

# Ultrasonic Flowmeter M-Flow PW

**Measuring the flow rate  
in the pipe with ultrasonic!**

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

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



Flow transmitter (Type: FLR-3)

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

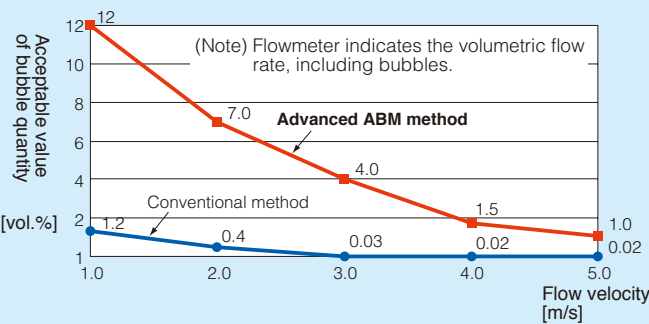
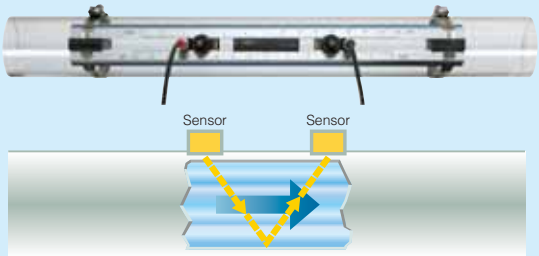
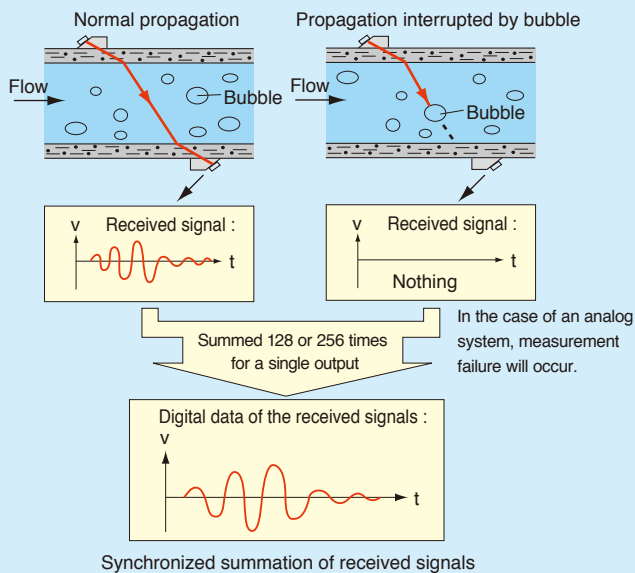
# Greatly developed anti-bubble performance

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



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

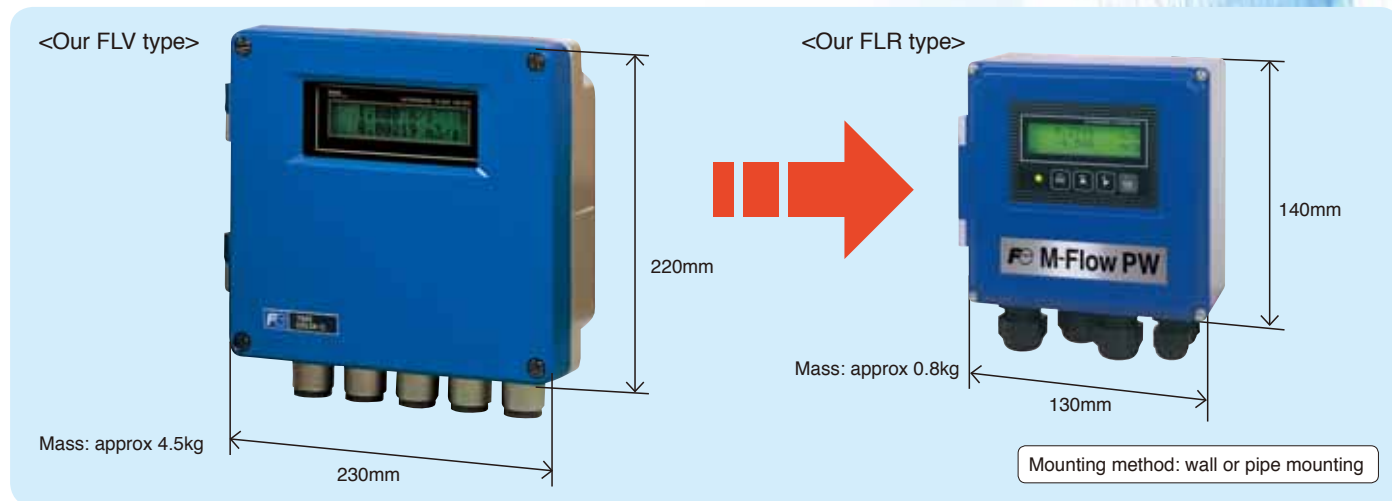
Normal	Extended on rails	Z method
		
pipe diameter $\phi 50$ to $\phi 300\text{mm}$ <V method>	pipe diameter up to $\phi 600\text{mm}$ <V method>	pipe diameter up to $\phi 1200\text{mm}$ <Z method> (rail removed)

(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	$\phi 50$ to $\phi 1200$	$-40$ to $120^{\circ}\text{C}$	• V or Z method mounting • Jet structure (equivalent to IP65)
Compact type		FSSA	$\phi 25$ to $\phi 225$	$-20$ to $100^{\circ}\text{C}$	• 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



- Operation can be performed from the outside panel  
(In case of IP66 type)

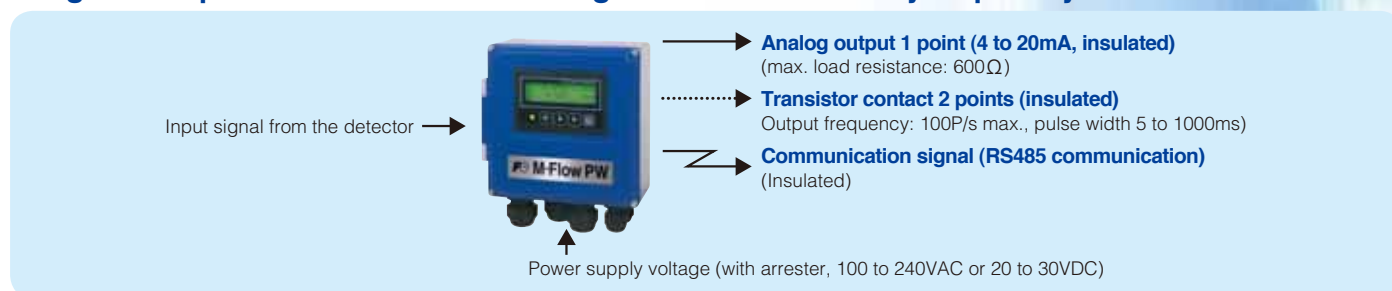
Various settings can be made from the front side without opening the cover of the flow transmitter. (Parameter setting, input of mounted pipe data, automatic calculation of mounting dimensions and similar)



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



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



- 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, m³/s, m³/min, m³/h, m³/d, Km³/d, Mm³/d
Multilingual display	The display language may be selected from 5 choices, including Japanese (Katakana), English, French, Spanish and German.



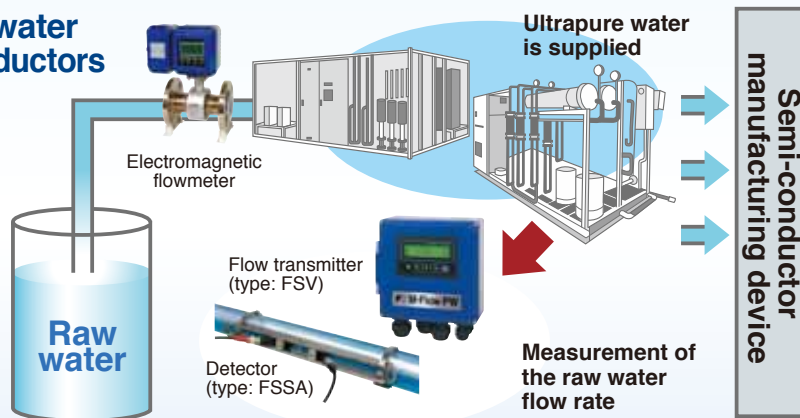
# Application example

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

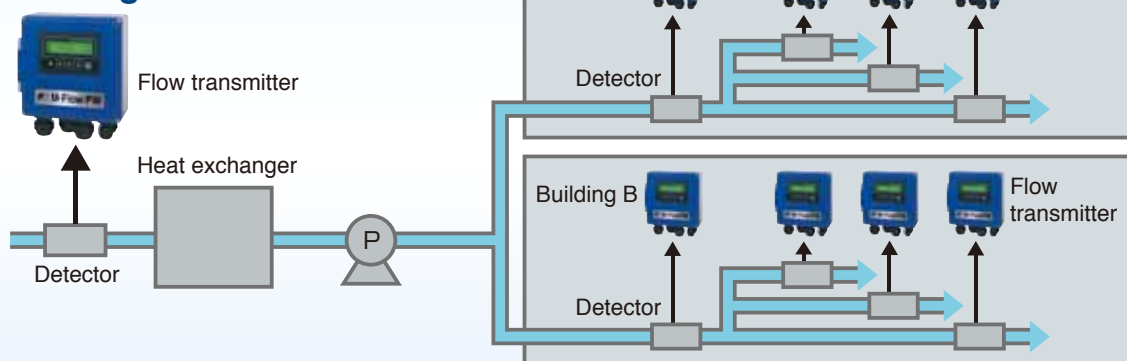
## 1 Flow rate measurement in a water purifying system for semi-conductors

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

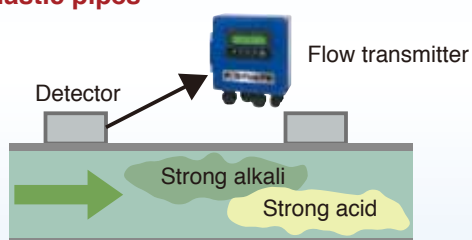


## 2 Flow rate measurement in the air-conditioning field



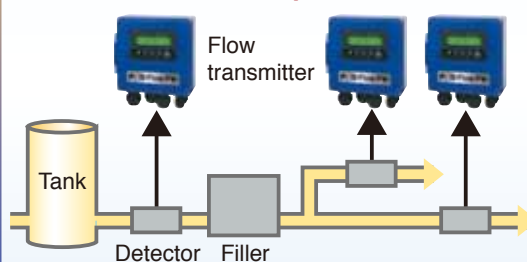
## 3 Flow rate measurement of corrosive fluid

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



## 4 Flow rate measurement in cooking oil production line

Unlike mechanical or Coriolis type, maintenance is not required.

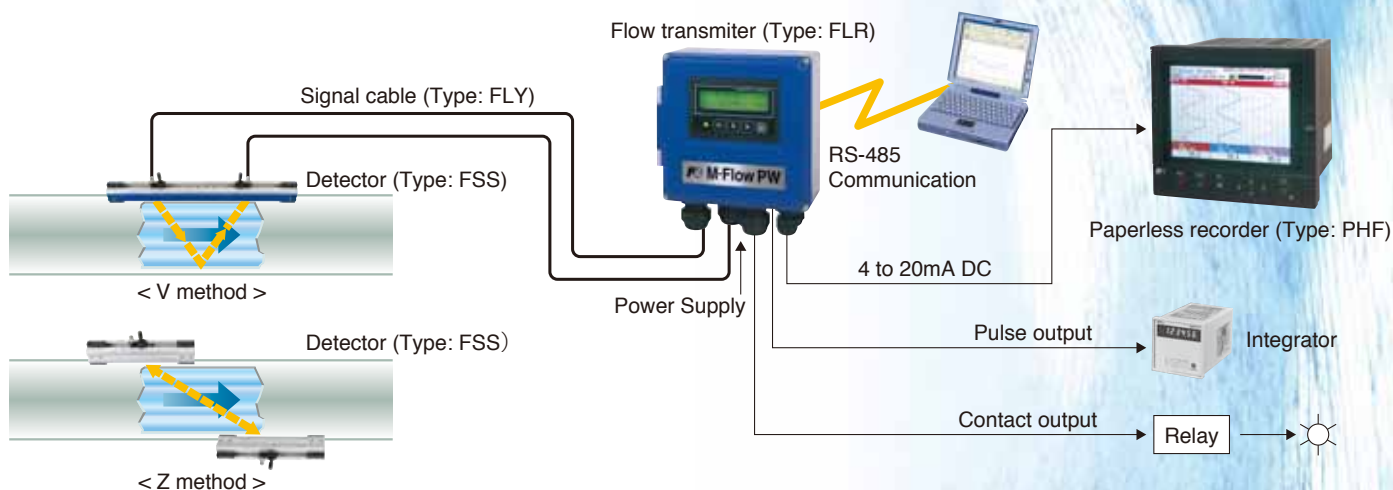


## Major applications



- 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

# Example of system configuration



## CODE SYMBOL

### Flow transmitter

1	2	3	4	5	6	7	8	9	10	11	12
F	L	R	E		Y	3		1			
			E								
			1								
			4								
			Y								
			D								
								1			
								A			
								B			
								Y			
								A			
								B			
								C			
								Y			
								A			
								B			
								C			
								Y			
								A			
								B			
								C			

(IP66) (IP67)

Description

Type (4th digit)

Standard for exports

Power Supply (5th digit)

100 to 240Vac, 50/60Hz

20 to 30Vdc

Communication function (6th digit)

None

RS-485

Case structure (9th digit)

Jetproof type (IP65)

Mounting bracket (10th digit)

For 2B pipe mount

For wall mount

Parameter setting, tag plate (11th digit)

Without

With setting

With setting + Tag plate

With Tag plate

Measurement accuracy (12th digit)

Standard

High accuracy type (Pipe diameter  $\phi 50\text{mm}$  or more)

### Detector

1	2	3	4	5	6	7	8	9	10
F	S	S	1					Y	
			C						
			A						
			1						
			Y						
			A						
			C						
			Y						
			A						
			B						
			Y						
			A						
			B						
			Y						
			A						
			B						

Description

<Sensor type> (4th digit)

Extendable rail type ( $\phi 50$  to  $\phi 1200\text{mm}$ )

Compact type ( $\phi 25$  to  $\phi 225\text{mm}$ )

<Guide rail> (5th digit)

Provided

<Mounting belt> (6th digit)

None

Stainless belt (1.0mx2)

SS belt fasten with screws (1.0mx4)

Wire  $\leq \phi 1500\text{mm}$

<Acoustic coupler> (7th digit) \*1

None

Silicon rubber (KE348)

Silicone-free grease (HIGH-Z)

<Watwe-proof treatment> (9th digit)

None

<Tag plate> (10th digit)

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

1	2	3	4	5	6	7	8
F	L	Y	A				1
			A				
			0	0	5		
			0	1	0		
			0	1	5		
			0	2	0		
			0	2	5		
			0	3	0		
			0	3	5		
			0	4	0		
			0	4	5		
			0	5	0		
			0	5	5		
			Z	Z	Z		

Description

<Type of detector> (4th digit)

For FSSA, FSAC

<Cable length: m> (5, 6, 7 digits)

5m

10m

15m

20m

25m

30m

35m

40m

45m

50m

55m

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					
Applicable piping and fluid temperature	Classifi cation	Detector type	Pipe inner diameter (mm)	Mounting method	Fluid temperature range (Note 2)	Applicable pipe material
	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	Z method	-40 to 120°C	Metal pipe(SS,steel pipe,copper pipe, aluminum pipe,etc.) Note 1
			φ600 to φ1200			
	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 fl uid 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

<b>Accuracy</b>	<b>Plastic pipe</b>			
	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
	<b>Metal</b>			
	Type of detector	Pipe diameter	Velocity: 2m/s or higher	Velocity: Less than 2m/s
<b>Accuracy (High accuracy type)</b>	FSSA, FSSC	φ50 to φ600mm	±2% of rate	±0.04m/s
	<b>Metal, Plastic pipe</b>			
	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
<b>Response time</b>	FSSC	φ200 to below φ1200mm	±1.0% of rate	±0.02m/s
	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) <ul style="list-style-type: none"> <li>• Output: 2 points</li> <li>• Normal: ON/OFF selectable</li> <li>• Contact capacity: 30VDC, 50mA</li> <li>• Output frequency: 100P/s max. (pulse width: 5, 10, 50, 100, 200, 500, 1000ms)</li> </ul>										
Serial communication	RS-485(MODBUS), isolated										
RS-485 (option)	Connectable quantity: 31 units Baud rate: 9600, 19200, 38400bps Parity: None/Odd/Even selectable	Stop bits: 1 or 2 bits selectable Cable length: 1km max. 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. <table border="1"> <thead> <tr> <th></th><th>Metric system</th><th>Inch system</th></tr> </thead> <tbody> <tr> <td>Unit: Velocity</td><td>m/s</td><td>ft/s</td></tr> <tr> <td>Flow rate</td><td>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</td><td>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</td></tr> </tbody> </table>			Metric system	Inch system	Unit: 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
	Metric system	Inch system									
Unit: 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	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. <table border="1"> <thead> <tr> <th></th><th>Metric system</th><th>Inch system</th></tr> </thead> <tbody> <tr> <td>Unit: Total</td><td>mL, L, m³, km³, Mm³, mBBL, BBL, KBBL</td><td>gal, kgal, ft³, kft³, Mft³, mBBL, BBL, kBBL, ACRE-ft</td></tr> </tbody> </table>			Metric system	Inch system	Unit: Total	mL, L, m³, km³, Mm³, mBBL, BBL, KBBL	gal, kgal, ft³, kft³, Mft³, mBBL, BBL, kBBL, ACRE-ft			
	Metric system	Inch system									
Unit: Total	mL, L, m³, km³, Mm³, mBBL, BBL, KBBL	gal, kgal, ft³, kft³, Mft³, mBBL, BBL, kBBL, ACRE-ft									
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)										

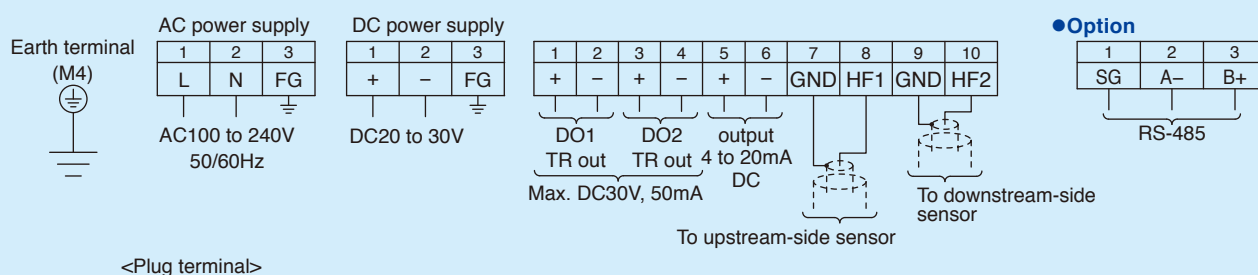
## Physical specifications

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)
	Fluid temperature	-40 to +150°C
	Teflon piping	Not usable
Outer dimensions, mass	See outline diagrams.	

## Loader software (standard accessory)

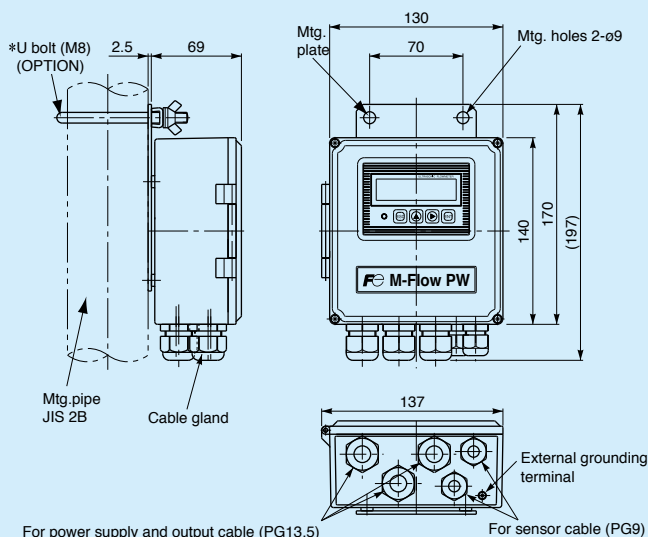
Compatible PC model	PC/AT compatible instrument Operation is undefined for PC98 series (NEC)
Main function	Software for setting/change of the main unit parameters and for collection of the measured data on PC
OS	Windows 2000/XP/7
Memory requirement	125MB min.
Hard disk capacity	Minimum free space of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

## Connection diagram



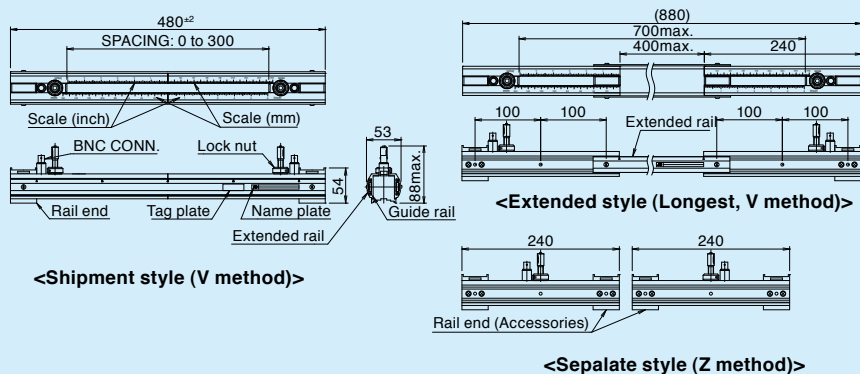
## Outline diagram of the flow transmitter (unit: mm)

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



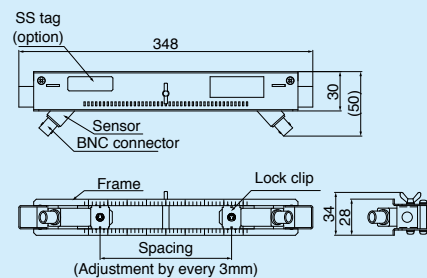
## Outline diagram of detector (unit: mm)

●Extendable rail type detector Type: FSSC (diameter  $\phi 50$  to  $\phi 1200$ , Weight: 1kg)



●Compact type detector

Type: FSSA (diameter  $\phi 25$  to  $\phi 225$ , Weight: 0.4kg)



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

**Fuji Electric Co., Ltd.**

Instrumentation & Sensors Planning Dept.

1, Fuji-machi, Hino-city, Tokyo 191-8502, Japan

[www.fujielectric.com](http://www.fujielectric.com)

Phone: +81-42-514-8930 Fax: +81-42-583-8275

[www.fujielectric.com/products/instruments/](http://www.fujielectric.com/products/instruments/)