FUJI ELECTRIC

TIME DELTA SERIES

ULTRASONIC FLOWMETER < TIME DELTA F (Flexible Type)>

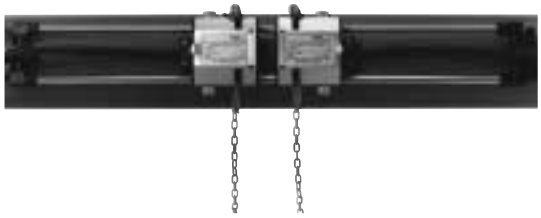
DATA SHEET

FLH•••3, FLW•••2

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.

Converter (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 (ϕ50 to ϕ6000mm) 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	ϕ50 to ϕ400
Middle sensor	ϕ200 to ϕ1200
Large sensor	ϕ200 to ϕ6000
High-temperature sensor	ϕ50 to ϕ400

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
ϕ50 to ϕ300 mm	2 to 32 m/s	±0.5% to 1.0% of rate
	0 to 2 m/s	0.02 m/s
ϕ300 to ϕ6000 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.

Converter (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)
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 m³/s, m³/m, m³/h, Mm³/d BBL/s, BBL/m, BBL/h, MBBL/d	gal/s, gal/m, gal/h, Mgal/d, ft³/s, ft³/m, ft³/h, Mft³/d BBL/s, BBL/m, BBL/h, MBBL/d

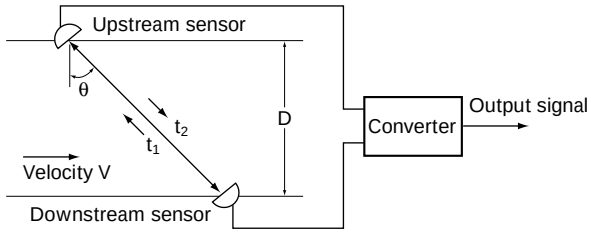
Total value display function :
Total value in forward or reverse direction, selectable; unit selectable from metric system and inch system

	Metric system	Inch system
Total value	mℓ, ℓ, m³, km³, Mm³, mBBL, BBL, kBBL	gal, kgal, ft³, kft³, Mft³, mBBL, BBL, kBBL

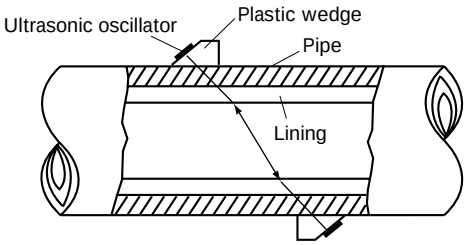
Instantaneous value output function :
Analog or BCD output
Calculating functions :
Average, sum or difference of two measured flow rate for 2-path or 2-pipe system
Damping : 0-100sec (time constant)
Low-flow cut : Approx. 0-5m/s or equivalent
Output setting function :
Setting of current output scaling/limit, 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.

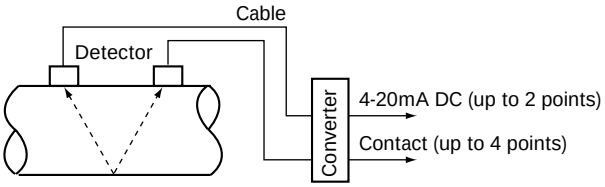


MOUNTING OF DETECTOR

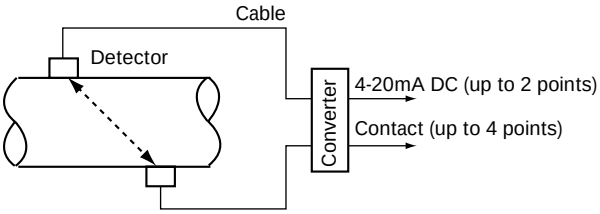


CONFIGURATION DIAGRAM

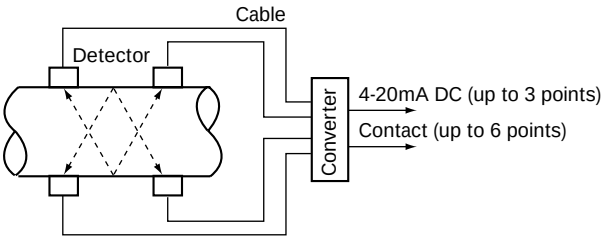
(1) Single-path system (V method)



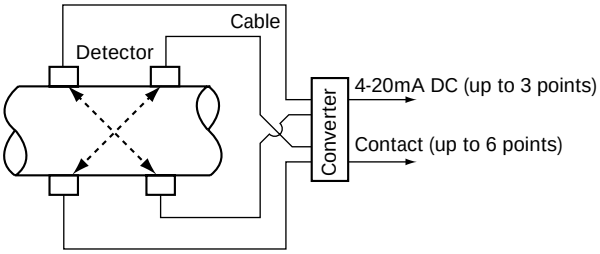
(2) Single-path system (Z method)



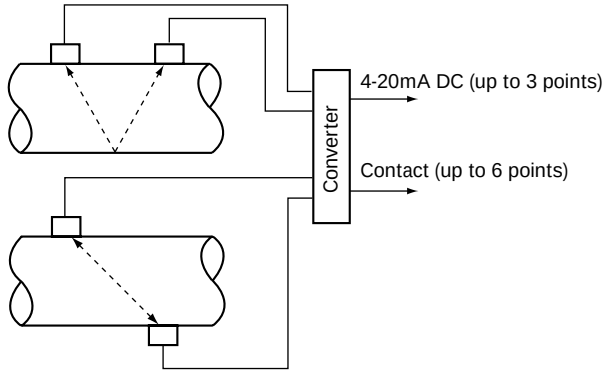
(3) 2-path system (V method)



(4) 2-path system (Z method)



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



SCOPE OF DELIVERY

Converter (FLH)

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

Signal cable (FLY)

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

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)

CODE SYMBOLS

<CONVERTER>

1 2 3 4 5 6 7 8	9 10 11	Description
F L H		3 –
		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
	0	None
	1	With Tag plate

<DETECTOR>

Standard type

Note) Two detectors and 2 sets of cables need to be prepared for 2-path and 2-pipe system.

1 2 3 4 5 6 7 8	9 10 11	Description
F L W		2 – Y Y
		Type
1 2 0		Small sensor
3 2 0		High-temperature sensor
4 1 0		Middle sensor
5 1 0		Large sensor
5 0 0		Large sensor
		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.

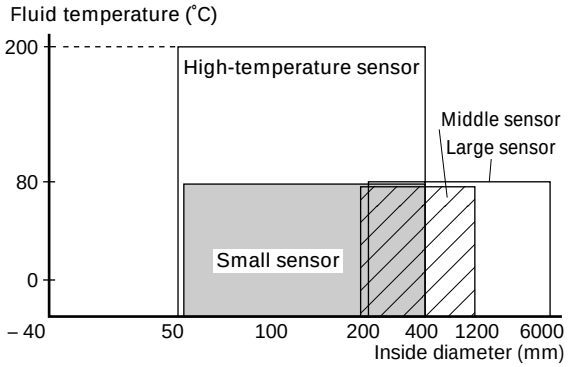
Submerged type

1 2 3 4 5 6 7 8	9 10 11	Description
F L W		2 –
		Type
1 2 1		Small sensor
4 1 1		Middle sensor
5 1 1		Large sensor
5 0 1		Large sensor
		Option
Y		None
A		Tag name plate
		Special cable
	B Y	10 m
	C Y	20
	D Y	30
	E Y	40
	F Y	50
	G Y	60
	H Y	70
	J Y	80
	K Y	90
	L Y	100
	M Y	110
	N Y	120
	P Y	130
	Q Y	140
	R Y	150
		Mounting method
	Y	Standard
	2	Z method

<SIGNAL CABLE>

1 2 3 4 5 6 7 8	Description
F L Y	1
	Converter
1	Small/middle/large sensor
2	High-temperature sensor
	Cable length
0 0 5	5 m
0 1 0	10
0 1 5	15
0 2 0	20
0 2 5	25
0 3 0	30
0 3 5	35
0 4 0	40
0 4 5	45
0 5 0	50
0 5 5	55
0 6 0	60
0 6 5	65
0 7 0	70
0 7 5	75
0 8 0	80
0 8 5	85
0 9 0	90
0 9 5	95
1 0 0	100
1 1 0	110
1 2 0	120
1 3 0	130
1 4 0	140
1 5 0	150

DETECTOR SELECTION

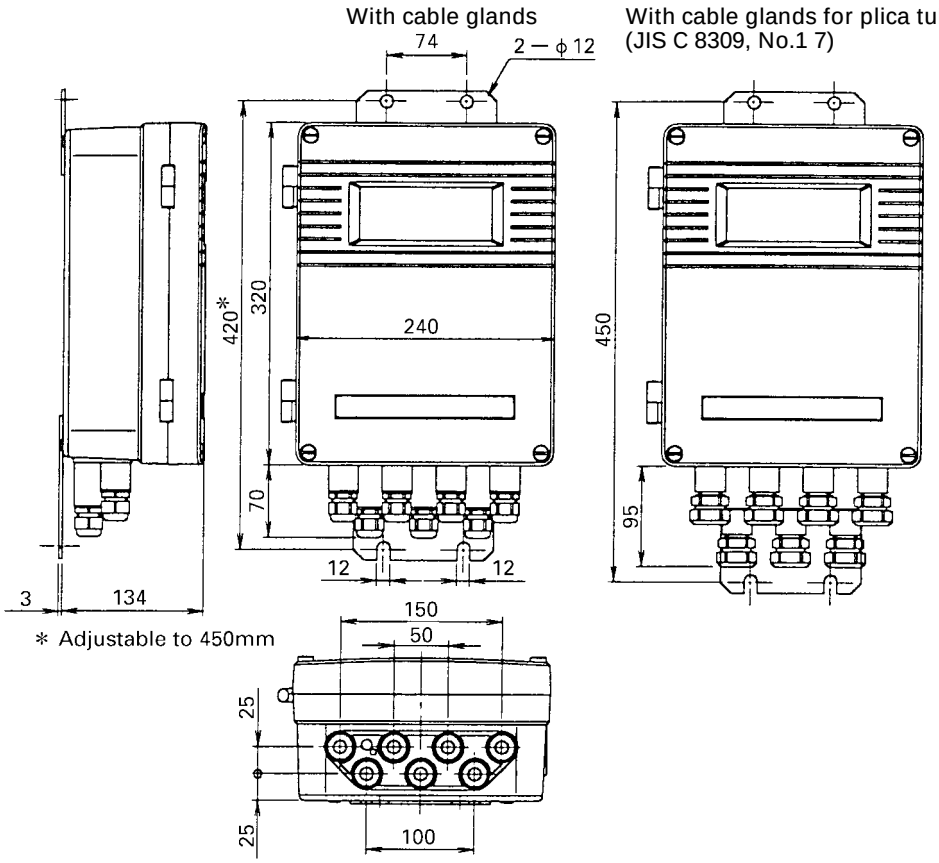


(Note) 1. High turbid fluid or scales sticking on the internal wall of pipes may interrupt the ultrasonic propagations.
Previous check with a portable type ultrasonic flowmeter is recommended.

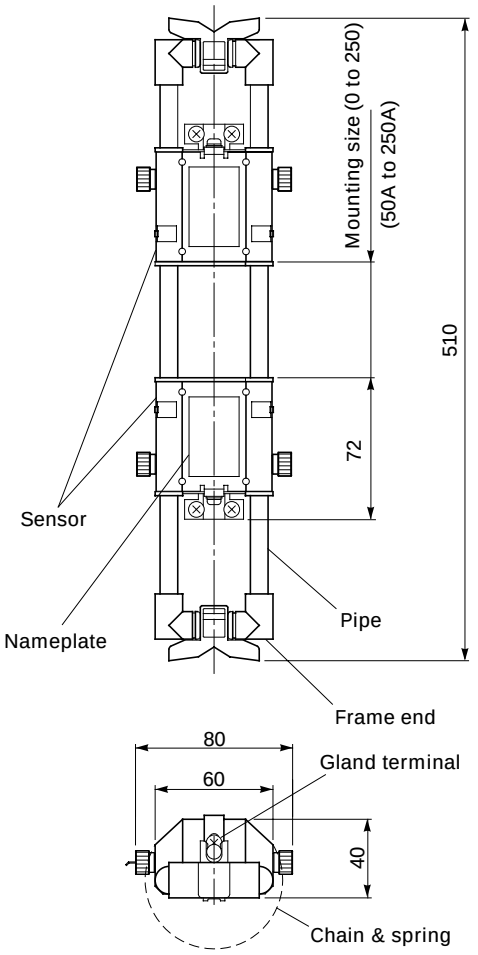
2. In case of cast iron pipes or pipes with lining, the Large sensor is recommended rather than the Middle sensor.

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.

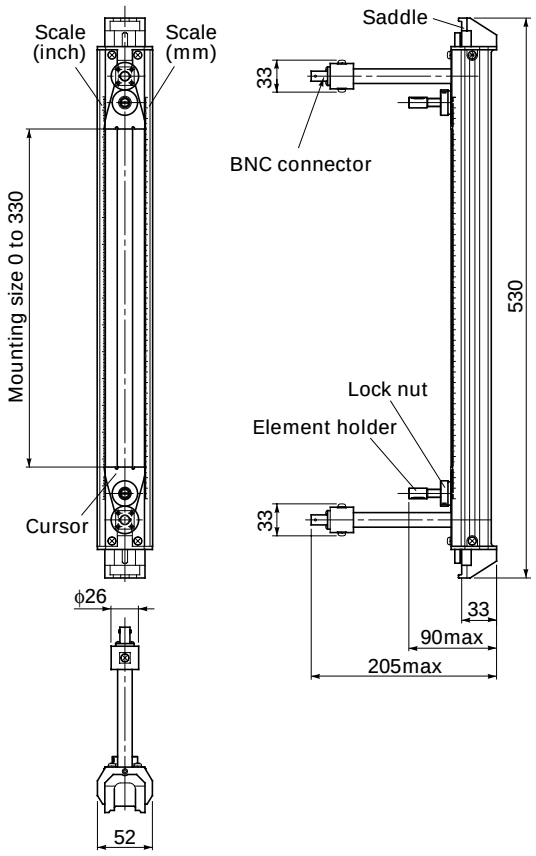
EXTERNAL OUTLINE DIAGRAM (Unit: mm)



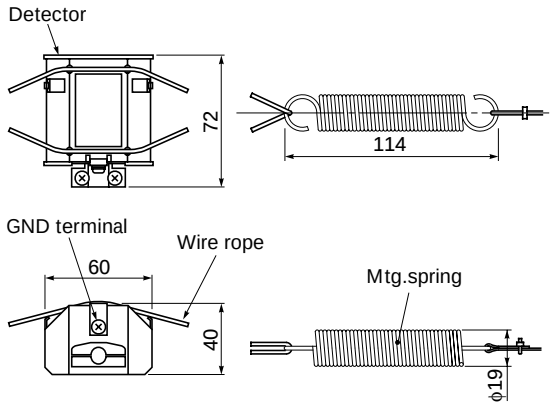
Converter, FLH



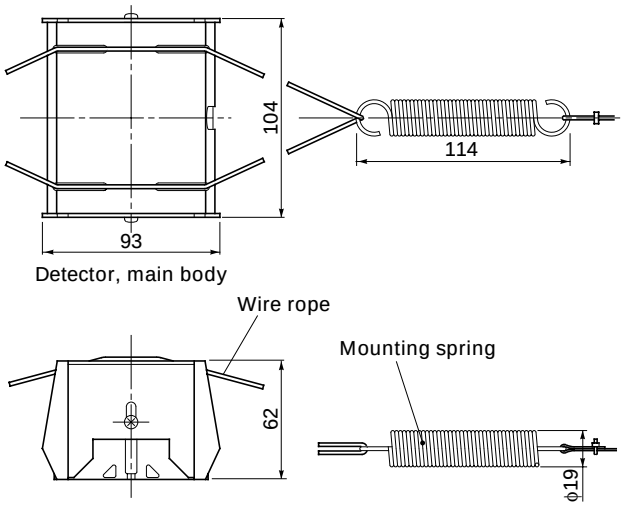
Detector, FLW1 (Small sensor)



Detector, FLW32 (High-temperature sensor)



Detector, FLW41 (Middle sensor)

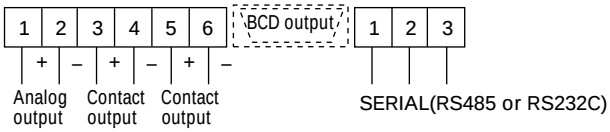


Detector, main body

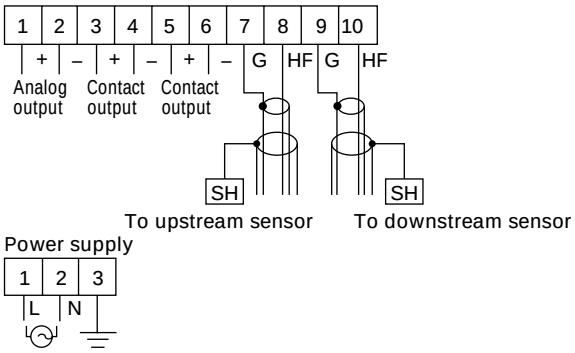
Detector, FLW5 (Large sensor)

CONNECTION DIAGRAM

(1) Single-path system

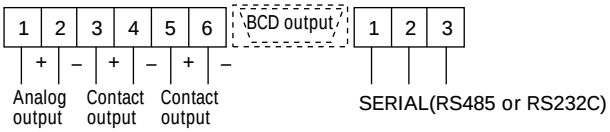


No.	RS485	RS232C
1	SHLD	COM
2	TRXD2	RXD(signal reception)
3	TRXD1	TXD(signal transmission)



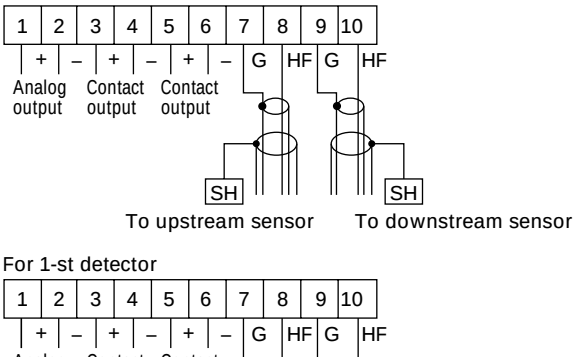
Power supply

(2) 2-path or 2-pipe system

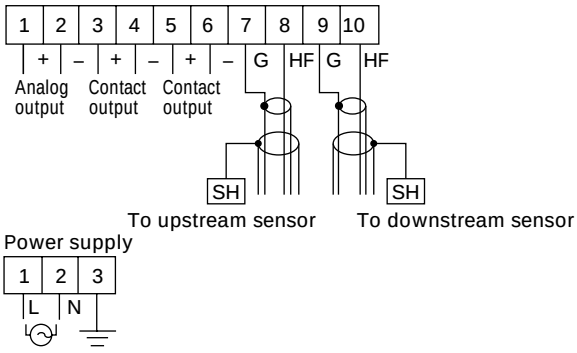


No.	RS485	RS232C
1	SHLD	COM
2	TRXD2	RXD(signal reception)
3	TRXD1	TXD(signal transmission)

For 2-nd detector



For 1-st detector



Power supply

ITEMS DESIGNATED ORDERING

1. Detector code symbols
2. Converter 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.

Fuji Electric Co.,Ltd.

Head office
11-2, Osaki 1-chome, Shinagawa-ku, Tokyo, 141-0032 Japan
http://www.fujielectric.co.jp

Fuji Electric Instruments Co.,Ltd.

Sales Div.
International Sales Dept.
No.1, Fuji-machi, Hino-city, Tokyo, 191-8502 Japan
Phone: 81-42-585-6201, 6202
Fax: 81-42-585-6187, 6189
http://www.fic-net.co.jp

Printed in Japan