

SPOOL PIECE ULTRASONIC FLOWMETER

DATA SHEET

FST

FST is an in-line ultrasonic flowmeter with three parallel measuring paths. With the latest digital signal processing technology and the calculation algorithm, it can deliver highly precise flow measurement. RS-485 communication is also available as option.

FEATURES

1. High accuracy: $\pm 0.2\%$ of rate
Using the new algorithm for calculating the flow velocity, it can measure any type of fluid with high accuracy.
2. Low maintenance
With no moving parts, it has long-term stability while requiring only minimal maintenance work.
3. Bubble resistant
By using the advanced anti-bubble measurement technology, the interference from air bubbles is greatly eliminated.
4. For any liquid from -40°C to $+150^{\circ}\text{C}$
Non conductive fluid including oil, mixed liquid, purified water can be measured.
5. Easy-to-operate
 - Backlit LCD and front keys
 - Troubleshooter provided
 - Can be vertically or horizontally installed



- **Enclosure:**
IP66
- **Ambient temperature:**
 -40°C to $+60^{\circ}\text{C}$
- **Ambient humidity:**
90% RH or less

SPECIFICATIONS

1. General specifications

- **Measuring principle:**
Transit time difference method
Parallel 3-path with the advanced ABM (anti-bubble measurement) system
- **Diameter (mm):**
50, 80, 100
- **Flow velocity range:**
Minimum 0 to 0.3 m/s or -0.3 to 0 m/s
Maximum 0 to 10 m/s or -10 to 0 m/s
- **Flow range:**

Diameter (mm)	50	80	100
Minimum (m ³ /h)	0 to 2.11	0 to 5.43	0 to 8.48
Maximum (m ³ /h)	0 to 70.6	0 to 180.8	0 to 282.6
- **Dimensions and weight:**
Refer to outline diagram
- **Power supply:**
100–240 V AC (+10% -15%), 50/60 Hz or 20-30V DC
- **Power consumption:**
Approx. 20 VA (AC power)
Approx. 6 W (DC power)
- **Grounding:**
D-class grounding with ground resistance of 100Ω or less
- **Arrestor:**
provided as standard, on power supply port and analog output port

2. Fluid conditions

- **Applicable fluid:**
Liquid (uniform liquid through which ultrasonic wave can propagate)
- **Bubble content:**
 ≤ 12 vol%
- **Turbidity:**
10,000 mg/L or less
- **Flow profile:**
fully-developed turbulent or laminar flow in a fully-filled pipe
- **Temperature:**
 -40°C to $+150^{\circ}\text{C}$
- **Pressure:**
Up to flange rating
- **Kinematic viscosity:**
 ≤ 100 mm²/s

3. Detector

- **Wetted parts material:**
 Flow cell: stainless steel 316L
 Flange: stainless steel 316L
 Sensor wetted parts: stainless steel 316L
- **Detector material:**
 Housing: SCS13
- **Process connections:**
 Flange (horizontal or vertical mounting)
- **Flange rating:**
 JIS10K/JIS20K
 ANSI class 150/300
 DIN PN16/40

4. Performance

- **Accuracy (reading and pulse output):**
 ±0.2% of rate (flow velocity: 1 m/s to 10 m/s)
 ±0.002 m/s (flow velocity: 0.5 m/s to 1 m/s)
(4–20 mA DC output):
 Above indicated accuracy ±0.01 mA (at the ambient temperature of 25°C)
- **Reference condition:**
 - Fluid: water
 - Straight run requirements: 10D on inlet side
 5D on outlet side
 (D: pipe diameter)
 - Measurement period: 600s
 - Pipe wall thickness: schedule 40
 - Fluid temperature: 0°C to 35°C
- **Response time:**
 1.2 s (standard)

5. Flow transmitter

- **Analog output signal:**
 4–20 mA DC (insulated), 1 point
 Allowable load resistance: ≤ 600Ω
- **Contact output:**
 Forward total, reverse total, alarm, acting range, flow switch, or total switch
 User configurable
 - Type: transistor output (isolated, open collector)
 - Contact capacity: 30 V DC, 50 mA
 - 2 points
 - Normal: ON or OFF, selectable
 - Frequency: 100 P/s max.
 (Pulse width: 5, 10, 50, 100, 200, 500, 1000 ms)
- **Communication (option):**
 RS-485 (MODBUS), isolated, arrester incorporated
 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 velocity, flow rate, forward total, reverse total, status, etc.
- **Display:**
 16-digit 2-line backlit LCD
 2-color LED (green: normal, red: at error)
- **Language:**
 Japanese (katakana), English, French, German, Spanish (switchable)
- **Flow velocity/flow rate indication:**
 8 digits numerals (decimal point is counted as 1 digit)
 Instantaneous flow rate, instantaneous flow velocity (minus indication for reverse flow)
 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

- **Total value indication:**
 Integrated value of forward flow or reverse flow (reverse flow is indicated with minus symbol)
 8 digits numerals (decimal point is counted as 1 digit)
 Unit: mL, L, m³, km³, Mm³
- **Housing material:**
 Aluminum alloy
- **Coating:**
 Urethane resin
- **Finish color:**
 Silver
- **Wiring port:**
 G1/2 internal thread
 Plastic water-proof gland + rubber plug
- **Terminal:**
 Rod terminal

6. Functional specifications

- **Setting**
 By using 4 keys (ESC, △, ▽, ENT)
- **Zero point adjustment:**
 By setting zero or clearing zero
- **Damping:**
 For analog output or velocity/flow rate indication, 0 to 100 seconds
 (In 1-second steps)
- **Low flow cut-off:**
 0 to 5 m/s in terms of flow velocity
- **Alarm:**
 For hardware error or process error
 Contact output available
- **Output burnout:**
 Analog output: hold, overscale, underscale, or zero
 Flow rate total: hold or count
 Burnout timer: 0 to 100 seconds (in 1-second steps)
- **Output limit:**
 High/low limit for analog output is available in the range from 0.8 mA to 23.2 mA
- **Bi-directional range:**
 Forward and reverse ranges configurable independently.
 Hysteresis: 0% to 20 % of working range
 Working range applicable to digital output.
- **Auto 2 range:**
 Two ranges configurable independently
 Hysteresis: 0% to 20 % of working range
 Working range applicable to digital output.
- **Flow switch:**
 High limit and low limit are configurable independently
 Contact output can be activated while the instantaneous flow rate is beyond the high/low limit.
- **Total switch:**
 High limit for total flow
 Contact output can be activated when the total flow has exceeded the high limit.
- **Total preset:**
 Total flow returns to the user-defined preset value every time a user resets the total.
- **Data backup at power outage**
 on nonvolatile memory

7. EU Directive Compliance (CE)

LVD (2014/35/EU)

EN 61010-1

EMC (2014/30/EU)

EN 61326-1 (Table 2)

EN 55011 (Group 1 Class A)

EN 61000-3-2 (Class A)

EN 61000-3-3

EN 61326-2-3

RoHS (2011/65/EU)

EN 50581

■ Parameter loader software

Provided as a standard accessory.

- For IBM PC compatible
- Allows a user to configure or to change parameter values.
- Supported OS:
Windows 7 (Home Premium, Professional), Windows 8 (Professional), Windows 10 (Enterprise)
- Memory:
≥ 125 MB
- Drive:
CO-ROM drive compatible with Windows 7 (Home Premium, Professional), Windows 8 (Professional), Windows 10 (Enterprise)
- Hard-disk space:
≥ 52 MB

Note 1) To use serial communication, select "D" in 10th code.

Note 2) Communication interface converter:

For a PC which supports the RS-232C serial interface, a RS232C to RS485 converter is required.

If your PC does not support the RS232C serial interface, an USB to RS232C converter is additionally required.

<Recommended products>

RS232C to RS485 converter:

OMRON K3SC-10 interface converter (insulated)

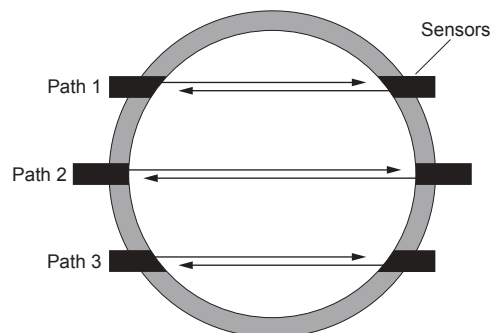
*A D-sub connector cable is required.

USB to RS232C converter:

SANWA SUPPLY USB-CVRS9

PRINCIPLE

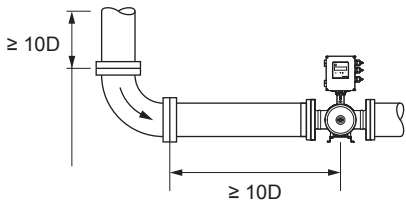
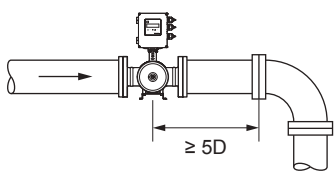
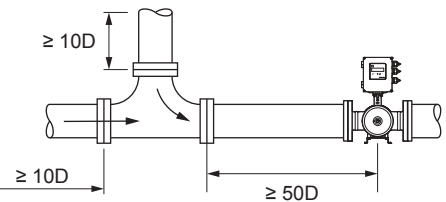
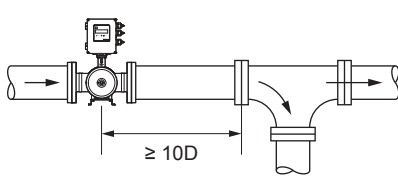
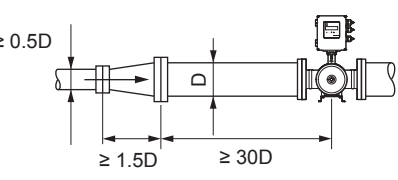
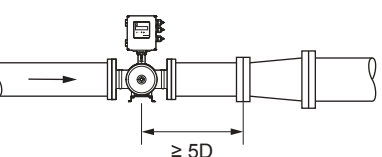
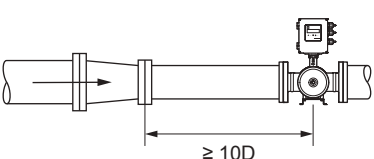
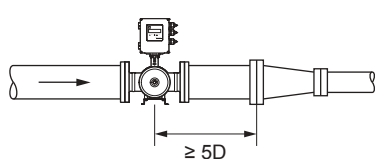
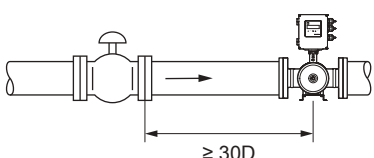
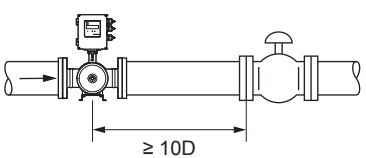
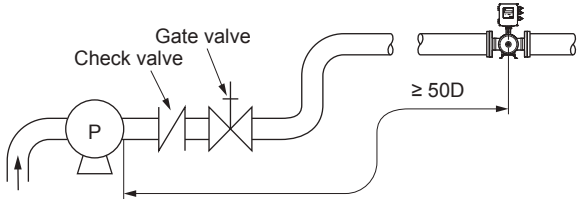
Parallel 3-path measurement



By measuring the flow with three parallel paths simultaneously, and averaging them, the flowmeter obtains the flow rate with $\pm 0.2\%$ of rate accuracy.

PIPE REQUIREMENTS

(D: inside diameter of pipe)

	Upstream	Downstream
90° bend		
T-shaped pipe		
Expanding pipe		
Tapered pipe		
Valves	 In the case where a flow control valve exists on upstream side	 In the case where a flow control valve exists on downstream side
Pump		

(Note)The source : JEMIS-032

CODE SYMBOLS

Digit	Description	FST														
		1	2	3	4	5	6	7	8	9	10	11	12			
4	<Enclosure> Non-explosion-proof	1											Y			
5	<Diameter> 50A 80A 100A		D	F	G											
6	<Flange rating and material> JIS 10K/SS 316L JIS 20K/SS 316L ----- ANSI 150LB/SS 316L ANSI 300LB/SS 316L DIN PN16/SS 316L DIN PN40/SS 316L		1	2	3	4	5	6								
7	<Power Supply> 100–240 V AC, 50/60 Hz 20–30 V DC					1	4									
8	Revision code							1								
9	<Parameter setting/tag plate> None With setting With setting + tag With tag									Y	A	B	C			
10	<Communication> None RS-485									Y	D					
11	<Mounting/wiring port position> Horizontal/on downstream side Horizontal/on upstream side Horizontal/on the right side seen from upstream Horizontal/on the left side seen from upstream Vertical/on bottom side											A	B	C	D	E
12	<Wiring port> 1/2 G internal thread/ Plastic water-proof gland + rubber plug															Y

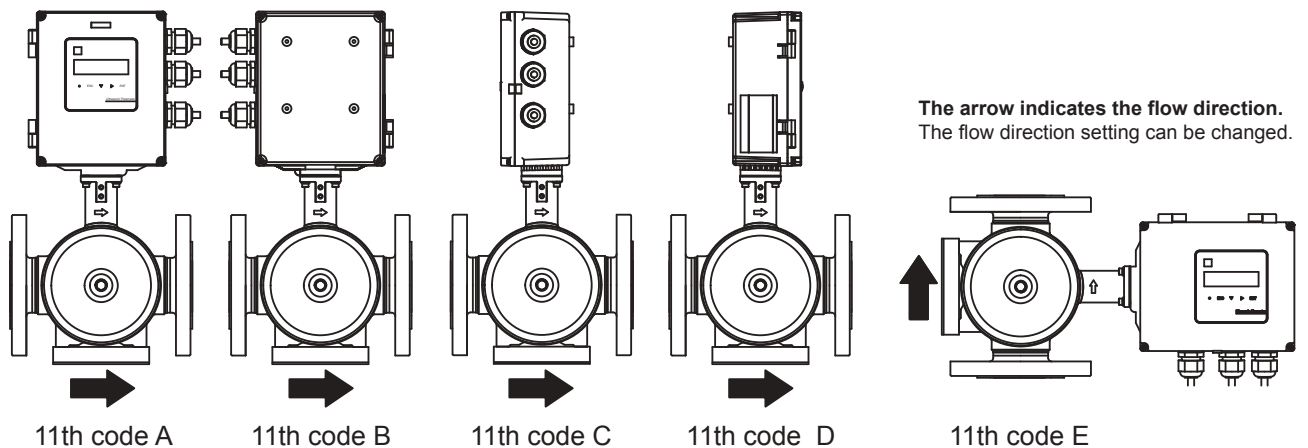
SCOPE OF DELIVERY

1. Flowmeter
 2. CD-ROM (contains Japanese/English/Chinese instruction manual, parameter loader software)
- Note) Bolts, nuts, and gaskets used for connecting with flange are not provided.

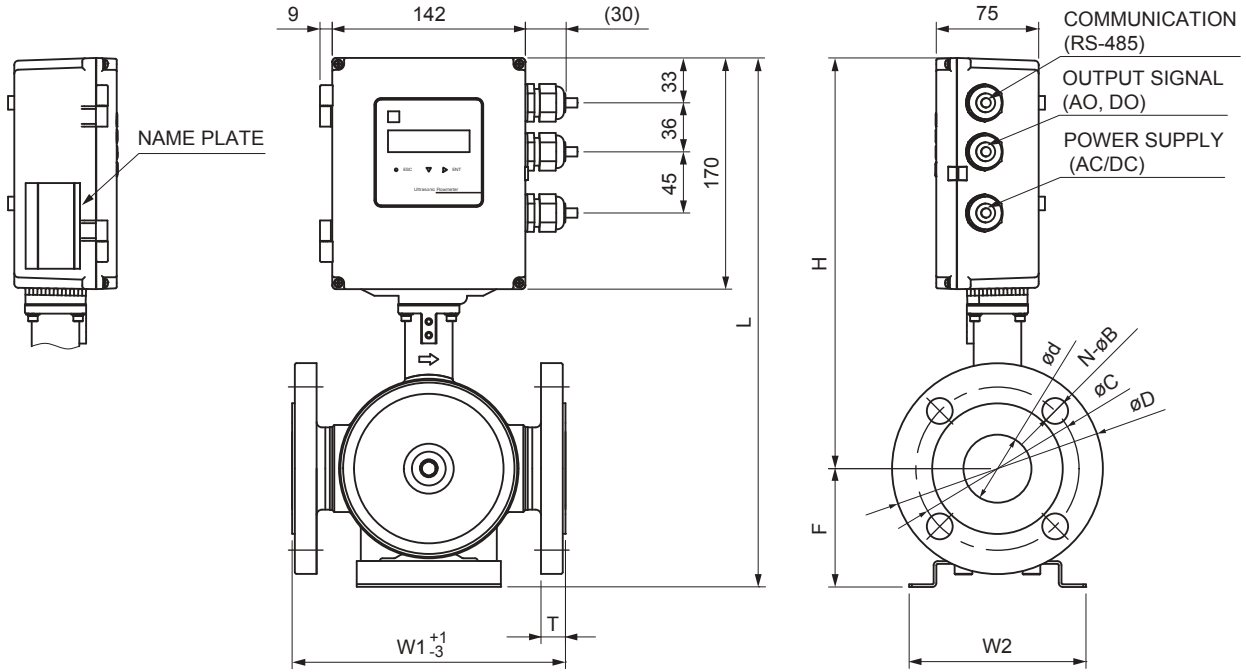
ORDERING INFORMATION

1. Code symbols
2. Tag number, as needed (up to 8 alphanumeric characters)
3. If you order a parameter set version, fill the parameter specification table on the next page and send us.

MOUNTING/WIRING PORT POSITION



OUTLINE DIAGRAM (Unit : mm)



BODY DIMENSIONS

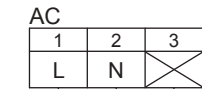
PIPE SIZE	50A	80A	100A
W1	200	300	300
W2	130	160	160
ød	50	74	97
H	303	315	326
F	87	120	129
L	390	435	455

FLANGE DIMENSIONS (6 DIGIT)

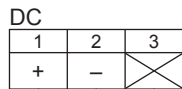
PIPE SIZE		50A	80A	100A
JIS 10K FLANGE (CODE: 1)	øD	155	185	210
	øC	120	150	175
	N-øB	4-19	8-19	8-19
	T	16	18	18
	MASS. (kg)	13	18	23
ANSI 150LB FLANGE (CODE: 3)	øD	150	190	229
	øC	120.7	152.4	190.5
	N-øB	4-19	4-19	8-19
	T	19.1	23.9	23.9
	MASS. (kg)	13	21	27
DIN PN16 FLANGE (CODE: 5)	øD	165	200	220
	øC	125	160	180
	N-øB	4-18	8-18	8-18
	T	18	20	20
	MASS. (kg)	14	21	24
JIS 20K FLANGE (CODE: 2)	øD	155	200	225
	øC	120	160	185
	N-øB	8-19	8-23	8-23
	T	18	22	24
	MASS. (kg)	13	21	26
ANSI 300LB FLANGE (CODE: 4)	øD	165	210	254
	øC	157	168.1	200
	N-øB	8-19	8-22	8-22
	T	22.3	28.6	31.8
	MASS. (kg)	15	25	35
DIN PN40 FLANGE (CODE: 6)	øD	165	200	235
	øC	125	160	190
	N-øB	4-18	8-18	8-22
	T	20	24	24
	MASS. (kg)	15	22	28

CONNECTION DIAGRAM

(1) Power supply



100-240 V AC
50/60Hz (20VA)

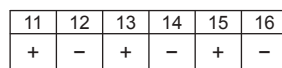


20-30 V DC (6W)

EARTH TERMINAL
(M4)

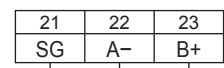


(2) Output



DO1 DO2 AO
30 V DC, 50 mA MAX. 4-20 mA DC

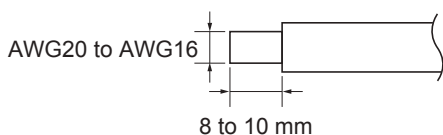
(3) RS-485 (option)



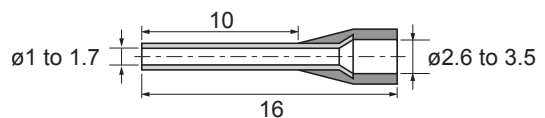
RS-485

Allowable wire

- Wire
Size: AWG20 (0.5 mm²) to AWG16 (1.5 mm²)
Strip length: 8-10 mm



- Recommended rod terminal
Weidmuller
<http://www.weidmuller.com>
Wire end ferrule with insulating collar



<Parameter specification table>

Item		Initial value	Set value	Item		Initial value	Set value	
ID No		0000						
Language		English						
Measuring conditions	System unit	Metric		Output conditions	Total output	Total mode	Stop	
	Flow unit	m ³ /h				Total rate	0 m ³	
	Total unit	m ³				Total preset	0 m ³	
Damping		5.0 s				Pulse width	50.0 ms	
Low flow cut-off		0.150 m ³ /h				Burnout (total)	Hold	
						Burnout timer	10 s	
Output conditions	Display	1st line	Flow velocity (m/s)		Communication	DO1 output type (Note 1)	Not used	
		1st line decimal point position	****.***			DO1 output action	ON when actuated	
		2nd line	Flow rate (m ³ /h)			DO2 output type	Not used	
		2nd line decimal point position	****.***			DO2 output action	ON when actuated	
	Analog output	Kind	Flow rate			Operation mode	Standard	
		Range type	Single range					
		Full scale 1	15.000 m ³ /h					
		Full scale 2	0.000 m ³ /h			Communication mode	RS-485	
		Hysteresis	10.00 %			Baud rate	9600 bps	
		Burnout (current)	Hold			Parity	Odd	
		Burnout timer	10 s		Stop bit	1 bit		
		Output low limit	-20 %		Station No.	1		
		Output high limit	120 %					
		Rate limit	0.000 m ³ /h					
Rate limit timer	0 s							

Note 1) If you specify DO1 and DO2 to output the total pulse, set the pulse width and the total rate in the way that both of the condition 1 and the condition 2 indicated below are satisfied.

$$\text{Condition 1: } \frac{\text{FULL SCALE} \times 1 \text{ [m}^3/\text{s]}}{\text{TOTAL RATE [m}^3]} \leq 100 \text{ [Hz]}$$

$$\text{Condition 2: } \frac{\text{FULL SCALE} \times 1 \text{ [m}^3/\text{s]}}{\text{TOTAL RATE [m}^3]} \leq \frac{1000}{2 \times \text{PULSE WIDTH [ms]}}$$

*1) The range of FULL SCALE 1 or FULL SCALE 2, whichever is larger, is the object in the case of automatic 2-range setup, bidirectional rage setup, and bidirectional and automatic 2-range setup.

[Remarks]

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[Reference]

	Unit
Flow velocity	m/s
Flow unit	L/s, L/min, L/h, L/d, kL/d, ML/d m ³ /s, m ³ /min, m ³ /h, m ³ /d, km ³ /d, Mm ³ /d
Total rate	mL, L, m ³ , km ³ , Mm ³

⚠ Caution on Safety

*Before using this product, be sure to read its instruction manual.

 **Fuji Electric Co., Ltd.**

Global Sales Section

Instrumentation & Sensors Planning Dept.

1, Fuji-machi, Hino-city, Tokyo 191-8502, Japan

<http://www.fujielectric.com>

Phone: +81-42-514-8930 Fax: +81-42-583-8275

<http://www.fujielectric.com/products/instruments/>