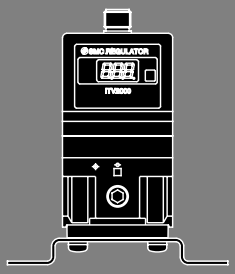


Electro-pneumatic Regulator
Electronic Vacuum Regulator
Series ITV

	Series	Model	Regulating pressure range	Port size	Page
Electro-pneumatic Regulator	***Series ITV0000*** With a simplified high-density circuit board design, an extremely compact size has been achieved.	**ITV001□**	0.001 to 0.1 MPa	Built-in One-touch fitting Metric size: ø4 Inch size: ø5/32	14-8-2
		ITV003□	0.001 to 0.5 MPa		
		ITV005□	0.001 to 0.9 MPa		
		ITV009□	–1 to –100 kPa		
	Series ITV1000 Controls air pressure steplessly in proportion to an electric signal.	**ITV101□**	0.005 to 0.1 MPa	1/8, 1/4	14-8-14
		ITV103□	0.005 to 0.5 MPa		
		ITV105□	0.005 to 0.9 MPa		
	Series ITV2000 Controls air pressure steplessly in proportion to an electric signal.	**ITV201□**	0.005 to 0.1 MPa	1/4, 3/8	14-8-14
		ITV203□	0.005 to 0.5 MPa		
		ITV205□	0.005 to 0.9 MPa		
	Series ITV3000 Controls air pressure steplessly in proportion to an electric signal.	**ITV301□**	0.005 to 0.1 MPa	1/4, 3/8, 1/2	14-8-14
		ITV303□	0.005 to 0.5 MPa		
		ITV305□	0.005 to 0.9 MPa		
Electronic Vacuum Regulator	***Series ITV209□*** Controls vacuum pressure steplessly in proportion to an electric signal.	**ITV209□**	–1.3 to –80 kPa	1/4	14-8-30

Compact Electro-pneumatic Regulator
Series ITV0000

Compact 15 mm

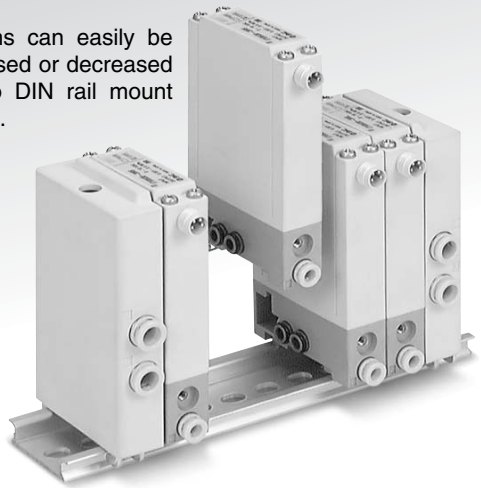
With a simplified high-density circuit board design, an extremely compact size has been achieved.

Lightweight 100 g

Compact electro-pneumatic regulator
Series ITV0000

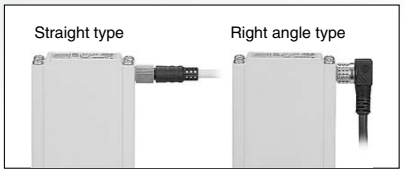
Realizes space-savings and reduction of weight for manifold use.

Stations can easily be increased or decreased due to DIN rail mount design.



■ Cable connectors

Straight type and right angle type are available.



■ Built-in One-touch fitting
■ With error indication LED
■ Brackets

Flat and L-brackets are available.

Flat bracket

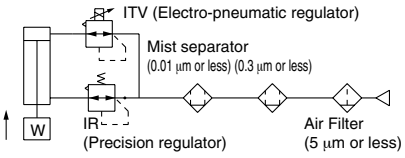
L-bracket

Model	Pressure range	Power supply voltage	Input signal	Output signal	Option
ITV001□	0.1 MPa	24 VDC 12 VDC	4 to 20 mA	Analog output 1 to 5 V	• Cable connectors Straight type Right angle type • Brackets Flat bracket L-bracket
ITV003□	0.5 MPa		0 to 20 mA		
ITV005□	0.9 MPa		0 to 5 VDC		
ITV009□	–100 kPa		0 to 10 VDC		

- **Equivalent to IP65**
- **Linearity within ±1%** (Full span)
  Hysteresis 0.5% (Full span)
  Repeatability ±0.5% (Full span)
- **High-speed response time 0.1sec**
  (Without load)

- **High stability**

Stable pressure control is possible even when a metal cylinder is used.



Compact Electro-pneumatic Regulator
Series ITV0000

How to Order

For single unit and single unit for manifold

ITV00 1 0 – 3 □ □ □ N

Pressure range

1	0.1 MPa
3	0.5 MPa
5	0.9 MPa
9 ∗	–100 kPa

∗ Option

Power supply voltage

0	24 VDC ±10%
1 ∗	12 to 15 VDC

∗ Option

Input signal

0 ∗	Current type 4 to 20 m A DC
1 ∗	Current type 0 to 20 m A DC
2 ∗	Voltage type 0 to 5 VDC
3	Voltage type 0 to 10 VDC

∗ Option

Built-in One-touch fittings type

For single unit

Symbol		SUP (VAC) 1	OUT 2	EXH (ATM) 3
Nil	Metric size (Light gray)	ø4		
U	Inch size (Orange)	ø5/32"		

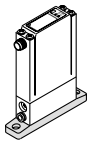
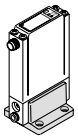
For manifold

Symbol		SUP (VAC) 1	OUT 2	EXH (ATM) 3
Nil	Metric size (Light gray)	ø6	ø4	ø6
U	Inch size (Orange)	ø1/4"	ø5/32"	ø1/4"

Cable connector (Option)

N	Without cable connector
S	Straight type 3 m
L	Right angle type 2 m

Bracket/
Option for single unit only

Nil	Without bracket
B	Flat Bracket 
C	L-bracket 

Base type

Nil	For single unit
M	For manifolds

Manifold

IITV00 – 02 – n

Stations

02	2 stations
03	3 stations
⋮	⋮
10	10 stations

Option
If a DIN rail longer than the specified stations is required, specify the appli cable stations in two digits.
(Maximum 10 stations)
Example) **IITV00-05-07**

Note) A DIN rail with the length specified by the number of stations is attached to the manifold. For dimensions of the DIN rail, refer to the external dimensions.

How to Order Manifold Assembly (Example)

Indicate the part numbers of electro-pneumatic regulators and options to be mounted below the manifold part number.

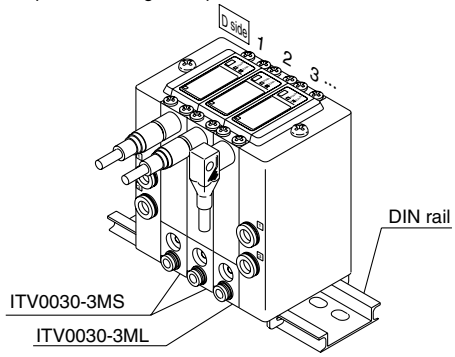
Example)
Due to the common supply/exhaust feature, note that different pressure range combinations are not available.

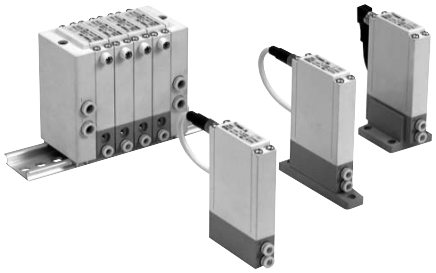
IITV00-03·····1 set (Manifold part no.)
∗ITV0030-3MS·····2 sets (Electro-pneumatic regulator part no. (1, 2 stations))
∗ITV0030-3ML·····1 set (Electro-pneumatic regulator part no. (3 stations))

Indicate part numbers in order starting from the first station on the D side.

Note) Combination with having different pressure ranges is not available due to common supply/exhaust features.

The asterisk (∗) specifies mounting. Add an asterisk (∗) at the beginning of electro-pneumatic regulator part numbers to be mounted.





Specifications

Model		ITV001□	ITV003□	ITV005□	ITV009□
Min. supply pressure		Set pressure +0.1 MPa			Set pressure –1 kPa
Max. supply pressure		0.2 MPa	1.0 MPa		–101 kPa
Regulating pressure range		0.001 to 0.1 MPa	0.001 to 0.5 MPa	0.001 to 0.9 MPa	–1 to –100 kPa
Maximum flow rate		3.5 ℓ/min(ANR) (Supply pressure: 0.2 MPa)	6 ℓ/min(ANR) (Supply pressure: 0.6 MPa)	6 ℓ/min(ANR) (Supply pressure: 0.6 MPa)	2 ℓ/min(ANR) (Supply pressure: –101 kPa)
Power supply	Voltage	24 VDC ±10%, 12 to 15 VDC			
	Current consumption	Power supply voltage 24 VDC type: 0.12 A or less Power supply voltage 12 to 15 VDC type: 0.18 A or less			
Input signal	Voltage type	0 to 5 VDC, 0 to 10 VDC			
	Current type	4 to 20 mADC, 0 to 20 mADC			
Input impedance	Voltage type	Approximately 10 kΩ			
	Current type	Approximately 250 Ω			
Output signal	Analog output	1 to 5 VDC (Load impedance: 1 kΩ or more) Output accuracy: Within ±6% (Full span)			
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			
Operating temperature range		0 to 50°C (With no condensation)			
Enclosure		IP65 equivalent *			
Connection type		Built-in One-touch fittings			
Connection size	For single unit	Metric size	1, 2, 3: ø4		
		Inch size	1, 2, 3: ø5/32"		
	Manifold	Metric size	1, 3: ø6, 2: ø4		
		Inch size	1, 3: ø1/4", 2: ø5/32"		
Weight (1)		100 g or less (without options)			

Note 1) Indicates the weight of a single unit.
For IITV00-n
Total weight (g) ≤ Stations (n) x 100 + 130 (Weight of end block A, B assembly) + Weight (g) of DIN rail

Note 2) Specifications other than the following are optional. Pressure range: 0.1 MPa, 0.5 MPa, 0.9 MPa, Power supply voltage: 24 VDC, Input signal: 0 to 10 VDC

Note 3) When there is a downstream flow consumption, pressure may become unstable depending on piping conditions.

* When using under the conditions equivalent to IP65, connect the fitting or tube to the breathing hole prior to use. (For details, refer to page 14-8-11 in Specific Product Precautions.)

Option

Bracket

Flat bracket assembly
P39800022

L-bracket assembly
P39800023

Tighting torque when assembling is 0.3 N·m.

Cable connector

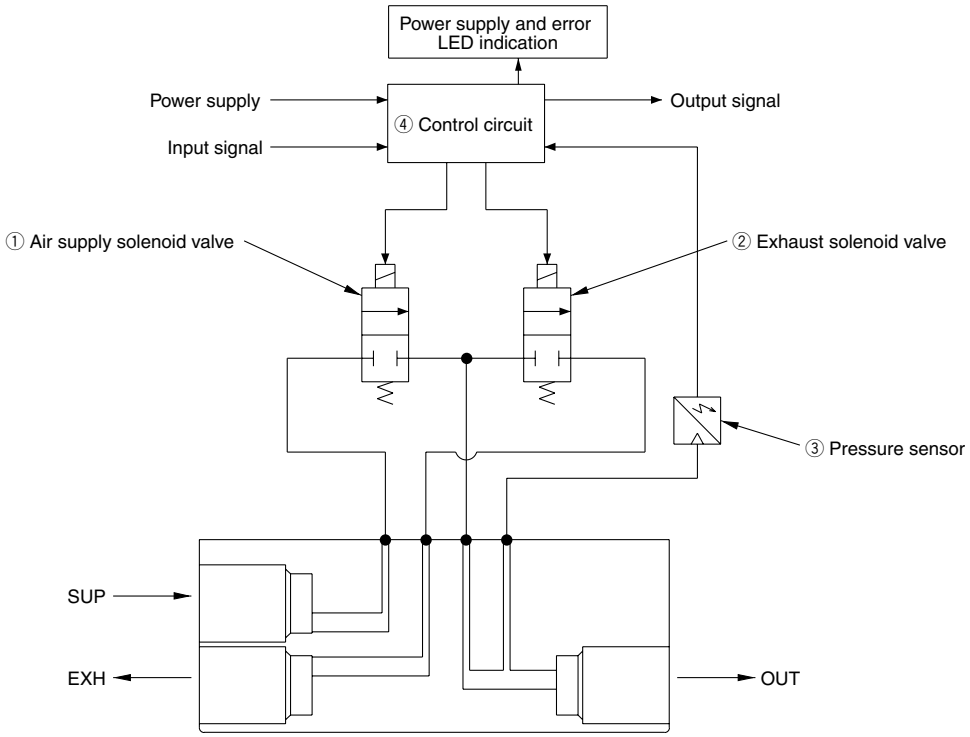
Straight type
M8-4DSX3MG4

Right angle type
ELWIKA-KV4408 PVC025 2M

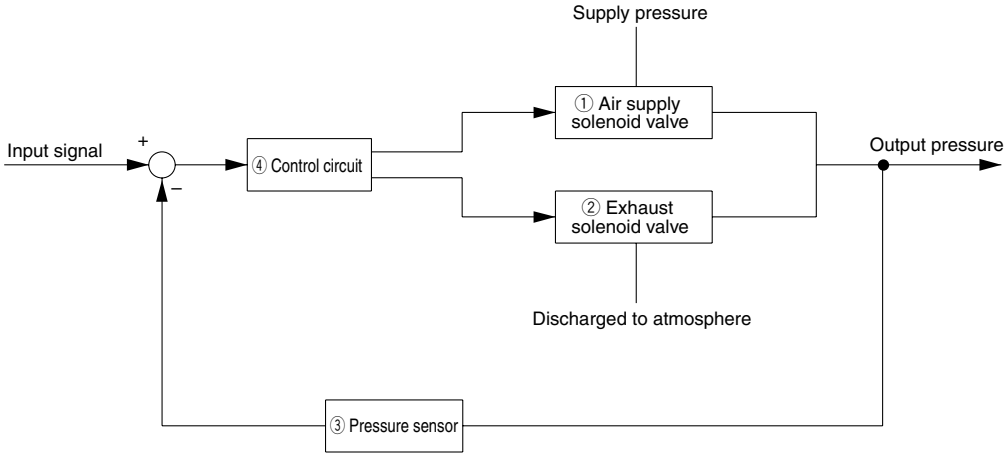
Working Principle

When the input signal rises, the air supply soloenoid valve ① turns ON. Due to this, part of the supply pressure passes through the air supply solenoid valve ① and changes to output pressure. This product pressure feeds back to the control circuit ④ via the pressure sensor ③. Here, pressure corrections continue until output pressure becomes proportional to the input signal, enabling output pressure that is proportional to the input signal.

Diagram of working principle

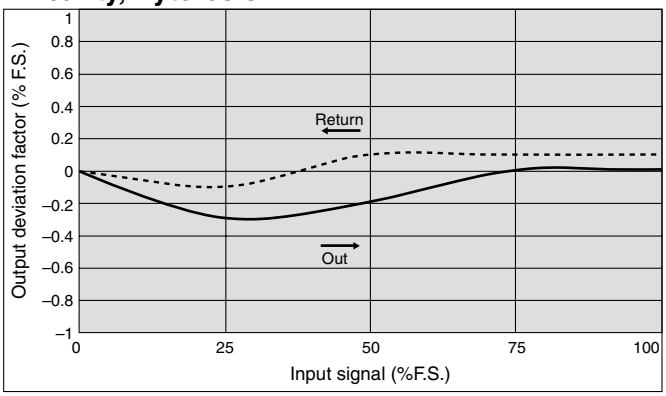


Block diagram



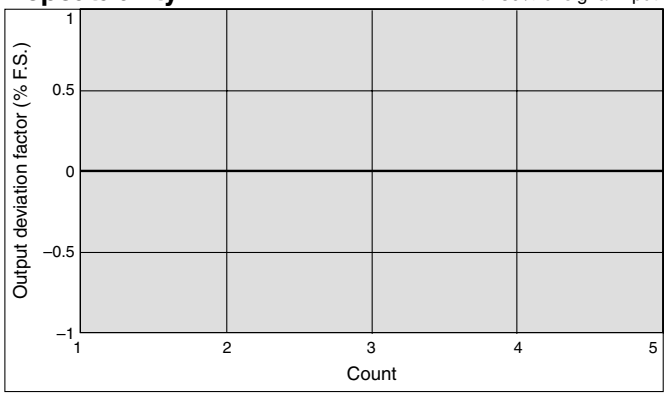
Series ITV001□

Linearity, Hyteresis



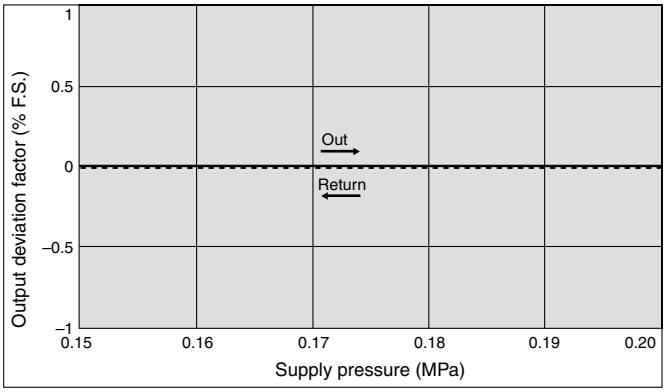
Repeatability

With 50% of signal input



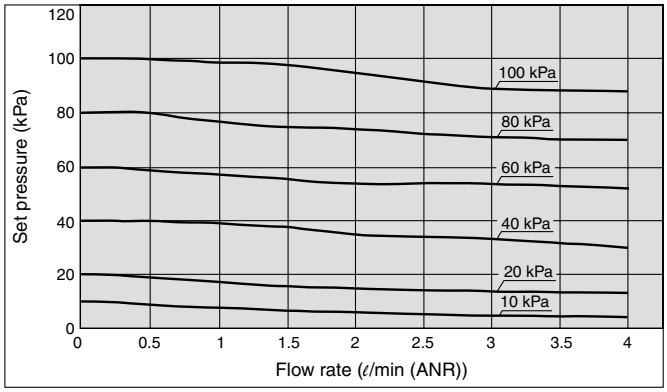
Pressure Characteristics

Set pressure: 0.05 MPa



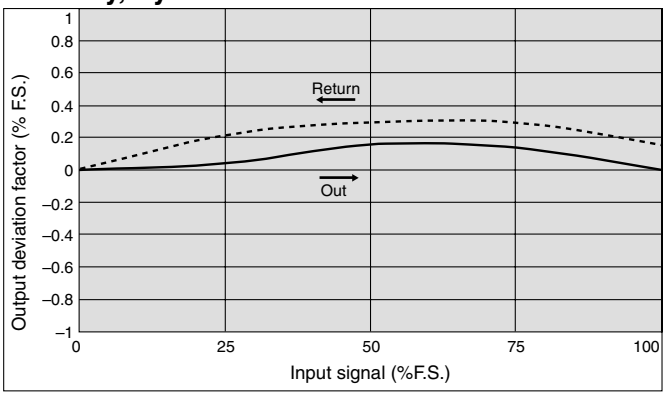
Flow Characteristics

Supply pressure: 0.2 MPa



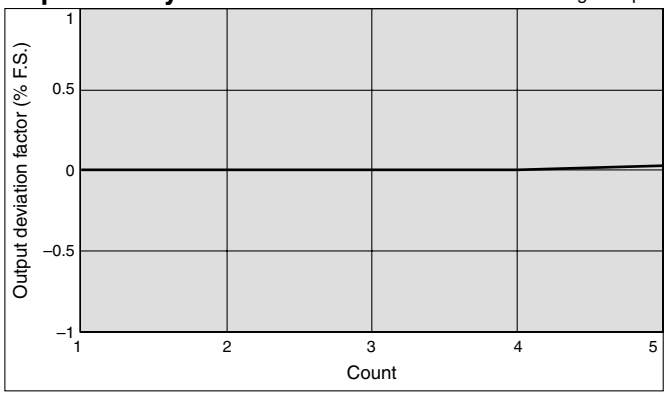
Series ITV003□

Linearity, Hyteresis



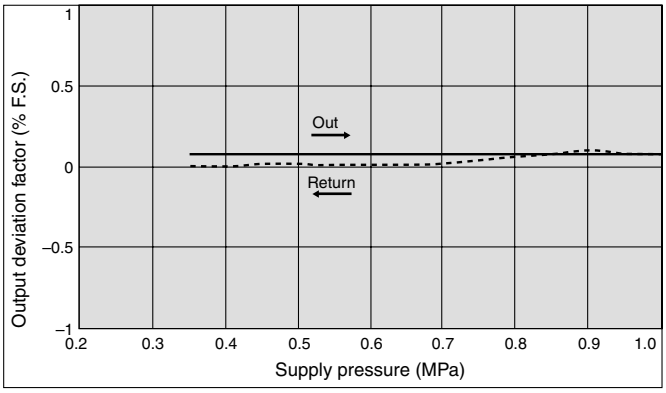
Repeatability

With 50% of signal input



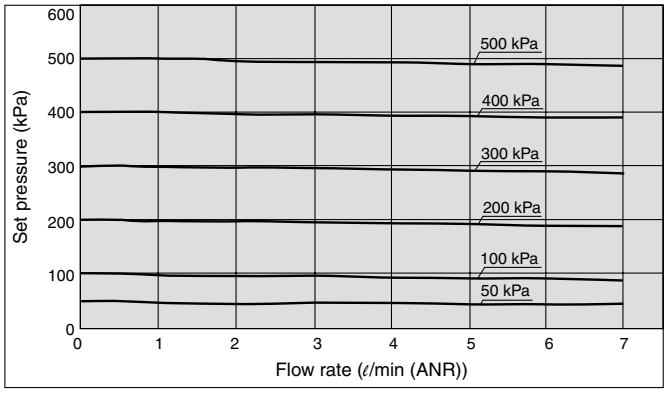
Pressure Characteristics

Set pressure: 0.25 MPa



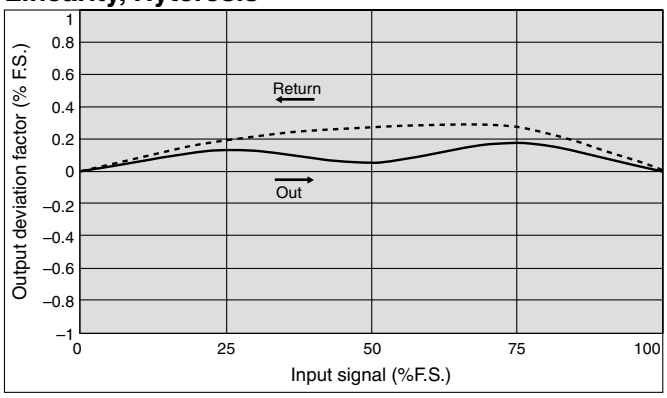
Flow Characteristics

Supply pressure: 0.6 MPa



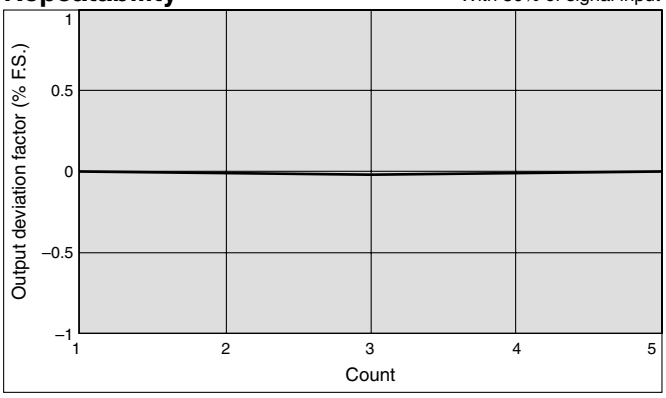
Series ITV005□

Linearity, Hyteresis



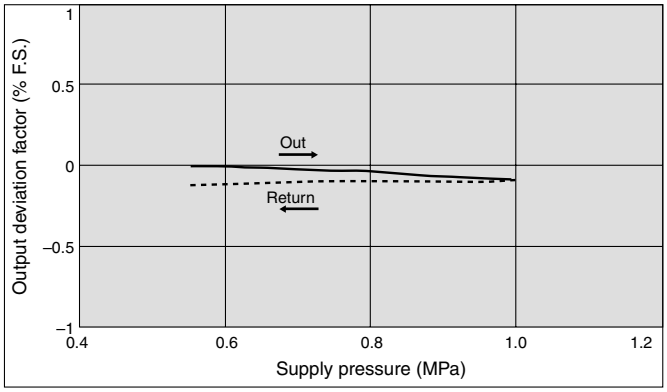
Repeatability

With 50% of signal input



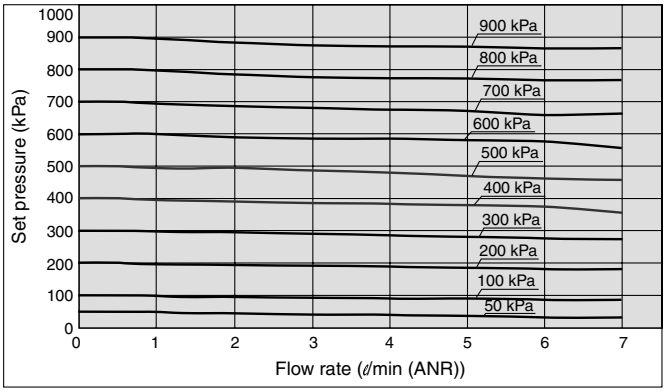
Pressure Characteristics

Set pressure: 0.45 MPa



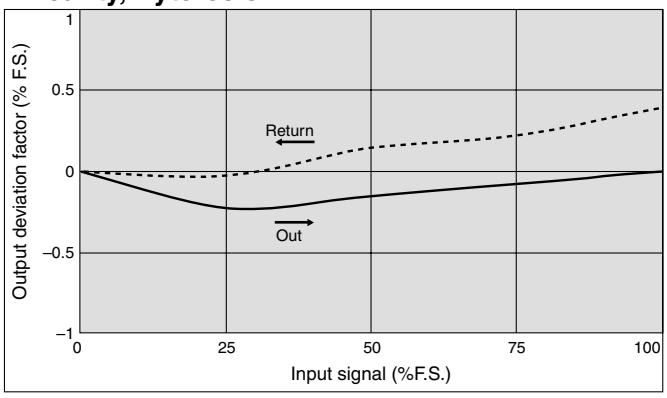
Flow Characteristics

Supply pressure: 1.0 MPa



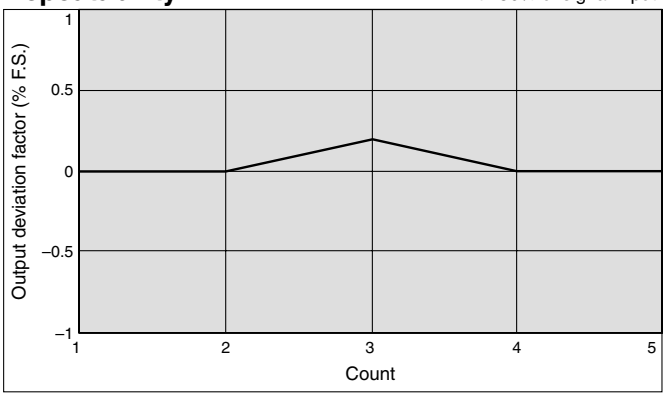
Series ITV009□

Linearity, Hyteresis



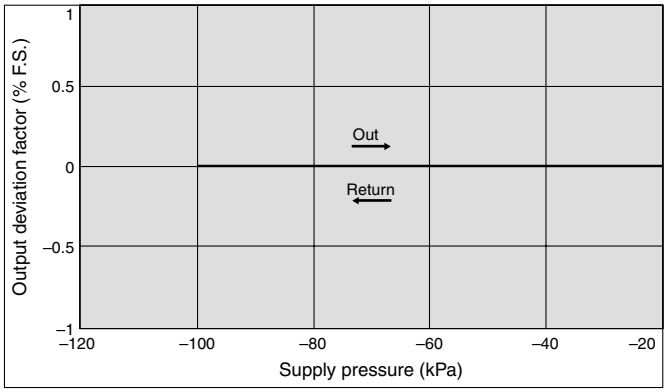
Repeatability

With 50% of signal input

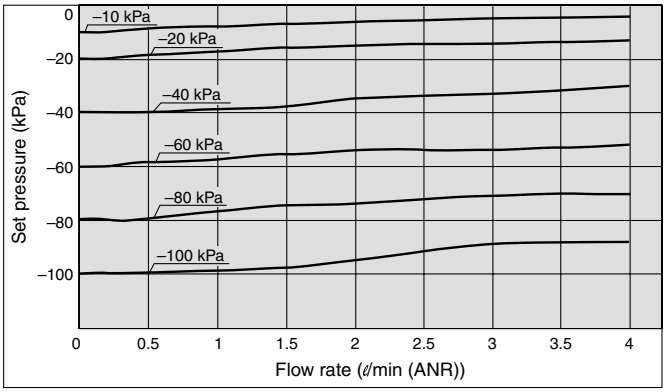


Pressure Characteristics

Set pressure: –10 kPa

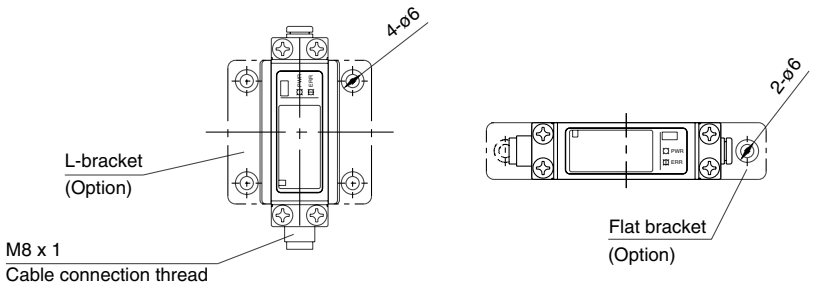


Flow Characteristics



Dimensions

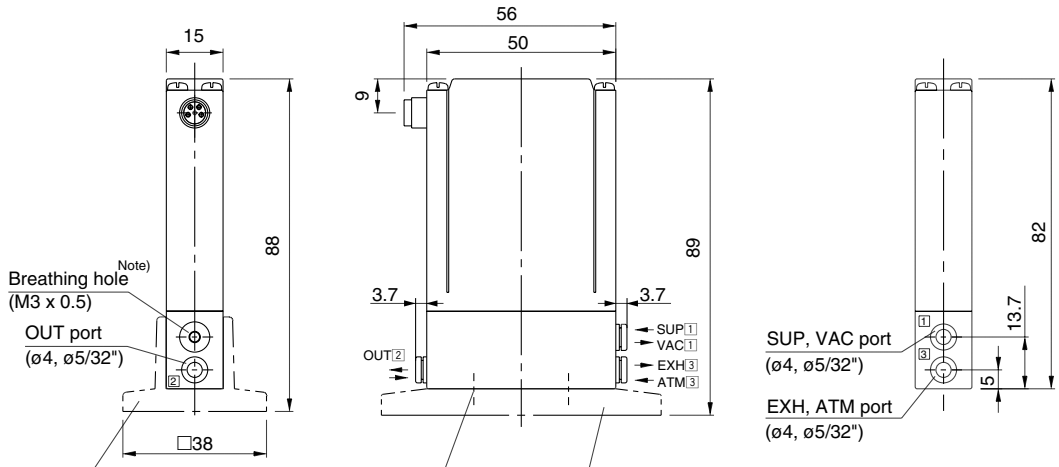
For Single Unit

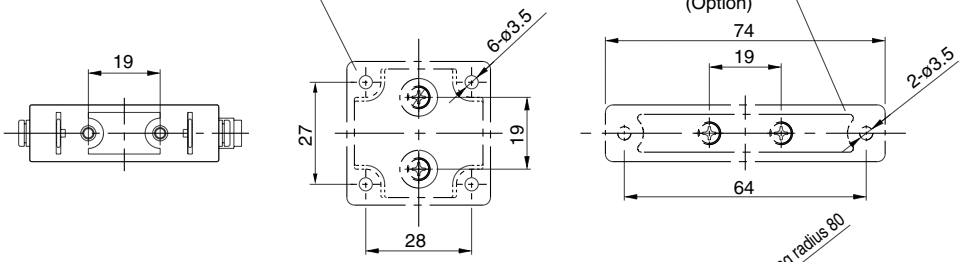


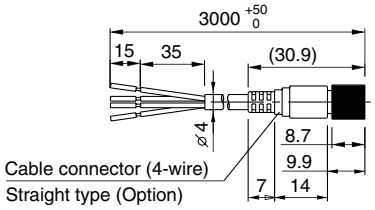
Port Location

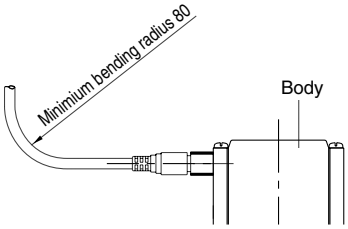
No.	1	2	3
1 ITV003□ 5	SUP	OUT	EXH
ITV009□	VAC		ATM

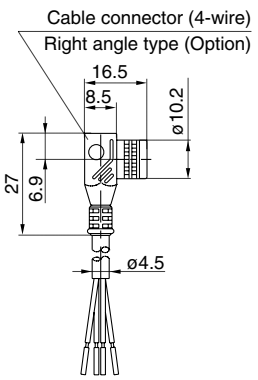
Note) When useing under the conditions equivalent to IP65, connect the fitting or tube to the bleed hole prior to use. (For details, refer to page 14-8-11 in Specific Product Precautions.)

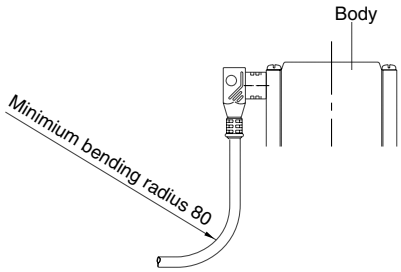






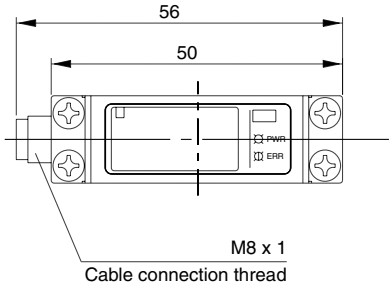


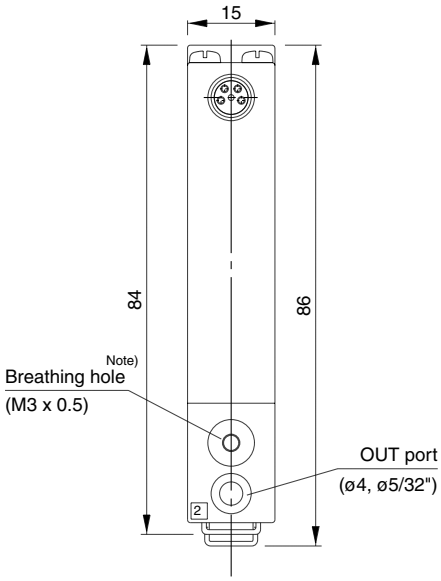


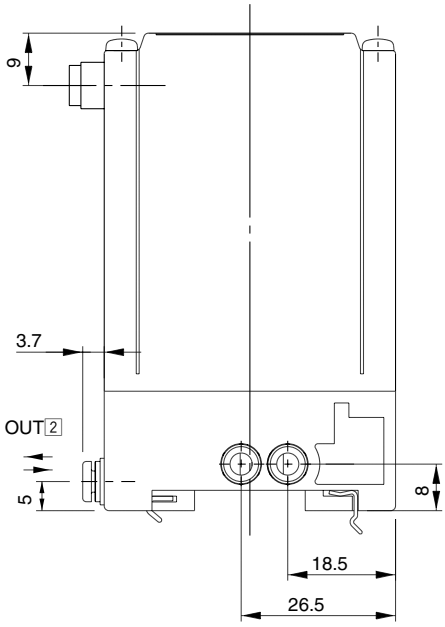


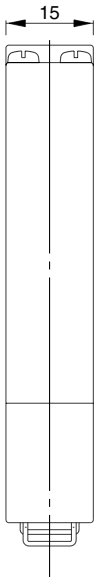
Dimensions

Single unit for manifold

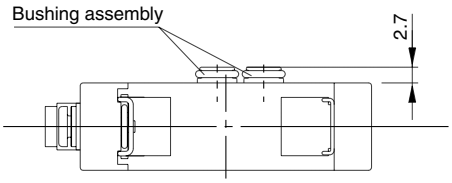








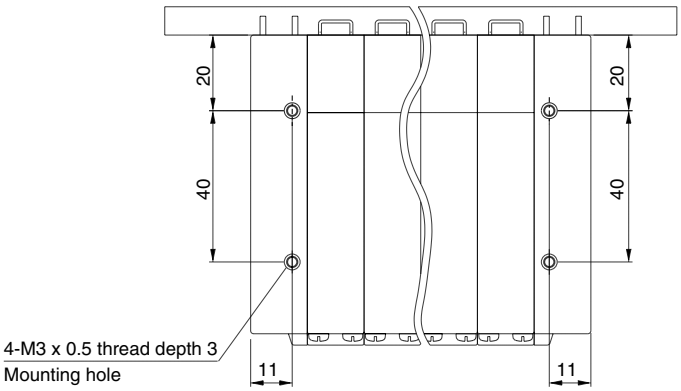
Note) When useing under the conditions equivalent to IP65, connect the fitting or tube to the bleed hole prior to use. (For details, refer to page 14-8-11 in Specific Product Precautions.)



Note) For dimensions of the cable connector, refer to single unit on page 14-8-8.

Dimensions

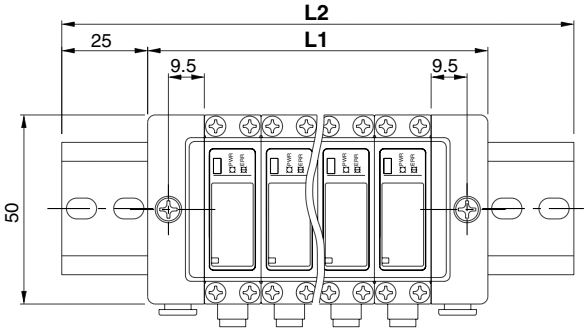
Manifold

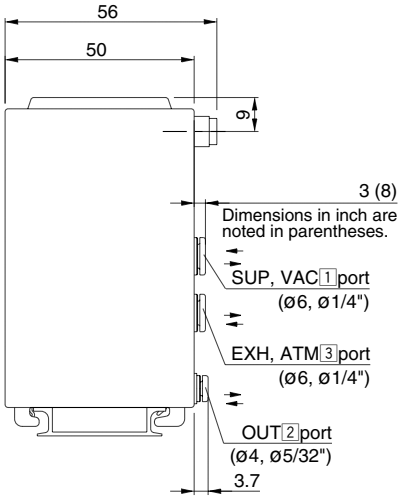


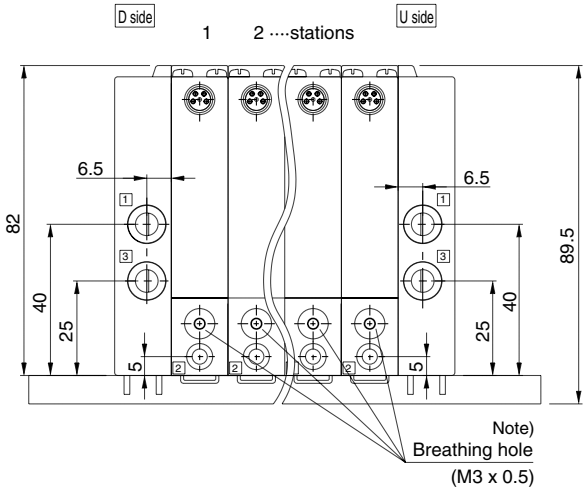
Port Location

No.	1	2	3
ITV003□ 1 5	SUP	OUT	EXH
ITV009□	VAC		ATM

Note) Stations are counted starting from the D side.







Note) For dimensions of the cable connector, refer to single unit on page 14-8-8.

Note) When using under the conditions equivalent to IP65, connect the fittings or tubing to the bleed hole prior to use. (For details, refer to "Specific Product Precautions" on page 14-8-11.)

(mm)

Manifold stations n	2	3	4	5	6	7	8	9	10
L1	60	75	90	105	120	135	150	165	180
L2	110.5	123	148	160.5	173	185.5	198	223	235.5

⚠ Precautions

Be sure to read before handling. Refer to pages 14-21-3 to 14-21-4 for Safety Instructions and Common Precautions.

Air Supply

⚠ Caution

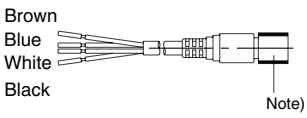
1. **Install an air filter near this product on the supply side. Select a filtration degree of 5 μm or less.**
2. **Compressed air containing large amounts of drainage can cause malfunction of this product and other pneumatic equipment. As a countermeasure, install an aftercooler, air dryer or Drain Catch, etc.**
3. **If large amounts of carbon dust are generated by the compressor, it can accumulate inside this product and cause malfunction.**

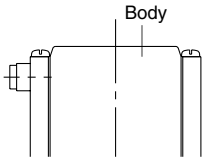
   For details on the above compressed air quality, refer to 14-14-2.

Wiring

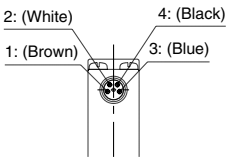
⚠ Caution

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.





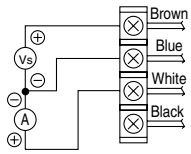
Terminal no.	1	2	3	4
Lead wire color	Brown	White	Blue	Black
Wiring	Power supply	Signal	COM	Monitor



Note) A right angle type is also available. The entry directions for the right angle type connector is downward (OUT port side). Never turn the connector as it is not designed to turn.
If forced, it will damage the connector port.

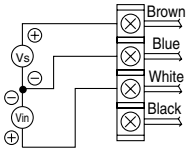
Wiring diagram

Current signal type



Vs : Power supply 24 VDC
12 to 15 VDC
A : Input signal 4 to 20 ADC
0 to 20 ADC

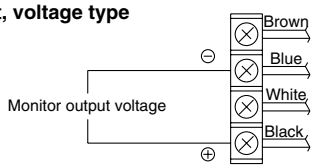
Voltage signal type



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

Monitor output wiring diagram

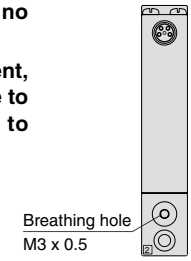
Analog output, voltage type



Handling

⚠ Caution

1. **Do not use a lubricator on the supply side of this product, as this can cause a malfunction. When lubrication of terminal equipment is necessary, connect a lubricator on the output side of this regulator.**
2. **If electric power is shut off while pressure is being applied, output pressure will be maintained. 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 supply to this regulator is cut off due to a power failure, etc., when it is in a regulated state, output pressure will be maintained temporarily. Handle carefully when operaing with output pressure released to the atmosphere, as air will continue to flow out until reaching atmospheric pressure.**
4. **If supply pressure to this regulator 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 solenoid valve may be shortened by this, be sure to shut off the power supply when supply pressure is shut off.**
5. **This product is adjusted for each specification at the time of shipment from the factory. Avoid unnecessary disassembly or removal of parts, as this can lead to a malfunction.**
6. **The optional cable connector is a 4-wire type. When the monitor output (analog output) is not being used, keep the monitor output wire (black) from touching the other wires as this can cause a malfunction.**
7. **Use caution that the right angle cable does not rotate and is limited to only one entry direction.**
8. **Take the following steps to avoid malfunction caused by 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) Make sure to take protective measures against load surge for an induction load (solenoid valves, relays, etc.).
9. **Characteristics are limited only to the static state, and when air is consumed on the output side, pressure may fluctuate.**
10. **For details on the handling of this product, refer to the instruction manual included with the product.**
11. **In locations where the body is exposed to water, dust, etc., there is a possibility that they can enter into the body throught the breathing hole. Use a fitting/tube (M-3AU-3 fitting and TIU01□-□□ tube are recommended), extend the piping to the location where there is no water, dust, etc.**
12. **When using in an enclosed environment, like an inspection box, etc., make sure to install a fan or other such device to prevent from overheating.**



Electro-pneumatic Regulator
Series ITV1000/2000/3000

Stepless control of air pressure proportional to an electrical signal

ITV1000
200 ℓ/min (ANR)*

ITV2000
1500 ℓ/min (ANR)*

ITV3000
4000 ℓ/min (ANR)*

200 ℓ/min type is newly introduced to the series.
Oil-free specifications (wetted parts)

* Pressure range: **0.9 MPa**, Supply pressure: **1.0 MPa**

IP65

Sensitivity: 0.2 kPa (100 kPa specifications)

Linearity: Within ±1% (F.S.)

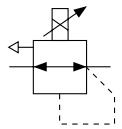
Hysteresis: Within ±0.5% (F.S.)

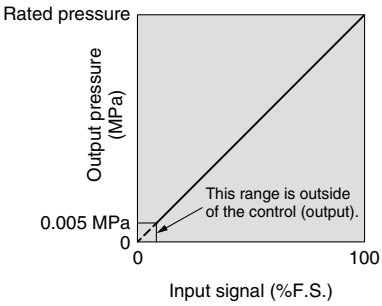
Electro-pneumatic Regulator
ITV1000/2000/3000

Straight type

Right angle type

JIS Symbol





Graph (1) Input/output characteristics chart

Standard Specifications

Model		ITV101□ / ITV201□ / ITV301□	ITV103□ / ITV203□ / ITV303□	ITV105□ / ITV205□ / ITV305□
Minimum supply pressure		Set pressure +0.1 MPa		
Maximum supply pressure		0.2 MPa	1.0 MPa	
Set pressure range Note 1)		0.005 to 0.1 MPa	0.005 to 0.5 MPa	0.005 to 0.9 MPa
Power supply	Voltage	24 VDC ± 10%, 12 to 15 VDC		
	Current consumption	Power supply voltage 24 VDC type: 0.12 A or less Power supply voltage 12 to 15 VDC type: 0.18 A or less		
Input signal	Current type Note 2)	4 to 20 mA, 0 to 20 mA (Sink type)		
	Voltage type	0 to 5 VDC, 0 to 10 VDC		
	Preset input	4 points		
Input impedance	Current type	250 Ω or less		
	Voltage type	Approx. 6.5 kΩ		
	Preset input	Approx. 2.7 kΩ		
Output signal (monitor output) Note 3)	Analog output	1 to 5 VDC (Load impedance: 1 kΩ or more) 4 to 20 mA (Sink type) (Load impedance: 250 Ω or less)		
	Switch output	NPN open collector output: Max. 30 V, 30 mA PNP open collector output: Max. 30 mA		
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/cm²: 0.01, bar: 0.01, PSI: 0.1 Note 4), kPa: 1		
Ambient and fluid temperature		0 to 50°C (with no condensation)		
Enclosure		IP65		
Weight	ITV10□□	Approx. 250 g (without options)		
	ITV20□□	Approx. 350 g (without options)		
	ITV30□□	Approx. 645 g (without options)		

Note 1) Please refer to "Graph (1)", relation to the differences between the set pressure and input. Additionally, refer to page 14-8-29 for the set pressure range by units of standard measured pressure. Additionally, refer to page 14-8-29 as maximum set pressure differs on unit of standard measure.
Note 2) 2-wire type 4 to 20 mA is not available. Power supply voltage (24 VDC or 12 to 15 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.
Note 4) The minimum unit for ITV205□ is 1PSI.
Note 5) The above characteristics are confined to the static state. When air is consumed on the output side, the pressure may fluctuate.

How to Order

ITV 3 0 1 0 – 0 1 □ 2 □ S □ – Q

Model

1	1000
2	2000
3	3000

Pressure range

1	0.1 MPa
3	0.5 MPa
5	0.9 MPa

Power supply voltage

0	24 VDC
1	12 to 15 VDC

Input signal

0	Current 4 to 20 mA (Sink type)
1	Current 0 to 20 mA (Sink type)
2	Voltage 0 to 5 VDC
3	Voltage 0 to 10 VDC
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 20 mA (Sink type)

* Option

Thread type

–	Rc
N*	NPT
T*	NPTF
F*	G

* Option

Port size

1	1/8 (1000 type)
2	1/4 (1000, 2000, 3000 type)
3	3/8 (2000, 3000 type)
4	1/2 (3000 type)

Cable connector type

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

* Option

Bracket

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

* Option

Pressure display unit Note 1)

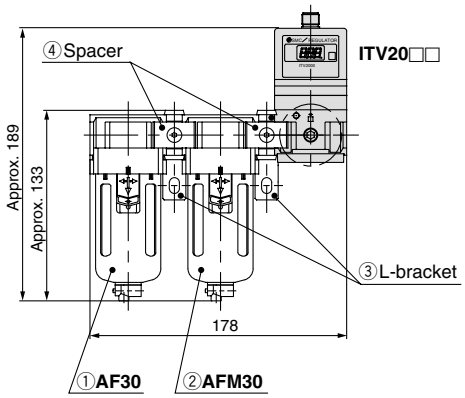
–	MPa
2	kgf/cm²
3	bar
4	PSI
5	kPa

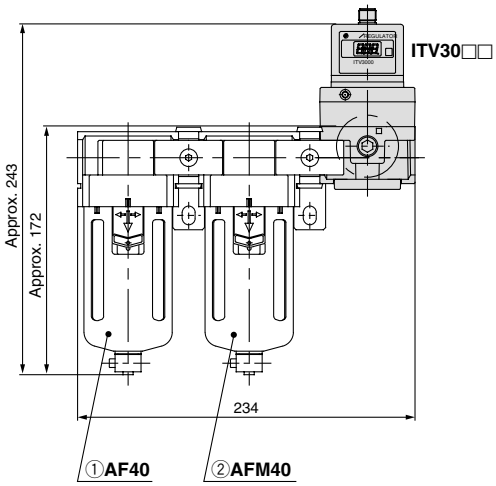
* Option

CE compliance

–	–
Q	CE compliant

* Please visit our SMC homepage: http://www.smcworld.com for the latest details on our CE compliant products.





Combinations

◎ Standard specifications ○ Combination possible ▭ Combination not possible

∗ ITV10□□ models are not applicable.

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

Modular Products and Accessory Combinations

∗ ITV10□□ models are not applicable.

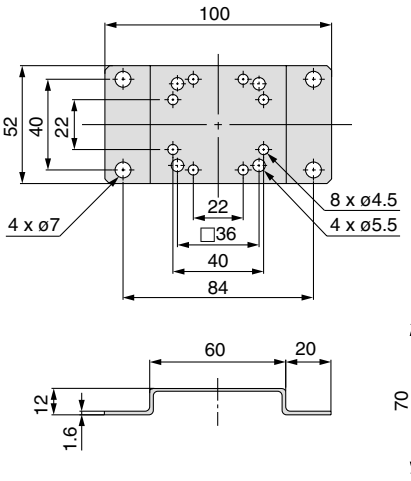
Applicable products and accessories	Applicable model	
	ITV20□□	ITV30□□
① Air filter	AF30	AF40
② Mist separator	AFM30	AFM40
③ L-bracket	B310L	B410L
④ Spacer	Y30	Y40
⑤ Spacer with L-bracket (③ + ④)	Y30L	Y40L

Accessory (Option)/Part No.

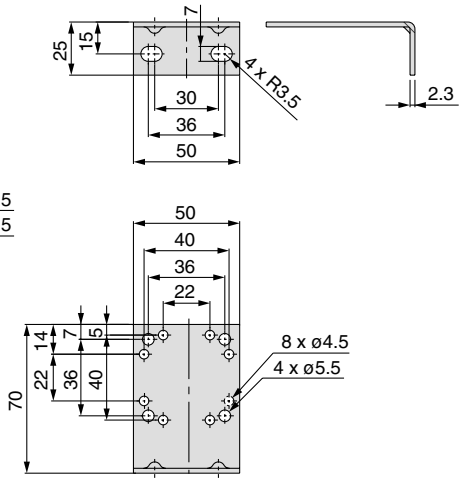
Description		Part no.		
		ITV10□□	ITV20□□	ITV30□□
Flat bracket		P3020114 (Mounting thread is not included.)		
L-bracket		INI-398-0-6 (Mounting thread is not included.)		
Cable connector	Straight type 3 m	TM-4DSX3HG4		
	Right angle type 3 m	TM-4DLX3HG4		

Dimensions

Flat bracket



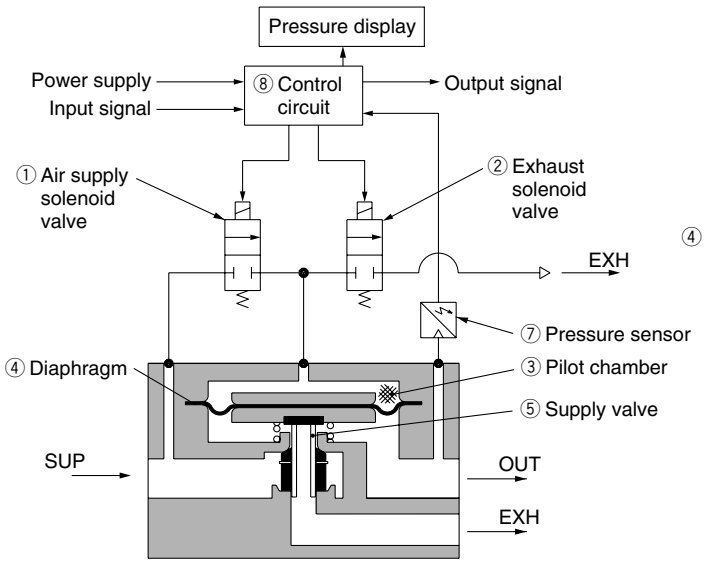
L-bracket



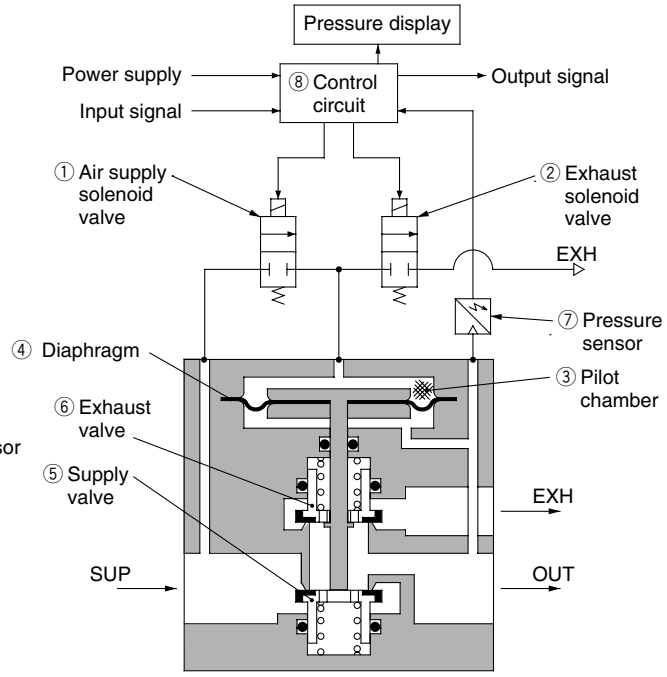
Working Principle

When the input signal rises, the air supply solenoid valve ① turns ON, and the exhaust solenoid valve ② turns OFF. Therefore, supply pressure 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

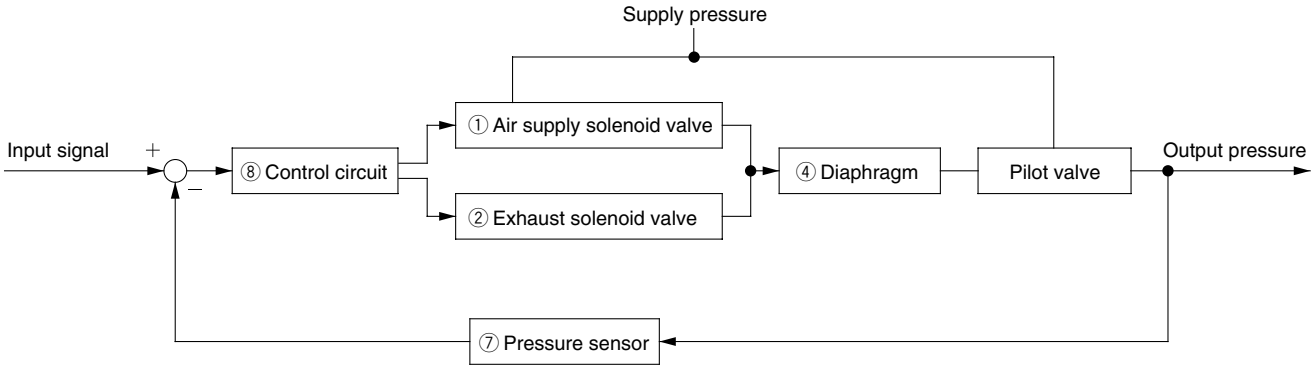


ITV1000



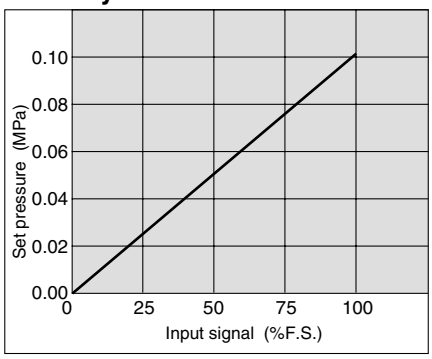
ITV2000, 3000

Block diagram

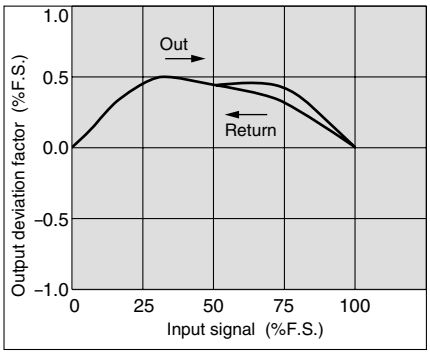


Series ITV101□

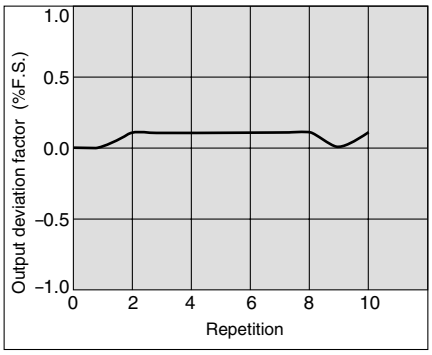
Linearity



Hysteresis

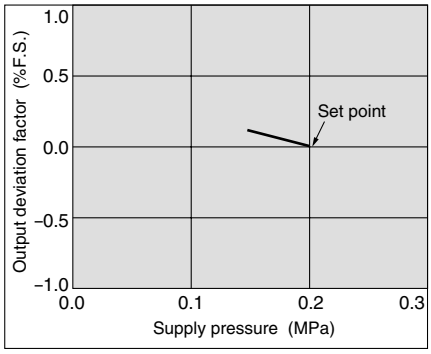


Repeatability



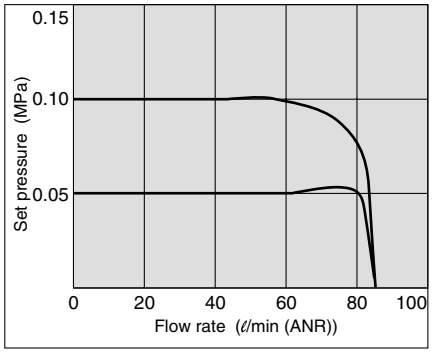
Pressure Characteristics

Set pressure: 0.05 MPa



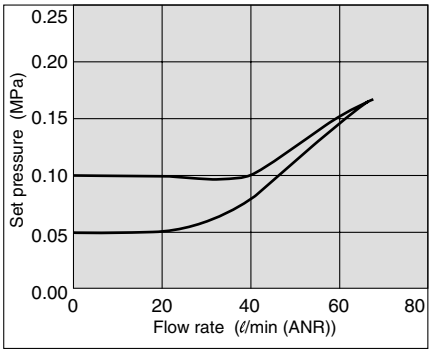
Flow Characteristics

Supply pressure: 0.2 MPa



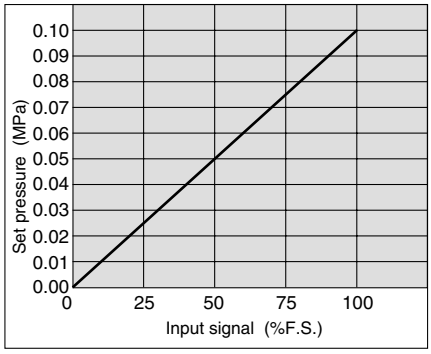
Relief Flow Characteristics

Supply pressure: 0.2 MPa

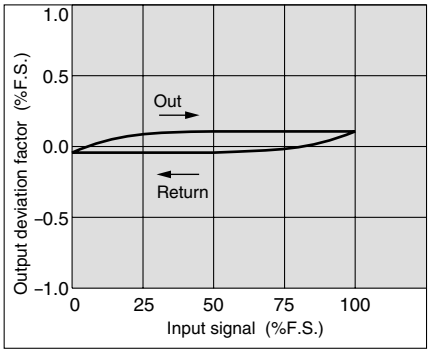


Series ITV201□

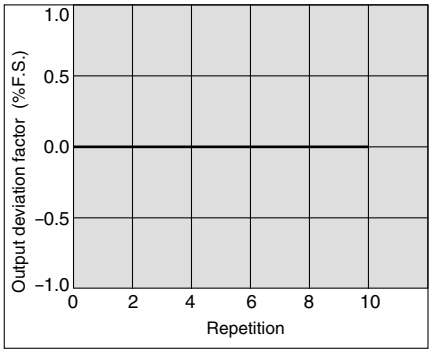
Linearity



Hysteresis

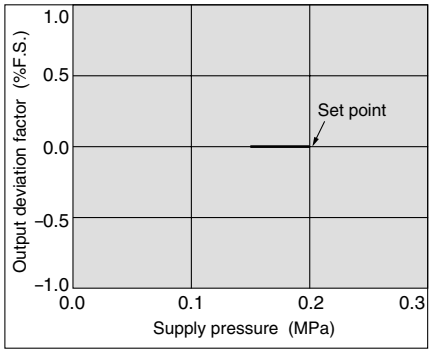


Repeatability



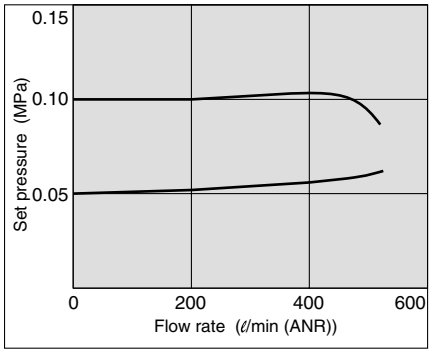
Pressure Characteristics

Set pressure: 0.05 MPa



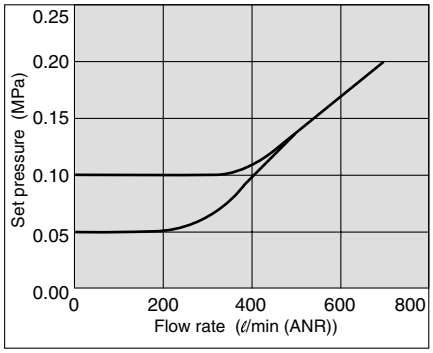
Flow Characteristics

Supply pressure: 0.2 MPa



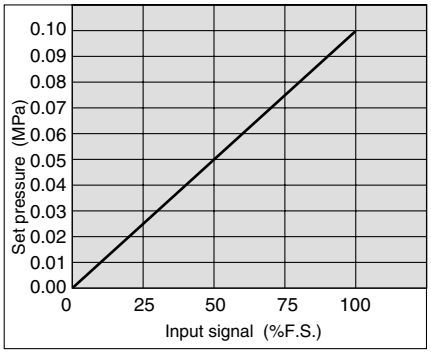
Relief Flow Characteristics

Supply pressure: 0.2 MPa

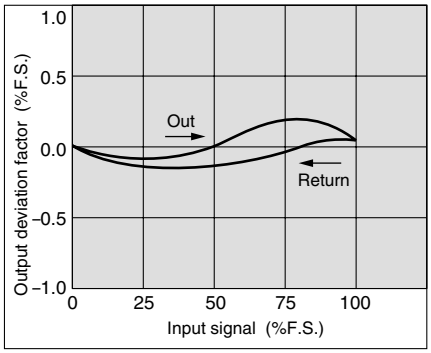


Series ITV301□

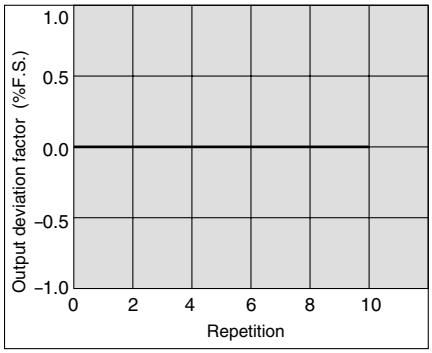
Linearity



Hysteresis

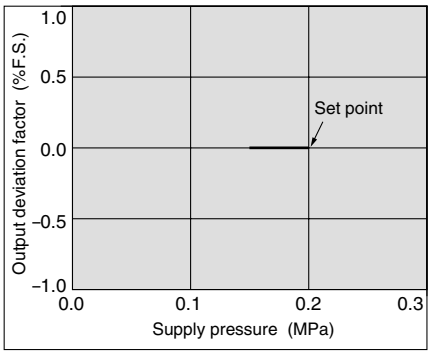


Repeatability



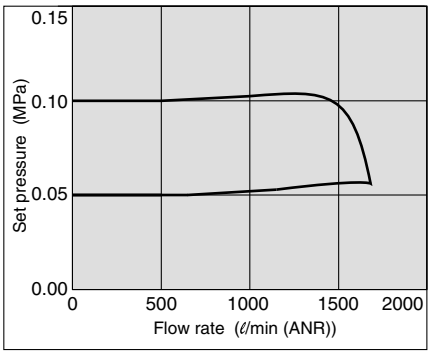
Pressure Characteristics

Set pressure: 0.05 MPa



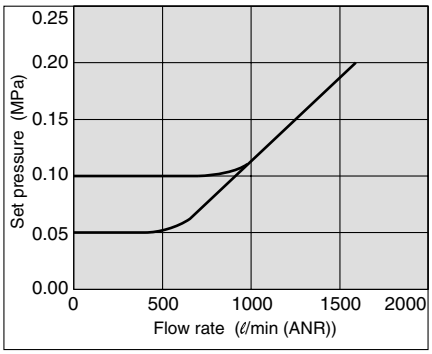
Flow Characteristics

Supply pressure: 0.2 MPa



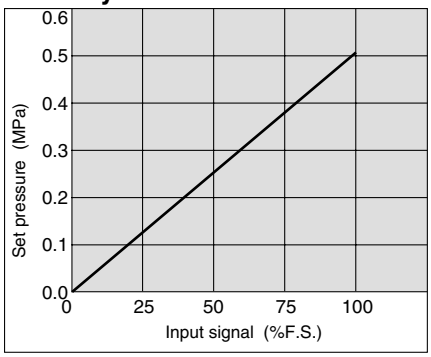
Relief Flow Characteristics

Supply pressure: 0.2 MPa

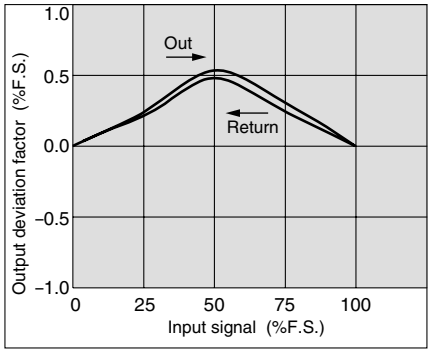


Series ITV103□

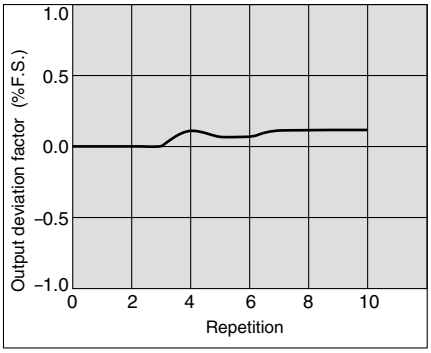
Linearity



Hysteresis

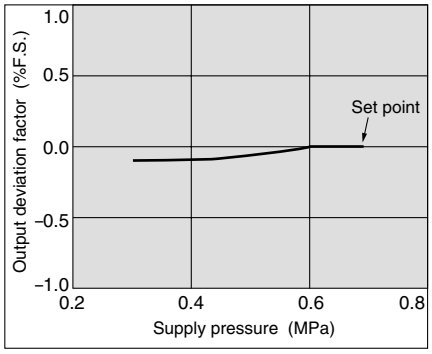


Repeatability



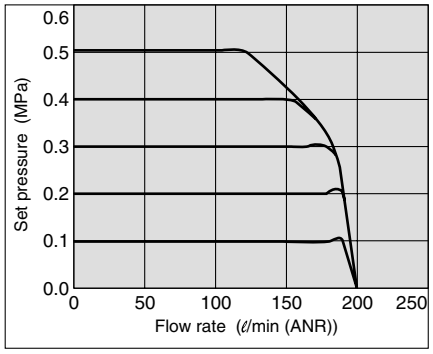
Pressure Characteristics

Set pressure: 0.2 MPa



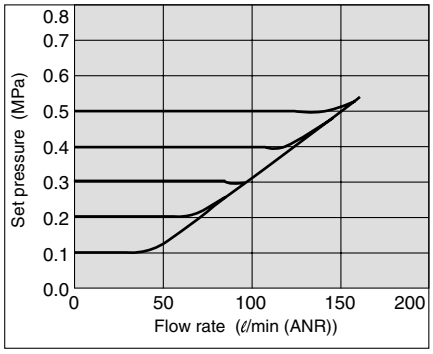
Flow Characteristics

Supply pressure: 0.7 MPa



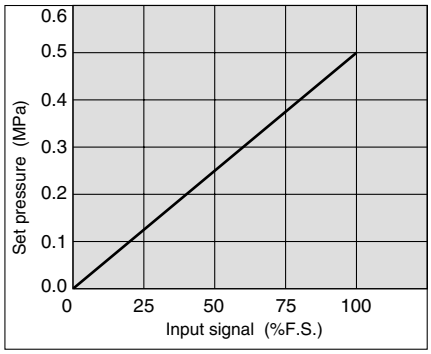
Relief Flow Characteristics

Supply pressure: 0.7 MPa

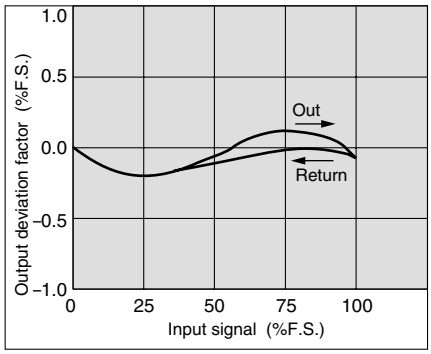


Series ITV203□

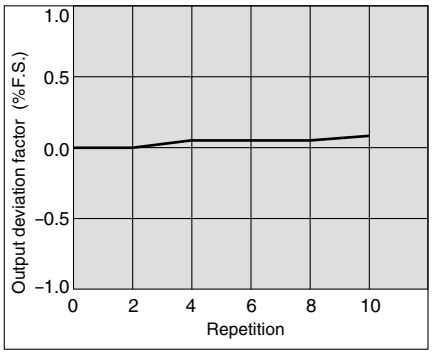
Linearity



Hysteresis

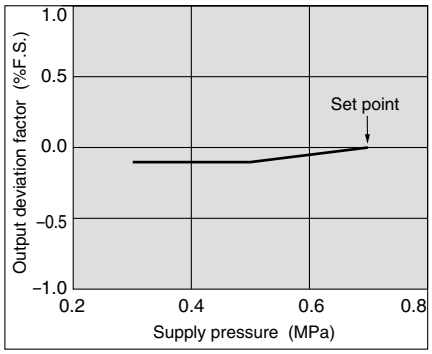


Repeatability



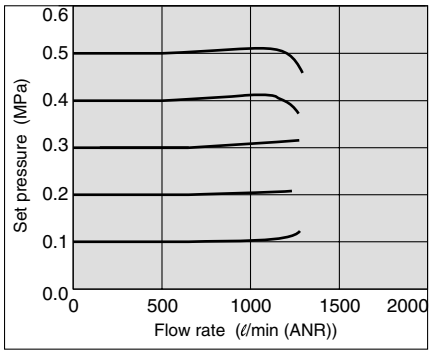
Pressure Characteristics

Set pressure: 0.2 MPa



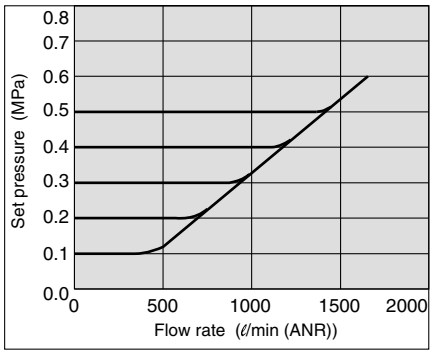
Flow Characteristics

Supply pressure: 0.7 MPa



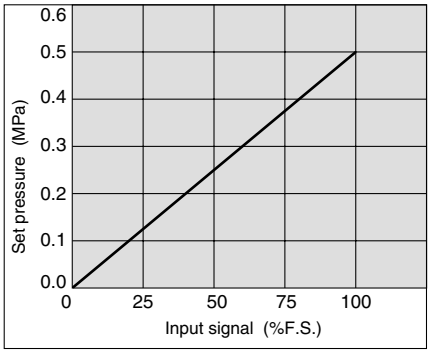
Relief Flow Characteristics

Supply pressure: 0.7 MPa

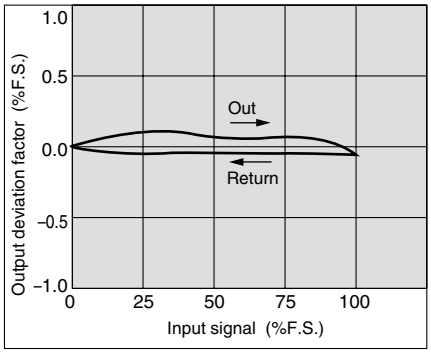


Series ITV303□

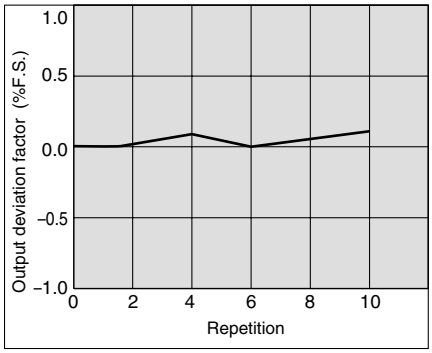
Linearity



Hysteresis

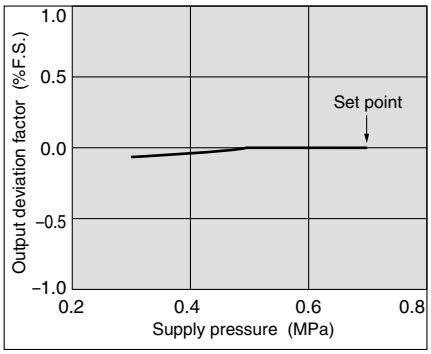


Repeatability



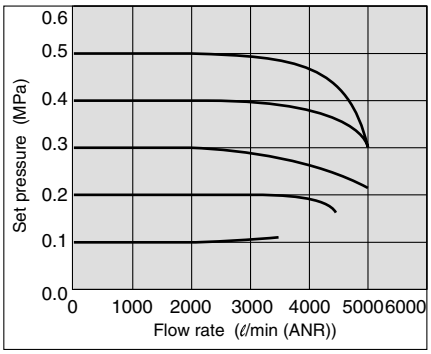
Pressure Characteristics

Set pressure: 0.2 MPa



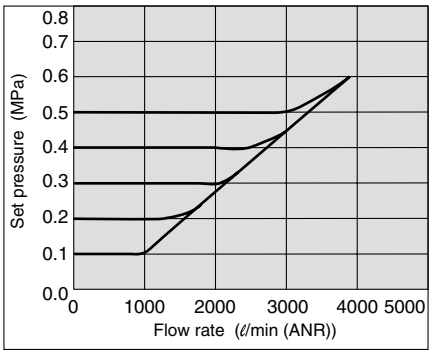
Flow Characteristics

Supply pressure: 0.7 MPa



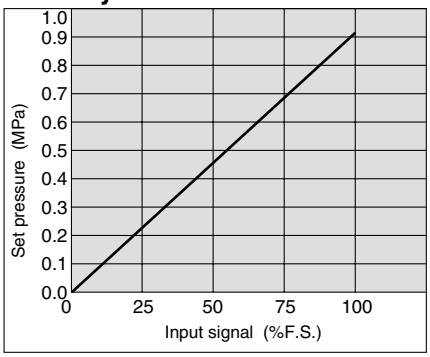
Relief Flow Characteristics

Supply pressure: 0.7 MPa

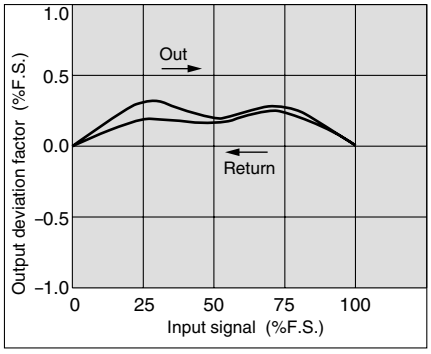


Series ITV105□

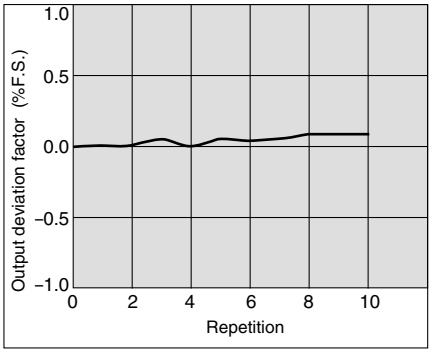
Linearity



Hysteresis

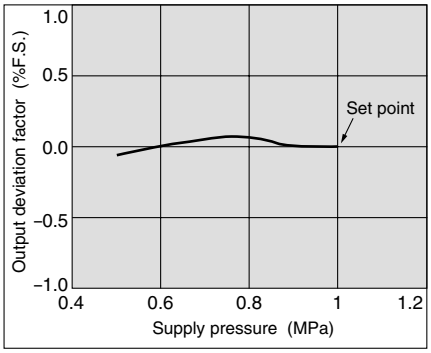


Repeatability



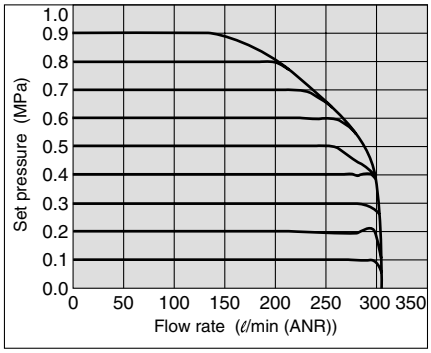
Pressure Characteristics

Set pressure: 0.4 MPa



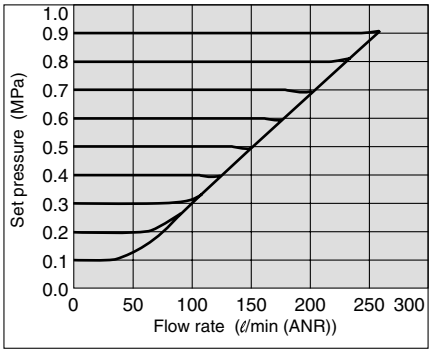
Flow Characteristics

Supply pressure: 1.0 MPa



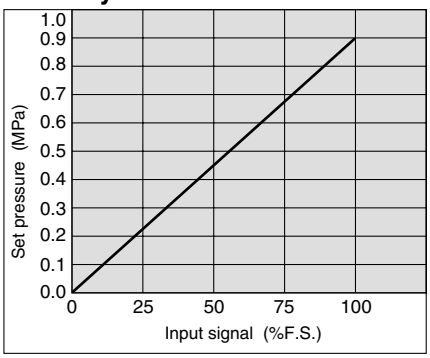
Relief Flow Characteristics

Supply pressure: 1.0 MPa

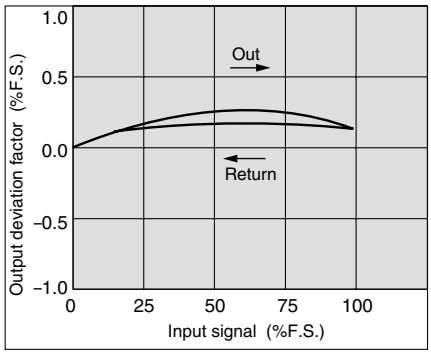


Series ITV205□

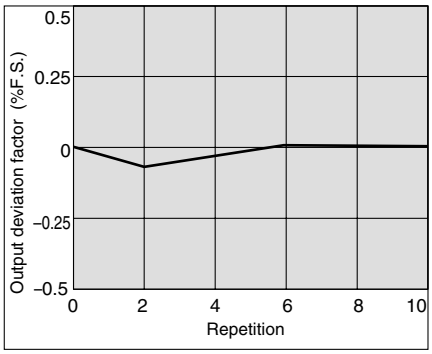
Linearity



Hysteresis

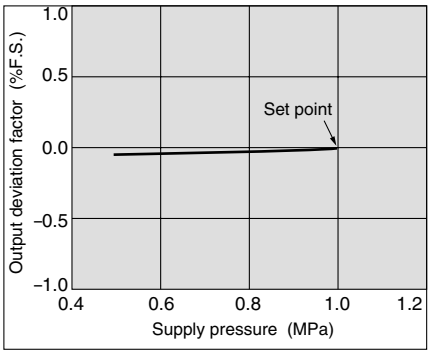


Repeatability



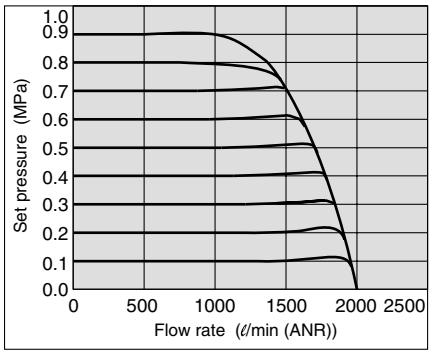
Pressure Characteristics

Set pressure: 0.4 MPa



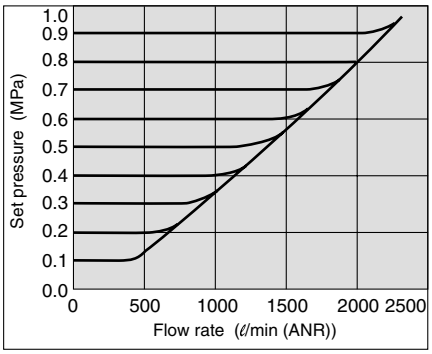
Flow Characteristics

Supply pressure: 1.0 MPa



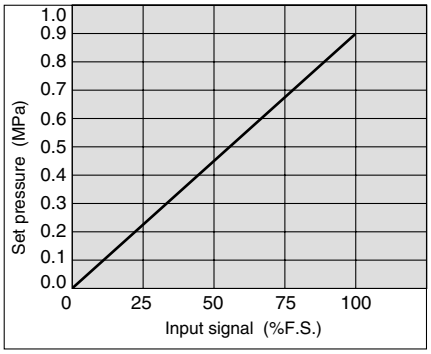
Relief Flow Characteristics

Supply pressure: 1.0 MPa

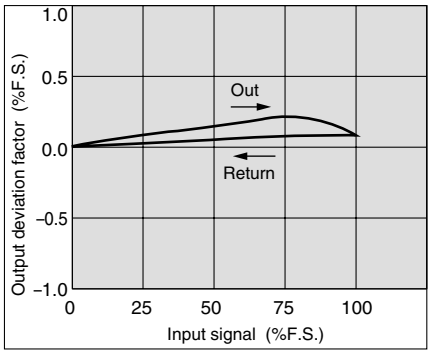


Series ITV305□

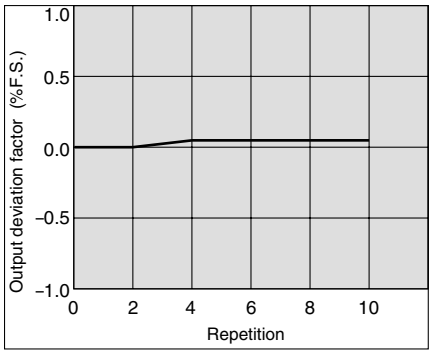
Linearity



Hysteresis

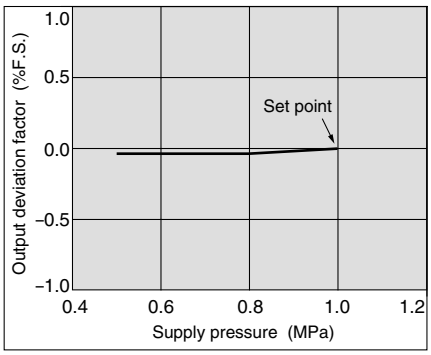


Repeatability



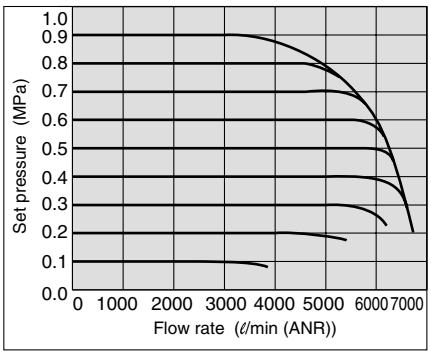
Pressure Characteristics

Set pressure: 0.4 MPa



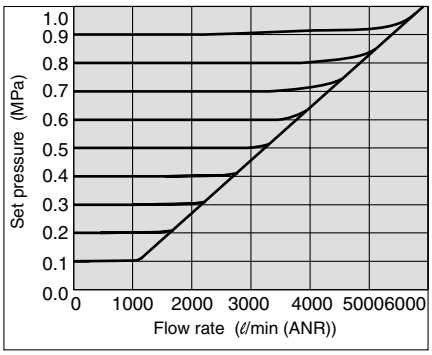
Flow Characteristics

Supply pressure: 1.0 MPa



Relief Flow Characteristics

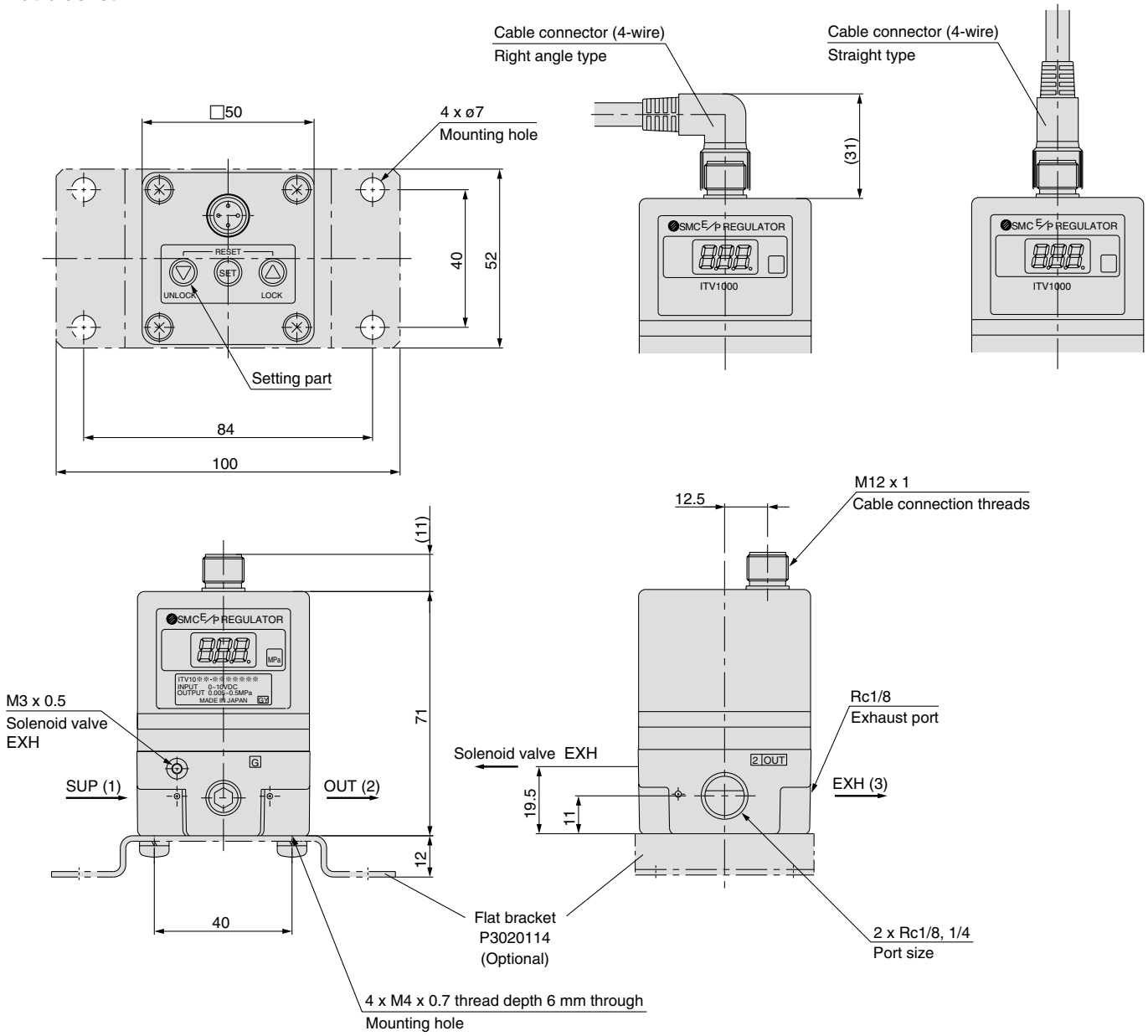
Supply pressure: 1.0 MPa



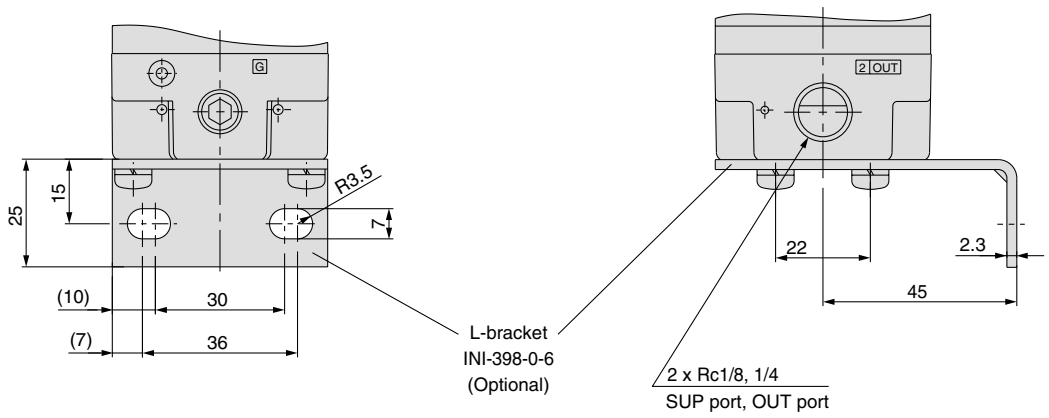
Dimensions

ITV10□□
Flat bracket

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



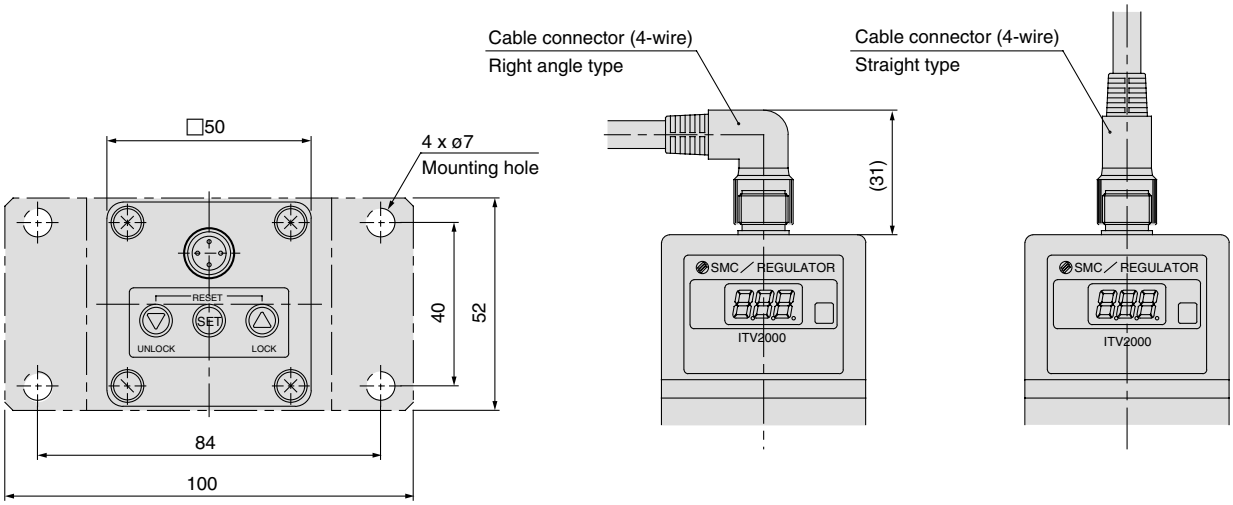
L-bracket

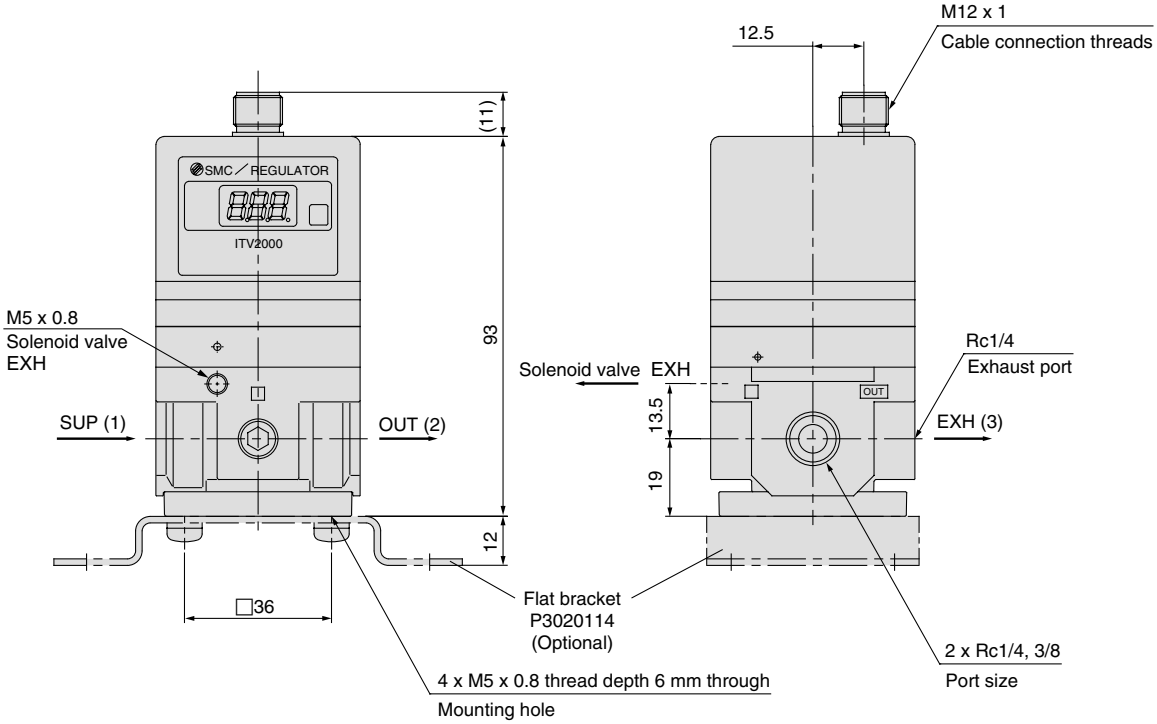


Dimensions

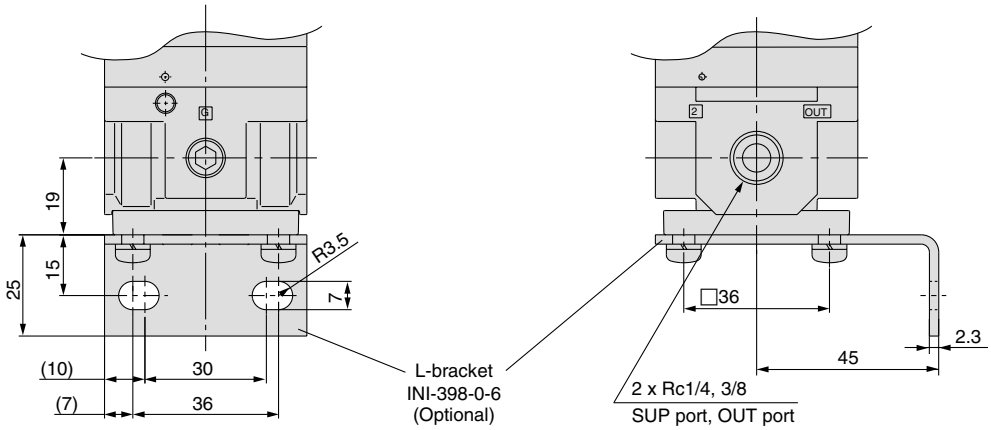
ITV20□□
Flat bracket

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





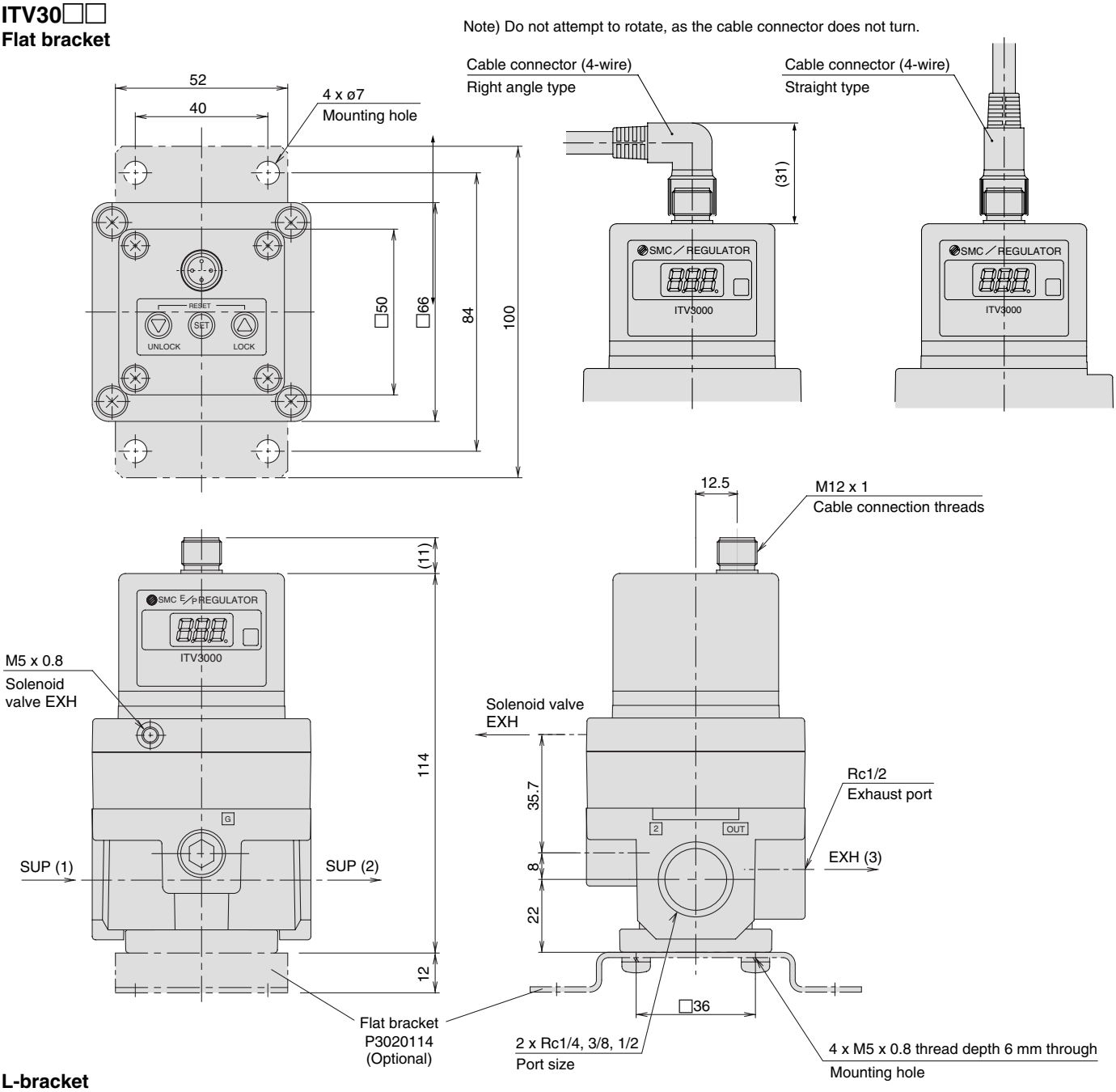
L-bracket



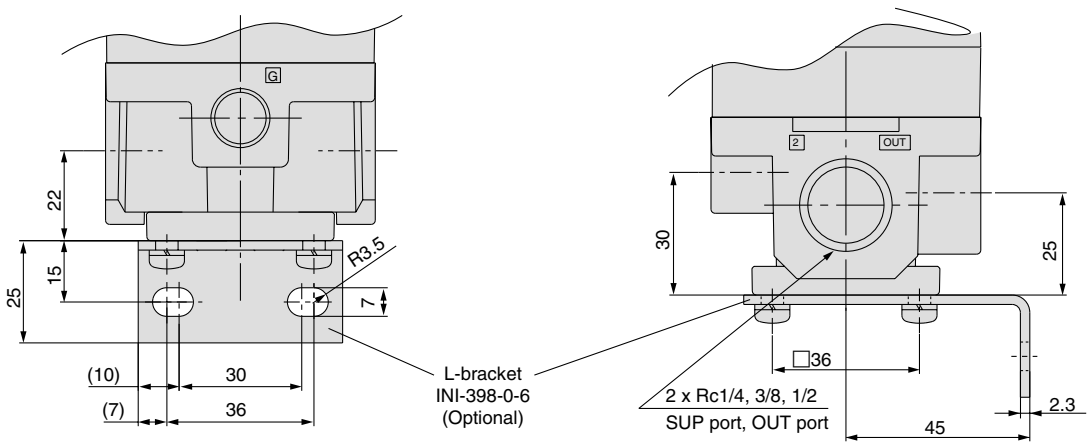
Dimensions

ITV30□□
Flat bracket

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



L-bracket



Specific Product Precautions 1

Be sure to read before handling.

Operating Environment

⚠ Warning

1. Employ suitable protective measures in locations where there is contact with water droplets, oil or welding spatter, etc.
2. Consult SMC when used in power plants, or if instrumentation related.

Air Supply

⚠ Caution

1. Install an air filter near this product on the supply side. Select a filtration degree of 5 μm 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 Best Pneumatics Vol. 16.

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 0.005 MPa or less. If it is desired to reduce the pressure completely to 0 MPa, 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) For avoiding the influence of noise 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.).
   4) Install or remove the connector after shutting off the power supply to avoid the influence of chattering of the power supply.
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 Rc1/8, Rc1/4 and Rc1/2.
11. Specifications on page 1 is in case of static environment. Pressure may fluctuate when air is consumed at the output side.
12. For details on the handling of this product, refer to the instruction manual which is included with the product.

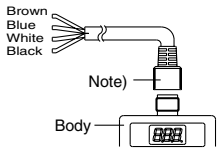
Specific Product Precautions 2

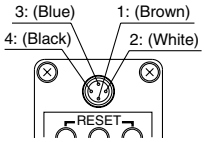
Be sure to read before handling.

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

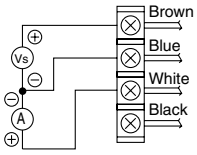
Preset input type

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

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.

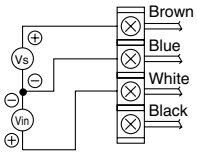
Wiring diagram

Current signal type



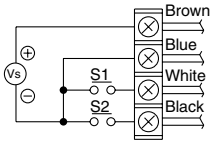
Vs: Power supply 24 VDC
12 to 15 VDC
A : Input signal 4 to 20 mADC
0 to 20 mADC

Voltage signal type



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

Preset input type



Vs: Power supply 24 VDC
12 to 15 VDC

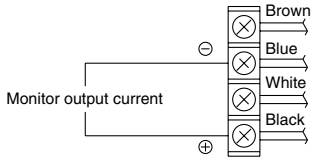
One of the preset pressures P1 through P4 is selected by the ON/OFF combination of S1 and S2.

S1	OFF	ON	OFF	ON
S2	OFF	OFF	ON	ON
Preset pressure	P1	P2	P3	P4

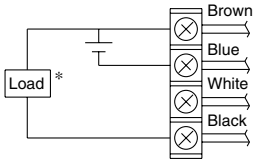
∗ For safety reasons, it is recommended that one of the preset pressures be set to 0 MPa.

Monitor output wiring diagram

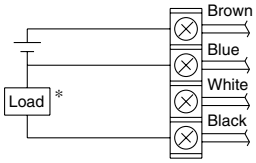
Analog output, voltage type



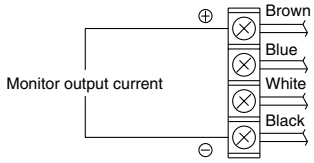
Switch output, NPN type



Switch output, PNP type



Analog output, current type (sink type)



∗ When 30 mA DC or more is applied, detecting device for overcurrent starts activating and then emits an error signal.
(Error number “5”)

Set Pressure Range

The regulating pressure range, by unit of standard measured pressure, is shown in the table below.

Regulating pressure range, by unit of standard measured pressure

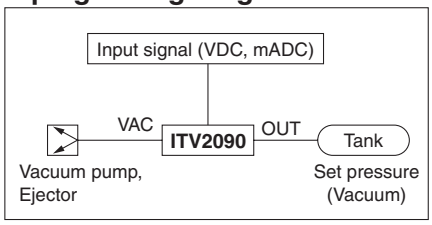
Unit	Regulating pressure range		
	ITV□01□	ITV□03□	ITV□05□
MPa	0.005 to 0.1	0.005 to 0.5	0.005 to 0.9
kgf/cm²	0.05 to 1	0.05 to 5	0.05 to 9
bar	0.05 to 1	0.05 to 5	0.05 to 9
PSI	0.7 to 15	0.7 to 70	0.7 to 130
kPa	5 to 100	5 to 500	5 to 900

Electronic Vacuum Regulator
Series ITV2090/2091

■ Stepless control of vacuum pressure in proportion to an electric signal

Straight type　　Right angle type

Piping/Wiring Diagram



Standard Specifications

Model		ITV2090	ITV2091
Power supply	Voltage	24 VDC ±10%	12 to 15 VDC
	Current consumption	Power supply voltage 24 VDC type: 0.12 A or less Power supply voltage 12 to 15 VDC type: 0.18 A or less	
Minimum supply vacuum pressure (1)		Set pressure –13.3 kPa	
Maximum supply vacuum pressure		–101 kPa	
Regulating pressure range		–1.3 to –80 kPa	
Input signal	Current type (2)	4 to 20 mA, 0 to 20 mA	
	Voltage type	0 to 5 VDC, 0 to 10 VDC	
	Preset input	4 points	
Input impedance	Current type	250 Ω or less	
	Voltage type	Approximately 6.5 kΩ	
	Preset input	Approximately 2.7 kΩ	
Output signal (3) (Monitor output)	Analog output	1 to 5 VDC (Load impedance: 1 kΩ or more) 4 to 20 mA (Sink type) (Load impedance: 250 Ω or less)	
	Switch output	NPN open collector output: Max. 30 V, 30 mA PNP open collector output: Max. 30 mA	
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		350 g	

Note 1) The minimum supply vacuum pressure should be 13.3 kPa less than the maximum vacuum pressure setting value.
Note 2) 4 to 20 mA is not possible with the 2-wire type. Power supply voltage (24 VDC or 12 to 15 VDC) 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. Use caution that the preset input type is not equipped with an output signal function.
Note 4) Please contact SMC regarding indication with other units of pressure.

How to Order

ITV 209 0 – 0 1 □ 2 □ S 5

Pressure range

9	–1.3 to –80 kPa

Power supply voltage

0	24 VDC
1	12 to 15 VDC

Input signal

0	Current type 4 to 20 mADC
1	Current type 0 to 20 mADC
2	Voltage type 0 to 5 VDC
3	Voltage type 0 to 10 VDC
4 *	Preset input

* Option

Monitor output

0 *	None (For preset input)
1	Analog output 1 to 5 VDC
2 *	Switch output/NPN output
3 *	Switch output/PNP output
4 *	Analog output 4 to 20 mADC

* Option

Thread type

Nil	Rc
N *	NPT
T *	NPTF
F *	G

* Option

Port size

2	1/4

Option (Bracket)

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

* Option

Cable connector type

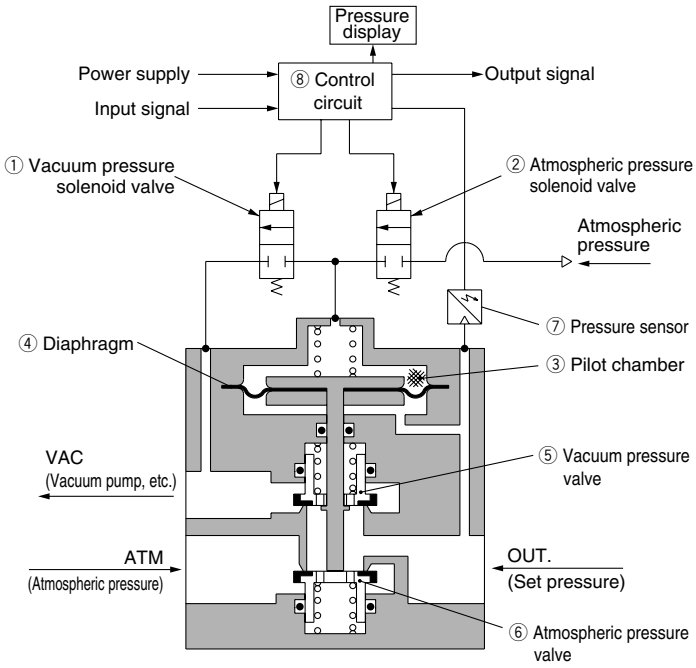
S	Straight type 3 m
L *	Right angle type 3 m
N *	Without cable connector

* Option

Pressure display unit

5	kPa

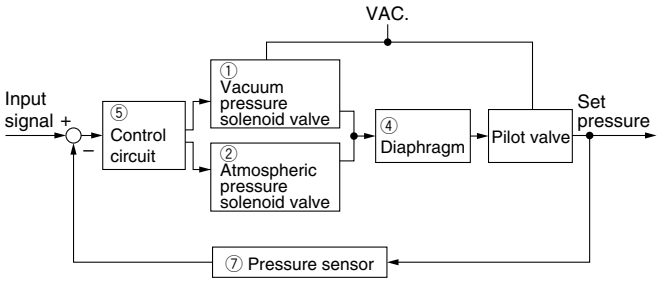
Working Principle



Working Principle

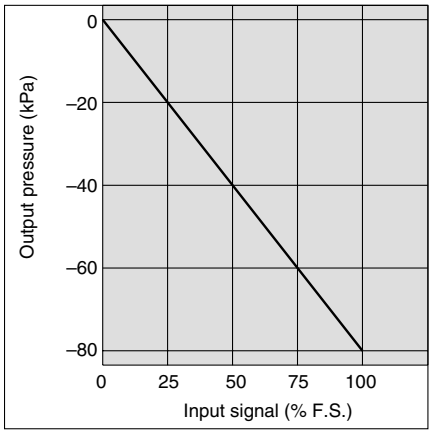
When the input signal increases, the vacuum pressure solenoid valve ① turns ON, and the atmospheric pressure solenoid valve ② turns OFF. Because of this, VAC and the pilot chamber ③ are connected, the pressure in the pilot chamber ③ becomes negative and acts on the top of the diaphragm.
As a result, 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

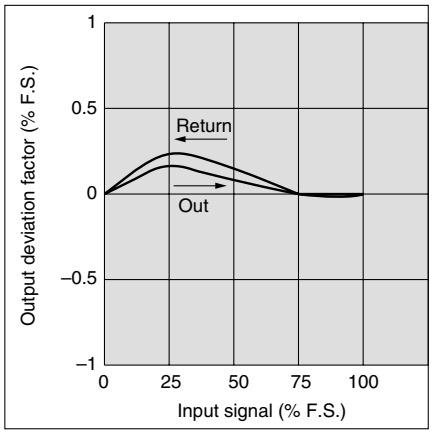


Series ITV209□

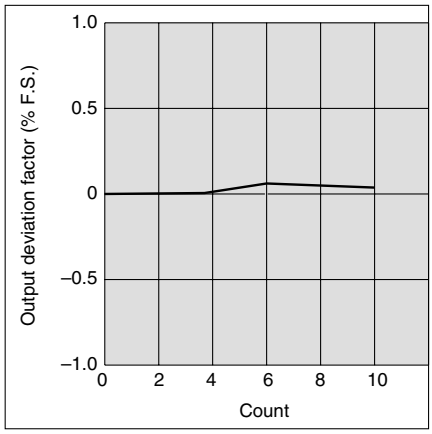
Linearity



Hysteresis

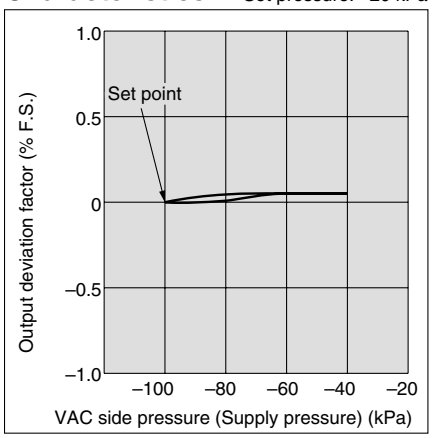


Repeatability



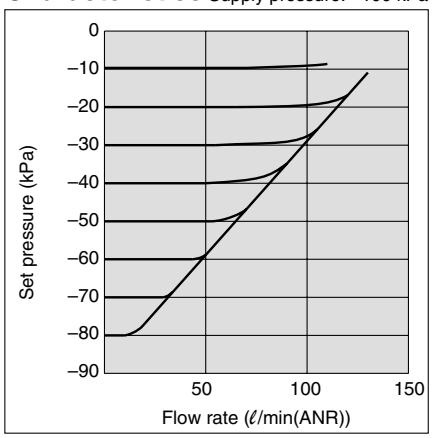
Pressure Characteristics

Set pressure: –20 kPa



Flow Characteristics

Supply pressure: –100 kPa



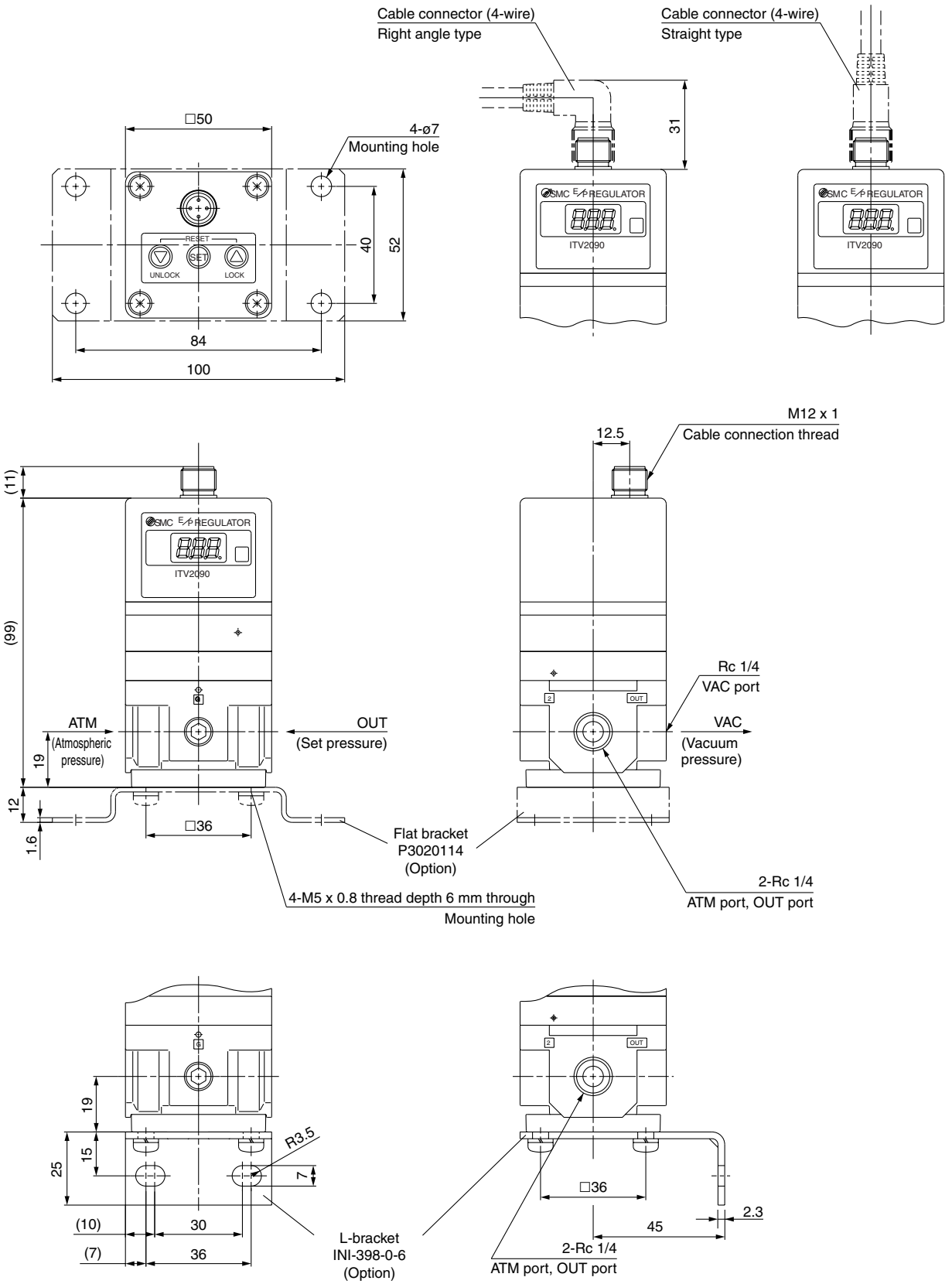
Flow characteristics measurement conditions

- Exhaust flow rate of the vacuum pump used for measurement: 500 ℓ/min (ANR)
- Inlet vacuum pressure: –100 kPa (When outlet flow rate is 0 ℓ/min (ANR))
- Maximum flow rate: 132 ℓ/min (ANR) (With inlet vacuum pressure at –39 kPa)

Dimensions

ITV2090

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

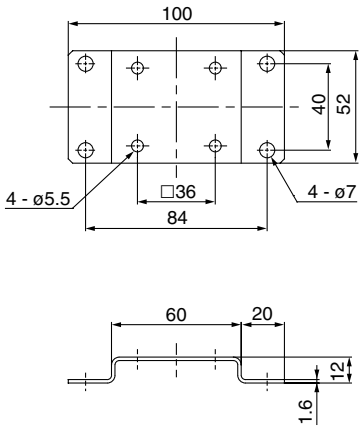


Accessory (Option)/Part No.

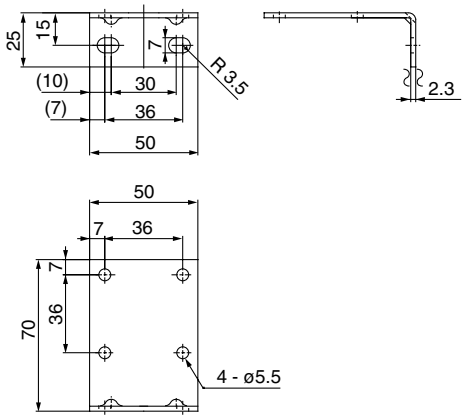
Description		Part no.
Flat bracket		P3020114
L-bracket		INI-398-0-6
Cable connector	Straight type	TM-4DSX3HG4
	Right angle type	TM-4DLX3HG4

Dimensions

Flat bracket



L-bracket



⚠ Precautions

Be sure to read before handling. Refer to pages 14-21-3 to 14-21-4 for Safety Instructions and Common Precautions.

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 no flow to 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 –1.3 kPa. In cases where the pressure needs to be reduced completely to 0 kPa, 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. Use caution that the right angle cable does not rotate and is limited to only one entry direction.
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) Make sure to take protective measures against load surge for an induction load (solenoid valves, relays, etc.).
15. Refer to the instruction manual included with the product for details on its handling.

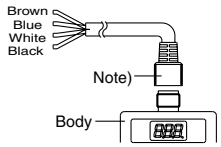
⚠Precautions

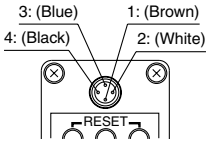
Be sure to read before handling. Refer to pages 14-21-3 to 14-21-4 for Safety Instructions and Common Precautions.

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

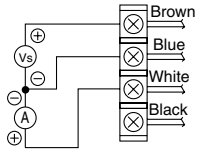
Preset Input Type

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 rotate it, since it's not designed to turn.

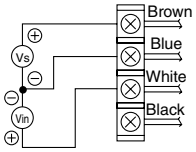
Wiring diagram

Current signal type



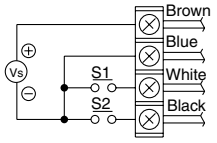
Vs : Power supply 24 VDC
12 to 15 VDC
A : Input signal 4 to 20 mADC
0 to 20 mADC

Voltage signal type



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

Preset input type



Vs : Power supply 24 VDC
12 to 15 VDC

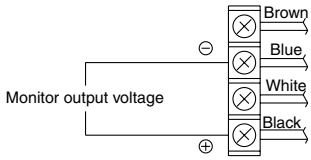
One of the preset pressures P1 through P4 is selected by the ON/OFF combination of S1 and S2.

S1	OFF	ON	OFF	ON
S2	OFF	OFF	ON	ON
Preset pressure	P1	P2	P3	P4

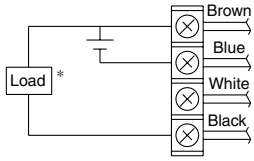
∗ For safety reasons, it is recommended that one of the preset pressures be set to 0 MPa.

Monitor output wiring diagram

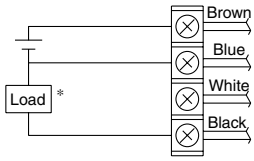
Analog output: Voltage type



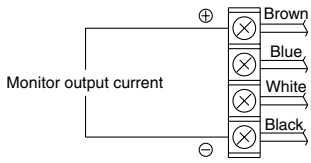
Switch output: NPN type



Switch output: PNP type



Analog output: Current type



∗ When 30 mADC or more is applied, detecting device for overcurrent starts activating and then emits an error signal. (Error number “5”)

Safety Instructions

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

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

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

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

Note 1) ISO 4414: Pneumatic fluid power--General rules relating to systems.
Note 2) JIS B 8370: General Rules for Pneumatic Equipment

⚠ Warning

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

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

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

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

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

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

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

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

Common Precautions

Be sure to read before handling.
For detailed precautions on every series, refer to main text.

Selection

⚠ Warning

1. Confirm the specifications.
Products represented in this catalog are designed for use in compressed air appllications only (including vacuum), unless otherwise indicated.
Do not use the product outside their design parameters.
Please contact SMC when using the products in applications other than compressed air (including vacuum).

Mounting

⚠ Warning

1. Instruction manual
Install the products and operate them only after reading the instruction manual carefully and understanding its contents. Also keep the manual where it can be referred to as necessary.

2. Securing the space for maintenance
When installing the products, please allow access for maintenance.

3. Tightening torque
When installing the products, please follow the listed torque specifications.

Piping

⚠ Caution

1. Before piping
Make sure that all debris, cutting oil, dust, etc, are removed from the piping.

2. Wrapping of pipe tape
When screwing piping or fittings into ports, ensure that chips from the pipe threads or sealing material do not get inside the piping. Also, when the pipe tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.

Air Supply

⚠ Warning

1. Operating fluid
Please consult with SMC when using the product in applications other than compressed air (including vacuum).
Regarding products for general fluid, please ask SMC about applicable fluids.

2. Install an air dryer, aftercooler, etc.
Excessive condensate in a compressed air system may cause valves and other pneumatic equipment to malfunction.
Installation of an air dryer, after cooler etc. is recommended.

3. Drain flushing
If condensate in the drain bowl is not emptied on a regular basis, the bowl will over flow and allow the condensate to enter the compressed air lines.
If the drain bowl is difficult to check and remove, it is recommended that a drain bowl with the auto-drain option be installed.
For compressed air quality, refer to “Air Preparation Equipment” catalog.

4. Use clean air
If the compressed air supply is contaminated with chemicals, cynthetic materials, corrosive gas, etc., it may lead to break down or malfunction.

Operating Environment

⚠ Warning

1. Do not use in environments where the product is directly exposed to corrosive gases, chemicals, salt water, water or steam.

2. Do not expose the product to direct sunlight for an extended period of time.

3. Do not use in a place subject to heavy vibrations and/or shocks.

4. Do not mount the product in locations where it is exposed to radiant heat.

Maintenance

⚠ Warning

1. Maintenance procedures are outlined in the operation manual.
Not following proper procedures could cause the product to malfunction and could lead to damage to the equipment or machine.

2. Maintenance work
If handled improperly, compressed air can be dangerous.
Assembly, handling and repair of pneumatic systems should be performed by qualified personnel only.

3. Drain flushing
Remove drainage from air filters regularly. (Refer to the specifications.)

4. Shut-down before maintenance
Before attempting any kind of maintenance make sure the supply pressure is shut of and all residual air pressure is released from the system to be worked on.

5. Start-up after maintenance and inspection
Apply operating pressure and power to the equipment and check for proper operation and possible air leaks. If operation is abnormal, please verify product set-up parameters.

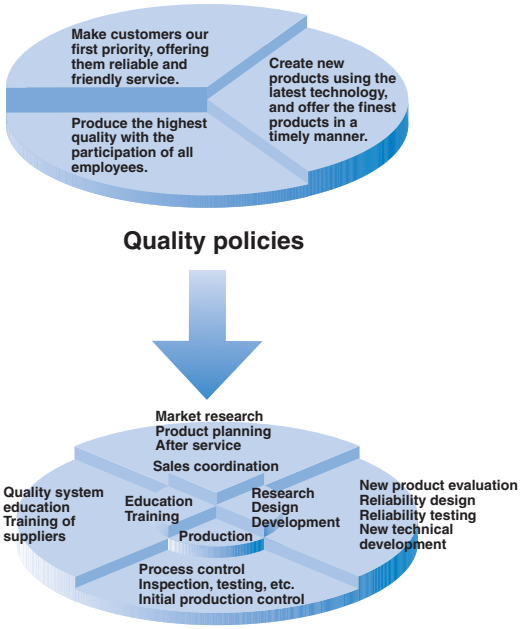
6. Do not make any modifications to be product.
Do not take the product apart.

Quality Assurance Information (ISO 9001, ISO 14001)

Reliable quality of products in the global market

To enable our customers throughout the world to use our products with even greater confidence, SMC has obtained certification for international standards “ISO 9001” and “ISO 14001”, and created a complete structure for quality assurance and environmental controls. SMC products pursue to meet its customers’ expectations while also considering company’s contribution in society.

SMC’s quality control system



Quality management system

ISO 9001

This is an international standard for quality control and quality assurance. SMC has obtained a large number of certifications in Japan and overseas, providing assurance to our customers throughout the world.

Environmental management system

ISO 14001

This is an international standard related to environmental management systems and environmental inspections. While promoting environmentally friendly automation technology, SMC is also making diligent efforts to preserve the environment.

SMC Product Conforming to Inter

SMC products complying with EN/ISO, CSA/UL standards are supporting

CE Mark

The CE mark indicates that machines and components meet essential requirements of all the EC Directives applied.
It has been obligatory to apply CE marks indicating conformity with EC Directives when machines and components are exported to the member Nations of the EU.
Once “A manufacturer himself” declares a product to be safe by means of CE marking (declaration of conformity by manufacturer), free distribution inside the member Nations of the EU is permissible.

■ CE Mark

SMC provides CE marking to products to which EMC and Low Voltage Directives have been applied, in accordance with CETOP (European hydraulics and pneumatics committee) guide lines.

■ As of February 1998, the following 18 countries will be obliged to conform to CE mark legislation

Iceland, Ireland, United Kingdom, Italy, Austria, Netherlands, Greece, Liechtenstein, Sweden, Spain, Denmark, Germany, Norway, Finland, France, Belgium, Portugal, Luxembourg

■ EC Directives and Pneumatic Components

• Machinery Directive

The Machinery Directive contains essential health and safety requirements for machinery, as applied to industrial machines e.g. machine tools, injection molding machines and automatic machines. Pneumatic equipment is not specified in Machinery Directive. However, the use of SMC products that are certified as conforming to EN Standards, allows customers to simplify preparation work of the Technical Construction File required for a Declaration of Conformity.

• Electromagnetic Compatibility (EMC) Directive

The EMC Directive specifies electromagnetic compatibility. Equipment which may generate electromagnetic interference or whose function may be compromised by electromagnetic interference is required to be immune to electromagnetic affects (EMS/immunity) without emitting excessive electromagnetic affects (EMI/emission).

• Low Voltage Directive

This directive is applied to products, which operate above 50 VAC to 1000 VAC and 75 VDC to 1500 VDC operating voltage, and require electrical safety measures to be introduced.

• Simple Pressure Vessels Directive

This directive is applied to welded vessels whose maximum operating pressure (PS) and volume of vessel (V) exceed 50 bar/L. Such vessels require EC type examination and then CE marking.

national Standards

you to comply with EC directives and CSA/UL standards.

Mark of compliance for CSA/UL

Mark of compliance for CSA

NRTL /C

■ CSA Standards & UL Standards

UL and CSA standards have been applied in North America (U.S.A. and Canada) symbolizing safety of electric products, and are defined to mainly prevent danger from electric shock or fire, resulting from trouble with electric products. Both UL and CSA standards are acknowledged in North America as the first class certifying body. They have a long experience and ability for issuing product safety certificate. Products approved by CSA or UL standards are accepted in most states and governments beyond question.
Since CSA is a test certifying body as the National Recognized Testing Laboratory (NRTL) within the jurisdiction of Occupational Safety and Health Administration (OSHA), SMC was tested for compliance with CSA Standards and UL Standards at the same time and was approved for compliance with the two Standards. The above CSA NRTL/C logo is described on a product label in order to indicate that the product is approved by CSA and UL Standards.

■ TSSA (MCCR) Registration Products

TSSA is the regulation in Ontario State, Canada. The products that the operating pressure is more than 5 psi (0.03 MPa) and the piping size is bigger than 1 inch. fall into the scope of TSSA regulation.

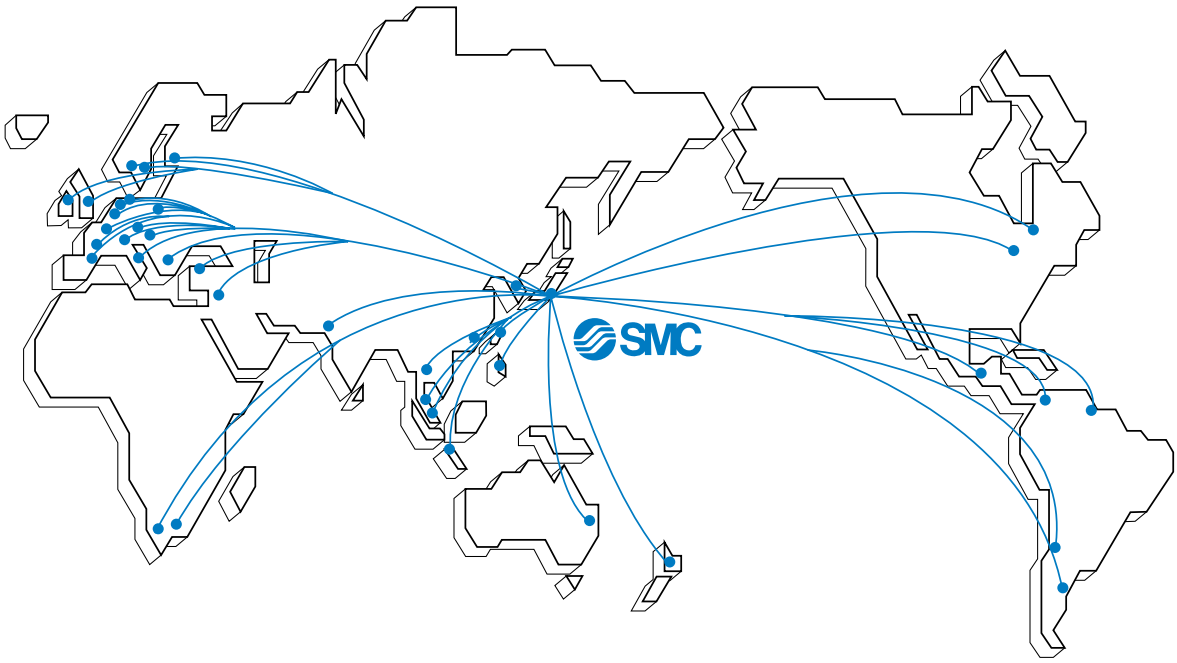
Products conforming to CE Standard

With CE symbol for simple visual recognition

In this catalog each accredited product series is indicated with a CE mark symbol. However, in some cases, every available models may not meet CE compliance. Please visit our web site for the latest selection of available models with CE mark.

http://www.smcworld.com

SMC's Global Service Network



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