Pressure & Flow Switches

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Sensors







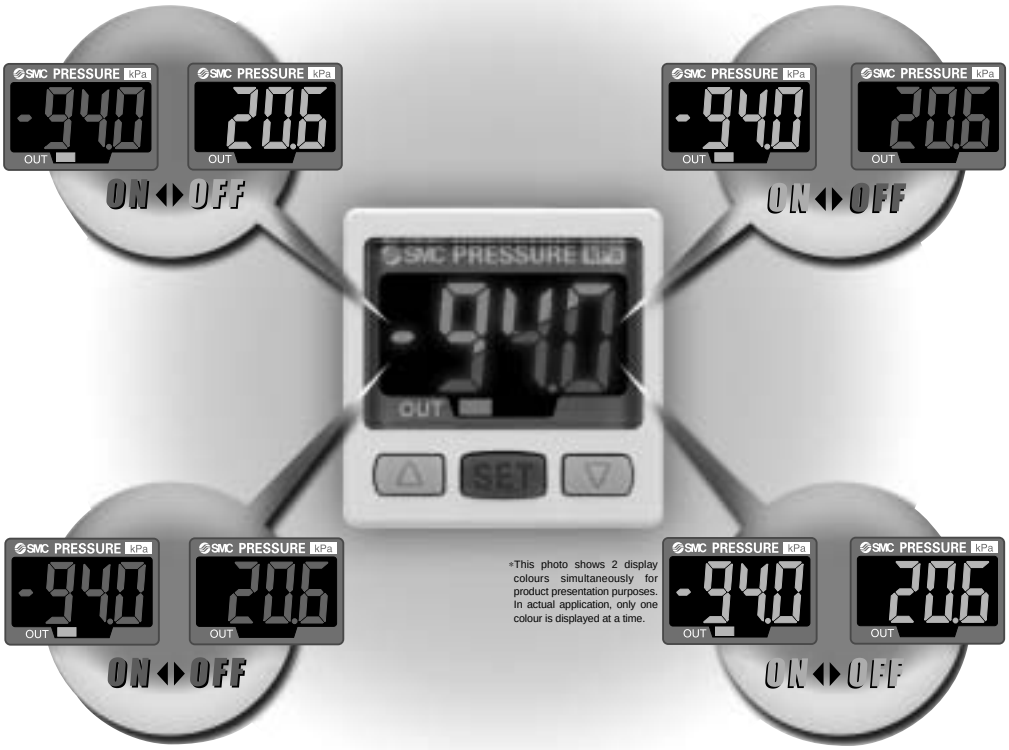




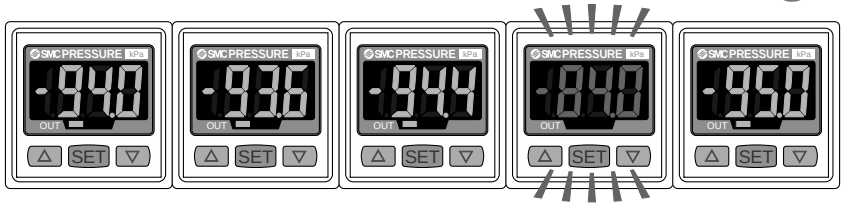



ZSE/ISE30

2-color digital display allows you to choose the setting according to your application requirements. 4 different display settings are available.



Abnormal conditions can be detected at a glance!

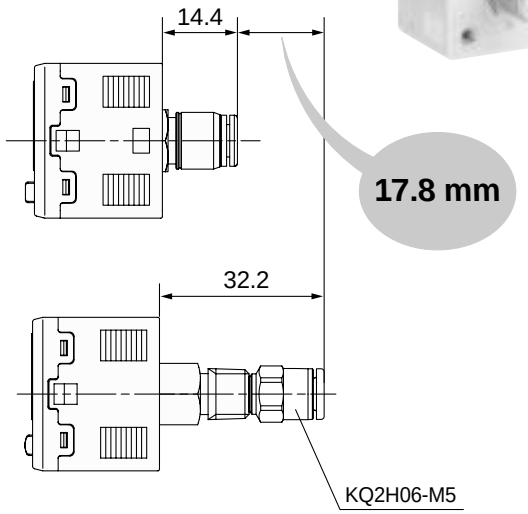


With one-touch fitting (ø4, ø6, ø5/32", ø1/4")

Reduced dimensions in piping direction

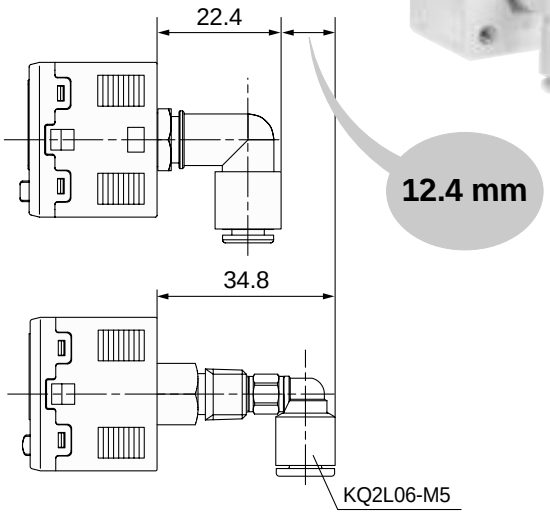
17.8 mm reduction*

Straight type



12.4 mm reduction*

Elbow type

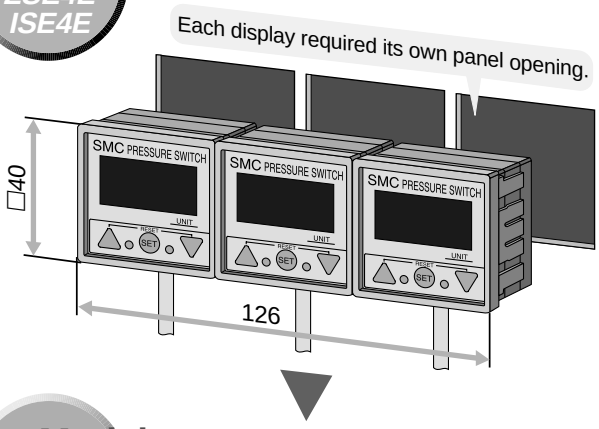


* Comparison when One-touch fittings (KQ2H06-M5 / KQ2L06-M5) are connected to the piping ports (M5)

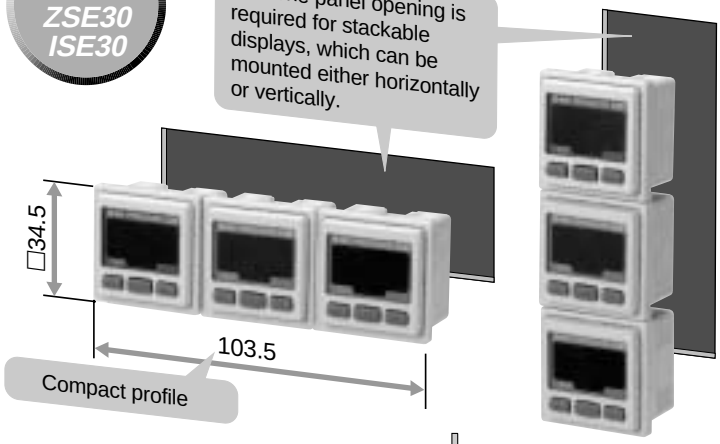
Space-saving improvement

Economical use of space

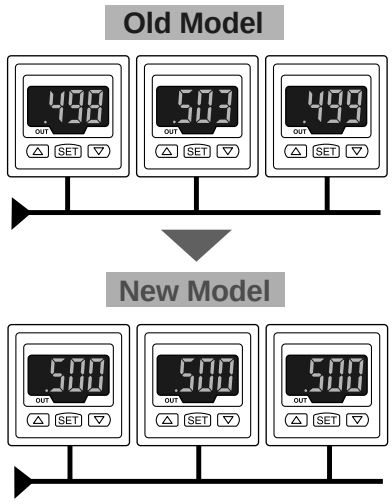
Old Model
ZSE4E
ISE4E



New Model
ZSE30
ISE30

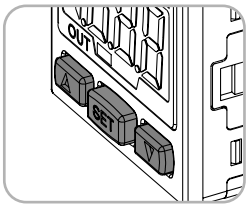


Display calibration

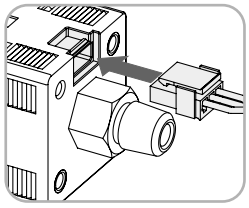


This function allows uniformity in the numbers displayed.

More user-friendly controls



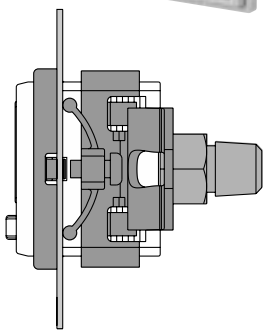
Raised rubber button controls are clearly set apart, simple to operate, soft to the touch.



Plug-type connectors take the burden out of wiring work and maintenance.

Applicable panel thickness is up to 6mm.

(Panel mounting)



With analogue output

In addition to the conventional voltage output type (1 to 5 V)

Current output type (4 to 20 mA)
is now available.

- Convenient when longer wiring is required
- Excellent noise resistance

High-precision resolution: 1/1000

Switches for vacuum and positive pressure can be easily distinguished.

The different display panel frame colours easily tell them apart.

Vacuum/Low pressure (ZSE30)

Blue 

Positive pressure (ISE30)

Gray 

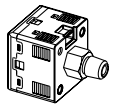
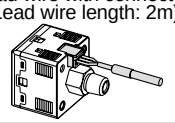
Variations

		Vacuum/Low pressure ZSE30	Positive pressure ISE30
Rated pressure range		100 kPa / 0 / –100 kPa	1 MPa / 0
Setting/Display resolution		0.2 kPa	0.001 MPa
Output	Switch output	NPN/PNP open collector (1 output)	
	Analogue output	Voltage output: 1 to 5 V; Current output: 4 to 20 mA	
Current consumption		45 mA or less (70 mA or less for current output)	
Option		Panel mount/Bracket	

2-Colour Display Type
High-Precision Digital Pressure Switch
Series ZSE30/ISE30

How to Order

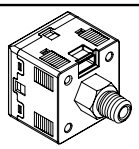
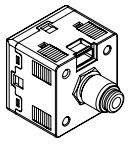
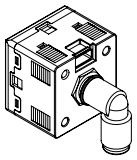
Option 1

Nil	Without lead wire 
L	Lead wire with connector (Lead wire length: 2m) 

For positive pressure ISE30 — **01** — **25** — **M** □ □

For vacuum/low pressure ZSE30 — **01** — **25** — **M** □ □

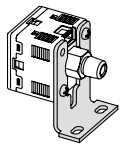
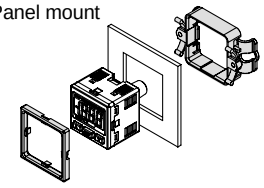
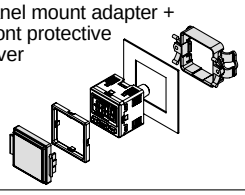
Piping specification

01	R 1/8 (with M5 female thread)	
T1	NPT 1/8 (with M5 female thread)	
C4H	ø4 one-touch fitting ø5/32" one-touch fiting	Straight type 
C6H	ø6 one-touch fitting	
N7H	ø1/4" one-touch fitting	
C4L	ø4 one-touch fitting ø5/32" one-touch fitting	Elbow type 
C6L	ø6 one-touch fitting	
N7L	ø1/4" one-touch fitting	

Output specification

25	NPN output
65	PNP output
26	1 to 5 V output
28	4 to 20 mA output

Option 2

Nil	None
A	Bracket 
B	Panel mount 
D	Panel mount adapter + Front protective cover 

Unit specification

Nil	With unit switching function
M	Fixed SI until (International System of Units) Note)

Note) Fixed units:
For vacuum/Low pressure: kPA
For positive pressure: MPa

Optional Part Nos.

When optional parts are required separately, use the following part numbers to place an order.

Option	Part no.	Note
Lead wire with connector	ZS-27-A	Lead wire length: 2 m
Bracket	ZS-27-B	With mounting screws (M3 x 5L: 2 pcs.)
Panel mount adapter	ZS-27-C	With M3 x 8L (2 pcs.)
Panel mount adater + Front protective cover	ZS-27-D	With M3 x 8L (2 pcs.)

Specifications

		ZSE30 (Vacuum/Low pressure)	**ISE30** (Positive pressure)
Rated pressure range		–100.0 to 100.0 kPa	0.000 to 1.000 MPa
Regulating pressure range		–101.0 to 101.0 kPa	–0.100 to 1.000 MPa
Proof pressure		500 kPa	1.5 MPa
Min. regulating unit		0.2 kPa	0.001 MPa
Fluid		Air, Inert gas, Non-flammable gas	
Power supply voltage		12 to 24 VDC, Ripple (p-p) 10% or less (with power supply polarity protection)	
Current consumption		45 mA or less (at no load)	
Switch output Note 1)		NPN or PNP open collector output: 1 output80 mA	
	Max. load current	30 V (with NPN output)	
	Max. applied voltage	1 V or less (with load current of 80 mA)	
	Residual voltage	2.5 ms or less (Response time selections with anti-chattering function: 20 ms, 160 ms, 640 ms, 1280 ms)	
	Response time	With short circuit protection	
	Short circuit protection	Output voltage: 1 to 5 V ±2.5% F.S. or less (with rated pressure range)	
Repeatability		±0.2% F.S. ±2 digit or less	±0.2% F.S. ±1 digit or less
Analogue output	**Voltage output** Note 2)	Linearity: ±1% F.S. or less, Output impedance: Approx. 1 kΩ Output current: 4 to 20 mA ±2.5% F.S. or less (with rated pressure range)	
	Current output Note 3)	Linearity: ±1% F.S. or less Maximum load impedance: 300 Ω with power supply voltage of 12 V; 600 Ω with power supply voltage of 24 V Minimum load impedance: 50 Ω	
Hysteresis	**Hysteresis mode**	Adjustable (can be set from 0)	
	Window comparator mode		
Display		3 1/2 digit, 7-segment indicator, 2-colour display (red and green) Sampling cycle: 5 times/s	
Display accuracy		±2% F.S. ±2 digit (at 25°C ambient temperature)	±2%F.S. ±1digit (at 25°C ambient temperature)
Indication light		Light up when output is ON (Green)	
Temperature characteristics		±2% F.S. or less (based on 25°C)	
Environ-mental resistance	**Enclosure**	IP40	
	Operating temperature range	Operating: 0 to 50°C, Stored: –10 to 60°C (with no freezing or condensation)	
	Operating humidity range	Operating and stored: 35 to 85%RH (with no condensation)	
	Withstand voltage	1000 VAC for 1 min. between live parts and enclosure	
	Insulation resistance	50 MΩ or more between live pars and enclosure (at 500 VDC)	
	Vibration resistance	10 to 150 Hz, 1.5 mm or 20 m/s^2 amplitude in X, Y, Z directions for 2 hours each	
	Impact resistance	100 m/s^2 in X, Y, Z diections 3 times each	
Standard		Compliant with CE Marking and UL (CSA) standards	

Note 1) When switch output is selected, analogue output is not available.

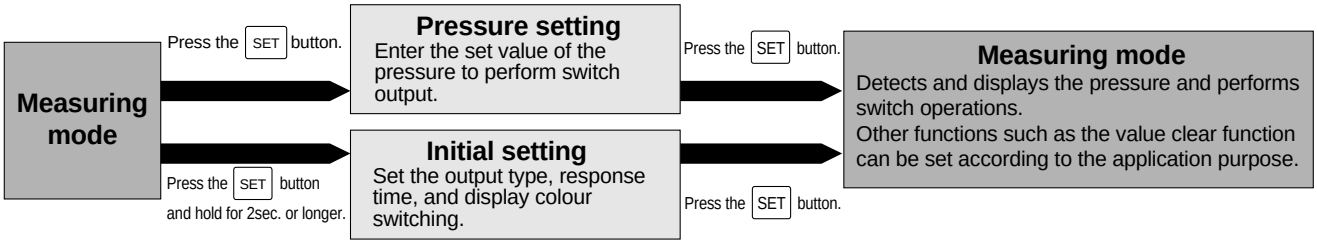
Note 2) When voltage output is selected, a simultaneous selection of switch output and current output is not available.

Note 3) When current output is selected, a simultaneous selection of switch output and voltage output is not available.

Piping Specification

Part		**01**	**T1**	**C4H**	**C6H**	**N7H**	**C4L**	**C6L**	**N7L**
Port size		R1/8 M5	NPT1/8 M5	–	–	–	–	–	–
	One-touch fitting Straight type	–	–	ø4 mm ø5/32 inch	ø6 mm	ø1/4 inch	–	–	–
	One-touch fitting Elbow type	–	–	–	–	–	ø4 mm ø5/32 inch	ø6 mm	ø1/4 inch
Wetted part material		Sensor pressure receiving area: silicon, piping port: C3602 (electroless nickel plated), O-ring: HNBR							
				O-ring: NBR			O-ring: NBR, fitting: PBT		
Weight	**With lead wire with connector** (2 m)	81 g		76 g			78 g		
	Without lead wire with connector	43 g		38 g			40 g		

Setting



Initial Setting

Initial setting mode

Press and hold the SET button for 2 seconds or longer. Display monitor will be per Figure A below, and the switch will now be in the display colour setting mode.

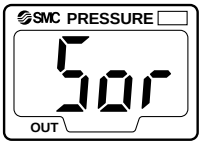
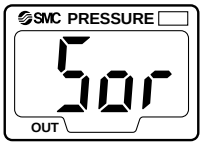


Figure A

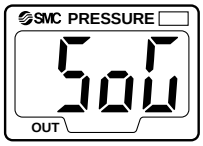
If the unit specification indicated at the time of ordering is "M", the fixed SI unit will be used. If it is Nil, refer to "Unit Switching Function" on page 5.

1. Display colour setting

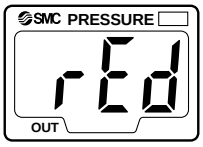
Select the colour for LCD display.
Press the △UP or ▽DOWN button to choose a display colour.



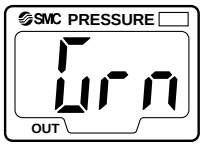
ON: Red



ON: Green



ON/OFF: Red

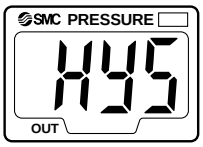


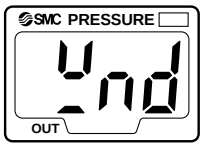
ON/OFF: Green

Press the SET button to set the colour and proceed to the operating mode setting.
If the analogue output is set, press the △UP or ▽DOWN button and select the desired display colour from Grn (Green) or rEd (Red). Press the SET button to exit this mode and return to the measuring mode.

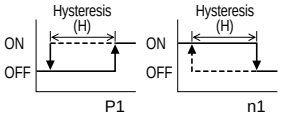
2. Operating mode setting

This mode will let you select the switch operating mode.
While the current operating mode is displayed, press the △UP or ▽DOWN button to select a newly desired operating mode.



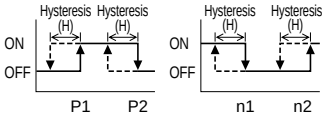


Hysteresis mode



(Standard: Factory setting) (Reversed)

Window comparator mode

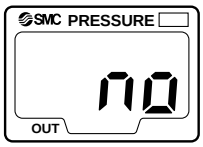


(Standard: Factory setting) (Reversed)

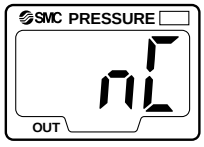
Press the SET button to set the mode and proceed to the output type setting.

3. Output type setting

The type of switch output can be set arbitrarily.
While the current output type is displayed, press the ▽DOWN button to switch between normally open no and normally closed nC.



Normally open

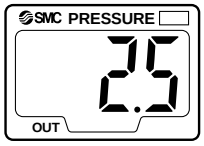


Normally closed

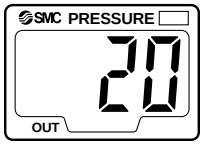
Press the SET button to set the output type and proceed to the response time setting.

4. Response time setting

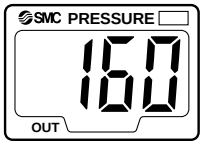
The switch output response time can be set arbitrarily.
Chattering can be prevented with a response time setting.
While the current response time is displayed, press the △UP or ▽DOWN button to select a new response time.



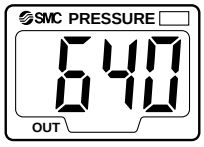
2.5 ms



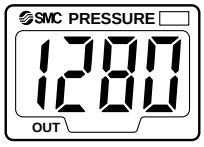
20 ms



160 ms



640 ms

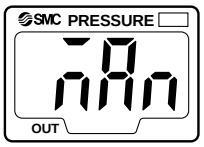


1280 ms

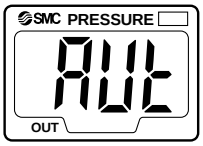
Press the SET button to set the response time and proceed to the auto preset setting.
If the operating mode is the window comparator mode, press the SET button to return to the measuring mode.

5. Auto preset setting

This function stores the measuring pressure that is set during the auto preset mode as a basic value.
While the current setting is displayed, press the △UP or ▽DOWN button to select it as an auto preset setting.



Manual



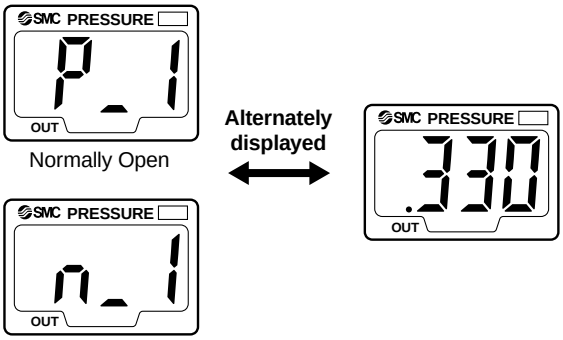
Auto

Press the SET button to set the auto preset and return to the measuring mode.

Pressure setting

Manual setting

Press the SET button in the measuring mode to display the set value. P_1 and the current set value blink alternately.



Press the SET button to display the next set value. Press the △UP or ▽DOWN button to change the value. (Refer to "How to Set Value" on the lower right hand corner of this page.)

Hysteresis mode

In this mode, hysteresis (H) and the set value for hysteresis are displayed alternately after setting P1. Press the SET button to return to the normal measuring mode. Press the △UP or ▽DOWN button to change the value.
(Refer to "How to Set Value" below right.)

Window comparator mode

In this mode, P2 and the current set value are displayed alternately after setting P1. Press the SET button to display the next set value (H: hysteresis). Press the △UP or ▽DOWN button to change the value.
(Refer to "How to Set Value" at right.)

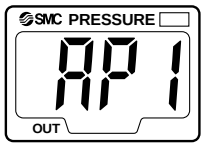
Next, H and the set vale for hysteresis will be displayed alternately. Press the SET button to return to the normal measuring mode. Press the △UP or ▽DOWN button to change the value.
(Refer to "How to Set Value" at right.)

Pressure set value can be verified without holding or stopping the switch output operation.

Auto preset setting

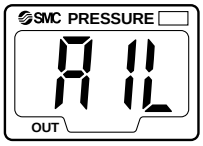
1. Auto preset preparation mode

While in the measuring mode, press the SET button to activate the auto preset preparation mode, and AP1 will be displayed. Proceed to prepare the devices to perform the pressure setting. While AP1 is still displayed, press both the △UP and ▽DOWN buttons simultaneously to return to the measuring mode.



2. Auto preset setting

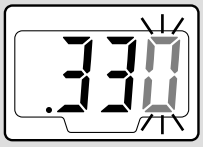
Press the SET button to activate the mode to execute auto preset functions. When AtL is displayed, start the system operation and change the pressure. The set value will be automatically detected and stored.
While AtL is still displayed, press the SET button to complete the setting and return to the normal measuring mode.



How to Set Value

To enter a value such as the one for pressure setting:

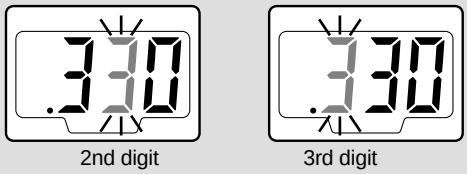
1. Press the △UP or ▽DOWN button to change the set value. The first digit blinks.



1st digit

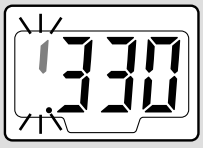
2. Press the △UP or ▽DOWN button to set the value arbitrarily. (If there is no button operation for more than 10 seconds, the current value will be automatically set and the function will return to the set value display mode.)

3. With every push of the SET button, the next (higher) digit blinks.



2nd digit 3rd digit

When the left-most digit is zero, "ı" or "ȷ" will blink.
If the SET button is pressed while the left-most digit is blinking, the right-most digit will now blink.



4. Press and hold the SET button for 1 second or longer to return to the set value display mode.

Setting

Function setting

Display calibration

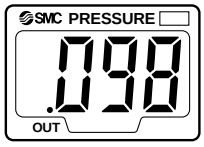
During measuring mode, press the SET and ▽DOWN buttons simultaneously and hold for 2 seconds or longer. FSt and current measured value will be displayed.
Press the △UP or ▽DOWN button to change the set value. If there is no button operation for more than 2 seconds after changing the set value, the display mode returns to displaying FSt and the current measured value.

Current measured value

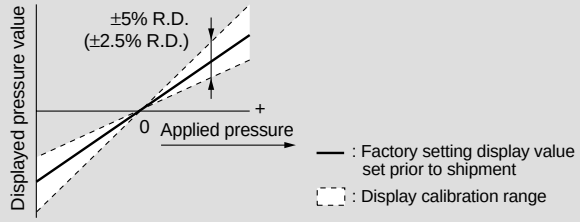
Press the SET button to display the adjusted value (percent).
The adjusted value and FSC will be alternately displayed.

Adjusted value (Percent)

Press the SET button to return to the normal measuring mode.



This function eliminates slight differences in the output values and allows uniformity in the numbers displayed.
Displayed values of the pressure sensor can be calibrated to within ±5% for Series ISE and ±2.5% for Series ZSE.



Note) When the display calibration function is used, the regulating pressure value may change ±1 digit.

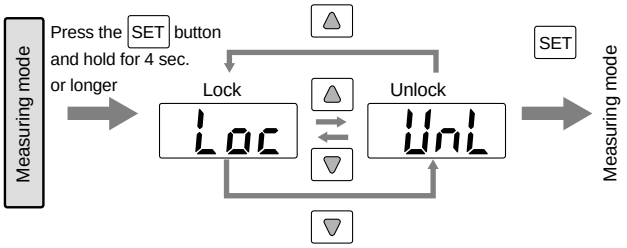
Peak/Bottom hold function

This function constantly detects and updates the maximum and minimum pressure values and allows to hold the display value.
To use a peak hold function, press and hold the △UP button for 1 second or longer. The maximum pressure value is held and blinks repeatedly. Press and hold the △UP button again for 1 second or longer to release this function and return to the measuring mode.
To use a bottom hold function, press the ▽DOWN button for 1 second or longer. The minimum pressure value is held and blinks repeatedly. Press and hold ▽DOWN button again for 1 second or longer to release this function and return to the measuring mode.

Key lock function

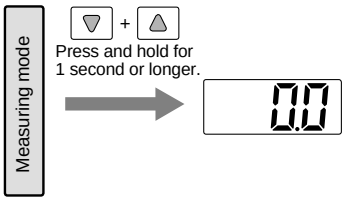
This function prevents incorrect operations such as changing the set value accidentally. Press the SET button and hold for 4 seconds or longer to display the current Loc or UnL setting. Press the △UP or ▽DOWN button to select the setting and set this function with the SET button. Use the Loc mode to avoid accidental button operation. To release a key lock function, press the SET button and hold for 4 seconds or longer to display the current setting, and select the UnL mode.

Selection of lock and unlock



Zero out (Zero ADJ) function

This function clears and resets the displayed value as long as the measuring pressure is within ±70 digits of the atmospheric pressure.
(Due to individual product differences, the setting range varies ±10% F.S.)
This function is effective in detecting pressure fluctuations that exceed a certain amount without being affected by the supply pressure. Press and hold the △UP and ▽DOWN buttons simultaneously to reset the display. Release the buttons to return to the measuring mode.



Unit Conversion Function

When not selecting "M" for unit specification

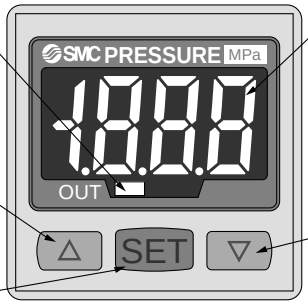
Desired display unit can be selected.
Press the △UP or ▽DOWN button to switch the unit, and the set value is automatically converted.
The conversion order is: PA⇔GF⇔bAr⇔PSi⇔inH⇔mmH
Press the SET button to set the unit and proceed to the display colour setting.

For vacuum/low pressure **Pa⇔kgf/cm²⇔bar⇔psi⇔inchHg⇔mmHg**
For positive pressure **MPa⇔kgf/cm²⇔bar⇔psi**

Indication of units

Displayed units	ISE30	ZSE30
Pa	0.001 MPa	0.2 kPa
kgf/cm²	0.01	0.002
bar	0.01	0.002
psi	0.2	0.05
mmHg	—	2
inchHg	—	0.2

Description



Indication light (Green)

Displays the switch operation status.

▲UP button

Use this button to change the mode or increase the ON/OFF set value. It also allows you to switch to the peak value display mode.

SET button

Use this button to switch the mode and set the set value.

LCD Display

Displays the current pressure condition, setting mode conditions, selected display unit, and error codes. A display colour type can be selected from either a single colour display with red or green, or 2-colour display in which green and red are switched according to the output.

▼DOWN button

Use this button to change the mode or decrease the ON/OFF set value. It also allows you to switch to the bottom value display mode.

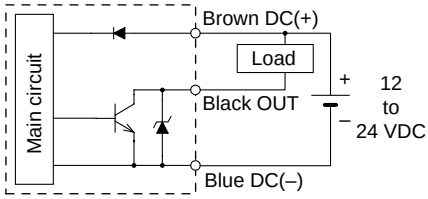
Error Correction

Take the following corrective solutions when errors occur.

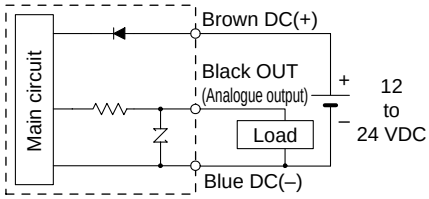
Error description	LCD display	Condition	Solution
Over-current error	Er 1	Load current of switch output is more than 80 mA.	Shut off the power supply. After eliminating the output factor that caused the excess current, turn the power supply back on.
Residual pressure error	Er 3	Pressure is applied during the zero out operation as follows: When the switch for positive pressure is used: ±0.071MPa or more. When the switch positive pressure is used: ±7.1 kPa or more. After displaying for 3 seconds, it will return to the measuring mode. Due to the individual product difference, the setting range varies ±10% F.S.	Bring the pressure back to atmospheric pressure and try using the zero out function.
Applied pressure error	HHH	Supply pressure exceeds the maximum regulating pressure.	Reduce/Increase supply pressure to within the regulating pressure range.
	LLL	Supply pressure is below the minimum regulating pressure.	
System error	Er 4	Internal data error	Shut off the power supply. Turn the power supply back on. If the power should not come back on, please contact SMC for an inspection.
	Er 6	Internal data error	
	Er 7	Internal data error	
	Er 8	Internal data error	

Internal Circuit and Wiring Examples

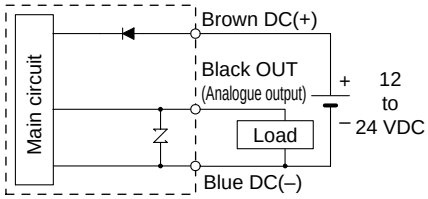
-25
NPN open collector output
Maximum 30 V, 80 mA
Residual voltage:
1 V or less



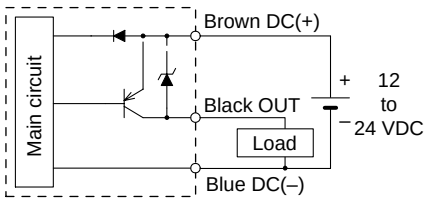
-26
Analogue output type
1 to 5 V (±2.5% F.S.)
Output impedance:
1 kΩ



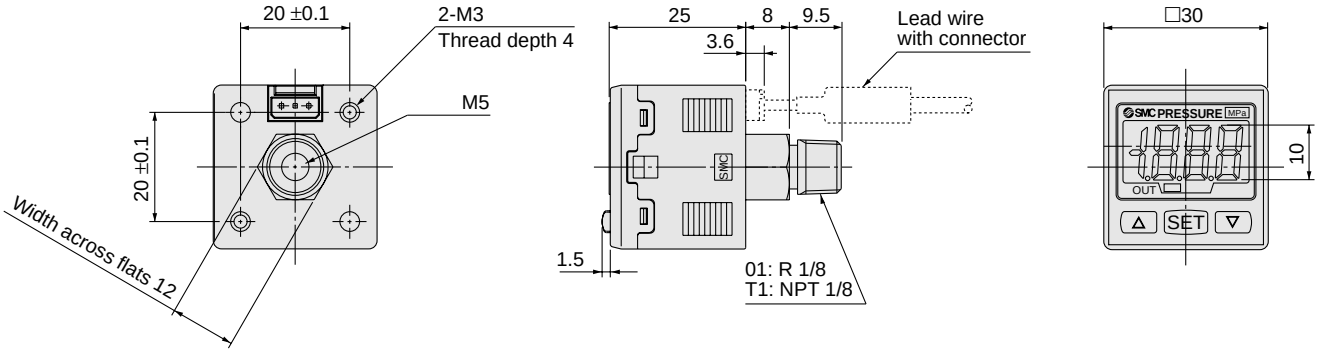
-28
Analogue output type
4 to 20 mA (±2.5% F.S.)
Maximum load impedance:
Power supply voltage 12 V: 300 Ω
Power supply voltage 24 V: 600 Ω
Minimum load impedance: 50 Ω

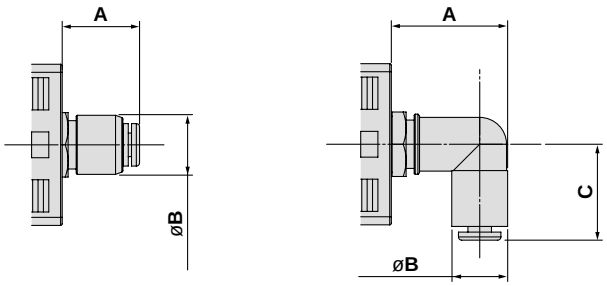


-65
PNP open collector
Maximum 80 mA



Dimensions





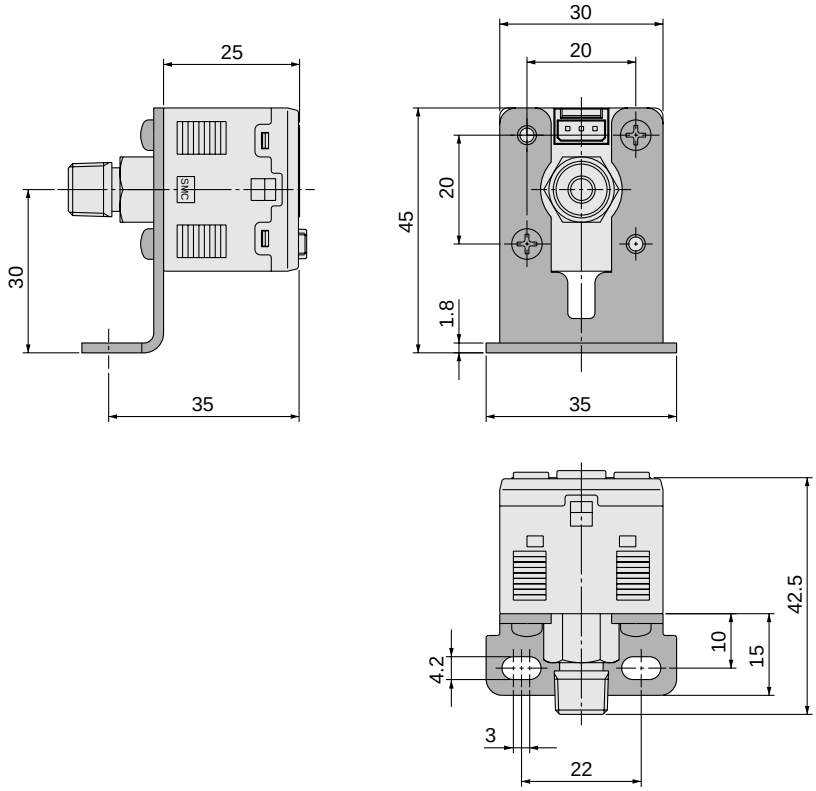
Straight **Elbow**

With one-touch fitting

(mm)

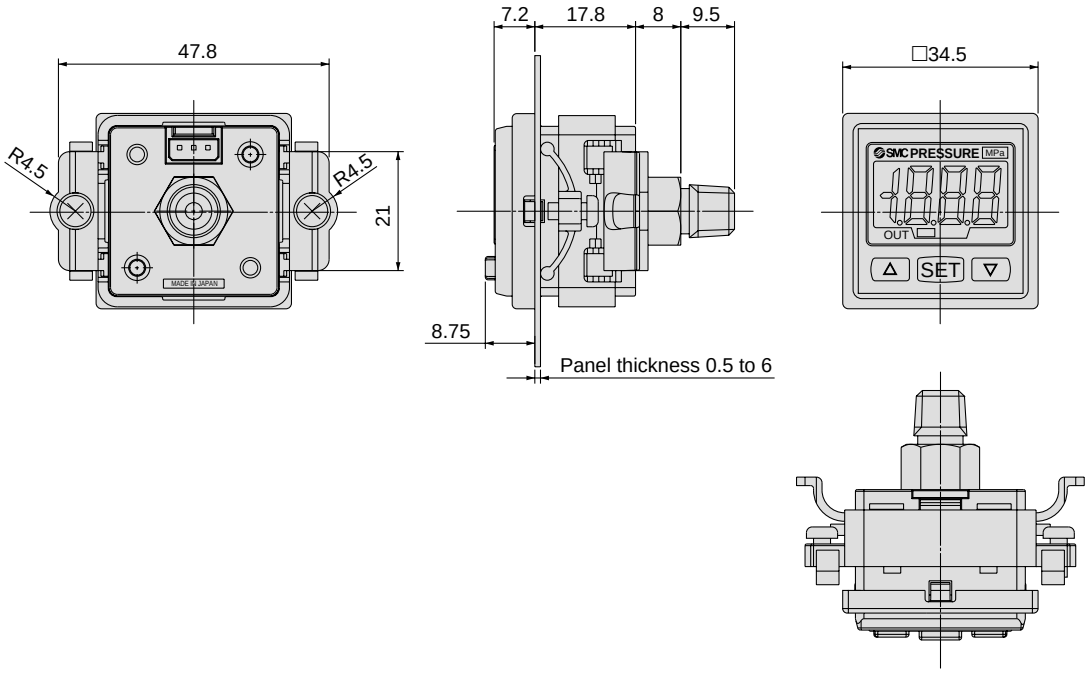
One-touch fitting size	Straight		Elbow		
	A	**B**	**A**	**B**	**C**
ø4, ø5/32"	14.4	11.2	20	10.4	18
ø6			22.4	12.8	20
ø1/4"			22.8	13.2	20.5

With bracket

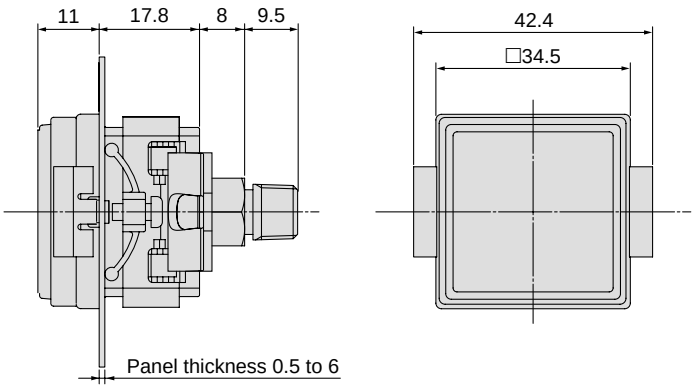


Dimensions

Panel mount



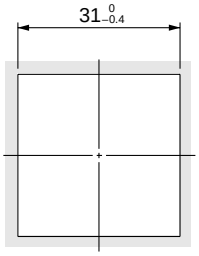
Panel mount adapter + Front protective cover



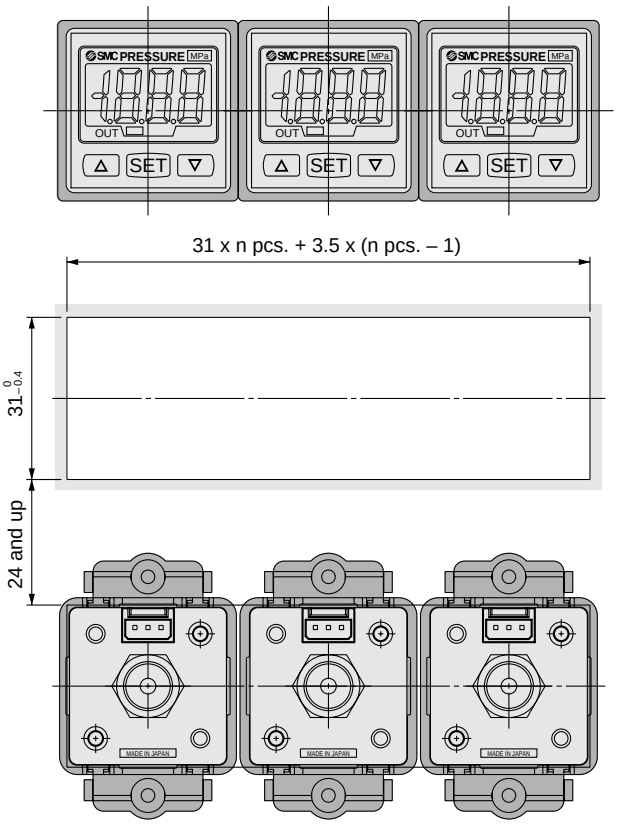
Dimensions

Panel fitting dimension

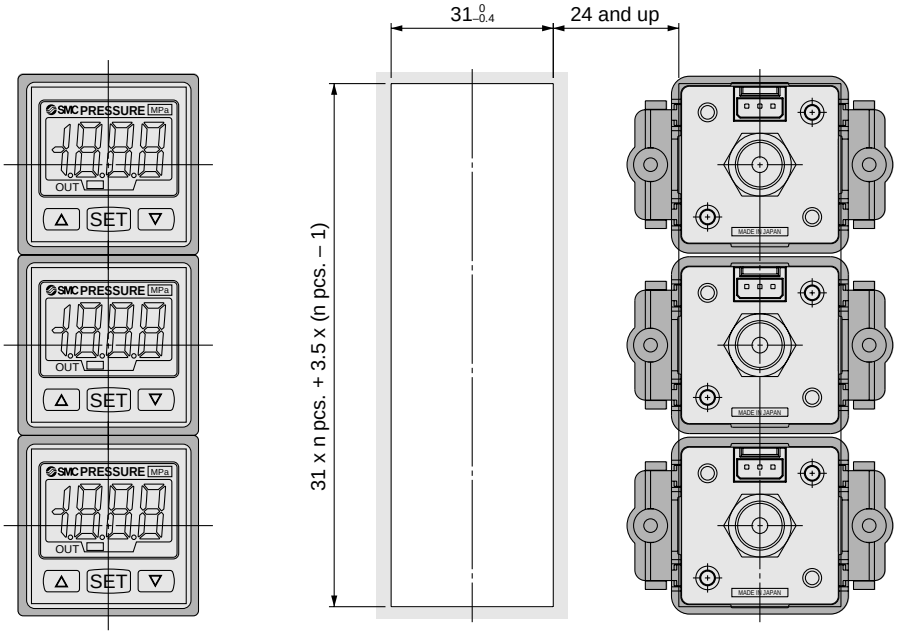
1-pc. mounting



Multiple (2 pcs. or more) horizontal mounting



Multiple (2 pcs. or more) vertical mounting



Series ZSE30/ISE30
Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of **"Caution"**, **"Warning"**, or **"Danger"**. To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

⚠Caution : Operator error could result in injury or equipment damage.

⚠Warning : Operator error could result in serious injury or loss of life.

⚠Danger : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power – General Rules for Pneumatic Equipment
Note 2) JIS B 8370: Pneumatic system axion

⚠ Warning

1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalog information with a view to giving due consideration to any possibility of equipment failure when configuring a system.

2. Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if handled incorrectly. Assembly, handling or maintenance of pneumatic systems should be performed by trained and experienced operators.

3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.

1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc. (Bleed air into the system gradually to create back pressure.)

4. Contact SMC if the product is to be used in any of the following conditions:

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, and therefore requires special safety analysis.

Series ZSE30/ISE30
Pressure Switch Precautions 1

Be sure to read before handling. Refer to pages 10 through 12 for safety instructions and pressure switch precautions, and to page 13 for specific product precautions.

Design and Selection

⚠Warning

1. Operate the switch only within the specified voltage.

Use of the switch outside the range of the specified voltage can cause not only malfunction and damage of the switch but also electrocution and fire.

2. Do not exceed the maximum allowable load specification.

A load exceeding the maximum load specification can cause damage to the switch or shorten its operating life span.

3. Do not use a load that generates surge voltage.

Although surge protection is installed in the circuit at the output side of the switch, damage may still occur if a surge is applied repeatedly. When a surge generating load such as a relay or solenoid is directly driven, use a type of switch with a built-in surge absorbing element.

4. Since the type of applicable fluid varies depending on the product, be sure to verify the specifications.

The switches do not have an explosion proof rating. To prevent a possible fire hazard, do not use with flammable gases or fluids.

5. Operate the switch within the regulating pressure range and maximum operating pressure.

Malfunction can occur if the pressure sensor is used outside the regulating pressure range, and the sensor may be permanently damaged if used at a pressure that is above the maximum operating pressure.

Mounting

⚠Warning

1. If the equipment is not operating properly, do not continue to use it.

Connect air and power after installation, repairs, or modifications, and verify proper installation. The switch should be checked for proper operation and possible leaks.

2. Mount switches using the proper tightening torque.

When a switch is tightened beyond the specified tightening torque, the mounting screws, mounting bracket, or switch may be damaged. On the other hand, tightening below the specified tightening torque may cause the installation screws to come loose during operation.

Nominal thread sizes	Tightening torque
M5	1/6 rotation after tightening by hand
R 1/8, NPT 1/8	7 to 9 N·m

3. Apply wrench only to the metal part of the main housing when installing the pressure switch onto the system piping.

Do not apply a wrench to the resin part as this may damage the switch.

Wiring

⚠Warning

1. Verify the colour and terminal number when wiring.

Incorrect wiring can cause the switch to be damaged and malfunction. Verify the colour and the terminal number in the instruction manual when wiring.

2. Avoid repeatedly bending or stretching the lead wire.

Repeatedly applying bending stress or stretching force to the lead wire will cause it to break. If you believe the lead wire is damaged and likely to cause malfunctions, replace it.

3. Confirm proper insulation of wiring.

Make sure that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a switch.

Operating Environment

⚠Warning

1. Never use in the presence of explosive gases.

The switches do not have an explosion proof rating. Never use in the presence of an explosive gas as this may cause a

Maintenance

⚠Warning

1. Perform periodic inspections to ensure proper operation of the switch.

Unexpected malfunctions may cause possible danger.

2. Take precautions when using the switch for an interlock circuit.

When a pressure switch is used for an interlock circuit, devise a multiple interlock system to prevent trouble or malfunctioning. Verify the operation of the switch and interlock function on a regular basis.

Digital Pressure Switch Precautions 1

Be sure to read before handling. Refer to pages 10 through 12 for safety instructions and pressure switch precautions, and to page 13 for specific product precautions.

Selection

⚠Warning

1. Monitor the internal voltage drop of the switch.

When operating below a specified voltage, it is possible that the load may be ineffective even though the pressure switch function is normal. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

Supply voltage − Internal voltage drop of switch > Minimum operating voltage of load

⚠Caution

1. Data of the digital pressure switch will be stored even after the power is turned off.

Input data (set pressure, etc.) will be stored in EEPROM so that the data will not be lost after the pressure switch is turned off. (Data will be stored for up to 100,000 hours after the power is turned off.)

Mounting

⚠Warning

1. Operation

Refer to the instruction manual for the operation of the digital pressure switch.

2. Do not touch the LCD indicator.

Do not touch the LCD indicator face of the pressure switch during operation. Static electricity can change the readout.

3. Pressure port

Do not introduce any wire or similar object to a pressure port as this may damage the pressure sensor and cause a malfunction.

Wiring

⚠Warning

1. Do not wire in conjunction with power lines or high voltage lines.

Wire separately from power lines and high voltage lines, avoiding wiring in the same conduit with these lines. Control circuits including switches may malfunction due to noise from these other lines.

2. Do not allow loads to short circuit.

Although digital pressure switches indicate excess current error if loads are short circuited, all incorrect wiring connections cannot be protected. Take precautions to avoid incorrect wiring.

As for other pressure switches, the switches will be instantly damaged if loads are short circuited. Take special care to avoid reverse wiring between the brown power supply line and the black output line.

3. Connect a DC(–) wire (blue) as close as possible to the DC power supply GND terminal.

Connecting the power supply away from the GND terminal can cause malfunctions due to noise from devices that are connected to the GND terminal.

4. Do not attempt to insert or pull the pressure sensor or its connector when the power is on. A switch output malfunction may occur.

Air Supply

⚠Warning

1. Use the switch within the specified fluid and ambient temperature range.

Ambient and fluid temperature operation is as follows:

Digital pressure switches: 0° to 50°C

Other pressure switches: 0° to 60°C

Take measures to prevent moisture from freezing in circuits when below 5°C, since this may cause damage to the O-ring and lead to a malfunction. The installation of an air dryer is recommended for eliminating condensate and moisture. Never use the switch in an environment where there are drastic temperature changes even when these temperatures are operated within the specified temperature range.

2. Vacuum switch

An instant pressure pulse of up to 500kPa (0.5MPa) (at the time of vacuum release) will not affect the performance of the switch. However, a constant pressure of 200kPa (0.2MPa) or more should be avoided.

Operating Environment

⚠Warning

1. Do not use in an area where surges are generated.

When there are units that generate a large amount of surge in the area around pressure switches (e.g., solenoid type lifters, high frequency induction furnaces, motors), this may cause deterioration or damage to the switches' internal circuitry. Avoid and protect against sources of surge generation and crossed lines.

2. Operating environment

In general, the digital pressure switches featured here are not dust or splashproof. Avoid using in an environment where the likelihood of splashing or spraying of liquids (water, oil, etc.) exists. If used in such an environment, use a dustproof and splashproof type switch.

Maintenance

⚠Caution

1. Cleaning of the switch body

Wipe off dirt with a soft cloth. If dirt does not come off easily, use a neutral detergent diluted with water to dampen a soft cloth. Wipe the switch only after squeezing the excess water out of the dampened cloth. Then finish off by wiping with a dry cloth afterwards.

Series ZSE30/ISE30
Specific Product Precautions 1

Be sure to read before handling. Refer to pages 10 through 12 for safety instructions and pressure switch precautions.

Handling

⚠Warning

1. **Do not drop, bump, or apply excessive impacts (980m/s^2) while handling. Although the body of the sensor may not be damaged, the internal parts of the sensor could be damaged and lead to a malfunction.**
2. **The tensile strength of the cord is 35N. Applying a greater pulling force on it can cause a malfunction. When handling, hold the body of the sensor ––do not dangle it from the cord.**
3. **Do not exceed the screw-in torque of 7 to 9 N·m when installing piping. Exceeding this value may cause malfunctioning of the sensor.**
4. **Do not use pressure sensors with corrosive and/or flammable gases or liquids.**
5. **Allow a sufficient margin of tube length in piping in order to prevent application of torsional, tensile or moment load to the tubes and fittings.**
6. **When a brand of tubing other than SMC is used, make sure that the tolerance of the tube's O.D. satisfies the following specifications.**
   1) Nylon tubing: ±0.1 mm or less
   2) Soft nylon tubing: ±0.1 mm or less
   3) Polyurethane tubing: +0.15 mm or less, –0.2 mm or less
7. **The applicable fluid is air. Please consult SMC if the switch is to be used with other types of fluids.**

Connection

⚠Warning

1. **Incorrect wiring can damage the switch and cause a malfunction or erroneous switch output. Connections should be done while the power is turned off.**
2. **Do not attempt to insert or pull the pressure sensor or its connector when the power is on. A switch output malfunction may occur.**
3. **Wire separately from power lines and high voltage lines, avoiding wiring in the same conduit with these lines. Malfunctions may occur due to noise from these other lines.**
4. **If a commercial switching regulator is used, make sure that the F.G. terminal is grounded.**

Operating Environment

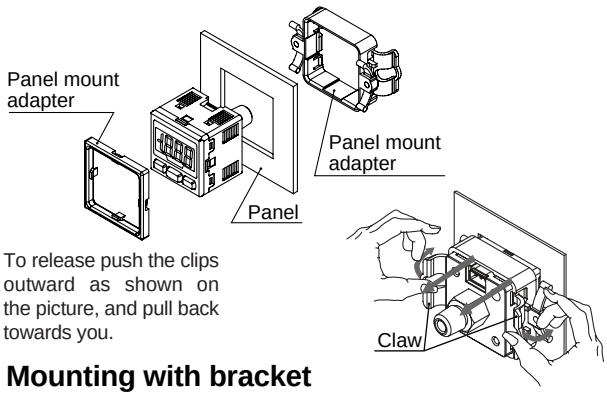
⚠Warning

1. **Our pressure switches are CE marked; however, they are not equipped with surge protection against lightning. Lightning surge counter measures should be applied directly to system components as necessary.**
2. **Our pressure switches do not have an explosion proof rating. Never use in the presence of an explosive gas as this may cause a serious explosion.**
3. **Do not use in an environment where static electricity can cause problems, otherwise system failure or malfunction may result.**

Mounting

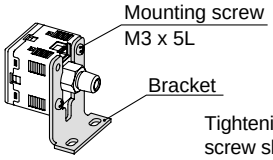
⚠Caution

1. Mounting with panel mount adapter



2. Mounting with bracket

Mount a bracket to the body using two M3 x 5L mounting screws and install on piping with hexagon socket head cap screws. The switch can be installed horizontally depending on the installation location.



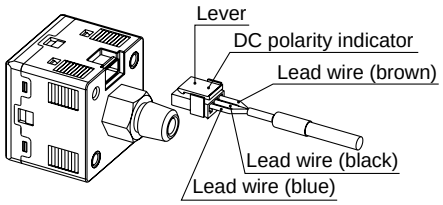
Tightening torque for bracket mounting screw should be 0.5 to 0.7 N·m.

Specific Product Precautions 2

Be sure to read before handling. Refer to pages 10 through 12 for safety instructions and pressure switch precautions.

Connection/Removal of Connector

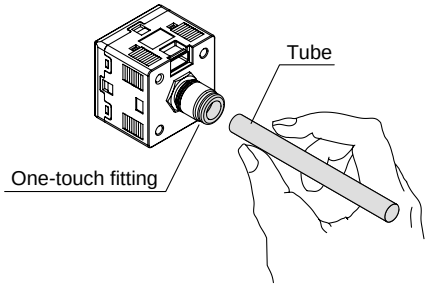
- To connect the connector, insert it straight while pinching the lever, and then push the lever into the jack of the housing and lock it.
- To remove the connector, pull it straight out while applying pressure with your thumb to the lever and unhooking it from the jack.



- Do not attempt to insert or pull the pressure sensor or its connector when the power is on. A switch output malfunction may occur.

Piping

- Cut the tube perpendicularly.
- Hold the tube and insert it into the One-touch fitting carefully and securely all the way to the bottom.



Regulating pressure range and rated pressure range

⚠Caution

Set the pressure within the rated pressure range.

The regulating pressure range is the range of pressure that is possible in setting.
The rated pressure range is the range of pressure that satisfies the specifications (accuracy, linearity, etc.) on the sensor.
Although it is possible to set a value outside the rated pressure range, the specifications will not be guaranteed even if the value stays within the regulating pressure range.

Switch		Pressure range
		-100 kPa / 0 / 100 kPa / 500 kPa / 1 MPa
For vacuum/ low pressure	ZSE30	–100 kPa … 100 kPa –101 kPa … 101 kPa
For positive pressure	ISE30	0 … 1 MPa –100 kPa (–0.1 MPa) … 1 MPa

Rated pressure range of switch
Regulating pressure range of switch

ZSE/ISE40

High speed response: 2.5ms or less
With anti-chattering function

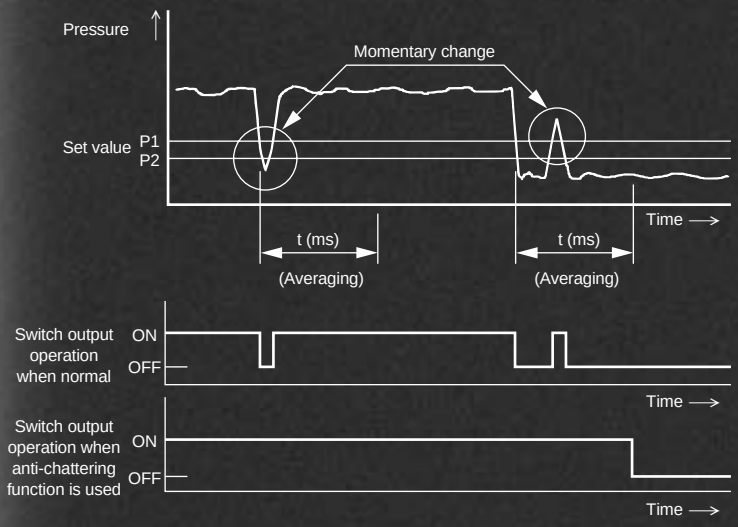
Stable switch output is possible even with sudden changes in the primary pressure (when operating large bore cylinders, etc.).

Anti-chattering function

Devices such as large bore cylinders and high-flow vacuum ejectors consume a large volume of air when they operate, and this may cause a momentary drop in the primary pressure. This function prevents such momentary pressure drops from being detected as abnormal pressures by allowing the response time selection to be changed.

[Selectable response times: t]
2.5ms (normal), 24ms, 192ms or 768ms
The normal setting is selected when shipped from the factory.

(Operating principle)
The pressure values measured within the user-selected response time are averaged, and switch output (ON/OFF) is determined by comparing this averaged pressure value with the set pressure.



With auto shift function

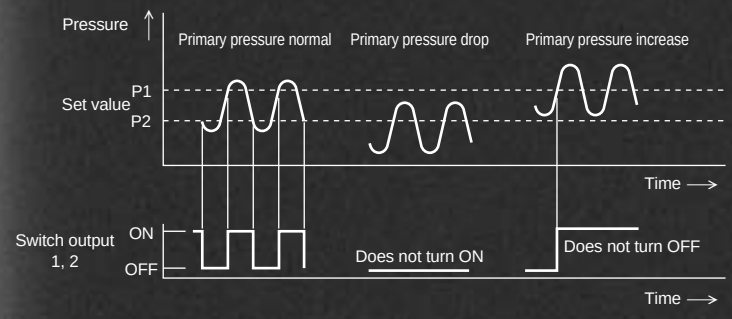
Allows switch output unaffected by variations in primary pressure.

Auto shift function

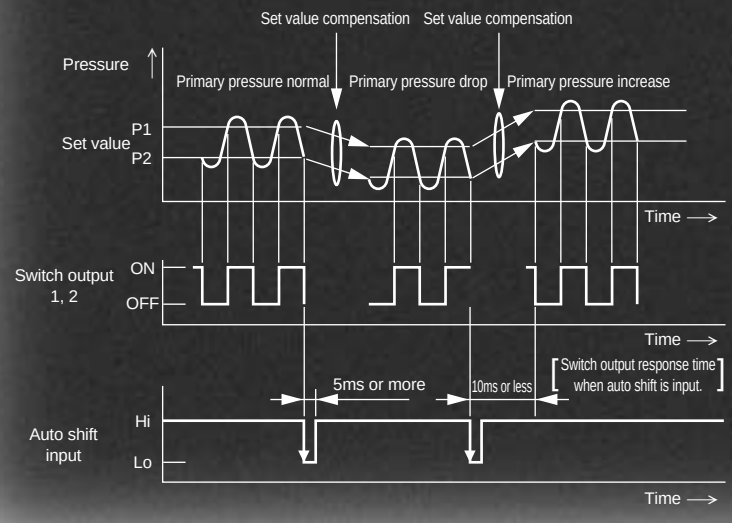
Erroneous operation may occur if there is fluctuation in the primary pressure.
The auto shift function compensates for pressure changes to ensure proper ON/OFF switch response during such fluctuations.

(Operating principle)
At the point when the primary pressure fluctuates, the set pressure value is compensated by setting the auto shift input (external input) to low (no-voltage) input, using the pressure measured at that point as a standard.

Without using auto shift
When the primary pressure fluctuates, a correct determination becomes impossible.



When using auto shift



Compound pressure (ZSE40F)

Able to detect suction pressure (vacuum pressure) and release pressure (positive pressure) with a single pressure switch.

3 types of piping

Different piping methods are possible to accommodate the installation location.

Repeatability

±0.2% F.S. ±1digit or less

IP65 compatible

Dust-tight/Splash proof type

Specifications

		ZSE40F (Compound pressure)	ZSE40 (Vacuum pressure)	ISE40 (Positive pressure)
Rated pressure range		–100.0 to 100.0kPa	0.0 to –101.3kPa	0.000 to 1.000MPa
Operating pressure range/Set pressure range		–100.0 to 100.0kPa	10.0 to –101.3kPa	–0.100 to 1.000MPa
Withstand pressure		500kPa		1.5MPa
Set pressure resolution (Note 1)	kPa	0.1		——
	MPa	——		0.001
	kgf/cm²	0.001		0.01
	bar	0.001		0.01
	psi	0.02		0.1
	mmHg	1		——
	InHg	0.1		——
Applicable fluid		Air, Non-corrosive/Non-flammable gas		
Power supply voltage		12 to 24VDC ±10%, Ripple (p–p) 10% or less		
Current consumption		55mA or less		
Switch output		NPN or PNP 2 outputs Max. load current : 80mA Max. applied voltage: 30VDC (with NPN output) Residual voltage : 1V or less (with 80mA load current)		
Repeatability		±0.2% F.S. ±1digit or less		
Hysteresis	Hysteresis mode	Variable		
	Window comparator mode	Fixed (3 digits) Note4)		
Response time (with anti-chattering function)		2.5ms or less (with anti-chattering function: 24ms, 192ms and 768ms selections)		
Output short circuit protection		Yes		
Display		3 1/2 digit LED display (sampling cycle: 5 times/sec.)		
Display accuracy		±2% F.S. ±1 digit or less (at ambient temperature of 25 ±3°C)		
Operation indicator light		Green LED (OUT1: Lights when ON), Red LED (OUT2: Lights when ON)		
Analog output (Note 2)		Output voltage: 1 to 5V ±5% F.S. or less (in rated pressure range) Linearity: ±1% F.S. or less Output impedance: Approx. 1kΩ	Output voltage: 1 to 5V ±2.5% F.S. or less (in rated pressure range) Linearity: ±1% F.S. or less Output impedance: Approx. 1kΩ	
Auto shift input (Note 3)		No-voltage input (reed or solid state), input 5ms or more		
Environmental resistance	Enclosure	IP65		
	Ambient temperature range	Operating: 0 to 50°C, Stored: –10 to 60°C (with no condensation or freezing)		
	Ambient humidity range	Operating/Stored: 35 to 85% RH (with no condensation)		
	Withstand voltage	1000VAC for 1min. between lead wires and body		
	Insulation resistance	50MΩ or more (at 500VDC) between lead wires and body		
	Vibration resistance	10 to 500Hz at the smaller of amplitude 1.5mm or acceleration 98m/s² (10G) in X, Y, Z directions for 2hrs. each (deenergized)		
	Impact resistance	980m/s² (100G) in X, Y, Z directions 3 times each (deenergized)		
Temperature characteristics		In a temperature range of 0 to 50°C, ±2% F.S. or less of pressure measured at 25°C		
Port size		01: R1/8, M5 x 0.8, T1: NPT1/8, M5 x 0.8, W1: Rc1/8 C4: With ϕ4 One-to uch fitting, C6: With ø6 One-touch fitting, M5: M5 female threads		
Lead wires		5 wire oil resistant heavy duty cord (0.15mm²)		
Weight		01/T1 types approx. 60g, W1 type approx. 80g, C4/C6/M5 types approx. 92g (each including 0.6m lead wires)		

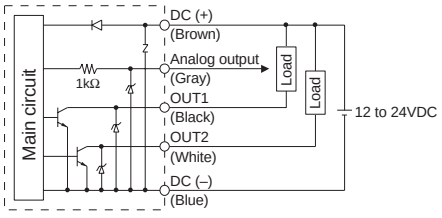
Note 1) Equipped with unit switching function
(Types without the unit switching function use SI units (kPa or MPa) only.)
Note 2) For ZSE40 (F)/ISE40-□-$^{22}_{62}$
Note 3) For ZSE40 (F)/ISE40-□-$^{30}_{70}$
Note 4) For ZSE40F (compound pressure) with "psi" indication, this is 0.03 to 0.04 psi.
Note 5) For ZSE40F (compound pressure) with "psi" indication, zero clear is in the range of ±0.01 psi.

Note:
When equipped with auto shift function, the following ranges can be set.

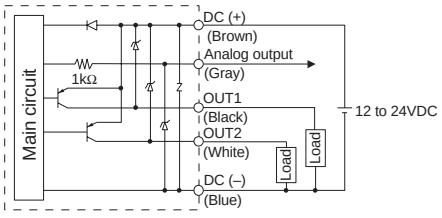
Set pressure range	Setting range
–100.0 to 100.0kPa	–100.0 to 100.0kPa
10.0 to –101.3kPa	–101.3 to 101.3kPa
– 0.1 to 1.000MPa	–1.000 to 1.000MPa

Internal circuits and wiring examples

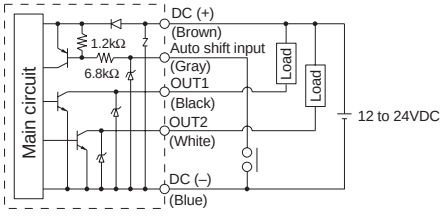
ZSE40 (F)
ISE40-□-22 (L)-(M)
With analog output



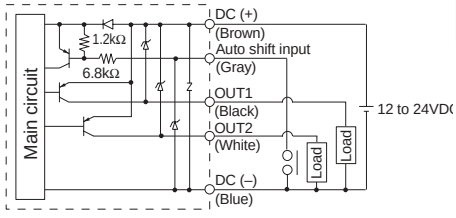
ZSE40 (F)
ISE40-□-62 (L)-(M)
With analog output



ZSE40 (F)
ISE40-□-30 (L)-(M)
With auto shift input



ZSE40 (F)
ISE40-□-70 (L)-(M)
With auto shift input



How to Order

Set pressure range

Nil	–0.100 to 1.000MPa	For positive pressure

For Positive Pressure **ISE40** — **01** — **22** — ☐ — ☐ ☐

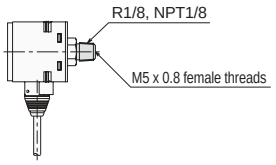
For Vacuum/Compound Pressure **ZSE40** — ☐ — **01** — **22** — ☐ — ☐ ☐

Set pressure range

Nil	10.0 to –101.3kPa	**For vacuum pressure**
F	–100.0 to 100.0kPa	**For compound pressure**

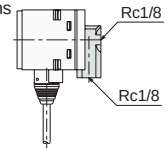
Piping specifications

01: R1/8 (with M5 female threads)
T1: NPT1/8 (with M5 female threads)



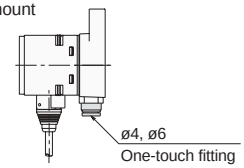
W1: Rc1/8

Reverse pressure two directions



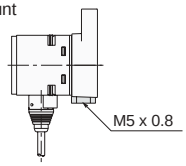
∗ **C4:** With ø4 One-touch fitting
∗ **C6:** With ø6 One-touch fitting

Wall mount



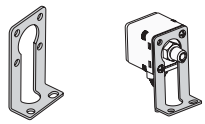
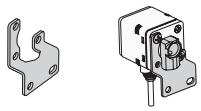
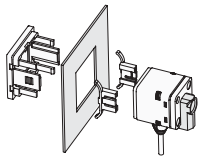
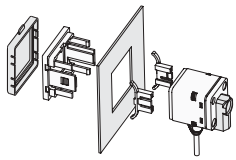
∗ **M5:** M5 x 0.8 (female threads)

Wall mount



∗ Optional

Option

Nil	None
A	Bracket A (ZS-24-A) 
B	Bracket B (ZS-24-B) 
E	Panel mount (ZS-22-A) 
F	Panel mount (ZS-24-C) + Front protective cover 

∗ When optional parts only are required, order with the part numbers inside ( ).

Input/Output specifications

22	NPN open collector 2 outputs + analog output
30∗	NPN open collector 2 outputs + auto shift input
62∗	PNP open collector 2 outputs + analog output
70∗	PNP open collector 2 outputs + auto shift input

∗ Optional

Note

When equipped with auto shift function, the following ranges can be set.

Set pressure range	Setting range
–100.0 to 100.0kPa	–100.0 to 100.0kPa
10.0 to –101.3kPa	–101.3 to 101.3kPa
–0.1 to 1.000MPa	–1.000 to 1.000MPa

Lead wire length

Nil	0.6m
L	3m

Unit specifications

Nil	With unit switching function Note1)
M	SI units only Note 2)

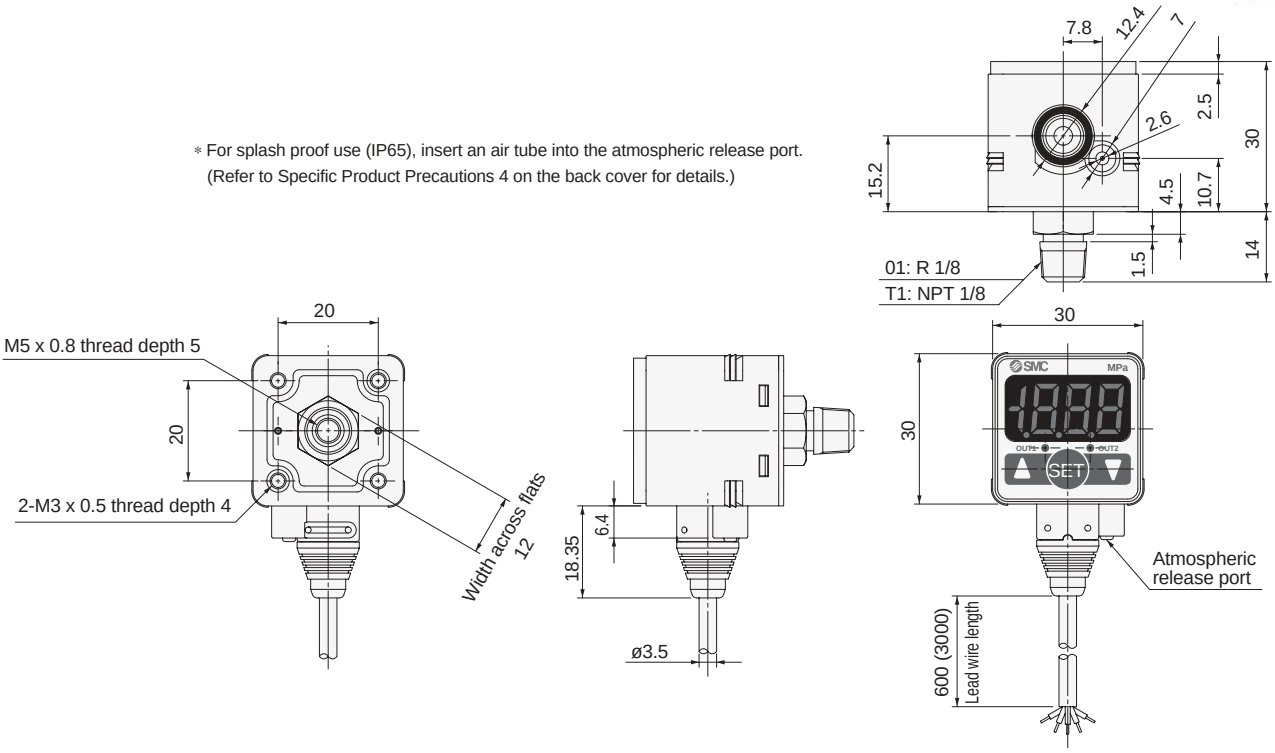
Note 1) This will no longer be sold for use in Japan after the new Weight and Measure Act is implemented (October,1999).

Note 2) Fixed units
For vacuum/compound pressure : kPa
For positive pressure : MPa

Dimensions

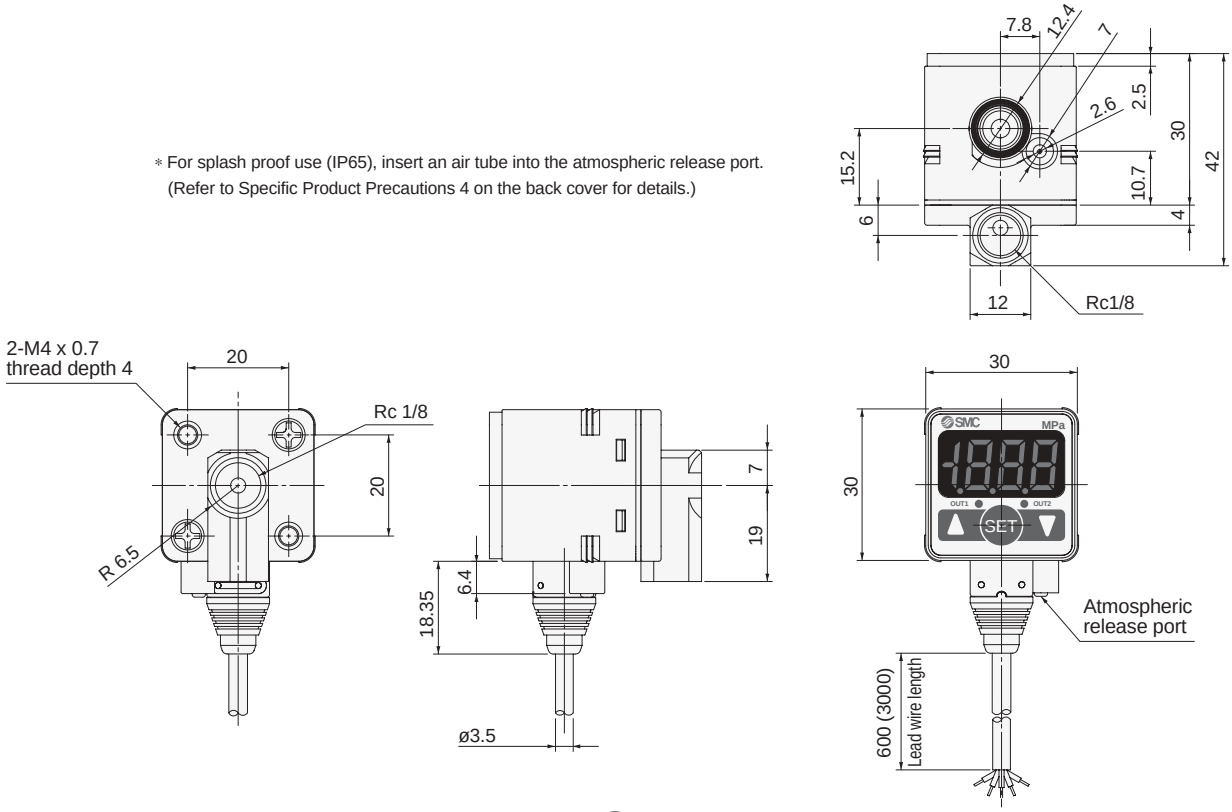
ZSE40(F)/ISE40– $^{01}_{T1}$

∗ For splash proof use (IP65), insert an air tube into the atmospheric release port.
(Refer to Specific Product Precautions 4 on the back cover for details.)



ZSE40(F)/ISE40–W1

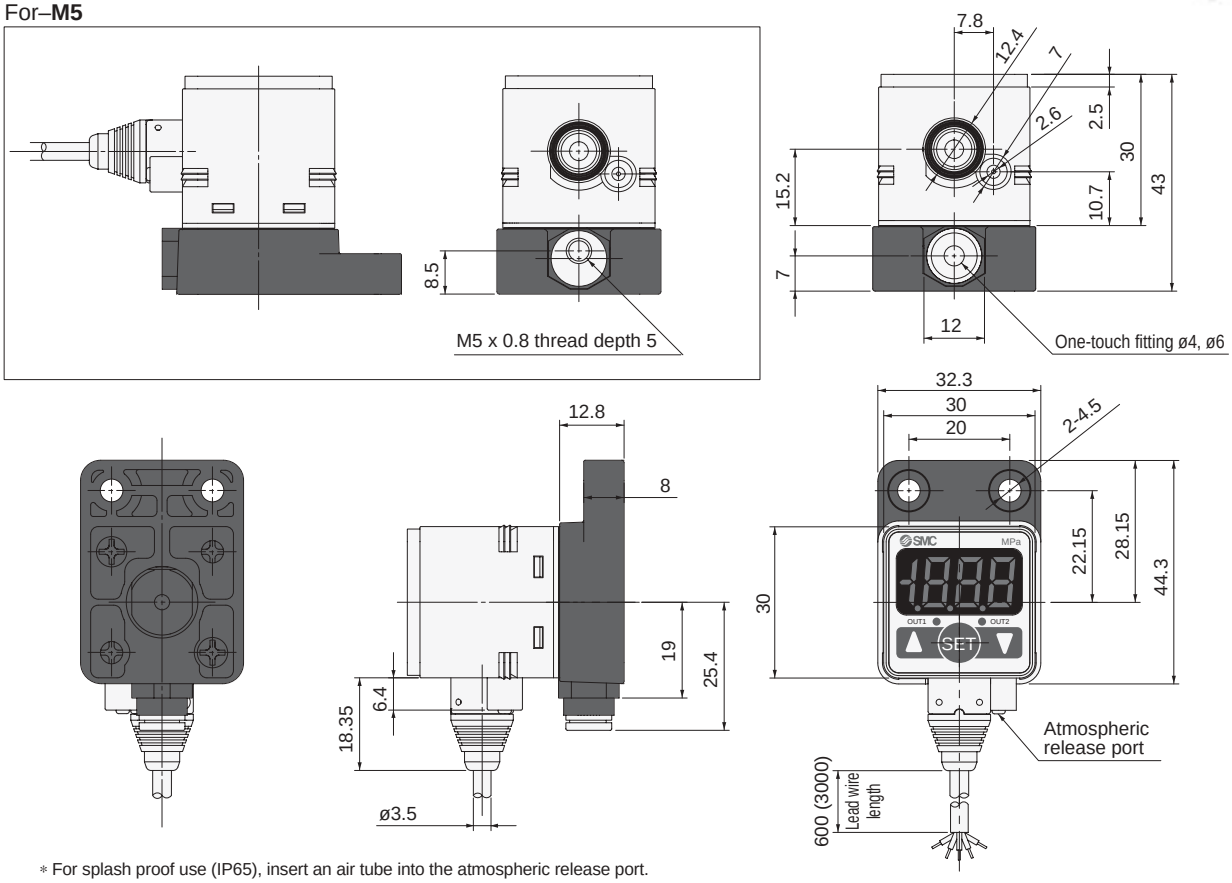
∗ For splash proof use (IP65), insert an air tube into the atmospheric release port.
(Refer to Specific Product Precautions 4 on the back cover for details.)



Dimensions

ZSE40(F)/ISE40– C4 C6 M5

For–**M5**

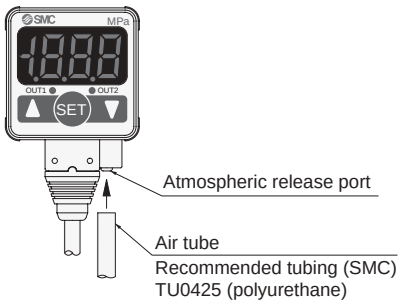


∗ For splash proof use (IP65), insert an air tube into the atmospheric release port.
(Refer to Specific Product Precautions 4 for details.)

⚠ Specific Product Precautions

⚠ Caution

1. Immediately after supplying power, there is drift of about ±0.5% F.S. When used with very low pressure, allow the unit to warm up for about 20 to 30 minutes.
2. Do not use in locations where there is splashing or spraying of oils and solvents.
3. When using a commercially available switching regulator, be sure to ground the FG terminal.
4. In locations where the switch is exposed to water and dust, etc., these may enter the switch from the atmospheric release port. Insert ø4 tubing (inside diameter ø2.5) into the atmospheric release port, and extend the other end to a safe area where water, etc., is not splashed or sprayed. Be sure that tubing is not bent and holes are not blocked, etc., or it will become impossible to make correct pressure measurements.



ZSE/ISE50/60

Pressure detection for a wide range of fluids.

Hydraulic fluid (JIS-K2213)

Silicon oil (JIS-K2213)

Lubricating oil (JIS-K6301)

Fluoro carbon

- To confirm absorption of work piece with water on the surface, e.g. wet LCD glass plate
- To measure hydraulic pressure

Argon

Air containing drain

Ammonia

Freon

Carbon dioxide

Nitrogen

- To measure low-quality air, containing drain
- Leakage test with nitrogen

Using of stainless steel diaphragm

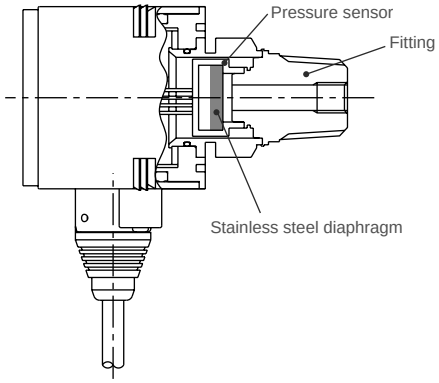
The stainless steel diaphragm prevents direct contact between sensor and measured fluid.

- Liquid and gas contact areas···· SUS630
- Fittings ····· SUS304

Extremely low leakage

Sensor and fittings are electron-beam welded. Leakage is kept at the lowest level by using VCR® and Swagelock® fittings.

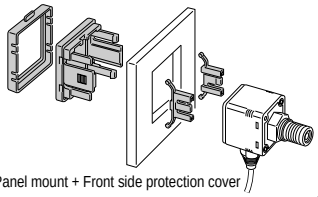
- ZSE50F / ISE50 1×10^{-5} Pa·m³/s
- ZSE60F / ISE60 1×10^{-10} Pa·m³/s



Enclosure **IP65**

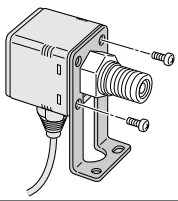
Option

Panel mount



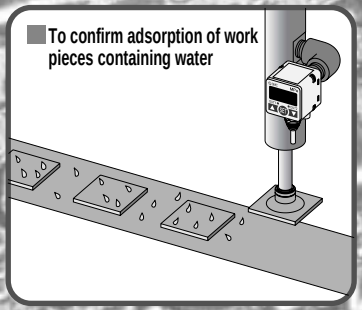
Panel mount + Front side protection cover

With bracket

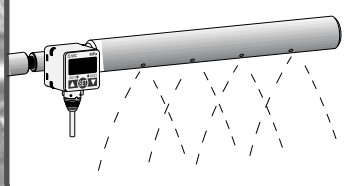


Application examples

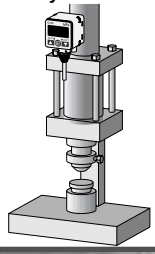
To confirm adsorption of work pieces containing water



To confirm primary pressure of cleaning line



To confirm working pressure of hydraulic cylinder



High precision and high resolution

Compound pressure 1/2000 (0.1kPa)
Positive pressure 1/1000 (0.001MPa)

Repeatability ±0.2%F.S. ±1digit or less

Variety of functions

Anti-chattering function
Prevents erroneous operation due to sudden fluctuations in primary pressure, by allowing the response time to be changed.

■ Selectable response times: 2.5ms (default), 24ms, 192ms, 768ms or less

Auto shift function
Pressure detection is not affected by fluctuations in primary pressure.

Auto preset function
Automatic pressure setting is possible. Saves time for setting operation.

- Key lock function
- Peak and bottom display function
- Zero out function

Series ZSE60F/ISE60

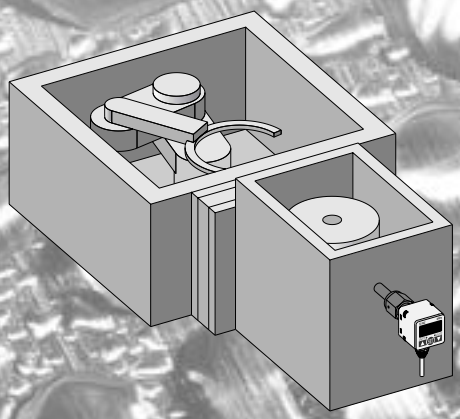
Special fitting types are used in semiconductor production equipment (metal gasket seal fittings)

■ Leak rate: 1 x 10^{-10}Pa·m³/s

■ ZSE/ ISE60(F)-A2

■ ZSE/ ISE60(F)-B2

■ Confirmation of atmospheric pressure of load lock



Variations

		ZSE50F	ISE50	ZSE60F	ISE60
Model		Standard thread type		Special fittings for the semiconductor industry (metal gasket seal fittings)	
Port size		R 1/4·NPT 1/4·G 1/4 (with M5 male thread)		URJ 1/4·TSJ 1/4	
Leak rate		1 x 10^{-5}Pa·m³/s		1 x 10^{-10}Pa·m³/s	
Rated pressure range		100kPa / 0 / -100kPa	1MPa / 0	100kPa / 0 / -100kPa	1MPa / 0
Output	Switch output	2 outputs NPN or PNP			
	Analog output	Output voltage 1 to 5V			

For General Fluids

High Precision Digital Pressure Switch

Series ZSE50F/ISE50

How to Order

For positive pressure ISE50 — 02 — 22 — L — M

For compound pressure ZSE50 F — 02 — 22 — L — M

Piping specifications

02	R 1/4 (M5 with female screw), Piping in backward direction
T2	NPT 1/4 (M5 with female screw), Piping in backward direction
G2	G 1/4 (M5 with female screw), Piping in backward direction

Input/output specifications

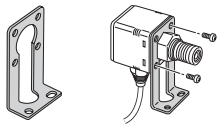
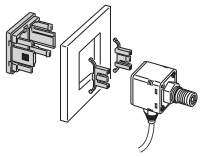
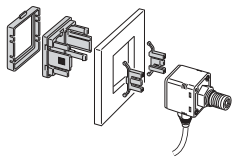
22	NPN open collector 2 output + Analogue output
30	NPN open collector 2 output + Auto shift input
62	PNP open collector 2 output + Analogue output
70	PNP open collector 2 output + Auto shift input

Note) Auto shift input is used for the auto shift function.
For more information, please refer to Auto Shift Function on page 5.

Lead wire length

L	3m

Option

Nil	None
A	Bracket A 
D	Bracket D Refer to the dimensions for the difference between brackets A and D, on page 8.
E	Panel mount 
F	Panel mount + Front protection cover 

Unit specification

Nil	With unit switching function Note 1)
M	Fixed SI unit Note 2)

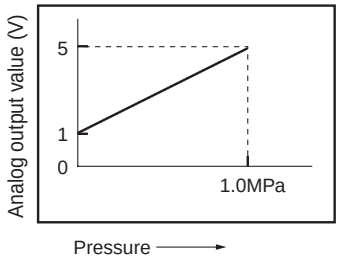
Note 1) Under the New Measurement Law, which has been in effect since October, 1999, sales of switches with the unit conversion function have not been allowed for use in Japan.

Note 2) Fixed units:
For compound pressure : KPa
For positive pressure : MPa

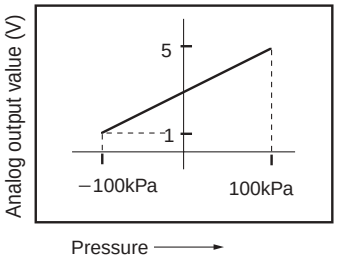
Analogue output

Suitable model: **ZSE50F/ISE50-□-22/62(L)-(M)**

Series ISE50



Series ZSE50F



Option

When option parts are required separately, use the following part numbers to place an order.

Option	Part no.	Qty.	Note
Bracket A	ZS−24−A	1	With 2 pcs. of mounting screws
Bracket D	ZS−24−D	1	With 2 pcs. of mounting screws
Panel mount	ZS−24−E	1	
Panel mount + Front protection cover	ZS−24−F	1	

Specifications

		ZSE50F (Compound pressure)	ISE50 (Positive pressure)
Rated pressure range		−100 to 100kPa	0.000 to 1.000MPa
Operating pressure range and regulating pressure range		−100 to 100kPa	−0.100 to 1.000MPa
Proof pressure		500kPa	1.5MPa
Setting/Display resolution Note 1)	**kPa**	0.1	—
	MPa	—	0.001
	kgf/cm²	0.001	0.01
	bar	0.001	0.01
	psi	0.02	0.1
	mmHg	1	—
	inHg	0.1	—
Fluid		Fluid that will not corrode stainless steel SUS 630 and 304	
Power supply voltage		12 to 24VDC, Ripple (p-p) 10% or less	
Current consumption		55mA or less (With no load)	
Switch output		NPN or PNP 2 output (Max. applied voltage 30V (NPN), Max. load current 80mA)	
Repeatability		±0.2% F.S. ±1 digit or less	±0.3% F.S. ±1 digit or less
Hysteresis	**Hysteresis mode**	Variable (0 or above)	
	Window comparator mode	Fix (3 digits) Note 4)	
Response time		2.5ms or less (with chattering prevention function: 24ms, 192ms, 768ms or less)	
Output short circuit protection		With short circuit protection	
Display		3 1/2 digit LED display (Sampling frequency: 5 times/sec)	
Display accuracy		±2% F.S. ±1 digit or less (With ambient temperature of 25 ±3°C)	
Indication light		Green LED (OUT1: Light up when ON), Red LED (OUT2: Lights up when ON)	
Analog output Note 2)		Output voltage: 1 to 5V ±5% F.S. or less	Output voltage: 1 to 5V ±2.5% F.S. or less
Auto shift input Note 3)		No-voltage input (solid state switch or reed switch), input 5ms or more	
Environmental resistance	**Enclosure**	IP65	
	Ambient temperature range	Operating: 0 to 50°C, Stored: −10 to 60°C (With no condensation or freezing)	
	Ambient humidity range	Operating and stored: 35 to 85% RH (With no condensation)	
	Withstand voltage	250VAC for 1 min, between all lead wires and enclosure	
	Insulation resistance	2MΩ or more (at 50VDC) between all lead wires and enclosure	
	Vibration resistance	10 to 500Hz with 1.5mm amplitude or 98m/s², whichever is smaller	
	Shock resistance	980m/s² in X, Y, Z directions 3 times each (Not energized)	
Temperature characteristics		±3%F.S. or less of measured pressure at 25°C in temperature range of 0 to 50°C	
Fluid contact material		Pressure receiving area: Stainless steel SUS 630, Fittings: Stainless steel SUS 304	
Port size		02: R 1/4, M5 T2: NPT 1/4, M5 G02: G1/4, M5	
Lead wire		5 wire oil proof heavy duty cable (0.15mm²)	
Weight		Approx. 120g (Each including 3m lead wire)	

Note 1) In case of types with unit conversion function. (Types without unit conversion function are fixed to the SI units (KPa or MPa).)
Note 2) When a type with analogue output is selected.
Note 3) When a type with auto shift is selected.
Note 4) 0.03 to 0.04 psi in psi display.
Note 5) Value clear ±0.01psi in psi display.

Note
The possible set ranges for types with auto shift function are as follows:

Regulating pressure range	Possible set range
−100.0 to 100.0kPa	−100.0 to 100.0kPa
−0.1 to 1.000MPa	−1.000 to 1.000MPa

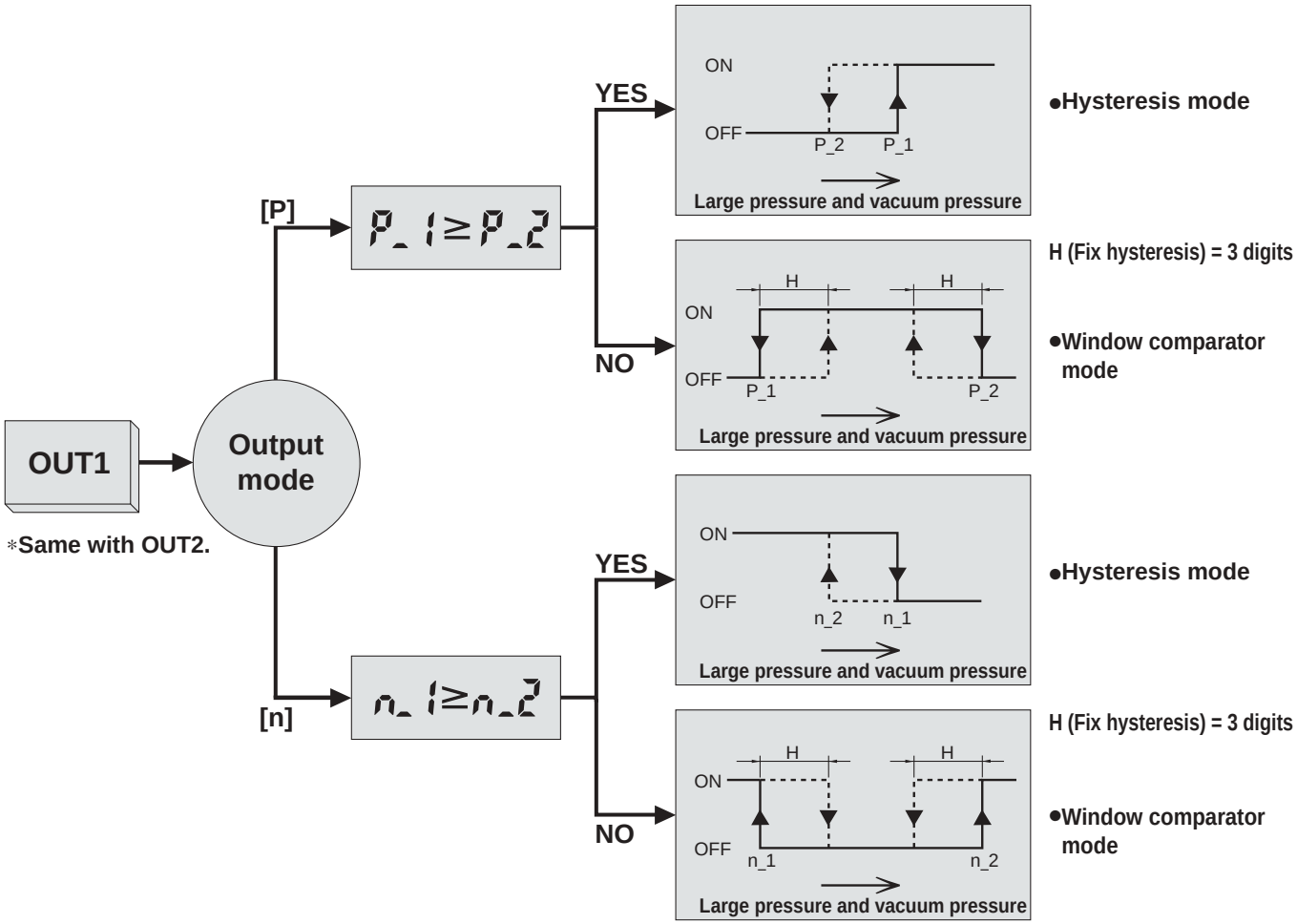
Function

Various additional functions are available for easy measurement, switch operation and check of measured values suitable for the conditions of the measured fluid.

Auto shift function Note 1)	Can correct the pressure set point value of switch output according to fluctuations in the primary pressure.	Page 5
Anti-chattering function	Prevents malfunction due to sudden fluctuations in the primary pressure by adjusting the response time.	
Key lock function	The keys can be locked to prevent incorrect operation.	Page 16
Peak hold function	Can retain the maximum pressure value displayed during measurement.	
Bottom hold function	Can retain the minimum pressure value displayed during measurement.	
Zero out function	The pressure display can be set at zero when the pressure is open to the atmosphere.	
Unit conversion (for overseas use) Note 1)	Can convert the display value.	

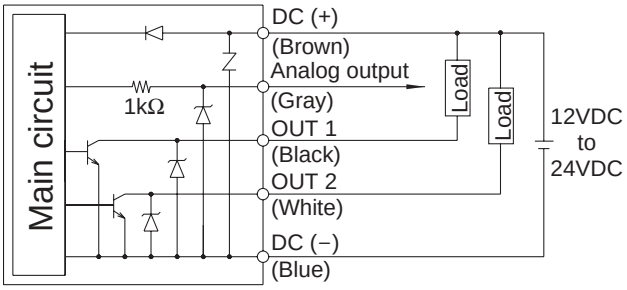
Note 1) Select and order by specifying the types and models.

Output Method

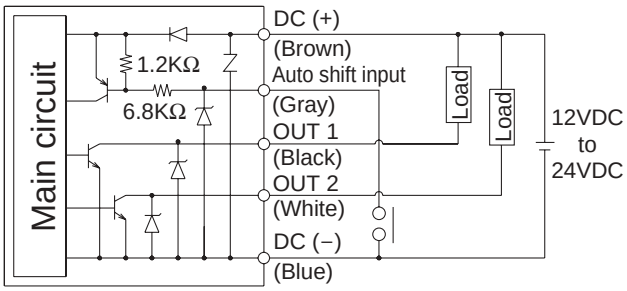


Example of Internal Circuit and Wiring

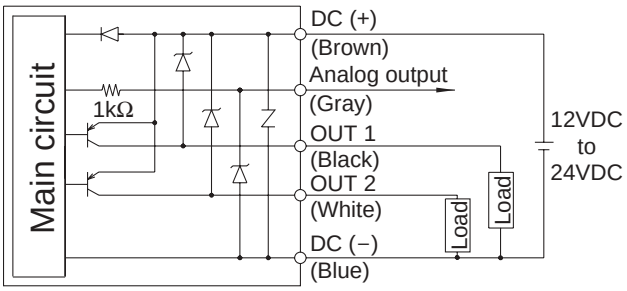
ZSE $^{50}_{60}$ F/ISE $^{50}_{60}$ -□-22(L)-(M)
With analog output



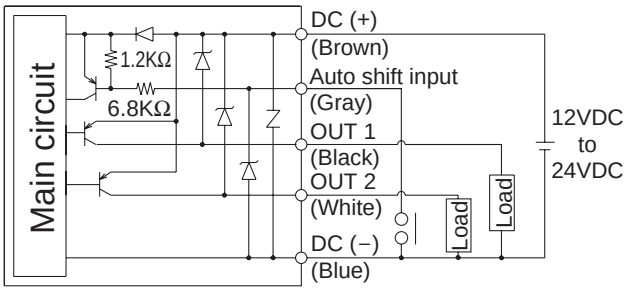
ZSE $^{50}_{60}$ F/ISE $^{50}_{60}$ -□-30(L)-(M)
With auto shift input



ZSE $^{50}_{60}$ F/ISE $^{50}_{60}$ -□-62(L)-(M)
With analog output



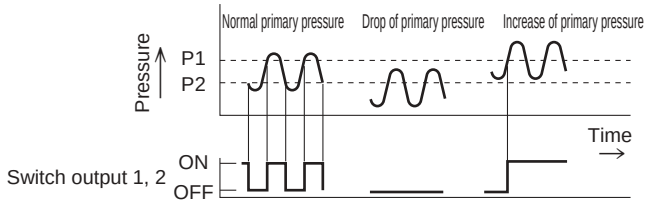
ZSE $^{50}_{60}$ F/ISE $^{50}_{60}$ -□-70(L)-(M)
With auto shift input



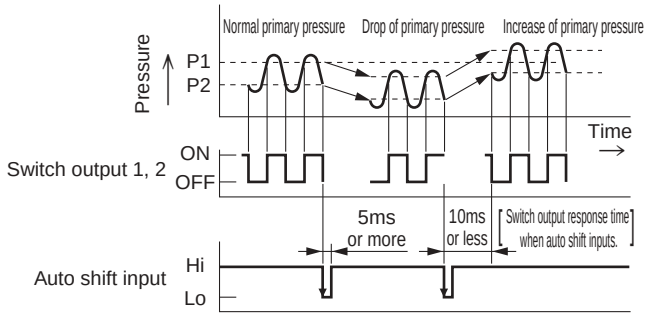
Auto Shift Function

This function uses the measured pressure at the time of auto shift input as the reference pressure value and corrects the set point values "P_1" and "P_2" of switch output 1 and "P_3" and "P_4" of switch output 2. "P_1" to "P_4" correspond to "n_1" to "n_4" in case of normally closed circuit.

When auto shift is not used:
Fluctuations in the primary pressure interrupt correct judgment.



When auto shift is used:
When the primary pressure changes, set the auto shift function to Lo. The pressure value at this point will be saved as the reference value to correct the pressure set point values in order to make correct judgments.



Auto shift function conditions and explanation

- Keep the pressure constant at least for 5 ms after the last transition signal of auto shift input.
- At the time of auto shift input, the display unit displays "ooo" for about 1 second. The pressure value at this time is saved as the correction value "C_5" .
- The set point values "P_1" to "P_4" or "n_1" to "n_4" are corrected based on the saved correction values.
- The time between the auto shift input and start of switch output is 10 ms or less.
- If the set point value corrected by auto shift input falls out of the possible set range, the correction value is not saved. The display will show "UUU" if the set point value is above the upper limit and "LLL" if it is below the lower limit.
- The correction value "C_5" set by auto shift input disappears when the power is turned off.
- The correction value "C_5" for the auto shift function is reset to zero (the initial value) when the power is turned on again.

∗The correction value is not stored on the EEPROM.

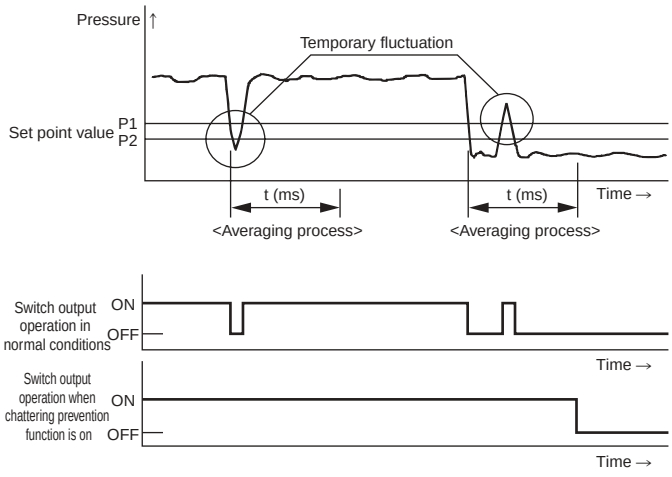
The possible set range for types with auto shift function is as follows:

Regulating pressure range	The possible set range for types with auto shift function
−100.0 to 100.0kPa	−100.0 to 100.0kPa
−0.1 to 1.000MPa	−1.000 to 1.000MPa

Anti-chattering Function

A large bore cylinder or ejector consumes a large amount of air in operation and may cause a temporary drop in the primary pressure. This function prevents detection of such temporary drops in primary pressure as abnormal pressure.

<Principle>
This function averages pressure values measured during the response time set by the user and then compares the average pressure value with the pressure set point value to output the result on the switch.



Description

Take the following measures when an error occurs.

Error description		LCD display	Condition	Solution
Over current error	OUT 1	Er 1	Load current of switch output is more than 80mA.	Shut off the power supply. After eliminating the output factor that caused the over current, turn the power supply back on.
	OUT 2	Er2		
Residual pressure error		Er3	Pressure is applied during the zero out operation as follows: [±0.071MPa or more with ISE50/60 ±7.1kPa or more with ZSE50F/60F] ∗After displaying for 3 seconds, it will return to the measuring mode.	Bring the pressure back to atmospheric pressure and try using the zero out function.
Applied pressure error		---	Supply pressure exceeds the maximum regulating pressure.	Reduce/Increase supply pressure to within the regulating pressure range.
		----	Supply pressure is below the minimum regulating pressure.	
Auto shift error		UUU	The value is above the upper limit of the set pressure ∗After displaying this message for about 1 seconds, the switch returns to the measurement mode.	Set the pressure again so that the sum of the applied pressure and pressure set point value at the time of auto shift input will not fall out of the set pressure range.
		LLL	The value is below the upper limit of the set pressure ∗After displaying this message for about 1 seconds, the switch returns to the measurement mode.	
System error		Er4	Internal data error	Shut off the power supply. Turn the power supply back on. If the switch does not come back to a normal operation, please contact SMC for an inspection.
		Er6	Internal data error	
		Er7	Internal data error	
		Er8	Internal data error	

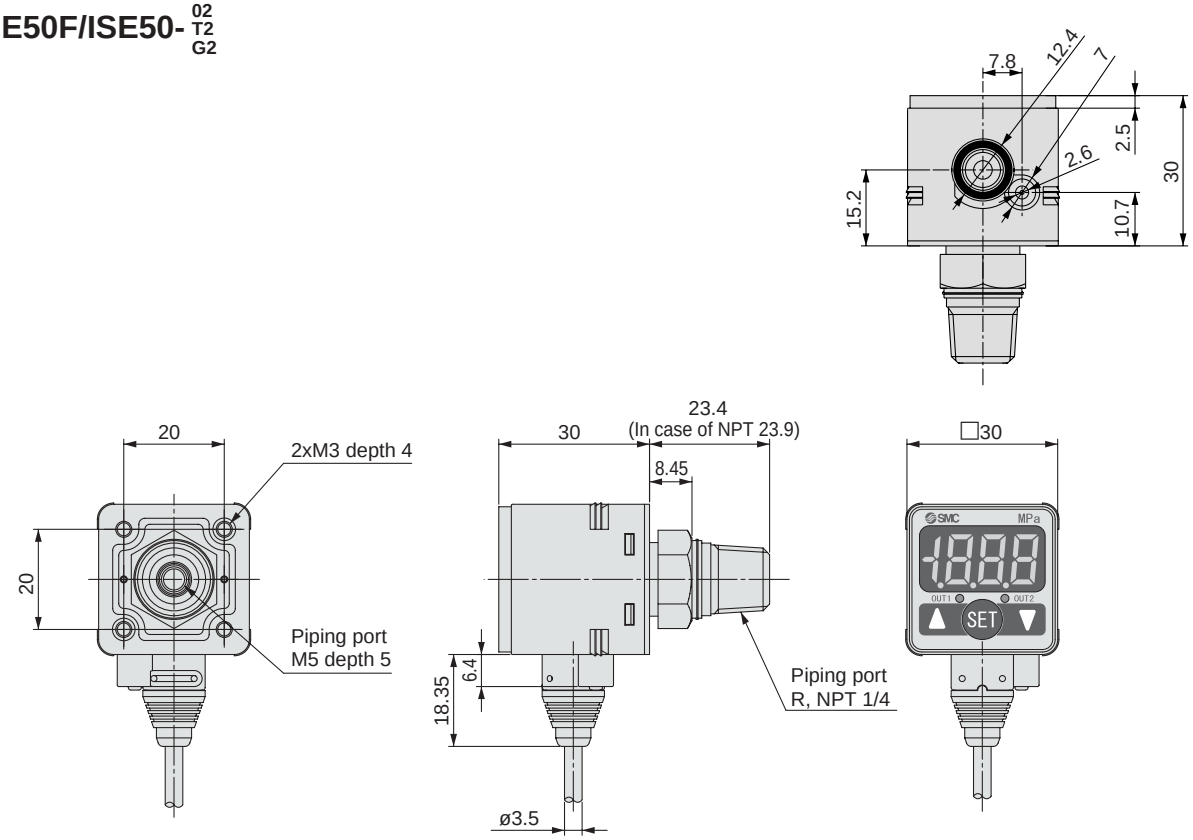
∗The upper limits and lower limits are shown in the table below.

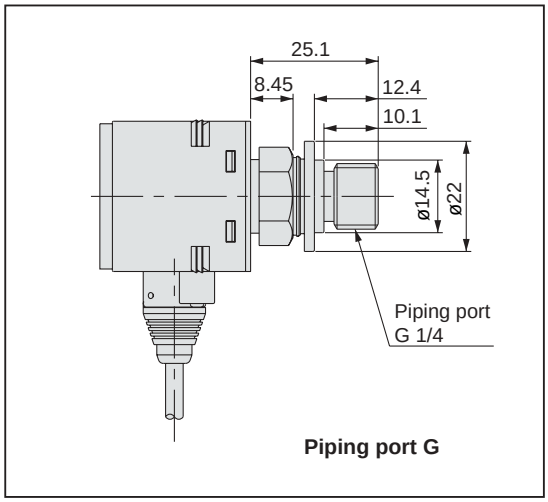
	Regulating pressure range	Lower limit	Upper limit
Compound pressure	−100.0 to 100.0kPa	−100.0kPa	100.0kPa
Positive pressure	−0.100 to 1.000MPa	−0.100MPa	1.000MPa

	With auto shift function		
	Regulating pressure range	Lower limit	Upper limit
Compound pressure	−100.0 to 100.0kPa	−100.0kPa	100.0kPa
Positive pressure	−1.000 to 1.000MPa	−1.000MPa	1.000MPa

Dimensions

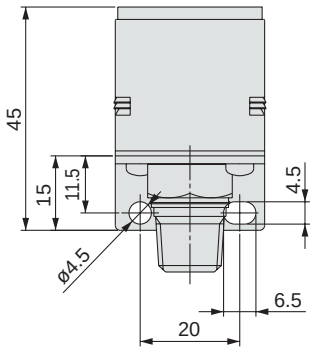
ZSE50F/ISE50- 02 / T2 / G2



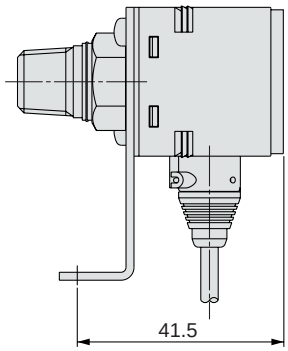


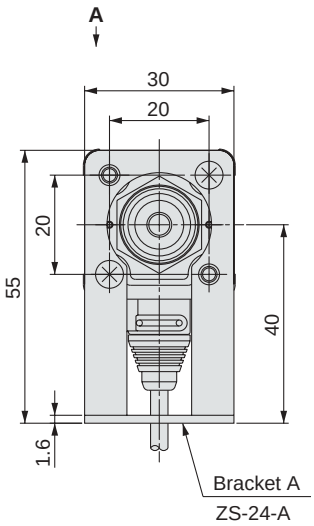
Dimensions

Bracket A

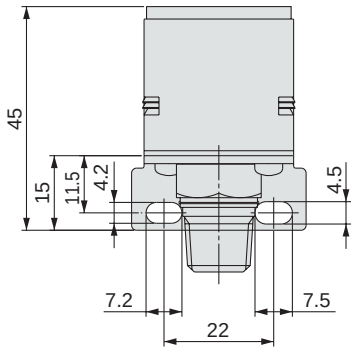


View A

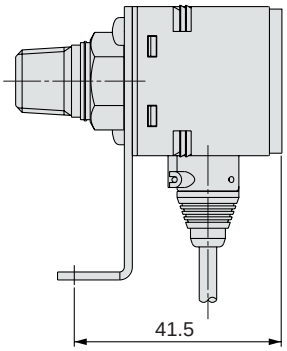


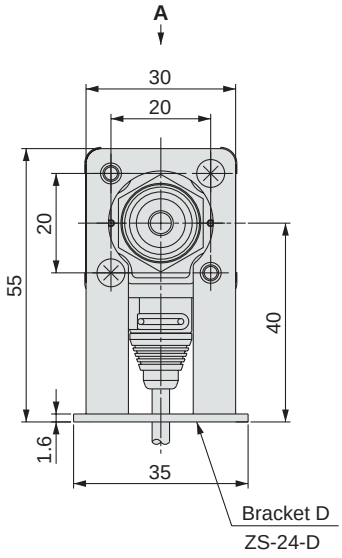


Bracket D

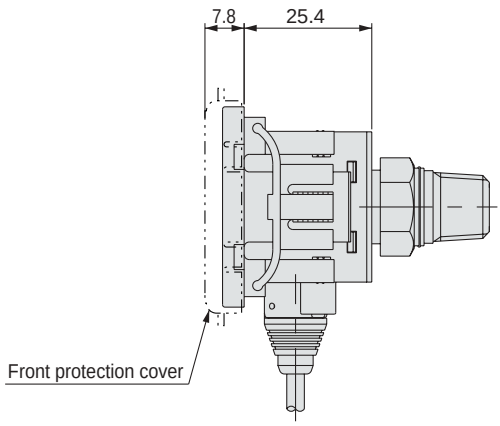


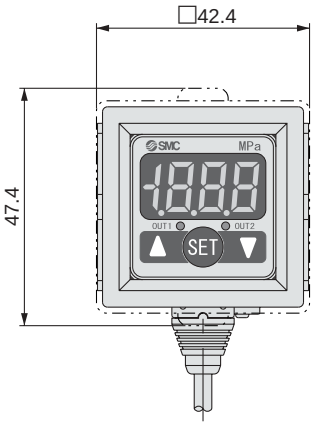
View A



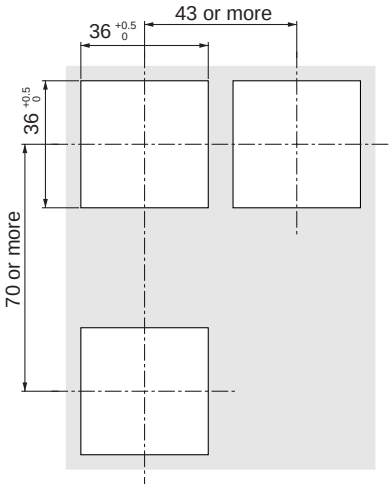


Panel mount





Cutting dimensions for panel mounting



Applicable panel thickness is 1 to 3.2mm.

For General Fluids

High Precision Digital Pressure Switch

Series ZSE60F/ISE60

How to Order

For positive pressure ISE60 — A2 — 22 — L — M

For compound pressure ZSE60 F — A2 — 22 — L — M

Piping specifications

A2	URJ 1/4*, Piping in the backward direction
B2	TSJ 1/4*, Piping in the backward direction

*URJ 1/4 and TSJ 1/4 are special fittings for semiconductor manufacturing equipment.

Input/output specifications

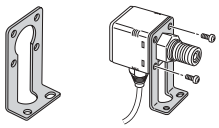
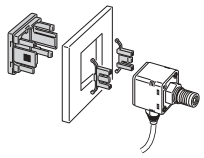
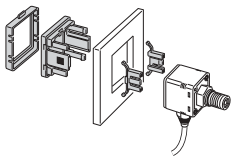
22	NPN open collector 2 output + Analogue output
30	NPN open collector 2 output + Auto shift input
62	PNP open collector 2 output + Analogue output
70	PNP open collector 2 output + Auto shift input

Note) Auto shift input is used for the auto shift function.
For more information, please refer to Auto Shift Function on page 5.

Lead wire length

L	3m

Option

Nil	None
A	Bracket A 
D	Bracket D Refer to the dimensions for the difference between brackets A and D,on page 12.
E	Panel mount 
F	Panel mount + Front protection cover 

Unit specification

Nil	With unit switching function Note 1)
M	Fixed SI unit Note 2)

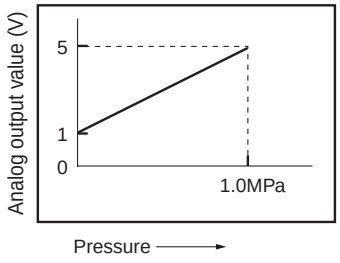
Note1) Under the New Measurement Law, which has been in effect since October, 1999, sales of switches with the unit conversion function have not been allowed for use in Japan.

Note 2) Fixed units:
For compound pressure : KPa
For positive pressure : MPa

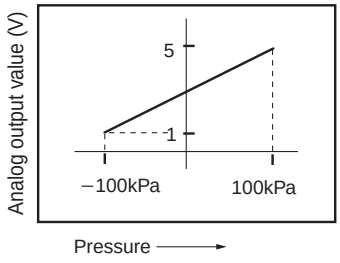
Analogue output

Suitable mode: **ZSE60F/ISE60-□-22/62(L)-(M)**

Series ISE60



Series ZSE60F



Option

When option parts are required separately, use the following part numbers to place an order.

Option	Part no.	Qty.	Note
Bracket A	ZS−24−A	1	With 2 pcs. of mounting screws
Bracket D	ZS−24−D	1	With 2 pcs. of mounting screws
Panel mount	ZS−24−E	1	
Panel mount + Front protection cover	ZS−24−F	1	

Specifications

		ZSE60F (Compound pressure)	ISE60 (Positive pressure)
Rated pressure range		−100 to 100kPa	0.000 to 1.000MPa
Operating pressure range and regulating pressure range		−100 to 100kPa	−0.100 to 1.000MPa
Proof pressure		500kPa	1.5MPa
Setting/Display resolution Note 1)	**kPa**	0.1	—
	MPa	—	0.001
	kgf/cm²	0.001	0.01
	bar	0.001	0.01
	psi	0.02	0.1
	mmHg	1	—
	inHg	0.1	—
Fluid		Fluid that will not corrode stainless steel SUS 630 and 304	
Power supply voltage		12 to 24VDC, Ripple (p-p) 10%or less	
Current consumption		55mA or less (With no load)	
Switch output		NPN or PNP 2 output (Max. applied voltage 30V (NPN), Max. load current 80mA)	
Repeatability		±0.2% F.S. ±1 digit or less	±0.3% F.S. ±1 digit or less
Hysteresis	**Hysteresis mode**	Variable (0 or above)	
	Window comparator mode	Fix (3 digits) Note 4)	
Response time		2.5ms or less (With chattering prevention function: 24ms, 192ms, 768ms or less)	
Output short circuit protection		With short circuit protection	
Display		3 1/2 digit LED display (Sampling frequency: 5 times / sec)	
Display accuracy		±2% F.S. ±1 digit or less (Ambient temperature of 25 ±3°C)	
Indication light		Green LED (OUT1: Light up when ON), Red LED (OUT2: Light up when ON)	
Analog output Note 2)		Output voltage: 1 to 5V ±5% F.S. or less	Output voltage: 1 to 5V ±2.5% F.S. or less
Auto shift input Note 3)		No-voltage input (solid state switch or reed switch), 5ms or longer input	
Environment resistance	**Enclosure**	IP65	
	Ambient temperature range	Operating: 0 to 50°C, Stored: −10 to 60°C (With no condensation or freezing)	
	Ambient humidity range	Operating and stored: 35 to 85% RH (With no)	
	With stand voltage	250VAC for 1 min, between all lead wires and enclosure	
	Insulation resistance	2MΩ or more (at 50VDC) between all lead wires and enclosure	
	Vibration resistance	10 to 500Hz with 1.5mm amplitude or 98m/s², whichever is smaller	
	Shock resistance	980m/s² in X, Y, Z directions 3 times each (Not energized)	
Temperature characteristics		±3%F.S. or less of measured pressure at 25°C in temperature range of 0 to 50°C	
Fluid contact material		Pressure receiving area: Stainless steel SUS 630, Fittings: Stainless steel SUS 304	
Port size		A2: URJ 1/4 B2: TSJ 1/4	
Lead wire		5 wire oil proof heavy duty cable (0.15mm²)	
Weight		Approx. 120g (Each including 3m lead wire)	

Note 1) In case of types with unit conversion function. (Types without unit conversion function are fixed to the SI units (KPa or MPa).)
Note 2) When a type with analogue output is selected.
Note 3) When a type with auto shift is selected.
Note 4) 0.03 to 0.04 psi in psi display.
Note 5) Value clear ±0.01psi in psi display.

Note
The possible set ranges for types with auto shift function are as follows:

Regulating pressure range	Possible set range
−100.0 to 100.0kPa	−100.0 to 100.0kPa
−0.1 to 1.000MPa	−1.000 to 1.000MPa

Function

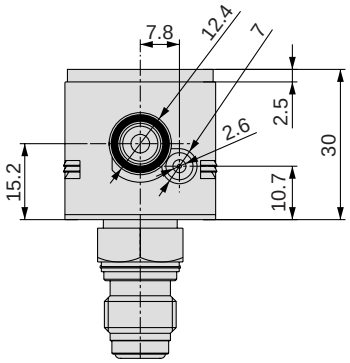
Various additional functions are available for easy measurement, switch operation and check of measured values suitable for the conditions of the measured fluid.

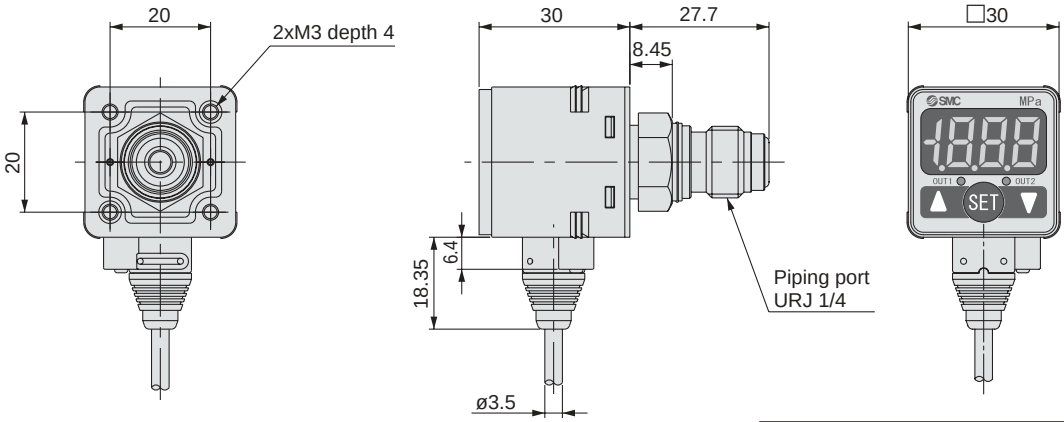
Auto shift function Note 1)	Can correct the pressure set point value of switch output according to fluctuation in the primary pressure.	Page 5
Anti-chattering function	Prevents malfunction due to sudden fluctuations in the primary pressure by adjusting the response time.	
Key lock function	The key can be locked to prevent incorrect operation.	Page 16
Peak hold function	Can retain the maximum pressure value displayed during measurement.	
Bottom hold function	Can retain the minimum pressure value displayed during measurement.	
Zero out function	The pressure display can be set at zero when the pressure is open to the atmosphere.	
Unit conversion function (For overseas use) Note 1)	Can convert the display value (For overseas use only).	

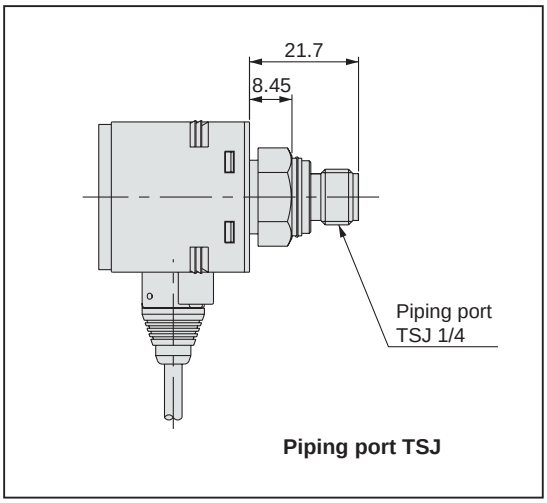
Note 1) Select and order by specifying the types and models.

Dimensions

ZSE60F/ISE60- A2 B2





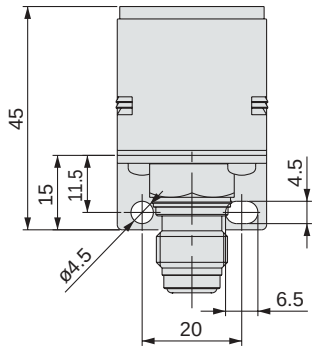


The following items are identical with those of series ZSE50F/ISE50.

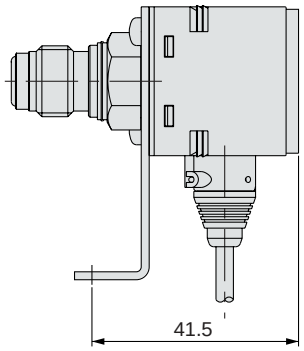
Item	Reference page
Output type	3
Example of internal circuit and wiring	4
Auto shift function, Chattering prevention function	5
Measures to be taken when error occurs	6

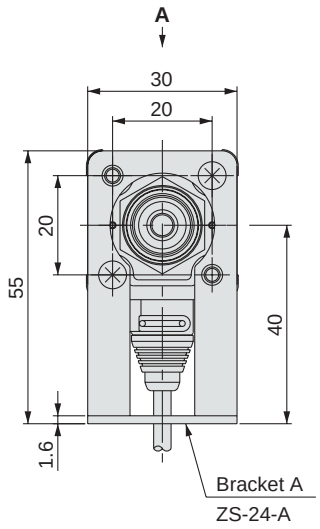
Dimensions

Bracket A

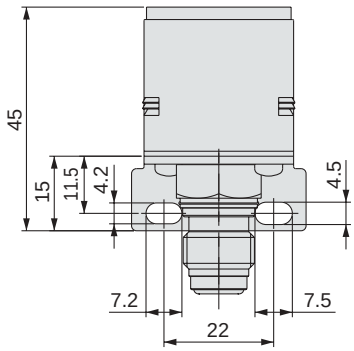


View A

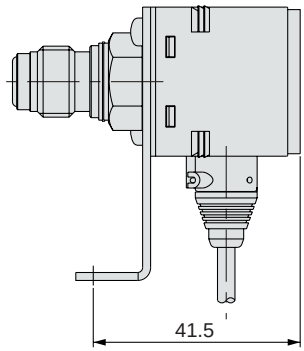


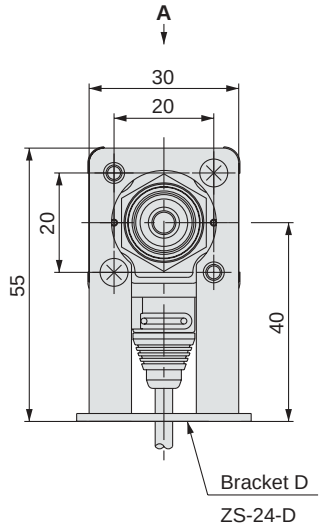


Bracket D

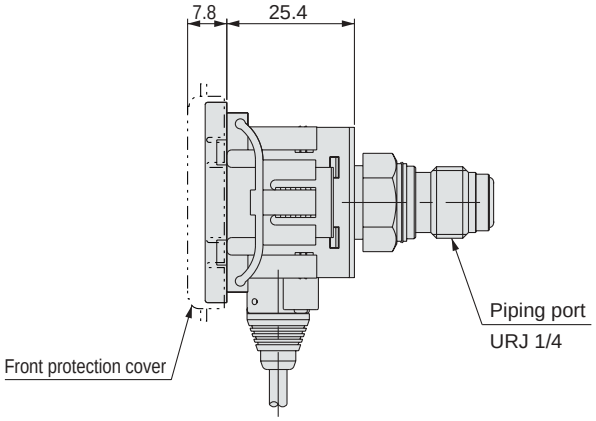


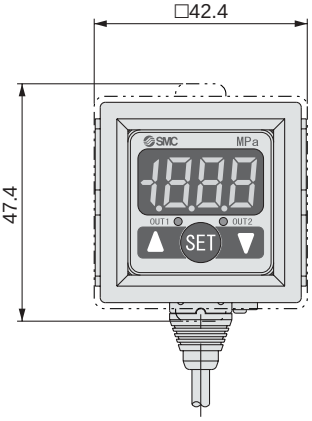
View A



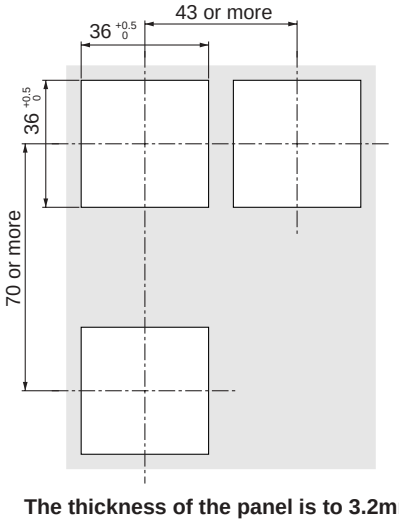


Panel mount



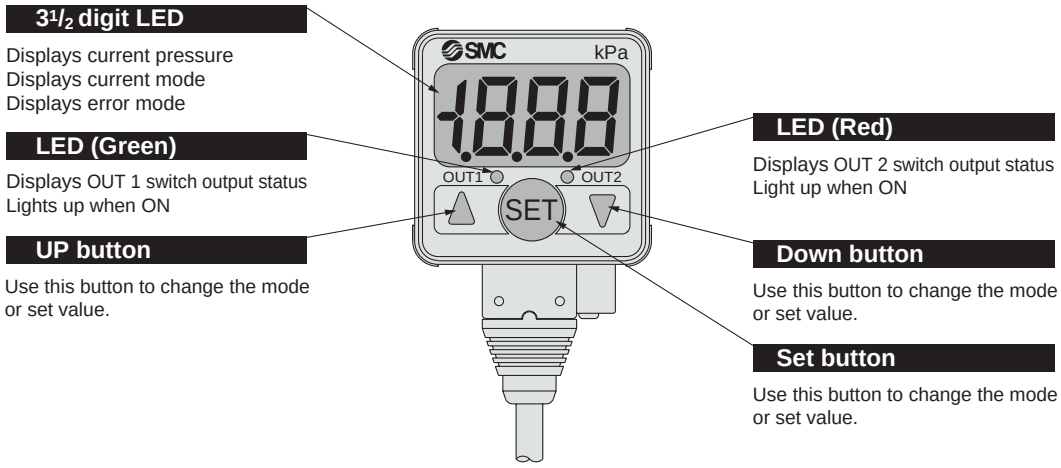


Cutting dimensions for panel mounting



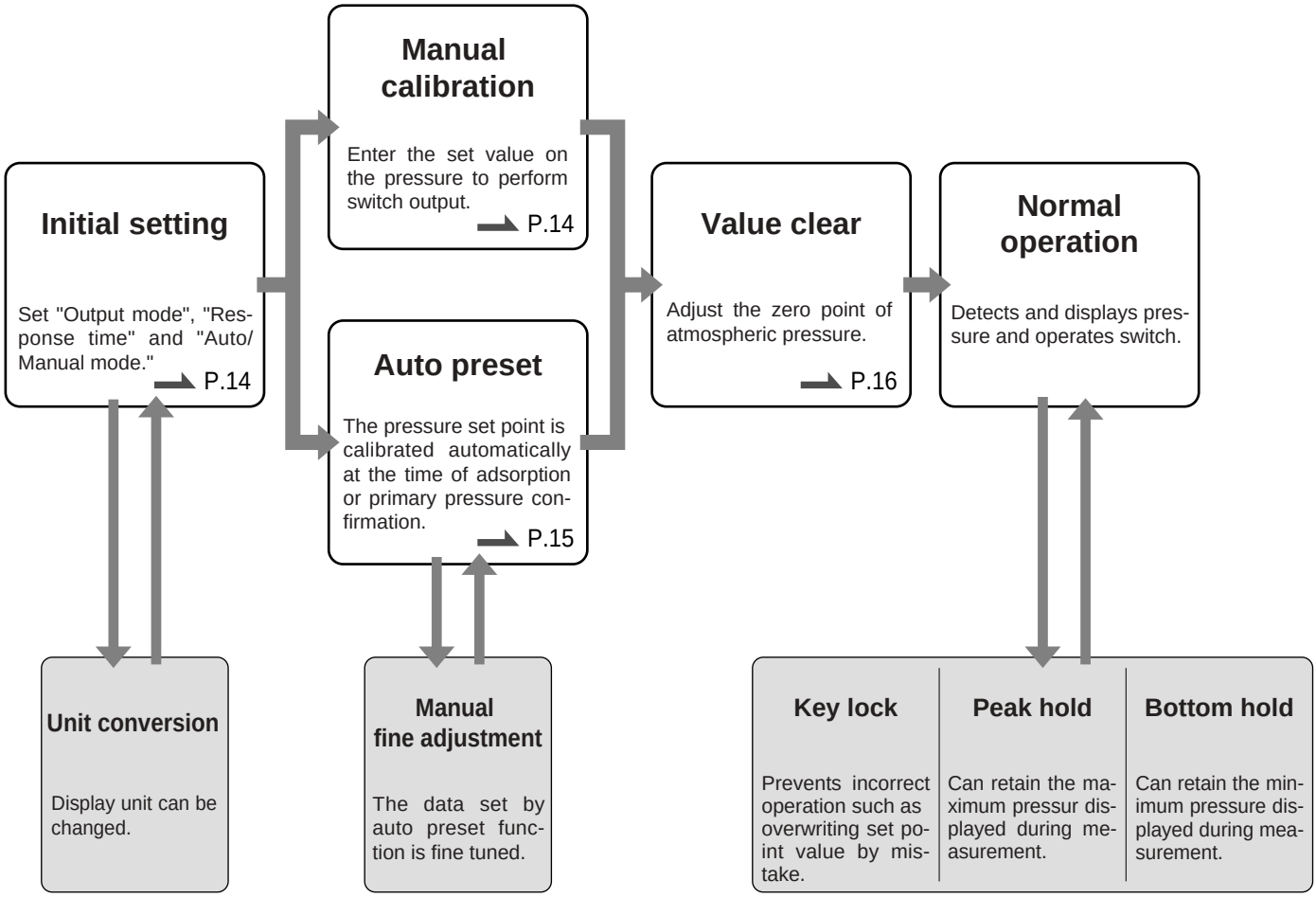
The thickness of the panel is to 3.2mm.

Description (Common to ZSE50F/ISE50 and ZSE60F/ISE60)



Setting (Common to ZSE50F/ISE50 and ZSE60F/ISE60)

Calibration procedure



Setting (Common to ZSE50F/ISE50 and ZSE60F/ISE60)

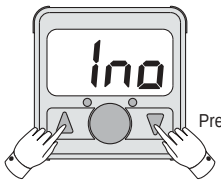
Initial setting

1. Initial setting mode

Press the SET button at least 2 seconds. Release it when the display turns to "1no"

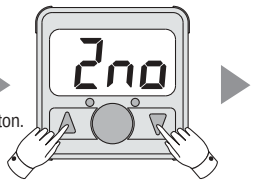
Unit specifications:	In case of types with unit conversion function, refer to "Unit setting (for overseas use)" on P.16.

2. OUT1 output mode selection



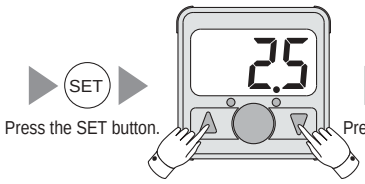
Select the "output mode" of OUT1 with ▲ or ▼ button.
"1no" : Normally open mode,
"1nC" : Normally closed mode

3. OUT2 output mode selection



Select the "output mode" of OUT2 with ▲ or ▼ button.
"2no" : Normally open mode,
"2nC" : Normally closed mode

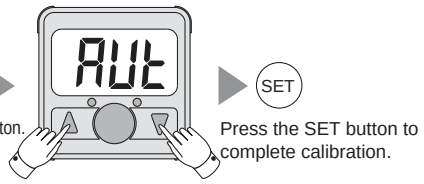
4. Response time selection



Set the response time with ▲ or ▼ button.
(Select from "2.5: 2.5ms," "24: 2.4ms," "192: 192 ms," and "768: 768ms. ")

Please refer to "Chattering prevention function" on page 5.

5. Auto / Manual setting



Select the auto preset mode or manual calibration mode with the ▲ or ▼ button.
"AUt" : Auto preset mode,
"mRn" : Manual calibration mode.

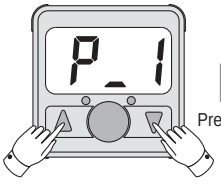
Manual pressure setting

The output method is determined by the pressure set point value.

1. Manual setting mode

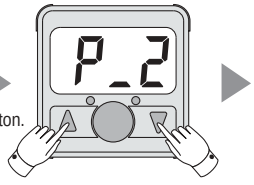
Select the manual setting mode as the initial setting mode. Press the SET button and hold it unit "P_1" or "n_1" appears on the display.

2. OUT1 (1) output set point value input



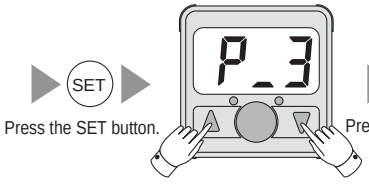
▲ button : Increases the set point value.
▼ button : Decrease the set point value.
"P_1" or "n_1" and the set point value light up alternately.

3. OUT1 (2) output set point value input



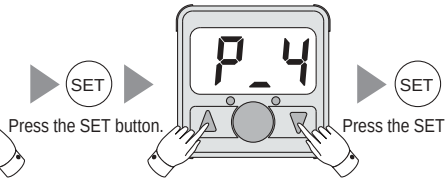
▲ button : Increases the set point value.
▼ button : Decrease the set point value.
"P_2" or "n_2" and the set point value light up alternately.

4. OUT2 (1) output set point value input



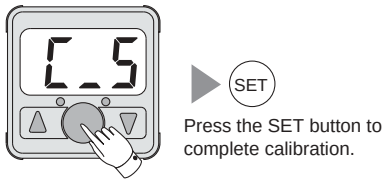
▲button: Increases the set point value.
▼button: Decrease the set point value.
"P_3" or "n_3" and the set point value light up alternately.

5. OUT2 (2) output set point value input



▲button: Increases the set point value.
▼button: Decrease the set point value.
"P_4" or "n_4" and the set point value light up alternately.

6. Auto shift input display



"C_5" and the correction value light up alternately. In case there has been no auto shift input, zero is displayed.
∗Auto shift input is displayed only if auto shift is supported by the I/O specifications (-30/-70). It is not displayed in case of types with analog output (-22/-62).

Setting (Common to ZSE50F/ISE50 and ZSE60F/ISE60)

Auto preset (Example: Adsorption Confirmation)

1. Auto preset mode

Select auto preset mode as the initial setting mode. Press the SET button and hold it until "RP1" appears on the display.

2. Preparation of auto preset

Prepare the equipment to be set while "RP1" is displayed.
If OUT1 setting is not required, press ▲ the ▼ and buttons simultaneously to skip to "RP2".

SET
Press the SET button.

3. OUT1 auto preset

Repeat vacuum and break several times while "AIL" is displayed. The optimum set point value is determined automatically.

4. Preparation of auto preset

SET
Press the SET button.

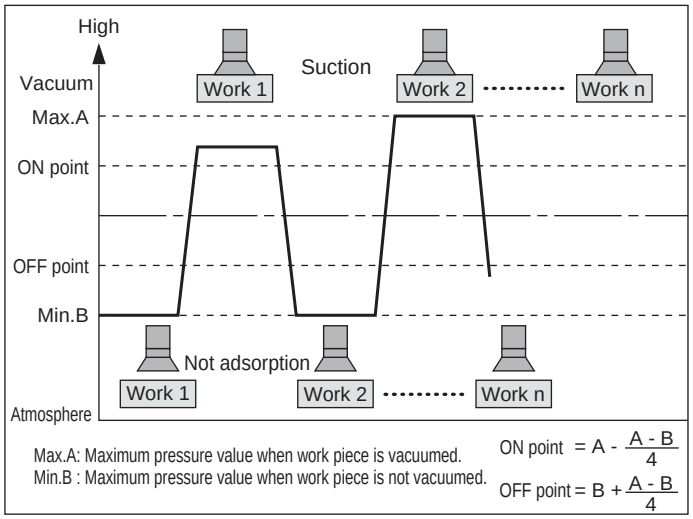
Change the vacuum nozzle or other conditions of the work piece and supply vacuum pressure. If OUT2 setting is not required, press the ▲ and ▼ buttons simultaneously to skip to the measurement mode.

5. OUT2 auto preset

SET
Press the SET button.

Repeat vacuum and break several times while "AIL" is displayed. The optimum set point value is determined automatically.

SET
Press the SET button to complete calibration.

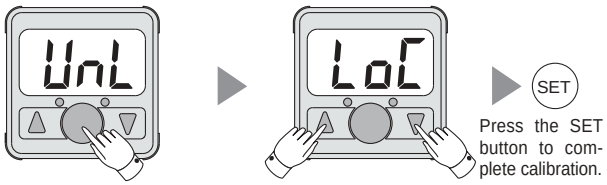


Setting (Common to ZSE50F/ISE50 and ZSE60F/ISE60)

Key lock function

Can prevent incorrect operation of operation buttons on the switch front.

Key lock start

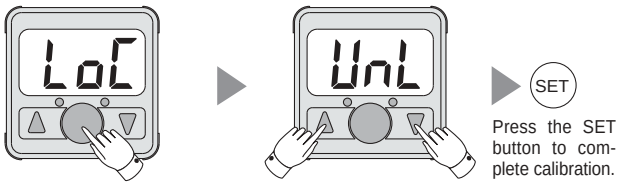


Press the SET button at least 2 seconds. Release it when the display turns to "UnL".

Change the display to "LoC" with the ▲ or ▼ button.

Press the SET button to complete calibration.

Key lock cancel



Press the SET button at least 4 seconds. Release it when the display turns to "LoC".

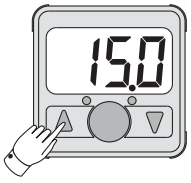
Change the display to "UnL" with the ▲ or ▼ button.

Press the SET button to complete calibration.

Peak/Bottom hold function

Can retain the maximum pressure value displayed (peak value) and minimum pressure value displayed (bottom value) during measurement.

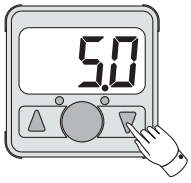
Peak hold



Press the ▲ button at least for 1 second during pressure display to enter the bottom display mode. The displayed value will blink. To return, press the ▼ button again at least for 1 second.

Note) There is no apparent difference between peak display and bottom display.

Bottom hold

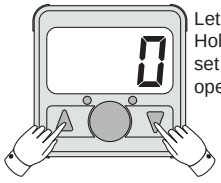


Press the ▲ button at least for 1 second during pressure display to enter the bottom display mode. The displayed value will blink. To return, press the ▼ button again at least for 1 second.

Note) There is no apparent difference between peak display and bottom display.

Zero out

The displayed value can be calibrated at zero if the measured pressure is in the range of ±70 increments of atmospheric pressure.



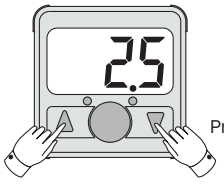
Let the supply pressure open to the atmosphere. Hold both ▲ and ▼ buttons simultaneously to reset the display value to zero. After resetting, the operation returns to the measurement mode.

Unit setting (for overseas use)

Only for ZSE $\frac{50}{60}$ F/ISE $\frac{50}{60}$ -□-□(L)

Unit selection

OUT1 output mode selection



Press the SET button.

Goes to 2. OUT1 output mode selection in Initial Setup on page 14.

Set the unit with the ▲or ▼button.

PF : kPa or MPa
GF : kgf/cm²
bAr : bar
PSI : psi
inH : inHg Note 1)
mmH : mmHg Note 1)

Note1) Calibration is available with series ZSE50 and ZSE60.

Series ZSE50/60F/ISE50/60
Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of **"Caution", "Warning"** or **"Danger"**. To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

⚠ Caution : Operator error could result in injury or equipment damage.

⚠ Warning : Operator error could result in serious injury or loss of life.

⚠ Danger : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power – Recommendations for the application of equipment to transmission and control systems

Note 2) JIS B 8370: General Rules for Pneumatic Equipment

⚠ Warning

1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements.

2. Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if handled incorrectly. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.

1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc. (Bleed air into the system gradually to create back pressure.)

4. Contact SMC if the product is to be used in any of the following conditions:

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, and therefore requires special safety analysis.

Series ZSE50/60F/ISE50/60
Pressure Switch Precautions

Be sure to read before handling. Refer to pages 17 through 19 for safety instructions and pressure switch precautions, and to page 20 for specific product precautions.

Design and Selection

⚠ Warning

1. Operate the switch only within the specified voltage.

Use of the switch outside the range of the specified voltage can cause not only malfunction and damage to the switch but also electric shocks and fire.

2. Do not exceed the maximum allowable load specification.

A load exceeding the maximum load specification can cause damage to the switch or shorten its operating life.

3. Do not use a load that generates surge voltage.

Although surge protection is installed in the circuit at the output side of the switch, damage may still occur if a surge is applied repeatedly. When a surge generating load such as a relay or solenoid is directly driven, use a type of switch with a built-in surge absorbing element.

4. The fluid compatibility varies among products. Be sure to confirm the specifications.

The switch does not have an explosion proof rating.
To prevent a possible fire hazard, do not use with flammable gases or fluids.

5. Operate the switch within the regulating pressure range and maximum operating pressure.

Malfunction can occur if the pressure sensor is used outside the regulating pressure range, and the sensor may be permanently damaged if used at a pressure that is above the maximum operating pressure.

Mounting

⚠ Warning

1. If the equipment is not operating properly, do not continue to use it.

Connect air and power after installation, repairs, or modifications, and verify proper installation. The switch should be checked for proper operation and possible leaks.

2. Mount switches using the proper tightening torque.

When a switch is tightened beyond the specified tightening torque, the mounting screws, mounting bracket, or switch may be damaged. On the other hand, tightening below the specified tightening torque may cause the installation screws to come loose during operation.

Nominal thread size	Proper tightening torque N·m
M5	1/6 rotation after tightening by hand
R 1/4, NPT 1/4, G 1/4, URJ 1/4, TSJ 1/4	13.6N·m

3. Apply wrench only to the metal part of the main housing when installing the pressure switch onto the system piping.

Do not apply a wrench to the resin part as this may damage the switch.

Wiring

⚠ Warning

1. Confirm the colours and terminal numbers of cords when wiring.

Incorrect wiring can cause the switch to be damaged and malfunction. Verify the colours and terminal number in the instruction manual when wiring.

2. Avoid repeatedly bending or stretching lead wires.

Repeatedly applying bending stress or stretching force to the lead wire will cause it to break. If you believe the lead wire is damaged and likely to cause malfunctions, replace it.

3. Confirm proper insulation of wiring.

Make sure that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a switch.

Operating Environment

⚠ Warning

1. Never use in the presence of explosive gases.

The switches do not have an explosion proof rating. Never use in the presence of an explosive gas as this may cause a serious explosion.

Maintenance

⚠ Warning

1. Perform periodic inspections to ensure proper operation of the switch.

Unexpected malfunctions or incorrect operation may cause possible danger.

2. Take precautions when using the switch for an interlock circuit.

When a pressure switch is used for an interlock circuit, devise a multiple interlock system to prevent trouble or malfunctioning. Verify the operation of the switch and interlock function on a regular basis.

Series ZSE50/60F/ISE50/60
Digital Pressure Switch Precautions

Be sure to read before handling. Refer to pages 17 through 19 for safety instructions and pressure switch precautions, and to page 20 for specific product precautions.

Selection

⚠ Warning

1. Monitor the internal voltage drop of the switch.

When operating below a specified voltage, it is possible that the load may be ineffective even though the pressure switch function is normal. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

Supply voltage − Internal voltage drop of switch > Minimum operating voltage of load

⚠ Caution

1. Data of the digital pressure switch will be stored even after the power is turned off.

Input data (set pressure, etc.) will be stored in EEPROM so that the data will not be lost after the pressure switch is turned off. (Data will be stored for up to 100,000 hours after the power is turned off.)

Mounting

⚠ Warning

1. Operation

Refer to the instruction manual for the operation of the digital pressure switch.

2. Pressure port

Do not introduce any wire or similar object to a pressure port as this may damage the pressure sensor and cause a malfunction.

Wiring

⚠ Warning

1. Do not wire conjunction with power lines or high voltage lines.

Wire separately from power lines and high voltage lines, avoiding wiring in the same conduit with these lines. Control circuit including the switches may malfunction due to noise from these other lines.

2. Do not allow loads to short circuit.

Although digital pressure switches indicate excess current error if loads are short circuited, all incorrect wiring connections cannot be protected. Take precautions to avoid incorrect wiring.

As for other pressure switches, the switches will be instantly damaged if loads are short circuited. Take special care to avoid reverse wiring between the brown power supply line and the black output line.

3. Connect a DC (-) wire (blue) as close as possible to the DC power supply GND terminal.

Connecting the power supply away from the GND terminal can cause malfunctions due to noise from devices that are connected to the GND terminal.

4. Do not attempt to insert or pull the pressure sensor or its connector when the power is on.

Pressure Source

⚠ Warning

1. Use the switch within the specified fluid and ambient temperature range.

Ambient and fluid temperature operation is as follows:

Digital pressure switches: 0° to 50°C

Take measures to prevent moisture from freezing in circuits when below 5°C, since this may cause damage to the O-ring and lead to a malfunction. The installation of an air dryer is recommended for eliminating condensate and moisture. Never use the switch in an environment where there are drastic temperature changes even when these temperatures are operated within the specified temperature range.

2. Compound pressure switch

Although application of a momentary pressure around 0.5 MPa will not affect the performance (at the time of vacuum break), be careful to not to apply constant pressure of 0.2 MPa or more.

Operating Environment

⚠ Warning

1. Do not use in an area where surges are generated.

When there are units that generate a large amount of surge in the area around pressure switches (e.g., solenoid type lifters, high frequency induction furnaces, motors), this may cause deterioration or damage to the switches' internal circuitry. Avoid and protect against sources of surge generation and crossed lines.

Maintenance

⚠ Caution

1. Cleaning of the switch body.

Wipe off dirt with soft cloth. If dirt does not come off easily, use a neutral detergent diluted with water to dampen a soft cloth. Wipe the switch only after squeezing the excess water out of the dampened cloth. Then finish off by wiping with a dry cloth afterwards.

Series ZSE50/60F/ISE50/60
Pressure Switch Precautions 1

Be sure to read before handling. Refer to pages 17 through 19 for safety instructions and pressure switch common precautions.

Handling

⚠ Warning

1. Do not drop, or apply excessive impact (980m/s^2) while handing. Although the body of the sensor may not be damaged, the internal parts of the sensor could be damaged and lead to a malfunction.
2. The tensile strength of the cord is 49N. Applying a greater pulling force on it can cause a malfunction. When handling, hold the body of the sensor — do not dangle it from the cord.
3. Do not exceed the screw-in torque of 13.6 N·m when installing piping. Exceeding this value may cause malfunctioning of the sensor.
4. Do not use pressure sensors with corrosive and/or flammable gases or liquids.

Connection

⚠ Warning

1. Incorrect wiring can damage the switch and cause a malfunction or erroneous switch output.
2. Turn off the power before connecting the wires.
3. Wire separately from power lines and high voltage lines, avoiding wiring in the same conduit with these lines. Malfunctions may occur due to noise from these lines.
4. If a commercial switching regulator is used, make sure that the F.G. terminal is grounded.

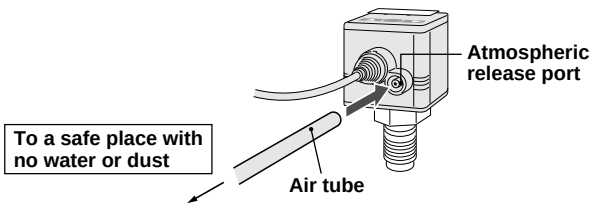
Operating Environment

⚠ Warning

1. Our pressure switches are CE marked; however, they are not equipped with surge protection against lightning. Lightning surge countermeasures should be applied directly to system components as necessary.
2. Our pressure switches do not have an explosion proof rating. Never use it in the presence of an explosive gas as this may cause a serious explosion.

⚠ Caution

1. Do not use in an environment with spattering liquid of oil or solvent.
2. In an environment where the body of the switch is exposed to water or dust, there is possibility of water or dust invasion of the switch through the atmospheric release port. Insert a ø4 tube (with inside diameter of ø2.5) into the atmospheric release port and pipe the other end to a place with no spattering water or other liquid. Do not fold or clog the tube or the pressure cannot be measured properly.



∗Confirm that the air tube is inserted to the bottom of the atmospheric release port.
∗Use SMC TU0425 (Material: Polyurethane, O.D.: ø4, I.D: ø2.5) as the air tube.

Pressure Source

⚠ Warning

1. Use of toxic, corrosive or flammable gas.

The materials of the pressure sensor and fittings on the switch are SUS630 and SUS304. Do not use **toxic or corrosive gas**.

The switch is not protected against explosion. Do not use it with flammable gas, either.

2. Compatible fluid

The fluid contact areas are SUS630 (pressure sensor) or SUS304 (fittings). Use fluid that will not corrode the materials. (For corrosiveness of fluid, consult the manufacturer of the fluid.)

<ZSE60F/ISE60>

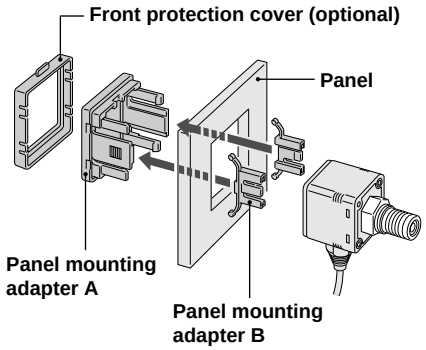
Helium leakage test

Helium leakage test is conducted on the welding parts. Use a ferrule a ferrule by (Swagelok® fittings) as the TSJ fittings and packing, ground, etc. by Cajon (VCR® fittings) as the URJ fittings. If a ferrule, packing or ground by other manufacturers are to be used, conduct helium leakage test before using those products.

Mounting Method

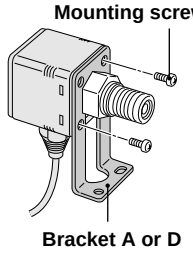
⚠ Caution

1. Mounting with panel mount adapter



2. Mounting with brackets

Mount a bracket to the using two M3 x 5L mounting screws and install on piping with a hexagon socket cap screws. The switch can be installed horizontally depending on the installation location.



The tightening torque for bracket mounting screw should be 0.98N·m or less.

ISE70/75/75H

2-colour Display
Digital Pressure Switch/For Air
Series ISE70

How to Order

1MPa **ISE70** – **02** – **43** – **M** [ ] [ ]

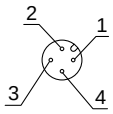
Piping

02	Rc1/4
N02	NPT1/4
F02	G1/4 (ISO1179) Note 1)

Note 1) G1/4: Applicable to ISO1179-1

Output

43	Fixed setting: NPN open collector 1 output (Pin no. 4) + PNP open collector 1 output (Pin no. 2)
65	PNP open collector 1 output (Pin no. 4)



Connector Pin Assignments

Output -43

1	Brown	DC (+)
2	White	OUT1 (PNP)
3	Blue	DC (–)
4	Black	OUT1 (NPN)

Output -65

1	Brown	DC (+)
2	White	NC
3	Blue	DC (–)
4	Black	OUT1 (PNP)

Display unit

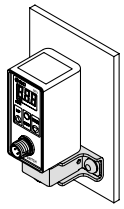
Nil	With unit display switching function
M	Fixed SI unit Note 1)
P	Pressure unit: PSI (Initial value) With unit display switching function

Note 1) Fixed unit: MPa

Option 1

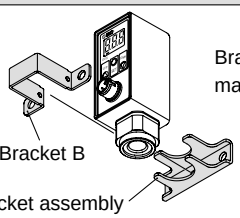
Nil	None
S	Lead wire with M12 connector (5m), straight
L	Lead wire with M12 connector (5m), right-angled

Option 2

Nil	None
A	With bracket  Note) Mounting screws are not included.

Optional Part No.

When option parts are required separately, use the following part numbers to place an order.

Option	Part No.	Note
Bracket	**ZS-31-A**	 Bracket B and the bracket assembly make up one set. Note: Mounting screws are not included.
Lead wire with M12 connector, straight	**ZS-31-B**	Lead wire length: 5m
Lead wire with M12 connector, right-angled	**ZS-31-C**	Lead wire length: 5m

Specifications

		ISE70
Rated pressure range		0 to 1MPa
Set pressure range		–0.1 to 1MPa
Proof pressure		1.5MPa
Set pressure resolution		0.01MPa
Fluid		Air, Inert gas, Non-flammable gas
Power supply voltage		12 to 24 VDC, Ripple (p-p) 10% or less (with power supply polarity protection)
Current consumption		55 mA or less (at no load)
Switch output		Output -43: Fixed setting; NPN open collector 1 output (Pin no. 4) + PNP open collector 1 output (Pin no. 2) Note 1) Output -65: PNP open collector 1 output (Pin no. 4) Note 1)
	Max. load current	80 mA
	Max. applied voltage	30 V (with NPN output)
	Residual voltage	1 V or less (with load current of 80 mA)
	Response time	2.5 ms (Response time selections with anti-chattering function: 20 ms, 160 ms, 640 ms, 1000 ms, 2000 ms)
	Short circuit protection	With short circuit protection
Repeatability		±0.5%F.S.
Hysteresis	**Hysteresis mode**	Adjustable (can be set from 0)
	Window comparator mode	
Display		3 ditit, 7-segment indicator, 2-colour display (red and green) can be interlocked with the switch output, Sampling cycle: 5 times/s
Display accuracy		±2%F.S. ±1 digit or less (at 25°C ±3°C)
Indication light		Light up when output is ON (Green)
Functions		Anti-chattering function, Unit display switching function, Zero out function, Key lock function
Environ-mental resistance	**Enclosure**	IP67
	Fluid temperature range	0 to 50°C (with no freezing or condensation)
	Operating temperature range	Operating: 0 to 50°C, Stored: –10 to 60°C (with no freezing or condensation)
	Operating humidity range	Operating and stored: 35 to 85%RH (with no condensation)
	Withstand voltage	1000 VAC for 1 min. between live parts and enclosure
	Insulation resistance	50 MΩ or more between live parts and enclosure (at 500 VDC Mega)
	Vibration resistance	10 to 500 Hz, 1.5 mm or 98 m/s^2 amplitude in X, Y, Z directions for 2 hours each
	Impact resistance	980 m/s^2 in X, Y, Z directions 3 times each (Non energized)
Temperature characteristics (Based on 25°C: Operating temperature range)		±2%F.S. or less
Standard		Compliant with CE Marking and UL/CSA (UL508) standards
Wetted material		Fitting: C3602 (electroless nickel plated), Sensor port: PBT, Sensor pressure receiving area: silicon, O-ring: NBR
Port size		02: Rc1/4, N02: NPT1/4, F02: G1/4 (ISO1179) Note 2)
Lead wire		Lead wire with M12 4-pin pre-wired connector (5 m)
Mass (Weight)		190 g (excluding the lead wire with M12 4-pin pre-wired connector)

Note 1) The NPN and PNP outputs function for a single set point.
Note 2) G1/4: Applicable to ISO1179-1

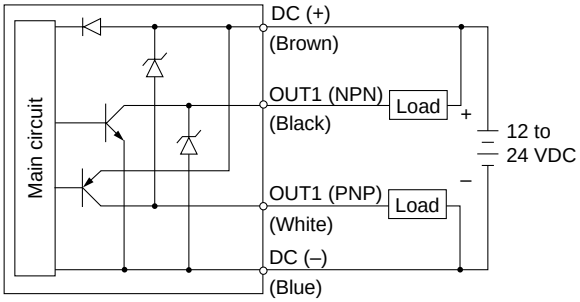
Internal Circuit and Wiring Examples

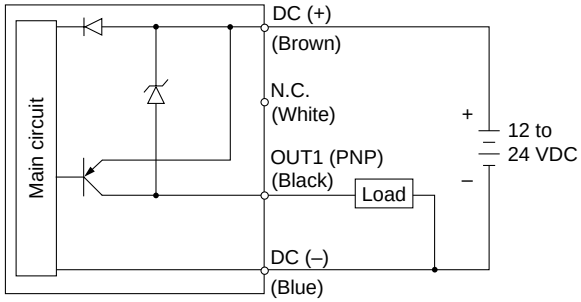
Output -65

Fixed setting:
NPN open collector output + PNP open collector output
(the pressure set point for switching the output signal is common to both outputs.)
Maximum 30 V (NPN only), 80 mA, Residual voltage 1 V or less

See the operation manual for information on how to set and on handling precautions.

Output -43





2-colour Display
Digital Pressure Switch/For General Fluids
Series ISE75/75H

How to Order

10MPa **ISE75** – **02** – **43** – **M** – – –

15MPa **ISE75H** – **02** – **43** – **M** – – –

Piping

02	Rc1/4
N02	NPT1/4
F02	G1/4 (ISO1179) Note 1)

Note 1) G1/4: Applicable to ISO1179-1

Output

43	Fixed setting: NPN open collector 1 output (Pin no. 4) + PNP open collector 1 output (Pin no. 2)
65	PNP open collector 1 output (Pin no. 4)

Display unit

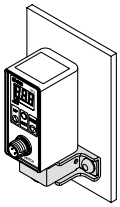
Nil	With unit display switching function
M	Fixed SI unit Note 1)
P	Pressure unit: PSI (Initial value) With unit display switching function

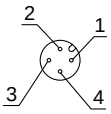
Note 1) Fixed unit: MPa

Option 1

Nil	None
S	Lead wire with M12 connector (5m), straight
L	Lead wire with M12 connector (5m), right-angled

Option 2

Nil	None
A	With bracket 



Connector Pin Assignments

Output -43

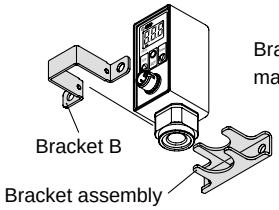
1	Brown	DC (+)
2	White	OUT1 (PNP)
3	Blue	DC (–)
4	Black	OUT1 (NPN)

Output -65

1	Brown	DC (+)
2	White	NC
3	Blue	DC (–)
4	Black	OUT1 (PNP)

Optional Part No.

When option parts are required separately, use the following part numbers to place an order.

Option	Part No.	Note
Bracket	**ZS-31-A**	 Bracket B and the bracket assembly make up one set.
Lead wire with M12 connector, straight	**ZS-31-B**	Lead wire length: 5m
Lead wire with M12 connector, right-angled	**ZS-31-C**	Lead wire length: 5m

Specifications

		ISE75	ISE75H
Rated pressure range		0 to 10MPa	0 to 15MPa
Set pressure range		0.4 to 10MPa	0.5 to 15MPa
Proof pressure		30MPa	45MPa
Set pressure resolution		0.1MPa	
Fluid		Fluid that will not corrode stainless steel SUS430 and SUS630	
Power supply voltage		12 to 24 VDC, Ripple (p-p) 10% or less (with power supply polarity protection)	
Current consumption		55 mA or less (at no load)	
Switch output		Output -43: Fixed setting; NPN open collector 1 output (Pin no. 4) + PNP open collector 1 output (Pin no. 2) Note 1) Output -65: PNP open collector 1 output (Pin no. 4) Note 1)	
	Max. load current	80 mA	
	Max. applied voltage	30 V (with NPN output)	
	Residual voltage	1 V or less (with load current of 80 mA)	
	Response time	2.5 ms (Response time selections with anti-chattering function: 20 ms, 160 ms, 640 ms, 1000 ms, 2000 ms)	
	Short circuit protection	With short circuit protection	
Repeatability		±0.5%F.S.	
Hysteresis	**Hysteresis mode**	Adjustable (can be set from 0)	
	Window comparator mode		
Display		3 ditit, 7-segment indicator, 2-colour display (red and green) can be interlocked with the switch output, Sampling cycle: 5 times/s	
Display accuracy		±2%F.S. ±1 digit or less (at 25°C ±3°C)	
Indication light		Light up when output is ON (Green)	
Functions		Anti-chattering function, Unit display switching function, Zero out function, Key lock function	
Environ-mental resistance	**Enclosure**	IP67	
	Fluid temperature range	–5 to 80°C (with no freezing or condensation)	
	Operating temperature range	Operating: –5 to 50°C, Stored: –10 to 60°C (with no freezing or condensation)	
	Operating humidity range	Operating and stored: 35 to 85%RH (with no condensation)	
	Withstand voltage	250 VAC for 1 min. between live parts and enclosure	
	Insulation resistance	50 MΩ or more between live parts and enclosure (at 50 VDC Mega)	
	Vibration resistance	10 to 500 Hz, 1.5 mm or 98 m/s^2 amplitude in X, Y, Z directions for 2 hours each	
	Impact resistance	980 m/s^2 in X, Y, Z directions 3 times each (Non energized)	
Temperature characteristics (Based on 25°C: Operating temperature range)		±3%F.S. or less	
Standard		Compliant with CE Marking and UL/CSA (UL508) standards	
Wetted material		Pressure receiving area: Stainless steel SUS630, Fittings: Stainless steel SUS430	
Port size		02: Rc1/4, N02: NPT1/4, F02: G1/4 (ISO1179) Note 2)	
Lead wire		Lead wire with M12 4-pin pre-wired connector (5 m)	
Mass (Weight)		210 g (excluding the lead wire with M12 4-pin pre-wired connector)	

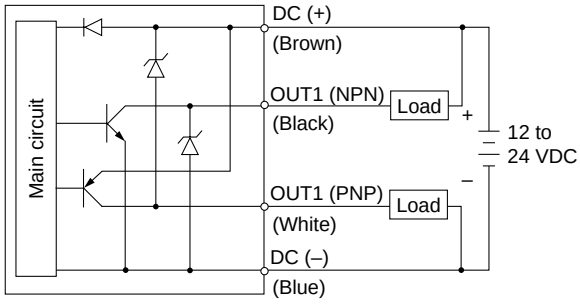
Note 1) The NPN and PNP outputs function for a single setpoint.
Note 2) G1/4: Applicable to ISO1179-1

Internal Circuit and Wiring Examples

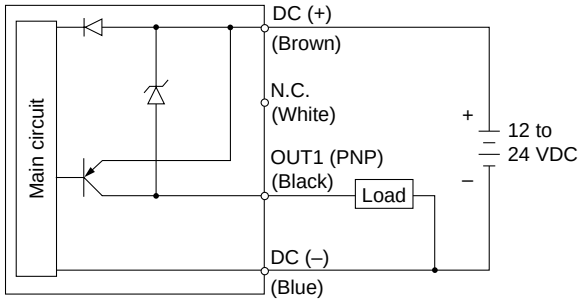
Fixed setting:
NPN open collector output + PNP open collector output
(the pressure set point for switching the output signal is common to both outputs)
Maximum 30 V (NPN only), 80 mA, Residual voltage 1 V or less

See the operation manual for information on how to set and on handling precautions.

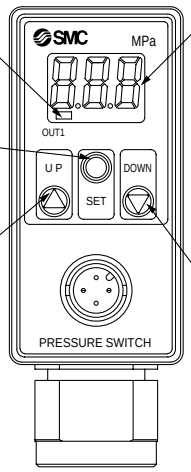
Output -43



Output -65



Description



Indication light (Green)

Displays the switch operation status.

SET button

Use this button to switch the mode and set the set value.

UP button

Use this button to change the mode or increase the ON/OFF set value. It also allows you to switch to the peak value display mode.

LCD display

Displays the current pressure condition, set mode and error code. The display mode can be selected from four options: fixed green single-colour reading, fixed red single-colour reading, green reading interlocked with output for switching to red reading, and red reading interlocked with output for switching to green reading.

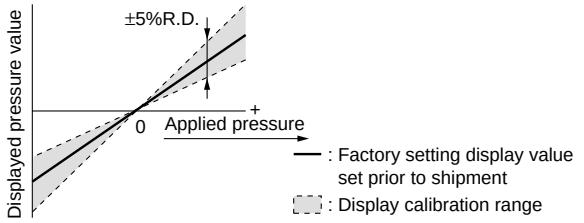
DOWN button

Use this button to change the mode or decrease the ON/OFF set value. It also allows you to switch to the bottom value display mode.

Functions

Display calibration function

This function eliminates slight differences in the output values and allows uniformity in the numbers displayed.
Displayed values of the pressure sensor can be calibrated to within ±5% of their readings.



Note) When the display calibration function is used, the set pressure value may change ±1 digit.

Peak/Bottom hold function

This function constantly detects and updates the maximum and minimum pressure values and allows to hold the display value.

Key lock function

This function prevents incorrect operations such as changing the set value accidentally.

Zero out (Zero ADJ) function

The measured pressure reading can be adjusted to zero.
More specifically, the factory-set reading can be corrected to within ±7% F.S.

Unit display switching function

The reading unit can be selected.

Unit/Reading resolution	ISE70	ISE75/75H
Pa	0.01MPa	0.1MPa
kgf/cm^2	0.1	1
bar	0.1	1
psi	1	1 (x 10)

Anti-chattering function

A large bore cylinder or ejector consumes a large amount of air in operation and may experience a temporary drop in the primary pressure. This function prevents detection of such temporary drops in primary pressure as abnormal pressure.

Response time selections: 20ms, 160ms, 640ms, 1000ms, 2000ms

Error function

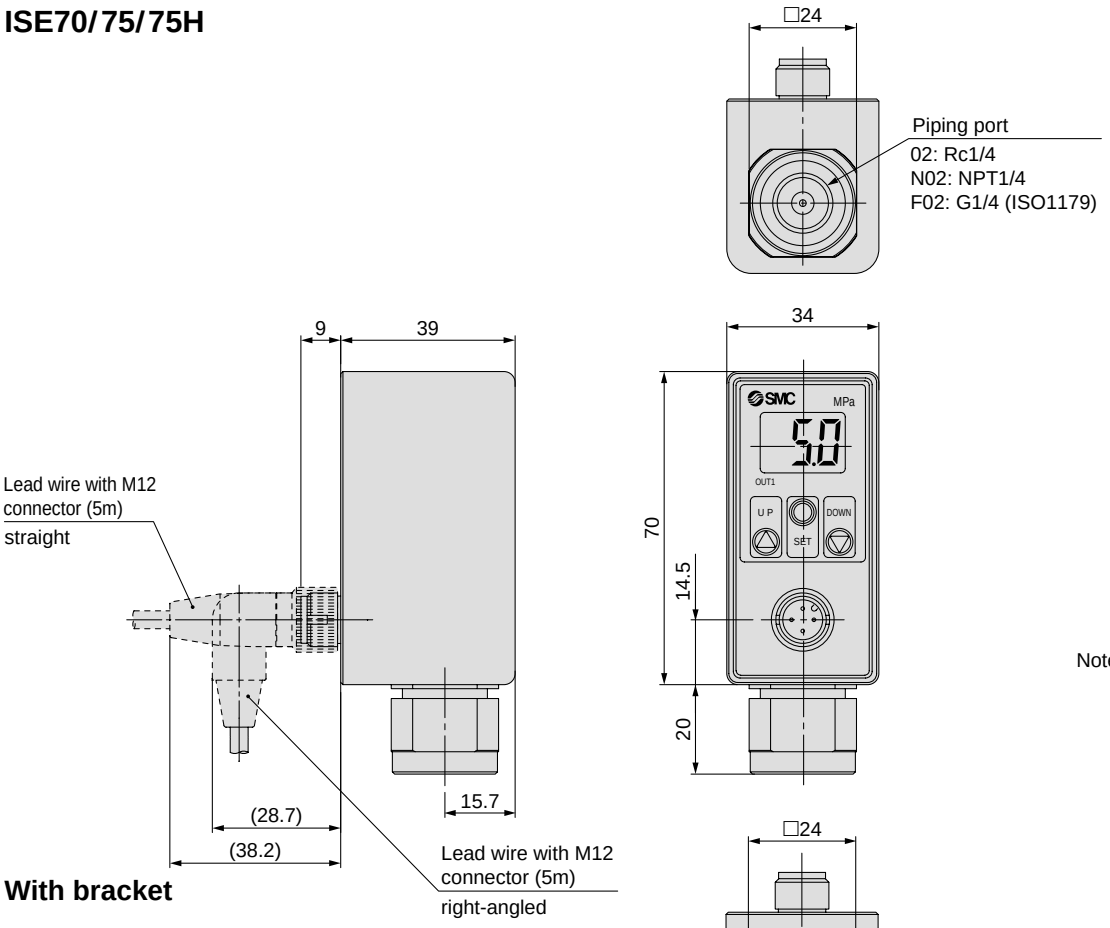
Take the following corrective solutions when error occurs.

Error description	LCD display	Condition	Solution
Over-current error	Er 1	A load current greater than 80 mA is turned on through either or both of the switch outputs.	Shut off the power supply. After eliminating the output factor that caused the excess current, turn the power supply back on.
Residual pressure error	Er 3	A pressure level greater than ±7% F.S. has been applied during zero adjustment. The switch will automatically return to measuring mode in three seconds, however. Note that the range of zero adjustment differs by ±1 digit due to switch-to-switch variations.	Bring the pressure back to atmospheric pressure and try using the zero out function.
Applied pressure error	HHH	Supply pressure exceeds the maximum set pressure.	Reduce/Increase supply pressure to within the set pressure range.
	LLL	Supply pressure is below the minimum set pressure.	
System error	Er 4	Internal data error	Shut off the power supply. Turn the power supply back on.
	Er 6	Internal data error	
	Er 7	Internal data error	
	Er 8	Internal data error	

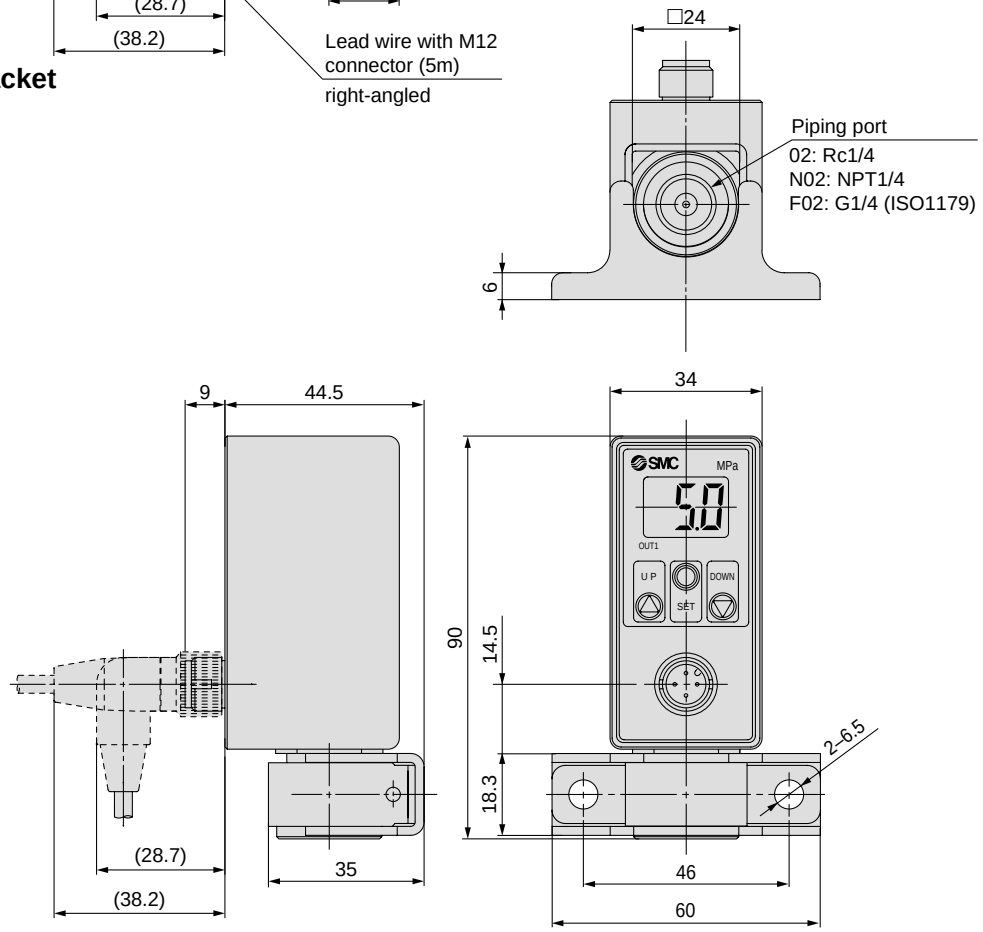
Note) If the switch will not recover to normal even after all of the above mentioned solutions have been applied, consult SMC for investigation.

Dimensions

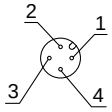
ISE70/75/75H



With bracket



Note) The connector faces down (toward the piping). Do not attempt to rotate the connector, as it is not rotatable.



Connector Pin Assignments

Output -43

1	Brown	DC (+)
2	White	OUT1 (PNP)
3	Blue	DC (–)
4	Black	OUT1 (NPN)

Output -65

1	Brown	DC (+)
2	White	NC
3	Blue	DC (–)
4	Black	OUT1 (PNP)

Series ISE70/75/75H
Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of **"Caution"**, **"Warning"**, or **"Danger"**. To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

⚠Caution : Operator error could result in injury or equipment damage.

⚠Warning : Operator error could result in serious injury or loss of life.

⚠Danger : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power – General rules relating to systems
Note 2) JIS B 8370: Pneumatic system axion

⚠ Warning

1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalogue information with a view to giving due consideration to any possibility of equipment failure when configuring a system.

2. Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.

1. Inspection and maintenance of machinery/equipment should only be performed once measures to prevent falling or runaway of the driver objects have been confirmed.
2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc.

4. Contact SMC if the product is to be used in any of the following conditions:

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, clutch and brake circuit in press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

Series ISE70/75/75H
Pressure Switch Precautions 1

Be sure to read before handling.

Design and Selection

⚠Warning

1. Operate the switch only within the specified voltage.

Use of the switch outside the range of the specified voltage can cause not only malfunction and damage of the switch but also electrocution and fire.

2. Do not exceed the maximum allowable load specification.

A load exceeding the maximum load specification can cause damage to the switch or shorten its operating life span.

3. Do not use a load that generates surge voltage.

Although surge protection is installed in the circuit at the output side of the switch, damage may still occur if a surge is applied repeatedly. When a surge generating load such as a relay or solenoid is directly driven, use a type of switch with a built-in surge absorbing element.

4. Since the type of applicable fluid varies depending on the product, be sure to verify the specifications.

The switches do not have an explosion proof rating. To prevent a possible fire hazard, do not use with flammable gases or fluids.

5. Strictly adhere to the rated pressure range and the maximum withstand pressure.

Operating the switch under pressures exceeding the range may cause the switch to malfunction.
If surge pressures exceeding the maximum withstand pressure are likely to arise, take measures to prevent such surge pressures from being applied to the switch. Operating the switch under pressures exceeding the maximum operating pressure may destroy the switch.

Mounting

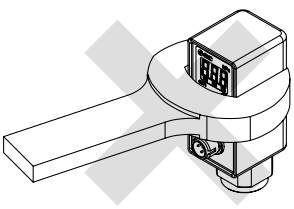
⚠Warning

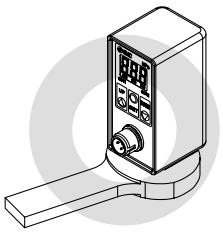
1. If the equipment is not operating properly, do not continue to use it.

Connect air and power after installation, repairs, or modifications, and verify proper installation. The switch should be checked for proper operation and possible leaks.

2. Apply wrench only to the metal part of the main housing when installing the pressure switch onto the system piping.

Do not apply a wrench to the body part as this may damage the switch.





Wiring

⚠Warning

1. Verify the colour and terminal number when wiring.

Incorrect wiring can cause the switch to be damaged and malfunction. Verify the color and the terminal number in the instruction manual when wiring.

2. Avoid repeatedly bending or stretching the lead wire.

Repeatedly applying bending stress or stretching force to the lead wire will cause it to break. If you believe the lead wire is damaged and likely to cause malfunctions, replace it.

3. Confirm proper insulation of wiring.

Make sure that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a switch.

Operating Environment

⚠Warning

1. Never use in the presence of explosive gases.

The switches do not have an explosion proof rating. Never use in the presence of an explosive gas as this may cause a serious explosion.

Maintenance

⚠Warning

1. Perform periodic inspections to ensure proper operation of the switch.

Unexpected malfunctions may cause possible danger.

2. Take precautions when using the switch for an interlock circuit.

When a pressure switch is used for an interlock circuit, devise a multiple interlock system to prevent trouble or malfunctioning. Verify the operation of the switch and interlock function on a regular basis.

Series ISE70/75/75H
Digital Pressure Switch Precautions 1

Be sure to read before handling.

Selection

⚠Warning

1. Monitor the internal voltage drop of the switch.

When operating below a specified voltage, it is possible that the load may be ineffective even though the pressure switch function is normal. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

Supply voltage − Internal voltage drop of switch > Minimum operating voltage of load

⚠Caution

1. Data of the digital pressure switch will be stored even after the power is turned off.

Input data (set pressure, etc.) will be stored in EEPROM so that the data will not be lost after the pressure switch is turned off. (Data will be stored for up to 100,000 hours after the power is turned off.)

Mounting

⚠Warning

1. Operation

Refer to the instruction manual for the operation of the digital pressure switch.

2. Pressure port

Do not introduce any wire or similar object to a pressure port as this may damage the pressure sensor and cause a malfunction.

Wiring

⚠Warning

1. Do not wire in conjunction with power lines or high voltage lines.

Wire separately from power lines and high voltage lines, avoiding wiring in the same conduit with these lines. Control circuits including switches may malfunction due to noise from these other lines.

2. Do not allow loads to short circuit.

Although digital pressure switches indicate excess current error if loads are short circuited, all incorrect wiring connections cannot be protected. Take precautions to avoid incorrect wiring.

3. Connect a DC(–) wire (blue) as close as possible to the DC power supply GND terminal.

Connecting the power supply away from the GND terminal can cause malfunctions due to noise from devices that are connected to the GND terminal.

4. Do not attempt to insert or pull the pressure sensor or its connector when the power is on.

5. A cable with a right-angled connector is also available.

The right-angled connector faces down (toward the piping). Do not attempt to rotate the connector, as it is not rotatable.

Pressure Sources

⚠Warning

1. Use the switch within the specified fluid and ambient temperature range.

Take measures to prevent moisture from freezing in circuits when below 5°C, since this may cause lead to a malfunction. The installation of an air dryer is recommended for eliminating condensate and moisture. Never use the switch in an environment where there are drastic temperature changes even when these temperatures are operated within the specified temperature range.

Operating Environment

⚠Warning

1. Do not use in an area where surges are generated.

When there are units that generate a large amount of surge in the area around pressure switches (e.g., solenoid type lifters, high frequency induction furnaces, motors), this may cause deterioration or damage to the switches' internal circuitry. Avoid and protect against sources of surge generation and crossed lines.

Maintenance

⚠Caution

1. Cleaning of the switch body

Wipe off dirt with a soft cloth. If dirt does not come off easily, use a neutral detergent diluted with water to dampen a soft cloth. Wipe the switch only after squeezing the excess water out of the dampened cloth. Then finish off by wiping with a dry cloth afterwards.

Specific Product Precautions 1

Be sure to read before handling. Refer to pages 7 through 9 for safety instructions and pressure switch precautions.

Handling

⚠Warning

1. **Do not drop, bump, or apply excessive impacts (980m/s^2) while handling. Although the body of the sensor may not be damaged, the internal parts of the sensor could be damaged and lead to a malfunction.**
2. **The tensile strength of the cord is 50N. Applying a greater pulling force on it can cause a malfunction. When handling, hold the body of the sensor––do not dangle it from the cord.**
3. **Do not exceed the screw-in torque of 40 N·m for ISE70 and 80 N·m for ISE75/75H when connecting the pipe to the switch. Exceeding these values may cause the switch to malfunction.**
4. **Do not use pressure sensors with corrosive and/poisonous or flammable gases or liquids.**
5. **When connecting the pipe to the switch, engage the wrench horizontally to the chamfered barrel of the fitting. Be careful not to apply excessive force to the switch's main unit.**

Connection

⚠Warning

1. **Incorrect wiring can damage the switch and cause a malfunction or erroneous switch output.**
2. **Connections should be done while the power is turned off.**
3. **Wire separately from power lines and high voltage lines, avoiding wiring in the same conduit with these lines. Malfunctions may occur due to noise from these other lines.**
4. **If a commercial switching regulator is used, make sure that the F.G. terminal is grounded.**

Operating Environment

⚠Warning

1. **Our pressure switches are CE marked; however, they are not equipped with surge protection against lightning. Lightning surge countermeasures should be applied directly to system components as necessary.**
2. **Our pressure switches do not have an explosion proof rating. Never use in the presence of an explosive gas as this may cause a serious explosion.**

⚠Caution

1. **Do not use in an environment with spattering liquid of oil or solvent.**

Pressure Sources

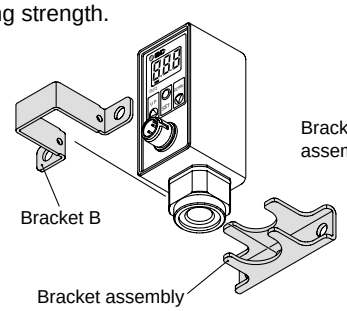
⚠Warning

1. **Regarding poisonous, corrosive or combustible gases**
   Do not use the switch for poisonous or corrosive gases. Also note that the switch is not explosion-proof.
2. **Regarding use of the switch for fluids**
   Do not use the switch for any corrosive or flammable gas or fluid (ISE70 series).
   Do not use the switch for any fluid capable of corroding SUS430 or SUS630 stainless steel; or for any flammable gas or liquid (ISE75/75H series).
   (For information on the corrosiveness of fluids, contact the fluid manufacturers.)

Mounting

⚠Caution

1. **Connecting pipe to the switch**
   When connecting the pipe to the switch, apply a torque of 13.6 N·m or greater for the ISE70 series and a torque of 25 N·m or greater for the ISE75/75H series.
2. **Bracket-mounting the switch**
   Interlock the neck of the switch's piping port between the bracket assembly and bracket B. Using two M6 screws, mount the switch onto a wall. If the panel thickness is less than 5 mm, use nuts or other alternative means to increase the mounting strength.



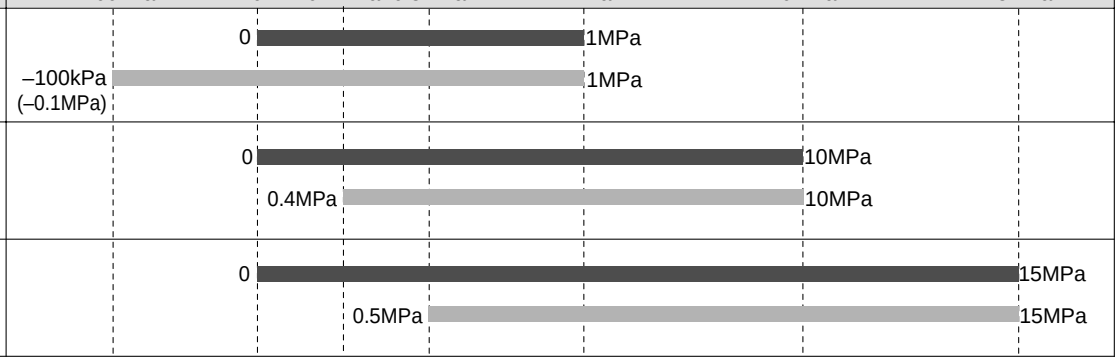
Set pressure range and rated pressure range

⚠ Caution

1. Set the pressure within the rated pressure range.

The set pressure range is the range of pressure that is possible in setting.
The rated pressure range is the range of pressure that satisfies the specifications (accuracy, linearity, etc.) on the sensor.
Although it is possible to set a value outside the rated pressure range, the specifications will not be guaranteed even if the value stays within the set pressure range.

Switch		Pressure range
For 1MPa (For Air)	**ISE70**	–100kPa (–0.1MPa) to 1MPa; 0 to 1MPa
For 10MPa (For General Fluids)	**ISE75**	0.4MPa to 10MPa; 0 to 10MPa
For 15MPa (For General Fluids)	**ISE75H**	0.5MPa to 15MPa; 0 to 15MPa



The ISE75/75H switch shows zero (0) when the pressure being applied goes below the lower limit of the set pressure range.

Rated pressure range of switch
Set pressure range of switch

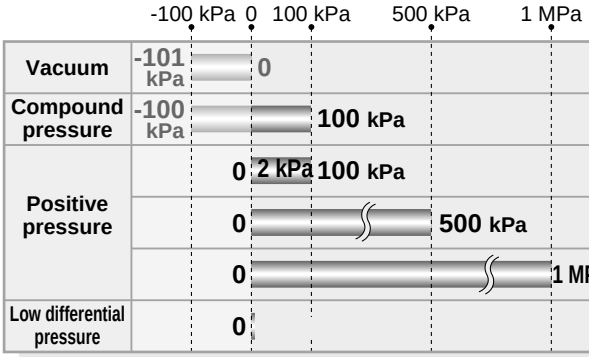
PSE

Remote Type Pressure Sensors/

		Pressure Sensors				Controllers	
	Model	PSE530  P. 1	PSE540  P. 4	PSE550  P. 7	PSE560  P. 10	PSE200  P. 13	PSE300  P. 19
Basic Specifications	Fluid	Air			General fluids		
	Rated pressure range (Minimum display)						
	Repeatability % (F.S.)	±1	±0.2	±0.3	±0.2	±0.1	
	Voltage	12 to 24 VDC					
	No. of outputs for a switch					5	2
	Analogue output	1 to 5 V		1 to 5 V 4 to 20 mA			1 to 5 V 4 to 20 mA
	Operating temperature °C	0 to 50			-10 to 60	0 to 50	
Functions	Digital display					1-colour	2-colour
	Enclosure	IP40			IP65	Front parts IP65 Others IP40	IP40
	Wiring specification	Connector	Grommet			Connector	
	Major setting function					Key lock, Peak/Bottom values holding, Auto preset, Auto shift, Display calibration, Anti-chattering	
Options	Connection threads	M reducer	M R, NPT reducer	Resin piping	R, NPT, Rc URJ,TSJ		
	Int'l standards	CE	CE, UL/CSA			CE	CE, UL/CSA
	Wiring: e-con	●	●	●	●	●	●
	Wiring: Flexible cable		●	●			
	Mounting: Direct	●	●	●	●	●	
	Mounting: With bracket			●			●
	Mounting: Panel mount					●	●

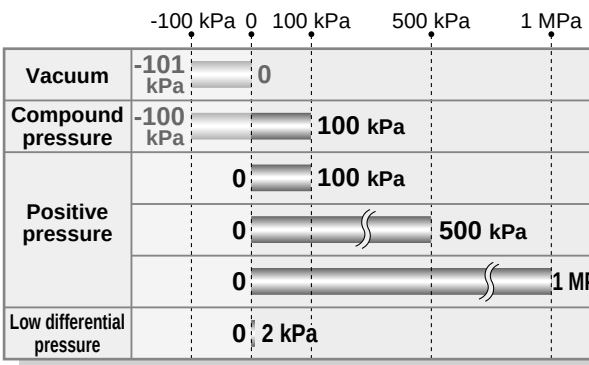
Controllers

Rated pressure range
Sensors



	PSE53□	PSE54□	PSE55□	PSE56□
Vacuum	PSE531	PSE541	—	PSE561
Compound pressure	PSE533	PSE543	—	PSE563
Positive pressure (0 to 2 kPa to 100 kPa)	PSE532	—	—	—
Positive pressure (0 to 500 kPa)	—	—	—	PSE564
Positive pressure (0 to 1 MPa)	PSE530	PSE540	—	PSE560
Low differential pressure	—	—	PSE550	—

Minimum display value
Controllers



	PSE200	PSE300
Vacuum	0.1 kPa	0.1 kPa
Compound pressure	0.1 kPa	0.2 kPa
Positive pressure (0 to 100 kPa)	0.1 kPa	0.1 kPa
Positive pressure (0 to 500 kPa)	—	1 kPa
Positive pressure (0 to 1 MPa)	0.001 MPa	0.001 MPa
Low differential pressure	—	0.01 kPa

Main Functions (For details, see page 25.)

Key lock	Locks the keys from functioning.
Peak/Bottom values holding	Displays the maximum and minimum values being set and can keep those values on the display.
Auto preset	Able to set the pressure automatically. In the case of adsorption confirmation, it memorises the pressure when adsorbed and released. By repeating several times, the optimum values are calculated automatically.
Auto shift	Stable switch output is available even though the supply pressure may fluctuate. Automatically corrects the set value in accordance with the fluctuations in the supply pressure.
Display calibration	Able to adjust the displayed value (±5%) and justify distribution of the values displayed on respective pressure switch.
Anti-chattering	Prevents malfunction due to sharp pressure fluctuations. The detection of momentary pressure fluctuation as abnormal pressure can be prevented by changing the setting of the response time.

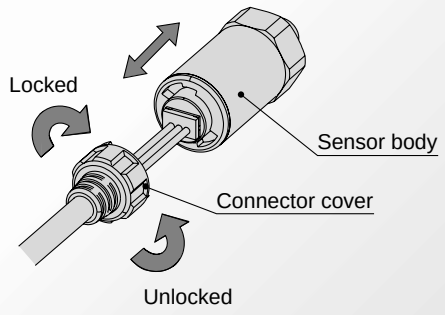
PSE530

Compact Pressure Sensor for Pneumatics

Series PSE530

Series	Rated pressure range
	-100 kPa / 0 / 100 kPa / 500 kPa / 1 MPa
PSE530	0 to 1 MPa
PSE531	-101 kPa to 0
PSE532	0 to 101 kPa
PSE533	-101 kPa to 101 kPa

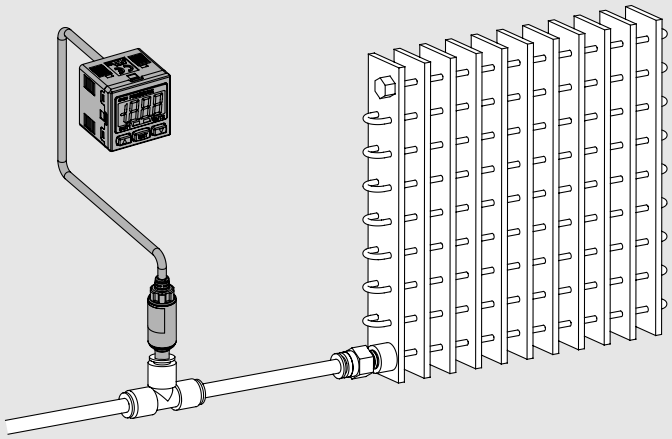
Connection



Application Example

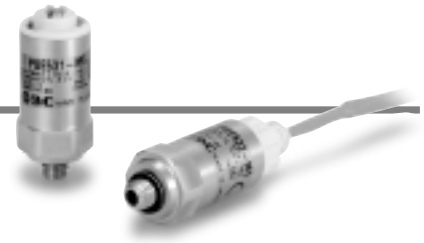
Inspection of a radiator

***Series* PSE532 + PSE300**



Low pressure sensor (PSE532-□) is used to detect minute differentiations. Auto shift function reduces influence of fluctuations in the supply pressure.

Pressure Sensor
Series PSE530



How to Order

PSE53 0 – M5 – □

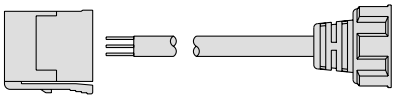
Sensor range

0	High pressure [0 to 1 MPa]
1	Vacuum [0 to –101 kPa]
2	Low pressure [0 to 101 kPa]
3	Compound pressure [–101 to 101 kPa]

Port size

M5	M5
R06	ø6 reducer
R07	1/4 inch reducer

Option

Nil	None
L	Sensor cable (3 m) 
C2L	Connector for pressure sensor controller (1 pc.) + Sensor cable (3 m) 

Note) At the factory, the connector is not attached to the cable, but packed together with it for shipment.

Option/Part No.

When only optional parts are required, order using the part numbers listed below.

Description	Part no.	Note
Connector for pressure sensor controller	ZS-28-C	1pc. per set
Sensor cable	ZS-26-F	Cable length: 3 m
Connector for pressure sensor controller + Sensor cable	ZS-26-J	Cable length: 3 m The connector is not connected to the cable at the time of shipment.

Specifications

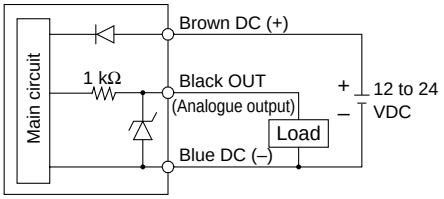
Model		PSE530	PSE531	PSE532	PSE533
Rated pressure range		0 to 1 MPa	0 to –101 kPa	0 to 101 kPa	–101 to 101 kPa
Proof pressure		1.5 MPa	500kPa		
Applicable fluid		Air, Non-corrosive gas, Non-flammable gas			
Power supply voltage		12 to 24 VDC, Ripple (p-p) 10% or less (With power supply polarity protection)			
Current consumption		15 mA or less (no load)			
Output specification		Analogue output 1 to 5 V, Output impedance: Approx. 1 kΩ			
Accuracy (Ambient temperature of 25°C)		±2% F.S. or less			
Linearity		±1% F.S. or less			
Repeatability		±1% F.S. or less			
Power supply voltage effect		±1% F.S. or less based on the analogue output at 18 V ranging from 12 to 24 VDC			
Environmental resistance	**Enclosure**	IP40			
	Temperature range	0 to 50°C; Stored: –10 to 70°C (No freezing or condensation)			
	Withstand voltage	1000 VAC, 50/60Hz for 1 minute between live parts and case			
	Insulation resistance	5 MΩ between live parts and case (at 500 VDC Mega)			
	Vibration resistance	10 to 500 Hz 1.5 mm amplitude or 98 m/s² acceleration, X, Y, Z directions for 2 hours each (De-energised)			
	Impact resistance	980 m/s² in X, Y, Z directions, 3 times each (De-energised)			
Temperature characteristics		±2% F.S. or less (Based on 25°C)			
Sensor cable/Option		Halogen-free heavy-duty cord, ø2.7, 0.15 mm², 3 cores, 3 m			

Piping Specifications

Model		M5	R06	R07
Port size		M5 male thread	ø6 reducer type	1/4 inch reducer type
Wetted parts material		Pressure sensor: Silicon, O-ring: NBR		
		Body: Stainless steel 304	Body: PBT	
Weight	With sensor cable (3 m)	41 g	38 g	
	Without sensor cable	7 g	3.8 g	

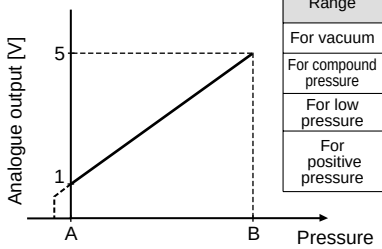
Internal Circuit

PSE53□
Voltage output type
1 to 5 V
Output impedance
Approx. 1 kΩ



Analogue Output

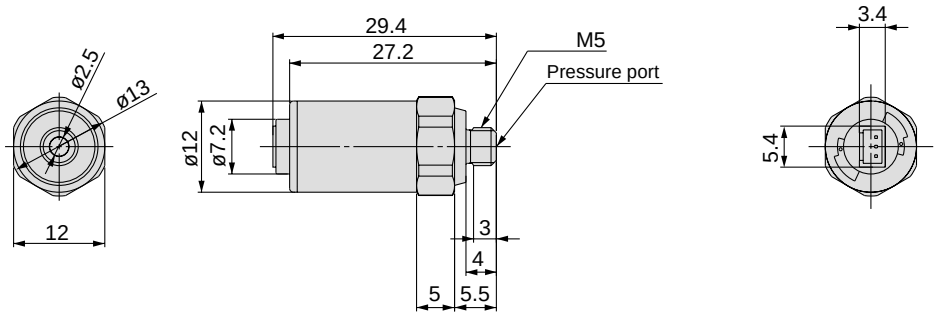
1 to 5 VDC



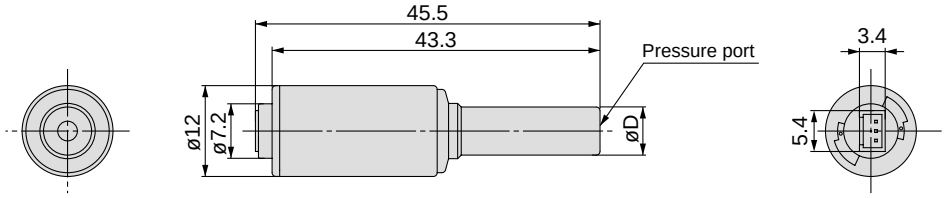
Range	Rated pressure range	A	B
For vacuum	0 to –101 kPa	0	–101 kPa
For compound pressure	–101 kPa to 101 kPa	–101 kPa	101 kPa
For low pressure	0 to 101 kPa	0	101 kPa
For positive pressure	0 to 1 MPa	0	1 MPa
	0 to 500 kPa	0	500 kPa

Dimensions

PSE53□-M5



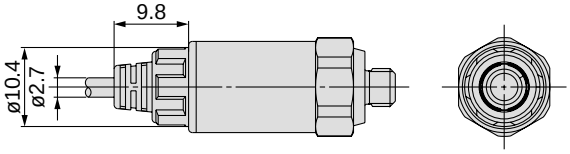
PSE53□-R06
R07



(mm)

Model	Applicable fitting size (D)
PSE53□-R06	6
PSE53□-R07	1/4"

With sensor cable

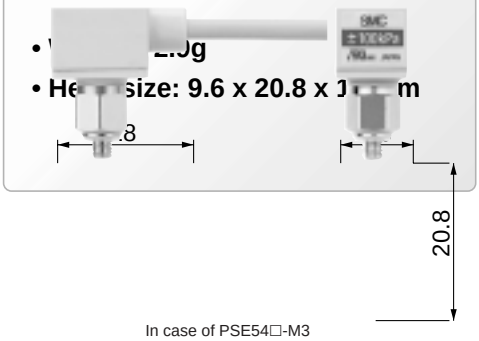


PSE540

Compact Pressure Sensor for Pneumatics

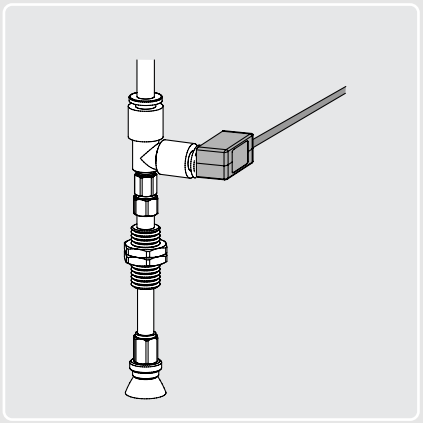
Series *PSE540*

Series	Rated pressure range
	-100 kPa / 0 / 100 kPa / 500 kPa / 1 MPa
PSE540	0 … 1 MPa
PSE541	-101 kPa … 0
PSE543	-100 kPa … 100 kPa

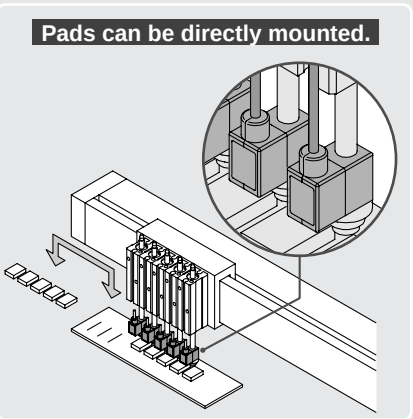


In case of PSE54□-M3

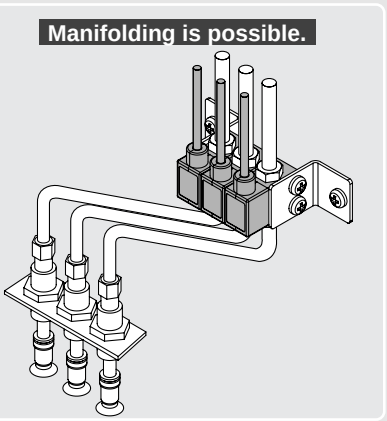
Application Example



Pads can be directly mounted.

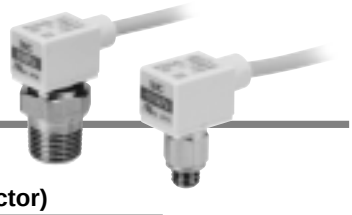


Manifolding is possible.



Compact Pressure Sensor for Pneumatics

Series PSE540



How to Order

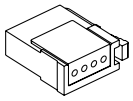
Sensor range

0	Positive pressure [0 to 1 MPa]
1	Vacuum [0 to –101 kPa]
3	Compound pressure [–100 to 100 kPa]

Accuracy

Nil	±2%F.S.
A	±1%F.S.

Option (Connector)

Nil	None
C2	Connector for pressure sensor controller (1 pc.) 

PSE54 1 □ M3 □

Port size

M3	M3	
M5	M5	
01	R 1/8 (With M5 female thread)	
N01	NPT1 /8 (With M5 female thread)	
R04	ø4 plug-in reducer	
R06	ø6 plug-in reducer	

IM5	M5 female thread, through type	
IM5H	M5 female thread, through type (With mounting hole)	

Note) At the factory, the connector is not attached to the cable, but packed together with it for shipment.

Option/Part No.

Description	Part no.	Note
Connector for pressure sensor controller	ZS-28-C	1 pc.

Specifications

Conforms to CE marking and UL (CSA) standards.

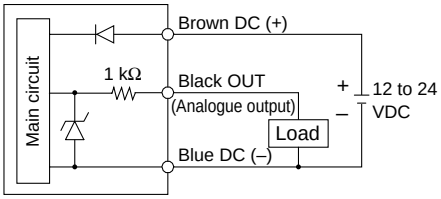
Model		PSE540	PSE541	PSE543
Rated pressure range		0 to 1 MPa	0 to –101 kPa	–100 to 100 kPa
Proof pressure		1.5 MPa	500 kPa	
Applicable fluid		Air, Non-corrosive gas, Non-flammable gas		
Power supply voltage		12 to 24 VDC, Ripple (p-p) 10% or less (With power supply polarity protection)		
Current consumption		15 mA or less		
Output specification		Analogue output 1 to 5 V, Output impedance: Approx. 1 kΩ		
Accuracy (Ambient temperature of 25°C)		PSE54□: ±2% F.S. or less PSE54□A: ±1% F.S. or less		
Linearity		±0.7%F.S. or less	±0.4% F.S. or less	
Repeatability		±0.2% F.S. or less		
Power supply voltage effect		±0.8% F.S. or less		
Environmental resistance	**Enclosure**	IP40		
	Operating temperature range	Operating: 0 to 50°C, Stored: –20 to 70°C (No freezing or condensation)		
	Operating humidity range	Operating/Stored: 35 to 85% RH (No condensation)		
	Withstand voltage	1000 VAC, 50/60 Hz for 1 minute between live parts and case		
	Insulation resistance	50 MΩ or more between live parts and case (at 500 VDC Mega)		
	Vibration resistance	10 to 500 Hz at whichever is smaller of 1.5 mm amplitude or 98 m/s^2 acceleration, in X, Y, Z directions, for 2 hours each (De-energised)		
	Impact resistance	980 m/s^2 in X, Y, Z directions, 3 times each (De-energised)		
Temperature characteristics		±2% F.S. or less (Based on 25°C)		

Piping Specifications

Model		M3	M5	01	N01	R04	R06	IM5	IM5H
Port size		M3	M5	R1/8 M5	NPT1/8 M5	ø4 plug-in reducer	ø6 plug-in reducer	M5 female thread, through type	M5 female thread, through type (with mounting hole)
Material	**Case**	Resin case: PBT Fitting: Stainless steel 303		Resin case: PBT Fitting: C3604BD		PBT		Resin case: PBT Fitting: A6063S-T5	
	Pressure sensing section	Pressure sensor: Silicon, O-ring: NBR							
Sensor cable		3-wire elliptical cable (0.15 mm^2)							
Weight	**With sensor cable**	42.4 g	42.7 g	49.3 g		41.4 g	41.6 g	43.3 g	44.1 g
	Without sensor cable	2.9 g	3.2 g	9.8 g		1.9 g	2.1 g	3.8 g	4.6 g

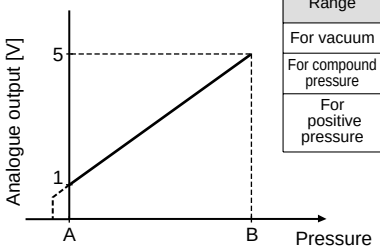
Internal Circuit

PSE54□
Voltage output type
1 to 5 V
Output impedance
Approx. 1 kΩ



Analogue Output

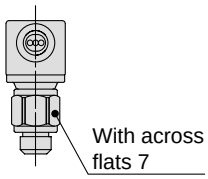
1 to 5 VDC

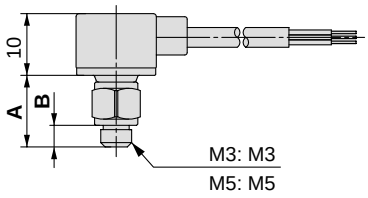


Range	Rated pressure range	A	B
For vacuum	0 to –101 kPa	0	–101 kPa
For compound pressure	–100 kPa to 100 kPa	–100 kPa	100 kPa
For positive pressure	0 to 1 MPa	0	1 MPa

Dimensions

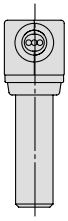
PSE54□-M3 / M5

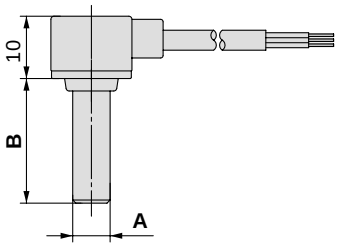




	PSE54□-M3	PSE54□-M5
A	10.8	11.5
B	3	3.5

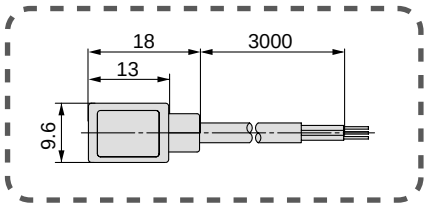
PSE54□-R04 / R06



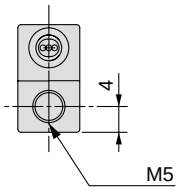


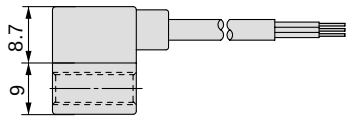
	PSE54□-R04	PSE54□-R06
A	ø4	ø6
B	18	20

Common dimensions

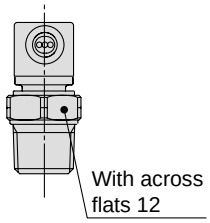


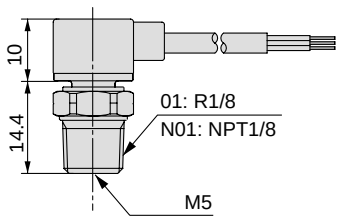
PSE54□-IM5



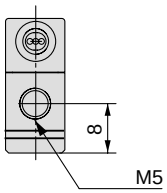


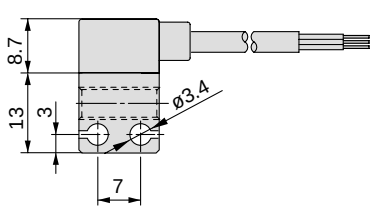
PSE54□-01 / N01





PSE54□-IM5H





PSE550

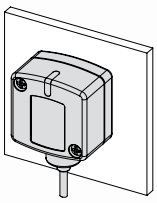
Low Differential Pressure Sensor

Series PSE550

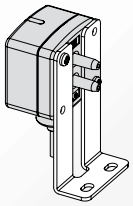
Series	Rated pressure range
PSE550	0 to 2 kPa (0, 1 kPa, 2 kPa)

With LED display for confirming energisation

2 types of mountings



Mounting directly



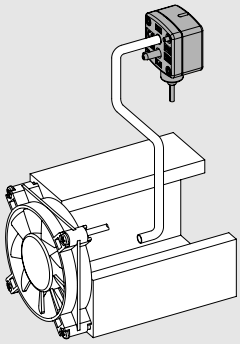
Mounting with bracket

Accuracy
±1%F.S.

Proof pressure
65 kPa

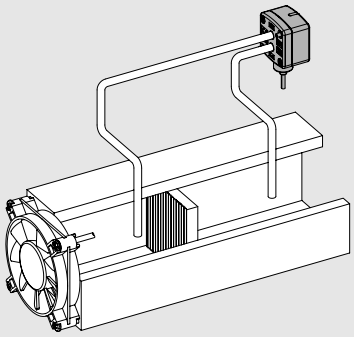
Application Example

Flow control
Series **PSE550**



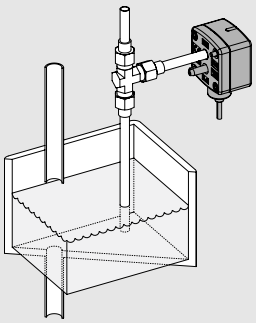
Can control air flow by monitoring the flow rate inside the duct.

Filter clogging monitoring
Series **PSE550**



Can control filtration and replacement periods by monitoring the clogging of the filter.

Liquid level detection
Series **PSE550**



Can detect the liquid level through changes in the purge pressure.

Low Differential Pressure Sensor

Series PSE550

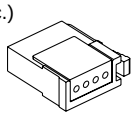
How to Order

PSE550 □ □ □

Output specifications

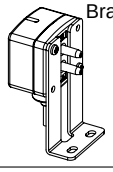
Nil	Voltage output type 1 to 5 V
28	Current output type 4 to 20 mA

Option 2 (Connector)

Nil	None
C2	Pressure sensor controller Connector for PSE300 (1 pc.) 

Note 1) Current output type cannot be connected to the Series PSE300.
Note 2) At the factory, the connector is not attached to the cable, but packed together with it for shipment.

Option 1 (Bracket)

Nil	None
A	Bracket 

Note) The bracket is not attached in the factory, but packed together for shipment.

Option/Part No.

Description	Part no.	Note
Bracket	ZS-30-A	With M3 x 5L (2 pcs.)
Pressure sensor controller Connector for PSE300	ZS-28-C	1 pc.

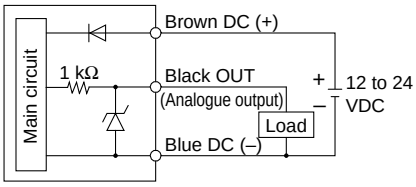
Specifications

Model		PSE550	PSE550-28
Rated differential pressure range		0 to 2 kPa	
Operating pressure range		–50 to 50 kPa Note)	
Proof pressure		65 kPa	
Applicable fluid		Air, Non-corrosive gas, Non-flammable gas	
Power supply voltage		12 to 24 VDC, Ripple (p-p) 10% or less (With power supply polarity protection)	
Current consumption		15 mA or less	—
Output specification		Analogue output 1 to 5 VDC (Within rated differential pressure range) Output impedance: Approx. 1 kΩ	Analogue output 4 to 20 mADC (Within rated differential pressure range) Allowable load impedance: 500 Ω or less (at 24 VDC) 100 Ω or less (at 12 VDC)
Accuracy (Operating temperature of 25°C)		±1% F.S. or less	
Linearity		±0.5% F.S. or less	
Repeatability		±0.3% F.S. or less	
Indication light		Orange light is on (When energised)	
Environmental resistance	**Enclosure**	IP40	
	Operating temperature range	Operating: 0 to 50°C, Stored: –20 to 70°C (No freezing or condensation)	
	Operating humidity range	Operating/Stored: 35 to 85% RH (No condensation)	
	Withstand voltage	1000 VAC, 50/60 Hz for 1 minute between live parts and case	
	Insulation resistance	50 MΩ or more between live parts and case (at 500 VDC Mega)	
	Vibration resistance	10 to 150 Hz at whichever is smaller of 1.5 mm amplitude or 100 m/s^2 acceleration, in X, Y, Z directions, for 2 hours each (De-energised)	
	Impact resistance	300 m/s^2 in X, Y, Z directions, 3 times each (De-energised)	
Temperature characteristics		±3% F.S. or less (Based on 25°C)	
Port size		ø4.8 (ø4.4 in the end) resin piping (Applicable to I.D. ø4 air tubing)	
Material of wetted parts		Resin pipe: Nylon, Piston area of sensor: Silicon	
Sensor cable		3-wire elliptical cable (0.15 mm^2)	2-wire elliptical cable (0.15 mm^2)
Weight	**With sensor cable**	75 g	
	Without sensor cable	35 g	

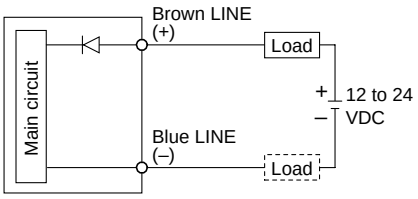
Note) Can detect differential pressure from 0 to 2 kPa within the range of –50 to 50 kPa.

Internal Circuit

PSE550
Voltage output type
1 to 5 V
Output impedance
Approx. 1 kΩ



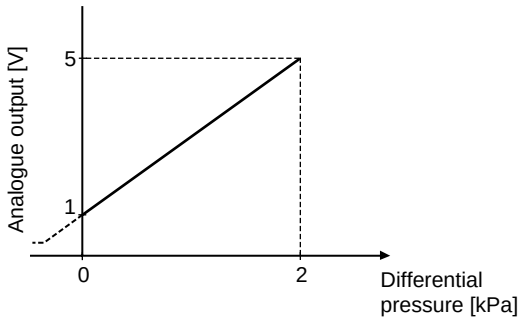
PSE550-28
Current output type
4 to 20 mA
Allowable load impedance
500 Ω or less (at 24 VDC)
100 Ω or less (at 12 VDC)



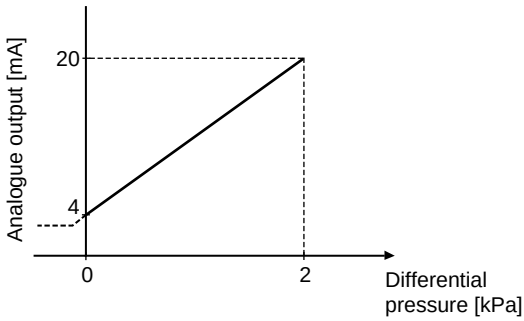
∗ Install the load either on the LINE (+) or LINE (–) side.

Analogue Output

1 to 5 VDC

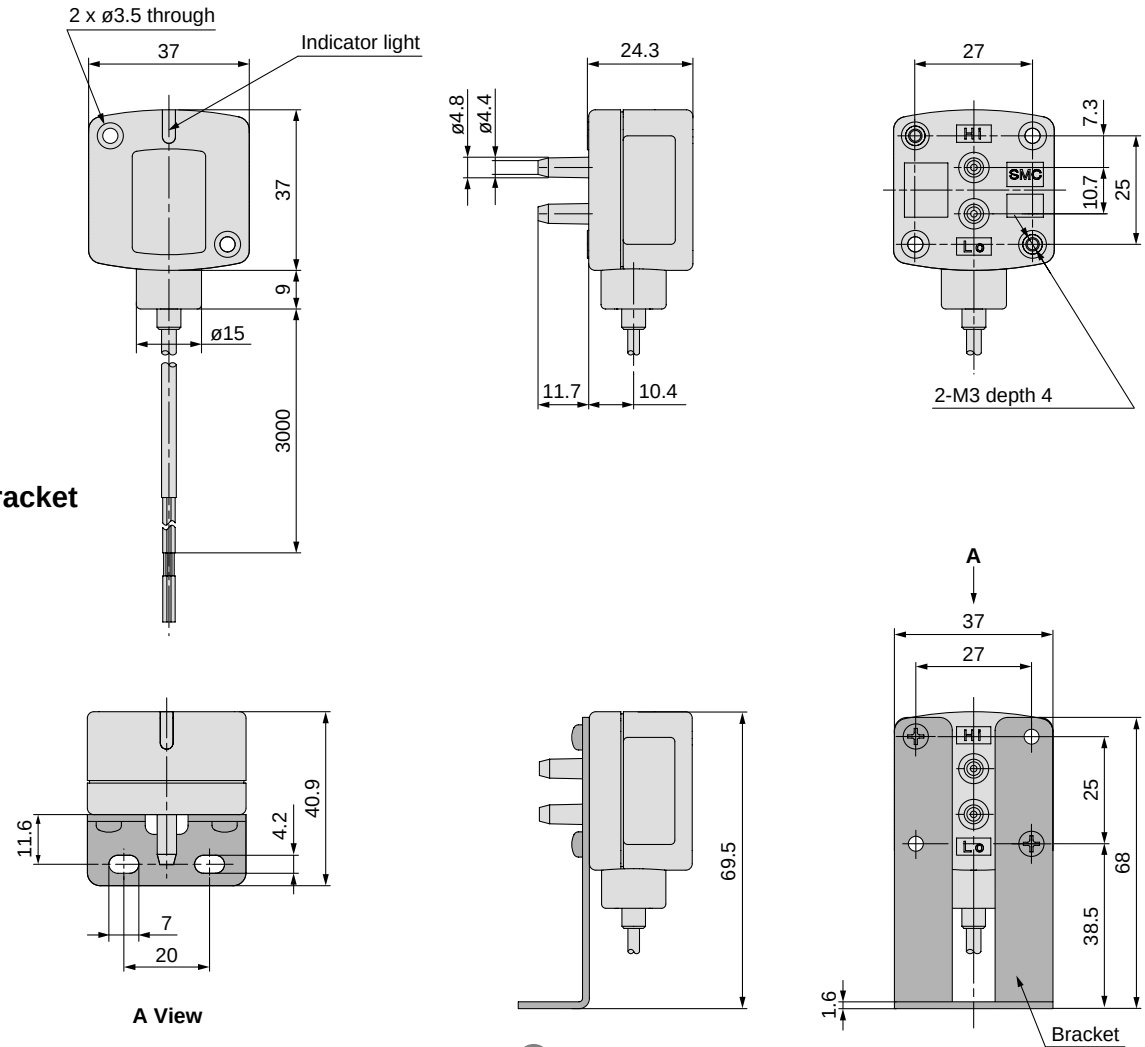


4 to 20 mADC



Dimensions

With bracket



PSE560

Pressure Sensor for General Fluids

Series PSE560

Series	Rated pressure range
	-100 kPa / 0 / 100 kPa / 500 kPa / 1 MPa
PSE560	0 to 1 MPa
PSE561	-101 kPa to 0
PSE563	-100 kPa to 100 kPa
PSE564	0 to 500 kPa

Applicable fluids example

- Argon
- Air containing drainage
- Ammonia
- Freon
- Nitrogen
- Hydraulic oil
- Silicon oil
- Carbon dioxide
- Lubricating oil
- Fluorocarbon

Wetted parts material
Stainless steel 316L

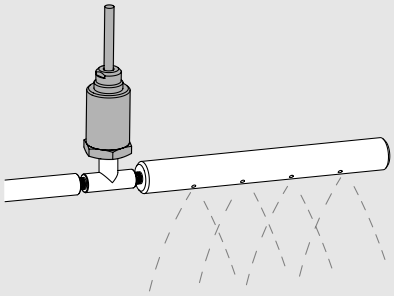
IP65

Copper-free

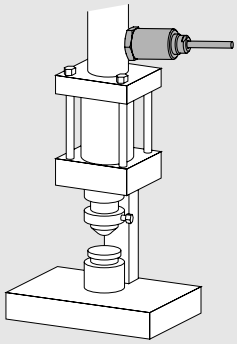
Oil-free
(Single diaphragm construction)

Application Example

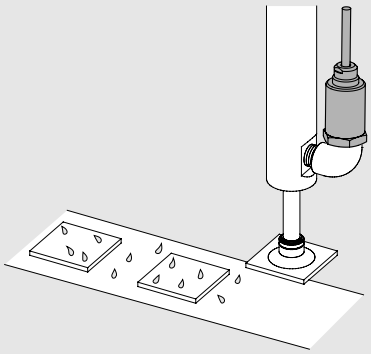
Washing line



Verification of caulking by hydraulic cylinders

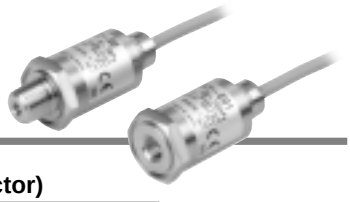


Adsorption confirmation of works with moisture



Pressure Sensor for General Fluids

Series PSE560



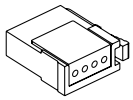
How to Order

Sensor range

0	Positive pressure (0 to 1 MPa)
1	Vacuum (0 to –101 kPa)
3	Compound pressure (–100 to 100 kPa)
4	Positive pressure (0 to 500 kPa)

PSE56 0 — 01 — □ — □

Option (Connector)

Nil	None
C2	Connector for pressure sensor controller (1 pc.) 

Note 1) Current output type cannot be connected to PSE20□ and PSE30□.
Note 2) At the factory, the connector is not attached to the cable, but packed together with it for shipment.

Port size

01	R 1/8 (With M5 female thread)
02	R 1/4 (With M5 female thread)
C01	Rc 1/8
N01	NPT 1/8 (With M5 female thread)
N02	NPT 1/4 (With M5 female thread)
A2	URJ 1/4
B2	TSJ 1/4

Output specifications

Nil	Voltage output type 1 to 5 V
28	Current output type 4 to 20 mA

Option/Part No.

Description	Part no.	Note
Connector for pressure sensor controller	ZS-28-C	1 pc.

Specifications

Conforms to CE marking and UL (CSA) standards.

Model	PSE560	PSE561	PSE563	PSE564
Rated pressure range	0 to 1 MPa	0 to –101 kPa	–100 to 100 kPa	0 to 500 kPa
Proof pressure	1.5 MPa	500 kPa	500 kPa	750 kPa

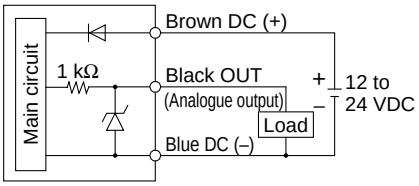
Model		PSE56□-□	PSE56□-□-28
Applicable fluid		Fluid, including gas, that will not corrode stainlesss steel 316L	
Power supply voltage		12 to 24 VDC, Ripple (p-p) 10% or less (With power supply polarity protection)	
Current consumption		10 mA or less	—
Output specification		Analogue output 1 to 5 V (Within rated pressure range) Output impedance: Approx. 1 kΩ	Analogue output 4 to 20 mA Allowable load impedance: 500 Ω or less (at 24 VDC) 100 Ω or less (at 12 VDC)
Accuracy (Ambient temperature of 25°C)		±1% F.S. or less	
Linearity		±0.5% F.S. or less	
Repeatability		±0.2% F.S. or less	
Power supply voltage effect		±0.3% F.S. or less	
Environmental resistance	**Enclosure**	IP65	
	Operating temperature range	Operating: –10 to 60°C, Stored: –20 to 70°C (No freezing or condensation)	
	Operating humidity range	Operating/Stored: 35 to 85% RH (No condensation)	
	Withstand voltage	250 VAC for 1 minute between live parts and case	
	Insulation resistance	50 MΩ or more between live parts and case (at 50 VDC Mega)	
	Vibration resistance	10 to 150 Hz at whichever is smaller of 1.5 mm amplitude or 20 m/s^2 acceleration, in X, Y, Z directions, for 2 hours each (De-energised)	
	Impact resistance	500 m/s^2 in X, Y, Z directions, 3 times each (De-energised)	
Temperature characteristics		±2% F.S. or less (0 to 50°C: Based on 25°C), ±3% F.S. or less (–10 to 60°C: Based on 25°C)	

Piping Specifications

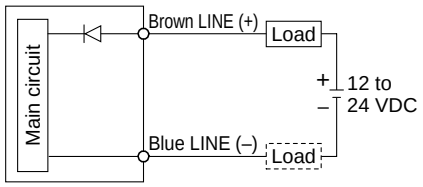
Model		01	02	N01	N02	C01	A2	B2
Port size		R 1/8 M5	R 1/4 M5	NPT 1/8 M5	NPT 1/4 M5	Rc 1/8	URJ 1/4	TSJ 1/4
Material		Case: C3604 + nickel plated, Piping port/pressure sensor: Stainless steel 316L						
Sensor cable		PSE56□-□: Oil proof 3-wire heavy-duty vinyl cable with air tube (0.2 mm^2) PSE56□-□-28: Oil proof 2-wire heavy-duty vinyl cable with air tube (0.2 mm^2)						
Weight	**With sensor cable**	193 g	200 g	194 g	201 g	187 g	203 g	193 g
	Without sensor cable	101 g	108 g	102 g	109 g	95 g	111 g	101 g

Internal Circuit

PSE56□-□
Voltage output type
1 to 5 V
Output impedance
Approx. 1 kΩ

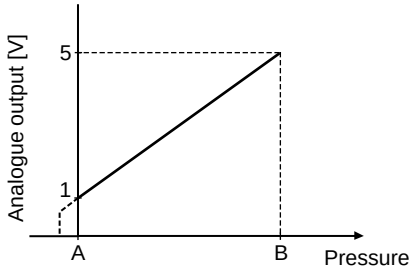


PSE56□-□-28
Current output type
4 to 20 mA
Allowable load impedance
500 Ω or less (at 24 VDC)
100 Ω or less (at 12 VDC)

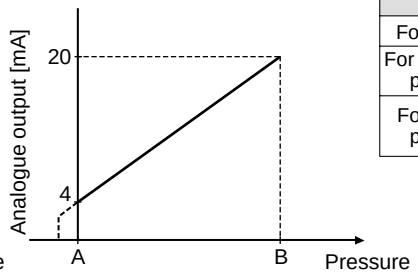


∗ Install the load either on the LINE (+) or LINE (–) side.

1 to 5 VDC



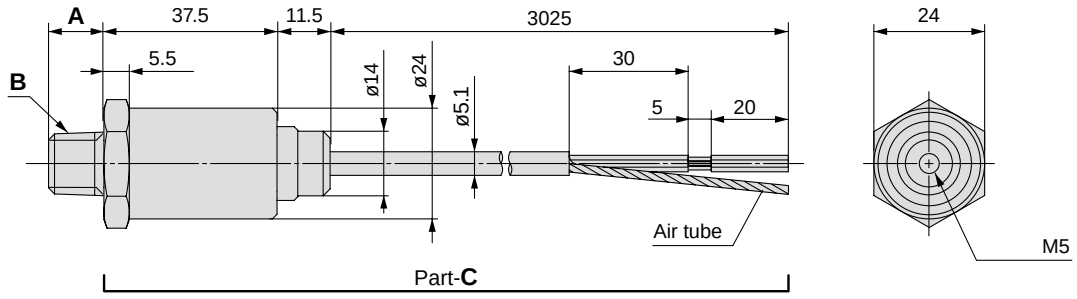
4 to 20 mADC



Range	Rated pressure range	A	B
For vacuum	0 to –101 kPa	0	–101 kPa
For compound pressure	–100 kPa to 100 kPa	–100 kPa	100 kPa
For positive pressure	0 to 1 MPa	0	1 MPa
	0 to 500 kPa	0	500 kPa

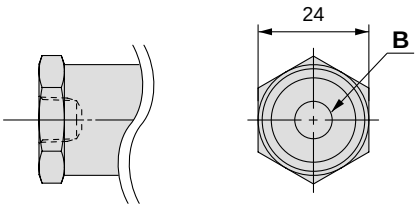
Dimensions

PSE56□-$^{01}_{02}$ / PSE56□-$^{N01}_{N02}$

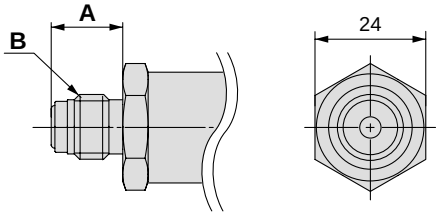


∗ The dimensions of part **C** are common to all PSE56□ models.

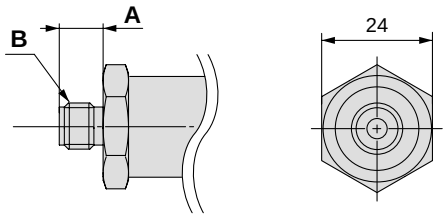
PSE56□-C01



PSE56□-A2



PSE56□-B2



Model	A	B
PSE56□-01	8.2	R 1/8
PSE56□-02	12	R 1/4
PSE56□-N01	9.2	NPT 1/8
PSE56□-N02	12.2	NPT 1/4
PSE56□-C01	—	Rc 1/8
PSE56□-A2	15.5	URJ 1/4
PSE56□-B2	9.5	TSJ 1/4

PSE200

Multi-channel, Digital Pressure Sensor Controller

Series PSE200

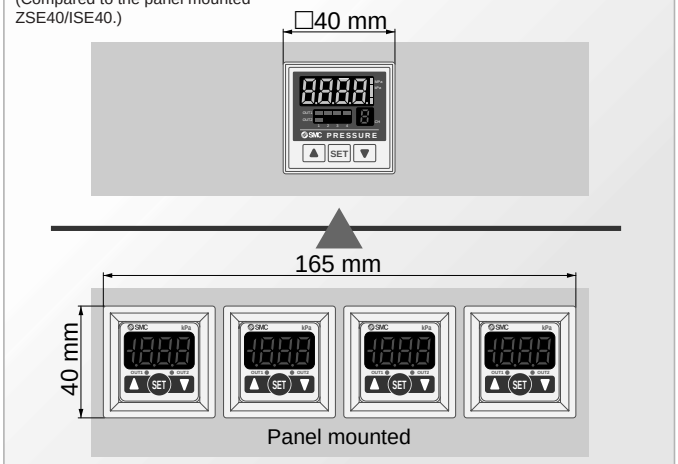
Applicable sensors				Rated pressure range
PSE53□	PSE54□	PSE55□	PSE56□	-100 kPa / 0 / 100 kPa / 1 MPa
PSE531	**PSE541**	—	**PSE561**	-101 kPa to 0
PSE533	**PSE543**	—	**PSE563**	-100 kPa to 100 kPa
PSE530	**PSE540**	—	**PSE560**	0 to 1 MPa
PSE532	—	—		0 to 100 kPa

A single controller monitors up to 4 pressure sensors

- **Sensor input: 4 inputs**
- **Switch output: 5 outputs (2 outputs for 1ch, 1 output for 2 to 4ch)**

76% reduction in installation space

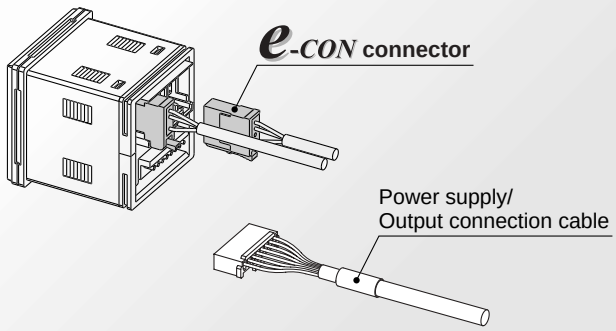
(Compared to the panel mounted ZSE40/ISE40.)



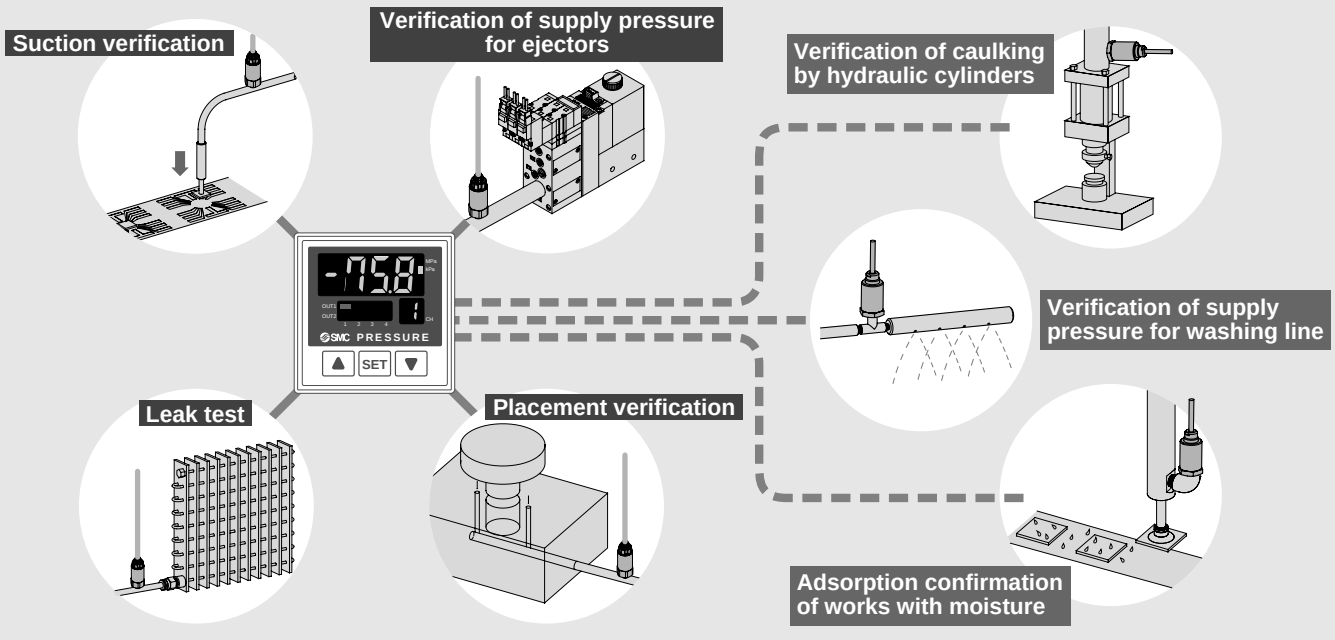
Functions

- **Auto shift function**
- **Auto preset function**
- **Auto identification function**
- **Copy function**
- **Channel scan function**
- **Reset function**
- **Key lock function**
- **Peak/Bottom values display function**
- **Unit display switching function**
- **Display calibration function**
- **Anti-chattering function**

Connection



A single controller monitors various applications



Multi-channel Controller
Series PSE200

How to Order

PSE20 0 — M □ □

Input/Output specifications

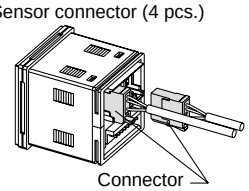
0	NPN 5 outputs + Auto shift input
1	PNP 5 outputs + Auto shift input

Unit specifications

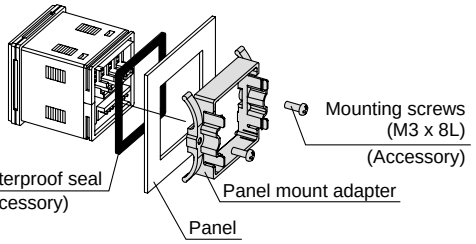
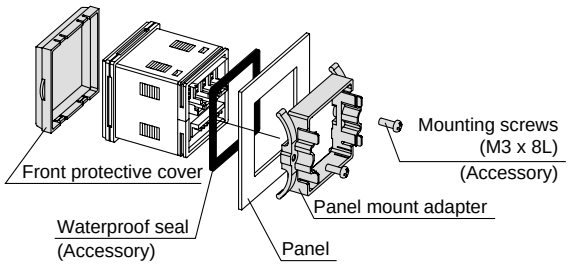
Nil	With unit display switching function Note 1)
M	Fixed SI unit Note 2)

Note 1) Under the New Measurement Law, sales of switches with the unit switching function have not been allowed for use in Japan.
Note 2) Fixed unit
For vacuum low pressure & compound pressure: kPa
For high pressure: MPa

Option 2

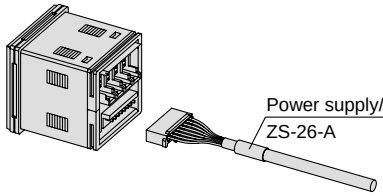
Nil	None
4C	Sensor connector (4 pcs.)  Connector

Option 1

Nil	None
A	Panel mount adapter  Mounting screws (M3 x 8L) (Accessory) Waterproof seal (Accessory) Panel mount adapter Panel
B	Front protective cover + Panel mount adapter  Mounting screws (M3 x 8L) (Accessory) Front protective cover Panel mount adapter Waterproof seal (Accessory) Panel

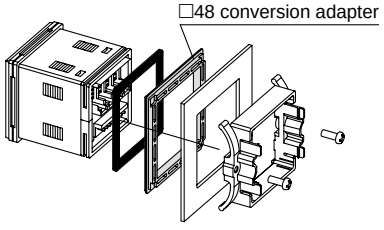
Accessory: Power supply/Output connection cable (2 m)

Included with the controller.



Option/Part No.

When only optional parts are required, order with the part numbers listed below.

Description	Part no.	Note
Panel mount adapter	ZS-26-B	Waterproof seal, screws included
Front protective cover + Panel mount adapter	ZS-26-C	Waterproof seal, screws included
□48 conversion adapter This adapter is used to mount Series PSE200 on the panel fitting of Series PSE100.	ZS-26-D  □48 conversion adapter Order panel mount adapter separately.	
Connector	ZS-28-C (1 pc. per set)	

Specifications

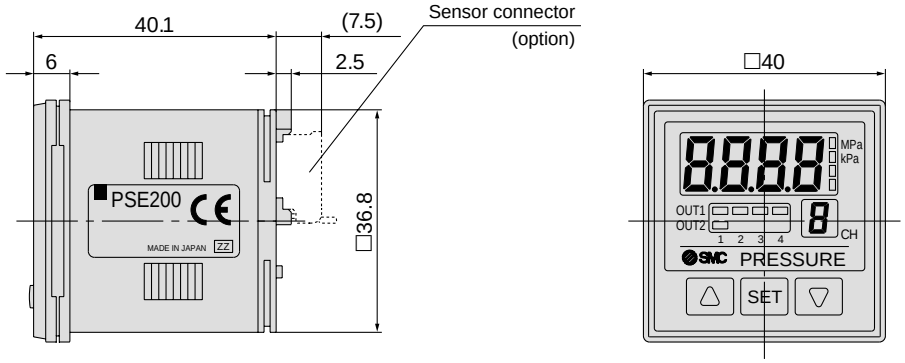
Model		PSE200	PSE201
Output specification		12 to 24 VDC, Ripple (p-p) 10% or less (With power supply polarity protection)	
Power supply voltage		55 mA or less (Current consumption for sensor is not included.)	
Power supply voltage for sensor		[Power supply voltage] –1.5 V	
Power supply current for sensor Note 1)		40 mA maximum (100 mA maximum for the total power supply current when 4 sensors are input.)	
Sensor input		1 to 5 VDC (Input impedance: Approx. 800 kΩ)	
	No. of inputs	4 inputs	
	Input protection	With excess voltage protection (Up to 26.4 V)	
Switch output		NPN open collector output: 5 outputs (Sensor input CH1: 2 outputs, CH2 to 4: 1 output)	PNP open collector output: 5 outputs (Sensor input CH1: 2 outputs, CH2 to 4: 1 output)
	Maximum load current	80 mA	
	Maximum load voltage	30 V	—
	Residual voltage	1 V or less (With load current of 80 mA)	
	Response time	5 ms or less (Response time selections with anti-chattering function: 20 ms, 160 ms, 640 ms)	
	Short circuit protection	With short circuit protection function	
Repeatability		±0.1% F.S. ±1 digit or less	
Hysteresis	**Hysteresis mode**	Adjustable (can be set from 0)	
	Window comparator mode	Fixed (3 digits)	
Display		For measured value display: 4-digit, 7-segment indicator, Display colour: Orange (Sampling frequency: 4 times/sec) For channel display: 1-digit, 7-segment indicator, Display colour: Red	
Display accuracy (Operating temerature of 25°C)		±0.5% F.S. ±1 digit or less	
Indication light		Red (Lights up when output is ON.)	
Auto shift input		Non-voltage input (Reed or Solid state), Input 10 ms or more, Independently controllable auto shift function ON/OFF	
Auto identification function		With auto identification function Note 2)	
Environmental resistance	**Enclosure**	Front face: IP65 (when panel-mounted), Other: IP40	
	Ambient temperature range	Operating: 0 to 50°C, Stored: –10 to 60°C (No freezing or condensation)	
	Ambient humidity range	Operating/Stored: 35 to 85% RH (No condensation)	
	Vibration resistance	10 to 500 Hz at whichever is smaller of 1.5 mm amplitude or 98 m/s² acceleration, in X, Y, Z directions for 2 hrs. each (De-energised)	
	Impact resistance	980 m/s² in X, Y, Z directions, 3 times each (De-energised)	
Temperature characteristics		±0.5% F.S. or less (Based on 25°C)	
Connection		Power supply/Output connection: 8P connector, Sensor connection: e-con connector	
Material		Housing: PBT; Display: Transparent nylon; Back rubber cover: CR	
Weight		Approx. 60 g (Power supply/output connecting cable not included)	

Pressure range	For compound pressure	For vacuum	For low pressure	For positive pressure
Applicable pressure sensor	**PSE533** **PSE543** **PSE563**	**PSE531** **PSE541** **PSE561**	**PSE532**	**PSE530** **PSE560**
Set pressure range	–101 to 101 kPa	10 to –101 kPa	–10 to 101 kPa	–0.1 to 1 MPa
Set pressure resolution	0.1 kPa	0.1 kPa	0.1 kPa	0.001 MPa

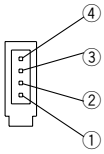
Note 1) If the Vcc and 0 V side of the sensor input connector are short circuited, the inside of the controller will be damaged.
Note 2) Auto identification function comes with “Series PSE53□” pressure sensor only. Other SMC series (PSE510, 520, 540 and 560) are not equipped with this function.

Dimensions

PSE200/201

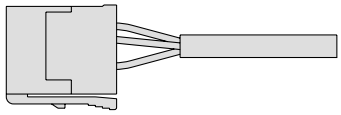


Sensor connector (4P x 4)

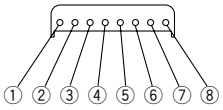


PIN no.	Terminal
①	DC (+)
②	N.C
③	DC (–)
④	IN (1 to 5 V)

Connector (Option)

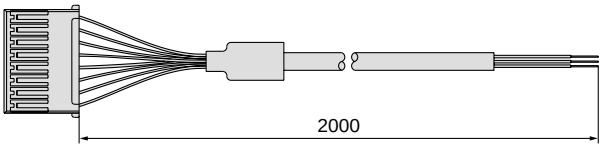


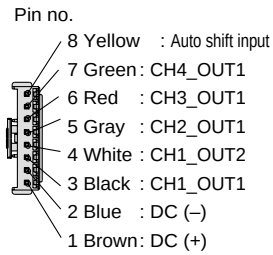
Power supply/Output connector (8P)



PIN no.	Terminal
①	DC (+)
②	DC (–)
③	CH1_OUT1
④	CH1_OUT2
⑤	CH2_OUT1
⑥	CH3_OUT1
⑦	CH4_OUT1
⑧	Auto shift input

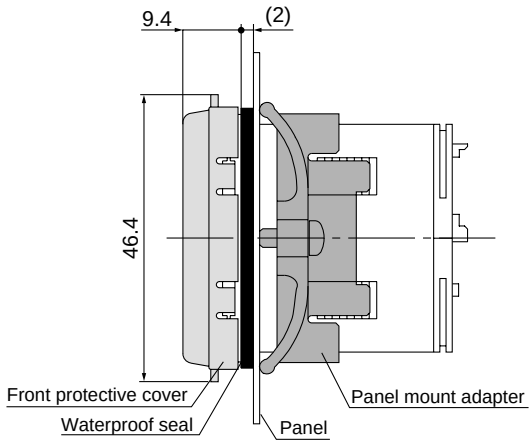
Power supply/Output connection cable (Accessory)

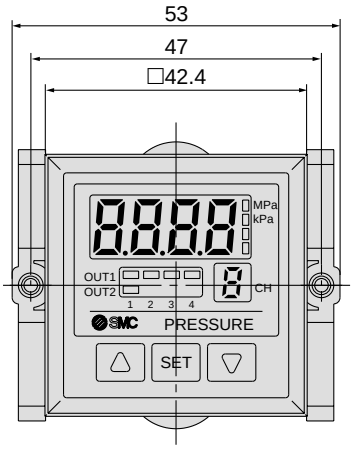




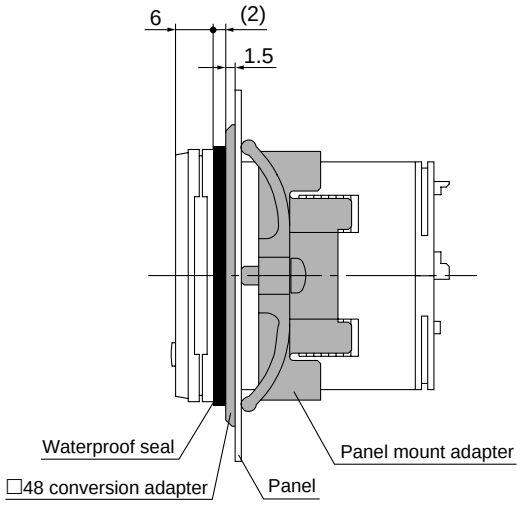
Dimensions

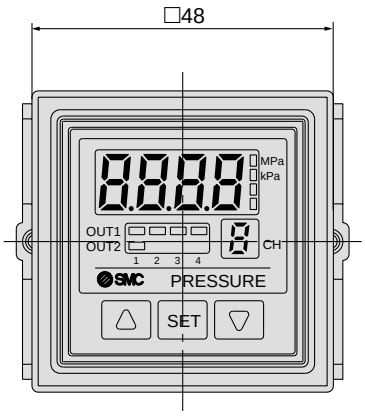
Front protective cover + Panel mount

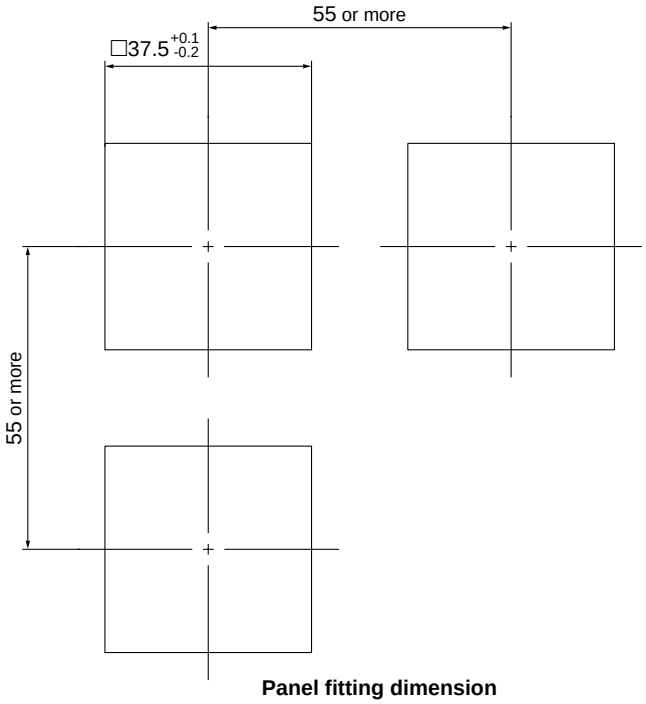




□48 conversion adapter + Panel mount







Panel fitting dimension
Applicable panel thickness: 0.5 to 8 mm

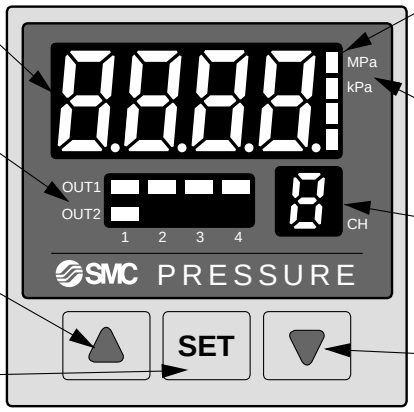
Descriptions

4-digit display
Displays the measured pressure value, content for each setting, and error code.

Switch output display
Displays the output status of OUT1 (CH1 to CH4), OUT2 (CH1 only).
Lights up when it is ON.

UP button
Use this button to change the mode or set value.

SET button
Use this button to set the mode or set value.



Unit display
The selected unit lights up. Use unit labels for units other than MPa and kPa.

Unit labels
kgf/cm² | bar | PSI | inHg | mmHg

Channel display
Displays the selected channel.

DOWN button
Use this button to change the mode or set value.

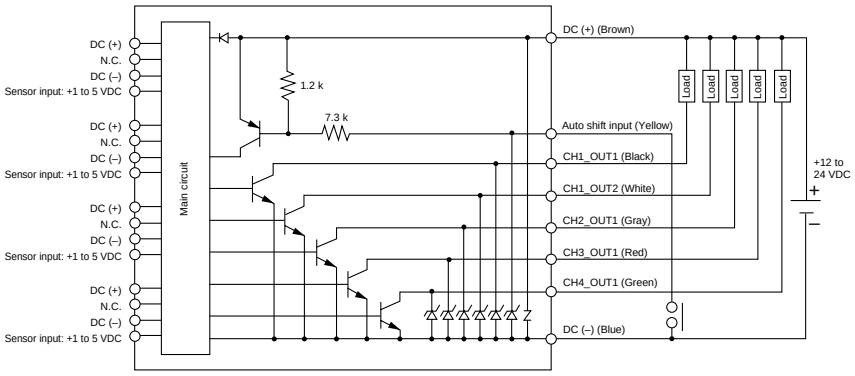
Error Code & Solution

Error name	LED display	Contents	Solution
Overcurrent error	Er 1	Excess current is flowing into the switch output of OUT1.	Shut off the power supply. After eliminating the output factor that caused the excess current, turn the power supply back on.
	Er 2	Excess current is flowing into the switch output of OUT2.	
Residual pressure error	Er 3	Pressure is applied to a pressure sensor during the reset operation (a zero point adjustment) as follows: When compound pressure is used: ± 2.5% F.S. or more. When pressure other than compound pressure is used: ±5% F.S. or more. ∗ After displaying for 2 seconds, it will return to the measuring mode.	Bring the pressure back to atmospheric pressure and use the reset function (zero point adjustment) again.
Applied pressure error	---	The DC (–) wire of the sensor may be disconnected, or pressure exceeding the upper limit of the setting pressure range may be applied.	Confirm the connection and wiring of the sensor and get the applied pressure back to within the setting pressure range.
	----	The sensor may be disconnected or mis-wired, or pressure exceeding the lower limit of the setting pressure range may be applied.	
System error	Er 5	Internal data error.	Please contact SMC.
	Er 6	Internal data error.	Shut off the power supply and turn it back on.
	Er 7	Internal data error.	
	Er 8	Internal data error.	

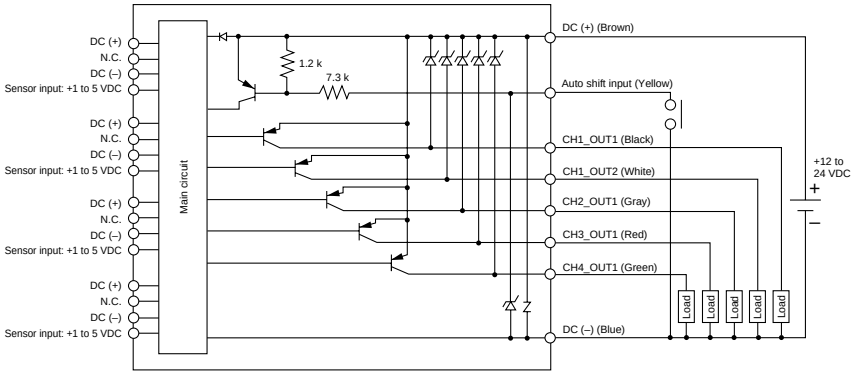
∗ In the case where the product cannot be returned to the normal state, even though the described measures were taken, please contact us for investigation.

Internal Circuit and Connection

PSE200-(M)□
• NPN open collector 5 outputs + Auto shift 1 input specification



PSE201-(M)□
• PNP open collector 5 outputs + Auto shift 1 input specification



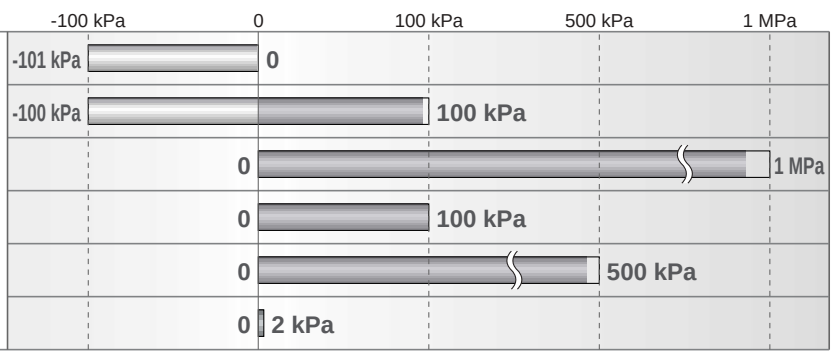
PSE300

2-colour Display, Digital Pressure Sensor Controller

Series PSE300

Applicable sensors			
PSE53□	PSE54□	PSE55□	PSE56□
PSE531	**PSE541**	—	**PSE561**
PSE533	**PSE543**	—	**PSE563**
PSE530	**PSE540**	—	**PSE560**
PSE532	—	—	—
—	—	—	**PSE564**
—	—	**PSE550**	—

Rated pressure range



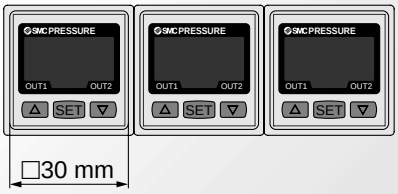
2-colour display (Red/Green)

Able to set the 4 patterns of the display colour.

Pattern	ON	OFF
①	Red	Green
②	Green	Red
③	Red	Red
④	Green	Green

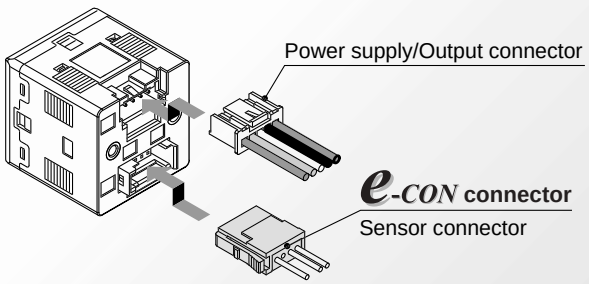
Can be mounted in close proximity with each other either horizontally or vertically.

Reduced panel fitting labor



Response time
1 ms

Connection



Functions

- Auto shift function
- Auto preset function
- Display calibration function
- Peak/Bottom values display function
- Key lock function
- Reset function
- Error indication function
- Unit display switching function
- Anti-chattering function

Pressure Sensor Controller

Series PSE300

How to Order

0	NPN 2 outputs + 1-5 V output
1	NPN 2 outputs + 4-20 mA output
2	NPN 2 outputs + Auto shift input
3	PNP 2 outputs + 1-5 V output
4	PNP 2 outputs + 4-20 mA output
5	PNP 2 outputs + Auto shift input

Unit specifications

Nil	With unit display switching function Note 1)
M	Fixed SI unit Note 2)

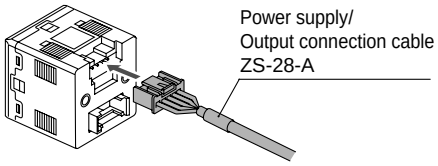
Note 1) Under the New Measurement Law, sales of switches with the unit switching function have not been allowed for use in Japan.

Note 2) Fixed unit
For vacuum & low pressure & low differential pressure & compound pressure: kPa
Positive pressure: MPa (For 1 MPa)
kPa (For 500 kPa)

PSE30 0 — M □ □ □

Option 1

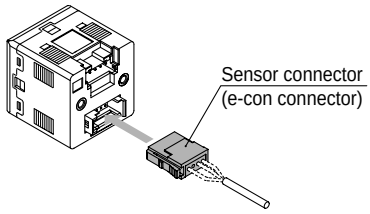
Nil	None
L	Power supply/Output connection cable



Note) The cable is unassembled in the factory, but is included with the shipment.

Option 3

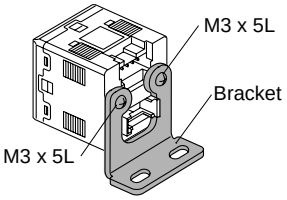
Nil	None
C	Sensor connector



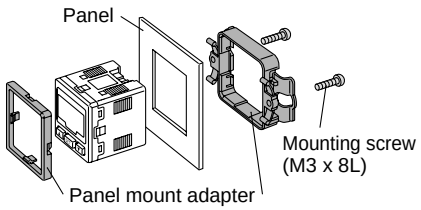
Note) At the factory, the connector is not attached to the cable, but packed together with it for shipment.

Option 2

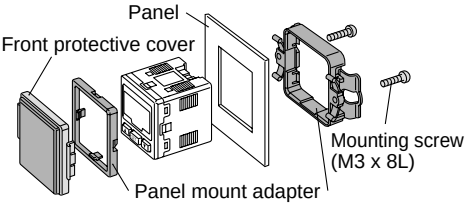
Nil	None
A	Bracket



B	Panel mount adapter



D	Panel mount adapter + Front protective cover



Note) These options are not attached in the factory, but packed together with it for shipment.

Option/Part No.

Description	Part no.	Note
Power supply/Output connection cable (2 m)	ZS-28-A	
Bracket	ZS-28-B	With M3 x 5L (2 pcs.)
Sensor connector	ZS-28-C	1 pc.
Panel mount adapter	ZS-27-C	With M3 x 8L (2 pcs.)
Panel mount adapter + Front protective cover	ZS-27-D	With M3 x 8L (2 pcs.)

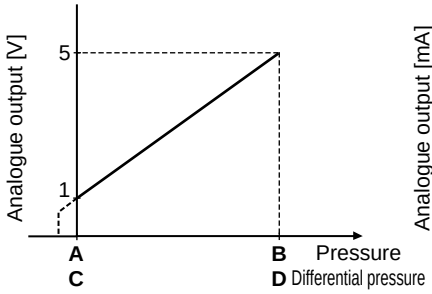
Specifications

Model		PSE30□					
Set (differential) pressure range		–101 to 101 kPa	10 to –101 kPa	–10 to 100 kPa	–0.1 to 1 MPa	–50 to 500 kPa	–0.2 to 2 kPa
Pressure range Note 1)		For compound pressure	For vacuum	For low pressure	For positive pressure		For low differencial pressure
Rated (differential) pressure range		–100 to 100 kPa	0 to –101 kPa	0 to 100 kPa	0 to 1 MPa	0 to 500 kPa	0 to 2 kPa
Power supply voltage		12 to 24 VDC, Ripple (p-p) 10% or less (With power supply polarity protection)					
Current consumption		50 mA or less (Current consumption for sensor is not included.)					
Sensor input		1 to 5 VDC (Input impedance: 1 MΩ)					
	No. of inputs	1 input					
	Input protection	With excess voltage protection (Up to 26.4 V)					
Hysteresis		Hysterisis mode: Variable, Window comparator mode: Variable					
Switch output		NPN or PNP open collector output: 2 outputs					
	Maximum load current	80 mA					
	Maximum load voltage	30 VDC (at NPN output)					
	Residual voltage	1 V or less (With load current of 80 mA)					
	Output protection	With short circuit protection					
Response time		1 ms or less					
	Anti-chattering function	Response time settings for anti-chattering function: 20 ms, 160 ms, 640 ms, 1280 ms					
Repeatability		±0.1% F.S. or less					
Analogue output	**Voltage output** Note 2)	Output voltage: 1 to 5 V (Within rated pressure range (Differential pressure)), Output impedance: Approx. 1 kΩ Linearity: ±0.2% F.S. (Not including sensor accuracy), Response speed: 150 ms or less					
	Accuracy (To display value) (25°C)	±0.6% F.S. or less				±1.0% F.S. or less	±1.5% F.S. or less
	Current output Note 2)	Output current: 4 to 20 mA (Within rated pressure range) Maximum load impedance: 300 Ω (at 12 VDC), 600 Ω (at 24 VDC), Minimum load impedance: 50 Ω Linearity: ±0.2% F.S. (Not including sensor accuracy), Response time: 150 ms or less					
	Accuracy (To display value) (25°C)	±1.0% F.S. or less				±1.5% F.S. or less	±2.0% F.S. or less
Display accuracy (Ambient temperature of 25°C)		±0.5% F.S. ±2 digits or less	±0.5% F.S. ±1 digit or less				
Display		3 + 1/2 digit, 7 segment indicator, 2-colour display (Red/Green), Sampling frequency: 5 times/sec					
Indicator light		OUT1: Lights up when ON (Green), OUT2: Lights up when ON (Red)					
Auto shift input Note 2)		Non-voltage input (Reed or Solid state), Low level input: 5 ms or more, Low level: 0.4 V or less					
Environmental resistance	**Enclosure**	IP40					
	Operating temperature range	Operating: 0 to 50°C, Stored: –10 to 60°C (No freezing or condensation)					
	Operating humidity range	Operating/Stored: 35 to 85% RH (No condensation)					
	Withstand voltage	1000 VAC for 1 minute between live parts and case					
	Insulation resistance	50 MΩ or more between live parts and case (at 500 VDC Mega)					
	Vibration resistance	10 to 150 Hz at whichever is smaller of 1.5 mm amplitude or 98 m/s^2 acceleration, in X, Y, Z directions, for 2 hours each (De-energised)					
	Impact resistance	100 m/s^2 in X, Y, Z directions, 3 times each (De-energised)					
Temperature characteristics		±0.5% F.S. or less (Based on 25°C)					
Connection		Power supply/Output connection: 5P connector, Sensor connection: 4P connector					
Material		Front case: PBT, Rear case: PBT					
Weight	With power supply/output connection cable	85 g					
	Without power supply/output connection cable	30 g					

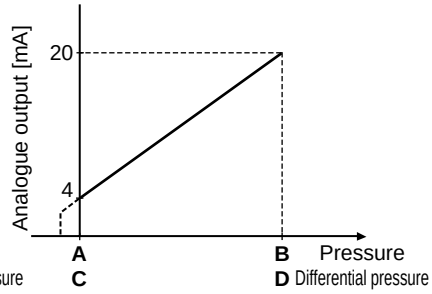
Note 1) Pressure range can be selected during initial setting.
Note 2) Auto shift function is not available when analogue output option is selected.
Also, analogue output option is not available when auto shift function is selected.
Note 3) The following units can be selected with unit conversion function:
For vacuum & compound pressure: kPa·kgf/cm^2·bar·psi·mmHg·inHg
For positive pressure & low pressure: MPa·kPa·kgf/cm^2·bar·psi
For low differential pressure: kPa·mmH$_2$O

Analogue Output

1 to 5VDC



4 to 20 mADC



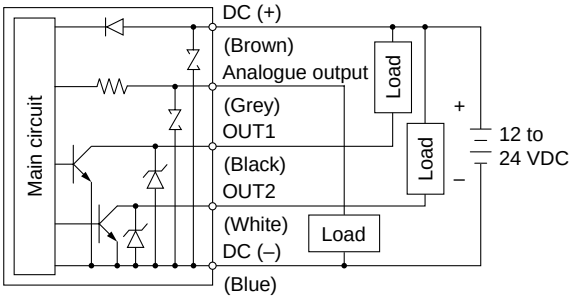
Range	Rated pressure range	A	B
For vacuum	0 to –101 kPa	0	–101 kPa
For compound pressure	–100kPa to 100 kPa	–100 kPa	100 kPa
For low pressure	0 to 100 kPa	0	100 kPa
For positive pressure	0 to 1 MPa	0	1 MPa
	0 to 500 kPa	0	500 kPa

Range	Rated differential pressure range	C	D
For low differential pressure	0 to 2 kPa	0	2 kPa

Internal Circuit

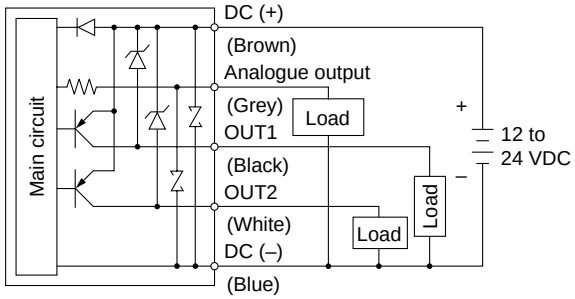
PSE300

NPN open collector output (2 outputs), Max. 30 V or 80 mA, residual voltage 1 V or less
Analogue output: 1 to 5 V
Output impedance: Approx. 1 kΩ



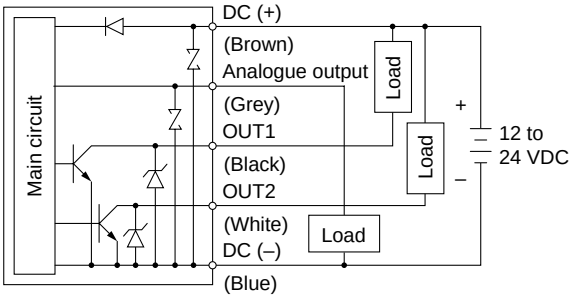
PSE303

PNP open collector output (2 outputs), Max. 80 mA, residual voltage 1 V or less
Analogue output: 1 to 5 V
Output impedance: Approx. 1 kΩ



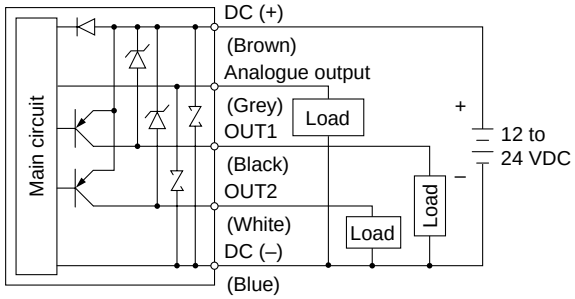
PSE301

NPN open collector output (2 outputs), Max. 30 V or 80 mA, residual voltage 1 V or less
Analogue output: 4 to 20 mA
Maximum load impedance: 300 Ω (12 VDC), 600 Ω (24 VDC)
Minimum load impedance: 50 Ω



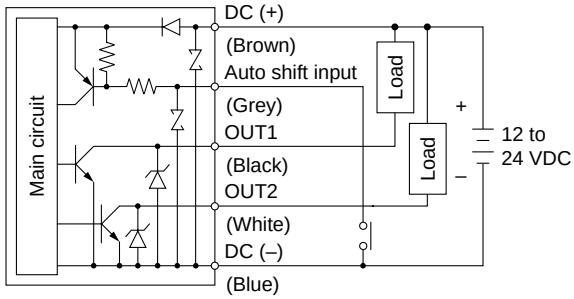
PSE304

PNP open collector output (2 outputs), Max. 80 mA, residual voltage 1 V or less
Analogue output: 4 to 20 mA
Maximum load impedance: 300 Ω (12 VDC), 600 Ω (24 VDC)
Minimum load impedance: 50 Ω



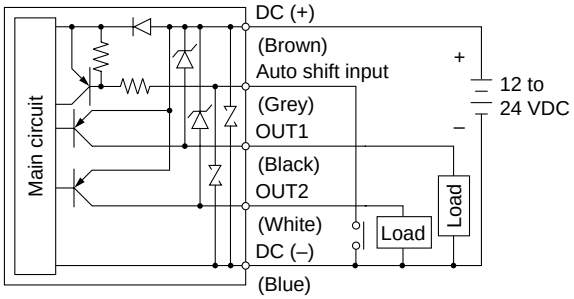
PSE302

NPN open collector output with auto shift input (2 outputs),
Max. 30 V, 80 mA, residual voltage 1 V or less



PSE305

PNP open collector output with auto shift input (2 outputs),
Max. 80 mA, residual voltage 1 V or less



Descriptions

LCD

Displays the current pressure, set mode, selected display unit, and error code. Four different display settings are available. Always use red or green display; or switch between green and red according to the output.

Output (OUT1) display (Green)

Lights up when OUT1 is ON.

Up button

Use this button to select the mode or increase the ON/OFF set value.
It is also used for switching to the peak display mode.

Output (OUT2) display (Red)

Lights up when OUT2 is ON.

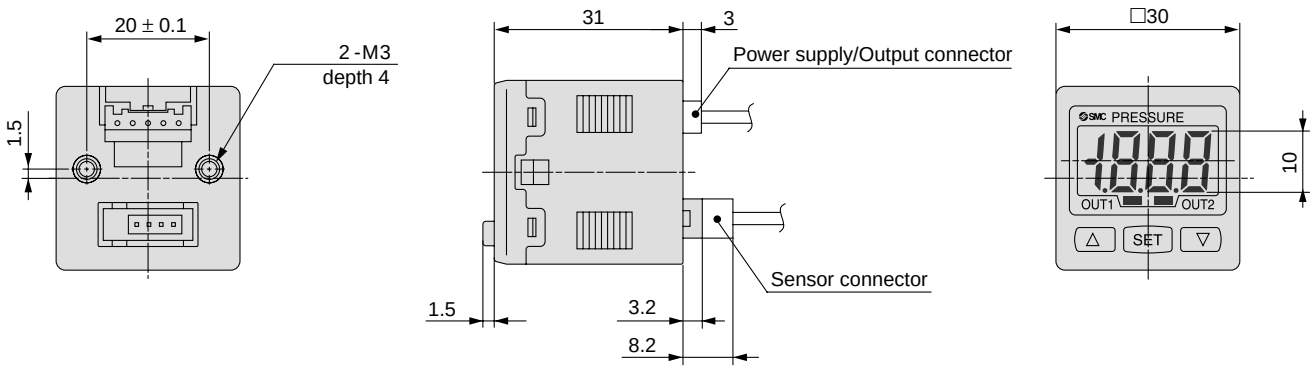
SET button

Use this button to change the mode or confirm the set value.

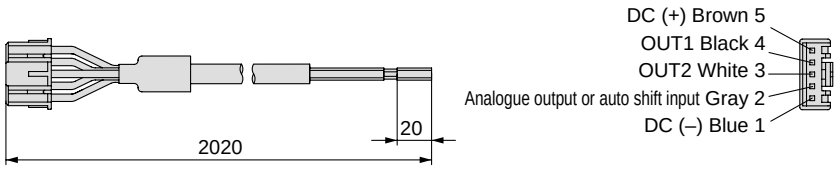
Down button

Use this button to select the mode or decrease the ON/OFF set value.
It is also used for switching to the bottom display mode.

Dimensions

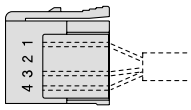


Power supply/Output connection cable (ZS-28-A)

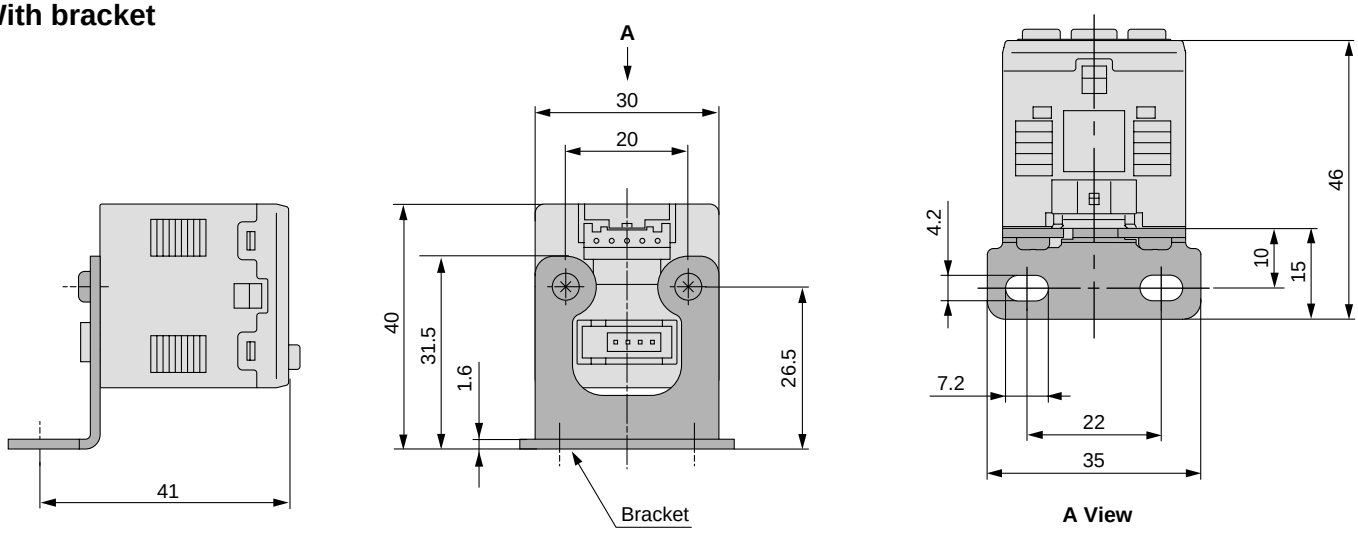


Sensor connector

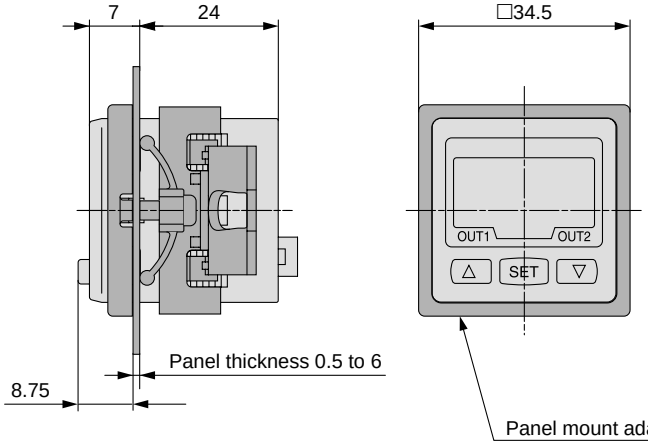
PIN no.	Terminal
1	DC (+)
2	N.C.
3	DC (–)
4	IN (1 to 5 V)



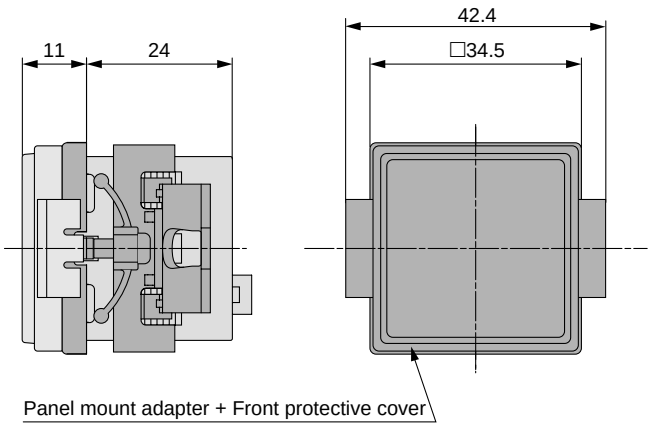
With bracket



With panel mount adapter



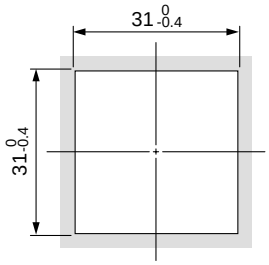
With panel mount adapter + Front protective cover



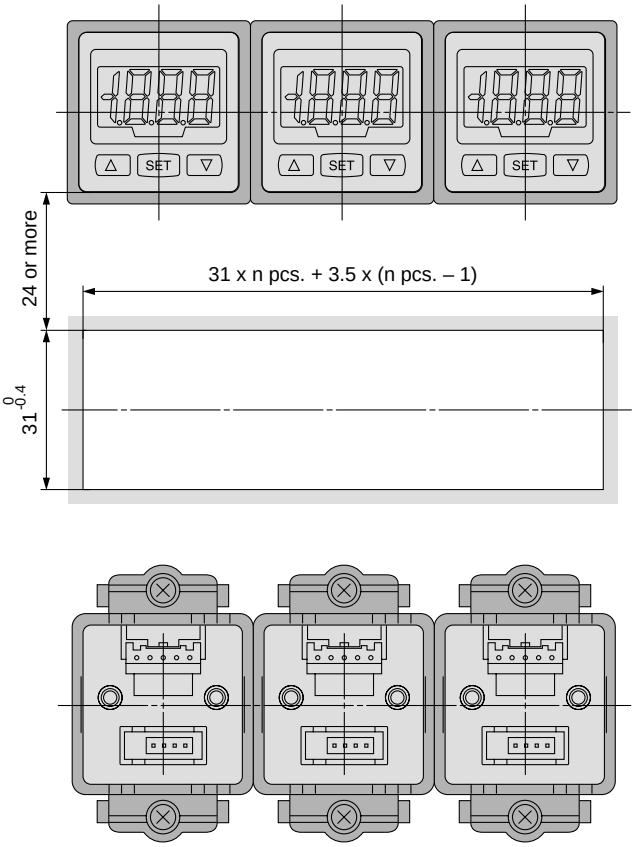
Dimensions

Panel cut out dimensions

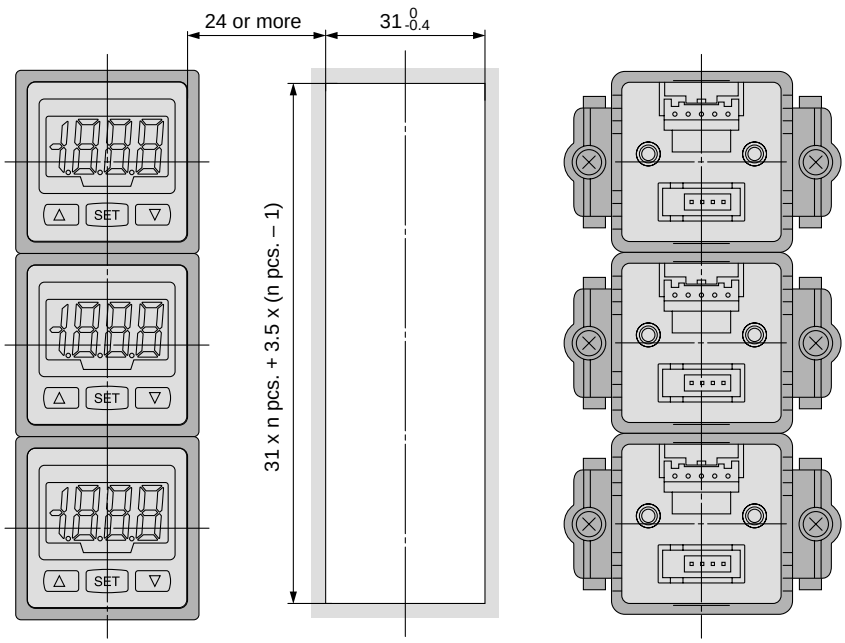
Mount of single unit



Horizontal stacking mount of multiple units (n pcs.)



Vertical stacking mount of multiple units (n pcs.)

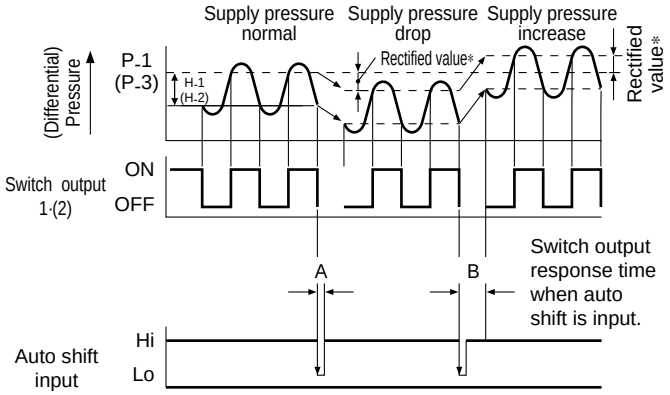


Function Details

A Auto shift function

When there are large fluctuations in the supply pressure, the switch may fail to operate correctly. The auto shift function compensates such supply pressure fluctuations. It measures the (differential) pressure at the time of auto shift signal input and uses it as the reference (differential) pressure to correct the set value on the switch.

Set value correction by auto shift function



	A	B
PSE200	10 ms or more	15 ms or less
PSE300	5 ms or more	10 ms or less

∗ **Rectified value**
When the auto shift is selected, “ooo” will be displayed for approximately 1 second, and the pressure value at that point will be saved as a rectified value “C_5” (for CH1 of PSE200 and PSE300) or “C_3” (for CH2 to 4 for PSE200). Based on the saved rectified values (Note), the set value “P_1” to “P_4” (for PSE200) or “P_1”, “H_1”, “P_3”, “H_2” (for PSE300) will likewise be rectified.

Note) When an output is reversed, “n_1” to “n_4” (for PSE200) or “n_1”, “H_1”, “n_3”, “H_2” (for PSE300) will be rectified.

Possible Set Range For Auto Shift Input

PSE200	Regulating pressure (Differential pressure) range	Possible set range
Compound pressure	–101.0 to 101.0 kPa	–101.0 to 101.0 kPa
Vacuum	10.0 to –101.0 kPa	–101.0 to 101.0 kPa
Low pressure	–10.0 to 101.0 kPa	–100.0 to 101.0 kPa
Positive pressure	–0.1 to 1.000 MPa	–1.000 to 1.000 MPa
	—	—
Low differential pressure	—	—

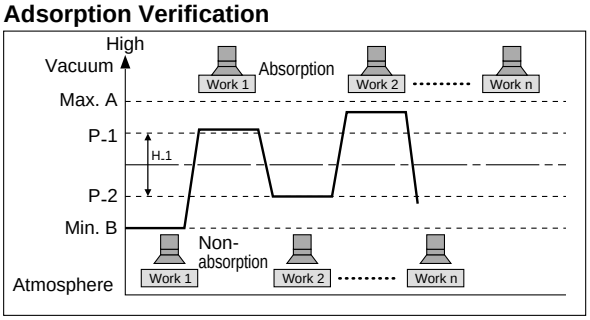
PSE300	Regulating pressure (Differential pressure) range	Possible set range
Compound pressure	–101.0 to 101.0 kPa	–101.0 to 101.0 kPa
Vacuum	10.0 to –101.0 kPa	–101.0 to 101.0 kPa
Low pressure	–10 to 100.0 kPa	–100.0 to 100.0 kPa
Positive pressure	–0.1 to 1.000 MPa	–1.000 to 1.000 MPa
	–50 to 500 kPa	–500 to 500 kPa
Low differential pressure	–0.2 to 2.00 kPa	–2.00 to 2.00 kPa

Auto shift zero (Series PSE300 only)
The basic function of auto shift zero is the same as the function for auto shift. Also it corrects values on the display, based on a pressure value of 0, when the auto shift is selected.

B Auto preset function

Auto preset function, when selected in the initial setting, calculates and stores the set value from the measured (differential) pressure. The optimum set value is determined automatically by repeating vacuum and break with the target workpiece several times.

Adsorption Verification

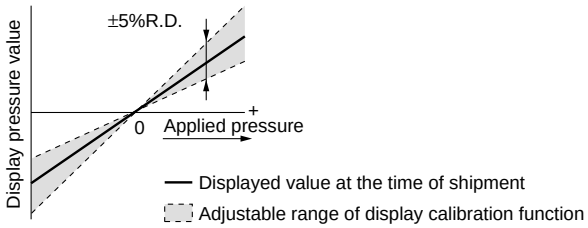


Formula for obtaining the set value

	P_1 or P_3	P_2(H_1) or P_4(H_2)
PSE200	P_1(P_3)=A-(A-B)/4	P_2(P_4)=B+(A-B)/4
PSE300		H_1(H_2)=(A-B)/2

C Precision indicator setting

This function eliminates slight differences in the output values and allows uniformity in the numbers displayed. Displayed values of the pressure sensors can be adjusted to within ±5%.



Note) When the precision indicator setting function is used, the set (differential) pressure value may change ±1 digit.

D Peak and bottom display function

This function constantly detects and updates the maximum and minimum values and allows to hold the display value.
For PSE300, when the ↑ ↓ are simultaneously pressed for 1 second or longer, while “holding”, the hold value will be reset.

E Key lock function

This function prevents incorrect operations such as accidentally changing the set value.

F Reset function

This function clears and resets the zero value on the display of measured (differential) pressure within ±7% F.S. of the factory adjusted value.

Function Details

G Error indication function

Error name	Error code PSE200	Error code PSE300	Description
Overcurrent error	Er 1	Er1	Load current of switch output (OUT1) exceeds 80 mA.
	Er 2	Er2	Load current of switch output (OUT2) exceeds 80 mA.
Residual pressure error	Er 3	Er3	Pressure applied during the zero reset operation exceeds ±7% F.S. ∗ After displaying the error code for 3 seconds, the switch automatically returns to the measuring mode. Due to individual product differences, the setting range varies ±4 digits.
Applied pressure error	- - -	HHH	Supply pressure exceeds the maximum set (differential) pressure or upper limit of the display pressure.
	- - - -	LLL	A sensor may be disconnected or mis-wired. Or, supply pressure is below the minimum set (differential) pressure or lower limit of the display pressure.
Auto shift error		or	The value measured at the time of auto shift input is outside the set (differential) pressure range. ∗ After displaying the error code for one second, the switch returns to the measuring mode.
System error	Er 5	Er4	Internal data error
	Er 6	Er6	Internal data error
	Er 7	Er7	Internal data error
	Er 8	Er8	Internal data error

H Copy function (Series PSE200 only)

Information that can be copied includes the following: ① Pressure set values, ② Range settings, ③ Display units, ④ Output modes, ⑤ Response times.

- When CH1 is copied to CH2, CH3, and CH4, information of OUT1 in CH1 will be copied.
- When CH2, CH3, or CH4 is copied to CH1, information of OUT1 in CH2, CH3, or CH4 will be copied only to OUT1 in CH1.

Note) When the copy function is used, the regulating pressure value of the copied channel may change ±1 digit.

I Auto identification function (Series PSE200 only)

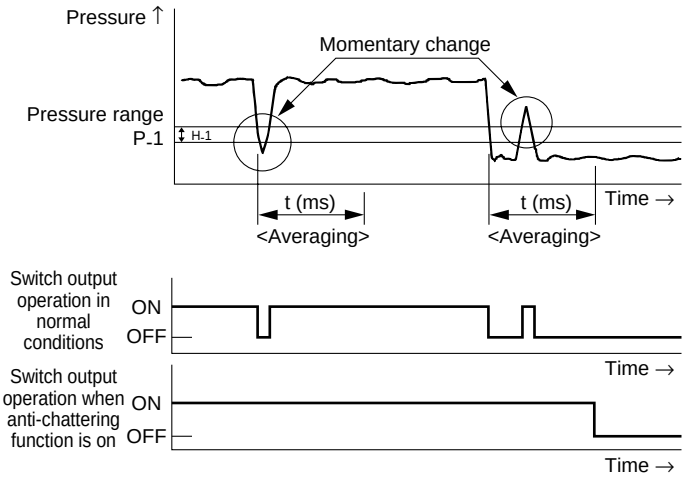
This function automatically identifies the pressure range of the pressure sensor that is connected to the multi-channel pressure sensor controller, thus eliminating the need of having to reset the range again after replacing the sensor. This function will be activated either when “Aon” is set in the auto identification mode or when the power is turned back on in that condition. However, this function only works in conjunction with specific pressure sensors (SMC Series PSE53□). When other pressure sensors are used, this function will not work. When using other types of pressure sensors, first set the auto identification mode to “AoF”, and then proceed to setting the range. Turning the power back on while in the “Aon” setting can cause a malfunction.

J Anti-chattering function

A large bore cylinder or ejector consumes a large volume of air in operation and may experience a temporary drop in the supply pressure. This function prevents detection of such temporary drops in the supply pressure as an error.

	Available response time settings
PSE200	20 ms, 160 ms, 640 ms
PSE300	20 ms, 160 ms, 640 ms, 1280 ms

<Principle>
This function averages pressure values measured during the response time set by the user and then compares the average pressure value with the pressure set point value to output the result on the switch.



K Anti-chattering function (Series PSE200 only)

Pressure value for the selected channel is displayed.

L Anti-chattering function (Series PSE200 only)

Pressure values for each channel are displayed by turns at 2-second intervals.

Function Details

M Unit display switching function

Display units can be switched with this function.
Units that can be displayed vary depending on the range of the pressure sensors connected to the controller.

PSE200

Pressure range		For compound pressure	For vacuum	For low pressure	For positive pressure
Applicable pressure sensor		**PSE533 PSE543 PSE563**	**PSE531 PSE541 PSE561**	**PSE532**	**PSE530 PSE540 PSE560**
Set pressure (differential pressure) range		−101 to 101 kPa	10 to −101 kPa	−10 to 100 kPa	−0.1 to 1 MPa
PA	kPa	0.1	0.1	0.1	—
	MPa	—	—	—	0.001
GF	kgf/cm²	0.001	0.001	0.001	0.01
bAr	bar	0.001	0.001	0.001	0.01
PSI	psi	0.02	0.01	0.01	0.1
inH	inHg	0.1	0.1	—	—
mmH	mmHg	1	1	—	—

PSE300

Pressure range		For compound pressure	For vacuum	For low pressure	For positive pressure		For low differential pressure
Applicable pressure sensor		**PSE533 PSE543 PSE563**	**PSE531 PSE541 PSE561**	**PSE532**	**PSE530 PSE540 PSE560**	**PSE564**	**PSE550**
Set pressure (differential pressure) range		−101 to 101 kPa	10 to −101 kPa	−10 to 100 kPa	−0.1 to 1 MPa	−50 to 500 kPa	−0.2 to 2.00 kPa
PA	kPa	0.2	0.1	0.1	—	1	0.01
	MPa	—	—	—	0.001	—	—
GF	kgf/cm²	0.002	0.001	0.001	0.01	0.01	—
bAr	bar	0.002	0.001	0.001	0.01	0.01	—
PSI	psi	0.05	0.02	0.02	0.2	0.1	—
inH	inHg	0.1	0.1	—	—	—	—
mmH	mmHg	2	1	—	—	—	1 mmH²O

Series PSE
Safety Instructions

The following safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by all safety practices, including labels of **"Caution", "Warning"** or **"Danger"**. To ensure safety, please observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

⚠Caution : Operator error could result in injury or equipment damage.

⚠Warning : Operator error could result in serious injury or loss of life.

⚠Danger : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power – General Rules relating to system
Note 2) JIS B 8370: Pneumatic system axiom

⚠ Warning

1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications, post analysis and/or tests to meet a specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalogue information and taking into consideration the possibility of equipment failure when configuring a system.

2. Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if handled incorrectly. Assembly, handling or maintenance of the pneumatic system should be performed by trained and experienced operators.

3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.

1. Inspection and maintenance of machinery/equipment should only be performed after confirming the control positions are safely locked-out.
2. When equipment is to be removed, confirm the safety processes mentioned above. Cut the supply pressure for the equipment and exhaust all residual compressed air in the system.
3. Before the machinery/equipment is restarted, take measures to prevent quick extension of a cylinder piston rod, etc. (Bleed air into the system gradually, to create back pressure.)

4. Contact SMC if the product is to be used in any of the following conditions:

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, clutch and brake circuits in press applications, or safety equipment.
3. An application which has the possibility of having a negative effects on people, property, or animals, and therefore requires special safety analysis.

Pressure Switch Precautions 1

Be sure to read before handling. Refer to back page 1 for Safety Instructions, and back page 5 through to 8 for Specific Product Precautions.

Design and Selection

⚠ Warning

1. Operate a switch only within the specified voltage.
Use of a switch outside the range of the specified voltage can cause not only malfunction and damage of a switch, but also electrocution and fire.

2. Do not exceed the maximum allowable load specification.
A load exceeding the maximum load specification can cause damage to the switch or shorten its operating life span.

3. Do not use a load that generates surge voltage.
Although surge protection is installed in the circuit at the output side of the switch, damage may still occur if a surge is applied repeatedly. When a surge generating load such as a relay or solenoid is directly driven, use a type of switch with a built-in surge absorbing element.

4. Since the type of applicable fluid varies depending on the product, make sure to verify the specifications.
Switch is not of an explosion proof construction. To prevent a possible fire hazard, do not use with flammable gases or fluids.

5. Operate a switch within the regulating pressure range and maximum operating pressure.
Using beyond the specified range may result in a malfunction. If surge pressure exceeding the maximum withstand pressure are likely to arise, take measure to prevent such surge pressures from being applied to the switch. Use of a switch beyond the maximum operating pressure may result in a breakdown.

Mounting

⚠ Warning

1. If the equipment is not operating properly, do not continue to use it.
Connect air and power after installation, repairs, or modifications, and verify if installed properly or not by conducting a performance and leak test properly.

2. Mount a switch by observing the proper tightening torque.
When a switch is tightened beyond the specified tightening torque, the mounting screws, mounting bracket, or switch may be damaged. On the other hand, tightening below the specified tightening torque may cause the installation screws to come loose during operation.
Connection thread: M3, M5, Rc, R, NPT

Thread	Proper tightening torque (N·m)
M3, M5	1/6 rotation after tightening by hand
1/8	7 to 9
1/4	12 to 14

3. Apply a wrench only to the metal part of the main housing when installing a pressure switch in the system piping.
Never apply a wrench to the resin part, since it may result in damage to a switch.

Wiring

⚠ Warning

1. Verify the colour and terminal number when wiring.
Incorrect wiring can cause the switch to be damaged and malfunction. Verify the colour and the terminal number in the instruction manual when wiring.

2. Avoid repeatedly bending or stretching the lead wire.
Repeatedly applying bending stress or stretching force to the lead wire will cause it to break. If you believe the lead wire is damaged and likely to cause malfunctions, replace the product. (Grommet and lead wire is irreplaceable one.)

3. Confirm proper insulation of wiring.
Make sure that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a switch.

Operating Environment

⚠ Warning

1. Never use in the presence of explosive gases.
The switches do not have an explosion proof rating. Never use in the presence of an explosive gas as this may cause a serious explosion.

Maintenance

⚠ Warning

1. Perform periodic inspections to ensure proper operation of the switch.
Unexpected malfunctions may cause possible danger.

2. Take precautions when using a switch for an interlock circuitry.
When a pressure switch is used for an interlock circuit, devise a multiple interlock system to prevent trouble or malfunction. Verify the operation of the switch and interlock function on a regular basis.

Digital Pressure Switch Precautions 1

Be sure to read before handling. Refer to back page 1 for Safety Instructions, and back page 5 through to 8 for Specific Product Precautions.

Selection

⚠ Warning

1. Monitor the internal voltage drop of a switch.

When operating below the specified voltage, it is possible that a load may be ineffective, even though the pressure switch functions normally. Therefore, the formula below should be satisfied after confirming the voltage of operating load.

Supply voltage − Internal voltage drop of switch > Voltage of operation load

⚠ Caution

1. Pressure switch for placement verification

Use the Air Catch Sensor/Series ISA for the purpose of placement verification of a work. The ISA series is both dustproof and drip proof.

2. Data of the digital pressure switch will be stored even after the power is turned off.

Input data (set pressure, etc.) is stored in EEPROM, so that the data will not be lost after the pressure switch is turned off. (Data is stored for up to 100,000 hours after the power is turned off.)

Mounting

⚠ Warning

1. Do not drop or apply the excessive force to a switch when handling.

Do not drop, bump, or apply excessive impact (1000 m/s^2 or greater) while handling. Although the body of the switch case may not be damaged, the inside of the switch could be damaged and lead to a malfunction.

2. Hold the body of the switch while handling.

If the product is held by its cable, it could lead to a breakage. Hold the body of the switch while handling.

3. Operation

Refer to the instruction manual for operating by the button for the digital pressure switch.

4. Do not touch the LCD readout.

Do not touch the LCD indicator face of the pressure switch during operation. Static electricity can change the readout.

5. Pressure port

Do not introduce any wire or similar object to a pressure port as this may damage the pressure sensor and cause a malfunction.

Wiring

⚠ Warning

1. Do not wire in conjunction with power lines or high voltage lines.

Wire separately from power lines and high voltage lines, avoiding wiring in the same conduit with these lines. Control circuits including switches may malfunction due to noise from these other lines.

2. Do not allow loads to short circuit.

(3-wire type)

Although digital pressure switches indicate excess current error if loads are short circuited, all incorrect wiring connections cannot be protected. Take precautions to avoid incorrect wiring.

As for other pressure switches, the switches will be instantly damaged if loads are short circuited. Take special care to avoid reverse wiring between the brown power supply line and the black output line.

Digital Pressure Switch Precautions 2

Be sure to read before handling. Refer to back page 1 for Safety Instructions, and back page 5 through to 8 for Specific Product Precautions.

Piping

⚠ Caution

1. Piping hose, etc.

When panel mounting the product, if excessive force is applied to the switch by piping material such as hose, it could lead to the connecting parts of the switch becoming damaged. Therefore, be careful not to apply such excessive force.

Air Supply

⚠ Warning

1. Use the switch within the specified fluid and ambient temperature range.

Ambient and fluid temperature operation for the PSE560 series should be within 0 to 60°C. Meanwhile, other remote type pressure switches should be within 0 to 50°C.

Take measures to prevent moisture from freezing in circuits when below 5°C, since this may cause damage to the O-ring and lead to a malfunction. The installation of an air dryer is recommended for eliminating condensate and moisture. Never use the switch in an environment where there are drastic temperature changes even when these temperatures are operated within the specified temperature range.

2. Vacuum switch

An instant pressure pulse of up to 0.5 MPa (at the time of vacuum release) will not affect the performance of the switch. However, a constant pressure 0.2 MPa or more should be avoided.

Operating Environment

⚠ Warning

1. Do not use in an area where surges are generated.

When there are units that generate a large amount of surge in the area around pressure switches (e.g., solenoid type lifters, high frequency induction furnaces, motors), this may cause deterioration or damage to the switches' internal circuitry. Avoid and protect against sources of surge generation and crossed lines.

2. Operating environment

In general, the digital pressure switches featured here are not dust or splashproof. Avoid using in an environment where the likelihood of splashing or spraying of liquids (water, oil, etc.) exists. If used in such an environment, use a dustproof and splashproof type switch.

Maintenance

⚠ Caution

1. Cleaning of the switch body

Wipe off dirt with a soft cloth. If dirt does not come off easily, use a neutral detergent diluted with water to dampen a soft cloth. Wipe the switch only after squeezing the excess water out of the dampened cloth. Then finish off by wiping with a dry cloth afterwards.

Specific Product Precautions 1

Be sure to read before handling. Refer to back page 1 through to 4 for Safety Instructions and Pressure Switch Precautions.

■ Pressure Sensor

Handling

⚠ Warning

1. Do not drop, bump, or apply excessive impact (PSE530, 540: 980 m/s², PSE560: 500 ms², PSE550: 300 m/s²) while handling. Although the body of the sensor may not be damaged, the inside of the sensor could be damaged and lead to malfunction.

2. The tensile strength of the cord is PSE530: 23 N, PSE540, 550, 560: 50 N or less. Applying a greater pulling force to it can cause malfunction. When handling, hold the body of the sensor—do not dangle it from the cord.

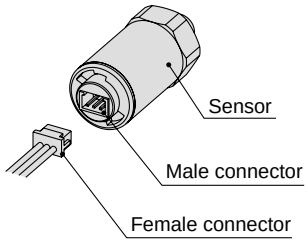
3. Do not use pressure sensors with corrosive and/or flammable gases or liquids.

(PSE530)

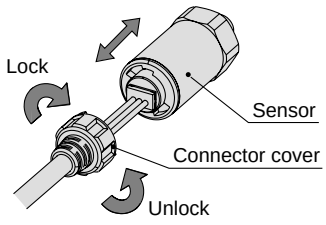
1. Do not exceed the screw-in torque of 3.5N·m when installing piping. Exceeding this value may cause malfunctioning of the sensor.

2. Connecting the sensor cable (optional)

Hold the female connector of the sensor cable with your fingers and carefully insert it into the connector.

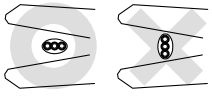


A connector cover is provided as part of the cable assembly (see the figure below). It is designed to keep the female cover in place, first make sure it is facing in the right direction as you slip it over the female connector, then lock it to the sensor body by turning it clockwise. To remove the cover, first unlock it by turning it counterclockwise, then pull back on it. To remove the female connector, grab it with your fingers and pull back on it. Do not pull on the cable.



(PSE540/550)

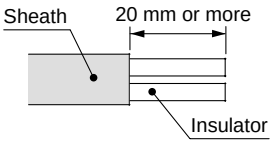
1. Care should be taken when stripping the outer cable covering as the insulator may be accidentally torn or damaged if incorrectly stripped, as shown on the right.



Wiring

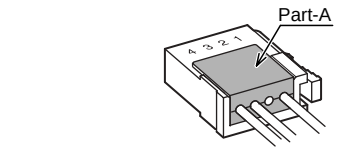
⚠ Caution

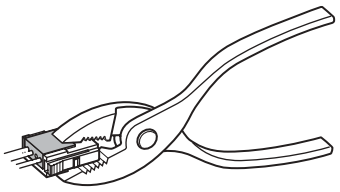
1. Connection of sensor connector



- Cut the sensor cable as illustrated to the right.
- Referring to the table below, insert each lead wire of the cable at the position marked with a number corresponding to the colour of the lead wire.
- Confirm that the numbers on the connector match the colours of the wires and that the wires are inserted to the bottom. Press Part A by hand for temporary fixing.
- Press in the central part of Part A vertically with a tool such as pliers.
- A sensor connector cannot be taken apart for reuse once it is crimped. If the wire arrangement is incorrect or if the wire insertion fails, use a new sensor connector.
- For connection to SMC pressure switches, use sensor connectors (ZS-28-C□) or e-con connectors listed below.

Connector no.	Wire core colour
1	Brown (DC (+))
2	Not used
3	Blue (DC (—))
4	Black (OUT: 1 to 5 V)





Series	Sumitomo 3M Ltd.	Tyco Electronic AMP K.K.	OMRON Corp.
PSE53□	37104-3101-000FL	3-1473562-4	XN2A-1430
PSE54□	37104-3101-000FL	1-1473562-4	XN2A-1430
PSE55□	37104-3101-000FL	1-1473562-4	XN2A-1430
PSE56□	37104-3101-000FL	1473562-4	XN2A-1430

- For details about the e-con connector, contact the respective connector manufacturer.

Series PSE5□□
Specific Product Precautions 2

Be sure to read before handling. Refer to back page 1 through to 4 for Safety Instructions and Pressure Switch Precautions.

Pressure Source

⚠ Warning

(PSE560)

1. Use of toxic, corrosive or flammable gas.

Do not use **toxic or corrosive gas**.

2. Compatible fluid

The fluid contact areas are stainless steel 316L (pressure sensor fittings). Use fluid that will not corrode the materials. (For corrosiveness of fluid, consult the manufacturer of the fluid.)

(PSE56□-$^{A2}_{B2}$ only)

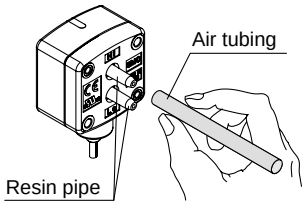
Helium leakage test

Helium leakage test is conducted on the welding parts. Use a ferrule by Crawford fitting company (Swagelok® fittings) as the TSJ fittings and packing, ground, etc. by Cajon company (VCR® fittings) as the URJ fittings. If a ferrule, packing or ground by other manufacturers are to be used, conduct helium leakage test before using those products.

Piping Connection

⚠ Caution

(PSE550)



- Cut the air tubing vertically.
- Carefully hold the air tubing and slowly push it into the resin pipe, ensuring that it is inserted by more than 8 mm. For your information, the tensile strength is approx. 25 N when inserted by more than 8 mm.
- Insert the low pressure tubing into “Lo” pipe, and the high-pressure tubing into “Hi” pipe.
- In cases where SMC air tubing is not used, make sure the product has similar I.D. accuracy within ø4±0.3 mm.
- Make sure that the air tubing is firmly inserted to avoid possible disconnection. (Tensile strength is approx. 25 N when being inserted 8 mm.)

Specific Product Precautions 1

Be sure to read before handling. Refer to back page 1 through to 4 for Safety Instructions and Pressure Switch Precautions.

■ Controller

Handling

⚠ Warning

1. **Do not drop, bump, or apply excessive impact (PSE200: 980 m/s^2, PSE300: 100 m/s^2) while handling. Although the body of the controller case may not be damaged, the inside of the controller could be damaged and cause malfunction.**
2. **The tensile strength of the power supply/output connection cable is 50 N; that of the pressure sensor lead wire with connector is 25 N. Applying a greater pulling force than the applicable specified tensile strength to either of these components can lead to malfunction. When handling, hold the body of the controller.**

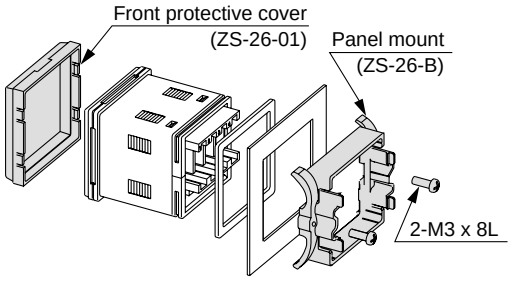
Mounting

⚠ Caution

(PSE200)

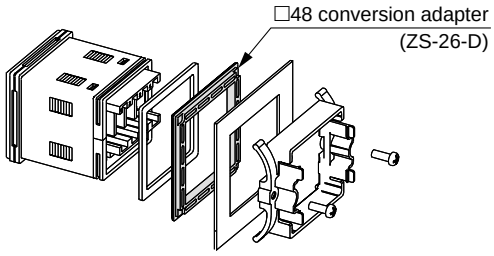
The front face of the panel mount conforms to IP65 (IP40 when using the □48 conversion adapter); however, there is a possibility of liquid filtration if the panel mount adapter is not installed securely and properly. Securely fix the adaptor with screws as shown below.

Standard



Tighten screws 1/4 to 1/2 turn after the heads are flush with the panel.

When using □48 conversion adapter



Handling

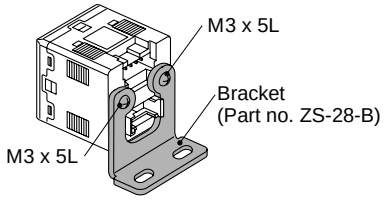
⚠ Caution

(PSE300)

1. Mounting with bracket

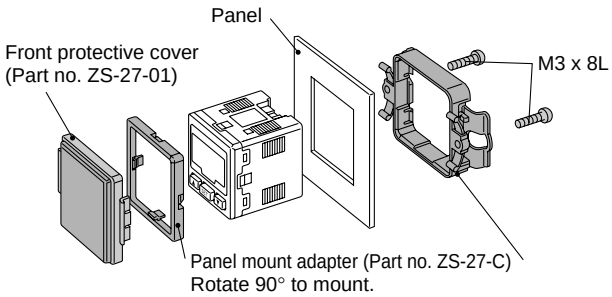
Mount the bracket on the body with two M3 x 5L mounting screws.

Tighten the bracket mounting screws at a tightening torque of 0.5 to 0.7 N·m.



2. Mounting with panel mount adapter

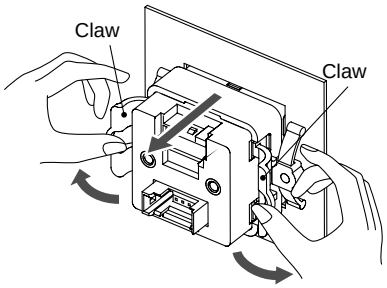
Secure the panel mount adapter with two M3 x 8L mounting screws.



3. Panel mount adapter removal

To remove the controller with panel mount adapter from the equipment, remove the two mounting screws, and pull out the controller while pushing the claws outward.

Failure to follow this procedure can cause damage to the controller and panel mount adapter.



Series PSE200/300
Specific Product Precautions 2

Be sure to read before handling. Refer to back page 1 through to 4 for Safety Instructions and Pressure Switch Precautions.

Connection

⚠ Warning

1. Incorrect wiring can damage the switch and cause malfunction or erroneous switch output. Connections should be done while the power is turned off.

2. Do not attempt to insert or pull out the pressure sensor or its connector when the power is on. Switch output may malfunction.

3. Wire separately from power lines and high voltage lines, avoiding wiring in the same conduit with these lines. Malfunctions may occur due to noise from these other lines.

4. If a commercial switching regulator is used, make sure that the F.G. terminal is grounded.

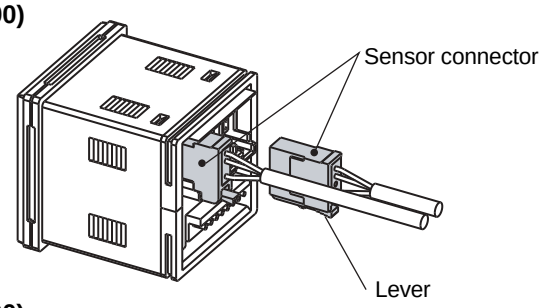
Wiring

⚠ Caution

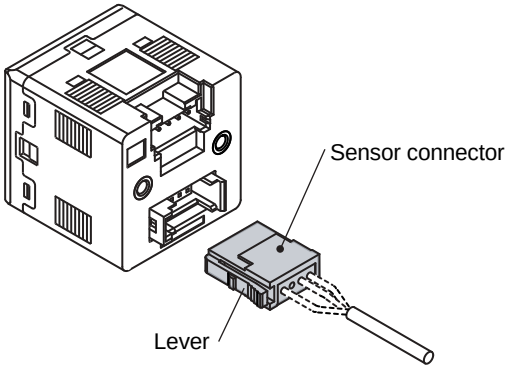
1. Connection and removal of sensor connector

- Hold the lever and connector body with two fingers and insert the connector straight into the pin until it is locked with a click sound.
- To remove the connector, pull it out straight while pressing the lever with one finger.

(PSE200)



(PSE300)



2. Connection of power supply cable and output cable

- Securely connect the power supply cable and the output cable to the body until a click is heard.

Operating Environment

⚠ Warning

1. Our pressure sensor controllers are CE marked; however, they are not equipped with surge protection against lightning. Lightning surge countermeasures should be applied directly to system components as necessary.

(PSE200)

- **If the product is mounted on a panel, the "IP65" enclosure rating is applicable only to the front parts. Never use pressure sensor in the presence of flammable or explosive gases.**

ISA2

Stable detection of 0.01 to 0.5 mm clearance

Due to the pneumatic bridge circuit and electronic pressure sensor, the non-contact type sensor is hardly affected by fluctuations in the supply pressure.

Plug connectors (Centralised wiring)

Requires less man hours to wire.
Easy to add and remove manifold stations.

Modular construction

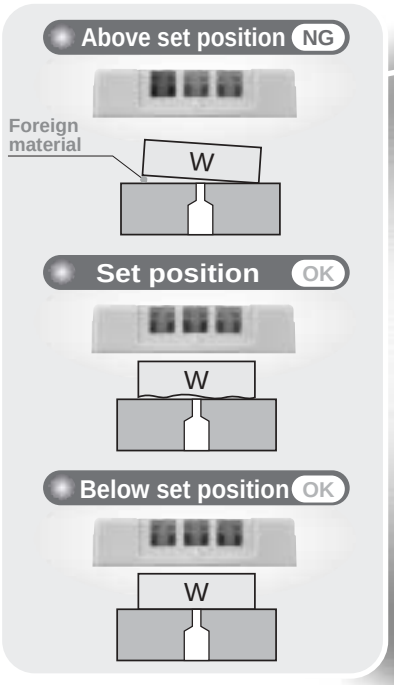
Requires less man hours to wire.

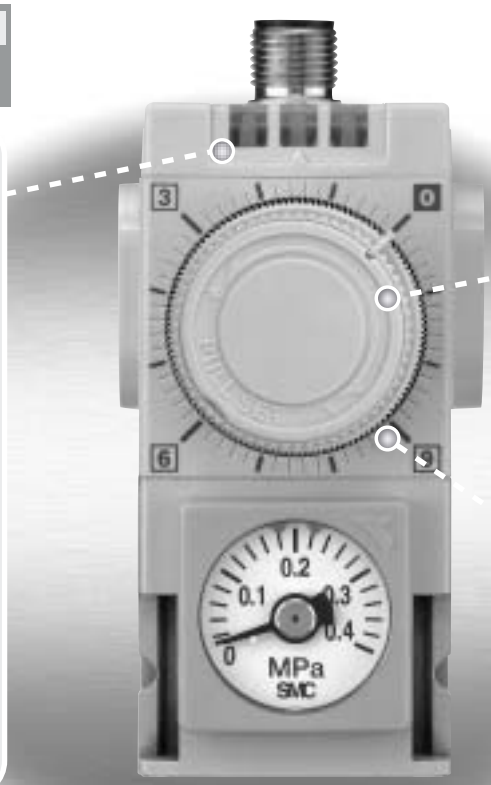
With regulator + 2 port solenoid valve

With 2 port solenoid valve

Optimum position is known at a glance.

LED level meter





Easy-to-operate large dial

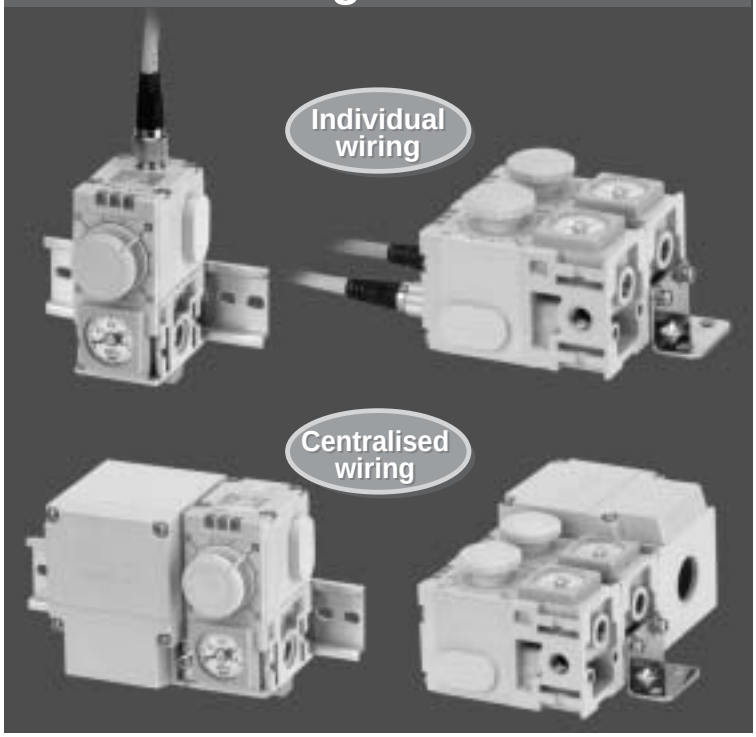
Scale provides guidelines for set position.

Minimum operating pressure 30kPa (ISA2-G)

Energy consumption can be reduced compared with the conventional models (Conventional models: 50kPa)

Position of supply port: Either right side or left side is available.

2 wiring methods



Variations

Model	ISA2-G	ISA2-H
Operating pressure range	30 to 200kPa	50 to 200kPa
Detection distance	0.01 to 0.25mm	0.03 to 0.5mm
Output type	NPN open connector, PNP open collector	
Electrical entry	Lead wire with connector (Individual wiring) Terminal box (Centralised wiring)	
Mounting	DIN rail, Bracket	
Number of manifold stations	1 to 6 stations	
Port size	Rc, NPT, G 1/8	
Enclosure	IP66 (IP65 for solenoid valve. Regulator and pressure gauge are open type.)	

Air Catch Sensor
Series ISA2

How to Order

Manifold

Without control unit IISA2 N **PL** – **3** **B**

With control unit IISA2 **C** **SL** – **3** **B** **1** **D** **E2**

Control unit

C	With regulator + 2 port solenoid valve
V	With 2 port solenoid valve

Electrical entry and supply port position

SR	Centralised wiring with supply port on the right
SL	Centralised wiring with supply port on the left
PR	Individual wiring with supply port on the right
PL	Individual wiring with supply port on the left

Note) The supply port position is the one when the switch is viewed from the front.

Stations

1	1 station
2	2 stations
3	3 stations
4	4 stations
5	5 stations
6	6 stations

Option

-	Without bracket
B	With bracket
D	With mounting bracket for DIN rail

Note) DIN-rail must be ordered separately. (Refer to the page 15.)

Voltage of 2 port solenoid valve

1	100VAC
2	200VAC
3	110VAC
4	220VAC
5	24VDC
6	12VDC
36	230VAC

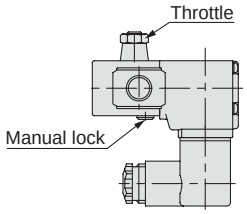
Pressure gauge of regulator Note 1)

A*	Without pressure gauge Note 2)		
E2	MPa single notation	0.2 MPa	Square embedded pressure gauge
Z2*	PSI single notation		
E4	MPa single notation	0.4 MPa	
Z4*	PSI single notation		
G2	MPa single notation	0.2 MPa	Round pressure gauge
P2*	MPa-PSI double notation		
G4	MPa single notation	0.4 MPa	
P4*	MPa-PSI double notation		

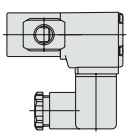
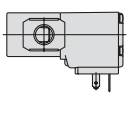
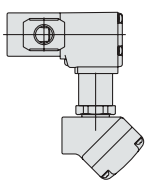
Note 1) Due to new Japanese weight and measurement legislation, PSI notation type cannot be sold or used in Japan.
Note 2) The pressure gauge port is Rc 1/8.
* Manufactured upon receipt of order.

Throttle/Manual lock of 2 port solenoid valve

-	Without throttle, without manual lock
C	With throttle, without manual lock
W	Without throttle, with manual lock
M	With throttle, with manual lock



Electrical entry of 2 port solenoid valve

D : DIN connector **DL:** DIN connector (With indicator light)	**D0:** DIN connector (Without connector)	**T** : Conduit terminal **TL:** Conduit terminal (With indicator light)
		

How to Order

For single and double notation type and additional stations

Air catch sensor **ISA2 – G □ E2 1 □**

Detection distance

G	0.01 to 0.25mm
H	0.03 to 0.5mm

Piping specifications

-	Rc 1/8
N	NPT 1/8
F*	G 1/8

* Made to order

Pressure gauge Note 1)

A*	Without pressure gauge Note 2)		
E2	MPa single notation	0.2 MPa	Square embedded pressure gauge
Z2*	PSI single notation		
E4	MPa single notation	0.4 MPa	
Z4*	PSI single notation		
G2	MPa single notation	0.2 MPa	Round pressure gauge
P2*	MPa-PSI double notation		
G4	MPa single notation	0.4 MPa	
P4*	MPa-PSI double notation		

Note 1) Due to new Japanese weight and measurement legislation, PSI notation type cannot be sold or used in Japan.
Note 2) The pressure gauge port is Rc 1/8.
* Manufactured upon receipt of order.

Output specifications

1	NPN Output
5	PNP Output

Electrical entry

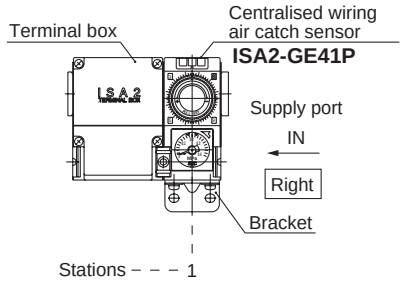
Individual wiring	-	Straight
	L*	Right angle
	N	Without lead wire
Centralised wiring	P	Terminal block box

* Manufactured upon receipt of order.

Example

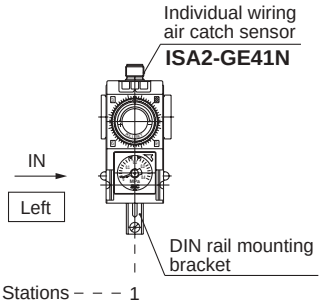
Without control unit

Centralised wiring



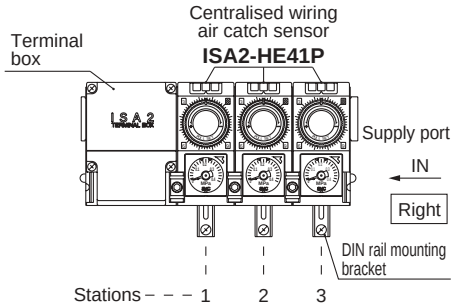
IISA2NSR-1B · · · 1 set (1 station manifold part number)
*__ISA2-GE41P__ · · · 1 set (Air catch sensor part number)
Prefix the part number of the air catch sensor with an asterisk (*).

Individual wiring



IISA2NPL-1D · · · 1 set (1 station manifold part number)
*__ISA2-GE41N__ · · 1 set (Air catch sensor part number)
Prefix the part number of the air catch sensor with an asterisk (*).

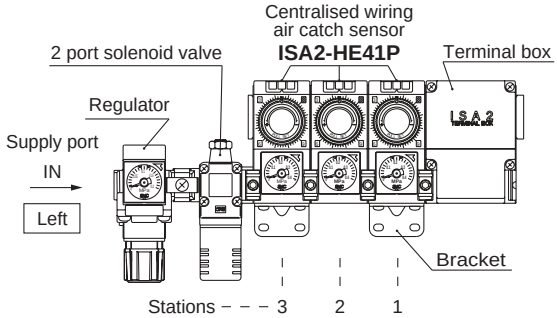
Centralised wiring/Supply port right



IISA2NSR-3D · · · 1 set (3 stations manifold part number)
*__ISA2-HE41P__ · · · 3 sets (Air catch sensor part number)
Prefix the part number of the air catch sensor with an asterisk (*).

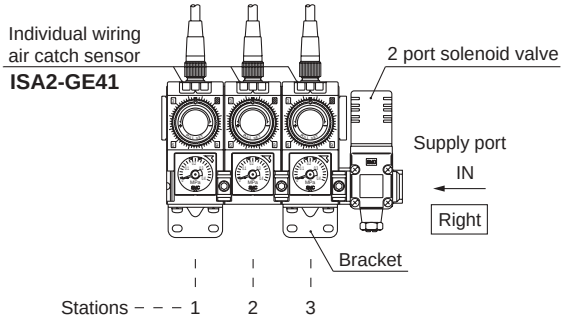
With control unit

Centralised wiring/Supply port left



IISA2CSL-3B5DLCE2 · · 1 set (3 stations manifold part number)
*__ISA2-HE41P__ · · · · · · · · · 3 sets (Air catch sensor part number)
Prefix the part number of the air catch sensor with an asterisk (*).

Individual wiring/Supply port right



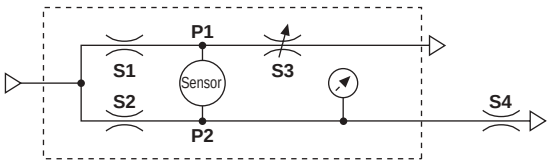
IISA2VPR-3B5DLC · · · 1 set (3 stations manifold part number)
*__ISA2-GE41__ · · · · · · · · · 3 sets (Air catch sensor part number)
Prefix the part number of the air catch sensor with an asterisk (*).

Specifications

Model			ISA2-G□□□1□	ISA2-G□□□5□	ISA2-H□□□1□	ISA2-H□□□5□
Detection distance			0.01 to 0.25mm		0.03 to 0.50mm	
Fluid			Dry air (filtered to 5μm)			
Operating pressure range			30 to 200kPa		50 to 200kPa	
Recommended detection nozzle			ø1.5		ø2.0	
Consumption flow rate ℓ/min (ANR)	Supply pressure	50kPa	5 or less		10 or less	
		100kPa	8 or less		15 or less	
		200kPa	12 or less		22 or less	
Power supply voltage			12 to 24VDC, Ripple (p-p) 10% or less (with power polarity protection)			
Current consumption			15mA or less			
Switch Output			NPN open collector: one output	PNP open collector: one output	NPN open collector: one output	PNP open collector: one output
	Maximum load current		80mA			
	Maximum load voltage		30VDC (at NPN output)			
	Residual voltage		1.5V or less (at 80mA)			
	Output protection		With short circuit protection			
Repeatability (Including temperature characteristics)			0.01mm or less (Detection distance range 0.01 to 0.15mm, supply pressure 100 to 200kPa)		0.01mm or less (Detection distance range 0.03 to 0.15mm, supply pressure 100 to 200kPa)	
Hysteresis Note 1)			0.01mm or less (Detection distance range 0.01 to 0.15mm)		0.01mm or less (Detection distance range 0.03 to 0.15mm)	
Indicator light			LED level meter Note 2) with 1 red, 2 green (Set value < detection distance: red, Set value = detection distance: green 1, Set value > detection distance: green 1 + green 2)			
Environmental Resistance	Enclosure		IP66			
	Operating temperature range		Operating: 0 to 60°C, Stored: –20 to 70°C (with no condensation and no freezing)			
	Operating humidity range		Operating/stored: 35 to 85%RH (with no condensation)			
	Withstand voltage		1000 VAC in 50/60Hz for 1 minute between external terminal and case			
	Insulation voltage		2 MΩ or more between external terminal and case (measured with 500 VDC megaohm meter)			
	Vibration resistance		1.5 mm amplitude in 10 to 500Hz or acceleration of 98 m/s² without control unit and bracket mounted, Others 30m/s², whichever is smaller for 2 hours in X, Y, Z direction each (de-energised)			
	Impact resistance		Without control unit and bracket mounted: 980m/s², Others: 150m/s² in X, Y and Z direction, 3 times each (de-energised)			
Port size			Nil: Rc 1/8, N type: NPT 1/8, F type: G 1/8			
Lead wire (individual wiring type)			4 core, oil resistant, cable (0.64mm²) with M12, 4 pin pre-wired connector			
Terminal block box (centralised wiring type)			Front wiring (Electrical entry ø21)			
Weight			Individual wiring type (body only): 253g, common wiring type (body only): 250g, Terminal box: 205g, lead wire: 278g, connecting bracket with sealing for additional station: 4g			

Note 1) Refer to “Relation between the nozzle diameter and detection distance” (page 5) for hysteresis.
Note 2) Refer to “Setting procedure” (page 8) for LED level meter.

Working principle

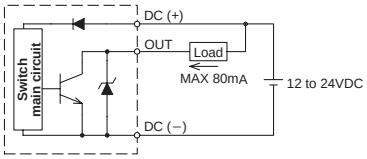


S1, S2: Fix orifice
S3: Variable orifice (adjusted by setting dial)
S4: Detection nozzle

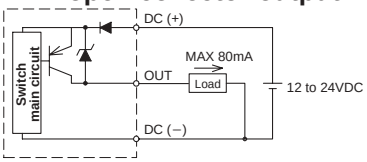
In a bridge circuit as in the left figure, a detection gap is applied to the detection nozzle (S4) while the setting dial S3 is adjusted to balance the pressure applied to the pressure sensor (P1=P2). The pressure sensor detects the differential pressure generated when the detection nozzle (S4) is released. When the work piece comes close to the detection nozzle, the back pressure P2 increases until it is larger than P1 (P2≧P1). Then the switch output turns on to notify that the pressure is below the detection gap.

Internal Circuit and Wiring

NPN open collector output

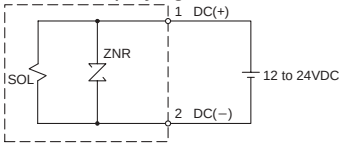


PNP open collector output

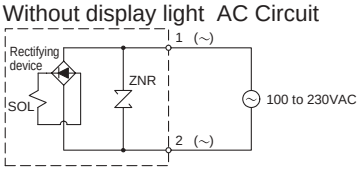


Circuit and wiring for 2 port solenoid valve

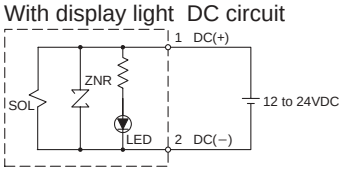
Without display light DC circuit



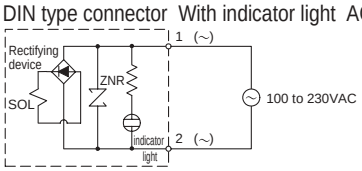
Without display light AC Circuit



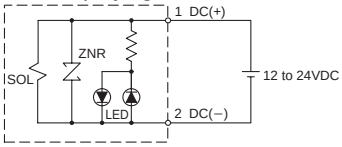
Conduit terminal
With display light DC circuit



Conduit terminal
DIN type connector With indicator light AC Circuit



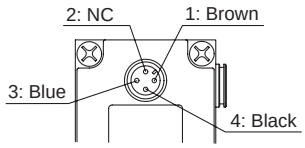
DIN type connector
With display light DC circuit



Refer to catalogue and instruction manual of Series VCA for wiring.
Pay attention to the power supply voltage. Use of incorrect power supply will cause damage to equipment.

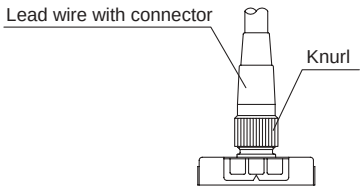
Wiring

Individual wiring



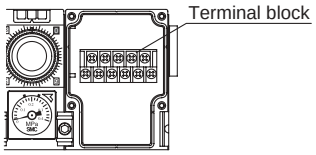
1	Brown	DC (+)
2	–	NC
3	Blue	DC (−)
4	Black	OUT

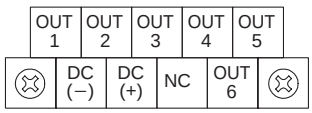
1. Insert the connector of the lead wire with its key groove at the proper position.
2. Hold the knurl with 2 fingers and rotate it clockwise until finger tight.



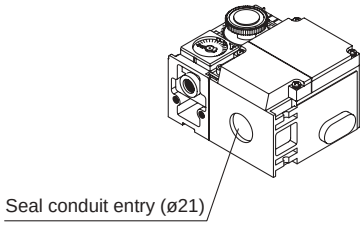
3. Connect the coloured wires coming from the cable terminal. Refer to the circuit diagram and table above to avoid mistakes.

Centralised wiring





1. Mount the seal conduit on the terminal box. For mounting procedure, refer to the catalogue and instruction manual provided by the manufacturer of the seal conduit.
2. Thread the cable through the seal conduit and arrange wiring according to the polarity of the terminal block illustrated above.
3. Fasten the seal conduit with a tightening torque not greater than 5 N·m. Do not hold the terminal box or the switch.

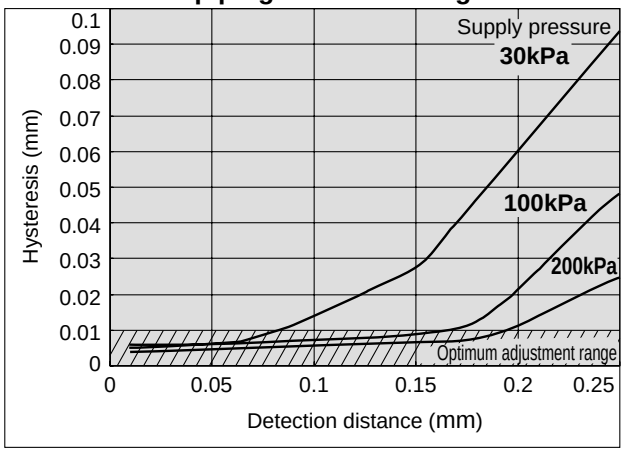


Relation between Nozzle Diameter and Detection Distance

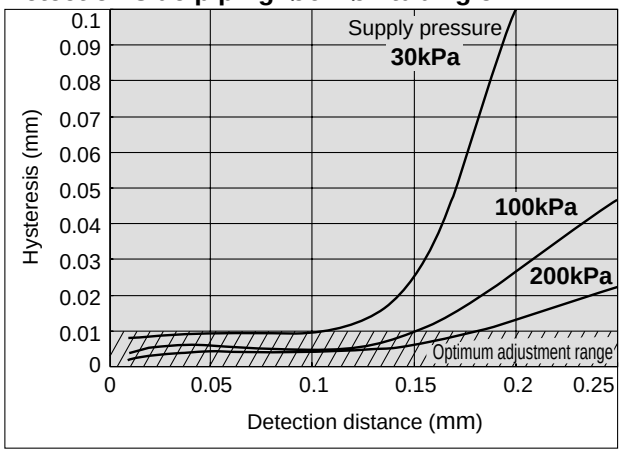
The data in the following charts are characteristics of hysteresis at the detection distance.
In case accuracy is required by the settings, the design should be made so that the hysteresis will stay within the optimum adjustment range not larger than 0.01 mm.
The smaller the hysteresis, the better the sensitivity. In cases where the hysteresis exceeds 0.01 mm, the air catch sensor should be used to check the presence of the work piece.

ISA2-G□□□□□

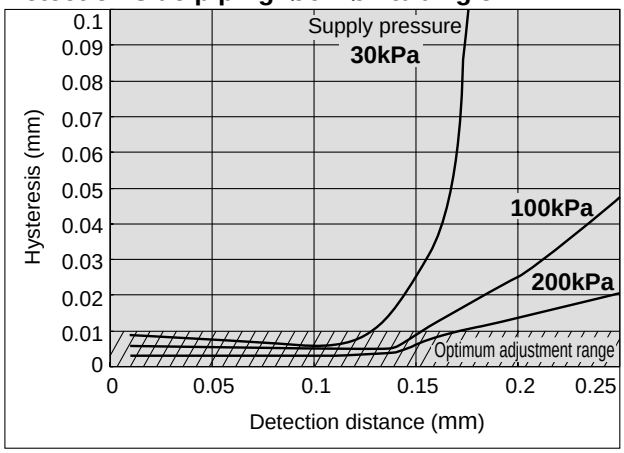
Detection nozzle: ø1.0
Detection side piping: ø6 x ø4 tubing 5m



Detection nozzle: ø1.5
Detection side piping: ø6 x ø4 tubing 5m

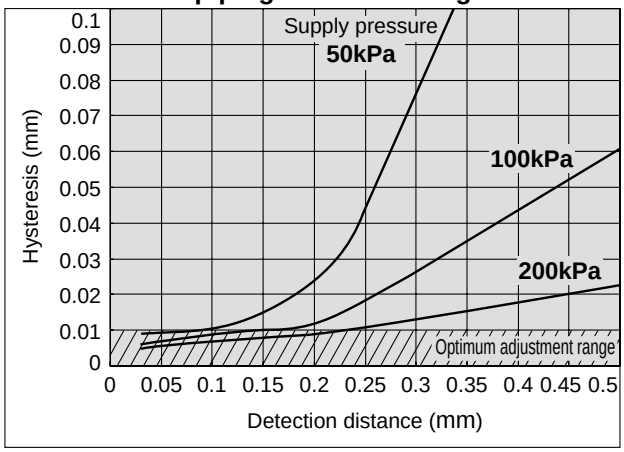


Detection nozzle: ø2.0
Detection side piping: ø6 x ø4 tubing 5m

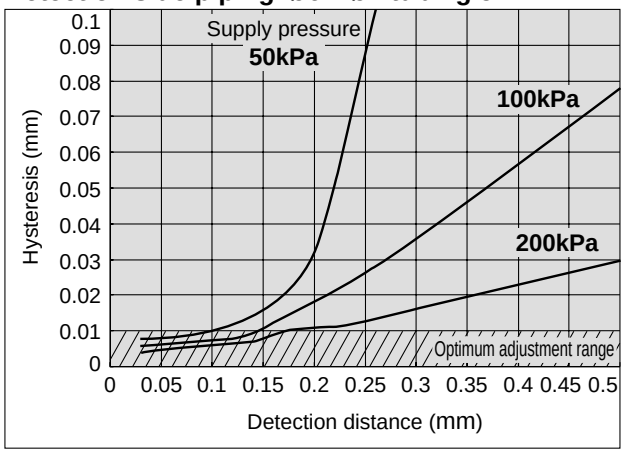


ISA2-H□□□□□

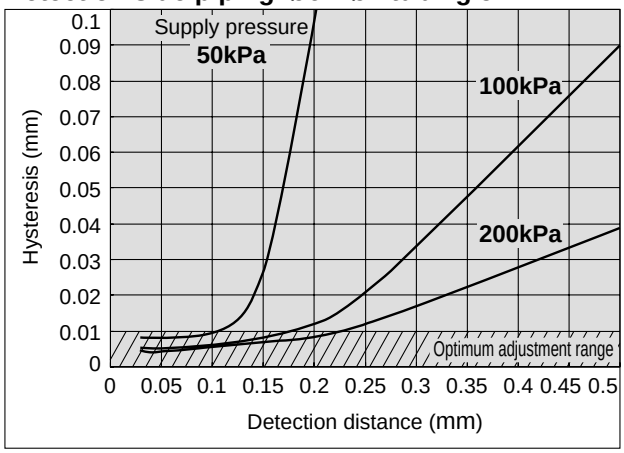
Detection nozzle: ø1.0
Detection side piping: ø6 x ø4 tubing 5m



Detection nozzle: ø1.5
Detection side piping: ø6 x ø4 tubing 5m



Detection nozzle: ø2.0
Detection side piping: ø6 x ø4 tubing 5m

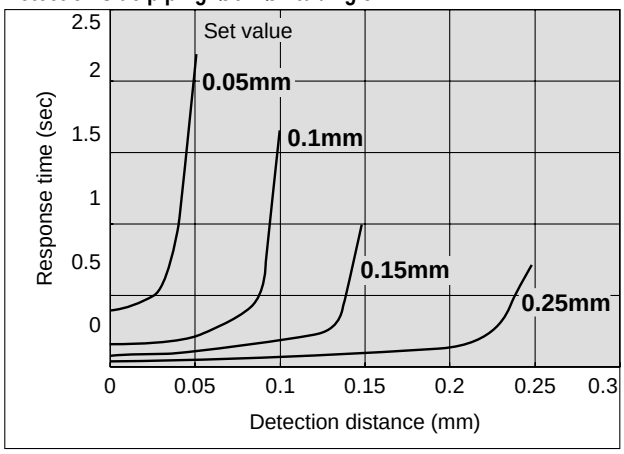


Response Time

Response time changes with detection distance and piping length. It is hardly influenced by the supply pressure and nozzle diameter (ø1.0 to ø2.0).
While all graphs assume a fixed set distance with changes in the detection distance, the upper charts show responses at various set values and the lower charts show responses at various piping lengths. If the set distance is equal to the set value, the response becomes quicker as the set value becomes smaller or the piping length becomes shorter.

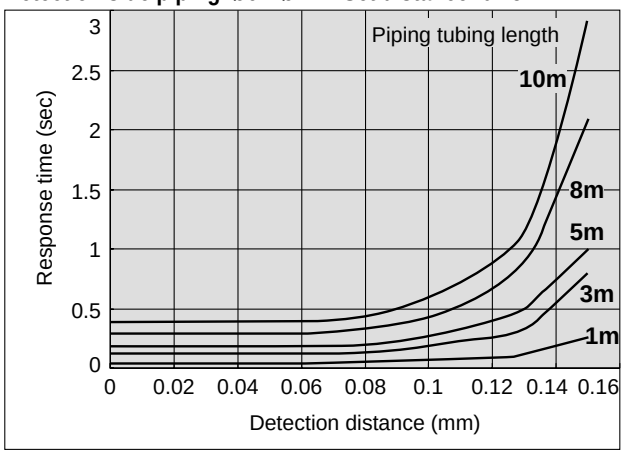
ISA2-G□□□□□

Detection nozzle: ø1.5 **Supply pressure: 100kPa**
Detection side piping: ø6 x ø4 tubing 5m



Detection distance−Response time characteristics

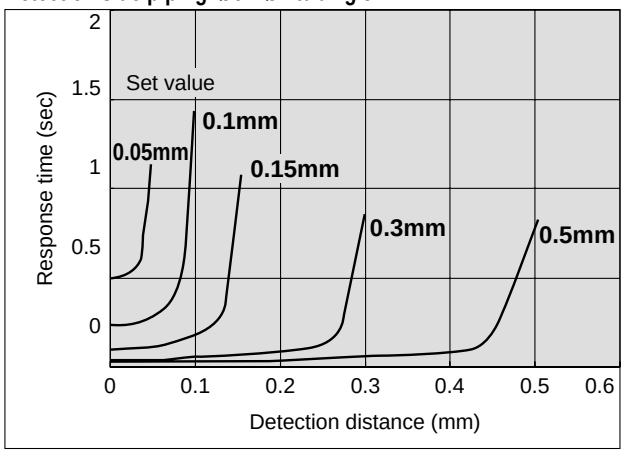
Detection nozzle: ø1.5 **Supply pressure: 100kPa**
Detection side piping: ø6 x ø4 **Set distance: 0.15mm**



Piping tubing length−Response time

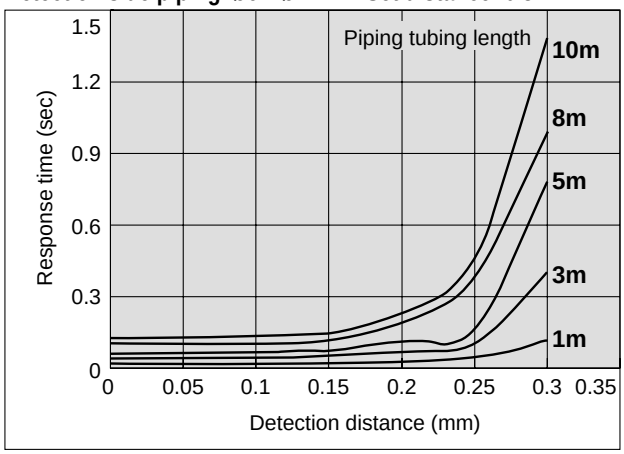
ISA2-H□□□□□

Detection nozzle: ø2.0 **Supply pressure: 100kPa**
Detection side piping: ø6 x ø4 tubing 5m



Detection distance−Response time characteristics

Detection nozzle: ø2.0 **Supply pressure: 100kPa**
Detection side piping: ø6 x ø4 **Set distance: 0.3mm**



Piping tubing length−Response time

Nozzle Shape

Please keep the nozzle shape as illustrated below.
Take every caution against chamfer on the detection surface and/or nozzle hole, which could affect the characteristics as illustrated in Figure 1.

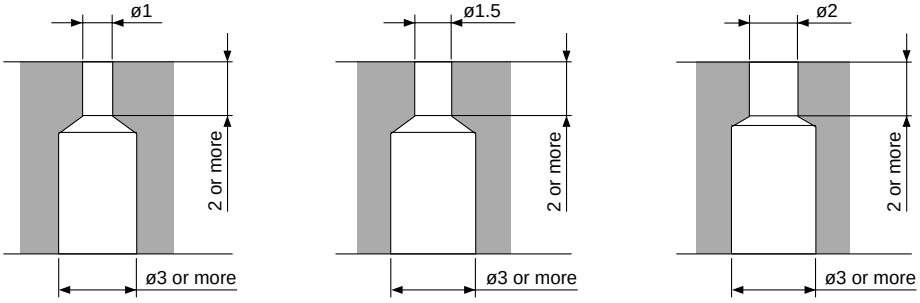
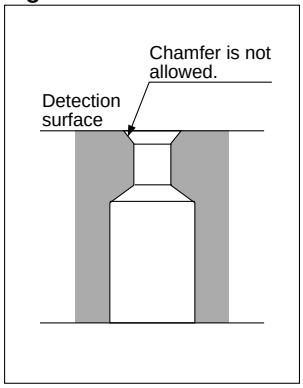


Figure 1

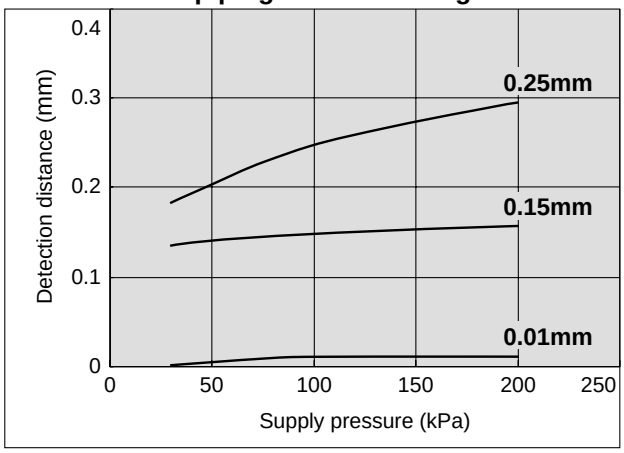


Supply Pressure Dependence

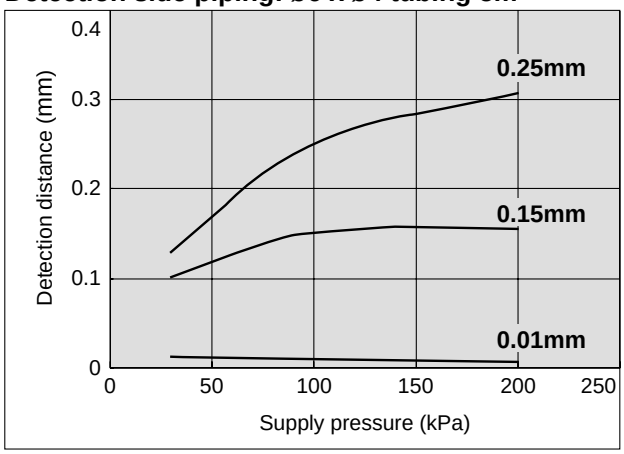
The charts illustrate changes in the detection distance with fluctuations in the supply pressure.

ISA2-G□□□□□

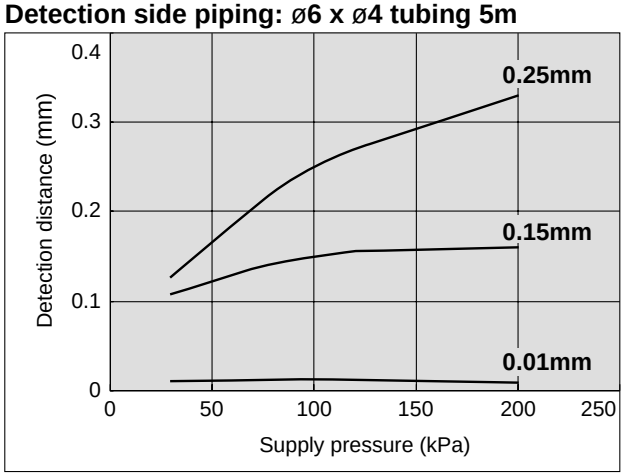
Detection nozzle: ø1.0
Detection side piping: ø6 x ø4 tubing 5m



Detection nozzle: ø1.5
Detection side piping: ø6 x ø4 tubing 5m

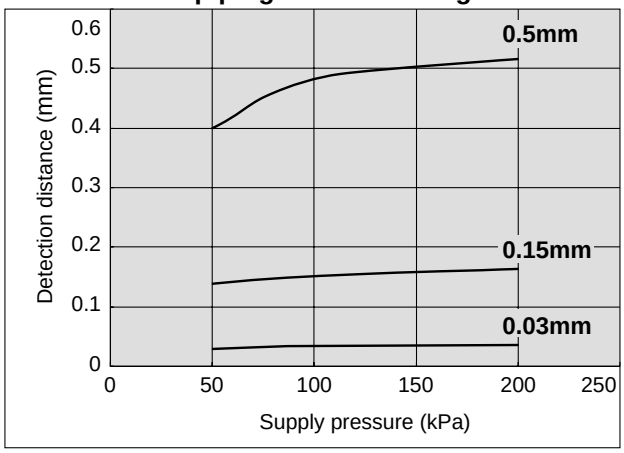


Detection nozzle: ø2.0
Detection side piping: ø6 x ø4 tubing 5m

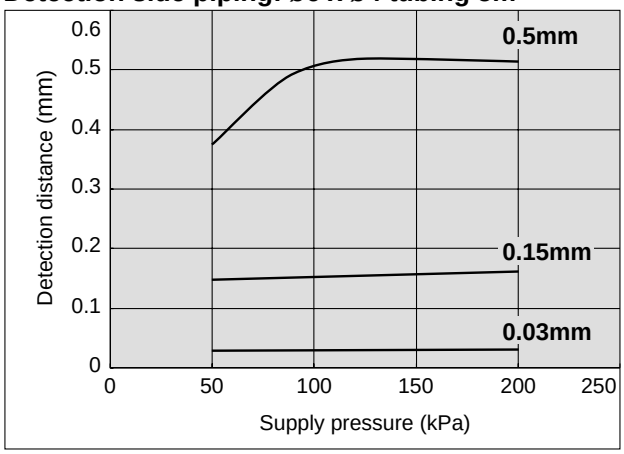


ISA2-H□□□□□

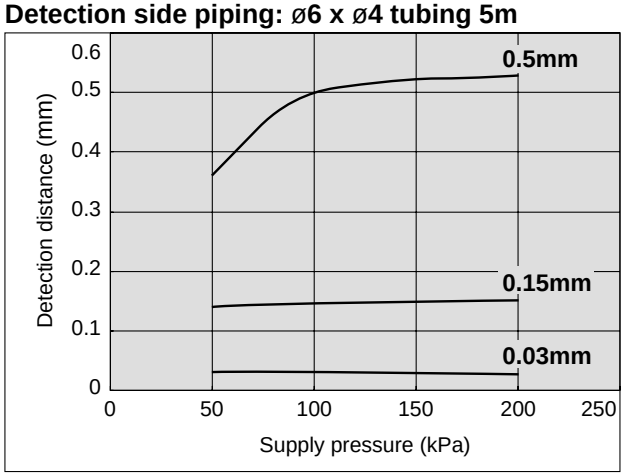
Detection nozzle: ø1.0
Detection side piping: ø6 x ø4 tubing 5m



Detection nozzle: ø1.5
Detection side piping: ø6 x ø4 tubing 5m

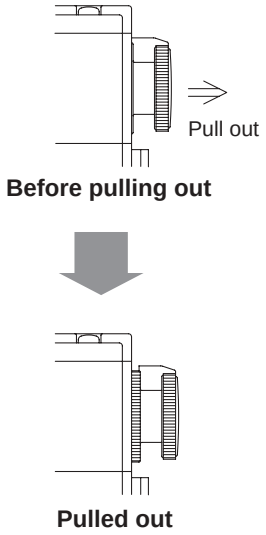


Detection nozzle: ø2.0
Detection side piping: ø6 x ø4 tubing 5m

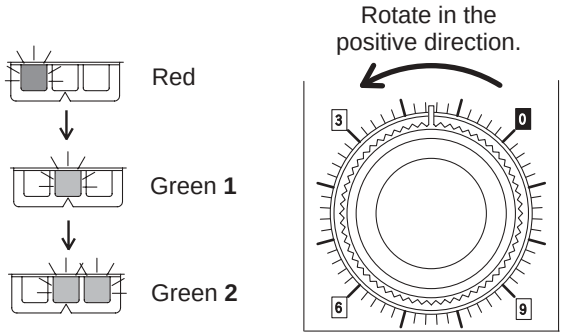


Setting Procedure

The detection distance is set with the LED level meter and setting dial.
Keep the setting dial pulled out while in use. If released, it will return to its original position and become unable to rotate.



1. For accuracy in setting, apply a clearance gauge to the detection nozzle to replicate the set condition in advance.
2. Confirm that the set pressure is applied. If the setting dial is fully open, the LED level meter appears as □□□.
3. Pull the setting dial and rotate it in the positive direction. The lights will turn on in the order shown below.



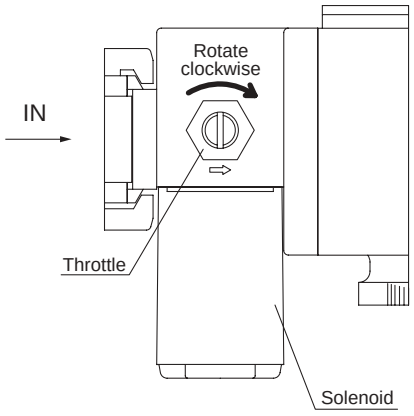
4. The sensor output comes on when the lights on the LED level meter turn on as ■□□. Complete the setting when this condition is observed.
5. Apply the clearance gauge again to confirm that the lights turn on as ■■■.

Handling and setting of 2 port solenoid valve

Throttle setting for blowing to prevent water and cutting oil from entering the nozzle.
(Clockwise: Close throttle, Counter-clockwise: Open throttle)

∗The setting is not applicable to valves without throttle.

1. Power off the valve.
2. Rotate the throttle clockwise for adjustment so that the detection nozzle will not suck up water or cutting oil.

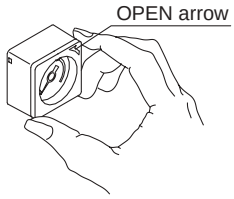


3. Power on the valve, then off again.
Confirm that the detection nozzle does not suck up water or cutting oil.
Note) Do not rotate the throttle more than 4 turns or it will fall out.

Handling and setting of limit gauge indicator

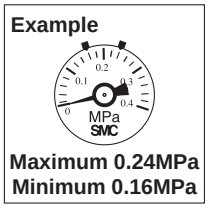
1. Removal of cover

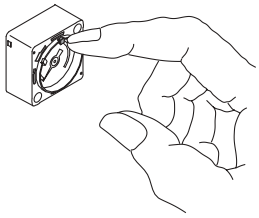
Grip fingers on the front cover ridge and rotate it in the direction of the OPEN arrow until it stops (15°).
Then pull out and remove the cover.



2. Setting the installation needle

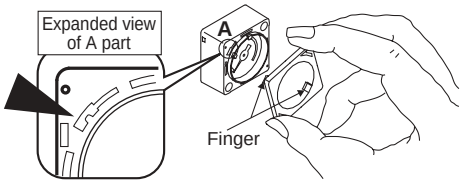
The installation needle should be moved by the fingertip.
Set the 2 green installation needles at the maximum and minimum limits of pressure.





3. Installation of cover

After setting the installation needles, locate the OPEN arrow at the top right position and insert the claws on the cover into the grooves on the case (indicated by ▼ in the expanded view of A part). Rotate the cover clockwise until it stops. Confirm that the cover is firmly secured.



Relation between Dial Scale and Detection Distance

Test procedure and conditions

Dial scales when the detection nozzle is under the following conditions;
Supplied pressure: 100kPa
Piping: ø6xø4 tubing, 5m in length.

Results of measurement Note 1)

●Relation between the detection distance and set dial scales Note 2) (scale numbers)

ISA2-G□

Detection distance	Detection nozzle diameter		
	ø1.0	ø1.5	ø2.0
0.05mm	0.3 to 0.7	0.9 to 1.4	0.3 to 0.7
0.10mm	1.1 to 1.5	2.3 to 2.8	2.0 to 2.5
0.15mm	1.9 to 2.3	3.4 to 4.1	3.7 to 4.6
0.20mm	2.5 to 3.0	4.4 to 5.5	5.3 to 7.0
0.25mm	3.0 to 3.5	5.2 to 7.0	6.6 to 10.7

ISA2-H□

Detection distance	Detection nozzle diameter		
	ø1.0	ø1.5	ø2.0
0.1mm	1.1 to 1.5	2.4 to 2.8	2.6 to 3.4
0.2mm	2.4 to 2.9	4.5 to 5.1	5.4 to 6.4
0.3mm	3.0 to 3.5	5.5 to 6.3	7.0 to 8.3
0.4mm	3.3 to 3.8	6.0 to 7.0	7.9 to 9.6
0.5mm	3.5 to 4.0	6.5 to 7.5	8.6 to 10.7

●Average variation per scale (detection distance [mm])

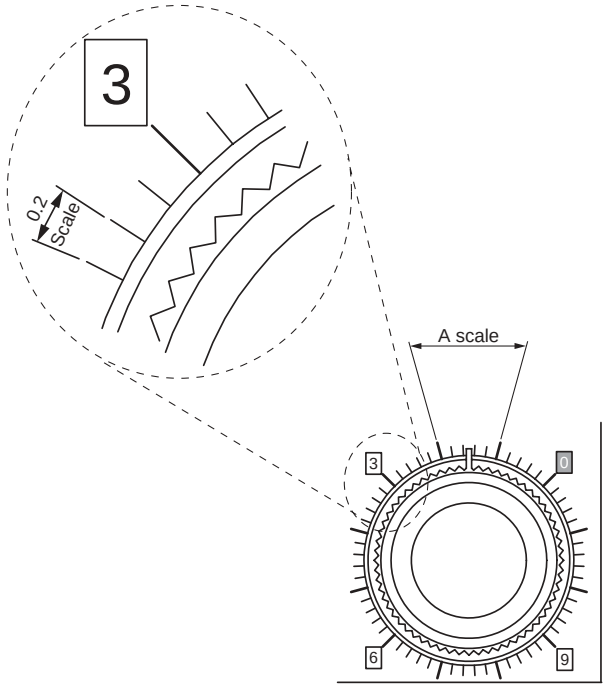
ISA2-G□

Detection distance	Detection nozzle diameter		
	ø1.0	ø1.5	ø2.0
0.05mm	0.010	0.005	0.006
0.10mm	0.007	0.004	0.003
0.15mm	0.010	0.005	0.004
0.20mm	0.010	0.005	0.003
0.25mm	0.010	0.007	0.003

ISA2-H□

Detection distance	Detection nozzle diameter		
	ø1.0	ø1.5	ø2.0
0.1mm	0.008	0.004	0.003
0.2mm	0.008	0.005	0.004
0.3mm	0.025	0.011	0.007
0.4mm	0.046	0.019	0.011
0.5mm	0.050	0.021	0.012

Note 1) This data provides reference values as a guide only, this should not be viewed as a guarantee of our products performance.
Note 2) Set dial scales are as follows;

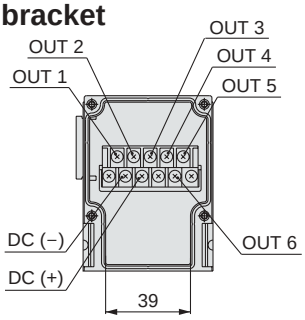


Between each major scales, it is sub divided into ten smaller settings (for example, between 2.0 to 3.0 – 2.1, 2.2, 2.3 etc), settings are possible at each increment.

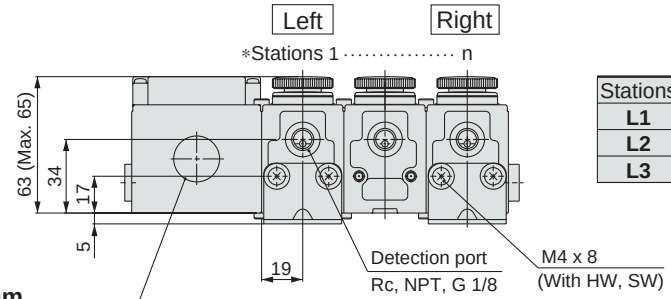
Dimensions/Centralised Wiring Type

∗ When the SUP port is on the left, the stations are sequentially numbered from the side of the terminal block box.

With bracket

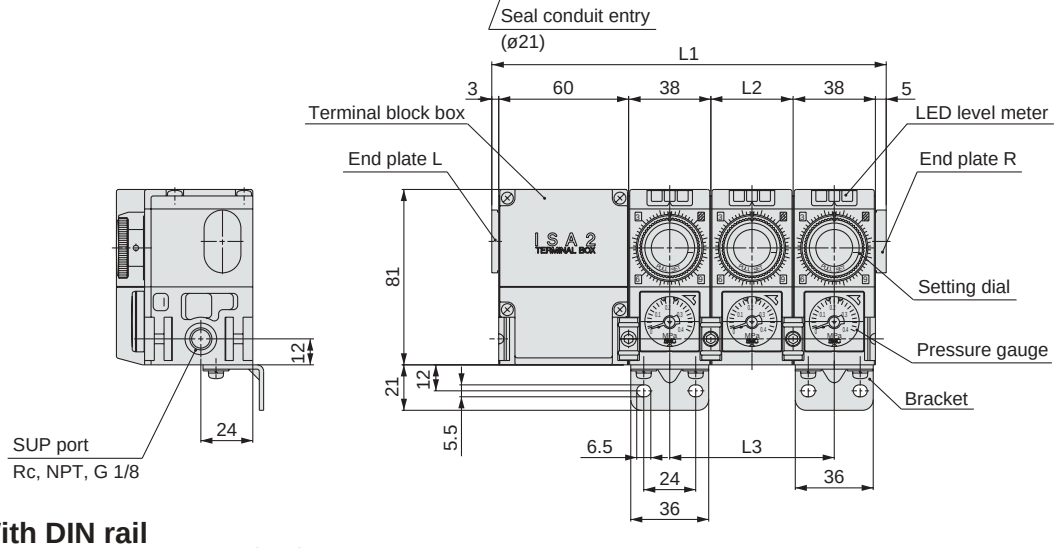


Terminal block box wiring diagram

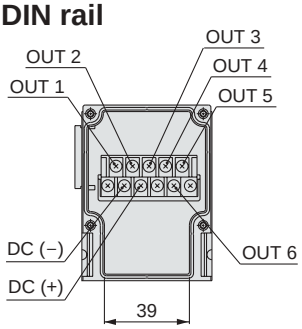


Stations	1	2	3	4	5	6
L1	106	144	182	220	258	296
L2	—	—	38	76	114	152
L3	—	38	76	114	152	190

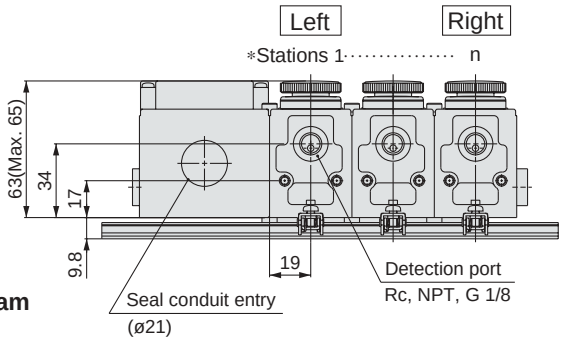
For the bracket attachment position, refer to page 13.



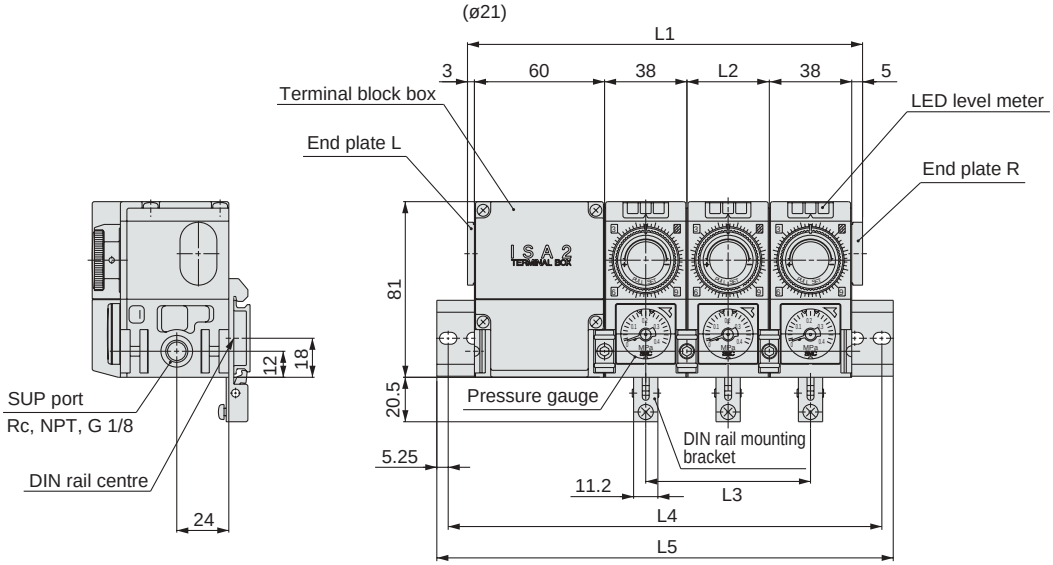
With DIN rail



Terminal block box wiring diagram

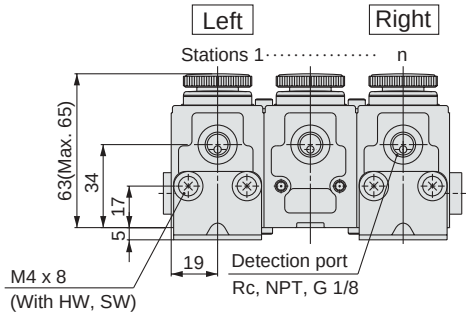


Stations	1	2	3	4	5	6
L1	106	144	182	220	258	296
L2	—	—	38	76	114	152
L3	—	38	76	114	152	190
L4	120	162.5	200	237.5	275	312.5
L5	135.5	173	210.5	248	285.5	323



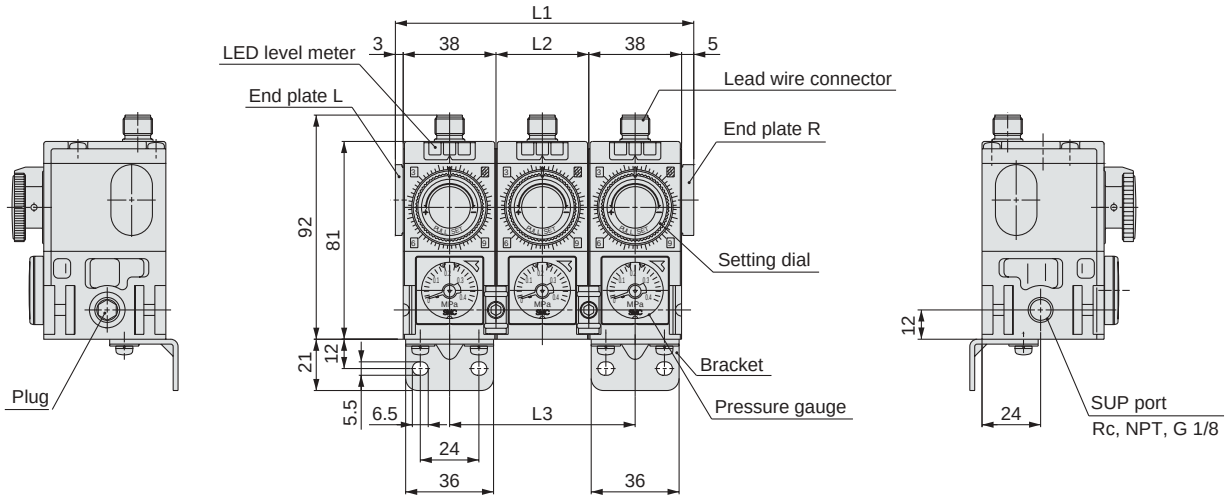
Dimensions/Individual Wiring Type

With bracket



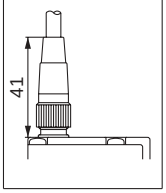
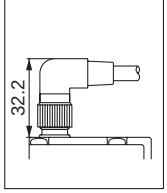
Stations	1	2	3	4	5	6
L1	46	84	122	160	198	236
L2	—	—	38	76	114	152
L3	—	38	76	114	152	190

For the bracket attachment position, refer to page 13.

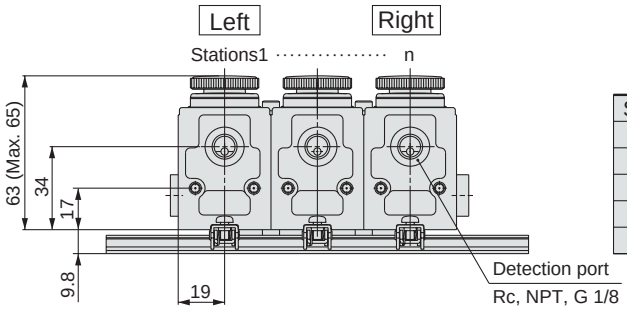


With DIN rail

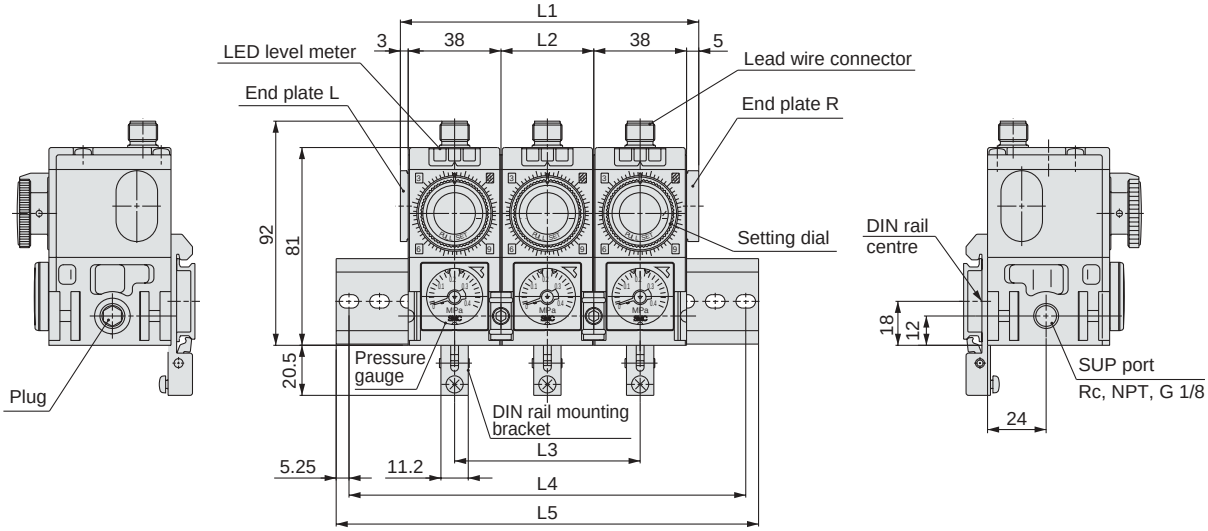
Electrical entry dimensions

Straight union	Right angle
	

The direction of a right angle connector cannot be changed.

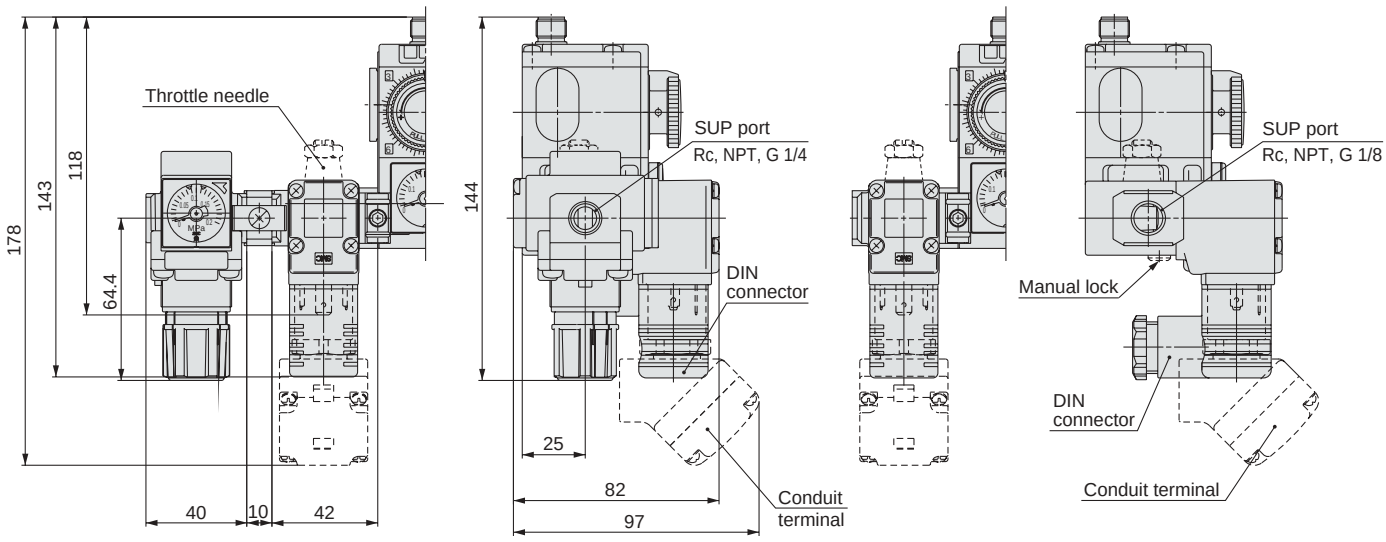


Stations	1	2	3	4	5	6
L1	46	84	122	160	198	236
L2	—	—	38	76	114	152
L3	—	38	76	114	152	190
L4	62.5	120	162.5	200	237.5	275
L5	73	135.5	173	210.5	248	285.5



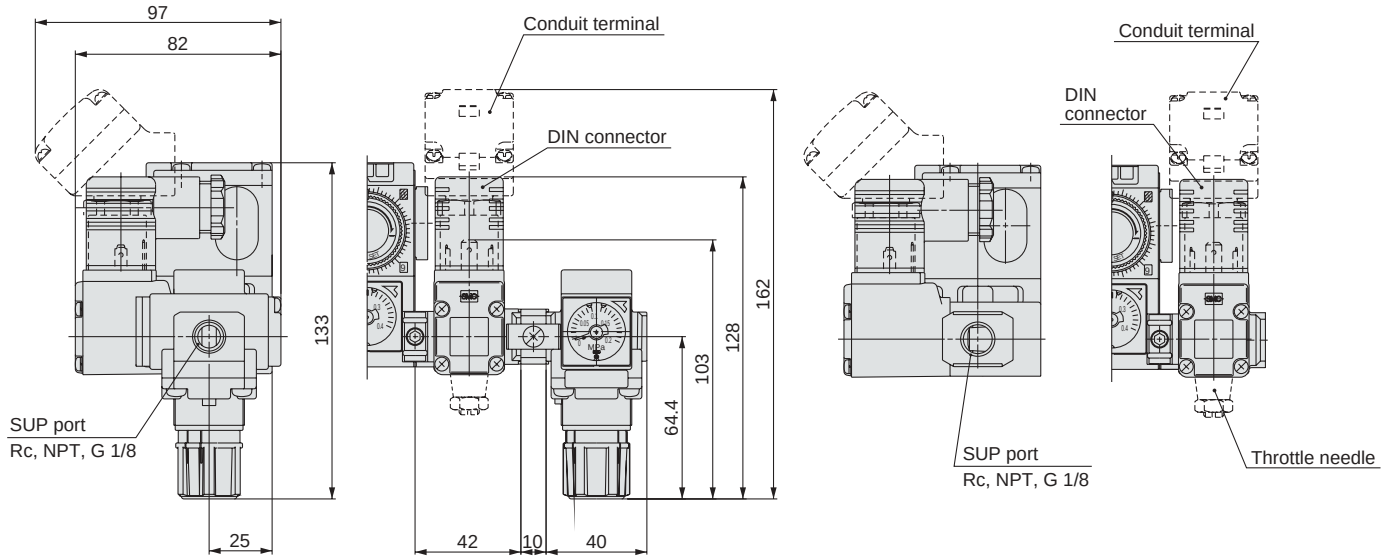
Dimensions/With control unit

SUP port on the left



With regulator + 2 port solenoid valve **With 2 port solenoid valve**

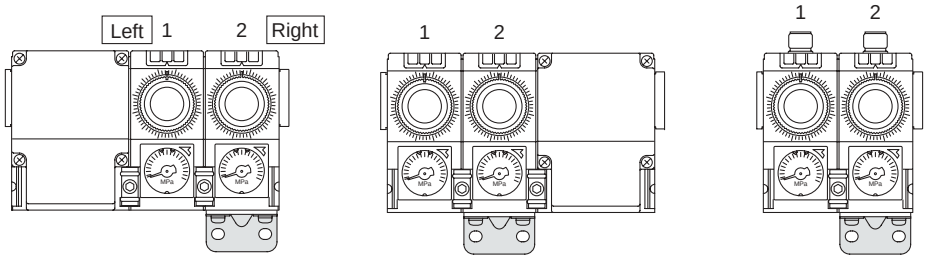
SUP port on the right



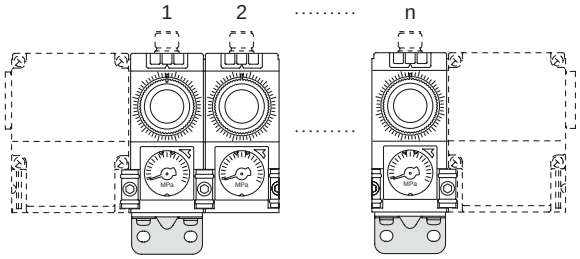
With regulator + 2 port solenoid valve **With 2 port solenoid valve**

Bracket Mounting Position

With 2 stations, the bracket is mounted on the second sensor from the left.

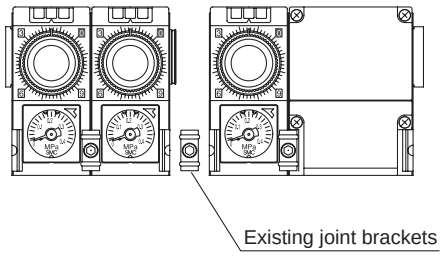


With n stations, the bracket is mounted on the first and "n" th sensor from the left.



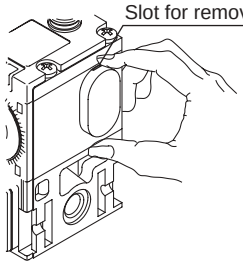
Addition of Manifold Stations

1. Disassembly



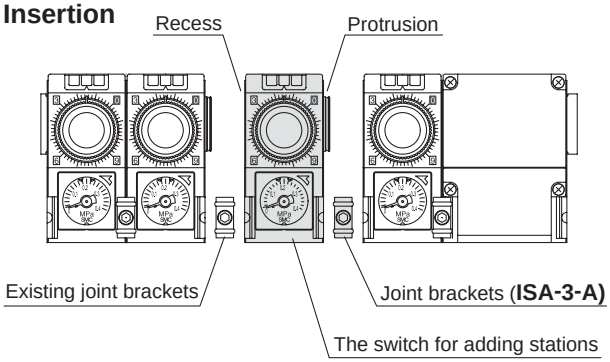
1. Loosen the screws and remove the 2 mounting brackets on the front and back side.
2. Disassemble the switch carefully so that the O-ring on the SUP port will not be detached.

End plate removal



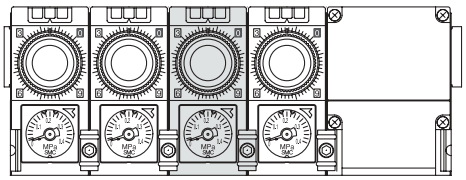
Grip the fingers on the top and bottom removal grooves to pull out the plate.
It can be removed by pulling horizontally.

2. Insertion



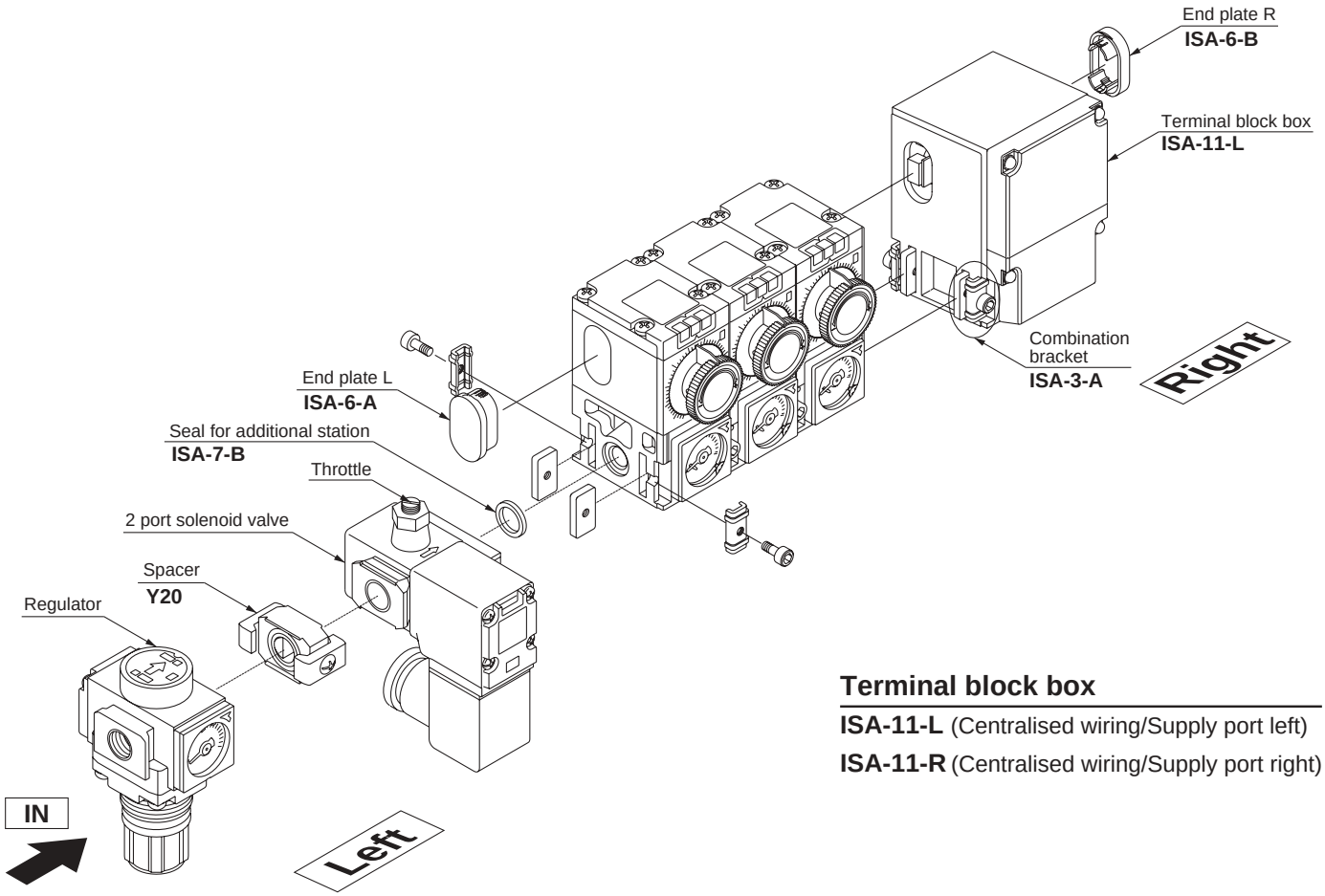
1. Fit seal for additional station (**ISA-7-B**) to the recess of the SUP port of the additional switch.
2. Fit the protrusion of the additional switch into the existing switch.
3. Mount joint brackets (**ISA-3-A**) at 2 positions.
   Note) Perform temporary tightening of screws.
4. Confirm that the recess of the SUP port of the existing switch has seal for additional station attached.
5. Fit the protrusion of the existing switch into the recess of the additional switch.
6. Mount the existing joint bracket.
   Note) Perform temporary tightening of screws.

3. Assembly



1. Tighten the joint brackets with the prescribed tightening torque of 1.2N·m.
2. Arrange pneumatic piping and confirm that there is no air leakage from new joints.

Parts List



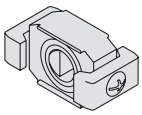
Terminal block box

ISA-11-L (Centralised wiring/Supply port left)

ISA-11-R (Centralised wiring/Supply port right)

Spacer

Y20



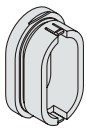
Seal for additional station

ISA-7-B
When 2 air catch sensors are connected or when a 2 port solenoid valve is connected to the left:

ISA-7-A
When a 2 port solenoid valve is connected to the right:

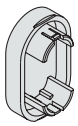
End plate L

ISA-6-A



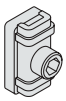
End plate R

ISA-6-B



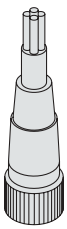
Joint bracket

ISA-3-A
A pair consists 1 set.

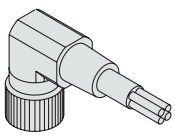


Lead wire with connector (Individual wiring type)

ISA-8-A
Straight, 5m

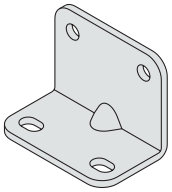


ISA-8-B
Right angle, 5m



Bracket

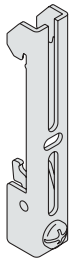
ISA-4-A



With mounting screw 2 pcs.

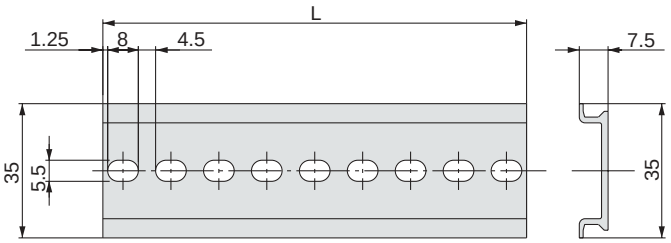
DIN rail mounting bracket

ISA-9-A



DIN Rail

ISA-5-□



Part no.	L	Applicable models	
		Individual wiring type	Centralised wiring type
ISA-5-1	73.0	IISA2□P□-1	—
ISA-5-2	135.5	IISA2□P□-2	IISA2□S□-1
ISA-5-3	173.0	IISA2□P□-3	IISA2□S□-2
ISA-5-4	210.5	IISA2□P□-4	IISA2□S□-3
ISA-5-5	248.0	IISA2□P□-5	IISA2□S□-4
ISA-5-6	285.5	IISA2□P□-6	IISA2□S□-5
ISA-5-7	323.0	—	IISA2□S□-6

Pressure Gauge for Air Catch Sensor

Square embedded pressure gauge

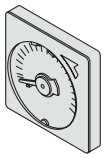
GC3 – □ 4 AS

Notation specification

-	MPa single notation
P	PSI single notation

Maximum pressure indication

2	0.2MPa
4	0.4MPa



Round pressure gauge

G36 – □ 4 – □ 01

Notation specification

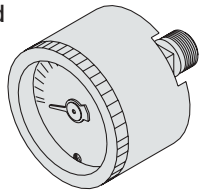
-	MPa single notation
P Note)	MPa-PSI double notation

Maximum pressure indication

2	0.2MPa
4	0.4MPa

Connection thread

-	R 1/8
N	NPT 1/8



Note) For double notation of MPa and PSI, add "-X30" at the end of part number.
Example) G36-P4-01-X30

Regulator

AR 20 – □ 02 E – 1 □

Thread type

-	Rc
N	NPT
F	G

Option (The shape of pressure gauge) Note 2)

-	None
E	Square embedded pressure gauge (with limit indicator)
G Note 1)	Round pressure gauge (with limit indicator)

Note 1) The pressure gauge port is Rc 1/8. The pressure gauge is included in the package (not assembled).
Note 2) Order individually when 0.4 MPa gauge is required.

Option specification

-	None
N	Non-relieving
R	Flow direction: Right to left
Z Note 1)	Unit representations on the label and pressure gauge are PSI and °F

When specifying more than one option, enter symbols first in numerical, then in alphabetical orders.
Note 1) Compatible with thread type NPT. Under the New Measurement Law, this type is only sold outside Japan. (The SI unit is used inside Japan.) In all cases, with the exception of NPT, add "-X2025" at the end of the order number. Example) AR20-02E-1-X2025

Standard specifications

Model			AR20
Port size			1/4
Fluid			Air
Proof pressure			1.5MPa
Maximum operating pressure			1.0MPa
Set pressure range			0.02 to 0.2MPa
Gauge port size Note 1)			1/8
Relief pressure			Set pressure + 0.05MPa {at relief flow of 0.1ℓ/min(ANR)}
Ambient and fluid temperature			−5 to 60°C (with no condensation)
Construction			Relieving type
Weight (kg)			0.29
Pressure gauge	0.2MPa	Round Note 2)	G36-2-□01
		Square embedded Note 3)	GC3-2AS

Note 1) The type with square embedded pressure gauge does not have connection.
Note 2) The "□" in the part number of the round pressure gauge indicates the type of connection threads, no symbol for R and N for NPT. Contact SMC for supply of the connection thread type NPT and the pressure gauge of PSI unit representation.
Note 3) With an O-ring (1 pc) and mounting screws (2 pcs).

2 Port Solenoid Valve

VCA27A – 5 DL S – 4 – 02 – Q

Voltage

1	100VAC
2	200VAC
3	110VAC
4	220VAC
5	24VDC
6	12VDC
36	230VAC

Port size

02	Rc 1/4
02N	NPT 1/4
02F	G 1/4

CE marked

Throttle

-	Without throttle and manual lock
S	With throttle
B	With manual lock
K	With manual lock and throttle

Electrical entry

D	DIN connector
DL	DIN connector (with light)
D0	DIN connector (without connector)
T	Conduit terminal
TL	Conduit terminal (with light)

Standard specifications

Valve specifications	Valve type		Direct operation poppet
	Fluid		Air, Inert gas
	Withstand pressure MPa		2.0
	Body material		Al
	Seal material		HNBR
	Ambient temperature °C		−20 to 60
	Fluid temperature °C		−10 to 60 (with no freezing)
	Enclosure		Dustproof and jetproof (Equivalent to IP65)
	Atmosphere		Environment with no corrosive or explosive gas
	Valve leakage cm³/min (ANR)		0.2 or less
	Mounting orientation		Free
	Vibration resistance/Impact resistance m/s² Note 2)		30/150 or less
Coil specifications	Rated voltage		24/12VDC, 100/110/200/220/230VAC (50/60Hz)
	Allowable voltage fluctuation		±10% rated voltage
	Type of coil insulation		B type
	Power consumption	DC	VCA2: 6.5W
	Apparent power	Note 1) AC 50Hz	VCA2: 7.5VA
		Note 1) AC 60Hz	VCA2: 7.5VA

Note 1) Since the AC specifications include a rectifying device, there is no difference between the apparent power required for starting and holding.
Note 2) Vibration resistance: No malfunction resulted in a one-sweep test in a 10 to 300Hz range in the axial and right angle directions of the main valve and armature, for both energised and de-energised states.
Shock resistance: No malfunction resulted in an impact test using a drop impact tester. The test was performed in the axial and right angle directions of the main valve and armature, for both energised and de-energised states.

Series *ISA2*
Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of **"Caution", "Warning" or "Danger"**. To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

⚠ Caution : Operator error could result in injury or equipment damage.

⚠ Warning : Operator error could result in serious injury or loss of life.

⚠ Danger : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power – General rules relating to systems
Note 2) JIS B 8370: General Rules for Pneumatic Equipment

⚠ Warning

1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified. Refering to the latest catalogue information with a view to giving due consideration to any possibility of equipment failure when configuring a system.

2. Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.

1. Inspection and maintenance of machinery/equipment should only be performed once measures to prevent falling or runaway of the driven object have been confirmed.
2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc.

4. Contact SMC if the product is to be used in any of the following conditions:

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, clutch and brake circuit in press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

Series ISA2
Common Precautions 1
Be sure to read before handling.

Design and Selection

⚠ Warning

1. Operate the switch only within the specified voltage.

Use of the switch outside the range of the specified voltage can cause not only malfunction and damage to the switch but also electric shocks and fire.

2. Never apply a load above the maximum load capacity.

It can damage the air catch sensor or shorten the life time.

3. Do not use a load that generates surge voltage.

Although the output circuit of the air catch sensor is equipped for surge protection, repeated application of surges can damage the air catch sensor.

When a load, such as a relay or solenoid, which generates surge is directly driven, use a type of switch having a built-in surge absorbing element.

4. Be sure to observe the set pressure range and maximum operating pressure.

Use of the air catch sensor outside the range of the specified pressure can cause failure. Use at a pressure exceeding the maximum operating pressure may damage the air catch sensor.

5. Be aware of internal voltage drops of the air catch sensor.

When the air catch sensor is used below the specified voltage, even if the air catch sensor operates normally, the load may fail to operate. Confirm the operating voltage of the load and adjust it to satisfy the formula below.

Power supply voltage − Internal voltage drop of air catch sensor > Load operating voltage

6. Quality of operating air

1. Use clean air.

Do not use compressed air which includes chemicals, synthetic oils containing organic solvents, salt or corrosive gases, etc., as it can cause damage or malfunction.

2. Install air filters.

Install air filters at the upstream side of valves, The filtration degree should be 5μm or finer.

3. Install an after cooler, air dryer or water separator, etc.

Air that includes excessive drainage may cause malfunction of valves and other pneumatic equipment. To prevent this, install an after cooler, air dryer or water separator, etc.

Mounting

⚠ Warning

1. Do not use the switch unless it operates normally.

After installation, repair or reform, connect air and electricity and conduct appropriate function and leakage tests to confirm proper installation.

2. Observe the prescribed tightening torque in installation.

If screws are tightened with a force beyond the tightening torque range, it can cause damage to the mounting screws, mounting brackets and switches. If the force is below the tightening torque range, the fixing screws can come loose during operation.

connection thread :1/8, 1/4

Nominal size	Proper tightening torque N·m
M5	1/6 rotation after manual tightening
1/8	7 to 9
1/4	12 to 14

3. Detection port

Do not insert wire, etc. into pressure port. It will damage the pressure sensor and cause malfunction.

Maintenance

⚠ Warning

1. Removal of the product

1. Shut off the fluid supply and release the fluid pressure inside the system.
2. Shut off the power supply.
3. Remove the product.

2. Perform periodic inspections to confirm proper operation.

Unexpected malfunctions or incorrect operation can cause possible danger.

3. Be careful when using the air catch sensor in an interlocking circuit.

When using the air catch sensor in an interlocking circuit, build a multiple interlocking system to prevent trouble or malfunction. At the same time, perform periodic inspections to confirm proper operation.

⚠ Caution

1. When the body becomes dirty.

Wipe off dirt with soft cloth. In case of heavy dirt, soak the cloth in neutral detergent diluted with water, wring the water out, wipe off the dirt with the cloth and finish with dry cloth.

Series ISA2
Common Precautions 2
Be sure to read before handling.

Wiring

⚠ Warning

1. Confirm the colours and terminal numbers of the wires when connecting.
Incorrect wiring can lead to damage, failure and malfunction. Confirm colours and terminal numbers in the operation manual when wiring.

2. Avoid repeatedly bending or stretching lead wires.
Broken wires will result from applying repeated bending stress or stretching force to the lead wires. Replace any lead wire that is damaged and can possibly cause malfunction.

3. Confirm proper insulation of wiring.
Be certain that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.) Damage may occur due to excess current flow into an air catch sensor.

4. Do not run wiring near power lines or high voltage lines.
Wire separately from power lines or high voltage lines, avoiding parallel wiring or wiring in the same conduit with these lines. Control circuits containing auto switches may malfunction due to noise from these other lines.

5. Do not allow short circuit of loads.
Take special care to avoid reverse wiring with the power supply line (brown) and the output line (black).

Operating Environment

⚠ Warning

1. Never use in an atmosphere of explosive gases.
The construction of air catch sensor is not intended to prevent explosion. Never use in an atmosphere with an explosive gas since this may cause a serious explosion.

2. Do not use in an atmosphere of corrosive gases, chemicals, sea water, water, or vapor or in an environment where such a substance adheres.

3. Do not use in environment where vibration or impact occurs.

4. Do not operate in a location near a heat source or where radiated heat will be received.

5. Take proper protection measures in an environment where water splashes, oil or spatters from welding may adhere to the product.

6. Do not use in locations where surge is generated.
If there is equipment generating a large surge (such as a solenoid lifter, high frequency induction furnace or motor) around the air catch sensor, it can deteriorate or damage the circuit elements inside the air catch sensor. Apply surge protection measures to the source of the surge and keep the lines apart from each other.

Pressure Source

⚠ Warning

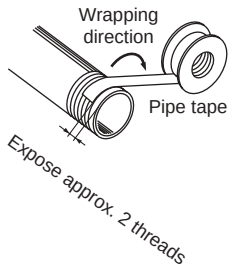
1. Use the air catch sensor within the specified fluid and ambient temperature range.
The fluid and ambient temperature are 0 to 60°C. Take measures to prevent freezing, since moisture in circuits may be frozen at or below 5°C, which can cause damage the O-ring and lead to malfunction. Installation of an air dryer is recommended to remove drain and moisture. Do not use the air catch sensor in an environment with sudden temperature changes even if the ambient temperature range is compliant with the specifications.

Piping

⚠ Caution

1. Preparation before piping
Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and other debris from inside the pipe.
Do not allow tensile, contracting or bending forces by piping to be applied to the valve body.

2. Wrapping of pipe tape
When screwing together pipes and fittings, etc., be certain that chips from the pipe threads and sealing material do not get inside the piping. Also, when pipe tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.



Series ISA2
Specific Product Precautions 1
Be sure to read before handling.

Air Catch Sensor Series ISA2

Operating Environment

⚠ Warning

1. **Do not use in an environment where vibration or impact occurs. Use a bracket in an environment with vibration exceeding 30 m/s^2.**
2. **The enclosure of the switch conforms to IP66 and that for the solenoid valve to IP65. The pressure gauge and the regulator have open constructions. Take proper protection measures in an environment where water splashes, oil or spatters from welding may adhere to the product.**
3. **Since steel piping lacking flexibility is easily affected by moment loads or propagation of vibration, employ flexible tubing, etc., to prevent interactions of such factors.**
4. **Although CE accredited, this air catch sensor is not equipped with surge protection against lightning. Necessary counter-measures for possible lightning surge should be fitted to system components as required.**
5. **Do not operate in locations having an atmosphere of flammable, explosive or corrosive gases, which can result in fire, explosion or corrosion. The air catch sensor does not have an explosion proof rating.**

⚠ Caution

1. **When an air catch sensor is contained in a box, provide an air outlet to constantly keep the atmospheric pressure inside the box.**
   Internal pressure rises will hinder normal air discharge and may lead to possible malfunction.
2. **The air outlet is provided on the setting dial section of the air catch sensor. Do not turn off air supply to the switch if water or cutting oil splashes around the setting dial.**

Mounting

⚠ Caution

1. **If the detection nozzle is exposed to splashes of water or cutting oil, do not allow backflow from the detection nozzle to the switch body. Install the switch body at a position higher than the detection nozzle wherever possible.**

Piping

⚠ Caution

1. **Piping equipment**
   In the piping between the switch body and the detection nozzle, do not use equipment or fittings that can possibly cause leakage or serve as resistance.
   Do not use one-touch fittings in an environment where the air catch sensor is exposed to water or other liquid.

Pressure Source

⚠ Caution

1. **Supply air**
   Since the orifice of the air catch sensor is small, prevent foreign matter from entering the equipment. For this purpose, use supply air that is dry and filtered 5μm or better.
2. **Operating pressure**
   Since the product adopts a semiconductor pressure sensor, keep the operating pressure not larger than 0.2 MPa.

2 Port Solenoid Valve Series VCA

Precautions on Design

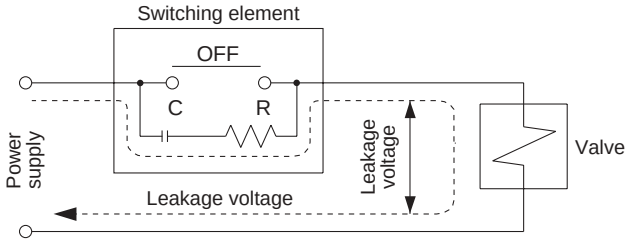
⚠ Warning

1. **Energised continuously**
   Consult SMC if the product is to be energised continuously for long periods of time.

Selection

⚠ Caution

1. **Leakage voltage**
   Take special precautions if a resistor is used in parallel with the switching element or a C-R element (for surge voltage protection) is used for protection of the switching element. The valve may fail to turn off due to leakage current flowing through the resistor or C-R element.



AC coil
10% or less rated voltage

DC coil
2% or less rated voltage

Mounting

⚠ Warning

1. **Do not use the air catch sensor if the leakage amount increases or the equipment does not operate properly.**
   After installation, connect compressed air and electricity and conduct an appropriate functionality inspection to confirm that the air catch sensor is installed properly.
2. **Do not apply external force to the coil.**
   Apply a wrench to the exterior surface of the piping joint at the time of tightening.
3. **Do not use heat insulators, etc. to keep the temperature at the coil assembly.**
   Do not use a tape heater for freeze prevention except on the piping and body. If may cause the coil to burn.

Specific Product Precautions 2

Be sure to read before handling.

2 Port Solenoid Valve *Series* VCA

Disassembly and Assembly

⚠ Caution

· Before the product is disassembled, shut off the power and pressure supply and exhaust the residual pressure.

· Disassembly procedure

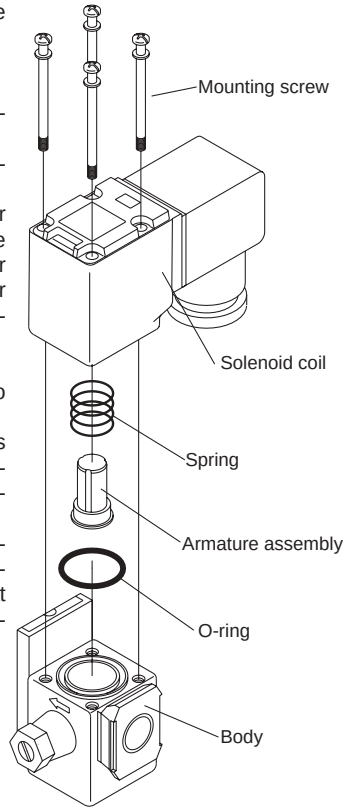
1. Remove the top mounting screws.
2. Remove the solenoid coil, spring and armature assembly.
3. If there is any foreign matter adhering on the surface, take appropriate measures to clear it off such as an air blow or washing with neutral detergent.

· Assembly procedure

Reverse the above procedure to assemble the product.

In case the electrical entry is changed, also change the mounting orientation of the solenoid coil before assembly.

Note 1) Tighten the 4 mounting screws by each pair of corners on a diagonal line at the proper tightening torque shown below.



Proper tightening torque N·m

VCA27	0.4 to 0.5

Wiring

⚠ Caution

1. Use electrical wires with a conductive sectional area of 0.5 to 1.25 mm². Make sure that no excessive force is applied to the wires.

2. Adopt an electrical circuit which will not cause chattering at the contact.

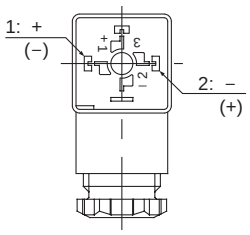
3. The voltage variation must stay within the -10% to +10% range of the rated voltage. In case importance is attached to response characteristics due to use of a DC power source, keep the variation within the -5% to +5% range. The voltage drop is the value at the lead wire to which the coil is connected.

Wiring

⚠ Caution

DIN connector (B type only)

The internal wiring of the DIN connector is illustrated below. Connect each terminal to the power supply.

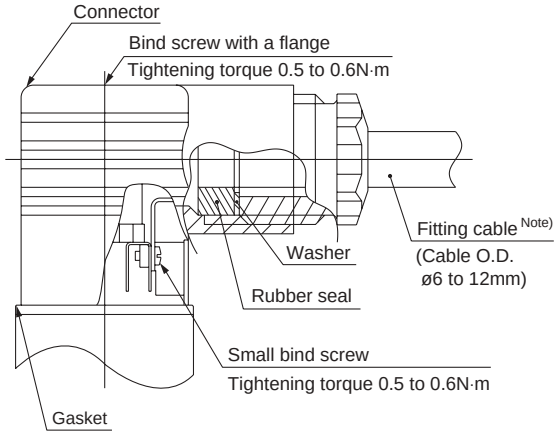


Terminal No.	1	2
DIN terminal	+ (−)	− (+)

∗No polarity.

· A compatible heavy duty cable with an O.D. ø6 to 12 mm is applicable.

· Tighten each part with an appropriate tightening torque shown below.



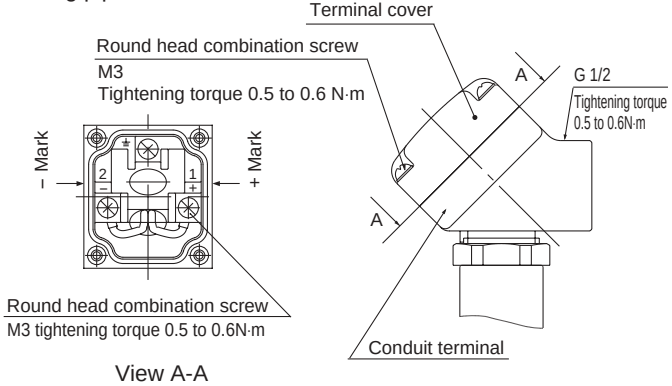
Note) With a cable O.D. ø9 to 12 mm, hollow the rubber sealing before use.

Conduit terminal

In case of a conduit terminal, refer to the marks below for wiring.

· Tighten each part with an appropriate tightening torque shown below.

· Seal the piping part (G 1/2) securely with a dedicated electric wiring pipe, etc.



View A-A
(Internal connection diagram)

Series ISA2
Specific Product Precautions 3
Be sure to read before handling.

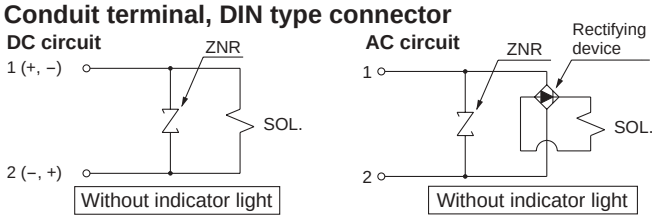
2 Port Solenoid Valve Series VCA

Electric Circuit

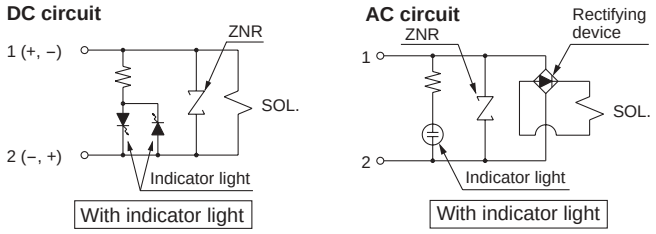
⚠ Caution

In case of series VC (B type coil)

Conduit terminal, DIN type connector



Conduit terminal, DIN type connector



Maintenance

⚠ Warning

1. Low-frequency operation

Perform valve switching at least every 30 days to prevent malfunction. Also, conduct a periodic inspection at intervals of approximately 6 months to use the product in its best condition.

Manual Operation

⚠ Warning

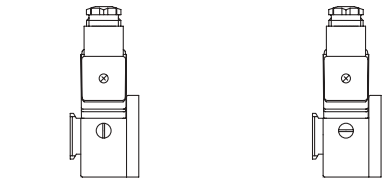
How to operate manually

Locking type (tool required)

To open valve: Rotate to the right by 90° using a flat head screwdriver. It will still hold open even when the driver removed.

To close valve: Rotate to the left by 90° to achieve the former closed position.

Electrical operations should be undertaken when the valve is closed.



Valve closed (vertical slit) Valve open (horizontal slit)

Regulator Series AR

Mounting and Adjustment

⚠ Warning

1. The adjustment knob must be handled manually. Use of tools may cause damage to the product.
2. Check the inlet and outlet pressure indications on the pressure gauge while setting. If the knob is turned to excess, it may cause internal parts to fracture.
3. Since products for 0.02 to 0.2 MPa settings come with a pressure gauge for 0.2 MPa, do not apply pressure exceeding 0.2 MPa. It may cause damage to the pressure gauge.

⚠ Caution

1. Unlock the knob before pressure adjustment and lock it again when the adjustment is over.
   Incorrect procedure may cause damage to the knob or lead to the outlet pressure fluctuation.
   - Pull the adjustment knob to release the lock. An orange coloured line is provided at the bottom of the adjustment handle for visual checking.
   - Push the pressure regulation knob to engage the lock. If it does not lock easily, turn the knob slightly clockwise or counterclockwise until the orange coloured line goes out of sight.
2. When the product is installed, leave a space of 60 mm on the side of the valve guide (opposite to the knob) for maintenance and inspection.

PF2


For Air
Series PF2A


For Water
Series PF2W


For De-ionised Water and Chemicals
Series PF2D


40.0
SET
Series PF2□200

1 Flow rate setting and monitoring are possible with the digital display.

2 Two types are available: Integrated and Remote type.

3 Three types of output: Switch, accumulated pulse, and analogue outputs.

4 Switching from real-time flow rate to accumulated flow is possible.
(Accumulated flow rate is reset when the power supply turns OFF.)

5 Two independent flow rate settings are possible.

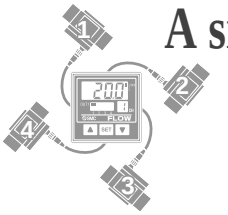
6 Water resistant construction conforming to IP65

For Air
Series PF2A

For Water
Series PF2W

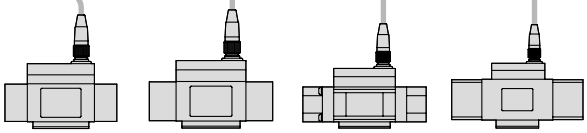
For De-ionised Water and Chemicals
Series PF2D

A single controller can monitor the flow rate of 4 different sensors.



4 independent flow rate ranges can be monitored by a single controller.

4-channel Flow Monitor
Series PF2□200



76 % reduced intallation space

(Compared with a PF2A3□□ and PF2W3□□, when panel mounted.)

Reduced panel fitting labor

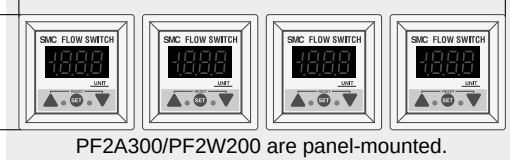
=

□40 mm

PF2□200

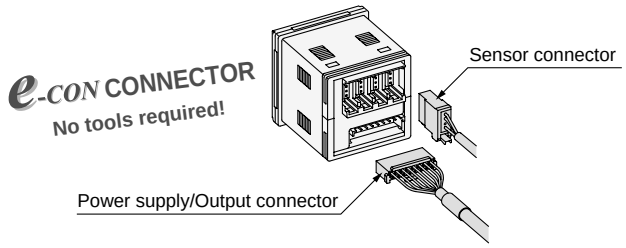
165 mm

40 mm



PF2A300/PF2W200 are panel-mounted.

Connection

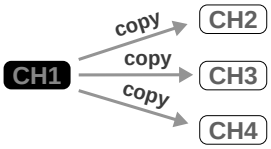


Function

Copy function

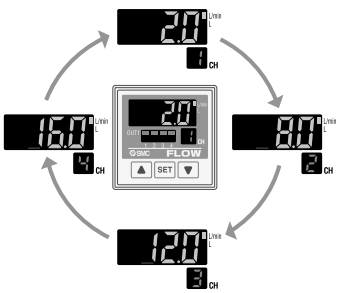
Possible to copy information from one channel to one or more other channels.

Copying CH1 setting to CH2, 3 and 4.



Channel scan function

Allows constant monitoring of the displayed flow rate value for each channel.



- **Key lock function**
- **Unit switching function**
- **Peak value and lowest value holding**

For Air

P. 1




Flow rate measurement range l/min	Integrated type	Remote type		
		Sensor unit	Display unit	Display unit (4ch)
1 to 10	**PF2A710**	**PF2A510**	**PF2A30□**	**PF2A20□**
5 to 50	**PF2A750**	**PF2A550**		
10 to 100	**PF2A711**	**PF2A511**	**PF2A31□**	
20 to 200	**PF2A721**	**PF2A521**		
50 to 500	**PF2A751**	**PF2A551**		
150 to 3000	**PF2A703H**	—	—	—
300 to 6000	**PF2A706H**			
600 to 12000	**PF2A712H**			

For Water

P. 15




Flow rate measurement range l/min	Integrated type	Remote type		
		Sensor unit	Display unit	Display unit (4ch)
0.5 to 4	**PF2W704(T)**	**PF2W504(T)**	**PF2W30□**	**PF2W20□**
2 to 16	**PF2W720(T)**	**PF2W520(T)**		
5 to 40	**PF2W740(T)**	**PF2W540(T)**		
10 to 100	**PF2W711**	**PF2W511**	**PF2W33□**	

For De-ionised Water and Chemicals

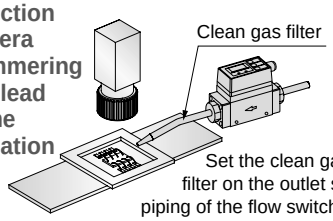
P. 44



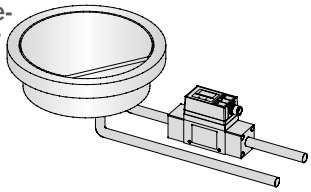
Flow rate measurement range l/min	Remote type		
	Sensor unit	Display unit	Display unit (4ch)
0.4 to 4	**PF2D504**	**PF2D30□**	**PF2D20□**
1.8 to 20	**PF2D520**		
4.0 to 40	**PF2D540**		

Application Examples

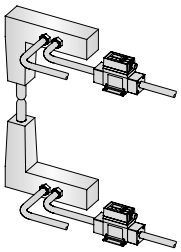
Flow control of N_2 gas to prevent detection camera shimmering and lead frame oxidation

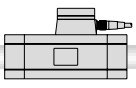


Flow control of cooling water for wafer temperature regulation and high frequency power supply



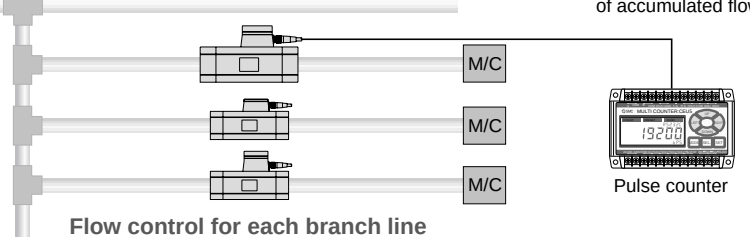
Flow control of pressurised cooling water for welding gun





Main line flow control

Makes it possible to monitor the air flow from the main line to each branch line.



■ The accumulated pulse output function enables remote monitoring of accumulated flow.

(Refer to page 36.)

PF2A

For Air

Digital Flow Switch

Series PF2A

Refer to www.smcworld.com for details of products compatible with overseas standards.

How to Order

Integrated Display Type

PF2A7 10 □ 01 27 □ M

Flow rate range

10	1 to 10 l/min
50	5 to 50 l/min
11	10 to 100 l/min
21	20 to 200 l/min
51	50 to 500 l/min

Thread type

Nil	Rc
N	NPT
F	G

Port size

Symbol	Port size	Flow rate (l/min) 10	50	100	200	500	Applicable model
01	1/8	●	●				PF2A710/750
02	1/4	●	●				
03	3/8			●	●		PF2A711/721
04	1/2					●	PF2A751

Output specification

Symbol	Output specification
27	NPN open collector 2 outputs
67	PNP open collector 2 outputs

Lead wire (Refer to page 35.)

Symbol	M12 3 m lead wire with connector
N	Without lead wire

Unit specification

Nil	With unit switching function
M	Fixed SI unit Note)

Note) Fixed units:
Real-time flow rate: l/min
Accumulated flow: l

Specifications

Model		PF2A710	PF2A750	PF2A711	PF2A721	PF2A751
Measured fluid		Air, Nitrogen				
Flow rate measurement range		0.5 to 10.5 l/min	2.5 to 52.5 l/min	5 to 105 l/min	10 to 210 l/min	25 to 525 l/min
Set flow rate range		0.5 to 10.5 l/min	2.5 to 52.5 l/min	5 to 105 l/min	10 to 210 l/min	25 to 525 l/min
Rated flow range		1 to 10 l/min	5 to 50 l/min	10 to 100 l/min	20 to 200 l/min	50 to 500 l/min
Minimum set unit		0.1 l/min	0.5 l/min	1 l/min	2 l/min	5 l/min
Accumulated pulse flow rate exchange value (Pulse width: 50 ms)		0.1 l/pulse	0.5 l/pulse	1 l/pulse	2 l/pulse	5 l/pulse
Display units Note 1, 2)	Real-time flow rate	l/min, CFM x 10^{-2}		l/min, CFM x 10^{-1}		
	Accumulated flow	l, ft^3 x 10^{-1}				
Operating fluid temperature		0 to 50°C				
Linearity		±5% F.S. or less				
Repeatability		±1% F.S. or less		±2% F.S. or less		
Temperature characteristics		±3% F.S. or less (15 to 35°C, based on 25°C), ±5% F.S. or less (0 to 50°C, based on 25°C)				
Current consumption (No load)		150 mA or less		160 mA or less		170 mA or less
Weight Note 3)		250 g		290 g		
Port size (Rc, NPT, G)		1/8, 1/4		3/8		1/2
Detection type		Heater type				
Indicator light		3-digit, 7-segment LED				
Operating pressure range		–50 kPa to 0.5 MPa		–50 kPa to 0.75 MPa		
Proof pressure		1.0 MPa				
Accumulated flow range Note 4)		0 to 999999 l				
Output specifications Note 5)	Switch output	NPN open collector	Maximum load current: 80 mA; Internal voltage drop: 1 V or less (with load current of 80 mA) Maximum applied voltage: 30 V; 2 outputs			
		PNP open collector	Maximum load current: 80 mA Internal voltage drop: 1.5 V or less (with load current of 80 mA); 2 outputs			
	Accumulated pulse output	NPN or PNP open collector (same as switch output)				
Status LED's		Illuminates up when output is ON OUT1: Green; OUT2: Red				
Response time		1 sec. or less				
Hysteresis		Hysteresis mode: Variable (can be set from 0), Window comparator mode Note 6): 3-digit fixed				
Power supply voltage		12 to 24 VDC (ripple ±10% or less)				
Resistance	Enclosure	IP65				
	Operating temperature range	Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)				
	Withstand voltage	1000 VAC for 1 min. between external terminal and case				
	Insulation resistance	50M Ω or more (500 VDC Mega) between external terminal and case.				
	Vibration resistance	10 to 500 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration, in each X, Y, Z direction for 2 hrs, whichever is smaller. (de-energised)				
	Impact resistance	490 m/s^2 in X, Y, Z directions 3 times each				
	Noise resistance	1000 Vp-p, Pulse width 1 μs, Rise time 1 ns				

Note 1) For digital flow switch with unit switching function. (Fixed SI unit [(l/min, or l, m^3 or m^3 x 10^3)] will be set for switch type without the unit switching function.)
Note 2) Flow rate display can be switched between the basic condition of 0°C, 101.3 kPa and the standard condition (ANR) of 20°C, 101.3 kPa, and 65% RH.
Note 3) Without lead wire.
Note 4) Accumulated flow rate is reset when the power supply turns OFF.
Note 5) Switch output and accumulated pulse output can be selected during initial setting.
Note 6) Window comparator mode — Since hysteresis will reach 3 digits, keep P_1 and P_2 or n_1 and n_2 apart by 7 digits or more. (In case of output OUT2, n_1, 2 to be n_3, 4 and P_1, 2 to be P_3, 4.)
Note 7) The flow switch conforms to the CE mark.

SMC

How to Order

Remote Type Sensor Unit **PF2A5 10 □ 01 □ □ C**

Flow rate range

10	1 to 10 l/min
50	5 to 50 l/min
11	10 to 100 l/min
21	20 to 200 l/min
51	50 to 500 l/min

Thread type

Nil	Rc
N	NPT
F	G

Option (Refer to page 35.)

Nil	None
C	e-con connector x 1 pc.

The cable and connector are shipped unassembled.

Port size

Symbol	Port size	Flow rate (l/min) 10	50	100	200	500	Applicable model
01	1/8	●	●				PF2A510/550
02	1/4	●	●				
03	3/8			●	●		PF2A511/521
04	1/2					●	PF2A551

Lead wire (Refer to page 35.)

Nil	M12 3 m lead wire with connector
N	Without lead wire

Output specification

Symbol	Specification	Applicable display unit (monitor) model
Nil	Output for display unit	Series PF2A300
1	Output for display unit + analogue output (1 to 5 V)	Series PF2A200/300
2	Output for display unit + analogue output (4 to 20 mA)	Series PF2A300

Specifications

Model		PF2A510	PF2A550	PF2A511	PF2A521	PF2A551
Measured fluid		Air, Nitrogen				
Detection type		Heater type				
Rated flow range		1 to 10 l/min	5 to 50 l/min	10 to 100 l/min	20 to 200 l/min	50 to 500 l/min
Operating pressure range		–50 kPa to 0.5 MPa		–50 kPa to 0.75 MPa		
Proof pressure		1.0 MPa				
Operating fluid temperature		0 to 50°C				
Linearity Note 1)		±5% F.S. or less				
Repeatability Note 1)		±1% F.S. or less (Connected with PF2A3□□), ±3%F.S. or less (Connected with PF2A2□□)				
Temperature characteristics		±2% F.S. or less (15 to 35°C, based on 25°C) ±3% F.S. or less (0 to 50°C, based on 25°C)				
Output specifications Note 2)	**Output for display unit**	Analogue voltage output (non-linear) output impedance 1 kΩ output for display unit PF2A3□□				
	Analogue output	Voltage output 1 to 5 V (within the flow rate range) Linearity: ±5% F.S. or less; allowable load resistance: 100 kΩ or more.				
		Current output 4 to 20 mA (within the flow rate range) Linearity: ±5% F.S. or less; allowable load resistance: 300 Ω or less with 12 VDC, 600 Ω or less with 24 VDC				
Power supply voltage		12 to 24 VDC (ripple ±10% or less)				
Current consumption (No load)		100 mA or less				110 mA or less
Resistance	**Enclosure**	IP65				
	Operating temperature range	Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)				
	Withstand voltage	1000 VAC for 1 min. between external terminal and case				
	Insulation resistance	50M Ω or more (500 VDC Mega) between external terminal and case.				
	Vibration resistance	10 to 500 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration, whichever is smaller.				
	Impact resistance	490 m/s^2 in X, Y, Z directions 3 times each				
	Noise resistance	1000 Vp-p, Pulse width 1 μs, Rise time 1 ns				
Weight Note 3)		200 g		240 g		
Port size (Rc, NPT, G)		1/8, 1/4		3/8		1/2

Note 1) The system accuracy when combined with PF2A2□□/3□□.
Note 2) Output system can be selected during initial setting.
Note 3) Without lead wire. (Add 20 g for the types of analogue output whether voltage or current output selected.)
Note 4) Flow rate unit measured under the following conditions: 0°C and 101.3 kPa.
Note 5) The sensor unit conforms to the CE mark.

How to Order

Remote Type Display Unit

PF2A3 [0] [0] – [A] – [M]

Flow rate range

Symbol	Flow rate range	Type for sensor unit
0	1 to 10 l/min	PF2A510
	5 to 50 l/min	PF2A550
1	10 to 100 l/min	PF2A511
	20 to 200 l/min	PF2A521
	50 to 500 l/min	PF2A551

Output specification

Symbol	Output specification	Applicable model
0	NPN open collector 2 outputs	PF2A300, 310
1	PNP open collector 2 outputs	PF2A301, 311

Mounting

A	Panel mounting

Unit specification

Nil	With unit switching function
M	Fixed SI unit Note)

Note) Fixed units:
Real-time flow rate: l/min
Accumulated flow: l

Specifications

Model		PF2A300/301		PF2A310/311		
Flow rate measurement range Note 1)		0.5 to 10.5 l/min	2.5 to 52.5 l/min	5 to 105 l/min	10 to 210 l/min	25 to 525 l/min
Set flow rate range Note 1)		0.5 to 10.5 l/min	2.5 to 52.5 l/min	5 to 105 l/min	10 to 210 l/min	25 to 525 l/min
Minimum set unit Note 1)		0.1 l/min	0.5 l/min	1 l/min	2 l/min	5 l/min
Accumulated pulse flow rate exchange value (Pulse width: 50 ms) Note 1)		0.1 l/pulse	0.5 l/pulse	1 l/pulse	2 l/pulse	5 l/pulse
Note 2, 3) Display units	Real-time flow rate	l/min, CFM x 10^{-2}		l/min, CFM x 10^{-1}		
	Accumulated flow	l, ft^3 x 10^{-1}				
Accumulated flow range Note 4)		0 to 999999 l				
Linearity Note 5)		±5% F.S. or less				
Repeatability Note 5)		±1% F.S. or less				
Temperature characteristics		±1% F.S. or less (15 to 35°C, based on 25°C) ±2% F.S. or less (0 to 50°C, based on 25°C)				
Current consumption (No load)		50 mA or less		60 mA or less		
Weight		45 g				
Output specifications Note 6)	Switch output	NPN open collector (PF2A300, PF2A310)		Maximum load current: 80 mA Internal voltage drop: 1 V or less (with load current of 80 mA) Maximum applied voltage: 30 V 2 outputs		
		PNP open collector (PF2A301, PF2A311)		Maximum load current: 80 mA Internal voltage drop: 1.5 V or less (with load current of 80 mA) 2 outputs		
	Accumulated pulse output	NPN or PNP open collector (same as switch output)				
Indicator light		3-digit, 7-segment LED				
Status LED		Illuminates up when output is ON OUT1: Green; OUT2: Red				
Power supply voltage		12 to 24 VDC (ripple ±10% or less)				
Response time		1 sec. or less				
Hysteresis		Hysteresis mode: Variable (can be set from 0), Window comparator mode Note 7): Fixed (3-digits)				
Resistance	Enclosure	IP40				
	Operating temperature range	Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)				
	Withstand voltage	1000 VAC for 1 min. between external terminal and case				
	Insulation resistance	50M Ω or more (500 VDC Mega) between external terminal and case.				
	Vibration resistance	10 to 500 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration, in each X, Y, Z direction for 2 hrs, whichever is smaller.				
	Impact resistance	490 m/s^2 in X, Y, Z directions 3 times each				
	Noise resistance	1000 Vp-p, Pulse width 1 μs, Rise time 1 ns				

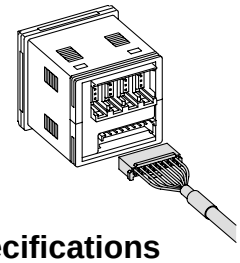
Note 1) The flow rate measurement range can be modified depending on the setting.
Note 2) For digital flow switch with unit switching function. (Fixed SI unit [l/min or l] will be set for switch types without the unit switching function.)
Note 3) Flow rate display can be switched between the basic condition of 0°C, 101.3 kPa and the standard condition (ANR) of 20°C, 101.3 kPa, and 65% RH.
Note 4) Accumulated flow rate is reset when the power supply turns OFF.
Note 5) The system accuracy when combined with PF2A5□□.
Note 6) Switch output and accumulated pulse output can be selected during initial setting.
Note 7) Window comparator mode — Since hysteresis will reach 3 digits, keep P_1 and P_2 or n_1 and n_2 apart by 7 digits or more. (In case of output OUT2, n_1, 2 to be n_3, 4 and P_1, 2 to be P_3, 4.)
Note 8) The display unit conforms to the CE mark.

How to Order

4-channel Flow Monitor
Remote Type Display Unit

PF2A20 0 — M □ □

Accessory / Power supply output cable (2 m)



Output specification

0	NPN4 outputs
1	PNP4 outputs

Unit specification

Nil	With unit switching function
M	Fixed SI unit Note)

Note) Fixed units:
Real-time flow rate: l/min
Accumulated flow: l

Option 2 (Refer to page 35.)

Nil	None
4C	Sensor connector (4 pc.)

Option 1 (Refer to page 35.)

Nil	None
A	Panel mounting
B	Front protective cover + Panel mounting

Connectable remote type sensor part is PF2A5□□-□-1 (with analogue output 1 to 5 V).

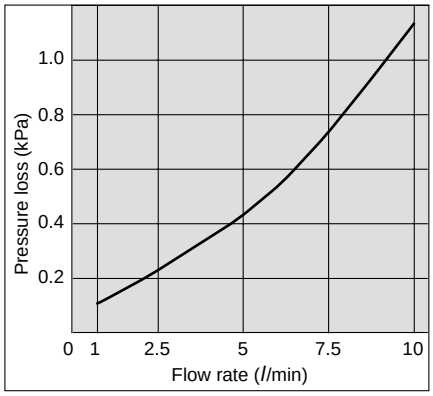
Specifications

Model		PF2A200/201				
Applicable flow rate sensor		PF2A510-□-1	PF2A550-□-1	PF2A511-□-1	PF2A521-□-1	PF2A551-□-1
Flow rate measurement range Note 1)		0.5 to 10.5 l/min	2.5 to 52.5 l/min	5 to 105 l/min	10 to 210 l/min	25 to 525 l/min
Set flow rate range Note 1)		0.5 to 10.5 l/min	2.5 to 52.5 l/min	5 to 105 l/min	10 to 210 l/min	25 to 525 l/min
Minimum set unit Note 1)		0.1 l/min	0.5 l/min	1 l/min	2 l/min	5 l/min
Accumulated pulse flow rate exchange value (Pulse width: 50 ms) Note 1)		0.1 l/pulse	0.5 l/pulse	1 l/pulse	2 l/pulse	5 l/pulse
Note 1, 2) **Display units**	**Real-time flow rate**	l/min, CFM x 10^{-2}		l/min, CFM x 10^{-1}		
	Accumulated flow	l, ft^3 x 10^{-2}		l, ft^3 x 10^{-1}		
Accumulated flow range Note 1)		0 to 999999 l, 0 to 999999 ft^3 x 10^{-2}		0 to 999999 l, 0 to 999999 ft^3 x 10^{-1}		
Power supply voltage		24 VDC (ripple ±10% or less) (With power supply polarity protection)				
Current consumption		55 mA or less (Not including the current consumption of the sensor)				
Power supply voltage for sensor		Same as [Power supply voltage]				
Power supply current for sensor Note 3)		Max. 110 mA (However, the total current for the 4 inputs is 440 mA maximum or less.)				
Sensor input		1 to 5 VDC (Input impedance: Approx. 800K Ω)				
	No. of inputs	4 inputs				
	Input protection	Excess voltage protection				
Output specifications Note 4)	**Switch output (Real-time switch output, Accumulated switch output)**	NPN open collector (PF2A200)	Maximum load current: 80 mA Internal voltage drop: 1 V or less (with load current of 80 mA) Maximum applied voltage: 30 V			
		PNP open collector (PF2A201)	Maximum load current: 80 mA Internal voltage drop: 1 V or less (with load current of 80 mA)			
	Accumulated pulse output	NPN open collector or PNP open collector (same as switch output)				
	No. of outputs	4 outputs (1 output per 1 sensor input)				
	Output protection	With short circuit protection				
Hysteresis		Hysteresis mode: Variable (can be set from 0), Window comparator mode: Fixed (3-digits)				
Response time Note 5)		1s or less				
Linearity Note 5)		±5% F.S. or less				
Repeatability Note 5)		±3% F.S. or less				
Temperature characteristics		±2% F.S. or less (0 to 50°C, based on 25°C)				
Display method		For measured value display: 4-digits, 7-segment LED (Orange) For channel display: 1-digit, 7-segment LED (Red)				
Status LED's		Illuminates when output is ON OUT1: Red				
Resistance	**Enclosure**	IP65 for the front face only, and IP40 for the remaining parts.				
	Operating temperature range	Operating: 0 to 50°C, Stored: –10 to 60°C (with no freezing and condensation)				
	Operating humidity range	Operating or Stored: 35 to 85%RH (with no condensation)				
	Vibration resistance	10 to 500 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration, in each X, Y, Z direction for 2 hrs, whichever is smaller. (de-energised)				
	Impact resistance	980 m/s^2 in X, Y, Z directions 3 times each (de-energised)				
	Noise resistance	500 Vp-p, Pulse width 1 μs, Rise time 1 ns				
Connection		Power supply / Output connection: 8P connector, Sensor connection: 4P connector (e-con)				
Material		Housing: PBT, Display: PET, Backside rubber: CR				
Weight		60 g (Except for any accessories that are shipped together)				

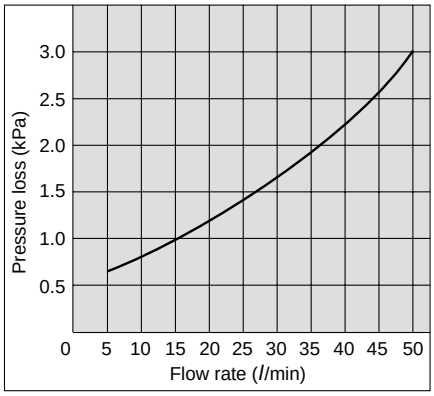
Note 1) Fixed SI unit [l/min or l] will be set for switch types without the unit switching function. ("-M" is suffixed at the end of part number.) Accumulated flow is reset when the power supply turns OFF.
Note 2) Flow rate display can be switched between the basic condition of 0°C, 101.3 kPa and the standard condition (ANR) of 20°C, 101.3 kPa, and 65% RH.
Note 3) If Vcc side on sensor input connector part is short-circuited with the 0V side, the flow monitor inside will be damaged.
Note 4) Switch output and accumulated pulse output can be selected during initial setting.
Note 5) The system accuracy when combined with an applicable flow sensor.
Note 6) This product conforms to the CE mark.

Flow Characteristics (Pressure Loss)

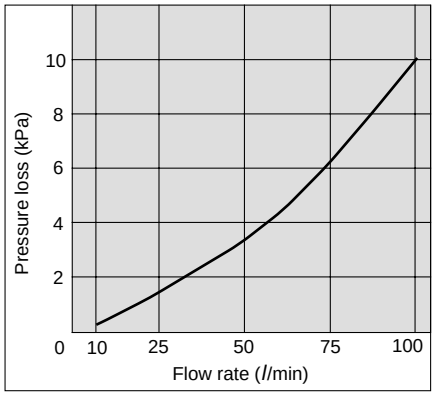
PF2A710, 510



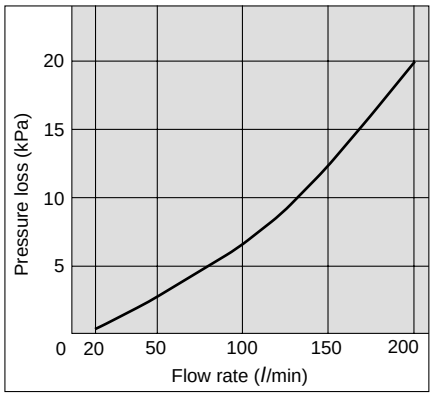
PF2A750, 550



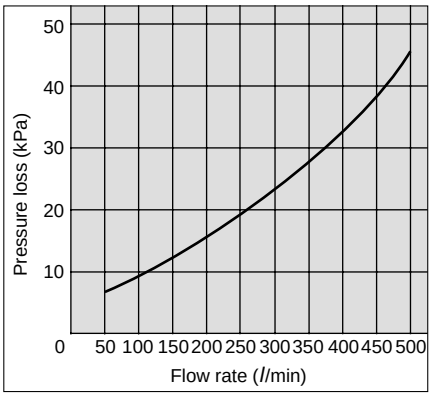
PF2A711, 511



PF2A721, 521

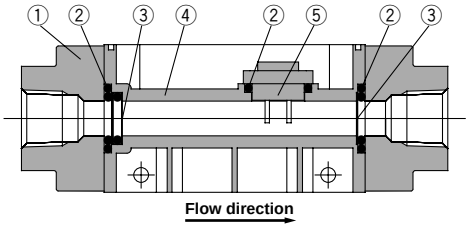


PF2A751, 551

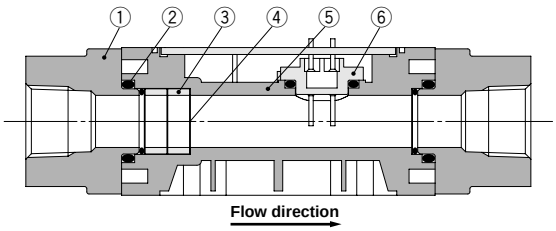


Sensor Unit Construction

PF2A710/750
PF2A510/550



PF2A711/721/751
PF2A511/521/551



Parts list

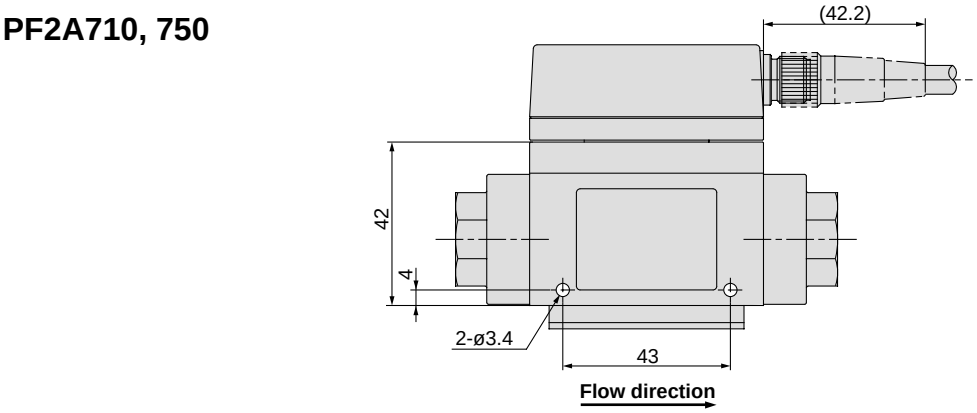
No.	Description	Material
1	**Attachment**	ADC
2	**Seal**	NBR
3	**Mesh**	Stainless steel
4	**Body**	PBT
5	**Sensor**	PBT

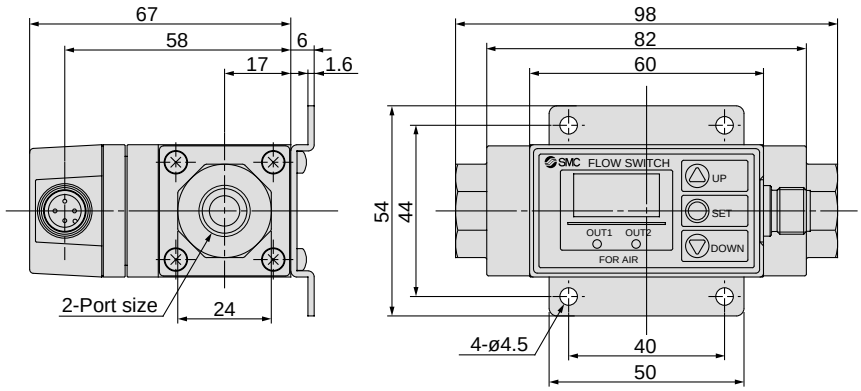
Parts list

No.	Description	Material
1	**Attachment**	ADC
2	**Seal**	NBR
3	**Spacer**	PBT
4	**Mesh**	Stainless steel
5	**Body**	PBT
6	**Sensor**	PBT

Dimensions: Integrated Display Type for Air

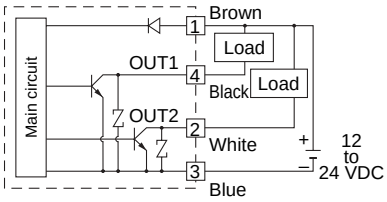
PF2A710, 750



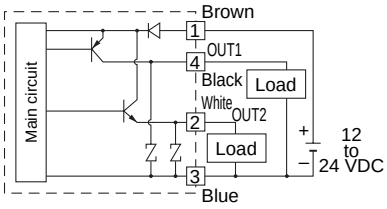


Internal circuits and wiring examples

1 to 4 are the terminal numbers.

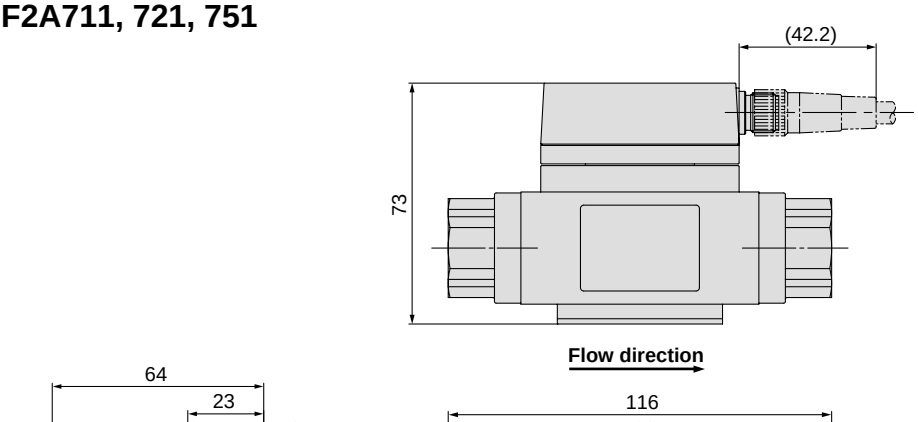


PF2A7□□-□□-27□(-M)

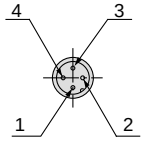


PF2A7□□-□□-67□(-M)

PF2A711, 721, 751



Connector pin numbers



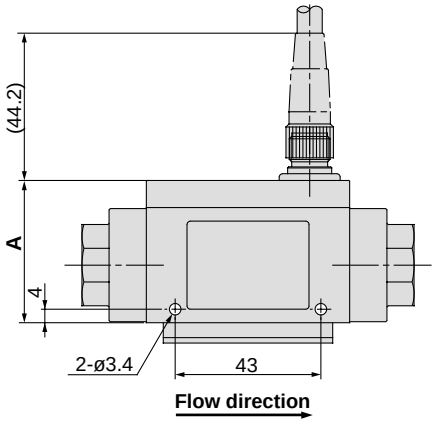
Pin no.	Pin description
1	DC(+)
2	OUT2
3	DC(–)
4	OUT1

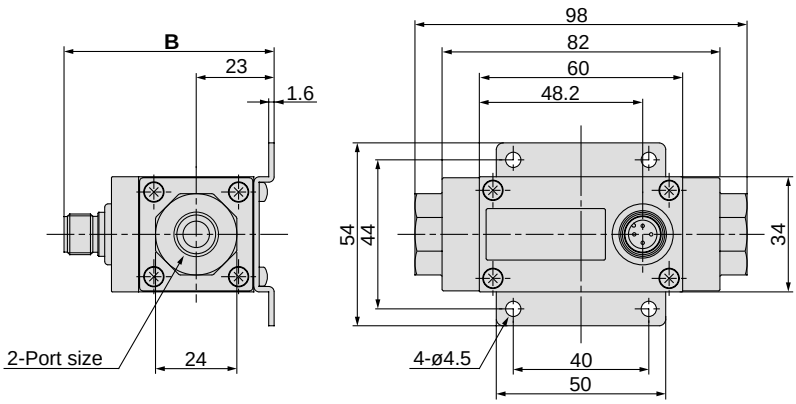
Dimensions: Remote Type Sensor Unit for Air

PF2A510, 550

(mm)

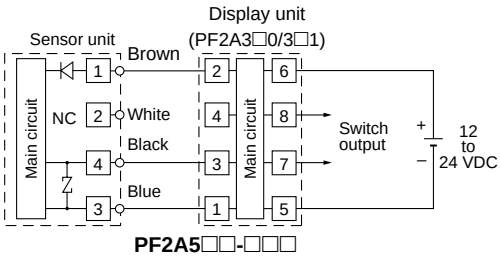
Output specification	A	B
Output for display unit only	42	62
Output for display unit + Analogue output	52	72



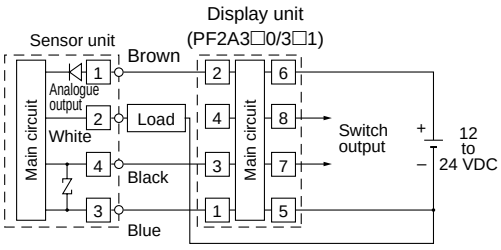


Internal circuits and wiring examples

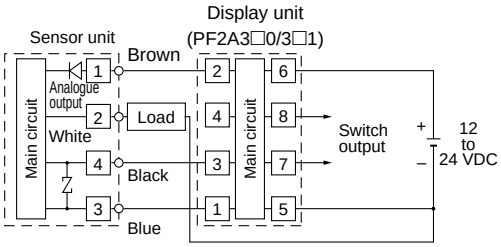
1 to 8 are the terminal numbers.



PF2A5□□-□□□



Load is an analogue input equipment such as a voltmeter.
PF2A5□□-□□□-1 (With voltage output type)

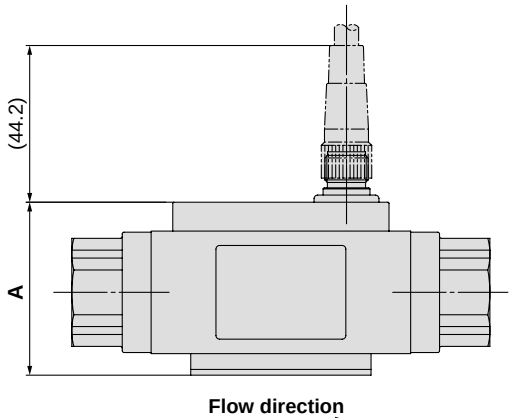


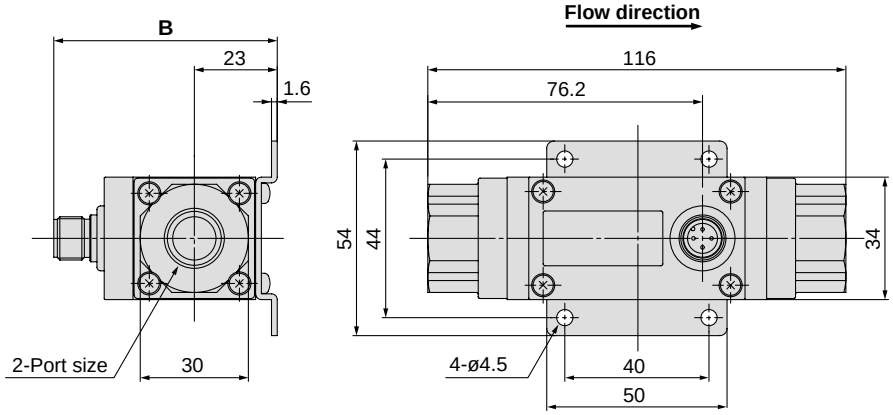
Load is an analogue input equipment such as a voltmeter.
PF2A5□□-□□□-2 (With voltage output type)

PF2A511, 521, 551

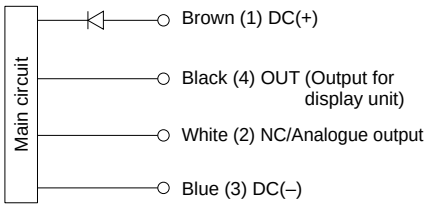
(mm)

Output specification	A	B
Output for display unit only	48	62
Output for display unit + Analogue output	58	72



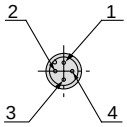


Wiring



∗ Use this sensor by connecting it to a SMC remote type display unit Series PF2A2□□/3□□.

Connector pin numbers

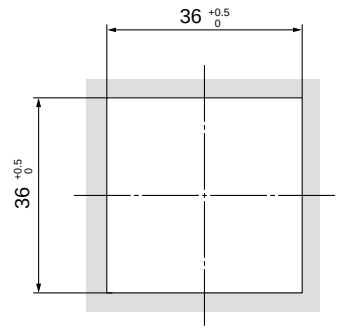


Pin no.	Pin description
1	DC(+)
2	NC/Analogue output
3	DC(–)
4	OUT

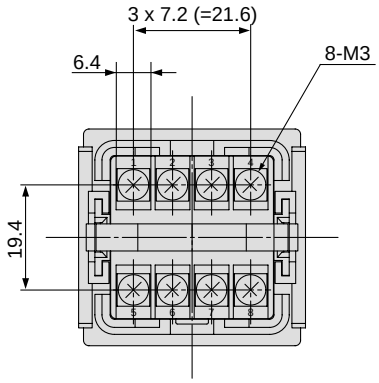
Dimensions: Remote Type Display Unit for Air

PF2A3□□-A
Panel mounting type

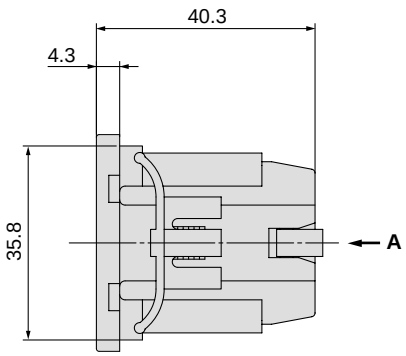
Panel fitting dimensions

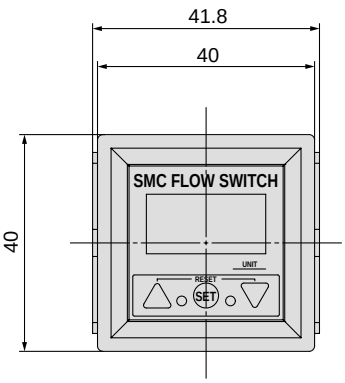


∗ The applicable panel thickness is 1 to 3.2 mm.



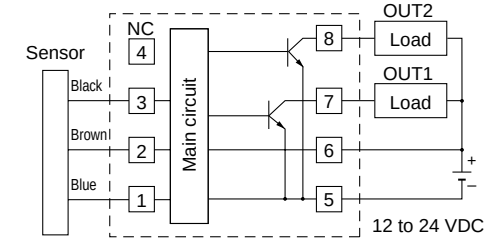
View A





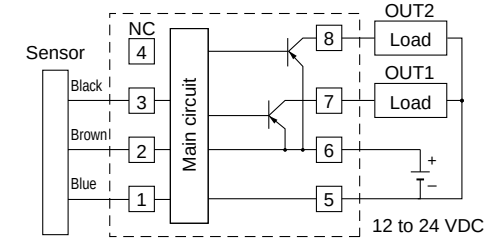
Internal circuits and wiring examples

1 to 8 are the terminal numbers.



Series PF2A5□□

PF2A3□0-A

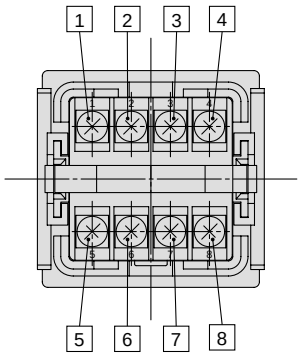


Series PF2A5□□

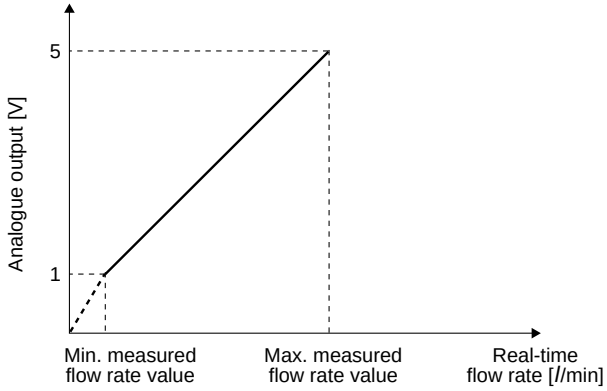
PF2A3□1-A

∗ Do not connect the white wire of the sensor to 3.

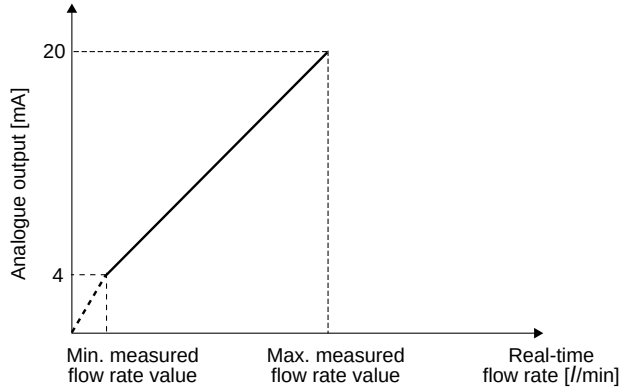
Terminal block numbers



Analogue output
1 to 5 VDC



4 to 20 mADC



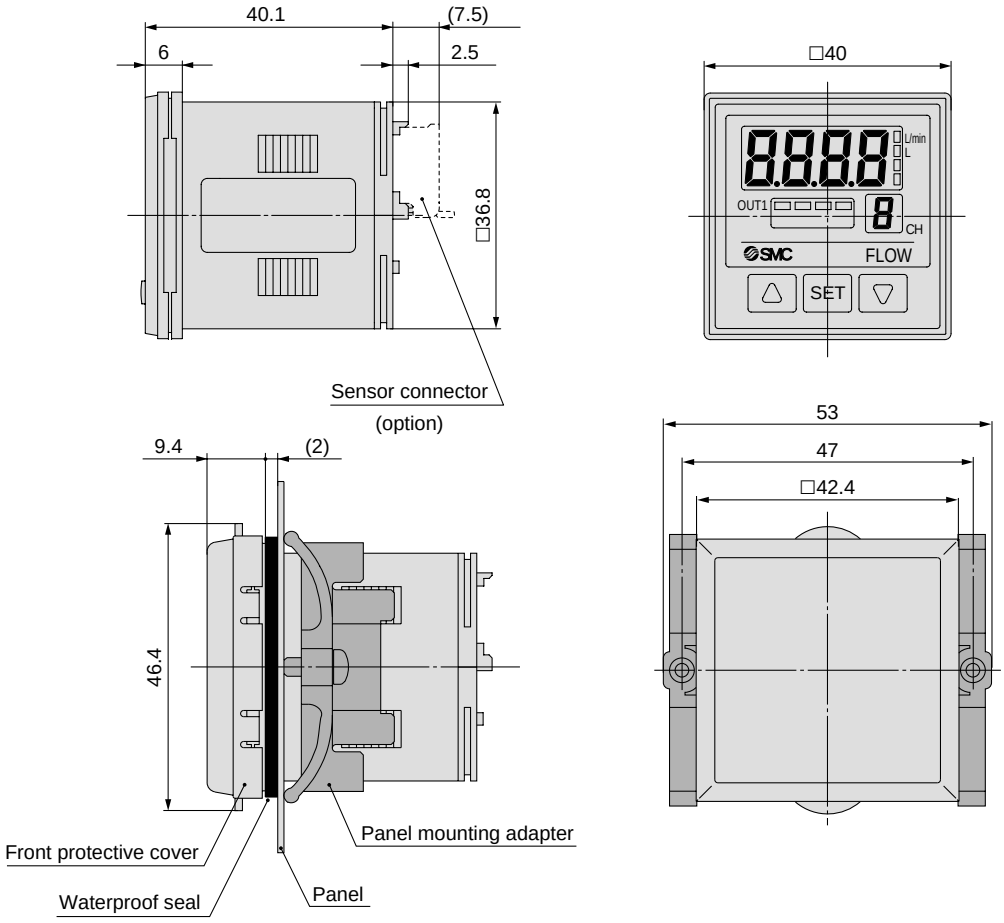
Part no.	Normal condition		Standard condition	
	Min. measured flow rate value [l/min]	Max. measured flow rate value [l/min]	Min. measured flow rate value [l/min]	Max. measured flow rate value [l/min]
PF2A510-□-1	1	10	1.1	10.7
PF2A550-□-1	5	50	5.4	53.5
PF2A511-□-1	10	100	11	107
PF2A521-□-1	20	200	21	214
PF2A551-□-1	50	500	54	535

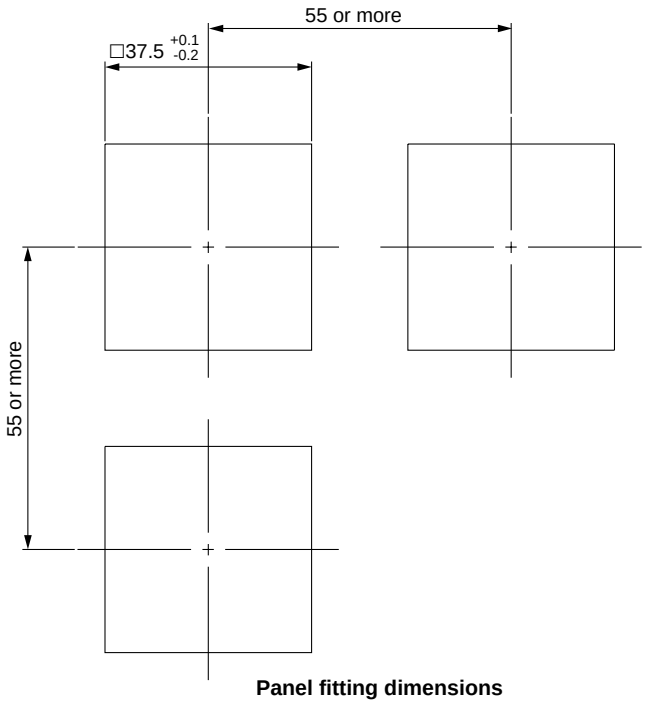
Part no.	Normal condition		Standard condition	
	Min. measured flow rate value [l/min]	Max. measured flow rate value [l/min]	Min. measured flow rate value [l/min]	Max. measured flow rate value [l/min]
PF2A510-□-2	1	10	1.1	10.7
PF2A550-□-2	5	50	5.4	53.5
PF2A511-□-2	10	100	11	107
PF2A521-□-2	20	200	21	214
PF2A551-□-2	50	500	54	535

Dimensions: Remote Type Display Unit **for Air** (4-channel Flow Monitor)

PF2A200, 201

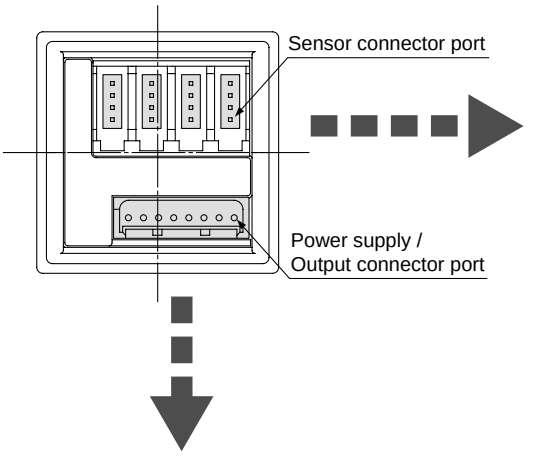
Front protective cover + Panel mounting



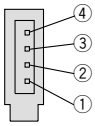


Panel fitting dimensions
Applicable panel thickness: 0.5 to 8 mm

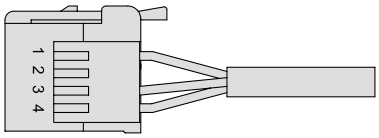
Dimensions: Remote Type Display Unit for Air (4-channel Flow Monitor)



Sensor connector (4P x 4)

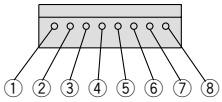


Connector (option)



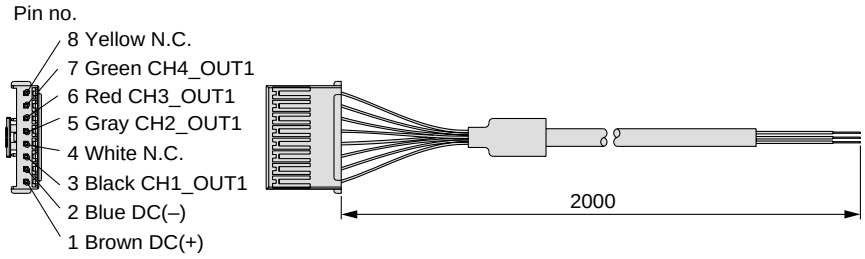
Pin no.	Terminal	Connector no.	Cable wire colour
①	DC+	1	Brown
②	N.C.	2	Not used
③	DC–	3	Blue
④	IN: 1 to 5 V	4	White

Power supply / Output connector (8P)



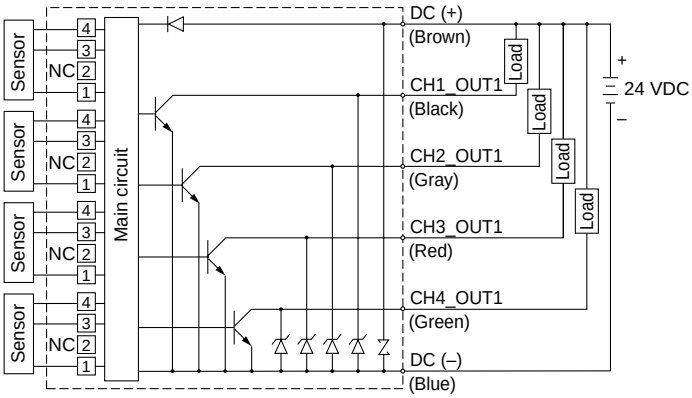
Pin no.	Terminal
①	DC (+)
②	DC (–)
③	CH1_OUT1
④	N.C.
⑤	CH2_OUT1
⑥	CH3_OUT1
⑦	CH4_OUT1
⑧	N.C.

Power supply / Output connector (accessory)

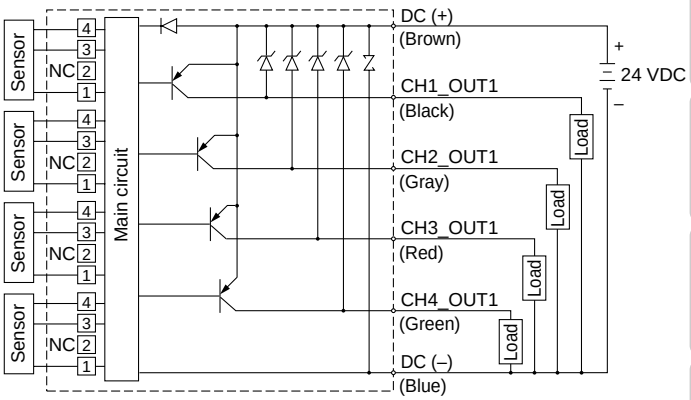


Internal circuits and wiring examples

PF2A200



PF2A201



For Air

Digital Flow Switch/High Flow Rate Type

Series PF2A

Refer to www.smcworld.com for details of products compatible with overseas standards.

How to Order

Integrated Display Type **PF2A7 □ H — □ □ — □ □ — M**

Flow rate range

03	150 to 3000 l/min
06	300 to 6000 l/min
12	600 to 12000 l/min

High flow rate type

Port specification

Nil	Rc
N	NPT
F	G

Port size

Symbol	Port size	Flow rate (l/min) 3000	6000	12000	Applicable model
10	1	●			PF2A703H
14	1 1/2		●		PF2A706H
20	2			●	PF2A712H

Lead wire (Refer to page 35.)

Nil	M12 3 m lead wire with connector
N	Without lead wire

Output specification

28	NPN open collector 1 output + Analogue output (1 to 5 V)
29	NPN open collector 1 output + Analogue output (4 to 20 mA)
68	PNP open collector 1 output + Analogue output (1 to 5 V)
69	PNP open collector 1 output + Analogue output (4 to 20 mA)

Switching of switch output and accumulated pulse output is possible with NPN or PNP open collector outputs.

Unit specification

Nil	With unit switching function
M	Fixed SI unit Note)

Note) Fixed units:
Real-time flow rate: l/min
Accumulated flow: l, m^3, $m^3 \times 10^3$

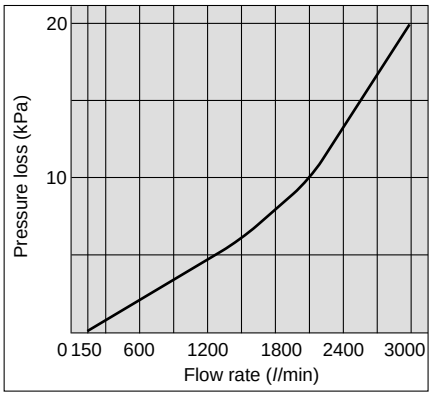
Specifications

Model		PF2A703H	PF2A706H	PF2A712H
Measured fluid		Dry air, Nitrogen		
Detection type		Heater type		
Rated flow range Note 1)		150 to 3000 l/min	300 to 6000 l/min	600 to 12000 l/min
Minimum set unit Note 1)		5 l/min	10 l/min	
Display units Note 2)	Real-time flow rate	l/min, CFM		
	Accumulated flow	l, m^3, $m^3 \times 10^3$, ft^3, $ft^3 \times 10^3$, $ft^3 \times 10^6$		
Operating pressure range		0.1 to 1.5 MPa		
Proof pressure		2.25 MPa		
Pressure loss		20 kPa (at maximum flow rate)		
Accumulated flow range		0 to 9,999,999,999 l		
Linearity Note 3)		±1.5% F.S. or less (0.7 MPa, at 20°C)		
Repeatability		±1.0% F.S. or less (0.7 MPa, at 20°C), ±3.0% of F.S. or less in case of analogue output		
Pressure characteristics		±1.5% F.S. or less (0.1 to 1.5 MPa, based on 0.7 MPa)		
Temperature characteristics		±2.0% F.S. or less (0 to 50°C, based on 25°C)		
Output specifications	Switch output Note 4)	NPN open collector Max. load current: 80 mA; Max. applied voltage: 30 V; Internal voltage drop: 1 V or less (with load current of 80 mA)		
		PNP open collector Max. load current: 80 mA; Internal voltage drop: 1.5 V or less (with load current of 80 mA)		
	Accumulated pulse output Note 4)	NPN or PNP open collector	Flow rate per pulse: 100 l/pulse, 10.0 ft^3/pulse ON time per pulse width: 50 msec	
	Analogue output Note 5)	Output voltage: 1 to 5 V; Load impedance: 100 kΩ or more		
		Output current: 4 to 20 mA; Load impedance: 250 Ω or less		
Response time		1 sec. or less		
Hysteresis		Hysteresis mode: Variable (can be set from 0); Window comparator mode: (can be set from 0 to 3% F.S.)		
Power supply voltage		24 VDC (ripple ±10% or less)		
Current consumption		150 mA or less		
Resistance	Enclosure	IP65		
	Operating temperature range	0 to 50°C (with no freezing and condensation)		
	Withstand voltage	1000 VAC for 1 min. between external terminal and case		
	Insulation resistance	50M Ω (500 VDC Mega) between external terminal and case		
	Vibration resistance	10 to 500 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration, in each X, Y, Z direction for 2 hrs, whichever is smaller.		
	Impact resistance	490 m/s^2 in X, Y, Z directions 3 times each		
	Noise resistance	1000 Vp-p, Pulse width 1 μs, Rise time 1 ns		
Weight		1.1 kg (without lead wire)	1.3 kg (without lead wire)	2.0 kg (without lead wire)
Port size (Rc, NPT, G)		1	1 1/2	2

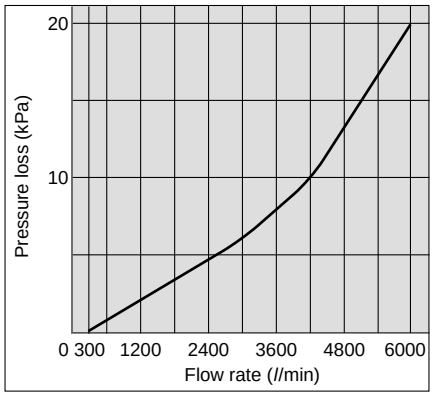
Note 1) Flow rate display can be switched between the basic condition of 0°C, 101.3 kPa and the standard condition (ANR) of 20°C, 101.3 kPa, and 65% RH.
Note 2) For digital flow switch with unit switching function. (Fixed SI unit [(l/min, or l, m^3 or $m^3 \times 10^3$)] will be set for switch type without the unit switching function.)
Note 3) The high flow rate type is CE marked; however, the linearity with applied noise is ±5% F.S. or less.
Note 4) Switch output and accumulated pulse output selections are made using the button controls.
Note 5) The analogue output operates only for real-time flow rate, and does not operate for accumulated flow.

Flow Characteristics (Pressure Loss)

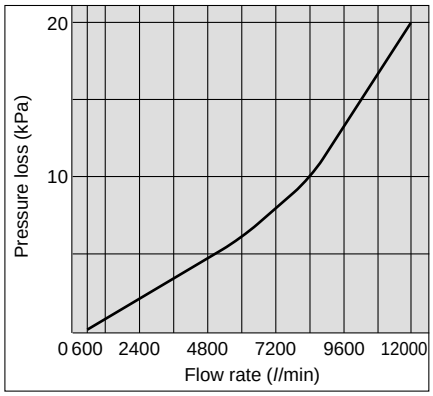
PF2A703H



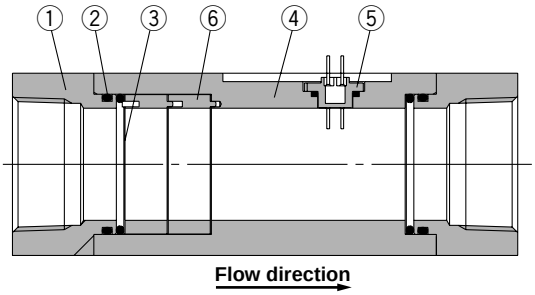
PF2A706H



PF2A712H



Construction



Parts list

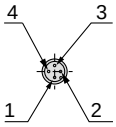
No.	Description	Material	Note
1	**Attachment**	Aluminum alloy	Anodized
2	**Seal**	HNBR	—
3	**Mesh**	Stainless steel	—
4	**Body**	Aluminum alloy	Anodized
5	**Sensor**	PPS	—
6	**Spacer**	PBT	—

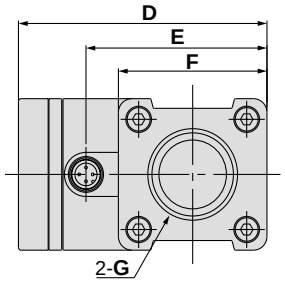
Dimensions

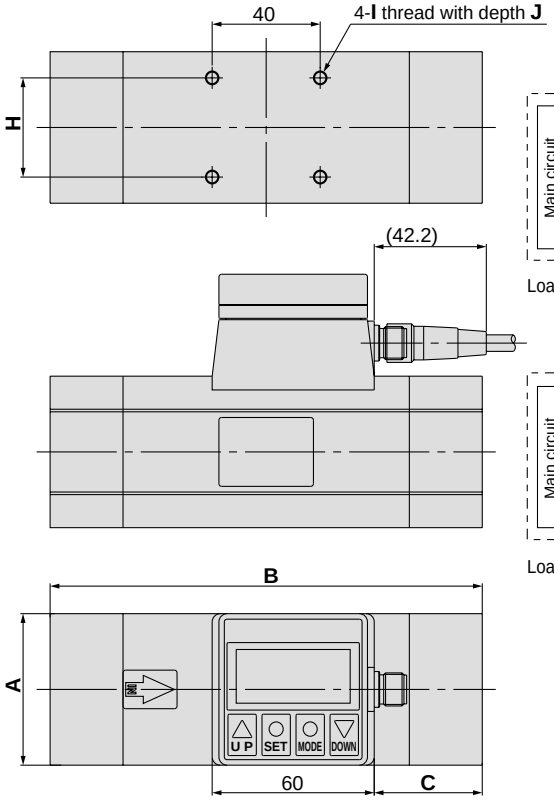
PFA703H, 706H, 712H

Connector pin numbers

Pin no.	Pin description
1	DC(+)
2	Analogue output
3	DC(–)
4	OUT1

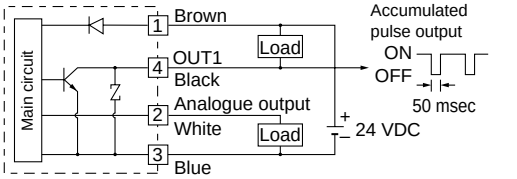






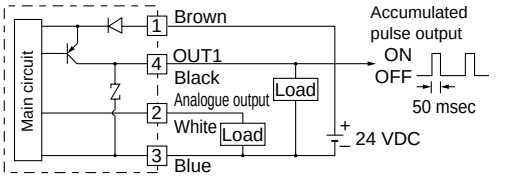
Internal circuits and wiring examples

1 to 4 are the terminal numbers.



Load is an analogue input equipment such as a voltmeter, ammeter.

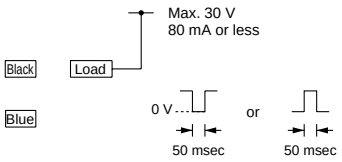
PF2A7□□H-□□-$^{28}_{29}$ (-M)



Load is an analogue input equipment such as a voltmeter, ammeter.

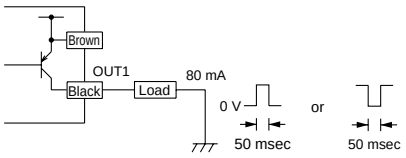
PF2A7□□H-□□-$^{68}_{69}$ (-M)

Accumulated pulse output wiring examples



PF2A7□□H-□□-$^{28}_{29}$ (-M)

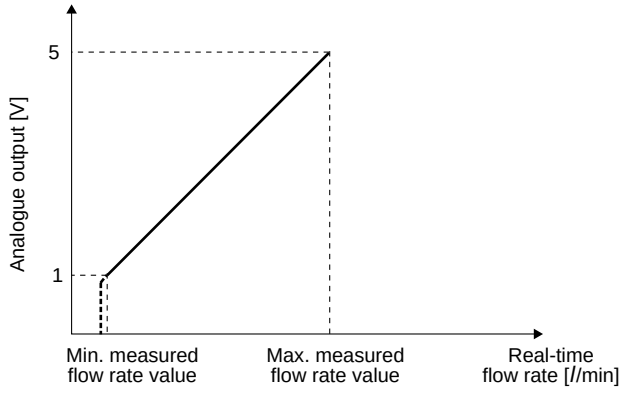
Model	A	B	C	D	E	F	G	H	I	J
PF2A703H	55	160	40	92	67	55	Rc1, NPT1, G1	36	M5	8
PF2A706H	65	180	45	104	79	65	Rc1$^1/_2$, NPT1$^1/_2$, G1$^1/_2$	46	M6	9
PF2A712H	75	220	55	114	89	75	Rc2, NPT2, G2	56	M6	9



PF2A7□□H-□□-$^{68}_{69}$ (-M)

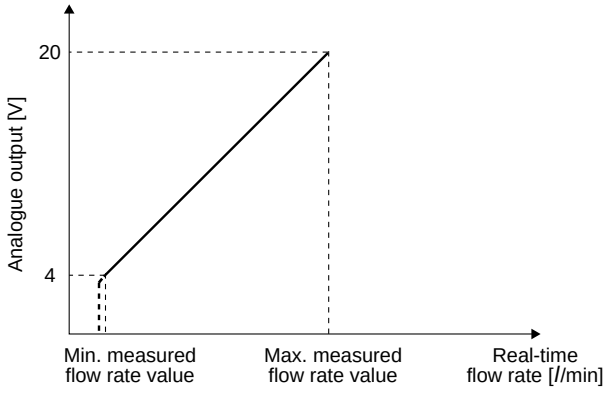
Analogue output

1 to 5 VDC



Part no.	Min. measured flow rate value [l/min]	Max. measured flow rate value [l/min]
PF2A703H-□-28 **PF2A703H-□-68**	150	3000
PF2A706H-□-28 **PF2A706H-□-68**	300	6000
PF2A712H-□-28 **PF2A712H-□-68**	600	12000

4 to 20 mADC



Part no.	Min. measured flow rate value [l/min]	Max. measured flow rate value [l/min]
PF2A703H-□-29 **PF2A703H-□-69**	150	3000
PF2A706H-□-29 **PF2A706H-□-69**	300	6000
PF2A712H-□-29 **PF2A712H-□-69**	600	12000

PF2W

For Water

Digital Flow Switch

Series PF2W

Refer to www.smcworld.com for details of products compatible with overseas standards.

How to Order

Integrated Display Type

PF2W7 20 — □ 03 — 27 □ — M

Flow rate range

04	0.5 to 4 /min
20	2 to 16 /min
40	5 to 40 /min
11	10 to 100 /min

Thread type

Nil	Rc
N	NPT
F	G

Port size

Symbol	Port size	Flow rate (/min) 4	16	40	100	Applicable model
03	3/8	●	●			PF2W704, PF2W720
04	1/2		●	●		PF2W720, PF2W740
06	3/4			●	●	PF2W740, PF2W711
10	1				●	PF2W711

Output specification

27	NPN open collector 2 outputs
67	PNP open collector 2 outputs

Lead wire (Refer to page 35.)

Nil	M12 3 m lead wire with connector
N	Without lead wire

Unit specification

Nil	With unit switching function
M	Fixed SI unit Note)

Note) Fixed units:
Real-time flow rate: /min
Accumulated flow:

Specifications

Model		PF2W704	PF2W720	PF2W740	PF2W711
Measured fluid		Water			
Flow rate measurement range		0.35 to 4.5 /min	1.7 to 17.0 /min	3.5 to 45 /min	7 to 110 /min
Set flow rate range		0.35 to 4.5 /min	1.7 to 17.0 /min	3.5 to 45 /min	7 to 110 /min
Rated flow range		0.5 to 4 /min	2 to 16 /min	5 to 40 /min	10 to 100 /min
Minimum set unit		0.05 /min	0.1 /min	0.5 /min	1 /min
Accumulated pulse flow rate exchange value (Pulse width: 50 ms)		0.05 /pulse	0.1 /pulse	0.5 /pulse	1 /pulse
Operating fluid temperature		0 to 50°C			
Linearity		±5% F.S. or less			±3% F.S. or less
Repeatability		±3% F.S. or less			±2% F.S. or less
Temperature characteristics Note 1)		±5% F.S. or less (0 to 50°C, based on 25°C)			
Current consumption (No load)		70 mA or less			80 mA or less
Weight Note 2)		460 g	520 g	700 g	1150 g
Port size (Rc, NPT, G)		3/8	3/8, 1/2	1/2, 3/4	3/4, 1
Detection type		Karman vortex			
Indicator light		3-digit, 7-segment LED			
Display units Note 3)	Real-time flow rate	/min, gal(US)/min			
	Accumulated flow	, gal(US)			
Operating pressure range		0 to 1 MPa			
Proof pressure		1.5 MPa			
Accumulated flow range Note 4)		0 to 999999			
Ambient temperature range		Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)			
Output specifications Note 5)	Switch output	NPN open collector: Maximum load current: 80 mA; Internal voltage drop: 1 V or less (with load current of 80 mA); Maximum applied voltage: 30 V; 2 outputs			
		PNP open collector: Maximum load current: 80 mA; Internal voltage drop: 1.5 V or less (with load current of 80 mA); 2 outputs			
	Accumulated pulse output	NPN or PNP open collector (same as switch output)			
Status LED's		Illuminates when output is ON, OUT1: Green; OUT2: Red			
Response time		1 sec. or less			
Hysteresis		Hysteresis mode: Variable (can be set from 0), Window comparator mode Note 6): 3-digit fixed			
Power supply voltage		12 to 24 VDC (ripple ±10% or less)			
Resistance	Enclosure	IP65			
	Operating temperature range	0 to 50°C			
	Withstand voltage	1000 VAC for 1 min. between external terminal and case			
	Insulation resistance	50M Ω or more (500 VDC Mega) between external terminal and case			
	Vibration resistance	10 to 500 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration in each X, Y, Z direction for 2 hrs, whichever is smaller.			
	Impact resistance	490 m/s^2 in X, Y, Z directions 3 times each			
	Noise resistance	1000 Vp-p, Pulse width 1 μs, Rise time 1 ns			

Note 1) In the case of PF2W711, ±3% of F.S. or less (15°C to 35°C, based on 25°C). Note 2) Without lead wire.
Note 3) For digital flow switch with unit switching function. (Fixed SI unit [/min or] will be set for switch type without the unit switching function.)
Note 4) Accumulated flow rate is reset when the power supply turns OFF. Note 5) Switch output and accumulated pulse output can be selected during initial setting.
Note 6) Window comparator mode — Since hysteresis will reach 3 digits, keep P_1 and P_2 or n_1 and n_2 apart by 7 digits or more.
(In case of output OUT2, n_1, 2 to be n_3, 4 and P_1, 2 to be P_3, 4.) Note 7) This product conforms to the CE mark.

How to Order

Remote Type Sensor Unit **PF2W5 20 □ 03 □ □ C**

Flow rate range

04	0.5 to 4 l/min
20	2 to 16 l/min
40	5 to 40 l/min
11	10 to 100 l/min

Thread type

Nil	Rc
N	NPT
F	G

Port size

Symbol	Port size	Flow rate (l/min) 4	16	40	100	Applicable model
03	3/8	●	●			PF2W504, PF2W520
04	1/2		●	●		PF2W520, PF2W540
06	3/4			●	●	PF2W540, PF2W511
10	1				●	PF2W511

Lead wire (Refer to page 35.)

Nil	M12 3m lead wire with connector
N	Without lead wire

Option (Refer to page 35.)

Nil	None
C	e-con connector x 1 pc.

The cable and connector are shipped unassembled.

Output specification

Symbol	Specification	Applicable display unit (monitor) model
Nil	Output for display unit	Series PF2W300
1	Output for display unit + Analogue output (1 to 5 V)	Series PF2W200/300
2	Output for display unit + Analogue output (4 to 20 mA)	Series PF2W300

Specifications

Model		PF2W504	PF2W520	PF2W540	PF2W511
Measured fluid		Water			
Detection type		Karman vortex			
Rated flow range		0.5 to 4 l/min	2 to 16 l/min	5 to 40 l/min	10 to 100 l/min
Operating pressure range		0 to 1 MPa			
Withstand pressure		1.5 MPa			
Operating fluid temperature		0 to 50°C			0 to 50°C
Linearity Note 1)		±5% F.S. or less			±3% F.S. or less
Repeatability Note 1)		±3% F.S. or less			±1% F.S. or less (connected with PF2W33□) ±3% F.S. or less (connected with PF2W2□□)
Temperature characteristics		±2% F.S. or less (15 to 35°C based on 25°C), ±3% F.S. or less (0 to 50°C, based on 25°C)			
Output specifications Note 2)	**Output for display unit**	Pulse output, N channel, open drain, output for display unit PF2W3□□. (Specifications: Maximum load current of 10 mA; Maximum applied voltage of 30 V)			
	Analogue output	Voltage output 1 to 5 V Linearity: ±5% F.S. or less; allowable load resistance: 100 kΩ or more.			
		Current output 4 to 20 mA Linearity: ±5% F.S. or less; allowable load resistance: 300 Ω or less with 12 VDC, 600 Ω or less with 24 VDC			
Power supply voltage		12 to 24 VDC (ripple ±10% or less)			
Current consumption (No load)		20 mA or less			
Resistance	**Enclosure**	IP65			
	Operating temperature range	Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)			
	Withstand voltage	1000 VAC for 1 min. between external terminal and case			
	Insulation resistance	50M Ω or more (500 VDC Mega) between external terminal and case			
	Vibration resistance	10 to 500 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration, whichever is smaller.			4.9 m/s^2
	Impact resistance	490 m/s^2 in X, Y, Z directions 3 times each			
	Noise resistance	1000 Vp-p, Pulse width 1 μs, Rise time 1 ns			
Weight Note 3)		410 g	470 g	650 g	1,100 g
Port size (Rc, NPT, G)		3/8	3/8, 1/2	1/2, 3/4	3/4, 1

Note 1) The system accuracy when combined with PF2W2□□/3□□.
Note 2) Output system can be selected during initial setting.
Note 3) Without lead wire. (Add 20 g for the types of analogue output whether voltage or current output selected.)
Note 4) The sensor unitis conforms to the CE mark.

How to Order

Remote Type Display Unit

PF2W3 [0] [0] — [A] — [M]

Flow rate range

Symbol	Flow rate range	Type for sensor unit
0	0.5 to 4 l/min	PF2W504
	2 to 16 l/min	PF2W520
	5 to 40 l/min	PF2W540
3	10 to 100 l/min	PF2W511

Output specification

0	NPN open collector 2 outputs
1	PNP open collector 2 outputs

Mounting

A	Panel mounting

Unit specification

Nil	With unit switching function
M	Fixed SI unit Note)

Note) Fixed units:
Real-time flow rate: l/min
Accumulated flow: l

Panel mount adapter part no.

Description	Panel adapter B
Part No.	ZS-22-02

Specifications

Model		PF2W300/301			PF2W330/331
Flow rate measurement range Note 1)		0.35 to 4.5 l/min	1.7 to 17.0 l/min	3.5 to 45 l/min	7 to 110 l/min
Set flow rate range Note 1)		0.35 to 4.5 l/min	1.7 to 17.0 l/min	3.5 to 45 l/min	7 to 110 l/min
Minimum set unit Note 1)		0.05 l/min	0.1 l/min	0.5 l/min	1 l/min
Accumulated pulse flow rate exchange value (Pulse width: 50 ms) Note 1)		0.05 l/pulse	0.1 l/pulse	0.5 l/pulse	1 l/pulse
Note 2) Display units	Real-time flow rate	l/min, gal(US)/min			
	Accumulated flow	l, gal(US)			
Accumulated flow range Note 3)		0 to 999999 l			
Linearity Note 4)		±5% F.S. or less			±3% F.S. or less
Repeatability Note 4)		±3% F.S. or less			±1% F.S. or less
Temperature characteristics		±2% F.S. or less (0 to 50°C, based on 25°C), ±1% F.S. or less (15 to 35°C, based on 25°C)			
Current consumption (No load)		50 mA or less			60 mA or less
Weight		45 g			
Output specifications Note 5)	Switch output	NPN open collector (PF2W300, PF2W330)	Maximum load current: 80 mA Internal voltage drop: 1 V or less (with load current of 80 mA) Maximum applied voltage: 30 V 2 outputs		
		PNP open collector (PF2W301, PF2W331)	Maximum load current: 80 mA Internal voltage drop: 1.5 V or less (with load current of 80 mA) 2 outputs		
	Accumulated pulse output	NPN or PNP open collector (same as switch output)			
Resistance	Enclosure	IP40			
	Operating temperature range	Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)			
	Withstand voltage	1000 VAC for 1 min. between external terminal and case			
	Insulation resistance	50M Ω or more (500 VDC Mega) between external terminal and case			
	Vibration resistance	10 to 500 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration in each X, Y, Z direction for 2 hrs, whichever is smaller.			
	Impact resistance	490 m/s^2 in X, Y, Z directions 3 times each			
	Noise resistance	1000 Vp-p, Pulse width 1 μs, Rise time 1 ns			
Indicator light		3-digit, 7-segment LED			
Status LED's		Illuminates when output is ON, OUT1: Green; OUT2: Red			
Power supply voltage		12 to 24 VDC (ripple ±10% or less)			
Response time		1 sec. or less			
Hysteresis		Hysteresis mode: Variable (can be set from 0) Window comparator mode: 3-digit fixed Note 6)			

Note 1) Values vary depending on each set flow rate range.
Note 2) For digital flow switch with unit switching function. (Fixed SI unit [l/min or l] will be set for switch types without the unit switching function.)
Note 3) Accumulated flow rate is reset when the power supply turns OFF.
Note 4) The system accuracy when combined with PF2W5□□.
Note 5) Switch output and accumulated pulse output can be selected during initial setting.
Note 6) Window comparator mode — Since hysteresis (H) will reach 3 digits, keep P_1 and P_2 or n_1 and n_2 apart by 7 digits or more. (In case of output OUT2, n_1, 2 to be n_3, 4 and P_1, 2 to be P_3, 4.)
Note 7) The display unit conforms to the CE mark.

How to Order

4-channel Flow Monitor
Remote Type Display Unit

PF2W20 □ — M □ □

Output specification

0	NPN4 outputs
1	PNP4 outputs

Unit specification

Nil	With unit switching function
M	Fixed SI unit Note)

Note) Fixed units:
Real-time flow rate: *l*/min
Accumulated flow: *l*

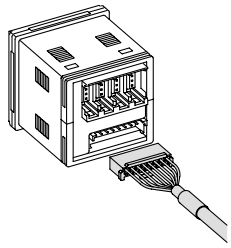
Option 1 (Refer to page 35.)

Nil	None
A	Panel mounting
B	Front protective cover + Panel mounting

Option 2 (Refer to page 35.)

Nil	None
4C	Sensor connector (4 pc.)

Accessory / Power supply output cable (2 m)



Connectable remote type sensor part is PF2W5□□-□-1 (with analogue output 1 to 5 V).

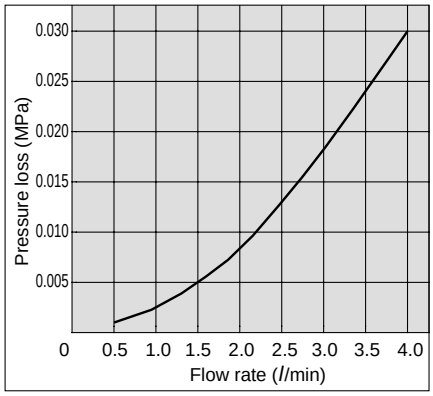
Specifications

Model		**PF2W200/201**			
Applicable flow rate sensor		PF2W504/504T-□-1	PF2W520/520T-□-1	PF2W540/540T-□-1	PF2W511-□-1
Flow rate measurement range Note 1)		0.35 to 4.50 *l*/min	1.7 to 17.0 *l*/min	3.5 to 45.0 *l*/min	7 to 110 *l*/min
Set flow rate range Note 1)		0.35 to 4.50 *l*/min	1.7 to 17.0 *l*/min	3.5 to 45.0 *l*/min	7 to 110 *l*/min
Minimum set unit Note 1)		0.05 *l*/min	0.1 *l*/min	0.5 *l*/min	1 *l*/min
Accumulated pulse flow rate exchange value (Pulse width: 50 ms) Note 1)		0.05 *l*/pulse	0.1 *l*/pulse	0.5 *l*/pulse	1 *l*/pulse
Display units Note 1)	**Real-time flow rate**	*l*/min, gal(US)/min			
	Accumulated flow	*l*, gal(US)			
Accumulated flow range Note 1)		0 to 999999 *l*, 0 to 999999 gal(US)			
Power supply voltage		24 VDC (ripple ±10% or less) (With power supply polarity protection)			
Current consumption		55 mA or less (Note including the current consumption of the sensor)			
Power supply voltage for sensor		Same as [Power supply voltage]			
Power supply current for sensor Note 2)		Max. 110 mA (However, the total current for the 4 inputs is 440 mA maximum or less.)			
Sensor input		1 to 5 VDC (Input impedance: Approx. 800K Ω)			
	No. of inputs	4 inputs			
	Input protection	Excess voltage protection			
Output specifications Note 3)	**Switch output (Real-time switch output, accumulated switch output)**	NPN open collector (PF2W200)	Maximum load current: 80 mA Internal voltage drop: 1 V or less (with load current of 80 mA) Maximum applied voltage: 30 V		
		PNP open collector (PF2W201)	Maximum load current: 80 mA Internal voltage drop: 1 V or less (with load current of 80 mA)		
	Accumulated pulse output	NPN open collector or PNP open collector (same as switch output)			
	No. of outputs	4 outputs (1 output per 1 sensor input)			
	Output protection	Short circuit protection			
Hysteresis		Hysteresis mode: Variable (can be set from 0), Window comparator mode: Fixed (3-digits)			
Response time Note 4)		1s or less			
Linearity Note 4)		±5% F.S. or less			
Repeatability Note 4)		±3% F.S. or less			
Temperature characteristics		±2% F.S. or less (0 to 50°C, based on 25°C)			
Display method		For measured value display: 4-digits, 7-segment LED (Orange) For channel display: 1-digit, 7-segment LED (Red)			
Status LED's		Illuminates when output is ON OUT1: Red			
Resistance	**Enclosure**	IP65 for the front face only, and IP40 for the remaining parts.			
	Operating temperature range	Operating: 0 to 50°C, Stored: –10 to 60°C (with no freezing and condensation)			
	Operating humidity range	Operating or Stored: 35 to 85%RH (with no condensation)			
	Vibration resistance	10 to 500 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration, in each X, Y, Z direction for 2 hrs, whichever is smaller. (de-energised)			
	Impact resistance	980 m/s^2 in X, Y, Z directions 3 times each (de-energised)			
	Noise resistance	500 Vp-p, Pulse width 1 μs, Rise time 1 ns			
Connection		Power supply / Output connection: 8P connector, Sensor connection: 4P connector (e-con)			
Material		Housing: PBT, Display: PET, Backside rubber: CR			
Weight		60 g (Except for any accessories that are shipped together)			

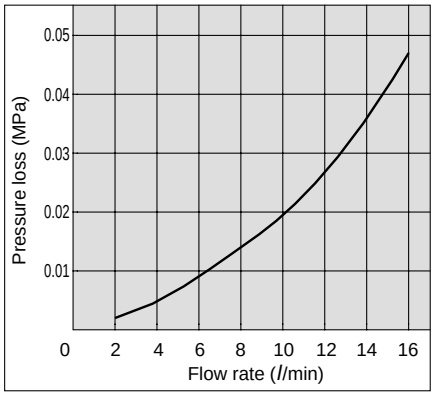
Note 1) Fixed SI unit [*l*/min or *l*] will be set for switch types without the unit switching function. ("-M" is suffixed at the end of part number.) Accumulated flow is reset when the power supply turns OFF.
Note 2) If Vcc side on sensor input connector part is short-circuited with 0V side, the flow monitor inside will be damaged.
Note 3) Switch output and accumulated pulse output can be selected during initial setting.
Note 4) The system accuracy when combined with applicable flow sensor.
Note 5) This product conforms to the CE mark.

Flow Characteristics (Pressure Loss)

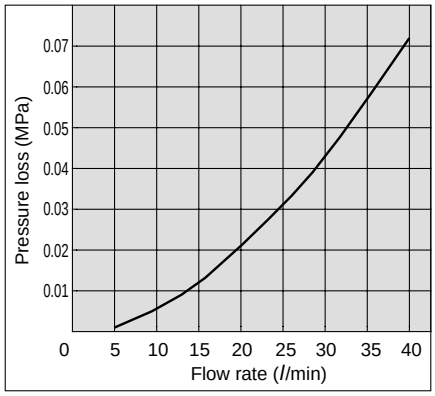
PF2W704, 504



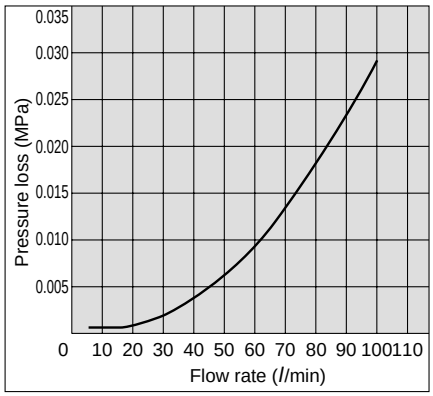
PF2W720, 520



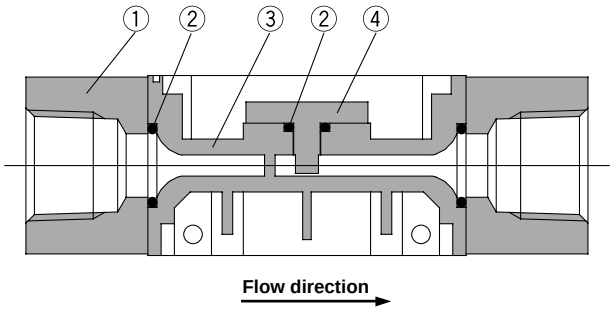
PF2W740, 540



PF2W711, 511



Sensor Unit Construction

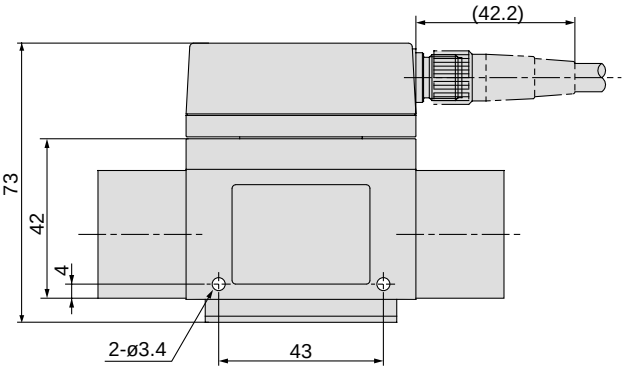


Parts list

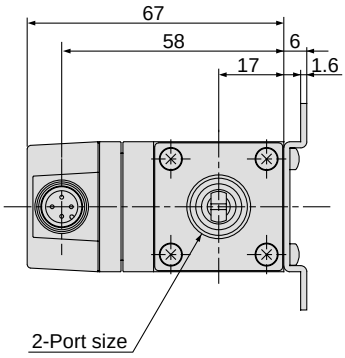
No.	Description	Material
1	**Attachment**	Stainless steel
2	**Seal**	NBR
3	**Body**	PPS
4	**Sensor**	PPS

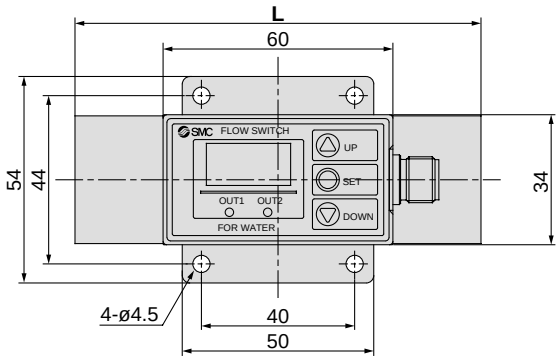
Dimensions: Integrated Display Type for Water

PF2W704, 720



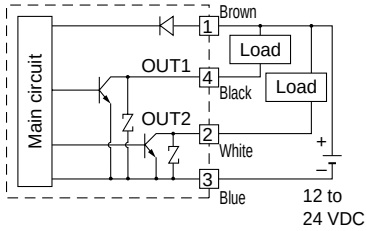
Model	L Dimension
PF2W704	100
PF2W720	106



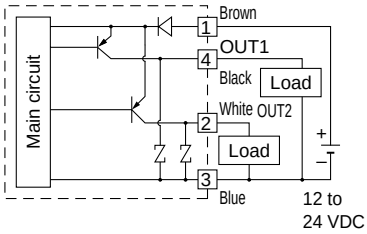


Internal circuits and wiring examples

1 to 4 are the terminal numbers.

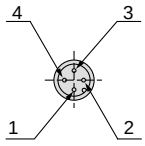


PF2W7□□-□□-27□(-M): NPN type



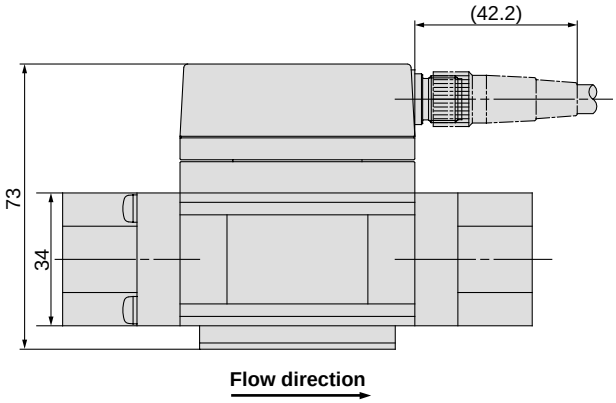
PF2W7□□-□□-67□(-M): PNP type

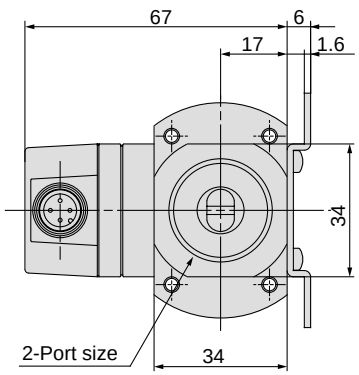
Connector pin numbers

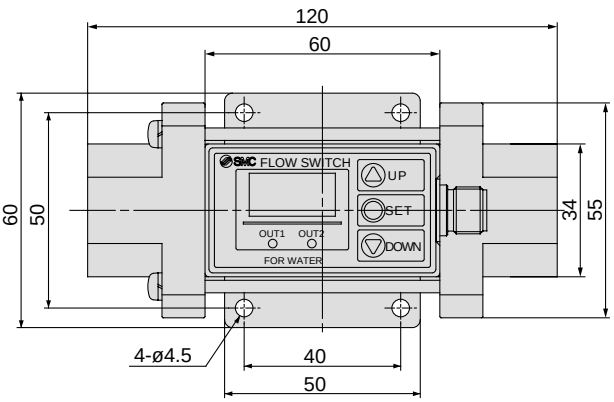


Pin no.	Pin description
1	DC(+)
2	OUT2
3	DC(–)
4	OUT1

PF2W740

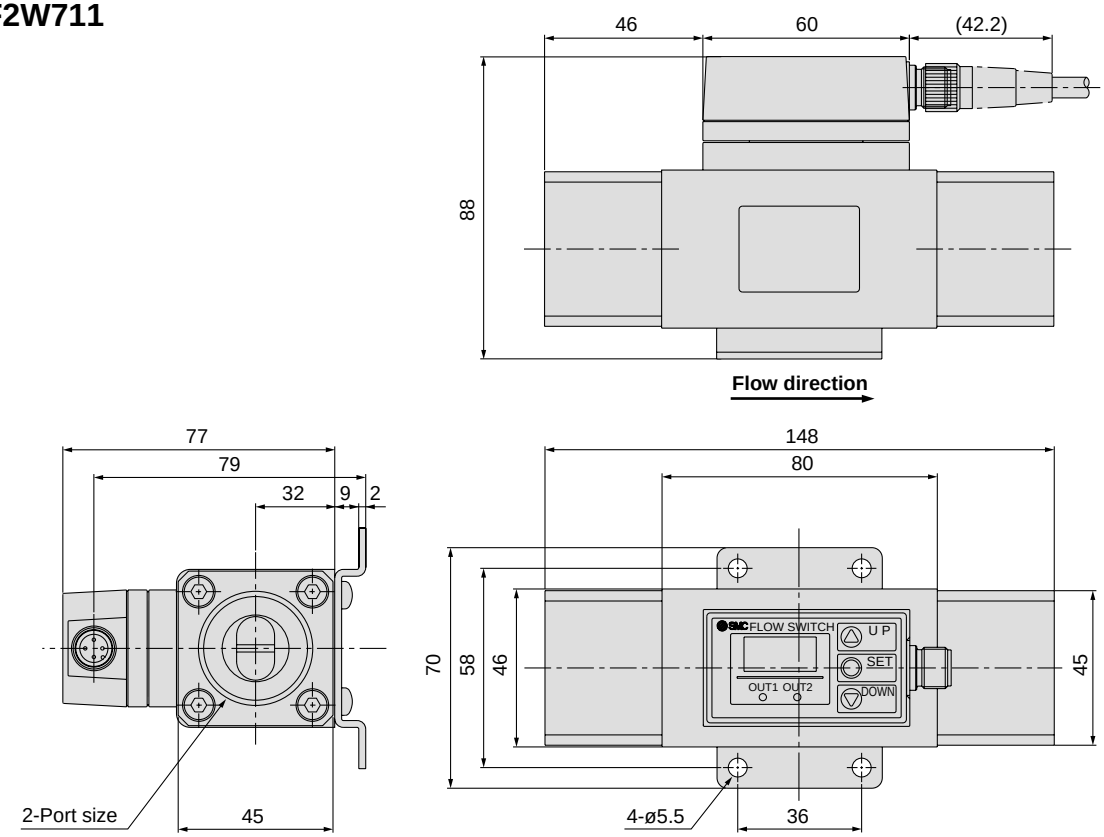






Dimensions: Integrated Display Type for Water

PF2W711

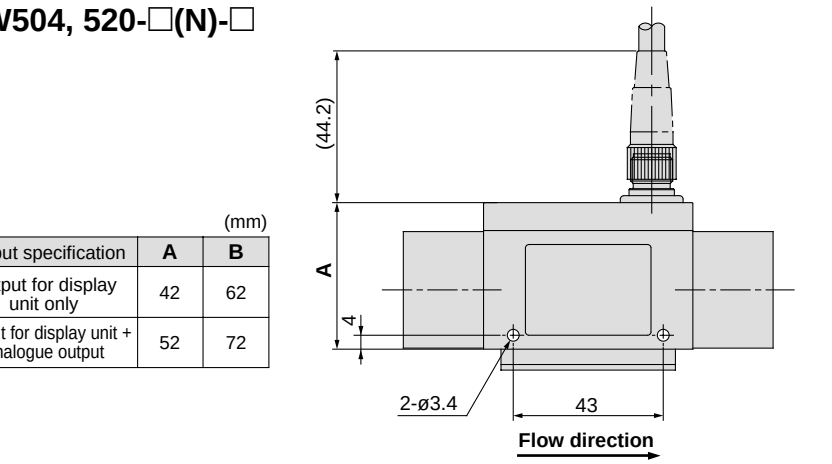


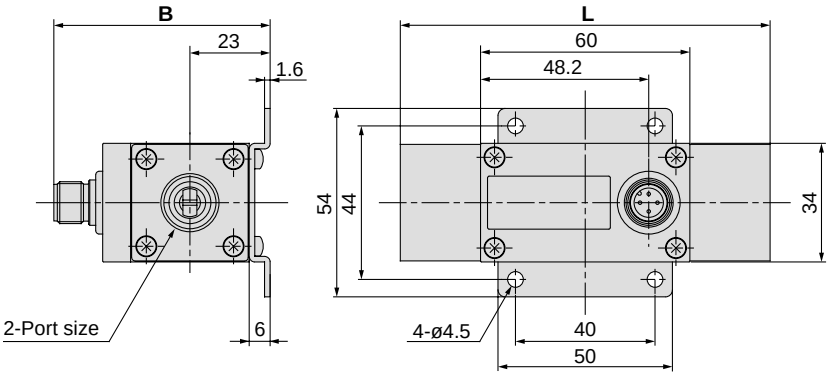
Dimensions: Remote Type Sensor Unit for Water

PF2W504, 520-□(N)-□

(mm)

Output specification	A	B
Output for display unit only	42	62
Output for display unit + Analogue output	52	72



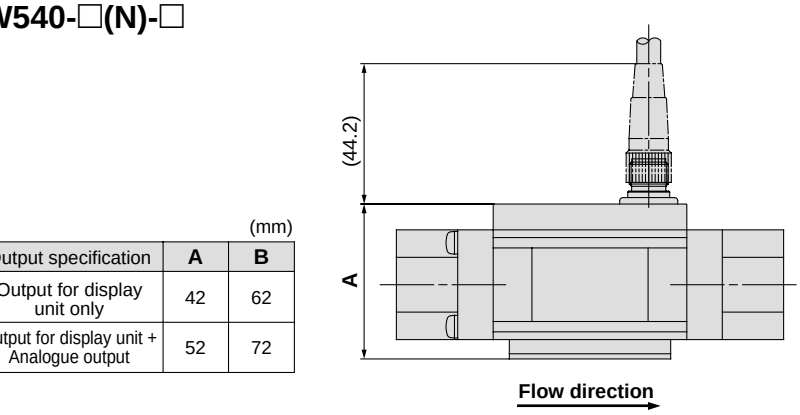


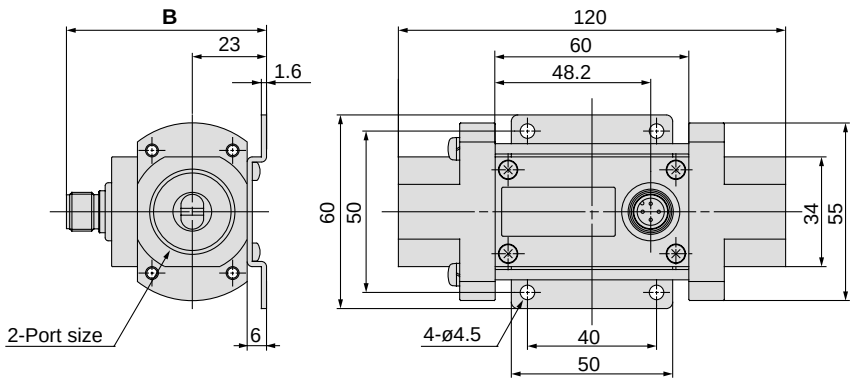
Model	L dimension
PF2W504	100
PF2W520	106

PF2W540-□(N)-□

(mm)

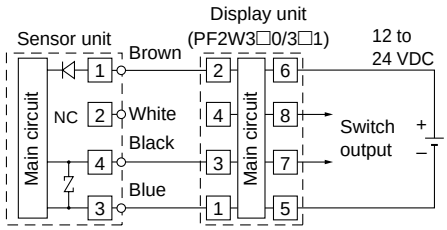
Output specification	A	B
Output for display unit only	42	62
Output for display unit + Analogue output	52	72



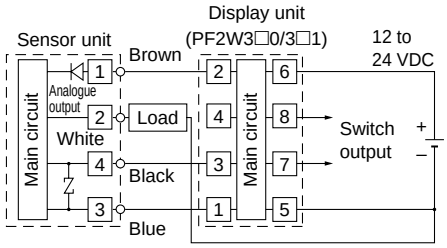


Internal circuits and wiring examples

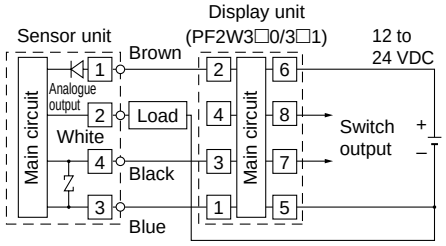
1 to 8 are the terminal numbers.



PF2W5□□-□□□

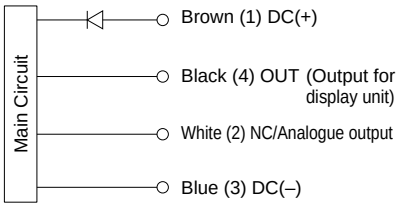


Load is an analogue input equipment such as a voltmeter.
PF2W5□□-□□□-1 (With voltage output type)



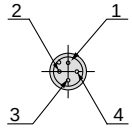
Load is an analogue input equipment such as a voltmeter.
PF2W5□□-□□□-2 (With voltage output type)

Wiring



∗ Use this sensor by connecting it to a SMC remote type display unit Series PF2W2□□/3□□.

Connector pin numbers



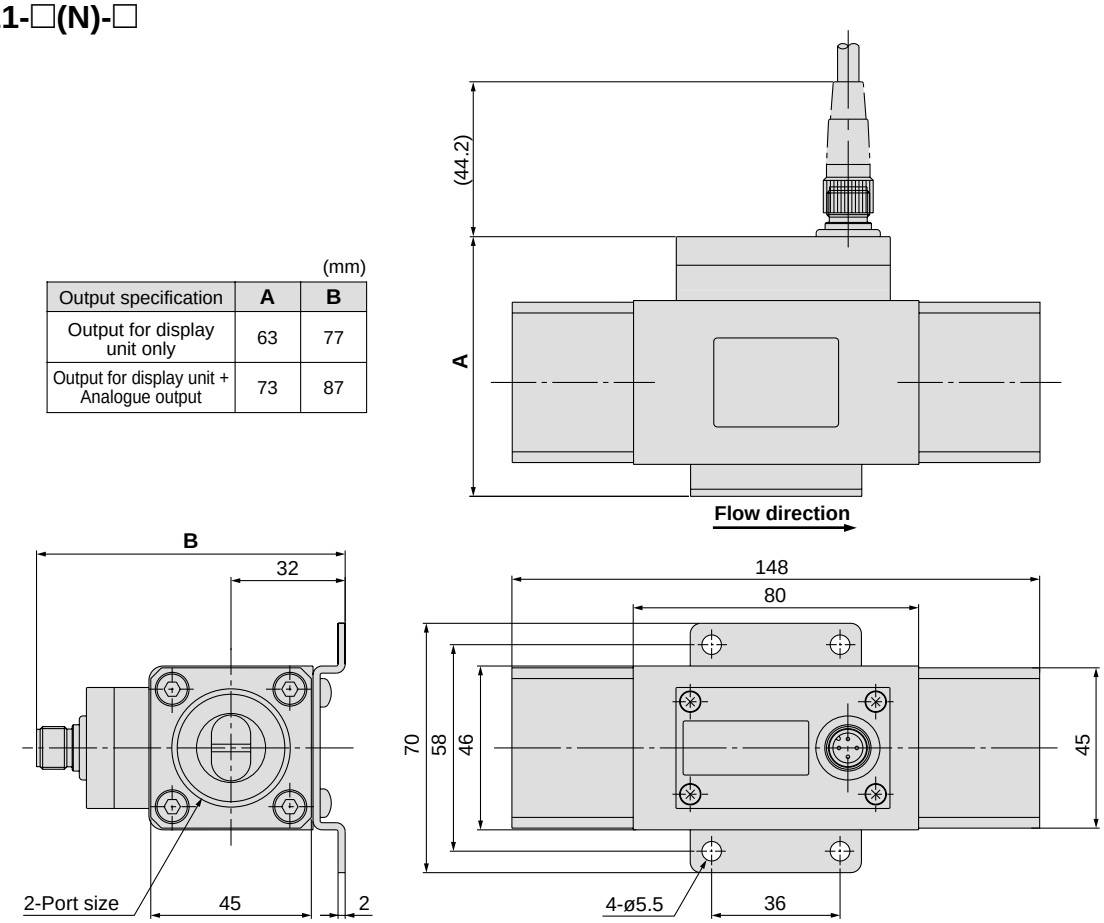
Pin no.	Pin description
1	DC(+)
2	NC/Analogue output
3	DC(–)
4	OUT

Dimensions: Remote Type Sensor Unit for Water

PF2W511-□(N)-□

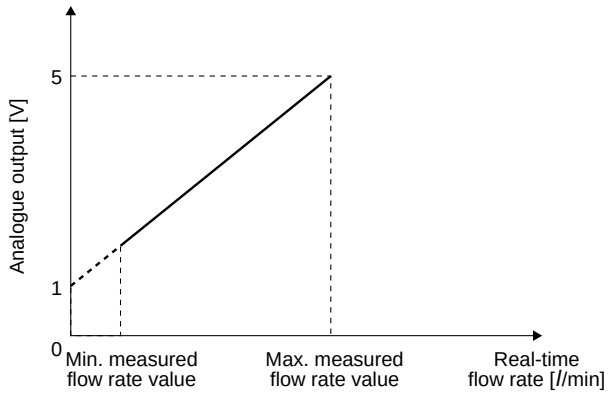
(mm)

Output specification	A	B
Output for display unit only	63	77
Output for display unit + Analogue output	73	87



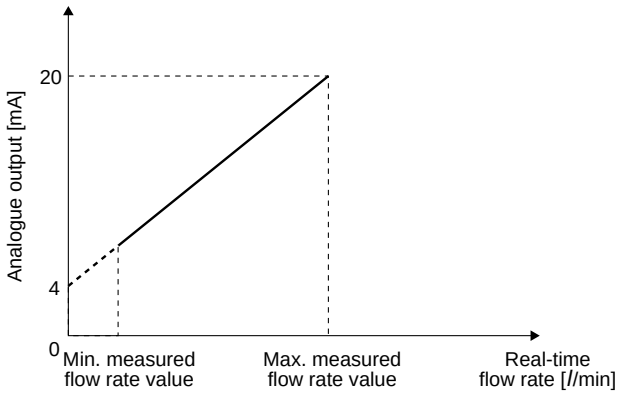
Analogue output

1 to 5 VDC



Part no.	Min. measured flow rate value [l/min]	Max. measured flow rate value [l/min]
PF2W504-□-1	0.5	4
PF2W520-□-1	2	16
PF2W540-□-1	5	40
PF2W511-□-1	10	100

4 to 20 mADC

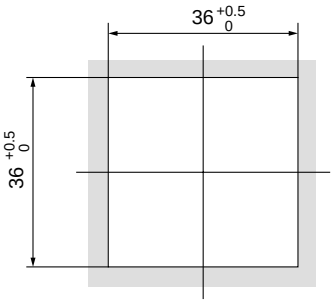


Part no.	Min. measured flow rate value [l/min]	Max. measured flow rate value [l/min]
PF2W504-□-2	0.5	4
PF2W520-□-2	2	16
PF2W540-□-2	5	40
PF2W511-□-2	10	100

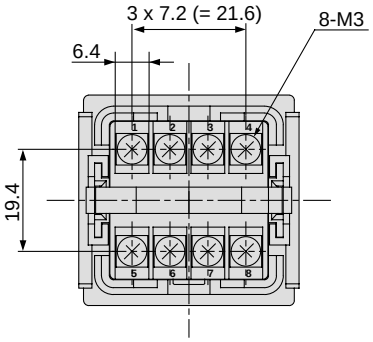
Dimensions: Remote Type Display Unit for Water

PF2W3□□-A
Panel mounting type

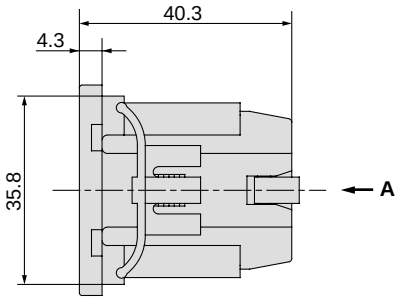
Panel fitting dimension

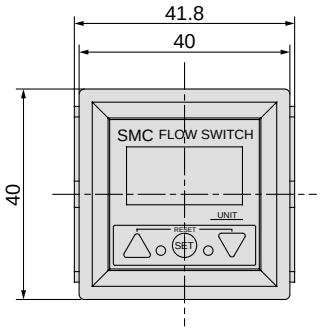


∗ The applicable panel thickness is 1 to 3.2 mm.



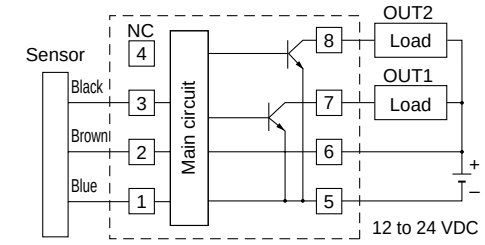
View A





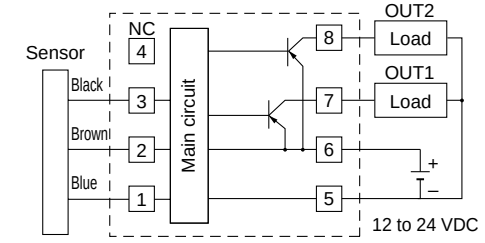
Internal circuits and wiring examples

1 to 8 are the terminal numbers.



Series PF2W5□□

PF2W3□0-A

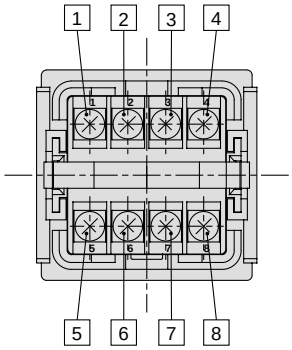


Series PF2W5□□

PF2W3□1-A

∗ Do not connect the white wire of the sensor to 3.

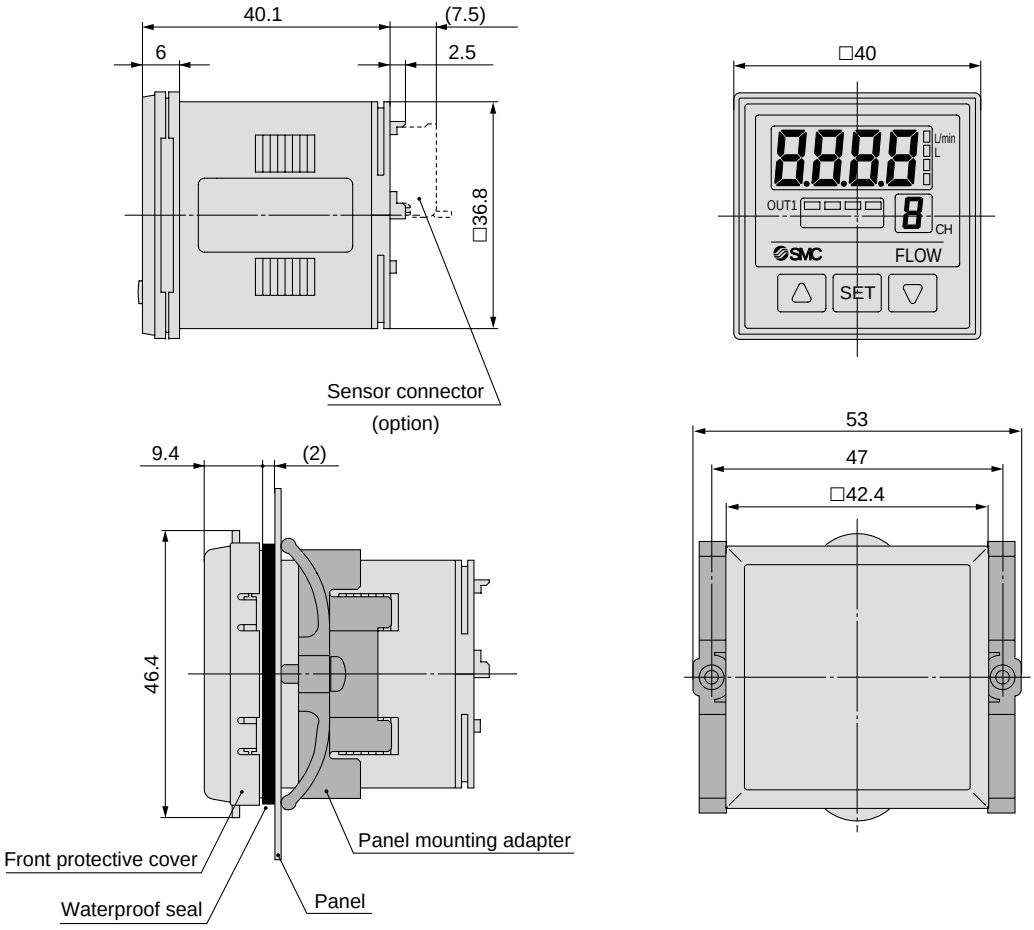
Terminal block numbers

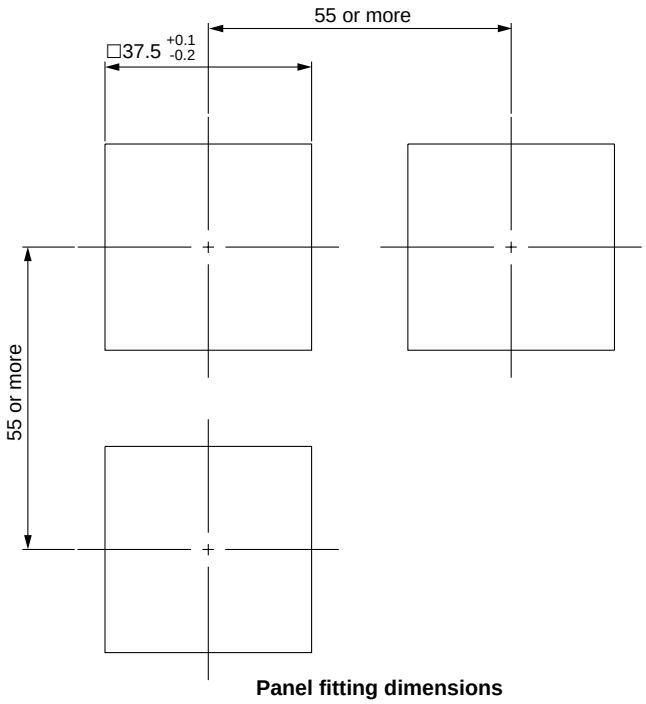


Dimensions: Remote Type Display Unit for Water (4-channel Flow Monitor)

PF2W200, 201

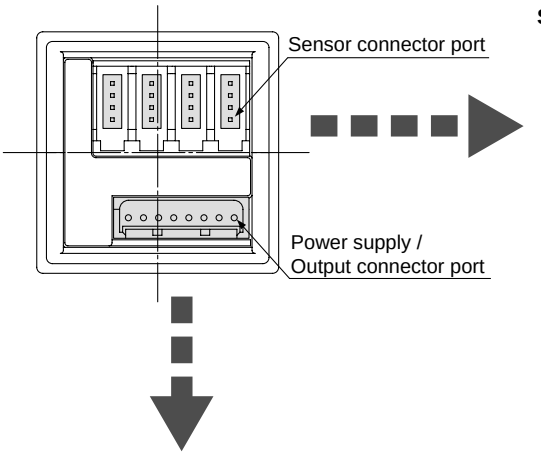
Front protective cover + Panel mounting



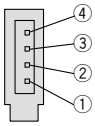


Panel fitting dimensions
Applicable panel thickness: 0.5 to 8 mm

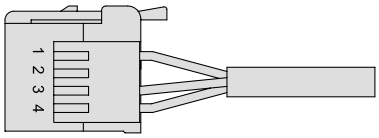
Dimensions: Remote Type Display Unit for Water (4-channel Flow Monitor)



Sensor connector (4P x 4)

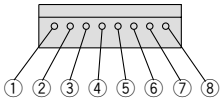


Connector (option)



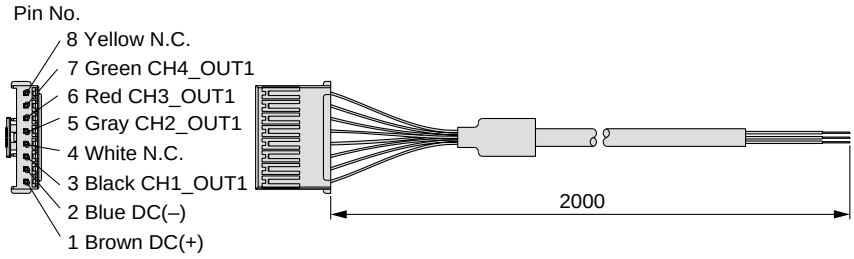
Pin no.	Terminal	Connector no.	Cable wire colour
①	DC+	1	Brown
②	N.C.	2	Not used
③	DC–	3	Blue
④	IN: 1 to 5 V	4	White

Power supply / Output connector (8P)



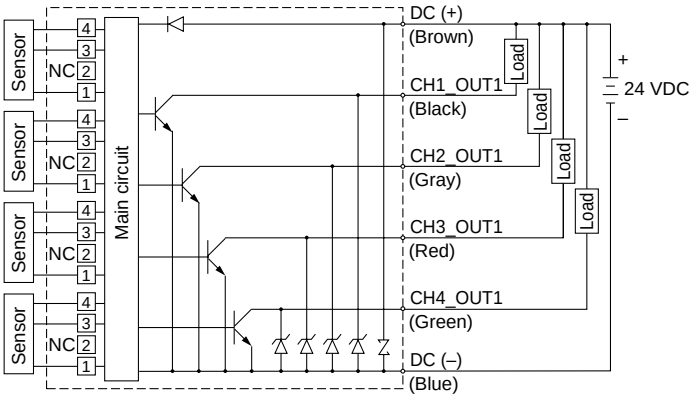
Pin no.	Terminal
①	DC (+)
②	DC (–)
③	CH1_OUT1
④	N.C.
⑤	CH2_OUT1
⑥	CH3_OUT1
⑦	CH4_OUT1
⑧	N.C.

Power supply / Output connector (accessory)

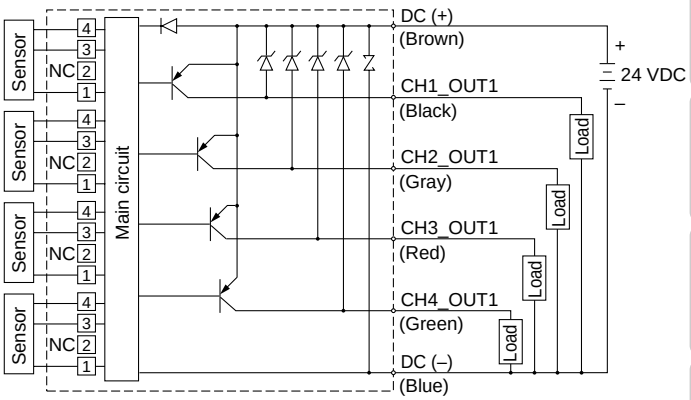


Internal circuits and wiring examples

PF2W200



PF2W201

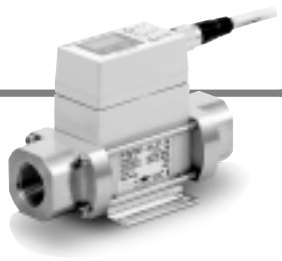


For Water

Digital Flow Switch/High Temperature Fluid Type

Series PF2W

Refer to www.smcworld.com for details of products compatible with overseas standards.



How to Order

Integrated Display Type

PF2W7 20 T — □ 03 — 27 □ — □

Flow rate range

04	0.5 to 4 l/min
20	2 to 16 l/min
40	5 to 40 l/min

Temperature range

T	0 to 90°C

Thread type

Nil	Rc
N	NPT
F	G

Port size

Symbol	Port size	Flow rate (l/min) 4	16	40	Applicable model
03	3/8	●	●		PF2W704T, PF2W720T
04	1/2		●	●	PF2W720T, PF2W740T
06	3/4			●	PF2W740T

Output specification

27	NPN open collector 2 outputs
67	PNP open collector 2 outputs

Lead wire (Refer to page 35.)

Nil	M12 3 m lead wire with connector
N	Without lead wire

Unit specification

Nil	With unit switching function
M	Fixed SI unit Note)

Note) Fixed units:
Real-time flow rate: l/min
Accumulated flow: l

Specifications

Model		PF2W704T	PF2W720T	PF2W740T
Measured fluid		Water, Mixture of water (50%) and ethylene glycol (50%)		
Flow rate measurement range		0.35 to 4.5 l/min	1.7 to 17.0 l/min	3.5 to 45 l/min
Set flow rate range		0.35 to 4.5 l/min	1.7 to 17.0 l/min	3.5 to 45 l/min
Rated flow range		0.5 to 4 l/min	2 to 16 l/min	5 to 40 l/min
Minimum set unit		0.05 l/min	0.1 l/min	0.5 l/min
Accumulated pulse flow rate exchange value (Pulse width: 50 ms)		0.05 l/pulse	0.1 l/pulse	0.5 l/pulse
Operating fluid temperature		0 to 90°C (with no cavitation)		
Linearity		±5% F.S. or less		
Repeatability		±3% F.S. or less		
Temperature characteristics Note 1)		±5% F.S. or less (0 to 90°C, based on 25°C)		
Current consumption (No load)		70 mA or less		
Weight Note 2)		710 g		
Port size (Rc, NPT, G)		3/8	3/8, 1/2	1/2, 3/4
Detection type		Karman vortex		
Indicator light		3-digit, 7-segment LED		
Display units Note 3)	Real-time flow rate	l/min, gal(US)/min		
	Accumulated flow	l, gal(US)		
Operating pressure range		0 to 1 MPa		
Withstand pressure		1.5 MPa		
Accumulated flow range Note 4)		0 to 999999 l		
Output specifications Note 5)	Switch output	NPN open collector: Maximum load current: 80 mA; Internal voltage drop: 1 V or less (with load current of 80 mA) Maximum applied voltage: 30 V; 2 outputs		
		PNP open collector: Maximum load current: 80 mA; Internal voltage drop: 1.5 V or less (with load current of 80 mA); 2 outputs		
	Accumulated pulse output	NPN or PNP open collector (same as switch output)		
Status LED's		Illuminates when output is ON OUT1: Green; OUT2: Red		
Response time		1 sec. or less		
Hysteresis		Hysteresis mode: Variable (can be set from 0); Window comparator mode Note 6): 3-digit fixed		
Power supply voltage		12 to 24 VDC (ripple ±10% or less)		
Resistance	Enclosure	IP65		
	Operating temperature range	Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)		
	Withstand voltage	1000 VAC for 1 min. between external terminal and case		
	Insulation resistance	50M Ω and more (500 VDC Mega) between external terminal and case		
	Vibration resistance	10 to 500 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration in each X, Y, Z direction for 2 hrs, whichever is smaller.		
	Impact resistance	490 m/s^2 in X, Y, Z directions 3 times each		
	Noise resistance	1000 Vp-p, Pulse width 1 μs, Rise time 1 ns		

Note 1) ±5% F.S. or less (0 to 50°C, based on 25°C), ±3% F.S. or less (15 to 35°C, based on 25°C)
Note 2) Without lead wire.
Note 3) For digital flow switch with unit switching function. (Fixed SI unit [l/min or l] will be set for switch type without the unit switching function.)
Note 4) Accumulated flow rate is reset when the power supply turns OFF.
Note 5) Switch output and accumulated pulse output can be selected during initial setting.
Note 6) Window comparator mode — Since hysteresis will reach 3 digits, keep P_1 and P_2 or n_1 and n_2 apart by 7 digits or more.
(In case of output OUT2, n_1, 2 to be n_3, 4 and P_1, 2 to be P_3, 4.)
Note 7) The flow switch conforms to the CE mark.

How to Order

Remote Type Display Unit **PF2W5 20 T □ 03 □ □ C**

Flow rate range

04	0.5 to 4 l/min
20	2 to 16 l/min
40	5 to 40 l/min

Temperature range

T	0 to 90°C

Thread type

Nil	Rc
N	NPT
F	G

Port size

Symbol	Port size	Flow rate (l/min) 4	16	40	Applicable model
03	3/8	●	●		PF2W504T, 520T
04	1/2		●	●	PF2W520T, 540T
06	3/4			●	PF2W540T

Lead wire (Refer to page 35.)

Nil	M12 3 m lead wire with connector
N	Without lead wire

Option (Refer to page 35.)

Nil	None
C	e-con connector x 1 pc.

The cable and connector are shipped unassembled.

Output specification

Symbol	Specification	Applicable display unit (monitor) model
Nil	Output for display unit	Series PF2W300
1	Output for display unit + Analogue output (1 to 5 V)	Series PF2W200/300
2	Output for display unit + Analogue output (4 to 20 mA)	Series PF2W300

Specifications

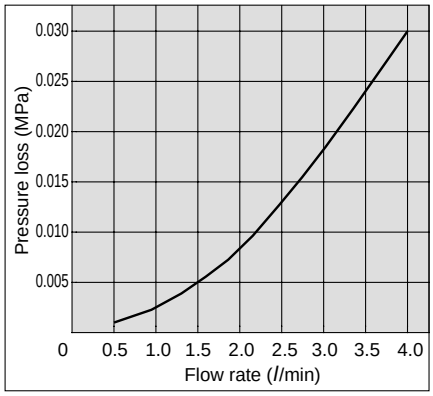
Model		PF2W504T	PF2W520T	PF2W540T
Measured fluid		Water, Mixture of water (50%) and ethylene glycol (50%)		
Detection type		Karman vortex		
Rated flow range		0.5 to 4 l/min	2 to 16 l/min	5 to 40 l/min
Operating pressure range		0 to 1 MPa		
Withstand pressure		1.5 MPa		
Operating fluid temperature		0 to 90°C (with no cavitation)		
Linearity Note 1)		±5% F.S. or less		
Repeatability Note 1)		±2% F.S. or less		
Temperature characteristics		±2% F.S. or less (15 to 35°C, based on 25°C), ±3% F.S. or less (0 to 50°C, based on 25°C)		
Output specifications Note 2)	**Output for display unit**	Pulse output, N channel, open drain, output for display unit PF2W3□□. (Specifications: Maximum load current of 10 mA; Maximum applied voltage of 30 V)		
	Analogue output	Voltage output 1 to 5 V Linearity: ±5% F.S. or less; allowable load resistance: 100 kΩ or more.		
		Current output 4 to 20 mA Linearity: ±5% F.S. or less; allowable load resistance: 300 Ω or less with 12 VDC, 600 Ω or less with 24 VDC		
Power supply voltage		12 to 24 VDC (ripple ±10% or less)		
Current consumption (No load)		20 mA or less		
Resistance	**Enclosure**	IP65		
	Operating temperature range	Operating: 0 to 50°C, Stored: –25 to 85°C (with no freezing and condensation)		
	Withstand voltage	1000 VAC for 1 min. between external terminal and case		
	Insulation resistance	50M Ω or more (500 VDC Mega) between external terminal and case		
	Vibration resistance	10 to 500 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration, whichever is smaller.		
	Impact resistance	490 m/s^2 in X, Y, Z directions 3 times each		
	Noise resistance	1000 Vp-p, Pulse width 1μs, Rise time 1ns		
Weight Note 3)		660 g		
Port size (Rc, NPT, G)		3/8	3/8, 1/2	1/2, 3/4

Note 1) The system accuracy when combined with PF2W2□□/3□□.
Note 2) Output system can be selected during initial setting.
Note 3) Without lead wire. (Add 20g for the types of analogue output whether voltage or current output selected.)
Note 4) The sensor unit conforms to the CE mark.

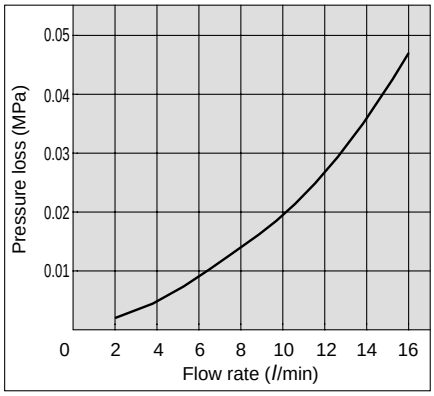
Display units are the same as those of remote type digital flow switch for water (series PF2W3□□/PF2W20□). Refer to pages 17, 18 for details.

Flow Characteristics (Pressure Loss)

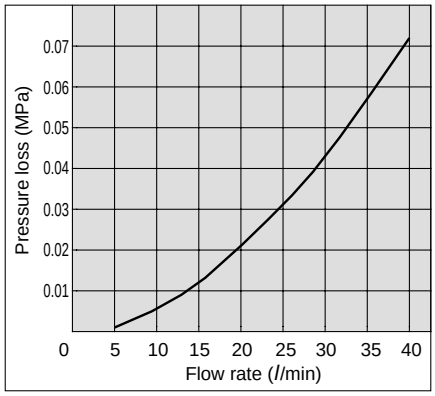
PF2W704T, 504T



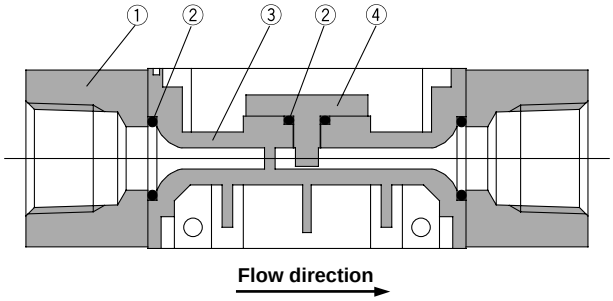
PF2W720T, 520T



PF2W740T, 540T



Sensor Unit Construction

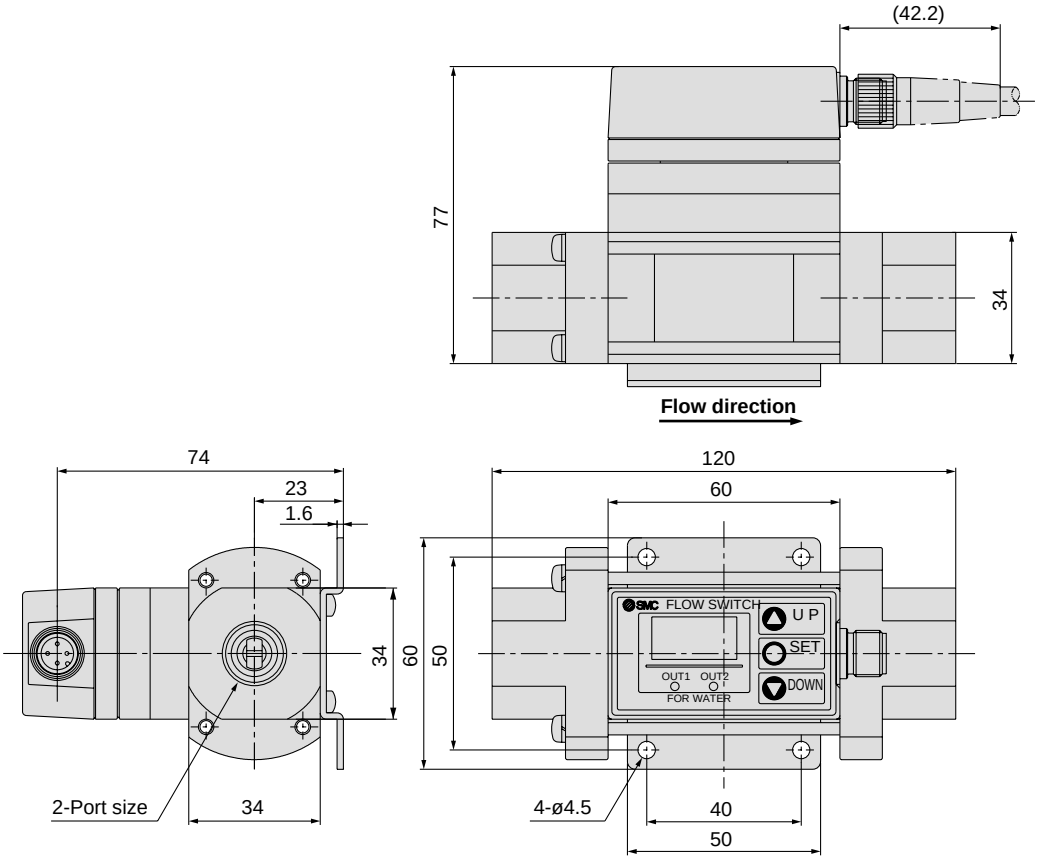


Parts list

No.	Description	Material
1	**Attachment**	Stainless steel
2	**Seal**	FKM
3	**Body**	PPS
4	**Sensor**	PPS

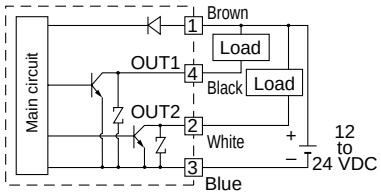
Dimensions: Integrated Display Type for Water

PF2W704T, 720T, 740T

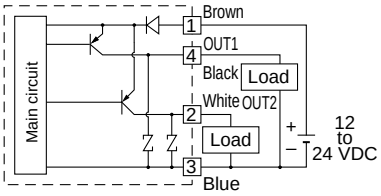


Internal circuits and wiring examples

1 to 4 are the terminal numbers.

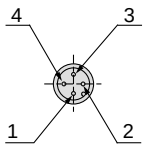


PF2W7□□T-□□-27□(-M)



PF2W7□□T-□□-67□(-M)

Connector pin numbers



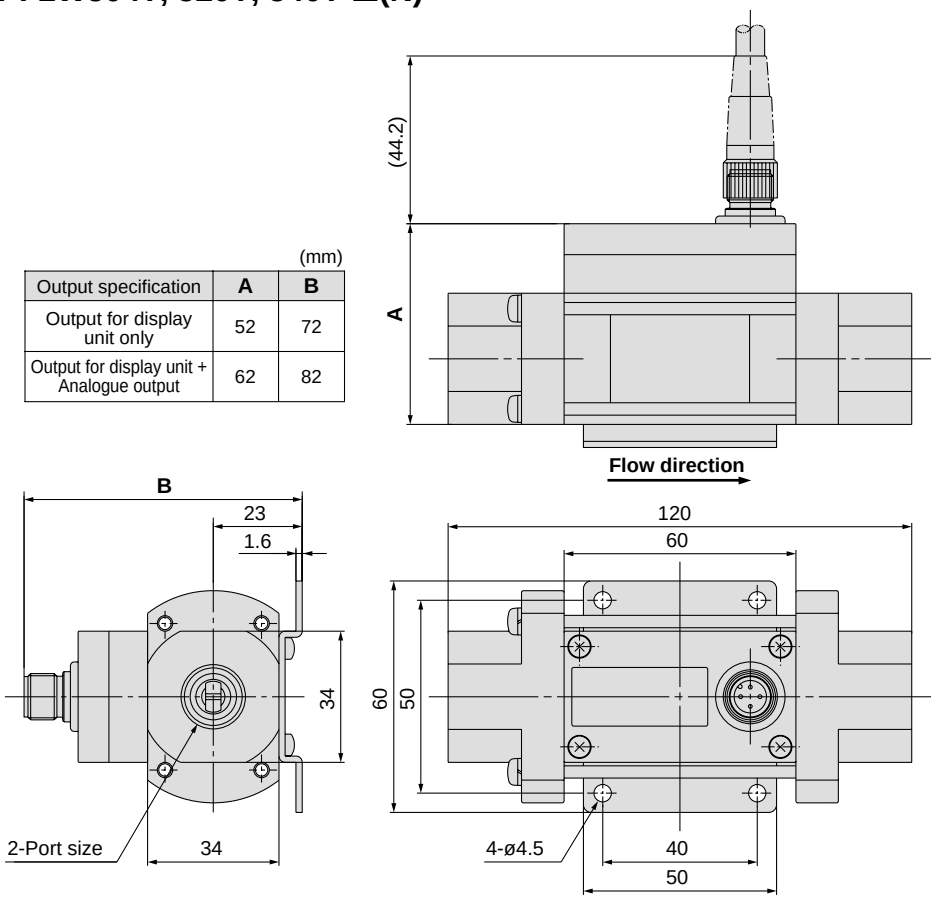
Pin no.	Pin description
1	DC(+)
2	OUT2
3	DC(–)
4	OUT1

Dimensions: Remote Type Sensor Unit for Water

PF2W504T, 520T, 540T-□(N)

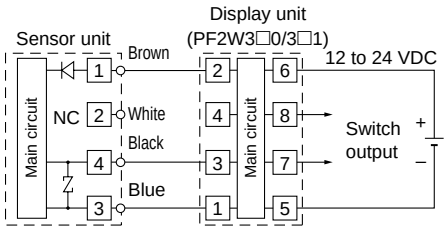
(mm)

Output specification	A	B
Output for display unit only	52	72
Output for display unit + Analogue output	62	82

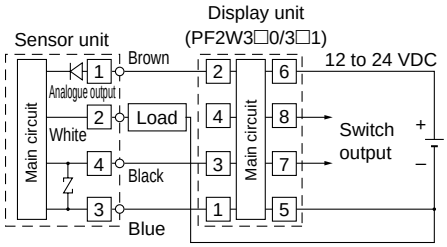


Internal circuits and wiring examples

1 to 8 are the terminal numbers.

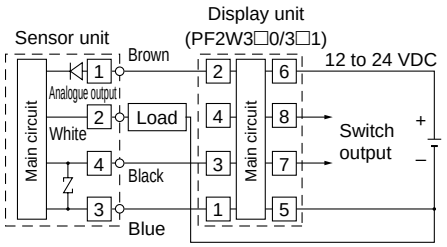


PF2W5□□T-□□□



Load is an analogue input equipment such as a voltmeter.

PF2W5□□T-□□□-1 (With voltage output type)

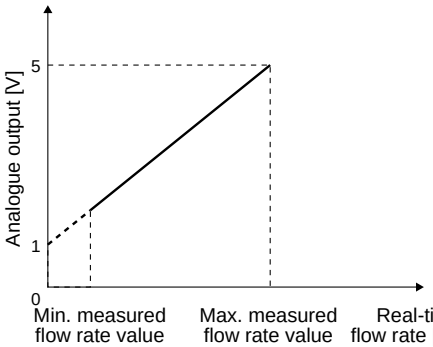


Load is an analogue input equipment such as a voltmeter.

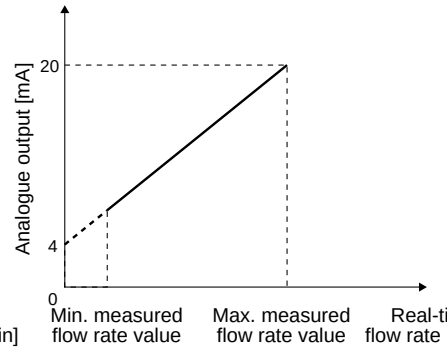
PF2W5□□T-□□□-2 (With voltage output type)

Analogue output

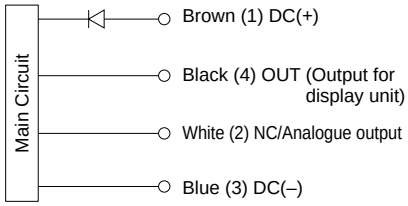
1 to 5 VDC



4 to 20 mADC



Wiring

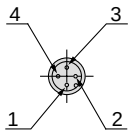


∗ Use this sensor by connecting it to a SMC remote type display unit Series PF2W3□□.

Part no.	Min. measured flow rate value [l/min]	Max. measured flow rate value [l/min]
PF2W504T-□-1	0.5	4
PF2W520T-□-1	2	16
PF2W540T-□-1	5	40

Part no.	Min. measured flow rate value [l/min]	Max. measured flow rate value [l/min]
PF2W504T-□-2	0.5	4
PF2W520T-□-2	2	16
PF2W540T-□-2	5	40

Connector pin numbers

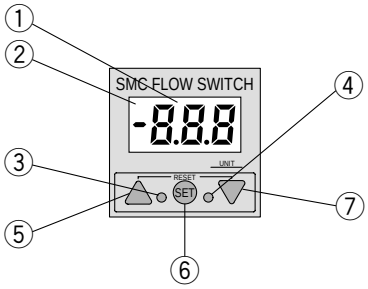


Pin no.	Pin description
1	DC(+)
2	NC/Analogue output
3	DC(–)
4	OUT

Description

Integrated Display Type
PF2A710, 750, 711, 721, 751
PF2W704(T), 720(T), 740(T), 11

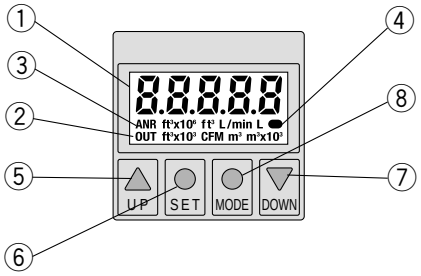
Remote Type/Display Unit
PF2A300, 301, 310, 311
PF2W300, 301, 330, 331



RESET button (▲ + ▼ button)
If the UP and DOWN buttons are pressed simultaneously, the RESET function will activate. In case of an emergency, please clear the display. The display of the accumulated flow will be reset to zero.

①	LED display/Red	Displays the measured flow rate, each setting condition, and error code.
②	Indicator (PF2A7□□, PF2A3□□ for air only)	Illuminates when the normal condition (nor) is selected.
③	Output (OUT1) display/Green	Displays the output condition of OUT1. Illuminates when turned ON.
④	Output (OUT2) display/Red	Displays the output condition of OUT2. Illuminates when turned ON.
⑤	UP button (▲ button)	Use to change the mode or to increase the set value.
⑥	SET button (● button)	Use this button to set the valve or the set mode.
⑦	DOWN button (▼ button)	Use to change the mode or decrease the set value.

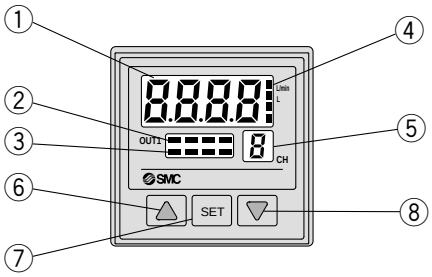
Integrated Display Type
PF2A703H, 706H, 712H



RESET button (▲ + ▼ button)
If the UP and DOWN buttons are pressed simultaneously, the RESET function will activate. In case of an emergency, please clear the display. The display of the accumulated flow will be reset to zero.

①	LCD display/Orange	Displays the measured flow rate, each setting condition, and error code.
②	Output (OUT1) display/Orange	Displays the output condition of OUT1. Illuminates when turned ON.
③	Unit display/Orange	Displays the selected unit. Type without unit switching function is fixed SI units (*l*/min, or *l*, m^3, m^3 x 10^3).
④	Flow rate confirmation display/Orange	The blinking intervals change depending on the flow rate value.
⑤	UP button (▲ button)	Use to change the mode or to increase the set value.
⑥	SET button (● button)	Use to select the function.
⑦	DOWN button (▼ button)	Use to change the mode or decrease the set value.
⑧	MODE button (● button)	Use for changing the function.

4-channel Flow Monitor (Remote type/Display unit)
PF2A200, 201
PF2W200, 201



①	LCD display/Orange	Displays the measured flow rate, each setting condition, and error code.
②	Switch output display/Red	Displays the output condition of OUT1 (CH1 to 4). Illuminates when turned ON.
③	Unit display of flow rate for air/ Red (PF2A200, 201 for air only)	CH1 to 4 will illuminate when the normal condition (nor) is selected.
④	Unit display/Orange	Illuminates the selected unit. Use after putting the unit label other than //min, *l*.
⑤	Channel display/Red	Displays the selected channel.
⑥	UP button (▲ button)	Use to change the mode or to increase the set value.
⑦	SET button	Use this button to set the value or the set mode.
⑧	DOWN button (▼ button)	Use to change the mode or decrease the set value.

Functions

Refer to the "Instruction Manual" for information on setting and operating.

Flow rate measurement selection

Real-time flow rate and accumulated flow rate can be selected.
A flow rate of up to 999999 can be accumulated.
The accumulated flow rate is reset when the power supply turns OFF. (PF2A7□H maintains the values.)

Unit switching

For Air

Display	Real-time flow rate	Accumulated flow
U_1	/min	/
U_2	CFM x 10^{-2} x CFM x 10^{-1}	ft^3 x 10^{-1}

CFM = ft^3/min

High Flow Rate Type (For Air)

Display	Real-time flow rate	Accumulated flow
U_1	/min	/, m^3, m^3 x 10^3
U_2	CFM	ft^3, ft^3 x 10^3, ft^3 x 10^6

For Water / High Temperature Fluid Type (For Water)

Display	Real-time flow rate	Accumulated flow
U_1	/min	/
U_2	GPM	gal (US)

GPM = gal (US)/min

Note) Fixed SI unit (/min, or /, m^3, m^3 x 10^3) will be set for the type without the unit switching function.

Flow rate conversion

Normal condition: 0°C, 101.3 kPa, dry air
Standard condition: 20°C, 101.3 kPa, 65%RH (ANR)
Switchable between these conditions.

Flow rate measuring unit confirmation

This function allows for the confirmation of the accumulated flow rate when real-time flow rate is selected and to confirm the real-time flow rate when accumulated flow rate is selected.

Key lock

This function prevents accidental operations such as changing the set value.

Accumulation clearance

This function clears the accumulated value.

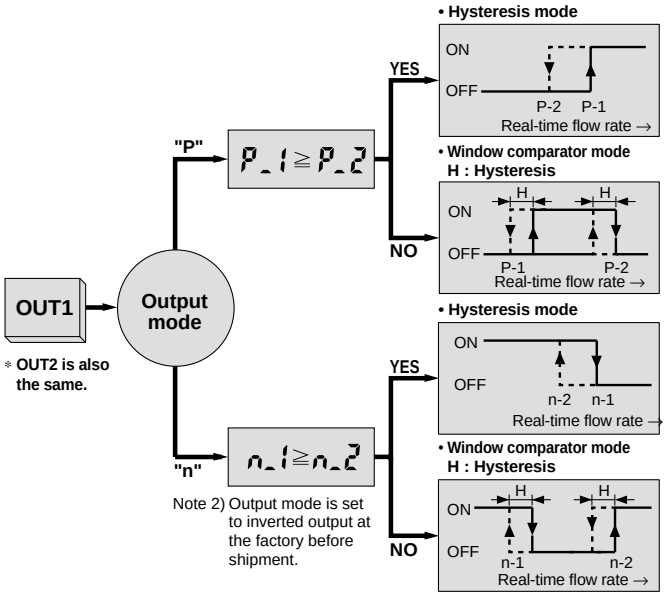
Initialization of setting (only for Series PF2A7□□H)

This function restores the setting to the original state, just as it had been shipped from the factory.

Output types

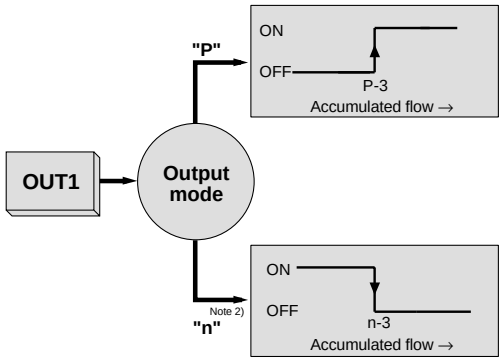
Real-time switch output, accumulated switch output, or accumulated pulse output can be selected as an output type.

Real-time switch output



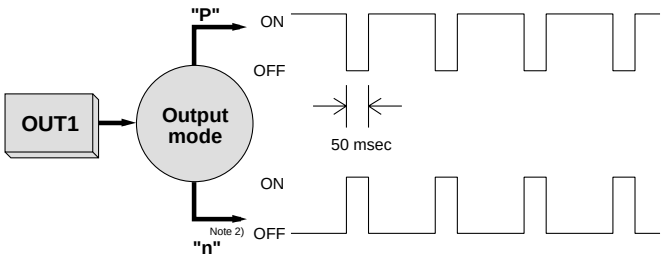
Note 2) Output mode is set to inverted output at the factory before shipment.

Accumulated switch output



Note 2) Output mode is set to inverted output at the factory before shipment.

Accumulated pulse output



Note1) For a digital flow switch with an unit switching function. (Fixed SI unit [/min, or /, m^3 or m^3 x 10^3] will be set for switch types without an unit switching function.)
Refer to the specifications of the display unit for the flow rate value per pulse.

Functions

Copy function (PF2□200, 201 only)

Information to be copied is:
① Flow rate range
② Display mode
③ Display unit (Only available when the unit specification is nil.)
④ Output method
⑤ Output mode
⑥ Flow rate display unit (available with PF2A20□ only)
⑦ Flow rate value

Peak hold, Bottom hold display function (PF2□200, 201 only)

The maximum or minimum value can be held in the case where the real-time flow rate display mode is selected during the initial setting.

Error correction

LED display	Contents	Solution
Er 1 Note 1) Err_1 Note 2)	A current of more than 80 mA is flowing to OUT1.	Check the load and the wiring for OUT1.
Er2 Note 1)	A current of more than 80 mA is flowing to OUT2.	Check the load and the wiring for OUT2.
Err_3 Note 2) Er4 Note 1)	The set data has changed for some reason.	Perform the RESET operation, and reset all the data again.
--- Note 1) ----- Note 2)	The flow rate is over the flow rate measurement range.	Use an adjustment valve, etc. to reduce the flow rate until it is within the flow rate range.

Note 1) Applicable to display integrated type and remote type except PF2A7□□H series.
Note 2) Applicable to PF2A7□□H series only.

For PF2A/W200, 201

LED display	Contents	Solution
Er 1	Over current is flowing to the load of a switch output.	Shut off the power supply. After eliminating the output factor that caused the excess current, turn the power supply back on.
Er0	Internal data error.	Contact SMC.
Er7	Internal data error.	
Er10	Internal data error.	
Er5	Internal data error.	Shut off the power supply and then reset the switch.
Er6	Internal data error.	
---	The flow rate is over the flow rate measurement range.	Use an adjustment valve, etc. to reduce the flow rate until it is within the flow rate range.

Channel select function (PF2□200, 201 only)

Every pushing the △ button, channel selection "1→2→3→4→1..." is available. The flow rate measurement of each selected channel is shown in the display unit.

Channel scan function (PF2□200, 201 only)

Changes displaying the channel shown every about 2 seconds and its detected flow rate.

Option

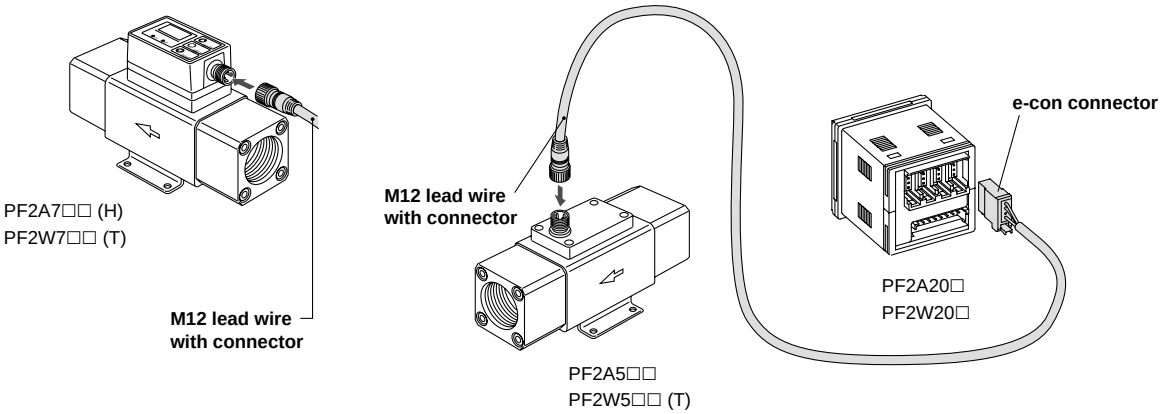
When only optional parts are required, order with the part numbers listed below.

M12 lead wire with connector

Part no.	Qty.	Lead wire length
ZS-29-A	1	3 m

e-con connector

Part no.	Qty.
ZS-28-CA-4	1



In addition to the lead wire assembly shown above, those listed below (female contact) can be connected.
However, they cannot be connected with an e-con connector because the diameter of the core wire and its coverage diameter are different. For details, contact each manufacturer.

Connector size	Pin no.	Manufacturer	Applicable series
M12	4	Correns Corp.	VA-4D
		OMRON Corp.	XS2
		Yamatake Co.,Ltd.	PA5-4I
		Hirose Electric Co., Ltd.	HR24
		DKK Ltd.	CM01-8DP4S

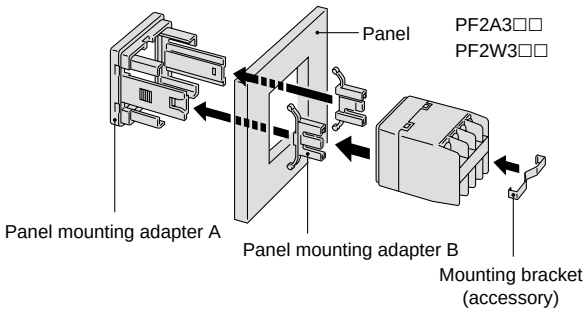
In addition to the connectors shown above, those listed below (e-con) can be connected.

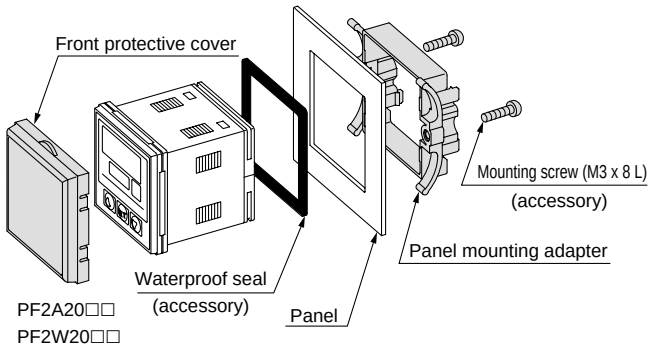
Manufacturer	Model
Sumitomo 3M Limited	37104-3122-000FL
Tyco Electronics AMP K.K.	2-1473562-4
OMRON Corp.	XN2A-1430

Panel mounting

Pin no.	Description	Note
ZS-22-E	Panel mounting adapter A, B	With mounting bracket

Part no.	Description	Note
ZS-26-B	Panel mounting adapter	With waterproof seal, mounting screw
ZS-26-C	Front protective cover + Panel mounting adapter	With waterproof seal, mounting screw





Related Product
Multi Counter
Series CEU5

How to Order

CEU5 □ □ — □

Output transistor mode

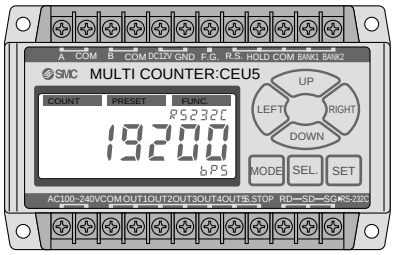
Nil	NPN open collector output
P	PNP open collector output

Power supply voltage

Nil	100 to 240 VAC
D	24 VDC

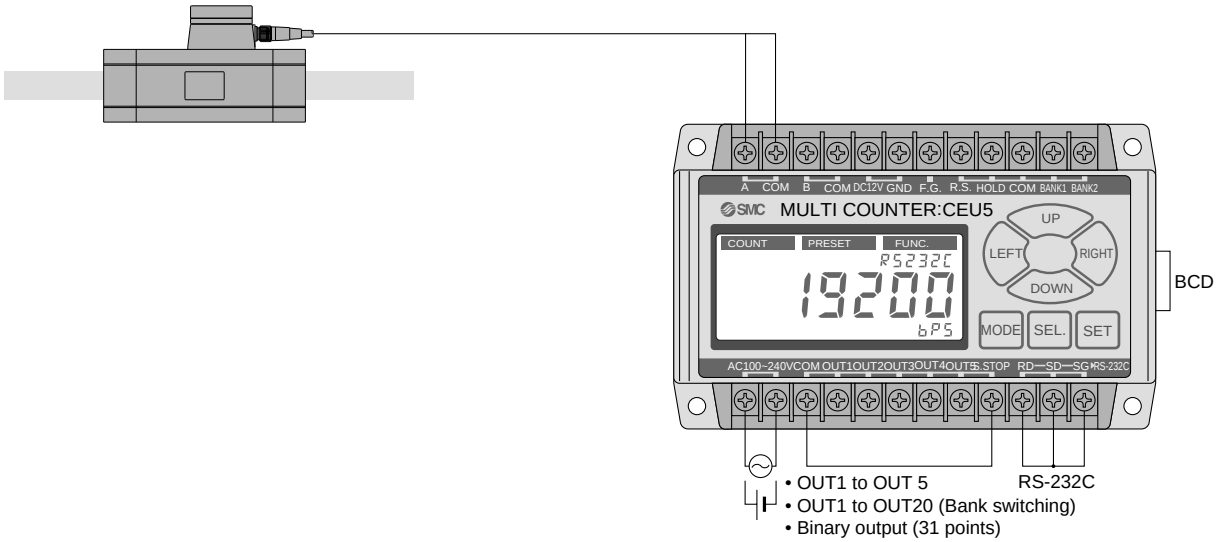
External output

Nil	RS-232C
B	RS-232C + BCD



Connection Method

Connection with the Digital Flow Switch (Series PF2)



- Possible to measure accumulated pulse output of a Digital Flow Switch by an unit of 100 ℓ (litter) and 10 ft^3 (cube foot) using the pre-scaling function* of the multi counter (When inputting to the multi counter, Up or Down is selected as input method.)
- Possible to take advantage of all CEU5 functions using preset mode and function mode.

* The set value is calculated by selecting manual mode. By multiplication by 4, then, per pulse value is set.

<Connection with other manufacturers' encoders>

- Possible to switch multi counter side input method to 2-phase or Up/Down.
- Possible to connect to an encoder if the output method is Open Collector.
- When selecting UP or DOWN, phase A to COM input is counted toward addition direction, phase B to COM input is counted toward subtraction direction.

⚠ Caution

When connecting the CEU5 with an encoder from another manufacturer, please thoroughly confirm the specification beforehand. Please note that the CEU5 may not count normally depending on the output method, output frequency and connecting cable length, etc. of the encoders.

Regarding connection with scale cylinder, refer to "Stroke reading cylinders & Counters CE series" in the Best Pneumatics Vol. 10.

Series PF2A/PF2W
Safety Instructions

The following safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by all safety practices, including labels of **"Caution", "Warning"** or **"Danger"**. To ensure safety, please observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

⚠Caution : Operator error could result in injury or equipment damage.

⚠Warning : Operator error could result in serious injury or loss of life.

⚠Danger : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power – General Rules for Pneumatic Equipment
Note 2) JIS B 8370: Pneumatic system axiom

⚠ Warning

1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications, post analysis and/or tests to meet a specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalogue information and taking into consideration the possibility of equipment failure when configuring a system.

2. Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if handled incorrectly. Assembly, handling or maintenance of the pneumatic system should be performed by trained and experienced operators.

3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.

1. Inspection and maintenance of machinery/equipment should only be performed after confirming the control positions are safely locked-out.
2. When equipment is to be removed, confirm the safety processes mentioned above. Cut the supply pressure for the equipment and exhaust all residual compressed air in the system.
3. Before the machinery/equipment is restarted, take measures to prevent quick extension of a cylinder piston rod, etc. (Bleed air into the system gradually, to create back pressure.)

4. Contact SMC if the product is to be used in any of the following conditions:

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, clutch and brake circuits in press applications, or safety equipment.
3. An application which has the possibility of having a negative effects on people, property, or animals, and therefore requires special safety analysis.

Series PF2A/PF2W
Specific Product Precautions 1

Be sure to read before handling. Refer to page 37 for safety instructions.

Design and Selection

⚠Warning

1. Operate the switch only within the specified voltage.

Use of the switch outside of the specified voltage range can cause not only a malfunction and damage to the switch, but it can also cause electrical shock and fire.

2. Do not exceed the maximum allowable load specification.

A load exceeding the maximum load specification can cause damage to the switch.

3. Do not use a load that generates a surge voltage.

Although the circuit at the output side of the switch is surge-protected, damage may still occur if a voltage surge is applied repeatedly. When a load which generates a surge, such as from a relay or solenoid valve, is directly driven, use a switch with a built-in surge absorbing element.

4. Since the type of fluid varies depending on the product, be sure to verify the specifications.

The switches do not have an explosion proof rating. To prevent a possible fire hazard, do not use with inflammable gases or fluids.

5. Monitor the internal voltage drop of the switch.

When operating below the specified voltage, it is possible that the load may be ineffective even though the pressure switch function is normal. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

Supply voltage	−	Internal voltage drop of switch	>	Minimum operating voltage of load

[For air]

6. Use the switch within the specified flow rate measurement and operating pressure.

Operating beyond the specified flow rate and operating pressure can damage the switch.

[For water]

7. Use the switch within the specified flow rate measurement and operating pressure.

Operating beyond the specified flow rate and operating pressure can damage the switch. Especially avoid the application of pressure through a water hammer, which is above the specification.

<Examples of pressure reduction measures>

a) Use a device such as a water hammer relief valve to slow the valve's closing speed.
b) Absorb impact pressure by using an accumulator or elastic piping material such as a rubber hose.
c) Keep the piping length as short as possible.

8. Design the system, so that the fluid always fills the detection passage.

Especially for vertical mounting, introduce the fluid from the bottom to the top.

9. Operate within the flow rate measurement range.

If operated outside of the flow rate measurement range, the Karman vortex will not be generated and normal measurement will not be possible.

[Series PF2A7□□H]

10. Sudden increase in flow rate may destroy the flow sensor. Ensure to open/close the flow control valve not to exceed the maximum flow rate measurement values.

Design and Selection

⚠Caution

1. Data from the flow switch is stored even after the power supply is turned off.

The input data is stored in EEPROM so that the data will not be lost after the flow switch is turned off. (The data can be rewritten for up to one million times, and stored for up to 20 years.)

2. Accumulated flow rate is reset when it is turned OFF.

Only the PF2A7□□H series (for air) will maintain, its accumulated flow rate value, even though the power supply is cut.

Mounting

⚠Warning

1. Mount the switch using the proper tightening torque.

When the switch is tightened beyond the specified tightening torque, it may be damaged. On the other hand, tightening below the specified tightening torque may cause the installation screws to loosen during operation.

Thread	Tightening torque N·m
Rc 1/8	7 to 9
Rc 1/4	12 to 14
Rc 3/8	22 to 24
Rc 1/2	28 to 30

Thread	Tightening torque N·m
Rc 3/4	28 to 30
Rc 1	36 to 38
Rc 1, 1/2	48 to 50
Rc 2	48 to 50

2. Apply a wrench only to the metal part of the piping when installing the flow switch onto the system piping.

Do not apply the wrench to any part other than the piping attachment or the switch may be damaged.

3. Monitor the flow direction of the fluid.

Install and connect piping so that fluid flows in the direction of the arrow indicated on the body.

4. Remove dirt and dust from inside of the piping by means of air blow, before attaching to the switch.

5. Do not drop or bump.

Do not drop, bump, or apply excessive impacts (490 m/s^2) while handling. Although the external body of the switch (switch case) may not be damaged, the switch inside could be damaged and cause a malfunction.

6. Hold the body of the switch when handling.

The tensile strength of the cord is 49N and applying a greater pulling force than this can cause a malfunction. When handling, hold the body of the switch.

7. Do not use until you can verify that equipment can operate properly.

Following mounting, repair, or retrofit, verify correct mounting by conducting suitable function and leakage tests after piping and power connections have been made.

8. Avoid the mounting orientation with the bottom of the body facing up.

The switch can be mounted in any way such as vertically or horizontally, however, avoid the mounting orientation with the bracket on the bottom of the body facing upward.

Specific Product Precautions 2

Be sure to read before handling. Refer to page 37 for safety instructions.

Mounting

⚠Warning

[For air]

9. Never mount a switch in a place that will be used as a step stool during piping.

Damage may occur if an excessive load is applied to the switch.

10. Be sure to allow straight pipe length that is minimum 8 times the port size upstream and downstream of the switch piping.

When abruptly reducing the size of piping or when there is a restriction such as a valve on the upstream side, the pressure distribution in the piping changes and makes accurate measurement impossible. Therefore, flow restriction measures such as these should be implemented on the downstream side of the switch.

[For water]

11. Never mount a switch in a place that will be used as a step stool during piping.

Damage may occur if an excessive load is applied to the switch. Especially when the switch supports the piping, do not apply a load of 15N·m or more to the metal part of the switch.

12. Be sure to allow straight pipe length that is minimum 8 times the port size upstream and downstream of the switch piping.

When abruptly reducing the size of piping or when there is a restriction such as a valve on the upstream side, the pressure distribution in the piping changes and makes accurate measurement impossible. Therefore, flow restriction measures such as these should be implemented on the downstream side of the switch.

When used with the downstream side open, be careful of the cavitation that is prone to occur.

Wiring

⚠Warning

1. Verify the colour and the terminal number when wiring.

Incorrect wiring can cause the switch to be damaged and malfunction. Verify the colour and the terminal number in the instruction manual when wiring.

2. Avoid repeatedly bending or stretching of the lead wire.

Repeatedly applying bending stress or stretching force to the lead wire will cause it to break.

3. Confirm proper insulation of wiring.

Make sure that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a switch.

4. Do not wire in conjunction with power lines or high voltage lines.

Wire separately from power lines and high voltage lines, and avoiding wiring in the same conduit with these lines. Control circuits including switches may malfunction due to noise from these lines.

5. Do not allow a load to short circuit.

Although a switch indicates excess current error if a load is short circuited, all incorrect wiring connections such as power supply polarity cannot be protected. Take precautions to avoid incorrect wiring.

Usage

⚠ Warning

1. When using a switch for high temperature fluid, the switch itself also becomes hot due to the high temperature fluid. Avoid touching the switch directly as this may cause a burn.

Operating Environment

⚠Warning

1. Never use in the presence of explosive gases.

The switches do not have an explosion proof rating. Never use in the presence of an explosive gas as this may cause a serious explosion.

2. Mount the switch in a locations where there is no vibration greater than 98 m/s² or impact greater than 490 m/s².

3. Do not use in an area where surges are generated.

When there are units that generate a large amount of surge in the area around a pressure switch, (e.g., solenoid type lifters, high frequency induction furnaces, motors, etc.) this may cause deterioration or damage to the switch's internal circuitry. Avoid sources of surge generation and crossed lines.

4. Switches are not equipped with surge protection against lightning.

The flow switches are CE compliant, however they are not equipped with surge protection against lightning. Lightning surge protection measures should be applied directly to the system components as necessary.

5. Avoid using the switch in an environment where the likelihood of splashing or spraying of liquids exists.

The switches are dustproof and splashproof, however avoid using in an environment where the likelihood of heavy splashing or spraying of liquids exists. Since the display unit of the remote type switches featured here is not dust or splashproof, the use in an environment where liquid splashing or spraying exists must be avoided.

[For air]

6. Use the switch within the specified fluid and ambient temperature range.

The fluid and ambient temperature range is 0° to 50°C. Take measures to prevent the fluid from freezing when it is below 5°C, since this may damage the switch and lead to a malfunction. The installation of an air dryer is recommended for eliminating condensation and moisture. Never use the switch in an environment where there are drastic temperature changes even when these temperatures are within the specification.

[For water]

7. Use the switch within the specified fluid and ambient temperature range.

The fluid and ambient temperatures range for the switch is 0 to 50°C (and 0 to 90°C for high temperature fluid). Take measures to prevent the fluid from freezing when it is below 5°C, since this may cause damage to the switch and lead to a malfunction. Never use the switch in an environment where there are drastic temperature changes even when these temperatures fall within the specified temperature range.

Specific Product Precautions 3

Be sure to read before handling. Refer to page 37 for safety instructions.

Maintenance

⚠Warning

1. Perform periodical inspections to ensure proper operation of the switch.
Unexpected malfunctions may cause a possible danger.

2. Take precautions when using the switch for an interlock circuit.
When a pressure switch is used for the interlock circuit, devise a multiple interlock system to prevent trouble or malfunction, and verify the operation of the switch and interlock function on a regular basis.

3. Do not disassemble or perform any conversion work on flow switches.

Measured Fluid

⚠Warning

1. Check regulators and flow adjustment valves before introducing the fluid.
If pressure or flow rate beyond the specified range are applied to the switch, the sensor unit may be damaged.

[For air]

2. The fluids that the switch can measure accurately are nitrogen and dry air.
Please note that accuracy cannot be guaranteed when other fluids are used.

3. Never use inflammable fluids.
The flow velocity sensor heats up to approximately 150°C.

4. Install a filter or mist separator on the upstream side when there is a possibility of condensate and foreign matter being mixed in with the fluid.
The rectifying device built into the switch will be clogged up and accurate measurement will no longer be possible.

[For water]

5. The fluid that the switch can measure accurately is water. Also, combination of equal parts water/ethylene glycol (50/50%) can be used if its temperature is high.
Please note that accuracy cannot be guaranteed when other fluids are used.

Measured Fluid

⚠Warning

6. Never use inflammable fluids.

7. Install a filter on the inlet side when there is a possibility of condensation and foreign matter being mixed with the fluid.
If foreign matter adheres to the switch's vortex generator or vortex detector, accurate measurement will no longer be possible.

Others

⚠Warning

1. After the power is turned on, the switch's output remains off while a message is displayed. Therefore, start the measurement after a value is displayed.

2. Perform settings after stopping control systems.
When the switch's initial setting and flow rate setting are performed, output maintains the condition prior to the settings.

3. Do not apply excessive rotational force to the display unit.
The integrated type display unit can rotate 360°. Rotation is controlled by the stopper; however, the stopper may be damaged if the display unit is turned with excessive force.

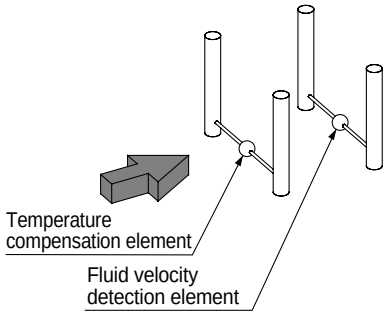
[For air]

4. Be certain to turn on the power supply when the flow rate is at zero.
Allow an interval of 10 minutes after turning on the power, as there are some changes in the display.

5. Flow rate unit
The switch measures at mass flow rates without being influenced by temperature and pressure. The switches use l/min as the flow rate indicator unit, in which the volumetric flow is substituted for mass flow at 0°C and 101.3 kPa (nor). The volumetric flow rate at 20°C, 101.3 kPa, and 65%RH (ANR) can be displayed with the high flow rate type switches for air.

Detection principle of digital flow switch for air

A heated thermistor is installed in the passage, and fluid absorbs heat from the thermistor as it is introduced to the passage. The thermistor's resistance value increases as it loses heat. Since the resistance value increase ratio has a uniform relationship to the fluid velocity, the fluid velocity can be detected by measuring the resistance value. To further compensate the fluid and ambient temperature, the temperature sensor is also built into the switch to allow stable measurement within the operating temperature range.



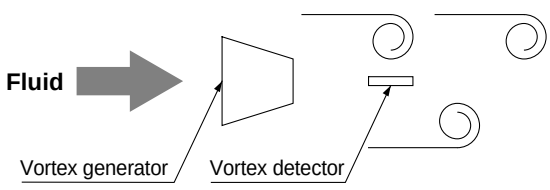
This flow switch uses l/min as the flow rate indicator unit. The mass flow is converted and displayed under the conditions of 0°C and 101.3 kPa.
The conversion conditions can be switched to 20°C and 101.3 kPa with high flow type switches.

Detection principle of digital flow switch for water

When an elongated object (vortex generator) is placed in the flow, reciprocal vortexes are generated on the downstream side. These vortexes are stable under certain conditions, and their frequency is proportional to the flow velocity, resulting the following formula.

$$f = k \times v$$

f: Frequency of vortex v: Flow velocity k: Proportional constant (determined by the vortex generator's dimensions and shape).
Therefore, the flow rate can be measured by detecting this frequency.



Contact SMC regarding the specifications for clean environment.

Specific Product Precautions 4

Be sure to read before handling. Refer to page 37 for safety instructions.

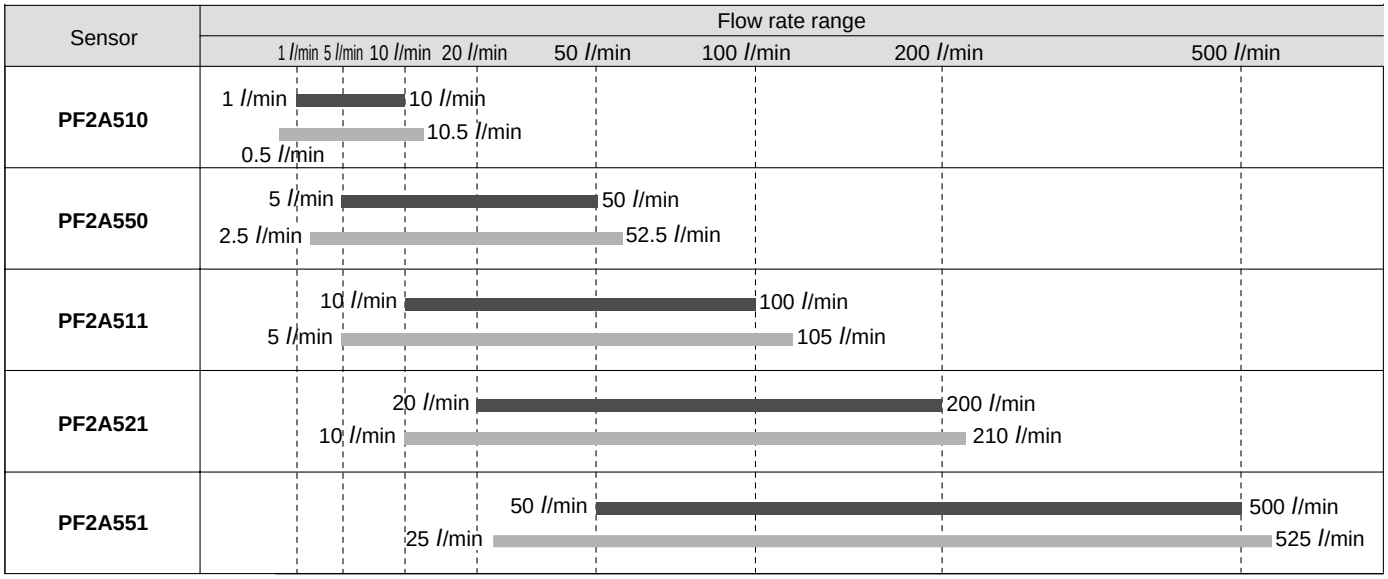
Set Flow Rate Range and Rated Flow Range

⚠ Caution

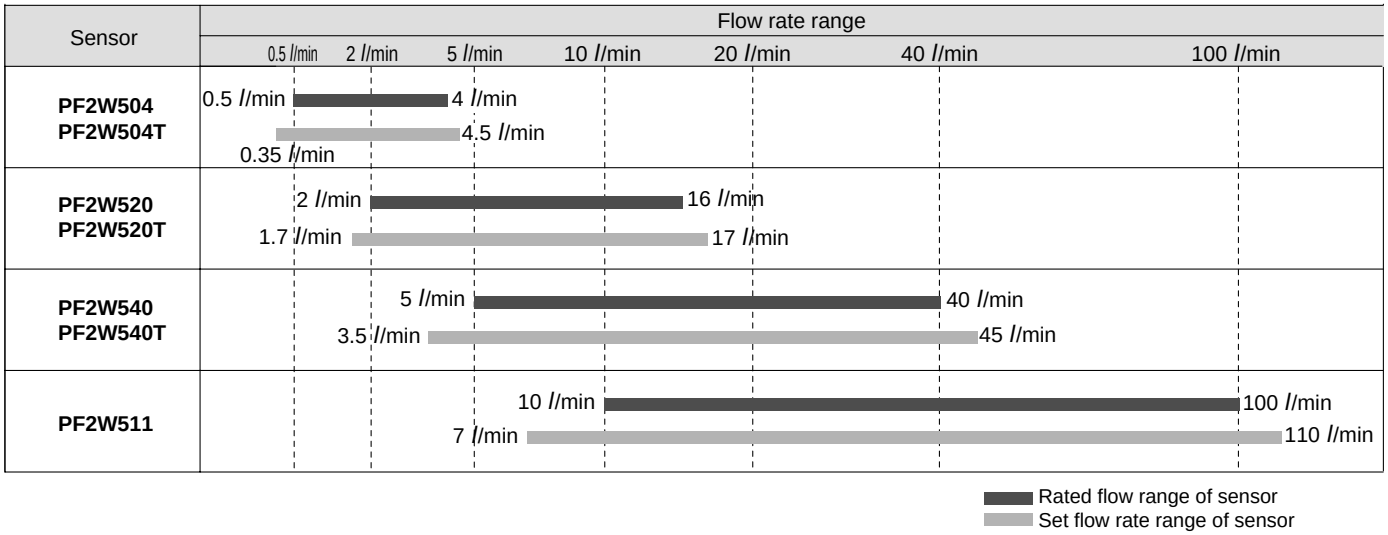
Set the flow rate within the rated flow range.

The set flow rate range is the range of flow rate that can be set on the controller.
The rated flow range is the range that satisfies the sensor's specifications (accuracy, linearity etc.).
It is possible to set a value outside of the rated flow range, however, the specification is not be guaranteed.

<For Air/PF2A>



<For Water/PF2W>



Specific Product Precautions 5

Be sure to read before handling. Refer to page 37 for safety instructions.

■ 4-channel Flow Monitor

Handling

⚠ Warning

1. **Do not drop, bump, or apply excessive impacts (980 m/s^2) while handling. Although the body of the flow monitor case may not be damaged, the inside of the flow monitor could be damaged and lead to a malfunction.**
2. **The tensile strength of the power supply/output connection cable is 50N and the sensor lead wire with a connector is 25N. Applying a greater pulling force than the applicable specified tensile strength to either of these components can lead to a malfunction. When handling, hold the body of the controller.**

Connection

⚠ Warning

1. **Incorrect wiring can damage the switch and cause a malfunction or erroneous switch output. Connections should be done while the power is turned off.**
2. **Do not attempt to insert or pull the flow rate sensor or its connector when the power is on. Switch output may malfunction.**
3. **Wire separately from power lines and high voltage lines, avoiding wiring in the same conduit with these lines. Malfunctions may occur due to noise from these other lines.**
4. **If a commercial switching power supply is used, make sure that the F.G. terminal is grounded.**

Operating Environment

⚠ Warning

1. **Our 4-channel flow monitor is CE marked, however, it is not equipped with surge protection against lightning. Lightning surge countermeasures should be applied directly to system components as necessary.**
2. **Our 4-channel flow monitor does not have an explosion proof rating. Never use pressure sensors in the presence of inflammable or explosive gases.**
3. **Enclosure "IP65" applies only to the front face of the panel when mounting. Do not use in an environment where oil splashing or spraying are anticipated.**

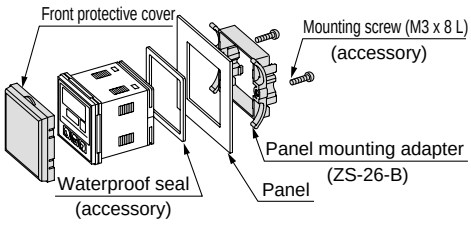
Mounting

⚠ Caution

The front face of the panel mount conforms to IP65, however there is a possibility of liquid infiltration if the panel mount adapter is not installed securely and properly. Securely fix the adapter with screws as shown below.

Front protective cover + Panel mounting

Tighten screws 1/4 to 1/2 turn after the heads are flush with the panel.

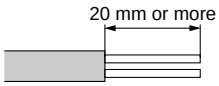


Wiring

⚠ Caution

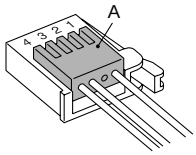
1. Connecting sensor cable and connector (ZS-28-CA-□)

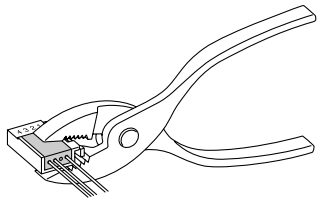
- Cut the sensor cable as shown below.
- Insert each lead wire into the corresponding connector number by following the chart provided below.



Connector no.	Cable wire colour
1	Brown (DC+)
2	Not used
3	Blue (DC–)
4	White (IN: 1 to 5 V)

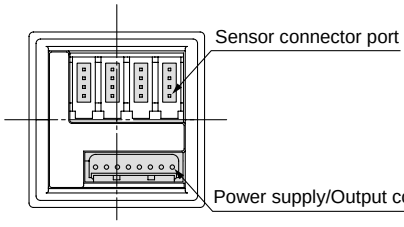
- Make sure that the numbers on the connector and the wire colours match. After verifying that the wires are fully inserted, temporarily hold A down by hand.
- Using pliers, press the center of A straight down.
- Note that that connector cannot be taken apart for reuse once it is crimped. Use a new sensor connector if wiring or cable insertion is done incorrectly.

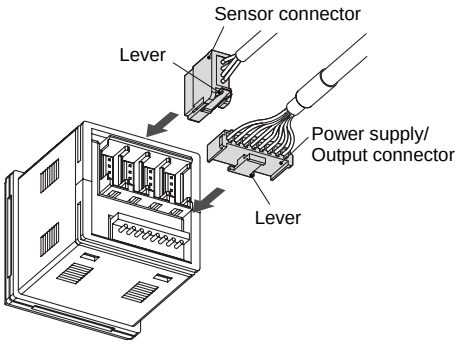


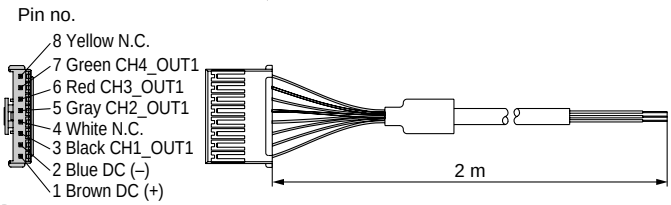


2. Inserting/Detaching of sensor connector, power supply/output connector

- Insert each connector straightforwardly until it clicks and locks onto the body.
- To remove the connector, pull it straight out while pushing the lever with your thumb.







PF2D

Digital Flow Switch for De-ionised Water and Chemicals

Series PF2D

A single controller can monitor the flow rate of 4 different sensors.

Body and Sensor

New PFA

Tube

Super PFA

Three types of flow range

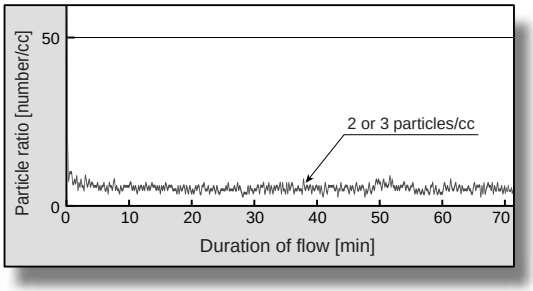
0.4 to 4 l/min (PF2D504)
1.8 to 20 l/min (PF2D520)
4.0 to 40 l/min (PF2D540)

4-channel Flow Monitor
Series PF2D200

Dust generation of 3 particles/cc or less (average number)

Karman vortex eliminates moving parts and allows low dust generation.

Particle characteristics (reference)

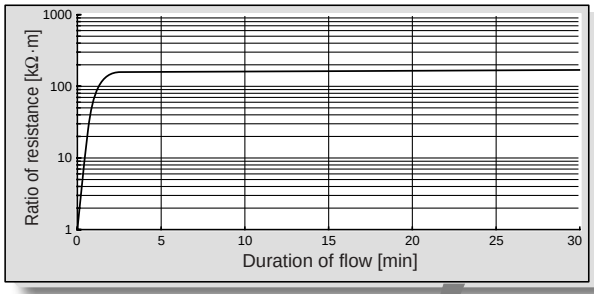


The data was obtained by performing an actual 10 minutes' supersonic cleaning using an average 16 MΩ·cm of de-ionised water at class 10000 clean room (1 l/min flow rate).
The diameter of the measured particles ranges from 0.1 to 0.5 µm. The flow rate used during measuring is 100 cc/min.

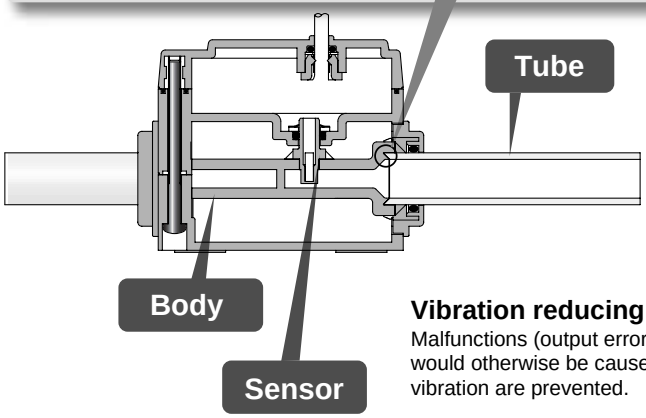
Swept flow characteristics

Tapered side seal minimizes dead volume to reduce accumulation of liquid pool.

Swept flow characteristics (reference)

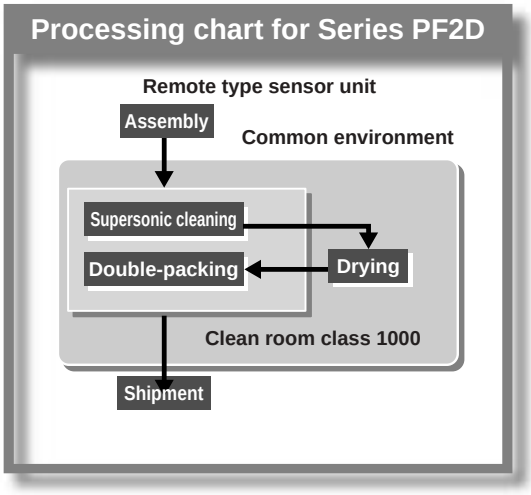


Fill the flow path with sulfuric acid and leave it for 30 minutes.
After disposing the sulfuric acid, flush the flow path out with de-ionised water and measure the resistance rate of the fluid that is discharged from the downstream side.
A quick recovery time indicates little liquid pool.



Vibration reducing seals
Malfunctions (output errors) that would otherwise be caused by vibration are prevented.

Processing chart for Series PF2D



SMC

For De-ionised Water and Chemicals

Digital Flow Switch

Series PF2D

How to Order

Remote Type Sensor Unit

PF2D5 [20] — [13] — [1] — [C]

Flow rate range

04	0.4 to 4 l/min
20	1.8 to 20 l/min
40	4 to 40 l/min

Port size: (inch)

11	3/8	PF2D504
13	1/2	PF2D520
19	3/4	PF2D540

Output specification

Symbol	Specification	Applicable display unit (monitor) model
Nil	Output for display unit	Series PF2D300
1	Output for display unit + analogue output (1 to 5 V)	Series PF2D200/300
2	Output for display unit + analogue output (4 to 20 mA)	Series PF2D300

Option (Refer to page 55.)

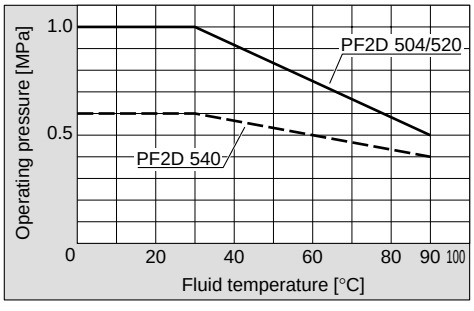
Nil	None
C	e-con connector x 1 pc.

The cable and connector are shipped unassembled.

Specifications for Sensor Unit

Model		PF2D504	PF2D520	PF2D540
Measured fluid		Liquid not to corrode nor erode de-ionised water and/or Teflon®. Viscosity: 3mPa·s (3cP) or less		
Detection style		Karman vortex		
Rated flow range		0.4 to 4 l/min	1.8 to 20 l/min Note 1)	4 to 40 l/min
Operating pressure range Note 2)		0 to 1 MPa		0 to 0.6 MPa
Proof pressure Note 3)		1.5 MPa		0.9 MPa
Operating fluid temperature		0 to 90°C		
Linearity Note 4)		±2.5% F.S. or less (at 25°C water)		
Repeatability		±1% F.S. or less (at 25°C water)		
Temperature characteristics		±5% F.S. or less (0 to 50°C, based on 25°C)		
Output specifications	**Pulse output**	Pulse output, N channel, open drain, output for display unit PF2D 300/301 (Specifications: Maximum load current of 10 mA; Maximum applied voltage of 30 V)		
	Analogue output	Voltage output Note 5) 1 to 5 V Linearity: ±2% F.S. or less, allowable load resistance: 100 kΩ or more		
		Current output Note 6) 4 to 20 mA Linearity: ±2% F.S.or less, allowable load resistance: 300 Ω or less with 12 VDC, 600 Ω or less with 24 VDC		
Power supply voltage		12 to 24 VDC (ripple ±10% or less)		
Current consumption		20 mA or less (without load)		
Environmental resistance	**Enclosure**	IP65		
	Operating temperature range	Operating: 0 to 50°C, Stored: –25 to 85°C in stock (with no condensation and freezing)		
	Voltage resistance	1000 VAC for 1 min. between external terminals and case		
	Insulation resistance	50M Ω or more (500 VDC Mega) between external terminals and case		
	Vibration resistance	4.9 m/s^2		
	Impact resistance	490 m/s^2 to X,Y,Z directions 3 times for each		
	Noise resistance	1000 Vp-p, Pulse width: 1 μs, Rise time: 1 ns		
Weight		140 g (without lead wire)		225 g (without lead wire)
Port size		3/8 inch tube	1/2 inch tube	3/4 inch tube
Wetted material		Body: New PFA, Sensor: New PFA, Tube: Super PFA		

Note 1) 1.6 to 20 l/min (0.1 MPa) with viscosity of 1 mPa·s (1 cP) or less
Note 2) The operating pressure range drops according to the fluid temperature. See attached graph.
Note 3) 1.5 times of the maximum operating pressure and varying with fluid temperature.
Note 4) The system accuracy when combined with PF2D30□.
Note 5) When the voltage output is selected.
Note 6) When the current output is selected.
Note 7) The sensor unit conforms to the CE mark.



How to Order

Remote Type Display Unit

PF2D30 [0] – [A] – [M]

Output specification

0	NPN open collector 2 outputs
1	PNP open collector 2 outputs

Panel mounting

Unit specification

Nil	With unit switching function
M	Fixed SI unit

Note) Fixed units: Real-time flow rate: l/min
Accumulated flow: l

Specifications for Display Unit

Model		PF2D300/301		
Flow rate measurement range Note 1)		0.25 to 4.5 l/min	1.3 to 21.0 l/min	2.5 to 45 l/min
Set flow rate range Note 1)		0.25 to 4.5 l/min	1.3 to 21.0 l/min	2.5 to 45 l/min
Minimum set unit Note 1)		0.05 l/min	0.1 l/min	0.5 l/min
Accumulated pulse flow rate exchange value (Pulse width: 50ms) Note 1)		0.05 l/pulse	0.1 l/pulse	0.5 l/pulse
Display units Note 2)	Real-time flow rate	l/min, gal (US)/min		
	Accumulated flow	l, gal (US)		
Accumulated flow range Note)		0 to 999999 l		
Linearity Note 3)		±2.5% F.S. or less		
Repeatability		±0.5% F.S. or less		
Temperature characteristics		±1% F.S. or less (15 to 35°C, based on 25°C) ±2% F.S. or less (0 to 50°C, based on 25°C)		
Current consumption (No load)		60 mA or less		
Weight		45 g		
Output specifications Note 4)	Switch output	NPN open collector (PF2D300)	Maximum load current: 80 mA Internal voltage drop: 1 V or less (with load current of 80 mA) Maximum applied voltage: 30 V 2 outputs	
		PNP open collector (PF2D301)	Maximum load current: 80 mA Internal voltage drop: 1.5 V or less (with load current of 80 mA) 2 outputs	
	Accumulated pulse output	NPN open collector or PNP open collector (same as switch output)		
Environmental resistance	Enclosure	IP40		
	Operating temperature range	Operating: 0 to 50°C, Stored: –25 to 85°C (with no condensation and freezing)		
	Voltage resistance	1000 VAC for 1 min. between external terminal and case		
	Insulation resistance	50M Ω or more (500 VDC Mega) between external terminal and case		
	Vibration resistance	10 to 500 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration in each X, Y, Z direction for 2 hrs., whichever is smaller.		
	Impact resistance	490 m/s^2 to X, Y, Z directions 3 times for each		
	Noise resistance	1000 Vp-p, Pulse width: 1 µs, Rise time: 1 ns		
Indicator light		3-digits 7-segment LED		
Status LED's		ON: when light is on, OUT1: Green; OUT2: Red		
Power supply voltage		12 to 24 VDC (ripple ±10% or less)		
Response time		1sec. or less		
Hysteresis		Hysteresis mode: adjustable (can be set from 0) Window comparator mode Note 5): fixed (3 digits)		

Note 1) The value varies depending on set flow range
Note 2) For digital flow switch with unit switching function. (Fixed SI unit [l/min or l] will be set for switch types without the unit switching function.)
Note 3) The system accuracy when combined with PF2D5□□.
Note 4) Switch output and accumulated pulse output can be selected using the control button operation during initial setting.

	1	2	3	4
Output 1	Switch output	Switch output	Accumulated pulse output	Accumulated pulse output
Output 2	Switch output	Accumulated pulse output	Switch output	Accumulated pulse output

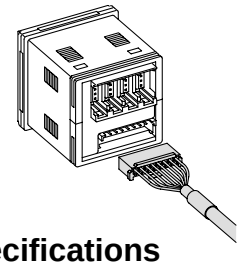
Note 5) Window comparator mode: Since hysteresis (H) will reach 3 digits, keep P_1 and P_2 or n_1 and n_2 apart by 7 digits more. (In case of output OUT2, n_1, 2 to be n_3, 4 and P_1, 2 to be P_3, 4.)
Note 6) The display unit conforms to the CE mark.
Note) Accumulated flow rate is reset when the power supply turns OFF.

How to Order

4-channel Flow Monitor
Remote Type Display Unit

PF2D20 □ — M □ □

Accessory / Power supply output cable (2 m)



Output specification

0	NPN4 outputs
1	PNP4 outputs

Unit specification

Nil	With unit switching function
M	Fixed SI unit Note)

Note) Fixed units:
Real-time flow rate: *l*/min
Accumulated flow: *l*

Option 2 (Refer to page 55.)

Nil	None
4C	Sensor connector (4 pc.)

Option 1 (Refer to page 55.)

Nil	None
A	Panel mounting
B	Front protective cover + Panel mounting

Connectable remote type sensor part is PF2D5□□-□-1 (with analogue output 1 to 5 V).

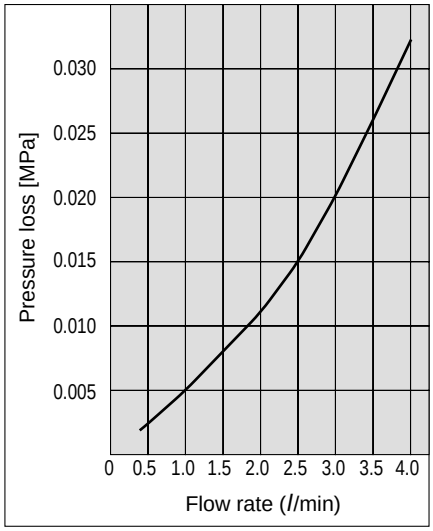
Specifications

Model		**PF2D200/201**		
Applicable flow rate sensor		PF2D504-□-1	PF2D520-□-1	PF2D540-□-1
Flow rate measurement range Note 1)		0.25 to 4.50 *l*/min	1.3 to 21.0 *l*/min	2.5 to 45.0 *l*/min
Set flow rate range Note 1)		0.25 to 4.50 *l*/min	1.3 to 21.0 *l*/min	2.5 to 45.0 *l*/min
Minimum set unit Note 1)		0.05 *l*/min	0.1 *l*/min	0.5 *l*/min
Accumulated pulse flow rate exchange value (Pulse width: 50ms) Note 1)		0.05 *l*/pulse	0.1 *l*/pulse	0.5 *l*/pulse
Display units Note 1)	**Real-time flow rate**	*l*/min, gal(US)/min		
	Accumulated flow	*l*, gal(US)		
Accumulated flow range Note 1)		0 to 999999 *l*, 0 to 999999 gal(US)		
Power supply voltage		24 VDC (ripple ±10% or less) (With power supply polarity protection)		
Current consumption		55 mA or less (Not including the current consumption of the sensor)		
Power supply voltage for sensor		Same as [Power supply voltage]		
Power supply current for sensor Note 2)		Max. 110 mA (However, the total current for the 4 inputs is 440 mA maximum or less.)		
Sensor input		1 to 5 VDC (Input impedance: Approx. 800K Ω)		
	No. of inputs	4 inputs		
	Input protection	Excess voltage protection		
Output specifications Note 3)	**Switch output (Real-time switch output, Accumulated switch output)**	NPN open collector (PF2D200)	Maximum load current: 80 mA Internal voltage drop: 1 V or less (with load current of 80 mA) Maximum applied voltage: 30 V	
		PNP open collector (PF2D201)	Maximum load current: 80 mA Internal voltage drop: 1 V or less (with load current of 80 mA)	
	Accumulated pulse output	NPN open collector or PNP open collector (same as switch output)		
	No. of outputs	4 outputs (1 output per 1 sensor input)		
	Output protection	Short circuit protection		
Hysteresis		Hysteresis mode: Variable (can be set from 0), Window comparator mode: Fixed (3-digits)		
Response time Note 4)		1s or less		
Linearity Note 4)		±5% F.S. or less		
Repeatability Note 4)		±3% F.S. or less		
Temperature characteristics		±2% F.S. or less (0 to 50°C, based on 25°C)		
Display method		For measured value display: 4-digits, 7-segment LED (Orange) For channel display: 1-digit, 7-segment LED (Red)		
Status LED's		Illuminates when output is ON OUT1: Red		
Resistance	**Enclosure**	IP65 for the front face only, the rest is IP40.		
	Operating temperature range	Operating: 0 to 50°C, Stored: –10 to 60°C (with no freezing and condensation)		
	Operating humidity range	Operating or Stored: 35 to 85%RH (with no condensation)		
	Vibration resistance	10 to 500 Hz with a 1.5 mm amplitude or 98 m/s^2 acceleration, in each X, Y, Z direction for 2 hrs., whichever is smaller. (de-energised)		
	Impact resistance	980 m/s^2 in X, Y, Z directions 3 times each (de-energised)		
	Noise resistance	500 Vp-p, Pulse width 1 μs, Rise time 1 ns		
Connection		Power supply / Output connection: 8P connector, Sensor connection: 4P connector (e-con)		
Material		Housing: PBT, Display: PET, Backside rubber: CR		
Weight		60 g (Except for any accessories that are shipped together.)		

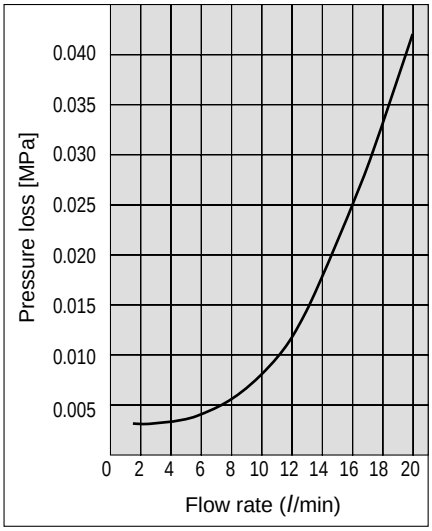
Note 1) Fixed SI unit [*l*/min or *l*] will be set for switch types without the unit switching function. ("-M" is suffixed at the end of part number.) Accumulated flow is reset when the power supply turns OFF.
Note 2) If Vcc side on sensor input connector part is short-circuited with the 0V side, the flow monitor inside will be damaged.
Note 3) Switch output and accumulated pulse output can be selected during initial setting.
Note 4) The system accuracy when combined with an applicable flow sensor.
Note 5) This product conforms to the CE mark.

Flow Characteristics (Pressure Characteristics)

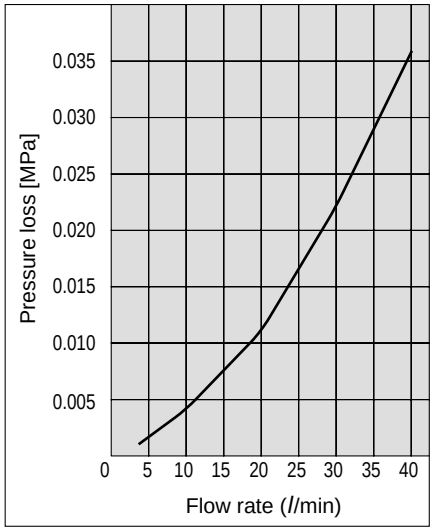
PF2D504



PF2D520

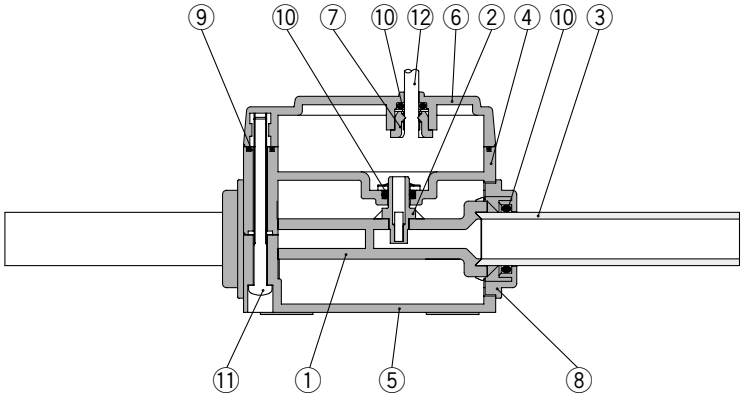


PF2D540



Construction

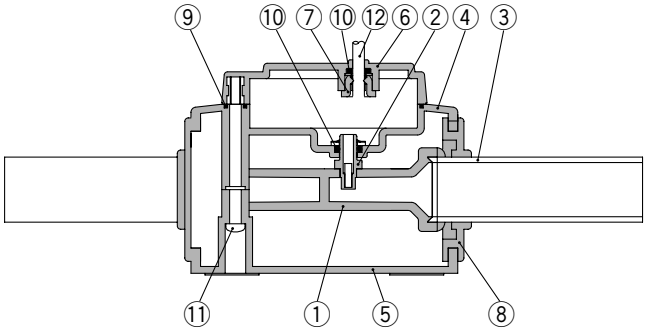
PF2D504/520



Parts list

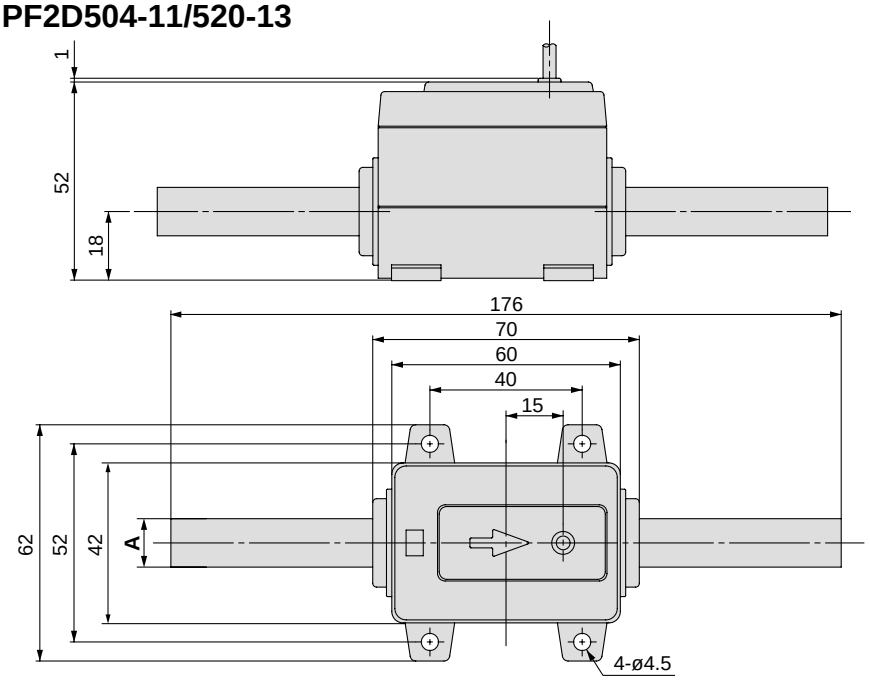
Number	Parts	Material
1	**Body**	New PFA
2	**Sensor**	New PFA
3	**Tube**	Super PFA
4	**Housing A**	PPS
5	**Housing B**	PPS
6	**Housing C**	PPS
7	**Bushing**	POM
8	**Cap**	PPS
9	**Gasket**	FKM
10	**O-ring**	FKM
11	**Thread**	Stainless steel 304
12	**Lead wire**	PVC

PF2D540



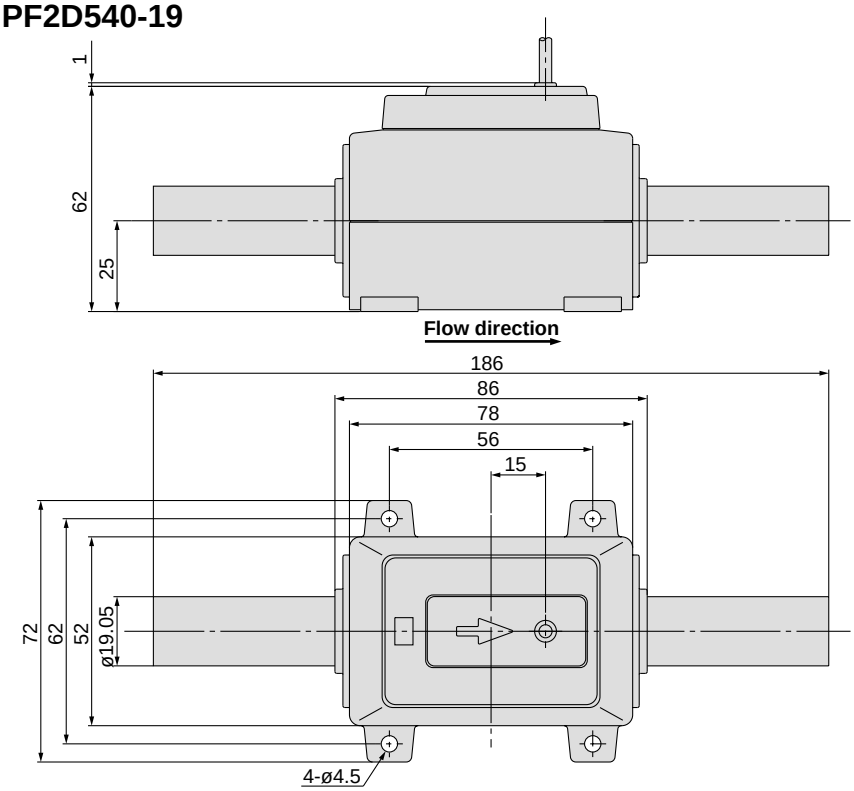
Dimensions: Remote Type Sensor Unit

PF2D504-11/520-13

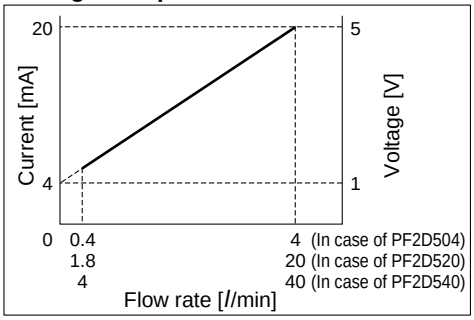


Model	A
PF2D504	ø9.52
PF2D520	ø12.7

PF2D540-19

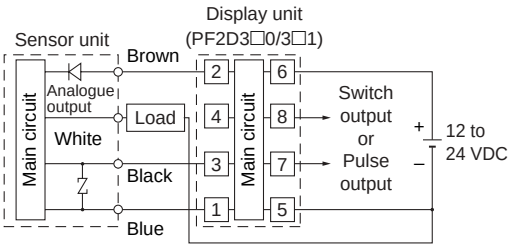


Analogue output

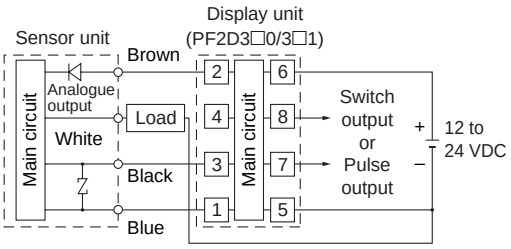


Internal circuits and wiring examples

1 to 8 are the terminal numbers.

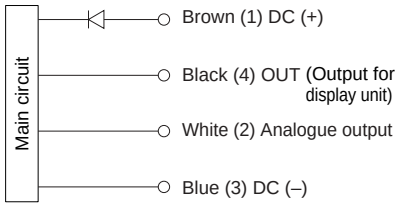


Load is an analogue input equipment such as a voltmeter.
PF2D5□□-□-1 (With voltage output type)



Load is an analogue input equipment such as a voltmeter.
PF2D5□□-□-2 (With voltage output type)

Wiring

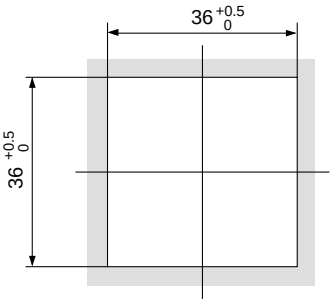


∗ Use this sensor by connecting it to a SMC remote type display unit Series PF2D2□□/3□□.

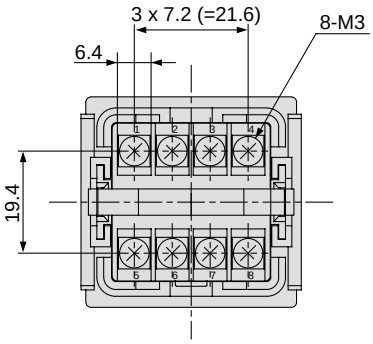
Dimensions: Remote Type Display Unit

PF2D30$^{0}_{1}$-A
Panel mounting type

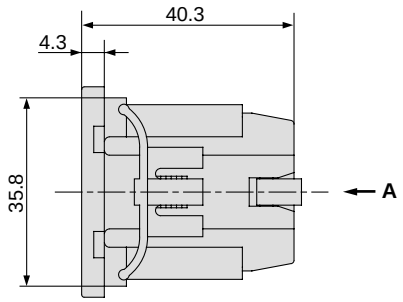
Panel fitting dimensions

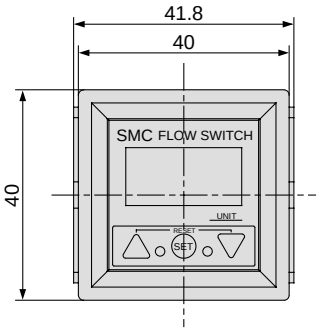


∗ The applicable panel thickness is 1 to 3.2 mm.



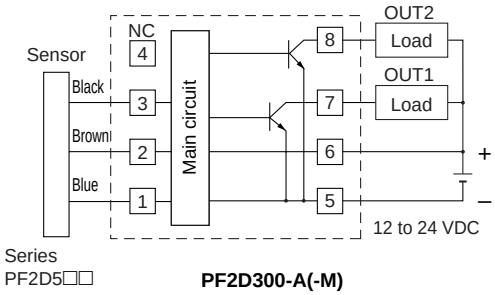
View A



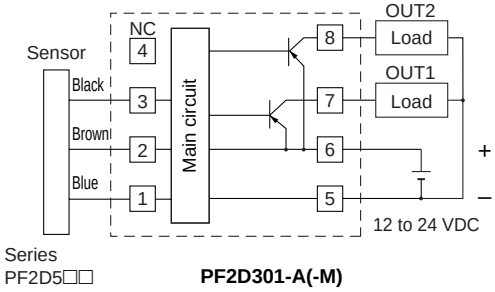


Internal circuits and wiring examples

1 to 8 are the terminal numbers.



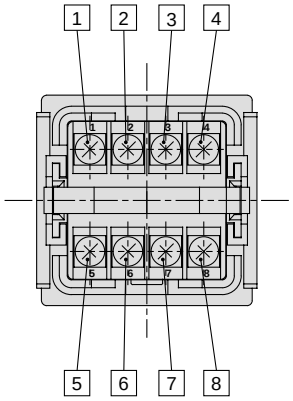
PF2D300-A(-M)



PF2D301-A(-M)

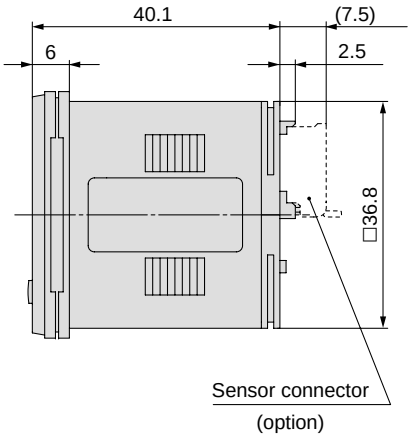
∗ Do not connect the white wire of the sensor to 3 of the display unit.

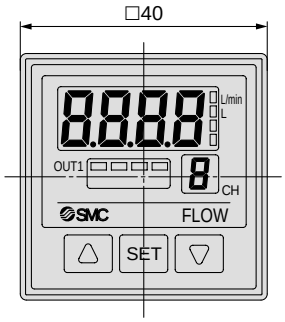
Terminal block numbers



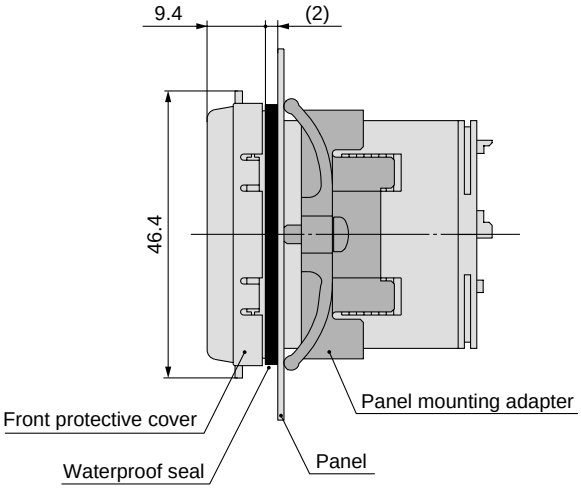
Dimensions: Remote Type Display Unit for De-ionised Water and Chemicals (4-channel Controller)

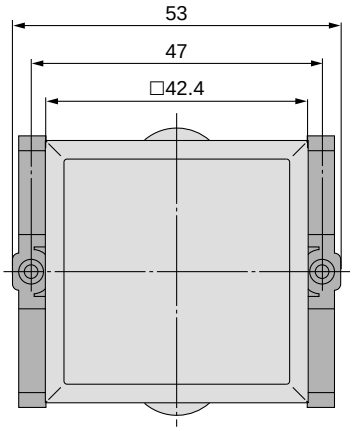
PF2D200/201

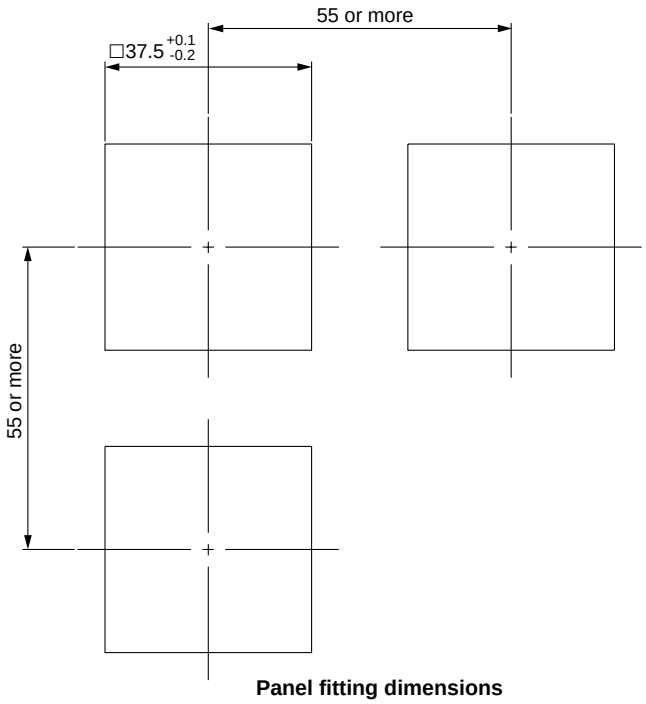




Front protective cover + Panel mounting

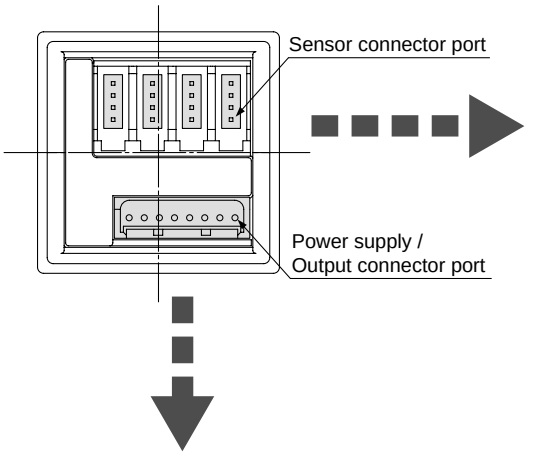




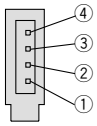


Panel fitting dimensions
Applicable panel thickness: 0.5 to 8 mm

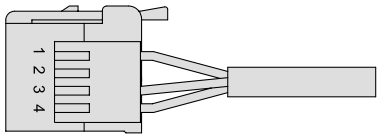
Dimensions: Remote Type Display Unit for De-ionised Water and Chemicals (4-channel Controller)



Sensor connector (4P x 4)

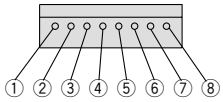


Connector (option)



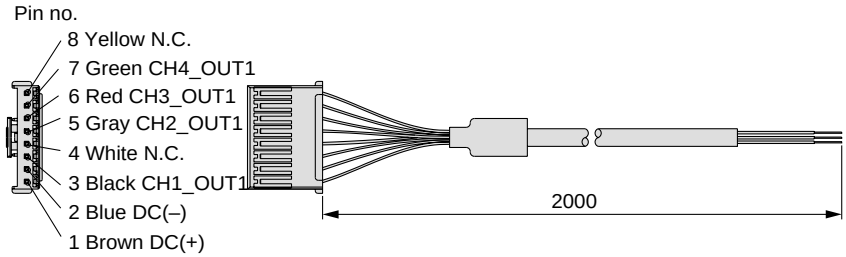
Pin no.	Terminal	Connector no.	Cable wire colour
①	DC+	1	Brown
②	N.C.	2	Not used
③	DC–	3	Blue
④	IN: 1 to 5 V	4	White

Power supply / Output connector (8P)



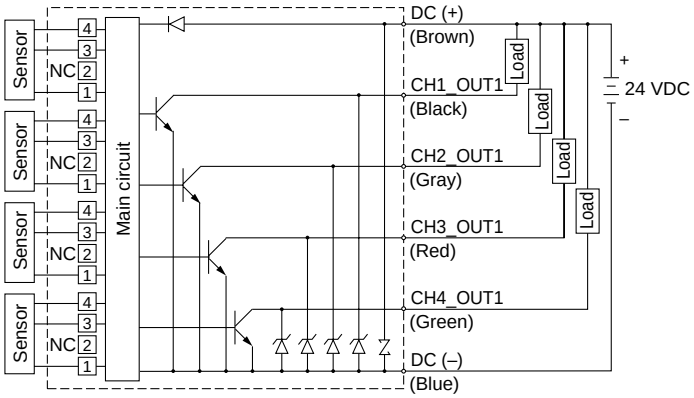
Pin no.	Terminal
①	DC (+)
②	DC (–)
③	CH1_OUT1
④	N.C.
⑤	CH2_OUT1
⑥	CH3_OUT1
⑦	CH4_OUT1
⑧	N.C.

Power supply / Output connector (accessory)

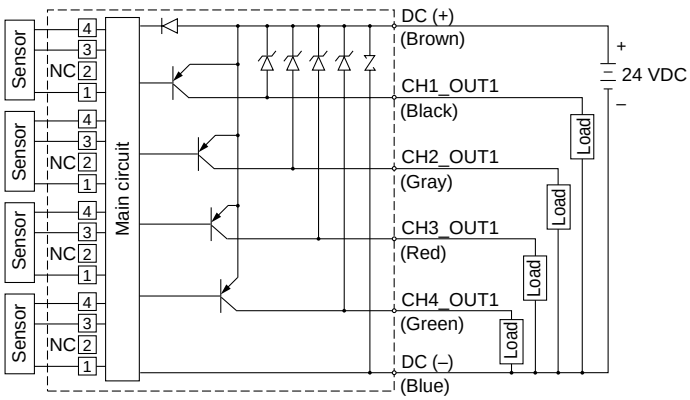


Internal circuits and wiring examples

PF2D200

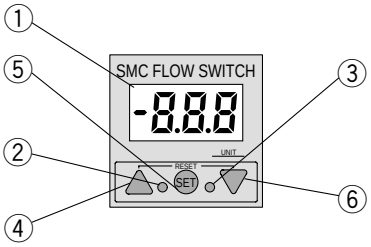


PF2D201



Description

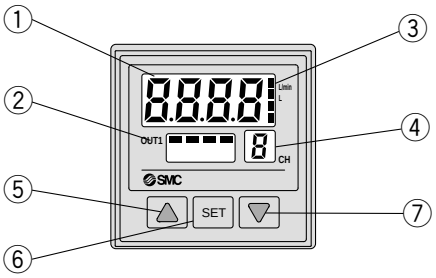
Remote Type/Display Unit
PF2D300, 301



RESET button (▲ + ▼ button)
If the UP and DOWN buttons are pressed simultaneously, the RESET function will activate.
In case of an emergency, please clear the display. The display of the accumulated flow will be reset to zero.

①	LED display/Red	Displays the measured flow rate, each setting condition, and error code.
②	Output (OUT1) display/Green	Displays the output condition of OUT1. Illuminates when turned ON.
③	Output (OUT2) display/Red	Displays the output condition of OUT2. Illuminates when turned ON.
④	UP button (▲ button)	Use to change the mode or to increase the set value.
⑤	SET button (● button)	Use this button to set the value or the set mode.
⑥	DOWN button (▼ button)	Use to change the mode or decrease the set value.

4-channel Flow Monitor (Remote type/Display unit)
PF2D200, 201



①	LED display/Orange	Displays the measured flow rate, each setting condition, and error code.
②	Switch output display/Red	Displays the output condition of OUT1 (CH1 to 4). Lights up when turned ON.
③	Unit display/Orange	Illuminates the selected unit. Use after putting the unit label other than //min, /.
④	Channel display/Red	Displays the selected channel.
⑤	UP button (▲ button)	Use to change the mode or to increase the set value.
⑥	SET button	Use this button to set the value or the set mode.
⑦	DOWN button (▼ button)	Use to change the mode or decrease the set value.

Functions/PF2D

Refer to the "Instruction Manual" for information on setting and operating.

Flow rate measurement selection

Real-time flow rate and accumulated flow rate can be selected.
A flow rate of up to 999999 can be accumulated.
The accumulated flow rate is reset when the power supply turns OFF.

Unit switching

Display	Real-time flow rate	Accumulated flow
U_1	l/min	l
U_2	GPM	gal (US)

GPM = gal (US)/min

Note) Fixed SI unit (l/min, l, m^3 or m^3x10) will be set for the type without the unit switching function.

Flow rate measuring unit confirmation

This function allows to confirm the accumulated flow rate when real-time flow rate is selected and to confirm the real-time flow rate when accumulated flow rate is selected.

Error correction

For PF2D300/301

LED display	Contents	Solution
Er 1	A current of more than 80 mA is flowing to OUT1.	Check the load and the wiring for OUT1.
Er2	A current of more than 80 mA is flowing to OUT2.	Check the load and the wiring for OUT2.
Er4	The set data has changed for some reason.	Perform the RESET operation, and reset all the data again.
- - -	The flow rate is over the flow rate measurement range.	Use an adjustment valve, etc. to reduce the flow rate until it is within the flow rate range.

For PF2D200/201

LED display	Contents	Solution
Er 1	Over current is flowing to the load of a switch output.	Shut off the power supply. After eliminating the output factor that caused the excess current, turn the power supply back on.
Er0	Internal data error.	Contact SMC.
Er7	Internal data error.	
Er10	Internal data error.	
Er5	Internal data error.	Shut off the power supply and then reset the switch.
Er6	Internal data error.	
- - -	The flow rate is over the flow rate measurement range.	Use an adjustment valve, etc. to reduce the flow rate until it is within the flow rate range.

Key lock

This function prevents incorrect operations such as changing the set value accidentally.

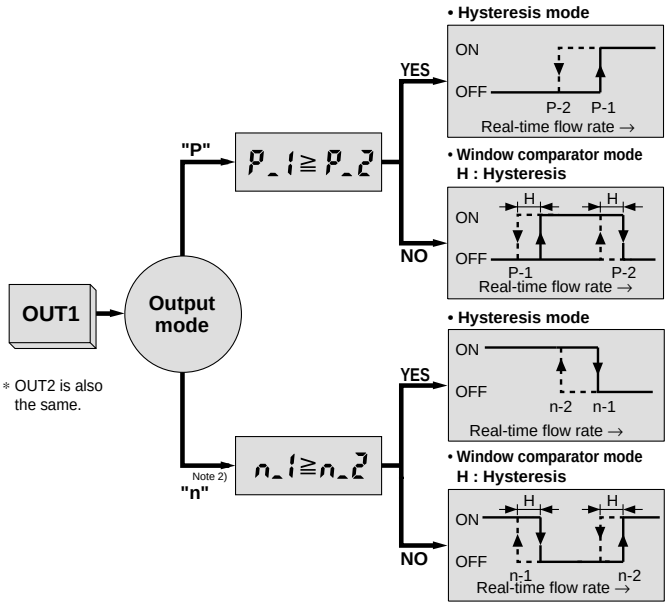
Accumulation clearance

This is to clear the accumulated value.

Output types

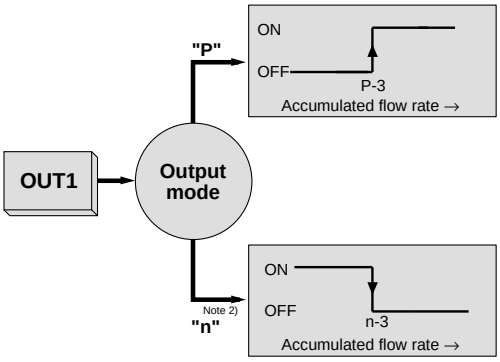
Real-time switch output, accumulated switch output, or accumulated pulse output can be selected as an output type.

Real-time switch output



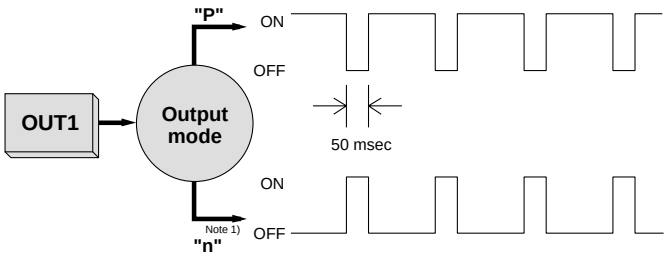
Note 2) Output mode is set to inverted output at the factory before shipment.

Accumulated switch output



Note 2) Output mode is set to inverted output at the factory before shipment.

Accumulated pulse output



Note1) Refer to the specifications of display unit for the flow rate value per pulse.

Functions

Copy function (PF2D200, 201 only)

Information to be copied is:
① Flow rate range
② Display mode
③ Display unit (Only available when the unit specification is nil.)
④ Output method
⑤ Output mode
⑥ Flow rate value

Peak hold, Bottom hold display function (PF2D200, 201 only)

The maximum or minimum value can be held in the case where the real-time flow rate display mode is selected during the initial setting.

Channel select function (PF2D200, 201 only)

Every pushing the △ button, channel selection "1→2→3→4→1..." is available. The flow rate measurement of each selected channel is shown in the display unit.

Channel scan function (PF2D200, 201 only)

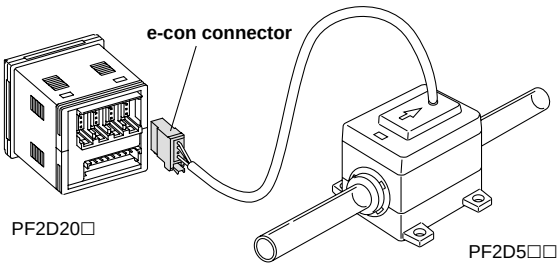
Changes displaying the channel shown every about 2 seconds and its detected flow rate.

Option

When only optional parts are required, order with the part numbers listed below.

e-con connector

Part no.	Qty.
ZS-28-CA-2	1

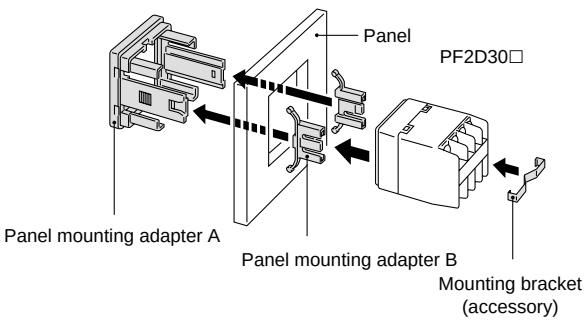


In addition to the connector shown above, those listed below (female contact) can be connected.

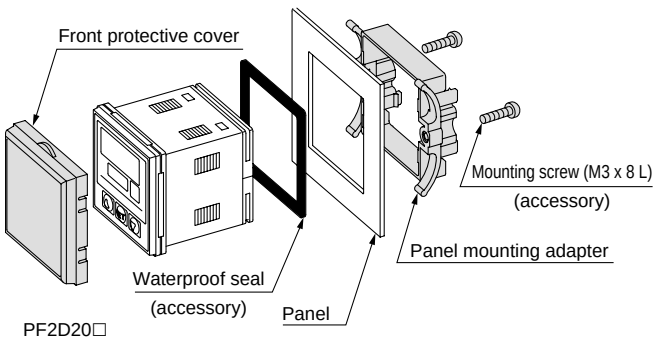
Manufacturer	Model
Sumitomo 3M Limited	37104-3101-000FL
Tyco Electronics AMP K.K.	1-1473562-4
OMRON Corp.	XN2A-1430

Panel mounting

Pin no.	Description	Note
ZS-22-E	Panel mounting adapter A, B	With mounting bracket



Part no.	Description	Note
ZS-26-B	Panel mounting adapter	With waterproof seal, mounting screw
ZS-26-C	Front protective cover + Panel mounting adapter	With waterproof seal, mounting screw



Applicable Fluid

Compatibility checklist: Between the digital flow switch material for de-ionised water and chemicals and the fluid selected.

Fluid		Compatibility
Acetone		○
Ammonium hydroxide		○
Isobutyl alcohol		×
Isopropyl alcohol		○
Hydrochloric acid		○
Ozone		×
Hydrogen peroxide	Concentration 50% or less 50°C or less	○
Ethyl acetate		○
Butyl acetate		○
Nitric acid (except fuming nitric acid)	Concentration 10% or less	○
De-ionised water		○
Sodium hydroxide		×
Ultra de-ionised water		○
Toluene		○
Hydrofluoric acid	Concentration 50% or less	○
Sulfuric acid (except fuming sulfuric acid)	Concentration 20% or less	○
Phosphoric acid	Concentration 30% or less	○

Note 1) The material and fluid compatibility check list provides reference values as a guide only.
Note 2) It is possible that some fluids are permeable depending on the type of fluid, its density and temperature. Any permeated fluid may affect the products life.
Thus, when using these fluid types, verify the fluid in advance by testing it, prior to making a decision to use it.

Table symbols ○ : Can be used
: Can be used under certain conditions
× : Cannot be used

· Compatibility is indicated for fluid temperatures at 90°C or less.
· The product does not have an explosion proof construction. Be sure to take measures to prevent the area around the product from becoming filled with an explosive gas, when using an explosive fluid.

Series PF2D

Safety Instructions

The following safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of **"Caution", "Warning"** or **"Danger"**. To ensure safety, please observe all safety practices.

⚠Caution : Operator error could result in injury or equipment damage.

⚠Warning : Operator error could result in serious injury or loss of life.

⚠Danger : In extreme conditions, there is a possible result of serious injury or loss of life.

⚠ Warning

1. **The compatibility of equipment is the responsibility of the person who designs the system or decides its specifications.**
   Since the products specified here are used in various operating conditions, their compatibility with the specific system must be based on specifications, post analysis and/or tests to meet a specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalogue information and taking into consideration the possibility of equipment failure when configuring a system.
2. **Only trained personnel should operate machinery and equipment.**
   Assembly, handling or repair of systems should be performed by trained and experienced operators.
3. **Do not service machinery/equipment or attempt to remove components until safety is confirmed.**
4. **To promote safe operation, be sure to observe company standard and legal regulations, etc.**
   Refer to ISO4414, JIS B 8370 (pneumatic system axiom), labor health and safety laws and other safety regulations.

Series PF2D
Specific Product Precautions 1

Be sure to read before handling.
Refer to page 57 for safety instructions and precautions.

Design and Selection

⚠Warning

1. Operate the switch only within the specified voltage.

Use of the switch outside of the specified voltage range can cause not only a malfunction and damage to the switch, but it can also cause electrocution and fire.

2. Do not exceed the maximum allowable load specification.

A load exceeding the maximum load specification can cause damage to the switch.

3. Do not use a load that generates a surge voltage.

Although the circuit at the output side of the switch is surge protected, damage may still occur if a voltage surge is applied repeatedly. When a load which generates a surge, such as from a relay or solenoid valve is directly driven, use a switch with a built-in surge absorbing element.

4. Be sure to verify the applicable fluid.

The switches do not have an explosion proof rating. To prevent possible fire hazard, do not use with flammable gases or fluids.

5. Monitor the internal voltage drop of the switch.

When operating below the specified voltage, it is possible that the load may be ineffective even though the pressure switch function is normal. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

Supply voltage	−	Internal voltage drop of switch	>	Minimum operating voltage of load

6. Use the switch within the specified flow rate measurement and operating pressure.

Operating beyond the specified flow rate and operating pressure can damage the switch. Especially avoid the application of pressure through a water hammer, which is above the specification.

<Examples of pressure reduction measures>

a) Use a device such as a water hammer relief valve to slow the valve's closing speed.
b) Absorb impact pressure by using an accumulator or elastic piping material such as a rubber hose.
c) Keep the piping length as short as possible.

7. Design the system so that the fluid always fills the detection passage.

Especially for vertical mounting, introduce the fluid from the bottom to the top.

8. Operate within the flow rate measurement range.

If operated outside of the flow rate measurement range, the Karman vortex will not be generated and normal measurement will not be possible.

9. Never use inflammable fluids and/or permeable fluids.

They may cause a fire, an explosion or corrosion.

∗Refer to the MSDA (material safety data sheet) when using chemicals.

Design and Selection

⚠Caution

1. Data from the flow switch is stored even after the power supply is off.

The input data is stored in EEPROM so that the data will not be lost after the flow switch is turned off. (The data can be rewritten for up to one million times, and stored for up to 20 years.)

2. Accumulated flow rate is reset when it is turned OFF.

Mounting

⚠Warning

1. Monitor the flow direction of the fluid.

Install and connect piping so that fluid flows in the direction of the arrow indicated on the body.

2. Remove dirt and dust from inside of the piping by means of air blow, before attaching to the switch.

3. Do not drop or bump.

Do not drop, bump, or apply excessive impacts (490 m/s^2) while handling. Although the external body of a switch (switch case) may not be damaged, the switch inside could be damaged and cause a malfunction.

4. Hold the body of the switch when handling.

The tensile strength of the cord is 49N and applying a greater pulling force than this can cause a malfunction. When handling, hold the body of the switch.

5. Do not use until you can verify that equipment can operate properly.

Following mounting, repair, or retrofit, verify correct mounting by conducting suitable function and leakage tests after piping and power connections have been made.

6. Never mount a switch in a place that will be used as a step stool during piping.

7. Be sure to allow straight pipe length that is minimum 8 times the port size upstream and downstream of the switch piping.

When abruptly reducing the size of piping or when there is a restriction such as a valve on the inlet side, the pressure distribution in the piping changes and makes accurate measurement impossible. Therefore, flow restriction measures such as these should be implemented on the outlet side of the switch.

When used with the outlet side open, be careful of the cavitation that is prone to occur.

Specific Product Precautions 2

Be sure to read before handling.
Refer to page 57 for safety instructions and precautions.

Wiring

⚠Warning

1. Verify the colour and the terminal number when wiring.

Incorrect wiring can cause the switch to be damaged and malfunction. Verify the colour and the terminal number in the instruction manual when wiring.

2. Avoid repeatedly bending or stretching of the lead wire.

Repeatedly applying bending stress or stretching force to the lead wire will cause it to break.

3. Confirm proper insulation of wiring.

Make sure that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a switch.

4. Do not wire in conjunction with power lines or high voltage lines.

Wire separately from power lines and high voltage lines, avoiding wiring in the same conduit with these lines. Control circuits including switches may malfunction due to noise from these other lines.

5. Do not allow loads to short circuit.

Although a switch indicate excess current error if a load is short circuited, all incorrect wiring connections such as power supply polarity cannot be protected. Take precautions to avoid incorrect wiring.

Usage

⚠Warning

1. When using a switch for high temperature fluid, the switch itself also becomes hot due to the high temperature fluid. Avoid touching the switch directly as this may cause a burn.

Operating Environment

⚠Warning

1. Never use in the presence of explosive gases.

The switches do not have an explosion proof rating. Never use in the presence of an explosive gas as this may cause a serious explosion.

2. Mount the switch in a location where there is no vibration (Display: greater than 98 m/s², Sensor: 4.9 m/s² or less), or no impact greater than 490 m/s².

3. Do not use in an area where surges are generated.

When there are units that generate a large amount of surge in the area around a pressure switch, (e.g., solenoid type lifters, high frequency induction furnaces, motors, etc.) this may cause deterioration or damage to the switch's internal circuitry. Avoid sources of surge generation and crossed lines.

4. Switches are not equipped with surge protection against lightning.

The flow switches are CE compliant; however, they are not equipped with surge protection against lightning. Lightning surge protection measures should be applied directly to system components as necessary.

5. Avoid using the switch in an environment where the likelihood of splashing or spraying of liquids exists.

The switches are dustproof and splashproof; however, avoid using in an environment where the likelihood of heavy splashing or spraying of water and/or oil exist. Since the display unit of the remote type switches featured here is not dust or splash proof, the use in an environment where water and/or oil splashing or spraying exists must be avoided.

Maintenance

⚠Warning

1. Perform periodical inspections to ensure proper operation of the switch.

Unexpected malfunctions may cause a possible danger.

2. Take precautions when using the switch for an interlock circuit.

When a pressure switch is used for the interlock circuit, devise a multiple interlock system to prevent trouble or malfunction. Verify the operation of the switch and the interlock function on a regular basis.

3. Do not disassemble or perform any conversion work on flow switches.

4. The following should be observed during regular maintenance to avoid damage and loss due to chemicals.

a) Do not touch the remaining chemicals in piping and/or digital flow switch.

b) Check the name and the nature of chemicals used and treat them accordingly.

Series PF2D
Specific Product Precautions 3

Be sure to read before handling.
Refer to page 57 for safety instructions and precautions.

Measured Fluid

⚠Warning

1. Check regulators and flow adjustment valves before introducing the fluid.

If pressure or flow rate beyond the specified range are applied to the switch, the sensor unit may be damaged.

2. Be sure to take measures to prevent exposing the switch to inflammable and/or explosive gases when using inflammable fluid.

3. Install a filter on the inlet side when there is a possibility of condensation and foreign matter being mixed with the fluid.

If foreign matter adheres to the switch's vortex generator or vortex detector, accurate measurement will no longer be possible.

Others

⚠Warning

1. After the power is turned on, the switch's output remains off while a message is displayed. Therefore, start the measurement after a value is displayed.

2. Perform settings after stopping control systems.

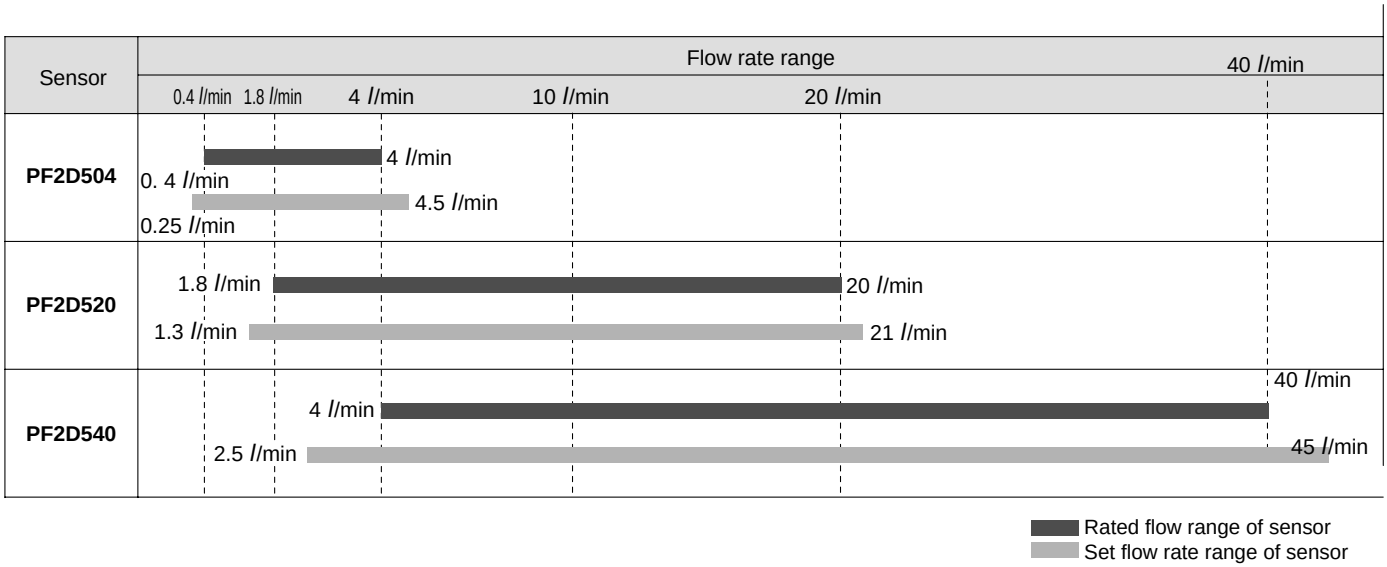
When the switch's initial setting and flow rate setting are performed, output maintains the condition prior to the settings. Output turns OFF when the switch's initial setting and flow rate setting are preformed.

Set Flow Rate Range and Rated Flow Range

⚠Caution

Set the flow rate within the rated flow range.

The set flow rate range is the range of flow rate that can be set on the controller side.
The rated flow range is the range that satisfies the sensor's specifications (accuracy, linearity etc.).
It is possible to set a value outside off the rated flow range, however, the specification is not be guaranteed.



Specific Product Precautions 4

Be sure to read before handling.
Refer to page 57 for safety instructions and precautions.

■ 4-channel Flow Monitor

Handling

⚠ Warning

1. **Do not drop, bump, or apply excessive impacts (980 m/s^2) while handling. Although the body of the flow monitor case may not be damaged, the inside of the flow monitor could be damaged and lead to a malfunction.**
2. **The tensile strength of the power supply/output connection cable is 50N and the sensor lead wire with a connector is 25N. Applying a greater pulling force than the applicable specified tensile strength to either of these components can lead to a malfunction. When handling, hold the body of the controller.**

Connection

⚠ Warning

1. **Incorrect wiring can damage the switch and cause a malfunction or erroneous switch output. Connections should be done while the power is turned off.**
2. **Do not attempt to insert or pull the flow rate sensor or its connector when the power is on. Switch output may malfunction.**
3. **Wire separately from power lines and high voltage lines, avoiding wiring in the same conduit with these lines. Malfunctions may occur due to noise from these other lines.**
4. **If a commercial switching power supply is used, make sure that the F.G. terminal is grounded.**

Operating Environment

⚠ Warning

1. **Our 4-channel flow monitor is CE marked, however it is not equipped with surge protection against lightning. Lightning surge countermeasures should be applied directly to system components as necessary.**
2. **Our 4-channel flow monitor does not have an explosion proof rating. Never use pressure sensors in the presence of inflammable or explosive gases.**
3. **Enclosure "IP65" applies only to the front face of the panel when mounting. Do not use in an environment where oil splashing or spraying are anticipated.**

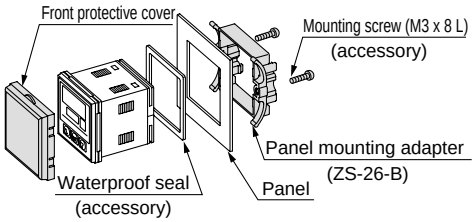
Mounting

⚠ Caution

The front face of the panel mount conforms to IP65, however there is a possibility of liquid infiltration if the panel mount adapter is not installed securely and properly. Securely fix the adapter with screws as shown below.

Front protective cover + Panel mounting

Tighten screws 1/4 to 1/2 turn after the heads are flush with the panel.

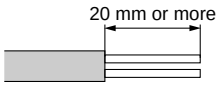


Wiring

⚠ Caution

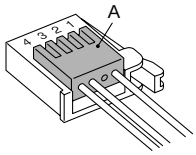
1. Connecting sensor cable and connector (ZS-28-CA-□)

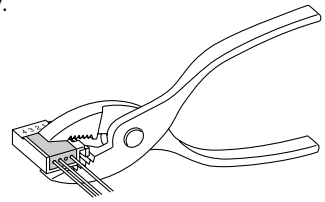
- Cut the sensor cable as shown below.
- Insert each lead wire into the corresponding connector number by following the chart provided below.



Connector no.	Cable wire colour
1	Brown (DC+)
2	Not used
3	Blue (DC–)
4	White (IN: 1 to 5 V)

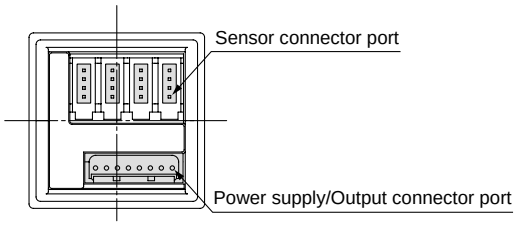
- Make sure that the numbers on the connector and the wire colours match. After verifying that the wires are fully inserted, temporarily hold A down by hand.
- Using pliers, press the center of A straight down.
- Note that that connector cannot be taken apart for reuse once it is crimped. Use a new sensor connector if wiring or cable insertion is done incorrectly.

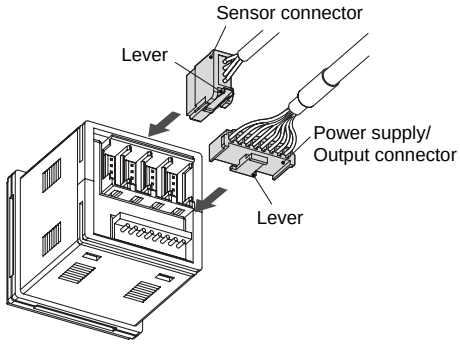




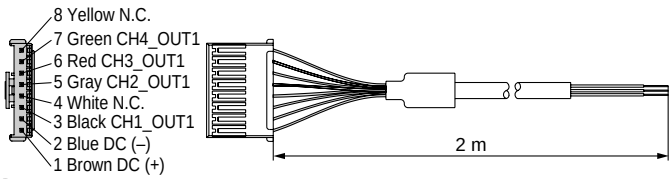
2. Inserting/Detaching of sensor connector, power supply/output connector

- Insert each connector straightforwardly until it clicks and locks onto the body.
- To remove the connector, pull it straight out while pushing the lever with your thumb.





Pin no.



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