

# Integral Ultrasonic Flowmeter <S-Flow>

DATA SHEET

FSZ, FLYF

This flowmeter is a clamp-on type ultrasonic flowmeter that can measure the volumetric flow rate inside a pipe by clamping on from the outside.

By making full use of the latest electronic and digital signal processing technologies, this flowmeter is significantly smaller than conventional products. It integrates the flow transmitter and detector, enabling it to eliminate the need for signal cable wiring while facilitating mounting to pipes by adopting a greaseless design. Its standard features include communications functions.

## FEATURES

### 1. Compact and lightweight

Thanks to the adoption of the latest electronics, the flowmeter has achieved an integrated and lightweight design for the flow transmitter and detector.

### 2. Easy mounting

Its greaseless design makes it easy to mount on piping. Since it integrates the flow transmitter and detector, it eliminates the need for signal cable wiring.

### 3. Excellent resistance against aerated flow

Its digital signal processing technology has dramatically improved its resistance against aerated flow.

### 4. High accuracy

It comes with an accuracy of  $\pm 2.0\%$  at standard conditions (20° water).

By adopting a new sound velocity measurement system, it can measure fluids of unknown sound velocity and suffers negligible impact from pressure.

### 5. Quick response

It achieves a high-speed response time of 0.5 seconds by utilizing digital signal processing.

### 6. Excellent performance and easy operation

Its LED and function keys make it easy to perform configurations and troubleshooting.

- Easy operation with the keypad on the front face of the flowmeter
- RS-485 communications

## SPECIFICATIONS

### Applications and operating environment

#### System configuration:

Single-path system using an integrated flow transmitter and detector

#### Applicable types:

FSZ08, FSZ15, FSZ25, FSZ40

#### Applicable fluid:

Homogenous liquid where the ultrasonic signal can be transmitted



Applicable piping nominal diameter 8A/10A, 15A/20A  
(Type: FSZ08, FSZ15)



Applicable piping nominal diameter 25A/32A  
(Type: FSZ25)



Applicable piping nominal diameter 40A/50A  
(Type: FSZ40)

Aerated flow: 0 to 12vol% (15A nominal diameter, water, flow velocity 1 m/s)

Fluid turbidity: 10,000 (mg/L) or less

Flow profile: Fully-developed turbulent or laminar flow in a fully-filled circular pipe

#### Measuring range:

0 to  $\pm 0.2 \dots \pm 5$  m/s

Reference flow rate range (for SGP Pipes, 5 m/s)

Nominal diameter		Outer diameter	Wall thickness	Flow rate range
DN	inch	[mm]	[mm]	[L/min]
8	1/4"	13.8	2.3	20
10	3/8"	17.3	2.3	38
15	1/2"	21.7	2.8	61
20	3/4"	27.2	2.8	110
25	1"	34.0	3.2	179
32	1-1/4"	42.7	3.5	300
40	1-1/2"	48.6	3.5	408
50	2"	60.5	3.8	659

Flow rate calculation formula [L/min] =  $0.3 \pi r^2$

\*Radius r: mm

**Power supply**

20 to 27.5 V DC

**Installation environment:**

Non-explosion-proof area with no direct sunlight, corrosive gas, or radiant heat

**Ambient temperature:**

During operation: -15 to +60°C  
 During storage: -15 to +65°C

**Ambient humidity:**

95%RH or less with no dew condensation

**Applicable piping:**

Type	Applicable piping nominal diameter	Applicable piping outer diameter
FSZ08	DN8, DN10 (1/4, 3/8 inch)	ø13 to ø18 mm
FSZ15	DN15, DN20 (1/2, 3/4 inch)	ø20 to ø28 mm
FSZ25	DN25, DN32 (1, 1-1/4 inch)	ø30 to ø43 mm
FSZ40	DN40, DN50 (1-1/2, 2 inch)	ø45 to ø64 mm

**Applicable pipe material:**

Metal piping (stainless steel, steel pipes, copper pipes)  
 Plastic (PVC, PP, PVDF)  
 Note 1: Lining pipes are not supported  
 Note 2: Piping thickness of 1.2 to 4.9 mm  
 Straight pipe length: Upstream side 10D, downstream side 5D (D: Pipe inner diameter). Details depend on straight pipe conditions. (Japan Electric Measuring Instruments Manufacturers' Association JEMIS-032)

**Fluid temperature:**

-15 to +85°C

When ambient temperature is 50°C or below	Fluid temperature is 85°C or below
When ambient temperature is 50 to 55°C	Fluid temperature is 75°C or below
When ambient temperature is 55 to 60°C	Fluid temperature is 60°C or below

**Performance specifications**

**Rated accuracy:**

Flow rate of 1 m/s to 5 m/s	Flow rate of less than 1 m/s
±2.0% of rate	±0.02 m/s

Note) Accuracy in water at 20°C (standard)

**Response time:**

0.5 s

**Power consumption:**

2.5 W or less

**Functional specifications**

**Analog signal:**

4 to 20 mA DC: 1 signal  
 Load resistance: 550 Ω max.

**Digital output:**

Forward total and alarms can be assigned as desired  
 Transistor contact (open collector)  
 • Outputs: 2  
 • Normal: ON/OFF selectable  
 • Contact capacity: 27.5 V DC, 100 mA  
 • Output frequency: Max. of 100 P/s (Pulse width of 5, 10, 50, 100, 200, 500, 1000 ms)

**Temperature measurements (optional):**

Pipe surface temperature measurement accuracy: ±2°C (at an ambient temperature of 20°C)  
 Measurement range: -15 to +85°C

**Serial communications:**

RS-485 (MODBUS)  
 No. of connectable modules: Up to 31  
 Baud rate: 9600, 19200, 38400 bps  
 Parity: None/odd/even, selectable  
 Stop bit: 1 or 2 bit, selectable  
 Cable length: Up to 1 km  
 Data: flow rate, pipe temperature, forward total, error information, etc.

**Display device:**

LED display, 4-digit, 7-segment, 2-line  
 Status LED (green when normal, red when abnormal)  
 Flow direction LED (setting)

**Flow rate indication:**

Instantaneous flow rate indication (minus indication for reverse flow)  
 Numbers: 4 digits (excluding decimal point)  
 Unit: L/min, gal/min

**Total indication:**

Forward total value indication  
 Numerals: 8 digits (4 digits × 2 lines, excl. decimal point)  
 Unit: L, gal

**Configuration:**

Three keys (UP, DOWN, ENTER)

**Zero adjustment:**

Zero adjustment, zero clear

**Damping:**

0, 1, 3, 5, 10, 30, 60, 90 s for analog output and flow rate display

**Low flow rate cutoff:**

Low flow rate cutoff value can be set as desired

**Alarm:**

Hardware or process abnormalities  
 Contact output available

**Burnout:**

Analog output: Hold/Overscale/Underscale/Zero selectable  
 Burnout timer: 10 to 900 s (every 1 s)

**Total reset:**

Total value can be set to zero

**Backup of power failure:**

Backup by non-volatile memory

**Physical specifications**

**Type of enclosure:**

IP65 (water jet) / IP67 (water immersion)  
 Waterproof performance with the dedicated cable

**Mounting method:**

Clamped on pipe surface

**Material:**

Plastic (PPS, PC, PPO), rubber, stainless steel

**Signal cable:**

Type: FLYF  
 • Material: Polyurethane (PUR)  
 • Outer diameter: ø6 mm  
 • Cable length: 3 m, 10 m  
 • Termination:  
 Flowmeter body side: M12, 8-pin connector  
 Connection point: No terminal processing

**Flowmeter body size:**

FSZ08: Max. of H65 × W120 × D42 mm  
FSZ15: Max. of H75 × W120 × D50 mm  
FSZ25: Max. of H90 × W120 × D68 mm  
FSZ40: Max. of H108 × W120 × D86 mm

**Mass:**

FSZ08: 400 g  
FSZ15: 500 g  
FSZ25: 600 g  
FSZ40: 800 g

**EU Directive Compliance****EMC (2014/30/EU)**

EN 61326-1 (Table 2)  
EN 61326-2-3

**RoHS (2011/65/EU+(EU)2015/863)**

EN IEC 63000:2018

**EMC (S.I.2016 No.1091)**

EN 61326-1 (Table 2)  
EN 61326-2-3

**RoHS (S.I.2012 No.3032)**

EN IEC 63000:2018

**■ PC loader software**

You can download the software from the Fuji Electric website. For the download URL, refer to the instruction manual.

Loader software is not covered by quality assurance.

- PC/AT compatible computer
- Main functions: Software for displaying and making changes to parameters, for gathering measurement data Instantaneous flow rate, pipe temperature, instantaneous flow velocity, total values, and error information, etc. can be imported.
- OS: Windows 10 (Pro, Enterprise)/Windows 11 (Pro) Editions in parentheses ( ) indicate versions for which operation has been verified.
- Required memory: 125 MB or more (Free space of 52 MB or more)

Note: Communication converter

To connect the flowmeter body to a device for RS-232C serial interface, a RS-232C - RS-485 converter is needed.

To connect to a PC for USB interface, additionally, a USB - RS-485 converter is also needed.

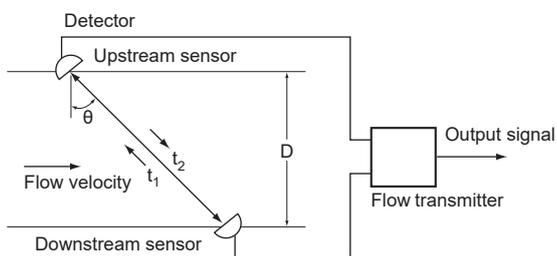
<Recommendation>

[USB - RS-485 converter]

Type SI-35USB-2 / LINEEYE CO., LTD.

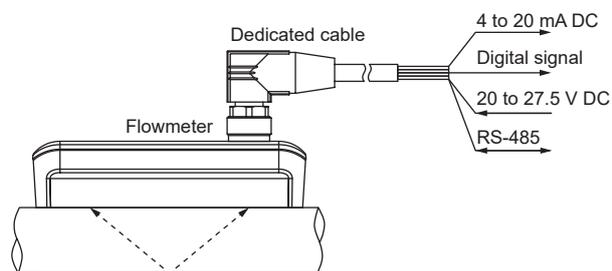
## MEASURING PRINCIPLE

With ultrasonic pulses propagated diagonally between the upstream and downstream sensors, flow rate is measured by detecting the time difference obtained by the flow of fluid.



## CONFIGURATION DIAGRAM

Single-path system (V method)



### Straight pipe conditions

(D: Inner diameter of piping)

Classification	Upstream side	Downstream side
90° bend		
Tee		
Diffuser		
Reducer		
Various valve	<p>In the case where a flow control valve exists on upstream side</p>	<p>In the case where a flow control valve exists on downstream side</p>
Pump		

(Note) The source: JEMIS-032

## CODE SYMBOL

### (Flowmeter body)

1	2	3	4	5	6	7	8	Description
F	S	Z			Y		3	
			0	8				Nominal diameter (4th, 5th digit) DN8, DN10 (1/4, 3/8 inch)
			1	5				DN15, DN20 (1/2, 3/4 inch)
			2	5				DN25, DN32 (1, 1-1/4 inch)
			4	0				DN40, DN50 (1-1/2, 2 inch)
					Y			Power supply (6th digit) 20 to 27.5 V DC
					Y			Flowmeter option (7th digit) None
					T			Pipe temperature measurement
							3	Revision No. (8th digit)

### (Dedicated cable)

1	2	3	4	5	6	7	8	Description
F	L	Y	F				1	
			F					Application (4th digit) Integral Ultrasonic Flowmeter <FSZ>
			0	0	3			Dedicated cable length (5, 6 and 7th digit) 3 m
			0	1	0			10 m
							1	Revision No. (8th digit)

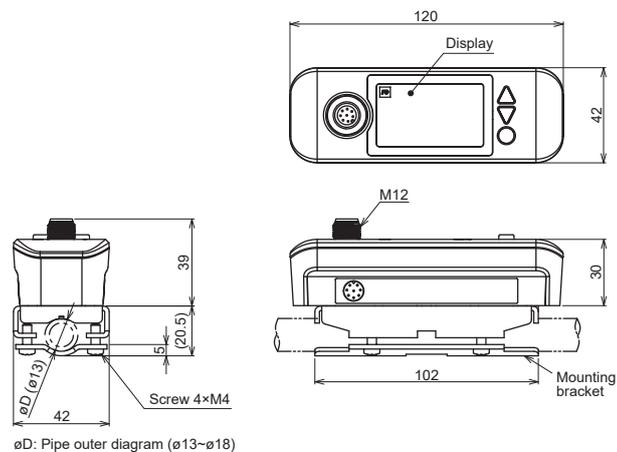
### Other items (Auxiliary parts)

	Name	Specifications	Order type
1	Mounting bracket FSZ08	SUS	ZZP*TQ407651P01
2	Mounting bracket FSZ15	SUS	ZZP*TQ407652P01
3	Mounting bracket FSZ25	SUS	ZZP*TQ407809P01
4	Mounting bracket FSZ40	SUS	ZZP*TQ409845P01
5	Fixing screw set FSZ08	M4×11, SUS, retaining washers (4 pcs.)	ZZP*TQ509186C01
6	Fixing screw set FSZ15	M4×14, SUS, retaining washers (4 pcs.)	ZZP*TQ509186C02
7	Fixing screw set FSZ25	M5×20, SUS, retaining washers (4 pcs.)	ZZP*TQ509186C03
8	Fixing screw set FSZ40	M5×52, SUS (4 pcs.) M5×67, SUS (4 pcs.) Nuts (4 pcs.)	ZZP*TQ509186C04
7	Acoustic coupler rubber	Special plate	ZZP*TQ508768P01

\*Required quantity: 1 per unit

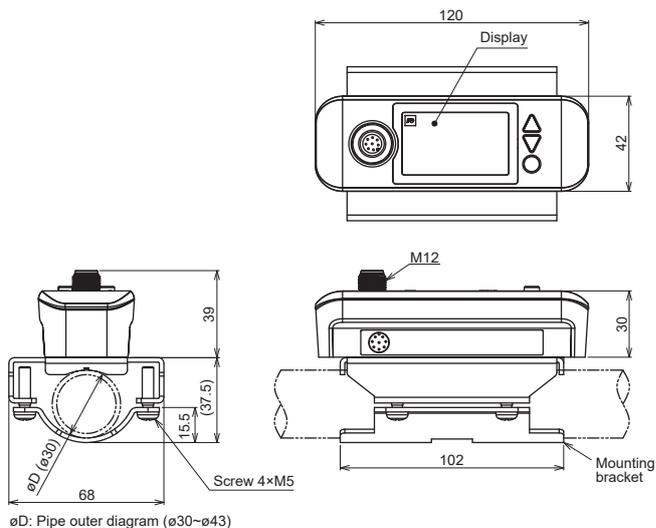
# OUTLINE DIAGRAM (Unit:mm)

(Flowmeter body)



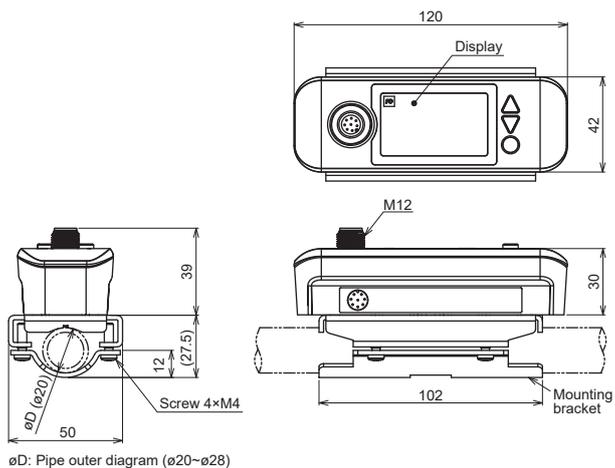
øD: Pipe outer diagram (ø13~ø18)

Type: FSZ08



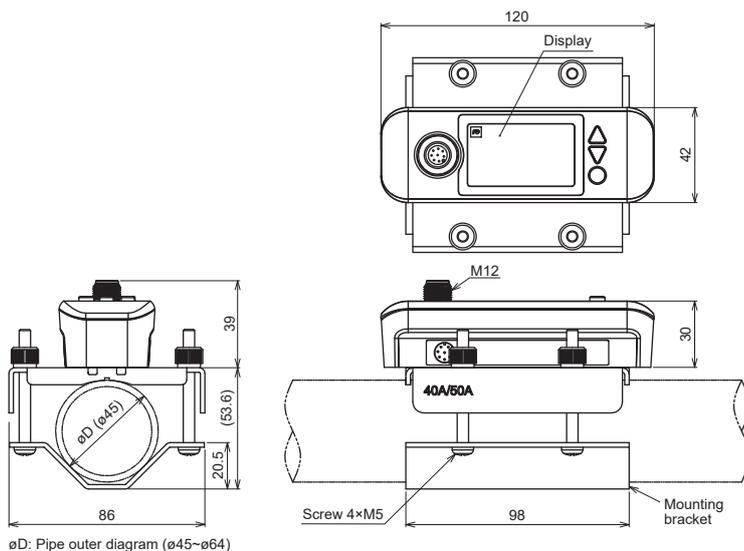
øD: Pipe outer diagram (ø30~ø43)

Type: FSZ25



øD: Pipe outer diagram (ø20~ø28)

Type: FSZ15

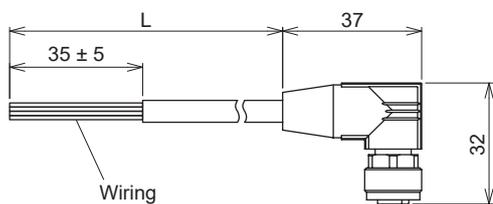


øD: Pipe outer diagram (ø45~ø64)

Type: FSZ40

## <Dedicated cable>

Type	FLYF003	FLYF010
L [m]	3 ± 0.15	10 ± 0.2



\* For connections, see the section on External Connections on the next page.

Type: FLYF

## External connection

Connection name	Wiring
Power supply	[5] Gray (GRY) — (+) 20-27.5 Vdc [8] Red (RED) — (-)
Current output	[3] Green (GRN) — (+) 4-20 mA [2] Brown (BRN) — (-)
Digital output 1	[4] Yellow (YEL) — (+) 27.5 Vdc max., [8] Red (RED) — (-) 0.1 A max.
Digital output 2	[6] Pink (PNK) — (+) 27.5 Vdc max., [8] Red (RED) — (-) 0.1 A max.
RS-485	[1] White (WHT) — (+) RS-485+ [7] Blue (BLU) — (-) RS-485- [8] Red (RED) — (GND)

## SCOPE OF DELIVERY

- Flowmeter body (FSZ)
- Dedicated cable (FLY)
- User-friendly instruction manual
- Precautions

## ITEMS DESIGNATED ORDERING

1. Designation of flowmeter body type (FSZ)
2. Designation of dedicated cable type (FLY)

## Items to check before purchasing

The following conditions may cause measurement failures or reduction in accuracy for the flowmeter.

If you have a concern whether the flowmeter will be suitable or not for your application, please consult and ask Fuji Electric to perform advance verification with an actual device.

### 1) Fluid

- If fluid contains a large amount of bubbles (approx. 12 vol% or more at 1 m/s flow rate)
- If fluid has bad turbidity 10000 (mg/L) or more
- If fluid contains slurry or solid materials (about 5 wt%)
- If flow rate is low Reynolds No.10000 or less  
(Reference: Flow rate 1.5 L/min at 32A)  
\*Flow rate is proportional to the pipe inner diameter
- If it is high-viscosity circulating oil, low-concentration chemical solutions, waste liquids, hot spring water, etc.

### 2) Piping

- Roughened carbon steel pipe with a rusty inner surface.
- Pipe with adhering substances and sediment on the inside.
- Pipe with roughened outer surface.
- Plastic piping with thick walls (5 mm or more)
- If it is SGPW pipe,
- If it is rubber pipe,
- PFA tube
- Fluororesin tube

### 3) Length of the straight pipe

For accurate measurements, adequate straight pipe lengths are needed between the up and down stream side of the measuring part. Please meet the straight pipe conditions described in page 3.

## Caution on use

- 1) Do not damage the flowmeter or the dedicated cable.
- 2) Make sure to fill the fluid inside the pipe to be measured.
- 3) When you use a horizontal pipe, we recommend mounting the flowmeter horizontally.
- 4) When the flowmeter is installed outdoors, we recommend mounting a waterproof cover to protect it from direct sunlight to prevent deterioration.
- 5) Use an insulated, ungrounded, regulated power supply.
- 6) Connect an insulated, ungrounded device to the analog current output and contact output.

Information in this catalog is subject to change without notice.  
Read the instruction manuals thoroughly before using the products.

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