Fuji Electric

Innovating Energy Technology

For Ship Scrubbers

Laser Gas Analyzer ZQS

Continuous monitoring of SO_2 and CO_2 in severe environment with saving running cost and space.

- ☑ Compact size
- ☑ Low running cost
- ☑ Easy maintenance

Measurable gas components

SO_2 Sulfur dioxide

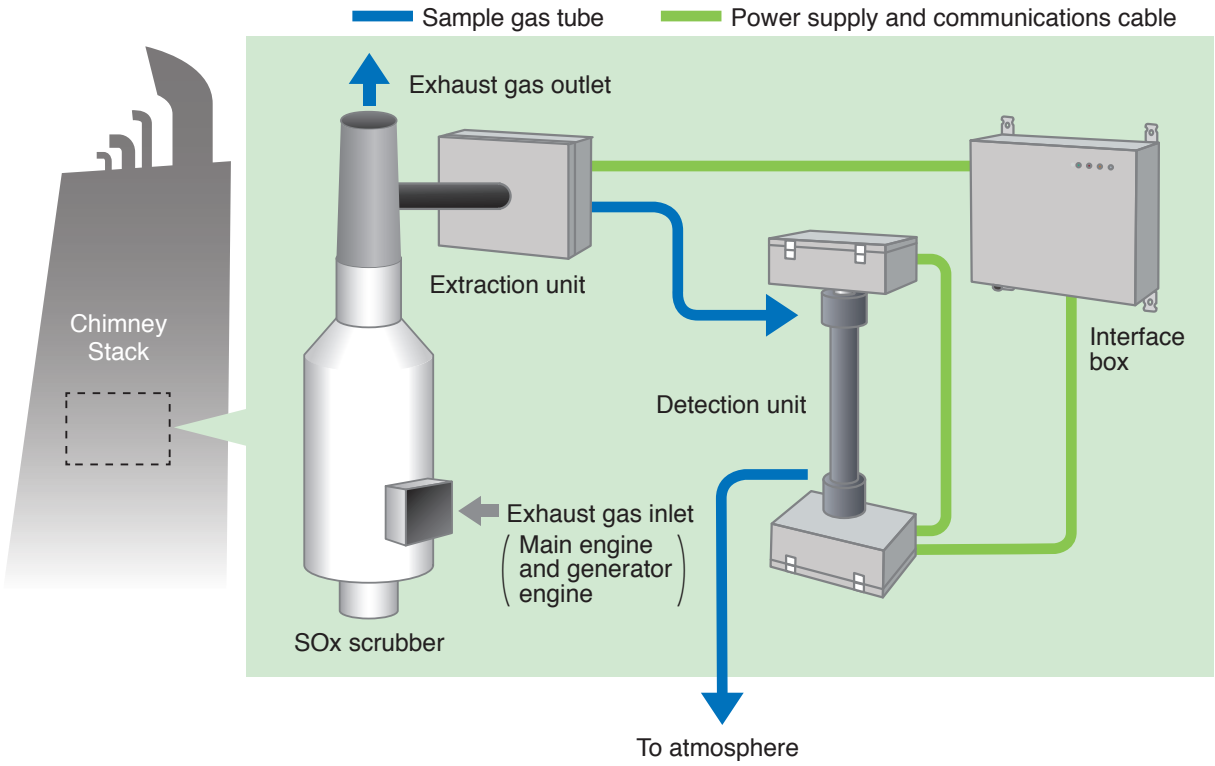
CO_2 Carbon dioxide

21C1-E-0109

Laser Gas Analyzer has mainly 3 benefits for any ship : Compact, Low running cost and Easy maintenance.

Emission control has become more stringent to reduce sulfur oxides (SOx) emitted from ships. The ZQS laser gas analyzer developed by Fuji Electric, will meet the customer needs by providing accurate monitoring of exhaust gases and by saving space and maintenance.

Equipment Configuration: ZQS Laser Gas Analyzer



Continuous monitoring of Sulfur Oxides (SOx) complied with IMO Resolution.

The International Maritime Organization (IMO) has strengthened emission control by adopting the “Regulations for the Prevention of Pollution from Ships” as stipulated in MARPOL Annex VI (MARPOL 73/78 Convention) for the prevention of marine pollution by ships.
To use an exhaust gas cleaning system (EGCS), it is one of the schemes that we can take to cope with their regulation. And, it is necessary to continuously monitor the concentrations of SO_2 and CO_2 using the gas analyzer mounted on a ship according to the guidelines for the systems (IMO Resolution MEPC.259 (68)). The gas analyzer developed by Fuji Electric has been certified by the Classification Society (ClassNK, DNV GL) according to the above guidelines.

ClassNK certification: EGCS compliance appraisal

ClassNK certification: Ship type certification

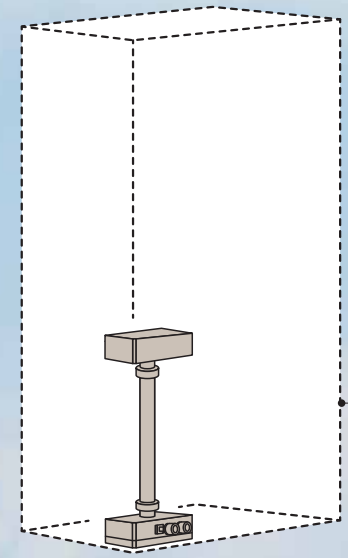
DNV GL certification

Specifications

- Components: SO_2 0 to 300 ppm and CO_2 0 to 10%
- Precision: 2.5 times the standard deviation of 10 repetitive responses ≤ ±1%FS
- Zero drift: ≤ ±2.0% FS for 6 months
- Span drift: ≤ ±2.0% FS for 6 months
- Certification: ClassNK and DNV GL

Compact size

We have succeeded in reducing the size to approx. 1/10 of the infrared type. Therefore, it can be easily installed even in a narrow space inside a ship. It is suitable for either the retrofit of existing in-service ships or new ships.

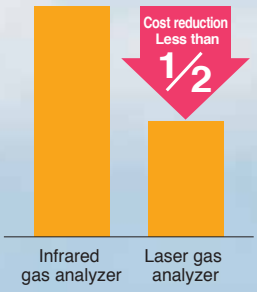


Volume ratio Approx. 1/10

Infrared gas analyzer (compared to our company's products)

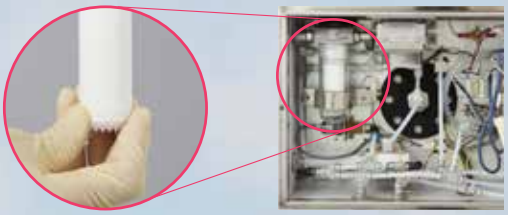
Low running cost

Compared to infrared gas analyzers, the maintenance cost can be reduced to less than 1/2 because the number of replacement parts is small and its calibration is required only once a year or two.

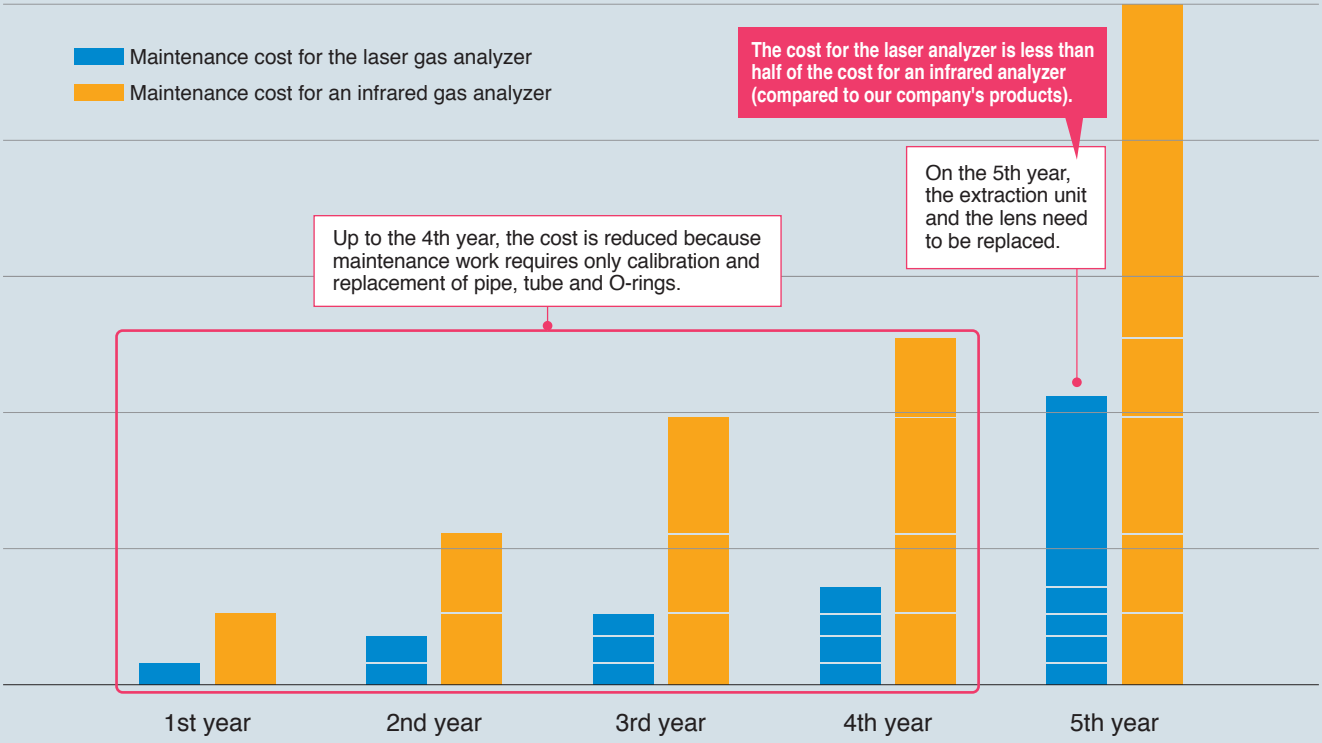


Easy maintenance

User maintenance requires only filter replacement.
As the number of parts to be replaced periodically is approximately 50% compared to infrared gas analyzers, replacement requires low workload and can be took in short period of time.



Running cost comparison (cumulative cost for five years)*



*Comparison simulation is carried out on the accumulated total of the initial cost and running cost for our laser gas analyzer and that for our infrared gas analyzer. Please note that the running cost varies depending on usage and installation environment. Also note that these results are for reference only and not guaranteed values.

Maintenance and Inspection Items

Inspection cycle	Target unit	Inspection location	Work items	Replacement part
1 to 6 months	Extraction unit	Filter	Replacement	Filter element
1 to 2 years	Detection unit Extraction unit Detection unit Overall	Zero span Extraction pipe O-ring Tube	Zero span calibration (using a calibration cylinder) Checking for corrosion Deterioration Leakage test and replacement	 O-ring Tube
2 years	Extraction unit Overall	Extraction pipe Pipe	Replacement Dirt and stain	Extraction pipe Pipe
5 years	Overall	Overall inspection	Unit replacement at the customer's dock (to be returned to us if possible)	SUS joint, Air cooling fan, Pipe, Extraction unit, etc.

Maintenance Parts List (Order Code:ZBN1QS□1) Note)

Detection unit

No.	Name	Quantity	Recommended replacement cycle
1	O-ring (S50)	2	1 year
2	O-ring (S60)	2	1 year
3	External tube	1	1 year

Extraction unit

No.	Name	Quantity	Recommended replacement cycle
1	Extraction pipe	1	2 years
2	Hexagon head bolt	4	2 years
3	Hexagon nut	4	2 years
4	Washer	4	2 years
5	Flange packing	1	2 years
6	Filter element	12	1 to 6 months

Note) Contact us if you need detail information.

Specifications

Components and ranges	SO_2: 0 to 300 ppm CO_2: 0 to 10 vol%
Principle	Non-dispersive infrared laser
Measuring 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×H×D)mm	Detection unit: 330 (W) × 880 (H) ×255 (D) mm Extraction unit: 400 (W) × 300 (H) ×323.4 (D) mm * Depth varies with the diameter of the flue 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: 1,000 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
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: exhaust gas temperature
Digital output (DO)	SPST-NO relay contact, 4 points Contact capacity: 30 V DC, 1 A (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 (N_2) is used for diluting these gases.

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		Extraction unit: 0°C to 65°C Detection 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		≤ 0.2 G (1.9 m/s²)
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

Calibration

Calibration interval (recommended)	1 year
Calibration method	Standard gases flow through the detection unit gas cell. •Zero gas (Conforms to NOx Technical Code 2008.) Pure nitrogen: impurities ≤ 1ppm C ≤ 1ppm CO ≤ 400ppm CO_2 ≤ 0.1ppm 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%

Complied Standards

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

Code Symbols

(1) Analyzer (extraction unit, detection unit, and interface box)

Measuring range of 1st component	Measuring range of 2nd component	Flange	Type
SO_2: 0 to 300 ppm	CO_2: 0 to 10 vol%	JIS 5K65A	ZQSSME01

(2) Extraction pipe

Length of the extraction pipe of the extraction unit (see note)	Code
300 mm	ZQZA3001
400 mm	ZQZA4001
500 mm	ZQZA5001
600 mm	ZQZA6001
700 mm	ZQZA7001
800 mm	ZQZA8001

Note: 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.

(3) Sample gas tube

Length of the tube between the extraction unit and the detection unit (see note)	Code
2 m	ZQZB0201
5 m	ZQZB0501
10 m	ZQZB0A01

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

(4) Cable between the detection unit and the interface box (for communication and heating)

Cable length (see note)	Code
2 m	ZQZC0201
5 m	ZQZC0501
10 m	ZQZC0A01
15 m	ZQZC0B01

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

(5) Cable between the extraction unit and the interface box (for communication and heating)

Cable length (see note)	Code
2 m	ZQZD0201
5 m	ZQZD0501
10 m	ZQZD0A01
15 m	ZQZD0B01
20 m	ZQZD0C01

Note: Select a sufficient length for the cable to connect the extraction unit and the interface box.

Scope of delivery

Product name	Quantity
Extraction unit (1)	1
Detection unit (1)	1
Interface box (1)	1
Cable between the transmitter unit and the receiver unit (1)	1
Gas sampling probe (2)	1
Sample gas tube (3)	1
Communication cable between the detection unit and the interface box (4)	1
AC cable between the detection unit and the interface box (4)	1
Communication cable between the extraction unit and the interface box (5)	1
AC cable between the extraction unit and the interface box (5)	1
Standard accessories, instruction manual	1

The numbers in paren theses correspond to the numbers given as the ones prefix for the tables on the left and also to the ones given in the wiring and piping diagrams on the next page.

Standard accessory

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

Others (optional items)

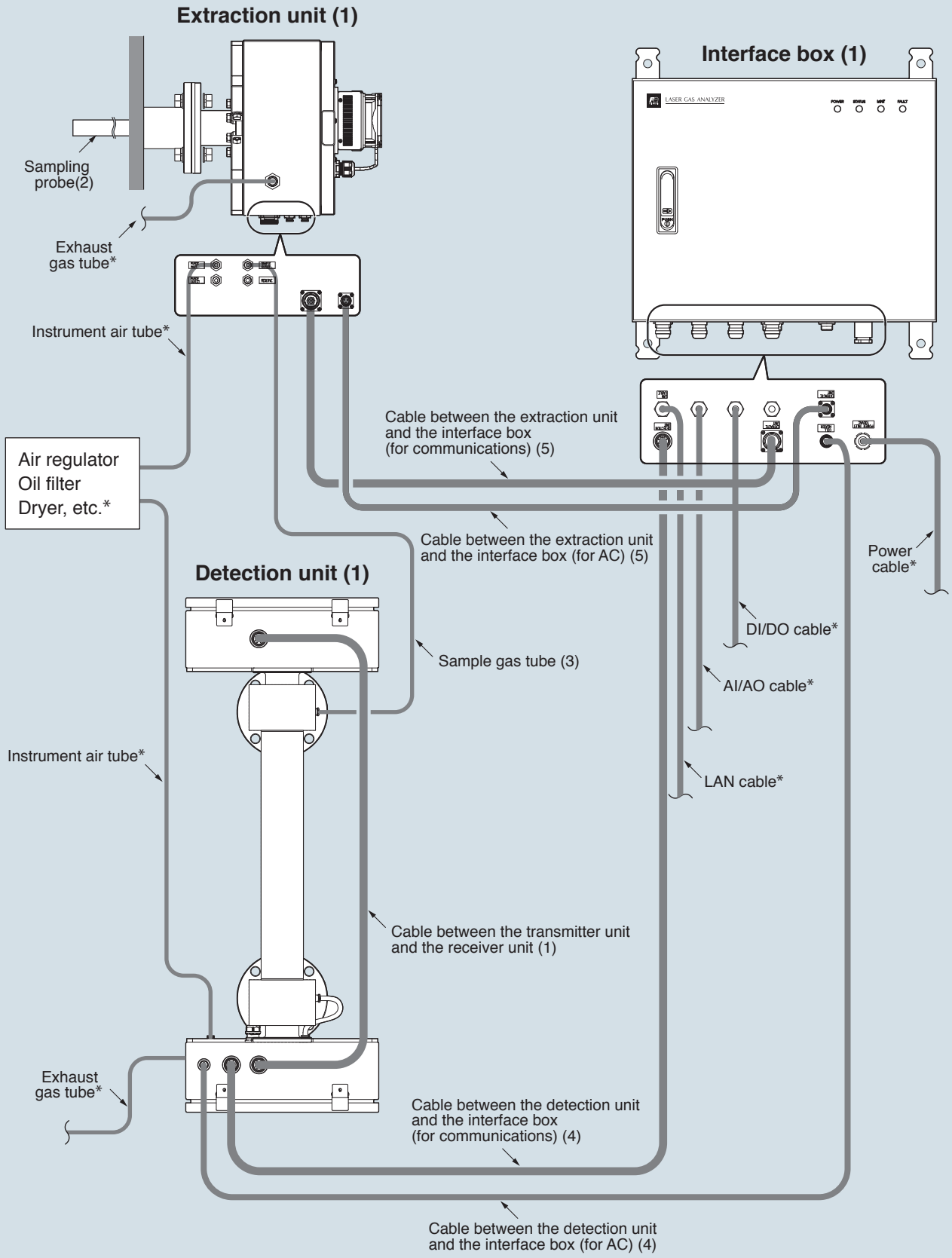
- Sampling gas tube
- Exhaust gas tube
- Standard gas (ZBM), pressure regulator (ZBD)
- Purging equipment*1
- Zero/span calibration equipment*2

*1 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

*2 Zero/span calibration equipment
- Pressure regulator
- Flowmeter

Please offer sales departonent of order code all the above items (1) to (5), i.e. analyzer, extraction pipe, sampling gas tube, and cable (two types).

Cable Connection and Wiring

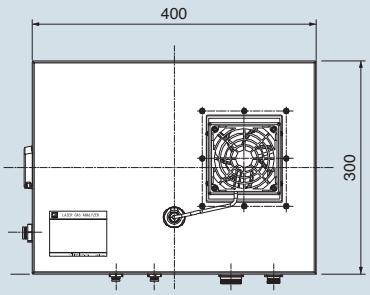


*As these items are not included in the scope of delivery, they need to be prepared by the customer.

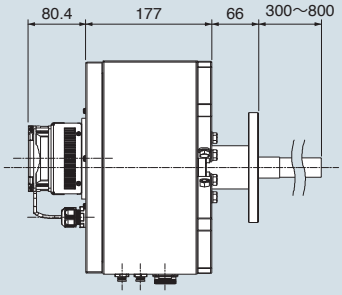
Outline Diagram and Clearance

Unit: mm

Extraction unit

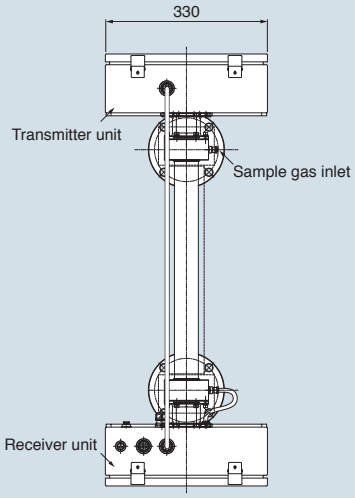


Front view

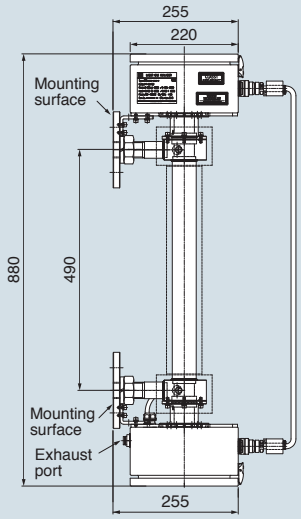


Right side view

Detection unit

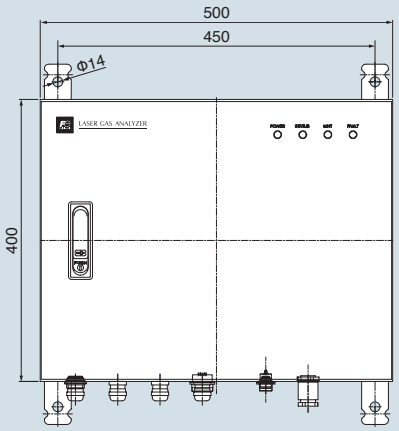


Front view

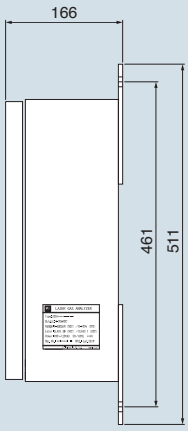


Left side view

Interface box

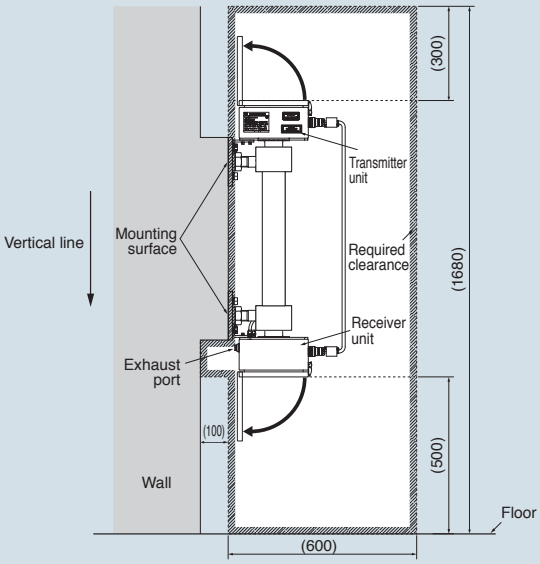


Front view



Right side view

Clearance (detection unit)



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

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