Ultrasonic Flowmeter M-Flow PW

Measurement accuracy: 1.5% of rate
Also applicable to 1.0% of rate

Measuring the flow rate in the pipe with ultrasonic!

Detector (Type:FSS)

Applicable pipe diameter φ25 to φ1200mm

Excellent anti-bubble performance!
Compact size transmitter!

- **Excellent anti-bubble performance**
  Adoption of advanced ABM (anti-bubble measurement method)

- **Optimal compact size transmitter to be installed to mechanical equipment**
  Dimensions 140(H) x 130 (W) x 69 (D)mm
  Mass: 0.8 kg compact transmitter

- **High-speed response with digital signal process**
  High speed calculation processing with 0.2 seconds

- **Easy installation. Clamp-on type sensor**
  Easy installation to existing pipe

- **Easy operation**
  Capable of operating a setting with front keypad and making a setting by PC.

- **Communication function (option)**
  Management of measurement data by PC through RS-485 (MODOBUS)

- **Hardly affected by pressure and temperature of the measured fluid.**

Fe M-Flow PW

Flow transmitter (Type: FLR-3)

1) 4 - 20mA DC output (1point)
2) Pulse output (2points)
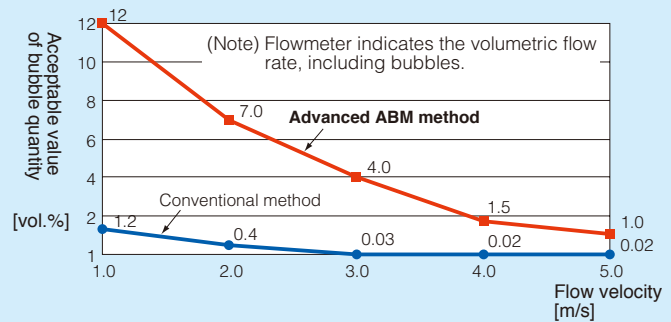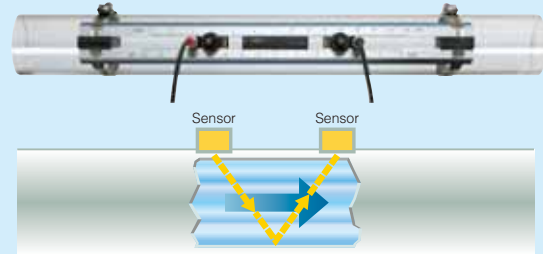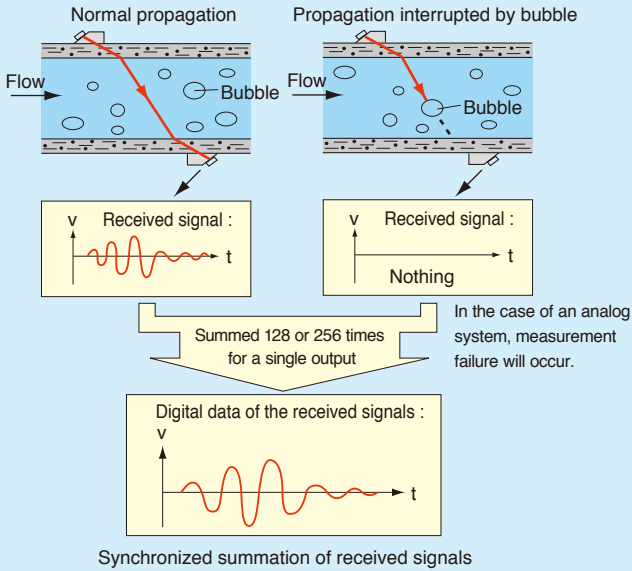3) Communication (RS-485)

Greatly developed anti-bubble performance

Anti-bubble performance is greatly developed due to adoption of advanced ABM (anti-bubble measurement method). 10 times greater than existing type.

■**Measuring principle**

With ultrasonic pulses propagated diagonally between the upstream and downstream sensors mounted on the exterior of the pipe, the flow rate is measured by detecting the time difference caused by the flow.

●Advanced received signal digital processing results in higher performance flow measurement

Normal propagation

Propagation interrupted by bubble

Flow

Bubble

Flow

Bubble

v Received signal :

t

v Received signal :

t

Nothing

Summed 128 or 256 times for a single output

In the case of an analog system, measurement failure will occur.

Digital data of the received signals :

v

t

Synchronized summation of received signals

Sensor   Sensor

Acceptable value of bubble quantity

12

10

8

6

4

2

[vol.%]

12

7.0

4.0

1.5

1.0

1.2

0.4

0.03

0.02

0.02

1

1.0   2.0   3.0   4.0   5.0

(Note) Flowmeter indicates the volumetric flow rate, including bubbles.

Advanced ABM method

Conventional method

Flow velocity [m/s]

Explanation of the extendable rail type detector (type: FSSC)

Normal	Extended on rails	Z method
pipe diameter φ50 to φ300mm <V method>	pipe diameter up to φ600mm <V method>	pipe diameter up to φ1200mm <Z method> (rail removed)

(A detector is simply attached to the exterior of the piping.)

Classification	Appearance	Detector type	Applicable pipe inner diameter (mm)	Measured fluid temperature	Mounting/structure
Extendable rail type		FSSC	φ50 to φ1200	−40 to 120°C	• V or Z method mounting • Jet structure (equivalent to IP65)
Compact type		FSSA	φ25 to φ225	−20 to 100°C	• V method mounting • Jet structure (equivalent to IP65)

Both the mass and volume of the flow transmitter are reduced by 2/3!

■ Compact and lightweight flow transmitter (1/3 size of model FLV) Easy to carry and install on a system

<Our FLV type>

220mm

Mass: approx 4.5kg

230mm

<Our FLR type>

M-Flow PW

140mm

Mass: approx 0.8kg

130mm

Mounting method: wall or pipe mounting
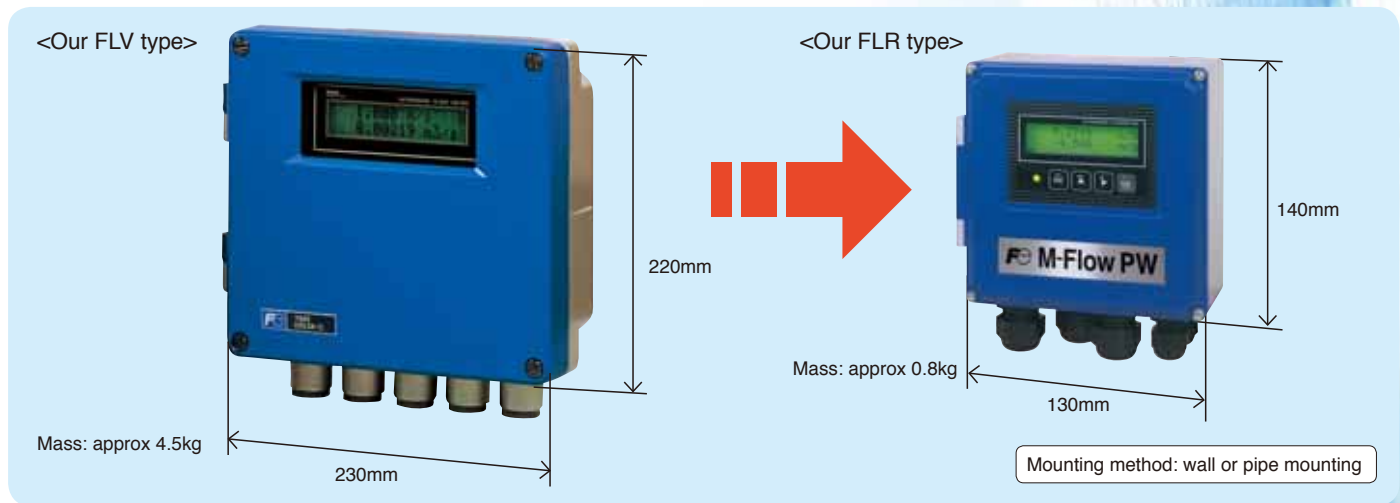
■ Operation can be performed from the outside panel
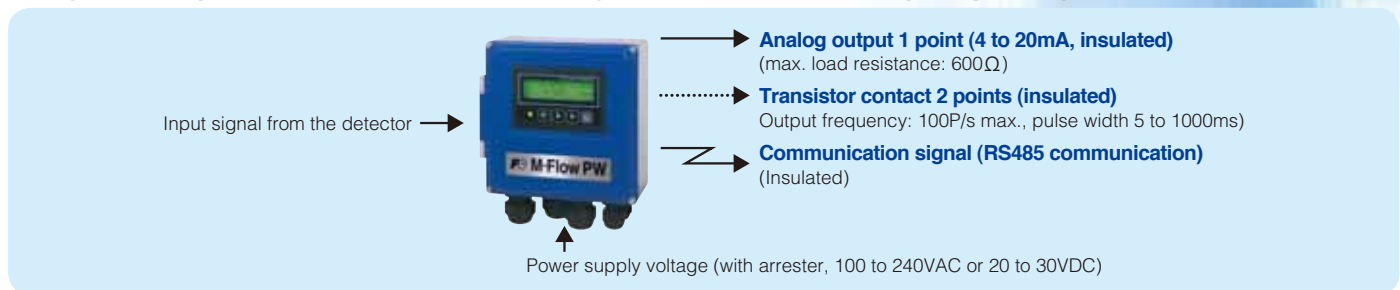(In case of IP66 type)

Various settings can be made from the front side without opening the cover of the flow transmitter. (Parameter setting, input of mounted pipe data, automatic calculation of mounting dimensions and similar)

11.000 m3/h
110.4 m3

Instantaneous flow velocity value (8-digit display)

Total flow rate value (8-digit display)

Normal: green
Extraordinary: Red

ESC

EN

Waterproof keypad

LCD display with backlight is clearly legible, even in dark places.

■ Parameter setting and data collection can be performed via optional PC communications interface.

RS485

Communication

M-Flow PW

PC loader software for the setting of various parameters and the collection of measured data is a standard accessory

■ Signal and process interfaces are designed with functionality as priority.

Input signal from the detector

M-Flow PW

Analog output 1 point (4 to 20mA, insulated)
(max. load resistance: 600Ω)

Transistor contact 2 points (insulated)
Output frequency: 100P/s max., pulse width 5 to 1000ms)

Communication signal (RS485 communication)
(Insulated)

Power supply voltage (with arrester, 100 to 240VAC or 20 to 30VDC)

■ Fully equipped with extensive functions

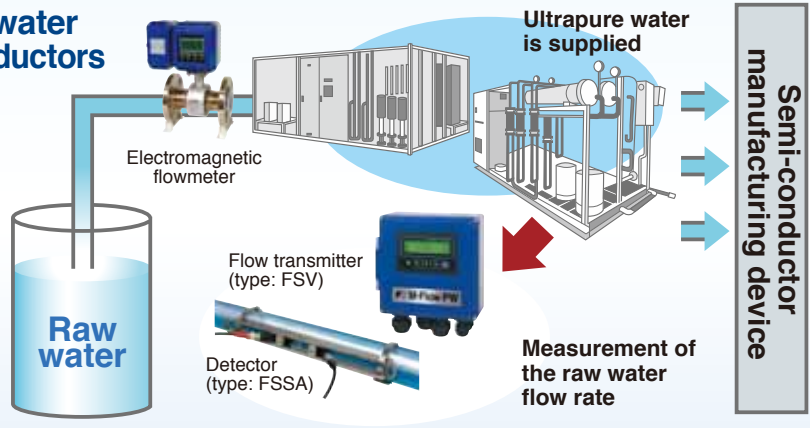|	
Zero adjustment	one-touch adjustment while the flow is stopped
Damping	Used to reduce the fluctuation of the measured value. Setting range: 0 to 100 sec. (setting per 0.1 sec.)
Low flow rate cut	Output may be cut when the flow rate is low. Setting range: 0 to 5m/s (setting in 0.01m/s unit)
Alarm contact output	Contact output at condition of hardware and process faults
Output burnout	When measurement cannot be made because the pipe is empty or bubbles are entrained in the fluid, contact output is activated while analog output is held.
Forward and backward ranges	Ranges may be set arbitrarily. The digital output of the operation range is available.
Auto 2-range	2 forward ranges are independently configurable. Digital output of operation is available.
Flow switch	Contact output is made when the upper or lower limit values of the instantaneous flow rate are reached
Total value switch	Contact output is made when the upper limit value of the total flow rate (forward) exceeds the setting value.
Display of various units	Unit may be set in m/s, L/s, L/min, L/h, L/d, KL/d, ML/d, m^3/s, m^3/min, m^3/h, m^3/d, Km^3/d, Mm^3/d
Multilingual display	The display language may be selected from 5 choices, including Japanese (Katakana), English, French, Spanish and German.

Application example

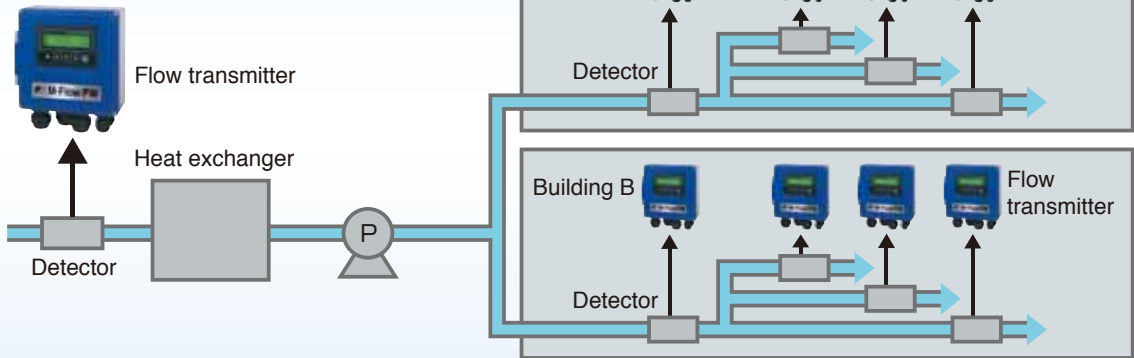■The ultrasonic flowmeter is a liquid flowmeter used in various applications.

① Flow rate measurement in a water purifying system for semi-conductors

Advantages of using an ultrasonic flowmeter for the system

1) It can be easily mounted on the exterior of a pipe, helping reduce mounting cost.

2) As a sensor, it can operate without coming into contact with fluid, so the fluid is not affected by metallic ions.

3) This meter, compact and lightweight, can be easily carried and mounted. M-Flow PW

Electromagnetic flowmeter

Ultrapure water is supplied

Semi-conductor manufacturing device

Raw water

Flow transmitter (type: FSV)

Detector (type: FSSA)

Measurement of the raw water flow rate

② Flow rate measurement in the air-conditioning field

Flow transmitter

Heat exchanger

Detector

P

Building A

Detector

Flow transmitter

Building B

Detector

Flow transmitter

③ Flow rate measurement of corrosive fluid

Non-contact measurement by M-Flow PW ideal for corrosive fluid in glass, metallic, and plastic pipes

Detector

Flow transmitter

Strong alkali

Strong acid
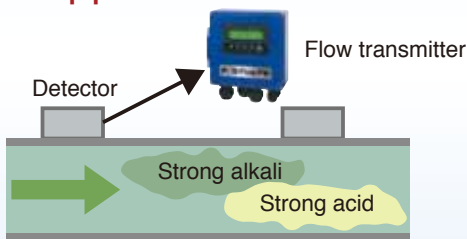
④ Flow rate measurement in cooking oil production line

Unlike mechanical or Coriolis type, maintenance is not required.
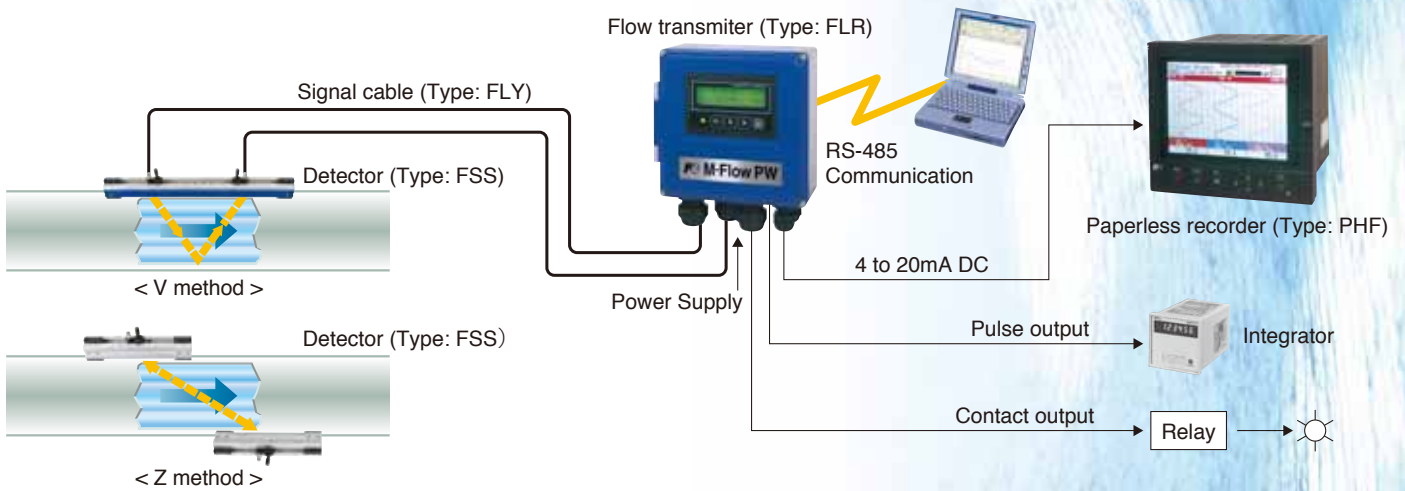
Flow transmitter

Tank

Detector   Filler
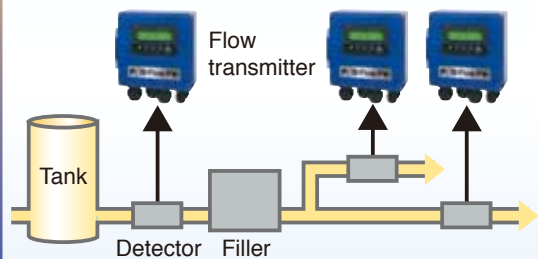
■Major applications

- Backup for the already constructed flowmeter
- Water supply and sewage systems ....leakage investigation of water pipe and investigation of the flow direction in the water distribution pipe
- Power plant ....flow rate measurement of the boiler water supply, condenser circulating pump and turbine oil
- Various plants ....flow rate measurement of cooling water, plating solution and corrosive liquid
- Food manufacturing plan....................flow rate measurement of raw material and washing water
- Semiconductor manufacturing plant...flow rate measurement of pure water
- Air-conditioning equipment.................flow rate measurement of hot water and chilled water in heating and cooling
- Hot spring..Measurement of suction quantity

Examplep of system configuration

Flow transmiter (Type: FLR)

Signal cable (Type: FLY)

Detector (Type: FSS)

< V method >

Detector (Type: FSS)

< Z method >

RS-485 Communication

Power Supply

4 to 20mA DC

Paperless recorder (Type: PHF)

Pulse output — Integrator

Contact output — Relay

CODE SYMBOL

（IP66）　（IP67）

■Flow transmitter

												Description
F	L	R	E			Y	3	—	1			
			E									Type (4th digit)
												Standard for exports
			1									Power Supply (5th digit)
			4									100 to 240Vac, 50/60Hz
												20 to 30Vdc
				Y								Communication function (6th digit)
				D								None
												RS-485
							1					Case structure (9th digit)
												Jetproof type (IP65)
								A				Mounting bracket (10th digit)
								B				For 2B pipe mount
												For wall mount
									Y			Parameter setting, tag plate (11th digit)
									A			Without
									B			With setting
									C			With setting + Tag plate
												With Tag plate
										Y		Measurment accuracy (12th digit)
										C		Standard
												High accuracy type (Pipe diameter φ50mm or more)

■Detector

										Description
F	S	S		1			1	—	Y	
			C							<Senser type> (4th digit)
			A							Extendable rail type (φ50 to φ1200mm)
										Compact type (φ25 to φ225mm)
				1						<Guide rall> (5th digit)
										Provided
					Y					<Mounting belt> (6th digit)
					A					None
					C					Stainless belt (1.0mx2)
					D					SS belt fasten with screws (1.0mx4)
										Wire ≤ φ1500mm
						Y				<Acoustic coupler> (7th digit) *1
						A				None
						B				Silicon rubber (KE348)
										Silicone-free grease (HIGH-Z)
								Y		<Watwe-proof treatment> (9th digit)
										None
									Y	<Tag plate> (10th digit)
									A	None
										Provided

*1) Normally select silicone rubber as acoustic coupler. Silicone rubber in tube (100g) is furnished. If you place an order for several units, 1 tube may suffice for every 5 units.
Select silicone-free grease for semiconductor manufacturing equipment or the like that is vulnerable to silicone. The silicone-free grease is water-soluble and, therefore, cannot be used in environment exposed to water or on piping subjected to a condensation. Since the grease does not set, a periodic maintenance (cleaning, refilling every about 6 months at normal temperature) is necessary.

■Signal cable

								Description
F	L	Y	A				1	
			A					<Type of detector> (4th digit)
								For FSSA, FSSC
				0	0	5		<Cable length: m> (5, 6, 7digits)
				0	0	5		5m
				0	1	0		10m
				0	1	5		15m
				0	2	0		20m
				0	2	5		25m
				0	3	0		30m
				0	3	5		35m
				0	4	0		40m
				0	4	5		45m
				0	5	0		50m
				0	5	5		55m
				Z	Z	Z		Others (Contact us)

SCOPE OF DELIVERY
・Flow transmitter (provided with U-bolt and nuts for pipe mount)
・Detector (provided with mounting fixture and acoustic coupler)
・Signal cable
・CD-ROM (contains instruction manual, loader software)

Specifications

■Applicable subjects and operation environment

Applicable fluid	Homogeneous liquids capable of ultrasonic wave propagation Bubble quantity: 0 to 12Vol% (reference diameter 50A, water and flow velocity of 1m/s) Turbidity of fluid: 10000 degrees (mg/L) or less Straight pipe length: upstream side 10D or more, downstream 5D or more (D: pipe inner diameter) State of flow: fully developed turbulent or laminar flow in round pipe filled with fluid

	Classification	Detector type	Pipe inner diameter (mm)	Mounting method	Fluid temperature range (Note 2)	Applicable pipe material
Applicable piping and fluid temperature	Compact type	FSSA	φ25 to φ50	V method	-20 to 100°C	Plastic(PVC,etc.) Note 1
			φ50 to φ225			Plastic(PVC,etc.)
	Extendable type	FSSC	φ50 to φ600		-40 to 120°C	Metal pipe(SS,steel pipe,copper pipe, aluminum pipe,etc.) Note 1
			φ600 to φ1200	Z method		

Note 1) Please select the FSSC type if following condition.
- When pipe material is PP and pipe wall thickness is 15mm or more
- When pipe material is PVDF and pipe wall thickness is 9mm or more
- When pipe material is hard to penetrate the ultrasonic wave such as cast-iron pipe, lining pipe and old carbon steel pipe etc..,
Note 2) If silicone-free grease is used as an acoustic couplant, the fluid temperature range is 0 to 60°C, regardless of the detector.

Flow velocity range	0 to ±0.3 ⋯⋯ ±10m/s
Power supply voltage	100 to 240VAC 50/60Hz or 20 to 30VDC
Power consumption	15VA or less (AC power supply), 6W or less (DC power supply)
Signal cable (between the detector and converter)	Coaxial cable (60m max.) Heat resistance: 80°C
Installation environment	Non-explosive area not exposed to direct sunlight, corrosive gas or heat radiation
Ambient temperature	Flow transmitter: -20 to 55°C Detector: -20 to 60°C
Ambient moisture	95% RH max.
Grounding	Class D (100Ω)
Arrester	Provided as standard at the power supply

■Performance

	Plastic pipe			
Accuracy	Type of detector	Pipe diameter	Velocity: 2m/s or higher	Velocity: Less than 2m/s
	FSSA	φ25 to below φ50mm	±2.5% of rate	±0.05m/s
	FSSA, FSSC	φ50 to φ600mm	±1.5% of rate	±0.03m/s
	Metal			
	Type of detector	Pipe diameter	Velocity: 2m/s or higher	Velocity: Less than 2m/s
	FSSA, FSSC	φ50 to φ600mm	±2% of rate	±0.04m/s
Accuracy (High accuracy type)	**Metal, Plastic pipe**			
	Type of detector	Pipe diameter	Velocity: 2m/s or higher	Velocity: Less than 2m/s
	FSSA	φ50 to φ225mm	±1.0% of rate	±0.02m/s
	FSSC	φ200 to below φ1200mm	±1.0% of rate	±0.02m/s
Response time	0.5 sec. (standard mode), 0.2 sec. depending on setting (quick response mode)			

Extendable rail type Detector (FSSC)

■Functional specifications

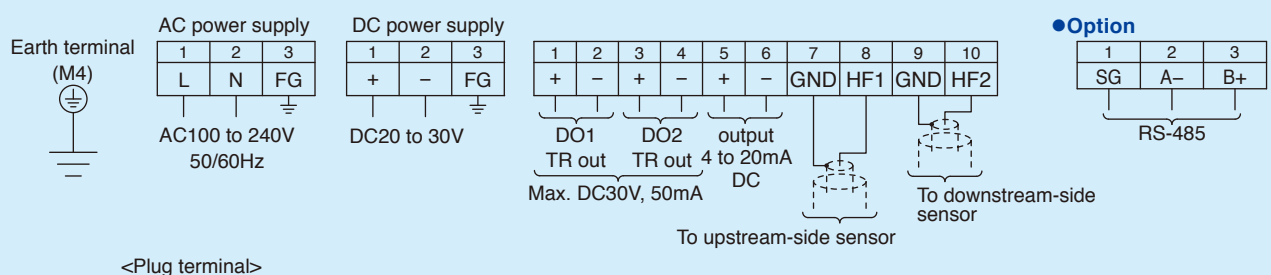|	
Analog signal	4 to 20mA DC (1 point), Load resistance: 600Ω max.
Digital output	Forward total, reverse total, alarm, acting range, flow switch, total switch assignable arbitrarily
	Transistor contact (isolated, open collector)
	• Output: 2 points
	• Normal: ON/OFF selectable
	• Contact capacity: 30VDC, 50mA
	• Output frequency: 100P/s max. (pulse width: 5, 10, 50, 100, 200, 500, 1000ms)
Serial communication RS-485 (option)	RS-485(MODBUS), isolated
	Connectable quantity: 31 units / Stop bits: 1 or 2 bits selectable
	Baud rate: 9600, 19200, 38400bps / Cable length: 1km max.
	Parity: None/Odd/Even selectable / Data: Flow velocity, flow rate, forward total, reverse total, status, etc.
Display device	2-color LED (Normal: green, Abnormal: red), LCD display (2 lines of 16 digits, back light provided)
Indication language	Japanese (Katakana), English, French, German, Spanish (switchable)
Flow velocity / flow rate indication	Instantaneous flow velocity / instantaneous flow rate indication (minus indication for reverse flow)
	Numerals: 8 digits (decimal point is counted as 1 digit) English and metric units selectable.
Total indication	Forward or reverse total value indication (negative indication for reverse direction)
	Numerals: 8 digits (decimal point is counted as 1 digit) English and metric units selectable.
Setting function	Setting available with 4 keys (ESC, △, ▷, ENT) on the flowmeter front
Zero adjustment	Set zero/Clear available
Damping	0 to 100s (setting per 0.1 sec.) for analog output and flow velocity/flow rate indication
Low flow rate cutoff	0 to 5m/s in terms of flow velocity
Alarm	Digital output available for Hardware fault or Process fault
Burnout	Analog output: Hold /Over-scale/Under-scale/zero (selectable)
	Flow rate total: Hold/Count (selectable)
	Burnout timer: 0 to 100s (every 1s)
Bi-directional range	Forward and reverse ranges configurable independently / Hysteresis: 0 to 20% of working range / Working range applicable to digital output
Auto 2-range	2 forward ranges configurable independently / Hysteresis: 0 to 20% of working range / Working range applicable to digital output
Flow switch	Lower limit, upper limit configurable independently (Digital output available for status at actuated point)
Total switch	Upper limit of the forward total settable (Digital output available when actuated)

Flow velocity / flow rate indication – Unit:

Unit:		Metric system	Inch system
	Velocity	m/s	ft/s
	Flow rate	L/s, L/min, L/h, L/d, kL/d, ML/d, m³/s, m³/min, m³/d, km³/d, Mm³/d, BBL/s, BBL/min, BBL/h, BBL/d, kBBL/d, MBBL/d	gal/s, gal/min, gal/h, gal/d, kgal/d, Mgal/d, ft³/s, ft³/min, ft³/d, Kft³/d, Mft³/d, BBL/s, BBL/min, BBL/h, BBL/d, kBBL/d, MBBL/d

Total indication – Unit:

Unit:	Metric system	Inch system
Total	mL, L, m³, km³, Mm³, mBBL, BBL, KBBL	gal, kgal, ft³, kft³, Mft³, mBBL, BBL, kBBL, ACRE-ft

■Physical specifications

Type of enclosure	Flow transmitter: IP65	
Mounting method	Mounted on wall or by 2B pipe / Detector: Clamped on existing piping.	
Acoustic couplant	Silicone rubber, silicone grease or silicone-free grease	
Note: The acoustic couplant is a medium that eliminates the gap between detector and pipe.	Type	Silicone rubber (type:KE-348W)	Silicone-free grease (type:HIGH Z)
	Fluid temperature	−40 to +150˚C	0 to +60˚C
	Teflon piping	Not usable	Good
Outer dimensions, mass	See outline diagrams.	

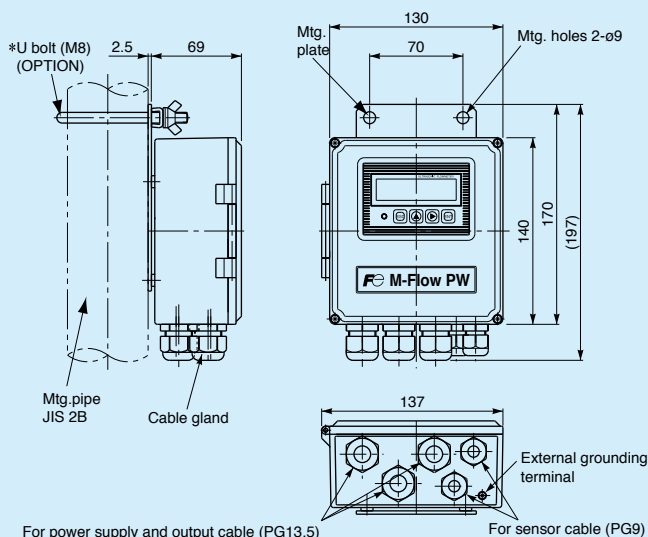## ■Loader software (standard accessory)

Compatible PC model	PC/AT compatible instrument Operation is undefined for PC98 series (NEC)
Main function	Software for setting/change of the main unit parameters and for collection of the measured data on PC
OS	Windows 2000/XP/7
Memory requirement	125MB min.
Hard disk capacity	Minimum free space of 52MB or more

Connection diagram

Earth terminal (M4)

AC power supply

1	2	3
L	N	FG

AC100 to 240V 50/60Hz

DC power supply

1	2	3
+	−	FG

DC20 to 30V

1	2	3	4	5	6	7	8	9	10
+	−	+	−	+	−	GND	HF1	GND	HF2

DO1 TR out / DO2 TR out / output 4 to 20mA DC

Max. DC30V, 50mA

To upstream-side sensor

To downstream-side sensor

●Option

1	2	3
SG	A−	B+

RS-485

\<Plug terminal\>

Outline diagram of the flow transmitter (unit: mm)

● **IP65 type Flow transmitter** Type: FLR (Weight: 0.8kg)

*U bolt (M8) (OPTION)
2.5
69
Mtg. plate
130
70
Mtg. holes 2-ø9
170
(197)
140

M-Flow PW

Mtg.pipe JIS 2B
Cable gland

137

External grounding terminal
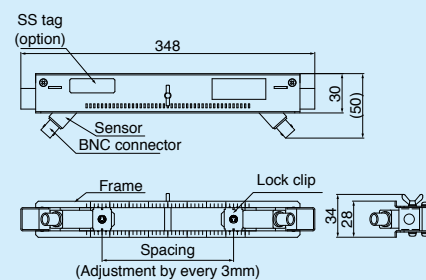
For power supply and output cable (PG13.5)
For sensor cable (PG9)

Outline diagram of detector (unit: mm)

● **Extendable rail type detector** Type: FSSC (diameter φ50 to φ1200, Weight: 1kg)

480±2
SPACING: 0 to 300
Scale (inch)   Scale (mm)
BNC CONN.   Lock nut
53
88max.
54
Rail end   Tag plate   Name plate   Guide rail
Extended rail

<Shipment style (V method)>

(880)
700max.
400max.
240
100 100   Extended rail   100 100

<Extended style (Longest, V method)>

240   240
Rail end (Accessories)

<Sepalate style (Z method)>
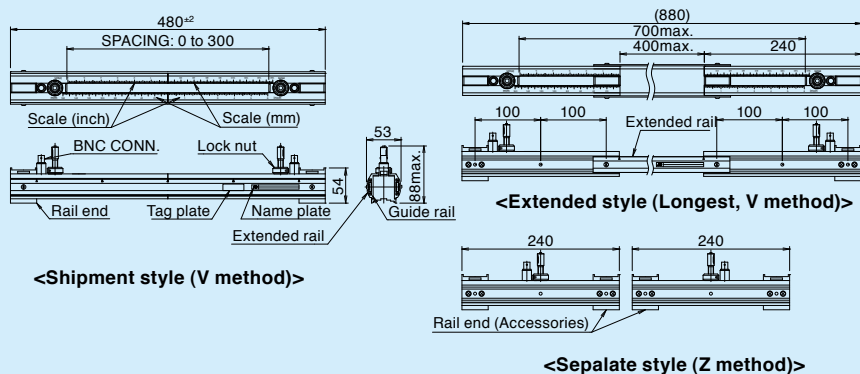
● **Compact type detector**
Type: FSSA (diameter φ25 to φ225, Weight: 0.4kg)

SS tag (option)
348
30
(50)
Sensor
BNC connector

Frame   Lock clip
34
28
Spacing
(Adjustment by every 3mm)

Information in this catalog is subject to change without notice.
Read the instruction manuals thoroughly before using the products.

Fuji Electric Co., Ltd.

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