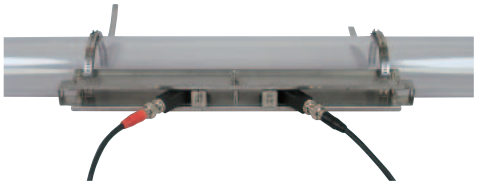
ULTRASONIC FLOWMETER <M-Flow PW>

DATA SHEET FLR, FLS, FLY

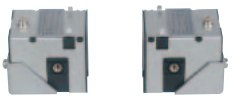
This meter is a clamp-on type ultrasonic flowmeter for permanent use based on transit time measuring method. The M-Flow PW is ideal for clean liquids containing no air bubbles such as pure water. The easy-to-use compact and lightweight design is intended for integration into mechanical devices. The flowmeter applicable to small and medium size pipes of diameter range from 25mm to 600mm provides superior cost performance.

Flow Transmitter (FLR)



Detector (FLSE12)
(FLSE22)

Detector (FLSE31)



Detector (FLSE41)

FEATURES

1. Ease of use:
   The detector (type: FLSE□2) is mountable quickly and easily.
   The parameters necessary for measurement can be configured on the surface of Flow Transmitter's housing case by menu-driven software.
2. Compact and light weight:
   The adoption of the latest electronics technology 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, which calculates sound velocity from transit time, keeps the flowmeter unaffected by the temperature and the pressure of the fluid to be measured.
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):
   Simultaneous transmission to two or more converters is allowed.
   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) and a flow transmitter (Model FLR), realizing single-path system.

Application: Clean liquids that pass ultrasound and do not contain air bubbles (such as pure water and chemical solution)
Turbidity: 10000deg (mg/L) or less
Fluid temperature (Continuous use rating):
-20 to +100deg°C (type: FLSE□2□3-Y)
0 to +120deg°C (type: FLSE□2□3-A)
-20 to +80deg°C (type: FLSE□1)
(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:

Detector	Internal pipe diameter	Pipe material	Installation method	Fluid temperature range
FLSE12	ø25 to ø100mm	Plastic (PVC, etc.) Note 1	V	9th digit in code symbol Y...-20 to +100°C A...0 to +120°C
	ø50 to ø100mm	Metal (stainless steel, steel, copper, aluminum, etc.)		
FLSE22	ø50 to ø225mm Note 3	Plastic (PVC, etc.) Note 1 Metal (stainless steel, steel, copper, aluminum, etc.) Note 2		
FLSE31	ø50 to ø300mm	Plastic (PVC, PP, PVDF, etc.) Metal (stainless steel, steel, copper, aluminum, etc.) Note 2	V	-20 to 80C
FLSE41	ø300 to ø600mm		Z	

Note 1: Select FLSE31 or FLSE41 if the pipe is made of PP or PVDF. The wall thickness of PP pipe is 15 mm or less, and that of PVDF pipe is 9 mm or less.
Note 2: Select FLSE31 or FLSE41 for the pipes that do not transmit ultrasound easily such as those made of cast iron, lining pipes, and old steel pipes.
Note 3: When the 9th digit in the code symbol is "A", the applicable piping diameter is 50 to 150mm.

Liner: Tar epoxy, mortar, rubber, and others
Fundamental straight pipe:
10D for upstream and 5D for downstream (D: internal 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: Co-axial cable up to 30m 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 (100 Ω or less)

Synchronization (option):
Simultaneous transmission eliminates cross talk between multiple flow meters and mutual acoustic interference.
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 rating:

Plastic pipe

Internal diameter	Velocity: 2m/s or higher	Velocity: Less than 2m/s
ø25 to ø50mm	±2.5% of rating	±0.05m/s
ø50 to ø600mm	±1.5% of rating	±0.03m/s

Metal pipe

Internal diameter	Velocity: 2m/s or higher	Velocity: Less than 2m/s
ø50 to ø600mm	±2% of rating	±0.04m/s

Response time: System cycle: 0.2s
Dead time: 0.2s or less, 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 (in case FLSE□2)
Note: Use FLSE31/FLSE41 at the temperature of 80°C or lower.

Functional specifications

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

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 2×10^5 operations (under rated load)
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, forward total, reverse 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:
Instantaneous velocity/flow rate display (The flow of opposite direction is displayed by minus numerals.)
Numeral: 7 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
Numeral: 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:
Jetproof type (IP65) both for converter and detector (FLSE□2: When waterproof BNC connector is provided)
FLSE□1: Immersion-proof type (IP67) (When the terminal block is filled with silicon rubber after wiring)

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

Acoustic coupler:
Silicon rubber or silicon-free grease

Material: Flow transmitter: Plastic ABS
Detector (type: FLSE□2):
Plastic PBT for sensor housing, SUS304 for guide frame
Detector (type: FLSE□1):
Plastic PBT for sensor housing, SUS304 for sensor cover, SUS304 and PBT for guide rail

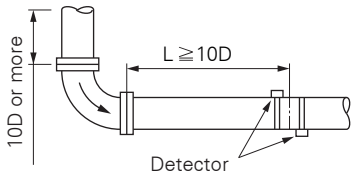
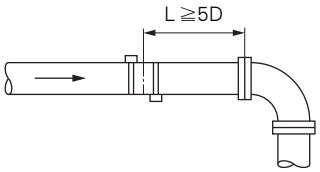
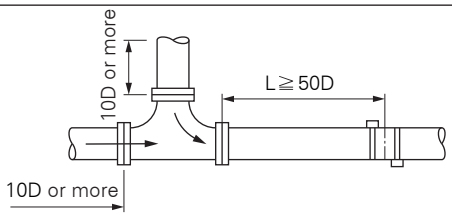
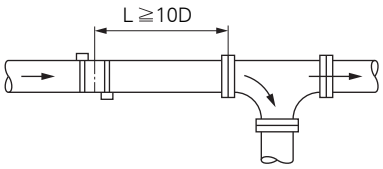
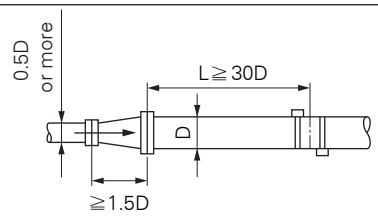
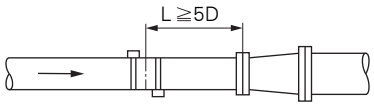
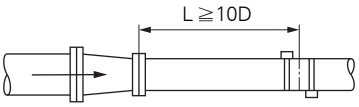
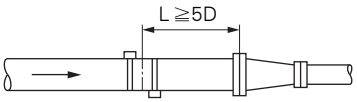
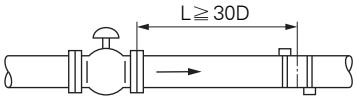
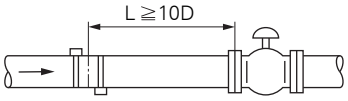
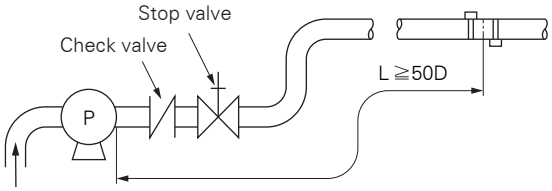
Sensor cable: 3D2V with outside diameter 5mm

Dimensions: Flow transmitter: H140 x W137 x D68mm
Detector: H50 x W228 x D34mm (FLSE1)
H50 x W348 xD34mm (FLSE2)
H40 x W500 x D80mm (FLSE3: mounting V method)
H40 x W72 x D60mm (FLSE4: mounting Z method)

Mass: Flow transmitter: 0.8kg
Detector: 0.3kg (FLSE1) / 0.4kg (FLSE2)
1kg (FLSE3: mounting V method)
0.4kg (FLSE4: mounting Z method)

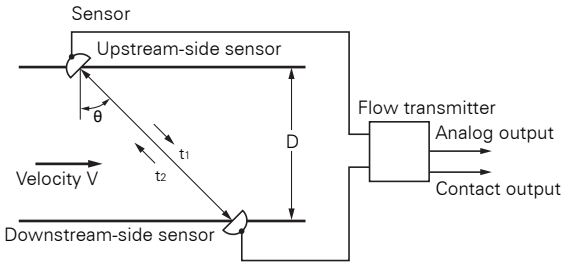
Conditions on straight pipe

(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

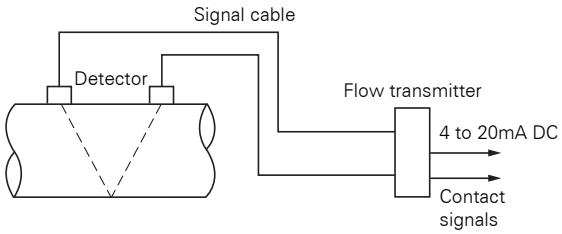
MEASURING PRINCIPLE



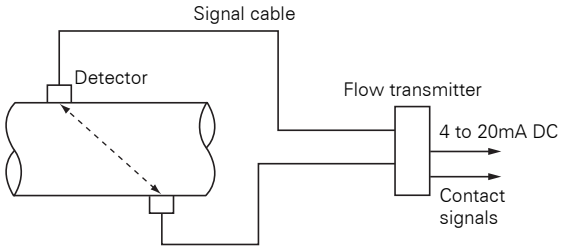
The transit-time technique uses a pair of sensors with each sensor sending and receiving ultrasonic signals obliquely through the fluid.

CONFIGURATION

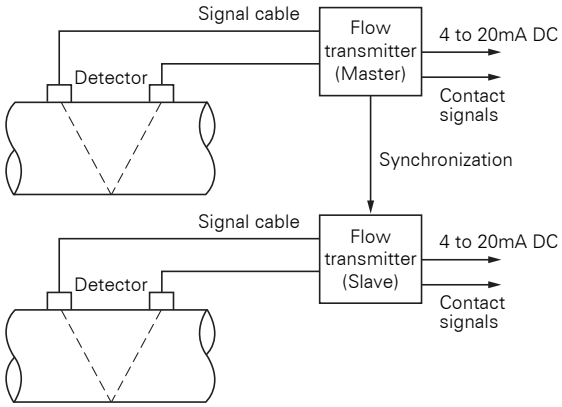
(1) Single-path system (V method)



(2) Single-path system (Z method)



(3) When using synchronization



<Dedicated Signal cable>

1 2 3 4 5 6 7 8

F L Y _ _ _ _ 1

	Description
	Type (4th digit)
3	Heat-resistant cable with one-side waterproof BNC connector for FLSE12 and FLSE22
4	Heat-resistant cable for FLSE31 and FLSE41
	Cable length (5th to 7th digit)
0 0 5	5m
0 1 0	10m
0 1 5	15m
0 2 0	20m
0 3 0	30m
	Modification No. (8th digit)
1	Mark 1

CODE SYMBOLS

<Flow Transmitter>

1 2 3 4 5 6 7 8 9 10 11 12

F L R E _ _ _ 2 – 1 _ _ _ –

	Description
	Type (4th digit)
E	Standard for exports
	Power Supply (5th digit)
2	100 to 120Vac, 50/60Hz
3	200 to 240Vac, 50/60Hz
4	20 to 30Vdc
	Communication and Synchronization (6th digit)
Y	None
A	RS-232C
B	RS-485 and Synchronization
C	Synchronization
	Arrester (7th digit)
Y	None
A	With arresters for outputs
	Modification No. (8th digit)
2	Mark 2
	Case structure (9th digit)
1	Jetproof type (IP65)
	Mounting bracket (10th digit)
A	For 2B pipe mount
B	For wall mount
	Parameter setting, tag plate (11th digit)
Y	Without
A	With setting
B	With setting (Tag plate)
C	With Tag plate
	Detector (12th digit)
A	FLSE12, FLSE22
B	FLSE31, FLSE41

(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

F L S E _ _ _ 3 – Y _

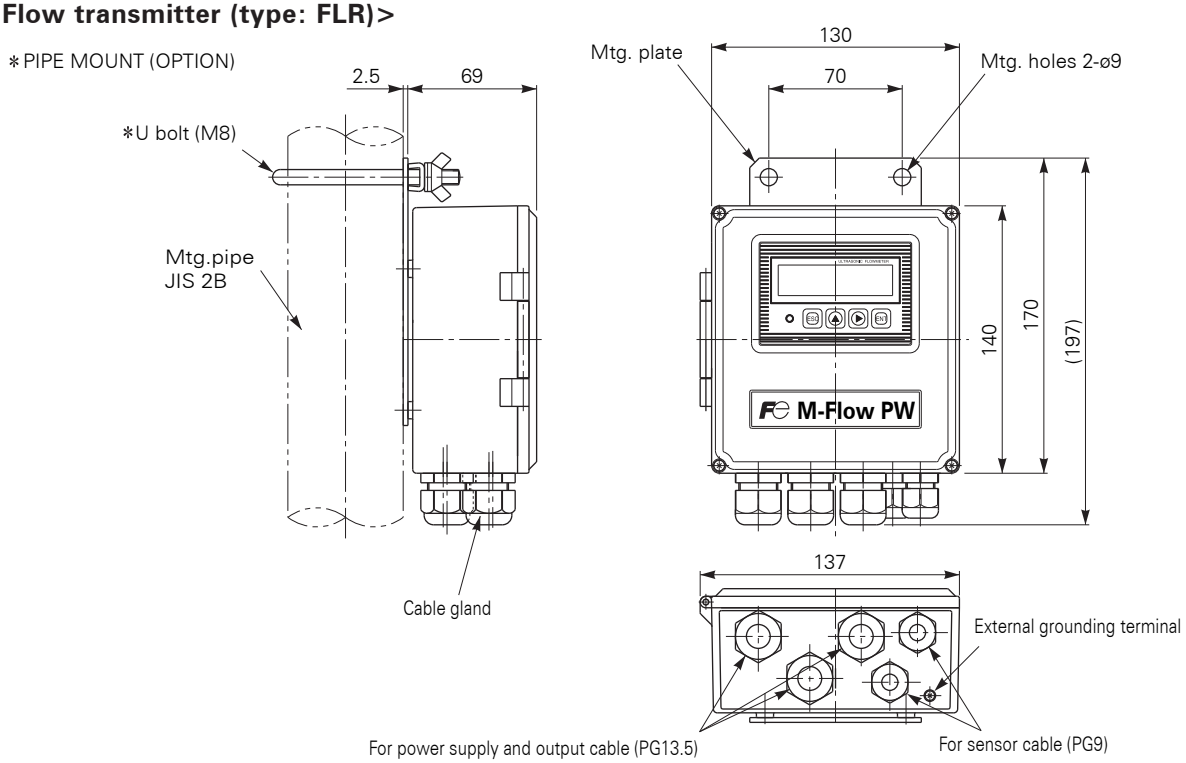
	Description
	Type (4th digit)
E	Standard
	Kind of detector (5th to 6th digit)
1 2	Small-dia. detector (ø25 to ø100 mm) } V method
2 2	Small detector (ø50 to ø225 mm) *1 } V method
3 1	Small detector (ø50 to ø300 mm) } V method
4 1	Small detector (ø300 to ø600 mm) Z method
	Acoustic coupler (7th digit) (Note)
Y	None
A	Silicon rubber (Fluid temperature: -20 to +100 deg.C)
B	Silicon-free grease (Fluid temperature: 0 to +60 deg.C)
	Modification No. (8th digit)
3	Mark 2
	Option (10th digit)
Y	Without
B	Tag plate

*1) When the 9th digit in the code symbol is "A", the applicable piping diameter is 50 to 150mm.

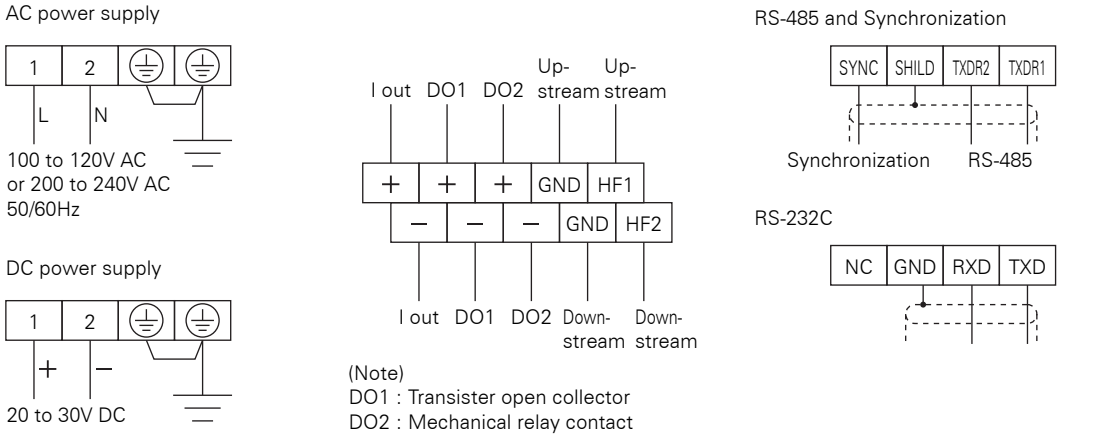
(Note) Imcase FLSE□2, select silicon rubber (A) for acoustic coupler in ordinary cases. Silicon rubber is supplied in a tube (100g). If one or more detectors are ordered, silicon rubber may be selected once every 5 orders or so.
Select silicon-free grease (B) for the use in an environment where generation of silicon is not desirable such as semiconductor manufacturing facilities. The silicon-free grease is soluble in water. Therefore, do not use it in an environment subject to splash of water or where condensation tends to occur on the surface of the piping. The grease, which does not become hardened, requires periodic maintenance (cleaning and refilling of about once in 6 months at room temperature).

OUTLINE DIAGRAM (Unit:mm)

<Flow transmitter (type: FLR)>

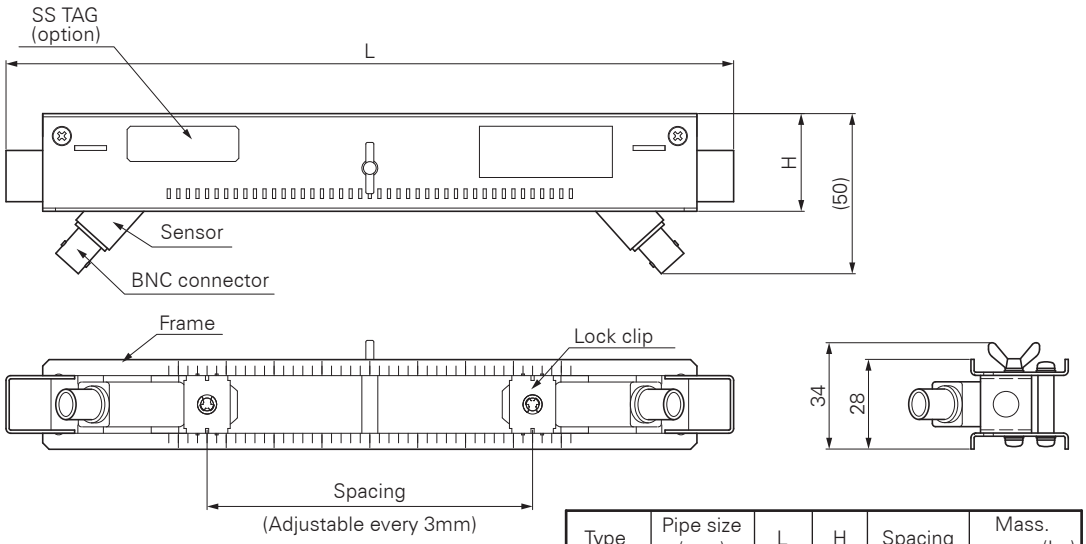


CONNECTION DIAGRAM



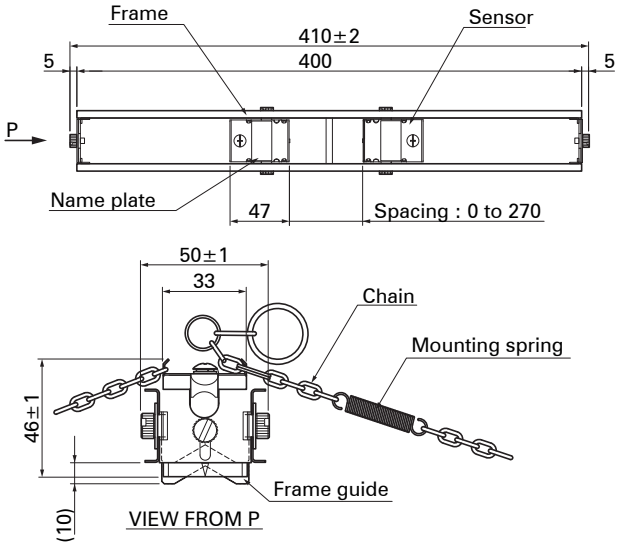
(Note)
DO1 : Transister open collector
DO2 : Mechanical relay contact

<Detector (type: FLSE□2)>

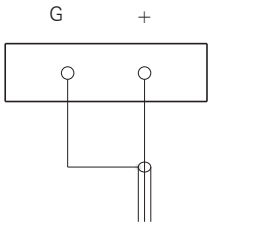


Type	Pipe size (mm)	L	H	Spacing	Mass. approx (kg)
FLSE12	25 to 100	228	31	21 to 120	0.3
FLSE22	50 to225	348	30	21 to 240	0.4

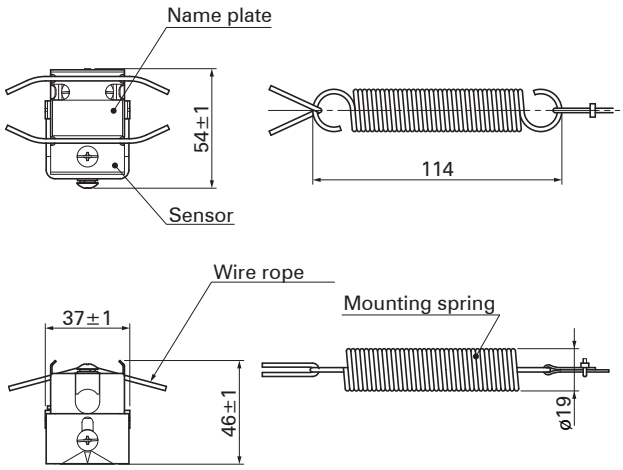
<Detector (type: FLSE31 V METHOD)>



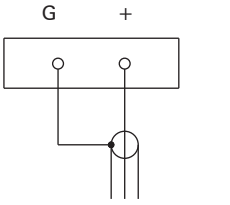
Connection diagram



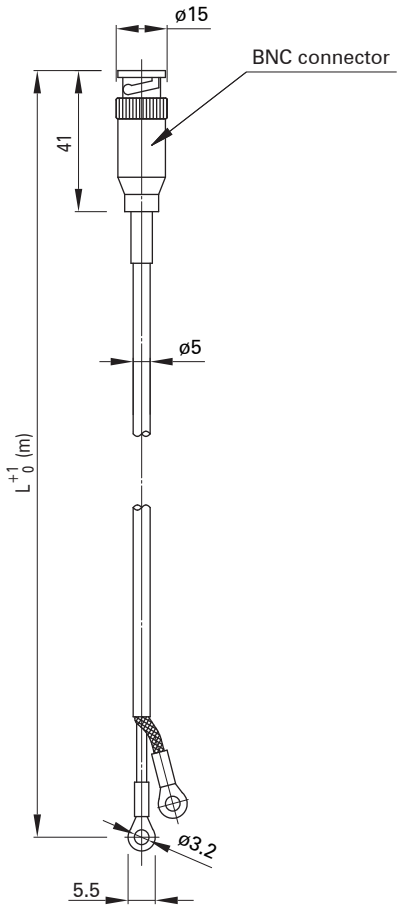
<Detector (type: FLSE41 Z METHOD)>



Connection diagram



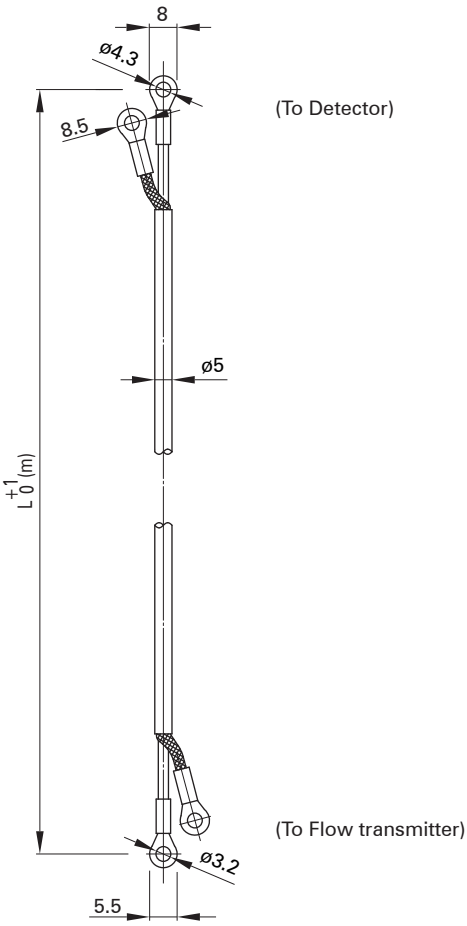
<Signal cable (type: FLY30)>



Type	L (m)	*Note1 Mass. approx. (kg)
FLY3005	5	0.6
FLY3010	10	1.2
FLY3015	15	1.8
FLY3020	20	2.4
FLY3030	30	3.6

*Note1: Total of two elements

<Signal cable (type: FLY40)>



Type	L (m)	*Note1 Mass. approx. (kg)
FLY4005	5	0.6
FLY4010	10	1.2
FLY4015	15	1.8
FLY4020	20	2.4
FLY4030	30	3.6

*Note1: Total of two elements

SCOPE OF DELIVERY

Flow transmitter FLR:
- Flow transmitter
- Instruction manual

Detector FLS:
- Sensor unit
- Mounting fixtures
- Silicon rubber or Silicon-free grease (option)

Signal cable FLY :
- Cable (one pair)

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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