FUJI ELECTRIC

ULTRASONIC FLOWMETER <M-Flow>

DATA SHEET FLR, FLS, FLY

This meter is a clamp-on type ultrasonic flowmeter for permanent use based on transit time measuring method. This flowmeter is designed to be suitable for machine mounting, thoroughly aimed at small size, light weight and ease of use. This flowmeter can be applied to the pipe size from 25 to 225mm, providing the best cost per performance.

Flow Transmitter (FLR)

Detector (FLS)

FEATURES

1. Ease of use:
   The parameters necessary for measurement can be configured on the surface of Flow Transmitter's housing case by menu-driven software. The detector is mountable quickly and easily.
2. Compact and light weight:
   The adoption of the latest LSI technology and plastic housing has reduced the size and weight of the flow transmitter to one-fifth of our general use flow transmitter.
3. Superior temperature effect:
   The adoption of *Sound Velocity Measurement System* permits almost no influence from fluid temperature and pressure.
4. Quick response:
   With the use of fast-speed transit time processor, the system cycle is 0.2 sec that is applicable to short batch process.
5. Multilingual:
   The following languages are supported for display: English, Japanese, French, German and Spanish
6. Synchronization (option):
   Cross-talk between flowmeters located closely or acoustic interference between flowmeters installed on the same pipe line can be removed by using this synchronization function of transmission timing of ultrasonic waves.

SPECIFICATIONS

Operational specifications

System configuration:
The system is composed of a detector (Model FLS···1) and a flow transmitter (Model FLR···1), realizing single-path system.

Application: Liquid flow without aeration that ultrasonic wave can propagate (purified water, cooling water, corrosive liquids, cooling/heating medium, etc.)
Turbidity: 10000deg (mg/L) or less
Fluid temperature:
-20 to +100deg.C (With silicon rubber for acoustic couplant)
0 to +60deg.C (With silicon-free grease for acoustic couplant)
Type of flow: Well-developed turbulent or laminar flow in a full-filled pipe

Applicable flow pipe:
Pipe size: 25 to 100mm (FLSE1) or 50 to 225mm(FLSE2) for plastic pipes
50 to 100mm (FLSE1) or 50 to 225mm (FLSE2) for metal pipes
Material: Plastics (PVC, PVDF, PEEK, PP, FRP, etc.) or Metals (Carbon steel, SS, copper, aluminum, etc.)
Liner: Tar epoxy, mortar, rubber, and others
Fundamental straight pipe:
10D for upstream and 5D for downstream (D: pipe diameter)
Refer to "Conditions on straight pipe" for details.

Velocity: 0 to ±0.3 ··· ±10m/s

Power supply: 100 to 120V AC ±10%, 50/60Hz or 200 to 240V AC ±10%, 50/60Hz or 20 to 30V DC

Signal cable: RF co-axial cable up to 30m with water-proof BNC at one end and thermal stability of 100 deg.C

Environment: Non-explosive environment without direct sunlight, corrosive gas and heat radiation

Ambient temperature:
-20 to +50deg.C for flow transmitter
-20 to +60deg.C for detector

Ambient humidity:
90%RH or less

Grounding: Class D (less than 100 ohm)

Synchronization (option):
Cross-talk when located closely or acoustic interference when installed on the same pipe line removable by simultaneous transmission of ultrasonic waves
Number of connectable units: up to 31
Cable length: up to 15m
Master/Slave selectable

Arrester (option):
Arrester unit for outputs available (while arrester for power supply incorporated as standard)

Performance specifications

Accuracy:

Pipe size (inside dia.)	2m/s or more	Less than 2m/s
25 to less than 50mm	±3% of rate	±0.06m/s
50 to 225mm	±2% of rate	±0.04m/s

Response time: System cycle: 0.2s
Dead time: less than 0.2s, Time constant: 0.1s

Power consumption:
15VA or less for AC power supply
5W or less for DC power supply

Permissible air volume rate:
Up to 0.2% at 1 m/s (inversely proportional to velocity)

Short-term thermal stability:
140deg.C, 30min

Functional specifications

Analog output: 4 to 20 mA DC (1 point)
Max. load resistance : 600 ohm

Digital output: + total, - total, alarm, acting range, flow switch or total switch arbitrarily available
Transistor open collector: 1 point (DO1)
Capacity: 30V DC, 0.1A
Normal off/on selectable
Total pulse: 1pulse/day to 100pps (Pulse width: 5, 10, 50, 100 or 200ms)
Mechanical relay contact: 1point (DO2), with socket (exchangeable)
Normal close/open selectable
Capacity: 220V AC /30V DC, 1A (resistive load)
Mechanical expected life: More than 2 x 10^7 operations
Total pulse: 1pulse/day to 1pps (Pulse width: 50, 100 or 200ms)

Communication interface (option):
RS-232C equivalent / RS-485
Number of connectable units: one (RS-232C)/ up to 31 (RS-485)
Baud rate: 2400/4800/9600/19200 bps selectable
Parity: None/Odd/Even selectable
Stop bit: 1 or 2 bits selectable
Cable length: up to 15m (RS-232C)/up to 1km (RS-485)
Data: Velocity, flow rate, +total, -total, status, etc.

Display device: 2-color LED (Normal: green, Extraordinary: red)
LCD with 2 lines of 16 characters and back light

Display language:
English, Japanese, French, German or Spanish selectable

Velocity/Flow rate display:
Display of velocity and/or flow rate with flow direction
Number: 9 digits (decimal point be counted as 1 digit)
Unit: Metric/Inch system selectable

	Metric system	Inch system
Velocity	m/s	ft/s
Flow rate	L/s, L/min, L/h, kL/h, ML/d, m^3/s, m^3/min, m^3/h, Mm^3/d, BBL/s, BBL/min, BBL/h, MBBL/d	gal/s, gal/min, gal/h, kgal/h, Mgal/d, ft^3/s, ft^3/min, ft^3/h, Mft^3/d, BBL/s, BBL/min,BBL/h, MBBL/d

Note: The "gal" means USgal.

Total display: Display of forward or reverse total
Number: 7digits (decimal point be counted as 1digit)
Unit: Metric/Inch system selectable

	Metric system	Inch system
Total	mL, L, m^3, km^3, Mm^3, mBBL, BBL, kBBL	gal, kgal, ft^3, kft^3, Mft^3, mBBL, BBL, kBBL, ACRE-in, ACRE-ft

Configuration: Fully configurable from the 4-key pad (ESC, △ , ▷ , ENT) on the surface of flow transmitter's housing case by menu-driven software

Zero adjustment:
Set zero/Clear available

Damping: 0 to 100s (every 1s) configurable for analog output and display

Low flow cut off :
0 to 5m/s configurable

Alarm: Hardware fault/Process fault applicable to digital output

Burnout: Analog output : Hold/Over-scale/Under-scale/ Zero selectable
Total: Hold/Count selectable
Working timer : 0 to 100s (every 1s) configurable

Bi-directional range:
Forward and reverse ranges configurable independently
Hysteresis: 0 to 10% of acting range configurable
Acting range applicable to digital output

Auto-2 ranges: Forward 2 ranges configurable independently
Hysteresis:0 to 10% of acting range configurable
Acting range applicable to digital output

Flow switch: Lower and upper switching points configurable independently
Acting point applicable to digital output

Total switch: +total switching point configurable
Acting point applicable to digital output

Physical specifications

Enclosure protection:
IP65 for both flow transmitter and detector
(When water-proof BNC is applied)

Mounting: Flow transmitter: Wall/2B pipe mount
Detector: Clamped on pipe surface

Acoustic coupler:
Silicon rubber or silicon-free grease

Material: Flow transmitter: Plastic ABS
Detector: Plastic PBT for sensor housing,
304SS for guide frame

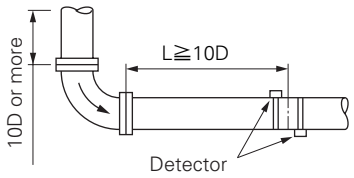
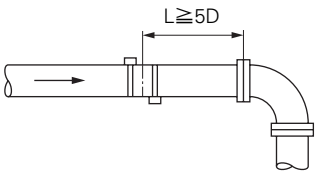
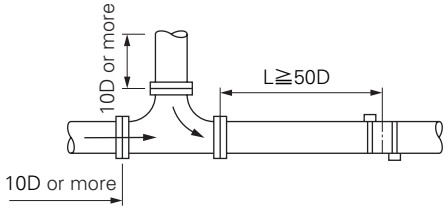
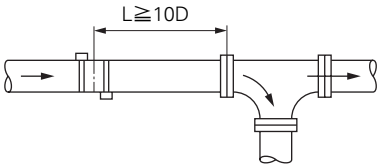
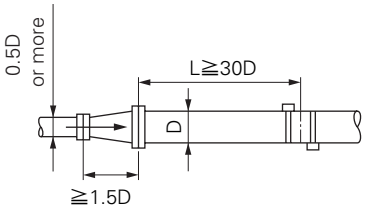
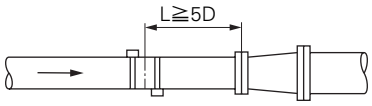
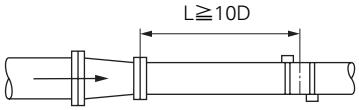
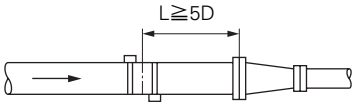
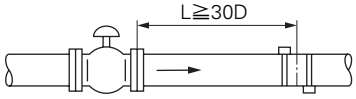
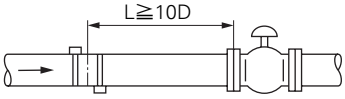
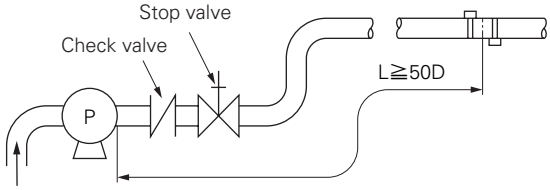
Sensor cable: 3D2V with outside diameter 5mm

Dimensions: Flow transmitter: H140 x W139 x D68mm
Detector: H28 x W240 x D50mm for FLSS1
H28 x W360 x D50mm for FLSS2

Mass: Flow transmitter: 0.8kg
Detector: 0.3kg (FLSS1) / 0.4kg (FLSS2)

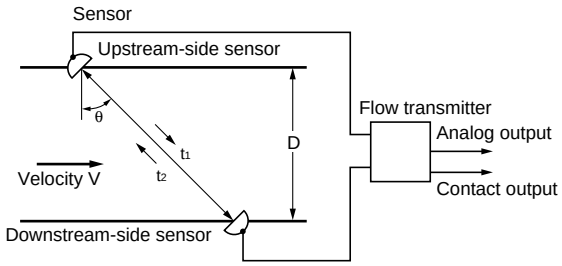
Conditions on straight pipe

(D : Inside diameter of pipe)

Classification	Upstream side	Downstream side
90° bend		
Tee		
Diffuser		
Reducer		
Various Valve	 In case that flow control valve exists on upstream side.	 In case that flow control valve exists on downstream side.
Pump		

(Note) The source : JEMIS-032

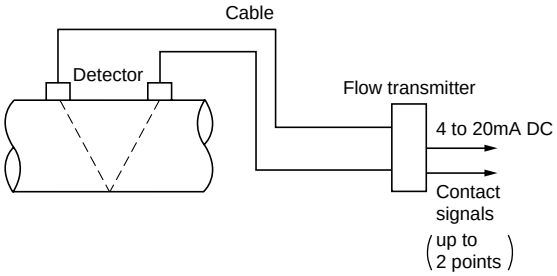
MEASURING PRINCIPLE



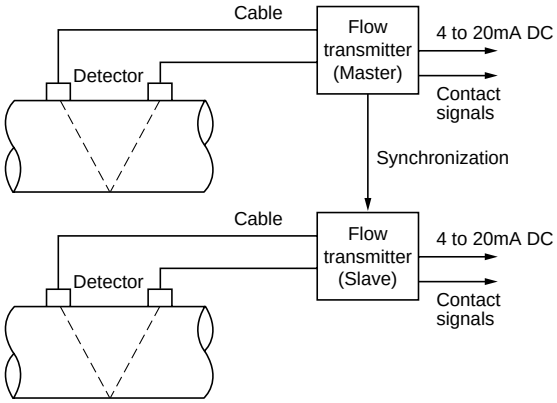
The transit-time technique uses a pair of sensors with each sensor sending and receiving ultrasonic signals obliquely through the fluid.
When the fluid is flowing, transit-time in the forward direction is shorter than one in the reverse direction.
As the difference between these transit-time is proportional to the velocity, the flow rate and direction can be measured properly by detecting such time difference.

CONFIGURATION

(1) Single-path system (V method)



(2) When using synchronization



CODE SYMBOLS

<Flow Transmitter>

1 2 3 4 5 6 7 8 – 9 10 11	Description
F L R E _ _ _ 1 – 1 _ Y	
E	**Type** (4th digit) Standard for exports
2	**Power Supply** (5th digit) 100 to 120Vac, 50/60Hz
3	200 to 240Vac, 50/60Hz
4	20 to 30Vdc
Y	**Communication & Synchronization** (6th digit) None
A	RS-232C
B	RS-485 & Synchronization
C	Synchronization
Y	**Arrester** (7th digit) None
A	With arresters for outputs
1	**Modification No.** (8th digit) Mark 1
1	**Case structure** (9th digit) IP65
A	**Mounting bracket** (10th digit) For 2B pipe mount
B	For wall mount
Y	**Option (11th digit)** None

(Note) This type has not so tough endurance against aeration as Fuji's general use ultrasonic flowmeters TIME DELTA-S/F (Model: FLV/FLH) and PORTAFLOW-X (Model: FLC). For applications containing air bubbles, those general use flowmeters are recommendable to be used.

<Detector>

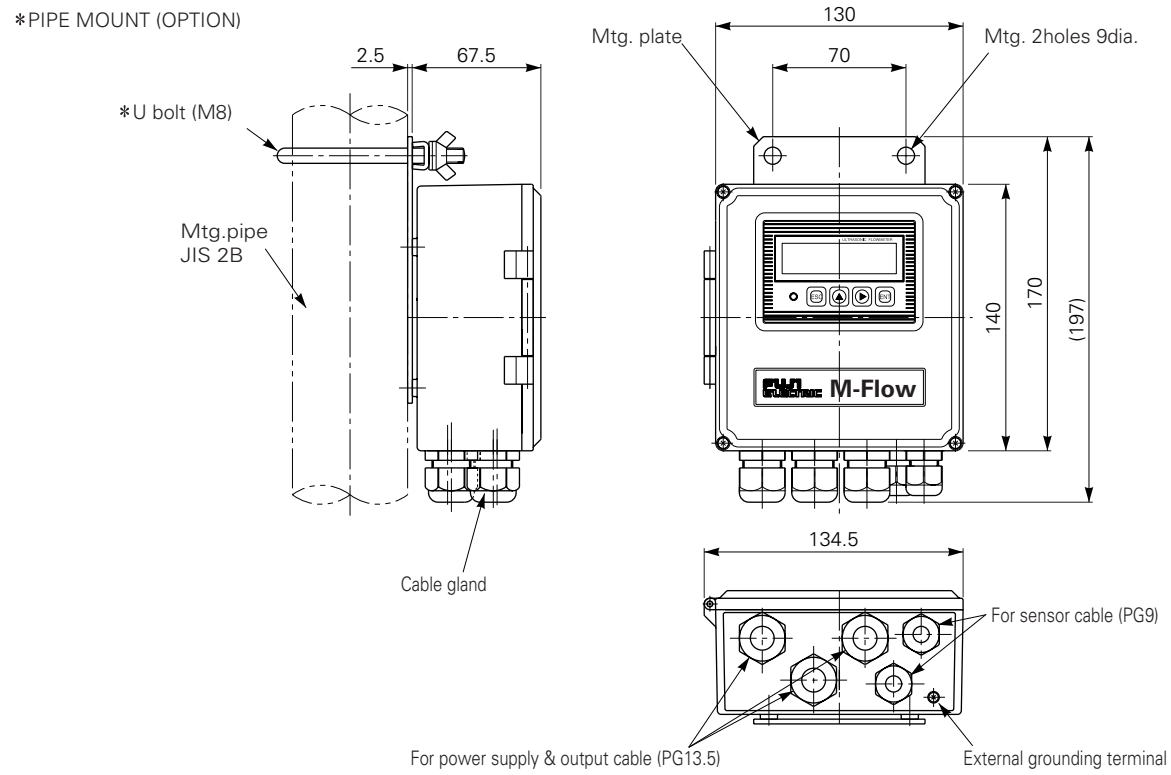
1 2 3 4 5 6 7 8 – 9 10	Description
F L S E _ 2 1 – Y Y	
E	**Type** (4th digit) Standard
1 2	**Kind of detector** (5th to 6th digit) Small size detector (for 25 to 100mm)
2 2	Middle size detector (for 50 to 225mm)
Y	**Acoustic coupler** (7th digit) None
A	Silicon rubber (Fluid temperature: -20 to +100 deg.C)
B	Silicon-free grease (Fluid temperature: 0 to +60 deg.C)
1	**Modification No.** (8th digit) Mark 1
Y	**Mounting method** (9th digit) Standard (V-mount)
Y	**Option** (10th digit) None

<Signal cable>

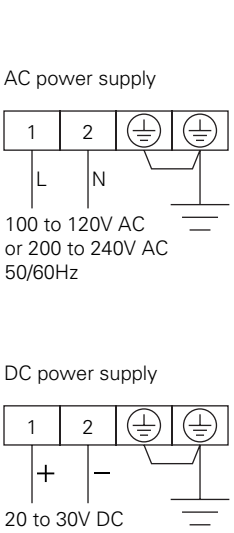
1 2 3 4 5 6 7 8	Description
F L Y 3 _ _ _ 1	
3	**Kind of cable** (4th digit) Heat resisting cable with water-proof BNC
0 0 5	**Cable length** (5th to 7th digit) 5m (one pair)
0 1 0	10m (one pair)
0 1 5	15m (one pair)
0 2 0	20m (one pair)
0 3 0	30m (one pair)
1	**Modification No.** (8th digit) Mark 1

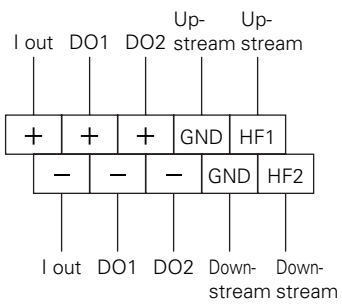
OUTLINE DIAGRAM (Unit:mm)

<Flow transmitter (type: FLR)>

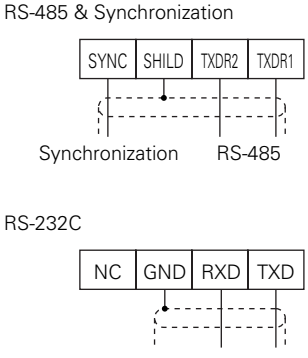


CONNECTION DIAGRAM

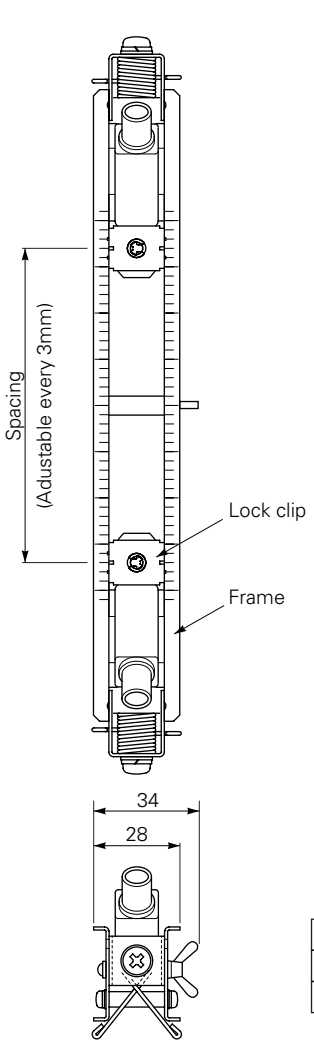


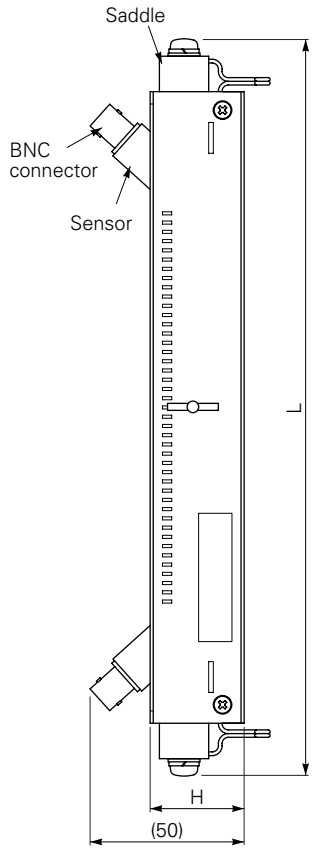


(Note)
DO1 : Transister open collector
DO2 : Mechanical relay contact



<Detector (type: FLS)>





Type	Pipe size (mm)	L	H	Spacing	Mass. approx. (kg)
FLSE1	25 to 100	240	31	21 to 120	0.3
FLSE2	50 to 225	360	30	21 to 240	0.4

SCOPE OF DELIVERY

Flow transmitter FLR:
- Flow transmitter
- Instruction manual

Detector FLS:
- Sensor unit
- Mounting belt
- Silicon rubber/ Silicon-free grease (option)

Signal cable FLY :

Orignal cable (2 wires)

The product conforms to the requirements of the Electromagnetic compatibility Directive 89/336/EEC as detailed within the technical construction file number TN513321. The applicable standards used to demonstrate compliance are :

EN 61326 : 1998

Electrical equipment for measurement, control and laboratory use ——
EMC requirements

⚠ Caution on Safety

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

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