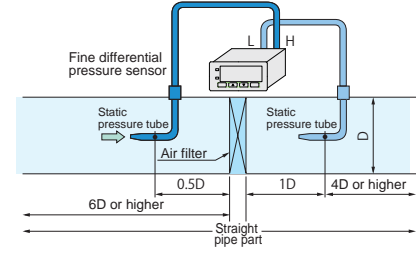
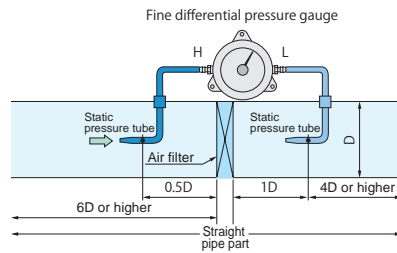
### Measurement of pressure loss

#### ◆ For detection of clogging of filters

H: high pressure side L: low pressure side

WO71

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.



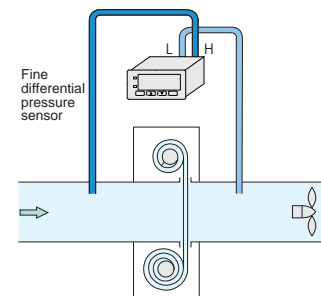
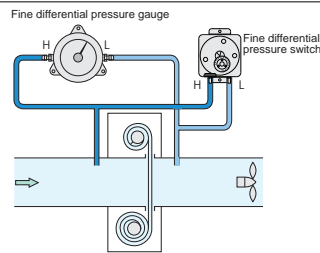
FR51A

MS99

MS99S

#### ◆ 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.



MS61A-RA

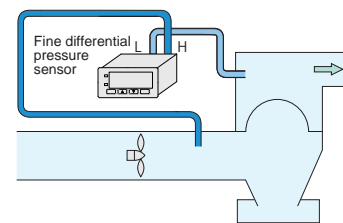
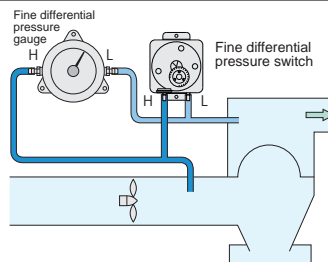
QDP33

EMD8A

EMD7

#### ◆ 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.



EMT1

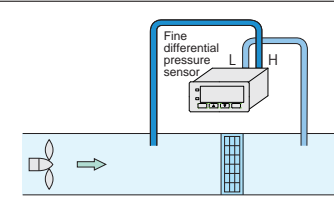
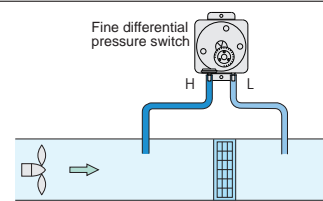
EMTGP1

EMT1H

EMT6

#### ◆ 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.



EMP5A

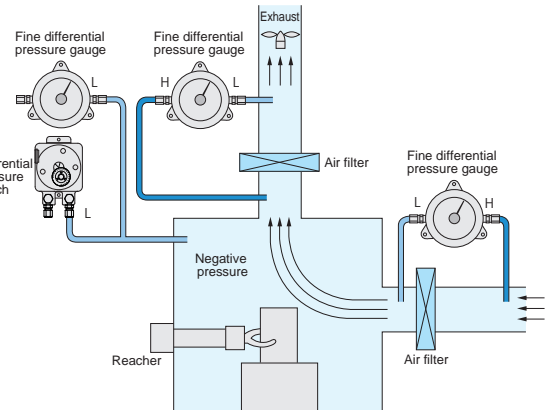
EMRT1

HWS15A

### 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.)



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.

Accessories

Application

Precautions

Maintenance



## 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

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

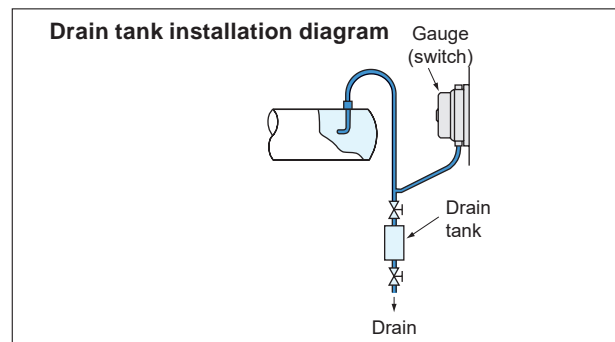
Maintenance

### 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.

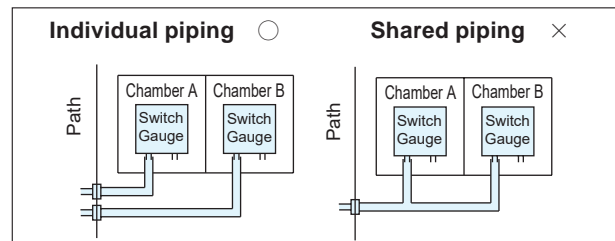
### Prevention of clogging of pipe by drainage

- 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.



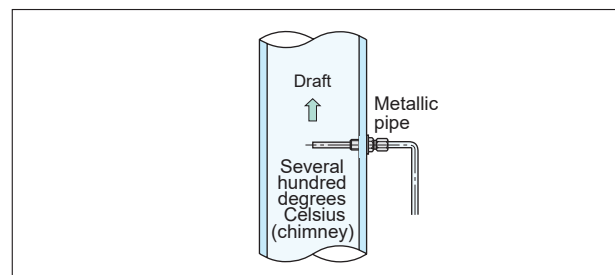
### Prohibition of shared piping

- 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.



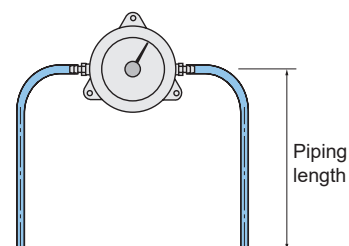
### Measurement of pressure of high-temperature gas

- 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

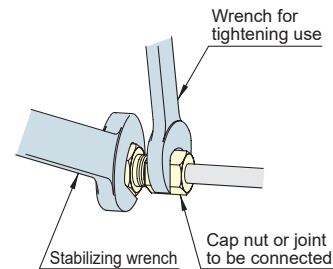
##### • Tightening torque

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.

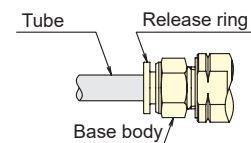
##### • Disconnection of tube

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.

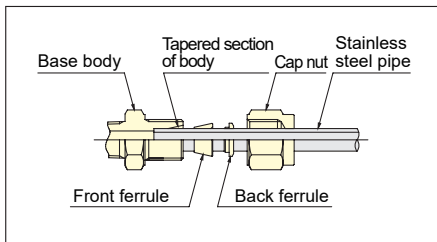
Failure to follow this instruction may lead to a failure or breakage of the instrument. Use a tube with a difference between its maximum outer diameter and minimum outer diameter of 0.2 mm or less and an exterior free of scratches.

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.

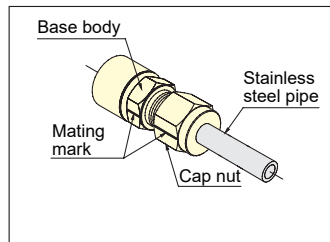


#### ● MTW base

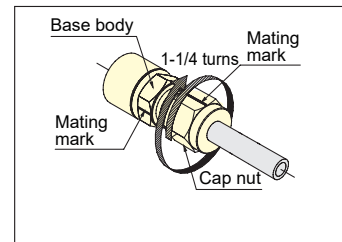
##### • Method to tighten pipe and base



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.

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

Application

Precautions

Maintenance

## Maintenance

List of products

WO81

WO71

FR51A

MS99

MS99S

MS61A-RA

QDP33

EMD8A

EMD7

EMT1

EMTGP1

EMT1H

EMT6

EMP5A

EMRT1

HWS15A

Accessories

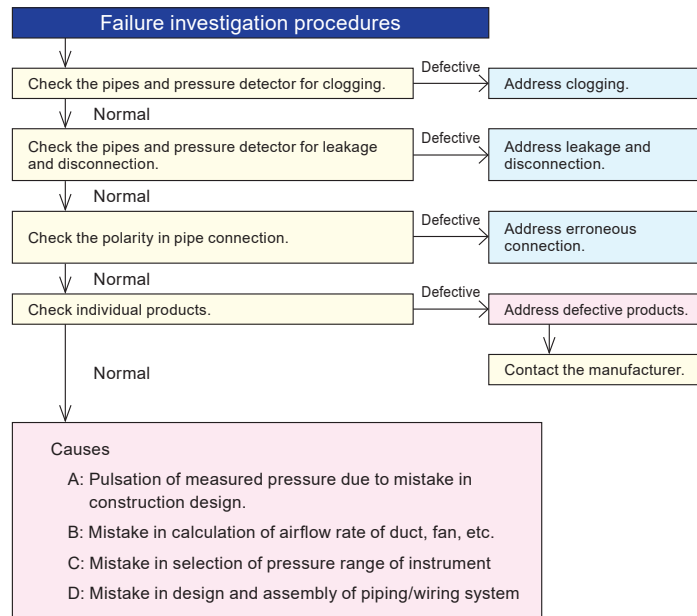
Application

Precautions

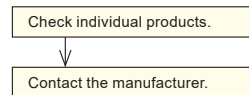
Maintenance

### 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



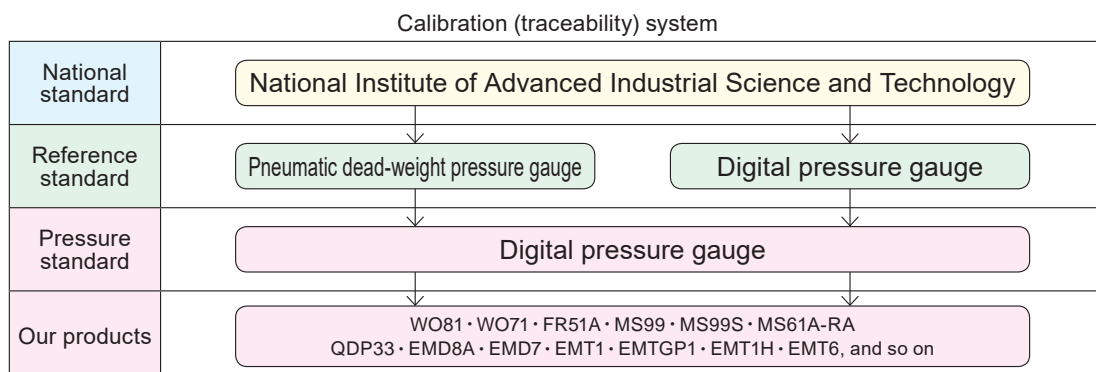
**Contact for failure and malfunctioning**  
**Manostar Shop Co., Ltd.**  
 1-2-3, Nishi-shiraike-cho, Nagata-ku, Kobe,  
 Hyogo 653-0031 JAPAN  
 TEL. +81-78-621-7000 FAX. +81-78-621-7788

### 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.



# Maintenance

## Maintenance

List of products

WO81

### 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 to 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.

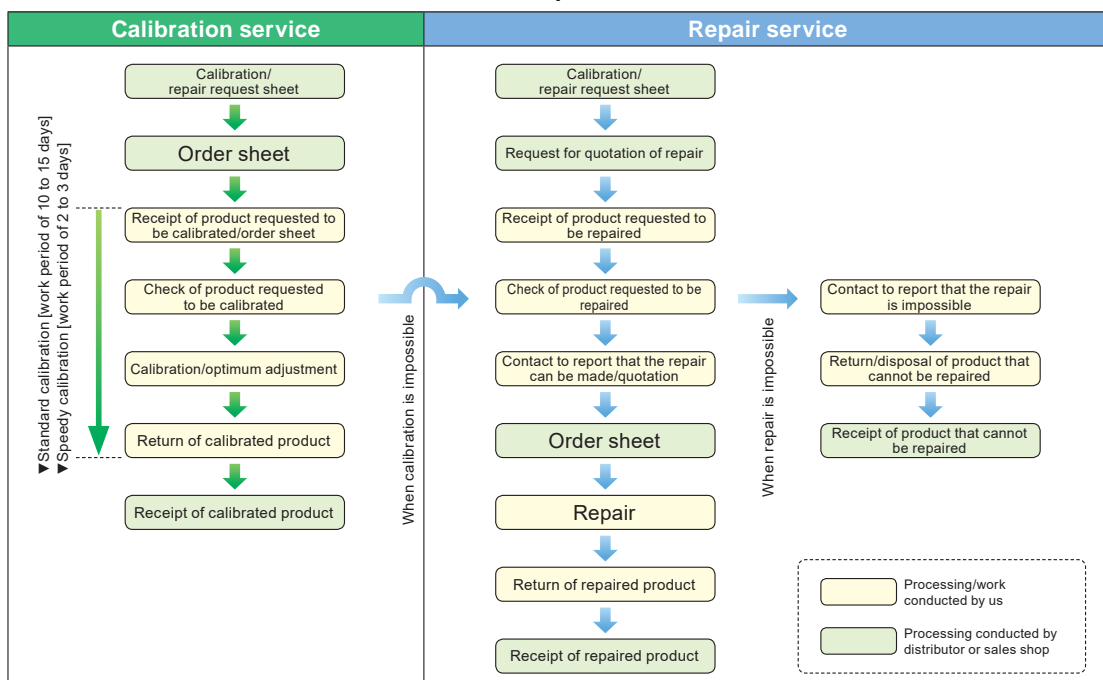
#### Documents to be issued

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

#### Others

When a product is to 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

General agent  **Manostar Shop Co., Ltd.**

1-2-3 Nishishiriike-cho, Nagata-ku, Kobe City, Hyogo 653-0031  
TEL. +81-78-621-7000 FAX. +81-78-621-7788

Manufacturer  **Yamamoto Electric Works Co., Ltd.**

1-2-3 Nishishiriike-cho, Nagata-ku, Kobe City, Hyogo 653-0031  
TEL. +81-78-631-6000 FAX. +81-78-631-6020