

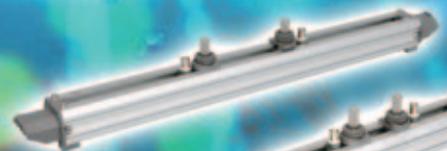
Fuji Ultrasonic Flowmeter Series



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. Non-invasive measurement eliminates the need of maintenance.
4. Battery-driven portable flowmeter allows measurement at various locations in the field.
5. Strong lineup meets various needs.

ULTRASONIC FLOWMETER LINEUP

Duosonics

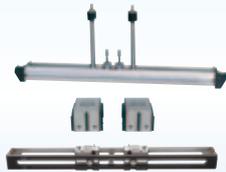
Hybrid type
(type: FSH, FSW)



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

2 Lines type

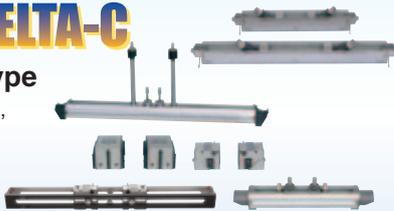
(type: FSH, FSG, FSD)



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

TIME DELTA-C

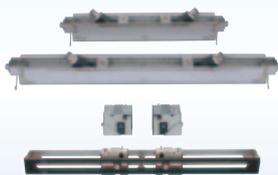
Compact type
(type: FSV, FSG, FSD, FLS)



- 4 to 20mADC(1 point)
- Integrated pulse, etc.(DO 3 point)
- Communication (1 point)(RS232C/485)

M-Flow PW

Compact type
(type: FLR, FLS)



- 4 to 20mADC(1 point)
- Integrated pulse, etc.(DO 2 point)
- Communication (1 point)(RS232/485)

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



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

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

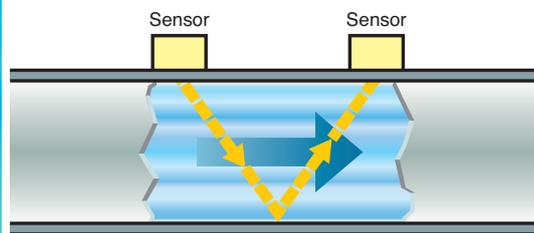
Fluid to be measured	Name and type				
	Duosonics (FSH, FSW)	2 Lines type (FSH, FSG, FSD)	TIME DELTA-C (FSV, FLS, FSG, FSD)	M-Flow PW (FLR, FLS)	Portaflow C (FSC, FSD)
Clean liquid without air bubbles	⊙	⊙	⊙	⊙	⊙
Sewage, wastewater	⊙	○	○	○	○
High-viscosity liquid	○	△	△	△	△
Petroleum, oil	○	△	△	△	△
Corrosive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

★Measurement may not be made depending on conditions.



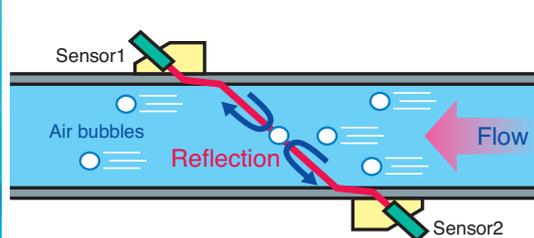
Measurement principle

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.

Duosonics (FSH, FSW)	2 Lines type (FSH, FSG, FSD)	TIME DELTA-C (FSV, FLS, FSG, FSD)	M-Flow PW (FLR, FLS)	Portaflow C (FSC, FSD)
Transit time +Pulse Doppler method	Transit time	Transit time	Transit time	Transit time
1 line or switching between 2 lines	1 line or 2 lines	1 line	1 line	1 line

High-accuracy hybrid ultrasonic flowmeter Duosonics

Ultrasonic flowmeter based on a new concept of using pulse Doppler method and propagation time difference method in combination

World first

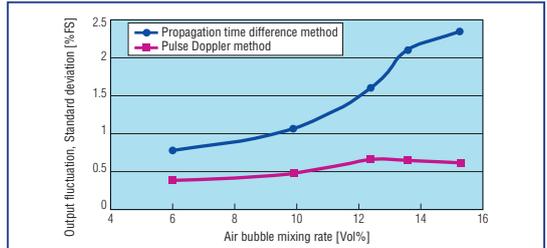


Features:

- Increased range of applicable fluids achieved by automatic switching
- High accuracy (0.5-1%) achieved by pulse Doppler method adopted for the first time in the world
- Flow velocity distribution in piping viewed in real time *
- High-speed response: 0.2 seconds (Depends on piping conditions.) *
- Relaxation of linear pipe length conditions allowed *
- Significant improvement of resistance to air bubbles *

*: Pulse Doppler method

Amount of contained air bubbles and fluctuation of output



Pulse Doppler method

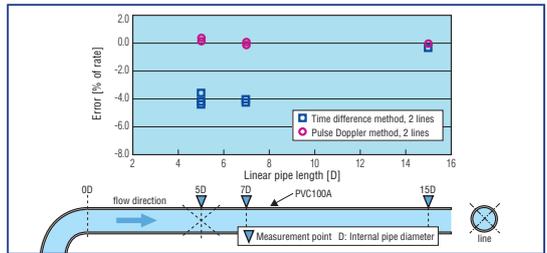
- Ultrasonic pulses are transmitted into liquid. Flow velocity distribution is calculated to find the flow rate, taking advantage of the nature of Doppler frequency of the echo from reflectors such as air bubbles and particles in fluid that fluctuates according to flow velocity.
- Suitable for nebulous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

Propagation time difference method

- Ultrasonic wave pulses are made to propagate diagonally from the upstream side and the downstream side. Time difference caused by the flow is detected and used for the measurement of the flow rate.
- Suitable for clean liquid.

Measurement automatically switched depending on fluid conditions

Relation between linear pipe length and accuracy



Hybrid Type Duosonics

Detector model : FSW Flow transmitter type : FSH



Compact Type TIME DELTA-C

Detector model : FSG, FSD, FLD, FLS Flow transmitter type : FSV



- ### 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 : FSWS12 : for $\phi 40$ to $\phi 200$ mm/-40 to 100°C
 FSWS21 : for $\phi 100$ to $\phi 400$ mm/-40 to 80°C
 FSWS40 : for $\phi 200$ to $\phi 500$ mm/-40 to 80°C
 FSWS50 : for $\phi 500$ to $\phi 1000$ mm/-40 to 80°C

Measurement range : -4 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 or RS232C
 Accuracy : 0.5 to 1.0% of rate
 Structure : IP67 Watertight for both flow transmitter and detector
 Power-supply voltage : 100 to 240VAC or 20 to 30VDC
 Cable length between detector and flow transmitter: 150m max.

- ### 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.
 - With RS232C/RS485 communication function provided (optional)

Specifications:

Sensor type : FLSE1 : for $\phi 25$ to $\phi 100$ mm/-20 to 100°C
 FLSE2 : for $\phi 50$ to $\phi 225$ mm/-20 to 100°C
 FSGS3 : for $\phi 50$ to $\phi 300$ mm/-40 to 80°C
 FSGS4,5 : for $\phi 200$ to $\phi 6000$ mm/-40 to 80°C
 FSD22 : for $\phi 13$ to $\phi 100$ mm/-40 to 100°C
 FSD32 : for $\phi 50$ to $\phi 400$ mm/-40 to 200°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 or RS232C
 Accuracy : 1.0% of rate
 Power-supply voltage : 100 to 240VAC or 20 to 30VDC

Compact M-Flow PW

Detector model : FLS Flow transmitter model : FLR



Features:

- Converter as compact as 140 × 130mm in size (front face)
- High-speed response of 0.2 seconds
- Accuracy: 1.5 to 2% of rating
- Low-cost flowmeter ideal for measurement of clean fluid

Specifications:

Sensor type: FLSE12 : for $\phi 25$ to $\phi 100$ mm/-20 to 100°C or 120°C
 FLSE22 : for $\phi 50$ to $\phi 225$ mm/-20 to 100°C or 120°C
 FLSE31 : for $\phi 50$ to $\phi 300$ mm/-20 to 80°C
 FLSE41 : for $\phi 300$ to $\phi 600$ mm/-20 to 80°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 or RS232C

Accuracy : 1.5 to 2% of rate

Structure: Waterproof detector and converter structure conforming to IP65

Power-supply voltage: 100V to 120VAC, 200 to 240VAC, or 20 to 30VDC

Cable length between detector and converter: 30m max.

2 Lines Type

Detector model : FSG, FLD Flow transmitter model : FSH



Features:

- High resistance 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 : FSGS3 : for $\phi 50$ to $\phi 400$ mm/-40 to 80°C
 FSGS5 : for $\phi 200$ to $\phi 6000$ mm/-40 to 80°C
 FSD32 : for $\phi 50$ to $\phi 400$ 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

Communication function : RS485 or RS232C

Accuracy : 1.0% of rate

Power-supply voltage : 100V to 240VAC or 20 to 30VDC

Cable length between detector and converter: 150m max.

Portable Portaflow -C

Detector model : FLD Flow transmitter model : FSC

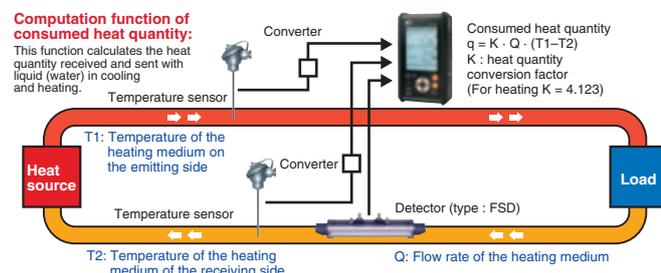


Features:

- 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
- Provided with a printer (option)

Computation function of consumed heat quantity:

This function calculates the heat quantity received and sent with liquid (water) in cooling and heating.



Specifications:

Sensor type : FSD22 : for $\phi 13$ to $\phi 100$ mm/-40 to 100°C
 FSD12 : for $\phi 50$ to $\phi 300$ mm/-40 to 100°C
 FSD32 : for $\phi 50$ to $\phi 400$ mm/-40 to 200°C
 FSD41 : for $\phi 200$ to $\phi 1200$ mm/-40 to 80°C
 FSD51 : for $\phi 200$ to $\phi 6000$ mm/-40 to 80°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

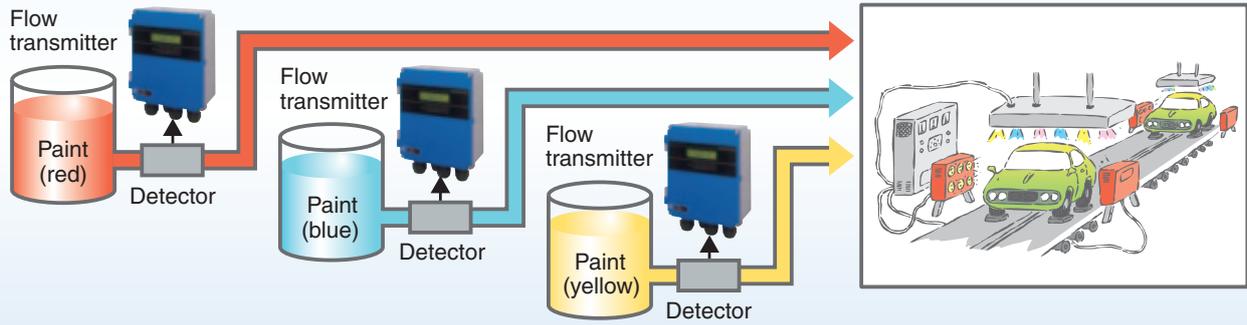
SD memory card: Saves instantaneous value, total value, etc

Options: With printer, Flow velocity profile

Applications example

1. Measuring system for the paint flow rate

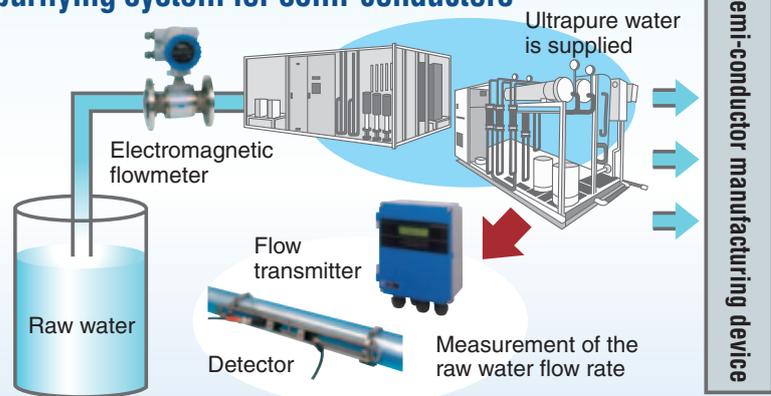
The flow rate of thick paint is measured by a detector mounted on the pipe already constructed.



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

Advantages of using an ultrasonic flowmeter for the system

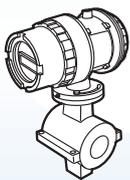
- 1) It can be easily mounted on the exterior of a pipe, helping reduce mounting cost.
- 2) As a sensor, it can operate without coming into contact with fluid, so the fluid is not affected by metallic ions.
- 3) This meter, compact and lightweight, can be easily carried and mounted.



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.

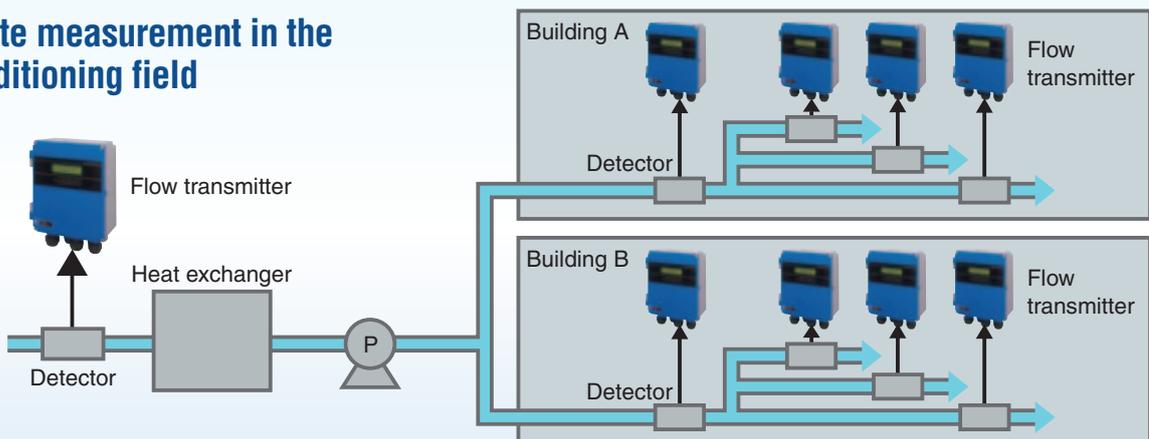
The price of the ultrasonic flowmeter stays the same irrespective of pipe diameter.



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

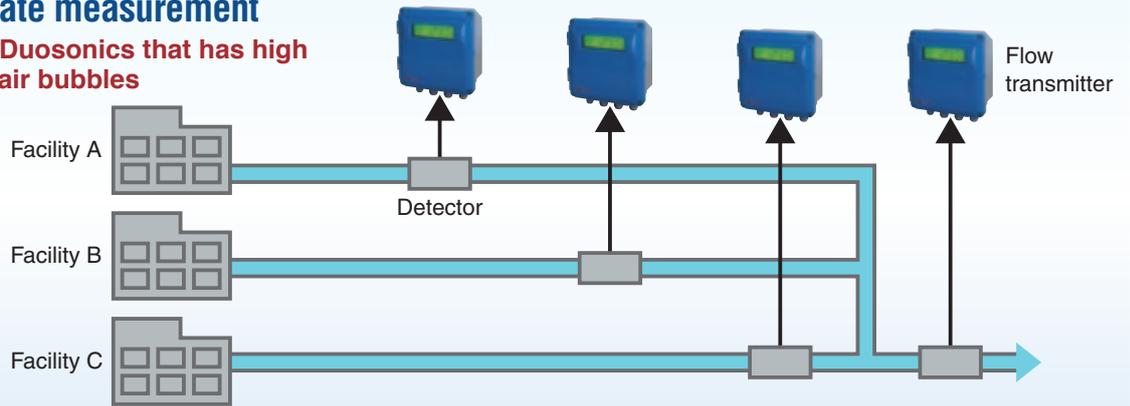
Ultrasonic flowmeter is more economical for measurement of flow in pipe whose diameter is 200mm or larger.

4. Flow rate measurement in the air-conditioning field



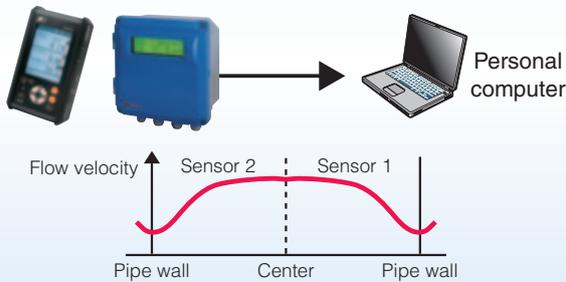
5. Drain flow rate measurement

Handled with Duosonics that has high resistance to air bubbles



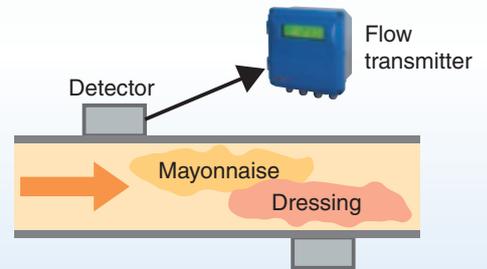
6. Facility diagnosis

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



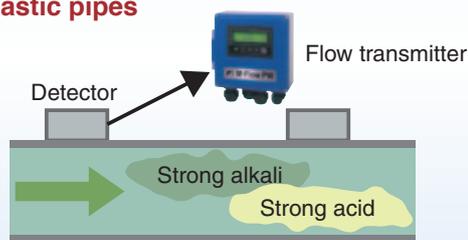
7. Flow rate measurement of mayonnaise and dressing

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



8. Flow rate measurement of corrosive fluid

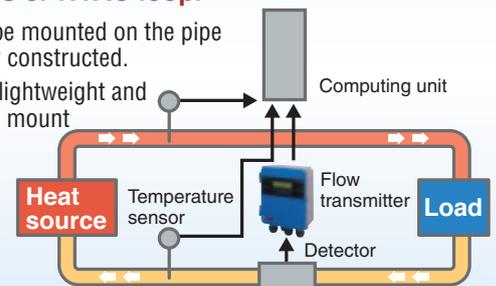
Non-contact measurement by M-Flow PW ideal for corrosive fluid in glass, metallic, and plastic pipes



9. A system for measuring heat transfer and efficiency.

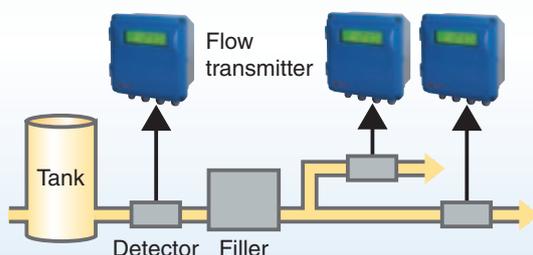
Heat is transferred by water flow in the process or HVAC loop.

- 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
Transmitter model	FSH	FSH	FSV	FLR	FSC
Detector model	FSW	FSG, FSD	FLS, FSG, FSD	FLS	FSD
Appearance					
Measurement method	Pulse Doppler method+ Propagation time difference method		Propagation time difference method		
Resistance to air bubbles	Ideal	Good	Good	Not usable	Good
Detector type Inside diameter of applicable pipes The value enclosed in parentheses is fluid temperature.	type : FSWS12 Φ40 to Φ200mm (-40 to 100°C)	type : FSG3 Φ50 to Φ300mm (-40 to 80°C)	type : FLS Φ25 to Φ225mm (-20 to 100°C)	type : FLSE12 Φ25 to Φ100mm (-20 to 100°C or 120°C)	type : FSD22 Φ13 to Φ100mm (-40 to 100°C)
	type : FSWS21 Φ100 to Φ400mm (-40 to 80°C)	type : FSGS5 Φ200 to Φ6000mm (-40 to 80°C)	type : FSGS3 Φ50 to Φ300mm (-40 to 80°C)	type : FLSE22 Φ50 to Φ225mm (-20 to 100°C or 120°C)	type : FSD12 Φ50 to Φ400mm (-40 to 100°C)
	type : FSWS40 Φ200 to Φ500mm (-40 to 80°C)	type : FSD32 Φ50 to Φ400mm (-40 to 200°C)	type : FSGS4, 5 Φ200 to Φ6000mm (-40 to 80°C)	type : FLSE31 Φ50 to Φ300mm (-20 to 80°C)	type : FSD41 Φ200 to Φ1200mm (-40 to 80°C)
	type : FSWS50 Φ500 to Φ1000mm (-40 to 80°C)	—	type : FSD22 Φ13 to Φ100mm (-40 to 100°C)	type : FLSE41 Φ300 to Φ600mm (-20 to 80°C)	type : FSD51 Φ200 to Φ6000mm (-40 to 80°C)
	—	—	type : FSD32 Φ50 to Φ400mm (-40 to 200°C)	—	type : FSD32 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.)
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 - 20mA DC output	✓	✓	✓	✓	✓
Pulse output	✓	✓	✓	✓	—
Alarm output	✓	✓	✓	✓	—
Communication function	RS485 or RS232C	RS485 or RS232C	RS485 or RS232C	RS485 or RS232C	SD memory card (USB port is used)
Accuracy	0.5% to 1% of rate	1.0% of rate	1.5/2% of rate		1.0% of rate
Power-supply voltage	100 to 240VAC, 50/60Hz or 20 to 30VDC			100 to 120VAC 50/60Hz or 200 to 240VAC or 20 to 30VDC	100 to 240VAC 50/60Hz Built-in battery
Length of dedicated cable between detector and converter	150m max.			30m 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 Co., Ltd.

International Sales Div.
Sales Group

Gate City Ohsaki, East Tower, 11-2, Osaki 1-chome,
Shinagawa-ku, Tokyo 141-0032, Japan

<http://www.fujielectric.com>

Phone: 81-3-5435-7280, 7281 Fax: 81-3-5435-7425

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