MODEL SELECTION

Base model No.			Flow rate range				Display function	Flow path material	Piping connection method	Fluid type	Signal type	Connector type	Optional functions 1	Optional functions 2	Optional functions 3	Code	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
F	7	M															
			9	0	1	0											Measurable flow rate range: 0.1–10 mL/min
			9	0	3	0											Measurable flow rate range: 0.3–30 mL/min
							A										No display (equipped with an LED status indicator)
								Q									Fused silica glass, PFA, PTFE
									1								Fitting for fluororesin tubes SUPER-300 Type Pillar fitting P series (made by Nippon Pillar Packing Co., Ltd.) Outer dia. 3 mm, inner dia. 2 mm
									2								Fitting for fluororesin tubes SUPER-300 Type Pillar fitting P series (made by Nippon Pillar Packing Co., Ltd.) Outer dia. 1/8 in., inner dia. 0.086 in.
										0							Water (H20)
											0						Analog output, digital input, digital output
												1					Waterproof connector: HR30-6R-6P(71)
													0				None
														0			None
															0		None
															D		With inspection certificate
																0	Product version

PARTS INCLUDED

The following parts are included with the product.

Mounting bracket	× 1
Union nuts	× 2
Sleeves	× 2 (size depends on the model of the main unit)

PARTS SOLD SEPARATELY

Part Name	Part No.	Remarks
PVC-insulated cable, 2 m	F9Y7HP1	Waterproof connector made by Hirose Electric Co., Ltd.; HR30-6R-6P (71)
Fluororesin-insulated cable, 2 m	F9Y7HF1	
Fitting (metric system), 2 sets	F9Y7F1	With sleeves and union nuts (outer dia.: 3 mm; inner dia.: 2 mm); same as included parts
Fitting (inch system), 2 sets	F9Y7F2	With sleeves and union nuts (outer dia.: 1/8 in.; inner dia.: 0.086 in.); same as included parts
Mounting bracket	F9Y7B1	Same as included part
Fluororesin tube assembly (metric system), 2 sets	F9Y7T1	Tube assembly with sleeve inserted (outer dia.: 3 mm; inner dia.: 2 mm; length: 500 mm)
Fluororesin tube assembly (inch system), 2 sets	F9Y7T2	Tube assembly with sleeve inserted (outer dia.: 1/8 in.; inner dia.: 0.086 in.; length: 500 mm)
Fluororesin tube assembly for metal pipes (female screw adaptor), 2 sets	F9Y7T3	Set including an adaptor for metal pipes and a fluoriresin tube (outer dia.: 1/8 in., tube langth : 200 mm) (adaptor : Rc 1/8 fitting, wetted material SUS316)
Fluororesin tube assembly for metal pipes (male screw adaptor), 2 sets	F9Y7T5	Set including an adaptor for metal pipes and a fluoriresin tube (outer dia.: 1/8 in., tube langth : 200 mm) (adaptor : R 1/8 fitting, wetted material SUS316)
Adapter for loader communication	F9Y7A1	Set including a cable for connecting to the PC, a USB cable for communicating with flow meter main unit (planed to commence sales from march, 2018)


F9Y7HP1


F9Y7T1


F9Y7T3


F9Y7A1

Please read “Terms and Conditions” from the following URL before ordering and use.
http://www.azbil.com/products/factory/order.html

Azbil Corporation
Advanced Automation Company

Yamatake Corporation changed its name to Azbil Corporation on April 1, 2012.

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URL: http://www.azbil.com

1st Edition : Dec. 2017-SO

CP-PC-1593E

CP-PC-1593E

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Thermal

Micro Flow Rate Liquid Flow Meter

Model F7M

Thermal Micro Flow Rate Liquid Flow Meter, achieving high-functionality measurement and usability

Measures 30 mL/min or lower

Compact, light-weight, and easy to install

Flexible installation and wide range of fluids

Straight flow path

Thermal

Micro Flow Rate Liquid Flow Meter

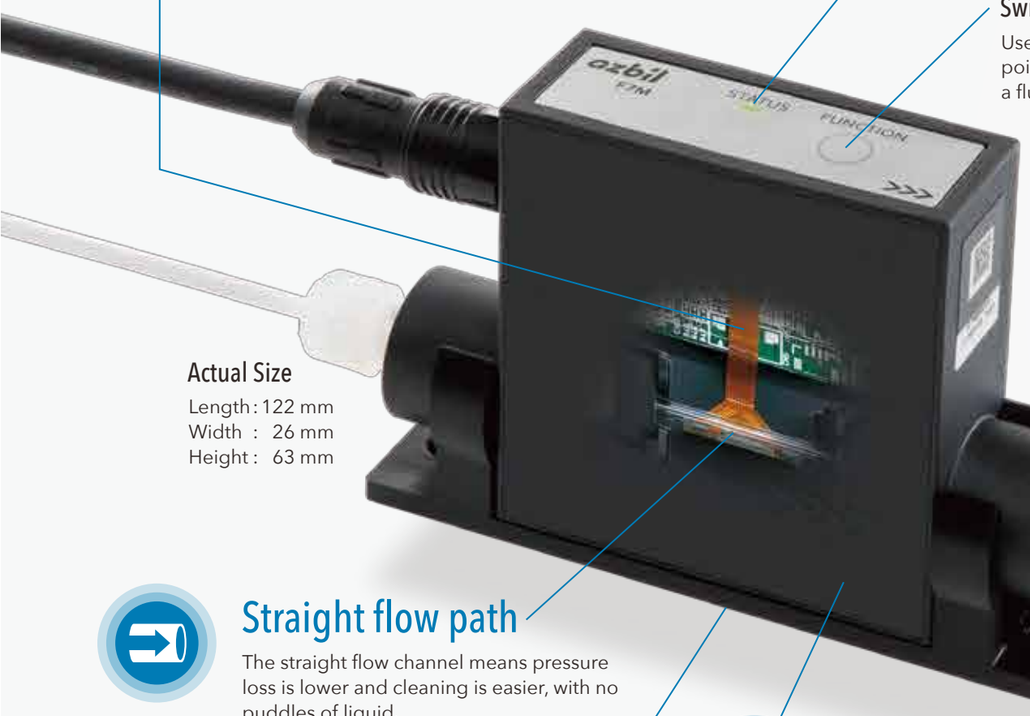
Model F7M

Features & Merits of the F7M

Combining a thermal MEMS sensor that is commonly used for gas flow meters and a flow path that is made of highly corrosion-resistant quartz glass, the product can measure both instantaneous and totalized flow value of micro flow rates **under 30 mL/min**, which is difficult to do with a high degree of reproducibility using traditional measurement methods. Compared with conventional methods, the measurement method used by this new product is **less susceptible to changes in the fluid state (e.g., bubbles, pulsations, and fluid temperature)** (although it may be necessary to change the settings parameters), and **micro flow rates can be measured easily**. Measuring the flow rates allows for **more reliable data management** by replacing alternative measures, such as managing the pump rotation speed, measuring the weight, and managing the fluid supply time. In addition, with the event functions it is possible to detect empty pipes and the presence of bubbles, and to monitor the status of pulsation.

Measures 30 mL/min or lower

Features the thermal measurement principle using MEMS sensing technology. Measuring micro flow rates under 30mL/min, which traditionally has been difficult, is now possible. (Measurement range: 0.1 to 10 mL/min, 0.3 to 30mL/min)



Straight flow path

The straight flow channel means pressure loss is lower and cleaning is easier, with no puddles of liquid.

Compact, light-weight, and easy to install

- This model is more compact and lighter than its predecessors.
- By using the included mounting bracket, it can be easily installed on a surface (for horizontal pipe connection).
- It can also be installed for vertical pipe connection.
- A separate converter (amplifier) is not required.

Flexible installation and wide range of fluids

- Compliant with IP65 protection rating.
- Exterior contains no metal, providing improved resistance to corrosive fluids, allowing use in environments with liquid spray.
- Can be used for **a variety of fluids**, so long as they do not corrode **quartz glass** (the material of the flow path) or **fluororesin** (the material of the fitting). The sensor does not come into contact with any fluids.

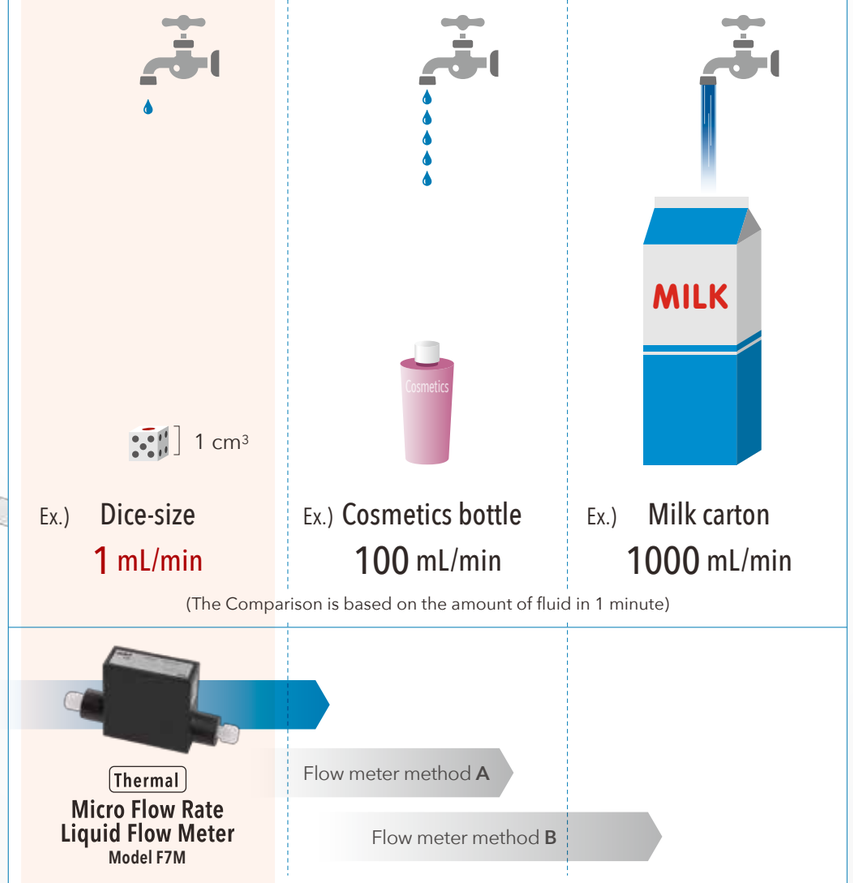
Product Overview

[Measurable flow rate range] 0.1–10 mL/min or 0.3–30 mL/min

[Measurable fluid] Water (H_2O)
For fluids other than water, the output may shift, depending on its thermal conductivity. Zero-point adjustment and the correction factor setting allow measurements to be taken with a degree of reproducibility that is as high as that for water. (However, accuracy is guaranteed only for water.)

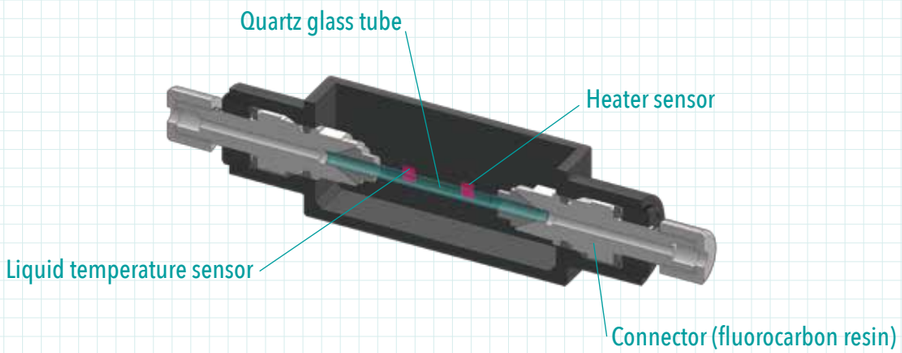
[Pipe connection method] Fluororesin tube (outer dia.: 3 mm; inner dia.: 2 mm or outer dia.: 1/8 in.; inner dia.: 0.086 in.)

Flow Volume Measured: Comparison with Other Methods



MEASUREMENT PRINCIPLE

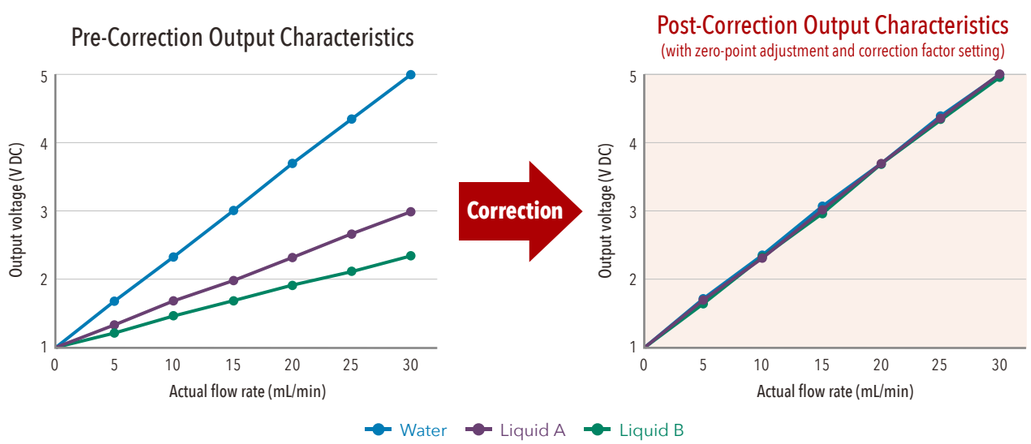
Combining a thermal MEMS sensor that is commonly used for gas flow meters and a flow path that is made of highly corrosion-resistant quartz glass, the product uses a method of measuring micro flow rates that is less susceptible to changes in the fluid state and more reliable.



- ☐ Heater surface **temperature is constantly controlled to keeps sit at a fixed value** that is slightly higher than the fluid temperature.
- ☐ Heat dissipation from the heater **changes depending on the flow rate**.
- ☐ As the flow rate rises, the amount of heat transferred to the fluid increases, and the power consumption of the heater increases.
- ☐ By measuring the heater's power consumption, the **flow rate can be calculated**.
  (Heat dissipation from the heater is quite small that it does not heat the fluid.)

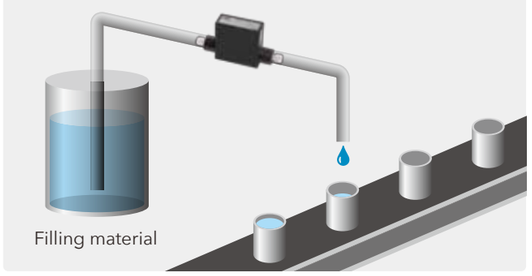
Output Characteristics Before and After Correction

The measurable range varies according to the thermal conductivity of the fluid, but the output characteristics can be adjusted by using the correction function. (See the conceptual diagrams below.)

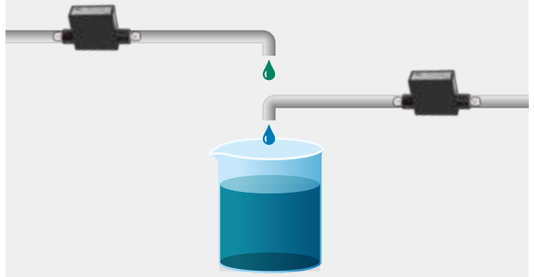


APPLICATION

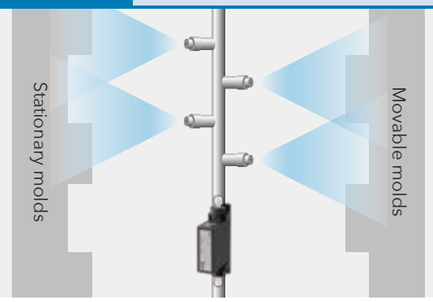
Filling Ex.) Electrolytic solutions



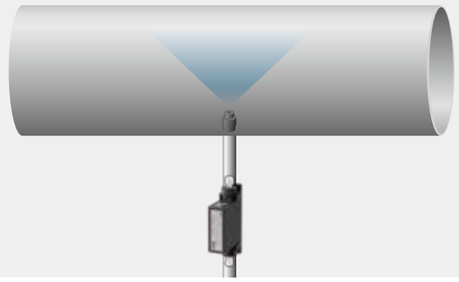
Mixing/Diluting Ex.) Cleaning solutions, chemical agents



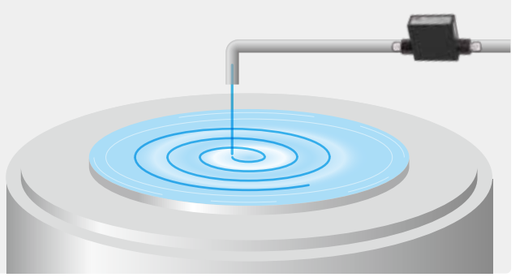
Spraying (1) Ex.) Release agents, steam



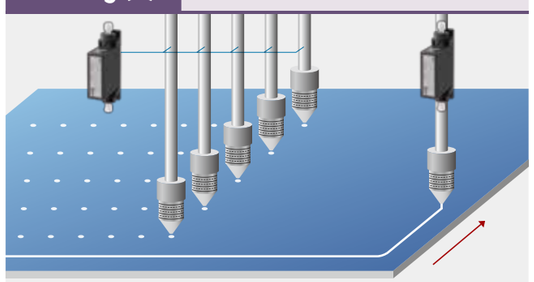
Spraying (2) Ex.) Sterilization solutions, flux



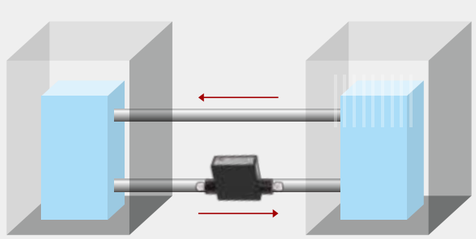
Coating (1) Ex.) Resist solutions, coating agents



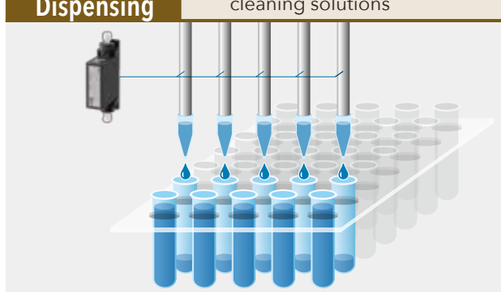
Coating (2) Ex.) Flux, sealants



Circulating Ex.) Coolants, lubricants



Extracting/ Dispensing Ex.) Test reagents, diluted solutions, cleaning solutions



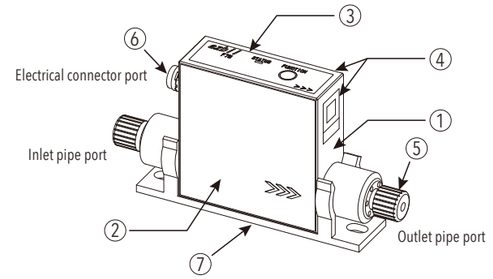
The application drawings above are conceptual images only. When installing this product, see the mounting orientation instructions on page 7.

PRODUCT SPECIFICATIONS

Model No.		F7M9010	F7M9030
Measurable flow rate range (for H_2O)		10 mL/min	30 mL/min
Measurable fluid		Fluid that does not clog the flow path or damage the glass tube or corrode the wetted part materials. If any fluid adheres to the inner surface of the flow path, a measurement error may occur. In addition, if there are bubbles in the fluid or pulsation, output fluctuations or shifts may occur, depending on the amount.	
Accuracy-guaranteed fluid		H_2O (water)	
Measurement accuracy*1 (typical values under standard conditions)*2		±5 % rdg (at 2 mL/min or more) ±1 % FS (at less than 2 mL/min)	±5 % rdg (at 6 mL/min or more) ±1 % FS (at less than 6 mL/min)
Measurable flow rate range (for H_2O)		0.1–11.5 mL/min (1–115 % FS)	0.3–34.5 mL/min (1–115 % FS)
Accuracy-guaranteed flow rate range (for H_2O)		0.2–10 mL/min *4 *5	0.6–30 mL/min *4 *5
Reproduceability*3 (typical values under standard conditions)*2		±1 % rdg (at 2 mL/min or more) ±0.2 % FS (at less than 2 mL/min)	±1 % rdg (at 6 mL/min or more) ±0.2 % FS (at less than 6 mL/min)
Response time		1.0 s typ. (63.2 % response)	
Temperature characteristics		±0.5 % rdg/°C when fluid and ambient temperature are in the 10–35 °C range and comparison is with output obtained at fluid temperature of 23 °C while other conditions are identical.	
Fluid pressure range		0 to 500 kPa (gauge)	
Pressure resistance		700 kPa (gauge)	
Mounting orientation		Horizontal or vertical (flow direction: bottom to top) With vertical mounting, an output shift of about ±1 % rdg occurs in measurements compared with horizontal mounting.	
Piping connection method (for applicable tubes)		PFA tube fitting, SUPER-300 series P-type (made by Nippon Pillar Packing Co., Ltd.) Applicable tubes: Metric system products (outer dia.: 3 mm; inner dia.: 2 mm) or inch system products (outer dia.: 1/8 in.; inner dia.: 0.086 in.)	
Operating conditions	Fluid temperature	5–50 °C	
	Ambient temperature	5–50 °C	
	Ambient humidity	10–90 %RH	
	Vibration	None	
	Shock (mechanical)	None	
Transport and storage conditions	Ambient temperature	5–60 °C	
	Ambient humidity	10–90 %RH	
	Vibration resistance	4.9 m/s^2	
	Shock resistance	490 m/s^2 (when packaged)	
Required straight pipe length (for H_2O)		50 mm straight pipe is required upstream of this device.	
Fitting pullout strength		30N	
Power		Rating: 24 Vdc; allowable power range: 21.6–26.4 Vdc (ripple: 2.5 % or less); power consumption: 0.7 W max.	
Analog output	Output signal	1–5 Vdc	
	Maximum output voltage	5.6 Vdc (115 %) (at the upper limit of the measurable flow rate range)	
	Required external load resistance	250 kΩ or more	
	Output value update cycle	10 ms	
	Output resolution	0.01 % max.	
Digital output	Number of outputs	1	
	Function types	1) Upper/lower limit flow rate event with hysteresis setting function; 2) upper/lower limit flow rate event; 3) totalized flow pulse output; and 4) output event when a problem occurs. (Function allocation settings can be changed using the PC loader.)	
	Output ratings	30 Vdc and 30 mA or less (NPN open collector with non-isolated output; contacts open when power is off)	
	Integrating flow pulse	Pulse weight: 0.01, 0.1, 1, and 10 mL/P (pulse width: 5ms typ, 100 Hz max.) (setting can be changed using the PC loader)	
Digital input	Number of inputs	1, for zero point adjustment only	
	External circuit type	Non-voltage contacts or open collector	
Warm-up time		30 minutes	
Protection rating		IP65	
Weight		85 g	
Standards and regulations compliance		EN61326-1、EN61326-2-3	

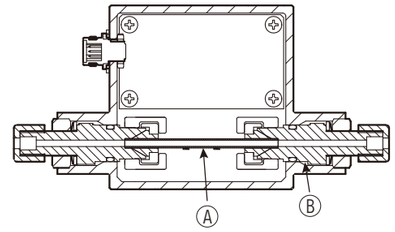
*1. Instrumental error in thae volumetric instantaneous flow rate compared with values obtained with Azbil's standard fluid flow rate equipment as a reference.
*2. Standard conditions are the measurement conditions from (1) to (9) below.
*3. Reproduceability represents an instrumental dispersion in the instantaneous flow rate output under the measurement conditions (1) to (9), with the device remains connected to the piping.
(1) fluid: water (H_2O); (2) fluid temperature: 23 °C; (3) no bubbles or pulsation in the fluid; (4) ambient temperature: 23 °C;
(5) fluid pressure: 250 kPa; (6) vibration: 0 m/s^2; (7) stabilization period before measurement : 2 hours or more at ambient temperature 23 °C, 30 minutes or more after power-on,
and also 10 minutes or more after supplied flow stabilized.; (8) mounting orientation: horizontal pipe, device top panel facing upward;
(9) output signal : instantaneous flow rate (analog 1 to 5 Vdc);
*4. This device cannot measure the flow rate for a fluid that flows in the reverse direction.
If the flow direction is reversed, the device will output a flow rate that is not equal to the regular forward flow rate without indicating an error.
*5. For a flow rate that is below the minimum measurable range, the output signal is fixed at 0 % (= 1 V).

PARTS AND MATERIAL



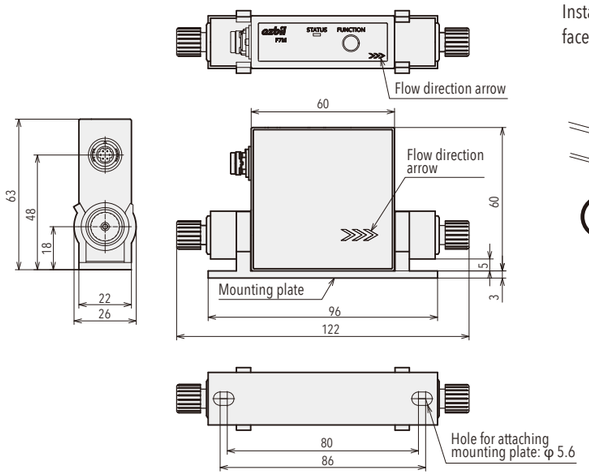
No.	Item	Material	Notes
1	Housing	PPS resin with glass	Epoxy resin adhesive connects the cover to the housing.
2	Cover	PPS resin with glass	
3	Protective sheet	PET resin film	–
4	Label	PET resin film	–
5	Union nut of fitting	PFA	–
6	Waterproof connector	PPS resin, PBT resin, polyacetal resin, chloroprene rubber	HR30-6R-6P (71), made by Hirose Electric Co., Ltd.
7	Mounting bracket	PC resin	–

MATERIAL OF WETTED PARTS



No.	Item	Material	Notes
A	Sensor tube	Fused silica glass	–
B	Fitting	PFA, PTFE	The material used for the included sleeves is PFA.

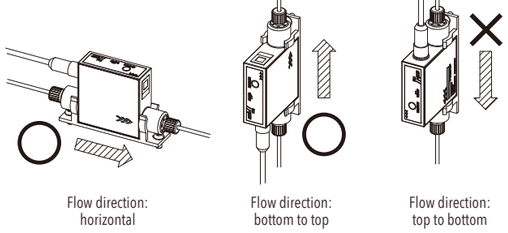
EXTERNAL DIMENSIONS



*1. Mounting screws are not included (specification: screw head height of 5 mm max.).

MOUNTING ORIENTATION

Install this device in the orientation shown below. The operation panel can face any direction.



SELECTION PRECAUTIONS

(1) Do not apply pressure in excess of the operating conditions described in the specifications or use this device at a temperature outside the specified range. In addition, take care when using this device not to drop it or subject it to vibration or impact in excess of the operating conditions. Otherwise, the quartz glass tube used for the device's fluid path may be damaged or the seal portion of the fluid path may deteriorate, causing the device to leak internally or externally or to malfunction, or causing an external device to catch fire or malfunction.
(2) Install this device in a place where it will not be subject to vibration. Otherwise, measurements will be incorrect and device malfunction or failure may occur.
(3) Take appropriate measures to ensure that the fluid is not contaminated with foreign matter. If rust, oil mist, or other foreign matter from the pipes enters and adheres to this device, a measurement error may occur or the device may be damaged. If there is a possibility of foreign matter entering this device, install a filter upstream of the device or take other appropriate measures. Be sure to inspect and replace the filter at regular intervals.
(4) If malfunction of this device can be expected to result in loss or damage, use appropriate redundancy in the system design.

* In addition to the information provided above, precautions, mounting precautions, and other relevant information can be found in the users' manual (detailed version), document No. CP-SP-1421E. Please refer to this manual also when selecting a model.