

SVPD 101

INSTRUCTION MANUAL



DIGITAL PRESSURE / VACUUM SENSOR

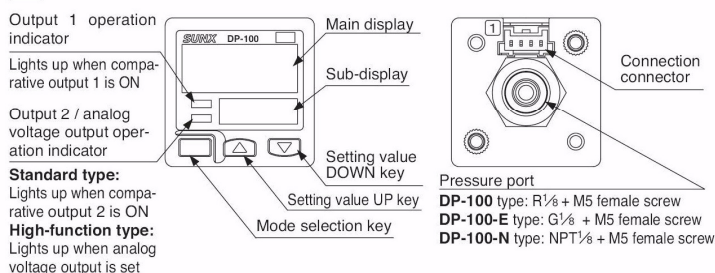
INSTRUCTION MANUAL

Thank you very much for using this 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

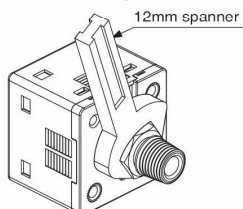
- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.
- Japanese Measurement Laws prohibit the use of this product in Japan.

1 NAMES OF EACH PART



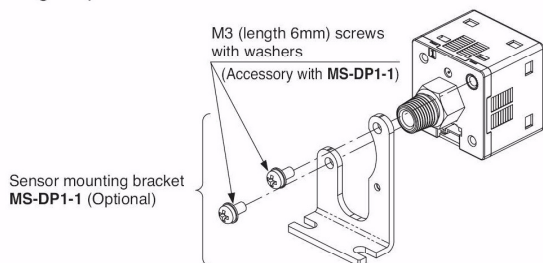
2 PIPING

- When connecting a commercial coupler to the pressure port, attach a 12mm spanner (14mm for DP-100-E type) to the pressure port's hexagon section to fix the port, and then tighten with a tightening torque of 9.8N·m or less. The commercial coupler or pressure port section will be damaged if the tightening torque is excessive. Wrap sealing tape around the coupler when connecting to prevent leaks.

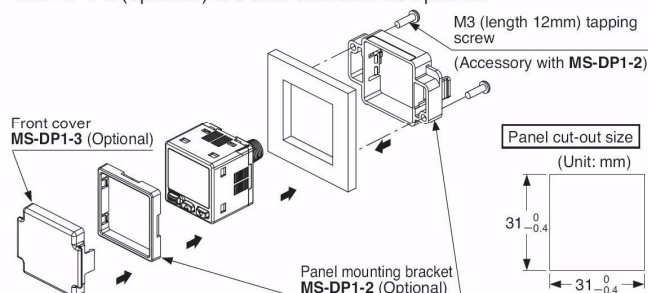


3 MOUNTING

- The sensor mounting bracket (MS-DP1-1) is available as an option. When mounting the sensor onto the sensor mounting bracket, etc., the tightening torque should be 0.5N·m or less.



- The panel mounting bracket MS-DP1-2 (optional) and front cover MS-DP1-3 (optional) are also available as options.



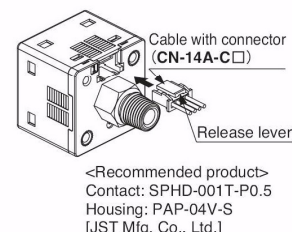
4 WIRING

Connection method

- Insert the cable with connector CN-14A-C into this product's connection connector section as shown in the right figure.

Disconnection method

- Pressing the release lever of the cable with connector, pull out the connector.



Note: Do not pull by holding the cable without pressing the release lever, as this can cause cable break or connector break.

<Connection connector pin arrangement>

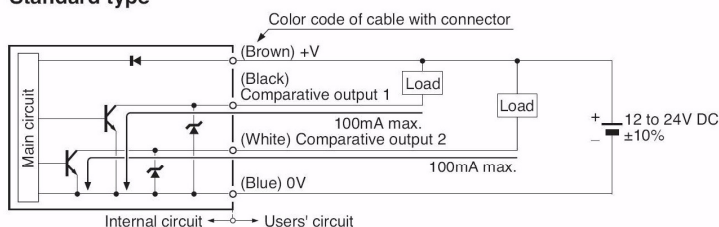
Connector pin No.	Terminal name
①	+V
②	Comparative output 1
③	Standard type: Comparative output 2 High-function type: Analog voltage output or external input
④	0V

5 I/O CIRCUIT DIAGRAMS

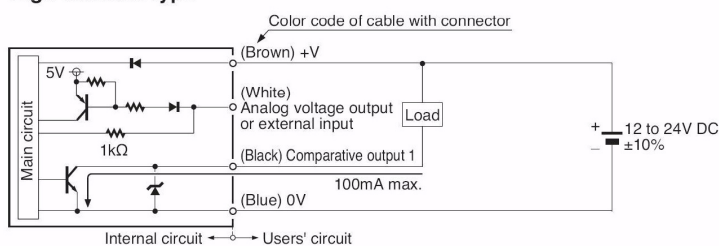
When using the analog voltage output, take care to the input impedance of the connected device. Furthermore, note that if the cable is extended, the cable resistance will cause the voltage to drop.

NPN output type

Standard type

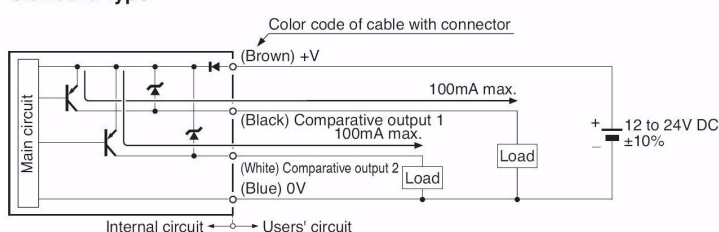


High-function type

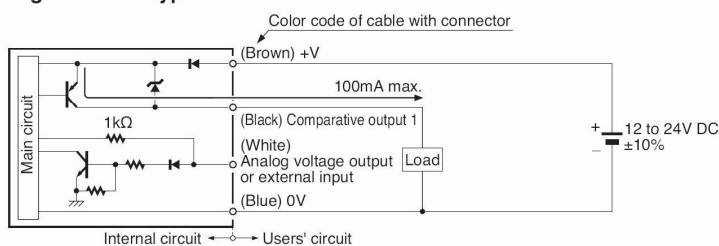


PNP output type

Standard type



High-function type



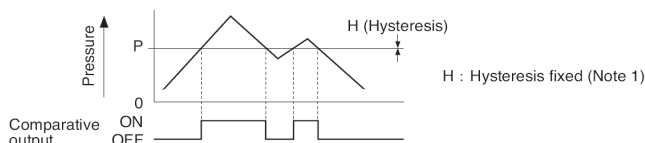
6 OUTPUT MODE AND OUTPUT OPERATION

- The EASY mode, hysteresis mode or window comparator mode can be selected as the output mode for comparative output 1 and comparative output 2.

Refer to 'Comparative output 1/2 output mode setting' in '9 MENU SETTING MODE' for details.

EASY mode

- ON / OFF of the comparative output is controlled in this mode.



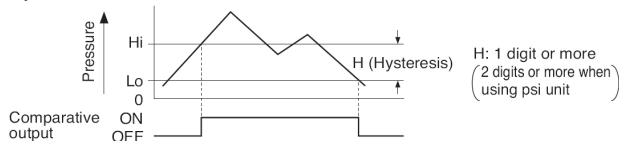
Notes:1) Hysteresis can be fixed in 8 steps.

Refer to '<Hysteresis fixed value selection>' in '10 PRO MODE' for setting.

2) 'P-1' is displayed for comparative output 1 and 'P-2' for comparative output 2 on the sub-display.

Hysteresis mode

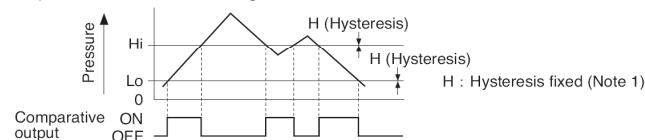
- The comparative output ON / OFF state can be controlled with randomly set hysteresis in this mode.



Note: 'Hi - 1' or 'Lo - 1' is displayed for comparative output 1 and 'Hi - 2' or 'Lo - 2' for comparative output 2 on the sub-display.

Window comparator mode

- In this mode, the ON or OFF state of the comparative output is controlled with a pressure in the set range.



Notes:1) Hysteresis can be fixed in 8 steps.

Refer to '<Hysteresis fixed value selection>' in '10 PRO MODE' for setting.

2) 'Hi - 1' or 'Lo - 1' is displayed for comparative output 1 and 'Hi - 2' or 'Lo - 2' for comparative output 2 on the sub-display.

7 SETTING

<Setting procedures>

RUN MODE

This is the pressure detection state.
Refer to '8 RUN MODE'.

MODE

Press for 2 sec.

MENU SETTING MODE

This is the setting mode for simple setting.
Refer to '9 MENU SETTING MODE'.

MODE

Press for 4 sec.
(Note)

PRO MODE

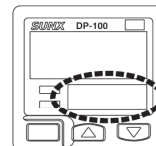
This is the setting mode for detailed setting.
Refer to '10 PRO MODE'.

Note: Although the menu setting mode appears two seconds after the mode selection key is pressed, keep pressing the key.

8 RUN MODE

Setting the threshold value

- Refer to 'Comparative output 1/2 output mode setting' and 'Analog voltage output / external input selection' in '9 MENU SETTING MODE' for setting conditions.



Since only the sub-display changes in the threshold setting, the following shows only the sub-display.

Note: If the set pressure range is exceeded, 'UP' (exceeds the upper limit) or 'DOWN' (exceeds the lower limit) will appear on the sub-display.
'DOWN' will also appear if the Hi side threshold value exceeds the Lo side threshold value when setting the 'hysteresis mode / window comparator mode' threshold value.

Standard type

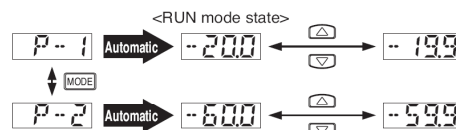
<Setting condition 1>

Comparative output 1 output mode: 'EASY' (EASY mode)
Comparative output 2 output mode: 'OFF' (OFF)



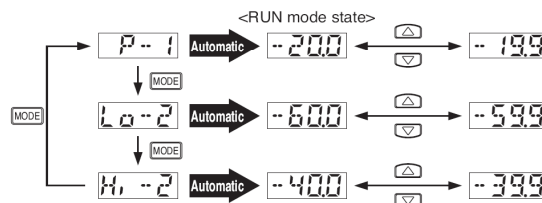
<Setting condition 2>

Comparative output 1 output mode: 'EASY' (EASY mode)
Comparative output 2 output mode: 'EASY' (EASY mode)



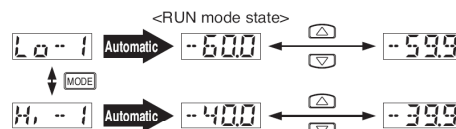
<Setting condition 3>

Comparative output 1 output mode: 'EASY' (EASY mode)
Comparative output 2 output mode: 'HYS' (Hysteresis mode) or 'WCOMP' (Window comparator mode)



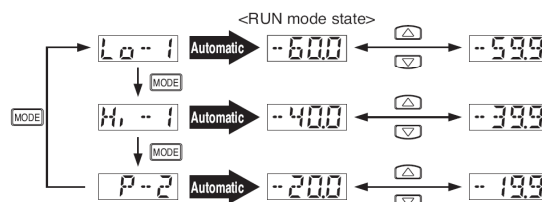
<Setting condition 4>

Comparative output 1 output mode: 'HYS' (Hysteresis mode) or 'WCOMP' (Window comparator mode)
Comparative output 2 output mode: 'OFF' (OFF)



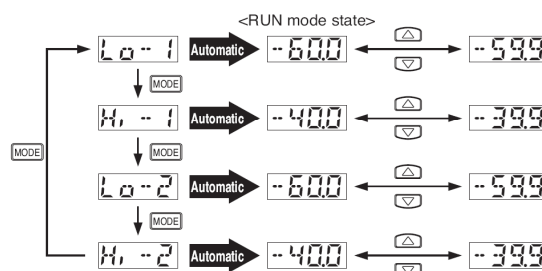
<Setting condition 5>

Comparative output 1 output mode: 'HYS' (Hysteresis mode) or 'WCOMP' (Window comparator mode)
Comparative output 2 output mode: 'EASY' (EASY mode)



<Setting condition 6>

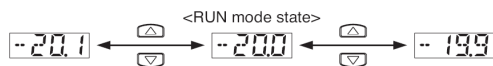
Comparative output 1 output mode: 'HYS' (Hysteresis mode) or 'WCOMP' (Window comparator mode)
Comparative output 2 output mode: 'HYS' (Hysteresis mode) or 'WCOMP' (Window comparator mode)



High-function type

<Setting condition 7>

Comparative output 1 output mode: 'EASY' (EASY mode)
Analog voltage output / external input selection: 'Rout' (Analog voltage output)



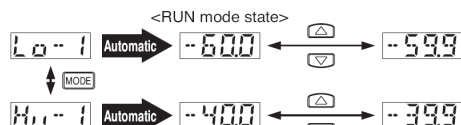
<Setting condition 8>

Comparative output 1 output mode: 'EASY' (EASY mode)
Analog voltage output / external input selection: 'AREF' (Auto-reference input) or 'ZERO' (Remote zero-adjustment input)



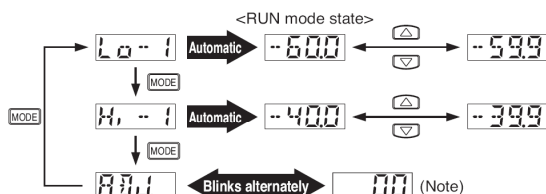
<Setting condition 9>

Comparative output 1 output mode: 'HYS' (Hysteresis mode) or 'WCOMP' (Window comparator mode)
Analog voltage output / external input selection: 'Rout' (Analog voltage output)



<Setting condition 10>

Comparative output 1 output mode: 'HYS' (Hysteresis mode) or 'WCOMP' (Window comparator mode)
Analog voltage output / external input selection: 'AREF' (Auto-reference input) or 'ZERO' (Remote zero-adjustment input)



Note: Auto-reference value and remote zero-adjustment value are displayed.
For details, refer to '12 AUTO-REFERENCE FUNCTION' and '13 REMOTE ZERO-ADJUSTMENT FUNCTION'.

Common

Zero-adjustment function

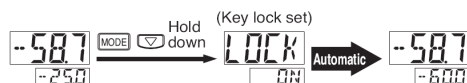
- The zero-adjustment function forcibly sets the pressure value to 'zero' when the pressure port is opened.



Key lock function

- The key lock function prevents key operations so that the conditions set in each setting mode are not inadvertently changed.

<Key lock set>



<Key lock released>



Peak / bottom hold function

- The peak / bottom hold functions display the peak value and bottom value of the fluctuating pressure.
- The peak value is displayed on the main display and the bottom value is displayed on the sub-display.

<Peak / bottom hold set>



<Peak / bottom hold released>



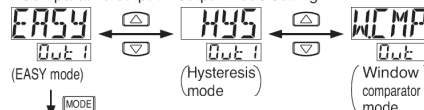
9 MENU SETTING MODE

- When the mode selection key is held down for two seconds in the RUN mode, the menu setting mode will open.
- The mode will change to the RUN mode when the mode selection key is held down during this setting process.
- The leftmost setting items are the default settings (factory settings).

<RUN mode>

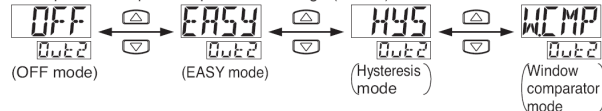
MODE Press for 2 sec.

<Comparative output 1 output mode setting>



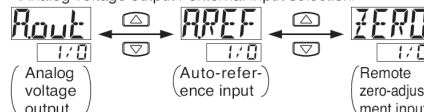
Standard type

<Comparative output 2 output mode setting> (Note 1)



High-function type

<Analog voltage output / external input selection>



Standard type

<N.O. / N.C. selection> (Note 1) (Note 2)

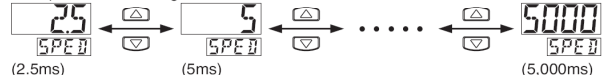


High-function type

<N.O. / N.C. selection> (Note 2)



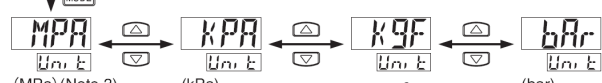
<Response time setting>



<Display color of the main display selection>



MODE



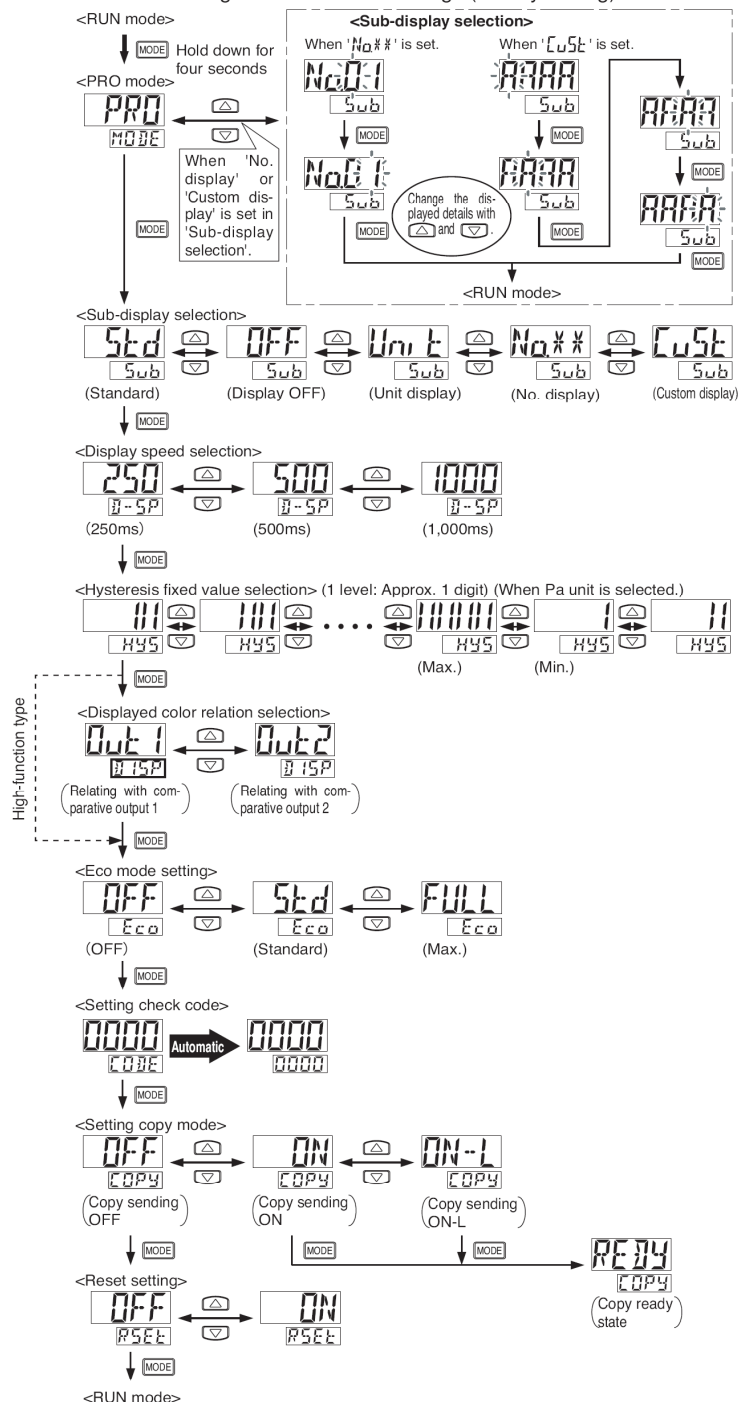
<RUN mode>

- Notes: 1) If the comparative output 2 output mode setting is set to 'OFF', the display of N.O. / N.C. selection is the same as the high-function type.
2) The default setting of the high pressure type is 'No', and that of the low pressure type is 'Nc'.
3) The default setting of the low pressure type is 'KPA'. 'MPA' is not displayed.
4) This is not displayed on the high-pressure type.

Setting item	Description
Comparative output 1 output mode setting	Sets the output operation of comparative output 1.
Comparative output 2 output mode setting (Standard type only)	Sets the output operation of comparative output 2.
Analog voltage output / external input selection (High-function type only)	Selects analog voltage output, auto-reference input, or remote zero-adjustment input.
N.O. / N.C. selection	Normal open (N.O.) or normal close (N.C.) can be selected.
Response time setting	Sets the response time. The response time can be selected from 2.5ms, 5ms, 10ms, 25ms, 50ms, 100ms, 250ms, 500ms, 1,000ms or 5,000ms.
Displayed color of the main display selection	Displayed color of the main indicator can be changed.
Unit selection	Pressure unit can be changed.

10 PRO MODE

- When the mode selection key is held down for four seconds in the RUN mode, the PRO mode will open.
- The mode will change to the RUN mode when the mode selection key is held down during this setting process. In this case, the changed item is entered.
- The leftmost settings are the default settings (factory setting).



Setting item	Description
Sub-display selection	Changes the indication of the sub-display. * OFF: Displays nothing. * Unit: Presently selected pressure unit is displayed. * No. display: Desired No. can be shown. * Cust: Desired numbers, alphabets (some of them cannot be displayed) and signs can be shown.
Display speed selection	Changes the speed of the displayed pressure value on the main display.
Hysteresis fixed value selection	Sets hysteresis of the EASY mode and the window comparator mode. (8 steps)
Displayed color relation selection (Standard type only)	The setting contents set at the displayed color setting in Menu setting mode can be related with either comparative output 1 or comparative output 2.
Eco mode setting	Current consumption can be lowered. * OFF: Normal operation (ECO mode is off.) * Std: If any key operation is not carried out for approx. 5 sec. in RUN mode, the display becomes dark. * Full: If any key operation is not carried out for approx. 5 sec. in RUN mode, the display is turned off. Press any key to temporarily show the normal indication.
Setting check code	Current setting contents can be checked. For codes, refer to 'Code table'.
Copy mode setting	The setting of the master side sensor can be copied to the slave side sensors. For details, refer to '11 SETTING COPY FUNCTION' * ON: The setting contents are copied. * ON-L: The setting contents are copied, and the slave side sensor goes into key-lock state.
Reset setting	Returns to default settings (factory settings).

Code table

Code	First digit	Second digit		Third digit	Fourth digit	
		Standard type	High-function type		Displayed color of the main display	Standard type only
0	EASY	N.O.	OFF	OFF	Analog voltage output / external input	Threshold display
1		N.C.	EASY	N.O.	Auto reference	Hi-1
2	Hysteresis	N.O.	N.C.	—	Remote zero-adjustment	P-2, Lo-2
3		N.C.	Hysteresis	N.O.	—	Hi-2
4	Window comparator	N.O.	N.C.	—	—	ADJ.
5		N.C.	Window comparator	N.O.	—	—
6	—	—	N.C.	—	—	—
7	—	—	—	—	—	—

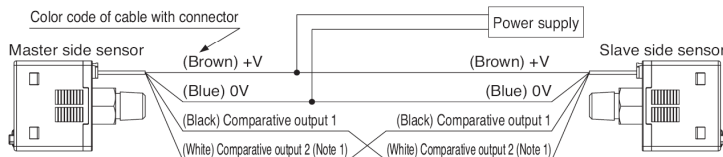
Code	Fifth digit	6th digit	7th digit	8th digit
Response time	Unit selection	Display speed	Eco mode	
0	2.5ms	MPa	250ms	OFF
1	5ms	kPa	500ms	Std
2	10ms	kgf/cm ²	1,000ms	Full
3	25ms	bar	—	—
4	50ms	psi	—	—
5	100ms	mmHg	—	—
6	250ms	inchHg	—	—
7	500ms	—	—	—
8	1,000ms	—	—	—
9	5,000ms	—	—	—

11 SETTING COPY FUNCTION

- This can copy the settings of the master side sensor to the slave side sensor.
- Be sure to use the setting copy function between the identical models. This function cannot be used between different models.
- Only one sensor can be connected on slave side with a master side sensor for the setting copy function.

<Setting procedure>

- Set the setting copy function of the master side sensor to 'Copy sending ON' or 'Copy sending ON-L', and then press the mode selection key so that the sensor is in copy ready state. For details, refer to **<Setting copy mode>** in '10 PRO MODE'.
- Turn off the master side sensor.
- Connect the master side sensor with the slave side sensor as shown below.



Notes: 1) For the high-function type, analog voltage / external input.

- Turn on the master side sensor and the slave side sensor at the same time. (Note 2) (Note 3)
- Set contents (16-bit coded) are shown in orange on the main display of the master side sensor and the copying starts.
- The same code explained above is shown in green on the the main display of the slave side sensor, and 'OK' is shown on the sub-display (When copying is complete.)
- Turn off the power of the master side sensor and the slave side sensor and disconnect the wire.

* If copying the setting to another sensor repeatedly, follow steps ③ to ⑥.

Notes: 2) Take care that if the power is not turned on at the same time, the setting contents may not be copied.

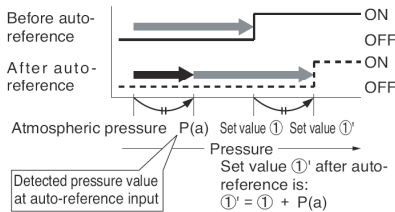
3) Note that when the power is on, pulse output is output to comparative output 1.

<To cancel the setting copy mode of master side sensor>

- Whilst the slave side sensor is disconnected, turn on the power of the master side sensor.
- Press the mode selection key for approx. two seconds.

12 AUTO-REFERENCE FUNCTION (ONLY HIGH-FUNCTION TYPE)

- The auto-reference function corrects the setting value using the detected pressure value during auto-reference input as the reference pressure.
- Using the detected pressure value at auto-reference input P(a) as a reference, the set value ①' is automatically corrected to 'set value ① + P(a)'.

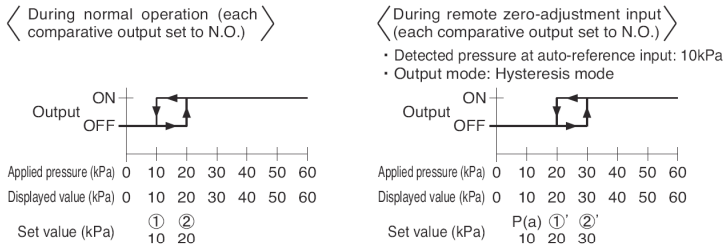


Settable range and set pressure range after correction

- The setting pressure range is wider than the rating pressure range so that the auto-reference function can be handled.

If the corrected setting value exceeds the set pressure range when auto-reference input is carried out, the setting value will be automatically corrected to within the set pressure range. Thus, take care not to exceed the set pressure range.

Operation chart



Note: The setting values shift in the same manner during the EASY mode or the window comparator mode.

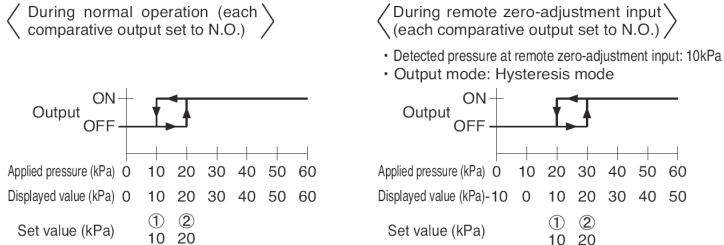
- The detected pressure value at auto-reference input becomes 'zero' when the setting of the analog voltage output / external input selection function is changed or the power is turned ON again.
- The auto-reference input value can be checked when setting the threshold value in RUN mode. Refer to the threshold value setting in '8 RUN MODE' for details.

13 REMOTE ZERO-ADJUSTMENT FUNCTION (HIGH-FUNCTION TYPE)

- The remote zero-adjustment function forcibly sets the pressure value to 'zero' when the external signal is input.

The setting value is not corrected when remote zero-adjustment is input. Make sure that the pressure and setting value during remote zero-adjustment do not exceed the settable pressure range.

Operation chart



Note: The setting values shift in the same manner during the EASY mode or the window comparator mode.

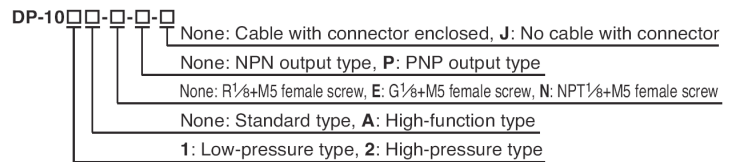
- The remote zero-adjustment value is cleared when the setting of the analog voltage output / external input selection is changed or the power is turned ON again, and normal operation based on the atmospheric pressure is resumed. The remote zero-adjustment value can be confirmed when setting the threshold value in RUN mode. Refer to the threshold value setting in '8 RUN MODE'.

14 ERROR INDICATION

Error message	Cause	Corrective action
E-1	The load is short-circuited causing an overcurrent to flow.	Turn the power OFF and check the load.
E-3	Pressure is 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.
E-4	External input is carried out outside the rated pressure range.	Applied pressure range should be brought within the rated pressure range.
E-5	Communication error (Disconnection, faulty connection, etc.)	Check the wiring when using the copy function.
E-6	Communication error (Incorrect model.)	Make sure that the system is configured of the same models when using the copy function.
XX	The applied pressure exceeds the upper limit of the display pressure range.	Applied pressure range should be brought within the rated pressure range.
--XX	The applied pressure exceeds the lower limit (reverse pressure) of the display pressure range.	

14 MAIN SPECIFICATIONS

● Model



Type	Standard type	High-function type
Item	Low-pressure type	High-pressure type
Pressure type	Gauge pressure	
Rated pressure range	-100 to +100 kPa	-0.1 to +1.0 MPa
Set pressure range	100 to +100 kPa	0.1 to +1.0 MPa
Withstand pressure	500 kPa	1.5 MPa
Applicable fluid	Non-corrosive gas	
Supply voltage	12 to 24 V DC $\pm$ 10% Ripple P-P 10 % or less	
Power consumption	Normal operation: 840mW or less (current consumption 35mA or less at 24V supply voltage) ECO mode (STD): 600mW or less (current consumption 25mA or less at 24V supply voltage) ECO mode (FULL): 480mW or less (current consumption 20mA or less at 24V supply voltage)	
Comparative output	<NPN output type> - NPN open-collector transistor - Maximum sink current: 100mA - Applied voltage: 30V DC or less (between comparative output and 0V) - Residual voltage: 2V or less (at 100mA sink current)	<PNP output type> - PNP open-collector transistor - Maximum source current: 100mA - Applied voltage: 30V DC or less (between comparative output and +V) - Residual voltage: 2V or less (at 100mA source current)
Output operation	Selectable either N.O. or N.C., with key operation	
Hysteresis	Min. 1 digit (variable) (however, 2 digits when using psi units)	
Repeatability	$\pm$ 0.1% F.S., $\pm$ within 2 digits	$\pm$ 0.2% F.S., $\pm$ within 2 digits
Response time	2.5ms, 5ms, 10ms, 25ms, 50ms, 100ms, 250ms, 500ms, 1.000ms or 5.000ms selectable with key operations	
Analog voltage output	<High-function, low-pressure type> - Output voltage: 1 to 5V - Zero point: Within 3V $\pm$ 5% F.S. - Span: Within 4V $\pm$ 5% F.S. - Linearity: Within $\pm$ 1% F.S. - Output impedance: 1kΩ approx.	<High-function, high-pressure type> - Output voltage: 0.6 to 5V - Zero point: Within 1V $\pm$ 5% F.S. - Span: Within 4.4V $\pm$ 5% F.S. - Linearity: Within $\pm$ 1% F.S. - Output impedance: 1kΩ approx.
External input	<High-function NPN output type> - ON voltage: 0.4V DC or less - OFF voltage: 5 to 30V DC or open - Input impedance: 10kΩ approx. - Input time: 1ms or more	<High-function PNP output type> - ON voltage: 5V to +V DC - OFF voltage: 0.6V DC or less or open - Input impedance: 10kΩ approx. - Input time: 1ms or more
Ambient temperature	-10 to +50°C (No dew condensation or icing allowed), Storage: -10 to +60°C	
Ambient humidity	35 to 85% RH, Storage: 35 to 85% RH	
Temperature characteristics	$\pm$ 0.5% F.S. (20°C reference)	$\pm$ 1% F.S. (20°C reference)
Material	Enclosure: PTB (with glass fiber), LCD display: Acrylic, Pressure port: Brass (nickel-plated), Mounting screw section: Brass (nickel-plated), Switch: Silicon rubber	
Weight	40g approx. (DP-100-E type: 45g approx.) (Main body only)	
Accessories	CN-14A-C2 (Cable with a connector, 2m long) (optional for J type), Unit switching label: 1 pc.	

15 CAUTIONS

⚠ WARNING

DP-100 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 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.
- The specification may not be satisfied in a strong magnetic field.
- 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.
- Make sure that stress by forcible bend or pulling is not applied directly to the sensor cable joint.
- This is a CE conformity product complying with EMC Directive. The standard with regard to immunity that applies to this product is EN 61000-6-2, and in order to meet the standard, every cable connected to this product must be within 10m with 0.3mm², or more, cable. However, in case CE conformity is not required, the cable length can be up to 100m with 0.3mm², or more, cable.



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