

INSTRUCTION MANUAL

Compact Size-Digital Pressure Sensor DP4 Series For use outside Japan

MJE-DP4 No.6035-02

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.
- 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

| | Model No. | Type | Vacuum pressure | Positive pressure | Compound pressure |
|-----------------------------|--|--------------------------|--|--------------------------------|---|
| | | NPN output PNP output | −101kPa type DP4-50 DP4-50P | 1MPa type DP4-52 DP4-52P | ±100kPa type DP4-57 DP4-57P |
| Item | | | | | |
| Type of pressure | | | Gauge pressure | | |
| Rated pressure range | | | 0 to −101.3kPa | 0 to 1.000MPa | −100.0 to 100.0kPa |
| Set pressure range | | | 5.1 to −101.3kPa | −0.050 to 1.050MPa | −101.3 to 105.0kPa |
| Pressure withstandability | | | 490kPa | 1,470kPa | 490kPa |
| Applicable fluid | | | Non-corrosive gas | | |
| Hysteresis | | | 1 digit (however, variable in hysteresis mode and 2 digits when using psi unit) | | |
| Supply voltage | | | 12 to 24V DC $+10_{-15}\%$ Ripple P-P 10% or less | | |
| Current consumption | | | 40mA or less | | |
| Comparative output | <NPN output type> | | <PNP output type> | | |
| | NPN open-collector transistor | | PNP open-collector transistor | | |
| | • Maximum sink current: 100mA | | • Maximum source current: 100mA | | |
| | • Applied voltage: 30V DC or less (between comparative output and 0V) | | • Applied voltage: Same as supply voltage (between comparative output and +V) | | |
| | • Residual voltage: 1V or less (at 100mA sink current) | | • Residual voltage: 2V or less (at 100mA source current) | | |
| | 0.4V or less (at 16mA sink current) | | | | |
| | Output operation | | NO/NC (selectable by key operation) | | |
| | Repeatability | | Within ±0.2% F.S. ±1 digit (within ±3 digits) | | Within ±0.2% F.S. ±2 digits (within ±6 digits) |
| | Response time | | 2ms, 16ms, 128ms, 512ms or less (selectable by key operation) | | |
| | Display | | 3½ digit LCD display (with red and green backlight) | | |
| 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 +10 to +40°C: within ±2% F.S. of detected pressure at +25°C Over ambient temperature range 0 to +50°C: within ±5% F.S. of detected pressure at +25°C | | |
| Pressure port | | | M5 female thread | | |
| Material | | | Front case: ABS, LCD display: PET Rear case: PBT [M5 screw part: brass (nickel plated)] | | |
| Weight | | | 30g approx. | | |
| Accessories | | | Panel mounting bracket (MS-DP-1): 1 set, Pressure unit label: 1 No. Connector: 1 set (Housing: 1 No., Connector pin: 3 Nos.) | | |

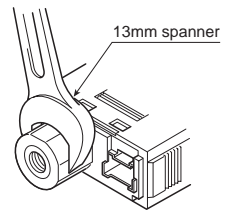
2 CAUTIONS

DP4 series is designed for use with non-corrosive gas. It cannot be used for liquid or corrosive gas.

- Use within the rated pressure range.
- Do not apply pressure exceeding the pressure withstandability value. The diaphragm will get damaged and correct operation shall not be maintained.
- Make sure to carry out the wiring in the power supply off condition.
- 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 (3 sec. approx.) after the power supply is switched on.
- Make sure that stress is not applied directly to the connector cable joint.
- If the used power supply generates a surge, connect a surge absorber to the power supply to absorb the surge.
- 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.
- In order to reduce noise, make the wiring as short as possible.
- 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 will get damaged and correct operation shall not be maintained.
- Do not operate the keys with pointed or sharp objects.

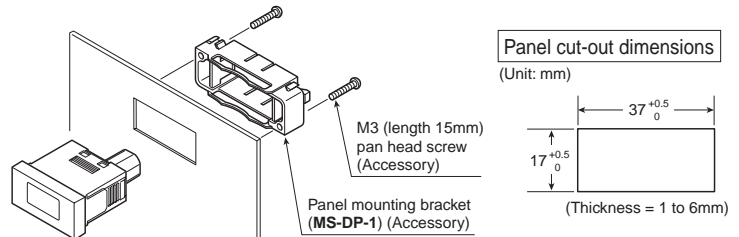
3 PIPING

- When connecting a commercial M5 coupling to the pressure port, hold the flat sides of the pressure port with a 13mm spanner and make sure that the tightening torque is 1N·m or less. If excessive tightening torque is applied, the commercial fitting may break.

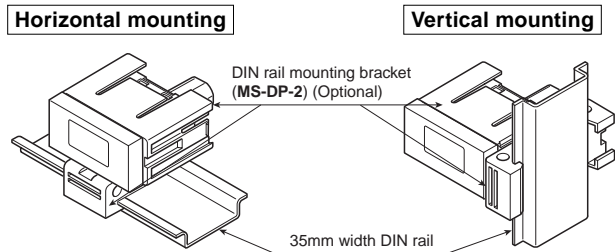


4 MOUNTING

- Mount the enclosed panel mounting bracket (MS-DP-1) as shown in the figure below.
The tightening torque should be 0.15N·m or less. Further, tighten both the right and the left screw gradually and equally, so that the panel mounting bracket does not tilt.
Sensor mounting bracket (MS-DP-3) which can be mounted on a horizontal plane and sensor mounting bracket (MS-DP-4) which can be mounted on a vertical plane are also available.

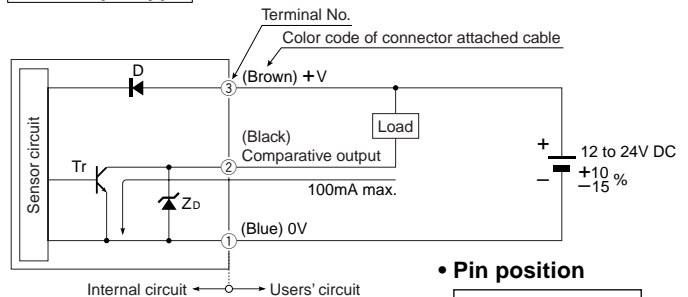


- DIN rail mounting bracket (MS-DP-2), which can fit on a 35mm width DIN rail, is also available.

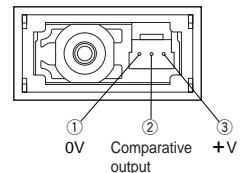


5 I/O CIRCUIT DIAGRAM

NPN output type

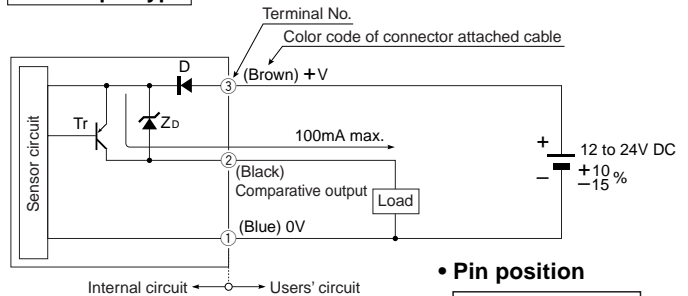


Pin position

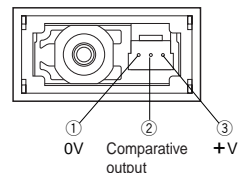


Symbols ... D : Reverse supply polarity protection diode
ZD : Surge absorption zener diode
Tr : NPN output transistor

PNP output type



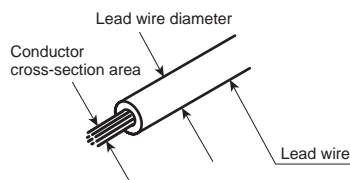
Pin position



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

6 ASSEMBLY OF CONNECTOR

- ① Using a suitable cable having the following specifications, prepare its end with a stripper, etc., as given in the figure below.
Further, the cable extension can be 100m or less with 0.3mm², or more, cable.

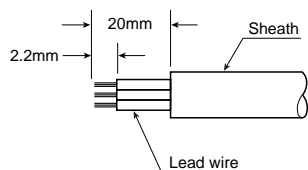


• Cable specifications

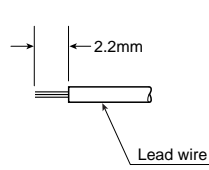
| | |
|-------------------------------------|---|
| Conductor cross-section area (Note) | 0.16 to 0.32mm ² (AWG 25 to 22) |
| Lead wire diameter | φ1.2 to φ1.8mm |
| Wire material | Tin plated, soft, twisted copper wire |

Note: If the wire length is 2m or more, use 0.3mm², or more, cable.

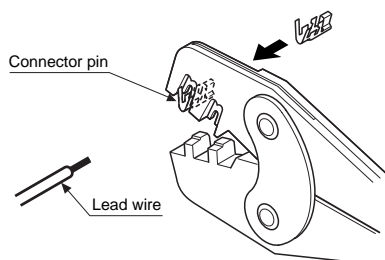
In case of cabtyre cable



In case of single lead wire



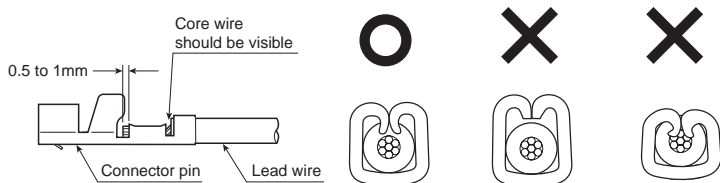
- ② Setting the connector pin in the groove of the exclusive crimp tool as shown in the figure below, insert the lead wire into the connector pin and crimp.



<Recommended>

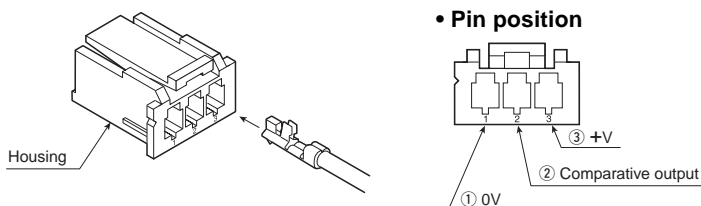
Crimping tool: YC-690R manufactured by J.S.T. MFG CO., LTD.
Connector pin: BXA-001T-P0.6 manufactured by J.S.T. MFG CO., LTD.

- ③ After crimping, make sure to confirm that the crimping is proper, as shown in the figure below.
In case the crimping is incorrect, cut the cable and repeat the procedure from Step ①.



- ④ As shown in the figure below, insert the connector pin till the end of the housing.
After inserting, make sure to confirm that the locking is proper by pulling lightly (10N or less) at the cable.

• Pin position



<Recommended>

Housing: XAP-03V-1 manufactured by J.S.T. MFG CO., LTD.

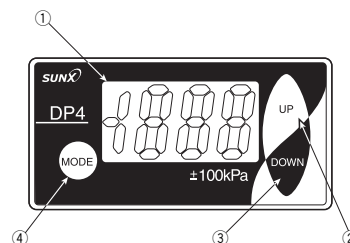
Note:

Do not reuse a connector pin which has been crimped once or inserted into the housing, as its performance cannot be guaranteed.

Please procure the optional connector (**CN-63**) (10 Nos./set) or the recommended product.

A connector attached cable (**CN-63-C2**) (cable length: 2m) is also available.

7 FUNCTIONAL DESCRIPTION



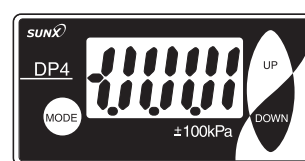
| | Description | Function |
|---|--|--|
| ① | 3 1/2 digit LCD display (with red and green backlight) | <ul style="list-style-type: none"> Displays measured pressure, settings, error messages and key-protect status. Red display when comparative output is ON. Green display when comparative output is OFF. |
| ② | UP key | <ul style="list-style-type: none"> In the initial setting mode and supplementary setting mode, pressing the key changes the setting item. In the pressure value setting mode, pressing the key changes the set value. In the sensing mode, pressing the key continuously for 4 sec., or more, displays the peak hold value. |
| ③ | DOWN key | <ul style="list-style-type: none"> In the initial setting mode and supplementary setting mode, pressing the key changes the set conditions. In the pressure value setting mode, pressing the key changes the set value. In the sensing mode, pressing the key continuously for 4 sec., or more, displays the bottom hold value. |
| ④ | MODE key | <ul style="list-style-type: none"> In the pressure setting mode, pressing the key changes the setting item. In the sensing mode, pressing the key continuously for 4 sec., or more, can set/cancel the key-protect. In the sensing mode, pressing both UP key and MODE key simultaneously changes the mode to the initial setting mode. Whereas, pressing both DOWN key and MODE key simultaneously changes the mode to the supplementary setting mode. |

8 ERROR MESSAGES

| Error message | Cause | Corrective action |
|---------------|---|---|
| E - 1 | Overcurrent due to short-circuit. | Switch off the power supply and check the load. |
| E - 3 | Pressure is being applied during zero-point adjustment. | Applied pressure at the pressure port should be brought to atmospheric pressure and zero-point adjustment should be done again. |
| - - - | Positive pressure and compound pressure types | Applied pressure exceeds the upper limit of displayable pressure range. |
| - - - | Vacuum pressure type | Applied pressure exceeds the lower limit (reverse pressure) of displayable pressure range. |
| - - - | Positive pressure and compound pressure types | Applied pressure exceeds the lower limit (reverse pressure) of displayable pressure range. |
| - - - | Vacuum pressure type | Applied pressure exceeds the upper limit of displayable pressure range. |

9 ANALOG BAR DISPLAY

- Pressure changes are displayed in an analog fashion by using LCD bar. Hence, any sudden changes in pressure can be detected at a glance.
- The analog bar display shows the measured pressure, in steps of 14% F.S. approx.



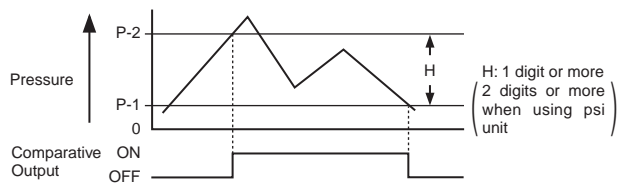
10 MEMORY BANK FUNCTION

- The memory bank function allows two types of set values to be stored: Set Values 1 to 3 (P-1 to P-3) and Set Values 4 to 6 (P-4 to P-6). This makes it possible to the change set values quickly. (Refer to '12 SETTING, Pressure value setting mode'.)

11 OUTPUT MODES & THEIR CHARACTERISTICS

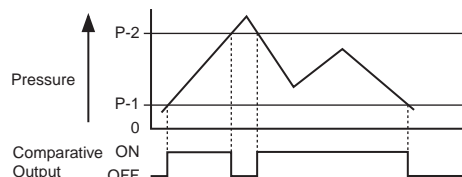
Hysteresis mode

- The hysteresis of the comparative outputs can be set arbitrarily by the set values for ON/OFF control.



Window comparator mode

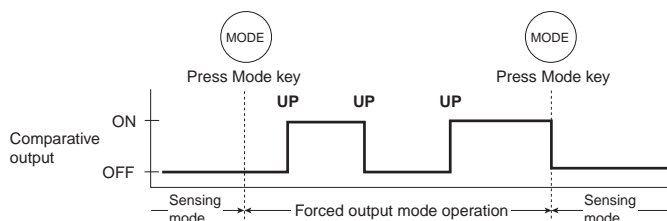
- The comparative output can be turned ON or OFF by a pressure which is within the set pressure range.



Forced output mode

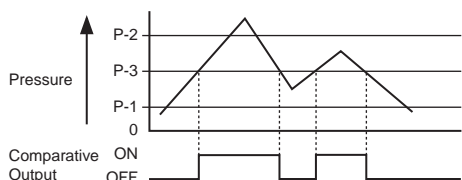
- The comparative output is forcibly maintained at OFF level in the sensing mode, irrespective of the set values. Hence, it is convenient for only displaying the pressure value without using the comparative outputs. Further, since the comparative outputs can be forcibly switched ON or OFF with key operation, without actually applying pressure, this mode is suitable for an operation check or a start-up check.

<Operation example>



Automatic sensitivity setting mode

- After [Set Value 1 (P-1)] and [Set Value 2 (P-2)] of the comparative output are set, [Set Value 3 (P-3)] is automatically set.

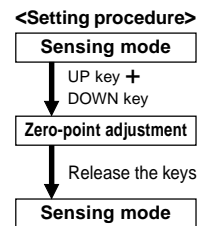


12 SETTING

Zero-point adjustment

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

- In the sensing mode, simultaneously press both UP key and DOWN key continuously to display 000 and then, when the keys are released, the zero-point adjustment is completed and the sensor returns to the sensing mode.



Initial setting mode

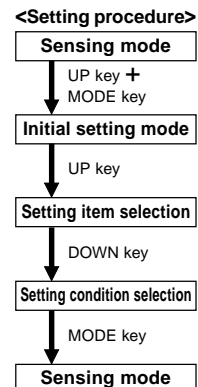
- [Display mode], [Output mode] and [Unit] are set by the following procedure.

- In the sensing mode, press both UP key and MODE key, simultaneously, to change the mode to the initial setting mode.
- The settable digit blinks.
- Setting item changes when UP key is pressed.
- Setting condition of each item changes when DOWN key is pressed.

| Unit | | Output mode | | Display mode | |
|----------|---------------------|-------------|------------------------------------|--------------|-----------------|
| Display | Description | Display | Description | Display | Description |
| P | kPa or MPa | H | Hysteresis mode | d | Digital display |
| J | kgf/cm ² | C | Window comparator mode | A | Analog display |
| b | bar | 0 | Forced output mode | | |
| S | psi | A | Automatic sensitivity setting mode | | |
| H (Note) | mmHg | | | | |
| I (Note) | inHg | | | | |

Note: Selectable only for vacuum pressure type [DP4-50(P)].

- Press MODE key. Sensor returns to sensing mode.



Supplementary setting mode

- [NO/NC], [Display cycle], [Response time] and [Pressure range] can be set by the following procedure.

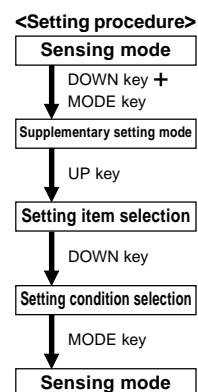
- In the sensing mode, press both DOWN key and MODE key simultaneously to change to the supplementary setting mode.
- The setting item and the setting condition are displayed alternately.
- The setting item changes when UP key is pressed.
- The set condition of each item changes when DOWN key is pressed.

| NO/NC Selection (U-1) | | Display cycle selection (U-2) | |
|-----------------------|--------------|-------------------------------|-------------|
| Display | Description | Display | Description |
| no | Normal open | 256 | 256ms |
| nc | Normal close | 512 | 512ms |
| | | 1024 | 1,024ms |

| Response time selection (U-3) | | Pressure range selection (U-4) (Note) | |
|-------------------------------|-------------|---------------------------------------|-------------|
| Display | Description | Display | Description |
| 2 | 2ms | ! | 1MPa |
| 16 | 16ms | 1000 | 1,000kPa |
| 128 | 128ms | | |
| 512 | 512ms | | |

Note: Displayable only for positive pressure type [DP4-52(P)].

- Press MODE key. Sensor returns to sensing mode.

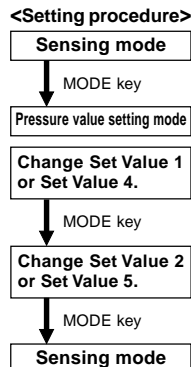


Pressure value setting mode

- In the positive pressure type and the compound pressure type, Set Value 2 (P-2) can be set only towards the higher pressure side with respect to Set Value 1 (P-1) and in the vacuum pressure type, it can be set only towards the higher vacuum side with respect to Set Value 1 (P-1).
- Pressure values can be set and also stored in the order of Set Value 1 (P-1), Set Value 2 (P-2) and Set Value 3 (P-3), or in the order of Set Value 4 (P-4), Set Value 5 (P-5) and Set Value 6 (P-6).

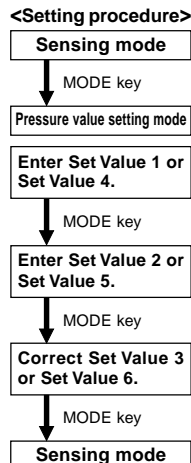
In case the output mode is set to either the hysteresis mode or the window comparator mode

- In the sensing mode, press MODE key to change to the pressure value setting mode.
- Display shows pressure value setting (P-1) and the present Set Value 1 alternately. At this time, if Mode key is pressed for 4 sec. or more, pressure setting value (P-4) and the present Set Value 4 is displayed alternately.
- Change Set Value 1 or Set Value 4 with UP key and DOWN key.
- Press MODE key to enter Set Value 1 or Set Value 4.
- In case pressure value setting (P-1) has been set at Step ②, the display shows pressure value setting (P-2) and the present Set Value 2 alternately. However, if pressure value setting (P-4) has been set, the display shows pressure value setting (P-5) and Set Value 5 alternately.
- Change Set Value 2 or Set Value 5 with UP key and DOWN key.
- Press MODE key to enter Set Value 2 or Set Value 5.
- Sensor returns to the sensing mode and setting is completed.



In case the output mode is set to the automatic sensitivity setting mode

- In the sensing mode, press MODE key to change to the pressure value setting mode.
- Pressure value setting (P-1) and the present Set Value 1 is displayed alternately. At this time, if MODE key is pressed for 4 sec. or more, pressure value setting (P-4) and the present Set Value 4 is displayed alternately.
- With the pressure desired to be automatically entered applied, press DOWN key. P-1 and the entered pressure value or P-4 and the entered pressure value are displayed alternately.
- When Mode key is pressed, in case pressure value setting (P-1) has been set at Step ②, the display shows pressure value setting (P-2) and the present Set Value 2 alternately. However, if pressure value setting (P-4) has been set at Step ②, the display shows pressure value setting (P-5) and Set Value 5 alternately.
- With the pressure desired to be automatically entered applied, press UP key. P-2 and the entered pressure value or P-5 and the entered pressure value are displayed alternately.
- When MODE key is pressed, in case pressure value setting (P-1) has been set at Step ②, pressure value setting (P-3) and Set Value 3, that is automatically set at the middle between Set Value 1 and Set Value 2, is displayed alternately. However, if pressure value setting (P-4) has been set at Step ②, pressure value setting (P-6) and the present Set Value 6, that is automatically set at the middle between Set Value 4 and Set Value 5, is displayed alternately.
- Set Value 3 or Set Value 6 can be corrected by UP key and DOWN key, provided they remain between Set Value 1 and Set Value 2, or Set Value 4 and Set Value 5, respectively.
- Press MODE key to enter Set Value 3 or Set Value 6.
- Sensor returns to the sensing mode and setting is completed.



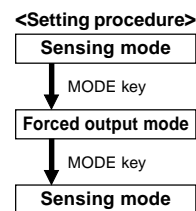
Notes:

- In case the output mode has been changed in the initial setting mode, check the set values of the pressure value setting mode again.
- After entering Set Value 2 and Set Value 3 and returning the sensor to the sensing mode, if the pressure value setting mode is selected again, Set Value 1 is displayed. However, after entering Set Value 5 and Set Value 6 and returning the sensor to the sensing mode, if the pressure value setting mode is selected again, Set Value 4 is displayed.
- The set conditions are written and stored into an EEPROM. However, note that the EEPROM has a life span and its guaranteed life is 100,000 write operation cycles.

13 FORCED OUTPUT MODE

- In the initial setting mode, if the output mode is set to the forced output mode, the comparative output is forcibly maintained at OFF level in the sensing mode, irrespective of Set Value 1 and 2. Further, if the keys are operated as per the procedure given below, the comparative output can be forcibly switched either ON or OFF without applying pressure at the pressure port. This is convenient for an operation check of the comparative output or for an inspection before commencing work.

- In the sensing mode, press MODE key to change to the forced output mode.
- Whenever UP key is pressed, the comparative output state switches to either ON and OFF alternately.
- Press MODE key to return to the sensing mode.

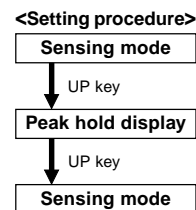


14 PEAK HOLD & BOTTOM HOLD FUNCTIONS

- Peak hold and bottom hold functions enable the display of the peak value and the bottom value.
- These functions are convenient for finding the pressure variation range or determining the reference for pressure setting.

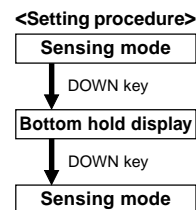
Peak hold display

- In the sensing mode, press UP key for 4 sec. or more.
- Peak hold display (P_{UP}) and the peak value are displayed alternately.
- Press UP key to return to the sensing mode.



Bottom hold display

- In the sensing mode, press DOWN key for 4 sec. or more.
- Bottom hold display (P_L) and the bottom value are displayed alternately.
- Press DOWN key to return to the sensing mode.

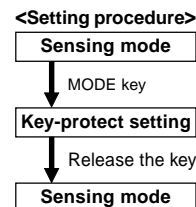


15 KEY-PROTECT FUNCTION

- 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 respond to the key operations.

Setting of key-protect

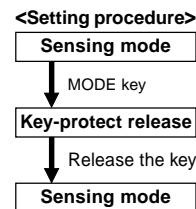
- In the sensing mode, press MODE key for 4 sec. or more.
- Key-protect is displayed.
- Release MODE key after the display.
- Key-protect is set and the sensor returns to the sensing mode.



- 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 for 4 sec. or more.
- Key-protect release is displayed.
- Release MODE key after the display.
- Key-protect is released and the sensor returns to the sensing mode.



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

SUNX Limited

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