

C

Flow Control Valves

■ Flow Control Valve	92-95
■ Precision Needle Valve w/Non-rotary Needle	96/97
MODEL 2412 Series	
■ Bellows Needle Valve (for rigid control of leaks)	98/99
MODEL 2450 Series	
■ Simplified Panel-mount Miniature Needle Valve	100
MODEL 2400 Series	
■ Multiturn Type Precision Needle Valve (Ideal for restriction of flows by dial control operation)	101
MODEL 2412M Series	
■ Large Capacity Precision Needle Valve (for Stable Control)	102
MODEL 2412D Series	
■ Multiple Rotation Type Large Capacity Simplified Needle Valve	103
MODEL 2400D Series	
■ Variable Secondary Pressure Flow Controller (Not Subject to outlet pressure variations)	104
MODEL 2203 Series	
■ Variable Primary Pressure Flow Controller (Not Subject to supply pressure variations)	105
MODEL 2204 Series	
■ All-Teflon Constant Flow Valve for Liquids/Chemicals	106
MODEL 2600 Series	
■ Constant Flow Valve for Liquid	107
MODEL 2600 Series	
■ Small Proportional Solenoid Valve	108
MODEL 2900 Series	
■ Shutoff Valve	109
MODEL 5220 Series	
■ Toggle Valve (Stop Valve with Small Retention Section)	110
MODEL 5500 Series	

C

Best Selection

Flow Control Valves

Precision Needle Valve
w/Non-rotary Needle
MODEL 2412 SERIES

P.96



Bellows Needle Valve (for rigid control of leaks)
MODEL 2450 SERIES

P.98



Simplified Panel-mount Miniature Need Valve
MODEL 2400 SERIES

P.100

Multidial Type Precision Needle Valve
(Ideal for restriction of flows by dial control operation)

MODEL 2412M SERIES

P.101



Variable Primary Pressure Flow Controller
(Not Subject to supply pressure variations)

MODEL 2204 SERIES

P.105



Variable Secondary Pressure Flow Controller
(Not Subject to outlet pressure variations)

MODEL 2203 SERIES

P.104



Large Capacity Precision Needle Valve
(for Stable Control)

MODEL 2412D SERIES

P.102

All-Teflon Constant Flow Valve for Liquids/Chemicals

MODEL 2600 SERIES

Constant Flow Valve for Liquid

MODEL 2600 SERIES

P.106

P.107



Shutoff Valve

MODEL 5220 SERIES

P.109



Small Proportional Solenoid Valve
MODEL 2900 SERIES

P.108



FLOW CONTROL VALVE (1)

Actual example of flow control

Our mechanical valves can be used for gas flow control in many ways. An example of the most popular method of constant flow control with a needle valve and flow controller is explained here.

(1) Flow control with needle valve

The needle valve controls the opening of a small orifice in a channel with a bar-shaped needle, controlling the flow by changing the channel resistance. The valve thus acts as a resistance. The flow changes when the pressure applied to the valve changes. Therefore, a pressure regulator is provided in the preceding stage as shown in Fig. A to make the pressure applied to the valve constant, thereby obtaining constant flow. This is an inexpensive method which is commonly used when the pressure loss on the valve outlet side does not change. Use a simplified type, precision type, or bellows type needle valve according to the usage.

(2) Flow control with variable primary pressure type flow controller

The variable primary pressure (supply pressure) type flow controller is made by combining the needle valve (1) and a pressure regulator. It can keep the flow constant even if the primary-side pressure changes. (Fig. B).

(3) Flow control with variable secondary pressure type flow controller

In methods (1) and (2), the flow will change if the pressure loss of a load in the subsequent stage is large. In that case, a variable secondary pressure (outlet-side pressure: load pressure) type flow controller is used to control flow according to the flow sheet shown in Fig. C. This flow sheet is complete with respect to pressure change, and is used basically for our gas mixing equipment. The primary-side pressure is controlled by a regulator, and the flow controller immune to pressure changes on the secondary side enables flow control free of the influence of the primary and secondary pressure.

Flow control characteristic CV value

The flow control characteristics of the flow control valves shown in this catalog are all represented by the flow characteristics graph shown in the figure. In the characteristics table (B), the flow changes substantially when the valve is turned slightly, which makes setting difficult and usage unstable. Therefore, it is necessary to select service conditions as close to the status (A) as possible.

KOFLOC manufactures valves individually to ensure they match the service conditions. Simply select the type of valve and specify the supply pressure (primary pressure), outlet pressure (load pressure: secondary pressure), and maximum operating flow rate, and then we will manufacture a flow control valve with the best control characteristics. Even if there is no table or graph like the ones shown here, we can select the best valve.

The CV value used as the flow characteristics of needle valves and the like is explained below.

The CV value is a kind of flow coefficient, indicating the approximate flow through a valve when a certain pressure is applied.

- P₁: Primary-side absolute pressure [MPa-abs]
- P₂: Secondary-side absolute pressure [MPa-abs]
- Q: Flow rate [m³/h]
- ρ: Specific gravity (Gas: Air = 1, Liquid: Water = 1)

Fig. A Flow control with needle valve

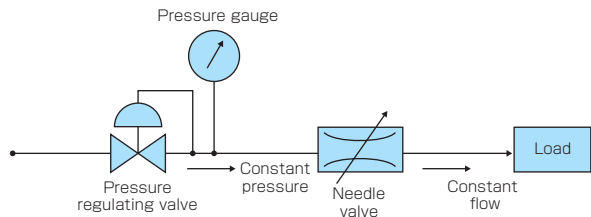


Fig. B Flow control with variable primary pressure flow controller

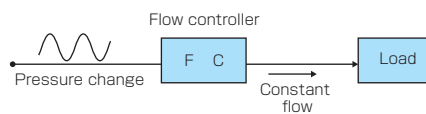
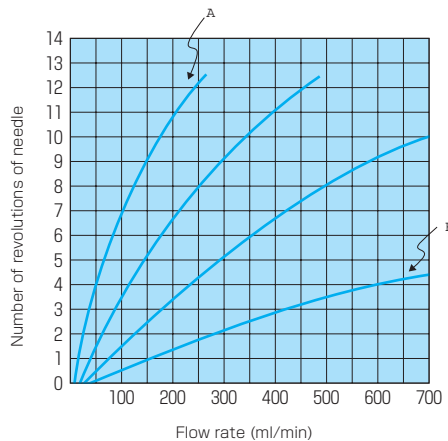
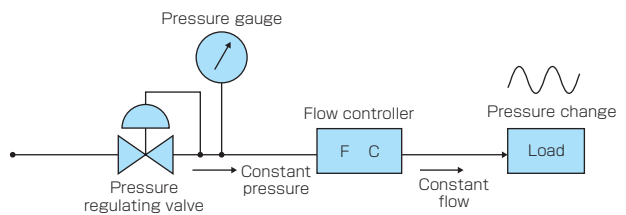


Fig. C Flow control with variable secondary pressure flow controller



	$P_2 > \frac{P_1}{2}$	$P_2 \leq \frac{P_1}{2}$
Nonviscous fluid	$CV = \frac{0.366Q}{(1.17)} \sqrt{\frac{\rho}{P_1 - P_2}}$	
Gas (20°C)	$CV = \frac{Q}{4170} \sqrt{\frac{\rho(273+t)}{(P_1 - P_2)P_2}}$	$CV = \frac{Q}{2090} \sqrt{\frac{\rho}{P_1} \rho(273+t)}$

() : Values in kg/cm³ · G

The CV value of a needle valve changes as shown in the figure when the valve opening changes. Setting aside the control characteristics, the problem is the flow rate, not selection of an actual valve. Therefore, the importance point is the maximum CV value shown in the figure.

This catalog shows the maximum CV values of all needle valves. When the maximum CV value is substituted in the aforementioned equation to find Q, the maximum flow rate under the operating pressure and temperature conditions is derived. However, application of this method becomes more difficult as the flow becomes more precise, so use it just as a rough standard.

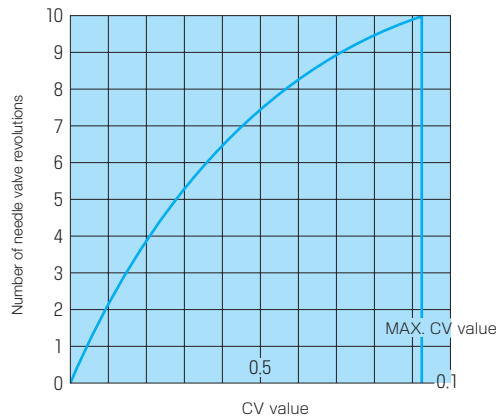
Suppose 0.075 is the CV value, for example. Let's find the flow rate when the primary pressure (gauge pressure) is 0.1 MPa and the secondary pressure in the atmosphere (gauge pressure) is 0 MPa in cases where air of 20°C is to be controlled. In terms of absolute pressure, the gauge pressure will be 0.1 MPa · abs.

$$P_1 = 0.2 \text{ MPa} \cdot \text{abs} \quad P_2 = 0.1 \text{ MPa} \cdot \text{abs}$$

$$P_2 \leq \frac{P_1}{2} \text{ holds.}$$

$$0.075 = \frac{Q}{2090 \times 0.2 \sqrt{1 \times (273 + 20)}} \quad \therefore Q \doteq 1.8 (\text{m}^3/\text{h}) = 30 (\text{L}/\text{MIN})$$

Therefore, the flow of 30 l/min can be controlled when the valve operates between the fully-open and fully-closed states under the above conditions.



Flow characteristics of needle valve

KOFLOC needle valves are classified into the simplified type, precision type, and large-capacity type.

The needle used for respective valves comes in various types according to the flow.

	Needle No
Precision type	SS1, S1, 1, 2, 2A, 3, 3A, 3B, 4, 4A, 5, 6, 6A, 6B, 7..... Precision needle (2412, 2412M)
	8, 9, 10..... Precision needle large-capacity type (2412D)
Simplified type	N1, N2, N3..... Simplified needle (2400)
	KD1, KD2..... Simplified needle large-capacity type (2400D)
Bellows type	BSS1, BS1, B1, B2, B2A, B3, B3B, B4, B4A, B5, B6, B6A, B7..... (2450)

The graph shown below summarizes the flow characteristics of representative KOFLOC needle valves. There may be a slight difference when respective needle valves are actually used because of operating condition errors and instrument errors, as well as the characteristic summarization based on differential pressure.

In the case of a gas, air is used as a representative for summarization; in the case of other gases, multiply the flow rate by

$$\sqrt{\frac{\text{Molecular weight of air: } 28.8}{\text{Molecular weight of gas}}} \text{ to find the standard.}$$

$$\text{Example: He flow} = \text{Air flow} \sqrt{\frac{28.8}{4}}$$

In the case of a liquid, water is used as a representative; in the case of other liquids, multiply the flow rate by

$$\sqrt{\frac{\text{Specific gravity of water}}{\text{Specific gravity of liquid}}}$$

When the viscosity is high, however, contact us for the specific coefficient of viscosity.

CAUTION

Precautions on use of needle valves

Needle valves do not guarantee constant flow continuously. Opening/closing of other valves, temperature changes, and impact will cause the flow rate to change. Please determine the period to monitor and readjust the flow rate.

Selection of valves

We offer eight types of flow control valves as described later to meet diverse needs.

Needle valves are divided into two main types: the simplified type and the precision type. The simplified type has a needle valve knob made integral, and the needle rotates to control flow. Meanwhile, the precision type has a needle and knob made separately, and the needle moves directly without rotation. The precision type excels in both ease of flow setting and stability. Select an appropriate type in terms of price and accuracy according to the intended usage.

The Model 2203 (flow controller) is a constant flow valve that maintains a constant flow when the secondary pressure changes. Model 2204 (flow controller) maintains a constant flow at the outlet side when the primary flow changes.

The Model 2412 precision needle valve is used for very small flow, while the Model 2412D is used for a wide range of uses as a large-capacity type. The Models 2400 and 2400D are simplified versions of the Models 2412 and 2412D.

The bellows seal Model 2450 is a low leakage valve that is suitable for use in a vacuum line. The Model 2412M is a precision needle valve equipped with a dial gauge.

* KOFLOC selects an optimum needle according to the operating conditions.

- Primary-side (inlet-side) pressure
- Secondary-side (outlet-side) pressure
- Maximum operating flow rate
- Name of fluid
- Type of valve

Advise us of the above, and we can offer the best type irrespective of the needle number.

Of course, we can also manufacture a needle valve according to the specified needle number.

Mounting and piping

Refer to the dimensional drawing when installing a needle valve on a panel. If you find any unclear point concerning mounting, contact our factory.



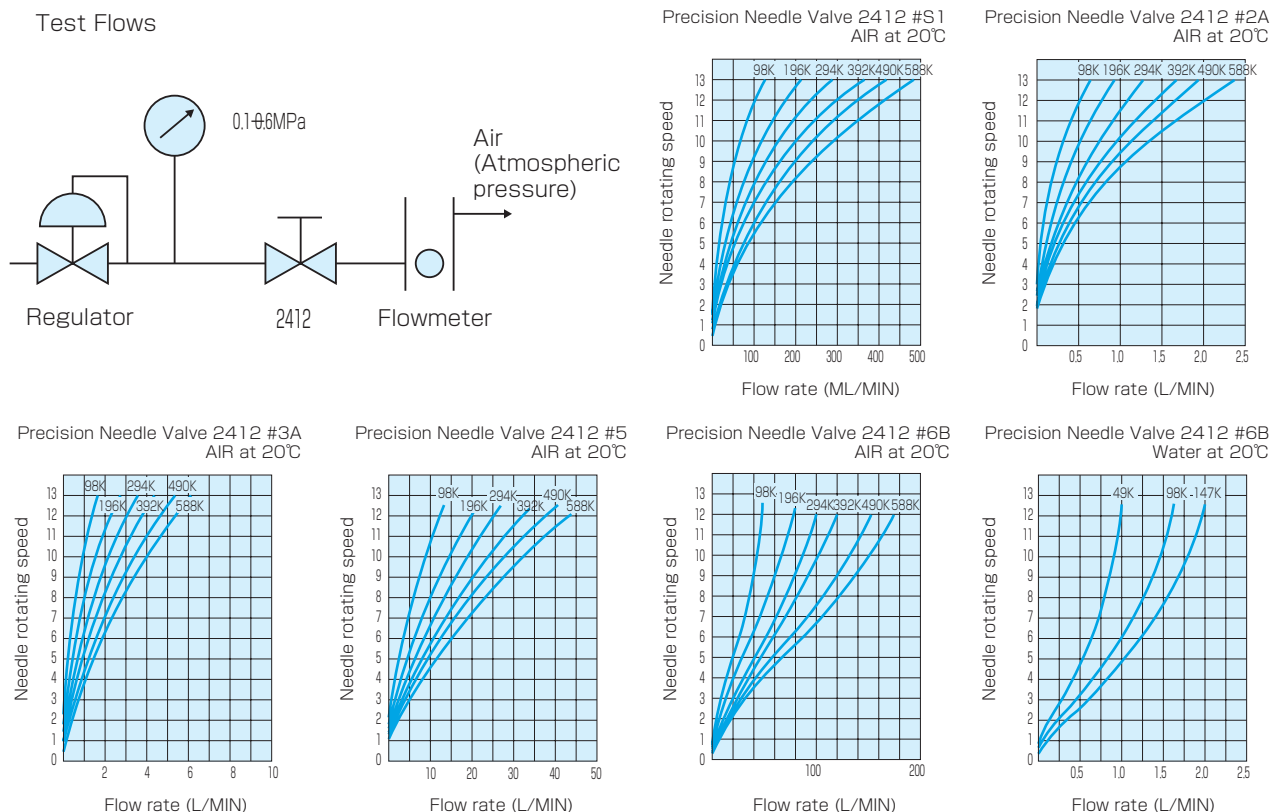
GENERAL INFORMATION ON FLOW CONTROL VALVES

Table of KOFLOC Flow Control Valves, Mechanical

Page	Product	Model	Max. control range (0.1 MPa)*	Max. operating pressure (MPa)	Max. CV value	Main materials of construction		Description (Characteristics and applications)	
						Al, BS	SUS316, PTFE		
96	Precision Needle Valve	MODEL2412	5ML/MIN-50L/MIN	1	0.00012-0.28	BS	○	High-precision control of MINute flows	
98	Bellows Needle Valve	MODEL2450	50ML/MIN-50L/MIN	1	0.00008-0.14	—	○	High-precision control of small leaks	
100	Simplified Needle Valve	MODEL2400	5L/MIN-50L/MIN	0.6	0.018-0.13	BS	SUS304	Handy valve for control of MINute flows	
101	Multidial Type Precision Needle Valve	MODEL2412M	5ML/MIN-50L/MIN	1	0.00012-0.28	BS	○	High-precision control valve w/dial	
102	For large capacity Precision Needle Valve (for stable control)	MODEL2412D	200L/MIN-400L/MIN	1	0.5-1.0	Al	○	High-precision control of large flows	
103	Large capacity Simplified Needle Valve	MODEL2400D	300L/MIN-400L/MIN	1	0.68-1.0	Al		Simplified type of large flows	
104	Variable Secondary Pressure Flow Controller	MODEL2203	10ML/MIN-20L/MIN	0.8	—	Al	○	Control of variable secondary pressure	
105	Variable Primary Pressure Flow Controller	MODEL2204	10ML/MIN-10L/MIN	0.8	—	Al	○	Control of variable primary pressure	
106	All-Teflon Constant Flow Valve for Liquids/Chemicals	MODEL2600T	500ML/MIN-1L/MIN	0.7	—	—	PTFE	Control of constant liquid flows	
107	Constant Flow Valve for Liquids	MODEL2600S MODEL2600PVC	10ML/MIN-1L/MIN 10ML/MIN-100ML/MIN	0.7	—	—	○ (-)	Control of constant liquid flows	
108	Small Proportional Solenoid Valve	MODEL2900	—	1	—	BS	—	Control of voltage and current	
109	Shutoff Valve	MODEL5220		0.8	0.23	BS	SUS304	90° turning knob	
110	Toggle Valve	MODEL5500		0.8	0.06	BS	SUS304	90° toggle	
			* Maximum flow control ranges depend upon the operating pressure. For more information, see the flow characteristics table of each valve model.						

Note: Because of KOFLOC's policy that gives stress on control of MINute flows, the term "large flows (large capacity)" as used in this catalog refers to flows of 50 L/MIN to 100 L/MIN and above. (1 MPa = 10 kPa)

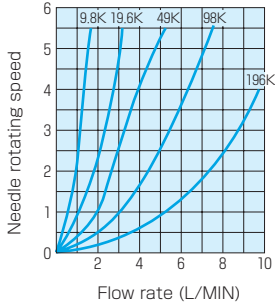
Example: Characteristics of Model 2412 Needle



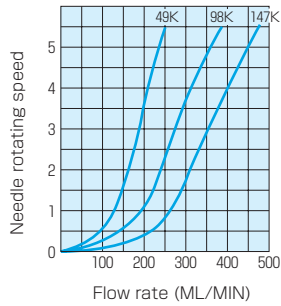
Example: Characteristics of Model 2400/2450 Needles

(In K=kPa)

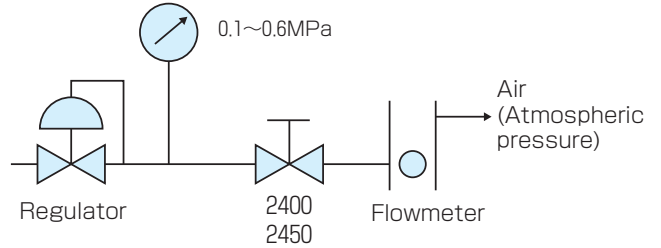
Simplified Needle Valve 2400 N1
AIR at 20°C



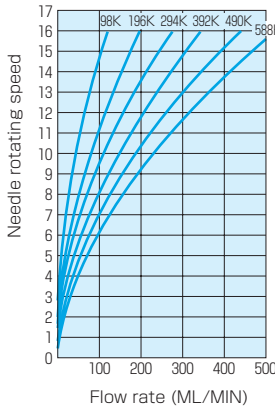
Simplified Needle Valve 2400 N1
Water at 20°C



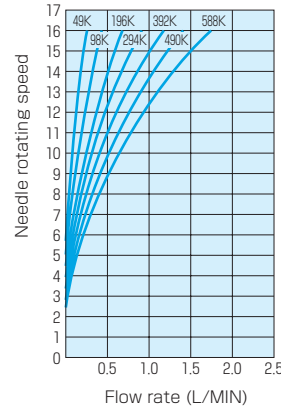
Test Flows



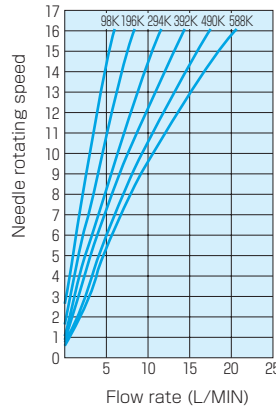
Bellows Needle Valve 2450 BS1
AIR at 20°C



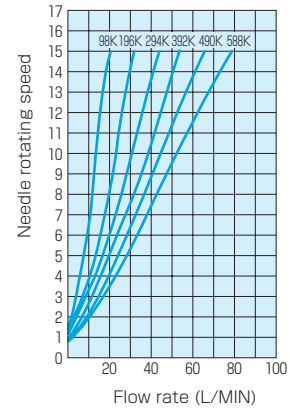
Bellows Needle Valve 2450 B2A
AIR at 20°C



Bellows Needle Valve 2450 B4
AIR at 20°C



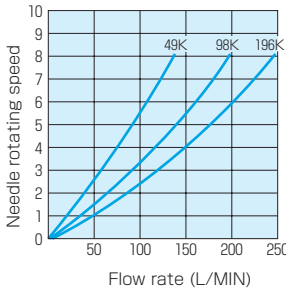
Bellows Needle Valve 2450 B6
AIR at 20°C



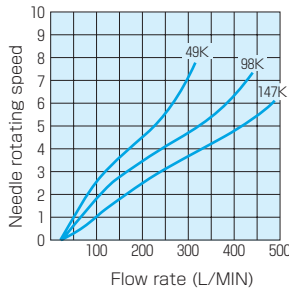
Example: Characteristics of Model 2412D/2400D Needles

(In K=kPa)

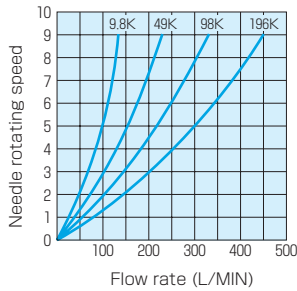
Large Capacity Precision
Needle Valve 2412D #8
AIR at 20°C



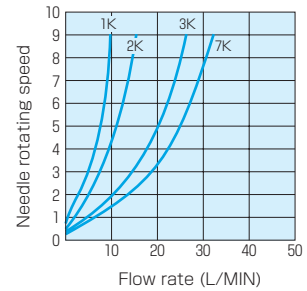
Large Capacity Precision
Needle Valve 2412D #10
AIR at 20°C



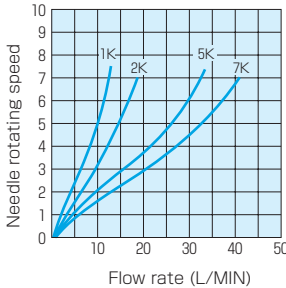
Large Capacity Precision
Needle Valve 2400D KD1
AIR at 20°C



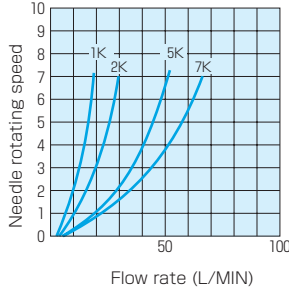
Large Capacity Precision
Needle Valve 2400D KD1
AIR at 20°C



Large Capacity Precision
Needle Valve 2412D #8
AIR at 20°C



Large Capacity Precision
Needle Valve 2412D #10
AIR at 20°C





Precision Needle Valve w/Non-rotary Needle

MODEL 2412 SERIES

This needle valve has been designed to control minute gas and liquid flows with precision and ease. Design allows the rotation of the regulating screw to transform into linear motion of the needle without subjecting the needle to gaps and/or vibrations produced by the screw, so smooth, stable flows can be ensured.

Features

- Capable of controlling ultra-minute flows**
 Very accurate, stable control of ultra-minute flows up to 1 ML/MIN possible
- Wide variations of needle type**
 15 types of needles are available for your choice of the type that best suits your needs.
- Needle of non-rotary structure**
 Because this valve is constructed so that the rotation of the regulating screw is transformed into linear motion of the needle, the valve has a longer life in addition to superior control performance.
- Superior temperature characteristic (15-35°C)**
 The valve counts on an outstanding temperature characteristic (flow fluctuations remain within an insignificant range of 0.3%/°C to ambient temperature variations) thanks to the temperature compensation system incorporated in the valve's needle and orifice. This temperature compensation system is a utility model of KOFLOC registered at the United States Patent and Trademark Office. (Optional specification for needles #SS1 to #3B-BS)
 This temperature compensation system is applicable to gases only, and not to liquids, because the viscosity of a liquid may fluctuate depending upon the temperature conditions.

Applications

- For accurate control of minute flows of gases and liquids

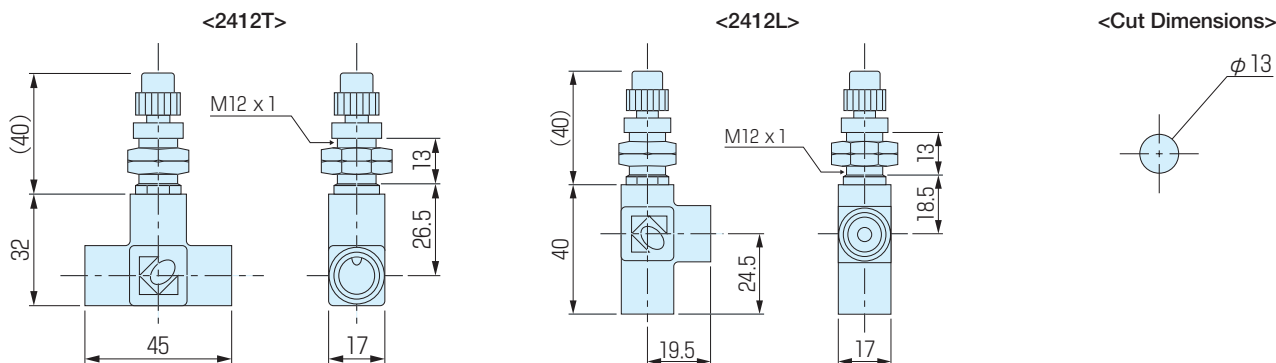
Standard Specifications

Rated flow ranges	See Table of Rated Flow Ranges on page 97.
Rotating speed	Approx. 12 turns
Max. operating pressure	1.0MPa
Max. operating temperature	(B) 70°C (SS) 120°C
Materials of parts exposed to fluids	B: Brass, Duracon®, NBR SS: SUS 316, Teflon®, Viton
Fluids	Gasses and liquids
Connection opening	Rc1/4 (Standard)

Optional Specifications

- Connection opening
- Materials not included in the standard specifications

Dimensions



Layout Example with Model 2412

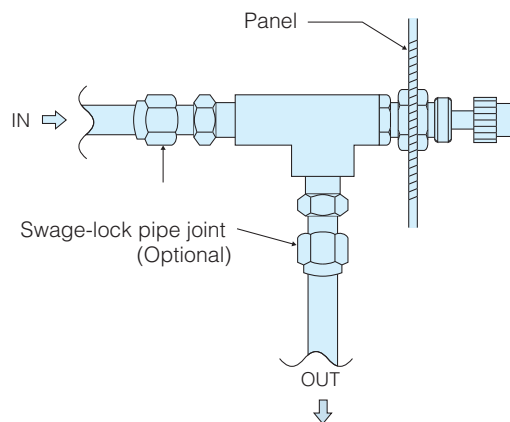


Table of Rated Flow Ranges (Reference)

Due to operating conditions and instrumental errors, there may be differences in the range of 80% to 130% between the values indicated in this table and those that are actually used by the customer. Please use these values for reference only.

Flow rate when the outlet valve is totally opened to release flows into air

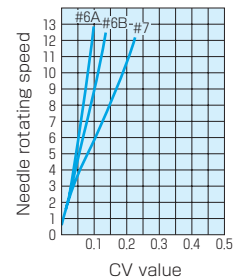
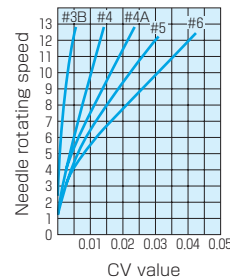
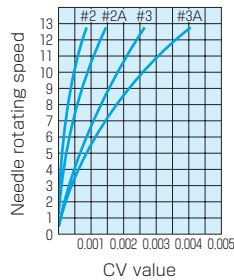
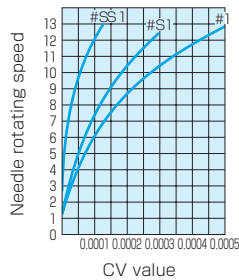
Needle #	Supply pressure (MPa) (Air at 20°C)							Supply pressure (MPa) (Water at 20°C)		
	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.05	0.1	0.15
#SS1	0.023	0.047	0.078	0.11	0.15	0.19	0.22	—	—	—
#S1	0.08	0.11	0.20	0.27	0.34	0.40	0.47	—	—	—
#1	0.15	0.23	0.36	0.51	0.65	0.79	0.93	0.00145	0.0026	0.0036
#2	0.34	0.46	0.71	1.0	1.2	1.5	1.75	0.0076	0.012	0.0153
#2A	0.45	0.65	1.0	1.3	1.65	2.0	2.3	0.0132	0.0195	0.0245
#3	0.9	1.3	2.0	2.6	3.25	3.9	4.6	0.0260	0.0390	0.0510
#3A	1.25	1.9	2.75	3.65	4.5	5.3	6.4	0.0365	0.0546	0.0740
#3B	1.85	2.5	3.7	5.0	6.0	7.2	8.3	0.053	0.0760	0.0980
#4	4.3	6.2	9.0	12.0	15.0	18.3	22.0	0.124	0.188	0.234
#4A	8.0	11.0	15.0	21.0	26.0	31.0	36.0	0.228	0.336	0.417
#5	10.0	14.0	21.0	27.0	33.0	40.0	46.0	0.294	0.435	0.576
#6	22.0	31.0	45.0	60.0	75.0	92.0	105.0	0.564	0.834	1.100
#6A	30.0	41.0	60.0	80.0	100	118	138	0.774	1.190	—
#6B	38.0	53.0	82.0	106	135	160	185	1.280	1.950	—
#7	80.0	110	160	215	260	285	310	1.840	2.890	—

* Due to operating conditions and instrumental errors, there may be differences between the values indicated in the table above and those that are actually used by the customer. (L/MIN)

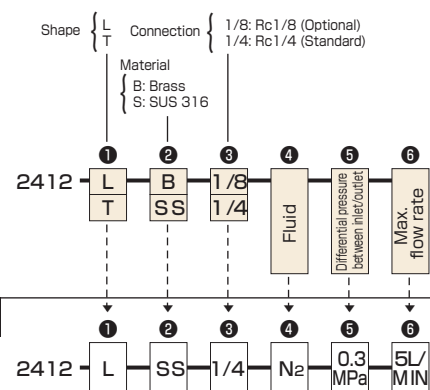
* The values shown in the table above are data for Model 2412L for illustrative purposes only. As compared with the 2412L, flows on the 2412T will run less smooth when the flow rate increases. It is therefore recommended that the 2412L be used for flows of 5 L/MIN or more.

CV Values

Needle #	Max. CV value
#SS1	0.00012
#S1	0.00028
#1	0.00058
#2	0.0012
#2A	0.0016
#3	0.0033
#3A	0.0048
#3B	0.0063
#4	0.016
#4A	0.028
#5	0.035
#6	0.078
#6A	0.10
#6B	0.13
#7	0.28



Ordering



Notes:

- For large flows, please refer to Model 2412D (page 102).
- We can suggest you the needle most suitable for your equipment if the pressure, fluid, flow rate and other operating conditions of your equipment are known. Please use the above table for reference only.
- Connection openings not included in the standard specifications, refer to page 129.

* Refer to "Ordering" and "Illustrative Example" when placing an order or requesting a quotation. Fill in the blanks in the "Order/Quotation Request Card" at the end of the catalog, and send the card by fax.



Bellows Needle Valve (for rigid control of leaks)

MODEL 2450 SERIES

This bellows seal type needle valve has been specifically developed so that it can satisfy the requirements for such areas in which leak is a concern of vital importance. Model 2450 Bellows Needle Valve has a construction to drastically prevent fluid leaks. In addition, it is outstanding in heat resistance and corrosion resistance, so the customer can use it with peace of mind not only in such adverse conditions where high vacuum, high pressure, high temperature or extremely low temperature is present but also for corrosive, toxic or costly fluids.

Features

- **Stringent leak test (2×10^{-9} Pam³/sec)**
100% leak test is conducted before shipping, using a helium leak detector.
- **Use of a precision needle**
The incorporated non-rotary type needle provides precise, smooth control of minute flows.
- **Compatible with both gases and liquids**
- **Superior temperature characteristic**
Flows are scarcely affected by ambient temperature fluctuations, remaining within an insignificant range of flow variations. This superior temperature characteristic is applicable to gases only, and not to liquids, because the viscosity of a liquid may greatly vary depending upon the temperature conditions.

Applications

- For vacuum systems
- For semiconductor manufacturing lines
- For production lines where toxic or corrosive gases are present

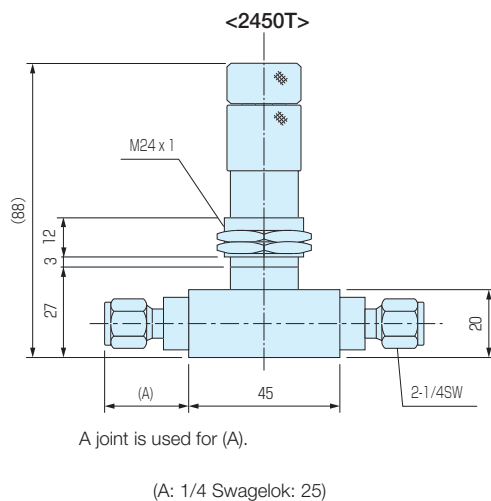
Standard Specifications

Rated flow ranges	See Table of Rated Flow Ranges on page 99.
Regulating screw rotating speed	Approx. 13-16 turns
Max. operating pressure	1MPa
Upper limit of working temperature	120°C
Fluids	Gases and liquids
Materials of parts exposed to fluids	SUS 316, Teflon®, Viton (joint)
Connection end	1/4 swagelok (for joint) * Optional: 1/8SW

Optional Items

- **Special types of joints** (Please contact us for consultation.)

Dimensions



Layout Example with Model 2450

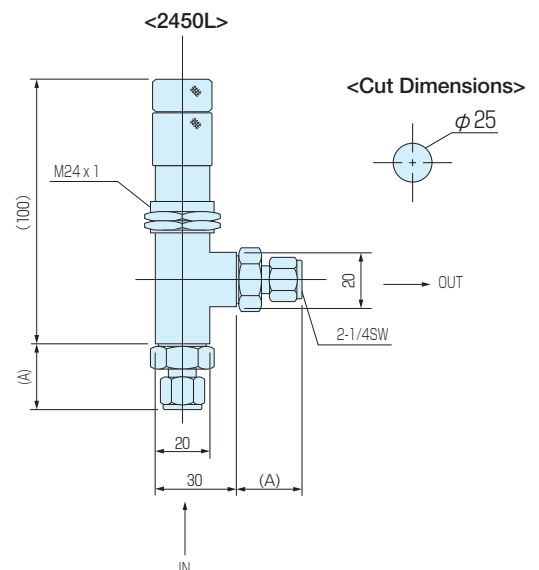
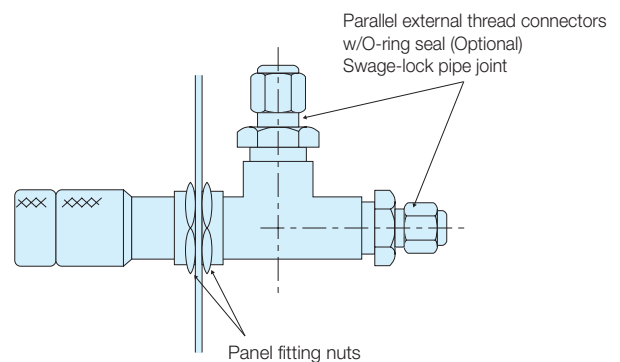


Table of Rated Flow Ranges (Reference)

Due to operating conditions and instrumental errors, there may be differences in the range of 80% to 130% between the values indicated in this table and those that are actually used by the customer. Please use these values for reference only.

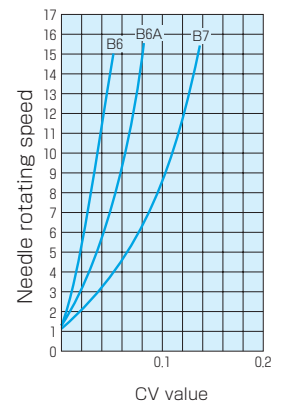
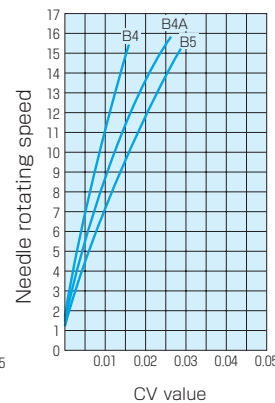
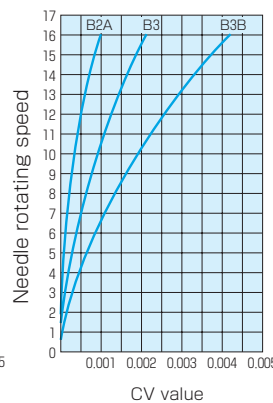
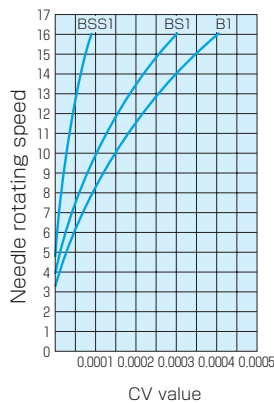
Flow rate when the outlet valve is totally opened to release flows into air

Needle #	Supply pressure (MPa) (Air at 20°C)							Supply pressure (MPa) (Water at 20°C)		
	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.05	0.1	0.15
BSS1	0.016	0.032	0.058	0.086	0.115	0.14	0.18	—	—	—
BS1	0.074	0.12	0.20	0.28	0.34	0.44	0.52	—	—	—
B1	0.10	0.16	0.24	0.34	0.42	0.53	0.60	—	—	—
B2	0.12	0.19	0.29	0.41	0.50	0.63	0.72	0.0010	0.0017	0.0024
B2A	0.25	0.39	0.60	0.82	1.05	1.30	1.50	0.010	0.015	0.018
B3	0.67	0.98	1.55	2.10	2.65	3.20	3.70	0.019	0.029	0.037
B3B	1.10	1.7	2.5	3.4	4.3	5.1	5.9	0.034	0.05	0.067
B4	4.4	6.3	9.4	12.0	16.0	19.2	22.0	0.15	0.21	0.27
B4A	6.7	9.8	13.9	19.0	24.0	27.9	31.6	0.23	0.32	0.40
B5	7.8	11.3	16.5	20.0	28.0	33.0	38.0	0.26	0.35	0.46
B6	15.3	20.5	32.0	44.0	55.0	68.0	80.0	0.46	0.66	0.79
B6A	21.0	32.0	51.0	70.0	90.0	110	128	0.72	1.0	1.15
B7	40.0	55.0	100	130	170	195	230	1.18	1.7	1.95

(L/MIN)

CV Values

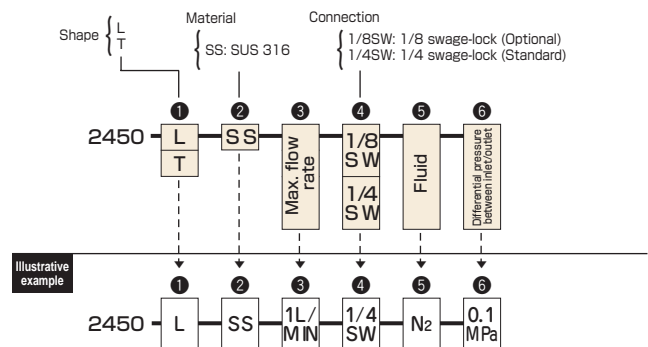
Needle #	Max. CV value
BSS1	0.00008
BS1	0.0003
B1	0.0004
B2	0.0005
B2A	0.00098
B3	0.0025
B3B	0.0043
B4	0.016
B4A	0.025
B5	0.028
B6	0.051
B6A	0.08
B7	0.14



Notes:

- We can suggest you the needle number most suitable for your equipment if the pressure, fluid, flow rate and other operating conditions of your equipment are known. Please use the above table for reference only.

Ordering



* Refer to "Ordering" and "Illustrative Example" when placing an order or requesting a quotation. Fill in the blanks in the "Order/Quotation Request Card" at the end of the catalog, and send the card by fax.



Simplified Panel-mount Miniature Needle Valve

MODEL 2400 SERIES

This is a miniature needle valve at an affordable price with simplified construction that allows easy control of operation for fine regulation of gases and liquids. Its simplified structure is comprised of the components that are the minimum requirement, avoiding overspecification.

Features

- **Panel-mount miniature type**
Compact, space-saving, and ideal for mounting on the instrumentation board
- **Compatible with both gases and liquids**
- **All precision-machined components are perfectly cleaned before assembly to ensure cleanliness of the product for the customer's use with peace of mind.**

Applications

- For flowmeters and pressure gauges
- For pollution-related instruments and analyzers
- For gas/liquid flow controls at laboratory
- For integration into instrumentation boards
- For sampling systems

Standard Specifications

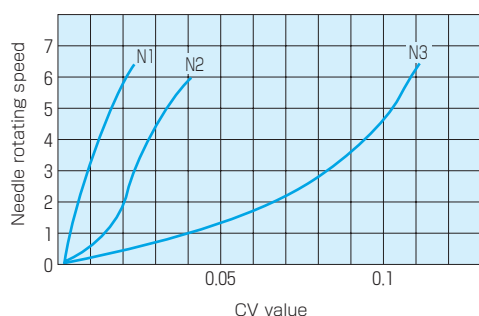
Regulating screw rotating speed	Approx. 12 turns (Effective turns: 5-12)
Type of needle	Three types
Max. operating pressure	0.6MPa
Materials of parts exposed to fluids	B: Brass, NBR, SUS 303, Duracon® S: SUS 304, Viton, SUS 303, Teflon®
Connection end	Rc1/4
Flow rating	See the table below.

Table of Rated Flow Ranges (Reference)

Due to operating conditions and instrumental errors, there may be differences between the values indicated in this table and those that are actually used by the customer. Please use these values for reference only.

Needle #	Max. CV value	Supply pressure (MPa)(Air at 20°)						Supply pressure (MPa)(Water at 20°)		
		0.01	0.05	0.1	0.2	0.3	0.05	0.1	0.15	
N1	0.018	1.6	5.0	7.5	12.0	15.0	0.16	0.24	0.31	
N2	0.03	3.8	9.0	13.0	21.0	27.0	0.26	0.42	0.86	
N3	0.13	12.0	31.0	55.0	90	120	1.2	1.8	2.5	

CV Values

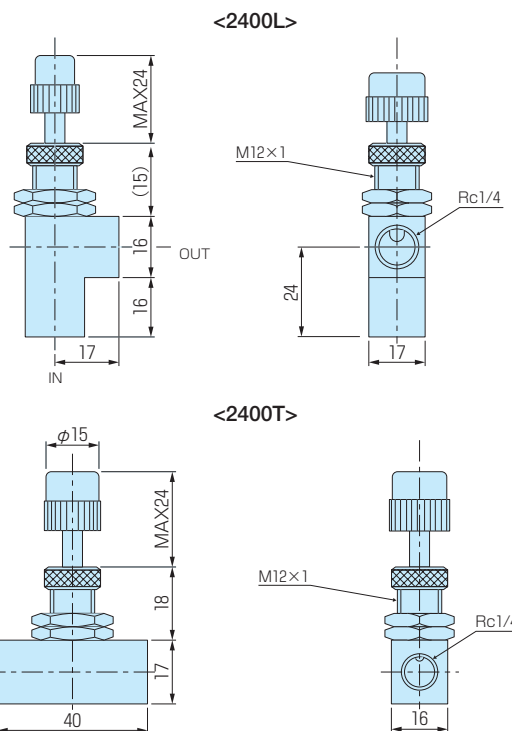


Notes:

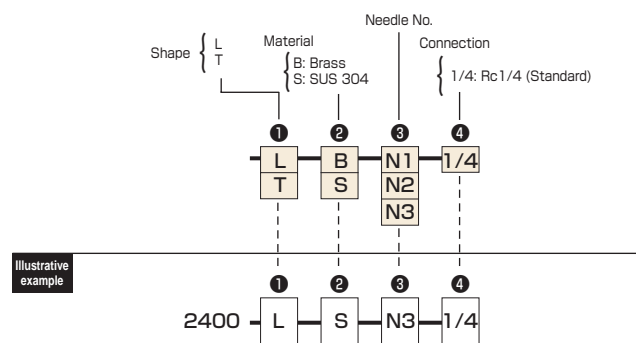
- Refer to Model 2400D on page 103 for large capacity valve.
- If you are not sure which needle you should use for your equipment, please indicate the fluid, pressure and flow rate of your equipment on the Order Form. We can suggest you the needle number most suitable for your equipment.
- Connection openings not included in the standard specifications, refer to page 129.



Dimensions



Ordering



* Refer to "Ordering" and "Illustrative Example" when placing an order or requesting a quotation. Fill in the blanks in the "Order/Quotation Request Card" at the end of the catalog, and send the card by fax.



Multidial Type Precision Needle Valve (Ideal for restriction of flows by dial control operation)

MODEL 2412M SERIES

This is an enhanced model of the KOFLOC Precision Needle Valve Model 2412 (see page 96), which now incorporates a multidial that allows the user to set desired flow rates by dial operations. This valve makes the most of the rotation-to-flow linearity and repeatability performance of the 2412 needle.

Features

- Since a precision needle valve usually has superior flow characteristics and repeatability, it can be used in place of a needle valve flowmeter.
- Wide variations are available for both the needle valve (Type T, Type L, and so on) and the multidial (Standard Type, Round Type, and so on).

Note: No scale calibration is required for the multidial.

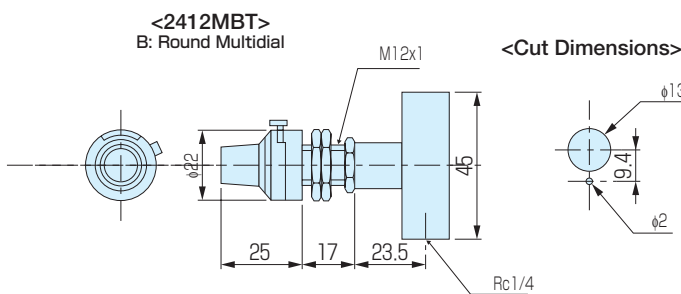
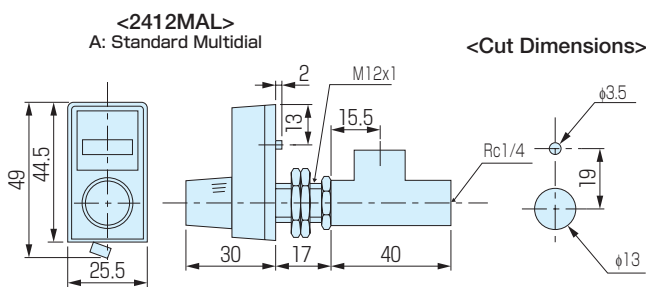
Applications

- Detection of deteriorated filters
- Substitute for a flowmeter
- Detection of fluctuations of flow path resistance

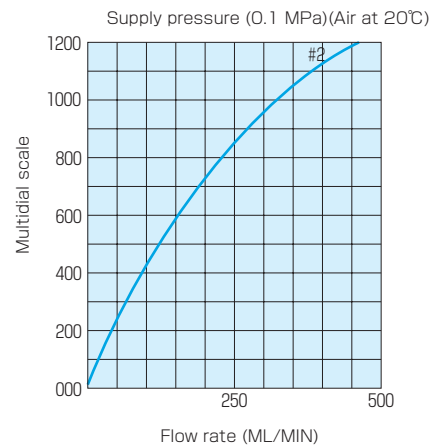
Standard Specifications

Regulating screw rotating speed	Multidial: 10 turns (Overscale possible) Needle valve: Approx. 12 turns
Multidial scale	3-digit setting (000-999)
Multidial type	A: Standard multidial B: Round multidial
Connection end	Rc1/4; Rc1/8 (Optional)
Flow rating	See Table of Rated Flow Ranges for Model 2412 on page 97.

Dimensions



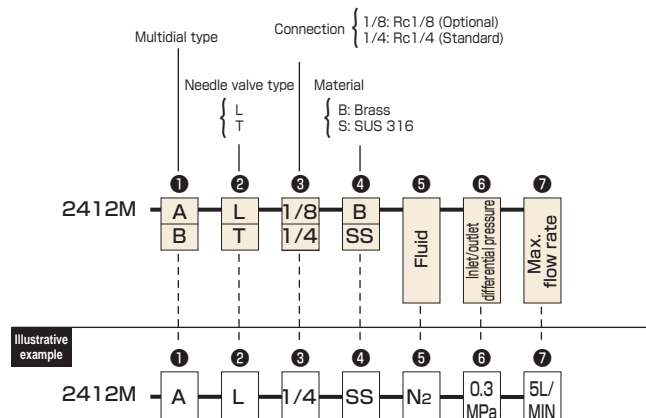
Example of Characteristic Curve



Notes:

- For flow rating, please see Table of Rated Flow Ranges for Model 2412 on page 97.
- You may specify the fluid and pressure flow of your equipment for our selection of the type that most suits your requirements.
- For information on available connection end types other than standard ones, please see page 129.
- The 2412M valve opens when it turns in the direction reverse to the 2412.

Ordering



* Refer to "Ordering" and "Illustrative Example" when placing an order or requesting a quotation. Fill in the blanks in the "Order/Quotation Request Card" at the end of the catalog, and send the card by fax.



Large Capacity Precision Needle Valve (for Stable Control)

MODEL 2412D SERIES

This large capacity needle valve exhibits high performance in precision control of comparatively large flow. The needle valve is a larger version of our precision needle valve (Model 2412) that has time-tested reliability, and is suitable for stable control in a comparatively large flow range of 50–300 l/min (0.1 MPa).

Features

- The rotational motion of the flow control screw is changed into a linear motion to ensure smooth flow control without causing a screw gap.
- The completely clean inside of the valve permits clean flow control.
- Special grease is used for the section not in contact with liquid to ensure outstanding durability.

Standard Specifications

Number of adjusting screw revolutions	Approx. 8–12 revolutions
Type of needle	3 types
Max. operating pressure	1MPa
Materials of parts in contact with fluids	(A) Brass, Al, NBR, Duracon (POM) (SS) SUS316, Viton®, Teflon®
End connection	Rc3/8 Rc1/4
Flow rating	See the table below.

Flow rating (Reference table)

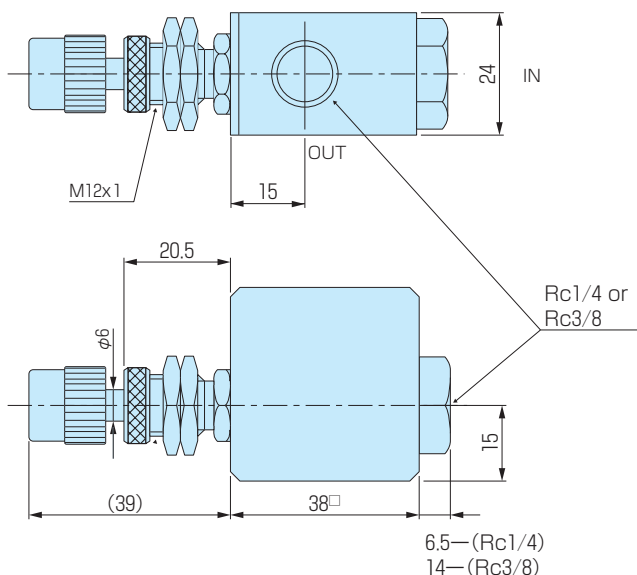
The actual flow may be different from the values shown in the table depending on the operating conditions and instrument errors. Please use these values for reference only.

Outlet side open to air at 20°C

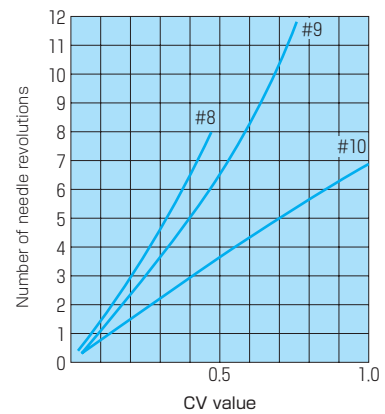
Needle No.	Max. CV value	Supply pressure (MPa)				
		0.01	0.05	0.1	0.2	0.3
#8	0.48	50	135	200	280	370
#9	0.83	65	235	320	480	—
#10	1.06	80	300	440	—	—

Unit: L/MIN

Dimensions



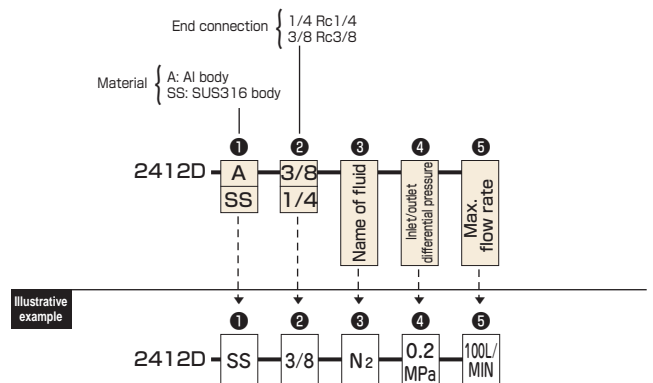
CV value



Purchasing

- Refer to Model 2412 on page 96 for control of very small flow.
- If you find it difficult to select a needle number, advise us of the name of the fluid, pressure, and flow, and we will select an appropriate valve.
- Refer to page 129 for end connection joints not covered by the standard specifications.

Ordering



* Refer to "Ordering" and "Illustrative Example" when placing an order or requesting a quotation. Fill in the blanks in the "Order/Quotation Request Card" at the end of the catalog, and send the card by fax.



Multiple Rotation Type Large Capacity Simplified Needle Valve

MODEL 2400D SERIES

Of all our products with a very small flow controlling function, this is a comparatively large flow control valve. This is a low-cost needle valve with a simple structure.

Features

- Precision machining ensures satisfactory control characteristics.
- In comparison with commercial simplified types, the number of revolutions of this needle valve is a maximum of 12 revolutions, permitting very smooth flow control.

Standard Specifications

Number of adjusting screw revolutions	Approx. 8–10 revolutions
Types of needle	2 types
Max. operating pressure	1MPa
Materials of parts in contact with fluids	(A) Al, Brass, NBR, Duracon, SUS303 (S) SUS304, Viton®, Teflon®, SUS303
End connection	Rc3/8 Rc1/4
Flow rating	See the table below.

Flow rating (Reference table)

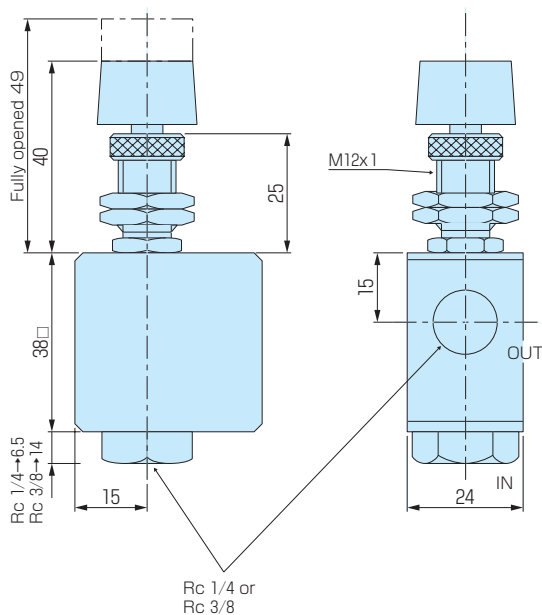
The actual flow may be different from the values shown in the table depending on the operating conditions and instrument errors. Please use these values for reference only.

Outlet side open to Air at 20°C

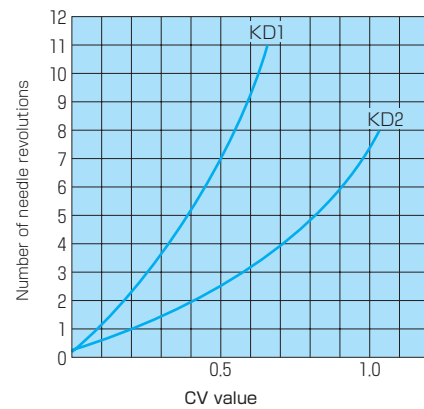
Needle No.	Max. CV value	Supply pressure (MPa)				
		0.01	0.05	0.1	0.2	0.3
KD1	0.68	70	215	295	440	—
KD2	1.0	85	280	400	—	—

Unit: L/MIN

Dimensions



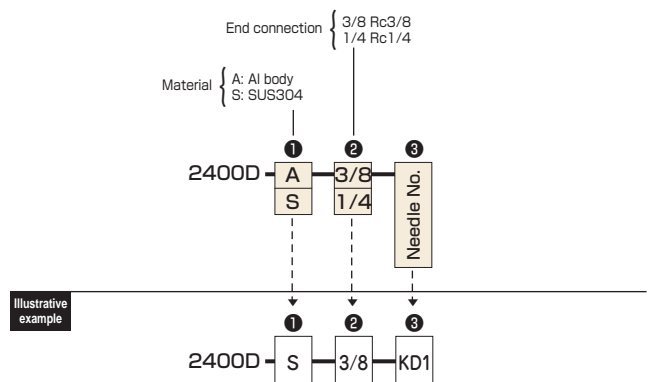
CV value



Purchasing

- Refer to Model 2400 on page 100 for control of small flow.
- If you find it difficult to select a needle number, advise us of the name of the fluid, pressure, and flow, and we will select an appropriate valve.
- Refer to page 129 for end connection joints not covered by the standard specifications.

Ordering



* Refer to "Ordering" and "Illustrative Example" when placing an order or requesting a quotation. Fill in the blanks in the "Order/Quotation Request Card" at the end of the catalog, and send the card by fax.



Variable Secondary Pressure Flow Controller (Not subject to outlet pressure variations)

MODEL 2203 SERIES

A flow controller is a differential pressure regulator designed to control minute gas flows with precision and keep a certain constant flow rate. Model 2203 Variable Secondary Pressure Flow Controller is a control valve that keeps mass flows at a constant rate under a given constant level of supply pressure even when the load pressure on the secondary side (outlet side) fluctuates, and its construction is designed so that the performance of its precision control over flows to the set flow rate is maintained by the incorporated precision needle valve without being affected by such fluctuations.

Features

- **Stable flow control**
A non-rotary needle valve composed of high-precision components ensures smooth control of minute flows.
- **Not subject to load pressure fluctuations**
The incorporated precision needle valve protects flows from being affected by secondary or outlet pressure fluctuations, so the product is a 'must-be' tool in the first stage of any flow control line.
- **Cleanliness ensured**
All the components are super-cleaned before assembly so that the product can be safely used even on instruments for analysis for which cleanliness is essential.

Applications

- Gas chromatographs
- Environmental instrumentation systems
- Gas mixing systems in various fields

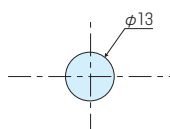
Standard Specifications

Model	2203
Flow rating	10 ML/MIN - 20 L/MIN
Control accuracy	Within $\pm 1.0\%$ of the set value to load pressure fluctuations (on condition of 0.05 MPa or more of inlet/outlet differential pressure)
Needle valve rotating speed for adjustment	Approx. 12-13 turns
Max. operating pressure	(A) 0.8MPa (SS) 0.95MPa
Max. working temperature	(A) 70°C (SS) 120°C
Materials of parts exposed to fluids	A: Al, Brass, Duracon®, NBR SS: SUS 316, Teflon®, Viton
Connection end	M8+Rc1/8

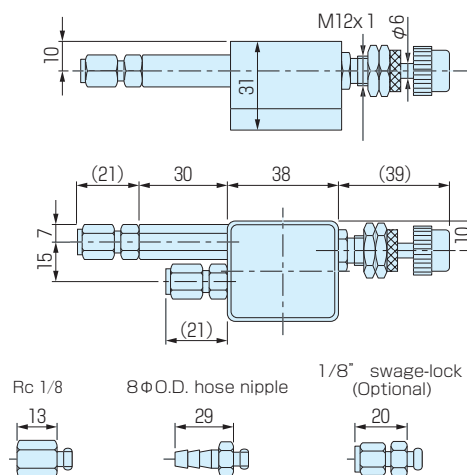
Optional Items

- IN side filter joint Model 2300B (See page 128)
- Connection joint (See page 129)

Panel cut



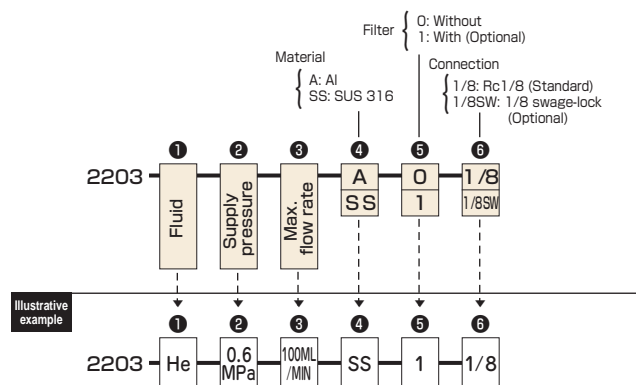
Dimensions



Notes:

- For information on available types of connection ends and filter joints other than those standard, please see page 129.
- You may specify the supply pressure, fluid and flow rate of your equipment for our selection of the type that most suits your requirements.
- Use the values on Table of Rated Flow Ranges for reference purposes only.

Ordering



* Refer to "Ordering" and "Illustrative Example" when placing an order or requesting a quotation. Fill in the blanks in the "Order/Quotation Request Card" at the end of the catalog, and send the card by fax.



Variable Primary Pressure Flow Controller (Not subject to supply pressure variations)

MODEL 2204 SERIES

Model 2204 Variable Primary Pressure Flow Controller is a control valve that always keeps flows at a constant rate under a given constant level of secondary pressure (outlet pressure) even when the primary pressure (inlet pressure) fluctuates. The built-in precision needle valve accurately controls flows to the set flow rate, including ultra-minute flows.

Features

- **Stable flow control**
A non-rotary needle valve composed of high-precision components ensures smooth control of even ultra-minute flows.
- **Not subject to supply pressure fluctuations**
Flows are protected from being affected by primary pressure (supply pressure) fluctuations, under a given constant level of secondary pressure (outlet pressure).
- **Cleanliness ensured**
All the high-precision components are super-cleaned before assembly so that the product can be safely used even on high-sensitivity instruments for analysis for which cleanliness is essential.

Applications

- Physical and chemical appliances
- Control of the second-stage operation of pumps
- Various instruments for analysis
- Environmental instrumentation systems

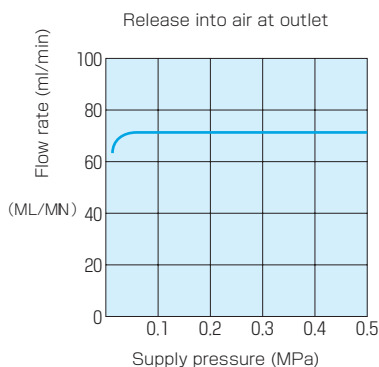
Standard Specifications

Flow rating	10 ML/MIN - 10 L/MIN
Control accuracy	Within $\pm 2\%$ of the set flow value to pressure fluctuations in a range of 0.3 MPa when the primary pressure (input pressure) varies between 0.07 MPa and 0.8 MPa.
Regulating screw rotating speed	12-13 turns
Max. operating pressure	0.8MPa
Max. working temperature	(A) 70°C (SS) 120°C
Materials of parts exposed to fluids	A: Al, Brass, Duracon®, NBR, SUS 316 SS: SUS 316, Teflon®, Viton
Connection end	Rc1/8 (M8+Rc1/8)

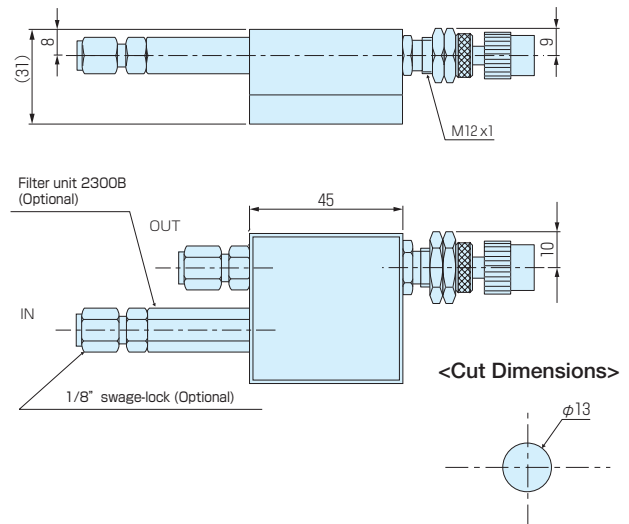
Optional Items

- IN side filter joint Model 2300 (See page 128)
- Connection joint (See page 129)

Control Characteristic Curve



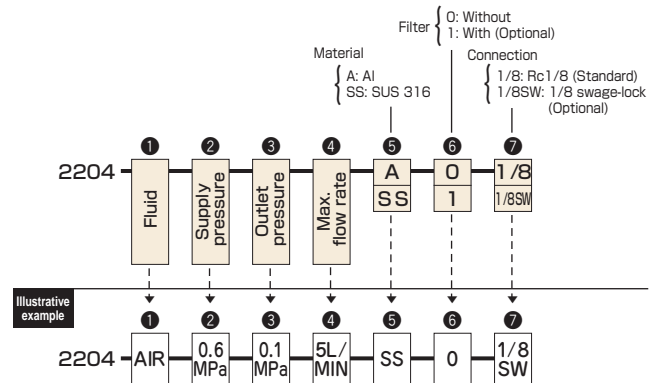
Dimensions



Notes:

- You may specify the fluid, pressure and flow rate of your equipment for our selection of the type that most suits your requirements. Use the values on Table of Rated Flow Ranges for reference purposes only.
- At least an inlet/outlet pressure difference of 0.07 MPa is required.

Ordering



* Refer to "Ordering" and "Illustrative Example" when placing an order or requesting a quotation. Fill in the blanks in the "Order/Quotation Request Card" at the end of the catalog, and send the card by fax.



All-Teflon Constant Flow Valve for Liquids/Chemicals

MODEL 2600 SERIES

This constant flow valve has been developed for control of water and chemical flows. It maintains liquid flows constant against fluctuations of both primary and secondary pressures.

Features

- **Outstanding control of liquid flows at a constant rate**
A valve composed of high-precision components ensures smooth control of flows.
- **Not affected by pressure variations**
Flows are maintained at a constant rate against fluctuations of both primary and secondary pressures.
- **Non-metal material (PTFE) used for the wetted part**
This resin (PTFE) is perfect for a part apt to be easily damaged by metal ions.
- **Small flows from 100-500 ml/min controllable**
Minute flows are also controllable optionally.
- **Model 2600, all-Teflon type, is compatible with practically all chemicals thanks to the use of a Perfluoro O-ring.**
(There are some operating conditions to be met according to the type of chemical. Be sure to contact us for information before placing your purchase order.)
- **Bubblers (air bubble purge taps) provided in the upper/lower diaphragm chambers**
Air bubble purge at the initial flow setting stage of operation provides the most accurate possible control.

Applications

- Ultrapure water analyzers
- Environmental instrumentation systems; food/chemical industry equipment
- Ultrapure water and chemical mixing systems

Standard Specifications

	Model 2600-T
Fluid	Liquids (Mainly H ₂ O)
Flow rating	100-500 ML/MIN 0.1-1 L/MIN
Control accuracy	Within ±3% of the set value
Operating differential pressure	0.1 MPa or more
Operating pressure	0.1-0.5 MPa
Proof pressure	0.7MPa
Materials of parts exposed to fluids	Teflon®, Perfluoro
Max. operating temperature	15°C-35°C
Connection end	Rc 1/4

Note: The control accuracy is guaranteed only when the fluid temperature is constant, because the viscosity varies with temperature. Contact us for the detailed specifications.

Optional Specifications

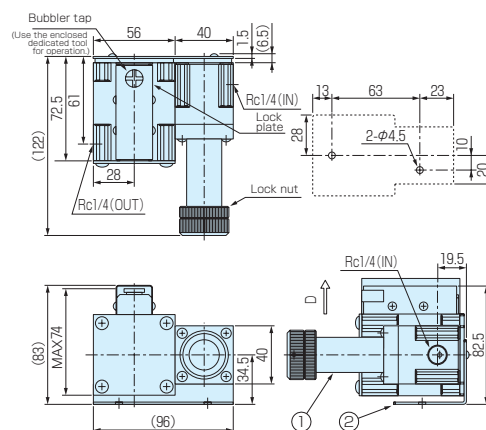
Custom-ordered flow ranges as well as types for special fluids are optionally available. Please contact us for information.

* The specifications above are subject to change without prior notice. Install a filter or the like on the IN side to prevent entry of foreign substances.



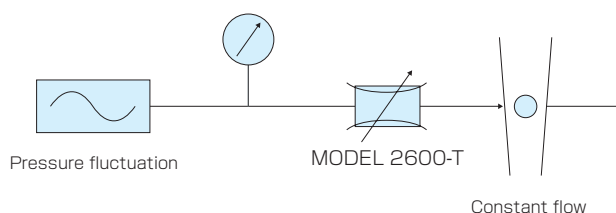
2600T

Dimensions

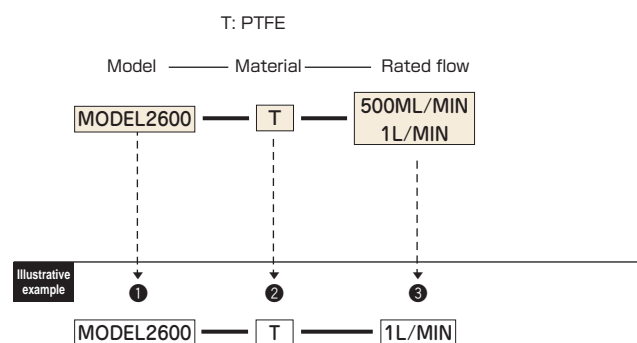


Connection Example with Model 2600

When the primary pressure fluctuates



Ordering



* Refer to "Ordering" and "Illustrative Example" when placing an order or requesting a quotation. Fill in the blanks in the "Order/Quotation Request Card" at the end of the catalog, and send the card by fax.



Constant Flow Valve for Liquid

MODEL 2600 SERIES

This is a constant flow valve developed for liquids, and maintains a constant liquid flow irrespective of pressure changes on the primary and secondary sides.

Features

- **Excellent constant flow valve for liquids**
The valve is made of high-precision parts for smooth control.
- **Immune to pressure changes**
The valve keeps the flow constant irrespective of changes in the primary- and secondary-side (outlet-side) pressure.
- **Control of very small flow from 10 ml/min**
- **Upper and lower diaphragm chambers equipped with air-breathers**
Air breathing during initial flow setting permits high-accuracy control.

Applications

- Analyzers
- Environmental measuring instruments
- Liquid mixing equipment

Standard Specifications

	Model 2600-S	PVC
Fluid	H ₂ O	H ₂ O
Flow rating (at H ₂ O calibration condition)	1-10 ML/MIN	1-10 ML/MIN
	10-100 ML/MIN	10-100 ML/MIN
	0.1-1 L/MIN	
Control accuracy ^{Note 1}	±3% F.S.	±5% F.S.
Operating differential pressure	0.1 MPa or more	
Operating pressure	0.1-0.5 MPa	
Proof pressure	0.7 MPa	
Materials of parts in contact with fluids	SUS 316, Viton, Teflon®	PVC, SUS 316, NBR, Viton
Operating temperature	15-35°C	
End connection	Rc 1/4	

Note: The control accuracy is guaranteed only when the fluid temperature is constant, because the viscosity varies with temperature. Contact us for the detailed specifications.

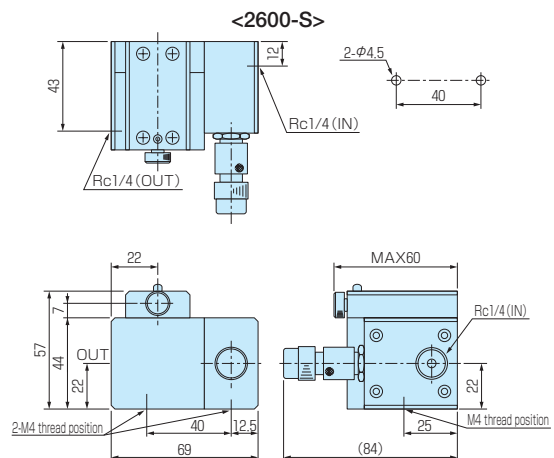
Special Specifications

Contact us for other ranges and other types of fluids.

Note: The above specifications are subject to change.
Install a filter or the like on the IN side to prevent entry of foreign substances.

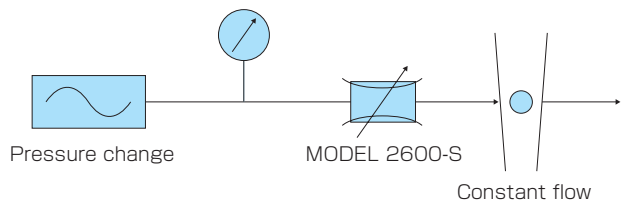


Dimensions

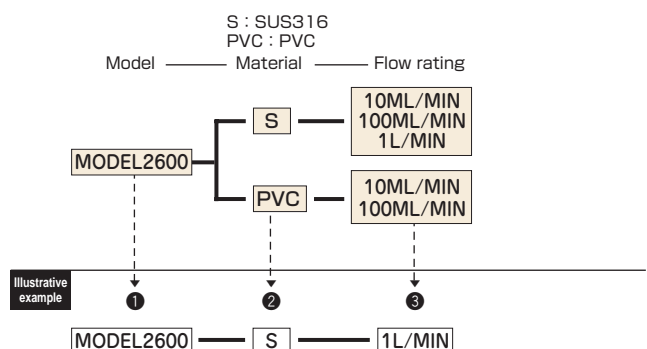


Example of use

When primary-side pressure changes



Ordering



* Refer to "Ordering" and "Illustrative Example" when placing an order or requesting a quotation. Fill in the blanks in the "Order/Quotation Request Card" at the end of the catalog, and send the card by fax.



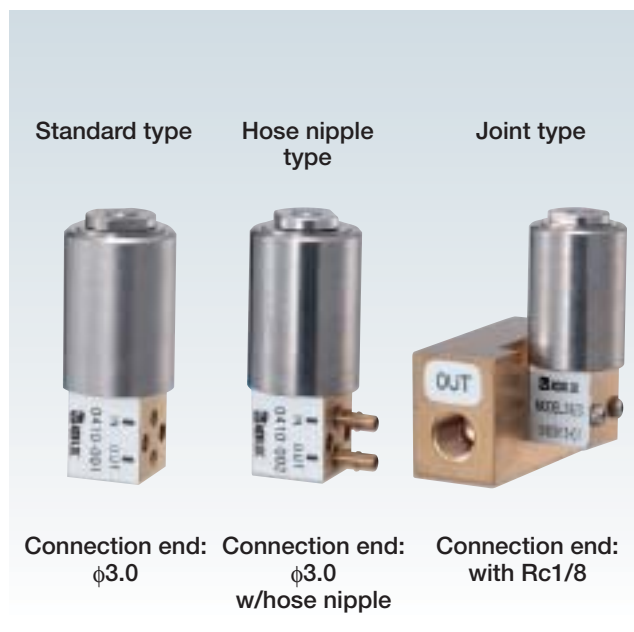
Small Proportional Solenoid Valve

MODEL 2900 SERIES

This small, or rather miniature, proportional solenoid valve maintains flow control characteristics of hysteresis within 15% (full-scale current) and is perfect for automatic gas flow control of gas chromatographs and various other analyzers. Because of its superior resolution, Model 2900 is also ideal for control of precision control of pressure.

Features

- High-performance proportional valve for a single power source ultra-compact in size, light in weight
- Low power consumption (2 W)
- Annealed magnetic materials, together with a specially designed flat spring, perfectly eliminate flow fluctuations caused by vibrations due to plunger run-outs and frictions.
- The incorporated magnetic yoke is annealed after precutting (and not bending) to remove magnetic flux passage interference, thereby to enhance magnetic power.
- Minimum hysteresis available in the industry (within 15%)
- Patent applied for (United States Patent and Trademark Office)



Standard Specifications

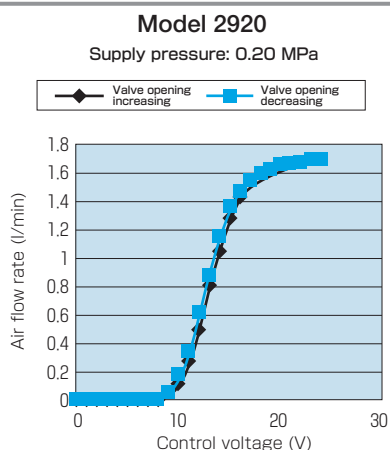
Model	2900 Series			
	2910 *1	2920	2930	2940
Orifice diameter (ϕ)	0.076	0.25	0.76	1.27
Pressure	Proof pressure	980kPa		
	Operating differential pressure	0-980kPa	0-980kPa	0-690kPa
Control	Power supply	24VDC \pm 10% (PWC*2 control available)		
	Control voltage range	7VDC-20VDC		
	Working voltage	Δ 10VDC		
	Power consumption	Max. 2W		
	Hysteresis	15% or less (full-scale current)		
Filter	20 μ m (IN, OUT)			Without filter
Working temperature range	0°C-50°C *3			
Retention temperature range	-5°C-70°C			
Materials of parts exposed to gases	BsBM (C3604), SUS 430F, Viton, SUS 316			
Size (mm)	\square 13 x 15 + ϕ 19 x 48			
Connection end	$\phi 3.0$ (Standard)			
Weight	Approx. 60 g (Approx. 200 g for type with Rc1/8)			

*1: Custom-ordered model. Contact us for information on details.

*2: PWC = Pulse Width Coding

*3: Temperature coefficient of the Model 2900 coil copper wire resistance is $R_t = R_oC^\circ (1+0.004t^\circ C)$. If you need to use voltage values for control, use the product in the environment where ambient temperature does not vary in large measure. Where there are large variations in ambient temperature, it is recommended to use current control.

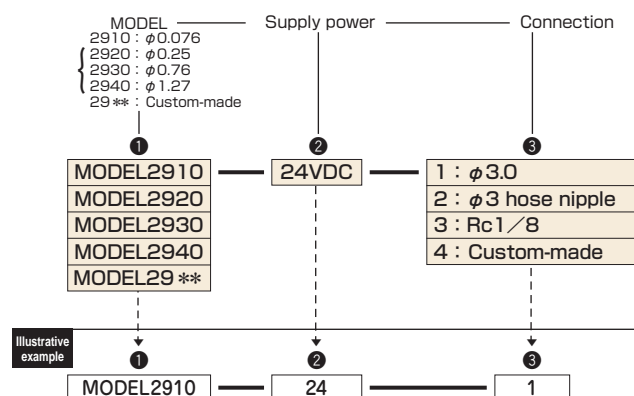
Flow Control Characteristic Curve (Example)



Ordering

* You may specify the operating conditions (see the example below) of your equipment for our selection of the orifice diameter type that best suits your requirements.

Operating conditions: Fluid - Supply pressure - Max. flow



Note 1: The specifications and overall size above are subject to change without prior notice.

Note 2: Applicable calibration conditions depend upon the type of gas. Please contact us for consultation.

Note 3: Specify the load value of the outlet pressure, if any.



Shutoff Valve MODEL 5220 SERIES

The KOFLOC shutoff valve is a stop valve developed for the flow control section of scientific instruments and analyzers that must be kept clean. The highly durable precision-machined valve also excels in air-tightness. Simply turning the knob 90 degrees shuts off the fluid.

Features

- **Easy opening/closing**
Just turn the knob 90 degrees to open and close the valve.
- **Panel-mount type**
This compact valve provided with a panel-mount nut is ideal for panel instrumentation.
- **Excellent cleanliness**
- **Excellent durability**
The valve is highly durable for frequent operation.
- **The valve can be used for both gas and liquid.**

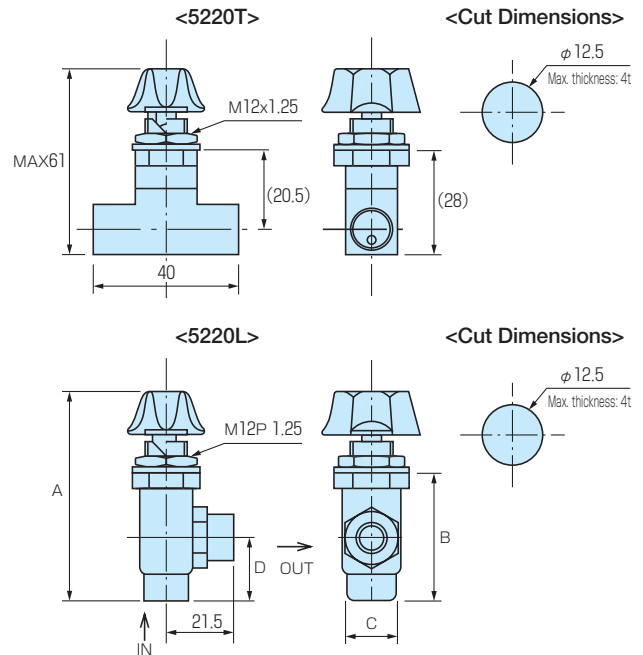
Applications

- In front and behind various types of fluid control equipment
- Scientific instruments, analyzers, and environmental measuring instruments
- Instrumentation panel board for control of gas and liquid in laboratories

Opening/closing operation	90° turning
Orifice dia.	φ3
CV value	0.23
Max. operating pressure	0.8MPa
Materials of parts in contact with fluids	(B) Brass, NBR, SUS304 (S) SUS304, Viton
End connection dia.	Rc1/8, Rc1/4
Mounting	Panel-mount
Max. operating temperature	(B) 80°C (S) 120°C



Dimensions



	A	B	C	D
5220-L-S-1/4	MAX.72	39	φ18	20
5220-L-S-1/8	MAX.70	37	φ15	22
5220-L-B-※	MAX.72	39	φ20	22

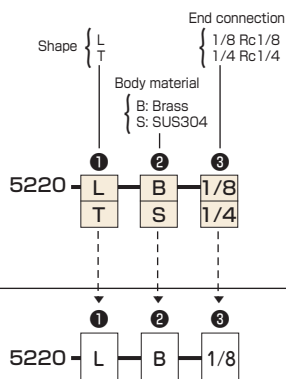
Special Specifications

- Joint other than standard joint (Refer to page 129.)
- M8P1 O-ring seal processing

Purchasing

- Refer to page 93 for the relationship between the CV value and pressure/flow.

Ordering



Illustrative example

* Refer to "Ordering" and "Illustrative Example" when placing an order or requesting a quotation. Fill in the blanks in the "Order/Quotation Request Card" at the end of the catalog, and send the card by fax.



Toggle Valve (Stop Valve with Small Retention Section)

MODEL 5500 SERIES

The KOFLOC toggle valve is a shutoff valve developed for quick, reliable opening/closing operation. The special structure with a valve section and special O-ring excels in durability, while ultra-cleanliness assures high-sensitivity analysis.

Features

- Lifting by 90 degrees and tilting for quick opening/closing.
- Precision machining ensures high air-tightness.
- The dead space has been minimized.
- The valve can be used for both gas and liquid.
- This panel-mount type for easy mounting on a panel is compact and ideal for instrumentation.

Applications

- Scientific instruments, analyzers, and environmental measuring instruments
- Compact portable measuring instruments
- Instrumentation panel boards and various testing devices

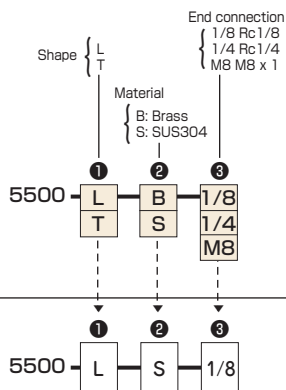
Standard Specifications

Opening/closing operation	90° toggle type
Orifice dia.	φ1.5
CV value	0.06
Max. operating pressure	0.8MPa
Materials of parts in contact with fluids	(B) Brass, Viton, NBR, Al (S) SUS304, Viton
End connection dia.	M8 × 1 (Option: Rc 1/8 and Rc 1/4)
Mounting	Panel-mount

Special Specifications

- Joint other than standard joint (Refer to page 129.)

Ordering

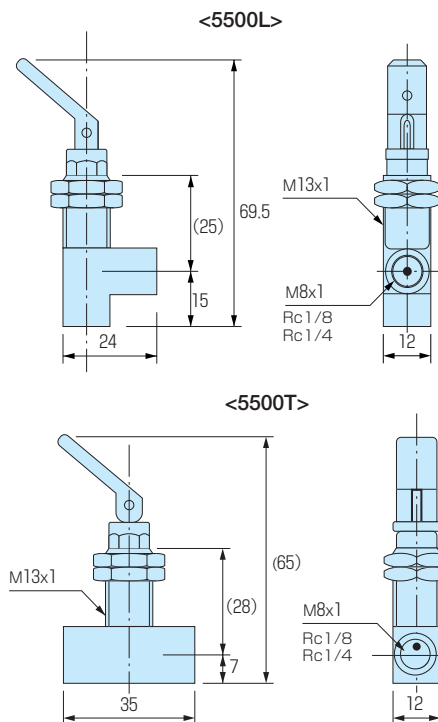


Illustrative example

* Refer to "Ordering" and "Illustrative Example" when placing an order or requesting a quotation. Fill in the blanks in the "Order/Quotation Request Card" at the end of the catalog, and send the card by fax.



Dimensions



Purchasing

- Refer to page 93 for the relationship between the CV value and pressure/flow.