

New Generation Handy Ultrasonic Flowmeter OVF-20



Versatility! Functionality! Reliability!

We are a flow measurement specialist.



OVAL ENGINEERING INC.

오벌엔지니어링 주식회사에 라이선스를 부여하며, 불법 복사 및 무단 수정을 금합니다.

Portable Ultrasonic Flowmeter



3 in 1 Meter (DN13mm-DN5000mm)

- Flow meter
- Mass meter
- Heat meter

Multi-Measurement System

- 1path / 1pipe, 2path / 1pipe or 1path / 2pipes

Weather-proof

- IP65

USB Data transfer



All in One unit

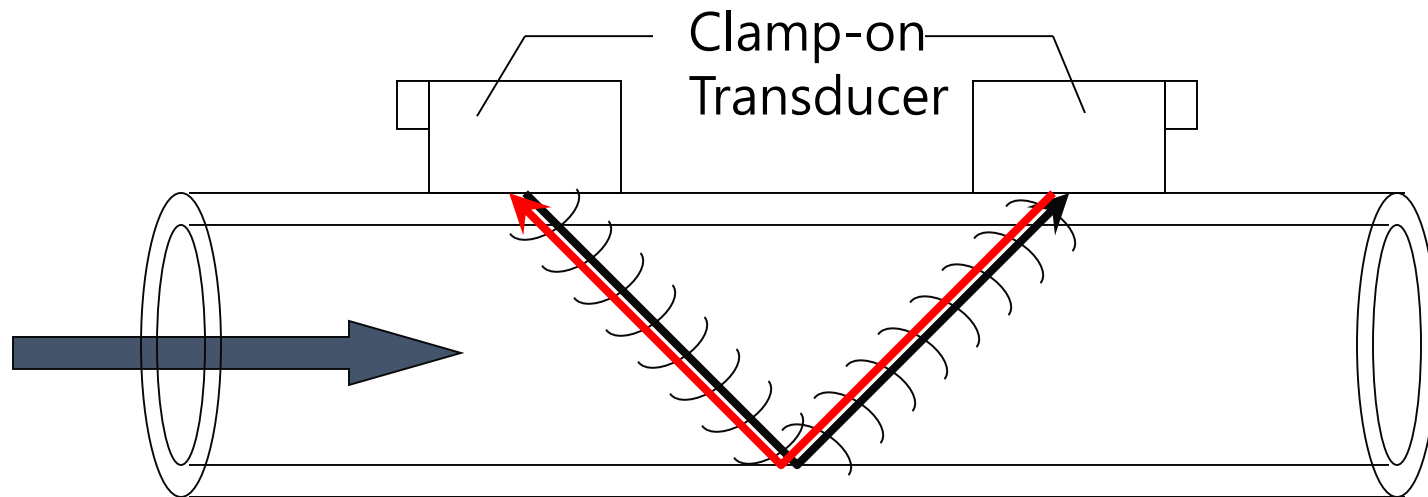
OVF-20 Pipe Range : 13~5000 mm

- Transit Time Differential
- Accuracy:

	$V \geq 1\text{m/s}$	$V < 1\text{m/s}$
DN 13 - 90 mm	$\pm 2.0\%RD$	$\pm 0.02 \text{ m/s}$
DN 100 - 250 mm	$\pm 1.5\%RD$	$\pm 0.015 \text{ m/s}$
DN 300 - 5000 mm	$\pm 1.0\%RD$	$\pm 0.01 \text{ m/s}$
- Measuring Range : -30 ~ +30 m/s
- Weight: Approx. 1.4 kg (incl. battery)
- Thickness Measuring: 1~100mm
- Velocity Measuring: 500~9999 m/s

Principle of "Transit Time"

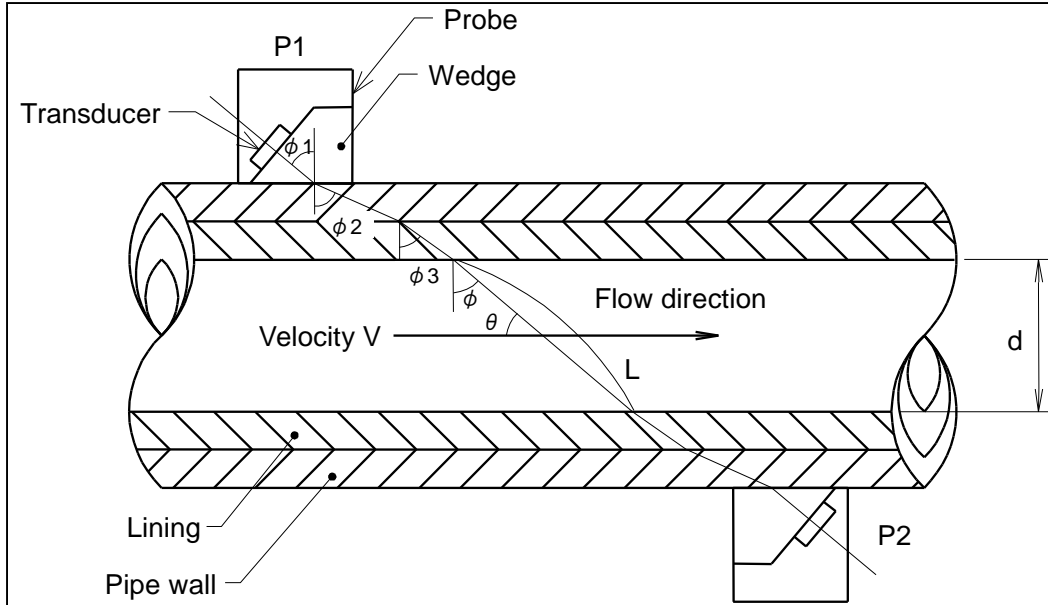
$$Q = A \times V$$



Time difference: with flow (black→) and against flow (red→) = velocity (v)

Flow volume (Q) = cross section area (A) x velocity (v)

Formula of Transit Time



$$\frac{\sin \phi_1}{C_1} = \frac{\sin \phi_2}{C_2} = \frac{\sin \phi_3}{C_3} = \frac{\sin \phi}{C}$$

$$td = \frac{d}{\sin \theta \cdot (C + V \cdot \cos \theta)} + \tau$$

$$tu = \frac{d}{\sin \theta \cdot (C - V \cdot \cos \theta)} + \tau$$

$$\Delta t = tu - td = \frac{2 \cdot (d/\sin \theta) \cdot V \cdot \cos \theta}{C^2}$$

$$to = \frac{tu + td}{2} = \frac{d/\sin \theta}{C} + \tau$$

$$\Delta t = \frac{2 \cdot (to - \tau)^2 \cdot V \cdot \cos \theta}{d/\sin \theta}$$

$$V = \frac{d/\sin \theta}{2 \cdot (to - \tau)^2 \cdot \cos \theta} \cdot \Delta t = \frac{d}{2 \cdot \sin \theta \cdot \cos \theta \cdot (to - \tau)^2} \cdot \Delta t$$

Flow volume correction coefficient $t(k)$

$$= \frac{\text{Average flow velocity obtained by ultrasonic flowmeter } (V)}{\text{Actual average flow velocity } (\bar{V})}$$

$$q = A \cdot \bar{V} = A \cdot \frac{V}{k} = \frac{1}{k} \cdot \frac{\pi \cdot d^2}{4} \cdot \frac{d}{2 \cdot \sin \theta \cdot \cos \theta \cdot (to - \tau)^2} \cdot \Delta t$$

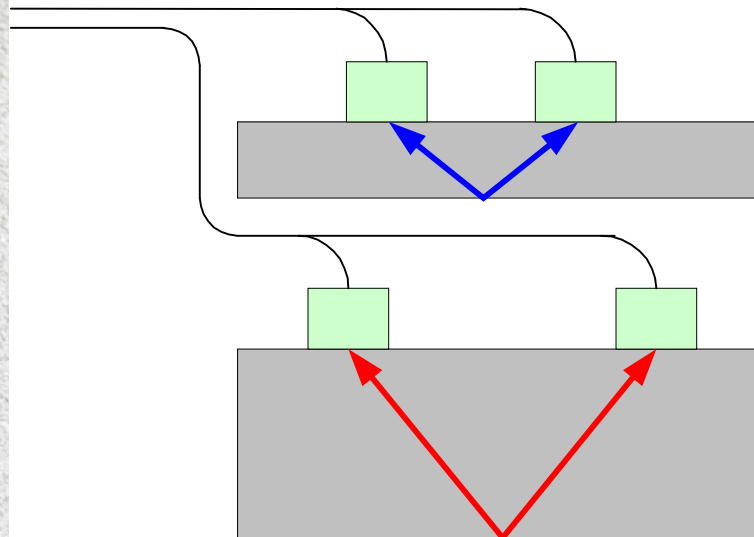
$$= \left[\frac{1}{k} \cdot \left\{ \frac{\pi \cdot d^2}{4} \cdot \frac{d}{2 \cdot \sin \theta \cdot \cos \theta} \right\} \right] \cdot \frac{\Delta t}{(to - \tau)^2}$$

$$\bar{V} = \frac{V}{1.05} \quad Re = \frac{d \cdot \bar{V}}{\nu} \quad (\nu = \text{Kinematic Viscosity})$$

Coefficient 'k' based on BLASIUS and G.E.BIRGER Formula.

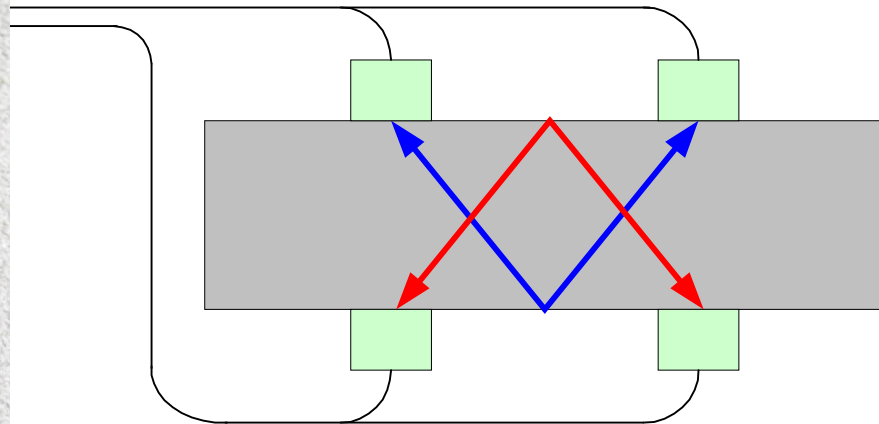
Handy Flowmeter OVF-20 Features

- Multi-Measuring Systems
 - 2 Channel System



Handy Flowmeter OVF-20 Features

- Multi-Measuring Systems
 - 2 Path System

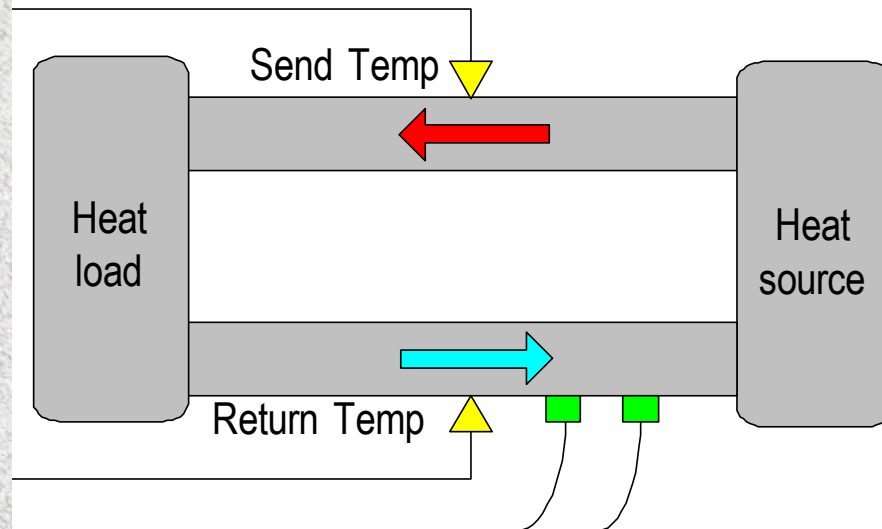


Handy Flowmeter OVF-20 Features

- BTU(열량계) Function

Flow volume x Specific Heat (J/kgK)

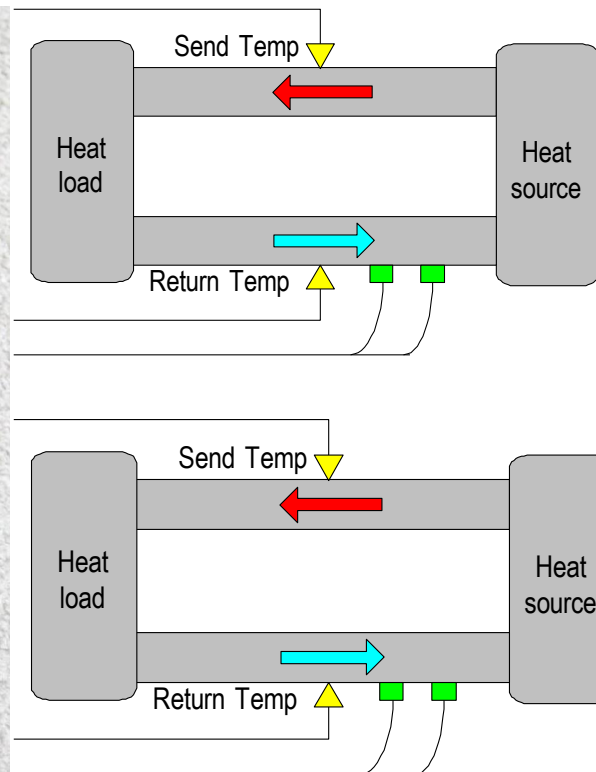
x Density (kg/m³) x Temp Differential = Energy (W)



**RTD Direct
Connection**

Handy Flowmeter OVF-20 Features

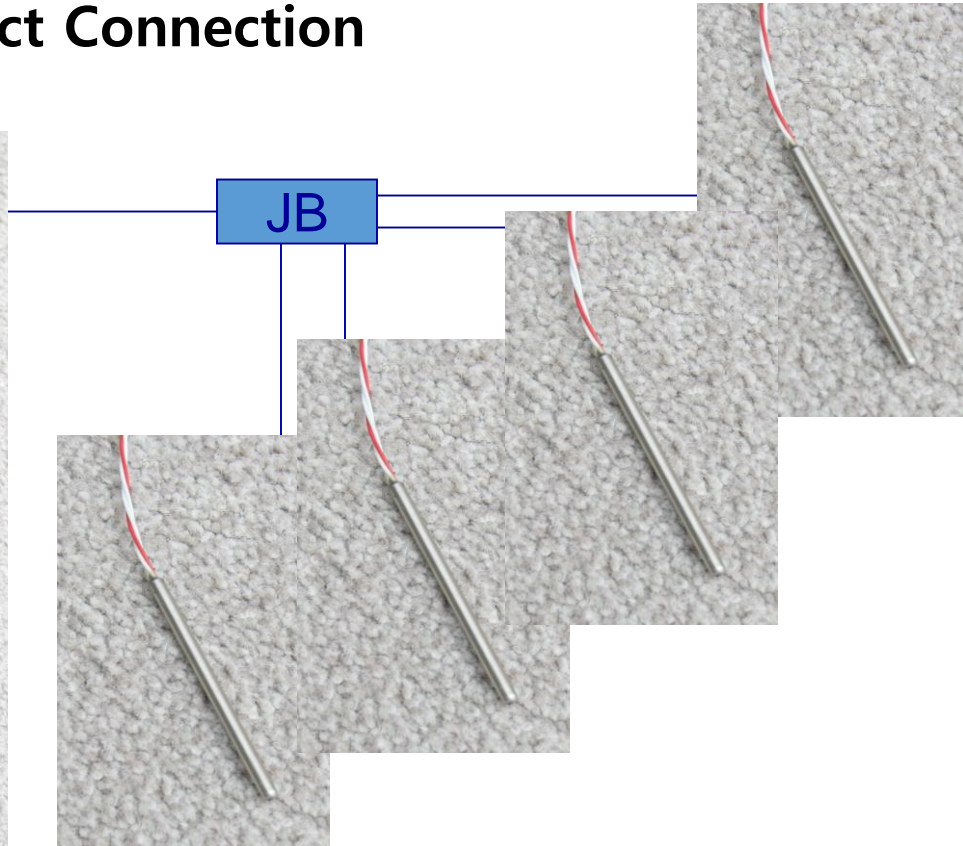
- BTU(열량계) Function
Also 2 Channel BTU is OK!



2 Flow
+
4 Temp
||
2 BTU

Handy Flowmeter OVF-20 Features

- RTD (Pt-100) Direct Connection



Pt-100에 별도의 전원 공급이 필요하지 않음.

Application Report ~Energy metering for Hot Spring in Japan~



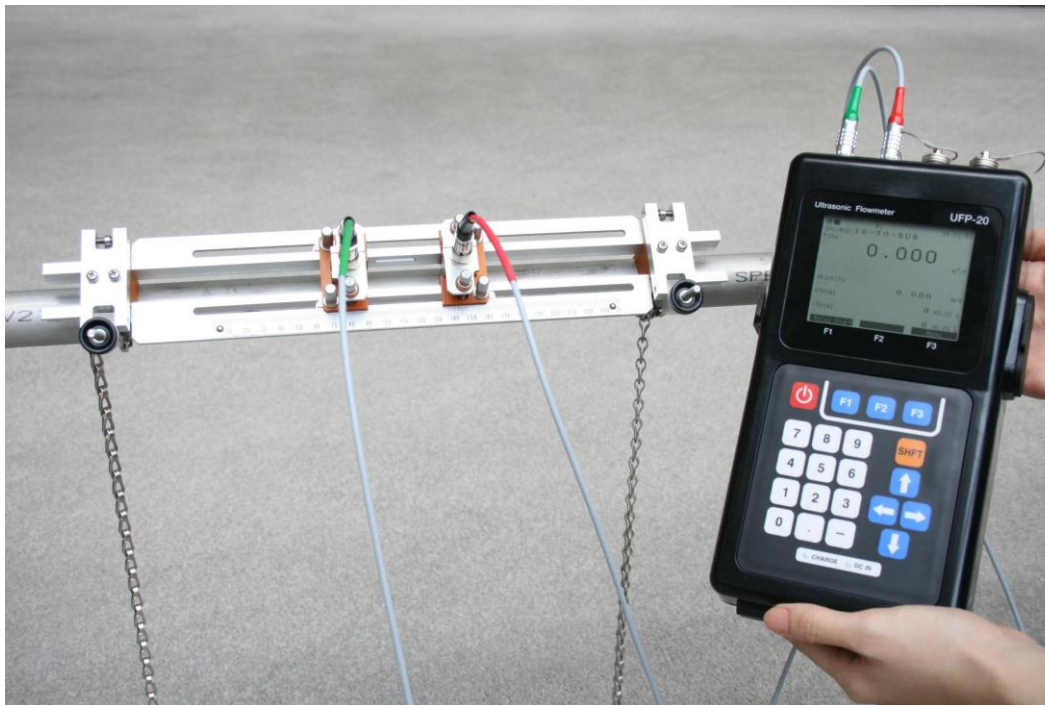
温泉
名湯の管理にも・・・

写真：宙 [SORA] 渡月荘金龍 殿（修善寺温泉）
協力：株式会社電器堂

Handy Flowmeter OVF-20 Features

- Mass Meter

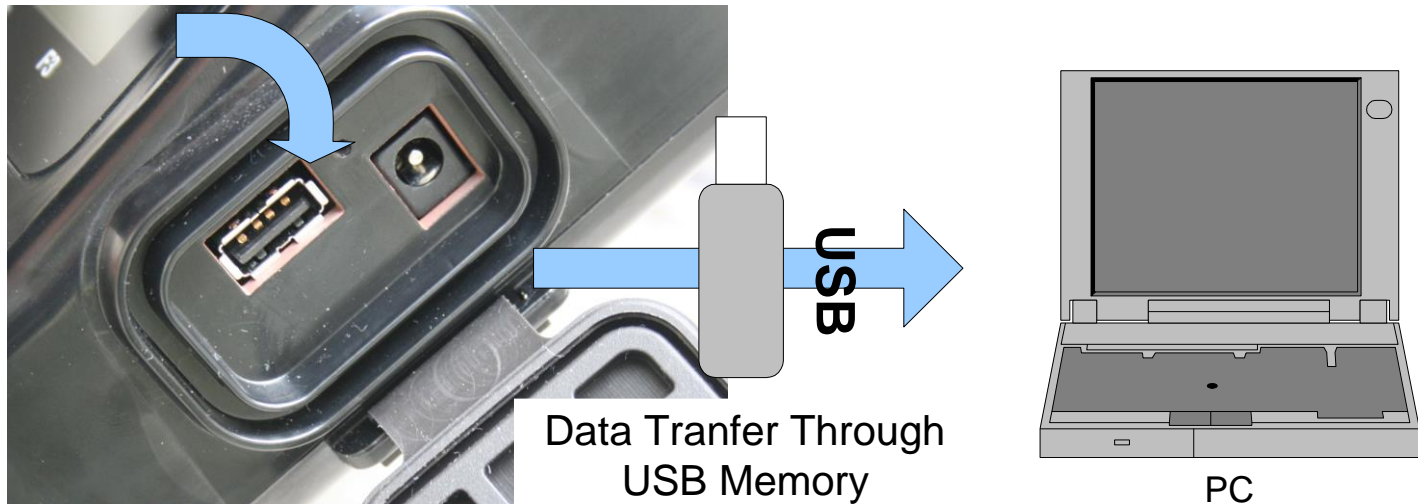
Flow volume x Density = Mass Volume (like kg/s or t/h)



Handy Flowmeter OVF-20 Features

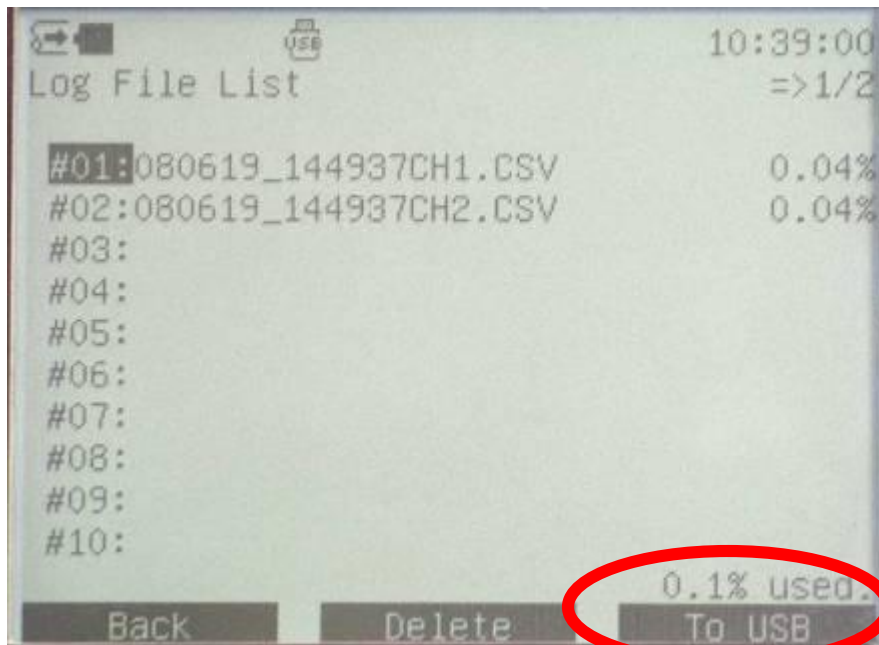
- Data Transfer by USB memory

Log Data, Site Condition
Stored Inside Main Unit

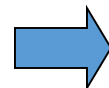


DATA LOGGING & Transfer

Auto-name file by **CSV** format



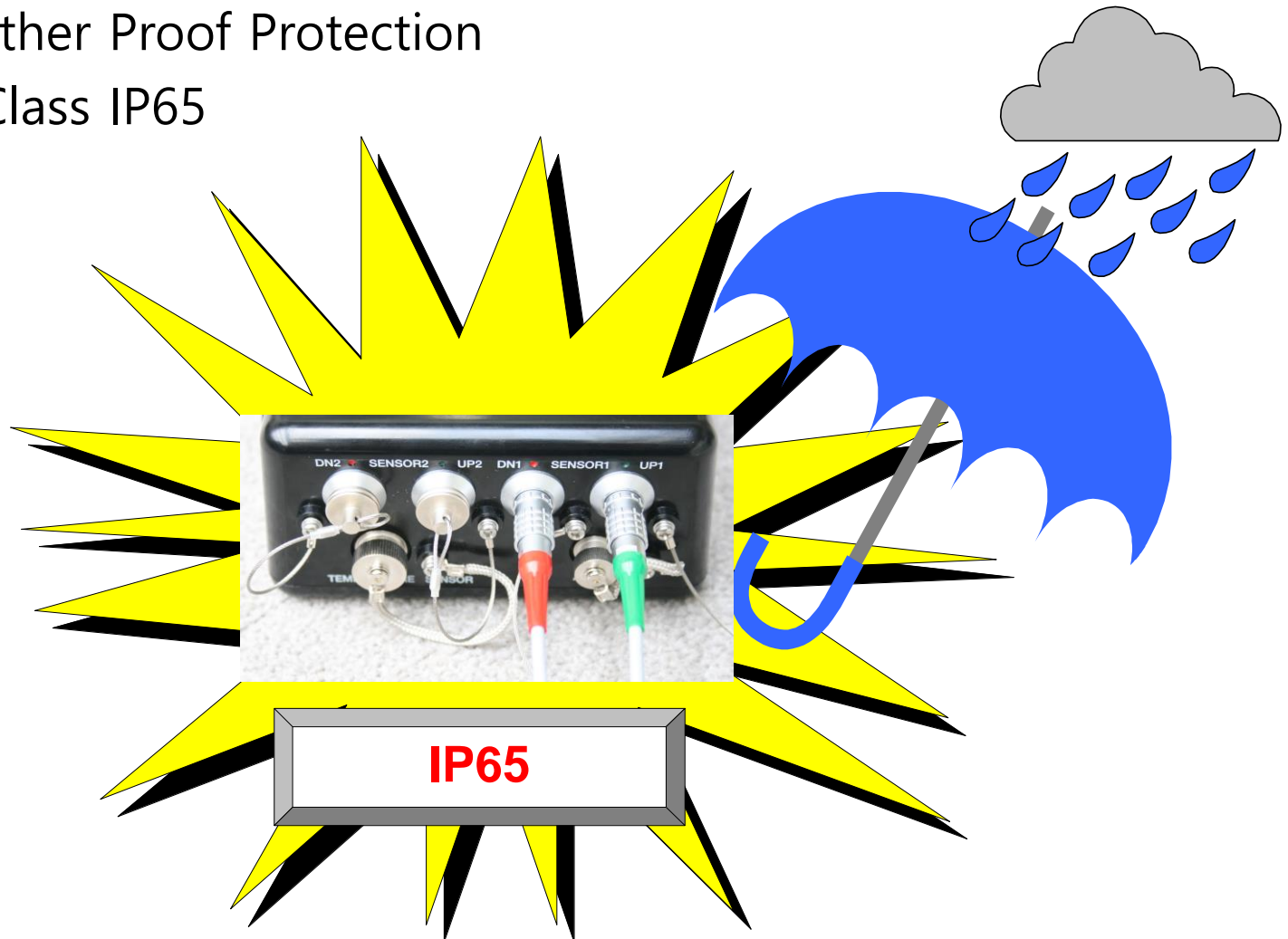
Any interval (min 5sec) can be set
& Easy synchronizing Totalize



Easy copy to USB memory

Handy Flowmeter OVF-20 Features

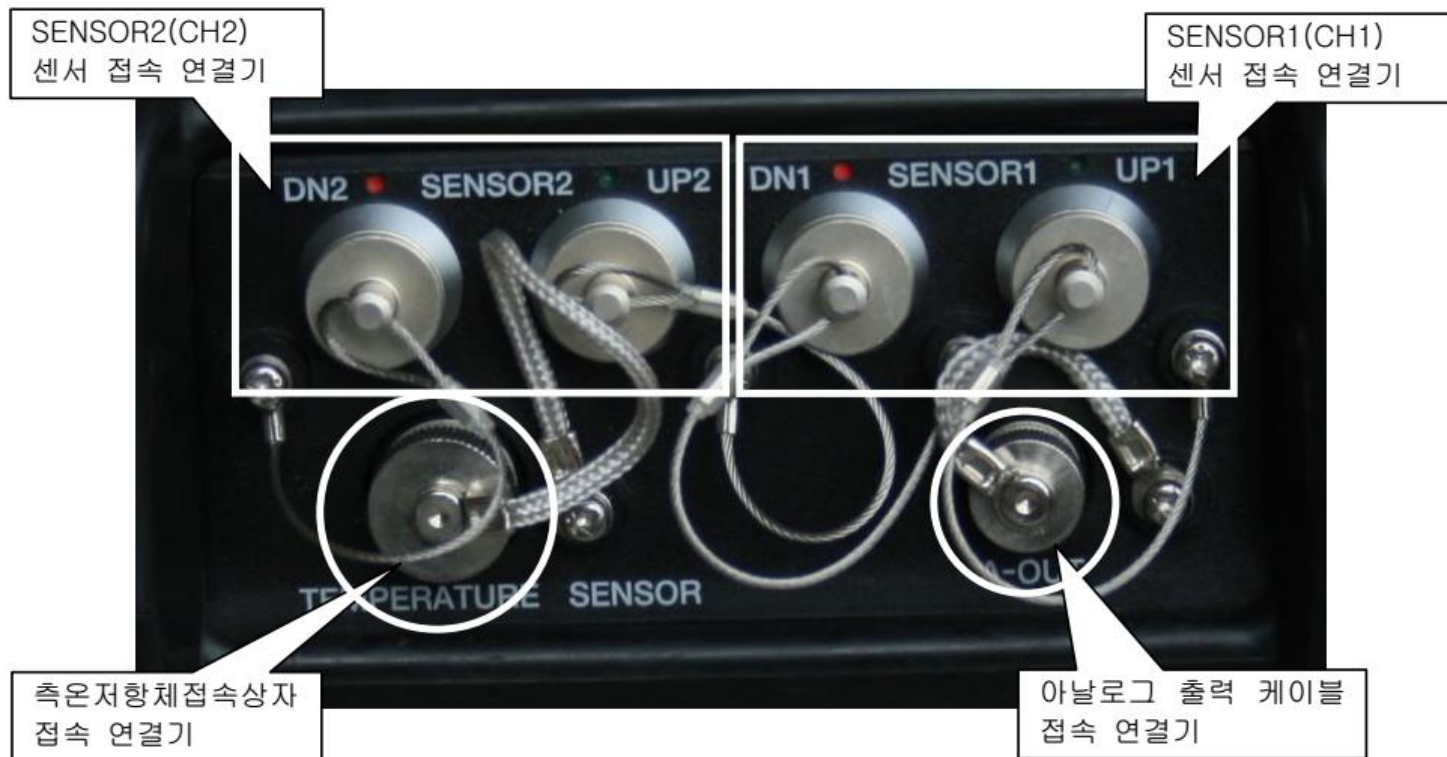
- Weather Proof Protection
 - Class IP65



I/O Port Assignment

4 Sensors / 1 Analog / 4 Temperature Inputs

유량 측정 중에도 IP 등급이 유지됩니다.



Battery Charge

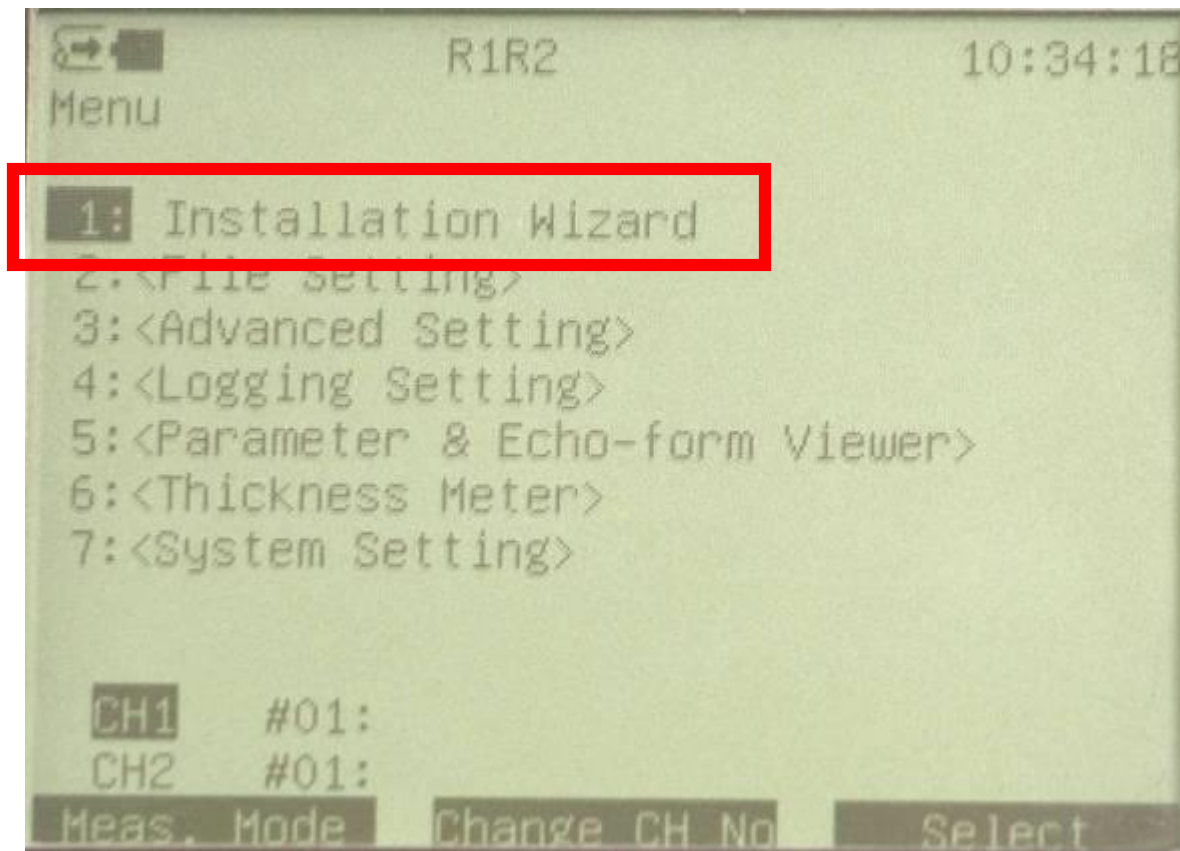
- Charging Lamp equipped
- Battery Life 8 Hours Max.
- External Long life battery under consideration



LED lamp equipped

Easy Interface

"설치 마법사"를 통해 대화 형 메뉴로 파라미터값을 쉽게 입력 할 수 있습니다.



Parameter Setup and Operation

1. Pipe information input

- a. Exact pipe diameter (mm) or circumference (mm)
- b. Material specification or sonic velocity
- c. Pipe wall thickness (mm)
- d. Lining material specification (if any)
- e. Lining thickness (if any)

2. Liquid specification input (or sonic velocity input)

3. Transducer type input and installation geometry

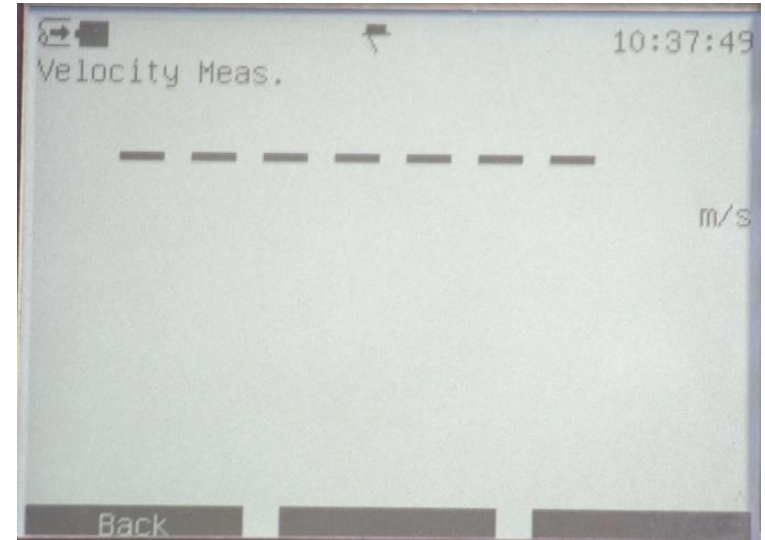
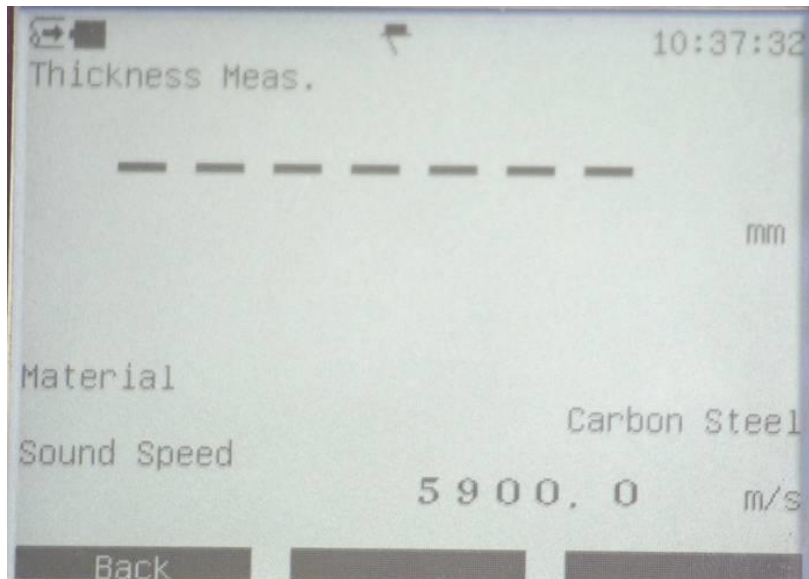
4. Mount transducers on pipe

5. START MEASURING !

Extra Functions



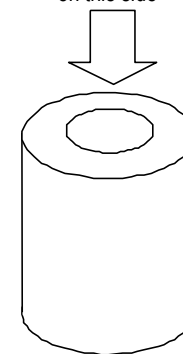
Thickness Measurement



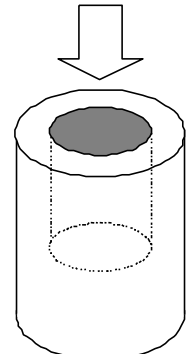
Velocity Measurement



Calibration done
on this side

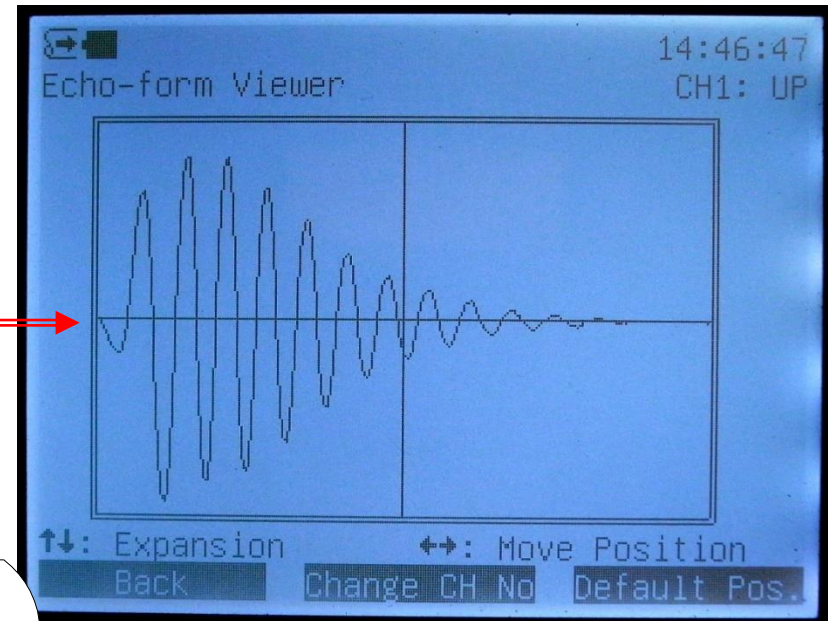
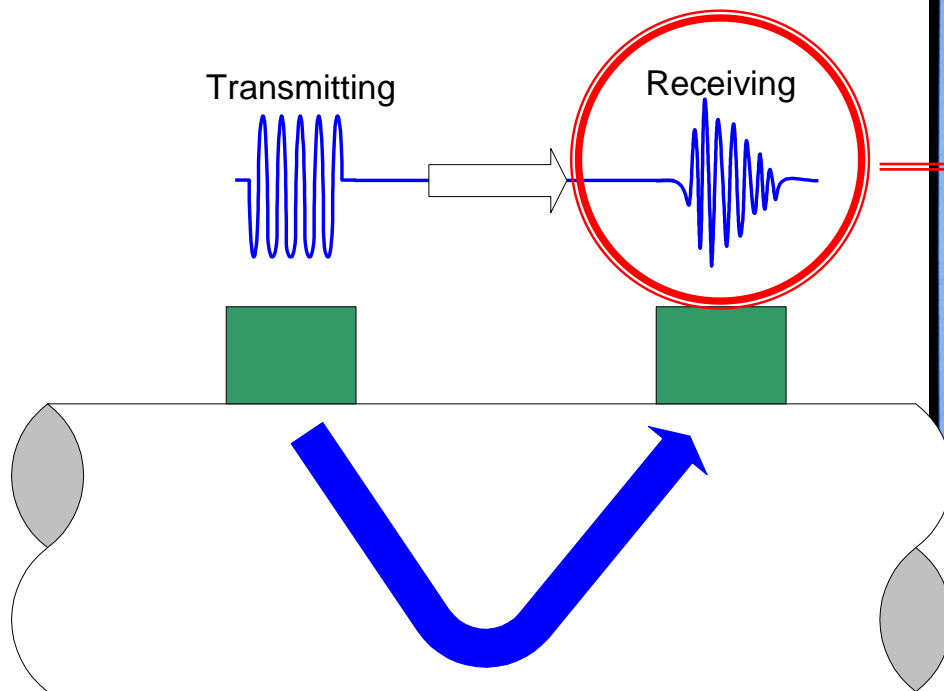


Sound speed
Measurement done
on this side



Receiving Echo Monitoring

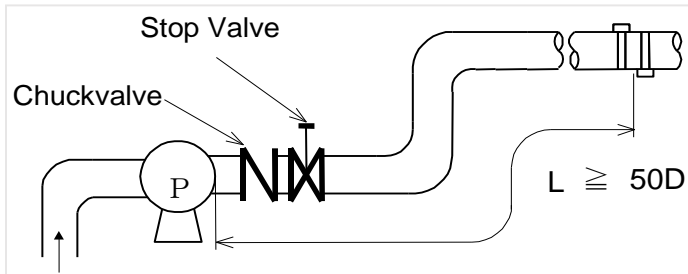
Visual confirmation that receiving echo is "good".



Appropriate Location for Measuring

Recommended installation points are...

Pump

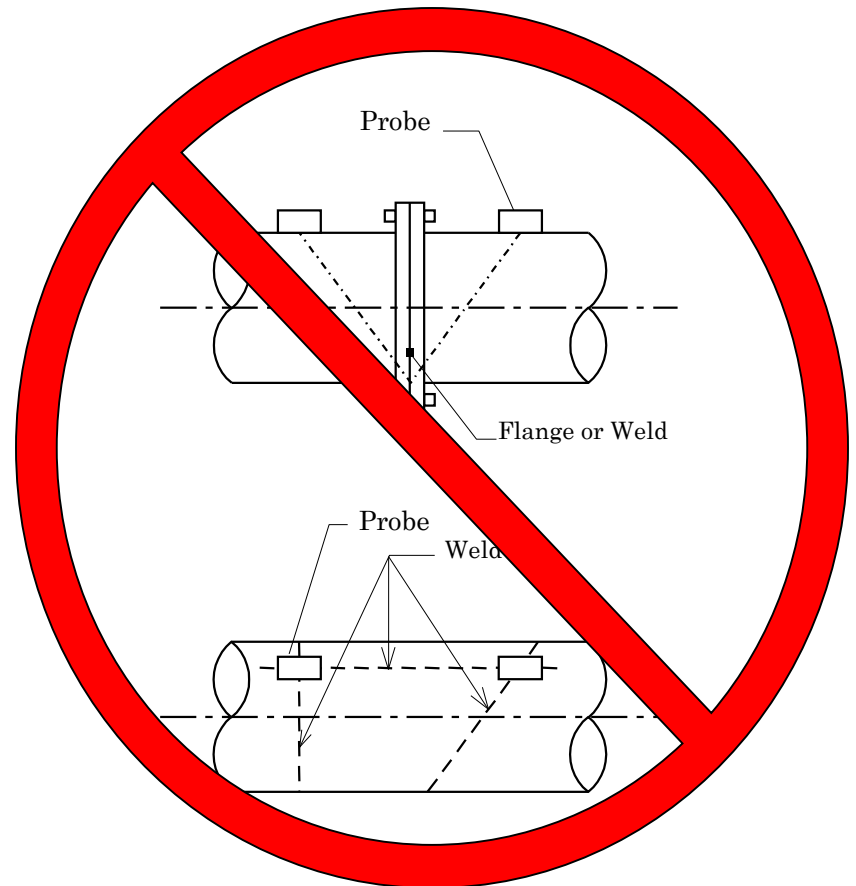
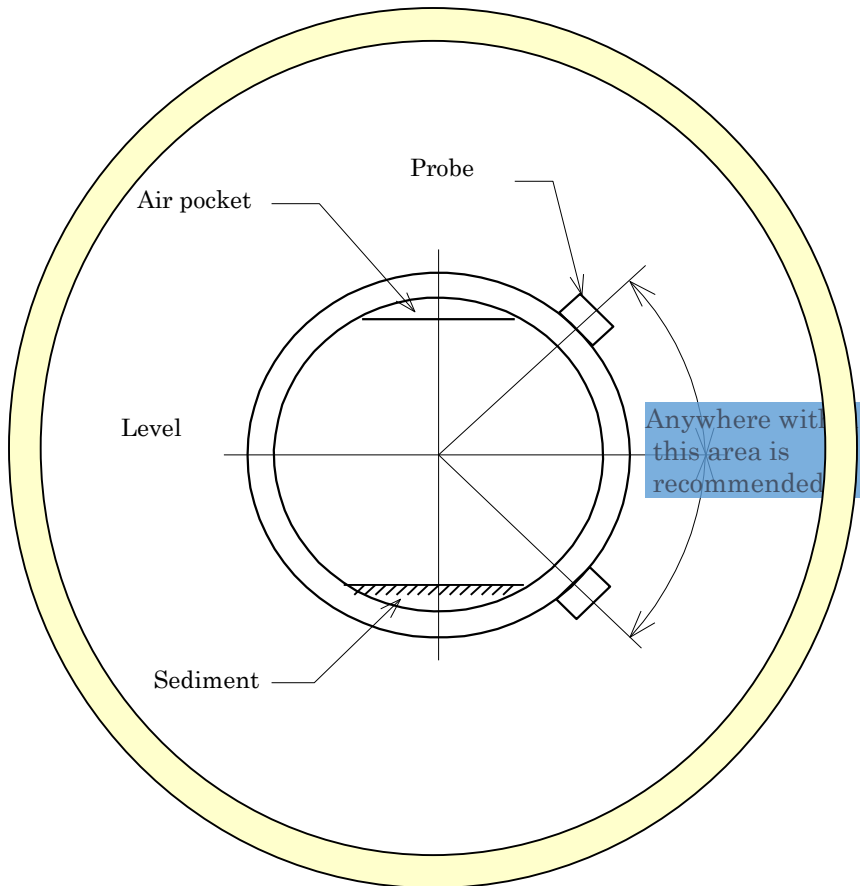


D : Pipe Diameter [Refer to JEMIS 032-1987]

Structural condition	Upstream straight pipe length	Downstream straight pipe length
90°bend		
T shape joint		
Increasing Diameter		
Reducing Diameter		
Control Valves		
	Flow Control at upper side	Flow Control at lower side

Recommended Installation for Measuring

(권장설치)



초음파는 공기를 통해 전파되지 않습니다.

- 파이프 표면에 녹 발생시 제거.

- 배관내에 녹이 다소 생긴 정도로는 영향이 없습니다만, 전면에 생기면 오차가 측정 불능 상태가 됩니다.
예를 들어 1,000mm배관의 내부에 1mm 크기의 녹 발생시 약 0.7%의 오차가 발생합니다.

- 파이프 내부에 스케일 발생시 측정위치 이동 필요.

- 파이프 표면에 페인트 및 라이닝

- 내부에 모르타르 또는 에폭시등으로 라이닝되어 있는 일반적인 배관에서는 측정하는데 영향은 없습니다.
그러나 염화비닐 라이닝 강철관에서는 강철관부분과 염화비닐 라이닝 부분과의 사이에 공기층이 생기는 일이 있어, 측정 불능 상태가 발생합니다. 센서 부착 위치 변경이 필요합니다.

- 기포가 없는 파이프 조건

- 유체 중에 다량의 기포가 연속으로 혼입되면 초음파가 현저하게 감쇠되어 결측, 혹은 측정 불능 상태가 됩니다.
덧붙여 시간차이법에 비해, 기포의 혼입에 강한 도플러법(하수용 개수로유량계)의 초음파 유량계에서도 다량의 기포가 연속으로 혼입되는 유체에서는 마찬가지로 결측 혹은 측정 불능 상태가 됩니다.

Transit Time Difference Principle

- 액체의 낮은 탁도

허용 탁도 범위 : 10,000deg. (mg / l) 이하
단. 기포를 포함하지 않을것.

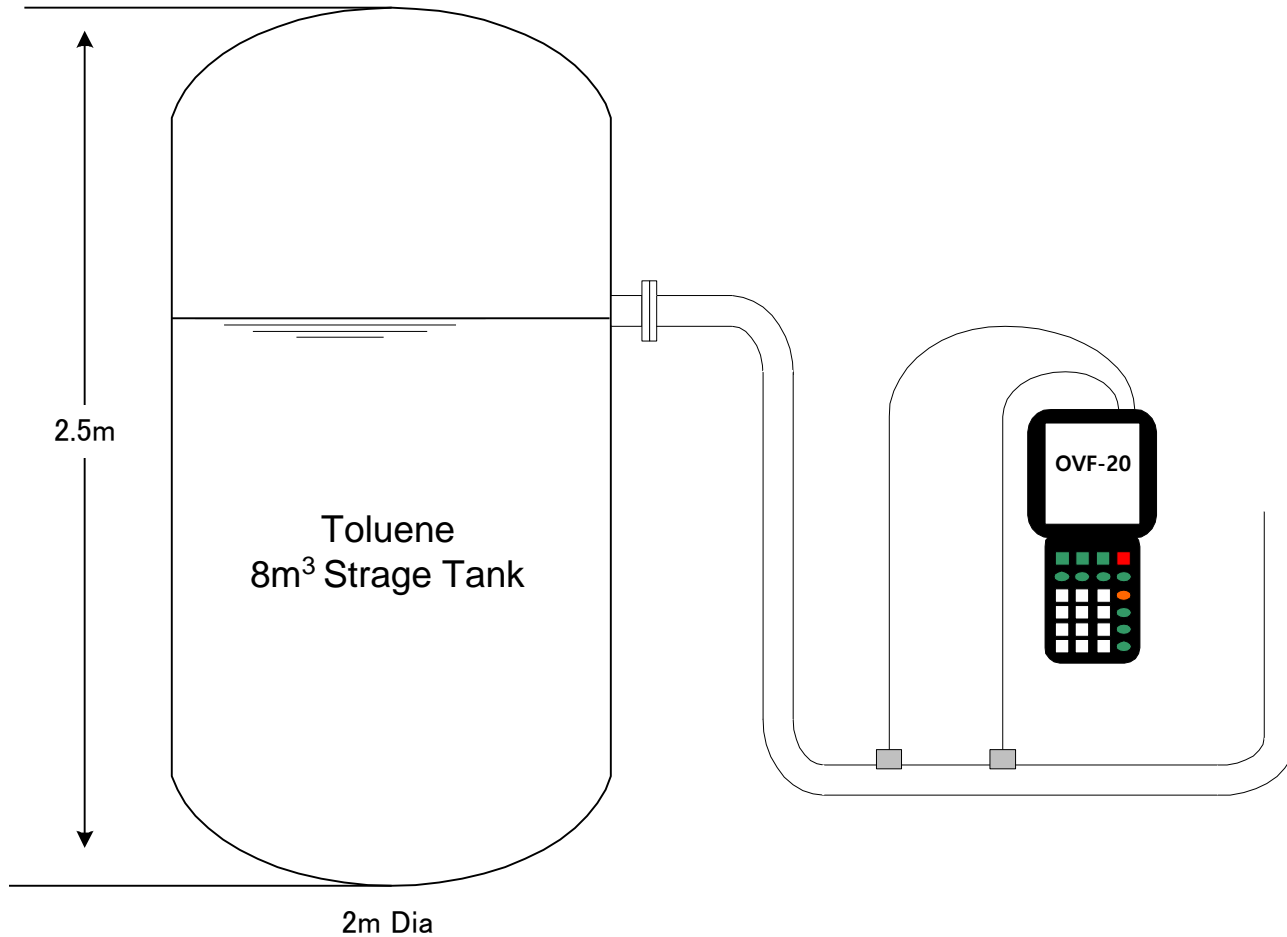
Application Reference



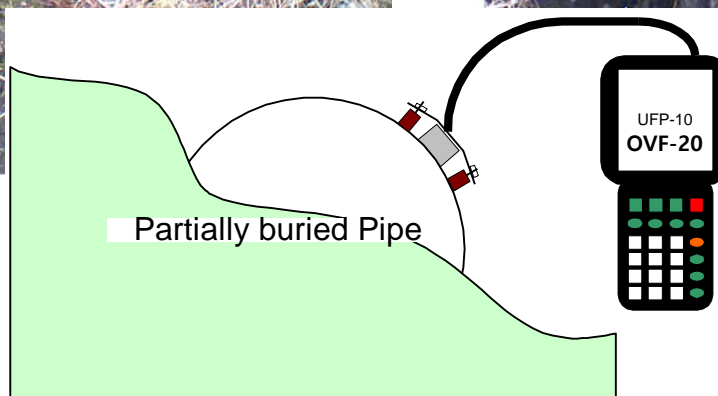
- Hydraulic Power Plant -



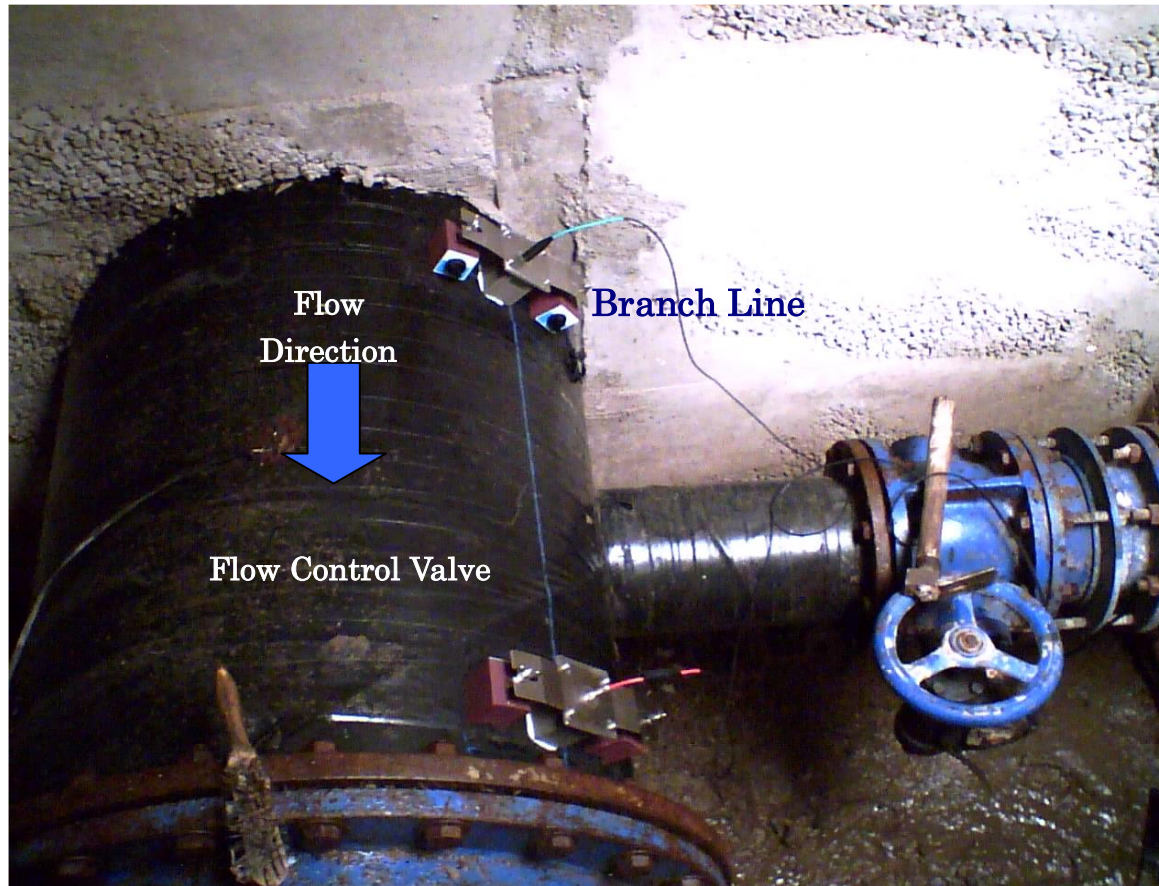
- Toluene Storage Tank outlet -



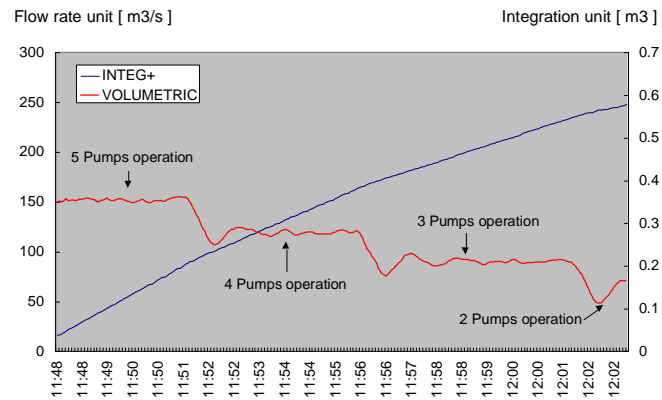
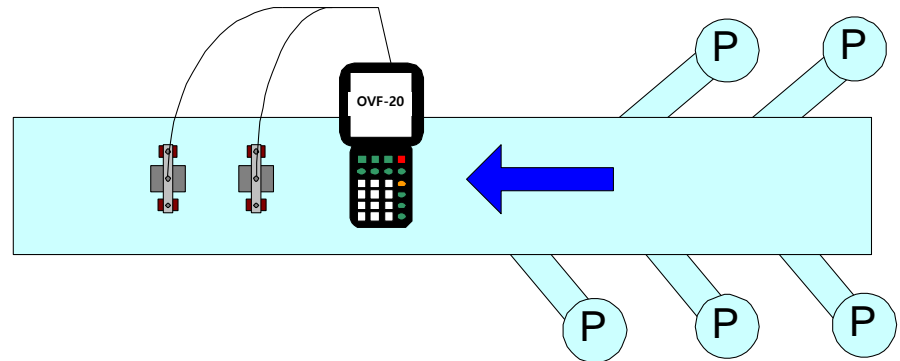
- Partially Buried Pipe -



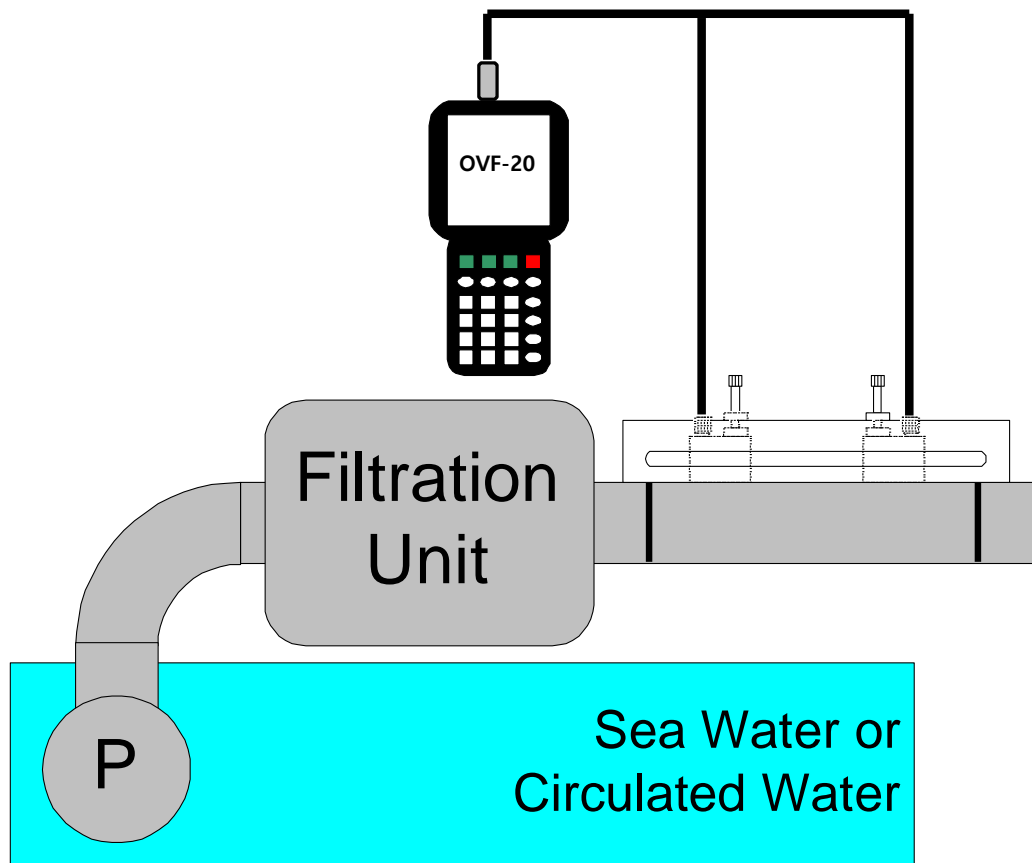
- Flow measurement Near Valve Position -



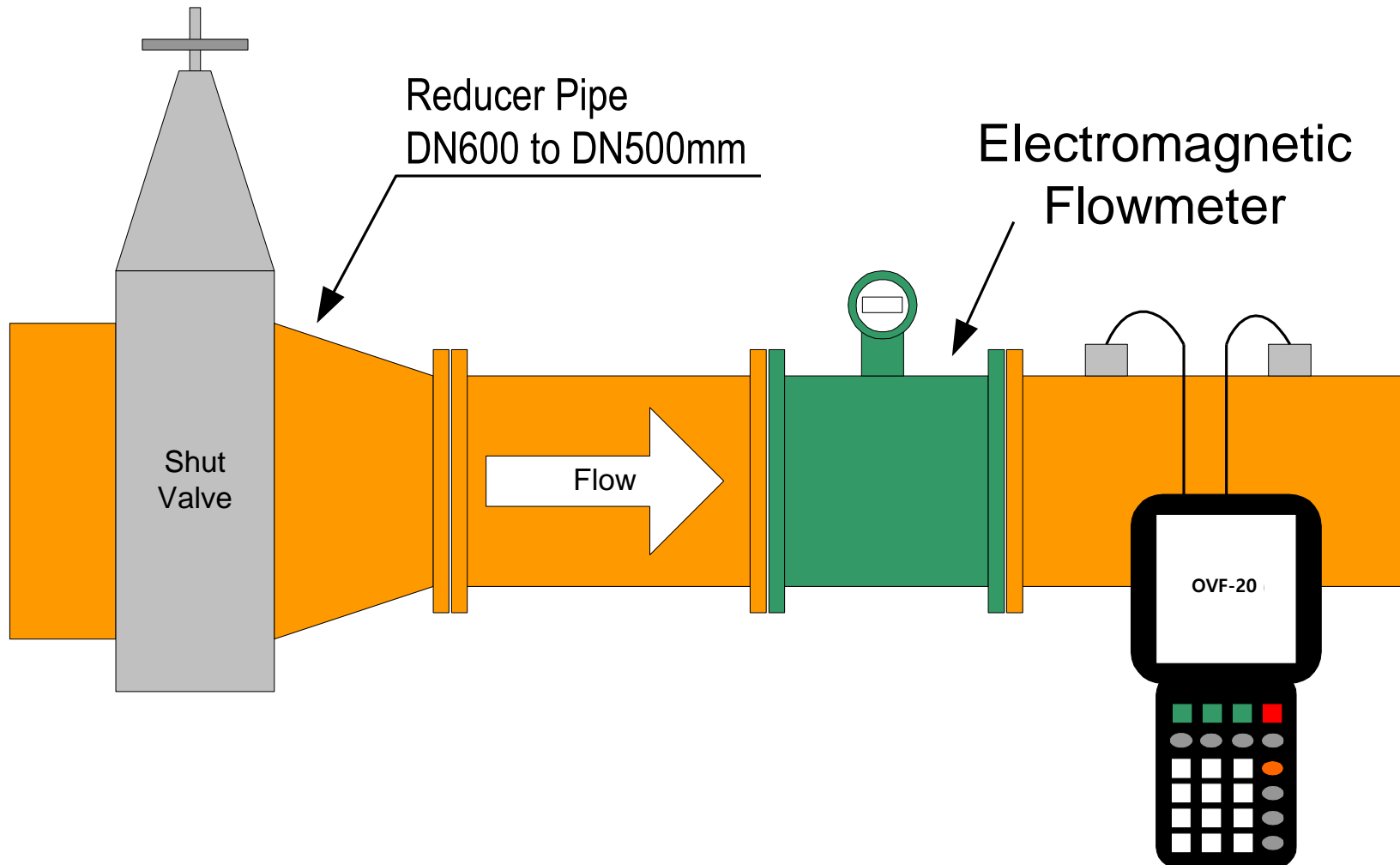
- Pump Station Outlet-



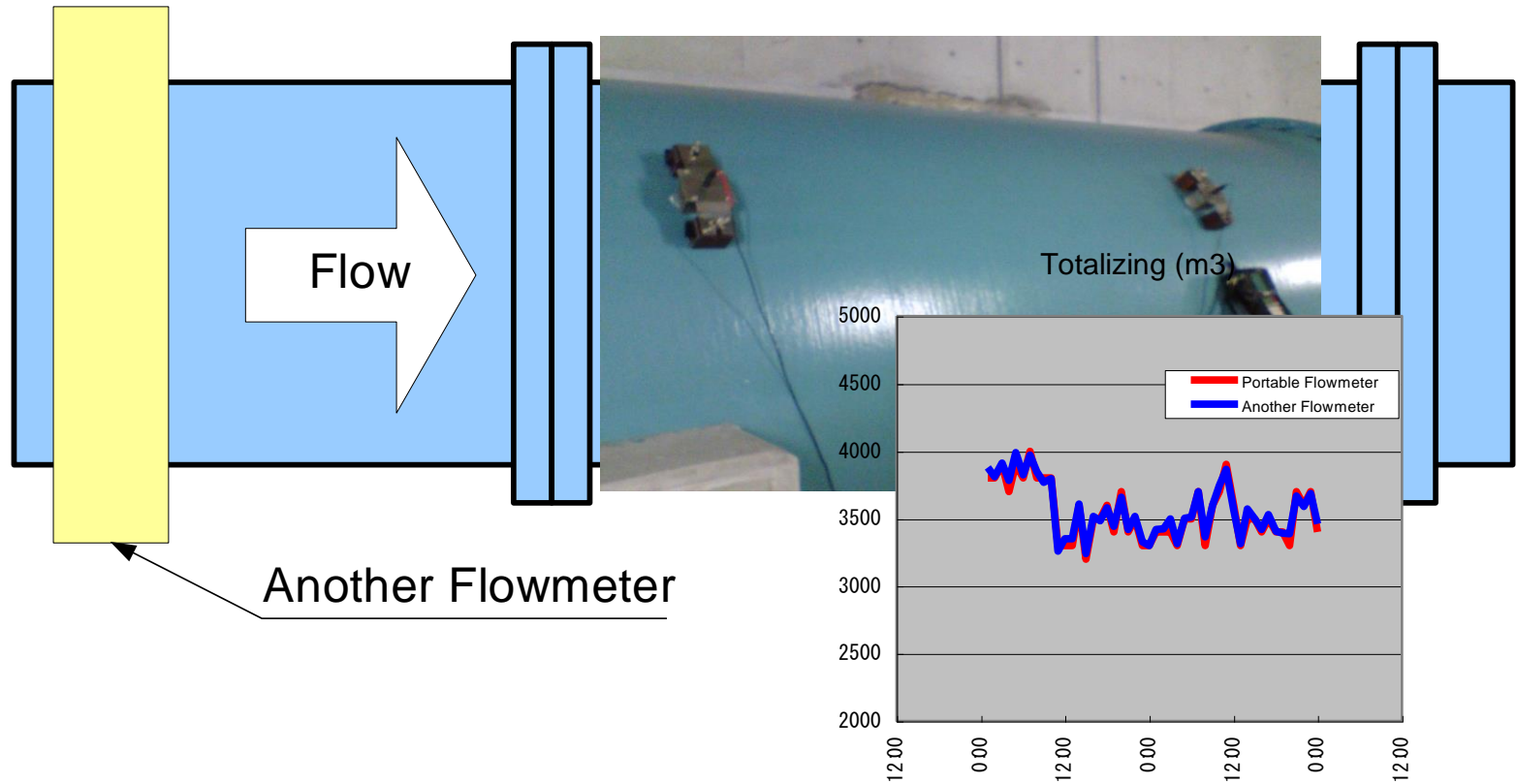
- Filtration Control for Aquarium -



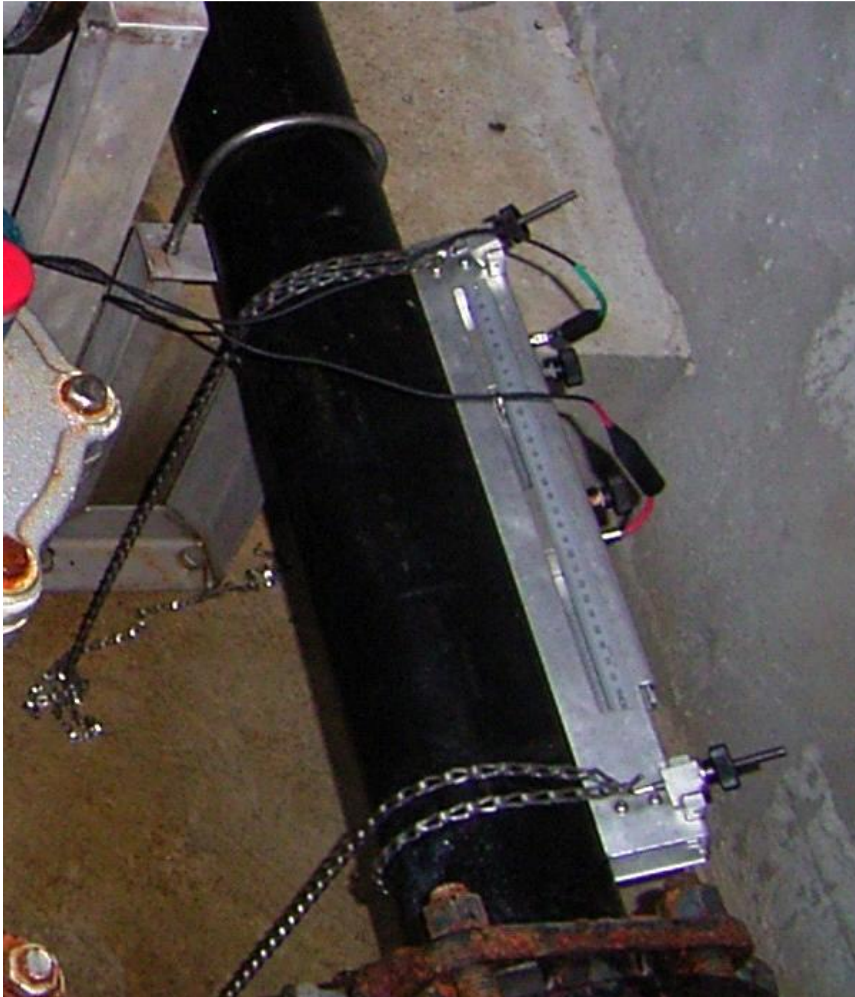
- Return Sludge Line Flow Measurement -



- Waste water inlet Flow Measurement -

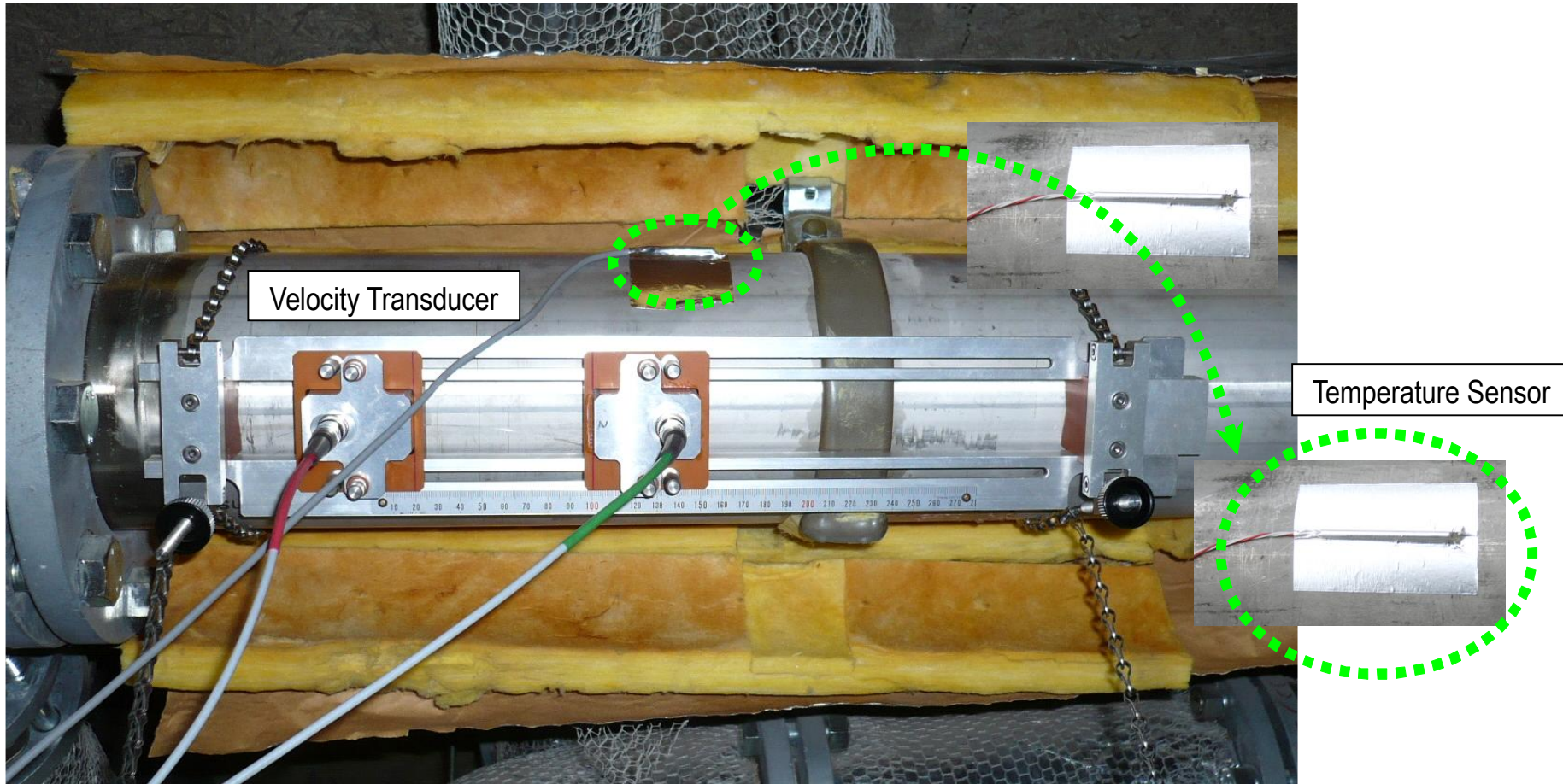


- Design Efficiency Check in Ships-

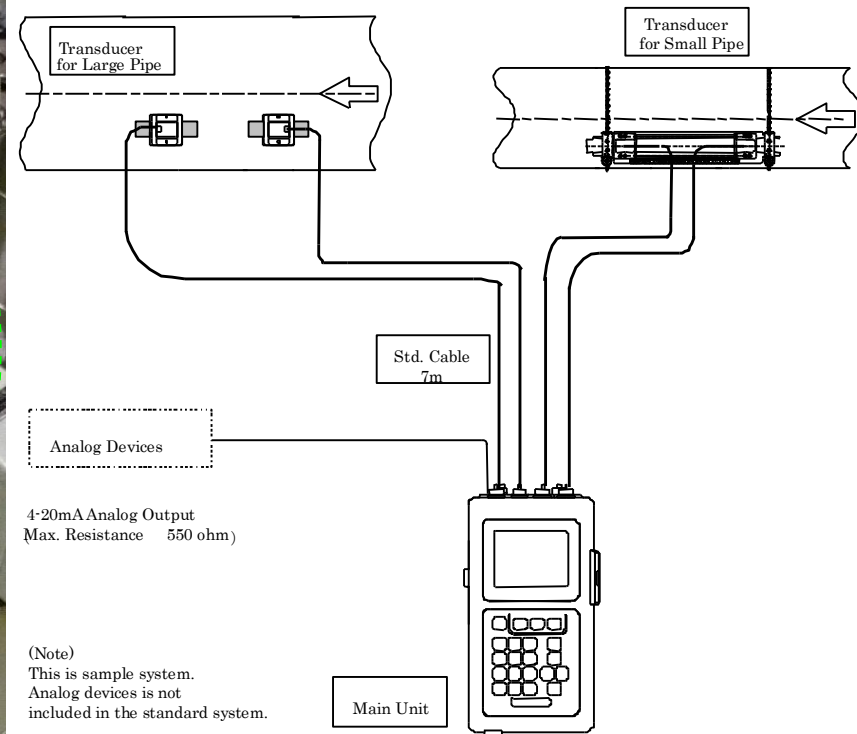
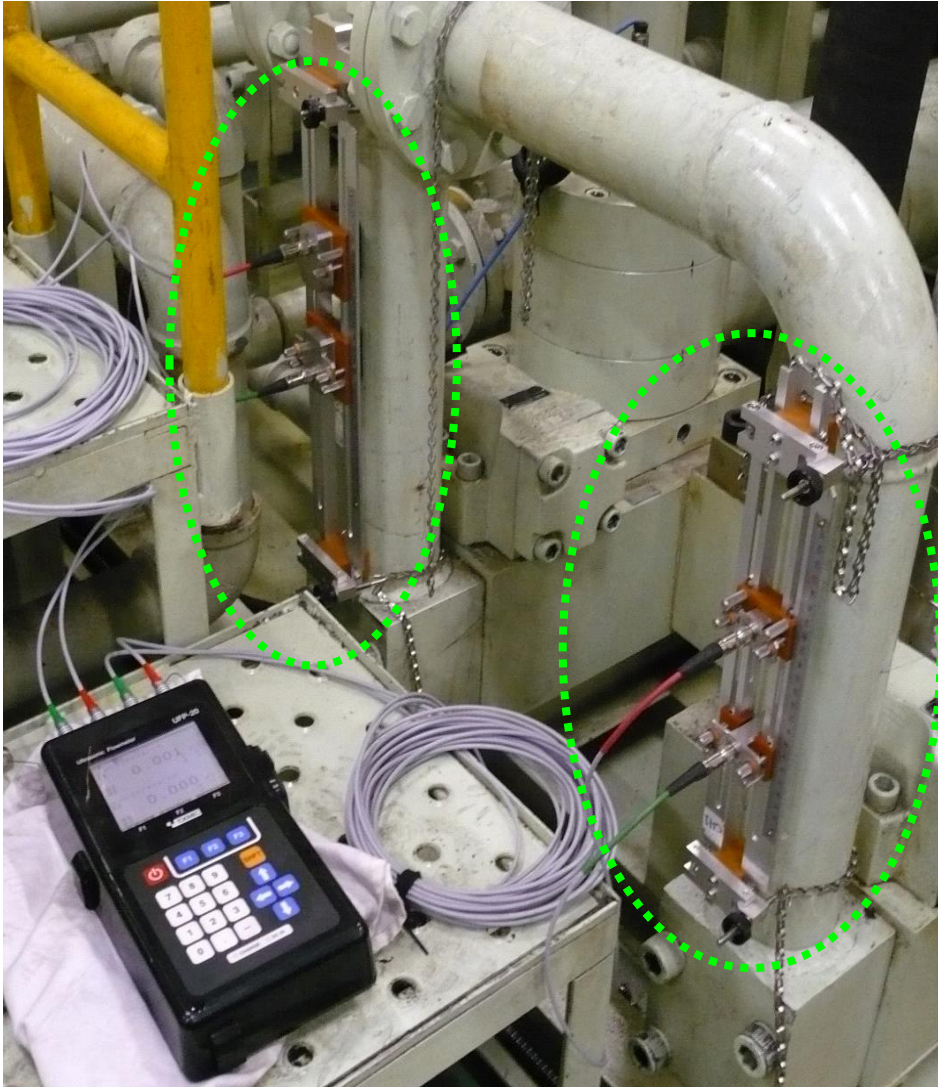


다량의 물 / 해수가 선박 엔진실의 엔진 및 기타 장비 냉각에 사용됩니다. 이 응용 분야에서 조선소 설계 엔지니어는 엔진실에 충분한 냉각수 / 해수 흐름을 확인해야했습니다. 또한 유량이 적절한 수준인지 확인하기 위해 유지 보수 목적으로 초음파유량계로 점검.

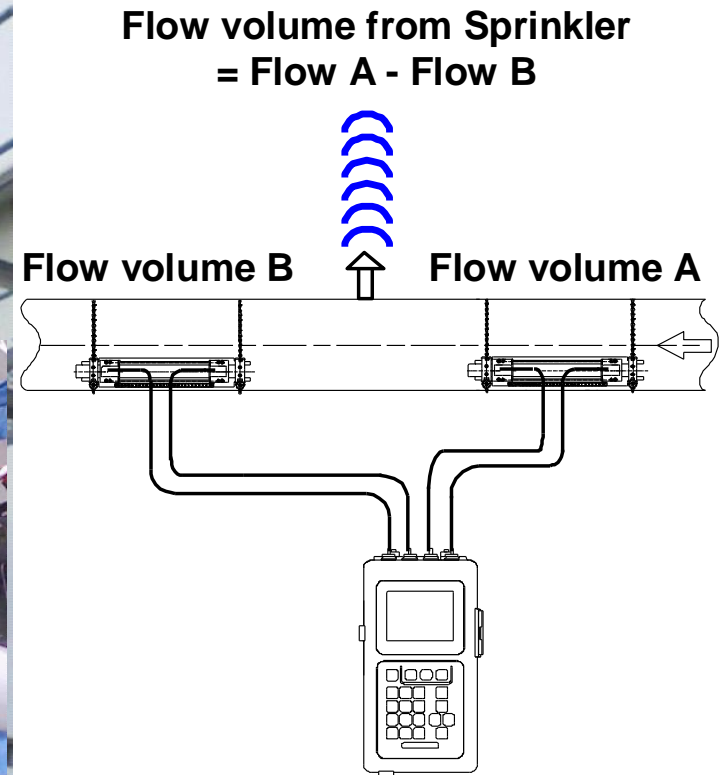
- Energy Efficiency Measurement-



- 2 different pipes measurement by 1 main unit -

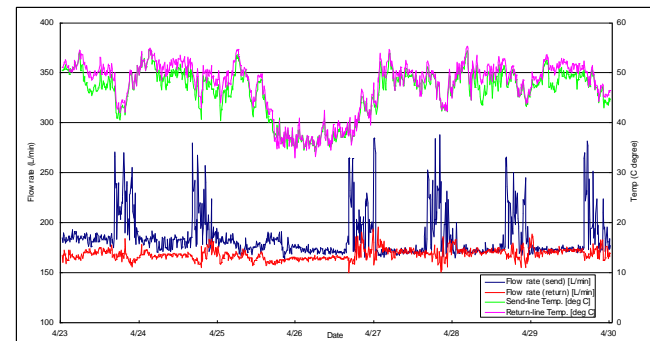
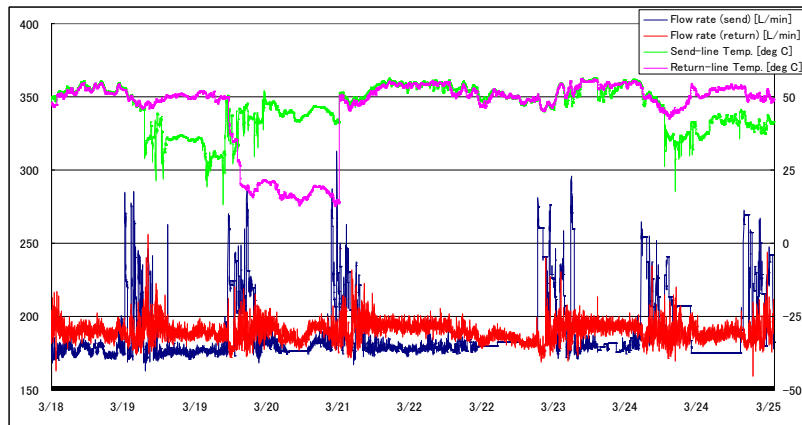
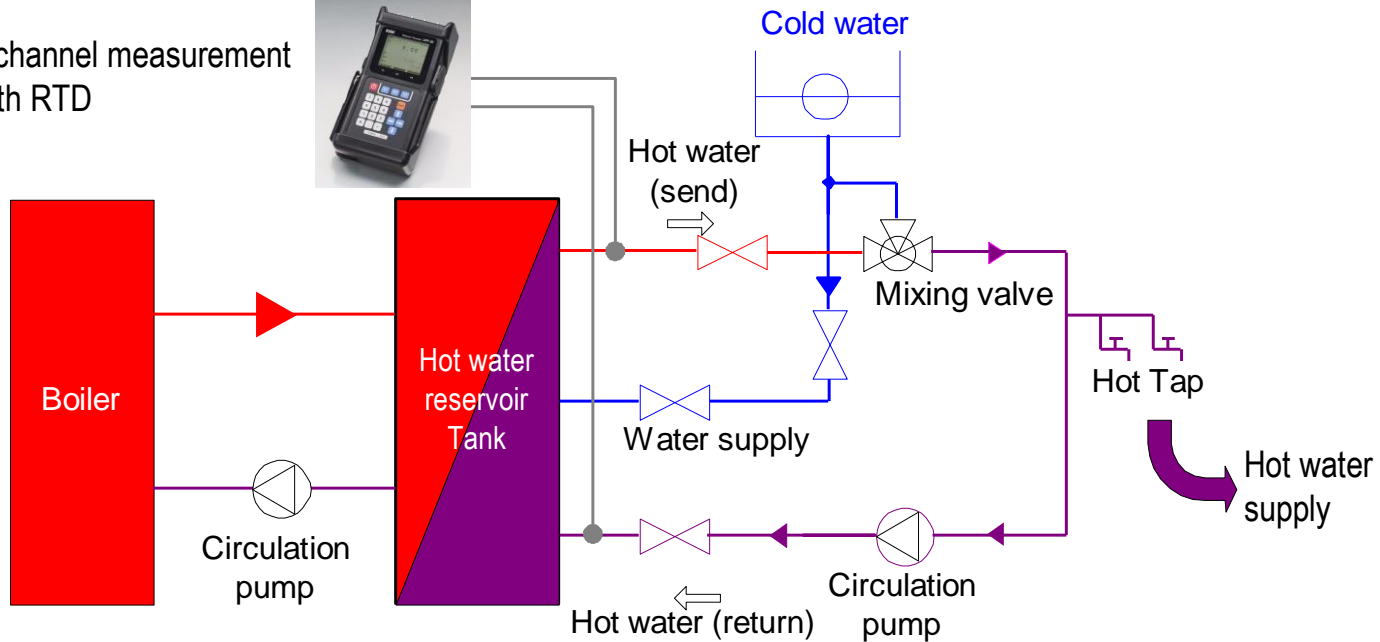


- Inspection tool for Fire Sprinkler -



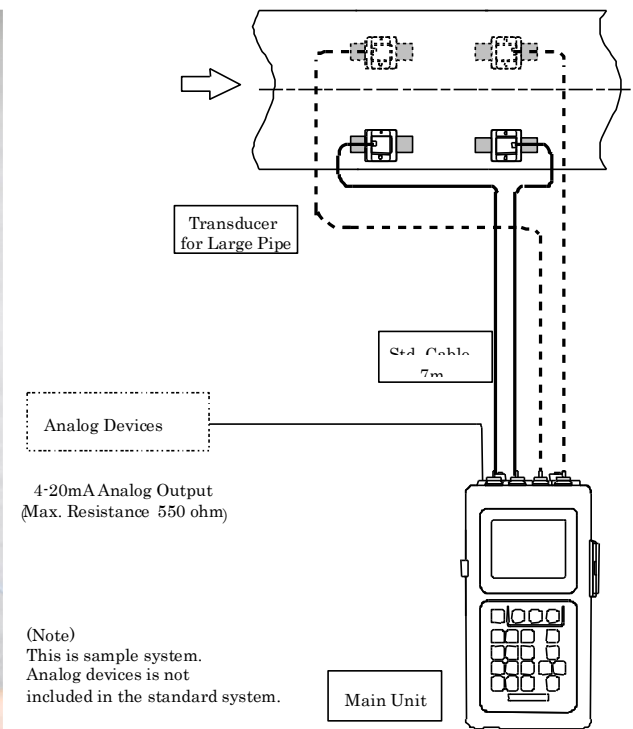
- Hot water supply system improvement -

2 channel measurement
with RTD



Return volume (red line) > Send volume (blue line)

- 2path measurement by 1 main unit -



FAQ

유량이 측정되지 않는 경우 :

1) 센서가 올바르게 설치되어 있습니까?

- 센서의 방향 확인
- 센서간의 거리 확인
- 변환기 유형 확인

2) 설정 데이터가 정확합니까?

- 파이프 및 기타 설정 매개 변수 확인

3) 파이프가 오래되었습니까?

- 파이프 내부가 녹슬지 않았는지 확인하십시오.
- 파이프 외부가 녹슬거나 페인트 칠 되어 있는지 확인하십시오.

4) 파이프에 유체가 완전히 만관되어 있습니까?

- 파이프가 완전히 만관되었는지 확인하십시오.

FAQ

유량이 측정되지 않는 경우 :

5) 부식성 물질의 파이프는?

- 파이프 재질 확인
- FRPM (Fiber Reinforced Plastic Mortar tube)과 같은 복합재의 경우 초음파 감쇠가 너무 클 수 있습니다.

6) 액체에 기포가 포함되어 있습니까?

- 유체에 공기가 없는지 확인하십시오.

FAQ

측정이 불안정한 경우 :

1) 파이프의 직관부가 적절합니까?

- 펌프, 밸브 또는 감속기의 위치 확인

2) 센서가 올바른 포트(UP, DOWN)에 연결되어 있습니까?

- 반대쪽 연결은 음수 값을 초래할 수 있습니다.

기타 :

1) 액체의 음속을 모르는 경우 어떻게해야 합니까?

- 사용하는 액체의 실제 음속을 측정 할 수 있습니다. (음속 측정 모드)

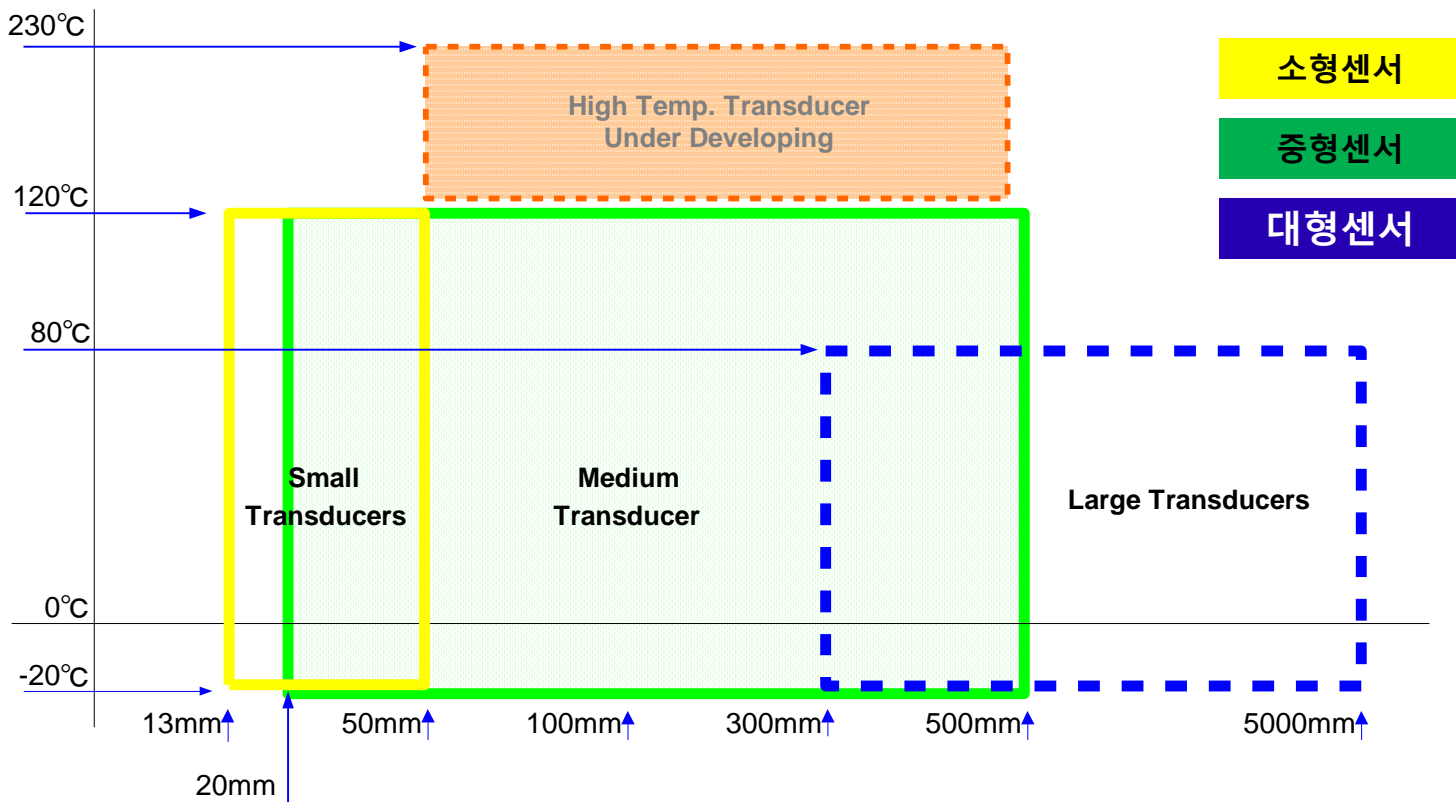
2) 파이프의 음속을 알 수 없으면 어떻게 합니까?

- 대부분의 파이프 재료의 음속은 인터넷등에서 쉽게 찾을 수 있습니다.

FAQ

기타 (계속) :

3) 모든 어플리케이션에서 하나의 변환기 (OVF-20)를 사용할 수 있습니까?



Required parameters for Inquiry

- AA. Pipe Information

1) Pipe Diameter	: DN	mm
2) Pipe Material	:	(t: mm)
3) Lining Material	: (if any)	(t: mm)
4) Straight Pipe Run	: from	from
	folds (times) for upstream side	folds (times) for down stream side

- BB. Liquid Information

1) Liquid Name : _____

2) Temperature : _____ C deg.~ _____ C deg.

- CC. Extra Information

1) Purpose of process :

2) Existing Flow instruments : (if any)

3) Any other problems at Flow :

Thank you very much for your attention

Building the foundation for a better life and society with advanced technology.

**TOKYO KEIKI, your partner
for a better society**

TOKYO KEIKI employs cutting edge technologies that transform human sensory functions of measurement, cognition, and control in products and systems that serve and benefit society. As Japan's first manufacturer of precision instruments, we have contributed to enhancing the community and the safety and quality of life of people for over a century. We will continue to strive with unwavering principle, dedication, and a diversity of technologies in supporting the foundation of a safe and secure optimal society.

 *with TOKYO KEIKI*

We are a flow measurement specialist.



OVAL ENGINEERING INC

경기도 화성시 동탄면 동부대로 970번길 117

<http://www.ovaleng.com>