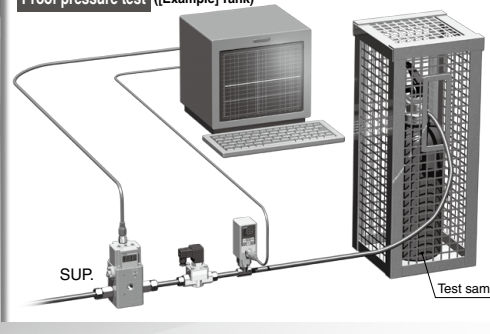
3.0 MPa Maximum Supply Pressure High Pressure Electro-Pneumatic Regulator

ITVH Series

Maximum supply pressure	3.0 MPa
Set pressure range	0.2 to 2.0 MPa Stepless control of air pressure up to 2.0 MPa
Stability	±1% F.S.* or less * The value is confined to the static state. Pressure may fluctuate when air is consumed at the output side.

Proof pressure test ([Example] Tank)

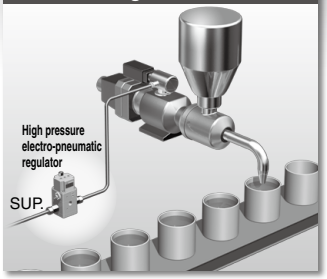


Power consumption	3 W or less
Maximum flow rate	3000 L/min (ANR)* * Supply pressure: 3.0 MPa, Set pressure: 1.0 MPa
Parts in contact with fluid	Fluorine grease
Pipe thread type	Rc, NPT, G
Weight	Approx. 630 g* * Without options
Digital pressure display	

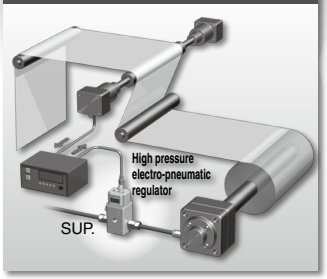
Linearity	±1% F.S. or less
Hysteresis	1% F.S. or less
Repeatability	±1% F.S. or less

Application Examples

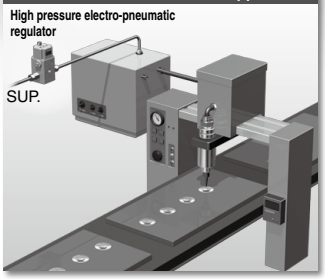
Discharge rate control



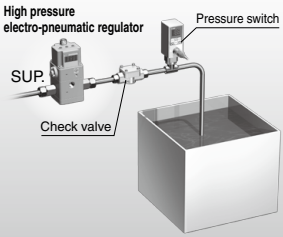
Tension control



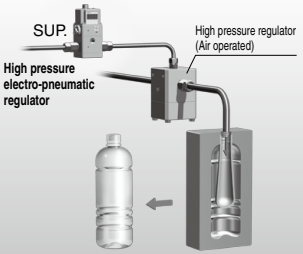
Pressure control for adhesive application



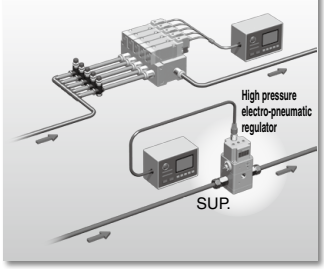
Leak tester



PET bottle molding machine (for remote control of high pressure regulator)



Multi-stage control to analog control



3.0 MPa Maximum Supply Pressure
High Pressure Electro-Pneumatic Regulator
ITVH2000 Series

How to Order

ITVH2020-01□2□S□

Set pressure range

2	0.2 to 2.0 MPa

Power supply voltage

0	24 VDC

Input signal

0	Current type 4 to 20 mA DC
1	Current type 0 to 20 mA DC
2	Voltage type 0 to 5 VDC
3	Voltage type 0 to 10 VDC
40	4 points preset input type

Monitor output

Nil	None (Preset input only)
1	Analog output 1 to 5 VDC
2	Switch output/NPN output
3	Switch output/PNP output
4	Analog output 4 to 20 mA DC (Sink type)

Pipe thread type

Nil	Rc
N	NPT
F	G Note)

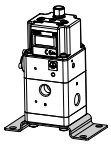
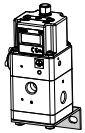
Note) Complies with ISO1179-1 (2007).

Port size

2	1/4
3	3/8

Note) EXH port: 1/4
Built-in regulator EXH port: M5
Solenoid valve EXH port: M5

Bracket*

Nil	Without bracket
B	Flat bracket 
C	L-bracket 

* Bracket is included.

Pressure display unit

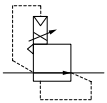
Nil	MPa
2 Note)	kgf/cm²
3	bar
4 Note)	psi

Note) Under Japan's new Measurement Act, this is only for overseas sales (SI units are to be used inside Japan).

Cable connector type

S	Straight type 3 m 
L	Right angle type 3 m 
N	Without cable connector

Symbol



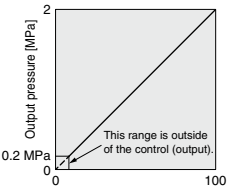


Fig. 1. Input/output characteristics chart

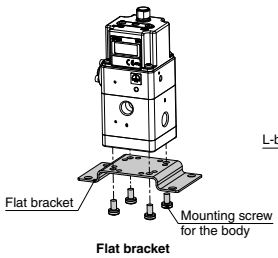
Standard Specifications

Model		ITVH2000
Minimum supply pressure		Whichever is higher: 0.5 MPa or the set pressure + 0.2 MPa
Maximum supply pressure		3.0 MPa
Set pressure range Note 1)		0.2 to 2.0 MPa
Power supply	**Voltage**	24 VDC ±10%
	Current consumption	0.12 A or less
Input signal	**Current type** Note 2)	4 to 20 mA DC, 0 to 20 mA DC (Sink type)
	Voltage type	0 to 5 VDC, 0 to 10 VDC
	Preset input type	4 points (Negative common)
Input impedance	**Current type**	500 Ω or less
	Voltage type	6.0 to 6.5 kΩ (at 25°C)
	Preset input type	Approx. 4.7 kΩ
Output signal (Monitor output) Note 3)	**Analog output**	1 to 5 VDC Output impedance: 1 kΩ or more Output accuracy: ±6% F.S. or less
		4 to 20 mA (Sink type) Output impedance: 250 Ω or less Output accuracy: ±6% F.S. or less
	Switch output	NPN open collector output: Max. 30 V, 80 mA Hysteresis: ±3% F.S. Self-diagnosis: ±5% F.S. or less
		PNP open collector output: Max. 80 mA Hysteresis: ±3% F.S. Self-diagnosis: ±5% F.S. or less
Linearity		±1% F.S. or less
Hysteresis		1% F.S. or less
Repeatability		±1% F.S. or less
Sensitivity		±1% F.S. or less
Temperature characteristics		±0.12% F.S. or less/°C
Output pressure display	**Accuracy**	±2% F.S. or less ±1 digit
	Minimum unit Note 4)	MPa: 0.01, kgf/cm²: 0.1, bar: 0.1, psi: 1
Ambient and fluid temperature		0 to 50°C (No condensation)
Weight		Approx. 630 g (without options)

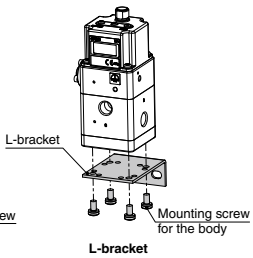
Note 1) Refer to Figure 1 for the relationship between set pressure and input signal.
Note 2) 2-wire type 4 to 20 mA is not available. Power supply voltage 24 VDC is required.
Note 3) Select either analog output or switch output. Further, when switch output is selected, select either NPN output or PNP output. When measuring analog output of 1 to 5 VDC with a load impedance less than 100 kΩ, the analog output may not obtain the output accuracy of ±6% F.S. or less.
Note 4) Adjustment of numerical values such as the zero/span adjustment is set based on the minimum units for output pressure display. Note that the unit cannot be changed.
Note 5) The above characteristics are confined to the static state. When air is consumed on the output side, the pressure may fluctuate.
Note 6) This product is not certified by Japan's High Pressure Gas Safety Act.

Accessories (Option)/Part No.

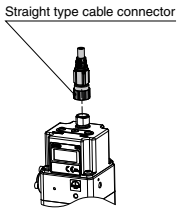
Description		Part no.
Flat bracket assembly (including mounting screws)		P398020-600
L-bracket assembly (including mounting screws)		P398020-601
Power cable connector	Straight type 3 m	P398020-500-3
	Right angle type 3 m	P398020-501-3



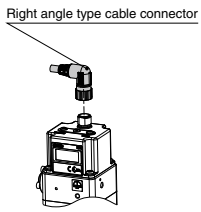
Flat bracket



L-bracket



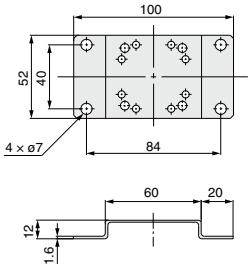
Straight type cable connector



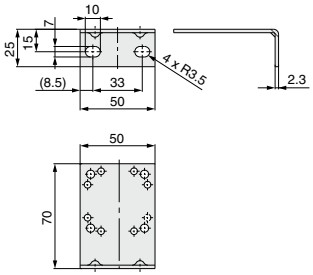
Right angle type cable connector

Dimensions

Flat bracket



L-bracket



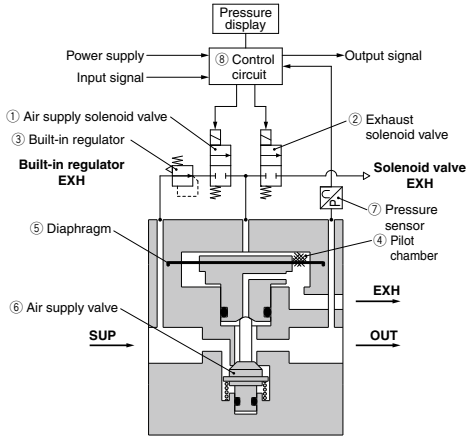
Working Principle

When the input signal rises, the **air supply solenoid valve** ① turns ON, and the **exhaust solenoid valve** ② turns OFF. Therefore, supply pressure regulated by a **built-in regulator** ③ passes through the **air supply solenoid valve** ① and is applied to the **pilot chamber** ④. The pressure in the **pilot chamber** ④ increases and operates on the upper surface of the **diaphragm** ⑤.

As a result, the **air supply valve** ⑥ linked to the **diaphragm** ⑤ opens, and a portion of the supply pressure becomes output pressure.

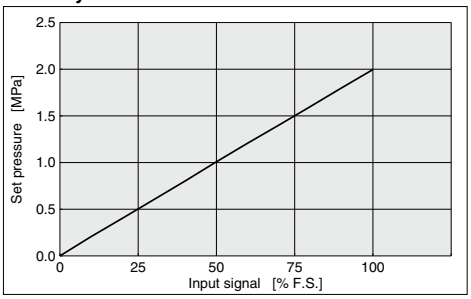
This output pressure feeds back to the **control circuit** ⑧ via the **pressure sensor** ⑦. Here, a correct operation functions until the output pressure is proportional to the input signal, making it possible to always obtain output pressure proportional to the input signal.

Working Principle Diagram

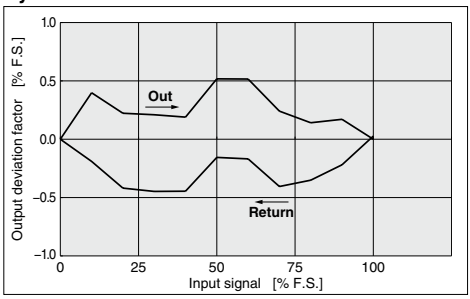


ITVH2000 Series

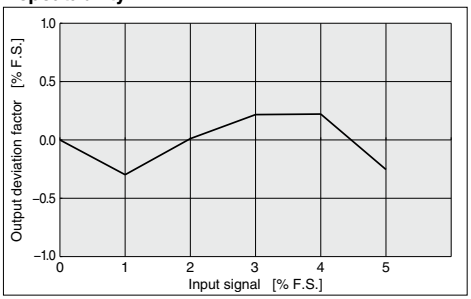
Linearity



Hysteresis

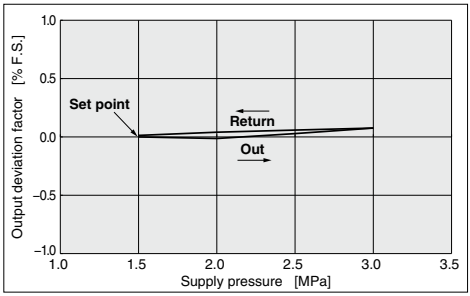


Repeatability



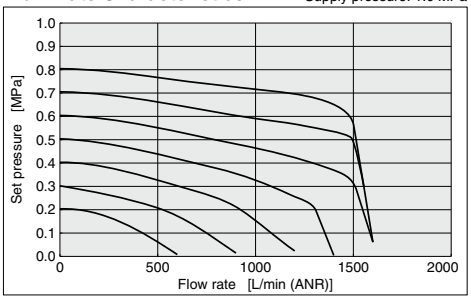
Pressure Characteristics

Set pressure: 1.0 MPa



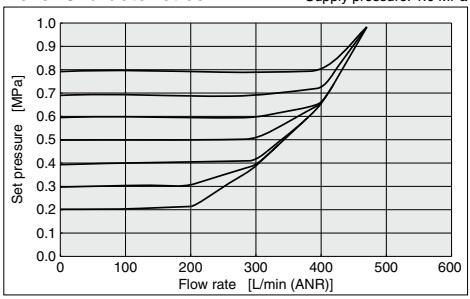
Flow Rate Characteristics

Supply pressure: 1.0 MPa

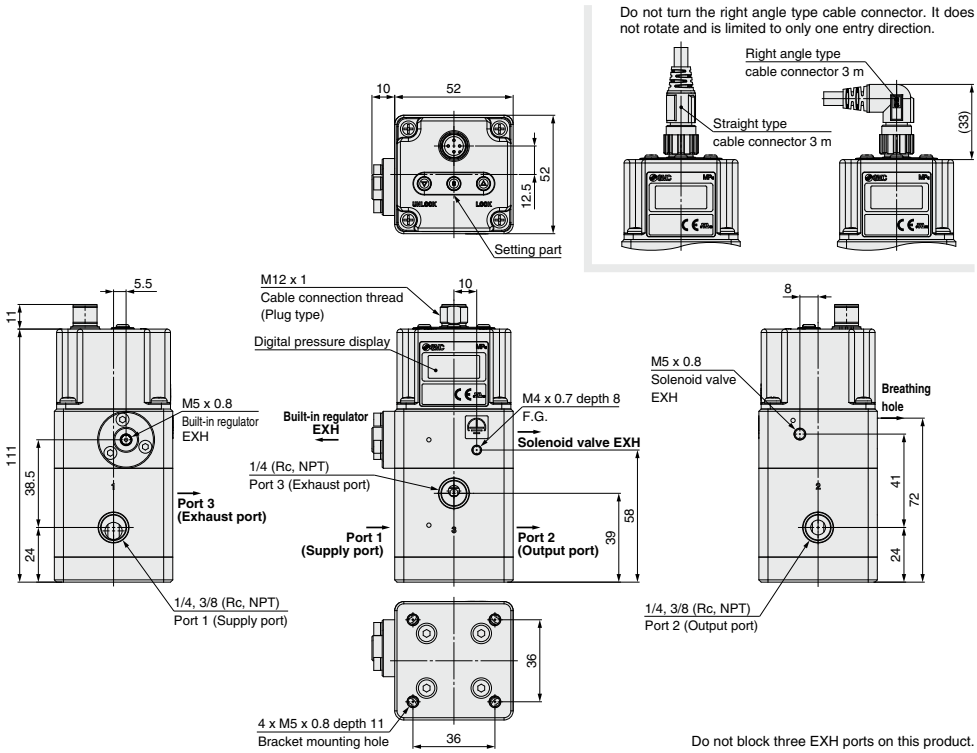


Relief Characteristics

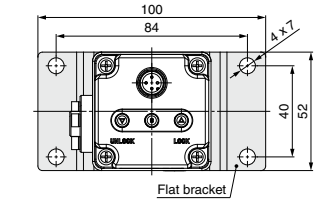
Supply pressure: 1.0 MPa



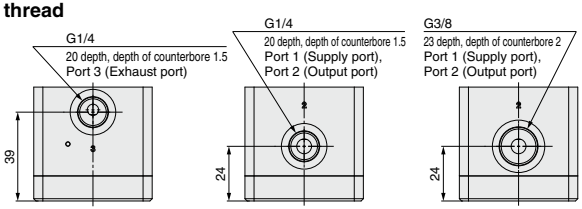
Dimensions

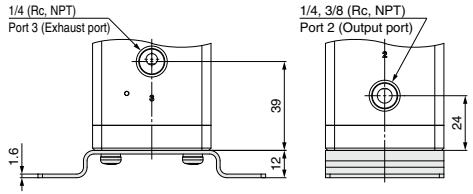


With flat bracket

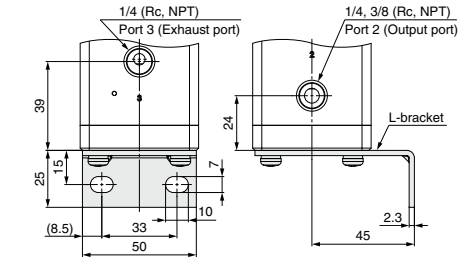


G thread





With L-bracket



Specific Product Precautions 1

Be sure to read this before handling the products. Refer to back page 50 for Safety Instructions and pages 387 to 391 for F.R.L. Precautions.

Piping

⚠ Warning

1. Screw piping together with the recommended proper torque while holding the side with the female threads.

Looseness or faulty sealing will occur if tightening torque is insufficient, while thread damage will result if the torque is excessive. Furthermore, if the side with the female threads is not held while tightening, excessive force will be applied directly to piping brackets etc., causing damage or other problems.

Connection thread	Recommended proper torque [N·m]
M5	1.5 to 2
1/4	8 to 12
3/8	15 to 20

2. Do not allow twisting or bending moment to be applied other than the weight of the equipment.

Provide separate support for external piping, as damage may otherwise occur.

3. Since excessive moment loads and the propagation of vibrations, etc. can easily result from inflexible piping made of materials such as steel, avoid these problems by using flexible tubing for intermediate connections.

4. Piping port indication

When connecting piping to a product, refer to the Operation Manual to avoid mistakes regarding the port.
Port 1: Supply port
Port 2: Output port
Port 3: Exhaust port

5. Exhaust port

Do not reduce the diameter of port 3 (the exhaust port), EXH port of solenoid valve, or EXH port of built-in regulator too much or block it. It will lead to an operation failure.

⚠ Caution

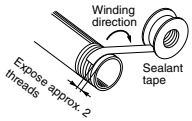
1. Preparation before piping

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.

2. Winding of sealant 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 sealant tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.



Operating Environment

⚠ Warning

1. Do not operate in locations having an atmosphere of corrosive gases, chemicals, sea water, or where there will be contact with the same.

⚠ Caution

1. In locations where the body is exposed to water, steam, dust, etc., there is a possibility that moisture or dust could enter the body through the EXH port, solenoid valve EXH port and/or built-in regulator EXH port, thereby causing problems.

2. Do not operate in locations where vibration or impact occurs.

3. In locations which receive direct sunlight, provide a protective cover etc.

4. In locations near heat sources, block off any radiated heat.

5. Employ suitable protective measures in locations where there is contact with water droplets, oil or welding spatter, etc.

Fluid Supply

⚠ Warning

1. Compressed air or nitrogen can be used as a fluid.

2. Do not use compressed air which includes chemicals, synthetic oils containing organic solvents, salt, or corrosive gases, etc., as this can cause damage or malfunction.

⚠ Caution

1. This product does not have a filtering function. Install an air filter on the supply side close to the product. Select an air filter with a filtration degree of 5 μm or finer.

2. Compressed air containing large amounts of drainage can cause a malfunction of this product and other pneumatic equipment. As a countermeasure, install an aftercooler, air dryer or water separator, etc.

3. If large amounts of carbon dust are generated by the compressor, it can accumulate inside this product and cause a malfunction (air leakage etc.).

For details on the above compressed air quality, refer to "Air Preparation Equipment Model Selection Guide" on pages 2 and 3.

ITVH2000 Series
Specific Product Precautions 2

Be sure to read this before handling the products. Refer to back page 50 for Safety Instructions and pages 387 to 391 for F.R.L. Precautions.

Handling

⚠ Caution

1. Do not use a lubricator on the supply side of this product, as this can cause a malfunction.

2. If electric power is shut off while pressure is being applied, pressure will be retained on the output side.

However, this output pressure is held only temporarily and is not guaranteed. If exhausting of this pressure is desired, shut off the power after reducing the set pressure, and discharge the air using a residual pressure exhaust valve etc.

3. If power to this product is cut off due to a power failure etc. when it is in a controlled state, output pressure will be retained temporarily. Handle carefully when operating with output pressure released to the atmosphere, as air will continue to flow out.

4. If supply pressure to this product is interrupted while the power is still on, the internal solenoid valve will continue to operate and a humming noise may be generated. Since the life of the product may be shortened, shut off the power supply also when supply pressure is shut off.

5. Do not block three EXH ports on this product.

6. This product does not have a shutoff valve function. If air pressure is supplied without electric power being applied, output pressure may increase to the pressure equivalent of the supply pressure. Due to product construction, a very small amount of air is discharged from the exhaust port when output pressure is generated. Operate the system to shut off the supply pressure when not operating the product.

7. The product is adjusted to each specification at the time of shipment from the factory. Do not perform unnecessary disassembly or removal of parts as it will cause failure.

8. The optional cable connector is a 4-core wire type. When the monitor output (analog output or switch output) is not being used, keep it from touching the other wires as this can cause a malfunction.

9. Do not turn the right angle type cable connector. It does not rotate and is limited to only one entry direction.

10. Take the following steps to avoid a malfunction due to noise.

1) Remove power supply noise during operation by installing a line filter etc. in the AC power line.

2) For avoiding the influence of noise or static electricity, install this product and its wiring as far as possible from strong electric fields such as those of motors and power lines, etc.

3) Be sure to implement protective measures against load surge for induction loads (solenoid valves, relays, etc.).

11. For details on the handling of this product, refer to the Operation Manual which is included with the product.

Design/Selection

⚠ Caution

1. The direct-current power supply to combine should be UL authorized power supply.

1) Limited voltage current circuit in accordance with UL508.
A circuit in which power is supplied by the secondary coil of a transformer that meets the following conditions.
- Maximum voltage (with no load):
  30 [Vrms] (42.4 [V peak]) or less
- Maximum current:
  1. 8 [A] or less (including when short circuited)
  2. Limited by circuit protector (such as fuse) with the following ratings

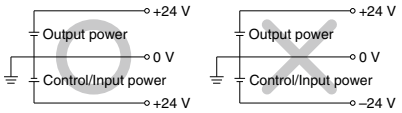
No load voltage [V peak]	Max. current rating [A]
0 to 20 [V]	5.0
Over 20 [V] to 30 [V]	$\frac{100}{\text{Peak voltage}}$

2) A circuit using max. 30 [Vrms] or less (42.4 [V peak]), which is powered by UL1310 or UL1585 compatible Class-2 power supply.

2. Operate these products only within the specified voltage.

Using voltages beyond the specified levels could cause faults or malfunctions.

3. Use 0 V as the baseline for the power supplied to this product for output, control and input.



4. Each product needs to be powered by one power supply unit.

The wiring of this product has the same common between the GND for power and the signals; there is a possibility that a wrong current occurs and prevents a proper operation if one power supply unit controls multiple electro-pneumatic regulators.

5. Please contact SMC for the usage when the downstream side is released to atmosphere.

This product is a pressure controller. The downstream side being released to atmosphere makes the inlet valve fully open, allowing a large amount of atmosphere flow into the body. Please contact SMC for the appropriate usage when you use the product under such condition since the product may not meet the specification or the life of the product may be shortened.

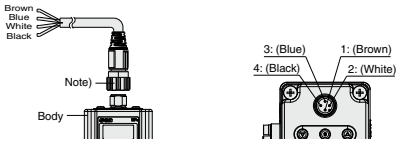
ITVH2000 Series
Specific Product Precautions 3

Be sure to read this before handling the products. Refer to back page 50 for Safety Instructions and pages 387 to 391 for F.R.L. Precautions.

Wiring

⚠ Caution

Connect the cable to the connector on the body with the wiring arranged as shown below. Proceed carefully, as incorrect wiring can cause damage.
Further, use DC power with sufficient capacity and a low ripple.



Note) The cable is also available in a right angle type.
A right angle type connector is attached facing left (toward the SUP port). Do not attempt to rotate, as the connector does not turn.

Current Signal Type
Voltage Signal Type

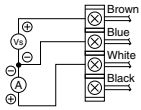
1	Brown	Power supply
2	White	Input signal
3	Blue	GND (COMMON)
4	Black	Monitor output

Preset Input Type

1	Brown	Power supply
2	White	Input signal 1
3	Blue	GND (COMMON)
4	Black	Input signal 2

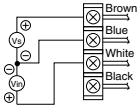
Wiring diagram

Current signal type



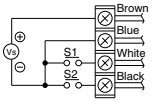
Vs: Power supply 24 VDC
A : Input signal 4 to 20 mA DC
0 to 20 mA DC

Voltage signal type



Vs : Power supply 24 VDC
Vin: Input signal 0 to 5 VDC
0 to 10 VDC

4 points preset input type



Vs: Power supply 24 VDC
(Negative common)

One of the preset pressures P1 through P4 is selected by the ON/OFF combination of S1 and S2.

S1	OFF	ON	OFF	ON
S2	OFF	OFF	ON	ON
Preset pressure	P01	P02	P03	P04

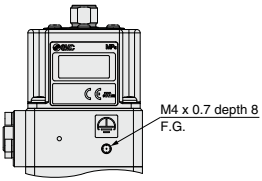
∗ For safety reasons, it is recommended that one of the preset pressures be set to 0 MPa.
∗ Preset pressures are set based on the minimum unit for output display.

MPa	kgf/cm²	bar	psi
0.01	0.1	0.1	1

Wiring

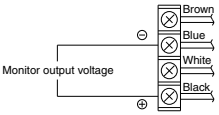
⚠ Caution

F.G. (Grounding)
Ground the frame ground (F.G.) terminal at the front of the main body. If the F.G. terminal port is not used, this product may not operate properly due to the noise.

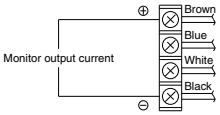


Monitor output wiring diagram

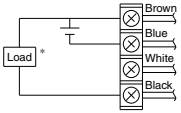
Analog output: Voltage type



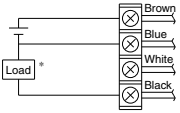
Analog output: Current type (Sink type)



Switch output: NPN type



Switch output: PNP type



∗ When 80 mA DC or more is applied, detecting device for over current starts activating and then emits an error signal. (Error number "5")

Return of Product

⚠ Warning

If the product to be returned is contaminated or is possibly contaminated with substances that are harmful to humans, for safety reasons, please contact SMC beforehand and then employ a specialist cleaning company to decontaminate the product. After the decontamination prescribed above has been carried out, submit a Product Return Request Sheet or the Detoxification/Decontamination Certificate to SMC and await SMC's approval and further instructions before attempting to return the item.
Please refer to the International Chemical Safety Cards (ICSC) for a list of harmful substances.
If you have any further questions, please don't hesitate to contact your SMC sales representative.