

Spool Piece Ultrasonic Flowmeter (FST) for liquid applications

Advanced Features for a Wide Range of Applications

- ✓ Accuracy: $\pm 0.2\%$ of rate
- ✓ Easy-to-operate
- ✓ Low maintenance
- ✓ IECEx, ATEX, NEPSI, Japanese ex-proof certification



Unparalleled Accuracy for Optimal Performance

Precision measurement of flow helps reduce costs and energy consumption



Offers various types of output

Operation from front panel

Accepts liquid from -40°C to 150°C

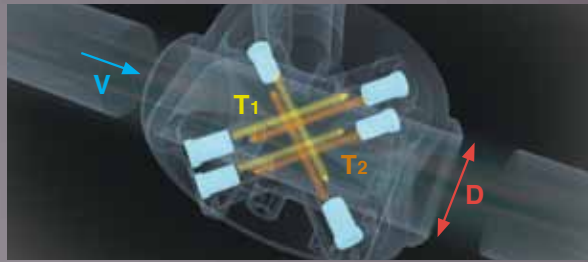
Pipe size: 50 A

Pipe size: 100 A

Three Pairs of Sensors for Accuracy of ±0.2% of rate

Wetted sensors are used to deliver highly sensitive measurement. Three parallel paths are arranged at selected positions to reduce the adverse effect of flow profile. Furthermore, we developed the unique algorithm to calculate the average value, thus achieving the high-precision. With no obstruction inside pipe, no pressure loss is generated.

Measuring principle: parallel three-path, transit time difference method



The sensors placed on upstream and downstream emit ultrasonic pulse in turn, and detect the transit time difference of the pulse to calculate the flow rate.

Flow velocity : $V = K \cdot (T_2 - T_1)$

Pipe cross-sectional areas : $A = \frac{\pi D^2}{4}$

Flow rate: $Q = A \cdot V$

- Pipe inner diameter : D
- Transit time with flow : T_1
- Transit time against flow : T_2
- Flow coefficient : K



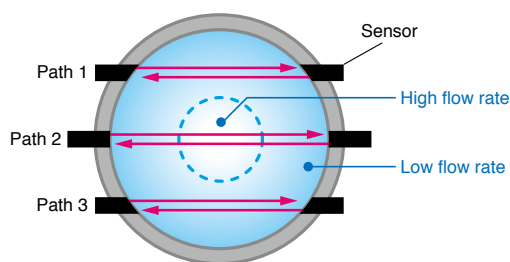
Pipe size: 80 A

Pipe size: 25 A
under development

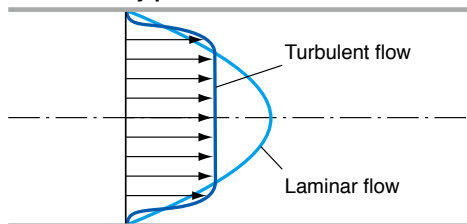
Precision Measurement for Various Liquids

Advanced Method of Measurement

The flow rate is not uniform all over the pipe. By placing three measurement paths in parallel, the flowmeter can sense both the flow rate at the center of the pipe and the flow rate near the pipe wall. The flowmeter then averages the flow rates based on our unique algorithm to achieve the accuracy of $\pm 0.2\%$ of rate.



Flow velocity profile



The flowmeter delivers accurate measurement regardless of the point of measurement, without being affected by the change in the flow velocity profile.

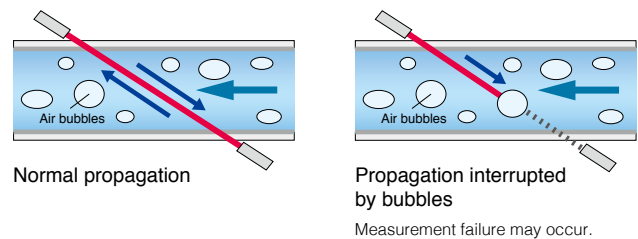
Improved Zero-Point Stability

Achieved by a combination of the advanced circuit design, the latest electronics, and innovative digital signal processing technology.

Superior Bubble Resistance

Fuji Electric's advanced anti-bubble measurement technology reduces the interference of air bubbles to ensure accurate measurements.

Signal Averaging



By averaging a set of several measurements, precise signals can be obtained.

Improved Sensitivity

Newly-developed high-sensitivity sensors and noise reduction technology result in improved signal-to-noise ratio.

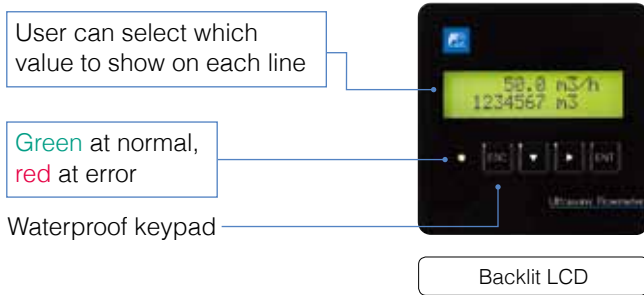
Accepts Various Types of Fluid with Temperature Ranging from -40°C to 150°C

Non-conductive fluid such as oil, purified water, or a mixture can be measured.

Designed for Ease-of-Use

Backlit LCD and Front Panel Operation

Front keys allow you to configure parameters, enter piping conditions, or calculate sensor spacing, without opening the cover. Measurement results are shown on the 16-digit 2-line LCD in Japanese, English, German, French, or Spanish. Self-diagnosis function tells you if an error occurs.



Selectable Panel Position

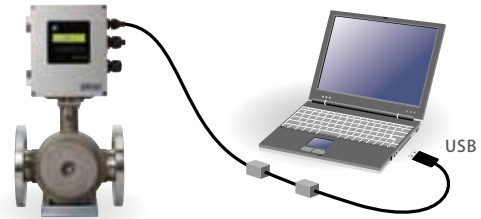
You can select the most suitable panel position for your application.

* See "Mounting / cable entry position" on Page 10, 11.



Convenient Configuration and Data Management from PC

Parameter loader software, provided as standard, allows parameter setting and measurement data acquisition on PC. RS-485 communication is optionally available.



* A RS232C to RS485 converter is required.
If your PC does not support the RS232C serial interface, a USB to RS232C converter is also required.

Low Maintenance

The lack of projections inside keeps the pipe almost entirely free from contamination, thereby reducing maintenance work.

Flexible Output Terminal

Equipped with terminals for insulated 4–20 mA DC analog output, pulse output, and alarm output.

Reliability. Safety. Convenience.

Reliability

Zero point adjustment

When the flow is stopped, the zero point can be adjusted with a single push of a button.

Damping

Used to reduce fluctuation of measured values.
Setting range: 0 to 100 s (in 0.1 second steps)

Low flow cut-off

Output can be cut off when the flow rate is low.
Setting range: 0 to 5 m/s (in 0.01 m/s steps)

Safety

Event-triggered alarms

Alarm output is activated upon instances of hardware error and/or process error.

Output burnout

When there is no fluid in the pipe or there are air bubbles in the fluid, the flowmeter holds the analog output and emits a contact output.

Flow switch

Contact output is emitted when the instantaneous flow rate has reached the high or low limit.

Total switch

Contact output is emitted when the total flow rate (forward direction) has reached the high limit.

Output limit

You can set the high and low limits for analog output in the range from 0.8 mA to 23.2 mA

Total preset

Total flow returns to the user-defined preset value every time a user resets the total.

Convenience

Unit selection

m/s, L/s, L/min, L/h, L/d, KL/d, ML/d, m³/s, m³/min, m³/h, m³/d, Km³/d, or Mm³/d

Bi-directional range

User can configure a range for each of forward flow and reverse flow. Operating range can be emitted as contact output.

Auto-switchable ranges

User-defined two ranges can be switched automatically.

For Hazardous Areas

TRUSONIC FLOW

Oil

Chemical

Pharmaceutical

International and Local Certifications

- IECEx
- ATEX
- NEPSI
- Japanese ex-proof certification

Key Operation with Magnet Bar

The magnet bar allows you to operate the keys without opening the cover.



For Various Liquids from -10°C to +150°C

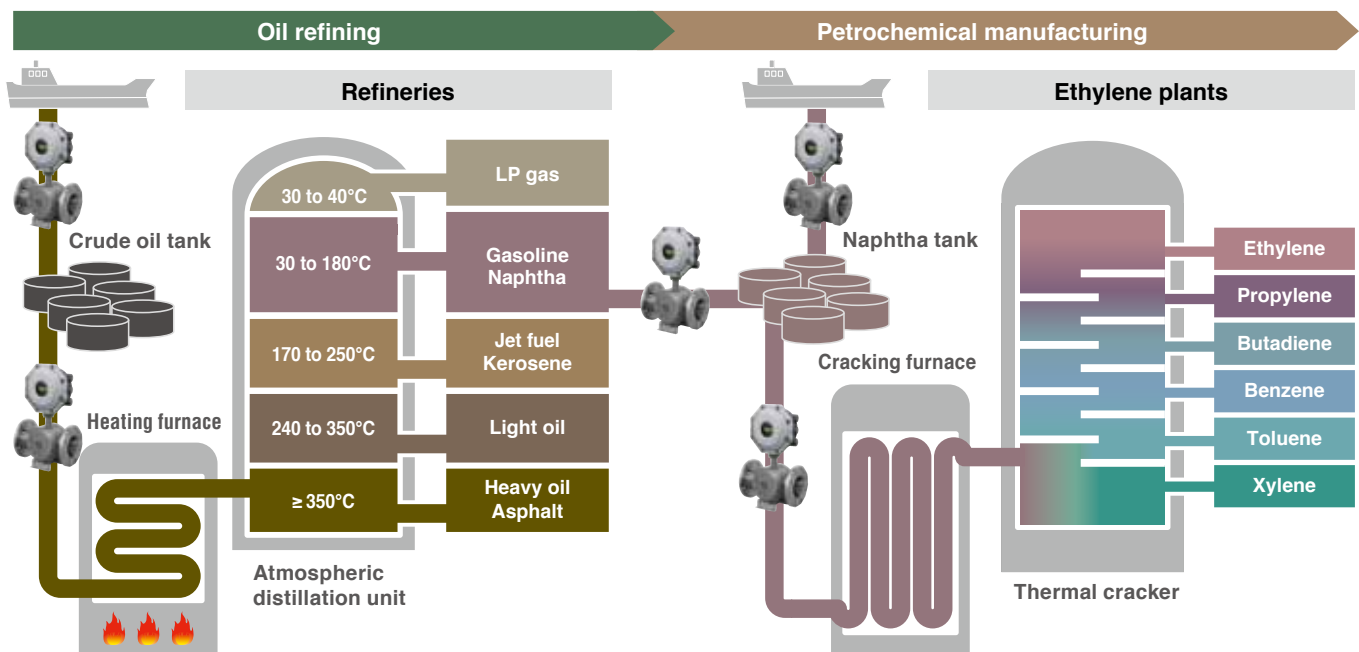
Non-conductive liquids such as oils, mixed liquids, and purified water can be measured.

HART or RS-485 Communication



You can transmit the measurement data to host devices.

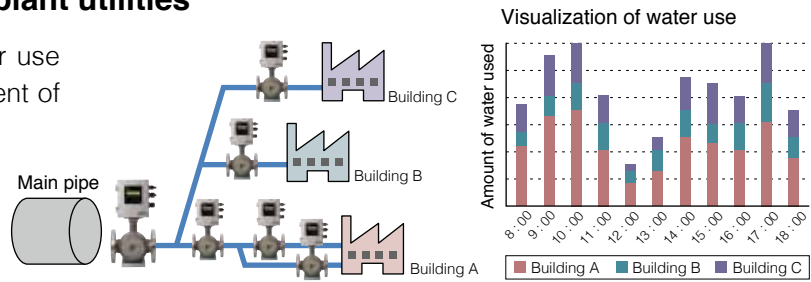
Application example



Applications

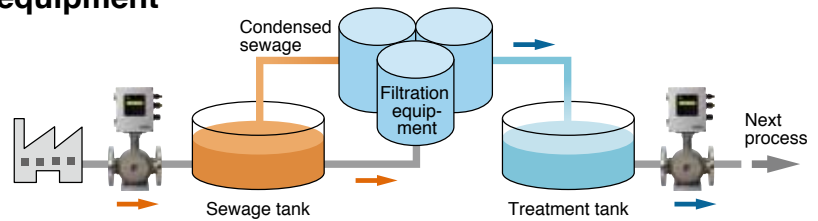
Reduction of water used in plant utilities

Visual depiction of a facility's water use results in more effective management of water consumption.



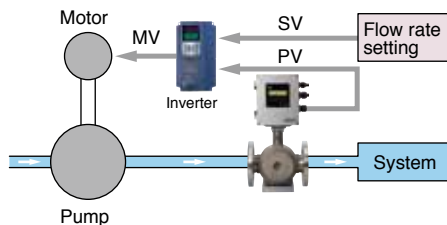
Flow monitoring in filtration equipment

Real-time visualization of the filtration capacity allows for the optimization of flow rates, while reductions in pressure loss result in energy savings.



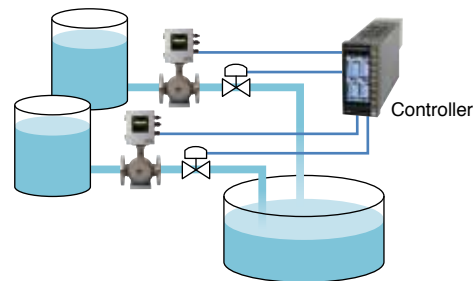
Motor load reduction

Reductions in power consumption are achieved by using an inverter only, instead of a combination of motorized valve and controller to control flow rate.



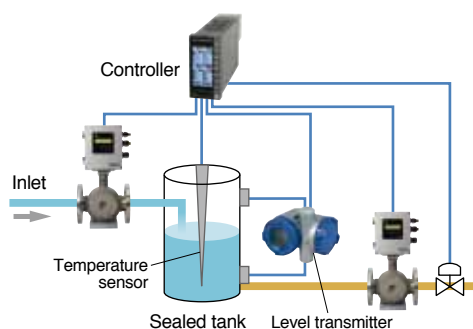
Flow measurement on two pipes

Optimal ratio of flow control for both pipes



Liquid level control in tanks

Monitoring the flow rate at inlet and at outlet enables you to manage the liquid level in a tank.



...and more

- Steel, chemical, petrochemical, cement, paper & pulp plants
- Air-conditioning system
- Water treatment plants
- Food plants
- Boilers
- Waste treatment plants
- Semiconductor manufacturing plants

Ordering code

Standard version

Digit	Description	1	2	3	4	5	6	7	8	9	10	11	12
		F	S	T	1				1	—			Y
4	Enclosure												
	Non-explosion-proof				1								
5	Diameter												
	25A (under development)					A							
	50A					D							
	80A					F							
	100A					G							
6	Flange rating and material												
	JIS 10K / SS 316L						1						
	JIS 20K / SS 316L						2						
	ANSI 150LB / SS 316L						3						
	ANSI 300LB / SS 316L						4						
	DIN PN16 / SS 316L						5						
DIN PN40 / SS 316L						6							
7	Power Supply												
	100-240 V AC, 50/60 Hz							1					
	20-30 V DC							4					
8	Revision code								1				
9	Parameter setting / tag plate												
	None									Y			
	With setting									A			
	With setting + tag									B			
	With tag									C			
10	Communication												
	None										Y		
	RS-485										D		
11	Mounting / cable entry position												
	Horizontal / on downstream side											A	
	Horizontal / on upstream side											B	
	Horizontal / on the right side seen from upstream											C	
	Horizontal / on the left side seen from upstream											D	
	Vertical / on bottom side (upward flow)											E	
12	Cable entry												
	G ¹ / ₂ plastic water-proof gland + rubber plug												Y

Ex-proof version

Digit	Description	1	2	3	4	5	6	7	8	9	10	11	12
		F	S	T					1	—			
4	Enclosure												
	ATEX / IECEx				2								
	Japanese Ex certification				3								
	NEPSI				4								
5	Diameter												
	25A (under development)					A							
	50A					D							
	80A					F							
	100A					G							
6	Flange rating and material												
	JIS 10K / SS 316L						1						
	JIS 20K / SS 316L						2						
	ANSI 150LB / SS 316L						3						
	ANSI 300LB / SS 316L						4						
	DIN PN16 / SS 316L						5						
DIN PN40 / SS 316L						6							
7	Power Supply												
	100-240 V AC, 50/60 Hz							1					
	20-30 V DC							4					
8	Revision code								1				
9	Parameter setting / tag plate												
	None									Y			
	With setting									A			
	With setting + tag									B			
	With tag									C			
10	Communication												
	None										Y		
	RS-485										D		
	HART										H		
11	Mounting / cable entry position												
	Horizontal / on downstream side											A	
	Horizontal / on upstream side											B	
	Horizontal / on the right side seen from upstream											C	
	Horizontal / on the left side seen from upstream											D	
	Vertical / on bottom side (upward flow)											E	
12	Cable entry												
	Three M20 x 1.5 blind plugs (4th code 2 or 4)												B
	Two cable glands with pressure-proof packing (4th code 3)*												C
	Three cable glands with pressure-proof packing (4th code 3)*												D

Scope of delivery: Flowmeter, CD-ROM (English/Chinese/Japanese instruction manual, parameter loader software), magnet bar (for ex-proof version only)

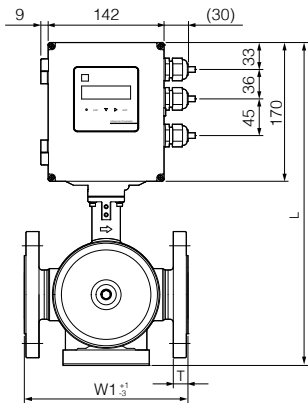
*Bolts, nuts, and gaskets for coupling the flowmeter flange to the flange of the process pipe are not provided.

Specifications

	Standard version	Ex-proof version
Principle	Transit time difference method (parallel 3-path)	
Pipe diameter	25 mm (under development), 50 mm, 80 mm, 100 mm	
Flange rating	ANSI 150 LB, ANSI 300 LB, DIN PN16, DIN PN40, JIS 10K, JIS 20K	
Accuracy	±0.2% of rate (flow velocity: 1 m/s to 10 m/s)	
Fluid pressure	Up to flange rating	
Fluid temperature	-40°C to +150°C	-10°C to +150°C
Measuring range	Flow velocity: 0 to ±0.3...±10 m/s	
Materials	Flange, flow cell, sensor wetted parts: stainless steel 316L Detector housing: SCS13 Transmitter housing: Aluminum alloy	
Output signal	4–20 mA DC, total pulse, alarm output	
Display	16-digit 2-line backlit LCD 2-color LED (green: normal, red: at error)	16-digit 2-line backlit LCD 2-color LED (green: normal, red: at error) Key operation available by using the magnet bar
Functions	Zero point adjustment, damping, low-flow cutoff, alarm, output burnout, output limit, bi-directional range, automatic two ranges, flow switch, total switch, preset total, data backup at power outage	
Communication (option)	RS-485	RS-485 or HART
Data backup at power outage	On nonvolatile memory	
Power supply voltage	100–240 V AC, 50/60 Hz or 20-30 V DC	
Grounding	Class-D grounding with a maximum resistance of 100Ω	Class-A grounding with a maximum resistance of 10Ω
Varistor	Attached to the power supply port	
Surge arrester	Attached to the analog output port	
Power consumption	AC power supply: approx. 20 VA DC power supply: approx. 6 W	
Ambient temperature	-40°C to 60°C	-10°C to 60°C
Ambient humidity	90% RH or less	
Unit	Flow velocity: m/s Flow rate: L/s, L/min, L/h, L/d, kL/d, ML/d, m³/s, m³/min, m³/h, m³/d, km³/d, Mm³/d	
IP rating	IP66	IP67
Ex-proof certification	-	IECEX, ATEX, NEPSI, Japanese ex-proof certification

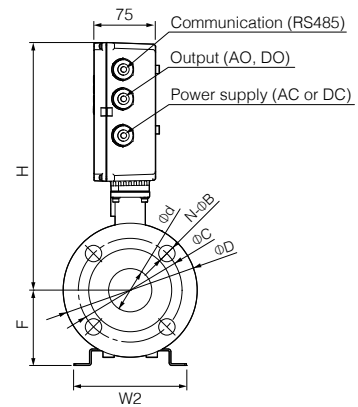
Dimensions Standard version (in mm)

Front view



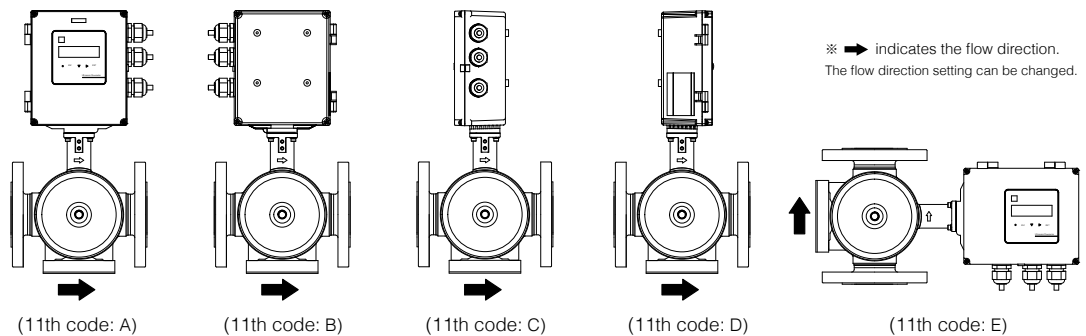
Pipe size	25A	50A	80A	100A
W1	200	200	300	300
W2	130	130	160	160
Φd	25	50	74	97
H	292	303	315	326
F	84	87	120	129
L	376	390	435	455

Flange (6th code)



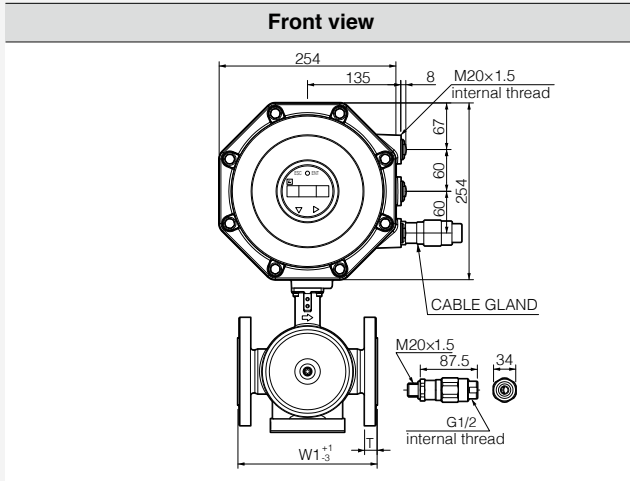
Pipe size		25A	50A	80A	100A
JIS 10K Flange (6th code: 1)	ΦD	125	155	185	210
	ΦC	90	120	150	175
	N-ΦB	4-19	4-19	8-19	8-19
	T	14	16	18	18
Weight in kg		10	13	18	23
JIS 20 K Flange (6th code: 2)	ΦD	125	155	200	225
	ΦC	90	120	160	185
	N-ΦB	4-19	8-19	8-23	8-23
	T	16	18	22	24
Weight in kg		10	13	21	26
ANSI 150LB Flange (6th code: 3)	ΦD	110	150	190	229
	ΦC	79.4	120.7	152.4	190.5
	N-ΦB	4-15.9	4-19	4-19	8-19
	T	14.3	19.1	23.9	23.9
Weight in kg		10	13	21	27
ANSI 300LB Flange (6th code: 4)	ΦD	125	165	210	254
	ΦC	88.9	157	168.1	200
	N-ΦB	4-19.1	8-19	8-22	8-22
	T	17.5	22.3	28.6	31.8
Weight in kg		12	15	25	35
DIN PN16 Flange (6th code: 5)	ΦD	115	165	200	220
	ΦC	85	125	160	180
	N-ΦB	4-14	4-18	8-18	8-18
	T	16	18	20	20
Weight in kg		11	14	21	24
DIN PN40 Flange (6th code: 6)	ΦD	115	165	200	235
	ΦC	85	125	160	190
	N-ΦB	4-14	4-18	8-18	8-22
	T	18	20	24	24
Weight in kg		12	15	22	28

Mounting / cable entry position



11th code	A	B	C	D	E
Mounting	Horizontal	Horizontal	Horizontal	Horizontal	Vertical (upward flow)
Cable entry	on downstream side	on upstream side	on the right side seen from upstream	on the left side seen from upstream	on upstream side (i.e. bottom side)

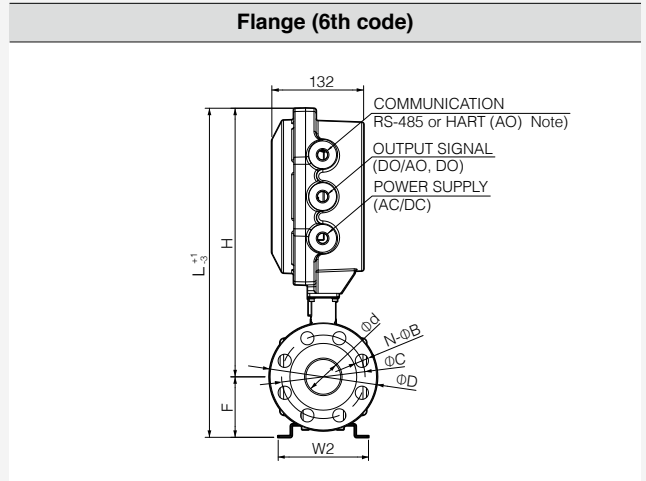
Dimensions Ex-proof version (in mm)



Pipe size	25A	50A	80A	100A
W1	200	200	300	300
W2	130	130	160	160
Φd	25	50	74	97
H	375	386	398	409
F	84	87	120	129
L	459	473	518	538

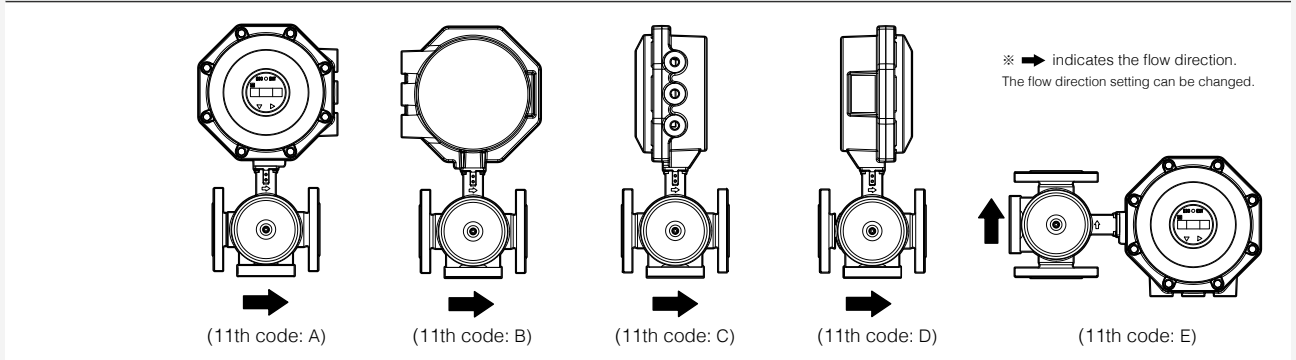
Notes on wiring for HART communication
 For HART communication, use a shielded twisted pair cable and connect it to the AO terminals through the cable entry of HART (AO), not the entry of OUTPUT SIGNAL.

Cable entry	HART		RS-485	
	YES	NONE	YES	NONE
COM.	HART (AO)	UNUSED	RS-485	UNUSED
OUTPUT SIG.	DO	AO, DO	AO, DO	AO, DO



Pipe size	25A	50A	80A	100A	
JIS 10K Flange (6th code: 1)	ΦD	125	155	185	210
	ΦC	90	120	150	175
	N-ΦB	4-19	4-19	8-19	8-19
	T	14	16	18	18
	Weight in kg	14	17	22	27
JIS 20K Flange (6th code: 2)	ΦD	125	155	200	225
	ΦC	90	120	160	185
	N-ΦB	4-19	8-19	8-23	8-23
	T	16	18	22	24
	Weight in kg	14	17	25	30
ANSI 150LB Flange (6th code: 3)	ΦD	110	150	190	229
	ΦC	79.4	120.7	152.4	190.5
	N-ΦB	4-15.9	4-19.1	4-19	8-19
	T	14.3	19.1	23.9	23.9
	Weight in kg	14	17	25	31
ANSI 300LB Flange (6th code: 4)	ΦD	125	165	210	254
	ΦC	88.9	127	168.1	200
	N-ΦB	4-19.1	8-19.1	8-22	8-22
	T	17.5	22.3	28.6	31.8
	Weight in kg	16	19	29	39
DIN PN16 Flange (6th code: 5)	ΦD	115	165	200	220
	ΦC	85	125	160	180
	N-ΦB	4-14	4-18	8-18	8-18
	T	16	18	20	20
	Weight in kg	15	18	25	28
DIN PN40 Flange (6th code: 6)	ΦD	115	165	200	235
	ΦC	85	125	160	190
	N-ΦB	4-14	4-18	8-18	8-22
	T	18	20	24	24
	Weight in kg	16	19	26	32

Mounting / cable entry position



11th code	A	B	C	D	E
Mounting	Horizontal	Horizontal	Horizontal	Horizontal	Vertical (upward flow)
Cable entry	on downstream side	on upstream side	on the right side seen from upstream	on the left side seen from upstream	on upstream side (i.e. bottom side)

Spool piece ultrasonic flowmeter: introduction movie

Read the QR code with your smartphone or tablet, or access the following URL:



www.fujielectric.com/products/instruments/products/flow_ultra/top.html

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

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