Fuji Electric

Innovating Energy Technology

Ultrasonic Flowmeter for Steam

World's first clamp-on type saturated steam flow measurements

Contributes to "visualization" of steam flow and works in combination with EMS to optimize energy and achieve energy savings.

- **Installable without turning off steam line**
  No piping work required
- **Effective use of steam energy**
  without pressure loss
- **Less maintenance costs**
  due to no moving parts

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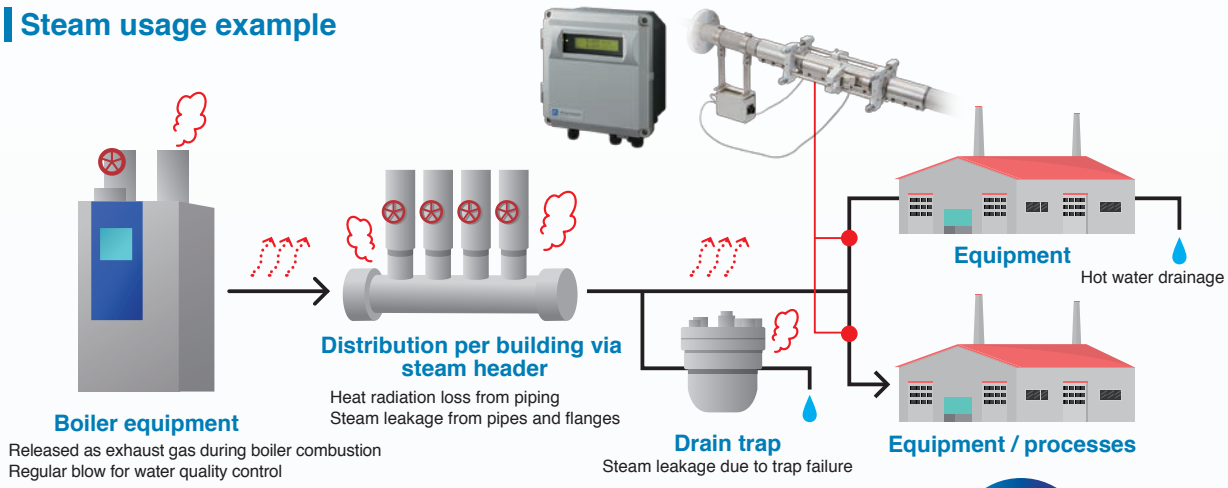
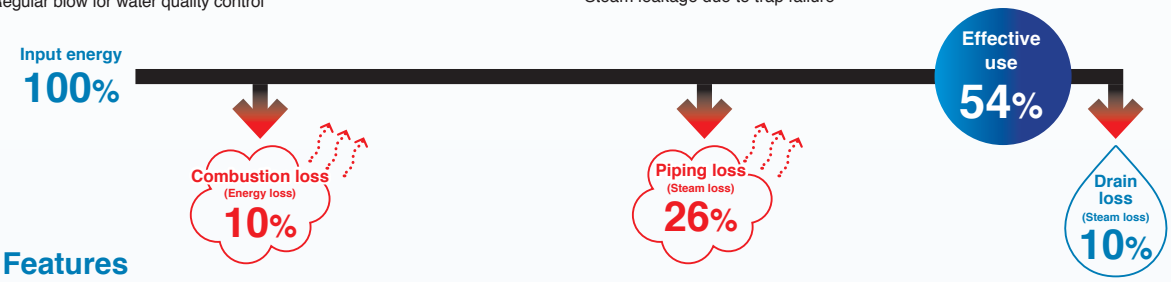
Makes it easy to “visualize” steam

Steam used in factories is produced in boilers and then lost due to pipe heat dissipation loss and steam leakage. This ultrasonic flowmeter for steam can be mounted easily without Plumbing. Operation of equipment is not necessary to stop when a steam flowmeter is added to the plant. “Visualization” of steam flow can be achieved in factories and facilities where it was previously difficult to perform. It helps optimum energy savings and energy management in factories.

Steam usage example

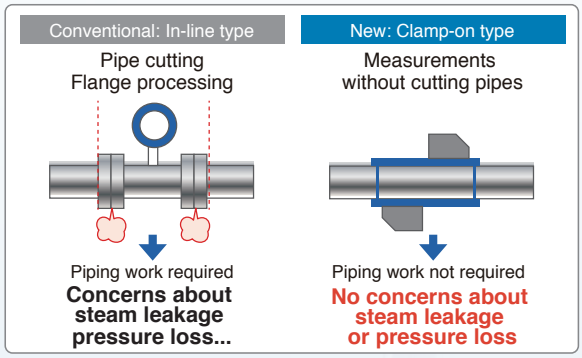




Features

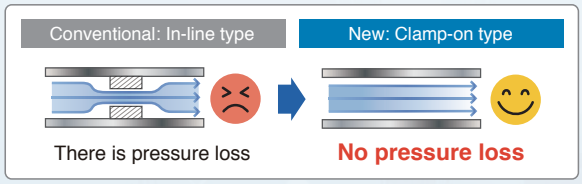
No plumbing required

Installable with no pipe cutting or flange processing. Installable without stopping production lines and no steam leakage concerns since plumbing is not required.



No pressure loss

The ultrasonic sensors do not interfere with the steam flow.

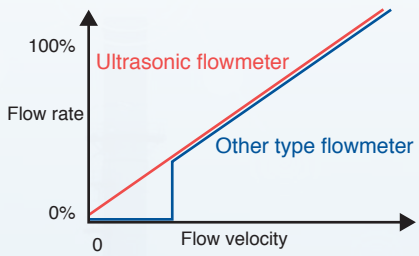


Less maintenance cost

No moving parts help to reduce regular maintenance costs such as cleaning.

Enables measurements at low flow rates

The ultrasonic flowmeter can meusure at low flow rate, even at flow rates of 0.

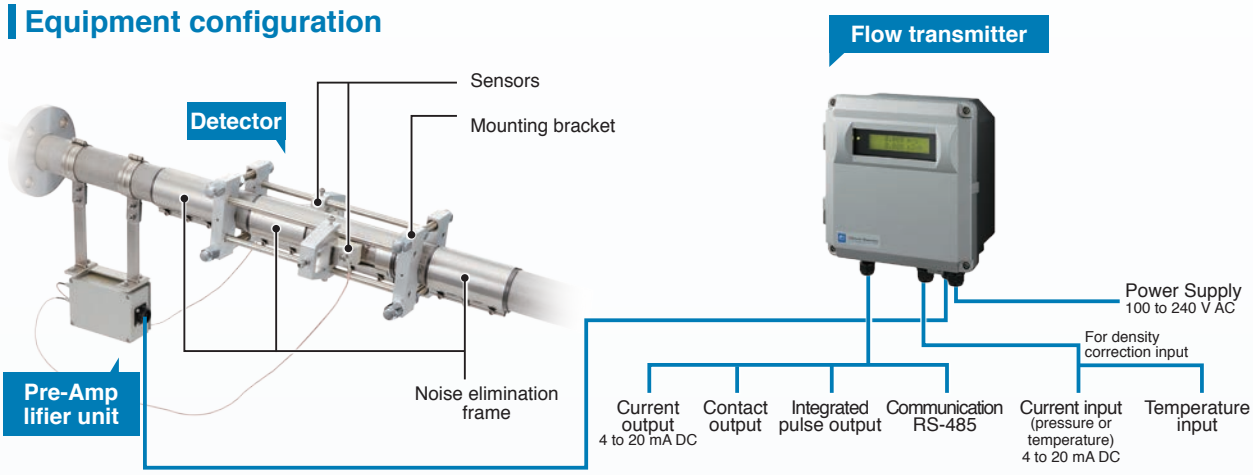


Convertible to mass flow rate

The measured volume flow measurement and density (fixed value) input can be converted to mass flow rate and output. Density correction can also be performed by measuring the pressure (4 to 20 mA DC) and temperature (with resistance bulb) of the saturated steam and inputting as external signal (AI).

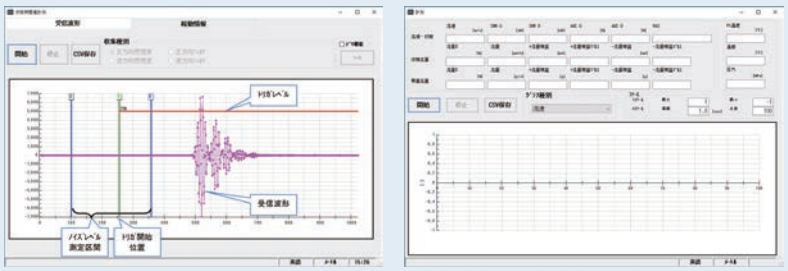
flow

Equipment configuration



[RS-485 communication enables the following]

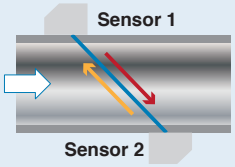
- Setting of parameters
- Checking of received waveforms
- Grasping of trends in measurement data, etc.



Measurement principle:

- Transit-time difference

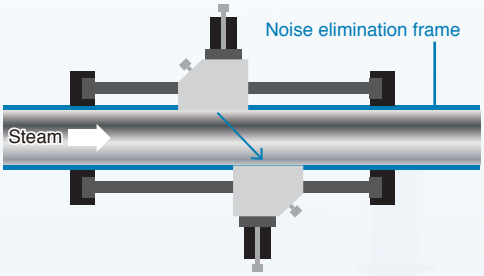
A pair of sensors are installed on the outside wall of the pipe, facing each other diagonally. The sensors emit ultrasonic pulse in turn, and detect the transit time difference of the pulse, by which the flow rate is calculated.



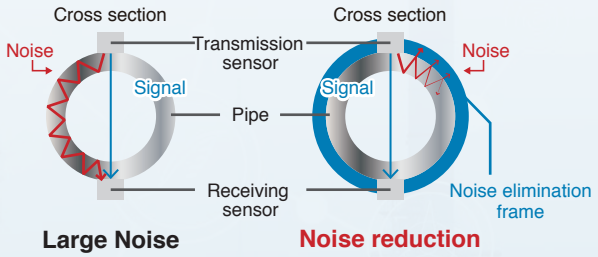
Accurate flow measurement

Noise elimination frame

The heat-resistant rubber frame on the piping surface can reduce noise and accurate cabtuning of the ultrasonic signals is achieuable.



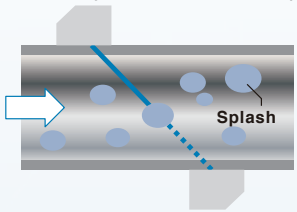
Without noise elimination frame | With noise elimination frame



Algorithm dedicated for steam measurement

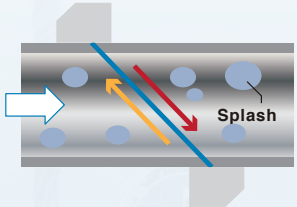
Conventional analog processing

Measurement failure may occur due to interruption by splash.



Digital processing by Fuji own algorithm

Normal transit of ultrasonic waves and synchronons addition processing of received signal.



Ensured sufficient signal level by summing flow rate signals

Ordering code

Flow transmitter

Code	4	5	6	7	8		9
	F	S	J		1	Y		1	-	F

Digit	Specifications	Note:	Code
4	Wiring port (note), mounting method		Note
	With water-proof gland, wall mount		L
	With union (for plica tube) gland, wall mount		M
	With water-proof gland, pipe mount		N
	With union (for plica tube) gland, pipe mount		P
5	Power Supply		
	100 to 240 V AC, 50/60 Hz		1
6	Explosion-proof specification		
	None		Y
7	Parameter setting/tag plate (flow transmitter)		
	None		Y
	With setting		A
	With setting + tag plate (flow transmitter)		B
	Tag plate (flow transmitter)		C
8	Revision code		1
9	<Communication functions>		
	RS-485		F

Note) Specifications for the wiring port are as follows.
With water-proof gland: G1/2 and G3/8 (female screw)
With union (for plica tube) gland: G1/2 (female screw)

Detector

Code	4	5	6	7	8		9
	F	S	X		S	Y		1	-	S

Digit	Specifications	Note:	Code
4	Pipe diameter		
	50A		5
	65A		6
	80A		8
	100A		A
5	Sensor fixing bracket, noise damping frame		
	Standard		S
6	Explosion-proof specification		
	None		Y
7	Acoustic coupler, tag plate (detector)		
	None		Y
	High-temperature grease (for short-term installation)		D
	High-temperature grease (for long-term installation)	Note	E
	Tag plate (detector)		F
	High-temperature grease (for short-term installation) + tag plate (detector)		G
	High-temperature grease (for long-term installation) + tag plate (detector)	Note	H
8	Revision code		1
9	Preamp unit		
	Standard		S

Note) Please contact Fuji when using high-temperature grease (long-term type) outside of Japan.

Dedicated signal cable

Code	4	5	6	7	8
	F	L	Y	E				1

Digit	Specifications	Code
4	Applications	
	Flow transmitter for steam (FSJ), detector for steam (FSX)	E
5 6 7	Dedicated cable length	
	5m	005
	10m	010
	15m	015
	20m	020
	25m	025
	30m	030
	Other standard length (Max. 30 m)	ZZZ
8	Revision code	1

Specifications

Item	Specifications
Mounting method	Clamp-on type
Measurement fluid	Saturated steam
Measuring method	Transit time difference
Flow velocity	0 to ±50 m/s
Accuracy	For required straight pipe length (upstream: 20 D or longer; downstream: 10 D or longer) Flow velocity 0 to 10 m/s: ±0.3 m/s (50 A), ±0.4 m/s (65, 80, 100 A) Flow velocity adove 10 to 30m/s: ±3% of rate (50 A), ±4% of rate (65, 80, 100 A) Flow velocity above 30 to 50 m/s: ±5% of rate
Required straight pipe length	Upstream: 20 D or longer; downstream: 10 D or longer
Piping material	Carbon steel, stainless steel
Pipe diameter	50 mm, 65 mm, 80mm, 100 mm
Pipe thickness	2.8 to 4.5 mm
Fluid temperature	120 to 180°C
Fluid pressure	0.1 to 0.9 MPa (G)
Moisture and splash	Wetness: 0%, there should be no splashing
Input (For mass flow rate conversion)	Current input (4 to 20 mA DC) ×1: Pressure measurement Temperature input (Pt100) ×1: Temperature measurement
Output	Current output (4 to 20 mA DC) ×1 Contact output ×2
Mass flow rate conversion	fixed value input (density) · temperature input · pressure input
Communication	RS-485
Power supply/ consumption	100 to 240 V AC, 20 VA
Degree of protection	IP67 (with connectors fitting)
Ambient temperature	-20 to +60°C
Ambient humidity	95% RH or less
Grounding	Class D grounding with ground resistance of 100Ω or less

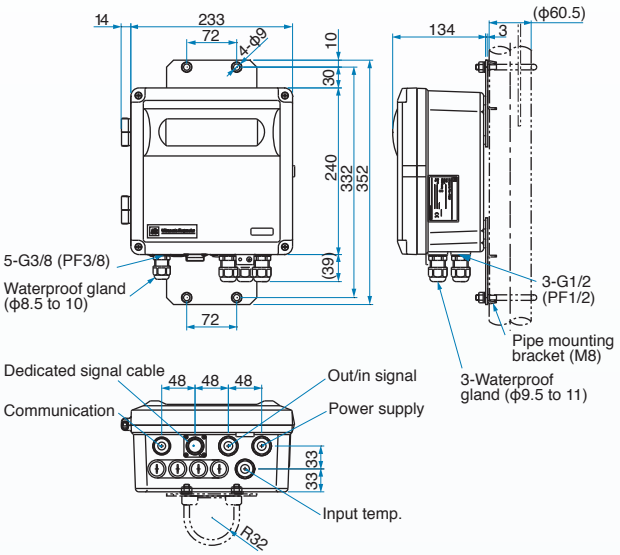
Measurement may be unavailable depending on conditions.

Outline diagram

(Unit: mm)

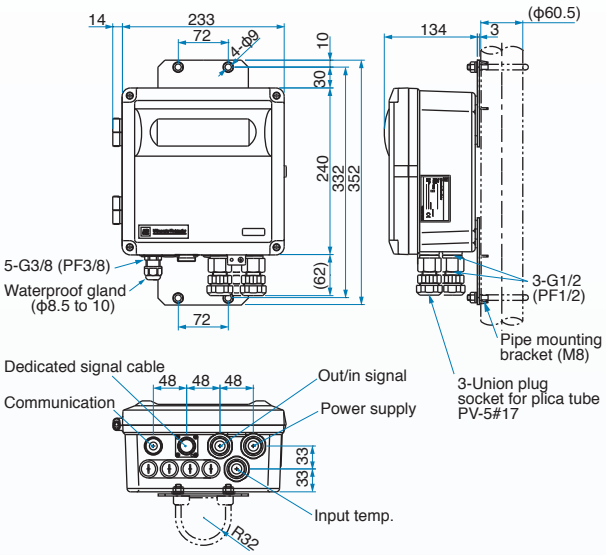
Flow transmitter (With water-proof gland)

(Type: FSJL)
(Type: FSJN)

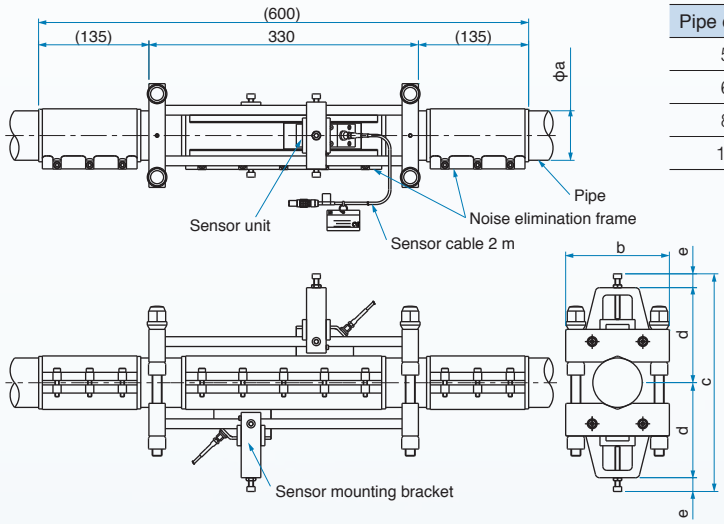


Flow transmitter (With union gland)

(Type: FSJM)
(Type: FSJP)

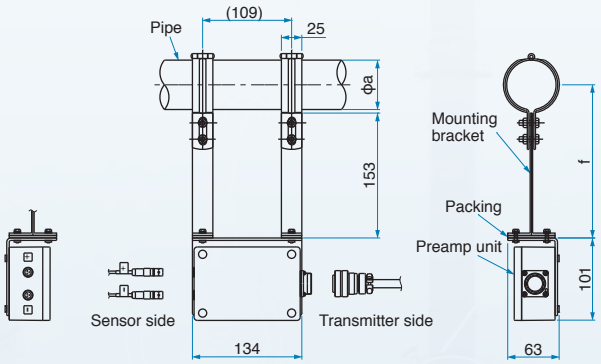


Detector (Type: FSX)

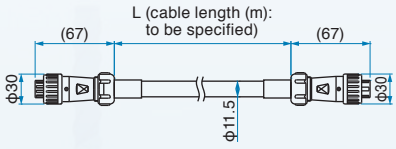


Pipe diameter	φa	b	c	d	e	f
50A	60.5	127	267	116	17	188
65A	76.3	175	282	124	17	196
80A	89.1	175	295	131	16	202
100A	114.3	175	320	145	16	215

Pre-amplifier



Dedicated signal cable (Type: FLYE)



Fuji Electric's EMS Solution

"Visualization", "Recognition" and "Optimization".

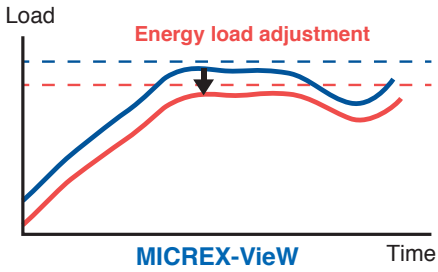
The 3-steps contrubute to your energy management sollution, based on our vision of creating daily and continuous improvement of "energy management".

STEP1 Visualization

Understanding energy usage

Understanding present situations and taking effective action immediately

1. Ascertaining the state of energy by measuring it at key points
2. Deploying known and feasible energy-saving measures



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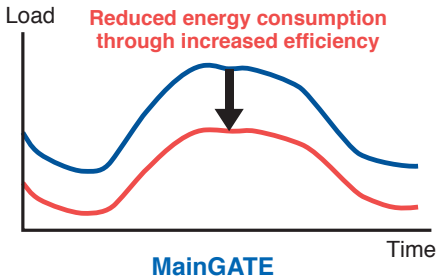
STEP2 Recognition

Energy management

Countermeasure point extraction and effect analysis

1. Achieving points of improvement while eliminating waste through energy-saving analysis support environment deployment
2. Establishing a daily improvement cycle
3. Model energy consumption trends through data collection



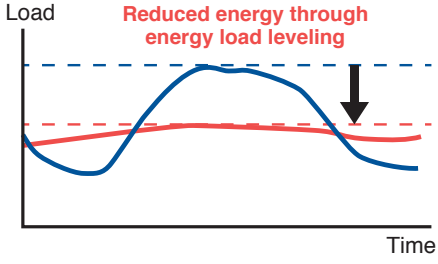
MainGATE

STEP3 Optimization

Energy usage optimization

Optimized usage, management and capital investment

1. Further reducing energy costs through use of energy-saving equipment and control technology
2. Achieving optimum supply control based on energy consumption models
3. Leveling energy loads through use of power generation and storage devices



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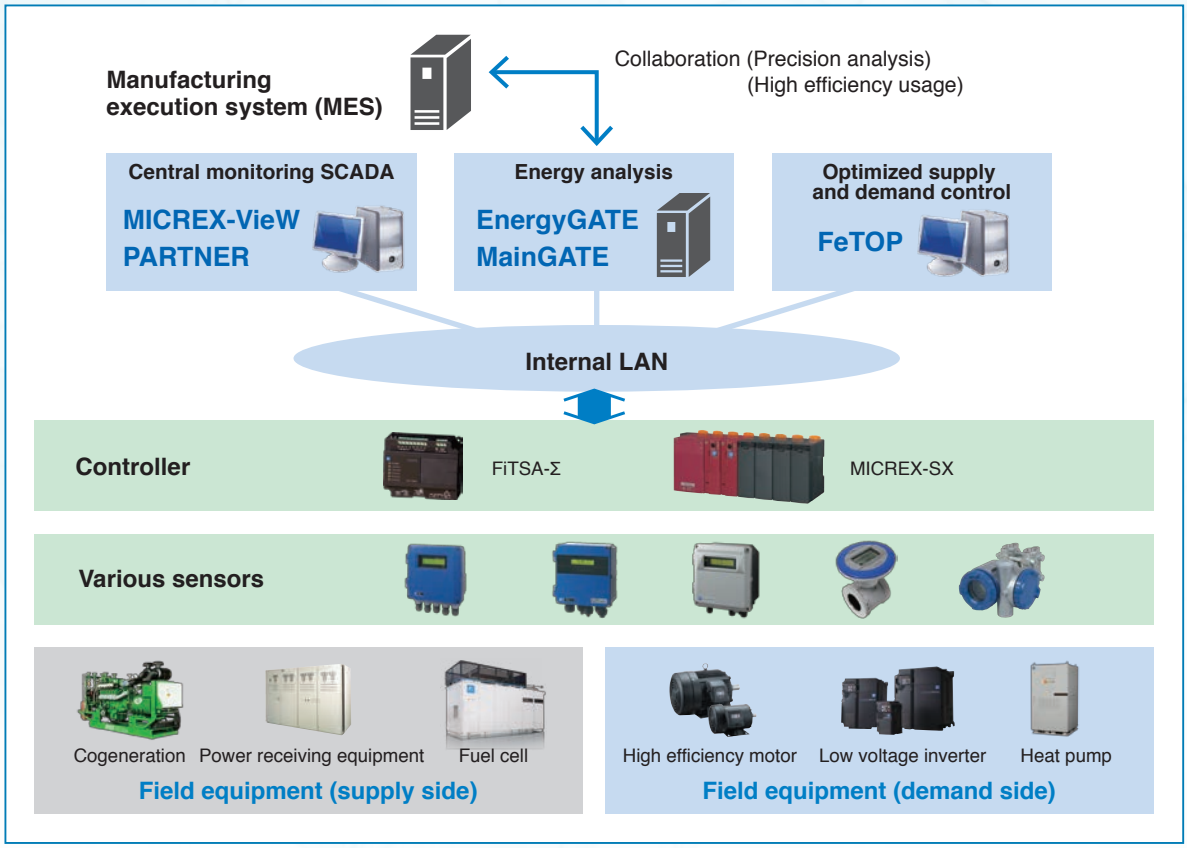

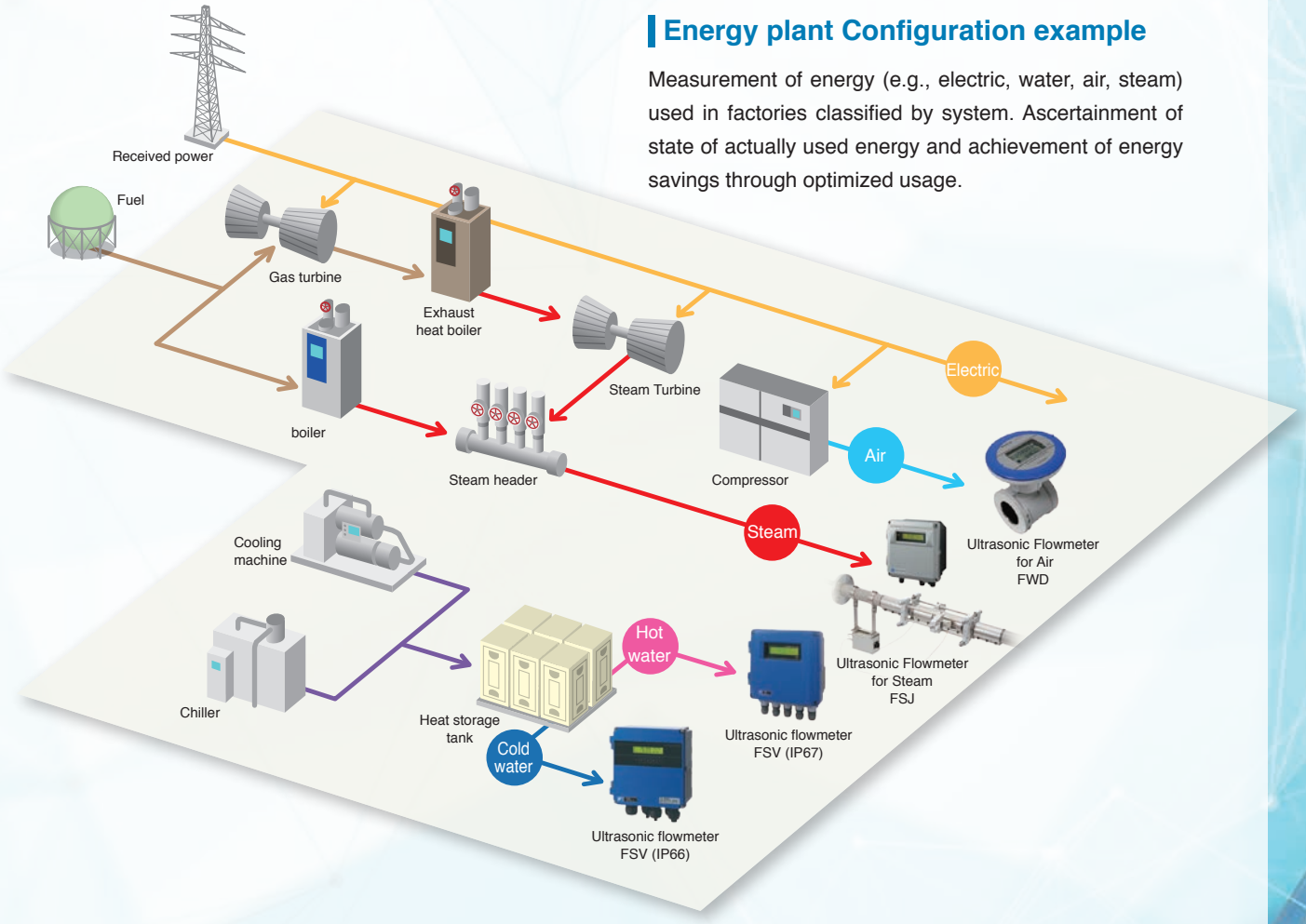

Energy plant Configuration example

Measurement of energy (e.g., electric, water, air, steam) used in factories classified by system. Ascertainment of state of actually used energy and achievement of energy savings through optimized usage.

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

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