

### OUTLINE

The UCUF-E series ultrasonic flowmeter is designed for measuring small flow rates of ultrapure water and chemical liquids. It is comprised of the UCUF-E detector and SFC converter. All wet parts of the detector are made of special-grade PFA molds for the semiconductor industry and have no moving parts or sealing mechanism such as O-rings which would accumulate liquid components. The simple and smooth construction leaves no residues and is ideal for processes such as semiconductor manufacturing which requires ultimate cleanliness. The SFC converter significantly reduces the effect of bubbles in liquid, which cause problems in semiconductor and chemical processes. It has an adjustment function to offset the effect on the kinematic viscosity of liquids, making the converter compatible with various chemicals. The RS485 communication function enables integrated management of the process. For details, see the Technical Guidance of the converter.

### FEATURES

- ❑ EMC compliance: EN61326-1:2013/EN61326-2-3:2013
- ❑ RoHS compatible
- ❑ Detachable detector cables with connectors
- ❑ Liquids with kinematic viscosity of as high as 40 mm<sup>2</sup>/s can be measured.
- ❑ Accuracy: Within  $\pm 1\%$  of the reading at flow velocity of 1 m/s or more
- ❑ Wide rangeability of 100:1 as a typical example
- ❑ Detector with highly clean construction
- ❑ Corrosion resistant and easy to install

### APPLICATIONS

- ❑ Pure water and ultrapure water in the semiconductor manufacturing process
- ❑ Chemical feeding
- ❑ Highly corrosive chemicals
- ❑ Chemical mechanical polishing (CMP) slurries
- ❑ Process liquids of small and medium flow rate
- ❑ Ideal for flow measurement and control of cleaning and CMP processes



### OPERATING PRINCIPLE

The measuring fluid flows into the U-shaped tube, changes direction by 90 degrees twice, and goes out as shown in Figure 1. Two piezoelectric transducers A and B are mounted at both ends of the measuring section. They emit and receive ultrasonic waves alternately and measure the traveling times  $t_A$  (A to B) and  $t_B$  (B to A) through the liquid. Without flow,  $t_A$  is equal to  $t_B$ . With flow,  $t_A$  becomes shorter and  $t_B$  longer in proportion to the flow rate. Thus, calculating  $t_B - t_A$  gives the flow rate of the liquid.  $t_A$  and  $t_B$  depend on the size and shape of the tube and liquid viscosity. The actual flow test data are stored in the linearizer in the converter, which enables the UCUF-E to measure flow rates with high accuracy.

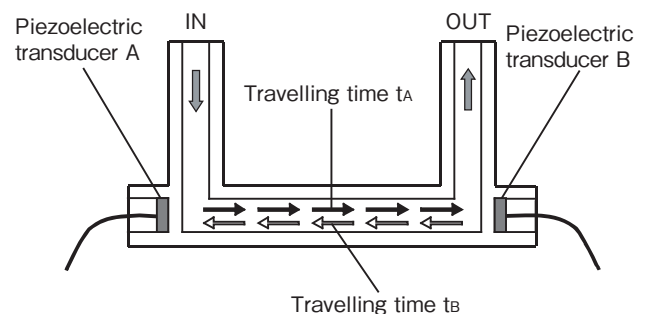


Figure 1 Operating principle

## STANDARD SPECIFICATIONS

- Measuring fluid : Liquids (Without bubbles, and homogeneously mixed)
- Ambient temperature\* : 0 to 60°C
- Ambient humidity : 30 to 80%RH
- Enclosure classification : IP65 equivalent, indoor use
- Fluid temperature\* : 10 to 60°C
- Fluid pressure : 0 to 0.5 MPa
- Fluid sound speed\* : 1000 to 2200 m/s
- Fluid kinematic velocity : 0.3 to 40 mm<sup>2</sup>/s
- Process connection : PFA tube end
- Connecting tube size : 3/8" outside diameter
- Materials
  - Body (wet parts) : New PFA with PFOA free
  - Sensor and cable cap : PP
  - Sealing at cap : Fluorocarbon rubber
- Nominal size
  - 04E : 4 mm
  - 06E : 6 mm
- Shape of flowmeter : U-shape (standard) or Z-shape
- Mass
  - 04E : Approx. 73 g excluding cable
  - 06E : Approx. 75 g excluding cable
- Installation : By M4 female threads using total 4 of screwed bores each 2 on inlet and outlet of flowmeter
- Flow range
  - 04E : Min. 0 to 50 mL/min  
Max. 0 to 3000 mL/min
  - 06E : Min. 0 to 400 mL/min  
Max. 0 to 8000 mL/min
- Accuracy\*
  - 04E : ±1% of reading at flow rate 800 mL/min or more  
±8 mL /min at flow rate less than 800 mL/min
  - 06E : ±1% of reading at flow rate 1700 mL/min or more  
±17 mL /min at flow rate less than 1700 mL/min
- Cable : 2 coaxial cables attached for IN and OUT
  - Sheath material\* : PVC
  - Length\* : 5 m
  - Mass\* : 95 g/piece
- Pressure loss :  $C \times Q^2$  in kPa for water in ambient temperature
  - Where C is 1.22 for 04E and 0.53 for 06E
  - Q is flow rate in L/min

Note : Specifications of all items with \* mark are those of standard types.

See the PRODUCT SPECIFICATION for those other than standard types.

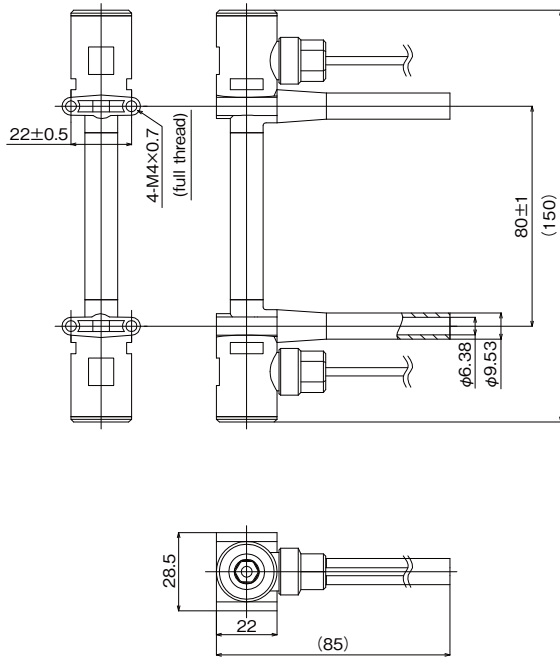
## MODEL CODE

UCUF	□□□	□	Description
Size	04E		4 mm
	06E		6 mm
Shape		U	U-shape
		Z	Z-shape

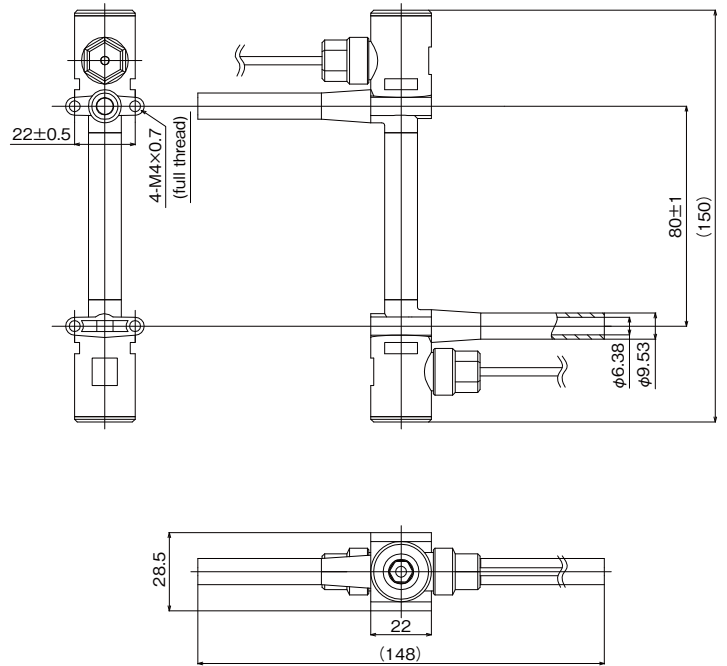
**DIMENSIONS**

Flow detector

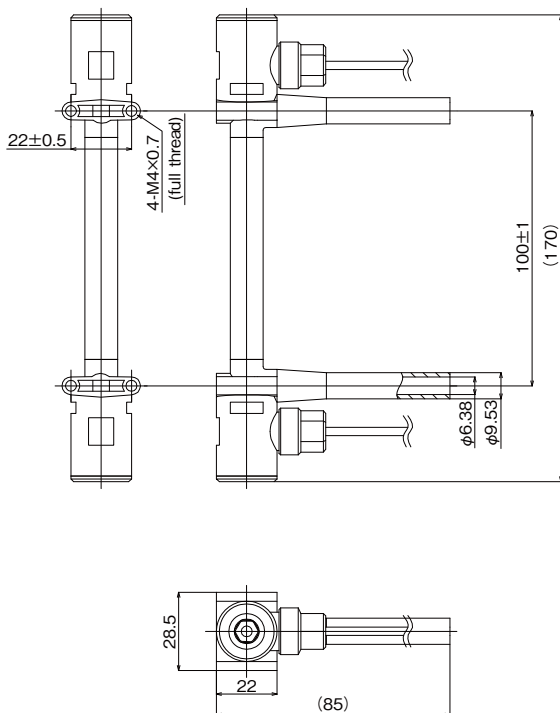
04E U-shape



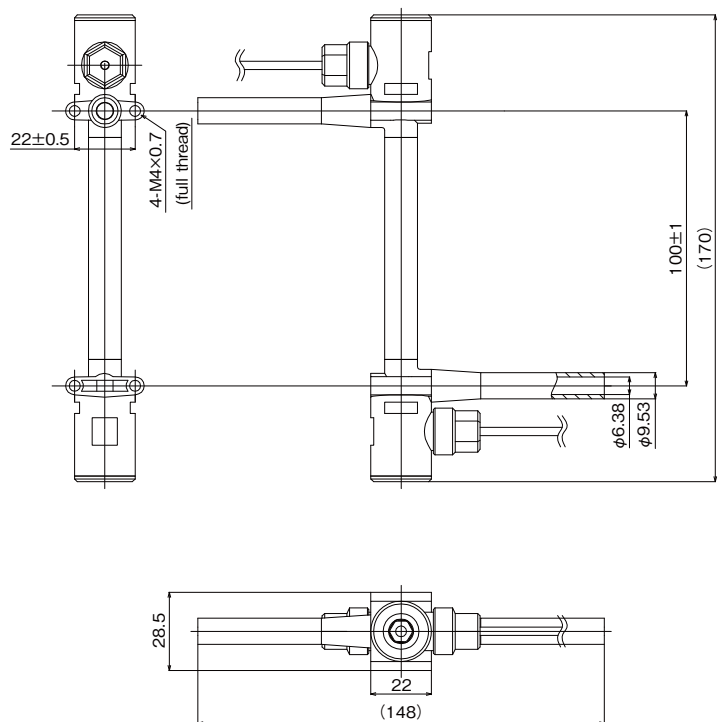
04E Z-shape



06E U-shape



06E Z-shape



## ■ COMPATIBLE CONVERTER MODEL

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SFC3000

## CAUTIONS ON INSTALLATION

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- ❑ To ensure accurate, stable measurement, do not bend the connecting tube during installation to avoid stress from the piping.
- ❑ To ensure accurate, stable measurement, stabilize the liquid temperature within  $\pm 5^{\circ}\text{C}$ .
- ❑ Keep the instrument pressurized even when it is not in use to avoid the formation of bubbles.
- ❑ Keep the measuring tube filled with liquids. Although the instrument can be installed with horizontal, vertical, or slant tubing, it is recommended to select a position for easy self-draining.
- ❑ Install a control valve downstream of the instrument, if necessary.
- ❑ Install the flow detector and converter away from noise sources such as power relays and solenoid valves.
- ❑ Lay the signal cable away from power cables of high voltage or current.
- ❑ For details on how to connect fittings, see the relevant documents of each manufacturer.

\* Specification is subject to change without notice.

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