

TAKASAGO ELECTRIC, INC.



ISO9001 certified for the following fields.

Applied businesses : Design, development, production and sales of solenoid valves, pinch valves, and metering pumps.

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Environment

Preserve clean air and water for future generations

Our products are installed into many kinds of environment-related applications like water quality analysers, automotive emissions analysers etc. to protect the environment.

Health

For mankind's well-being

We hope our products are used to improve people's health and happiness. e.g. in blood analysers, dialysis machines and other medical / diagnostic applications.

Technology

Small, Fast, Highly Accurate

We, as a high-tech fluidic control system manufacturer, always aim to achieve the most advanced technological standards.

Having developed in excess of 4000 different valves over 50 years, Takasago has established itself as a leading manufacturer of valves and other fluidic devices. With this experience and knowledge about fluid-handling and precision control, we can provide our customers with high quality custom-made products. The products listed in this brochure represent only a small part of our product range. Various applications of our products include :

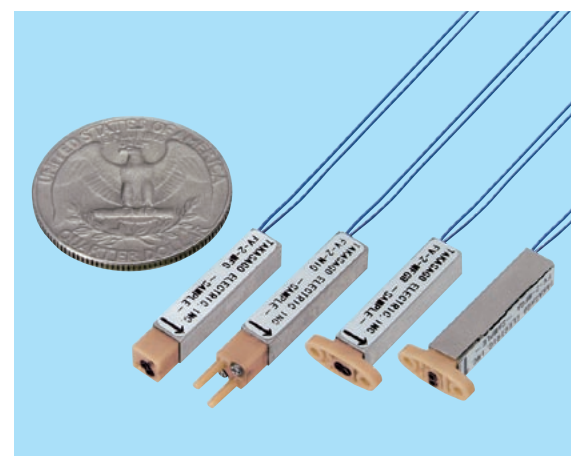
Diagnostic instruments such as clinical chemistry/immunoassay analysers
Analytical instruments including liquid/gas chromatographs
Biotechnology equipments for DNA analysis, cell culture, cell handling, etc.
Environmental measuring instruments for water, air, flue gas or automotive exhaust gas
Ink-jet printers
Medical instruments including dialysis machines
Fluid control devices for special chemicals, beverages, etc.
Portable fuel cells
Semiconductor and LCD manufacturing equipment

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Innovatively Small and Highly Functional : Miniature Isolation Valves

FV Series



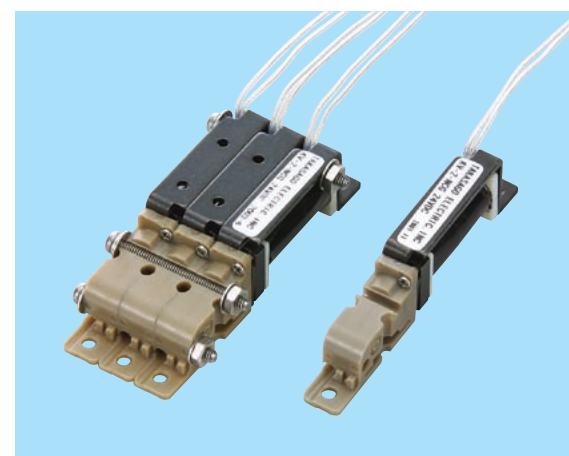
Latching solenoid type also available. Refer to P9.

Dimensions (mm)	W 4.2 × L 4.2 × H 23.1*
Orifice Diameter (mm)	φ 0.4
Port Connection	Barb, Gasket
Pressure	0 ~ 100 kPa
Voltage	5 VDC, 12 VDC
Power Consumption	1 W (5 VDC), 1.2 W (12 VDC)

Patented

*FV-2-MFG

KV Series



Dimensions (mm)	W 6 × L 50 × H 12.5
Orifice Diameter (mm)	φ 0.8
Port Connection	O-ring
Pressure	0 ~ 100 kPa
Voltage	12 VDC, 24 VDC
Power Consumption	1.8 W

EXV Series



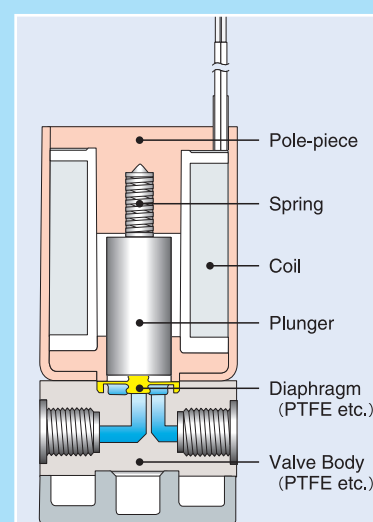
Dimensions (mm)	W 14 × H 31.7
Orifice Diameter (mm)	φ 1
Port Connection	Gasket
Pressure	-50 ~ 200 kPa
Voltage	12 VDC, 24 VDC
Power Consumption	2.8 W

EXAK Series



Dimensions (mm)	φ 12 × H 48.1
Orifice Diameter (mm)	φ 0.8
Port Connection	Barb, M5
Pressure	-40 ~ 100 kPa
Voltage	12 VDC, 24 VDC
Power Consumption	0.94 W

Miniature Isolation Valves



Our solenoid valve consists of two sections ; one is the valve part made of highly inert plastics like PTFE or PEEK, which opens and closes a flow path. The other is the actuator made of a coil and metallic parts, driving the valve part. In order to preserve the purity of the fluid, a diaphragm is installed between the two sections in our isolation valves. The diaphragm prevents the fluids from flowing into the actuator and protects the metallic parts from being corroded. Also, metal dust generated in the actuator does not contaminate the fluid. This structure is ideal for analytical and diagnostic applications which are sensitive to particles. It is also suitable for handling acids and chemicals which erode metals.

By reducing the size of these isolation valves, we have been able to reduce the dead volume, improve the control of the pumping volume, and reduce the installation area, thereby improving accuracy and avoiding wasting chemicals and solvents.

Pumping Volume

The diaphragm produces a pumping effect on a fluid as the valve opens and closes. As some valve models pump several microliters of fluid at one time, the pumping volume forms negative factors in metering an accurate fluid volume, and also in preventing fluid from dripping from a dispensing nozzle. Our miniature solenoid valves have a remarkably small pumping volume, particularly the EXAK valve which has a pumping volume 100 times lower than our standard valves. This is achieved due to a special internal structure designed to reduce the pumping volume.

unit : μl							
MODEL	PORT	ON - 1	OFF - 1	ON - 2	OFF - 2	ON - 3	OFF - 3
EXAK-3	COM	+ 0.002	- 0.015	+ 0.002	- 0.015	+ 0.002	- 0.015
	NC	+ 0.024	- 0.010	+ 0.024	- 0.010	+ 0.024	- 0.010
	NO	+ 0.005	- 0.005	+ 0.005	- 0.005	+ 0.005	- 0.005
MTV-3 (Regular type)	COM	- 0.64	- 0.34	- 0.74	- 0.44	- 0.44	- 0.49
	NC	- 0.64	2.01	- 0.59	2.06	- 1.77	2.06
	NO	0.00	- 0.34	0.00	- 0.29	0.00	- 0.29

Diaphragm Valves with High Reliability and Outstanding Inertness

STV Series



Dimensions (mm)	φ20 × H 42.5
Orifice Diameter (mm)	φ1.2
Port Connection	M6, 1/4-28UNF
Pressure	−50 ~ 200 kPa
Voltage	12 VDC, 24 VDC
Power Consumption	2.5 W

MTV Series



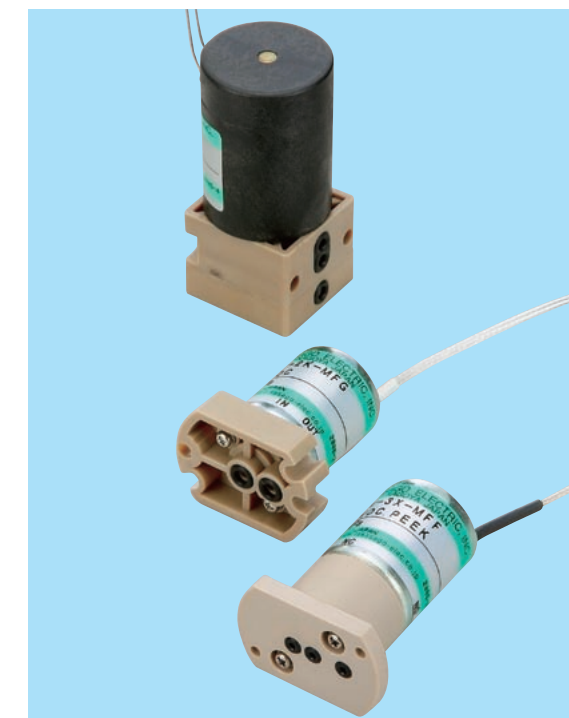
Dimensions (mm)	φ26 × H 53.2
Orifice Diameter (mm)	φ1.6 ~ φ2
Port Connection	M6, 1/4-28UNF, Barb
Pressure	−90 ~ 300 kPa
Voltage	12 VDC, 24 VDC
Power Consumption	1.9 W

PKV Series



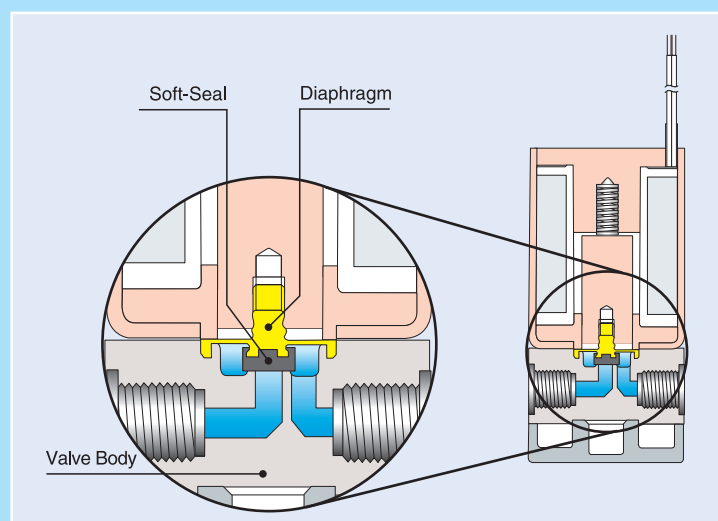
Dimensions (mm)	W 42 × L 40 × H 71
Orifice Diameter (mm)	φ4 ~ φ6
Port Connection	Rc1/8, Rc1/4, Barb
Pressure	−50 ~ 200 kPa
Voltage	12 VDC, 24 VDC
Power Consumption	6 W

Various Manifold-mountable Models



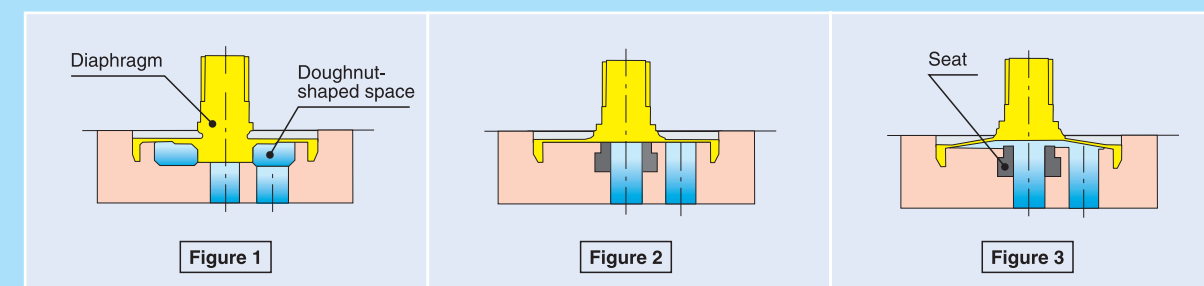
These are to be mounted on a manifold.
Main types are STV series and MTV series.

Soft-Seal



Problems can arise with PTFE diaphragm valves when scratches on the seal part of the valve, due to dust or crystals in the fluid, cause the valve to leak. Takasago offers an optional "Soft-Seal" to protect the sealing surface from being scratched by covering it with perfluoroelastomer, which is a special elastomer that has outstanding resistance to most chemicals and solvents. The chemical inertness of the perfluoroelastomer is almost equal to PTFE. It has a high reputation for use with chemicals in analytical or semi-conductor industries. FPM (FKM) is also available for the Soft-Seal material.

Zero-Internal-Volume Design



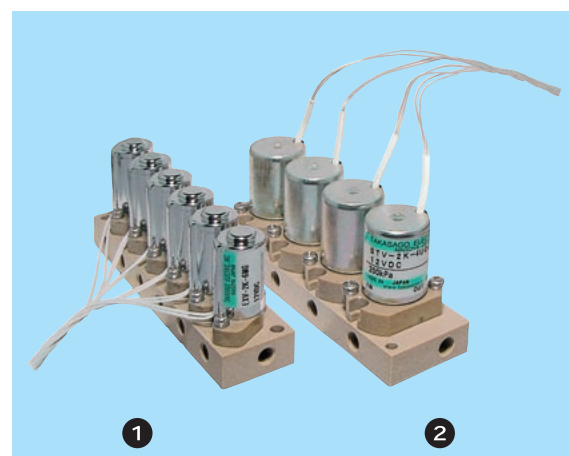
■ Applicable models

- STV Series (2-way type only)
- MTV Series
- MLV Series

A diaphragm solenoid valve normally has a doughnut-shaped space right under the diaphragm, through which fluids flow to the outlet port (Figure 1). This space, often called a "valve chamber", works as excess internal volume to waste solvents and samples. Fluids tend to stay in this dead space and therefore decrease the purity of each fluid. In addition, air bubbles may be trapped in this valve chamber and can have a negative effect on analytic accuracy. To conclude a valve chamber causes various undesirable results for applications. To overcome these problems, Takasago has designed the Zero-Internal-Volume Valve, in which a special structure is employed to eliminate the valve chamber (Figure 2). On opening, the diaphragm is lifted and the space is formed for the fluid to stream (Figure 3). (Note) This Zero-Internal-Volume structure is patented.

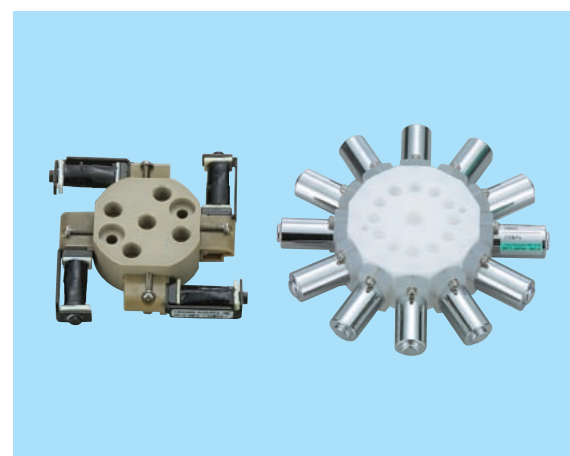
Products to Meet Your Requirements Flexibly

Standard Manifolds



	① EXV Series	② STV Series
Orifice Diameter (mm)	φ 1	φ 1.2
Port Connection	M6, 1/4-28UNF	M6, 1/4-28UNF
Pressure	-20 ~ 200 kPa	-50 ~ 200 kPa
Voltage	12 VDC, 24 VDC	12 VDC, 24 VDC
Power Consumption	2.8 W × (No. of valve)	2.5 W × (No. of valve)
Maximum number of valves	6	6

Custom Manifolds



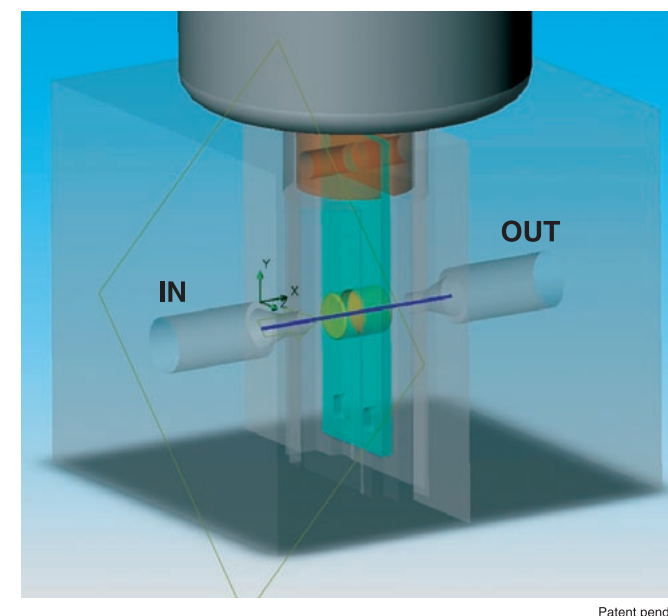
If you wish install valves compactly and connect flow-paths over a short distance, the manifold is the best choice. If you let us know the flow diagram you require, we can design and produce the manifold to meet your requirements. A variety of shapes, materials, and structural methods are available and we are also capable of equipping the manifold with components like pumps. Please contact us for further details.

Bonded PTFE Manifold

- This is a 100% PTFE manifold, with internal channels made by bonding two layers of modified PTFE. Due to excellent chemical resistance, this product is compatible with a wide range of fluids.
- Highly integrated manifolds with freely curving channels that could not be fabricated through the conventional drilling process are now made available.
- Bonding is achieved through the use of a special technique that does not use adhesive, so the channels are absolutely contamination-free. The bonding method is highly reliable such that the bonding surfaces are unified so well that the point of joining can be hardly distinguished.

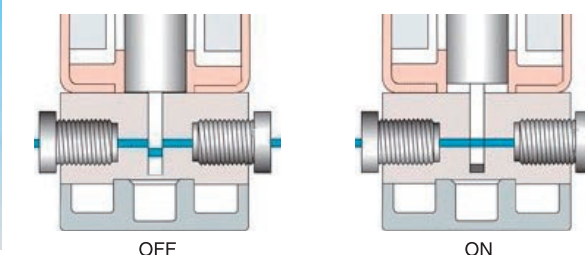


Solenoid-driven Slider Valve



Pumping volume ^(※) has a negative effect on analysis accuracy and precise fluid dispensation. Through the incorporation of part of the flow path into a sliding structure, this pumping volume is reduced to almost zero and an impressive increase in operating pressure is exhibited. In addition, the elimination of excess internal volume reduces cross-contamination. Amongst many varied possible applications, this valve can be utilised as a sample injector.

(※) Please refer to P.5 for more details of pumping volume.

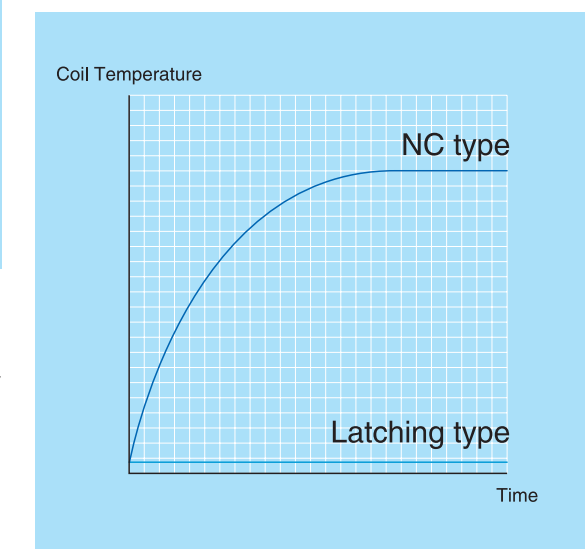


Latching Solenoid Valves



	Orifice Diameter or Tube Diameter (mm)	Valve Type
① FLV Series	φ 0.4	Diaphragm valve
② WLB Series	φ 2	Diaphragm valve
③ PL Series	φ 1 × φ 3	Pinch valve
④ EL Series	φ 10 × φ 13	Pinch valve

In the case of a conventional (e.g. N.C. - Normally Closed) solenoid valve, continuous energisation is required to maintain open status. The latching solenoid doesn't require a power supply for the purpose of maintaining open status through the utilisation of a permanent magnet. Suitable for applications where the power consumption and the effect of temperature on a fluid is a concern.



Variety of Other Products : Pinch Valves, Air-Operated Valves and Others

Pinch Valves



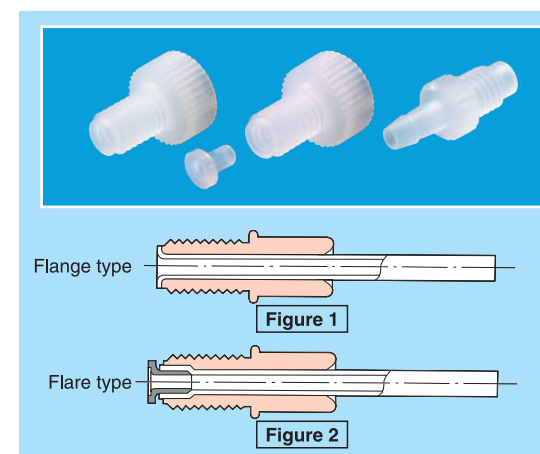
	① PE Series	② PSK Series	③ PMK Series	④ PK Series	⑤ NP Series	⑥ EPK Series
Dimensions (mm)	φ14 × H 55.1	φ20 × H 51	φ26 × H 61.5	W 40 × L 36 × H 65 ~ 88.3	W 40 × L 36 × H 65 ~ 88.3	φ64 × H 112 ~ 132
Tube Material	Silicone	Silicone, PharMed®	Silicone, PharMed®	Silicone	Silicone	Silicone
Tube Diameter (mm)	φ0.8 × φ2.4	φ1 × φ3 φ1.6 × φ3.2	φ0.8 × φ2.4 φ1 × φ3	φ3 × φ5 φ6 × φ8	φ3 × φ5 φ6 × φ8	φ10 × φ13 φ15 × φ19
Pressure	0 ~ 100 kPa	0 ~ 150 kPa	0 ~ 150 kPa	0 ~ 50 kPa	0 ~ 50 kPa	0 ~ 50 kPa
Voltage	12 VDC, 24 VDC	12 VDC, 24 VDC	12 VDC, 24 VDC, 100 VAC	12 VDC, 24 VDC, 100 VAC	12 VDC, 24 VDC, 100 VAC	12 VDC, 24 VDC, 100 VAC
Power Consumption	2.8 W	3 W	4.4 W	10 W	10 W	60 W (intermittent : 5 min.)

Air Operated Valves



	① PDT	② PMDP
Dimensions (mm)	φ44.5 × H 52 ~ 67	φ25 × H 42 ~ 49
Orifice Diameter (mm)	φ3 ~ 5	φ2
Fluid Flow Connection	Rc1/8, Rc1/4	M6, 1/4-28UNF, Barb
Operating Pressure	0 ~ 300 kPa	-90 ~ 500 kPa
Port Connection for air pressure	Rc1/8	M5, M6, 1/4-28UNF
Air Pressure for actuation	300 ~ 600 kPa	300 ~ 600 kPa

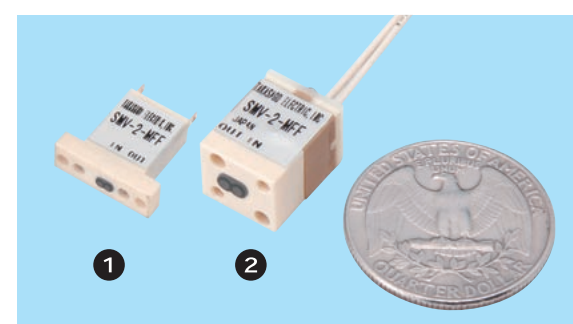
Tube Fittings



We have three types of fittings.

- A flange type is used for tubing made of plastic like PTFE, and has a simple structure. Before use, the tube end should be enlarged like a trumpet and pushed into the bottom of a valve port (Figure 1).
- With a flare type, ferrule called a "Seal Joint" is attached for easy connection (Figure 2). The Seal Joint is a component moulded in a flange shape. Simply insert the Seal Joint into the end of the tube for use.
- For elastic tubing such as silicone, barb types are very convenient (see the picture on your right-hand side). Screw fittings into the valve ports beforehand and then connect tubing to the barb section of the fitting.

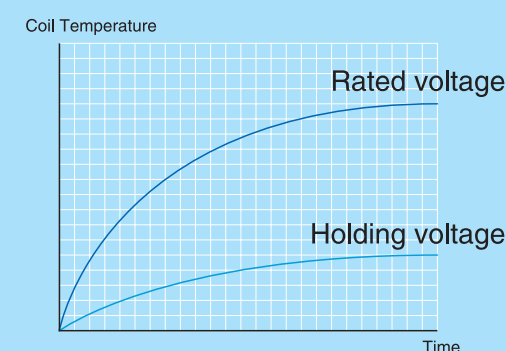
Low Power Consumption Miniature Valves



Patented

	①	②
Dimensions (mm)	W 4 × L 16 × H 16.5	W 8.9 × L 10.4 × H 14
Orifice Diameter (mm)	φ0.4	φ0.8
Driving Current	250 mA	250 mA
Operating Frequency	0.5 Hz or less	0.5 Hz or less
Power Consumption	0.3 W or less	0.3 W or less

Holding Voltage



Once switched to ON-position by energising at rated voltage, a solenoid valve can hold the ON-position status even after the applied voltage is dropped. Using this characteristic, power consumption and heat-generation can be reduced. Response time can also be improved by using the same method.

Manufacturing Facilities



Clean Room

As most of our products are used in sensitive devices like diagnostic or environmental analysers, we take great care of tiny dust particles that disturbs analytical accuracy and valve's functions. We do our assembling, testing, and packaging in our class 1000 clean rooms.

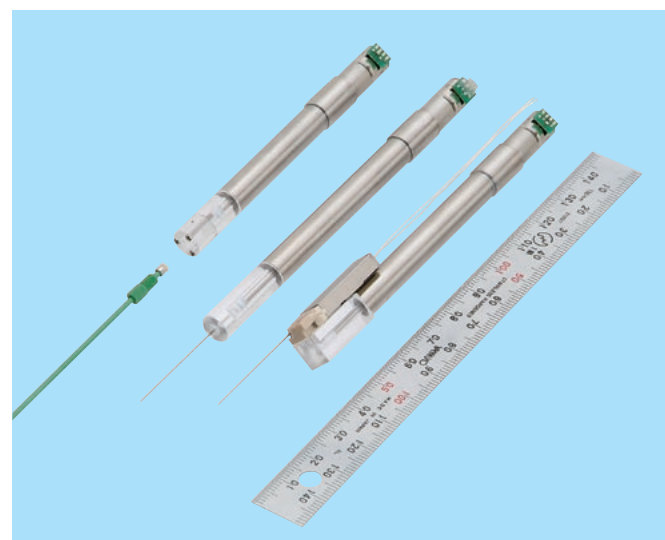


Fully Automated Processing Line for valve bodies

Our machining processes are highly automated. This enables us to manufacture valves very cost-effectively, even when they are custom-designed.

A Wide Range of Small-sized Liquid Pumps

Pen Type Syringe Pumps 〈Under Development〉



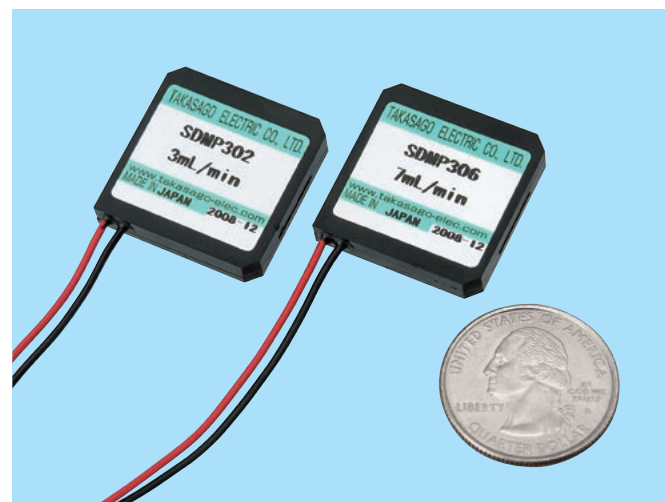
A small size of dia. 8.8 mm and a light weight of only 18 g (25 µl model), now with a built-in stepper motor. A resolution of 10 nl is theoretically possible. Needle models, threaded port models for fittings, and ultra small 3-way valve mounted models are available.

Specifications of Needle Models

Syringe Capacity	25 µl	50 µl
Dimensions (mm)	φ 8.8 × L 83.9 (Excluding needle)	φ 8.8 × L 108.4 (Excluding needle)
Weight	18 g	22 g
Theoretical Resolution	10 nl	
Wetted Materials	PMMA (Barrel) *, PTFE (Tip), Stainless Steel (Needle)	

*Glass barrels are also available.

Piezoelectric Micro Pumps



The SDMP302/306/320 is a piezoelectric diaphragm micro pump. The main features are as follows:

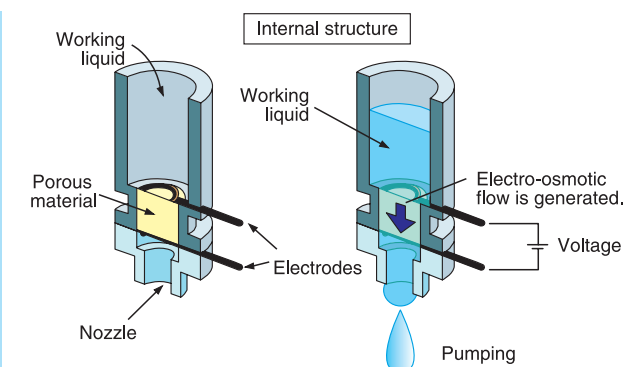
- Small-sized, lightweight and thin
- No metal parts in contact with fluid
- Quiet and low power consumption
- Flow controllable by adjusting drive voltage and drive frequency
- Self priming

The SDMP302D/306D is the same as the SDMP302/306 but with a built-in driving circuit. When applying 2.5 - 6 VDC, it will start to operate at a fixed voltage and frequency.

	SDMP302	SDMP306	SDMP320	SDMP302D	SDMP306D
Pump Type	Piezoelectric diaphragm pump				
Flow	3 ml/min	7 ml/min	20 ml/min	3 ml/min	7 ml/min
Pump Pressure	40 kPa	45 kPa	35 kPa	40 kPa	
Voltage	60 ~ 250 Vp-p (Drive Voltage)			2.5 ~ 6.0 VDC (Input Voltage)	
Dimensions (mm)	25 × 25 × 4.8		33 × 33 × 5.5	25 × 25 × 8.9	
Power Consumption	47 mW		76 mW	120 mW	

*The above specifications of SDMP302/306/320 are under the conditions of Distilled water, 250Vp-p, 40 Hz Sine wave.
*The above specifications of SDMP302D/306D are under the conditions of Distilled water, VDD=5V.

Micro Electro-Osmotic Pumps



The Micro Electro-Osmotic pump is a miniaturised liquid-pumping apparatus based on electrokinetics, a fluid-flow phenomenon that becomes significant in the microscale.

Features

- Zero-pulsation flow and no noise (No mechanical parts)
- High pressure (up to 2 MPa)
- Variable flow (From 1 to 1600 µl/min)
- Small body size (minimum φ 6 × L 11.5)
- Lightweight (minimum 0.2 g)
- Good controllability

Type	① Reservoir	② Reservoir	③ Self Priming
Dimensions (mm)	φ 6 × L 11.5 (Inc. Reservoir)	φ 8 × L 3.5 (Body only)	φ 8 × L 4 (Body only)
Maximum Flow	10 µl/min	190 µl/min	190 µl/min
Maximum Pressure	90 kPa	110 kPa	110 kPa
Power Consumption	6 mW	100 mW	100 mW

Ultra Small Peristaltic Pumps



	① RP-Q1	② RP-Q.5X* (Under development)	③ RP-SM* (Under development)
Dimensions (mm)	W 12 × L 30 × H 14	φ 9.4 × L 38	W 8 × L 30 × H 4
Maximum Flow	0.45 ml/min. ±15% (3VDC, tap water at 20°C)	0.3 ml/min. ±15% (3VDC, tap water at 20°C)	Approx. 0.06 ml/min.
Motor	DC geared motor	DC geared motor	DC geared motor
Voltage	3 VDC	3 VDC	1.3 VDC
Tube Material	Silicone	Olefine	Silicone
Tube Size (I.D.)	1.5 mm	0.5 mm	0.3 mm

Stepper Motor Driven Ultra Small Peristaltic Pump is also available. (Under development)
*Specifications may be changed at any time without notice.

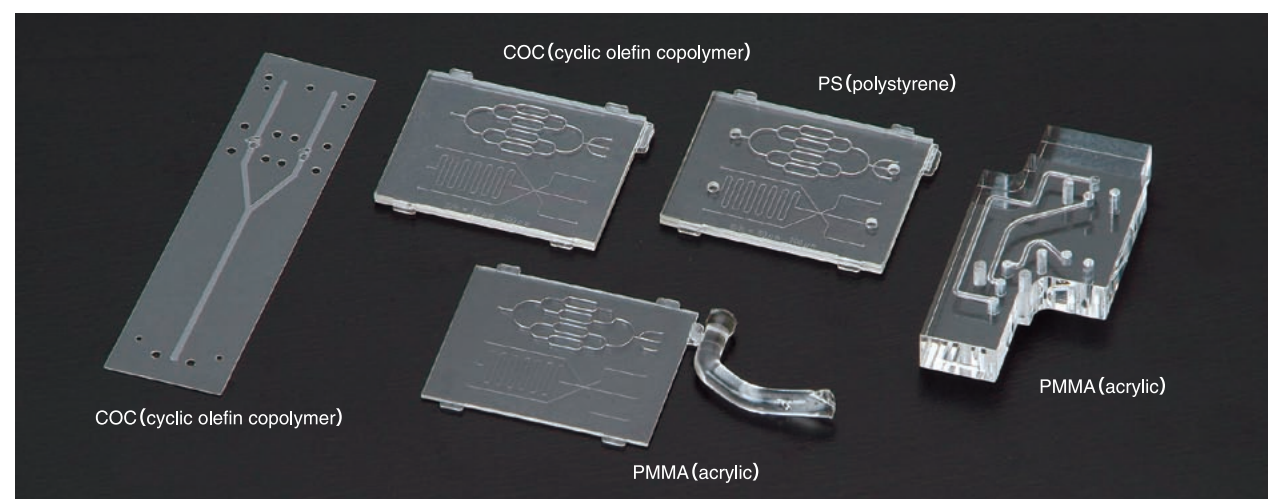
Metering Pumps



	① MCP-50	② PKP-500P
Dimensions (mm)	φ 30 × H 63.5	W 36 × L 43 × H 78
Pumped Volume	5 ~ 50 µl/cycle	50 ~ 500 µl/cycle
Maximum Operating Frequency	4 Hz	2 Hz
Port Connection	M6, 1/4-28UNF	M6, 1/4-28UNF
Voltage	12 VDC, 24 VDC	12 VDC, 24 VDC
Power Consumption	4.4 W	10 W

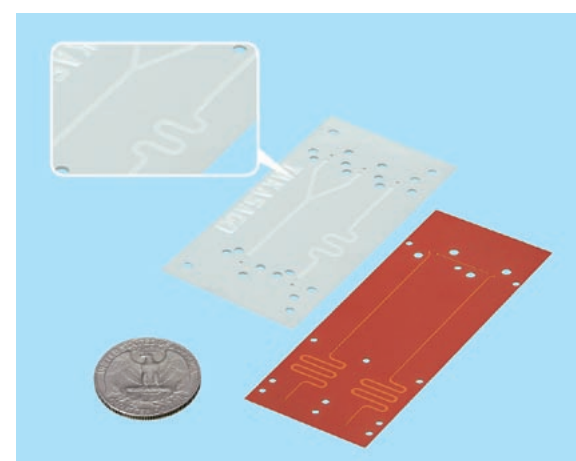
Microfluidic Solution Provider

Bonded Plastic Chips



The above products are a range of chips made by bonding plastic plates. The channels are precisely moulded or machined on a plate before bonding. The minimum channel cross-sectional dimensions made possible by our precision moulding technology are $50 \times 50 \mu\text{m}$. Chip materials available are COC (cyclic olefin copolymer), PMMA (acrylic) and PS (polystyrene).

Film Chips

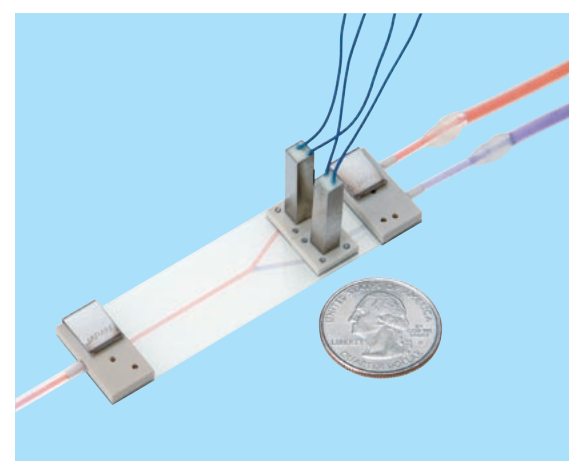


Patent pending

Maximum Dimensions (mm)	W 250 × L 250
Material	Cyclic olefin copolymer, Polyimide, Polyethylene naphthalate
Minimum Channel Width	$50 \mu\text{m}$
Layer Thickness	25, 50, $75 \mu\text{m}$

This product consists of several layers of bonded plastic film, in which fine channels are engraved. It is much thinner and lighter than glass or plastic block manifolds and can be used with μTAS applications like chips or reactors. It is bendable and temperature control of the flow path is easy. Our miniature valves can be mounted on the Film Chips.

Example of Module with Film Chip

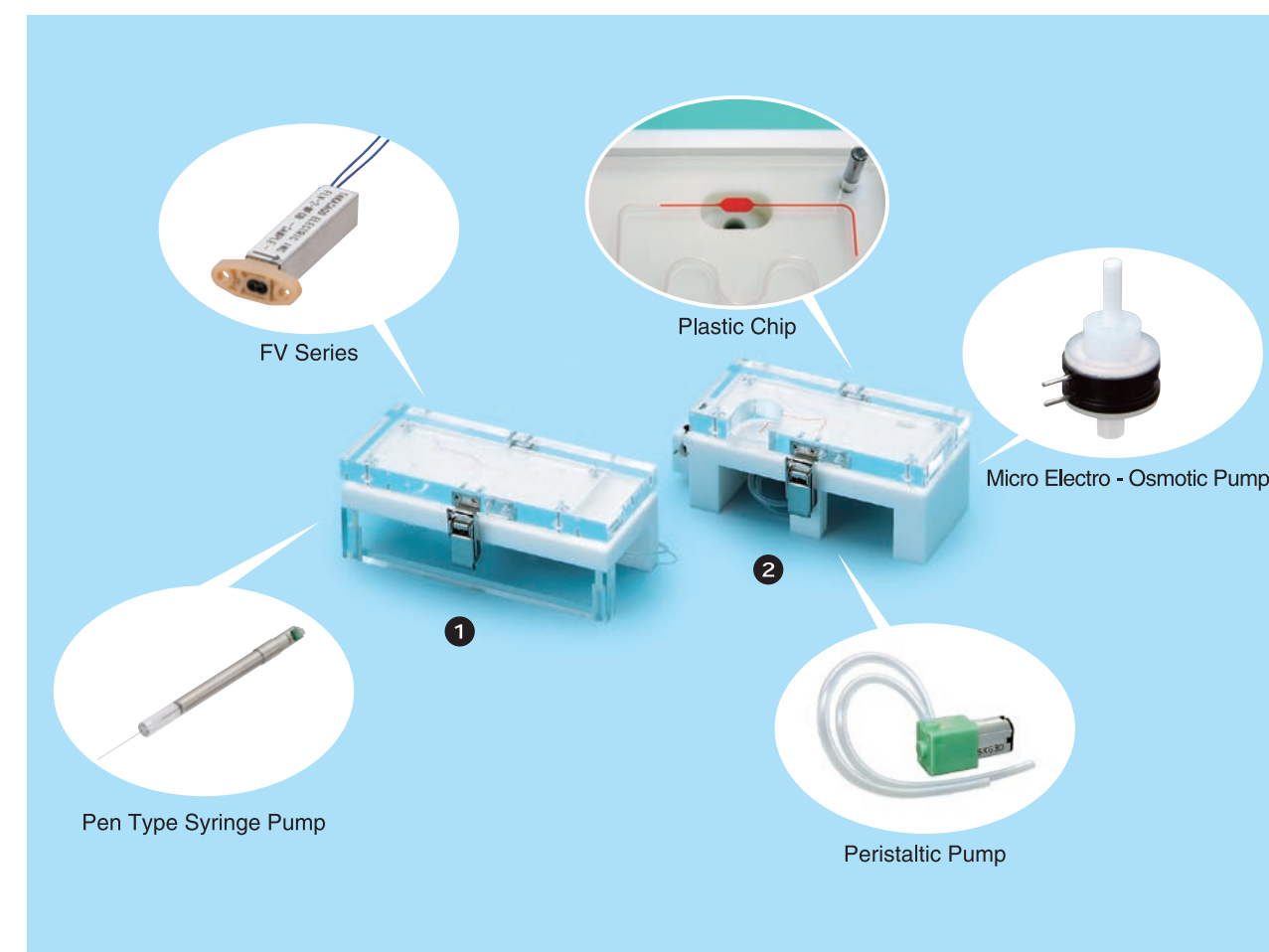


This is a demo module exhibiting the introduction and mixing of two liquids in the internal channels of a film chip of just $225 \mu\text{m}$ thickness. The flow of each liquid can be controlled by opening and closing the mounted ultra-small solenoid valves. A "clip-on" connection is adopted for easy interface between the film chip and tube connection bars.

Microfluidic Device Specialist

Microfluidic control devices are our key products. The trend of miniaturisation and modularisation is prevailing in markets worldwide. Our products are supplied not only as standalone equipment and components, but also in the form of integrated modules combining such products with other devices. We serve our customers with elegant and sophisticated solutions for various applications; presenting modules of integrated devices designed to solve the particular microfluidic control challenge posed. The below is an example of one such microfluidic control module.

Example of Microfluidic Control Module



- 1 This is a demo module in which a plastic chip is prefilled with a reagent. It is constructed from a pen type syringe pump and an ultra-small inert 3-way valve.
- 2 This module demonstrates the basic processes including sample introduction, mixing with a reagent, and detection, by using a chip with Y-shaped internal channels. A sample is introduced into the chip by an ultra-small peristaltic pump and, after being metered in accordance with the length of the channel, transported and mixed with the pre-filled reagent by a pair of electro-osmotic pumps. The flow is switched by ultra-small valves. The chip is designed to be disposable and can be easily fixed on the module by the holding plate.