FUJI ELECTRIC

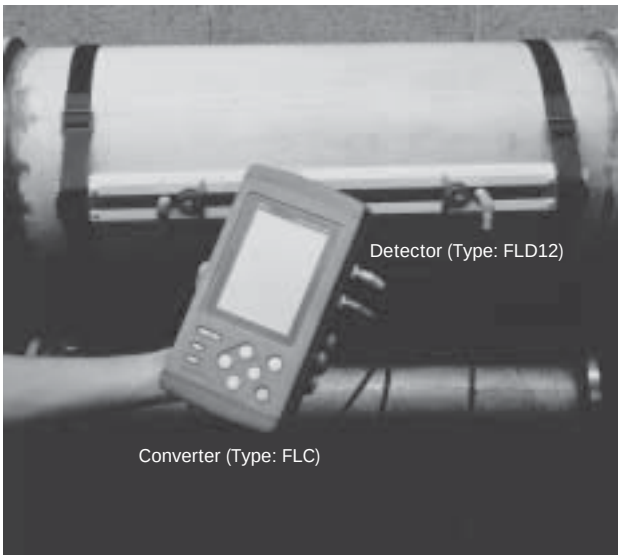
PORTABLE TYPE
ULTRASONIC FLOWMETER (PORTAFLOW X)

DATA SHEET FLC···2, FLD

PORTAFLOW-X is a portable type ultrasonic flowmeter utilizing transit time difference for measuring flow rates in pipes from the outside.
It is a compact and light-weight instrument incorporating the latest electronics and digital signal processing technologies, realizing high performance and easy operation.

FEATURES

1. Compact and light-weight
   The adoption of the latest electronics and digital signal processing technologies has reduced the size and weight of the converter to 1/7 and 1/5, respectively, in comparison with traditional model.
2. Battery operation
   This flowmeter is designed for 5 hours of continuous operation with its own built-in battery which is rechargeable in 3 hours with the supplied power adaptor.
3. Full variety of sensors
   The flowmeter can be used with various types of sensors applicable for small to large diameter pipe (ϕ13 to ϕ6000) and low to high temperature (-40 to +200°C).
4. High accuracy
   The flowmeter is designed for high accuracy (±1.0%). The adoption of new sound velocity measurement system permits measurements of fluids of unknown sound velocity, and also slightly affection from fluid temperature and pressure.
5. Improvement in anti-bubble characteristic
   Anti-bubble characteristic is greatly improved by digital signal processing.
6. Quick response
   With the use of high-speed micro-processor suited for digital signal processing, the response time is at fast as 1 second or less.
7. Multi-lingual
   The following languages are supported for display: Japanese (katakana), English, German and French.
8. Excellent performance and easy operation
   Large type graphic LCD and minimum number of function keys are used for page selection, allowing easy setting.
   - LCD with back light
   - Equipped with 40000 data logging function of 20 sites
   - Equipped with received wave monitoring function
   - Equipped with serial communication function
   - Easy mounting of sensor
   - Integrated type graphic printer (option)



SPECIFICATIONS

Fluid conditions

Measured fluid: Homogeneous liquids (water, sea water, oil or fluid of unknown sound velocity) capable of ultrasonic wave propagation
Turbidity of fluid: 10000 deg. (mg/ℓ) or less
State of flow: Axis-symmetric flow in pipe filled with fluid
Fluid temperature:
Small diameter sensor, –40 to +100°C
Small sensor, [Standard] –40 to +100°C
Middle sensor, –40 to +80°C
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: Steel, stainless steel, cast iron, vinyl-chloride, FRP, asbestos, aluminum, acrylic, etc.
Pipe size: Small diameter sensor, ϕ13 to ϕ100
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 material of known sound velocity
Straight pipe length:
Upstream side, 10D or more
Downstream side, 5D or more (D: inner pipe diameter)
Refer to Japan Electric Measuring Instruments Manufactures' Association's standard JEMIS-032 for details.

Accuracy

Pipe size	Flow velocity	Accuracy
ϕ13 to ϕ50 or less	2 to 32 m/s	1.5% of rate
	0 to 2 m/s	0.03m/s
ϕ50 to ϕ300 or less	2 to 32 m/s	1.0% of rate
	0 to 2 m/s	0.02m/s
ϕ300 to ϕ6000	1 to 32 m/s	1.0% of rate
	0 to 1 m/s	0.01m/s

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

Converter (Type:FLC)

Power supply: Built-in battery or power adaptor
Built-in battery: Special type Ni-Cd battery
Continuous operation time, 5 hours (without printer, back light OFF)
Recharging time, 3 hours (power adaptor used)
Power adaptor: Special type power adaptor 90 to 264V AC, 47 to 63Hz or 10 to 30V DC
Power consumption:
12W or less
LCD display: Full dot graphic display
240 x 320 dot (with back light)
LED display: DC IN (green), FAST CHARGE (red)
Key pad: 10 keys (ON, OFF, △, ▽, ▷, ◁, ESC, ENT, LIGHT, PRINT)
Power failure backup:
Memory backup with lithium battery (effective term, 5 years)
Response time: 1s or less
Output signal: 4 to 20mA DC, 1 point (load resistance, 0 to 1kΩ)
Input signal: 4 to 20mA DC (not isolated), 1 point
Serial communication:
RS-232C (not isolated), 1 point
Transmission speed: Max. 9600BPS
Transmission distance: Max. 15m
Printer (option): To be mounted on top of converter
Thermal serial dot printing (8 x 256 dot)
Ambient temperature:
–10 to +55°C (without printer)
–10 to +45°C (with printer)
Ambient humidity:
90% RH or less
Type of enclosure:
Dust-proof type (IP50 or equivalent)
Enclosure case: Plastic case (color: gray)
Dimensions: H240 x W127 x D70mm (without printer)
H359 x W127 x D70mm (with printer)
Mass: 1.5kg (without printer)
2.0kg (with printer)

Detector (Type: FLD)

Mounting method:
Mounting on outside of already constructed pipe
Sensor mounting method:
V or Z method
Mounting belt /wire:
Small diameter sensor, plastic cloth belt
Small sensor, plastic cloth belt
Middle sensor, stainless wire
Large sensor, stainless wire
High-temperature sensor, stainless belt
Acoustic coupler: Silicone grease
Signal cable: Special type coaxial cable
Connection: Converter; BNC connector
Sensor, middle/large type; terminal screws
Other; BNC connector
Ambient temperature:
–20 to +60°C
Ambient humidity:
Middle/large sensor, 100% RH or less
Other, 90% RH or less
Type of enclosure:
Middle/large sensor, immersion-proof type
(IP67 or equivalent)
Other, drip-proof type
(IP52 or equivalent)
Material:

Kind	Sensor case	Mounting bracket
Small diameter	Plastic	Aluminum alloy + Plastic
Small type	Plastic	Aluminum alloy + Plastic
Middle type	Plastic	—
Large type	Plastic	—
High temperature	304SS	Aluminum alloy + 304SS

Dimensions/mass:

Kind	Dimensions (HxWxD)	Mass
Small diameter	420 x 53 x 90mm	0.6kg
Small type	540 x 53 x 90mm	0.8kg
Middle type	72 x 60 x 40mm	0.4kg (Note)
Large type	104 x 93 x 62mm	1.4kg (Note)
High temperature	530 x 52 x 205mm	1.7kg

Note: mass of both sensors

Functions

Display language: Japanese (Katakana)/English/German/French, selectable

Instantaneous value display function:
Two of velocity, flow rate (with flow direction) and analog input, simultaneous display
Unit; Metric/English system selectable
Metric system:
Velocity m/s
Flow rate ℓ/s, ℓ/min, ℓ/h, Mℓ/d, m^3/s, m^3/min, m^3/h, Mm^3/d, BBL/s, BBL/min, BBL/h, MBBL/d
English system:
Velocity ft/s
Flow rate gal/s, gal/min, gal/h, Mgal/d, ft^3/s, ft^3/min, ft^3/h, Mft^3/d, BBL/s, BBL/min, BBL/h, MBBL/d
Note: Gal refers to U.S. gallons.

Total value display function:
Forward and reverse total values, simultaneous display
Unit; Metric/English system, selectable
Metric system: mℓ, ℓ, m^3, km^3, Mm^3 mBBL, BBL, KBBL
English system: gal, kgal, ft^3, kft^3, Mft^3 mBBL, BBL, KBBL

Clock display function:
Time (year, month, day, hour, minute) display and setting

Damping: 0 to 99s (time constant)

Low flow cut: 0 to 1.000m/s 0 to 3.300 ft/s

Output setting function:
Current output scaling, output type, burnout setting and calibration

Communication function:
Velocity, flow rate, totals, analog input, status, logging data transmission on request

Logging function: Site data (place, piping, fluid, sensor mounting method, type of sensor) up to 20 places and a maximum of 40000 data (time, velocity, flow rate, totals, analog input, status) can be stored in memory.

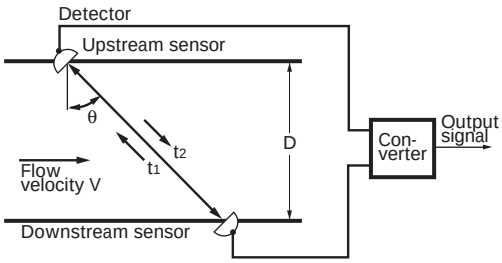
Waveform display function:
Display of bi-directional received waveforms

Graph display function:
Display of velocity, flow rate or analog input trend graph

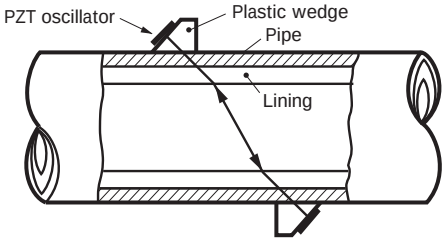
Printing function: Printout of screen, fixed cycle printout (time, velocity, flow rate, totals, analog input, status), logging data, trend graph, and waveforms by using integral printer (option)

MEASURING PRINCIPLE

With ultrasonic pulses propagated diagonally between the upstream and downstream sensors, flow rate is measured by detecting the time difference obtained by the flow of fluid.

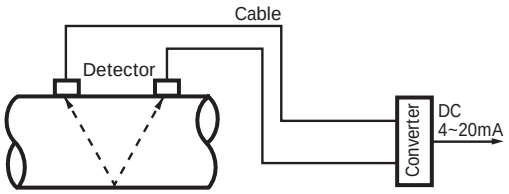


MOUNTING OF DETECTOR

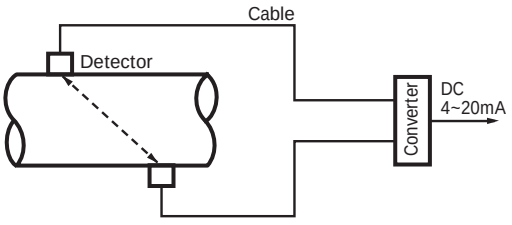


CONFIGURATION DIAGRAM

(1) Single-measuring-path system (V method)



(2) Single-measuring-path system (Z method)



CODE SYMBOLS

<Converter>

1 2 3 4 5 6 7 8	Description
F L C	
	Specification
S	Standard
	Converter
1	Basic system
2	Basic system + Printer
	Power adapter
1	AC power (90 to 264V AC, 50/60Hz)

Note: DC power adapter is optional accesoories.

<Detector>

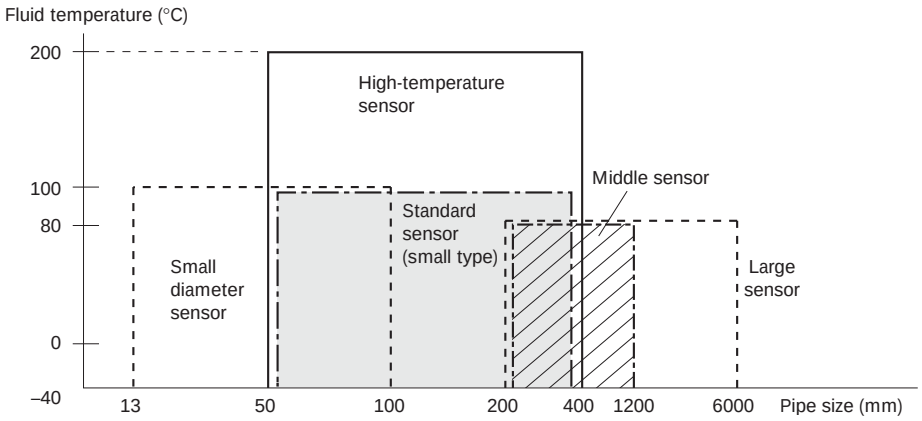
1 2 3 4 5 6 7 8 9	Description
F L D	
	Kind
1 2	Small sensor (standard)
2 2	Small diameter sensor
3 2	High-temperature sensor
4 1	Middle sensor
5 1	Large sensor
	Terminal mold
0	None
1	Provided (Middle/Large sensor only)
	Structure
Y	General use
	Coaxial cable
A	5m

The product conforms to the requirements of the Electromagnetic compatibility Directive 89/336/EEC as detailed within the technical construction file number TN510423. The applicable standards used to demonstrate compliance are :-

EN 55011:1991 Conducted and Radiated emissions CLASS A

EN 50082-1 :-1992 Radiated immunity, ESD and FBT

DETECTOR SELECTION GUIDE



[Note]

1. High turbid fluid or scales sticking on the internal wall of pipes may interrupt the ultrasonic propagations.
2. In case of cast iron pipes or pipes with lining, the Large sensor is recommended rather than the Middle sensor.

SCOPE OF DELIVERY

Converter (Type: FLC)

	Name of unit	Scope of delivery
1	Basic system	1) Converter unit 2) Power adaptor 3) Power cable (2m) 4) Analog input/output cable (1.5m) 5) Carrying case 6) Manual
2	Printer	1) Printer unit 2) Roll paper (1 roll)

Detector (Type: FLD)

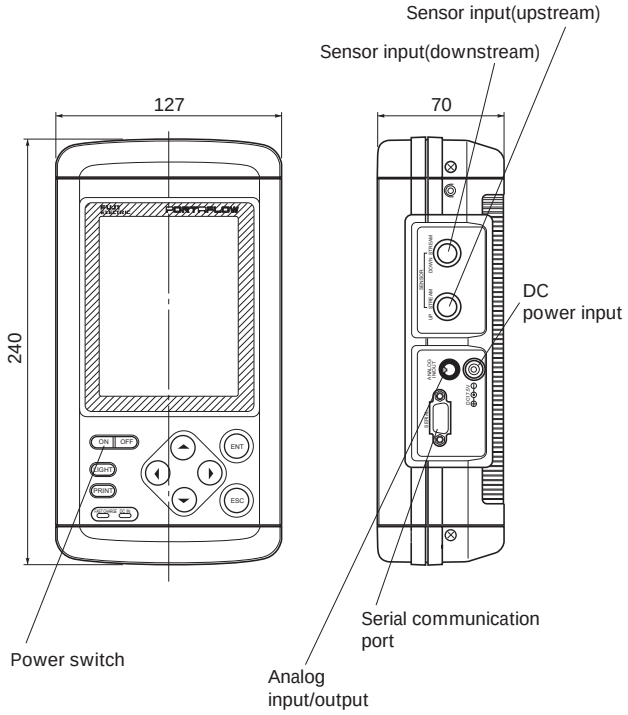
	Name of unit	Scope of delivery
1	Small diameter/small/ middle/large/high temperature	1) Sensor unit 2) Signal cable (5m, 2 cables) 3) Mounting belt/wire 4) Silicone grease (100g)

(Note) Small sensor and small diameter sensor can be put in the basic system carrying case.

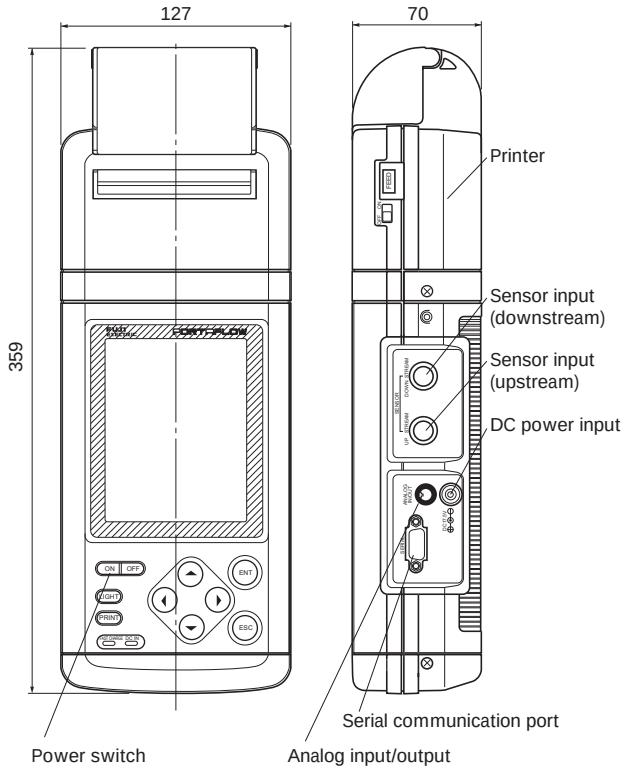
OPTIONAL ACCESSORIES

	Item	Specification	Drawing No.
1	Battery	Special type Ni-Cd battery (12V, 1200mAh)	TK7G7975C1
2	Power adaptor	Special type power adaptor, with power cable, 2m 90 to 264V AC, 47 to 63Hz 10 to 30V DC (with car cigarette cable)	 TK7G7976C1 TK7G7977C1
3	Printer unit	Mounted on top of converter, with roll paper (1 roll), Thermal serial dot system (8 x 256 dot)	TK7G7978C1
4	Printer roll paper	Maker: SEIKO I Type: TP080–20LJ1 Specification: thermal roll paper, 80mm wide x ϕ40, without core	TK7G7982C1
5	Silicone grease	Maker: Shin-Etsu Type: Standard G40M, 100g High temperature KS62M, 100g	 TK7G7984C1 TK7G7983C1
6	Signal cable	Special type signal cable, 5m x 2 Middle/large sensor; BNC connector on one side Other: BNC connector on both sides	 TK468664C5 TK7G7987C1
7	Extension signal cable	Special type coaxial cable with BNC connector 10m x 2 50m x 2	 TK468664C3 TK468664C4
8	Analog input/output cable	4-core cable, 1.5m, with connector	TK7G7974C1
9	Mounting belt/wire	Small/small diameter sensor: plastic cloth belt Middle sensor: stainless wire Large sensor: stainless wire High-temperature sensor: stainless belt	TK7G7979C1 TK7G7980C3 TK7G7980C5 TK7G7981C1
10	Pipe thickness gauge	Maker: Kawatetsu Advantech Type: TI–50K Specification: Material; copper, cast iron, aluminum, glass, hard resin, ceramic, etc. Measuring range; 0.8 to 80mm Accuracy; $\pm$0.1mm or 0.5% RD	TI-50K

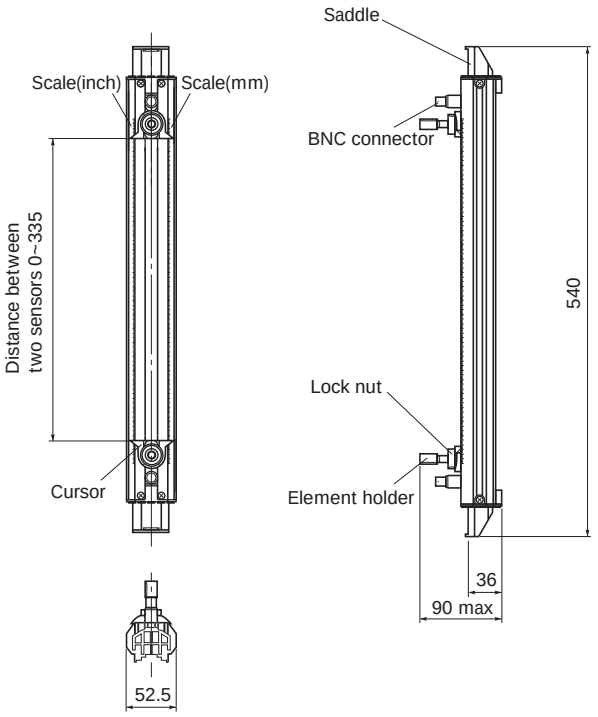
OUTLINE DIAGRAM (Unit:mm)



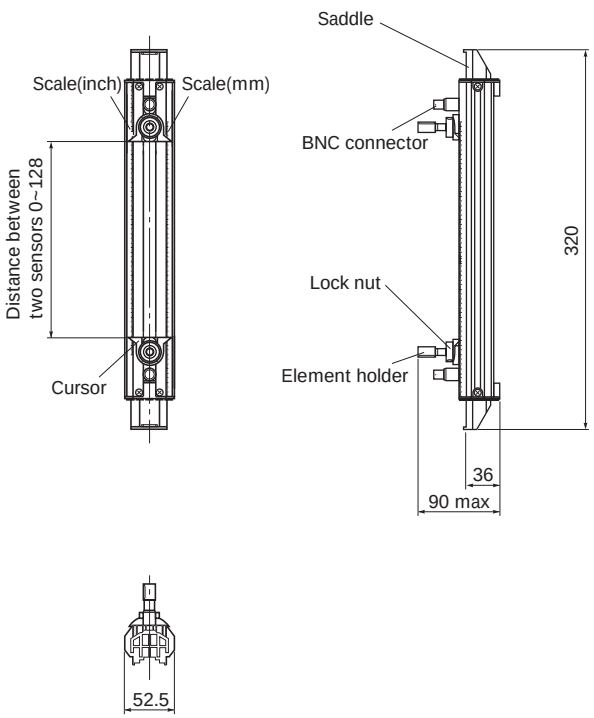
Converter FLCS1



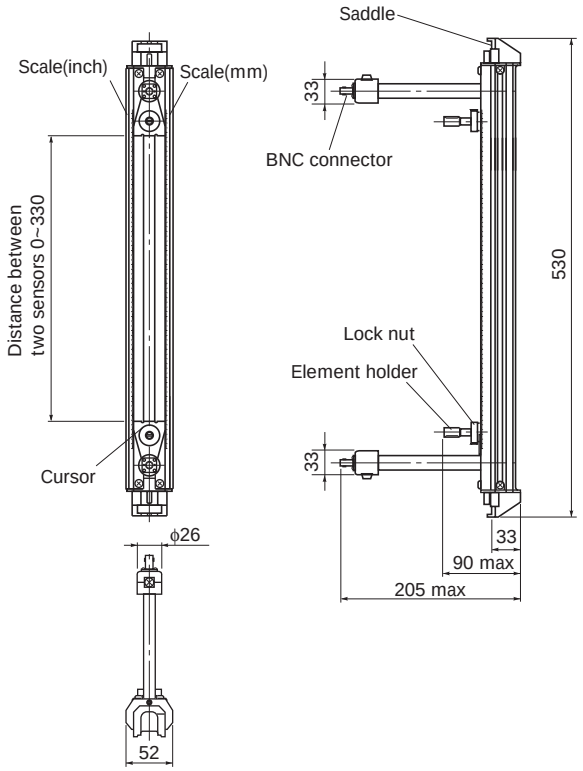
Converter FLC2 (with printer)



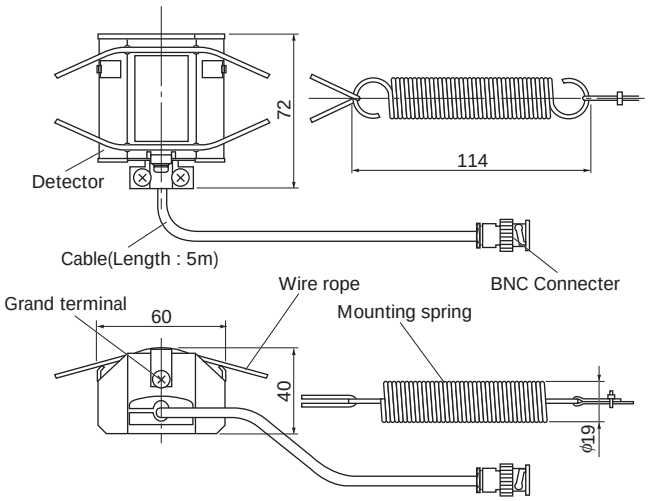
Detector FLD12 (Small sensor)



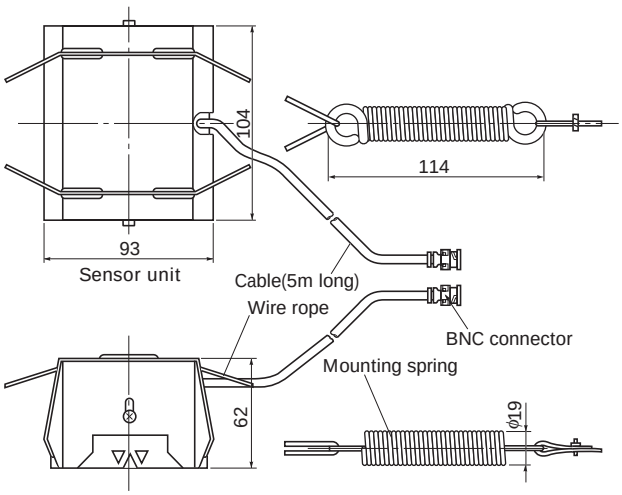
Detector FLD22 (Small diameter sensor)



Detector FLD32 (High-temperature sensor)



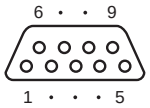
Detector FLD41 (Middle sensor)



Detector FLD51 (Large sensor)

EXTERNAL CONNECTION DIAGRAM

Serial communication

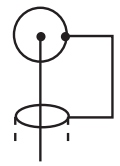


CONNECTOR :
D-SUB 9 Pin
Plug (male)

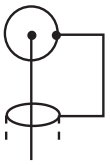
Pin No.	Symbol	Item
1	—	—
2	R x D	Receive data
3	T x D	Send data
4	D T R	Data terminal ready
5	G N D	Signal ground
6	D S R	Data set ready
7	R T S	Send request
8	C T S	Send ready
9	—	—

Sensor input/output

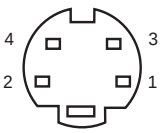
Upstream side



Downstream side



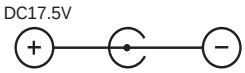
Analog input/output



CONNECTOR :
Circular
connector
4 pin

Pin No.	Item	Color
1	Analog input +	Black
2	Analog output –	Red
3	Analog input –	White
4	Analog output +	Blue

Power input (power adaptor ouput)



Fuji Electric

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