

**【new product】**

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**Introduction of Ultrasonic Flowmeter for Steam**

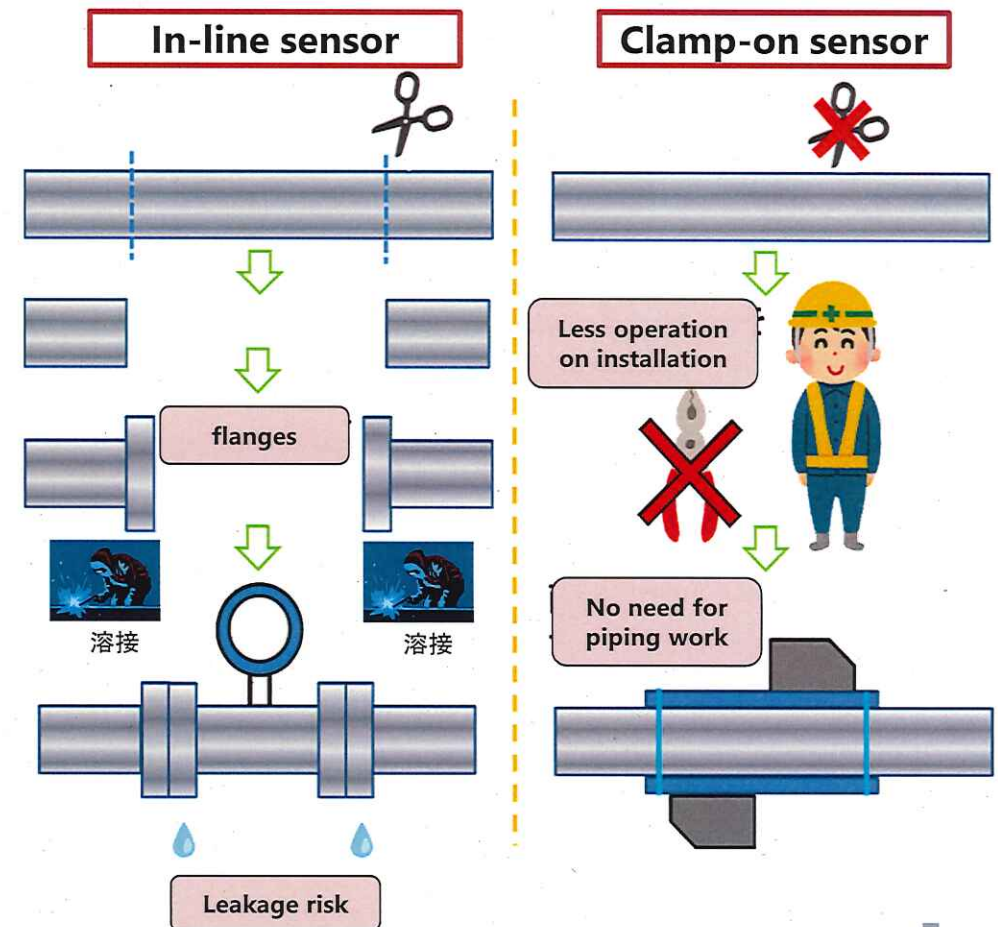
**Fuji Electric Co., Ltd.**

The world's first clamp-on ultrasonic flowmeter that can measure saturated steam

- Improved signal-noise ratio
- Optimized sensor positioning
- Algorithm dedicated for steam measurement

## Advantages of clamp-on sensor

- Easy installation without interrupting the steam line
- No need for piping work  
No steam leakage
- No pressure loss
- Low maintenance and more versatile





Advantages: No piping work, no pressure loss, measurable even at zero flow

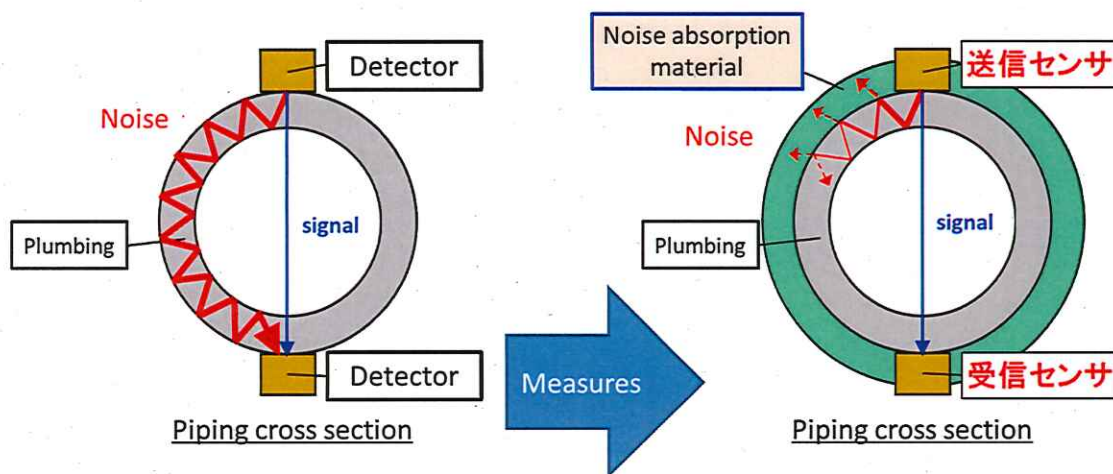
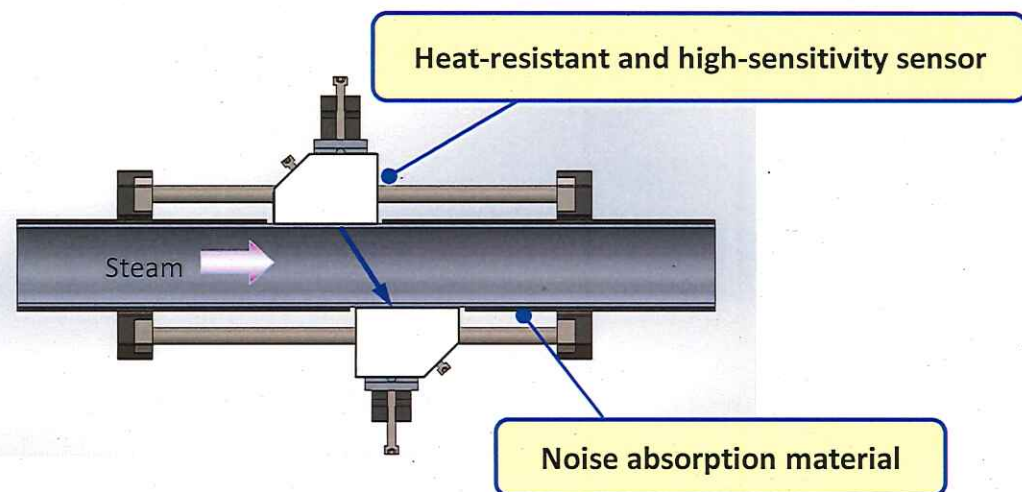
Manufacturer	Fuji (under development)	Company A	Company B
Principle	Clamp-on ultrasonic 	Vortex 	Orifice + DP 
Piping work	○ Unnecessary	× Necessary	× Necessary
Accuracy	○ $\pm 3\% \sim 5\%$ of reading	◎ $\pm 1 \sim 2\%$ of reading	○ $\pm 2\%$ of reading
Pressure loss	○ No	× Yes	× Yes
Low flow measurement	○ Low flow rate (no dead-band)	×	×
Range ability	◎ Yes 2 range switchable	▲ Wide	× Small



	item	Main Specifications
1	Applicable fluid/Principle	Saturated steam/Transit time difference method
2	Measuring range	Flow velocity: 0 to $\pm 50$ m/s
3	Accuracy (reading and pulse output)	When pipe straight run is $\geq 20$ D (1.0m) on upstream, $\geq 10$ D (0.5m) on downstream: Flowrate $\leq 10$ m/s : $\pm 0.3$ m/s $\leq 10\text{--}30$ m/s : $\pm 3\%$ $\leq 30\text{--}50$ m/s : $\pm 5\%$
4	Straight run requirements	$\geq 20$ D (1.0m) on upstream, $\geq 10$ D (0.5m) on downstream
5	Applicable piping material	Select from carbon steel, stainless steel
6	Pipe size	50 mm (Other calibers are planned)
7	Pipe wall thickness	2.8–3.9 mm (SUS pipe: sch 10S ~40S), 3.8mm (SPG pipe)
8	Fluid temperature	+120°C to +180°C
9	Fluid pressure	0.1–0.9 MPaG
10	Input (mass flow conversion)	4–20 mA DC $\times 1$ , Pt $\times 1$ (option)
11	Output	4–20 mA DC $\times 1$ , total pulse output $\times 1$ , contact output $\times 1$
12	Mass flow conversion	Mass flow output by conversion with fixed value input, temperature or pressure input
13	Communication	RS485 (option), Ethernet (option, under development)
14	Power supply voltage	100–240 V AC, 24VA
15	Ambient temperature	-20°C to +60°C

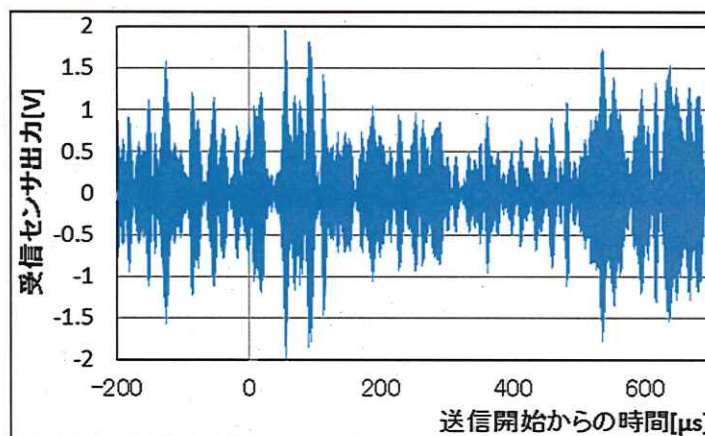


## New technology



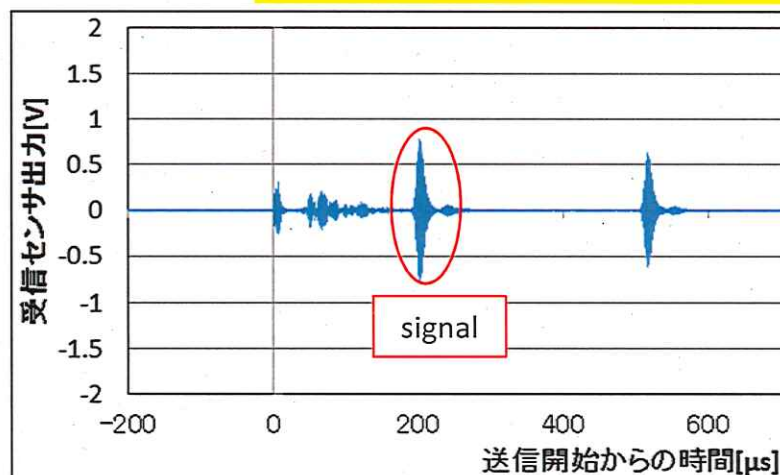
## Effect

Before



After

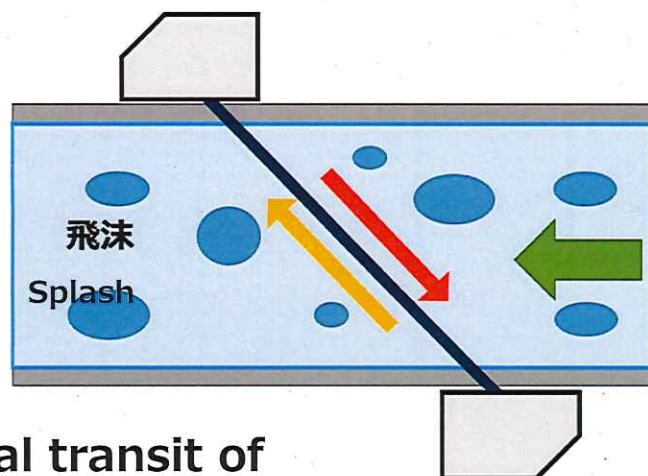
detects signals hidden behind noise



## ☆the Algorithm remit measurement failures by splashes, and developed the world's first product

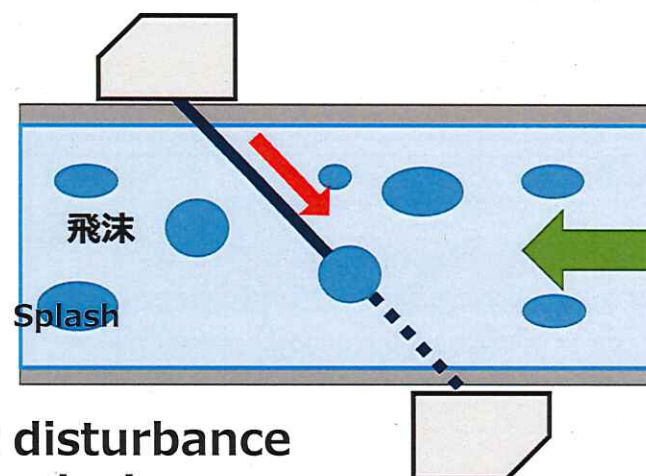
Fuji's unique digital signal processing reduces measurement failures caused by splash.

### Synchronous addition processing of received signals



**Normal transit of ultrasonic waves**

The flow can be measured without disturbance.

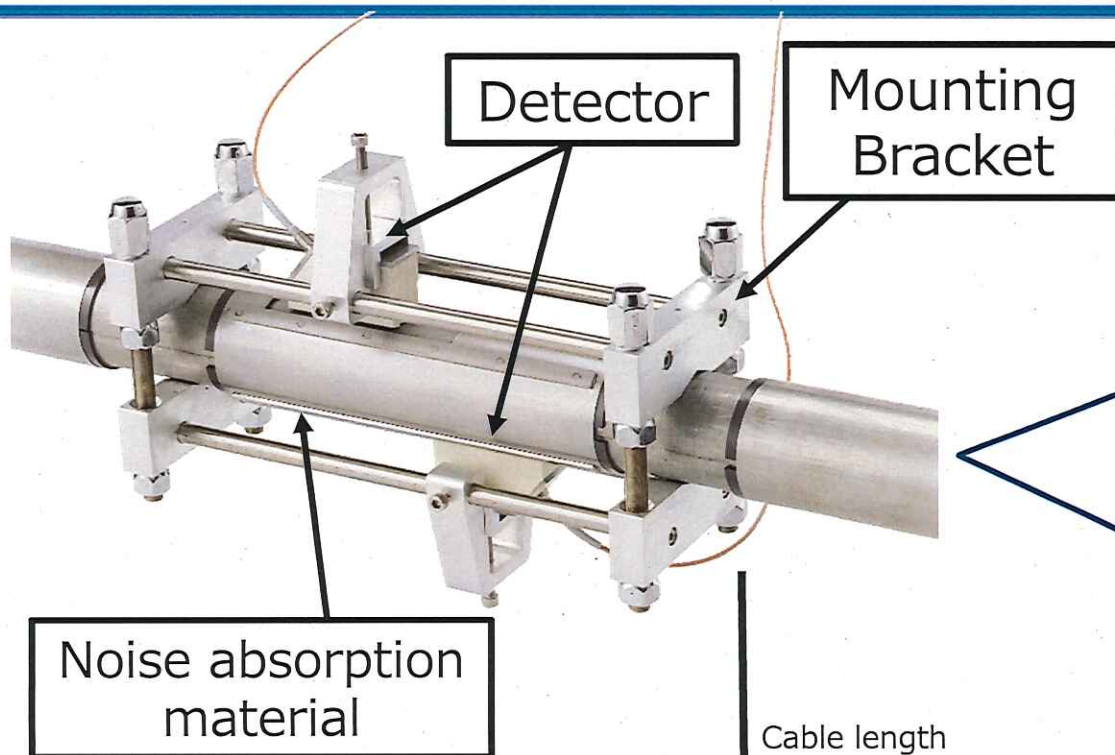


**Transit disturbance due to splash**

Conventional analog processing signals can cause measurement failures.

**Ensured sufficient signal level by summing flow rate signals**



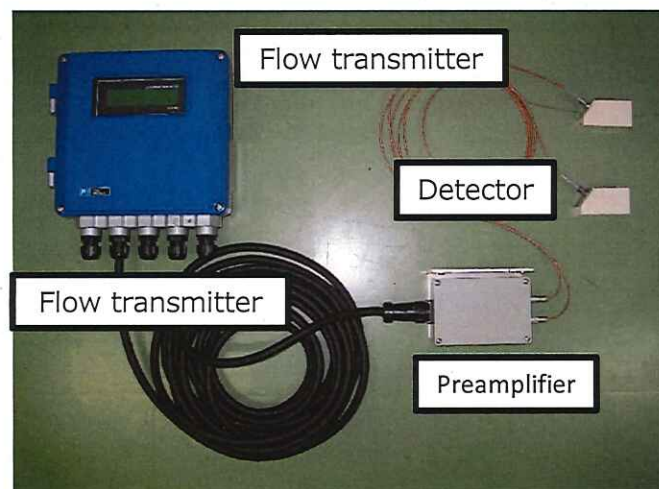


## Installation example

Before installing an insulation material



After installing an insulation material



Cable length  
between Detector to Preamplifier  
**2m**



Cable length between  
Preamplifier to Flow  
transmitter  
**5m-30m**

※Please contact us if you have  
a request for cable lengths of  
30m or more.

**Preamplifier**

## Flow transmitter



4-20 mA DC

Total pulse

Pt (option)

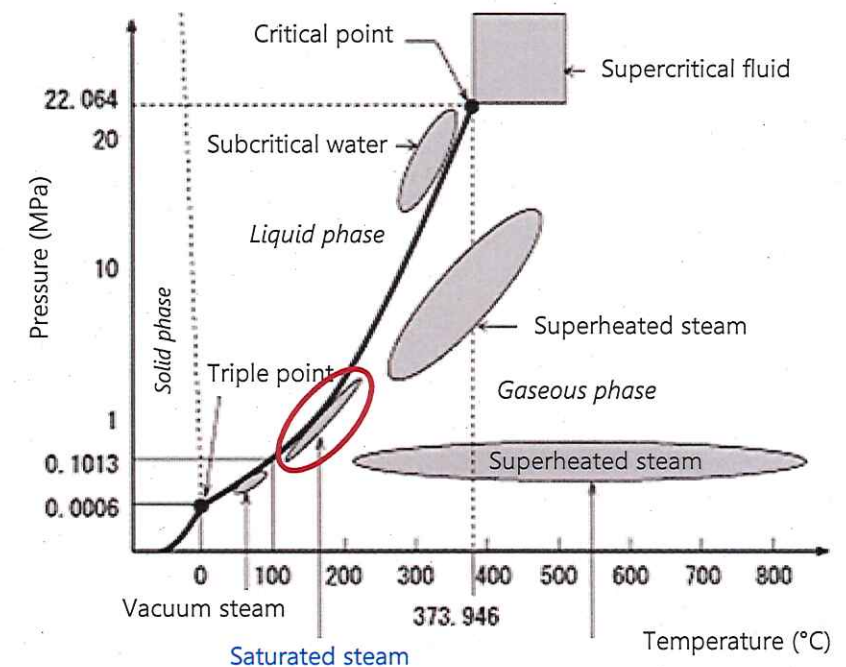
RS-485 Communication  
(option)

Thank you!



Saturated steam	<ul style="list-style-type: none"> <li>Typically 0.05–2.0 MPa, 110–215°C</li> <li>Wet or dry</li> </ul>
Superheated steam (subcritical steam)	Steam heated above the boiling point but not higher than the critical pressure
Vacuum steam	<ul style="list-style-type: none"> <li>Below the atmospheric pressure, 30–100°C</li> <li>Used as a substitute for hot water</li> </ul>
Subcritical water	Used to oxidize and decompose protein
Supercritical fluid (water)	<ul style="list-style-type: none"> <li>Water heated above the critical pressure and temperature</li> <li>Expected to be used as a solvent</li> </ul>

Our new product is applicable to this type of steam



高田 敏則. 食品業界における蒸気の有効利用技術.  
食品機械装置. 2006年12月号. Vol.43  
<https://www.tlv.com/ja/articles/steam/doc9/>

**Confidential**

## <FAM/Steam consumption>

	Steam consumption			FAM (Billion yen)
	Amount of steam for cleaning (t/h)	Amount of steam for drying (t/h)	Amount of steam for sterilization (t/h)	
<b>Food</b>	<b>1,378</b>	<b>2,411</b>	<b>1,963</b>	<b>63.3</b>
Beverrage・Tabacco・Feed	259	135	1,249	13.9
Transport equipmant (Automobile)	2,262	240	0	15.0
Textile industry	878	3,039	0	17.2
<b>Pulp・Paper・Paper product</b>	<b>638</b>	<b>10,267</b>	<b>0</b>	<b>84.2</b>
Chemical industry(Inorganic)	444	846	0	8.6
Chemical industry(Organic)	0	5,399	2,724	58.5
Chemical industry (Pharmaceutical)	97	16	218	3.3
Petroleum・Coal product	0	0	0	9.2
Rubber product	26	219	0	1.0
Ceramic・Stone product	96	1,692	0	7.4
<b>Steel industry</b>	<b>674</b>	<b>3,593</b>	<b>0</b>	<b>3.2</b>
Nonferrous metal product	125	0	0	1.4
General machinery	490	0	0	2.5
Electronic parts・circuit	624	92	0	4.3
Distribution center	New market			

Washing/120℃

## Target customer

- Food
- Pulp・Paper・Paper product
- Steel industry



# Clamp-on Ultrasonic Flowmeters: Outline

- Highly accurate flow measurement with three measuring paths
- Applicable to various liquids

## Principle

Pipe inner diameter

: D

Transit time from upstream to downstream

: T1

Transit time from downstream to upstream

: T2

Flow coefficient

: K

Flow velocity:  $V = K \cdot (T_2 - T_1)$

Pipe cross-sectional areas:  $A = \frac{\pi D^2}{4}$

Flow rate:  $Q = A \cdot V$

