

# Fuji Ultrasonic Flowmeter Series



**Liquid flow rate measurement over a wide range**  
**Measurement not hampered by entry of bubbles and solid matter**  
**Strong lineup**





# Features of ultrasonic flowmeter in flow rate measurement

1. Total cost reduction allowed by elimination of piping installation
2. Can be installed even while facility is in operation.
3. Measurement without contacting fluid.
4. Battery-driven portable flowmeter allows measurement at various locations in the field.
5. Strong lineup meets various needs.

## Ultrasonic Flowmeter Lineup

### Duosonics

**Hybrid type**  
(type: FSH, FSW)



- 4 to 20mADC(1 point)
- Integrated pulse, etc.(DO 3 point)
- Communication (1 point)(RS232/485)
- Flow velocity distribution

### 2 Lines type

(type: FSH, FSG, FSD)



- 4 to 20mADC(1 point)
- Integrated pulse, etc.(DO 3 point)
- Communication (1 point)(RS232/485)

### TIME DELTA-C

**Advanced type**  
(type: FSV, FSS)



- 4 to 20mADC(1 point)
- Integrated pulse, etc. (DO 2 point)
- Communication (1 point)(RS485)

### M-Flow PW

**Regular type**  
(type: FLR, FSS)



- 4 to 20mADC(1 point)
- Integrated pulse, etc.(DO 2 point)
- Communication (1 point)(RS485)

### Portaflow-C

**Portable type**  
(type: FSC, FSD)



- 4 to 20mADC
- SD memory card (USB port is used)

### Connected devices



Recorder (PHL)



Recorder (PHF)



Recorder (PHU)



Integrating meter



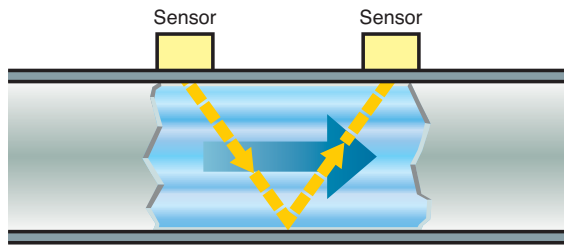
Controller with integrating function (PXH)



Personal Computer

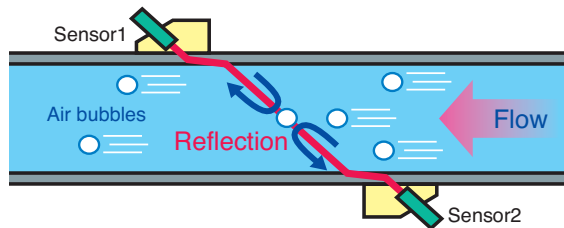
## Measurement principle

### Transit time propagation time difference method








Ultrasonic wave pulses are made to propagate diagonally from the upstream side and the downstream side with the sensor installed on the exterior of piping. Time difference caused by the flow is detected and used for the measurement of the flow rate.

### Pulse Doppler method



Ultrasonic pulses are transmitted into the liquid. Flow velocity distribution is calculated to find the flow rate, taking advantage of the nature of Doppler frequency of the echo from reflectors such as air bubbles and particles in fluid that fluctuates according to flow velocity.

## New Series Detectors TIME DELTA-C / M-Flow PW

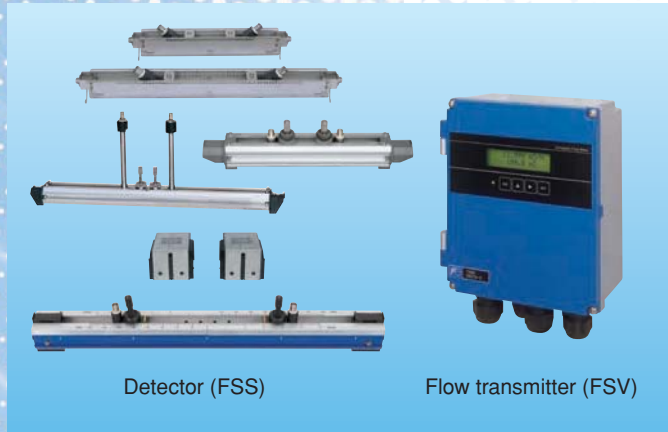
	Type	Flow transmitter	Inner pipe diameter (mm)	Fluid temperature (°C)
FSSC	Extendable type 	FLR-3 FSV-2	φ50 to φ1200	-40 to 120
FSSA	Easy installation type 	FLR-3 FSV-2	φ25 to φ225	-20 to 100
FSSD	Small diameter type 	FSV-2	φ13 to φ100	-40 to 100
FSSE	Large diameter type 	FSV-2	φ200 to φ6000	-40 to 80
FSSH	High temperature type 	FSV-2	φ50 to φ400	-40 to 200

## Explanation of the extendable rail type detector

Normal	Extended on rails	Z method
		
pipe diameter φ50 to φ300mm <V method>	pipe diameter up to φ600mm <V method>	pipe diameter up to φ1200mm <Z method> (rail removed)

## Advanced Type **TIME DELTA-C**

Detector model : FSS Flow transmitter type : FSV



### Features:

- Small, lightweight flow transmitter having a high tolerance for air bubbles in liquid
- High accuracy measurement (1.0% of rate)
- Setting operation can be performed from the front side of the flow transmitter.

### Specifications:

Sensor type : FSS : for  $\phi 25$  to  $\phi 6000\text{mm}$  / -40 to  $200^\circ\text{C}$   
 Measurement range : -32 to 0 to +32m/s (min. 0.3m/s)  
 Response Time : 0.2 sec. or less  
 Output signal : 4 to 20mADC, pulse output, alarm output  
 Communication function : RS485 (MODBUS)  
 Power-supply voltage : 100 to 240VAC or 20 to 30VDC

## Regular Type **M-Flow PW**

Detector model : FSS Flow transmitter model : FLR



### Features:

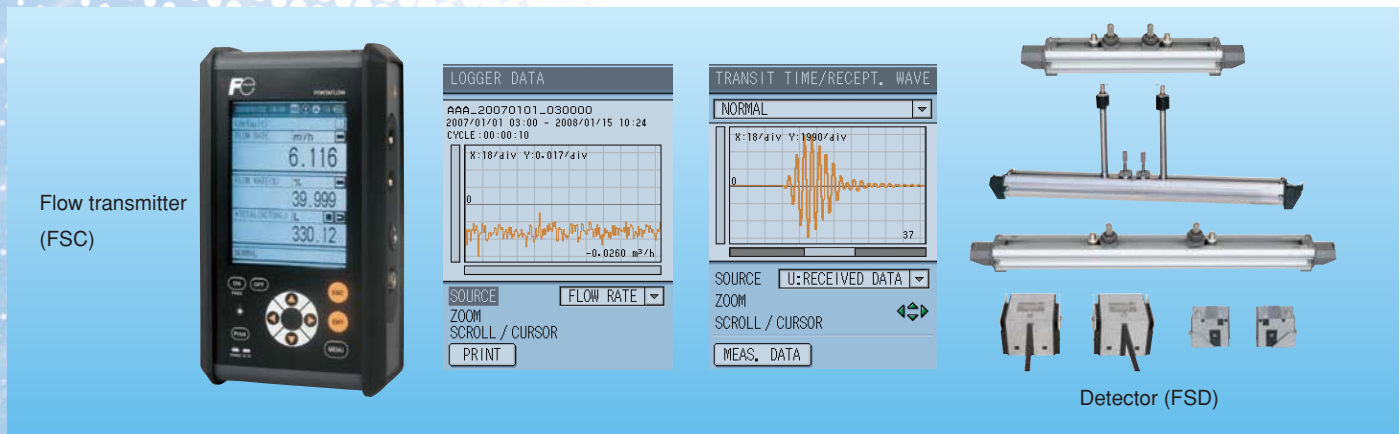
- High tolerance to air bubbles in liquid.
- Converter as compact as 140 x 130mm in size (front face)
- High-speed response of 0.2 seconds

### Specifications:

Sensor type : FSS : for  $\phi 25$  to  $\phi 1200\text{mm}$  / -40 to  $120^\circ\text{C}$   
 Measurement range : -10 to 0 to 10m/s (min.0.3m/s)  
 Response Time : 0.2 seconds  
 Output signal : 4 to 20mADC, Pulse output, Alarm output  
 Communication function : RS485 (MODBUS)  
 Structure : Waterproof detector and converter structure conforming to IP65  
 Cable length between detector and converter : 60m max.

## Portable **Portaflow-C**

Detector model : FLD Flow transmitter model : FSC



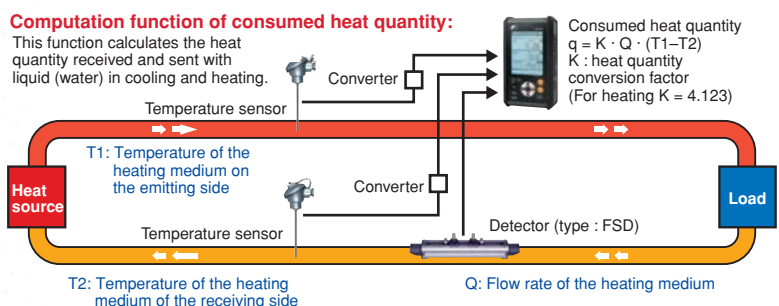
### Features:

- The measurement data can be stored in a SD Large memory card for a long time
- Consumed heat quantity can be measured
- Designed for 12 hours of continuous operation with its own built-in battery

### Specifications:

Sensor type : FSD : for  $\phi 13$  to  $\phi 6000\text{mm}$  / -40 to  $200^\circ\text{C}$   
 Measurement range : -32 to 0 to 32m/s (min. 0.3m/s)  
 Response Time: within 1 second  
 Analog output signal : 4 to 20mADC  
 Analog input signal : 4 to 20mADC / 1 to 5VDC  
 Accuracy : 1.0% of rate

Power-supply voltage : 100 to 240VAC, Built-in battery  
 SD memory card : Saves instantaneous value, total value, etc  
 Options : With printer, Flow velocity profile



# Select one according to the type of fluid to be measured.

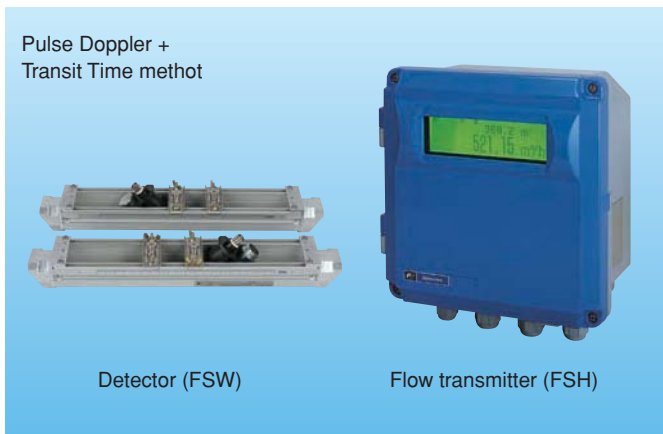
◎: Ideal ○: Good △: Usable under limited conditions ×: Not usable

Fluid to be measured	Name and type				
	Duosonics (FSH, FSW)	2 Lines type (FSH, FSG, FSD)	TIME DELTA-C (FSV, FSS)	M-Flow PW (FLR, FSS)	Portaflow-C (FSC, FSD)
Clean liquid without air bubbles	◎	◎	◎	◎	◎
Sewage, wastewater	◎	○	○	○	○
High-viscosity liquid	○	△	△	△	△
Petroleum, oil	○	△	△	△	△
Corrosive liquid	◎	◎	◎	◎	◎
Abrasive slurry	○	△	△	△	△
Fiber slurry	○	△	△	△	△
Low-speed fluid	○	△	△	△	△
Pulsating fluid	○	×	×	×	×
High-temperature fluid	×	○	○	○	○
High-pressure fluid	◎	◎	◎	◎	◎

★Measurement may not be made depending on conditions.

## Hybrid Type Duosonics

Detector model : FSW Flow transmitter type : FSH



### Features:

- Expansion of applicable fluid domain enabled by automatic switching
- High accuracy of 0.5 to 1%
- Flow velocity distribution within the piping is visible
- Quick response (0.2 sec.)

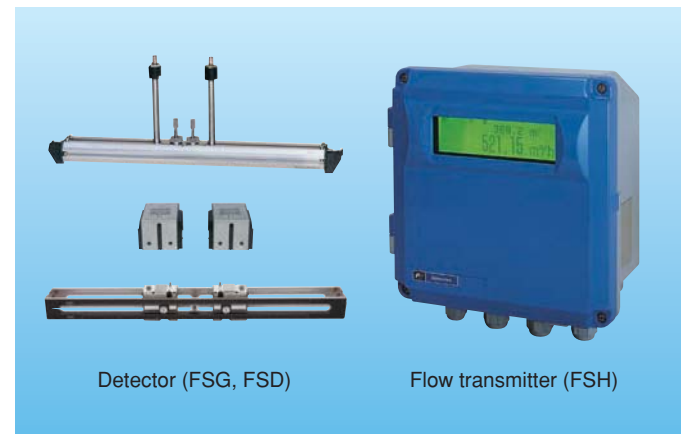
### Specifications:

Sensor type : FSW : for  $\phi 40$  to  $\phi 1000\text{mm}$  / -40 to 100°C  
 Measurement range : -4 to 0 to +32m/s (min. 0.3m/s)  
 Output signal : 4 to 20mADC, pulse output, alarm output  
 Structure : IP67 Watertight for both flow transmitter and detector

Cable length between detector and flow transmitter : 150m max.

## 2 Lines Type

Detector model : FSG, FLD Flow transmitter model : FSH



### Features:

- High tolerance to air bubbles in liquid.
- Simultaneous 2-line
- High-accuracy measurement of 1.0% of rating
- Rarely affected by temperature and pressure fluctuation of fluid.

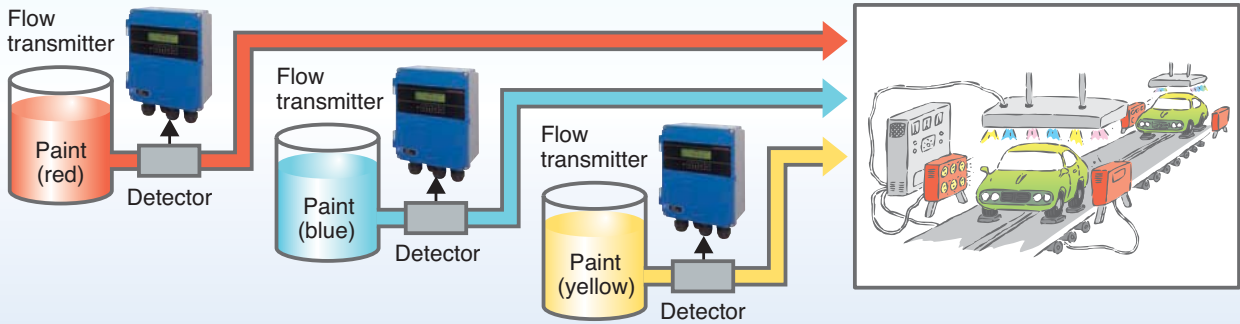
### Specifications:

Sensor type : FSG : for  $\phi 50$  to  $\phi 6000\text{mm}$  / -40 to 200°C  
 Measurement range : -32 to 0 to 32m/s (min. 0.3m/s)  
 Response Time : within 0.5 seconds  
 Output signal : 4 to 20mADC, Pulse output, Alarm output  
 Cable length between detector and converter : 150m max.

# Applications example

## 1. Measuring system for the paint flow rate

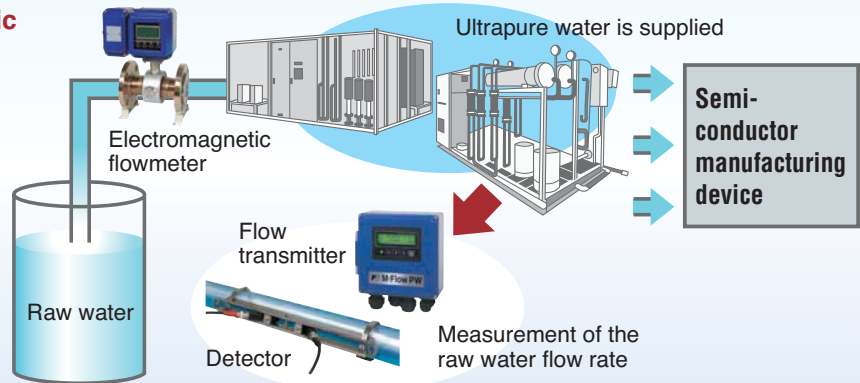
The flow rate of thick paint is measured by a detector mounted on the pipe already constructed.



## 2. Flow rate measurement in a water purifying system for semi-conductors

Advantages of using an ultrasonic flowmeter for the system

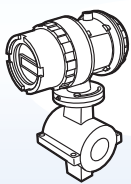
- 1) It can be easily mounted on the exterior of a pipe, helping reduce mounting cost.
- 2) As a sensor, it can operate without coming into contact with fluid, so the fluid is not affected by metallic ions.
- 3) This meter, compact and lightweight, can be easily carried and mounted.



## 3. Ideal for flow rate measurement of liquid flowing within large-diameter pipes

**1** Ultrasonic flowmeters are much more economical than electromagnetic flowmeters when used for fluid within a pipe whose diameter is 200mm or larger.

**2** Possible generation of air bubbles within pipe can be handled by Duosonics.



The larger the diameter of electromagnetic flowmeter, the higher the price of the electromagnetic flowmeter.

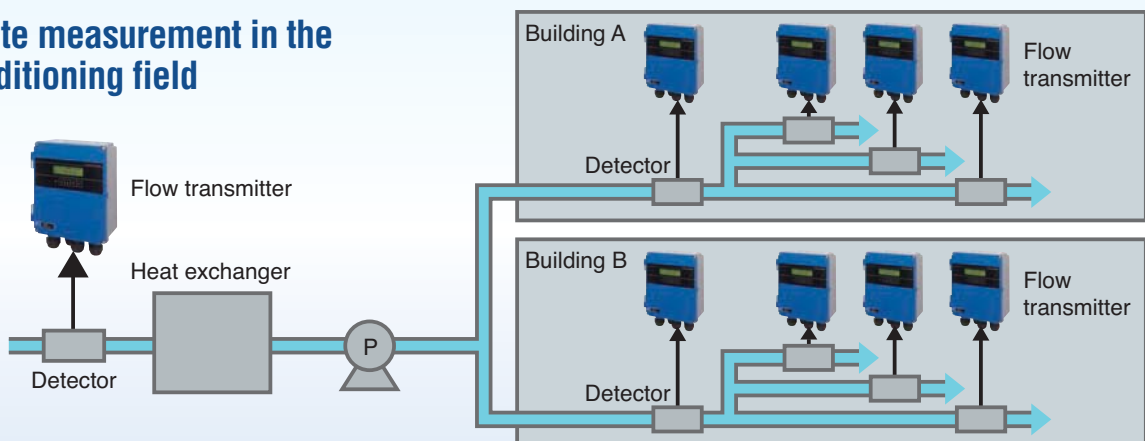
The price of the ultrasonic flowmeter stays the same irrespective of pipe diameter.



Resistance to bubbles **5 times** as large as that of conventional products (our company ratio)

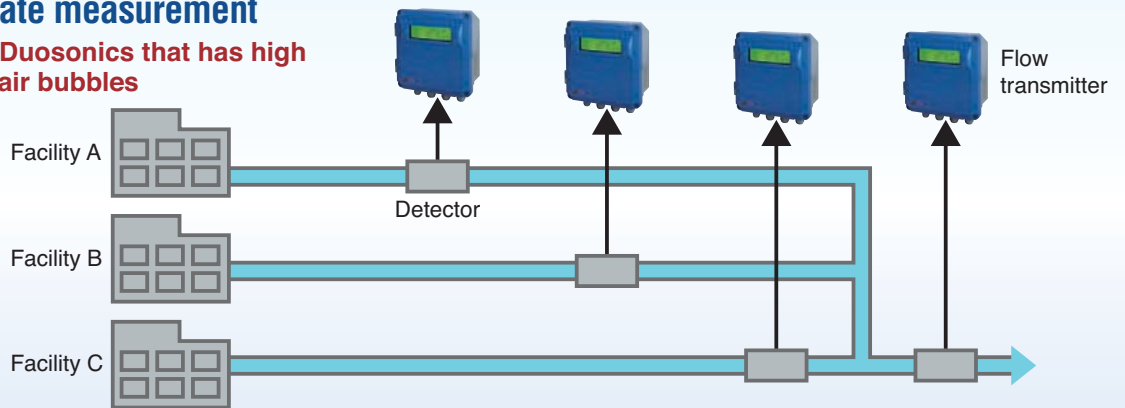
**Ultrasonic flowmeter is more economical** for measurement of flow in pipe whose diameter is 200mm or larger.

## 4. Flow rate measurement in the air-conditioning field



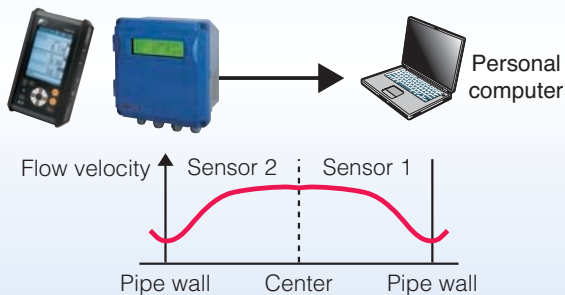
## 5. Drain flow rate measurement

Handled with Duosonics that has high resistance to air bubbles



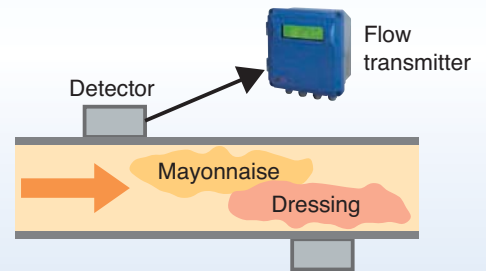
## 6. Facility diagnosis

Facility optimization diagnosis allowed by measurement of flow velocity distribution within piping



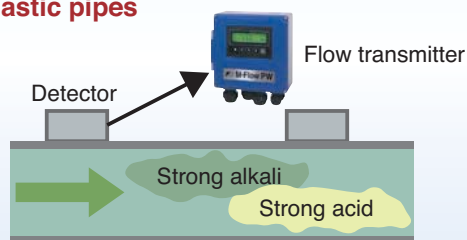
## 7. Flow rate measurement of mayonnaise and dressing

Accurate measurement of high-viscosity and low-velocity fluid allowed by Duosonics



## 8. Flow rate measurement of corrosive fluid

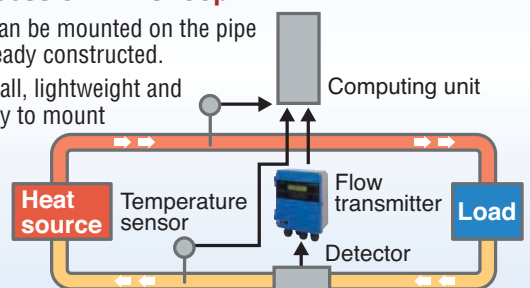
Non-contact measurement by M-Flow PW ideal for corrosive fluid in glass, metallic, and plastic pipes



## 9. A system for measuring heat transfer and efficiency.

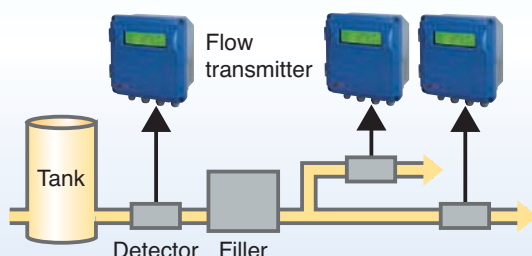
Heat is transferred by water flow in the process or HVAC loop.

- It can be mounted on the pipe already constructed.
- Small, lightweight and easy to mount



## 10. Flow rate measurement in cooking oil production line

Unlike mechanical or Coriolis type, maintenance is not required.





## 11. Portaflow C ideal for checking flow rate in the field

Handy Portaflow C not requiring power supply is ideal for checking flow rate in the field.



# Specifications

Name	Duasonics	2 lines type	TIME DELTA-C	M-Flow PW	Portaflow-C
Converter model	FSH	FSH	FSV	FLR	FSC
Detector model	FSW	FSG, FSD	FSS	FSS	FSD
Appearance					
Measurement method	Pulse Doppler method+ Propagation time difference method	Propagation time difference method			
Resistance to air bubbles	Ideal	Good	Good	Good	Good
Detector type Inside diameter of applicable pipes The value enclosed in parentheses is fluid temperature.	<b>type : FSWS12</b> Φ40 to Φ200mm (-40 to 100°C)	<b>type : FSG3</b> Φ50 to Φ300mm (-40 to 80°C)	<b>type : FSSA</b> Φ25 to Φ225mm (-20 to 100°C)	<b>type : FSSA</b> Φ25 to Φ225mm (-20 to 100°C)	<b>type : FSD22</b> Φ13 to Φ100mm (-40 to 100°C)
	<b>type : FSWS21</b> Φ100 to Φ400mm (-40 to 80°C)	<b>type : FSGS5</b> Φ200 to Φ6000mm (-40 to 80°C)	<b>type : FSSC</b> Φ50 to Φ1200mm (-40 to 120°C)	<b>type : FSSC</b> Φ50 to Φ1200mm (-40 to 120°C)	<b>type : FSD12</b> Φ50 to Φ400mm (-40 to 100°C)
	<b>type : FSWS40</b> Φ200 to Φ500mm (-40 to 80°C)	<b>type : FSD32</b> Φ50 to Φ400mm (-40 to 200°C)	<b>type : FSSE</b> Φ200 to Φ6000mm (-40 to 80°C)	—	<b>type : FSD41</b> Φ200 to Φ1200mm (-40 to 80°C)
	<b>type : FSWS50</b> Φ500 to Φ1000mm (-40 to 80°C)	—	<b>type : FSSD</b> Φ13 to Φ100mm (-40 to 100°C)	—	<b>type : FSD51</b> Φ200 to Φ6000mm (-40 to 80°C)
	—	—	<b>type : FSSH</b> Φ50 to Φ400mm (-40 to 200°C)	—	<b>type : FSD32</b> Φ50 to Φ400mm (-40 to 200°C)
Measurement Range	±4m/s(0.3m/s min.) ±32m/s(0.3m/s min.) (Propagation time difference method)	±32m/s (0.3m/s min.)		±10m/s (0.3m/s min.)	±32m/s (0.3m/s min.)
Number of measured lines	1 line or switching between 2 lines	1 line or 2 lines	1 line	1 line	1 line
Response Time	within 0.2 seconds (Pulse Doppler method)	within 0.5 seconds	within 0.2 seconds	within 0.2 seconds	within 1 second
4 - 20mADC output	✓	✓	✓	✓	✓
Pulse output	✓	✓	✓	✓	—
Alarm output	✓	✓	✓	✓	—
Communication function	RS485 or RS232C	RS485 or RS232C	RS485	RS485	SD memory card (USB port is used)
Accuracy	0.5% to 1% of rate	1.0% of rate		1.0/1.5% of rate	1.0% of rate
Power-supply voltage	100 to 240VAC, 50/60Hz or 20 to 30VDC				100 to 240VAC 50/60Hz Built-in battery
Length of dedicated cable between detector and converter	150m max.			60m max.	150m max.
Display unit of converter	Graphic LCD (with backlight)		Character LCD (with backlight)		Graphic LCD (with backlight)
External dimensions of converter (mm)	240(H)×247(W)×134(D)	240(H)×247(W)×134(D)	170(H)×142(W)×70(D)	140(H)×137(W)×68(D)	210(H)×120(W)×65(D)
Mass of converter	About 5.0kg	About 5.0kg	About 1.5kg	About 0.8kg	About 1.0kg

## Cautions on safety

\* Be sure to read the instruction manual before using the flowmeter.

# Fuji Electric

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