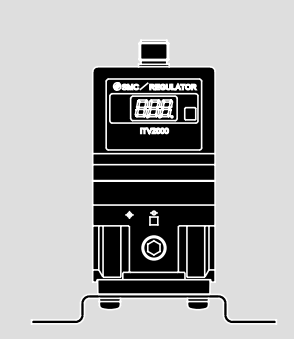
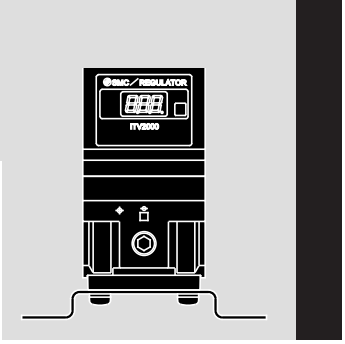


Electro-Pneumatic Regulator

Electronic Vacuum Regulator

Series ITV

	Series	Model	Set pressure range	Port size	Page
Electro–Pneumatic Regulator	**Series ITV2000** Controls air pressure steplessly in proportion to an electric signal. 	**ITV201□**	0.005 to 0.1MPa	1/4, 3/8	1.12-1
		ITV203□	0.005 to 0.5MPa		
		ITV205□	0.005 to 0.9MPa		
	Series ITV3000 Controls air pressure steplessly in proportion to an electric signal. 	**ITV301□**	0.005 to 0.1MPa	1/4, 3/8, 1/2	1.12-1
		ITV303□	0.005 to 0.5MPa		
		ITV305□	0.005 to 0.9MPa		
Electronic Vacuum Regulator	**Series ITV209□** Controls vacuum pressure steplessly in proportion to an electric signal. 	**ITV209□**	–1.3 to –80kPa	1/4	1.12-12



Electro-Pneumatic Regulator
Series ITV2000/3000

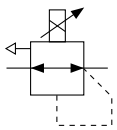
Standard Specifications

Straight type Right angle type

Model		ITV201□ / ITV301□	ITV203□ / ITV303□	ITV205□ / ITV305□
Minimum supply pressure		Set pressure +0.1MPa		
Maximum supply pressure		0.2MPa	1.0MPa	
Regulating pressure range		0.005 to 0.1MPa	0.005 to 0.5MPa	0.005 to 0.9MPa
Power supply	Voltage	24V DC ±10%, 12 to 15V DC		
	Current consumption	Power supply voltage 24V DC type: 0.12A or less Power supply voltage 12 to 15V DC type: 0.18A or less		
Input signal	Current type (1)	4 to 20mA, 0 to 20mA		
	Voltage type	0 to 5V DC, 0 to 10V DC		
	Preset input	4 points		
Input impedance	Current type	250Ω or less		
	Voltage type	Approx. 6.5kΩ		
	Preset input	Approx. 2.7kΩ		
Output signal (2) (monitor output)	Analog output	1 to 5V DC (load impedance: 1kΩ or more) 4 to 20mA (sink type) (load impedance: 250Ω or less)		
	Switch output	NPN open collector output: Max. 30V, 30mA PNP open collector output: Max. 30mA		
Linearity		Within ±1% (full span)		
Hysteresis		Within 0.5% (full span)		
Repeatability		Within ±0.5% (full span)		
Sensitivity		Within 0.2% (full span)		
Temperature characteristics		Within ±0.12% (full span)/°C		
Output pressure display	Accuracy	±3% (full span)		
	Minimum unit	MPa: 0.01, kgf/cm^2: 0.01, bar: 0.01, PSI: 0.1 (3), kPa: 1		
Ambient and fluid temperature		0 to 50°C (with no condensation)		
Enclosure		IP65 equivalent		
Weight	ITV20□□	350g		
	ITV30□□	645g		

Note 1) 2 wire type 4 to 20mA is not available. Power supply voltage (24V DC or 12 to 15V DC) is required.
Note 2) Select either analog output or switch output.
Further, when switch output is selected, select either NPN output or PNP output.
Note 3) The minimum unit for ITV205□ is 1PSI.

Symbol



How to Order

ITV 3 0 1 0 – 0 1 □ 2 □ S □

Model

2	2000
3	3000

Pressure range

1	0.1MPa
3	0.5MPa
5	0.9MPa

Power supply voltage

0	24V DC
1	12 to 15V DC

Input signal

0	Current 4 to 20mA
1	Current 0 to 20mA
2	Voltage 0 to 5V DC
3	Voltage 0 to 10V DC
4 *	Preset input

* Option

Monitor output

0 *	None (for preset input)
1	Analog output 1 to 5V DC
2 *	Switch output/NPN output
3 *	Switch output/PNP output
4 *	Analog output 4 to 20mA

* Option

Thread type

–	Rc(PT)
N *	NPT
T *	NPTF
F *	G(PF)

* Option

Port size

2	1/4 (2000, 3000)
3	3/8 (2000, 3000)
4	1/2 (3000)

Bracket

–	Without bracket
B *	Flat bracket
C *	L-bracket

* Option

Cable connector type

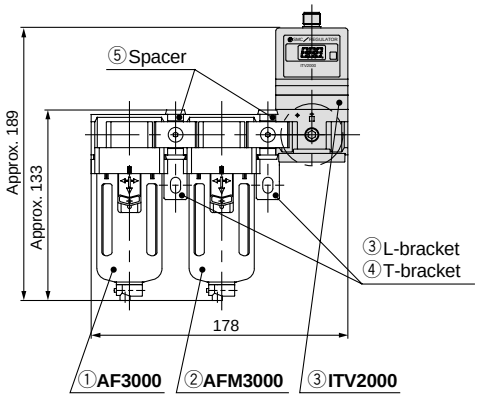
S	Straight type 3m
L *	Right angle type 3m
N *	Without cable connector

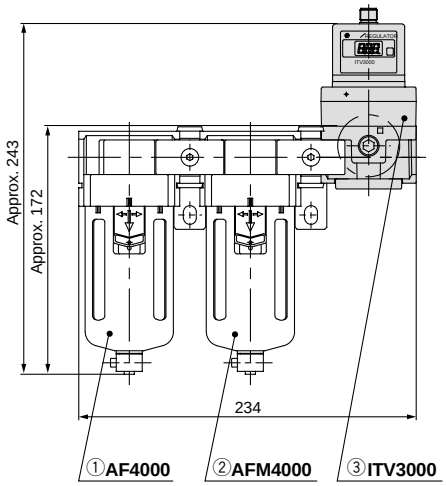
* Option

Pressure display unit

–	MPa
2 *	kgf/cm^2
3 *	bar
4 *	PSI
5 *	kPa

* Option





Specification Combinations

●: Standard specifications ○: Combination possible Blank: Combination not possible

Specifications		Symbol	Applicable model	
			ITV20□□	ITV30□□
Standard specifications	Set pressure max. 0.1MPa	1	●	●
	Set pressure max. 0.5MPa	3	●	●
	Set pressure max. 0.9MPa	5	●	●
	Connection Rc(PT) 1/4	02	●	●
	Connection Rc(PT) 3/8	03	●	●
	Connection Rc(PT) 1/2	04		●
Accessories	Bracket	B	○	○
	Bracket	C	○	○
Optional specifications	Connection NPT1/4	N02	○	○
	Connection NPT3/8	N03	○	○
	Connection NPT1/2	N04		○
	Connection G(PF) 1/4	F02	○	○
	Connection G(PF) 3/8	F03	○	○
	Connection G(PF) 1/2	F04		○

Modular Connection Part Numbers

Description		ITV20□□	ITV30□□
	Air filter	AF3000	AF4000
	Mist separator	AFM3000	AFM4000
Attachments	L-bracket	B310L	B410L
	T-bracket	B310T	B410T
	Spacer	Y30	Y40
	Spacer with L-bracket	Y30L	Y40L
	Spacer with T-bracket	Y30T	Y40T

Modular Products and Accessory Combinations

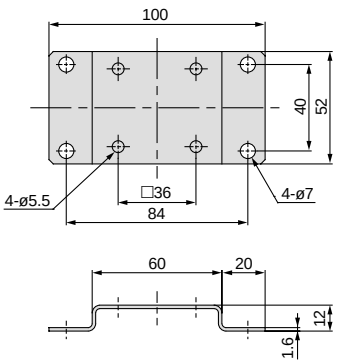
Applicable products and accessories	Applicable model	
	ITV20□□	ITV30□□
① Air filter	AF3000	AF4000
② Mist separator	AFM3000	AFM4000
③ L-bracket	B310L	B410L
④ T-bracket	B310T	B410T
⑤ Spacer	Y30	Y40
⑥ Spacer with L-bracket	Y30L	Y40L
⑦ Spacer with T-bracket	Y30T	Y40T

Accessories (Optional)/Part Numbers

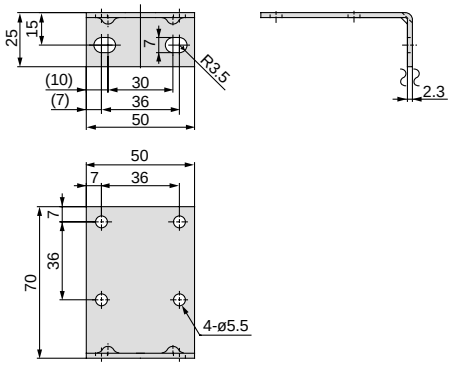
Description	Part No.	
	ITV20□□	ITV30□□
Flat bracket	P3020114	
L-bracket	INI-398-0-6	

Dimensions

Flat bracket



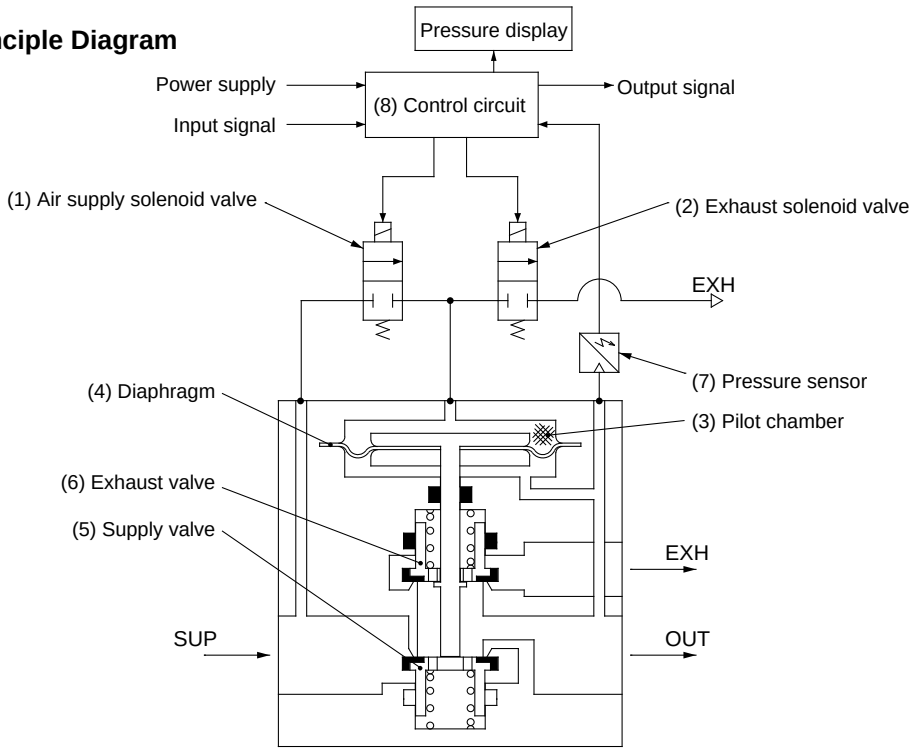
L-bracket



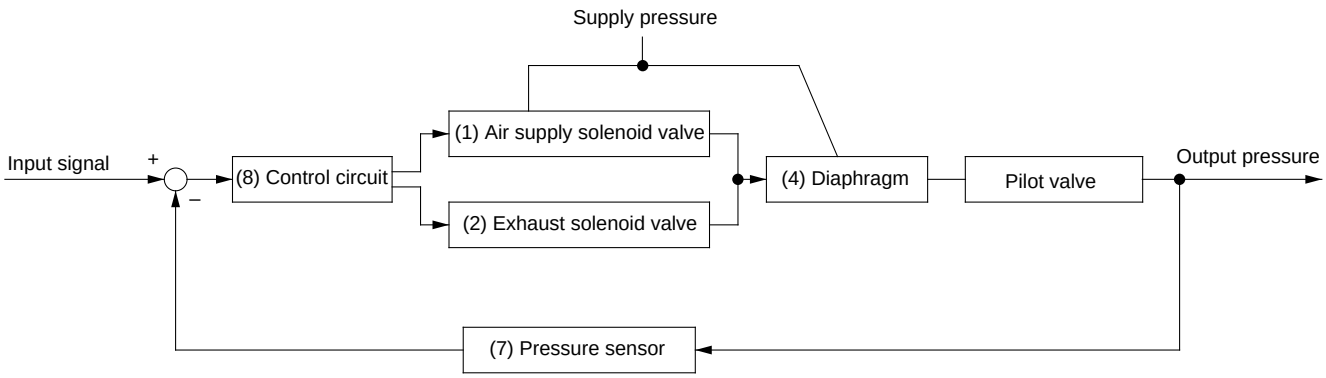
Working Principles

When the input signal rises, the air supply solenoid valve (1) turns ON, and the exhaust solenoid valve (2) turns OFF. Therefore, supply pressure passes through the air supply solenoid valve (1) and is applied to the pilot chamber (3). The pressure in the pilot chamber (3) increases and operates on the upper surface of the diaphragm (4).
As a result, the air supply valve (5) linked to the diaphragm (4) 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

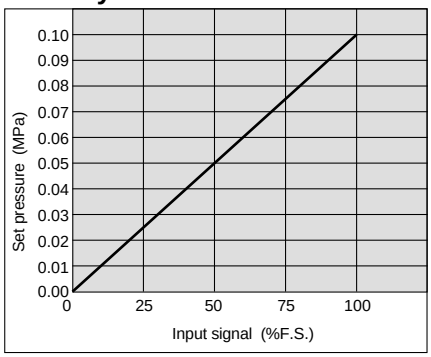


Block diagram

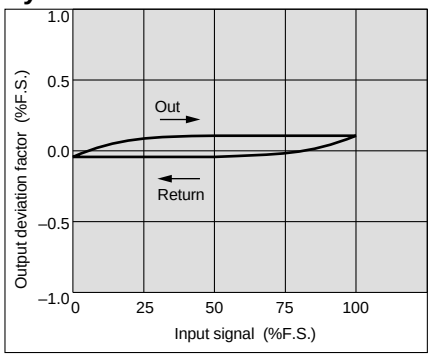


Series ITV201□

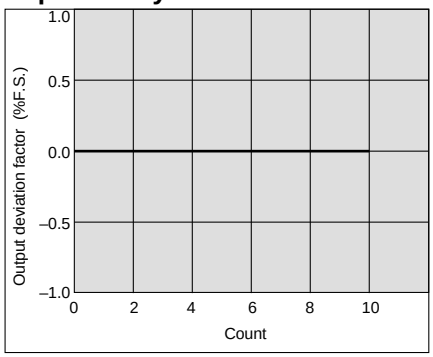
Linearity



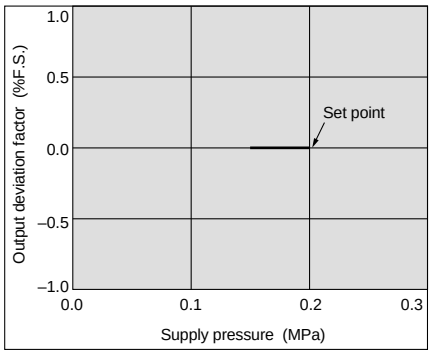
Hysteresis



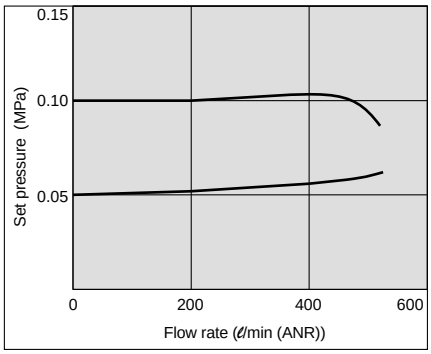
Repeatability



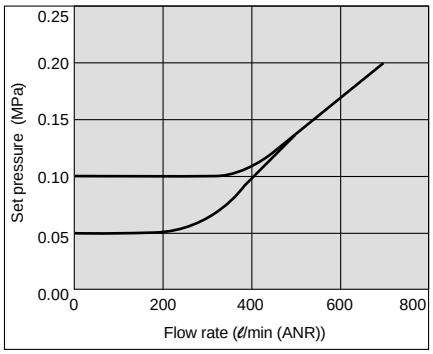
Pressure characteristics Set pressure: 0.05MPa



Flow characteristics Supply pressure: 0.2MPa

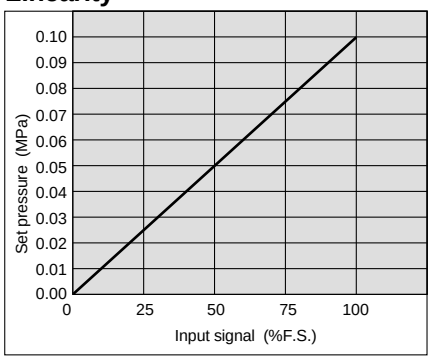


Relief flow characteristics Supply pressure: 0.2MPa

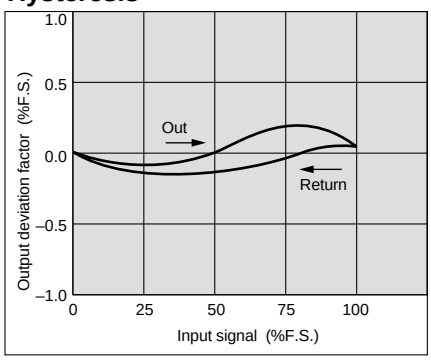


Series ITV301□

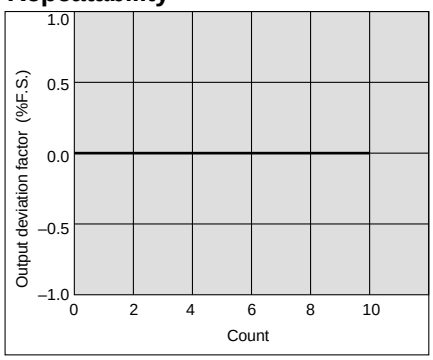
Linearity



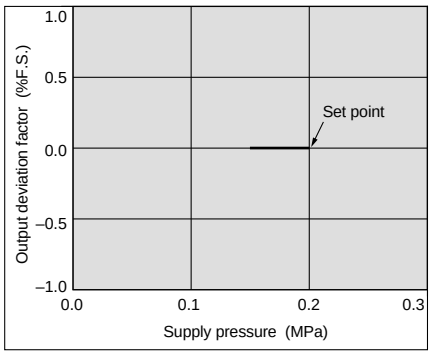
Hysteresis



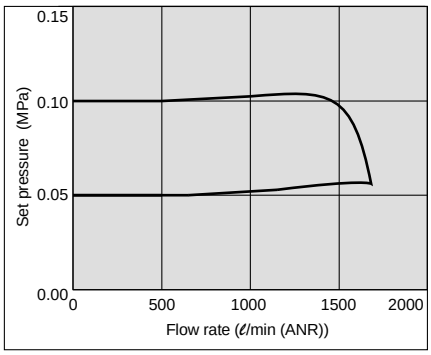
Repeatability



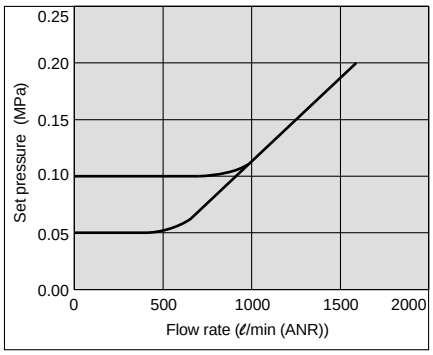
Pressure characteristics Set pressure: 0.05MPa



Flow characteristics Supply pressure: 0.2MPa

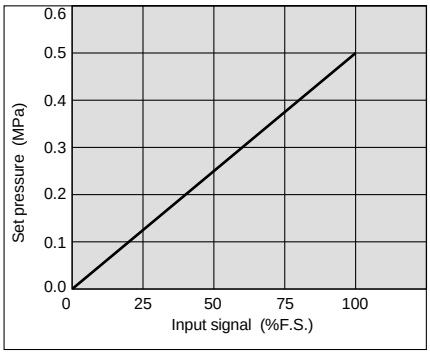


Relief flow characteristics Supply pressure: 0.2MPa

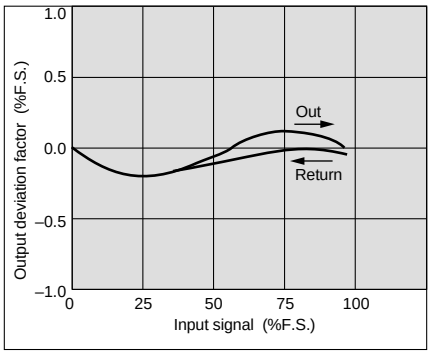


Series ITV203□

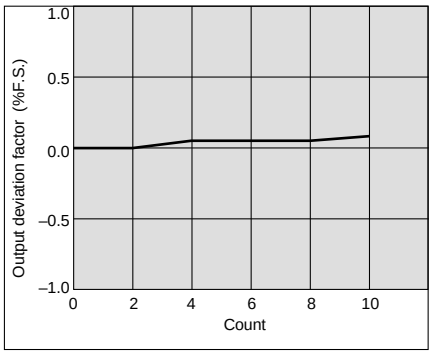
Linearity



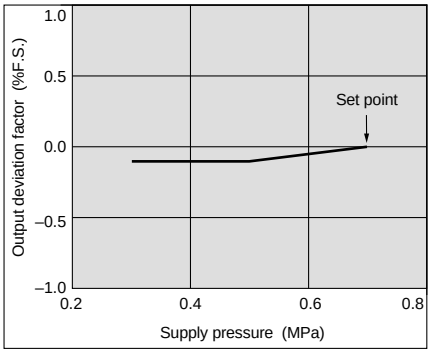
Hysteresis



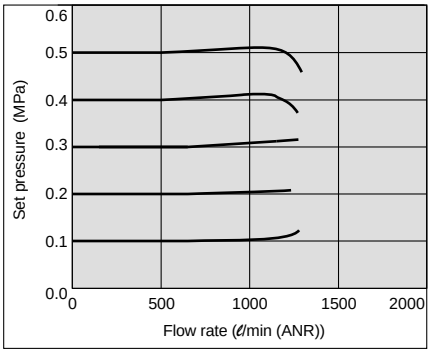
Repeatability



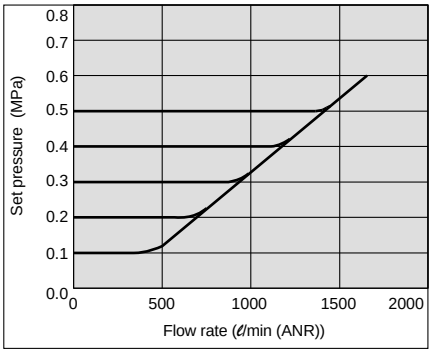
Pressure characteristics Set pressure: 0.2MPa



Flow characteristics Supply pressure: 0.7MPa

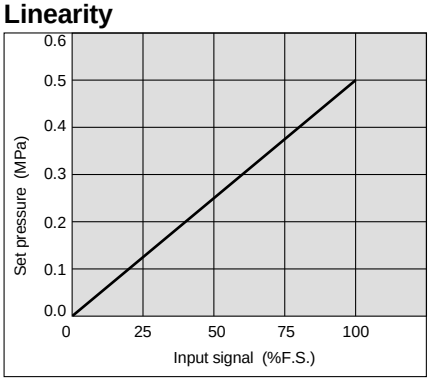


Relief flow characteristics Supply pressure: 0.7MPa

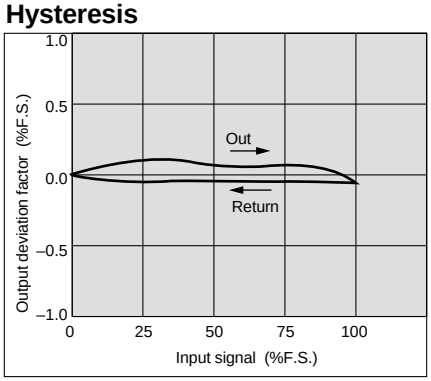


Series ITV303□

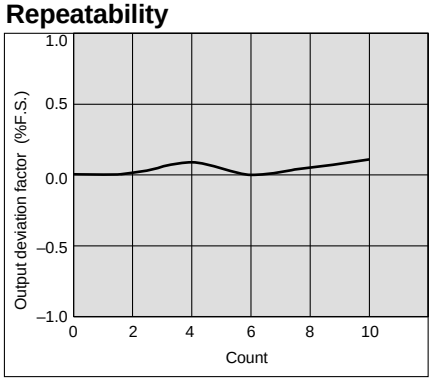
Linearity



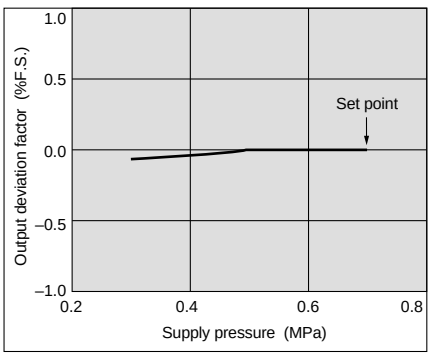
Hysteresis



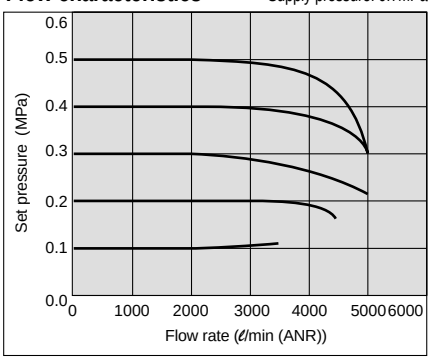
Repeatability



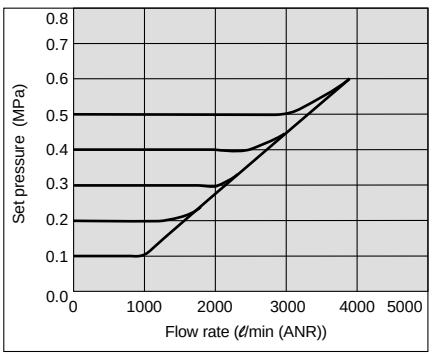
Pressure characteristics Set pressure: 0.2MPa



Flow characteristics Supply pressure: 0.7MPa

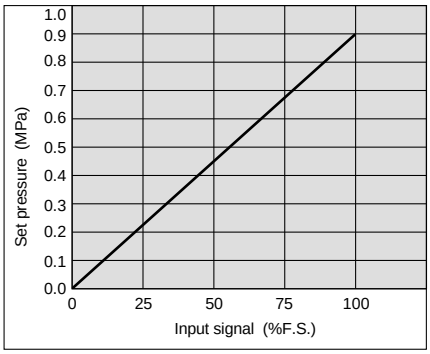


Relief flow characteristics Supply pressure: 0.7MPa

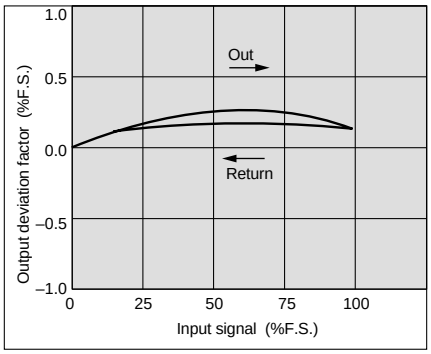


Series ITV205□

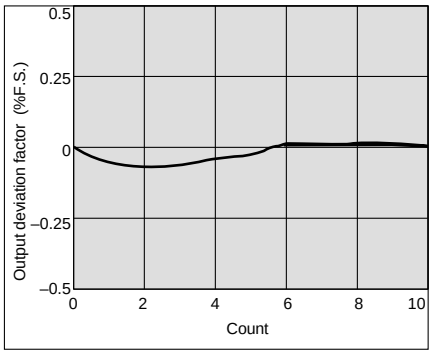
Linearity



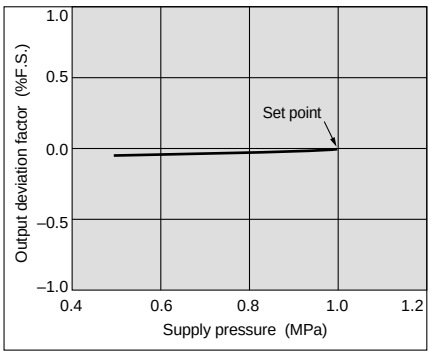
Hysteresis



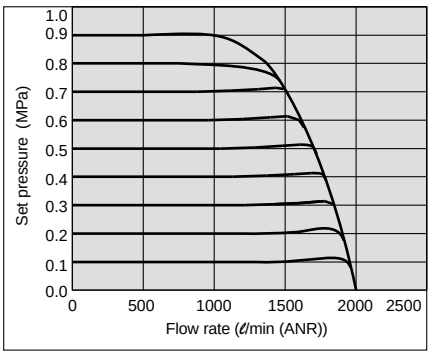
Repeatability



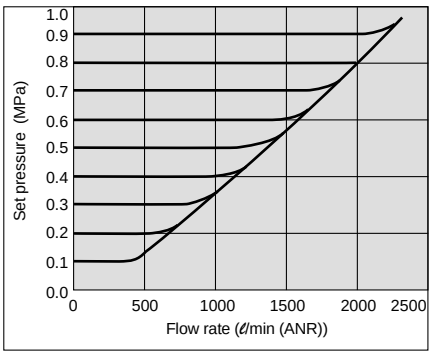
Pressure characteristics Set pressure: 0.4MPa



Flow characteristics Supply pressure: 1.0MPa

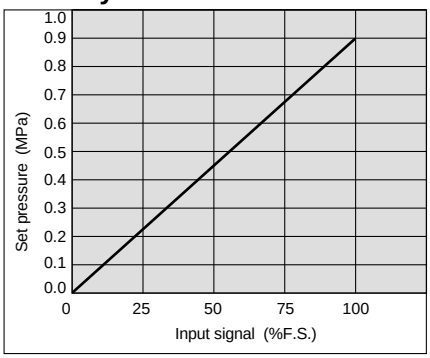


Relief flow characteristics Supply pressure: 1.0MPa

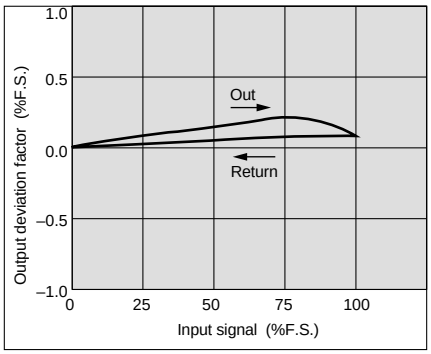


Series ITV305□

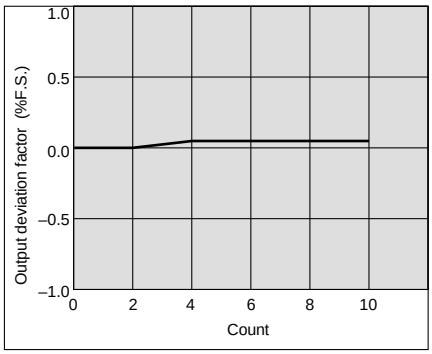
Linearity



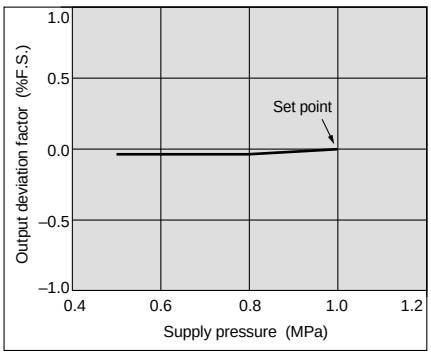
Hysteresis



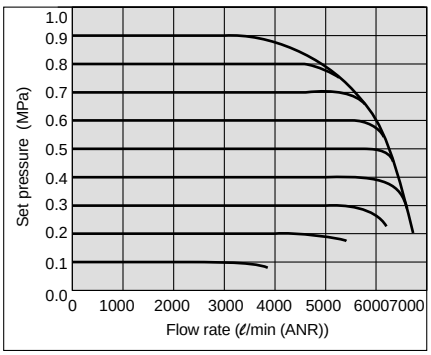
Repeatability



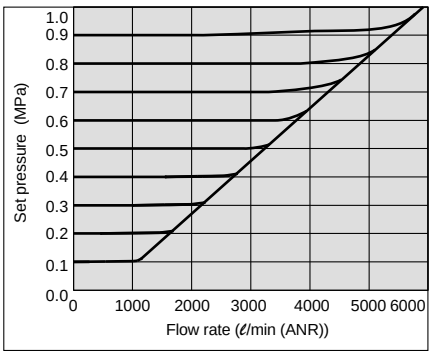
Pressure characteristics Set pressure: 0.4MPa



Flow characteristics Supply pressure: 1.0MPa

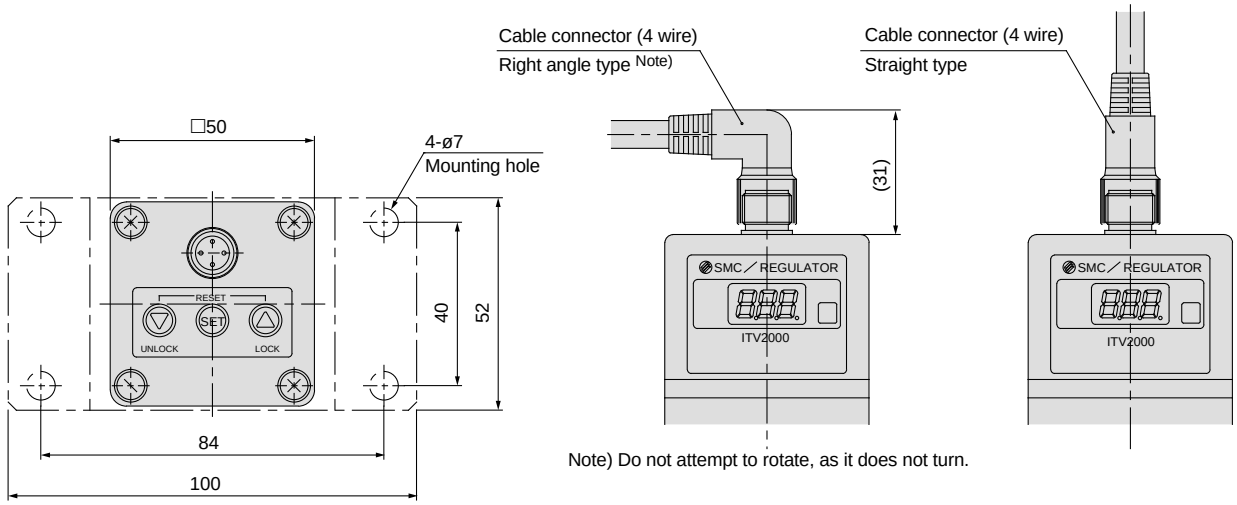


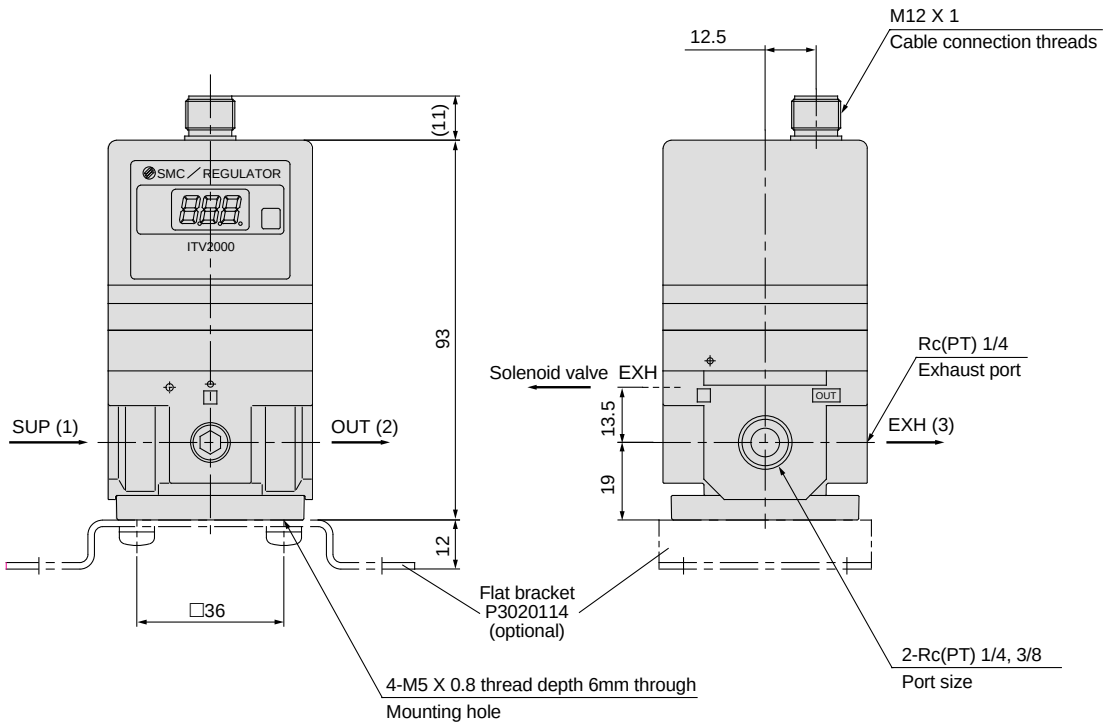
Relief flow characteristics Supply pressure: 1.0MPa

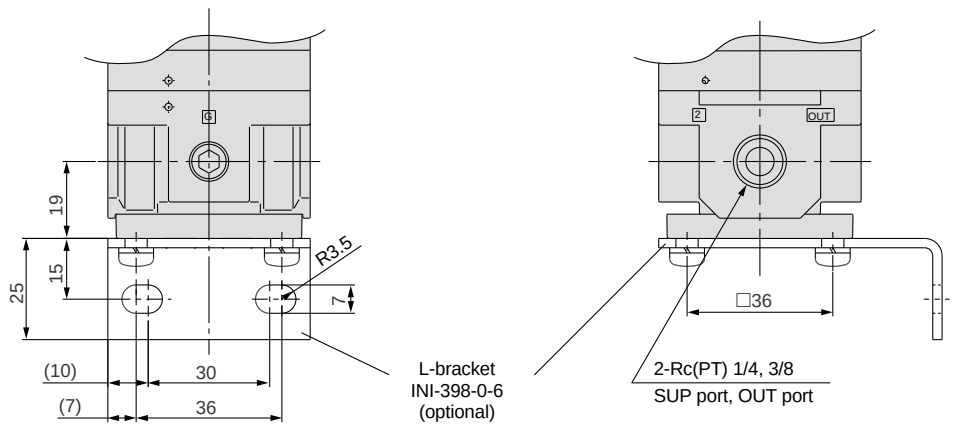


Dimensions

ITV20□□

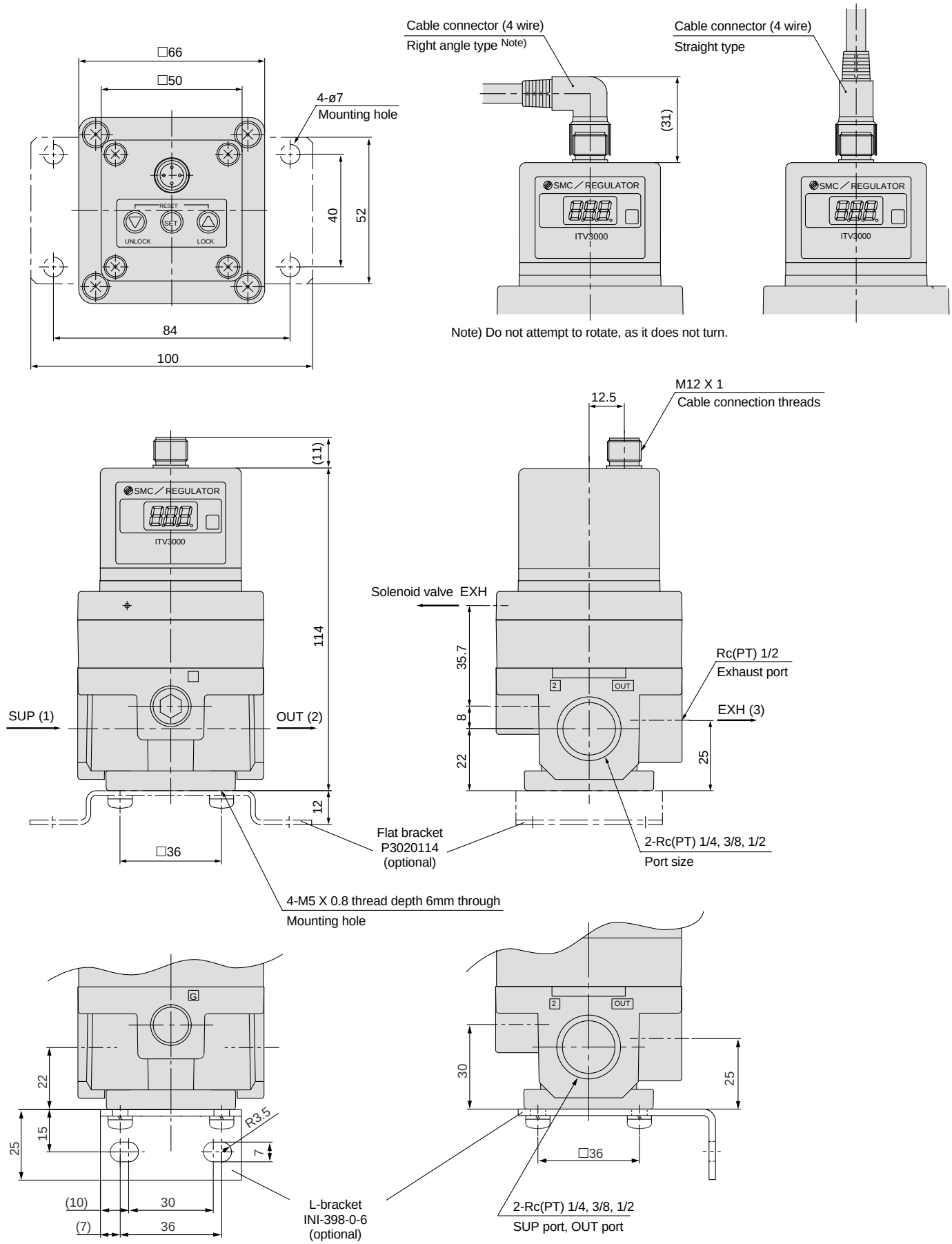






Dimensions

ITV30□□



Series ITV2000/3000
Made to Order Specifications

Contact SMC regarding detailed dimensions, specifications and delivery times.

1 Ozone Resistant Specifications

Fluoro rubber is used for the rubber parts of seals.

80 — Standard part number

● **Ozone resistant specifications**

2 Manifold Specifications (Except Series ITV3000)

2 through 8 station manifold.

How to Order Manifolds

IITV20 — ☐ 02 — 5

● **Valve stations**

2	2 stations
⋮	⋮
8	8 stations

● **OUT port size**

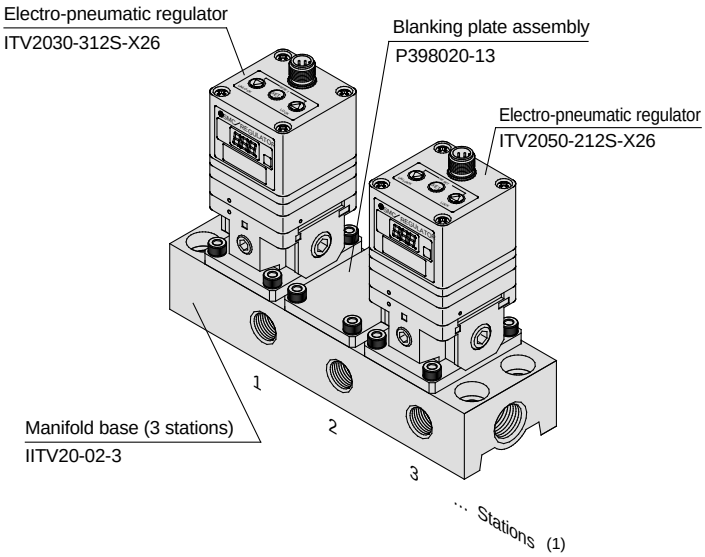
02	1/4
03	3/8

● **Connection thread type**

–	PT
N	NPT
F	PF

How to Order Manifold Assemblies

Example



IITV20-02-3..... 1set (3 station manifold base part no.)
*ITV2030-312S-X26 .....1set (Electro-pneumatic regulator part no.) (2)
*P398020-13 .....1set (Blanking plate assembly part no.)
*ITV2050-212S-X26 .....1set (Electro-pneumatic regulator part no.) (2)
→ The * is the symbol for mounting. Add the * symbol at the beginning of part numbers for electro-pneumatic regulators, etc. to be mounted on the base.

Note 1) Electro-pneumatic regulators are counted starting from station 1 on the left side with the OUT ports in front.

Note 2) The port size for mounted electro-pneumatic regulators is Rc(PT)1/4 only.

Note 3) When there is a large number of stations, use piping with the largest possible inside diameter for the supply side, such as steel piping.

Note 4) The use of the straight type cable connector is recommended.

⚠ Precautions

Be sure to read before handling.
Refer to p.0-26 and 0-27 for Safety Instructions and p.1.0-1 and 1.0-2 for precautions.

Oprating Environment

⚠ Warning

①**In locations where there is contact with spatter from water, oil or solder, etc., implement suitable protective measures.**

Air Supply

⚠ Caution

①**Install an air filter near this product on the supply side. Select a filtration degree of 5μm or less.**

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

③**If large amounts of carbon dust are generated by the compressor, it can accumulate inside this product and cause malfunction.**

For details on the above compressed air quality, refer to SMC's "Air Preparation Equipment".

Handling

⚠ Caution

①**Do not use a lubricator on the supply side of this product, as this can cause malfunction. When lubrication of terminal equipment is necessary, connect a lubricator on the output side of this equipment.**

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.**

Handling

⚠ Caution

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**In this product, the output side pressure cannot be completely relieved within the range of 0.005MPa or less. If it is desired to reduce the pressure completely to 0MPa, install a 3 way valve or other device on the output side to exhaust the pressure.**

⑥**This product is adjusted for each specification at the time of shipment from the factory. Avoid careless disassembly or removal of parts, as this can lead to malfunction.**

⑦**The optional cable connector is a 4 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 malfunction.**

⑧**Please note that the right angle cable does not rotate and is limited to only one entry direction.**

⑨**Take the following steps to avoid malfunction due to noise.**

1) Remove power supply noise during operation by installing a line filter, etc. in the AC power line.
2) 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.).

⑩**Due to the large volume of the output side, a loud exhaust noise will be produced when being used for the purpose of a relief function. Therefore, install a silencer (SMC Series AN200 or AN400) on the exhaust port (EXH port). The port sizes are Rc1/4 and Rc1/2.**

⑪**For details on the handling of this product, refer to the instruction manual which is included with the product.**

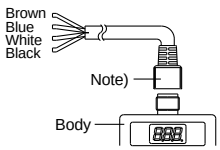
⚠ Precautions

Be sure to read before handling.
Refer to p.0-26 and 0-27 for Safety Instructions and p.1.0-1 and 1.0-2 for common precautions.

Wiring

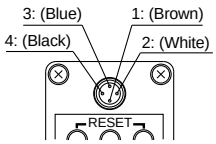
⚠ Caution

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.



Current signal type
Voltage signal type

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



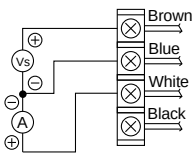
Preset input type

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

Note) A right angle type cable is also available.
The entry direction for the right angle type connector is to the left (SUP port side).
Never turn the connector as it is not designed to turn.

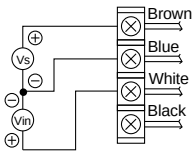
Wiring diagram

Current signal type



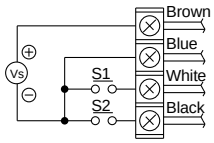
Vs: Power supply 24V DC
12 to 15V DC
A : Input signal 4 to 20mA DC
0 to 20mA DC

Voltage signal type



Vs: Power supply 24V DC
12 to 15V DC
Vin: Input signal 0 to 5V DC
0 to 10V DC

Preset input type



Vs: Power supply 24V DC
12 to 15V DC

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	P1	P2	P3	P4

∗ For safety reasons, it is recommended that one of the preset pressures be set to 0MPa.

Electronic Vacuum Regulator
Series ITV2090/2091

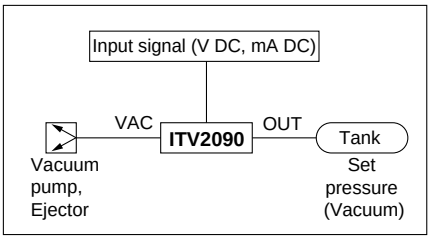
Straight type **Right angle type**

Standard Specifications

Model		ITV2090	ITV2091
Power supply	Voltage	24V DC ± 10%	12 to 15V DC
	Current consumption	Power supply voltage 24V DC type: 0.12A or less Power supply voltage 12 to 15V DC type: 0.18A or less	
Minimum supply vacuum pressure(1)		Set pressure –13.3kPa	
Maximum supply vacuum pressure		–101kPa	
Regulating pressure range		–1.3 to –80kPa	
Input signal	Current type (2)	4 to 20mA, 0 to 20mA	
	Voltage type	0 to 5V DC, 0 to 10V DC	
	Preset input	4 points	
Input impedance	Current type	250Ω or less	
	Voltage type	Approx. 6.5kΩ	
	Preset input	Approx. 2.7kΩ	
Output signal (3) (Monitor output)	Analog output	1 to 5V DC (load impedance: 1 kΩ or more) 4 to 20mA (sink type) (load impedance: 250Ω or less)	
	Switch output	NPN open collector output: Max. 30V, 30mA PNP open collector output: Max. 30mA	
Linearity		Within ±1% (full span)	
Hysteresis		Within 0.5% (full span)	
Repeatability		Within ±0.5% (full span)	
Sensitivity		Within 0.2% (full span)	
Temperature characteristics		Within ±0.12% (full span)/°C	
Output pressure display	Accuracy	±3% (full span)	
	Units	kPa (4) Minimum display: 1	
Ambient and fluid temperature		0 to 50°C (with no condensation)	
Enclosure		IP65 equivalent	
Weight		350g	

Note 1) The minimum supply vacuum pressure should be 13.3kPa less than the maximum vacuum pressure setting value.
Note 2) 4 to 20mA is not possible with the 2 wire type. Power supply voltage (24V DC or 12 to 15V DC) is required.
Note 3) Either analog output or switch output must be selected. Furthermore, when switch output is selected, either NPN output or PNP output must also be selected.
Please note that the preset input type is not equipped with an output signal function.
Note 4) Contact SMC regarding indication with other units of pressure.

Piping/Wiring diagram



How to Order

ITV 209 0 – 0 1 □ 2 □ S 5

Pressure range

9	–1.3 to –80kPa

Power supply voltage

0	24V DC
1	12 to15V DC

Input signal

0	Current type 4 to 20 mA DC
1	Current type 0 to 20 mA DC
2	Voltage type 0 to 5V DC
3	Voltage type 0 to 10V DC
4*	Preset input

* Option

Monitor output

0*	Without (in case of preset input)
1	Analog output 1 to 5V DC
2*	Switch output/NPN output
3*	Switch output/PNP output
4*	Analog output 4 to 20mA DC

* Option

Thread type

—	Rc(PT)
N*	NPT
T*	NPTF
F*	G(PF)

* Option

Port size

2	1/4

Bracket

—	Without bracket
B*	Flat bracket
C*	L-bracket

* Option

Cable connector type

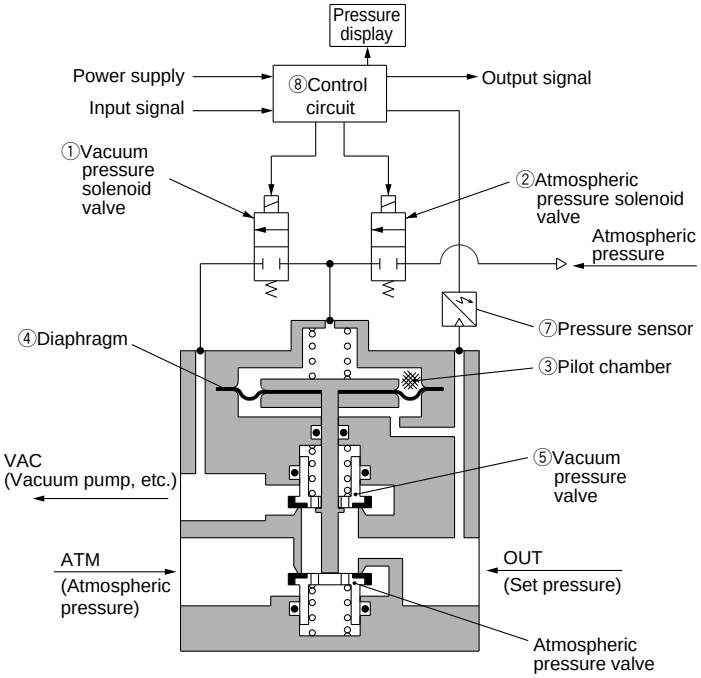
S	Straight type 3m
L*	Right angle type 3m
N*	Without cable connector

* Option

Pressure display units

5	kPa

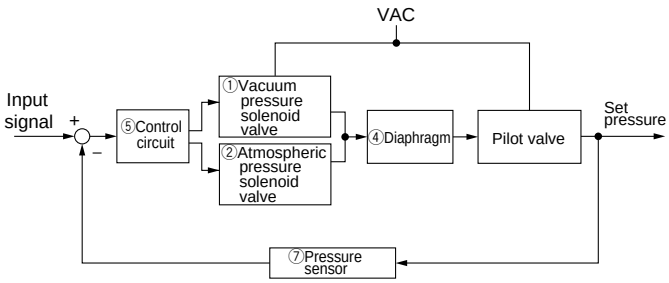
Operating Principles



Operating Principles

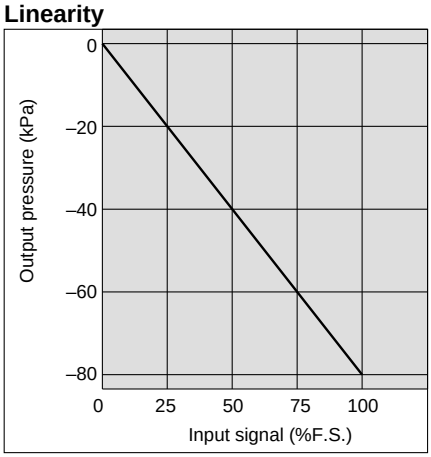
When the input signal increases, the vacuum pressure solenoid valve ① turns ON, and the atmospheric pressure solenoid valve ② turns OFF. Because of this, VAC and the pilot chamber ③ are connected, the pressure in the pilot chamber ③ becomes negative and acts on the top of the diaphragm. As a result, the vacuum pressure valve ⑤ which is linked to the diaphragm ④ opens, VAC and OUT are connected, and the set pressure becomes negative.
This negative pressure feeds back to the control circuit ⑧ via the pressure sensor ⑦. Then, a correct operation works until a vacuum pressure proportional to the input signal is reached, and a vacuum pressure is obtained which is always proportional to the input signal.

Block diagram

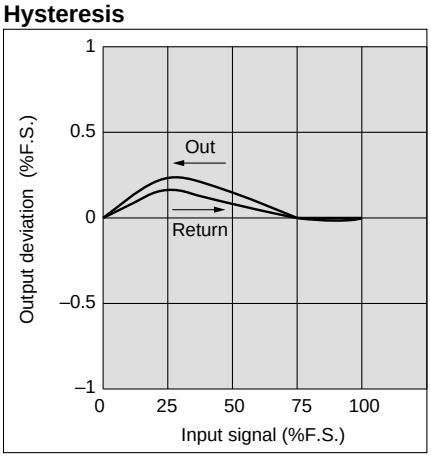


Series ITV209□

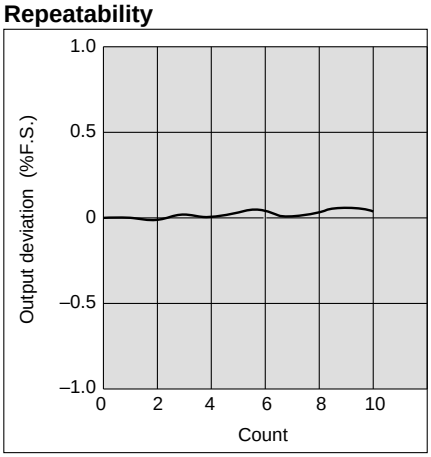
Linearity



Hysteresis

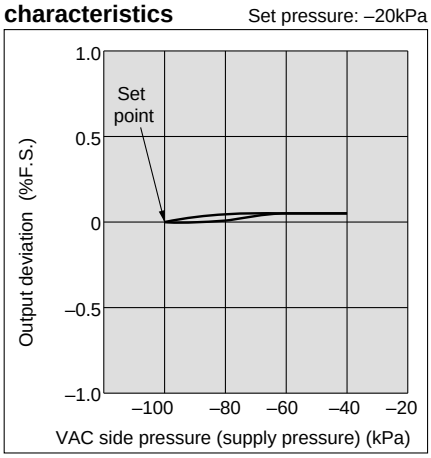


Repeatability



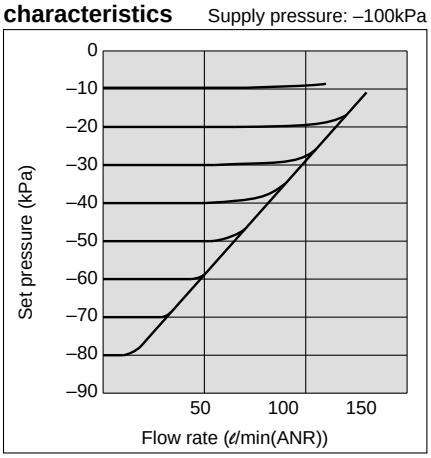
Pressure characteristics

Set pressure: –20kPa



Flow rate characteristics

Supply pressure: –100kPa



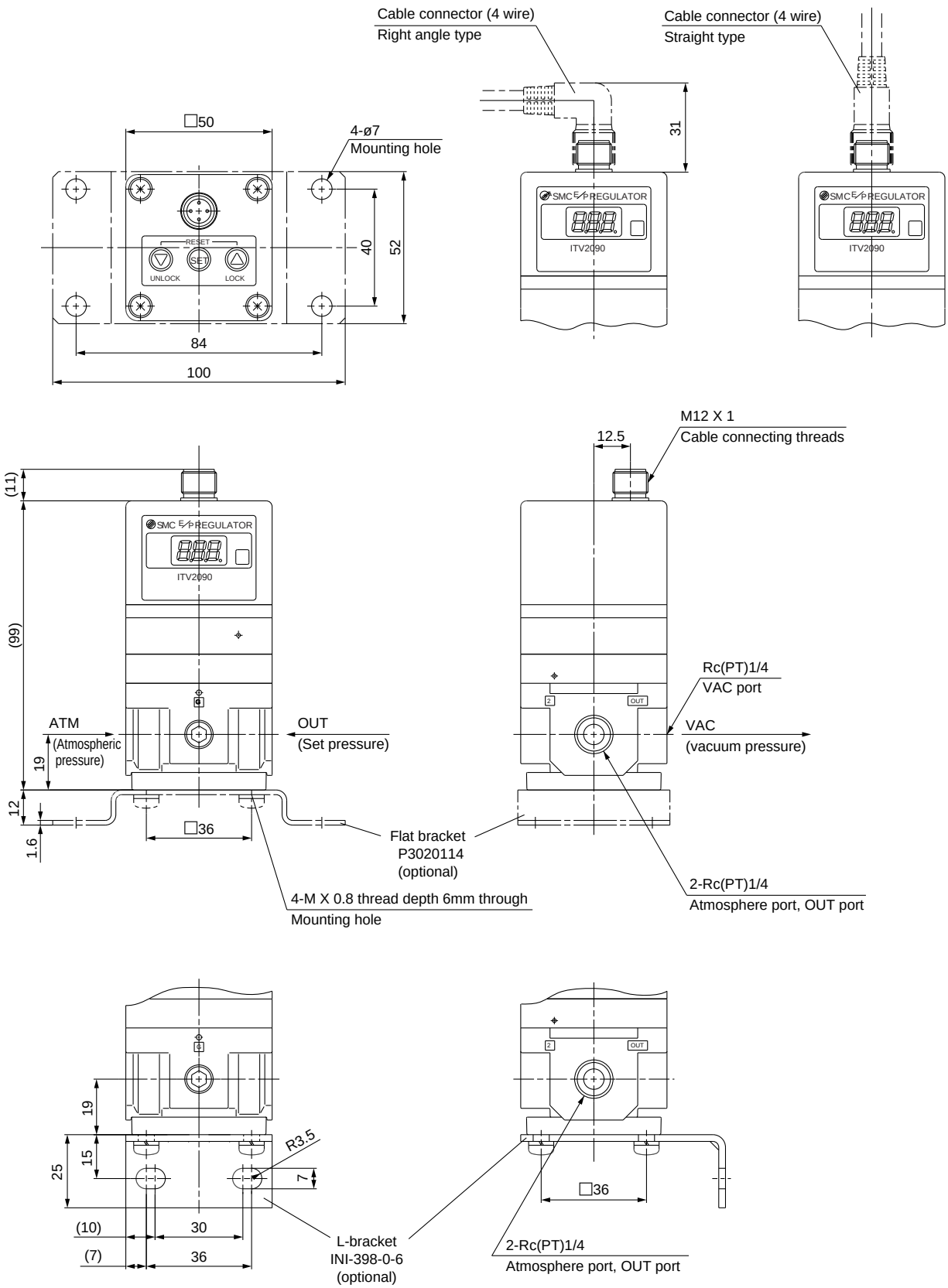
Flow characteristics measurement conditions

- Exhaust flow rate of the vacuum pump used for measurement: 500ℓ/min (ANR)
- Upstream vacuum pressure: –100kPa
  (when downstream flow rate is 0ℓ/min (ANR)
- Maximum flow rate: 132ℓ/min (ANR)
  (with upstream VAC. pressure at –39kPa)

Dimensions

ITV2090

Note) Do not attempt to rotate the cable connector, as it does not turn.

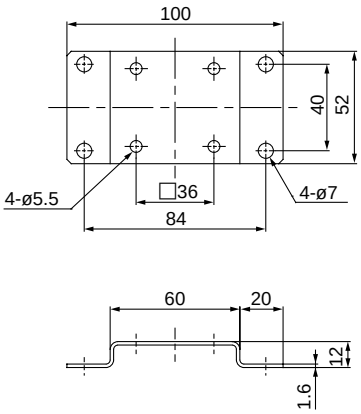


Accessories (Optional)/Part Numbers

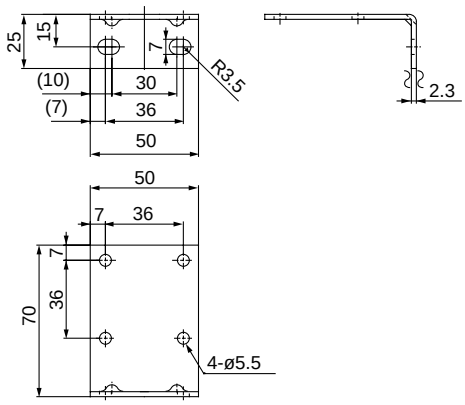
Description	Part No.
Flat bracket	P3020114
L-bracket	INI-398-0-6

Dimensions

Flat bracket



L-bracket



⚠ Precautions

Be sure to read before handling. Refer to p.0-26 and 0-27 for Safety Instructions and common precautions on the products mentioned in this catalog, and refer to p.1.0-1 and 1.0-2 for more detailed precautions of every series.

Handling

⚠ Caution

① Connect the vacuum pump to the port which is labeled "VAC".
② Pressure adjustment changes from "atmospheric pressure to vacuum pressure" when the input signal is increased, and from "vacuum pressure to atmospheric pressure" when the input signal is decreased.
③ When adjusting the vacuum pressure, be careful not to block the atmospheric pressure inlet port labeled "ATM".
④ Since this product is designed exclusively for use with negative pressure, be careful not to apply positive pressure in error.
⑤ In cases where the vacuum pump being used has a relatively small capacity, or the piping has a small inside diameter, etc., large variations in the set pressure (the range of pressure variation when changing from a no flow to a flow state) may appear. In this situation, the vacuum pump or the piping, etc. should be changed. In cases where it is not practical to change the vacuum pump, install a capacity tank (volume depending on the operating conditions) on the VAC side.
⑥ The vacuum pressure response time after a change in the input signal is influenced by the internal volume on the setting side (including piping). Since the capacity of the vacuum pump also influences the response time, give careful consideration to these points before operation.
⑦ If the electric power is shut off when in a control state, the pressure on the setting side will go into a holding condition. However, this setting side pressure will be held only temporarily and is not guaranteed. In addition, when atmospheric pressure is desired, shut off the power after reducing the set pressure, and then introduce atmospheric pressure by using a vacuum release valve, etc.
⑧ If the power for this product is cut off by a power failure, etc. when it is in a controlled state, the setting side pressure will be held temporarily. Further, if operated without sealing the setting side so that atmospheric air is sucked in, handle with care as air will continue to be sucked in.
⑨ If the VAC side pressure to this product is interrupted while the power is still on, the internal solenoid valve will continue to operate and may cause a humming noise. Since this may shorten the life of the product, be sure to shut off the power when the VAC side pressure is shut off.
⑩ The setting side pressure cannot be completely released from this product in the range below –1.3kPa. In cases where the pressure needs to be reduced completely to 0kPa, install a 3 port valve, etc. on the setting side to discharge the residual pressure.
⑪ This product is adjusted for each specification at the factory before shipment. Avoid careless disassembly or removal of parts, as this can cause failure.
⑫ The optional cable connector is a 4 wire type. When the monitor output (analog output, switch output) is not being used, keep it from touching the other wires, as this can cause malfunction.
⑬ Note that there is only one entry direction for the right angle cable which does not rotate.
⑭ Take the following steps to avoid malfunction due to noise.
1) Eliminate power supply noise during operation by installing a line filter, etc. in the AC power line.
2) Install this product so that it will not be effected by noise, keeping the product and its wiring away from strong electric field sources such as motors and power lines.
3) Be sure to employ protective measures against load surge for induction load (solenoid valves, relays, etc.).
⑮ Refer to the instruction manual included with the product for details on its handling.

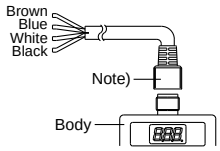
⚠ Precautions

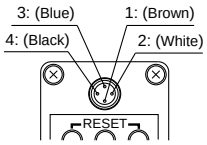
Be sure to read before handling. Refer to p.0-26 and 0-27 for Safety Instructions and common precautions on the products mentioned in this catalog, and refer to p.1.0-1 and 1.0-2 for more detailed precautions on every series.

Wiring

⚠ Caution

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





Current signal type
Voltage signal type

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

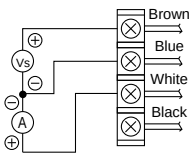
Preset input type

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

Note) A right angle type cable is also available.
The entry direction for the right angle type connector is to the left (SUP port side).
Never attempt to rotate the connector, as it does not turn.

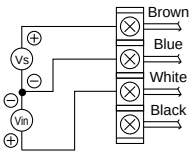
Wiring diagram

Current signal type



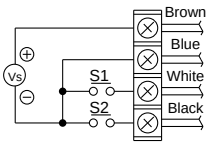
Vs: Power supply 24V DC
12 to 15V DC
A : Input signal 4 to 20mA DC
0 to 20mA DC

Voltage signal type



Vs: Power supply 24V DC
12 to 15V DC
Vin: Input signal 0 to 5V DC
0 to 10V DC

Preset input type



Vs: Power supply 24V DC
12 to 15V DC

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	P1	P2	P3	P4

∗ For safety reasons, it is recommended that one of the preset pressures be set to 0MPa.