

# INSTRUCTION MANUAL

LED Display • Digital Differential Pressure Sensor

## DP-M Series SI unit only

Thank you very much for using SUNX sensors. Please read this Instruction Manual carefully and thoroughly for the correct and optimum use of this sensor. Kindly keep this manual in a convenient place for quick reference.



This product is not a safety sensor. Its use is not intended or designed to protect life and prevent body injury or property damage from dangerous parts of machinery. It is a normal pressure detection sensor.

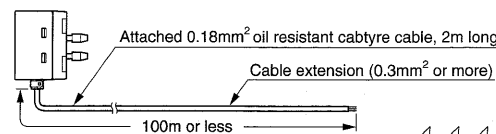
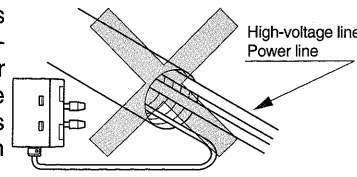
## 1 SPECIFICATIONS

Item	Type	Standard	With analog current output
	Model No.	DP-M2Z	DP-M2ZA
Type of pressure	Differential pressure		
Rated pressure range	0 to 2.00 kPa.D		
Set pressure range	0 to 2.00 kPa.D		
Setting resolution	0.01 kPa.D		
Pressure withstandability	6 kPa.D		
Applicable fluid	Non-corrosive gas		
Supply voltage	12 to 24V DC $\pm 10\%$ Ripple P-P 10% or less		
Current consumption	50mA or less		75mA or less
Comparative output	NPN open-collector transistor		
	<ul style="list-style-type: none"> <li>Maximum sink current: 100mA</li> <li>Applied voltage: 30V DC or less (between comparative output and 0V)</li> <li>Residual voltage: 1V or less (at 100mA sink current) 0.4V or less (at 16mA sink current)</li> </ul>		
Output operation	Selectable either Normally Open (NO) or Normally Closed (NC) by the keys. (Refer to <b>SETTING [Output mode and output operation]</b> for more details.)		
Hysteresis	0.01 kPa.D		
Repeatability	Within $\pm 1\%$ 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)
			Zero-point: Within 4mA $\pm 1\%$ F.S. Span: Within 16mA $\pm 3\%$ F.S. Linearity: Within $\pm 1\%$ F.S. Load resistance: 0 to 250 $\Omega$
Display	3 digit red LED display (Sampling rate: 4 times/sec. approx.)		
Indicators	Displayable pressure range	- 0.05 to 2.10 kPa.D	
	Operation	Orange LED (lights up when comparative output is ON)	
	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°C (No dew condensation), Storage: -10 to +60°C		
Ambient humidity	35 to 85% RH, Storage: 35 to 85% RH		
Temperature characteristics	Over ambient temperature range 0 to +50°C: within $\pm 3\%$ F.S. of detected pressure at 25°C		
Pressure port	$\phi 4.8$ mm resin pipe		
Material	Front case: ABS, Rear case: ABS LED display: Acrylic, Pressure port: PA		
Cable	0.18mm <sup>2</sup> 3-core oil resistant cabtyre cable, 2m long	0.18mm <sup>2</sup> 4-core oil resistant cabtyre cable, 2m long	
Weight	75g approx.		

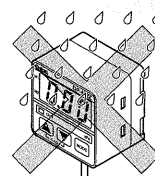
## 2 CAUTIONS

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

- Use within the rated pressure range.
- Make sure to carry out the wiring in the power supply off condition.
- 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.
- Cable extension, using 0.3mm<sup>2</sup> or more, cable, should be 100m or less overall.



- Avoid dust, dirt, and steam.
- Take care that the sensor does not come in direct contact with water, oil, grease, or organic solvents, such as, thinner, etc.
- 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.

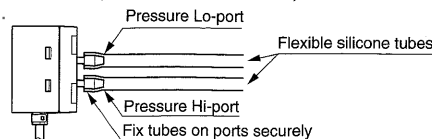


## 3 PIPING

- Apply higher pressure to the Hi-port and lower pressure to the Lo-port.
- Use flexible silicone tubes that can fit the ports,  $\phi 4.8$ mm in diameter. The tubes should cover more than half the length of the pressure ports.

### Recommended silicone tube

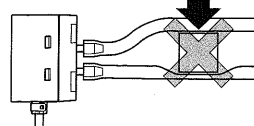
- LABORAN® silicone tube, size: internal dia 4mm, external dia 6mm, made by Tigers Polymer.
- TYGON® tube R-3603, size: internal dia 4mm, external dia 6mm, made by NORTON.



Notes: 1) LABORAN and TYGON are registered trademarks of Tigers Polymer and NORTON, respectively.

- 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.

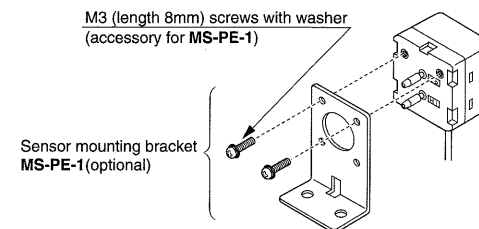
- 3) Please do not compress the silicone tube. If the silicone tube is compressed, pressure exceeding the rated value may be generated, damaging the diaphragm (pressure sensing device).



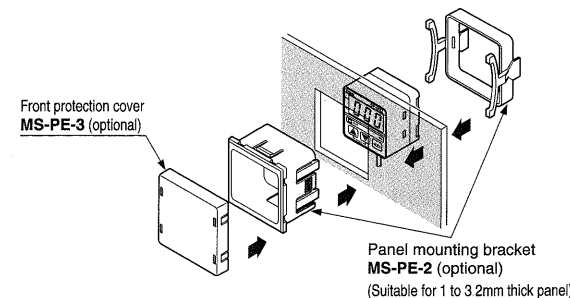
## 4 MOUNTING

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

M3 (length 8mm) screws with washer (accessory for MS-PE-1)

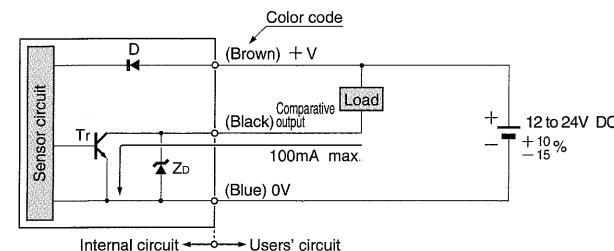


- Panel mounting bracket MS-PE-2 (optional) and a front protection cover MS-PE-3 (optional) are also available.



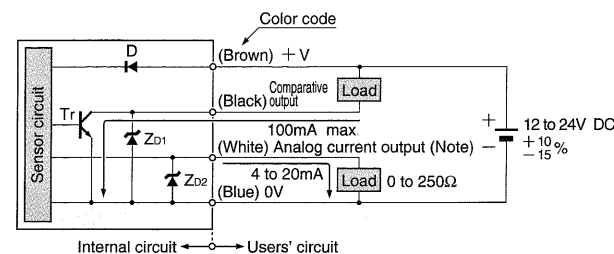
## 5 I/O CIRCUIT DIAGRAMS

### Standard type/DP-M2Z



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

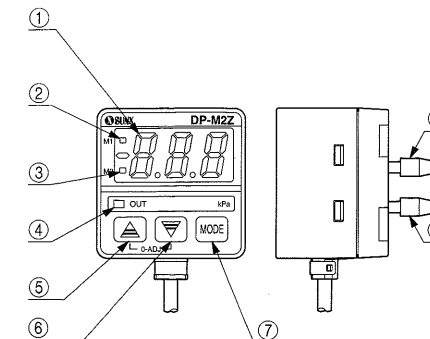
### With analog current output type/DP-M2ZA



Note: The analog voltage 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 Increment key (▲)	<ul style="list-style-type: none"> <li>The settable digit is shifted cyclically at every press of the key during the initial setting mode.</li> <li>Pressing the key increases the set value, in the upper and lower threshold value setting mode.</li> </ul>
⑥ Decrement key (▼)	<ul style="list-style-type: none"> <li>The set condition changes at every press of the key during the initial setting mode.</li> <li>Pressing the key decreases the set value, in the upper and lower threshold value setting mode.</li> </ul>
⑦ Mode selection key (MODE)	<ul style="list-style-type: none"> <li>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.</li> <li>During the sensing mode, pressing the key for 4 sec., or more, can make the key protection either effective or ineffective.</li> <li>Holding the increment key and simultaneously pressing the mode selection key brings the sensor from the sensing mode to the initial setting mode.</li> </ul>
⑧ Pressure Lo-port	Lower pressure should be applied.
⑨ Pressure Hi-port	Higher pressure should be applied.

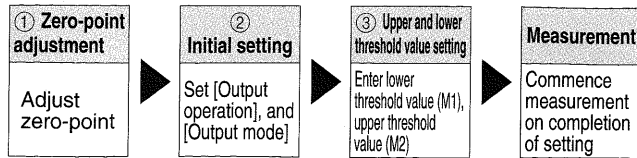
## 7 ERROR MESSAGES

- 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 Low-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).	Applied pressure should be brought within the rated pressure range.
- - -	Applied pressure (differential pressure) exceeds the lower limit of displayable pressure range (- 0.05 kPa.D).	(0 to 2.00 kPa.D)

## 8 SETTING

### ● Setting procedure

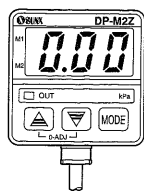


- If key-protect has been set, make sure to release key-protect before operating the keys (Please refer to '9 KEY-PROTECT FUNCTION' for the procedure.)

### ① Zero-point adjustment

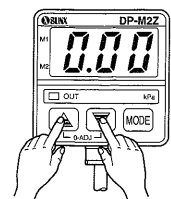
- The displayed differential pressure when the pressure port is left open is adjusted to zero.

#### Set to sensing mode



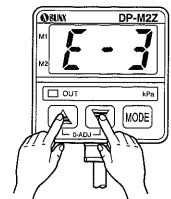
- The sensor will automatically enter the sensing mode when power is supplied.

#### 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 and decrement keys continuously.

- 0.00 is displayed and, when the fingers are released, zero-point adjustment is completed and the sensor returns to the sensing mode after 0.00 blinks once.

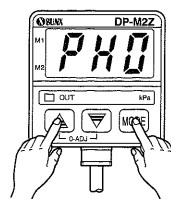


- If pressure has been applied during zero-point adjustment, E-3 is displayed when the keys are pressed. Bring the applied pressure to atmospheric pressure (i.e., no applied pressure condition) and carry out the zero-point adjustment once again.

### ② Initial setting

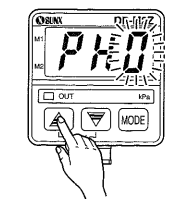
- Pressure [Output operation] and [Output mode] of the comparative outputs are set.

#### Set to initial setting mode

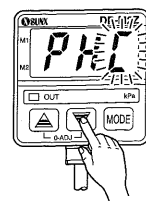


- In the sensing mode, press MODE key while pressing ▲ key. [Initial setting is displayed.]

#### Set initial conditions

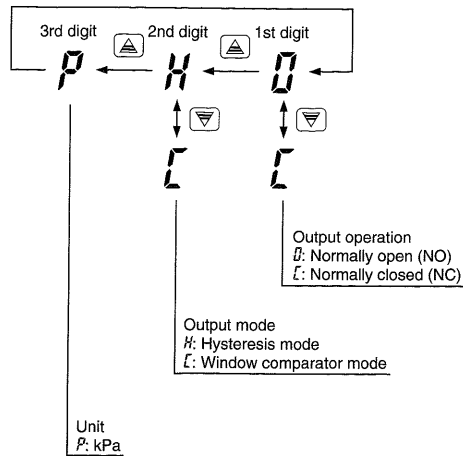


- The settable digit blinks.
- The settable digit changes when ▲ key is pressed.



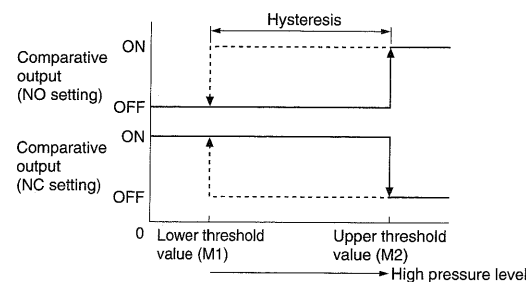
- Change the setting of each digit as desired.
- The setting is changed when ▼ key is pressed.

Change with ▲ key.

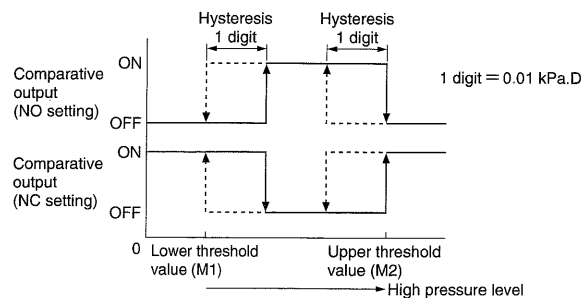


### [Output mode and output operation]

#### ● Hysteresis mode (H) (M1 < M2)

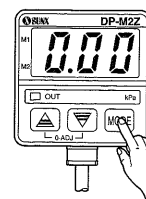


#### ● Window comparator mode (L) (M1 < M2)



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

#### Set to sensing mode



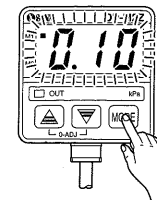
- Press MODE key.
- Your set data is registered and the sensor enters into the sensing mode.
- Since the initial conditions which have been set are stored in an EEPROM, they are not erased even if the power supply is switched off.

### 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

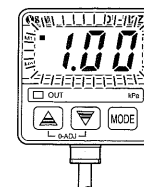
#### Set to lower threshold value (M1) set mode



- In the sensing mode, press MODE key.

- The registered lower threshold value (M1) appears and blinks. The M1 setting indicator also blinks.

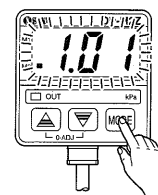
#### Enter lower threshold value (M1)



- 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 H.P (upper limit exceeded) or L.L (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 also blinks.

#### Enter upper threshold value (M2)

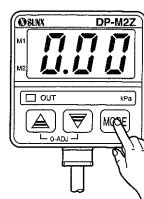


- Using ▲ key and ▼ key, enter in a manner similar to that for entering lower threshold value (M1).

- If the set pressure range is exceeded, either H.P (upper limit exceeded) or L.L (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 (L) 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) or more.

#### Set to sensing mode

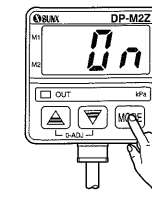


- Press MODE key.
- The sensor returns to sensing mode after lower threshold value (M1) and upper threshold value (M2) have been set.
- Since the values which have been set are stored in an EEPROM, they are not erased even if the power supply is switched off.

## 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.

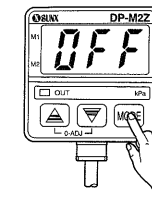
### Setting of key-protect



- In the sensing mode, press MODE key continuously until 0.n appears. (4 sec. approx.)
- Once 0.n 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.

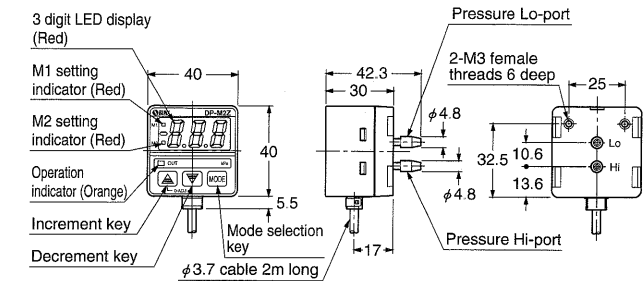
### Release of key-protect



- In the sensing mode, press MODE key continuously until 0.FF appears. (4 sec. approx.)
- Once 0.FF is displayed, release the key. Then the key-protect is cancelled and the sensor enters into the sensing mode again.

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

## 10 DIMENSIONS (Unit: mm)



Pioneer in Sensor Systems  
**SUNX**

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