TIME DELTA SERIES

ULTRASONIC FLOWMETER < TIME DELTAF (Flexible Type)>

DATA SHEET FLH…3, FLW…2, FLD…1

This flowmeter is a fixed type ultrasonic flowmeter based on transit-time measuring method. Thanks to micro-processor based electronics, the flowmeter can be easily configured from the keyboard to specific applications, the flowmeter is suitable for liquid flow measurements for pipe size 50mm to 6000mm diameter.

The flowmeter is a compact and light-weight instrument incorporating the latest electronics and high speed digital signal processing technologies (32bit MPU), realizing high performance and easy operation. This high performance flowmeter is capable of realizing a simultaneous 2-path or 2-pipe system.

Flow transmitter (FLH)

Small sensor (FLW12)

FEATURES

1. Compact and light-weight

   This flowmeter is designed through use of the latest electronics and digital signal processing technologies.

2. Full variety of sensors

   The flowmeter can be used with various types of sensors applicable for small to large pipe (ø50 to ø6000mm) and low to high fluid temperature (-40 to +200°C).

3. High accuracy

   The flowmeter is designed for high accuracy (better than ±1.0% of rate) by dynamic correction of fully-developed flow profile. Reynolds Number is calculated and a meter factor (K) is automatically applied for best accuracy at all flow velocities.

   The adoption of new sound velocity measurement system permits measurements of fluids of unknown sound velocity with slightly affecting from fluid temperature and pressure.

4. Excellent resistance against aerated flow

   Fuji' s unique ABM feature improves measurement reliability for different flows like slurries, sludge, raw sewage and bubble-contained flow (acceptable up to air bubbles of 12% volume at 1m/s velocity).

5. Simultaneous 2-path or 2-pipe system

   Average flow rate on 2 propagation paths can be measured simultaneously with less influence from changes in time of flow profile. And also flow measurement in two separate pipes with one FLH3 can be realized for calculating functions of flow.

6. Excellent performance and easy operation

   Large LCD and function keys allow easy configuration and trouble shooting.

   – LCD with back light

   – Easy mounting of sensor

   – Trouble shooting

SPECIFICATIONS

Fluid conditions

Measured flow : Liquid flow through which ultrasonic signal can be transmitted (water, sea water, oil and fluid having unknown sound velocity)

Turbidity : 10000deg (mg/L) or less

State of flow : Turbulent or Imainor uniform flow well grown up

Fluid temperature :

Small sensor Middle sensor Large sensor	-40 to +80°C
High-temperature sensor	-40 to +200°C

Velocity range : -32 to 0 to +32m/s

Piping conditions

Pipe material : Carbon steel, ss, cast iron, polyvinyl chloride, FRP, asbestos, copper, aluminum, acryl, etc.

Pipe size :

Small sensor	ø50 to ø400
Middle sensor	ø200 to ø1200
Large sensor	ø200 to ø6000
High-temperature sensor	ø50 to ø400

Lining material : None, tar epoxy, mortar, rubber, or other material with known sound velocity

Straight pipe length :

Upstream, 10D or more

Downstream, 5D or more (D= Inside diameter of pipe)

Refer to JEMIS-032 for details.

JEMIS :

Japan Electric Measuring Instruments Manufacturers' Association's standard.

Accuracy

Inside diameter	Velocity	Accuracy
ø50 to ø300 mm	2 to 32 m/s	±0.5% to 1.0% of rate
	0 to 2 m/s	0.02 m/s
ø300 to ø6000 mm	1 to 32 m/s	±0.5% to 1.0% of rate
	0 to 1 m/s	0.01 m/s

(Note) Reference conditions are based on JEMIS-032.

Flow transmitter (FLH)

Measuring system :
Simultaneous 2-path or 2-pipe or single-path

Power supply : 100 to 120V AC, 200 to 240V AC ±10% (50/60Hz)

Power consumption :
About 50VA

Indicator display : Character LCD (16-digit, 2-line), with back light

Operation unit : Sheet key (20 keys)

Power failure protection :
Backup with non-volatile memory (effective term; more than 10 years)

Response time: 1.5 sec or less

Output signal :
- Analog signal: 4 to 20A DC; 2-path, 2-pipe: 3 points, single-path: 2 points (load resistance: 0-1kΩ)
- Contact signal: Open collector (30V DC/0.1A); 2-path, 2-pipe: 6 points, single-path: 4 points
- BCD output (option): Open collector (30V DC/0.1A, insulated, negative logic); 1 set (6 digits with parity), with connector, 37 pins, D-sub and cable (2m)

Communication : RS-232C or RS-485 (equivalent) changeable, 1 channel
Baud rate: 2400 to 9600bps
Distance: 15m max. for RS-232C,
1km max. for RS-485

Ambient temperature :
-10 to +50°C

Ambient humidity :
90%RH or less (no condensation)

Enclosure : Immersion-proof (aluminum casting case) IP65 or equivalent

Finish color : Cover (blue), case (silver)

External dimensions :
H320×W240×D134mm

Mass : About 9kg

Detector (FLW)

Mounting : Clamp-on outside of existing piping

Sensor mounting method :
V or Z method

Mounting belt/wire :
Small sensor; stainless chain
Middle sensor; Large sensor; } stainless wire
High-temperature sensor; stainless belt

Acoustic coupler : Silicone grease for high temp.sensor, silicone rubber for others

Signal cable : Special coaxial cable, 150m max.

Connection method :
BNC connector for high-temperature sensor, terminal screws for others.

Ambient temperature :
-20 to +60°C

Ambient humidity :
100%RH or less

Enclosure : Enclosure: Immersion-proof (IP67 or equivalent), drip-proof for high-temperature sensor (IP52 or equivalent)
The submersible type can withstand being underwater for several days.

Material :

Kind	Sensor case	Guide rail
Small sensor	Plastic	304SS + plastic
Middle sensor Large sensor	Plastic	—
High-temperature sensor	304SS	304SS + aluminum alloy

Dimensions/mass :

Kind	Dimensions (H×W×D)	Mass
Small sensor	510×80×40mm	1.0 kg
Middle sensor	72×80×40mm	0.4 kg
Large sensor	104×93×62mm	1.4 kg
High-temperature sensor	530×52×205 mm	1.6 kg

FUNCTIONS

Display language :
Japanese (Katakana) or English, selectable

Flow rate display function :
Velocity or flow rate, selectable; unit selectable from metric and inch system

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

Total value display function :
Total value in forward or reverse direction, selectable; unit selectable from metric system and inch system

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

Instantaneous value output function :
Analog or BCD output

Calculating functions :
Average, sum or difference of two measured flow rate for 2-path or 2-pipe system

Damping : 0-100sec (time constant)

Low-flow cut : Approx. 0-5m/s or equivalent

Output setting function :
Setting of current output scaling/limit, burnout. Current output calibration is possible.

Communication function :
Velocity, flow rate, total, status

Auto range selection :
2 ranges, range discriminated by contact output

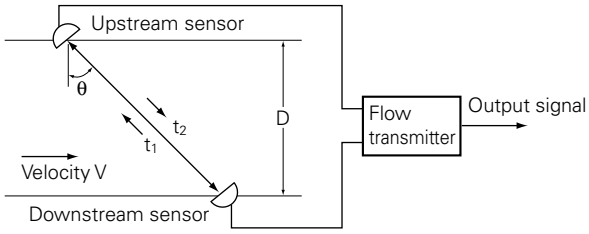
Forward/reverse range output :
Forward/reverse range, flow direction discriminated by contact output

Total pulse output :
1P/day to 5P/s, pulse width (50, 100ms, selectable), total constant setting

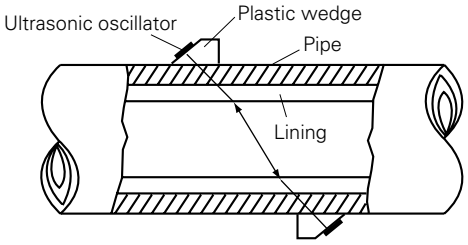
Other : Flow switch, total switch, self-diagnosis function

MEASUREMENT PRINCIPLE

Ultrasonic pulses are propagated aslant between the upstream and downstream sensors, detecting the time difference due to flow for measurement.

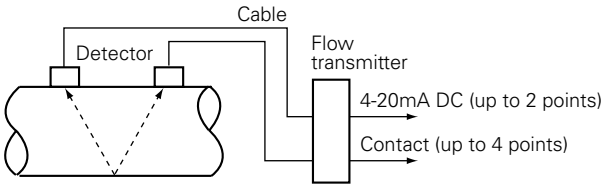


MOUNTING OF DETECTOR

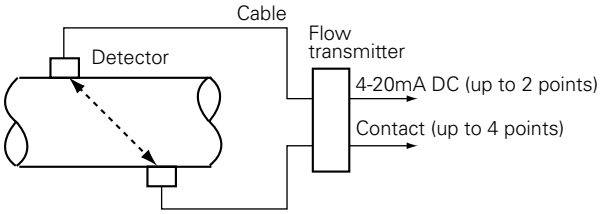


CONFIGURATION DIAGRAM

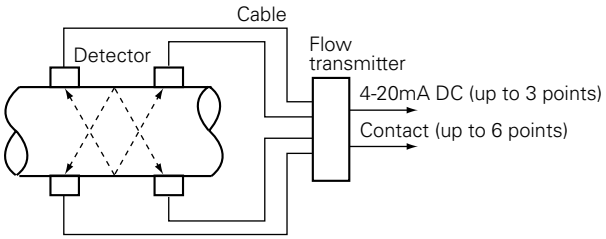
(1) Single-path system (V method)



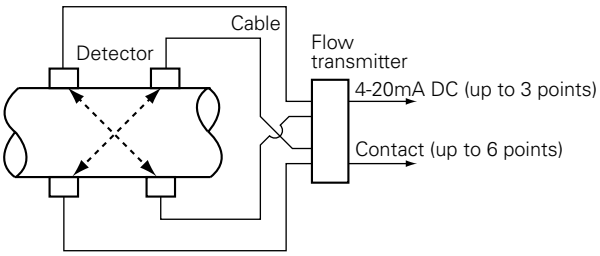
(2) Single-path system (Z method)



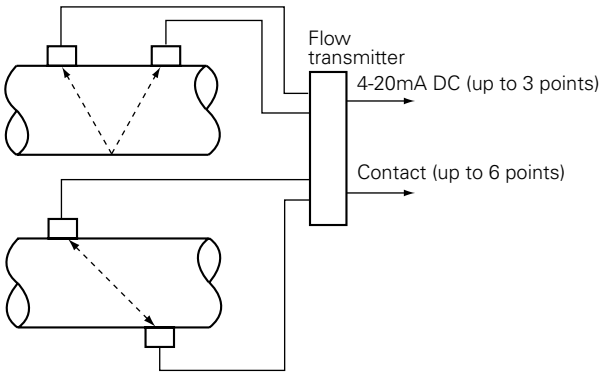
(3) 2-path system (V method)



(4) 2-path system (Z method)

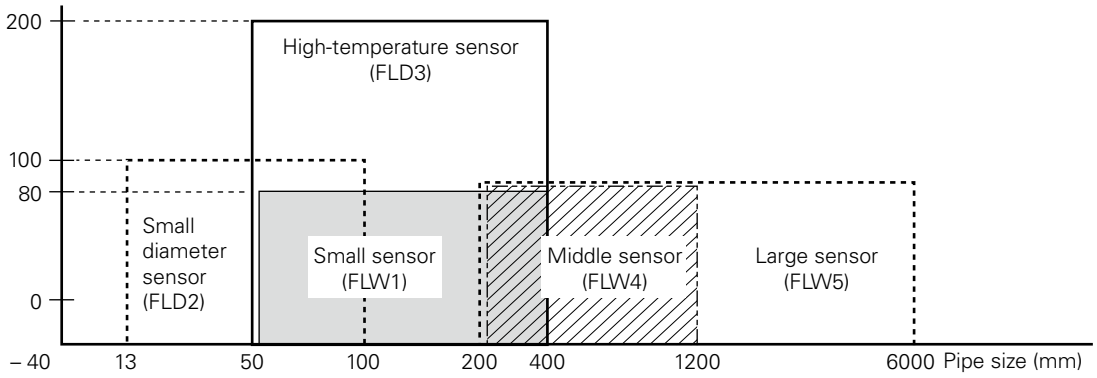


(5) 2-pipe system (with any combination of sensors)



DETECTOR SELECTION

Fluid temperature (°C)



(Note) 1. High turbid fluid or scales sticking on the internal wall of pipes may interrupt the ultrasonic propagations. Previous check with a portable type ultrasonic flowmeter is recommended.

2. In case of cast iron pipes or pipes with lining, the Large sensor is recommended rather than the Middle sensor.

3. If the pipe has poor inside surface conditions or highly attenuating fluids, you may not be able to a reliable signal, therefore you should use the "FLW50˝ sensor.

SCOPE OF DELIVERY

Flow transmitter (FLH)

	Unit name	Scope of delivery
1	Flow transmitter	1) Converter 2) Parameter table (blank) 3) Manual

Detector (FLW)

	Unit name	Scope of delivery
1	Small/high-temperature/middle/large sensor	1) Sensor unit 2) Signal cable (for submerged type) 3) Mounting chain/wire/belt 4) Silicone rubber/grease (100g)

Signal cable (FLY)

	Unit name	Scope of delivery
1	Signal cable	Special cable (2pcs)

CODE SYMBOLS

<Flow transmitter>

	Description
	Case structure
2	Immersion-proof structure
	Data display
C	Japanese/English selection display
	Application
Y	Single-path
B	2-path or 2-pipe
	Power supply
3	100 to 120V AC, 50/ 60Hz
4	200 to 240V AC, 50/ 60Hz
	Conduit connection
Y	With cable gland
A	With cable gland for pulica tube
	Option
0	None
1	With BCD output
	Tag plate
Y	None
T	With Tag plate

<SIGNAL CABLE>

	Description
	Type of sensor (4th digit code)
1	Small, middle and large sensor (FLW120/410/510)
2	Small dia. and high temp. sensor (FLD 22/32)
	Cable length (5, 6 and 7th digit)
0 0 5	5m
0 1 0	10 m
0 1 5	15 m
0 2 0	20 m
0 2 5	25 m
0 3 0	30 m
0 3 5	35 m
0 4 0	40 m
0 4 5	45 m
0 5 0	50 m
0 5 5	55 m
0 6 0	60 m
0 6 5	65 m
0 7 0	70 m
0 7 5	75 m
0 8 0	80 m
0 8 5	85 m
0 9 0	90 m
0 9 5	95 m
1 0 0	100 m
1 1 0	110 m
1 2 0	120 m
1 3 0	130 m
1 4 0	140 m
1 5 0	150 m

Note: No need to order signal cable of FLY when your ordering submergence-proof or explosion-proof type sensor. A pair of cables is provided as one unit.

<DETECTOR>

Standard type

	Description
	Type
1 2 0	Small sensor (ø50 to ø400) V method (Standard)
4 1 0	Middle sensor (ø200 to ø1200) V method (Standard)
5 1 0	Large sensor (ø200 to ø6000) V method or Z method
5 0 0	Large sensor (ø200 to ø6000) V method or Z method
	Option
Y	None
A	Tag name plate
	Mounting method
Y	Standard
2	Z method

(Note) Signal cables are not provided with detector. Signal cable FLY should be ordered separately.

Submerged type

	Description
	Type
1 2 1	Small sensor (ø50 to ø400) V method (Standard)
4 1 1	Middle sensor (ø200 to ø1200) V method (Standard)
5 1 1	Large sensor (ø200 to ø6000) V method or Z method
5 0 1	Large sensor (ø200 to ø6000) V method or Z method
	Option
Y	None
A	Tag name plate
	Special cable
B	10 m
C	20
D	30
E	40
F	50
G	60
H	70
J	80
K	90
L	100
M	110
N	120
P	130
Q	140
R	150
Z	Other
	Mounting method
Y	Standard
2	Z method

(Note)

1. High turbid fluid or scales sticking on the internal wall of pipes may interrupt the ultrasonic propagations. Previous check with a portable type ultrasonic flowmeter is recommended.
2. In case of cast iron pipes or pipes with lining, the Large sensor is recommended rather than the Middle sensor.
3. If the pipe has poor inside surface conditions or highly attenuating fluids, you may not be able to a reliable signal, therefore you should use the "FLW50" sensor.

Small diameter and high-temperature sensor

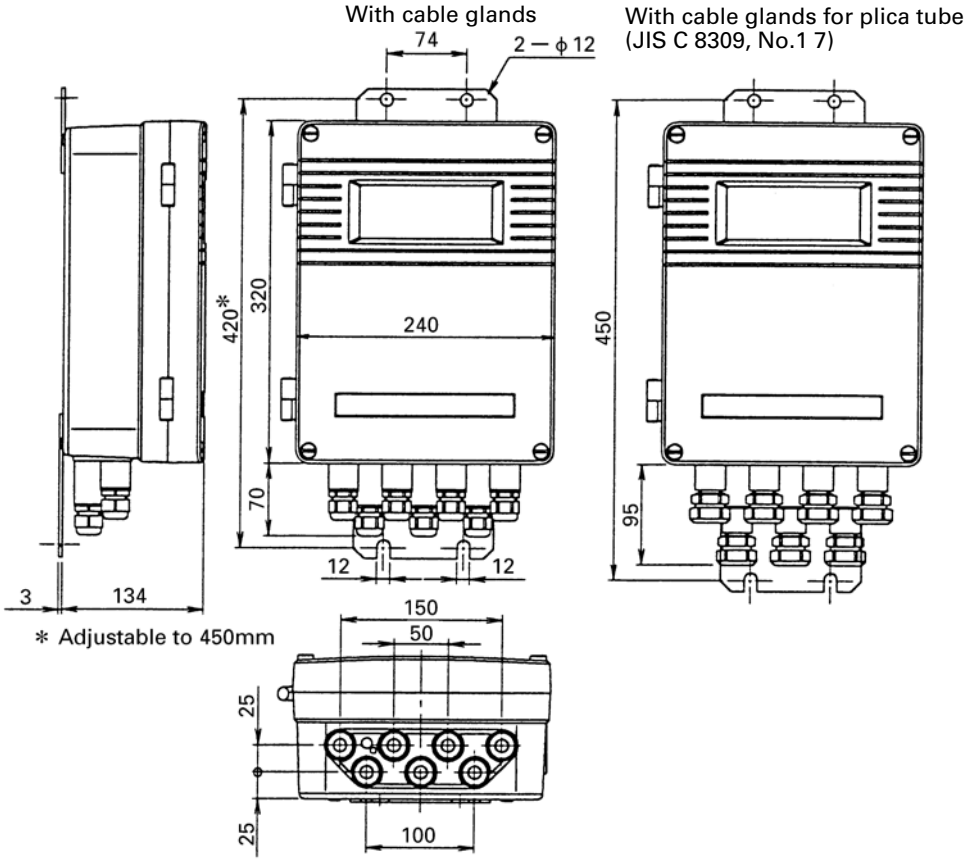
	Description
	Type
2 2 0	Small diameter sensor (ϕ13 to ϕ100)
3 2 0	High-temparature sensor (Note) (ϕ50 to ϕ400)
	Belt and Coupler
S	Fixed type
	Special cable
Y	None

(Note)

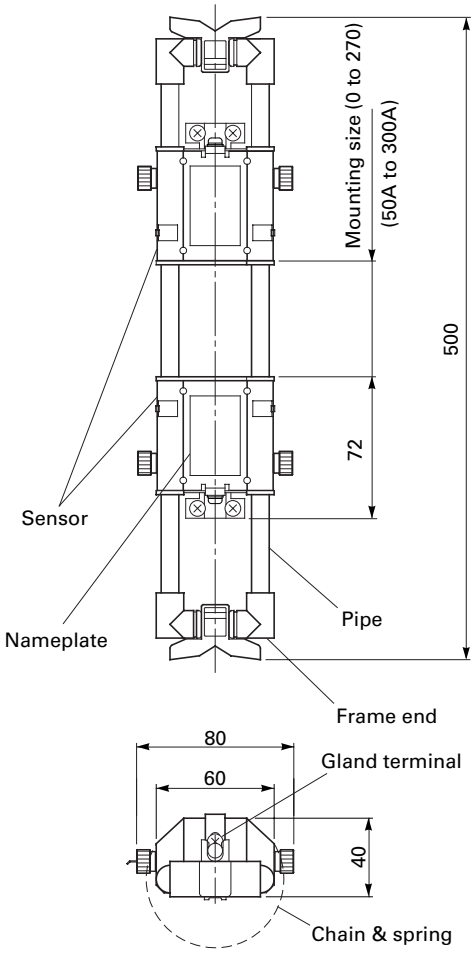
Use the optional guide rail if a pipe that does not allow ultrasonic waves to pass through easily such as an old pipe, cast iron pipe, or a pipe with mortar lining is used, or when the flow of liquid high in turbidity is measured. Employ the Z method for mounting.

Applicable diameter range: V method: ø50 to ø250
Z method: ø150 to ø400

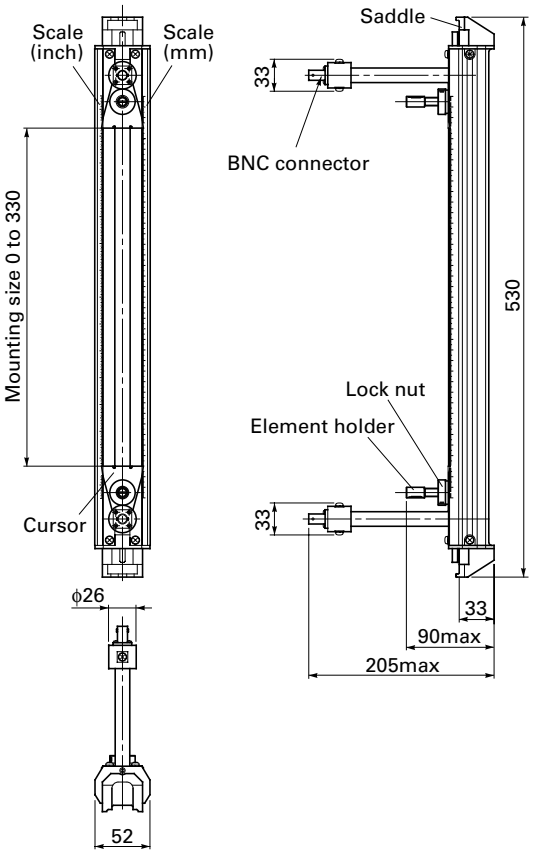
EXTERNAL OUTLINE DIAGRAM (Unit: mm)



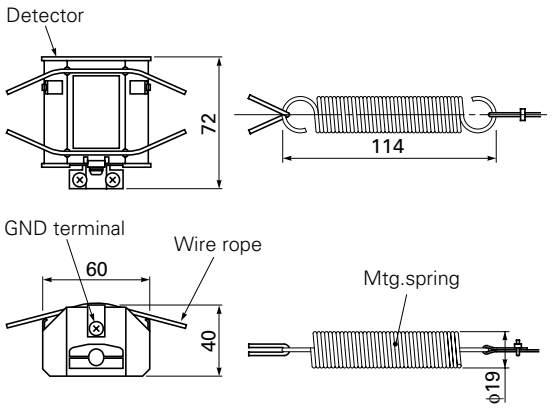
Flow transmitter, FLH



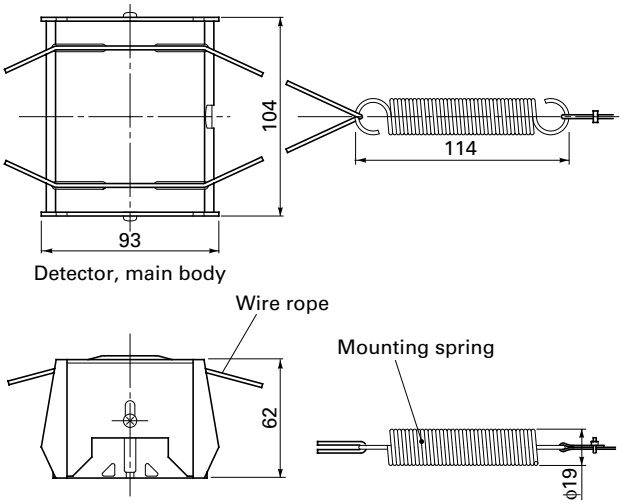
Detector, FLW1 (Small sensor)



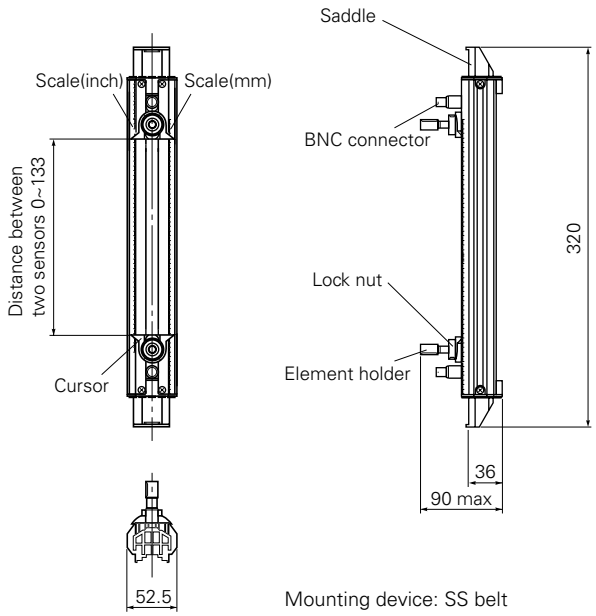
Detector, FLD32 (High-temperature sensor)



Detector, FLW41 (Middle sensor)



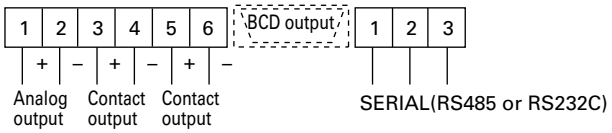
Detector, FLW5 (Large sensor)



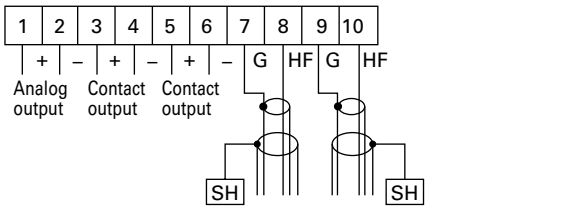
DETECTOR : FLD220 (Small diameter sensor)

CONNECTION DIAGRAM

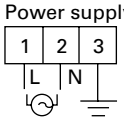
(1) Single-path system



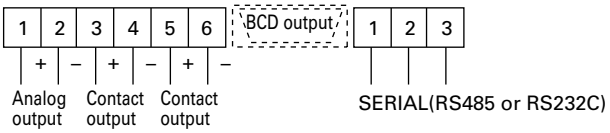
No.	RS485	RS232C
1	SHLD	COM
2	TRXD2	RXD(signal reception)
3	TRXD1	TXD(signal transmission)



Power supply

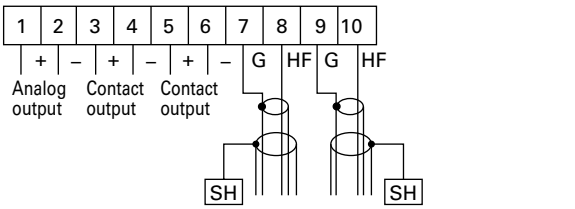


(2) 2-path or 2-pipe system

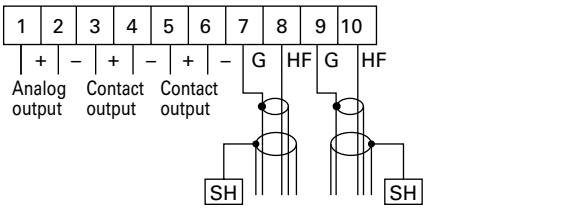


No.	RS485	RS232C
1	SHLD	COM
2	TRXD2	RXD(signal reception)
3	TRXD1	TXD(signal transmission)

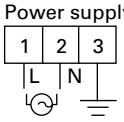
For 2-nd detector



For 1-st detector



Power supply



ITEMS DESIGNATED ORDERING

1. Detector code symbols
2. Flow transmitter code symbols
3. Signal cable code symbols
4. Tag No. , as necessary

⚠ Caution on Safety

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

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