Panasonic **INSTRUCTION MANUAL**

LED Display・Digital Differential Pressure Sensor
DP-M Series

For use outside Japan

MJE-DPM No.0020-08V

Thank you very much for purchasing Panasonic products. Please read this Instruction Manual carefully and thoroughly for the correct and optimum use of this product. Kindly keep this manual in a convenient place for quick reference.

WARNING

- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.
- In case this sensor is used within Japan, SI unit must be used since use of pressure units in Japan is restricted to SI units.

1 SPECIFICATIONS

Item \ Type / Model No.		Standard	With analog current output
		DP-M2	**DP-M2A**
Type of pressure		Differential pressure	
Rated pressure range		0 to 2.00 kPa.D {0 to 204 mmH2O.D}	
Set pressure range		0 to 2.00 kPa.D {0 to 204 mmH2O.D}	
Setting resolution		0.01 kPa.D {1 mmH2O.D}	
Pressure withstandability		6 kPa.D {612 mmH2O.D}	
Applicable fluid		Non-corrosive gas	
Supply voltage		12 to 24V DC $^{+10}_{-15}$ % Ripple P-P 10% or less	
Current consumption		50mA or less	75mA or less
Comparative output		NPN open-collector transistor ・Maximum sink current: 100mA ・Applied voltage: 30V DC or less (between comparative output and 0V) ・Residual voltage: 1V or less (at 100mA sink current) 0.4V or less (at 16mA sink current)	
	Output operation	Selectable either Normally open (NO) or Normally closed (NC) by the keys. (Refer to '8 SETTING' [**Output mode and output operation**] for more details.)	
	Hysteresis	0.01 kPa.D {1mm H2O.D}	
	Repeatability	Within ±1% F.S.	
	Response time	10ms or less	
	Short-circuit protection	Incorporated	
Analog current output		—	Output current: 4 to 20mA (0 to 1.96 kPa.D {0 to 200 mmH2O.D}) Zero-point: Within 4mA ±1% F.S. Span: Within 16mA ±3% F.S. Linearity: Within ±1% F.S. Load resistance: 0 to 250Ω
Display		3 digit red LED display (Sampling rate: 4 times/sec. approx.)	
	Displayable pressure range	-0.05 to 2.10 kPa.D {-5 to 210 mmH2O.D}	
Indicators	Operation	Orange LED (lights up when the comparative output is ON)	
	Pressure unit	Red LED (The indicator corresponding to the selected unit lights up during the sensing mode.)	
	M1 setting	Red LED (blinks in the M1 setting mode)	
	M2 setting	Red LED (blinks in the M2 setting mode)	
Ambient temperature		0 to +50℃ (No dew condensation), Storage: -10 to +60℃	
Ambient humidity		35 to 85% RH, Storage: 35 to 85% RH	
Temperature characteristics		Over ambient temperature range 0 to +50℃: within ±3% F.S. of detected pressure at 25℃	
Pressure port		ϕ4.8mm resin pipe	
Material		Front case: ABS, Rear case: ABS LED display: Acrylic, Pressure port: PA	
Cable		0.18mm² 3-core oil resistant cabtyre cable, 2m long	0.18mm² 4-core oil resistant cabtyre cable, 2m long
Weight		75g approx.	

2 CAUTIONS

DP-M series is designed for use with non-corrosive gas. It cannot be used for liquid or corrosive gas.

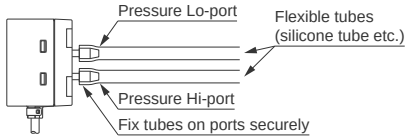
- This product has been developed / produced for industrial use only.
- Use within the rated pressure range.
- Make sure that the power supply is off while wiring.
- Take care that wrong wiring will damage the sensor.
- Verify that the supply voltage variation is within the rating.
- If power is supplied from a commercial switching regulator, ensure that the frame ground (F.G.) terminal of the power supply is connected to an actual ground.
- In case noise generating equipment (switching regulator, inverter motor, etc.) is used in the vicinity of this sensor, connect the frame ground (F.G.) terminal of the equipment to an actual ground.
- Do not use during the initial transient time (0.5 sec.) after the power supply is switched on.
- Do not run the wires together with high-voltage lines or power lines or put them in the same raceway. This can cause malfunction due to induction.
- Avoid dust, dirt, and steam.
- Take care that the sensor does not come in contact with water, oil, grease, organic solvents, such as, thinner etc., or strong acid, and alkaline.
- Do not insert wires, etc, into the pressure port. The diaphragm (pressure sensing device) will get damaged and correct operation shall not be maintained.
- Do not operate the keys with pointed or sharp objects.
- Make sure that stress by forcible bend or pulling is not applied directly to the sensor cable joint.
- Extension up to total 100m is possible with 0.3mm², or more, cable. However, in case of using this product as a CE conformity product, the power wire connected to this product must be within 10m.

3 PIPING

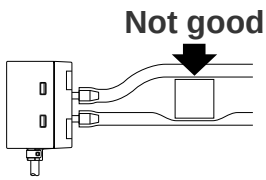
- Apply higher pressure to the Hi-port and lower pressure to the Lo-port.
- Use flexible tubes (silicone tube etc.) that can fit the pressure ports, ϕ4.8mm in diameter. The tubes should cover more than half the length of the pressure ports.

Recommended tube

・TYGON® tube, size: internal dia 4mm, external dia 6mm, made by SAINT-GOBAIN.

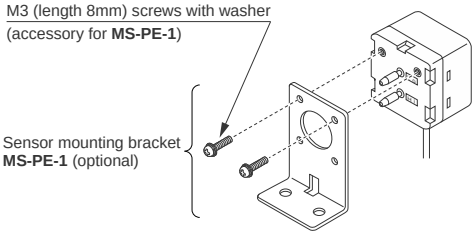


Notes: 1) TYGON is registered trademarks of SAINT-GOBAIN.
2) Ensure that excessive pressure is not applied to the pressure ports. Since this sensor is designed for detecting small pressures, if excessive pressure or shock is applied to the pressure ports, the diaphragm (pressure sensing device) in the sensor may get damaged.
3) Please do not compress the tube. If the tube is compressed, pressure exceeding the rated value may be generated, damaging the diaphragm (pressure sensing device).

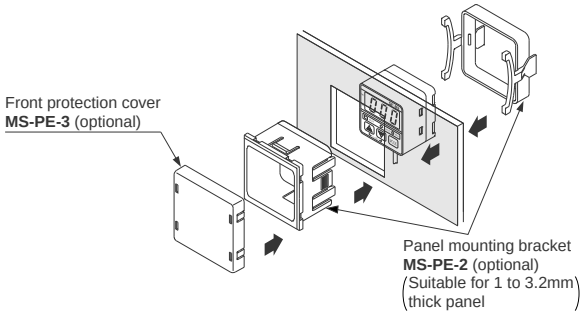


4 MOUNTING

- The displayed value may vary by 1 digit (0.01 kPa.D {1 mmH2O.D}) maximum depending on whether the sensor is installed vertically or horizontally.
- The sensor mounting bracket **MS-PE-1** (optional) is available. When mounting the sensor with the sensor mounting bracket, etc., the tightening torque should be 0.5N·m or less.

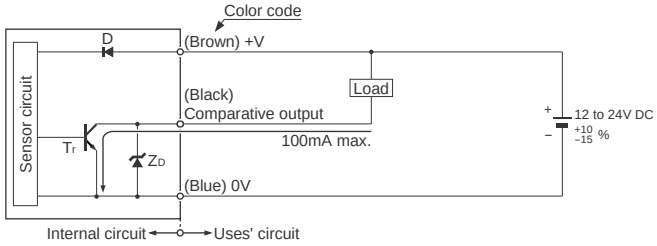


- The panel mounting bracket **MS-PE-2** (optional) and the front protection cover **MS-PE-3** (optional) are also available.



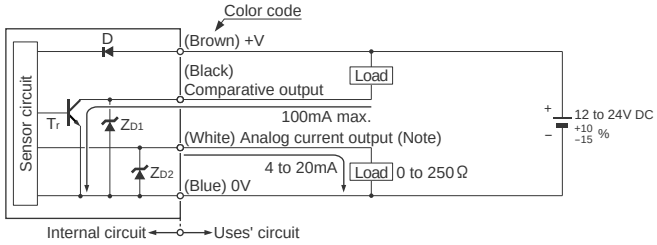
5 I/O CIRCUIT DIAGRAMS

● Standard type / DP-M2



Symbols... D : Reverse supply polarity protection diode
ZD : Surge absorption zener diode
Tr : NPN output transistor

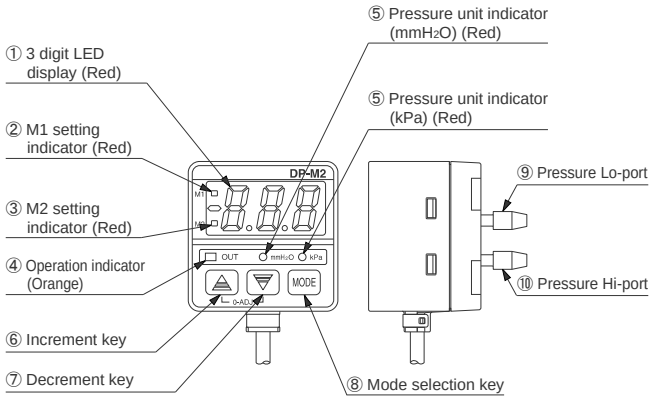
● With analog current output type / DP-M2A



Note: The analog current output is not incorporated with a short-circuit protection circuit. Do not directly connect a power supply or a capacitive load.

Symbols... D: Reverse supply polarity protection diode
ZD1, ZD2: Surge absorption zener diode
Tr: NPN output transistor

6 FUNCTIONAL DESCRIPTION



	Designation	Function	
①	3 digit LED display (Red)	The measured differential pressure level, setting values, error codes, and key protection sign are displayed.	
②	M1 setting indicator (Red)	Blinks in the lower threshold value (M1) setting mode.	
③	M2 setting indicator (Red)	Blinks in the upper threshold value (M2) setting mode.	
④	Operation indicator (Orange)	Lights up when the comparative output is ON.	
⑤	Pressure unit indicator (mmH2O, kPa) (Red)	・The indicator of the selected unit lights up during the sensing mode. ・Both indicators turns off during the initial setting mode and during an error occurrence. ・The indicator of the selected unit blinks during the upper and lower threshold value setting mode.	
⑥	Increment key (▲)	・The settable digit is shifted cyclically at every press of the key during the initial setting mode. ・Pressing the key increases the set value, in the upper and lower threshold value setting mode.	During the sensing mode, pressing both switches calibrates the sensor into atmospheric zero.
⑦	Decrement key (▼)	・The set condition changes at every press of the key during the initial setting mode. ・Pressing the key decreases the set value, in the upper and lower threshold value setting mode.	
⑧	Mode selection key (MODE)	・Three modes, the sensing mode, the lower threshold value (M1) setting mode, and the upper threshold value (M2) setting mode, are cyclically selected at every press of the key. ・During the sensing mode, pressing the key for 4 sec., or more, can make the key protection either effective or ineffective. ・Holding the increment key (▲) and simultaneously pressing the mode selection key brings the sensor from the sensing mode to the initial setting mode.	
⑨	Pressure Lo-port	Lower pressure should be applied.	
⑩	Pressure Hi-port	Higher pressure should be applied.	

7 ERROR MESSAGES

- When an error occurs, take the following corrective action.

Error message	Cause	Corrective action
E-1	Overcurrent due to short-circuit.	Switch off the power supply and check the load.
E-3	Pressure (differential pressure) is being applied during zero-point adjustment.	Applied pressure at the Hi-port and Lo-port should be brought to atmospheric pressure and zero-point adjustment should be done again.
- - -	Applied pressure (differential pressure) exceeds the upper limit of displayable pressure range (2.10 kPa.D {210 mmH2O.D}).	Applied pressure should be brought within the rated pressure range. (0 to 2.00 kPa.D {0 to 204 mmH2O.D})
- - - -	Applied pressure (differential pressure) exceeds the lower limit of displayable pressure range (-0.05 kPa.D {-5 mmH2O.D}).	

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8 SETTING

● Setting procedure

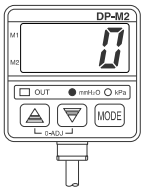
① Zero-point adjustment	② Initial setting	③ Upper and lower threshold value setting	Measurement
Adjust zero-point	Set [Output operation], [Output mode], and [Unit]	Enter lower threshold value (M1), upper threshold value (M2)	Commence measurement on completion of setting

If key-protect has been set, make be to release key-protect before operating the keys.
(Please refer to ' **9 KEY-PROTECT FUNCTION**' for the procedure.)

① Zero-point adjustment

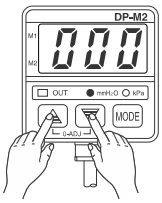
● The displayed differential pressure when the pressure port is left open is adjusted to zero.

Set to sensing mode

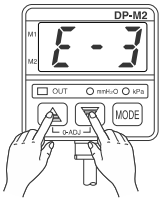


- The sensor will automatically enter the sensing mode when power is supplied.
  - The figure on the left shows the display when the pressure unit is set to 'mmH2O'.
  - 0.00 is displayed if the pressure unit is set to 'kPa'.

Perform zero-point adjustment



- Let the pressure ports (Hi-port and Lo-port) be at atmospheric pressure (i.e., no applied pressure condition), and press, simultaneously, the increment key (▲) and decrement key (▼) continuously.
- 000 is displayed and, when the fingers are released, zero-point adjustment is completed and the sensor returns to the sensing mode.
  - When the unit of 'kPa' has been selected, 0.00 blinks once after the keys are released.

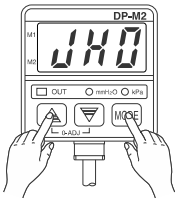


- If pressure has been applied during zero-point adjustment, E-3 is displayed when the keys are pressed. Bring the applied pressure to atmospheric pressure (i.e., no applied pressure condition) and carry out the zero-point adjustment once again.

② Initial setting

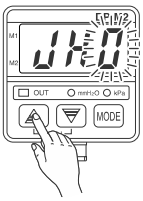
● Pressure [Output operation], [Output mode], and [Unit] of the comparative outputs are set.

Set to initial setting mode

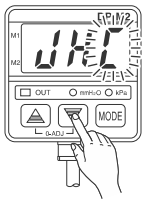


- In the sensing mode, press MODE key while pressing ▲ key.
  - Initial setting is displayed.
  - If sensor is being used for the first time, JH0 is displayed.

Set initial conditions

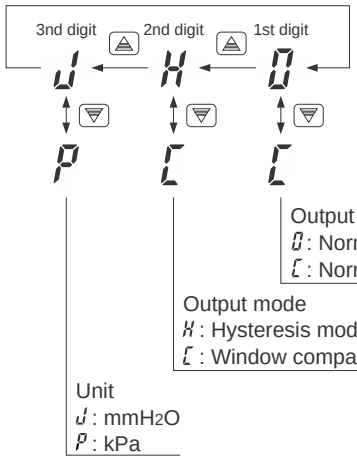


- The settable digit blinks.
- The settable digit changes when ▲ key is pressed.



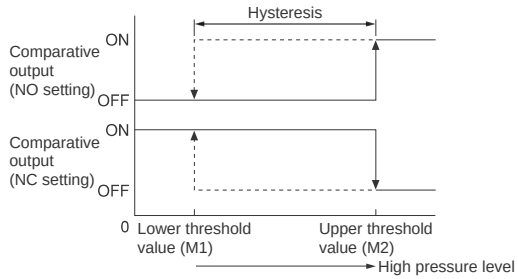
- Change the setting of each digit as desired.
- The setting is changed when ▼ key is pressed.

Change with ▲ key.

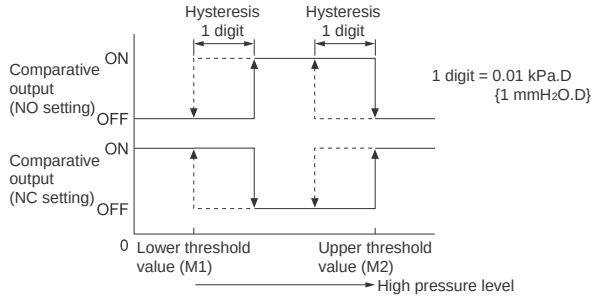


[Output mode and output operation]

● **Hysteresis mode (H) (M1 < M2)**

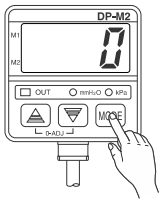


● **Window comparator mode (C) (M1 < M2)**



When operating in window comparator mode (C) lower threshold value (M1) and upper threshold value (M2) should be set with a difference of 3 digits (0.03 kPa.D {3 mmH2O.D}) or more.

Set to sensing mode



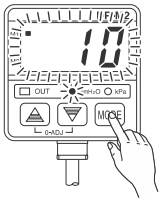
- Press MODE key.
  - Your set data is registered and the sensor enters into the sensing mode.
  - Since the initial conditions which have been set are stored in an EEPROM, they are not erased even if the power supply is switched off.
  - The figure on the left shows the display when the pressure unit is set to 'mmH2O'.

③ Upper and lower threshold value setting

● [lower threshold value (M1)] and [upper threshold value (M2)] of the comparative outputs are set.

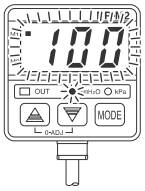
The lower threshold value (M1) and the upper threshold value (M2) can be entered in under the following conditions.
M1 < M2
No vacuum values

Set to lower threshold value (M1) set mode



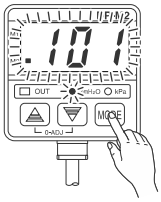
- In the sensing mode, press MODE key.
  - The registered lower threshold value (M1) appears and blinks. The M1 setting indicator (red) and the pressure unit indicator (red) also blinks.

Enter lower threshold value (M1)



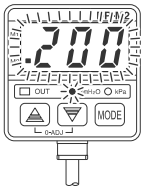
- Enter using ▲ key and ▼ key.
- If ▲ key is pressed once, the set value increases by 1 digit and if ▼ key is pressed once, the set value decreases by 1 digit. Further, if ▲ key or ▼ key is pressed continuously, the set value changes quickly.
  - If the set pressure range is exceeded, either UP (upper limit exceeded) or Lo (lower limit exceeded) is displayed.

Set to upper threshold value (M2) set mode



- In the lower threshold value (M1) set mode, press MODE key.
  - If set value M1 is larger than the registered upper threshold value (M2), the sum of the M1 value plus 1 digit appears and blinks. Otherwise, the registered upper threshold value (M2) appears and blinks. The M2 setting indicator (red) and the pressure unit indicator (red) also blinks.

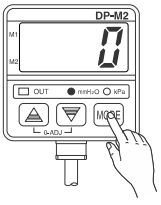
Enter upper threshold value (M2)



- Using ▲ key and ▼ key, enter in a manner similar to that for entering lower threshold value (M1).
  - If the set pressure range is exceeded, either UP (upper limit exceeded) or Lo (lower limit exceeded) is displayed.

- The upper threshold value (M2) can be set to a value of lower threshold value (M1) + 1 digit, or more, only.
- If the output mode has been set to the window comparator mode (⊏) in the initial setting mode, lower threshold value (M1) and upper threshold value (M2) should be set with a difference of 3 digits (0.03 kPa.D {3 mmH₂O.D}) or more.

Set to sensing mode

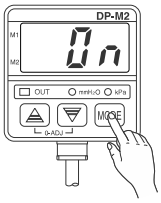


- Press MODE key.
  - The sensor returns to sensing mode after lower threshold value (M1) and upper threshold value (M2) have been set.
  - Since the values which have been set are stored in an EEPROM, they are not erased even if the power supply is switched off.

9 KEY-PROTECT FUNCTION

● Key-protect is a function which prevents any unintentional change in the conditions which have been entered in each setting mode by making the sensor not to respond to the key operations.

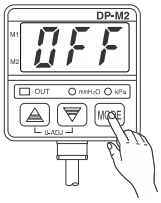
Setting of key-protect



- In the sensing mode, press MODE key continuously until On appears. (4 sec. approx.)
- Once On is displayed, release the key. Then the key-protect is set and the sensor enters into the sensing mode again.

- Since the key-protect information is stored in an EEPROM, it is not erased even if the power supply is switched off.
- Please take care to remember if the key-protect function has been set.

Release of key-protect



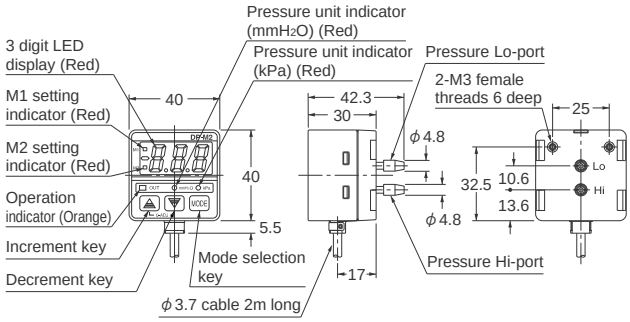
- In the sensing mode, press MODE key continuously until OFF appears. (4 sec. approx.)
- Once OFF is displayed, release the key. Then the key-protect is canceled and the sensor enters into the sensing mode again.

When the keys are to be operated, make sure that key-protect is released.

10 CONVERSION TABLE FOR PRESSURE UNITS

	kPa	mmH_2O	mmHg (Torr)	kgf/cm_2	atm
1kPa	1	1.01972×10^{2}	7.50062	1.01972×10^{-2}	9.86923×10^{-3}
1mmH_2O	9.80665×10^{-3}	1	7.35559×10^{-2}	1×10^{-4}	9.67841×10^{-5}
1mmHg (1Torr)	1.33322×10^{-1}	1.35951×10	1	1.35951×10^{-3}	1.31579×10^{-3}
1kgf/cm^2	9.80665×10	1×10^{4}	7.35559×10^{2}	1	9.67841×10^{-1}
1atm	1.01325×10^{2}	1.03323×10^{4}	7.60000×10^{2}	1.03323	1

11 DIMENSIONS (Unit: mm)



12 INTENDED PRODUCTS FOR CE MARKING

● The models listed under '1 SPECIFICATIONS' come with CE Marking.
As for all other models, please contact our office.

CE

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