

## Installation example

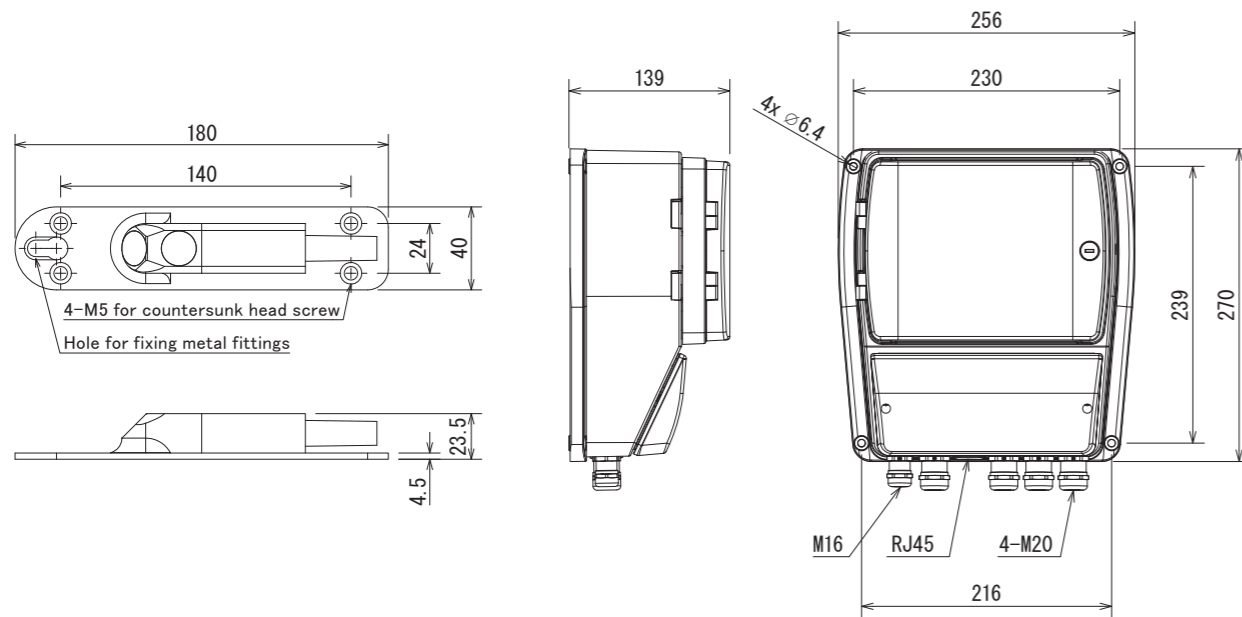
This is an example of setting an underdrain channel. Use the mounting bracket to attach a combined sensor to the bottom of the channel. Please contact us for various mounting methods.



## External Dimensions

CSW-10 Combined sensor of flow velocity and water level

FM-10 Transmitter



\*Specifications in this catalog are subject to change without prior notice due to product improvement.

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# Ultrasonic Pulse Coherent Flowmeter

# FM-10



High-precision flow measurement  
 based on the Ultrasonic Pulse Coherent method

High accuracy measurement using Ultrasonic Pulse Coherent method.

More accurate by dividing the water depth direction into cells and measuring the flow velocity distribution.

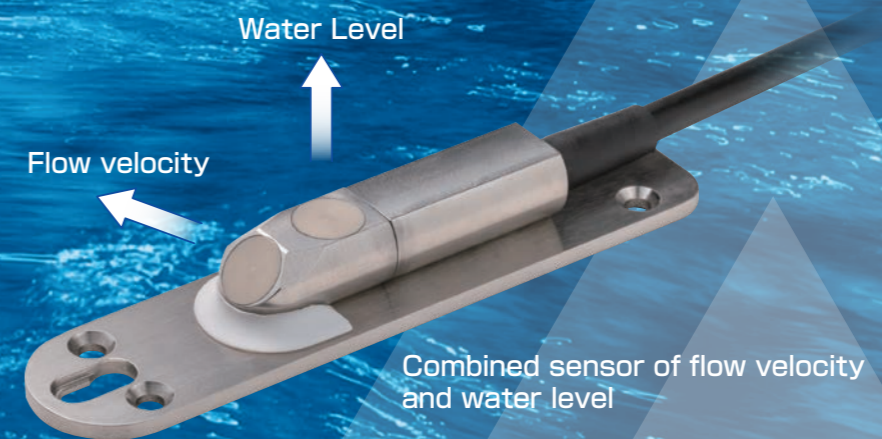
Applicable to open channel, closed ditch, non-full pipes, and full pipes.

The data logger function is carried.

Easy setting with a web browser.



Transmitter



**JFE Advantech Co., Ltd.**

## Features

- One sensor measures flow velocity and water level.
- Can be used in combination with an external water level gauge.
- High accuracy measurement using Ultrasonic Pulse Coherent method.
- High-precision measurement is possible by dividing the water depth direction into cells and obtaining the flow velocity for each water depth.
- Suitable for all purposes. Applicable to open channel, closed ditch, non-full pipes, and full pipes.
- FM-10 is equipped with a large-capacity data logger function. It also has a setting sealing function.
- CSW-10 has excellent environmental resistance because it has a structure that does not contain electronic components inside the sensor.

## Measurement principle

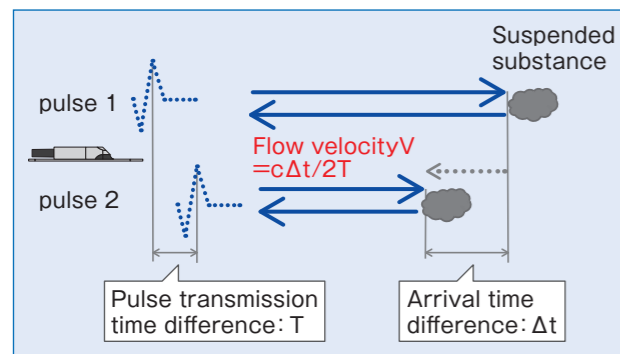
This method measures the flow velocity and water level in the channel, and calculates the flow rate from the average flow velocity, fluid cross-sectional area, and correction factor.

A combined sensor of flow velocity and water level is installed at the bottom of the channel to measure the flow velocity and water level in the channel using a single sensor housing.

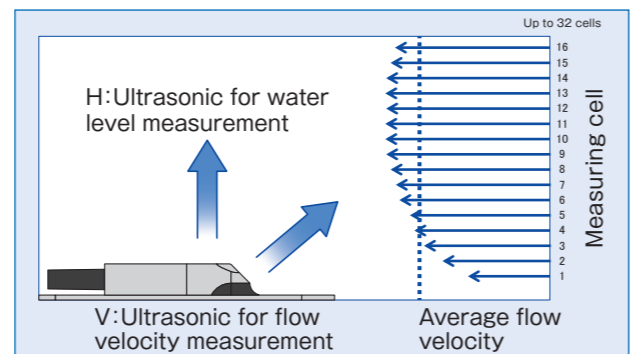
The flow velocity is calculated by transmitting a pair of time-staggered ultrasonic pulses into water, receiving a reflected wave from a suspension in water, and determining the flow velocity from the arrival time difference of the received wave and the speed of sound in the fluid. (Ultrasonic Pulse Coherent method)

Furthermore, the water depth direction is divided into a maximum of 32 measurement cells, and ultrasonic pulse pairs with a time difference are transmitted for each measurement cell to obtain the flow velocity, that is, the flow velocity distribution for each measurement cell. And calculate the average flow velocity of the water depth direction. The water level is calculated from the propagation time between the transmission of ultrasonic waves in the vertical direction and the reception of ultrasonic waves reflected at the water surface.

### Ultrasonic Pulse Coherent method

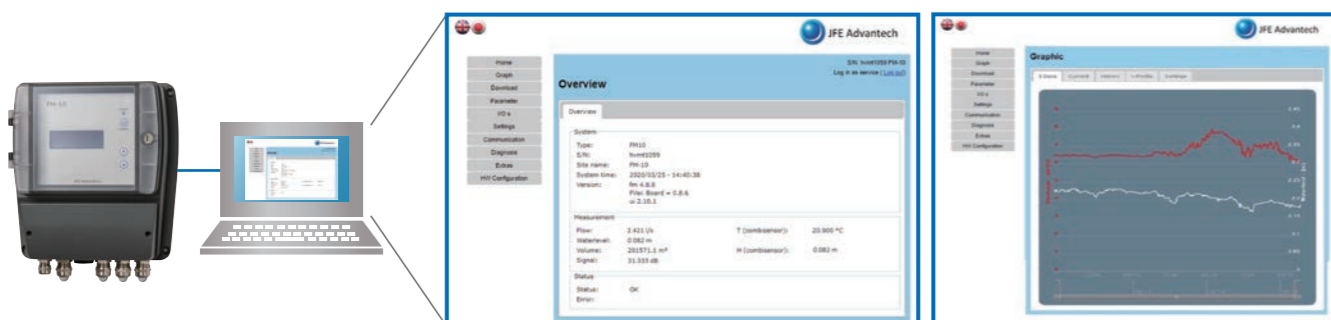


### Flow velocity distribution for each measurement cell



## Setting operation

Settings can be easily operated with a web browser by connecting a personal computer.



## Specifications

### CSW-10 Combined sensor of flow velocity and water level

| Flow velocity measurement   | Specifications   |
|-----------------------------|--|
| Measurement method          | Ultrasonic Pulse Coherent Flowmeter  |
| Measuring range             | -5 to +5m/s  |
| Measuring cell              | Up to 32 cells (water level 0.1 to 1.0m)   |
| Measuring accuracy          | ±1.0% F.S. (flow velocity 1m/s or more)<br>±0.6% F.S. (flow velocity less than 1m/s)                   |
| Water level measurement     | Specifications   |
| Measurement method          | Ultrasonic propagation time measurement method   |
| Measuring range             | 0.05m to 1.00m   |
| Measuring accuracy          | ±2mm   |
| Body                        | Material: Body stainless steel (SUS316L)<br>Transmission/reception side PEEK<br>Protection class: IPX8 |
| Operating temperature range | -15 to 50°C (no freezing allowed)  |
| Cable length                | Up to 100m   |
| Cable outer diameter        | 10.0mm±0.3mm   |
| Cable exterior material     | Polyethylene   |
| Frequency                   | 1MHz   |
| External dimensions         | 180(W)×23.5(H)×40(D)mm   |
| Weight                      | Approx. 0.4kg (excluding cables)   |

\*Due to the principle of measurement, the measurement may be affected by suspended solids and air bubbles in the water. Please contact us for details.

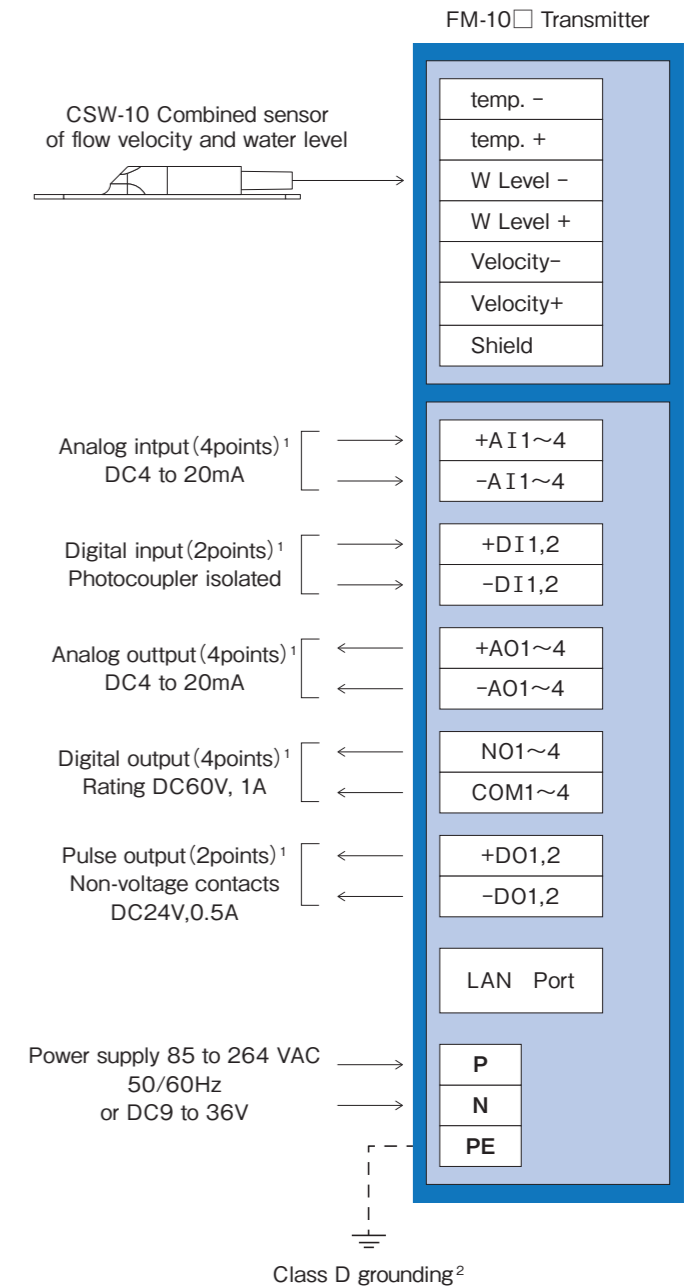
### FM-10 Converter

| Inputs                      | Item  |
|-----------------------------|---|
| Sensor                      | 1 point : Combined sensor of flow velocity and water level  |
| Analog input                | 4 points : DC4 to 20mA (input resistance 100Ω or less)<br>AI1 and 2 can be set to a 2-wire water level gauge (DC4 to 20mA).<br>Supply voltage DC24V, max 200mA. |
| Digital input               | 2 points : Photocoupler isolated<br>Internal resistance 2kΩ (DC12 to 24V, max 12mA)   |
| Outputs                     | Item  |
| Analog output               | 4 points : DC4 to 20mA (Allowable load resistance 550Ω)   |
| Digital output              | 4 points : Non-voltage contacts DC60V, 1A<br>2 points : Pulse output<br>Non-voltage contacts DC24V, 0.5A  |
| Display                     | LCD (4 lines 20 characters)   |
| Data storage device         | Built-in MicroSD card 16GB<br>Can be stored for 5 years (1 minute cycle)  |
| Communication function      | Ethernet 10/100 Mbps  |
| Case                        | Mounting method : Wall-mounted type<br>Material : Body aluminum die cast<br>cover Polycarbonate resin<br>Protection class : IP66 equivalent                     |
| Operating temperature range | -15 to 60°C   |
| Power supply                | FM-10A: 85 to 264VAC, 50/60Hz<br>FM-10D: DC9 to 36V Specified when ordering.  |
| Power consumption           | FM-10A: Approx. 27W<br>FM-10D: Approx. 12W  |
| External dimensions         | 256(W)×270(H)×139(D)mm<br>(excluding cable gland)   |
| Weight                      | Approx. 4.4kg   |

### Flow rate measurement accuracy

- ± 3% to ± 6% of measured value
- The factory test result is ± 3% of the measured value.

## Device wiring diagram



- 1: For details on input / output, refer to the instruction manual.  
2: Be sure to connect the grounding terminal (PE) to ground potential. (Class D grounding: ground resistance of 100Ω or less)