UCUF-E Series Ultrasonic Flowmeter

DESCRIPTION

The UCUF-E series ultrasonic flowmeter is designed to measure small flow rates of liquids, including ultrapure water and chemical liquids. It consists of the UCUF-E detector and the SFC converter. All wetted parts of the UCUF detectors are made of semiconductor grade PFA and use no moving parts or mechanical seals, such as O-rings, which tend to cause fluid buildup. With an ideal design for cleanliness, this flowmeter is the best choice for processes that require a high degree of cleanliness, such as semiconductor manufacturing.
The SFC converter significantly reduces the effect of bubbles in the fluid, which has been a problem in semiconductor and chemical processes. A correction function is available to eliminate the effect of kinematic viscosity, allowing the flowmeter to work with different types of chemicals. The RS485 communication function enables integrated process management. (For more information, refer to the Technical Guidance for the converter.)



KEY FEATURES

- EMC compliance: EN61326-1/EN61326-2-3
- RoHS2 compliant
- Use of detachable sensor cables with connectors
- Can measure fluids with high kinematic viscosity up to 40 mm^2/s.
- Accuracy: Within ±1% of reading (at 1 m/s flow velocity or greater)
- Wide rangeability (100:1 typical)
- Detector with an ideal design for cleanliness
- Corrosion resistant and easy to install

APPLICATIONS

- Measuring flow rates of pure and ultra-pure water used in semiconductor manufacturing processes
- Measuring flow rates of chemical fluids during the injection process
- Measuring flow rates of highly corrosive fluids
- Measuring flow rates of CMP slurries
- Other flow rate measurement of fluids in processes with small to medium diameter piping
- Ideal for measuring and controlling flow rate of cleaning equipment and CMP machines

OPERATING PRINCIPLE

As shown in Figure 1, the flow path of the detector is U-shaped. Liquid entering the IN port makes a 90° turn, flows through the measuring tube, makes another 90° turn, and exits the OUT port.
The measuring tube is equipped at both ends with piezoelectric elements A and B, which transmit and receive ultrasonic waves.
Using these elements, the flowmeter determines the time ta and tb, the time it takes for the ultrasonic waves to travel in the fluid from A to B and B to A. When the liquid is not flowing, ta = tb. As the flow velocity increases, ta becomes shorter, and tb becomes longer. Therefore, the flow velocity can be determined from the difference between ta and tb. The relationship between flow rate, ta, and tb varies with conditions such as pipe dimensions, shape, and fluid viscosity. To achieve highly accurate measurements, the flowmeter works in conjunction with the converter's built-in linearizer, which stores the results of various fluid tests performed in advance.

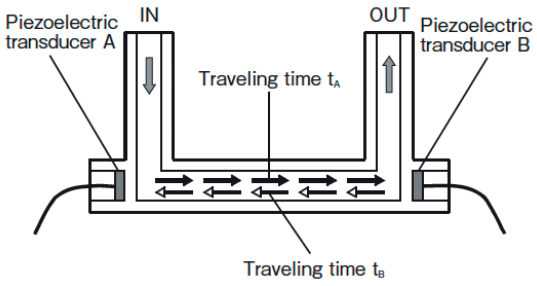


Figure 1 Operating principle

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STANDARD SPECIFICATIONS

- •Measurable media : All types of liquids (free of air bubbles, and evenly dissolved if the liquid is a mixture)
- •Ambient temperature* : 0 to +60℃
- •Ambient humidity : 30 to 80%RH
- •Protection category : Equivalent to IP65 (for indoor installation)
- •Fluid temperature* *1 : +10 to +90℃
- •Fluid pressure : 0 to 0.5 MPa (G)
- •Sound speed in the fluid* : 1000 to 2200 m/s
- •Kinematic viscosity : 0.3 to 40 mm^2/s
- •Process connection : PFA tube end
- •Connecting tube sizes (O.D.) 04SE: 1/4" 04E, 06E: 3/8"
- •Body (wetted part) material : New PFA (PFOA free)
- •Sensor/cable cap material : PP
- •Cap seal material : Fluororubber
- •Nominal diameter 04SE, 04E: 4 mm, 06E: 6 mm
- •Shape : U-shaped (standard) or Z-shaped
- •Weight 04SE, 04E: Approx. 76 g, 06E: Approx. 78 g (Sensor cables not included.)
- •Installation : M4 female screws (Four screws total, two each right and left through holes.)
- •Flow range 04SE, 04E: 0 to 50 mL/min (minimum), 0 to 3000 mL/min (maximum) 06E: 0 to 400 mL/min (minimum), 0 to 8000 mL/min (maximum)
- •Measurement accuracy* *2 : ±1% of reading (800 mL/min or more), ±8 mL/min (less than 800 mL/min) (04SE, 04E), ±1% of reading (1700 mL/min or more), ±17 mL/min (less than 1700 mL/min) (06E)
- •Sensor cable : Coaxial cables (2) (IN/OUT)
  - Sheath material* : PVC
  - Cable length* : 5m
  - Weight* : Approx. 95 g/cable
- •Pressure loss : Pressure drop of water at room temperature (kPa) = C x Q^2, C = 3.63 (04SE), 1.22 (04E),0.53 (06E) Q: Flow rate (L/min)

【Note】
Items marked with an asterisk (*) indicate standard specifications.
For products with specific specifications, refer to their own Product Specifications.
*1 Do not use if the fluid temperature changes suddenly.
*2 Accuracy (calibrated with water at 20℃)

MODEL CODE

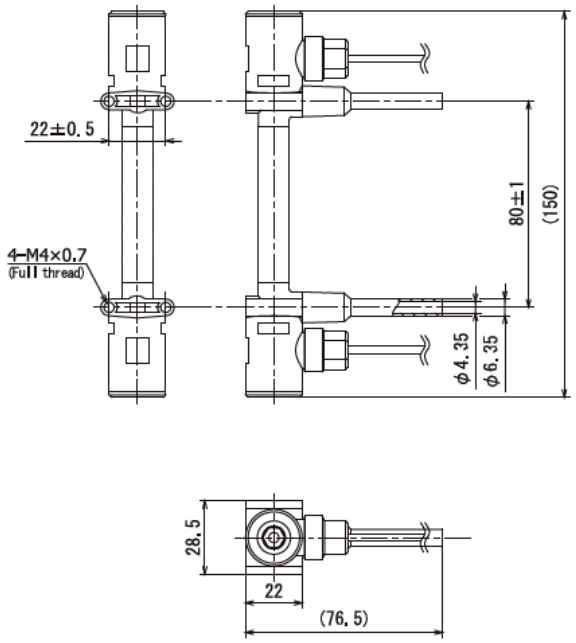
UCUF	□□	E	□	Description
Pipe diameter	04S			: 4 mm (1/4" connection)
	04			: 4 mm (3/8" connection)
	06			: 6 mm (3/8" connection)
Shape			U	U-shaped
			Z	Z-shaped

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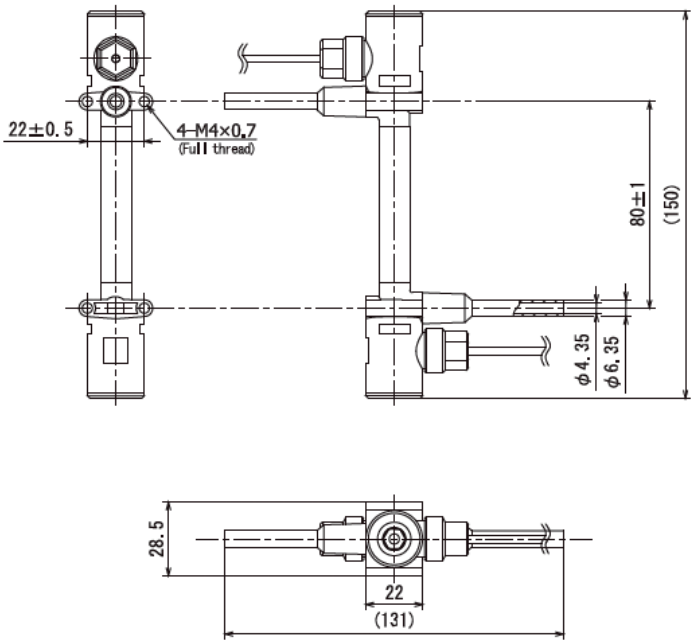
OUTLINE DRAWINGS

Detector

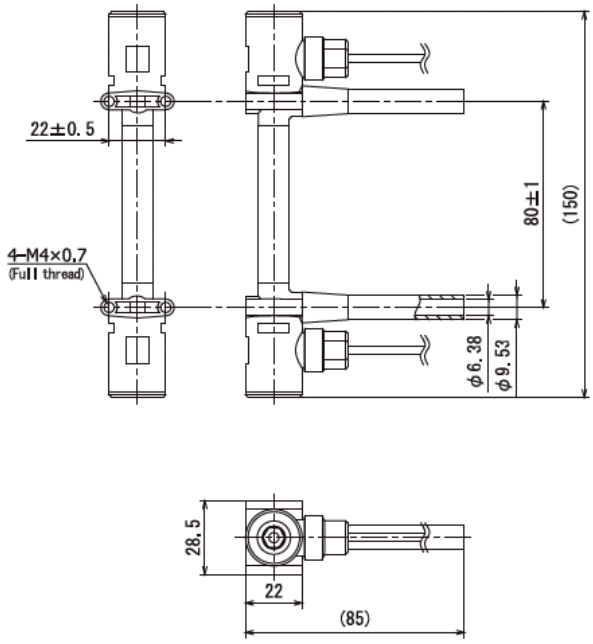
04SE U-shaped



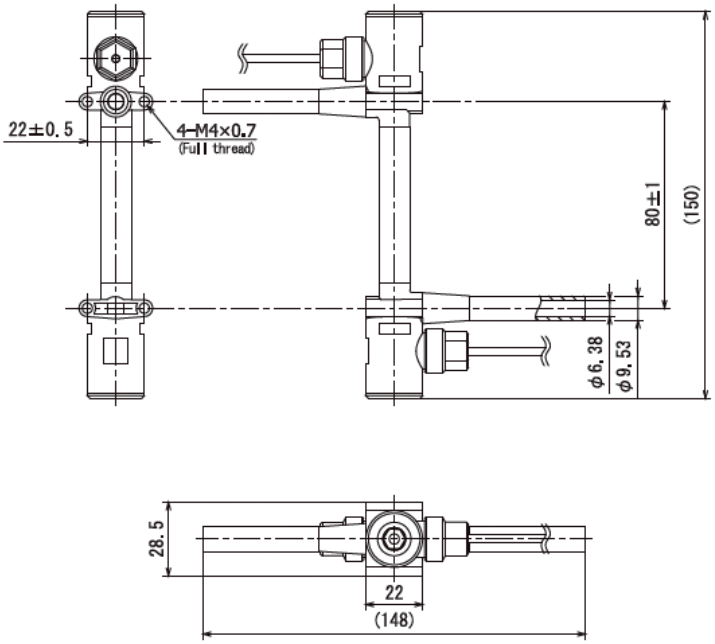
04SE Z-shaped



04E U-shaped

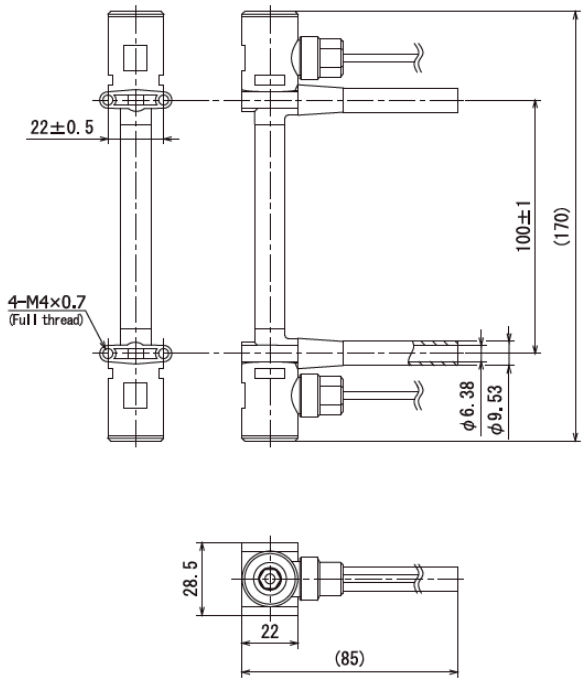


04E Z-shaped

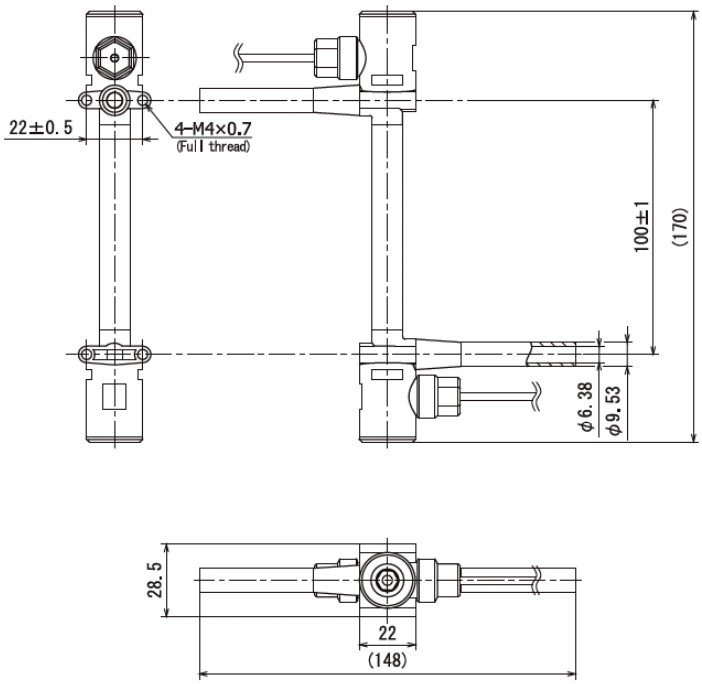


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06E U-shaped



06E Z-shaped



COMPATIBLE CONVERTERS

SFC3000, SFC4000

CAUTIONS ON INSTALLATION

- To ensure accurate and stable measurements, install the flowmeter carefully to avoid any pipe strain or stress. Also make sure that no part of the tubing connected to the main body is bent.
- To ensure accurate and stable measurements, the temperature of the liquid should be kept constant (within ±5°C is recommended).
- To prevent bubble formation when the fluid is not being measured, install the detector so that it is pressurized when not in use.
- The measuring tube of the detector should be filled with liquid at all times. Although the flowmeter can be installed in any orientation, horizontal, vertical, or diagonal, it is recommended that the flowmeter be installed in an orientation that facilitates liquid drainage.
- Install the flow control valve downstream of the detector.
- Install the detector and the converter away from noise sources such as power relays and solenoid valves.
- Keep the signal cables away from high voltage and high current cables such as power lines.
- Connect the tube fittings according to the manufacturer's instructions.

*Specification is subject to change without notice.

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