SONIC CORPORATION

INDUSTRIAL ULTRASONIC FLOWMETER

PRODUCT CATALOG

- Ultrasonic Gas Flowmeter
- Ultrasonic Liquid Flowmeter
- Ultrasonic Boundary Level Meter
- Ultrasonic Industrial Anemometer

Ultrasonic Gas Flowmeter

GF-Series

Ultrasonic Gas Flowmeter

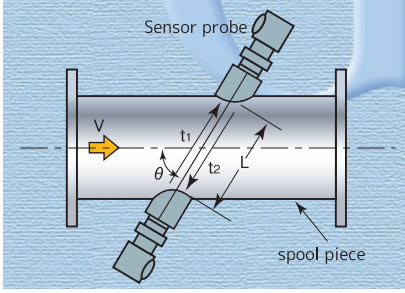
The wave propagation speed varies depending on the flow velocity of the gas when the ultrasonic wave is propagated into the gas in the tube. Ultrasonic gas flowmeter uses this basic principle and measures the flow velocity of the gas in the tube. Measured flow velocity is converted into the flow rate and output as an electric signal then. Ultrasonic gas flowmeter has many advantages --- such as no pressure loss because of no intrusive parts inside the tube, wide dynamic range and outstanding reproducibility. Flow control and management of steam, air and gases by ultrasonic gas flowmeter contribute maximum energy-saving.

[Principles of measurement]

■Principles of measuring flow velocity

- $t_1 = \frac{L}{C + V\cos\theta}$
- $t_2 = \frac{L}{C - V\cos\theta}$
- $V = \frac{L}{2\cos\theta}\left(\frac{1}{t_1} - \frac{1}{t_2}\right)$

V=Flow velocity(m/s)
θ=Angle between the ultrasonic wave propagation axis and the central axis of the tube
L=Distance between the probes(m)
C=Sound speed in the stationary gas



■Conversion from flow velocity to flow rate

- $\bar{V} = V \times (1/k)$
- $k = 1 + 0.01\sqrt{6.25 + 431 \times Re^{-0.237}}$
- $Q = 3600 \times V \times S\ (m^3/h)$

$\bar{V}$=Cross sectional average flow velocity (m/s)
V=Flow velocity through the ultrasonic propagation route (linear average flow velocity(m/s)
Re=Reynolds number
k=Flow velocity correction coefficient

■Normal flow rate correction

- $Q_N = 3600 \times \bar{V} \times S \times \frac{T_0 \times P}{T \times P_0}$

QN=Flow rate(m³/h, ntp)*
S=Cross sectional area of tube (m²)
T0=Temperature (K) in reference state
T=Temperature (K) in measurement state
P0=Pressure (Pa・abs) in reference state
P=Pressure (Pa・abs) in measurement state

*ntp：standard (0℃,1atm)

[Measurement range of flow rate]

●Table of measurement range of flow rate

Flow rate unit	Real flow rate (m³/h)		Normal flow rate (m³/h·ntp)	
Air condition	25℃, Barometric pressure, Air		25℃, 0.5MPa, Compressed air	
Flow rate	**Minimum**	**Maximum**	**Minimum**	**Maximum**
50A	9.2	440	8.5	2,460
100A	18.3	1,780	16.8	9,770
150A	27.0	3,880	24.7	21,200
200A	35.6	6,760	32.6	37,000
250A	44.2	10,400	49.7	57,100
300A	52.9	15,000	71.4	82,100
400A	67.8	24,700	117.3	135,000
500A	85.5	39,200	186.2	214,000

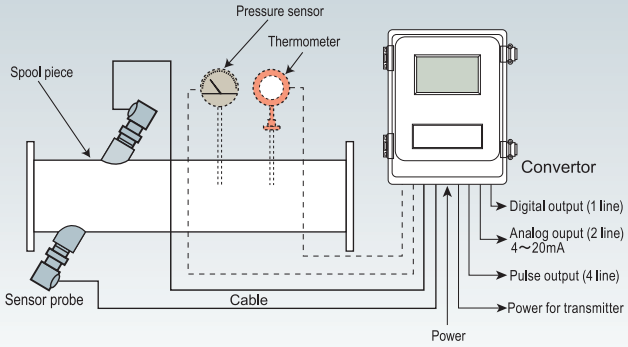
*The maximum flow rate is calculated using by approx. 60 m/s of measurement upper limit.

GF-2500

[Features]

- Wide-screen LCD and various display function
- High noise tolerance design
- No pressure loss
- Various output port (analog x 2, digital x1, contact x1)
- Automatic pressure and temperature correction
- Easy replacement with the compatibility of existing sensor
- Wider measurement range

System diagram



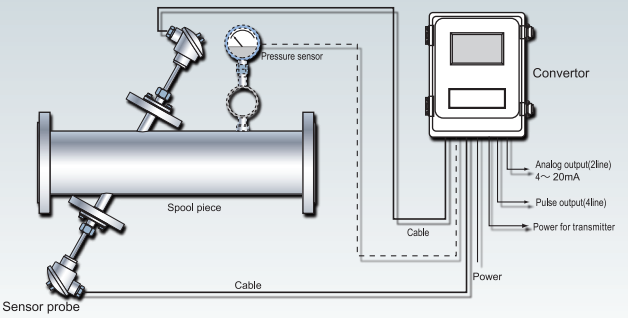
※Dotted line is option

Steam type GF-2500

[Features]

- Semi-clamp-on type, non-intrusive flowmeter
- Gas seal unit enables sensor detachment without flow intervent
- No moving parts, low maintenance cost
- No pressure loss

System diagram



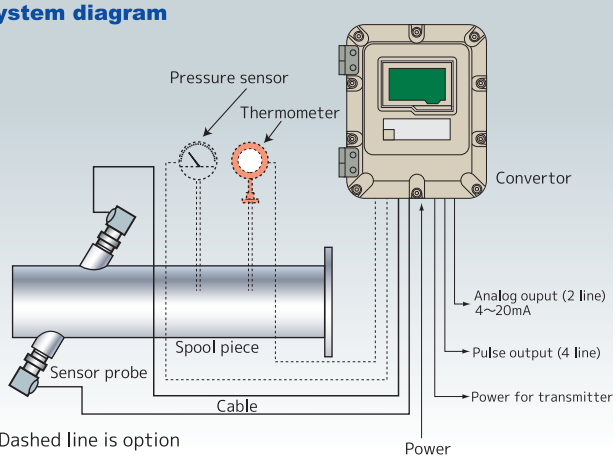
Ultrasonic Gas Flowmeter

Flame-proof
FEx-100

[Features]

- Flame-proof ExdII BT6-compliant
- Wide-Screen LCD and various display function
- Various output port (analog x2, digital x1, contact x4)
- Automatic pressure and temperature correction
- Flexible parameter configuration
- Bulit-in power unit for pressure sensor and temperature
- Wider measurement range
- Precisely measure a small amount of biogas and digestion gas

System diagram



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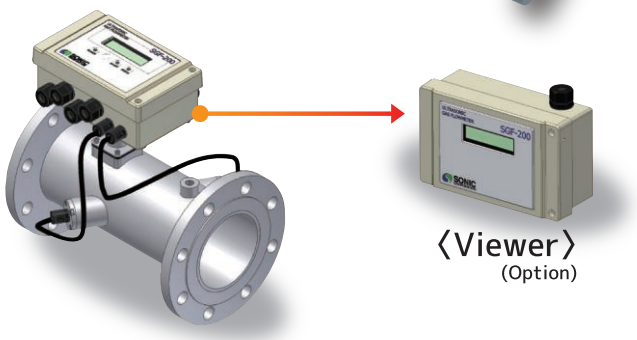
Small type
SGF-200



〈Viewer〉
(Option)

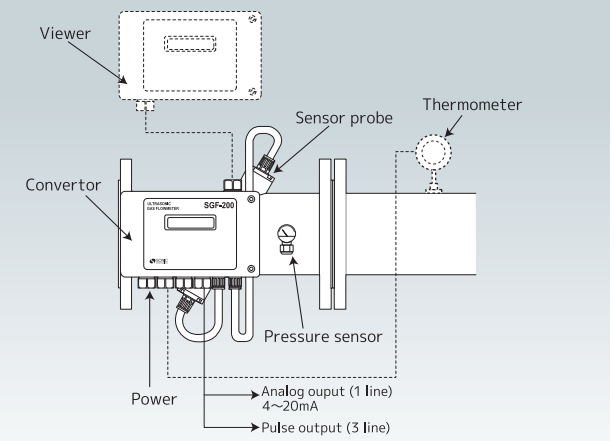
[Features]

- Wider measurement range
- Automatic temperature correction
- Attachable to vertical piping
- Integrated flow rate and instant flow rate selectable output
- Remote viewer(option)
  (Maximum cable length 30m)

[Lineup (nominal diameter)]

40mm,50mm,65mm,80mm,
100mm,125mm,150mm

System diagram



※Dashed line is option

[Ultrasonic gas flowmeter selection Guide]

			Ultrasonic gas flowmeter			
Measurement method				Ultrasonic transit time method		
Model			SGF-200	FEx-100 (Frame-proof)	GF-2500 (Standard)	GF-2500 (Steam)
Applicable fluid	Gas	Air	○	○	○	—
		No corrosive gas	○	○	○	—
		Others	—	○	○	—
	Steam (staturated)		—	—	—	○
Fluid condition	Fluid temperature		0～60℃	−30～180℃		
	Fluid pressure		0～1MPa	−0.05～1MPa		
	Measurement range	Flow velocity calibration	0～±30m／s	0～±60m／s		
Function	Measurement accuracy		±2%RD	±1%FS		
	Pressure loss		No loss			
	Analog output	Flow rate output	DC4～20mA			
	Integrated output	Open collector	○	○	○	○
	Normal/reverse pulse output	Open collector	○	○	○	○
	Alarm pulse output	Open collector	○	○	○	○
	Temperature and pressure correction		Automatic correction			
	Display	LCD	16char.x2 line	128×240dots	128×240dots	128×240dots
	Flame-proof	Convertor	—	ExdⅡBT6	—	—
		Sensor probe	—	ExdⅡBT4	—	—
	2 chordal path		—	(○)	(○)	(○)
	Gas seal		—	○	(○)	—
	Built-in power	Transmitter	—	DC24V		
Power			AC90～250V or DC24V	AC100V (AC115、220V)		
Installation requirement	Pipe diameter		40～150mm	50～5000mm		50～400mm
	Pipe material		SGP	SGP、SUS304 ※1		
	Pipe length	Upper stream	More than 15D			
		Lower stream	More than 5D			

(○):option ※1:Consult sales representative if you would like to select materials other than listed above.

Ultrasonic Liquid Flowmeter

LF-series

Ultrasonic Liquid Flowmeter

Newly designed clamp-on type sensor built in the ultrasonic liquid flowmeter developed by the integration of in-house technology and accumulated know-how of ultrasonic. Issued ultrasonic pulse from the sensor mounted on the outside of tube is propagated into the inside. A flow rate is calculated by the use of basic principle of ultrasonic transit time method varies depending on a flow velocity between sensors and then it converts into conventional 4-20mA analog signal as output data.

[Principles of liquid flowmeter measurement]

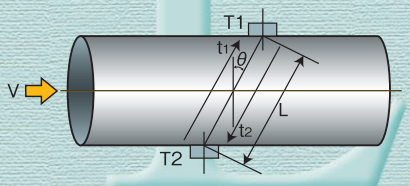
■Principles of measuring flow velocity

$$t_1 = \frac{L}{C+V\sin\theta} + \tau$$

τ: Propagation time in pipe wall

$$t_2 = \frac{L}{C-V\sin\theta} + \tau$$

$$V = \frac{C^2}{2L\sin\theta} \cdot \triangle t$$



V=Flow velocity(m/s)
T1,T2=Sensor probe
θ=Angle between the ultrasonic wave propagation axis and the central axis of the tube
L=Distance between the probes(m)
C=Sound speed in the stationary liquid

■Conversion from flow velocity to flow rate

$$\bar{V} = V \times (1/k)$$

$$k = 1 + 0.01\sqrt{6.25 + 431\,Re^{-0.237}}$$

$$Q = 3600 \times \bar{V} \times S\ (m^3/h)$$

$\bar{V}$=Cross sectional average flow velocity (m/s)
V=Flow velocity through the ultrasonic propagation route (linear average flow velocity(m/s)
Re=Reynolds number
k=Flow velocity correction coefficient
S=Cross-sectional area

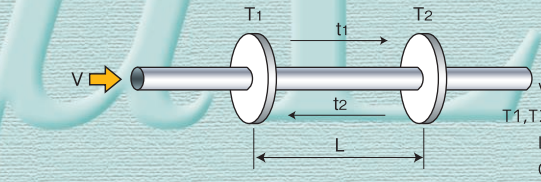
[Principles of micro liquid flowmeter measurement]

■Principles of measuring flow velocity

$$t_1 = \frac{L}{C+V}$$

$$t_2 = \frac{L}{C-V}$$

$$\bar{V} = \frac{L}{2} \cdot \frac{\triangle t}{t_1 \cdot t_2}$$



■Conversion from flow velocity to flow rate

$$Q = 60 \times \bar{V} \times S\ (L/min)$$

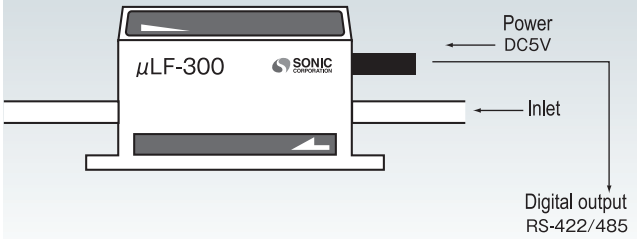
$\bar{V}$:Cross sectional average flow velocity (m/s)
S:Cross-secctional area

V=Flow velocity(m/s)
T1,T2=Sensor probe
L=Distance between the probes(m)
C=Sound speed in the stationary liquid
t1,t2=Propagation time(s)

[Features]

- Capable of accurately measuring micro flow
- Rapid measurement response (300 sampling time per second)
- Non-contact sensing, integrated straight PFA tube
- Wider measurement range

System diagram



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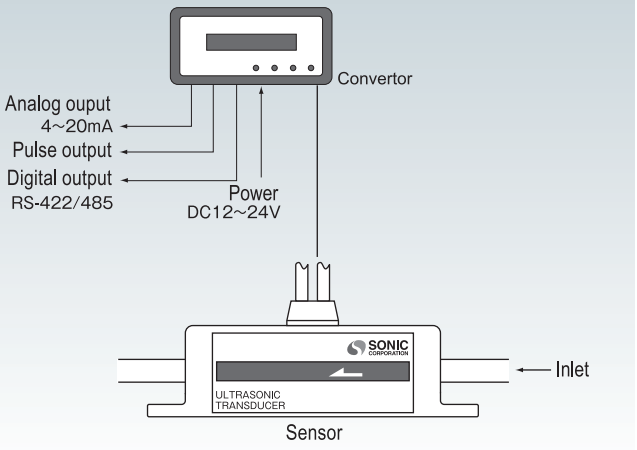
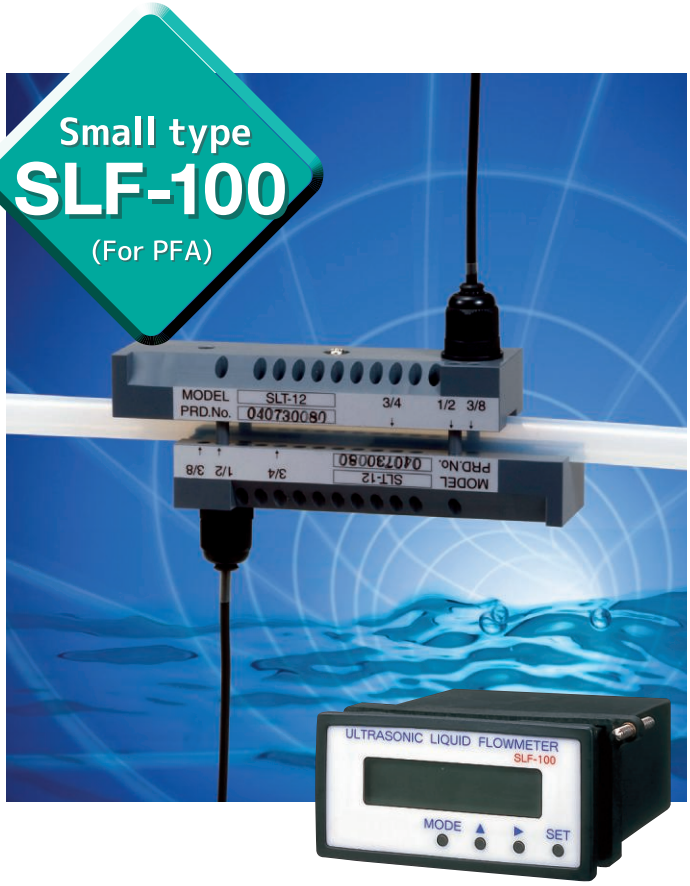


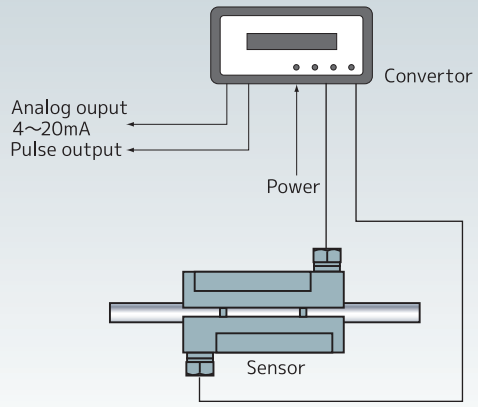
Ultrasonic Liquid Flowmeter

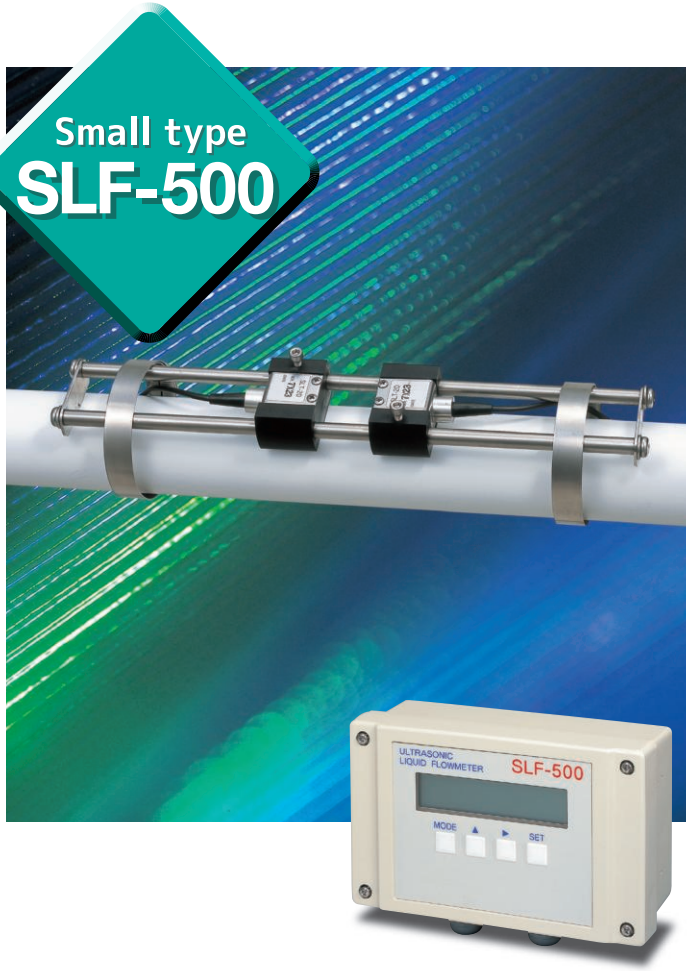


[Features]

- Clamp-on type sensor
- Wide measurement range ability
- Low-power
- Compact design

System diagram





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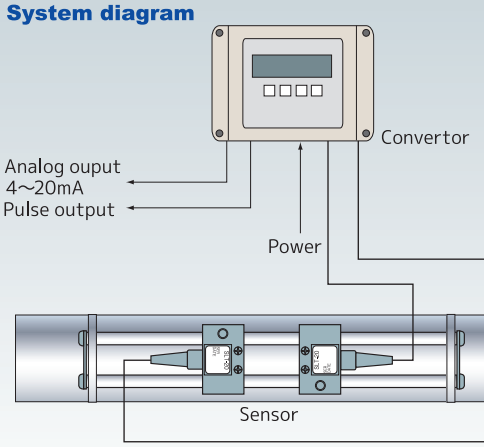
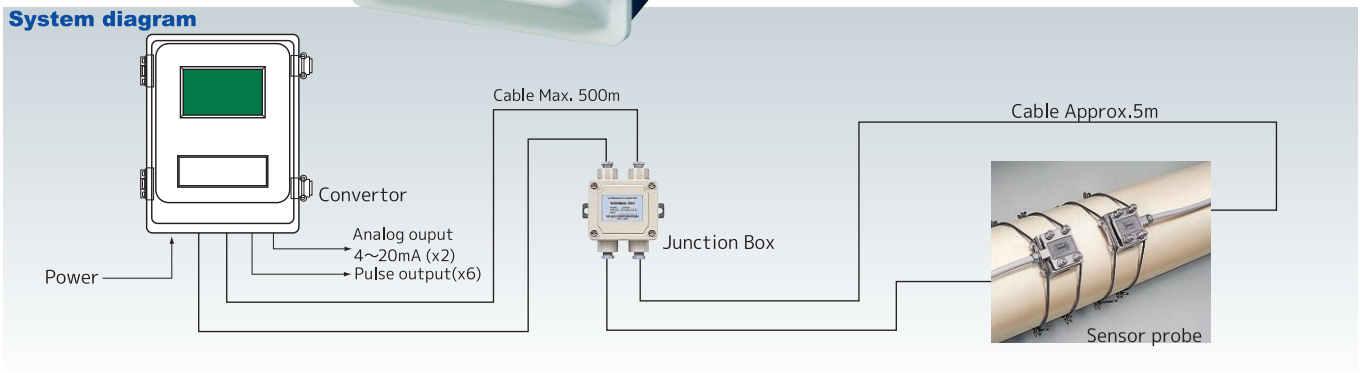
System diagram



[Features]

- Equipped with wide screen LCD (trend graph)
- Flexible parameter configuration
- Various output port (analog x2, digital x1, contact x6)
- Wide measurement range
- No pressure loss
- Clamp-on type sensor
- Non-intrusive in liquid

System diagram



[Ultrasonic liquid flowmeter selection Guide]

			Ultarasonic liquid flowmeter				
Measurement method			Digital cross-correlation method		Ultarasonic transit time method		
Model			μLF-300	μLF-300S	SLF-100	SLF-500	LF-2000
Applicable fluid	Water		○		○	○	○
	Chemical liquid (IPA)		○		○	○	○
	Service water,Industrial water		○		○	○	○
	Sewage,Drainage		—		○	○	○
	Turbidity less than 5000ppm		—		○	○	○
Fluid condition	Fluid temperature		15~80℃		10~60℃	0~60℃	
	Measurement range	Flow velocity conversion	0 ~ Approx. 9m/s		0 ~ 10m/s		0 ~ 30m/s
Function	Measurement accuracy		±1%RD(more than 1m/s)	±0.5%RD(more than 1m/s)※1	±2%RD(more than 1m/s)		±1%RD(more than 0.8m/s)
			±1cm/s (less than 1m/s)	±0.5cm/s(less than 1m/s)※1	±2cm/s (less than 1m/s)		±0.8cm/s (less than 0.8m/s)
	Pressure loss		No loss		No loss		
	Analog output	Flow rate output	—	DC4~20mA	DC4~20mA	DC4~20mA	
	Digital output	Flow rate, Alarm info	RS-422/485		—	RS232C	RS-232C/422
	Integrated output	Open collector	—	○	○	○	○
	Normal/reverse pulse output	Open collector	—	○	—	○	○
	Alarm pulse output	Open collector	—	○	○	○	○
	Display		6 LED Lights	20 char. LED x 2 line	16 char. x2 lines		128x240dots
	Range switch		—	—	—	—	○
	2 chordal path		—	—	—	—	(○)
Power			DC5V	DC12~24V	DC12~30V	AC85~264V	AC100V、115V、220V
Installation requirement	Pipe diameter		Φ1/4 inch,Φ1/8 inch		3/4,1/2,3/8 inch	16 ~ 300 ㎜ (more than external diameter 20mm)	50~6000mm
	Pipe material		NEW PFA Tube		PFA Tube	PFA,PVC,SUS	Steel,SUS,castiron,PVC,FRP
	Pipe length	Upper stream	—		more than 10D		
		Lower stream	—		more than 5D		
	Sensor type		Semi-clamp-on type		Clamp-on type		

(○):option ※1 : depending on the measurement conditions

Ultrasonic Boundary Level Meter

Ultrasonic Boundary Level Meter

BL-550

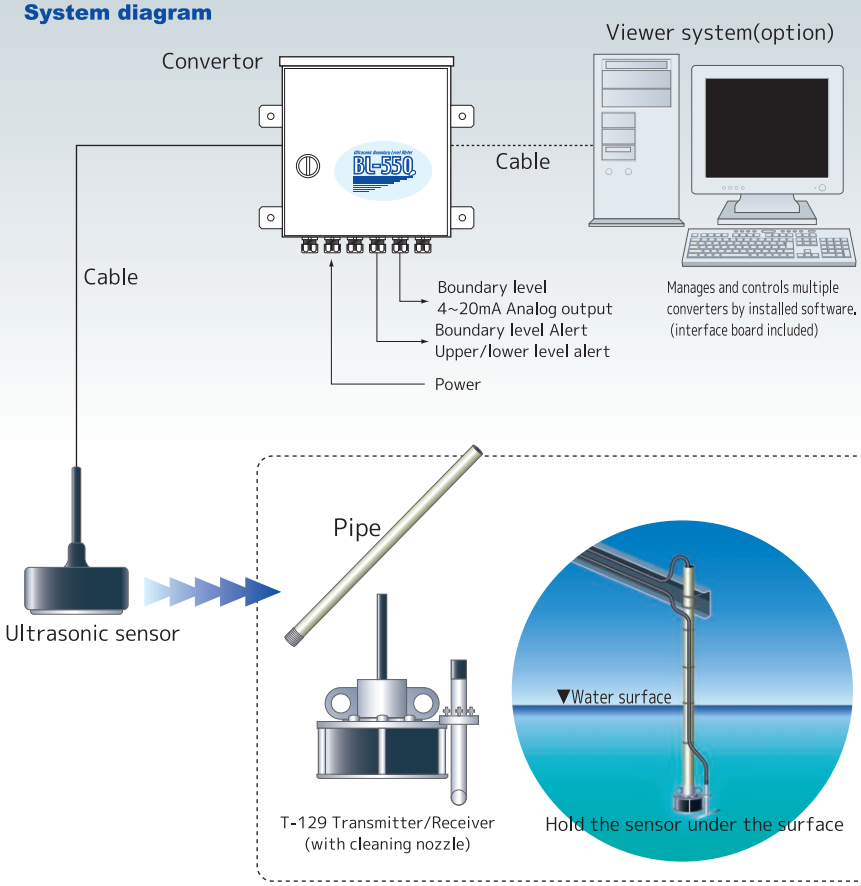
Sequential measurement without disturbance of the boundary !

Real-time monitoring system displays contents of tank and bin.

[Features]

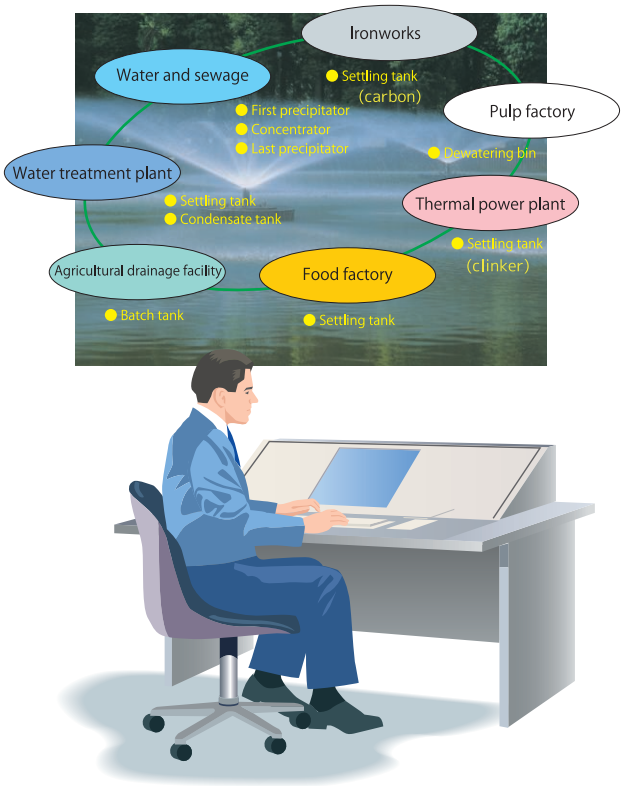
- High speed response to changes happened at the boundary
- Sequentially monitors changes without disturbance of the boundary
- Less mechanical parts, easy maintenance
- Wider measurement range
- Capable of precisely monitoring floating sludge by image viewer

System diagram



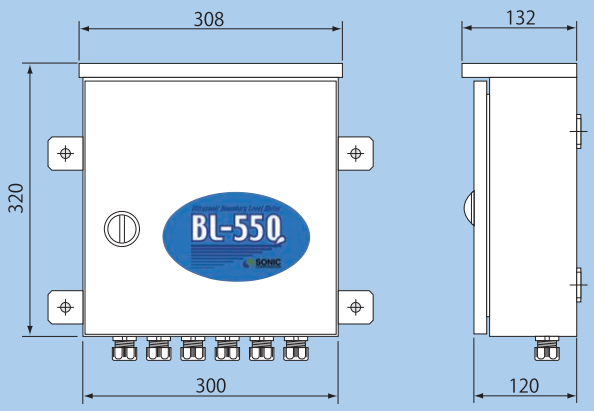
[Features]

●Convertor	
Model	BL-550 Convertor
Measurement method	Ultrasonic pulse-echo technique
Measurement range	0 (+dead band)~10m, dead band=30cm
Accuracy	±1cm (in-house evaluation)
System control	Controlled by CPU
Pulse repetition period	1Hz or 2Hz
Display	LCD Display (20 x 2)
Output	Boundary level, 4-20mA analog output
	Boundary alarming upper/lower limit relay type output
	Contact output once sensor signals are missed
	Data for image monitoring
Input	4-20mA analog output as position correction information
Operating condition	Temperature -10 ~ 40 ℃ (no freezing)
	Humidity 20 ~ 80 % (no condensation)
Power supply	AC100V, 115V, 220V, 50/60Hz
Power dissipation	10VA
Dimensions	310W x 320H x 135D (except convex part)
Housing material	Stainless (SUS304)
Protection grade	IP44
Weight	Approx. 8.2Kg
●Sensor	
Model	T-129 Type transmitter/receiver
Structure	Resin moid, water-proof (include bracket and cleaning nozzle)
Frequency	200kHz
Weight	5kg
Ambient temperature	-5 ~ +60 ℃
Cable length	14m (2 core shield flexible cable)

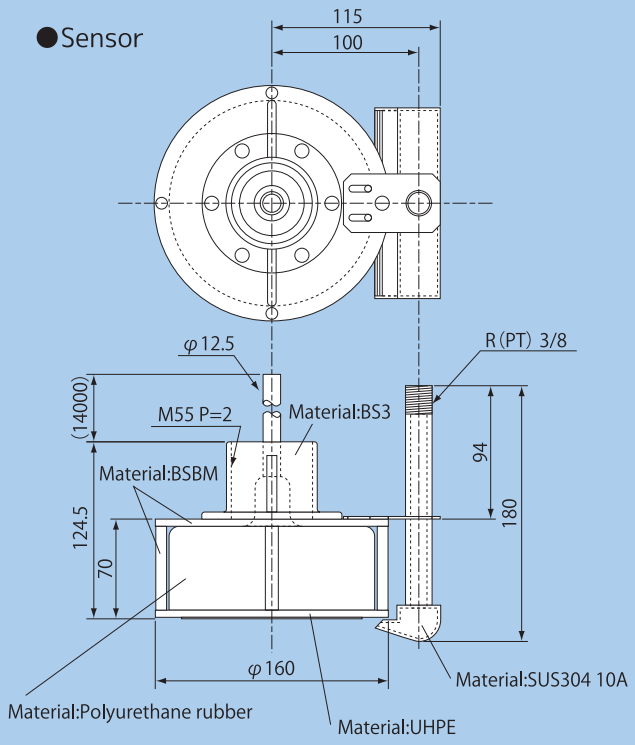


■Dimensions

●Convertor



●Sensor



Ultrasonic Industrial Anemometer

Ultrasonic Industrial Anemometer

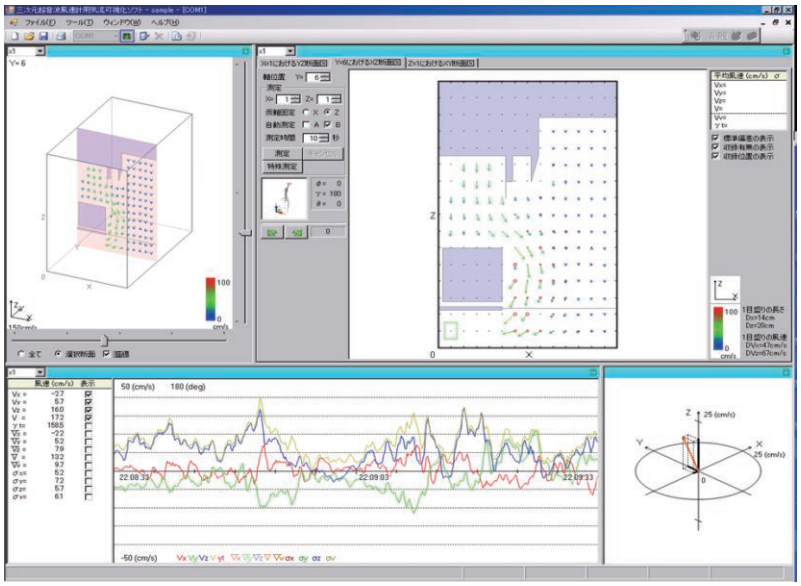
WA-790

Visually monitors the airstream inside factories or rooms.

Provides a stable monitoring without a temperature effect.

[Features]

- Measures a wind velocity for 3 axes
- Possible to measure "ZERO" m/sec
- Visually monitors a wind velocity and a wind direction
- Equipped with digital I/O interface
- Possible to measure a sonic virtual temperature



VISUALIZE THE AIR FLOW.

3D Perspective View

Visualizes an airstream with 3D view. 3D view helps better understading of analysis.

2D Cross-sectional View

Cross-sectionally monitors an airsteam inside the room.

Temporal Axis Plotter

Plots the status of wind velocity and direction. Possible to review them with the temporal axis.

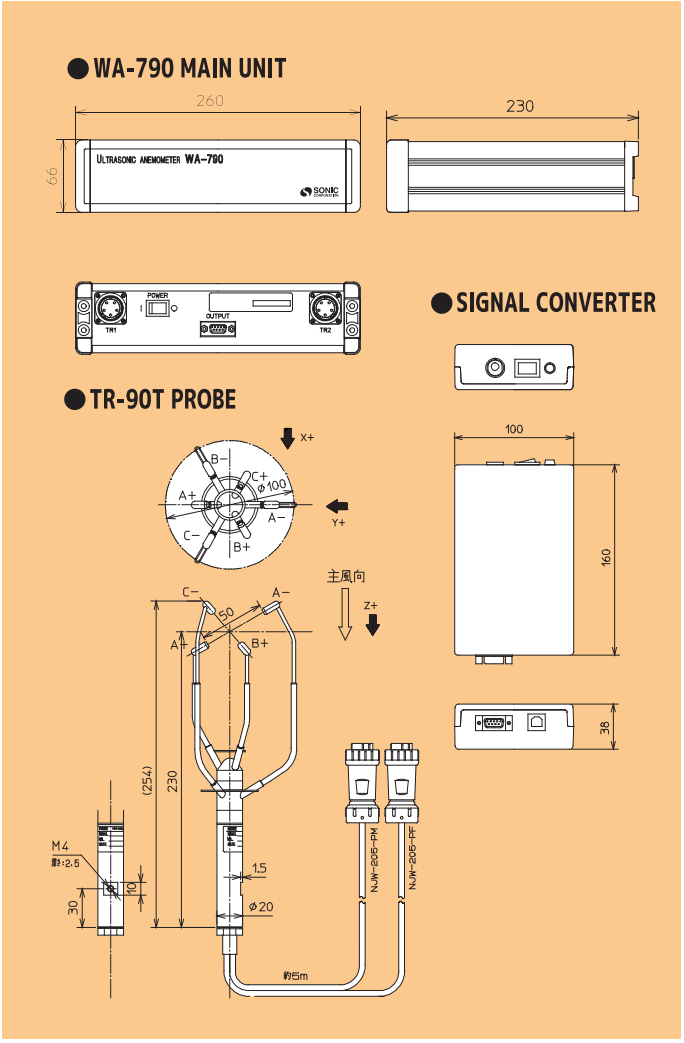
3D Vane Monitoring

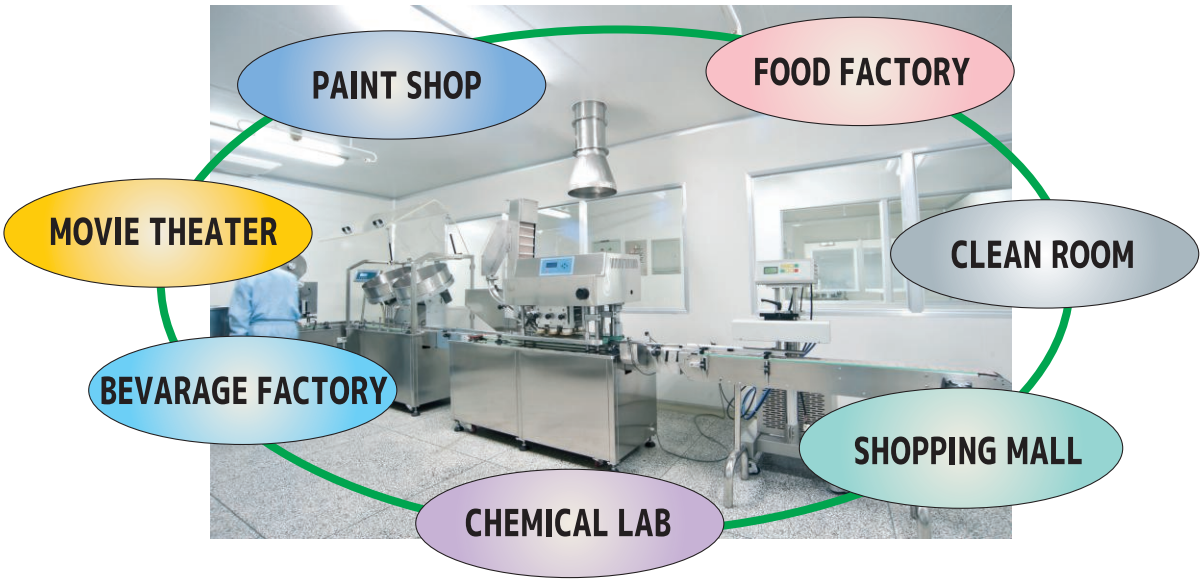
Materializes a vane by three-dimensional modeling. Possible to analyze an invisible vane.

[Features]

Measurement	Time sharing transmission / reception switching ultrasonic pulse emission	
Signal processing	Ultrasonic transit time method	
Measurement range	0 ~ 10m/s, -20 ~ +50℃ (Sonic virtual temperature) -20 ~ +120℃ (High temperature mode)* option Sonic virtual temperature is calculated by ultrasonic time transit time considered with a temperature, atmospheric pressure and temperature fluctuation	
Accuracy	±2.0%RD (1 ~ 10m/s) ±0.02m/s (0 ~ 1m/s) * Defined accuracy above for only the main axis	
Resolution	0.005m/s (Velocity)	
Measurement cycle	10 times/s	
Digital output	RS-422 (USB converted by signal converter)	
	Baudrate	9600 bps
	Data transfer rate	10 times/s
	Data format	ASCII
	6 bytes	payload
	Output data	A,B,C
Operating condition	Main unit, Sensor probe / -20 ~ +50℃ 20 ~ 80%RH	
	Signal converter / 0 ~ +40℃ 20 ~ 80%RH	
	* No dew condensation at all	
	* Max 120℃ (High temperature probe option)	
Power supply	AC100V ~ 240V±10%, Approx.15VA(DC12V)	
Host PC/OS	Windows 7, 10 (32bit/64bit)	
Comm interface	USB port	

■Dimensions





⚠ CAUTION FOR SAFETY : Please read surely INSTRUCTION MANUAL before operating.

●Specification is subject to change without prior notice for improvement.

ISO 9001 JQA-QMA13079 JAB CM009

SONIC CORPORATION

HEAD OFFICE
1-18-2, Akebono, Tachikawa, Tokyo, JAPAN 190-0012
TEL. +81-42-512-5496 FAX. +81-42-595-9950
URL http://www.u-sonic.co.jp/english
email : info@u-sonic.co.jp

SINGAPORE REPRESENTATIVE OFFICE
80 Robinson Road #10-01A Singapore 068898
Tel +65-6420-6250

Rev 2017.09