Fuji Electric

Laser Gas Analyzer for EGCS

DATA SHEET

ZQS

The laser gas analyzer for EGCS (ZQS) continuously monitors the concentrations of SO_2 and CO_2 contained in the gas emitted from a marine engine and then cleaned by a SO_x scrubber. ZQS conforms to the Scheme B of the resolution MEPC 259(68), the 2015 Guidelines for exhaust gas cleaning systems, adopted by the Marine Environment Protection Committee (MEPC), which is a branch of International Maritime Organization (IMO).

Detection unit

Extraction unit

Interface box

FEATURES

1. Compact for installation in confined spaces, and can be easily mounted.
2. Outstanding long-term stability.
3. Low-frequency and easy maintenance.

SPECIFICATIONS

General specifications

Components and ranges: table1

Components	Ranges
SO_2	0 to 300 ppm
CO_2	0 to 10 vol%

Principle:
Non-dispersive infrared laser
Measurement method: Gas extraction method
Measuring object:
SOx scrubber outlet flue (dedicated) for marine engine exhaust gas
Light source: Semiconductor laser
Laser class:
Class 1 (laser devices are Class 1 and Class 3B)
Dimensions (W × D × H) mm:
Detection unit: 330 (W) × 880 (H) × 255 (D) mm
Extraction unit: 400 (W) × 300 (H) × 323.4 (D) mm
*Depth varies with diameters of the stack.
Interface box: 500 (W) × 400 (H) × 166 (D) mm
Weight (except cables):
Detection unit: 30 kg
Extraction unit: 18 kg
Interface box: 20 kg
Enclosure:
Indoor use, IP44 (totally enclosed, splash-proof)
Only the extraction unit fan: IPX4.
Materials:
Detection unit: Stainless steel
Extraction unit: Stainless steel
Interface box: Stainless steel
Materials of gas-contacting parts:
SUS316L, CaF_2, FKM, Silicone, PTFE, Glass, PVDF
Power supply:
Rated voltage: 100 V AC (operating voltage: 90 to 115 V AC)
Frequency: 50/60 Hz
Power consumption:
Max. rated power: Approximately 1000 VA
Display:
LED indicator lamps
Display content:
Warm-up, measurement, maintenance request, standby, Analyzer error
Communication functions:
Ethernet / Protocol: Modbus TCP
Cable length:
Between the receiver unit and the transmitter unit: 1 m
Between the detection unit and the interface box: ≤ 15 m
Between the extraction unit and the interface box: ≤ 20 m
Sample gas tube length:
Between the detection unit and the extraction unit: ≤ 10 m
Analog output (AO):
- 4 to 20 mA DC, 3 points
- Insulated from the grounding line and the internal circuit. Not insulated between signals.
- Load resistance: ≤ 300 Ω
- Output contents: SO_2 concentration, CO_2 concentration, SO_2/CO_2 ratio
- Output is held at 0% during maintenance and during suspension of scrubber.

Analog input (AI):
- 4 to 20 mA DC, 1 point
- Insulated from the grounding line and the internal circuit. Not insulated between signals.
- Input contents: gas temperature

Digital output (DO):
- SPST-NO relay contact, 4 points
- Contact capacity: 30 V DC, 1A (resistive load)
- Insulated from the internal circuit. Contacts are not insulated each other (shared COM).
- Output contents: maintenance, warm-up, sampling suspension, maintenance request, analyzer error (extraction unit error, detection unit error), power interruption

Digital input (DI):
- Voltage contact input, 4 points
- Contact ON at 18 to 25 V input
- Insulated from the internal circuit. Contacts are not insulated each other (shared COM).
- Input contents: maintenance, EGCS on/off

Performance

Accuracy:
Not more than ±2.0% rdg or ±0.3% FS whichever is larger
Precision:
2.5 times the standard deviation of 10 repetitive responses: ≤ ±1.0% FS
Noise:
≤ 2.0% FSp-p
Zero drift:
≤ ±2.0% FS for 6 months
Span drift:
≤ ±2.0% FS for 6 months
Response time (90% FS response):
≤ 180 s
Warm-up time:
≤ 120 min
Other gas interference:
Within the error in the case of any of the following interfering gases flowing: ≤ ±2.0% FS
(1) 500 ppm NO
(2) 200 ppm NO_2
(3) 2000 ppm CO
(4) 10 ppm NH_3
(5) 10 ppm CH_4
(6) 60°C saturated H_2O
Nitrogen is used for diluting these gases.

Function

Digital output items:
- **Maintenance, warm-up, sampling suspension**
  Closed contact during maintenance, during warm-up, and while sampling is stopped.
- **Maintenance request**
  Closed contact when maintenance is necessary.
- **Analyzer error**
  Closed contact when analyzer error occurs.
- **Power interruption**
  Closed contact when power ON.

Digital input items:
- **Maintenance**
  Input during maintenance.
- **EGCS on/off**
  Input during EGCS operation.

Requirements on exhaust gas:
- **Condition**
  It should be exhaust gas after cleaning with a SOx scrubber.
- **Gas temperature**
  5°C to 60°C
- **Exhaust gas mist concentration**
  There should be none.
  * Even if mist production is unavoidable, measurement is possible. However, the higher the mist concentration, the higher the likelihood of adverse effects such as extraction unit piping corrosion and premature filter clogging.
- **Water vapor**
  ≤ 20 vol% (below 60°C dew point)
- **Pressure**
  -10 kPa to 10 kPa
- **Gas composition**
  SO_2 ≤ 300 ppm
  CO_2 ≤ 10 vol%
  NOx ≤ 1000 ppm
  CO ≤ 2000 ppm
  O_2 ≤ 1 vol% to 21 vol%
  CH_4 ≤ 10 ppm
  NH_3 ≤ 10 ppm
  Others N_2, H_2O

Installation environment

Ambient temperature:
Detection unit: 0°C to 65°C
Extraction unit: 0°C to 55°C
Interface box: 0°C to 45°C
However, air purge is necessary between 40°C to 45°C.
Sample gas tube: 0°C to 65°C
Ambient humidity:
≤ 90%RH (no condensation)
Vibration:
≤ 0.2G (1.9 m/s^2)
Storage environment:
Ambient temperature: -20°C to 70°C
Ambient humidity: ≤ 100%RH (no condensation)
Flange:
JIS 5K65A

Requirements on instrument air

Flow rate:
≤ 150 L/min
Pressure:
0.3 to 0.4 MPaG
Purity:
ISO 8573-1: 2010 (JIS B 3892-1: 2012) Class 2.3.2
- Solid particle:
  Particle size 0.1 µm to 0.5 µm: Maximum number of particles per m^3: 400 000
  Particle size 0.5 µm to 1.0 µm: Maximum number of particles per m^3: 6000
  Particle size 1.0 µm to 5.0 µm: Maximum number of particles per m^3: 100
- Pressure dew point: ≤ -20°C (atmospheric pressure dew point: ≤ -34°C)
- Oil: ≤ 0.1 mg/m^3

Instrument air tube:
Connect with 6-mm outer diameter, fluoroplastic tube.

Calibration

Calibration interval: 1 year
Calibration method:
Standard gas is flowing through the detection unit gas cell.
- Zero gas (conforms to NOx Technical Code 2008)
  Pure nitrogen: impurities ≤ 1 ppm C
  ≤ 1 ppm CO
  ≤ 400 ppm CO_2
  ≤ 0.1 ppm NO
- Span gas (conforms to NOx Technical Code 2008)
  SO_2 concentration: 240 ppm or higher, less than 300 ppm
  CO_2 concentration: 8 vol% or higher, less than 10 vol%

Compliance

- IMO Resolution MEPC.259 (68) “2015 Guidelines for Exhaust Gas Cleaning Systems.”
- IMO Resolution MEPC.177 (58) “NOx Technical Code 2008.”

CODE SYMBOLS

* Please order the analyzer, gas sampling probe, sample gas tube, and cables 1 and 2 together.

Analyzer

Digit	Specification	Notes	Digit → 1	2	3	4	5	6	7	8
			Z	Q	S	S	M	E	0	1
4	<Measuring range of 1st component> SO_2 0 to 300 ppm					S				
5	<Measuring range of 2nd component> CO_2 0 to 10 vol%						M			
6	<Flange> JIS 5K65A							E		
7	—								0	
8	<Revision code>									1

Gas sampling probe

Digit	Specification	Notes	Digit → 1	2	3	4	5	6	7	8
			Z	Q	Z	A		0	0	1
4	<Accessories and gas sampling probe>					A				
5	<Length of gas sampling probe of extraction unit> 300 mm 400 mm 500 mm 600 mm 700 mm 800 mm	**Note1**					3 4 5 6 7 8			
6	—							0		
7	—								0	
8	<Revision code>									1

Note 1: Select the gas sampling probe length so that the end of the probe comes as near as possible to the center of the exhaust pipe in radial direction.

Sample gas tube

Digit	Specification	Notes	Digit → 1	2	3	4	5	6	7	8
			Z	Q	Z	B	0		0	1
4	<Accessories: sample gas tube>					B				
5	—						0			
6	<Length of tube between extraction unit and detection unit> 2 m 5 m 10 m	**Note1**						2 5 A		
7	—								0	
8	<Revision code>									1

Note 1: Select a sufficient length for sample gas tube to connect the extraction unit and detection unit.

Cable 1 (between the detection unit and the interface box)

Digit	Specification	Notes	Digit → 1	2	3	4	5	6	7	8
			Z	**Q**	**Z**	**C**	**0**		**0**	**1**
4	<Accessories: cable>					C				
5	—						0			
6	<Cable length>	**Note1**								
	2 m							2		
	5 m							5		
	10 m							A		
	15 m							B		
7	—								0	
8	<Revision code>									1

Note 1: Select a sufficient length for cable 1 (detection unit - interface box) to connect the detection unit and the interface box.

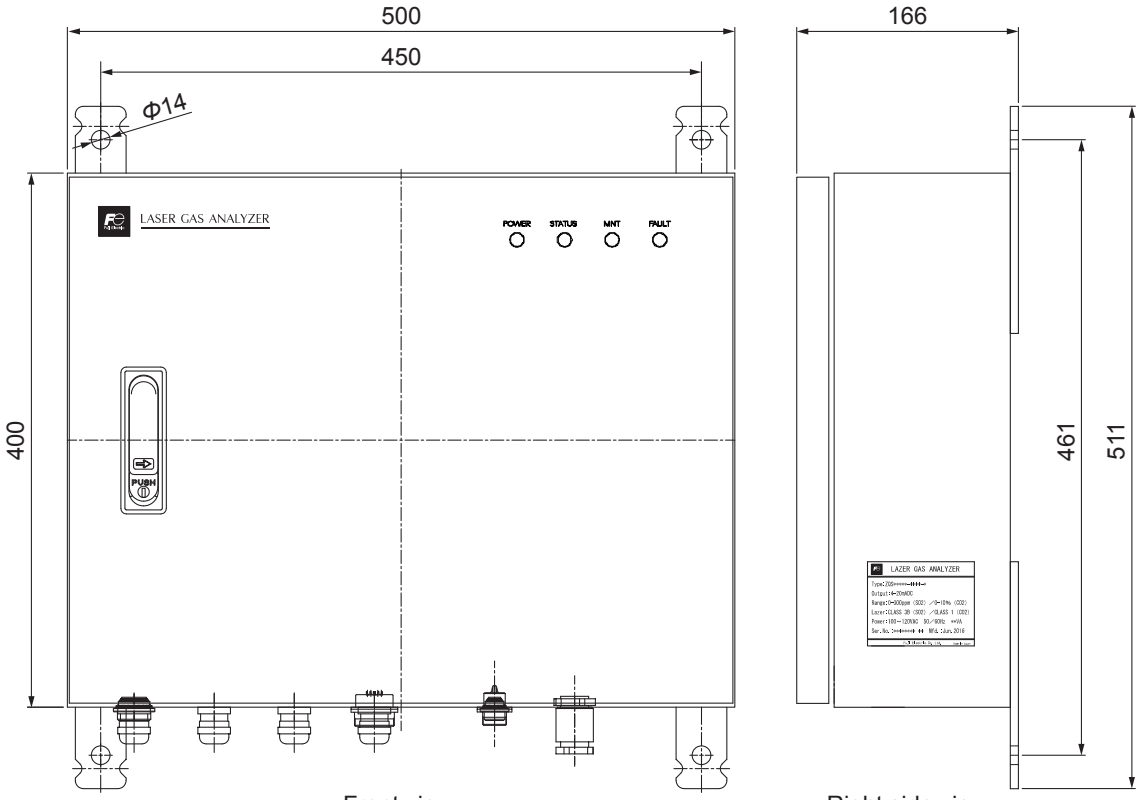
Cable 2 (between the extraction unit and the interface box)

Digit	Specification	Notes	Digit → 1	2	3	4	5	6	7	8
			Z	**Q**	**Z**	**D**	**0**		**0**	**1**
4	<Accessories: cable>					D				
5	—						0			
6	<Cable length>	**Note1**								
	2 m							2		
	5 m							5		
	10 m							A		
	15 m							B		
	20 m							C		
7	—								0	
8	<Revision code>									1

Note 1: Select a sufficient length for cable 2 (extraction unit - interface box) to connect the extraction unit and the interface box.

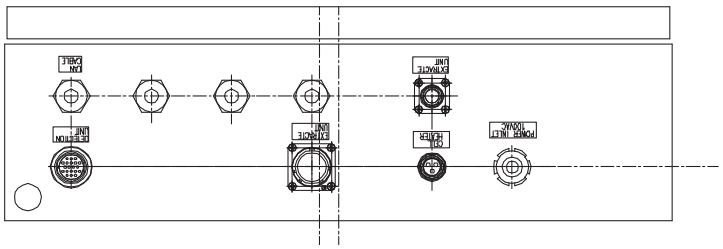
OUTLINE DIAGRAM (Unit : mm)

Interface box



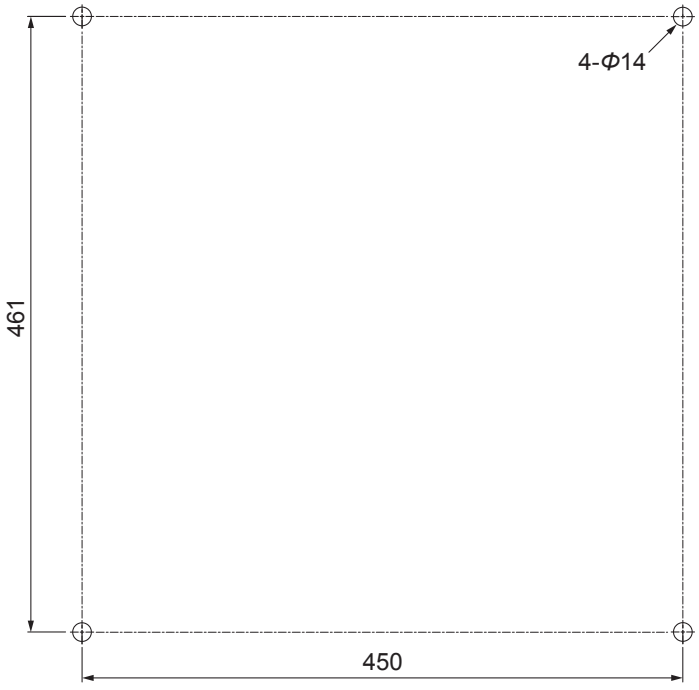
Front view

Right side view

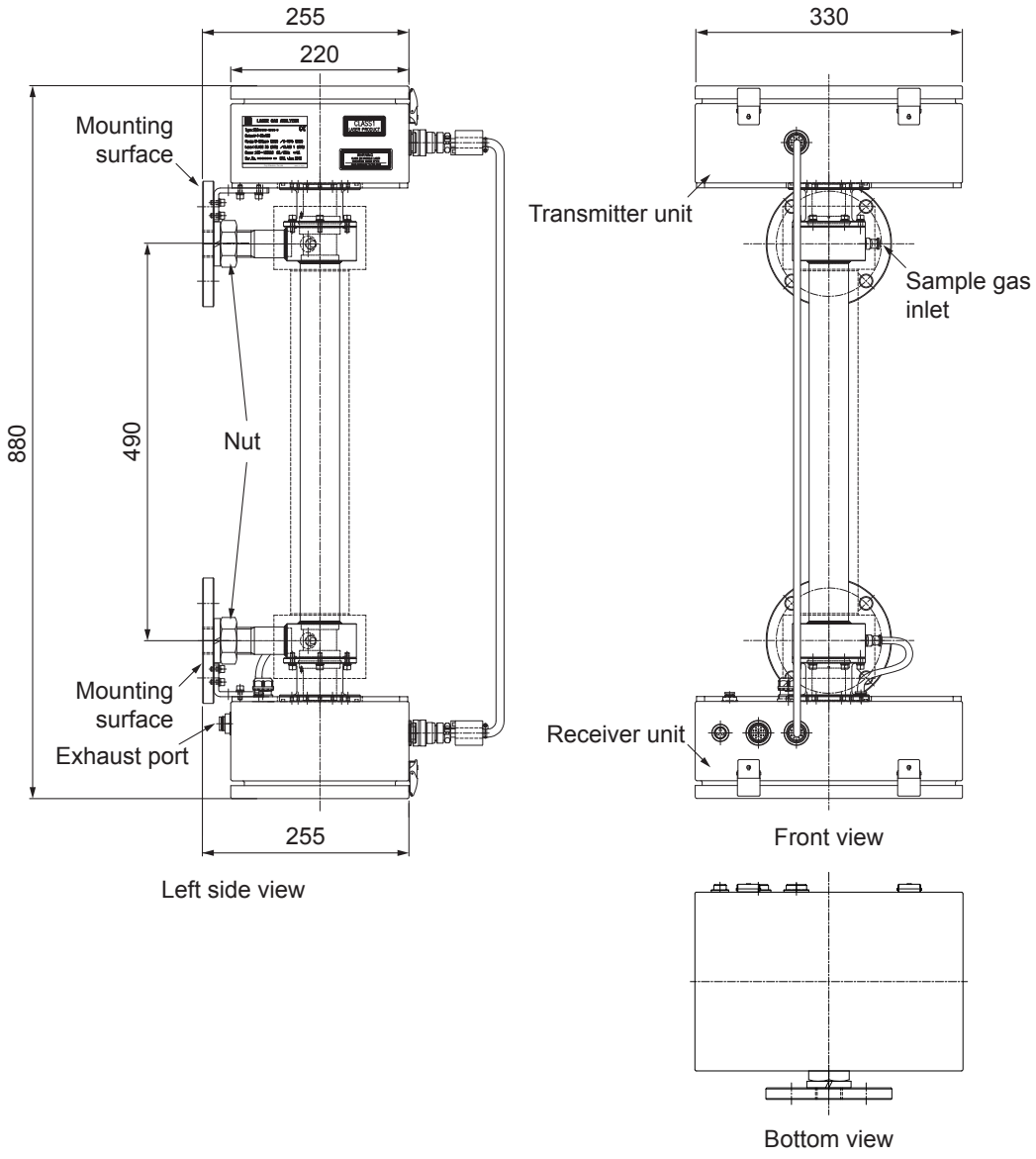


Bottom view

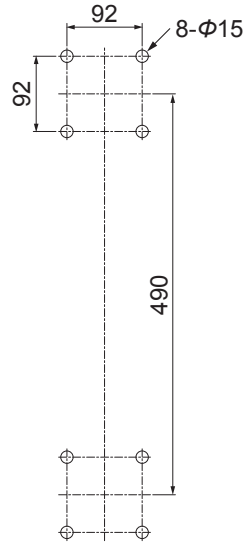
Mounting holes dimensions



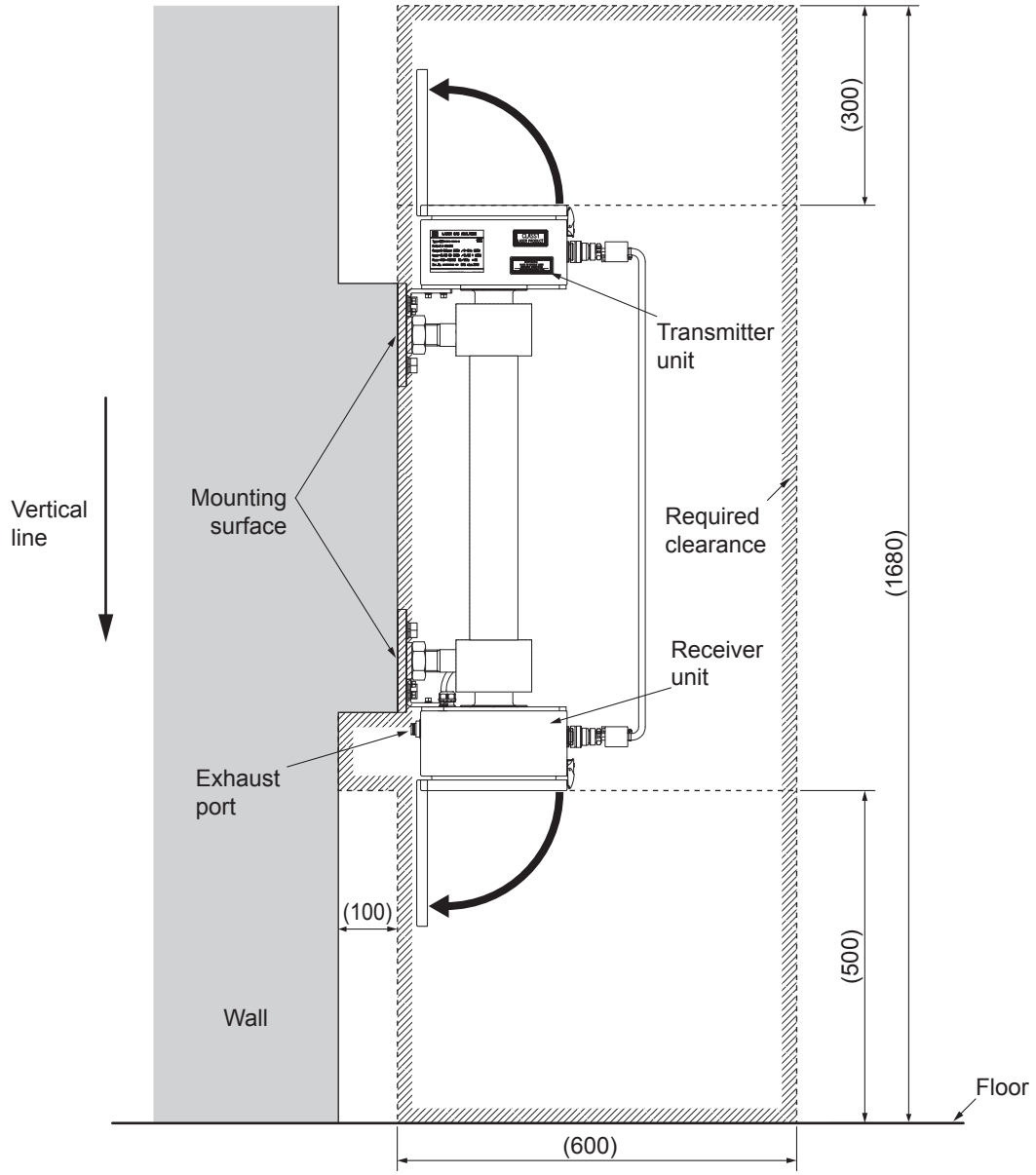
Detection unit



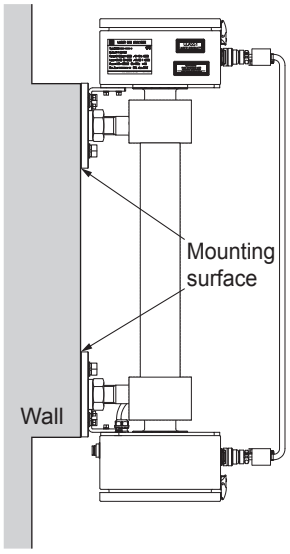
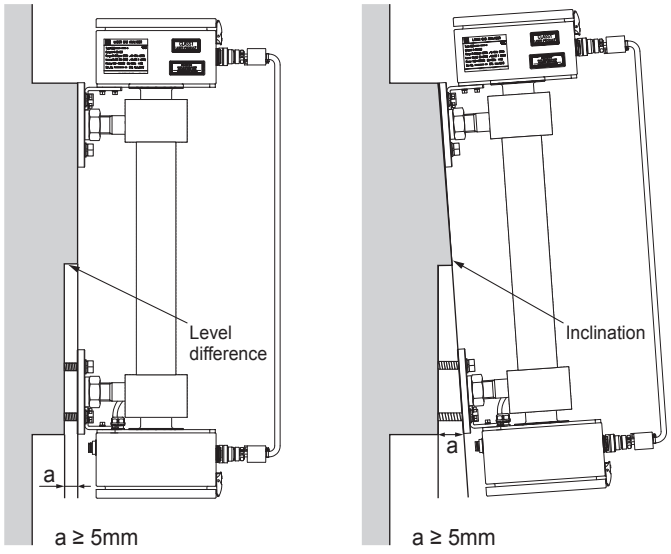
Mounting holes dimensions



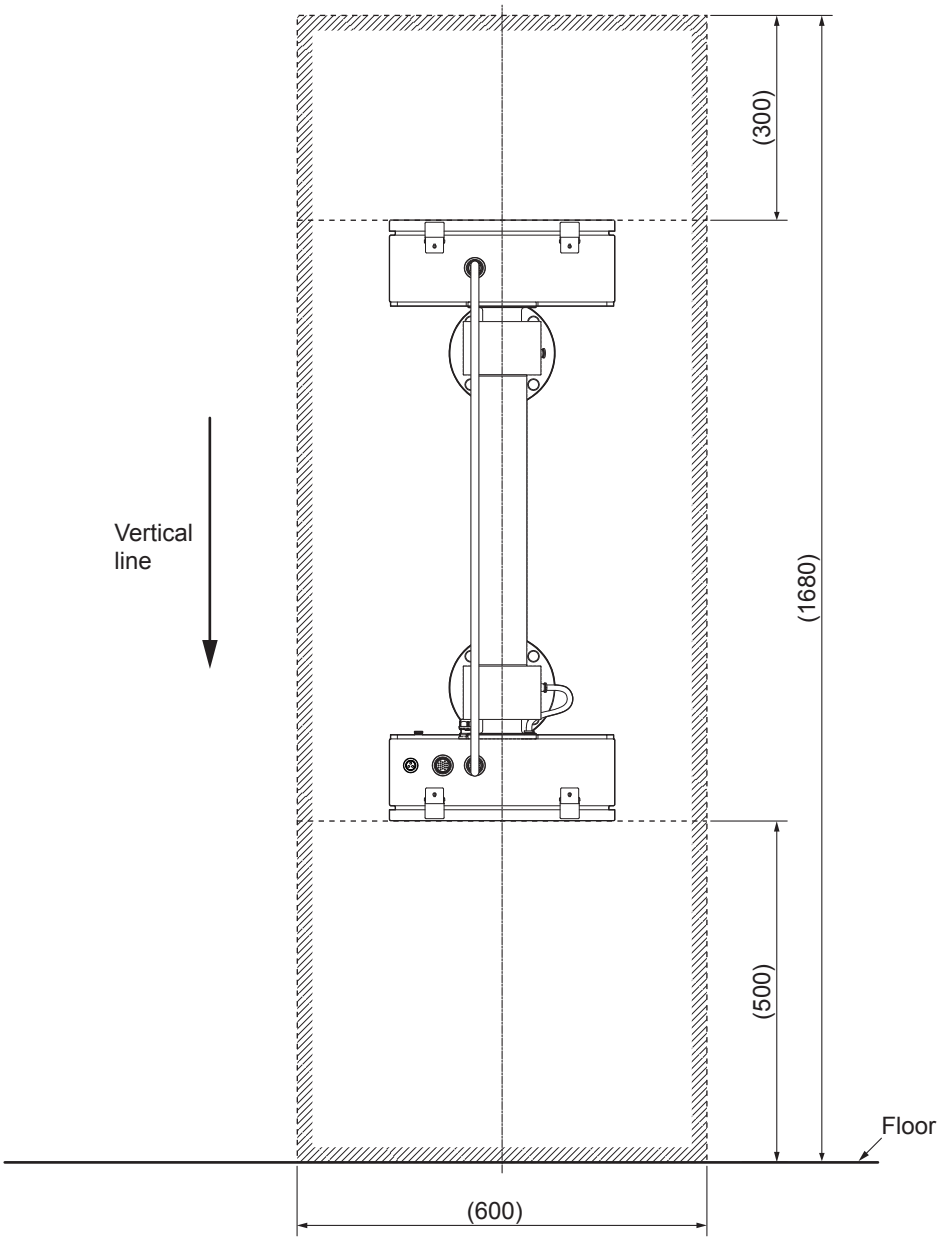
Clearance (side view)



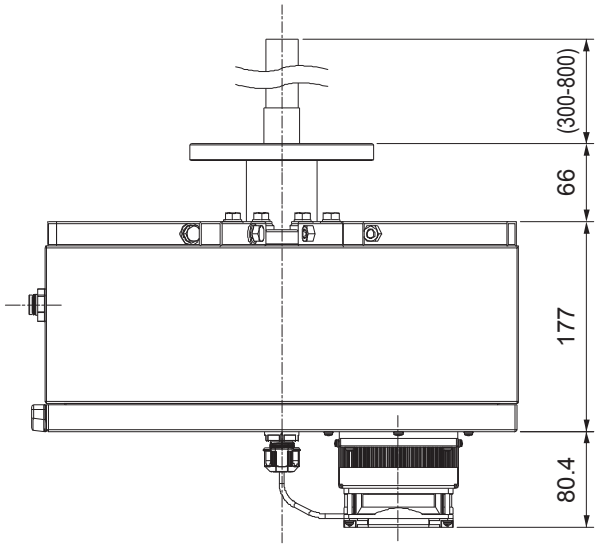
Detection unit installation example

Example of good panel (side view)	Example of bad panel (side view)
	
Panels are on same flat surface.	Panels are at different levels and inclined, and when one mounting surface and panel are fastened with bolts with no gap between them, gap [a] between the other mounting surface and panel is a ≥ 5 mm.

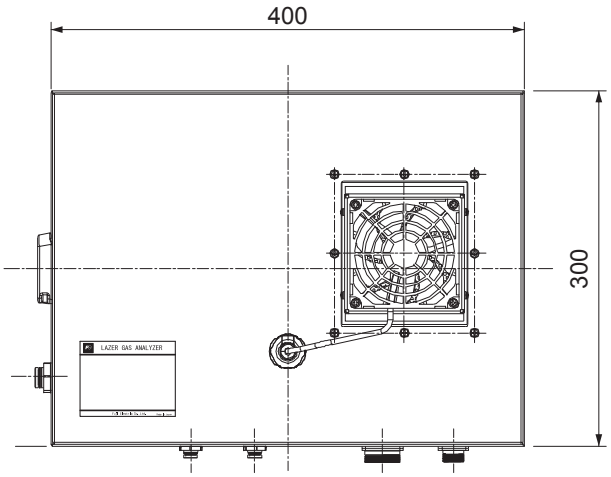
Clearance (front view)



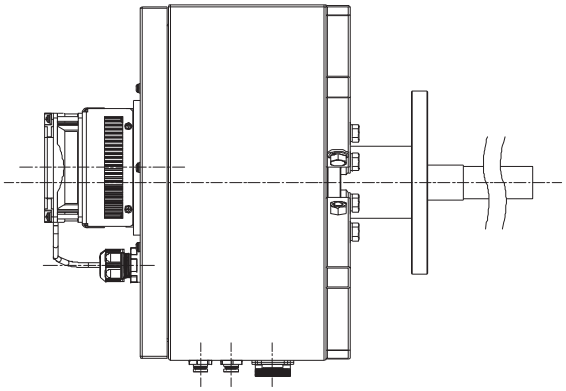
Extraction unit



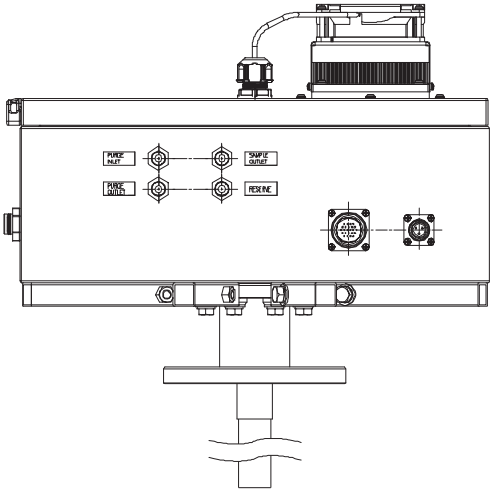
Top view



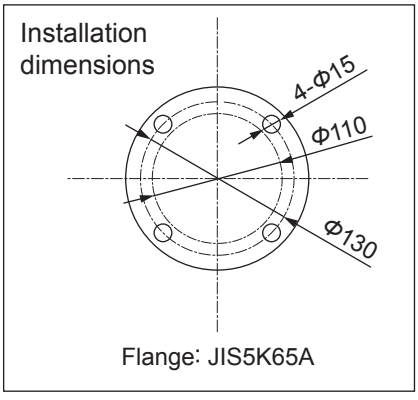
Front view



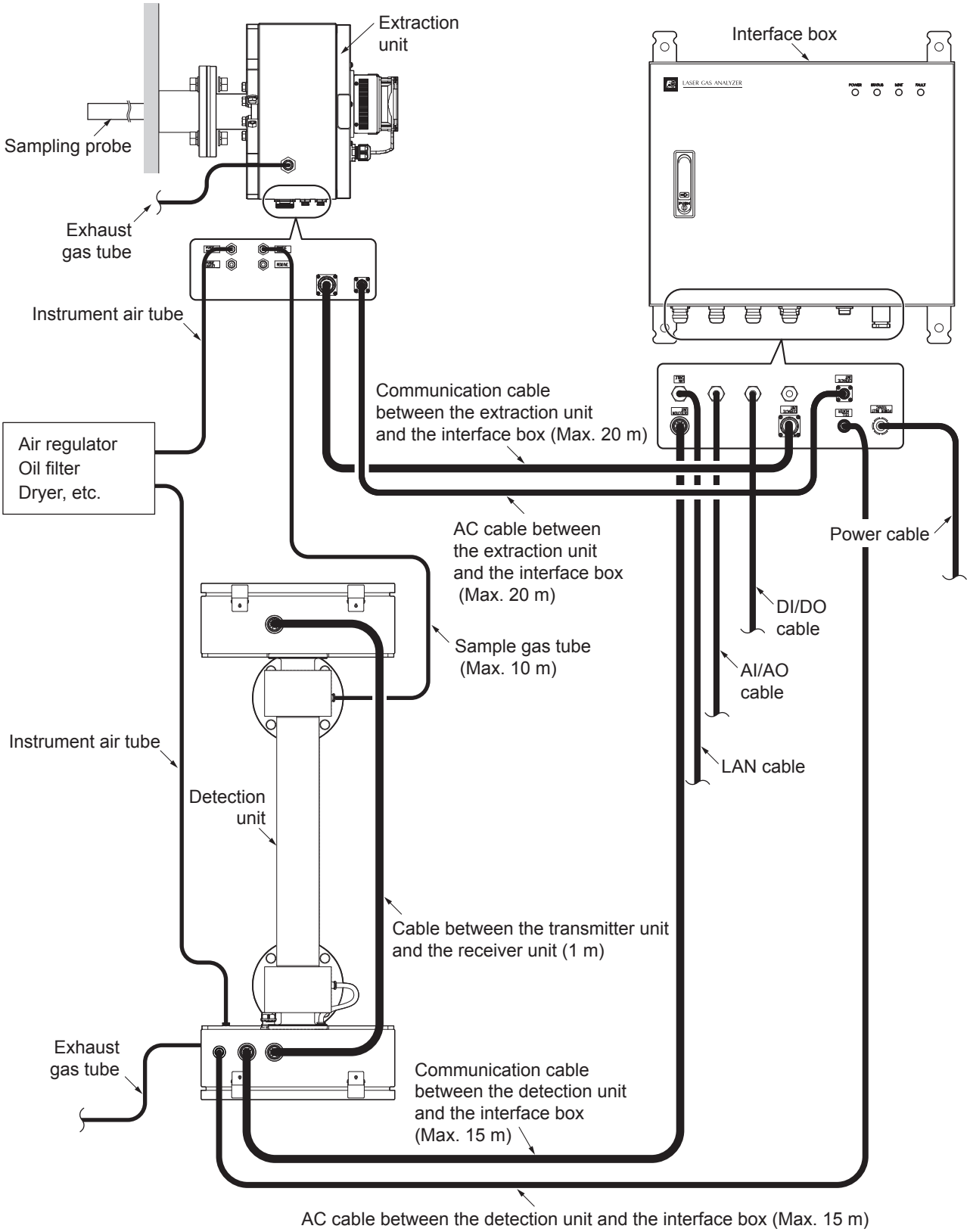
Right side view



Bottom view



CABLE CONNECTION AND WIRING



EXTERNAL CONNECTION DIAGRAM (INSIDE RELAY BOX)

External power terminal, PE terminal

L	N	PE
1	2	3

Screw size: M4
1: 100 V AC (50/60Hz) (L)
2: 100 V AC (50/60Hz) (N)
3: Protective earth (PE)

Analog output (AO) / input (AI) terminal (PUMV)

21		11
22		12
23		13
24		14
25		15
26		16
27		17
28		18
29		19
30		20

Analog output (AO)

11 AO1+ / 12 AO1− : SO_2 concentration 4 to 20 mA (0 to 300 ppm)

16 AO2+ / 17 AO2− : CO_2 concentration 4 to 20 mA (0 to 10 vol%)

24 AO3− / 25 AO3+ : SO_2/CO_2 4 to 20 mA* (0 to 300 ppm/vol%)

* 0 mA is output if the CO_2 gas concentration is 0.50 vol% or less.

Analog input (AI)

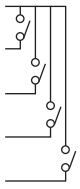
14 AI1+ / 15 AI1− : Gas temperature 4 to 20 mA (0 to 100℃)

Screw size: M3 × 7

Digital output (DO) / input (DI) terminal (PUME)

21		11
22		12
23		13
24		14
25		15
26		16
27		17
28		18
29		19
30		20

Digital output (DO)



16 COM
17 DO5 — Maintenance, warm-up, sampling suspension
18 DO6 — Maintenance request
19 DO7 — Analyzer error
20 DO8 — Power interruption

Digital input (DI)

24 DI1 + / 25 COM − : Maintenance

29 DI5 + / 30 COM − : EGCS on/off

Screw size: M3 × 7

SCOPE OF DELIVERY

Product name	Quantity
Extraction unit	1
Detection unit	1
Interface box	1
Gas sampling probe	1
Communication cable between the extraction unit and the interface box	1
AC cable between the extraction unit and the interface box	1
Communication cable between the detection unit and the interface box	1
AC cable between the detection unit and the interface box	1
Cable between the transmitter unit and the receiver unit	1
Sample gas tube	1
Standard accessories, instruction manual	

STANDARD ACCESSORIES

Product name	Quantity
Bolt	4
Nut	4
Spring washer	4
Flat washer	4
Companion flange packing	3
Replacement filter element	2
Tube cap (A)	1
Tube cap (B)	2
Interface box key	1
Receiver/transmitter box key	1

OTHER (OPTIONAL ITEMS)

- Sample gas tube
- Exhaust gas tube
- Standard gas (ZBM), Pressure regulator (ZBD)
- Purging equipment
- Zero/span calibration equipment

Purging equipment

- Purging equipment in a box: flowmeter scale 20 to 100 L/min
- Purging equipment without box: flowmeter scale 20 to 100 L/min
- Flowmeter with 20 to 100 L/min scale
- Filter regulator
- Mist separator
- R 1/4 cap nut for mist separator

Zero/span calibration equipment

- Pressure regulator
- Flowmeter

⚠ Safety information

- Be sure to read thoroughly the instruction manual before use.
- This product can be used as Class 1 laser product.
  However, be sure to follow the instructions below for safety because the product emits laser beam when energized.
  – Do not remove the transmitter unit, the receiver unit, or any part of them from the detection unit.
  Otherwise, it may cause a loss of eyesight and/or skin lesion.

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

Fuji Electric Co., Ltd.

Gate City Ohsaki, East Tower, 11-2, Osaki 1-chome, Shinagawa-ku, Tokyo 141-0032, Japan
Phone: +81-3-5435-7111
www.fujielectric.com
www.fujielectric.com/products/instruments/

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