

ULTRASONIC GAS ANALYZER

 **DAICHINEKKEN CO.,LTD.**

◆ ULTRASONIC GAS ANALYZER US series

These analyzers have ultrasonic sensors for gas detecting.

These analyzers indicate concentration, outputs analog voltage and electrical current by measuring speed of sound and temperature of mixture of two gases.

PRINCIPLE

Speed of sound what carries in the gases depends on molecular weight of the gas.

If sound speeds and temperature in the gas are found, average molecular weight can be calculated.

If the average molecular weight of measured gas is known, each concentration of two known gases is found.

<Average molecular weight in ideal gas>

$$M = (\gamma \times R \times T \div V^2) \times 10^3$$

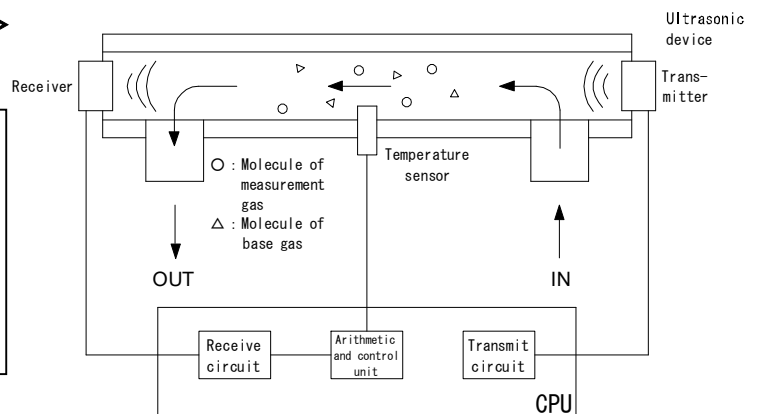
M is average molecular weight of mixed gas.

T is absolute temperature of the gas.

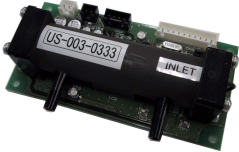
γ is the ratio of heat capacity at constant volume to heat capacity at constant pressure.

V is speed of sound in the mixed gases.

R is constant of the gas : (8.314).



Product lineup I

T Y P E	US-100-5VS type2	US- I X	US- II E	US- I
PICTURE				
DISPLAY UNIT	—	Digital Meter	—	Digital Meter
OPERATION	Optional switchboard	Switch	Switch	Optional switchboard
R A N G E	1			
O U T P U T	DC0-1V	—	DC0-1V	DC4-20mA
P I P I N G	hose of φ5~6.5mm in inside diameter		1/4" Swagelok or 3/8" Swagelok	Rc1/4
S A M P L E T E M P .	Normal temperature (Max. 50°C)			
SAMPLING	Sample gas pressure			
FLOW RATE	0.5 ~ 5.0L/min		0.5 ~ 2.0L/min	
S A M P L E PRESS. ※3	Atmospheric pressure ~ +20kpa	Atmospheric pressure ~ +5kpa	Atmospheric pressure ~ +20kpa	
INSTALLATION	Fixed	Portable	Fixed	Fixed or Panel mounting
POWER SUPPLY	DC+5.0V or DC+12.0V	7.2V lithium ion battery	DC+5.0V or DC+12.0V	AC100 ~ 240V
CHARGE TIME	—	Approx. 3 hours	—	—
M A S S	Approx. 0.1kg	Approx. 0.6kg (include soft case)	Approx. 1kg	Approx. 1.7kg
EXTERNAL DIMENSIONS	W100×D50×H25.6	W150×D40×H111	W165×D100×H135.2	W172×D184×H90

Product lineup II

T Y P E	US-ⅡT-S(R)	US-ⅡT-P	US-ⅠT-P	US-ⅡT-SH
PICTURE				
DISPLAY UNIT	5.7 inch TFT color LCD monitor			
OPERATION	Touch panel			
R A N G E	1 ~ 10 (Please contact our company)			
A N A L O G O U T P U T	DC4-20mA DC0-1V or 0-10V			
CONTACT OUTPUT※1	—	7 points (all A)		—
I N P U T SIGNAL※2	—	Remote calibration signal		—
P I P I N G	Rc1/4 or 1/4" VCR			Rc1/4
S A M P L E T E M P .	Normal temperature (Max. 50℃)			
SAMPLING	Sample gas pressure		Suction by pump Max. 46.7kpa	Sample gas pressure
FLOW RATE	0.5 ~ 2.0L/min	0.5 ~ 2.0L/min With flow meter needle valve		0.5 ~ 2.0L/min
S A M P L E P R E S S . ※3	Atmospheric pressure ~ +20kpa		—	Atmospheric pressure ~ +20kpa
INSTALLATION	Panel mounting		Portable	Portable or Panel mounting
POWER SUPPLY	AC85 ~ 260V		AC90 ~ 110V	AC85 ~ 260V
M A S S	Approx. 5kg	Approx. 6kg	Approx. 7kg	Approx. 6.5kg
EXTERNAL DIMENSIONS	W220×D252×H150	W290×D235×H170	W294×D330×H170	Portable: W220×D268×H200 Panel mounting: W220×D268×H150

※1 Concentration alarm 2 points, Failure alarm and Signal whole calibration, Others are used to the optional function. Exp) auto calibration function

Resistance load : AC250V 5.0A, DC30V 5.0A

Inductive load : AC250V 2.0A, DC30V 2.0A

US-ⅡT-SR has Concentration alarm 2 point (or a Concentration alarm and a Failure alarm).

※2 Non-voltage input (Isolation)

※3 Sample pressure has indicated the case of exhaust to atmosphere.

Sample pressure (+1.0 Mpa or less) ±0.05Mpa is possible to specify.

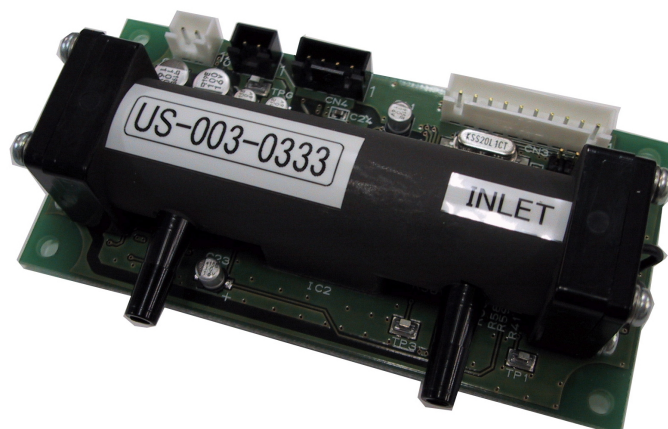
(Pressure-resistant of US-100-5VS & US-ⅠX is +0.1MPa. Pressure-resistant of US-ⅡT-P is +0.8MPa.)

Please specify part and the composition of the measurement gas when you order.

1. ULTRASONIC GAS MODULE US-100-5VS type.2

STRONG POINT

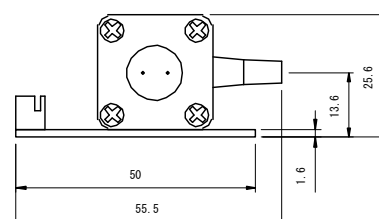
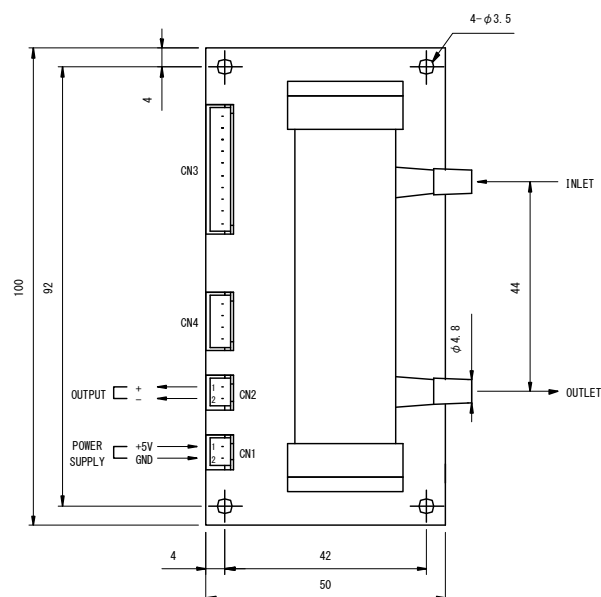
- ◎ No consumables and long-lasting
- ◎ Calibration and maintenance are unnecessary for a long time
- ◎ Warm-up time is short and power saving
- ◎ Compact, Light, Easy installation



SPECIFICATIONS

WARM-UP TIME Approx. 10 seconds
SAMPLE TEMP. Normal temperature (Max. 50°C)
SAMPLE PRESS. Atmospheric pressure ~ +20kpa
FLOW RATE 0.5 ~ 5.0L/min
POWER SUPPLY Less than $\pm 0.3V$ of DC+5.0V
(option : DC+12.0V)
AMBIENT TEMP. 5 ~ 45°C/90%RH or less
P I P I N G Hose of $\phi 5 \sim 6.5$ mm in inside diameter
ANALOG OUTPUT DC0-1V
RESPONSE TIME 90% reading is within 10sec.
LINEARITY/ REPEATABILITY Less than $\pm 1\%$ of full scale (max range)
M A S S Approx. 0.1kg
E X T E R N A L DIMENSIONS W100 × D50 × H25.6

OUTLINE DIAGRAM



PERFORMANCE

Composition	MEASUREMENT MAX RANGE	MEASURABLE MINIMUM DIGIT
He/N2	0~ 50%	0.1 %
He/Air	0~ 50%	0.1 %
O2/N2	0~100%	0.4 %
Xe/Ar	0~100%	0.05%
Kr/N2	0~100%	0.05%
CF4/N2	0~100%	0.05%
Xe/N2	0~100%	0.03%
SF6/N2	0~100%	0.03%
CO2/Ar	0~ 50%	0.1 %

2. ULTRASONIC PORTABLE GAS ANALYZER US-IX

● Portable



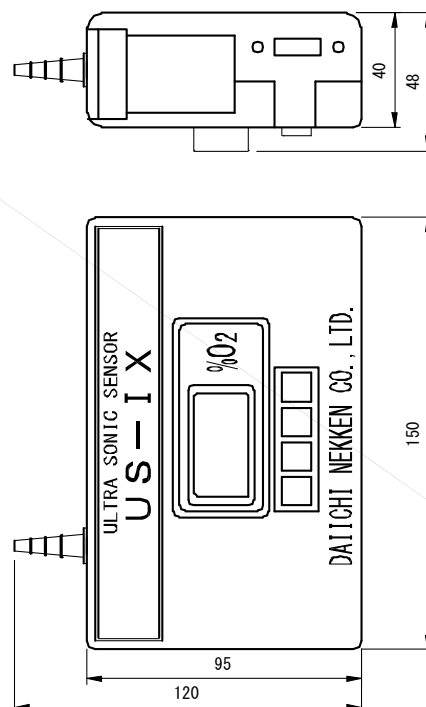
STRONG POINT

- ◎ No consumables and long-lasting
- ◎ Calibration and maintenance are unnecessary for a long time
- ◎ Warm-up time is short and power saving
- ◎ Compact, Light, Easy to carry
- ◎ With soft case
- ◎ Continuous measurements up to approx. 3 hours possible

SPECIFICATIONS

MEASUREMENT RANGE	0.0 ~ 100.0%
WARM-UP TIME	Approx. 10 seconds
SAMPLE TEMP.	Normal temperature (Max. 50°C)
SAMPLE PRESS.	Atmospheric pressure ~ +5kpa
FLOW RATE	0.5 ~ 5.0L/min
POWER SUPPLY	7.2V lithium ion battery
CHARGE TIME	Approx. 3 hours
AMBIENT TEMP.	5 ~ 45°C/90%RH or less
P I P I N G	Hose of $\phi 5 \sim 6.5$ mm in inside diameter
RESPONSE TIME	90% reading is within 10sec.
LINEARITY/ REPEATABILITY	Less than $\pm 2\text{vol } \%$ of full scale
M A S S	Approx. 0.6kg (include soft case)
E X T E R N A L D I M E N S I O N S	W150 × D40 × H111

OUTLINE DIAGRAM



※Performance is equivalent to Ultrasonic gas module.

3. ULTRASONIC GAS ANALYZER US-II E

● Space-saving



STRONG POINT

- ◎ No consumables and long-lasting
- ◎ Calibration and maintenance are unnecessary for a long time
- ◎ Warm-up time is short and power saving
- ◎ Analog output only

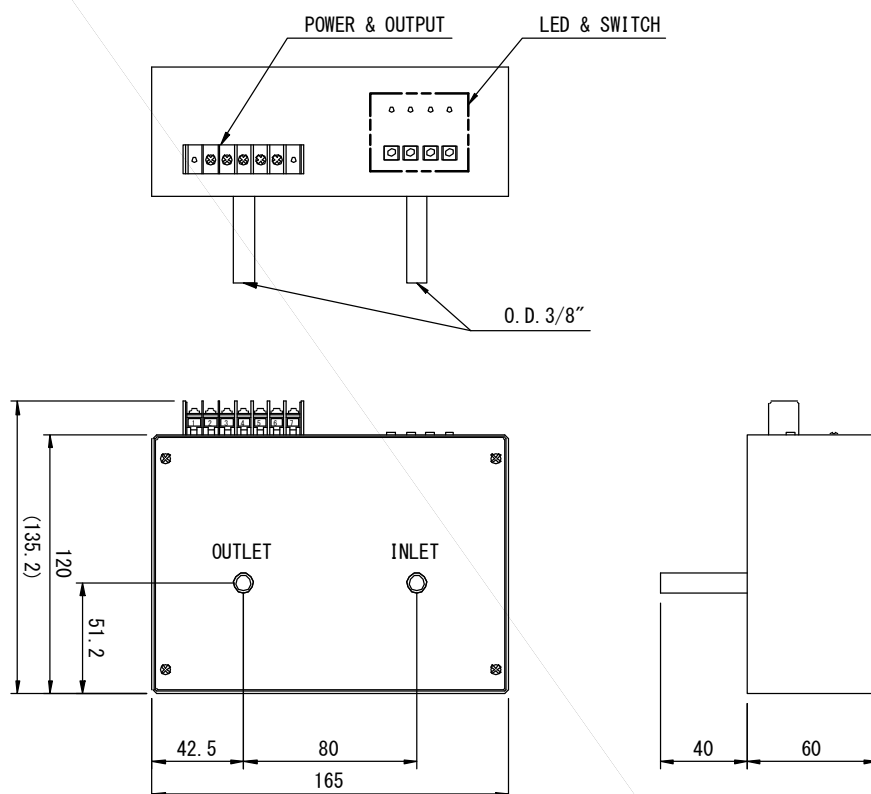
SPECIFICATIONS

INSTALLATION	Fixed
WARM-UP TIME	Approx. 10 seconds
SAMPLE TEMP.	Normal temperature (Max. 50°C)
SAMPLE PRESS.	Atmospheric pressure ~ +20kpa
FLOW RATE	0.5 ~ 2.0L/min
POWER SUPPLY	DC+5.0V $\pm$ 0.3V 以内 (DC+12.0V $\pm$ 1.0V 以内)
AMBIENT TEMP.	5 ~ 45°C/90%RH or less
P I P I N G	1/4" Swagelok or 3/8" Swagelok
ANALOG OUTPUT	DC0-1V
RESPONSE TIME	90% reading is within 10sec.
LINEARITY/ REPEATABILITY	Less than $\pm$ 1% of full scale (max range)
M A S S	Approx. 1kg
E X T E R N A L D I M E N S I O N S	W165×D100×H135.2

PERFORMANCE

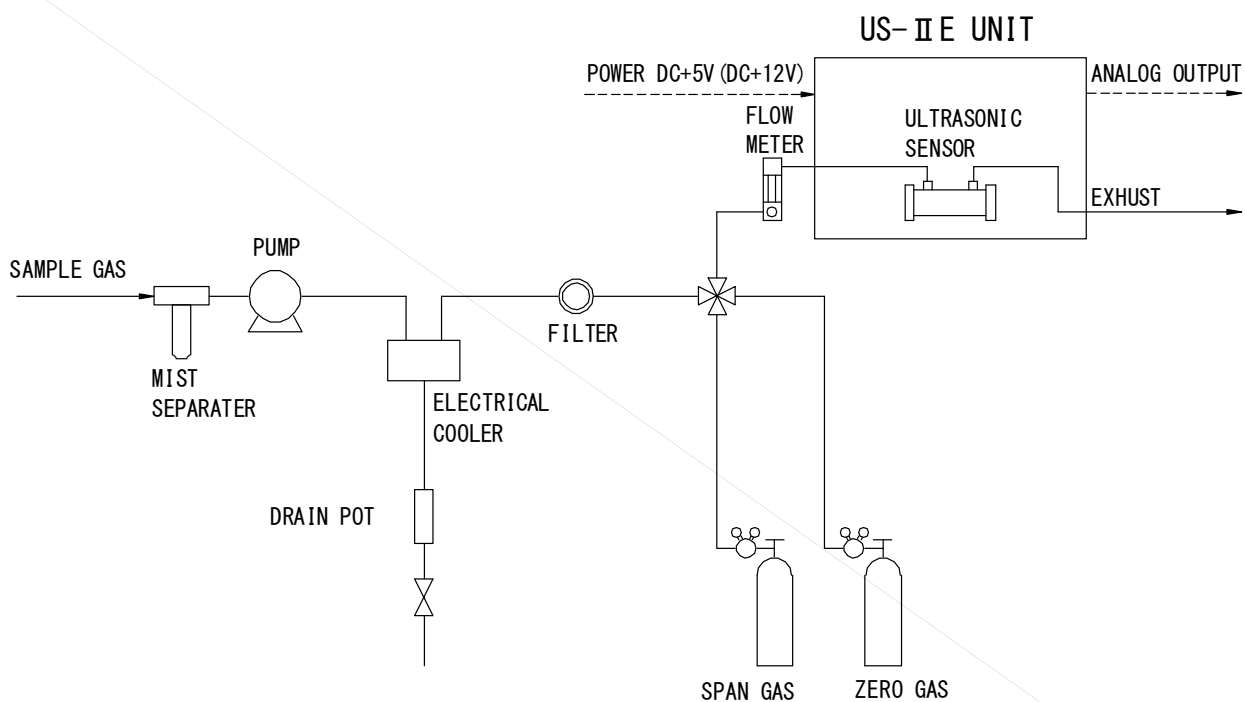
Composition	MEASUREMENT MAX RANGE	MEASURABLE MINIMUM DIGIT
H ₂ /N ₂	0~ 50%	0.04 %
He/N ₂	0~ 50%	0.04 %
He/Air	0~ 50%	0.04 %
O ₂ /N ₂	0~100%	0.2 %
Xe/Ar	0~100%	0.02 %
Kr/N ₂	0~100%	0.02 %
CF ₄ /N ₂	0~100%	0.02 %
Xe/N ₂	0~100%	0.01 %
SF ₆ /N ₂	0~100%	0.01 %
CO ₂ /Ar	0~ 50%	0.1 %

OUTLINE DIAGRAM



EXAMPLE OF FLOW

<EXAMPLE OF MEASURING INDUSTRIAL FURNACES>



※If sample gas is DRY, it is not necessary to prepare mist separator and electrical cooler.

4. ULTRASONIC GAS ANALYZER US- I

- For Portable
- For Panel mount



STRONG POINT

- ◎ No consumables and long-lasting
- ◎ Calibration and maintenance are unnecessary for a long time
- ◎ Warm-up time is short and power saving
- ◎ Compact, Light, Easy to carry
- ◎ Free choice of output scaling
- ◎ AC adapter included
- ◎ Special clamps for panel mounting
(Clamps are not included in the price)

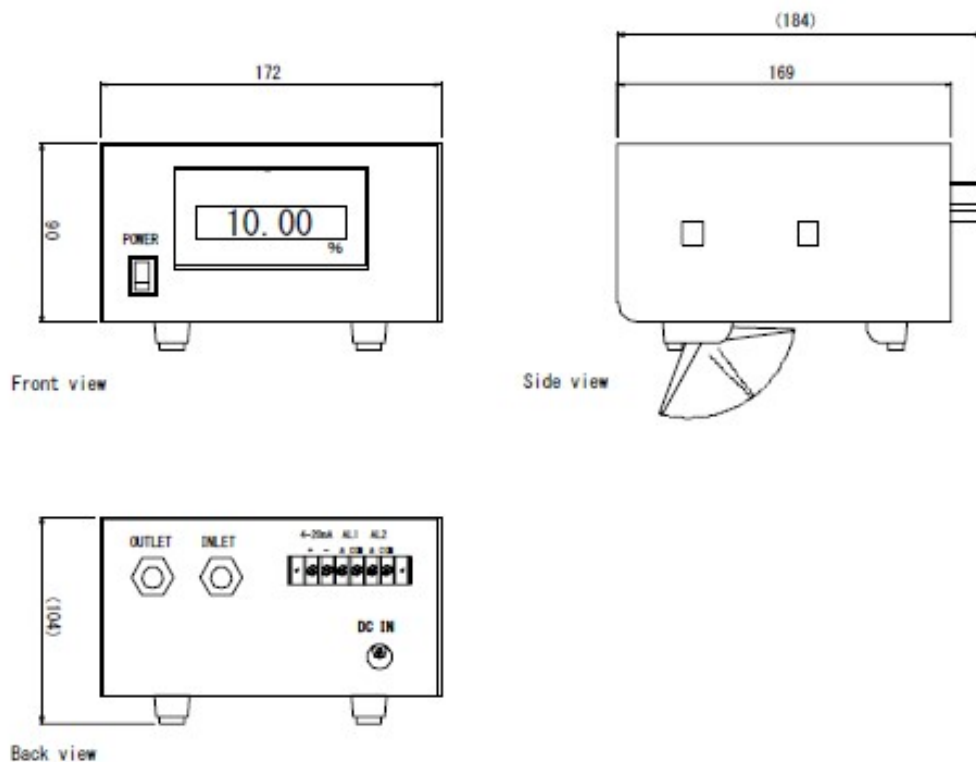
SPECIFICATIONS

INSTALLATION	Portable, Panel mount
WARM-UP TIME	Approx. 10 seconds
SAMPLE TEMP.	Normal temperature (Max. 50°C)
SAMPLE PRESS.	atmosphere ~ +20kPa
FLOW RATE	0.5 ~ 2.0L/min
POWER SUPPLY	Analyzer: DC11~48V Ac adapter: AC100~240V 50/60Hz
AMBIENT TEMP.	5 ~ 45°C/90%RH or less
P I P I N G	IN OUT : Rc1/4
ANALOG OUTPUT	D. C. 4~20mA
ALARM	Concentration alarm : 2
LINEARITY/ REPEATABILITY	Less than $\pm 1\%$ of full scale (max range)
RESPONSE TIME	90% reading is within 10sec.
M A S S	Approx. 1.7kg
E X T E R N A L D I M E N S I O N S	W172×D184×H90 (except tilt leg)

PERFORMANCE

Composition	MEASUREMENT MAX RANGE	MEASURABLE MINIMUM DIGIT
H ₂ /N ₂	0~ 50%	0.04 %
He/N ₂	0~ 50%	0.04 %
He/Air	0~ 50%	0.04 %
O ₂ /N ₂	0~100%	0.2 %
Xe/Ar	0~100%	0.02 %
Kr/N ₂	0~100%	0.02 %
CF ₄ /N ₂	0~100%	0.02 %
Xe/N ₂	0~100%	0.01 %
SF ₆ /N ₂	0~100%	0.01 %
CO ₂ /Ar	0~ 50%	0.1 %

OUTLINE DIAGRAM



PRINCIPLE

Speed of sound what carries in the gases depends on molecular weight of gas.

ULTRASONIC SENSOR calculates average molecular weight that is changed by concentration and temperature of mixed gas, and indicates concentration of mixture of two gases.

Speed of sound goes as follows.

$$V = \sqrt{\gamma \times R \times T \div M}$$

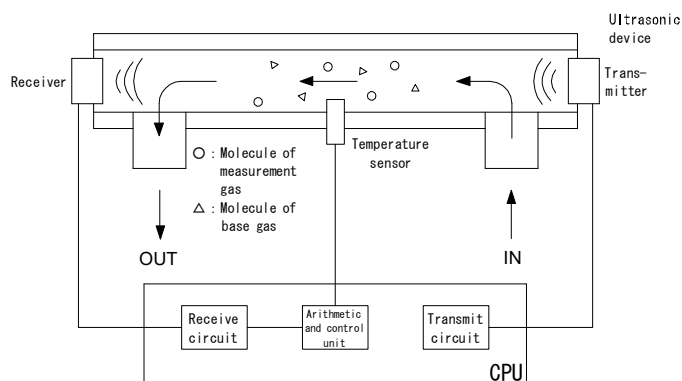
where

γ is the ratio of heat capacity at constant volume to heat capacity at constant pressure

R is constant of gas (8.314)

T is Absolute temperature of gas

M is average molecular weight of mixed gas



5. ULTRASONIC GAS ANALYZER US-II T-S (R)

● Standard type



STRONG POINT

- ◎ No consumables and long-lasting
- ◎ Color LCD monitor with touch panel
- ◎ Two choices of analog output
: DC 0-10V or DC 0-1V
- ◎ Warm-up time is short and power saving
- ◎ Multiple range for various kinds of gases
- ◎ Free choice of output scaling by user
- ◎ Wide power supply between AC 85V and AC 260V
- ◎ Free choice of sampling period by user
- ◎ Alarm output (only for US-II T-SR)

SPECIFICATIONS

INSTALLATION	Panel mounting
WARM-UP TIME	Approx. 10 seconds
SAMPLE TEMP.	Normal temperature (Max. 50°C)
SAMPLE PRESS.	Atmospheric pressure ~ +20kpa
FLOW RATE	0.5 ~ 2.0L/min
POWER SUPPLY	AC85 ~ 260V 50/60Hz
AMBIENT TEMP.	5 ~ 45°C/90%RH or less
P I P I N G	Rc1/4 or 1/4" VCR
ANALOG OUTPUT	DC4-20mA, 0-1V or 0-10V
*1 RESPONSE TIME	90% reading is within 10sec.
LINEARITY/ REPEATABILITY	Less than $\pm 1\%$ of full scale (max range)
M A S S	Approx. 5kg
E X T E R N A L D I M E N S I O N S	W220 × D252 × H150

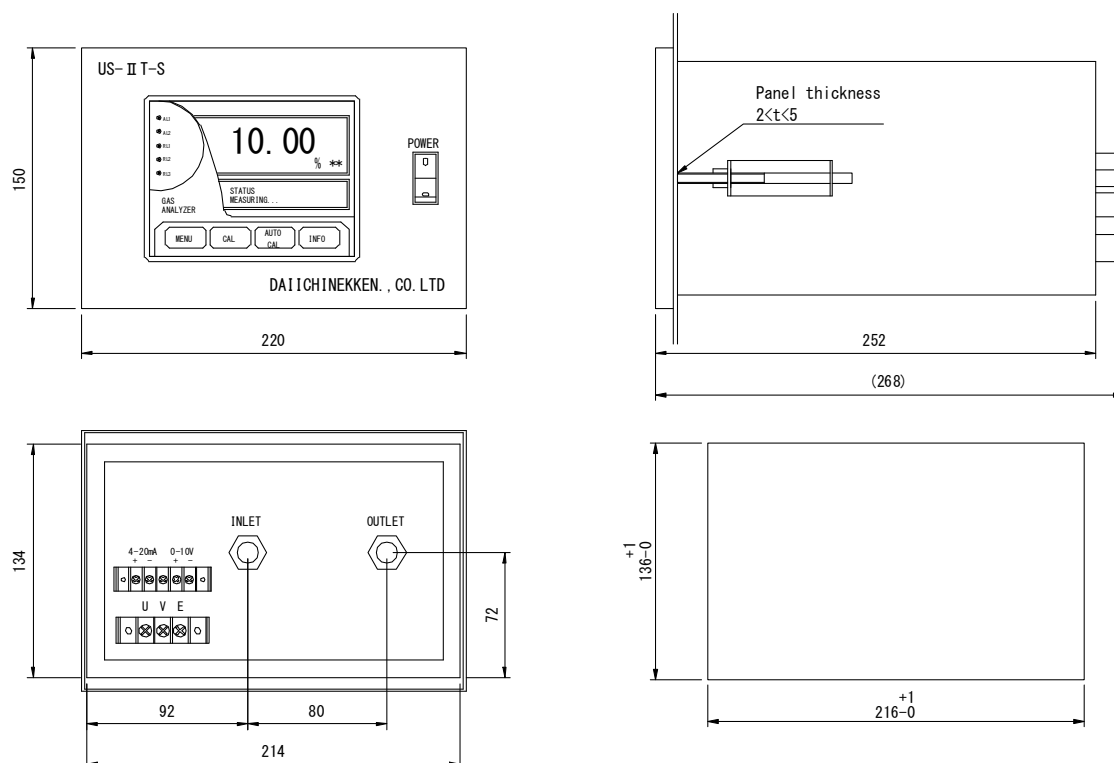
PERFORMANCE

Composition	MEASUREMENT MAX RANGE	MEASURABLE MINIMUM DIGIT
H2/N2	0~ 50%	0.02 %
He/N2	0~ 50%	0.02 %
He/Air	0~ 50%	0.02 %
O2/N2	0~100%	0.1 %
Xe/Ar	0~100%	0.01 %
Kr/N2	0~100%	0.01 %
CF4/N2	0~100%	0.01 %
Xe/N2	0~100%	0.005%
SF6/N2	0~100%	0.005%
CO2/Ar	0~ 50%	0.05 %

*1

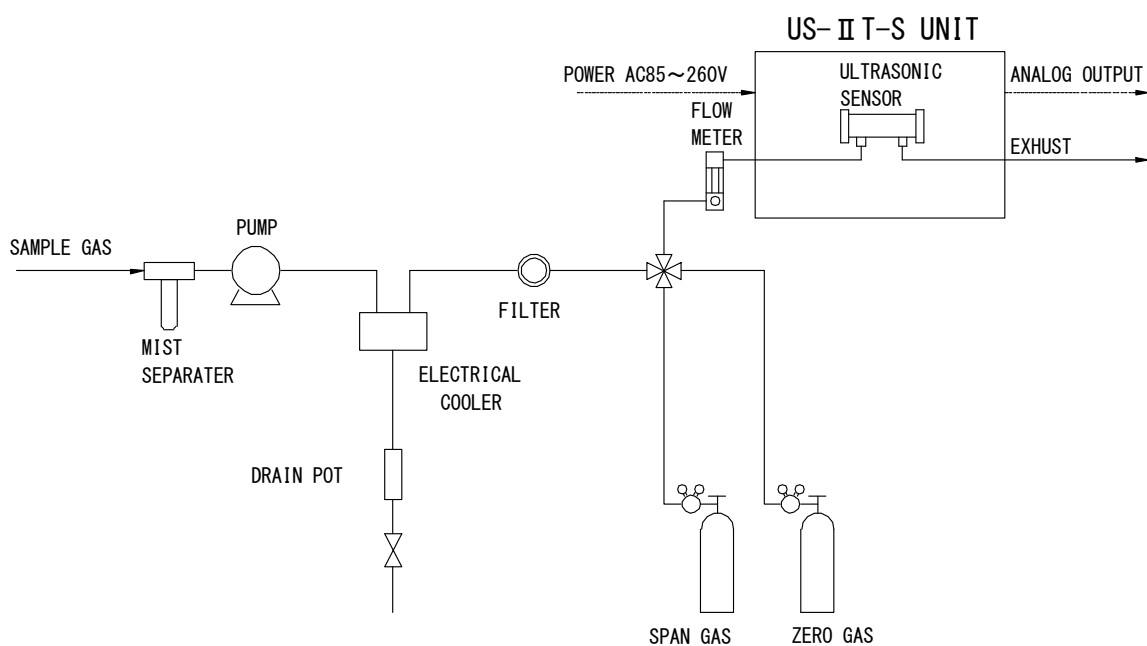
Can be arbitrarily set by a user

OUTLINE DIAGRAM



EXAMPLE OF FLOW

<EXAMPLE OF MEASURING INDUSTRIAL FURNACES>



※If sample gas is DRY, it is not necessary to prepare mist separater and electrical cooler.

6. ULTRASONIC GAS ANALYZER US-II T-P

● Type with flow meter



STRONG POINT

- ◎ No consumables and long-lasting
 - ◎ Color LCD monitor with touch panel
 - ◎ RS232C Serial communication function (optional)
 - ◎ Two choices of analog output : DC 0-10V or DC 0-1V
 - ◎ Multiple range for various kinds of gases
- ◎ Failure alarm (self-diagnosis function)
 - ◎ Free choice of output scaling by user
 - ◎ Auto calibration function, Remote calibration function
 - ◎ Wide power supply between AC 85V and AC 260V
 - ◎ Free choice of sampling period by user

SPECIFICATIONS

INSTALLATION	Panel mounting
WARM-UP TIME	Approx. 10 seconds
SAMPLE TEMP.	Normal temperature (Max. 50°C)
SAMPLE PRESS.	Atmospheric pressure ~ +20kpa
FLOW RATE	0.5 ~ 2.0L/min
POWER SUPPLY	AC85 ~ 260V 50/60Hz
AMBIENT TEMP.	5 ~ 45°C/90%RH or less
P I P I N G	Rc1/4 or 1/4" VCR
ANALOG OUTPUT	DC4-20mA, 0-1V or 0-10V
*1 A L A R M	Concentration alarm : 2, Failure alarm : 1
*2 CONTACT OUTPUT	7 points (all A)
INPUT SIGNAL	Remote calibration signal
*3 RESPONSE TIME	90% reading is within 10sec.
LINEARITY/ REPEATABILITY	Less than ±1% of full scale (max range)
M A S S	Approx. 6kg
EXTERNAL DIMENSIONS	W290 × D235 × H170

PERFORMANCE

Composition	MEASUREMENT MAX RANGE	MEASURABLE MINIMUM DIGIT
H2/N2	0~ 50%	0.02 %
He/N2	0~ 50%	0.02 %
He/Air	0~ 50%	0.02 %
O2/N2	0~100%	0.1 %
Xe/Ar	0~100%	0.01 %
Kr/N2	0~100%	0.01 %
CF4/N2	0~100%	0.01 %
Xe/N2	0~100%	0.005%
SF6/N2	0~100%	0.005%
CO2/Ar	0~ 50%	0.05 %

- * 1

Concentration alarm 2 point, Failure alarm and Signal whole calibration, Others are used to the optional function. Exp) auto calibration function

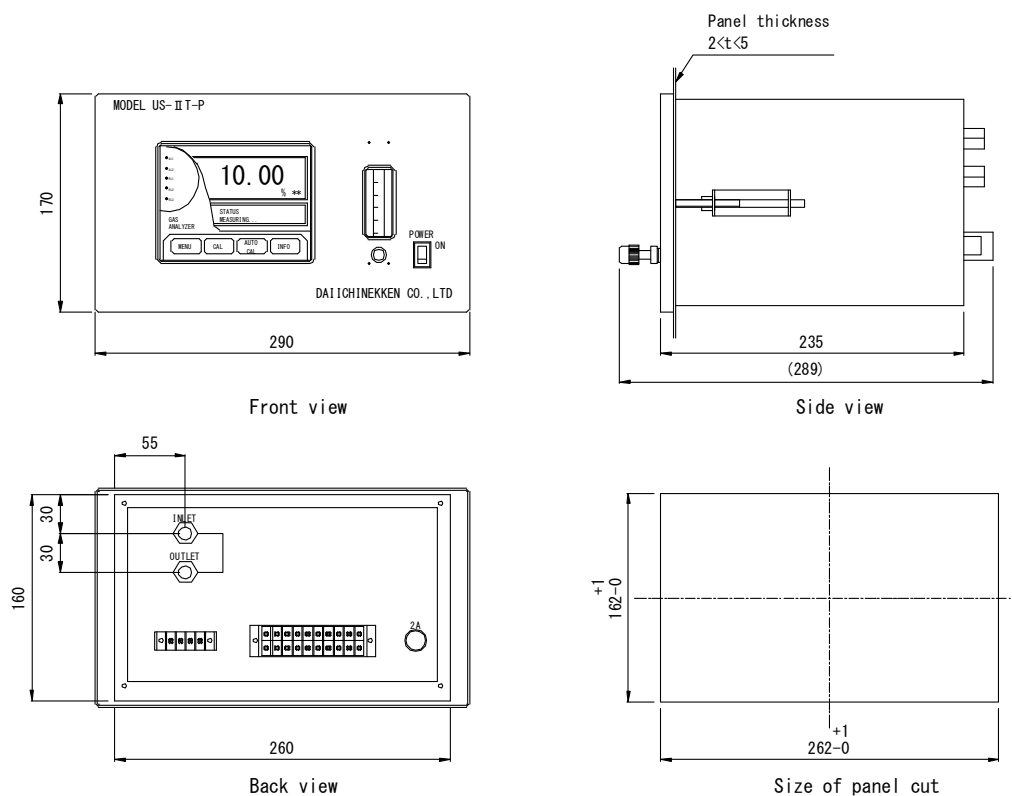
Resistance load : AC250V 5.0A, DC30V 5.0A

Inductive load : AC250V 2.0A, DC30V 2.0A
- * 2

Non-voltage input (Isolation)
- * 3

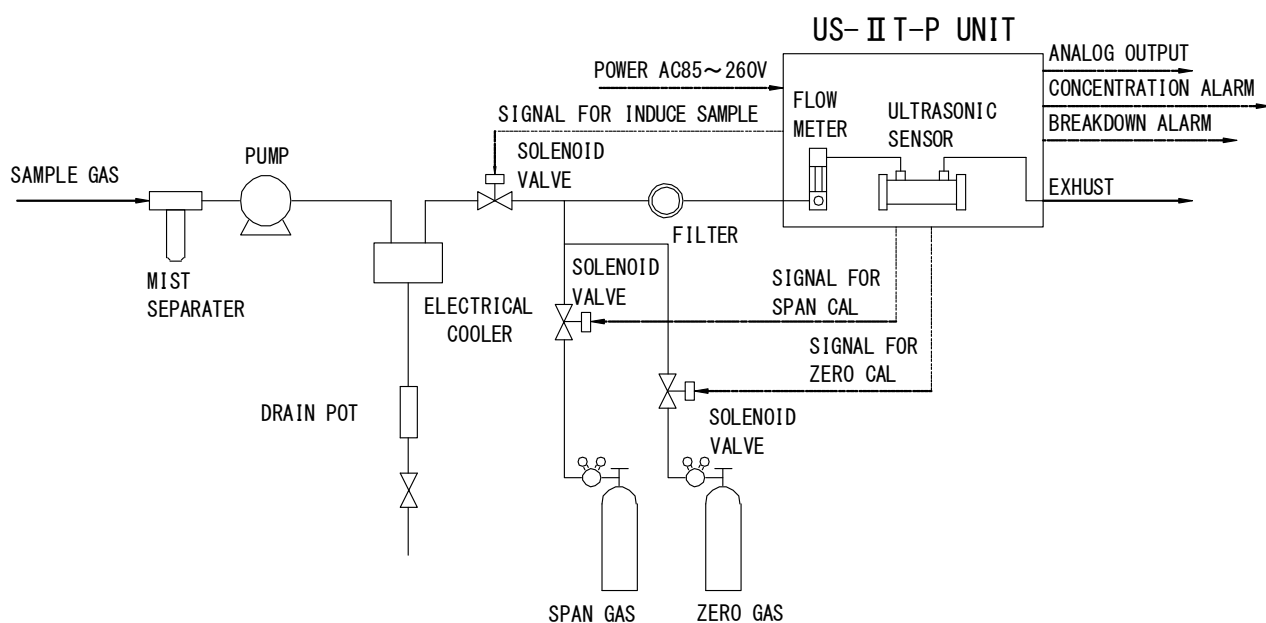
Can be arbitrarily set by a user

OUTLINE DIAGRAM



EXAMPLE OF FLOW

<EXAMPLE OF MEASURING SAMPLE GAS>



※If sample gas is DRY, it is not necessary to prepare mist separator and electrical cooler.

7. ULTRASONIC GAS ANALYZER US-IT-P

- Type with flow meter
- Type with pump



STRONG POINT

- ◎ No consumables and long-lasting
- ◎ Color LCD monitor with touch panel
- ◎ RS232C Serial communication function (optional)
- ◎ Two choices of analog output : DC 0-10V or DC 0-1V
- ◎ Auto calibration function, Remote calibration function
- ◎ Multiple range for various kinds of gases
- ◎ Failure alarm (self-diagnosis function)
- ◎ Free choice of output scaling by user
- ◎ Flow meter and sampling pump installed
- ◎ Free choice of sampling period by user

SPECIFICATIONS

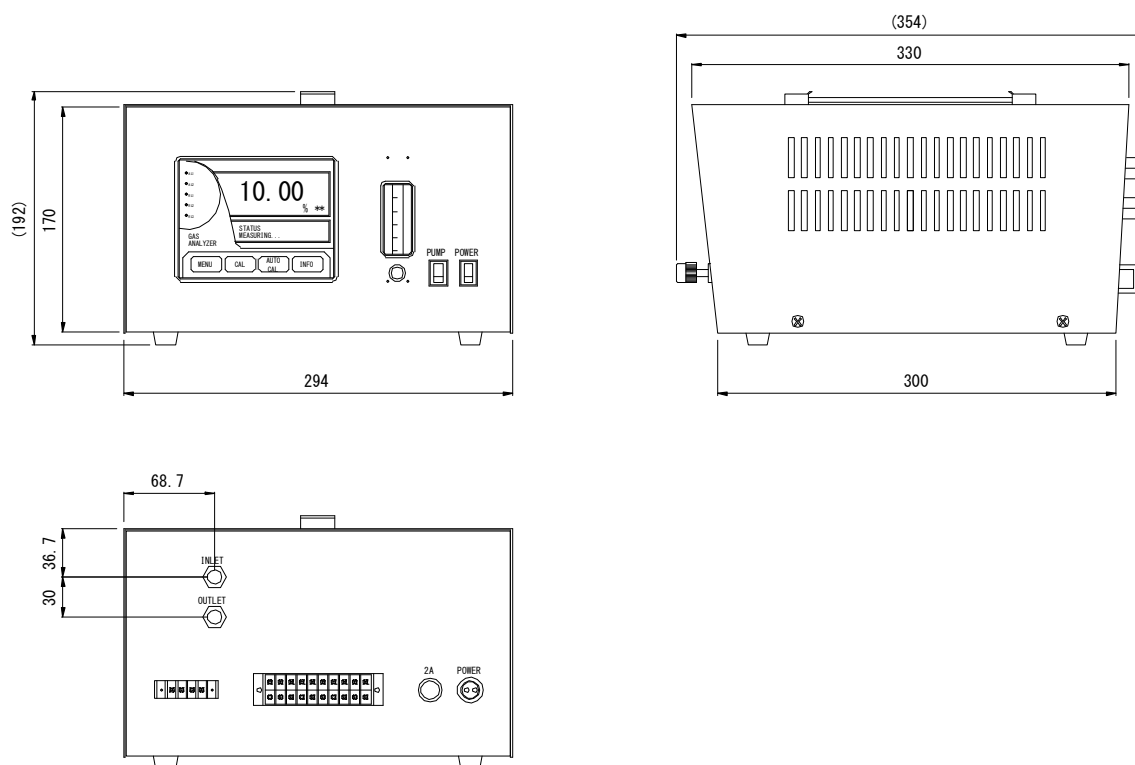
INSTALLATION	Portable
WARM-UP TIME	Approx. 10 seconds
SAMPLE TEMP.	Normal temperature (Max. 50°C)
Maximum vacuum level	46.7kpa
POWER SUPPLY	AC90 ~ 110V 50/60Hz
AMBIENT TEMP.	5 ~ 45°C/90%RH or less
P I P I N G	Rc1/4 or 1/4" VCR
ANALOG OUTPUT	DC4-20mA, 0-1V or 0-10V
A L A R M	Concentration alarm : 2, Failure alarm : 1
*1 CONTACT OUTPUT	7 points (all A)
*2 INPUT SIGNAL	Remote calibration signal
*3 RESPONSE TIME	90% reading is within 10sec.
LINEARITY/REPEATABILITY	Less than ±1% of full scale (max range)
M A S S	Approx. 7kg
EXTERNAL DIMENSIONS	W294 × D330 × H170

PERFORMANCE

Composition	MEASUREMENT MAX RANGE	MEASURABLE MINIMUM DIGIT
H2/N2	0~ 50%	0.02 %
He/N2	0~ 50%	0.02 %
He/Air	0~ 50%	0.02 %
O2/N2	0~100%	0.1 %
Xe/Ar	0~100%	0.01 %
Kr/N2	0~100%	0.01 %
CF4/N2	0~100%	0.01 %
Xe/N2	0~100%	0.005%
SF6/N2	0~100%	0.005%
CO2/Ar	0~ 50%	0.05 %

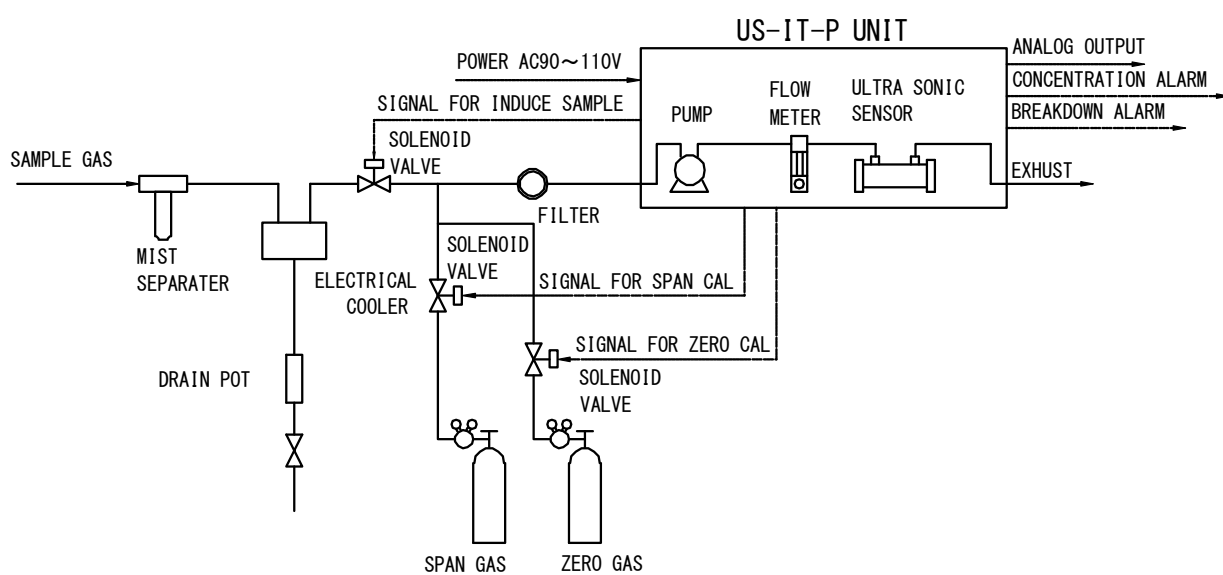
- *1
Concentration alarm 2 point, Failure alarm and Signal whole calibration, Others are used to the optional function. Exp) auto calibration function
Resistance load : AC250V 5.0A, DC30V 5.0A
Inductive load : AC250V 2.0A, DC30V 2.0A
- *2
Non-voltage input (Isolation)
- *3
Can be arbitrarily set by a user

OUTLINE DIAGRAM



EXAMPLE OF FLOW

<EXAMPLE OF MEASURING SAMPLE GAS>



※If sample is DRY, it is not necessary to prepare mist separator and electrical cooler.

8. ULTRASONIC GAS ANALYZER US-II T-SH

- Possible to measure 0–100%He
- Possible to measure 0–100%H₂



STRONG POINT

- ◎ No consumables and long-lasting
- ◎ Color LCD monitor with touch panel
- ◎ Two choices of analog output
: DC 0–10V or DC 0–1V
- ◎ Warm-up time is short and power saving
- ◎ Multiple range for various kinds of gases
- ◎ Free choice of output scaling by user
- ◎ Wide power supply between AC 85V and AC 260V
- ◎ Both portable and panel mounting are possible
- ◎ Free choice of sampling period by user

SPECIFICATIONS

INSTALLATION	Portable or Panel mounting
WARM-UP TIME	Approx. 10 seconds
SAMPLE TEMP.	Normal temperature (Max. 50°C)
SAMPLE PRESS.	Atmospheric pressure ~ +20kpa
FLOW RATE	0.5 ~ 2.0L/min
POWER SUPPLY	AC85 ~ 260V 50/60Hz
*1 AMBIENT TEMP.	5 ~ 45°C/90%RH or less
P I P I N G	Rc1/4
ANALOG OUTPUT	DC4–20mA, 0–1V or 0–10V
LINEARITY/ REPEATABILITY	Less than ±1% of full scale (max range)
*2 RESPONSE TIME	90% reading is within 10sec.
M A S S	Approx. 6.5kg
E X T E R N A L D I M E N S I O N S	Portable: W220 × D268 × H200 Panel mounting: W220 × D268 × H150

PERFORMANCE

Composition	MEASUREMENT MAX RANGE	MEASURABLE MINIMUM DIGIT
H ₂ /N ₂	0~100%	0.04 %
He/N ₂	0~100%	0.04 %
He/Air	0~100%	0.04 %

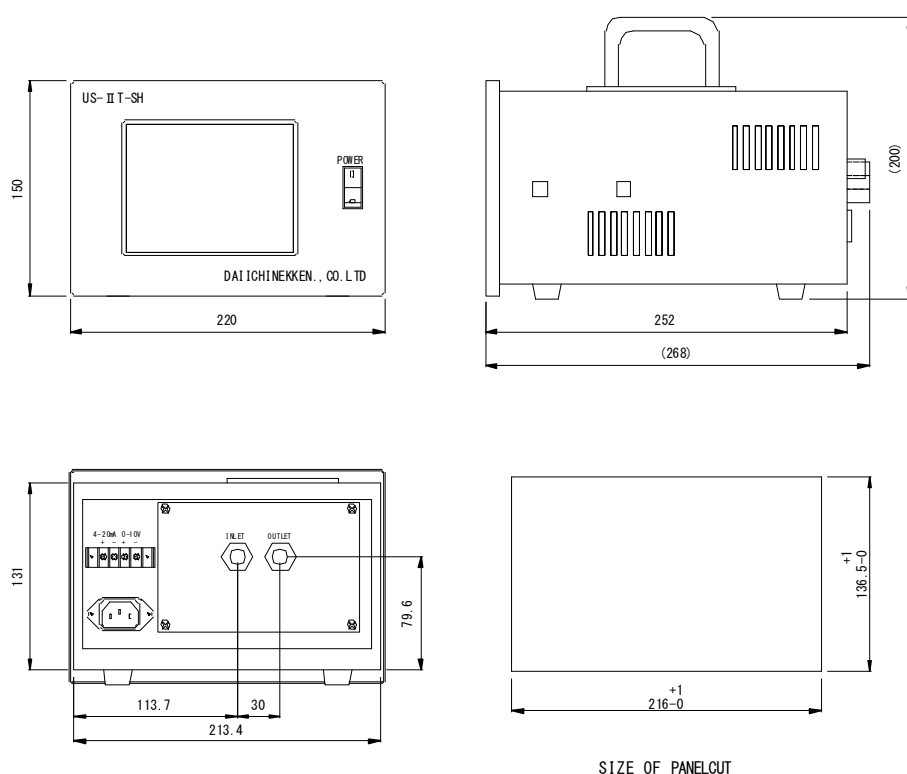
*1

The gas analyzer for H₂ is 「5~30°C」

*2

Can be arbitrarily set by a user

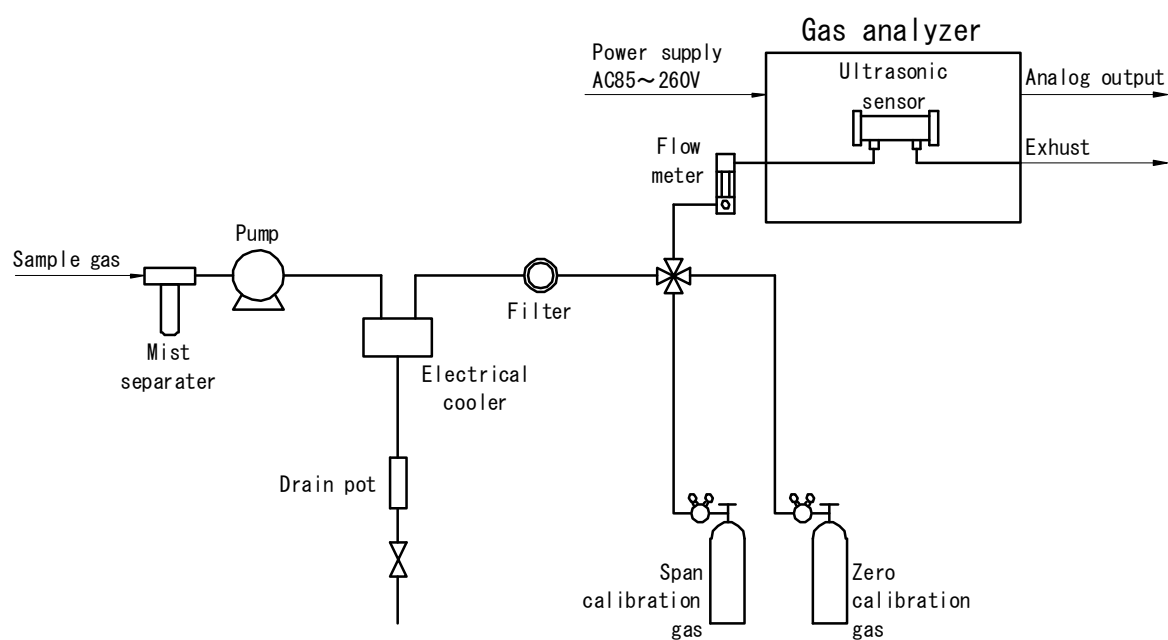
OUTLINE DIAGRAM



- ※ The gas analyzer for H₂ has a fan on the back to diffuse the gas around the detection unit.
- ※ If it is used for Panel mounting, detach their rubber foots.

EXAMPLE OF FLOW

<EXAMPLE OF MEASUREMENT>



- ※ If sample gas is dry, it is not necessary to prepare mist separator and electrical cooler.
- ※ If impurities are mixed to the sample gas, please set the filter before INLET.

9. ULTRASONIC GAS ANALYZER PANEL

We design and manufacture of the gas analyzer panel installed ultrasonic gas analyzer, sampling equipments, control systems and so on into.

Some sampling equipments such as the tube, the connector, solenoid valve and control systems such as the relay are installed in the one panel.

We respond to the customer's demands such as the measured gas and auto calibration function by remote control.

It is possible to combine a various analytical instruments according to facilities.

We receive specification and the provision of instruments used.





We supply to the domestic auto parts manufacturer.

CO2/Ar analyzer panel for outdoor

W600 × D650 × H1700

Observation item

- Measured gas : CO2/Ar
- Analog output : 0-1V、4-20mA
- Concentration alarm :
Two-step upper limit value,
Two-step lower limit value or
Upper limit value + Lower limit value

Main instruments in panel

1. Ultrasonic gas analyzer
2. Main breaker
3. Circuit breaker
4. Gas regulator
5. Solenoid valve
6. Terminal block
7. Light with buzzer



The above-mentioned is an example.

We design and manufacture a gas analyzer panel according to the specification of the customer.