



Operation Manual

PRODUCT NAME

Digital Pressure Switch

MODEL / Series / Product Number

ZSE3
ISE3(L)

SMC Corporation




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Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution", "Warning" or "Danger". They are all important notes for safety and must be followed in addition to International standards (ISO/IEC) *1) and other safety regulations.

- *1) ISO 4414: Pneumatic fluid power -- General rules relating to systems.
- ISO 4413: Hydraulic fluid power -- General rules relating to systems.
- IEC 60204-1: Safety of machinery -- Electrical equipment of machines. (Part 1: General requirements)
- ISO 10218-1992: Manipulating industrial robots -Safety.
- etc.

 Caution :	CAUTION indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
 Warning :	WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
 Danger :	DANGER indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

Warning

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

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

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

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalogue.
3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

Caution

The product is provided for use in manufacturing industries.

The product herein described is basically provided for peaceful use in manufacturing industries. If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.
If anything is unclear, contact your nearest sales branch.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".

Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first. *2)
Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalogue for the particular products.

*2) Vacuum pads are excluded from this 1 year warranty.

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulation of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

Caution

SMC products are not intended for use as instruments for legal metrology.

Products that SMC manufactures or sells are not measurement instruments that are qualified by pattern approval tests relating to the measurement laws of each country.
Therefore, SMC products cannot be used for business or certification ordained by the measurement laws of each country.

Operator

- ◆ This operation manual is intended for those who have knowledge of machinery using pneumatic equipment, and have sufficient knowledge of assembly, operation and maintenance of such equipment. Only those persons are allowed to perform assembly, operation and maintenance.
- ◆ Read and understand this operation manual carefully before assembling, operating or providing maintenance to the product.

■ Safety Instructions

Warning

- Do not disassemble, modify (including changing the printed circuit board) or repair.
An injury or failure can result.
- Do not operate the product outside of the specifications.
Do not use for flammable or harmful fluids.
Fire, malfunction, or damage to the product can result.
Verify the specifications before use.
- Do not operate in an atmosphere containing flammable or explosive gases.
Fire or an explosion can result.
This product is not designed to be explosion proof.
- Do not use the product in a place where static electricity is a problem.
Otherwise it can cause failure or malfunction of the system.
- If using the product in an interlocking circuit:
 - Provide a double interlocking system, for example a mechanical system
 - Check the product regularly for proper operationOtherwise malfunction can result, causing an accident.
- The following instructions must be followed during maintenance:
 - Turn off the power supply
 - Stop the air supply, exhaust the residual pressure and verify that the air is released before performing maintenanceOtherwise an injury can result.

Caution

- Do not touch the terminals and connectors while the power is on.
Otherwise electric shock, malfunction or damage to the product can result.
- After maintenance is complete, perform appropriate functional inspections and leak tests.
Stop operation if the equipment does not function properly or there is a leakage of fluid.
When leakage occurs from parts other than the piping, the product might be faulty.
Disconnect the power supply and stop the fluid supply.
Do not apply fluid under leaking conditions.
Safety cannot be assured in the case of unexpected malfunction.

■ NOTE

- Follow the instructions given below when designing, selecting and handling the product.
 - The instructions on design and selection (installation, wiring, environment, adjustment, operation, maintenance, etc.) described below must also be followed.
 - *Product specifications
 - Use the specified voltage.
Otherwise failure or malfunction can result.
 - Do not exceed the specified maximum allowable load.
Otherwise it can cause damage or shorten the lifetime of the Pressure switch.
 - Design the product to prevent reverse current when the circuit is opened or the product is forced to operate for operational check.
Reverse current can cause malfunction or damage to the product.
 - Input data to the Pressure switch is not deleted, even if the power supply is cut off.
(Writing time: 1,000,000 times, Data duration: 10 years after power off)
 - For the details of compressed air quality, refer to ISO 8573-1, 1.1.2 to 1.6.2: 2001.
This can cause operating failure.
If compressed air containing condensate is used, install an air dryer or drain catch before the filter and perform drainage regularly.
If drainage is not performed regularly and condensate enters the secondary side, it can cause operating failure of pneumatic equipment.
If regular drainage is difficult, the use of a filter with an auto drain is recommended.
 - Applicable fluid is air, inert gases and incombustible gases.
Do not use a fluid containing chemicals, synthetic oils including organic solvent, salt and corrosive gases.
Otherwise, damage to the product and malfunction can result.
Check the details of the specifications before using.
 - Use the specified measurement flow rate and operating pressure.
Otherwise it can cause damage to the pressure switch or inability to measure correctly.
 - Reserve a space for maintenance.
Allow sufficient space for maintenance when designing the system.

● Product handling

*Installation

- Tighten to the specified tightening torque.
If the tightening torque is exceeded the mounting screws and brackets may be broken.
If the tightening torque is insufficient, the product can be displaced and loosen the mounting screws.
(Refer to "Mounting and Installation" on page 12.)
- Be sure to ground terminal FG when using a commercially available switch-mode power supply.
- Do not drop, hit or apply shock to the Pressure switch.
Otherwise damage to the internal parts can result, causing malfunction.
- Do not pull the lead wire forcefully, not lift the product by pulling the lead wire. (Tensile force 49N or less)
Hold the body when handling to avoid the damage of the Pressure switch which lead to cause the failure and malfunction.
- For piping of the Pressure switch, hold the piping with a spanner on the metal part of the piping (Piping attachment).
Holding other part with spanner leads to damage the Pressure switch.
- Eliminate any dust left in the piping by air blow before connecting the piping to the product.
Otherwise it can cause damage or malfunction.
- Do not insert metal wires or other foreign matter into the pressure measurement port.
It can damage the pressure sensor causing failure or malfunction.
- Never mount a Pressure switch in a location that will be used as a foothold.
The product may be damaged if excessive force is applied by stepping or climbing onto it.
- If the entering of foreign material to the fluid is possible, install and pipe the filter or the mist separator to the inlet to avoid failure and malfunction.

*Wiring

- Do not pull the lead wires.
In particular, never lift a Pressure switch equipped with fitting and piping by holding the lead wires.
Otherwise damage to the internal parts can result, causing malfunction or to be off the connector.
- Avoid repeatedly bending or stretching the lead wire, or placing heavy load on them.
Repetitive bending stress or tensile stress can cause the sheath of the wire to peel off, or breakage of the wire.
If the lead wire can move, fix it near the body of the product.
The recommended bend radius of the lead wire is 6 times the outside diameter of the sheath, or 33 times the outside diameter of the insulation material, whichever is larger.
Replace the damaged lead wire with a new one.
- Wire correctly.
Incorrect wiring can break the Pressure switch.
- Do not perform wiring while the power is on.
Otherwise damage to the internal parts can result, causing malfunction.
- Do not route wires and cables together with power or high voltage cables.
Otherwise the product can malfunction due to interference of noise and surge voltage from power and high voltage cables to the signal line. Route the wires (piping) of the product separately from power or high voltage cables.
- Confirm proper insulation of wiring.
Poor insulation (interference from another circuit, poor insulation between terminals, etc.) can lead to excess voltage or current being applied to the product, causing damage.
- Design the system to prevent reverse current when the product is forced to operate for operational check.
Depending on the circuit used, insulation may not be maintained when operation is forced, allowing reverse current to flow, which can cause malfunction and damage the product.
- Keep wiring as short as possible to prevent interference from electromagnetic noise and surge voltage.
Do not use a cable longer than 10m.
Wire the DC(-) line (blue) as close as possible to the power supply.
- When analog output is used, install a noise filter (line noise filter, ferrite element, etc.) between the switch-mode power supply and this product.

*Environment

- Do not use the product in area that is exposed to corrosive gases, chemicals, sea water, water or steam.
Otherwise failure or malfunction can result.
- Do not use in a place where the product could be splashed by oil or chemicals.
If the product is to be used in an environment containing oils or chemicals such as coolant or cleaning solvent, even for a short time, it may be adversely affected (damage, malfunction, or hardening of the lead wires).

- Do not use in an area where surges are generated.
If there is equipment which generates a large amount of surge (solenoid type lifter, high frequency induction furnace, motor, etc.) close to the Pressure switch, this may cause deterioration or breakage of the internal circuit of the Pressure switch. Avoid sources of surge generation and crossed lines.
- Do not use a load which generates surge voltage.
When a surge-generating load such as a relay or solenoid is driven directly, use a Pressure switch with a built-in surge absorbing element.
- The product is CE marked, but not immune to lightning strikes. Take measures against lightning strikes in the system.
- Mount the product in a place that is not exposed to vibration or impact.
Otherwise failure or malfunction can result.
- Prevent foreign matter such as remnant of wires from entering the Pressure switch.
Take proper measures for the remnant not to enter the Pressure switch in order to prevent failure or malfunction.
- Do not use the product in an environment that is exposed to temperature cycle.
Heat cycles other than ordinary changes in temperature can adversely affect the inside of the product.
- Do not expose the product to direct sunlight.
If using in a location directly exposed to sunlight, shade the product from the sunlight.
Otherwise failure or malfunction can result.
- Keep within the specified fluid and ambient temperatures range.
The fluid and ambient temperatures should be 0 to 60 °C. Operation under low temperature (5 °C or less) leads to cause damage or operation failure due to frozen moist in the fluid or air.
Protection against freezing is necessary. Air dryer is recommended for elimination of drain and water.
Avoid sudden temperature change even within specified temperature.
- Do not operate close to a heat source, or in a location exposed to radiant heat.
Otherwise malfunction can result.

***Adjustment and Operation**

- Turn the power on after connecting a load.
Otherwise it can cause excess current causing instantaneous breakage of the Pressure switch.
- Do not short-circuit the load.
Although error is displayed when the Pressure switch load is short circuit, generated excess current lead to cause the damage of the Pressure switch.
- Do not press the setting buttons with a sharp pointed object.
It may damage the setting buttons.
- If using the product to detect very small pressure rates, warm up the product for 10 to 15 minutes first.
There will be a drift on the display and the analog output of approximate $\pm 1\%$ immediately after the power supply is turned on, within 10 minutes.
- Perform settings suitable for the operating conditions.
Incorrect setting can cause operation failure.
For details of each setting, refer to page 15 to 17 of this manual.
- Do not touch the LCD during operation.
The display can vary due to static electricity.

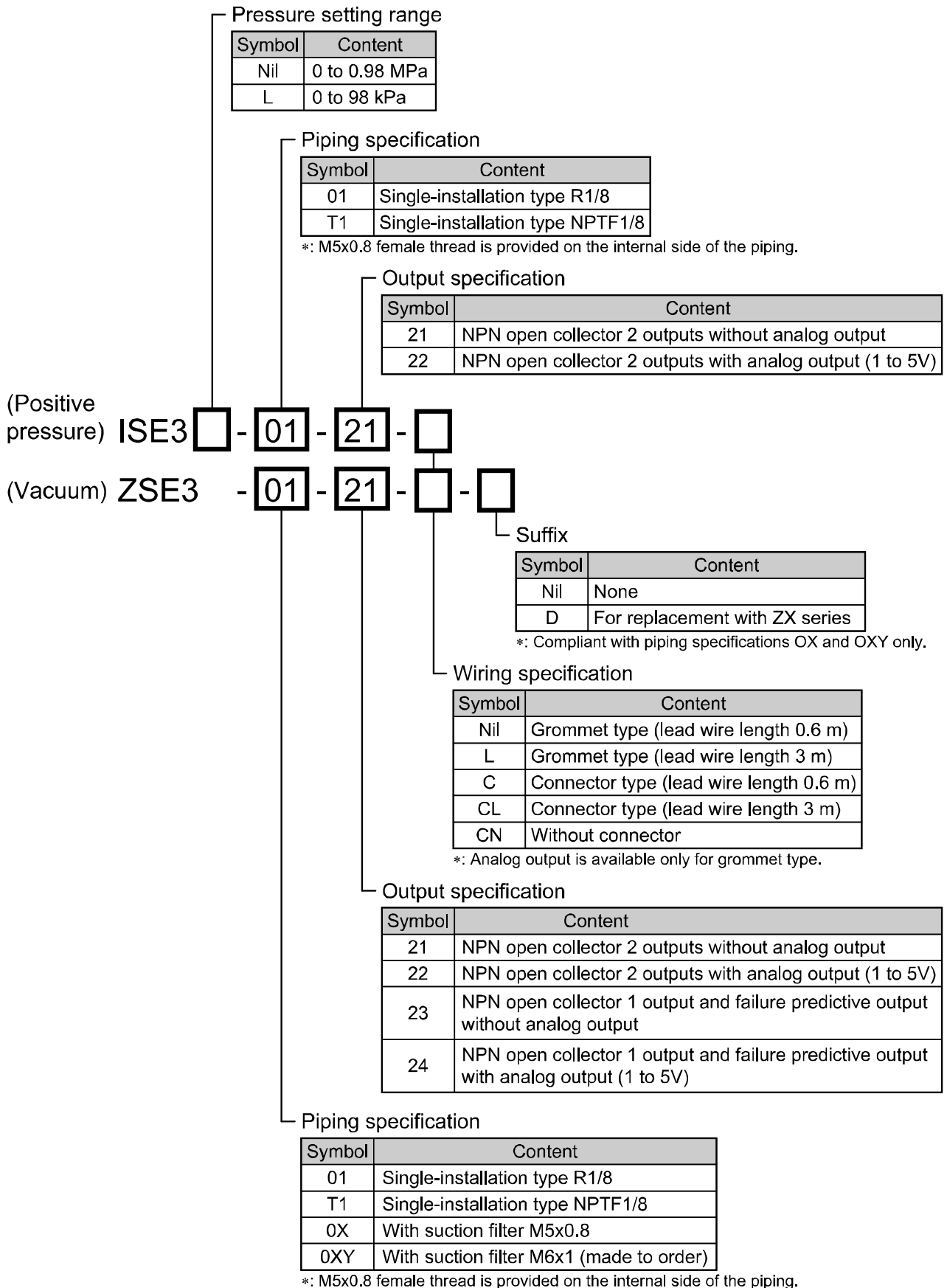
***Maintenance**

- Turn off the power supply, stop the supplied air, exhaust the residual pressure and verify the release of air before performing maintenance.
There is a risk of unexpected malfunction.
- Perform regular maintenance and inspections.
There is a risk of unexpected malfunction.
- Perform drainage regularly.
If condensate enters the secondary side, it can cause operating failure of pneumatic equipment.
- Do not use solvents such as benzene, thinner etc. to clean the Pressure switch.
They could damage the surface of the body and erase the markings on the body.
Use a soft cloth to remove stains. For heavy stains, use a cloth soaked with diluted neutral detergent and fully squeezed, then wipe up the stains again with a dry cloth.

When the 0X or 0XY type (with filter) is used

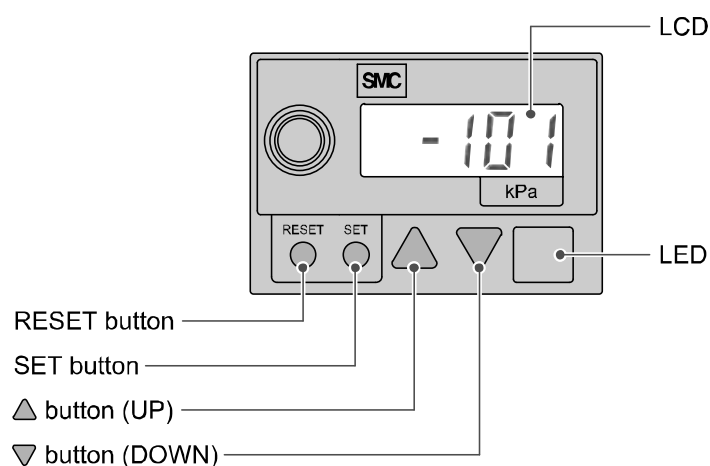
- If the filter element (ZX1-FE) is clogged, stop operation and replace the element.

Model Identification and How to Order



Summary of Product parts

○Names of individual parts



RESET button: Resets at error occurrence and for zero clear of the display.

SET button: Switches the setting mode and enters the set value.

LCD: Displays pressure value, setting mode, and error code.

LED: The green LED lights up when output OUT1 is ON. The red LED lights up when output OUT2 is ON and failure predictive output. When both OUT1 and OUT2 are ON, both the green and red LEDs light up. Upon error occurrence, the red LED flashes.

▲ button (UP): Switches to the peak display mode and increases the ON/OFF set value.

▼ button (DOWN): Switches to the bottom display mode and decreases the ON/OFF set value.

■ Definition and terminology

	Terms	Meaning
7	7-segment indication	When "8" is shown on the display. It is called 7-segment because 8 consists of 7 pieces of "-" (segments)".
A	Analog output (function)	Function to output the voltage or current in proportion to the pressure.
B	Bottom hold mode	Shows the minimum pressure reached at that moment.
D	Digit (Min. setting unit)	Shows how precisely the pressure can be indicated or set by the digital Pressure switch. When 1 digit = 1 kPa, the pressure is given with an increment of 1kPa, e.g., 1, 2, 3, ..., 99, 100.
E	Error indication (Error code)	With the self-diagnosis function given to the Pressure switch, it indicates that there is a failure which could cause a switch failure.
F	Failure predictive function	Refer to "Failure predictive function" on page 16.
	F.S. (full span/full scale)	Abbreviation for full span and full scale; means the maximum fluctuation range of the Pressure switch rated value. For example, when the output voltage is 1 to 5[V], the F.S. will be $5-1=4[V]$. (Reference: $1\%F.S. = 4 \times 0.01 = 0.04[V]$)
H	Hysteresis	Difference between the points at which the Pressure switch is turned on and off.
	Hysteresis mode	Refer to "Output method" on page 15
I	Insulation resistance	Insulation resistance of a product itself. The resistance between an electric circuit and a body.
L	Load impedance	See "Max. load impedance".
M	Max. applied voltage	The maximum value of applied voltage available to the output line of the NPN output.
	Max. load current	The maximum current available to the output (output line) of the switch output.
	Max. (Min.) load impedance	The maximum (minimum) load (resistance value and impedance) which can be connected to the output (output line) of the analog current output.
	Min. setting unit	Refer to "digit".
N	NPN (open collector) (output)	The switch that uses the NPN transistor for output.
0	Output impedance	The resistance value of a component between the voltage outputting element and the output line at the output of the analog voltage output. It is indicated as a resistance value which is converted in accordance with the condition in which resistance is directly connected to the voltage output element. There may be an error in the output voltage depending on this output impedance and the input impedance of customers' equipment. (Example: If the Pressure switch with output impedance of 1kΩ is connected to the A/D converter to detect the analog output of 5V, the detected voltage by the A/D converter becomes $5(V) \times 1(M\Omega)/(1(k\Omega) + 1(M\Omega)) \cong 4.995(V)$, and there is an error of approximate 0.005 V.)
P	Peak hold mode	Shows the maximum pressure reached at that moment.
	Piping-port size	The size of the port on the switch body with which a device and the switch are connected.
	Pressure setting	The setting of pressure to determine the point at which the Pressure switch turns on and off.

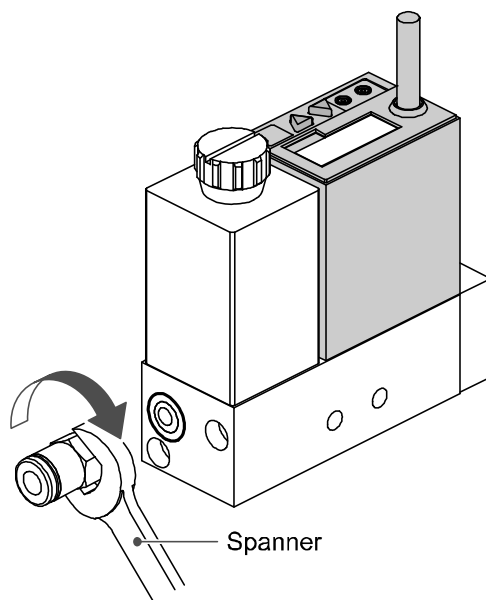
	Terms	Meaning
R	Rated pressure range	The pressure range in which the Pressure switch satisfies the specifications. Values over this range can be set if they are within the set pressure range, but cannot assured the specifications to be satisfied.
	Repeatability	Reproducibility of the displayed value for pressure and ON-OFF output operating point when the pressure changes at a temperature of 25 °C.
	Response time	The elapsed time until the ON-OFF output begins working since the pressure supplied for the Pressure switch has reached the set value. Generally, the shorter response time is, the better the performance is.
	Ripple	A type of chattering.
V	Voltage resistance	Durability to voltage applied between an electric circuit and a body. A product's durability in withstanding voltage. If more voltage is applied to the product, the product may be broken. (Voltage mentioned here is not power voltage to activate the product.)
W	Window comparator mode	An output type that holds the output when the pressure is within a certain range. (Refer to "Output method" on page 15.)
Z	Zero clear (function)	Adjusts the displayed pressure value to "zero".

Mounting and Installation

■Piping

○Piping connection

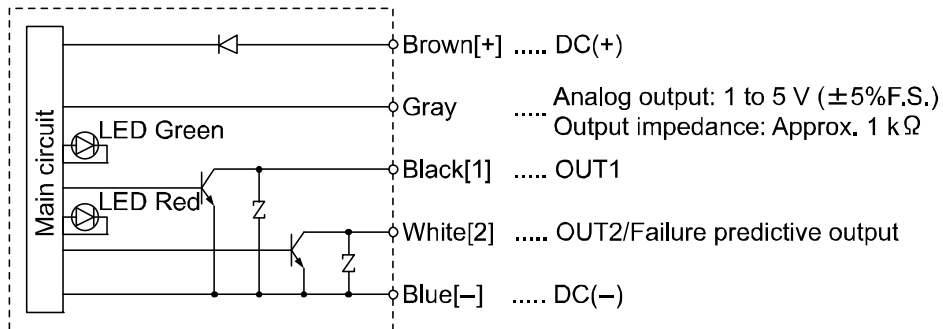
- Connect the digital pressure to the piping with a hexagon socket head plug or a fitting.
- The tightening torque for piping port must be 8.8 Nm or less.



■ Wiring

○ Connection

- Be sure to turn off the power supply before performing connection work.
- Incorrect wiring will lead to digital pressure switch breakdown, failure or malfunction. So be sure to confirm the wire color and terminal number before wiring.

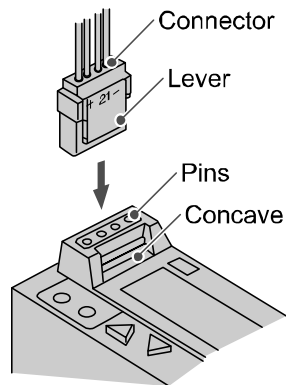


*: The symbol shown in [] means the pin assignment of connector connection type.

○ Connector

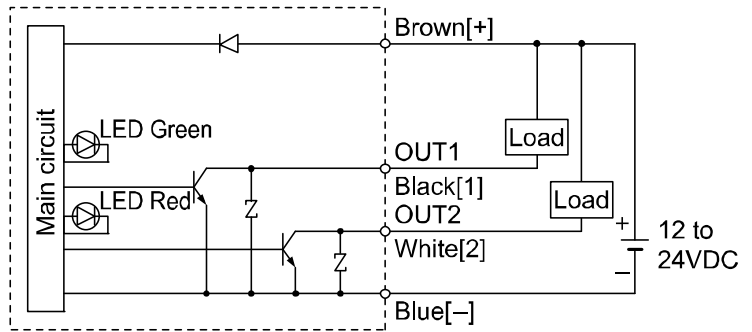
Connecting/Disconnecting

- When connecting a connector, insert the connector straight by tightly holding its lever and body with fingers and lock it, making sure the lever hook is securely received in the groove of the housing.
- When disconnecting the connector, pull it straight away from the housing by pressing the lever with the thumb and removing the lever hook from the groove.

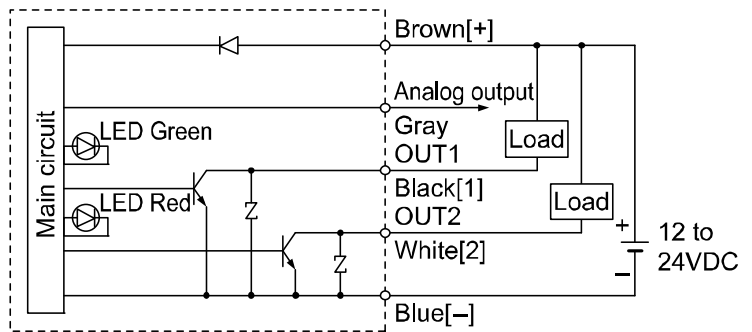


○ Internal circuit and wiring example

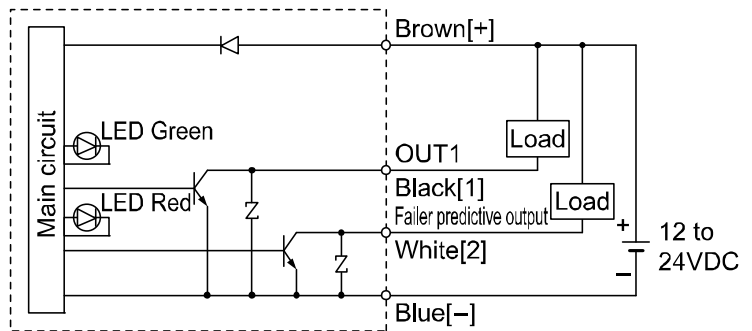
- 21
Switch output
NPN open collector output 2 outputs
Max. 30 V, 80 mA



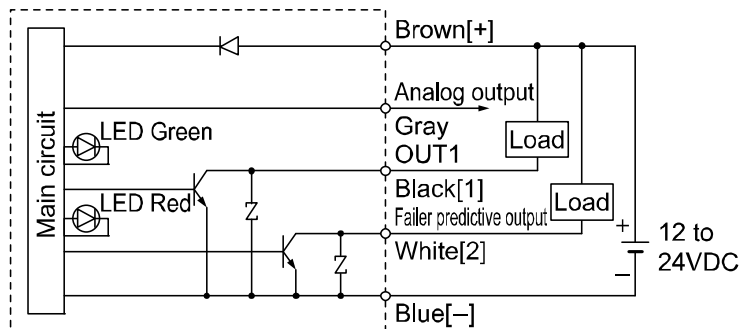
- 22
Switch output
NPN open collector output 2 outputs
Max. 30 V, 80 mA
Analog output: 1 to 5V ($\pm 5\%$ F.S.)
Output impedance: Approx. 1 k Ω



- 23
Switch output
NPN open collector output 1 output
Max. 30 V, 80 mA
Failure predictive output
NPN open collector output 1 output



- 24
Switch output
NPN open collector output 1 output
Max. 30 V, 80 mA
Failure predictive output
NPN open collector output 1 output
Analog output: 1 to 5V ($\pm 5\%$ F.S.)
Output impedance: Approx. 1 k Ω



Pressure Setting

■ 2-output type

1. Set value input mode

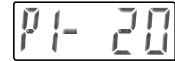
Press the "SET" button to display "P1-20" *1.
The output OUT1(1) set value input mode is selected.



*1: If the set value of P1 is -20)

2. OUT1(1) set value input

Pressing the button increases the set value.
Pressing the button decreases the set value.
Press the "SET" button to save the set value and select the output OUT1(2) set value input mode.
The set value of P2 is displayed.



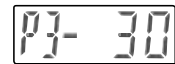
3. OUT1(2) set value input

Pressing the button increases the set value.
Pressing the button decreases the set value.
Press the "SET" button to save the set value and select the output OUT1(1) set value input mode.
The set value of P3 is displayed.



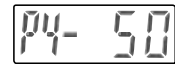
4. OUT2(1) set value input

Pressing the button increases the set value.
Pressing the button decreases the set value.
Press the "SET" button to save the set value and select the output OUT2(2) set value input mode.
The set value of P4 is displayed.



5. OUT2(2) set value input

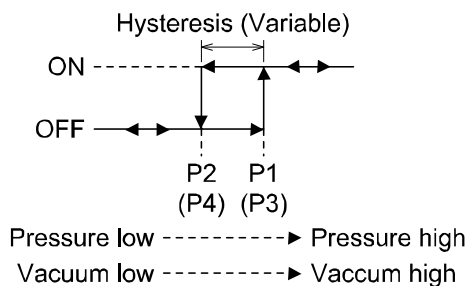
Pressing the button increases the set value.
Pressing the button decreases the set value.
Press the "SET" button to save the set value and exit this mode.



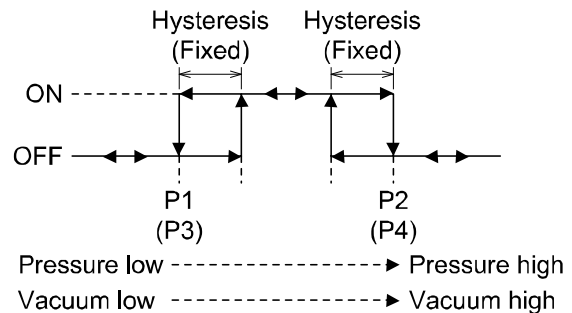
*: P1: Set value for OUT1(1)
P2: Set value for OUT1(2)
P3: Set value for OUT2(1)
P4: Set value for OUT2(2)

○ Output method

● Hysteresis mode ($P1 \geq P2$, $P3 \geq P4$)



● Window comparator mode ($P1 < P2$, $P3 < P4$) (Hysteresis = 3 digits fixed)



*: ● Hysteresis mode (same as for positive pressure use) When the value of hysteresis is set to 2 digits or less, the switching output might chatter due to fluctuation of the input pressure around its set point.
● Window comparator mode (same as for positive pressure use) since the hysteresis will be 3 digits, separate P1 from P2 (in case of 2-output type, same as for P3 and P4) by 7 digits or more.
*: 1 digit is the minimum pressure display unit.

■ 1-output type with the failure predictive function

1. Set value input mode

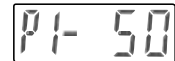
Press the "SET" button to display "P1-50" *1.
The output OUT1(1) set value input mode is selected.



*1: If the set value of P1 is -50)

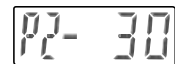
2. OUT1(1) set value input

Pressing the button increases the set value.
Pressing the button decreases the set value.
Press the "SET" button to save the set value and select the output OUT1(2) set value input mode.
The set value of P2 is displayed.



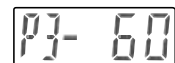
3. OUT1(2) set value input

Pressing the button increases the set value.
Pressing the button decreases the set value.
Press the "SET" button to save the set value and select the failure predictive pressure set value input mode.
The failure predictive set value is displayed.



4. Failure predictive pressure set value input

Pressing the button increases the set value.
Pressing the button decreases the set value.
Press the "SET" button to save the set value and select the failure predictive count set value input mode.
The failure predictive count set value is displayed.



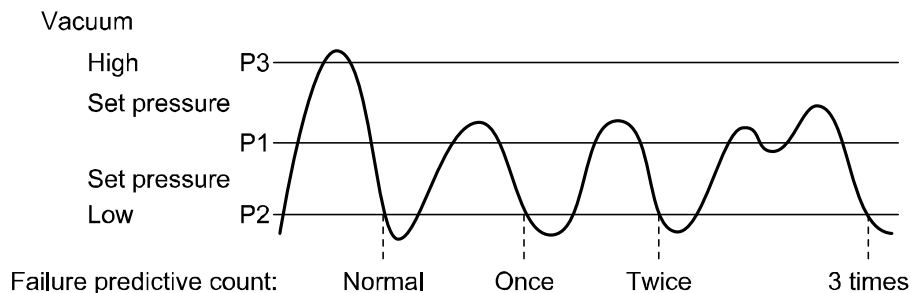
5. Failure predictive count set value input

Pressing the button increases the set value.
Pressing the button decreases the set value.
Press the "SET" button to save the set value and exit this mode.



*: P1: Set value for OUT1(1)
P2: Set value for OUT1(2)
P3: Set value for failure predictive pressure
EC: Set value for failure predictive count



○ Failure predictive function




The failure predictive detection counter is incremented when the switch is turned on then is turned off, without the pressure (exceeding P1) not reaching the failure predictive pressure (P3).
The failure predictive detection output is energized when the set failure predictive counter (EC) is incremented consecutively. When the switch is turned ON and the pressure (exceeding P1) exceeds the failure predictive pressure (P3), the failure predictive counter is reset.
(This example shows a case in the hysteresis mode.)



Other Settings

○Peak hold mode

Pressing the  button when pressure is displayed enables the upper limit peak value (value with a high degree of vacuum) to be held. In this case, "H" is displayed on the LCD. To reset holding, press the  button again.



○Bottom hold mode

Pressing the  button when pressure is displayed enables the lower limit peak value (value with low vacuum) to be held. In this case "d" is displayed on the LCD. To return holding, press the  button again.



○Bottom hold mode

Pressing the RESET button causes the following



1. Measurement mode

- Zero clear
- Clearing the peak hold mode or bottom hold mode
- Clearing the failure predictive function internal counter
- Resetting the failure predictive output

2. Upon error occurrence

- The data set in the setting mode is retained as is and the state when the power supply was turned on is restored (System reset is triggered).
- In case of a data error, the setting mode is selected. When you finish setting, the state when the power supply was turned on is restored (System reset is triggered).

*: In the set value input mode, the reset function does not work.

Maintenance

How to reset the product for power cut or forcible de-energizing

The setting of the product is remained as that before power cut or de-energizing.

The output condition is also basically recovered to that before power cut or de-energizing, but may change depending on the operating environment. Therefore, check the safety of whole facility before operating the product.

If the facility is under accurate control, wait until it has warmed up. (Approximate 10 minutes)

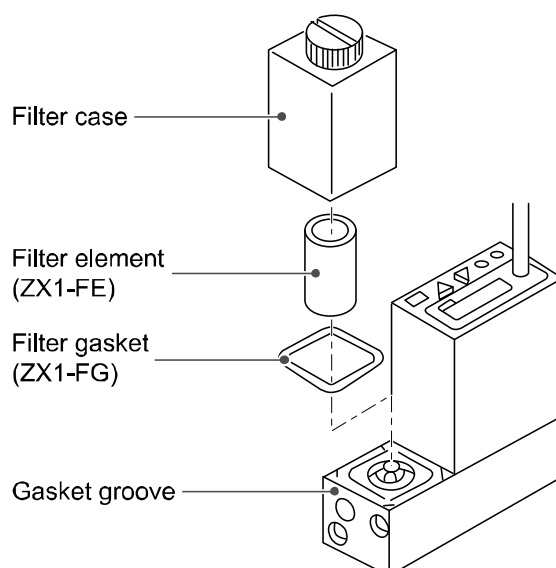
○Replacement of elements

If element clogging causes deterioration of the adsorption force or slows the response time, stop operation and replace the element.

Filter element part no.: ZX1-FE

Confirm that a filter gasket is seated in the groove before reassembling the parts.

Filter gasket part no.: ZX1-FG



○Filter cases

- The case is made of polycarbonate. Therefore, do not use it in an environment that is exposed to chemicals such as thinner, carbon tetrachloride, chloroform, acetic ester, aniline, cyclohexane, trichloroethylene, sulfuric acid, lactic acid, or water-soluble cutting oil (alkalinic).

- Operate it away from direct sunlight.

○Connector wiring

●**Crimping of lead wire and socket**

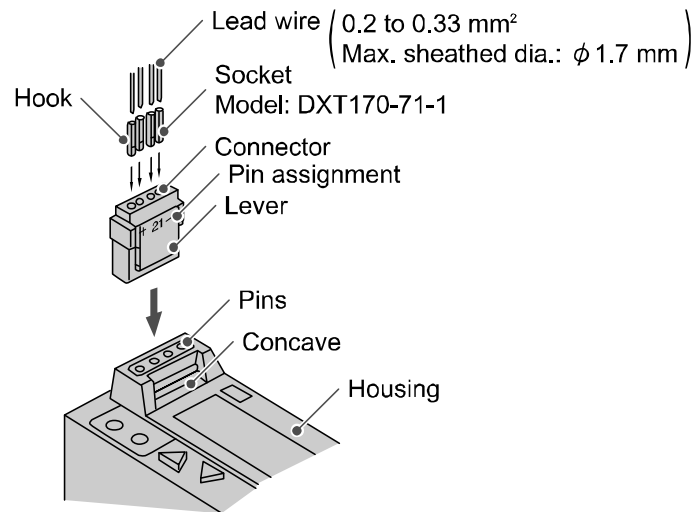
Strip 3.2 to 3.7 mm at the tip of the lead wire and enter the core wires neatly into a socket and crimp with a crimping tool. In this case, be sure that the cover of the lead wire does not enter the core wire crimping area (Crimping tool: Model DXT170-75-1).

●**Attachment of socket with lead wire**

Insert a socket into a square hole in the connector (+, 1, 2, – indication provided). Holding by the lead wire, push it all the way in until the hook on the socket catches and locks in the seat of the connector. (When the lead wire is pushed in, the hook widens and locks it automatically.) Then pull the lead wire gently to confirm that it is locked.

●**Removal of socket with lead wire**

To remove a socket from the connector, pull the lead wire out while pushing in the socket's hook using a bar with a thin end (approximately 1 mm). If the socket is to be reused, widen the hook outward.



Troubleshooting

○ Cross-reference for troubleshooting

Reference No.	Problem	Possible cause	Investigation method	Countermeasure
1	<ul style="list-style-type: none"> •Output remains on. LED remains on. •Output remains off. LED remains off. 	Wrong pressure setting	(1) Check the set pressure.	(1) Reset the pressure setting.
		Product failure		Replace the product.
2	Output remains on. LED works correctly.	Incorrect wiring	Check the wiring of the output line. Check if the load is connected directly to DC(+) or DC(-).	Correct the wiring.
		Product failure		Replace the product.
3	Output remains off. LED works correctly.	Incorrect wiring	Check the wiring of the output line. Check if the load is connected directly to DC(+) or DC(-).	Correct the wiring.
		Lead wire breakage	Check if there is bending stress applied to any parts of the lead wire. (Bending radius and tensile force applied to the lead wire)	Correct the wiring conditions. (Adjust the tensile force and widen the bending radius.)
		Product failure		Replace the product.
4	Switch output generates chattering.	Incorrect wiring	Check the wiring. Check if the brown and blue wires are connected to DC(+) and DC(-) respectively, and if the output line is about to come off (contact failure).	Correct the wiring.
		Wrong setting	(1) Check the set pressure. (2) Check if the hysteresis range is too narrow.	(1) Reset the pressure setting. (2) Widen the hysteresis.
		Product failure		Replace the product.
5	Slow switch output response	Incorrect pressure setting	Check the pressure setting. Check if the detected pressure and the set pressure value have the same value or are too close.	Reset the pressure setting. Set up the pressure setting value so it is not too close to the detected pressure value.
6	Analog output is not provided. (Specified accuracy is not satisfied.)	Incorrect wiring	Check if the analog output line is connected with a load.	Correct the wiring.
		Non-compliance with the load spec.	(1) Check if the proper load is connected. (2) Check if input impedance of input equipment (A/D transformer) is proper.	Connect a proper load.
		Insufficient warm-up	Check if the product satisfies the specified accuracy in 10 minutes after supplying power.	After energizing, indication and output can drift. For detecting fine pressure, warm up the product for 10 to 15 minutes.
		Product failure		Replace the product.

Reference No.	Problem	Possible cause	Investigation method	Countermeasure
7	<ul style="list-style-type: none"> •An over current error (E2, CE1, 2) is indicated. •System error (Er, 1dE) is indicated. •The display shows "E3 PE". •Residual pressure error (E4 HP) is indicated. 	Over current to the output (E2, CE1, 2)	(1) Check if a current of 80mA or more is flowing to the output. (2) Check if the connected load satisfies the specifications, and if the load is shorted. (3) Check if a relay without a surge voltage suppressor is connected. (4) Check if the wiring is in the same route as (or bundled together with) a high-voltage line or the power line.	(1), (2) Connect the load as specified. (3) Use a relay with a surge voltage suppressor or take a measure to prevent noise. (4) Separate the wiring from the high-voltage line and/or power line.
		Improper transaction of the internal data of the Pressure switch (Er, 1dE)	(1) Check if there is noise interference such as static electricity. Check if there is a noise source (2) Check if the power supply voltage is in the range of 12 to 24 VDC $\pm 10\%$.	(1), (2) Press the RESET button and set all data again.
		Applied pressure is over the upper limit (E3 PE).	(1) Check if the pressure is supplied 0.5 MPa or more (Positive pressure type is 0.98 MPa) (2) Check if foreign matter got into the piping.	(1) Bring the pressure back within the set pressure range. (2) Take measures to prevent foreign matter from getting into the piping.
		Pressure is not atmospheric pressure at zero clear operation (E4 HP)	Check if the pressure over $\pm 7\%$ F.S. of the atmospheric pressure is applied.	Return the applied pressure to atmospheric pressure, and retry the zero clear operation.
		Product failure		Replace the product.
8	Indicated values fluctuate.	Incorrect power supply	Check if the power supply voltage is within the range of 12 to 24 VDC $\pm 10\%$.	Supply power supply voltage of 12 to 24 VDC $\pm 10\%$.
		Incorrect wiring	Check the wiring to the power supply. Check if the brown and blue wires are connected to DC(+) and DC(-) respectively and if the output line is about to come off (contact failure).	Correct the wiring.
		Factory pressure change	Check if the factory pressure is changed.	If the fluctuation is not acceptable, the number of digit can be changed by the setting of the resolution of display.

Reference No.	Problem	Possible cause	Investigation method	Countermeasure
9	<ul style="list-style-type: none"> Indicator turns off. A part of the indication misses. 	Incorrect power supply	Check if the power supply voltage is within the range of 12 to 24 VDC $\pm 10\%$.	Supply power supply voltage of 12 to 24 VDC $\pm 10\%$.
		Incorrect wiring	Check the power supply wiring. Check if the brown and blue wires are connected to DC(+) and DC(-) respectively and if the output line is about to come off (contact failure).	Correct the wiring.
		Product failure		Replace the product.
10	The pressure indication accuracy does not satisfy the specifications.	Foreign matter	Check if foreign matter has entered the pressure port.	Install a 5 μm filter to prevent foreign matter from getting into the pressure port. Also, clean the filter regularly to prevent drainage deposits.
		Air and liquid leakage	Check if air and liquid are leaking from the piping.	Rework the piping. If excessive tightening torque over the specified range is applied, a mounting screw, mounting bracket, and product may be broken.
		Insufficient warm-up	Check if the product satisfies the specified accuracy 10 minutes after supplying power.	After energizing, indication and output can drift. For detecting fine pressure, warm up the product for 10 to 15 minutes.
		Product failure		Replace the product.
11	Noisy.	Air and liquid leakage	Check if air liquid are leaking from the piping.	Rework the piping. If excessive tightening torque over the specified range is applied, a mounting screw, mounting bracket, and product may be broken.
		Product failure		Replace the product.

○Error indication function

This function is to display error location and content when a problem or an error occurs.

Error Display	Error Type	Troubleshooting Method
E1 dE	The set data has been changed under some influences.	Press the RESET button and set all data again.
E2 CE1	Load of OUT1 has short-circuited and overcurrent is flowing.	Turn off the power supply and replace the load connected to the OUT1 (black wire).
E2 CE2	Load of OUT2 has short-circuited and overcurrent is flowing.	Turn off the power supply and replace the load connected to the OUT2 (white wire).
E3 PE	Pressure exceeding 0.5 MPa has been applied. (In case of positive pressure, pressure exceeding the rated pressure has been applied.)	Lower the pressure to 0.5 MPa or less. (In case of positive pressure, lower the pressure to the rated pressure or less.)
E4 HP	Compared with the ambient pressure, -0.07 MPa (in case of 1 MPa use) or -7 kPa or more (in case of vacuum use or 100 kPa use) has been applied during zero clear.	After adjusting the pressure to the ambient pressure, perform RESET operation.

If the error can not be reset after the above measures are taken, then please contact SMC.

Specification

■ Specifications

Model No.	ZSE3 (Vacuum)	ISE3L (Positive pressure 100 kPa)	ISE3 (Positive pressure 1 MPa)
Rated pressure range	0 to -101 kPa	0 to 98 kPa	0 to 0.98 MPa
Min. display unit	1 kPa		0.01 MPa
Applicable fluid	Air, inert gases and incombustible gases		
Max. operating pressure	200 kPa ^{*1}		1 MPa
Power supply voltage	12 to 24 VDC $\pm 10\%$, ripple (P-P) 10% or less (Protected against inverse connection)		
Current consumption	25 mA or less		
Switch output	NPN open collector output		
Max. load current	80 mA		
	Max. applied voltage		
	30 VDC		
Response time			5 msec
Repeatability	$\pm 1\%$ F.S.		
Hysteresis ^{*4-2}	Hysteresis mode		
	Variable (0 digits or more)		
Window comparator mode	Fixed (3 digits)		
	Analog output ^{*2-3}		
Voltage output: 1 to 5 V $\pm 5\%$			Output impedance: Approx. 1 k Ω
Display method	3 1/2 digits LCD (character height 5 mm)		
Indicator light ^{*3-4}	Light when ON OUT1: Green OUT2: Red		
Self-diagnosis function	Detection of overcurrent, overpressure, data error and pressure during zero clear		
Error indication	Indicator: Red flashing, Error code is displayed LCD		
Environmental	Enclosure		
	IP40		
	Ambient temperature range		
	0 to 60 °C (No condensation or freezing)		
Withstand voltage			1000 VAC, 50/60 Hz, 1 minute, Between the external terminal and the case
Insulation resistance			2 M Ω (at 500 VDC) Between the external terminal and the case
Temperature characteristic	$\pm 3\%$ F.S.		
Port size	R1/8: M5x0.8 NPTF1/8: M5x0.8 With suction filter : M5x0.8 (M6x1 (made to order))	R1/8: M5x0.8 NPTF1/8 : M5x0.8	
Lead wire	Connector type		
	Heat-resistant vinyl electric wire, 4-wire, Cross section: 0.31 mm ² , Insulator O.D.: 1.55 mm		
Grommet type			Oil-resistant vinyl cable code
-21, -23: 4 cores, $\phi 3.5$, Cross section: 0.14 mm ² , Insulator O.D.: 1.0 mm			-22, -24: 5 cores, $\phi 3.5$, Cross section: 0.15 mm ² , Insulator O.D.: 1.0 mm
Standard	CE, RoHS		
Weight	40 g(including lead wire 0.6 m)		

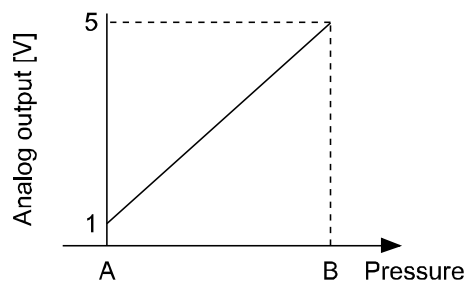
*1: When vacuum is used, there is no influence on the switch even if 0.5 MPa of pressure is supplied instantaneously.

*2: Window comparator mode: Since the hysteresis is 3 digits, P1 should be separated from P2 by 7 digits or more.
1 digit is the minimum pressure display unit. (See the table above)

*3: Only for the pressure switch with analog output selected.

*4: In case of ZSE3-□-23 or 24, failure predictive output: Red.

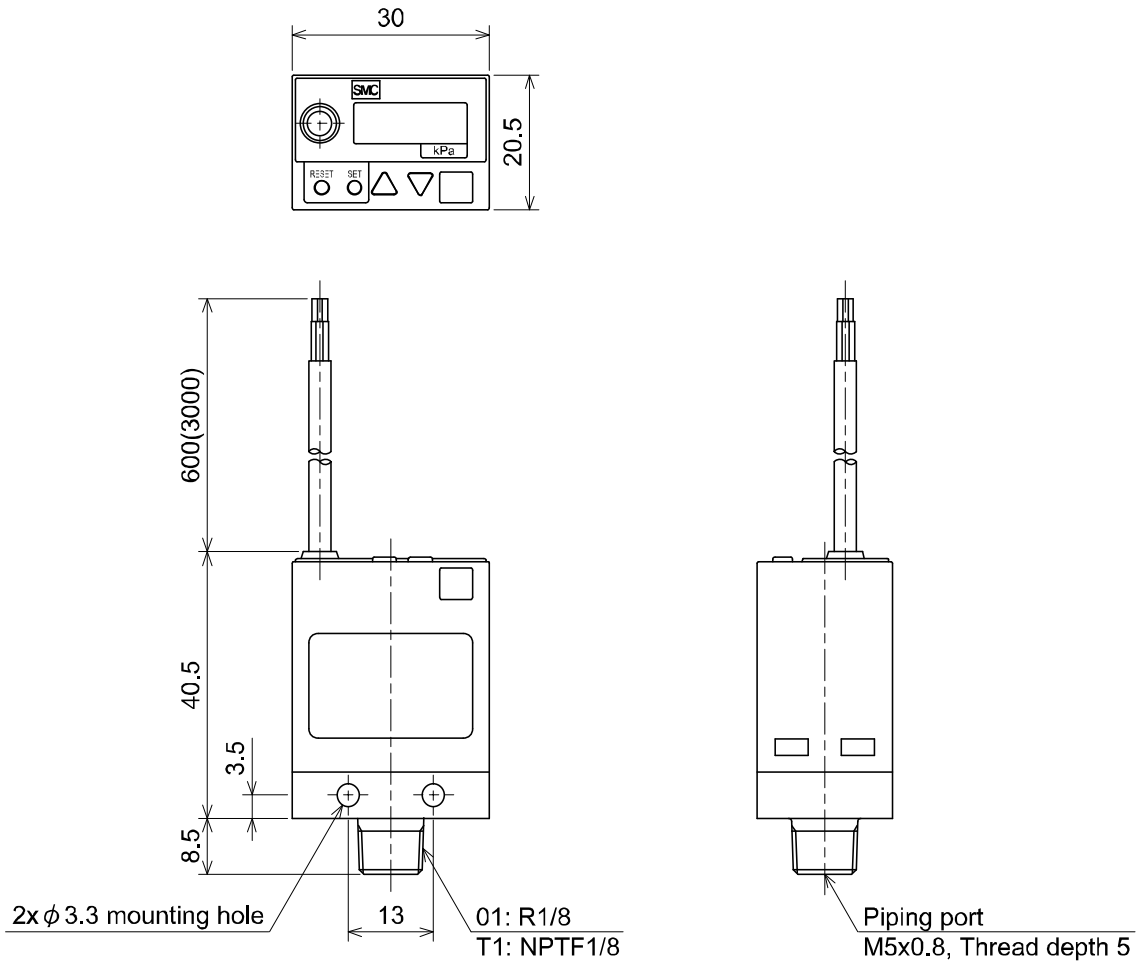
○Analog output



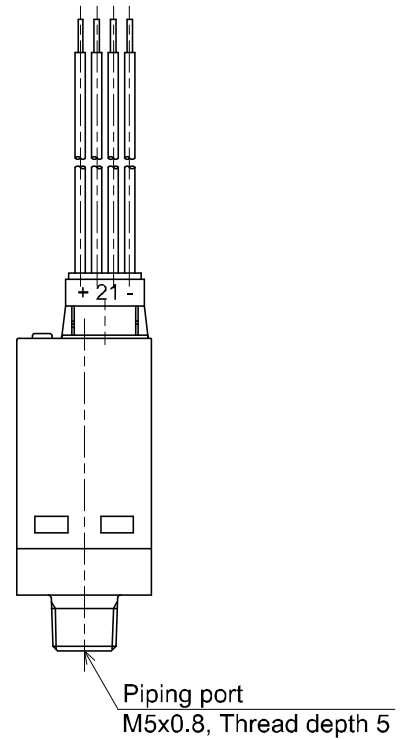
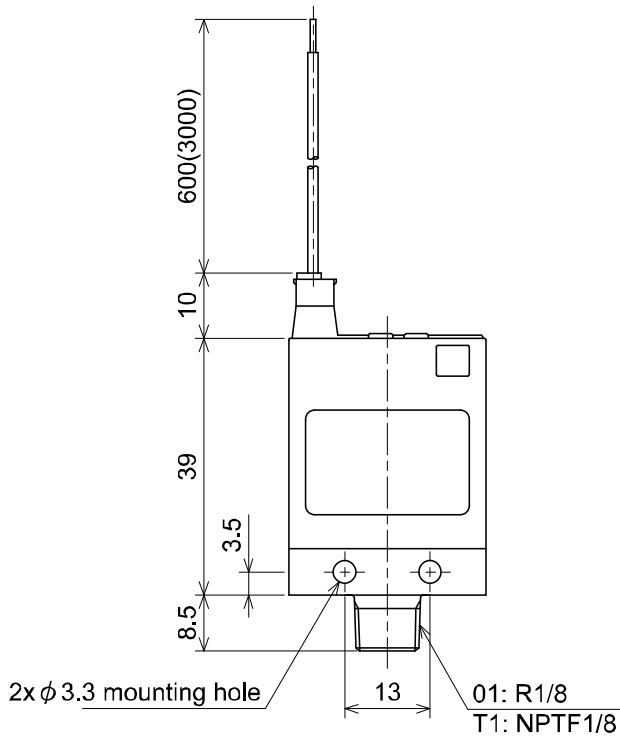
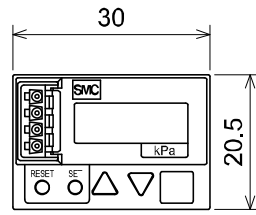
Model No.	Rated pressure range	A	B
ZSE3	0 to -101 kPa	0	-101 kPa
ISE3L	0 to 98 kPa	0	98 kPa
ISE3	0 to 0.98 MPa	0	0.98 MPa

■ Dimensions

- Grommet type
Z/ISE3-01/T1-*

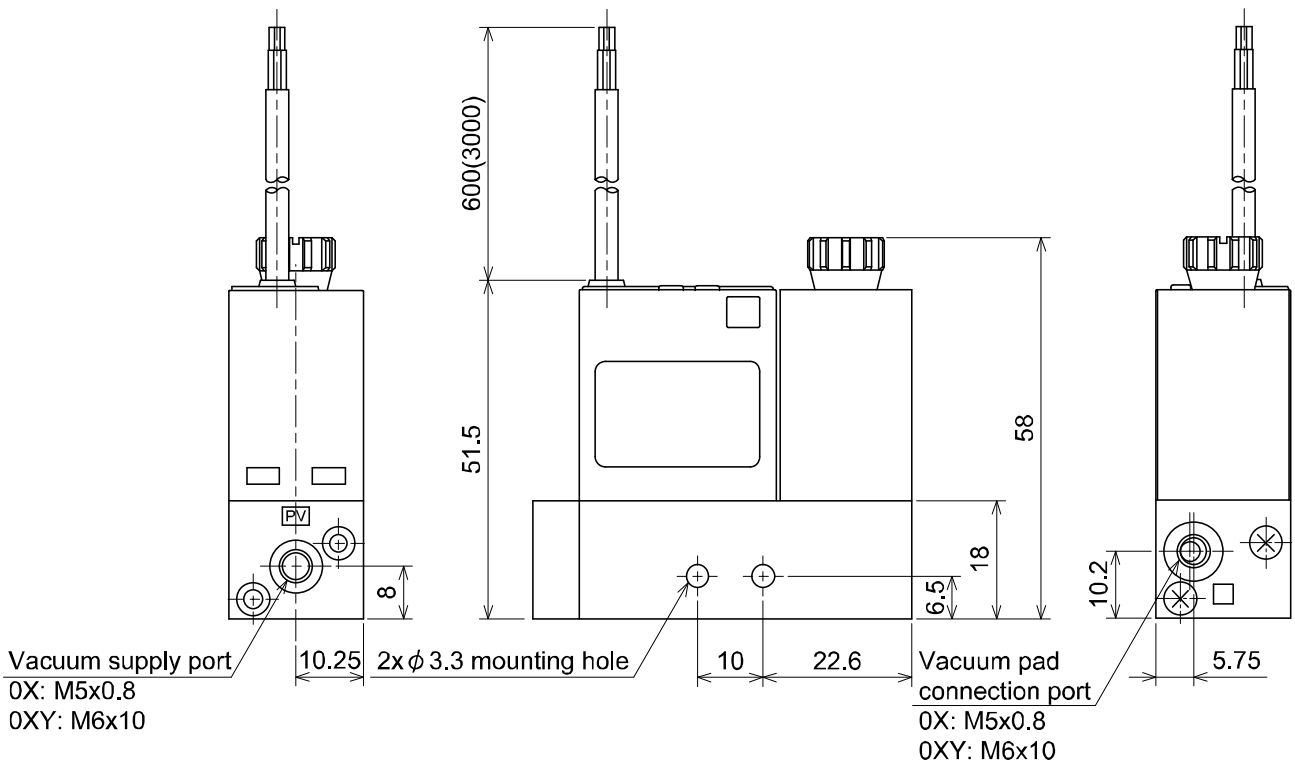
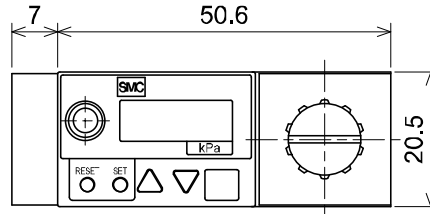


- Connector type
Z/ISE3-01/T1-*C

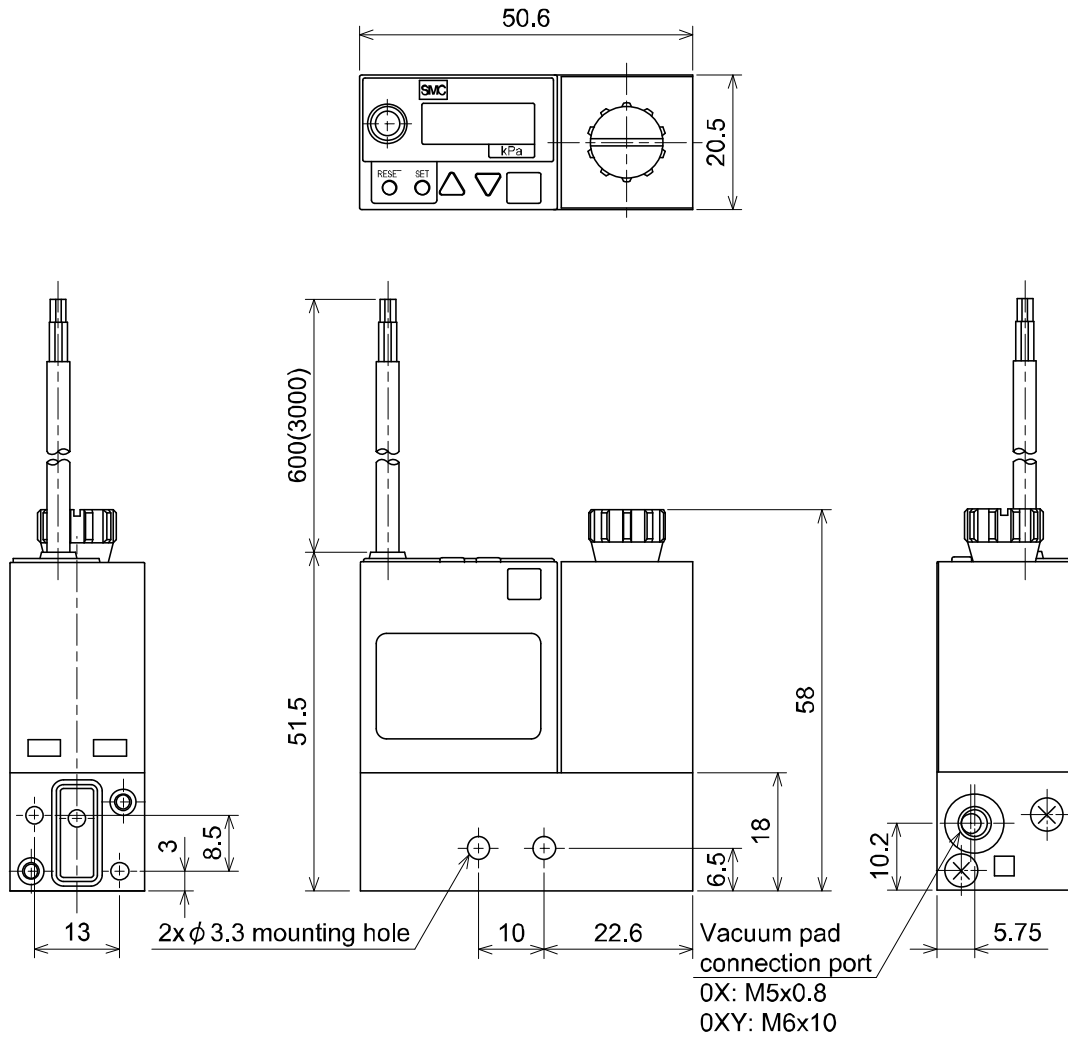


○ Single-installation type

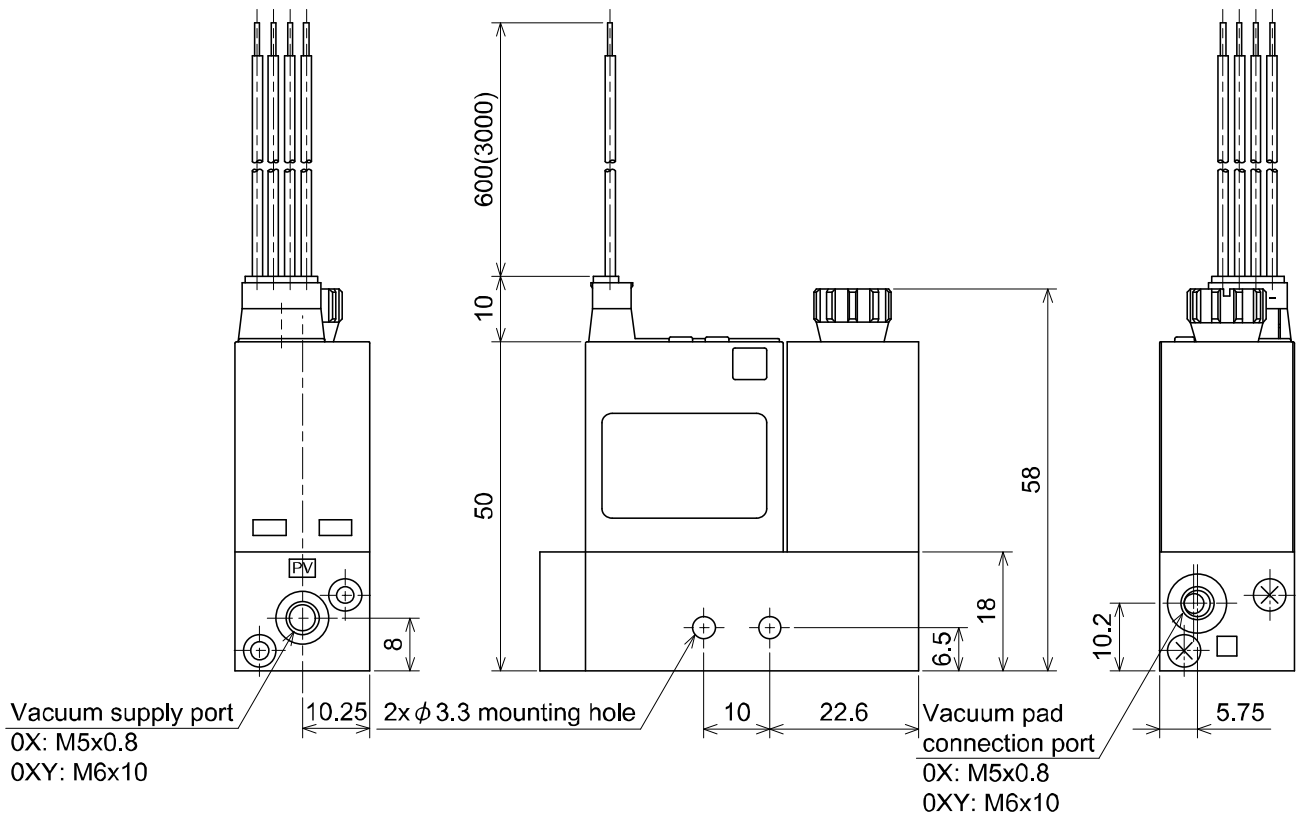
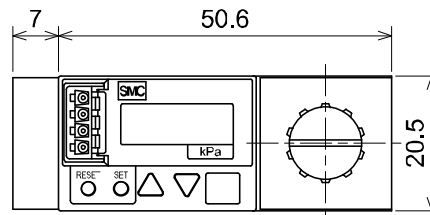
● Grommet type
ZSE3-0X*-*



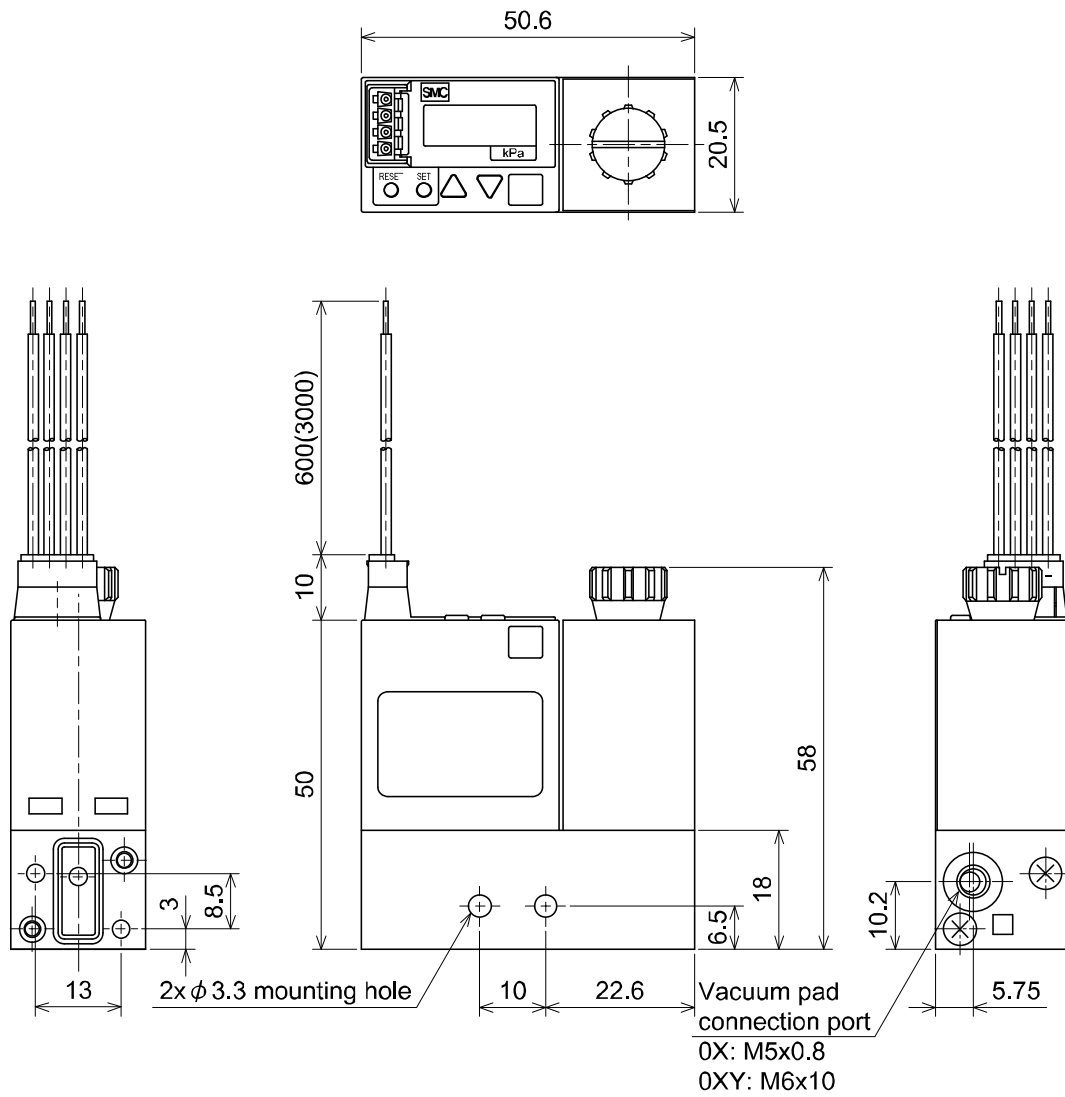
ZSE3-0X*-*-D



•Connector type
ZSE3-0X*-*C



ZSE3-0X*-*C-D



Revision history

A: Limited warranty and Disclaimer and measurement laws are added.

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.
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