

Cross Stack

# Laser Gas Analyzer ZSS

In-Situ Measurement: Speed and Stability  
for Optimizing Your Process

- ✓ Low Power-Consumption
- ✓ Low Cost of Ownership
- ✓ CO and O<sub>2</sub> Analyzer Available

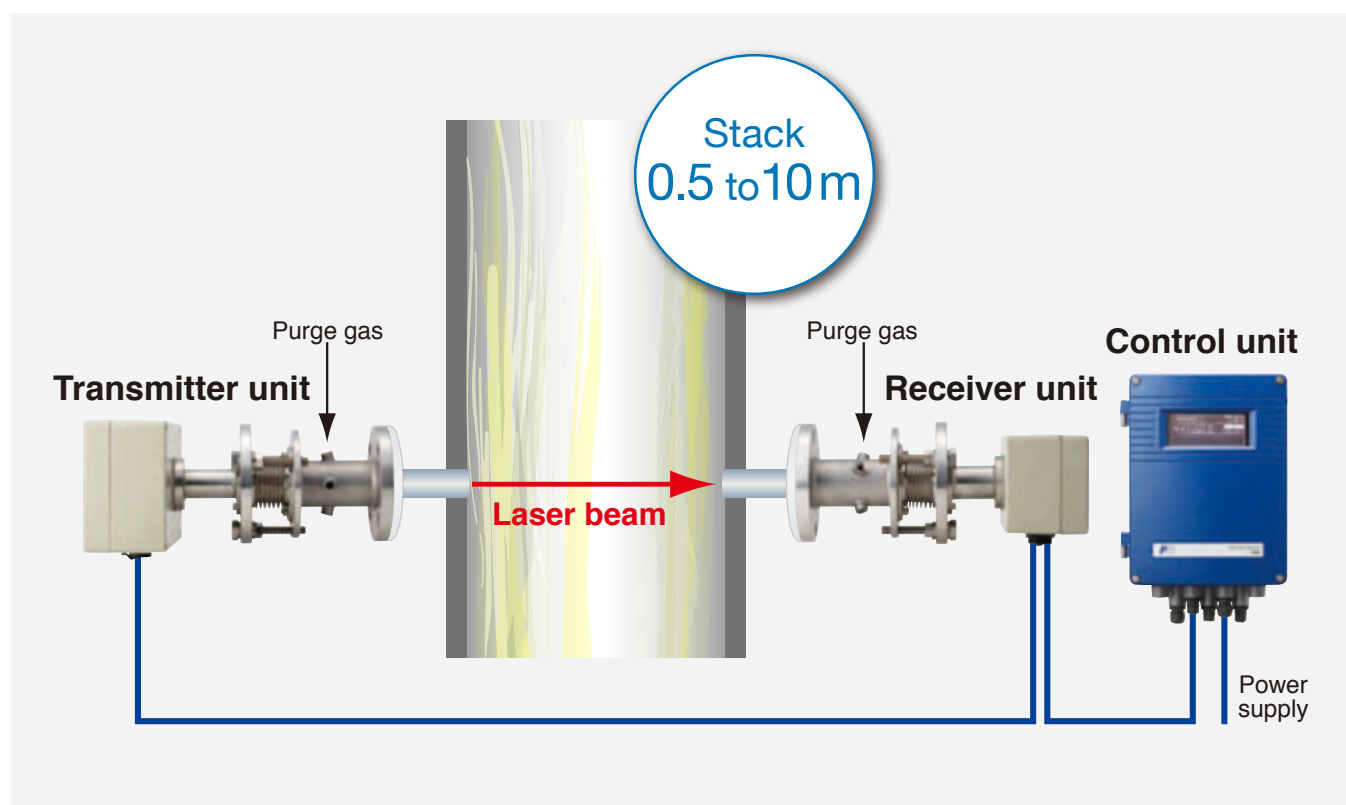
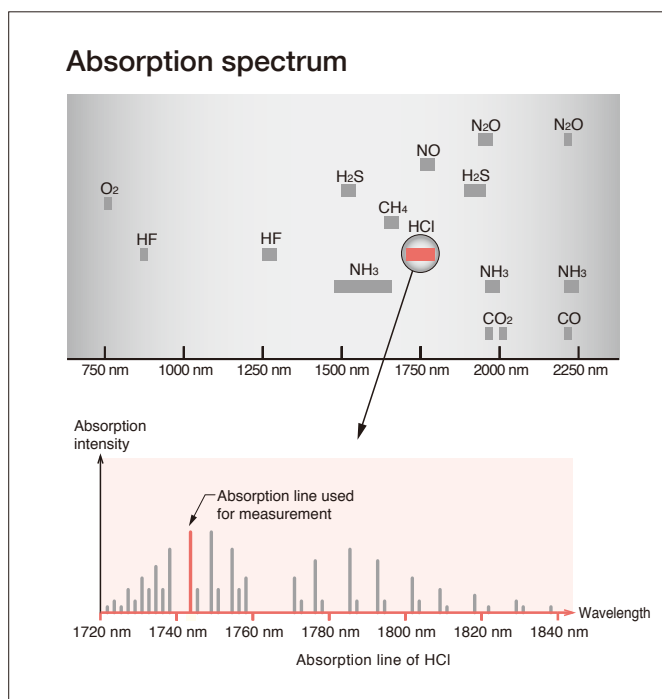


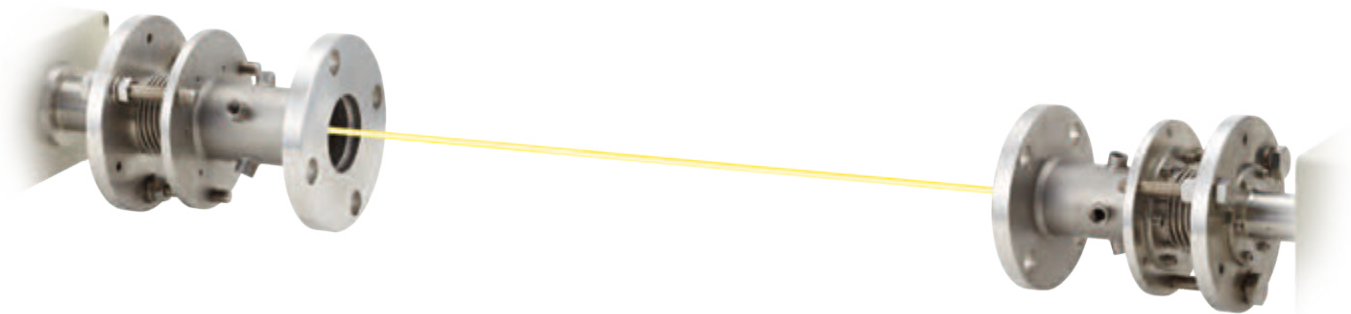
# Improve the efficiency of your plant

## Fast Response Within 2 Seconds and High Accuracy

The analyzer can respond quickly because it requires no gas sampling through long tube. By the use of a narrowed waveband to detect the target component, the analyzer offers highly precise measurement.

<b>NH<sub>3</sub></b>	<b>HCl</b>	<b>O<sub>2</sub></b>	<b>CO</b>	<b>CO<sub>2</sub></b>	<b>CH<sub>4</sub></b>
Ammonia	Hydrogen chloride	Oxygen	Carbon monoxide	Carbon dioxide	Methane



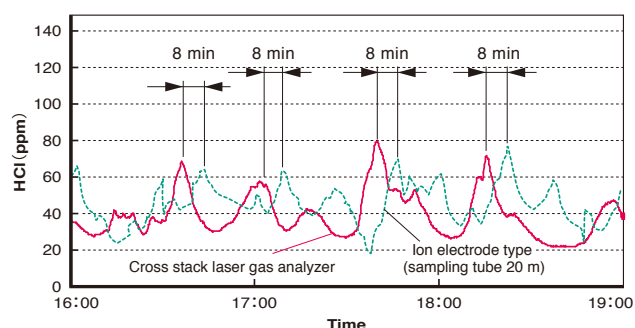


\*The image of laser beam is for illustrative purpose only.

### Fast Response Within 2 Seconds

Compared to the gas sampling type (ion electrode method), the direct measurement provides remarkably faster response.

Comparison with sampling system



### CO and O<sub>2</sub> Analyzer for Combustion Control

Simultaneous measurement of CO and O<sub>2</sub> enables precise control of air-fuel ratio while reducing the cost of installation and maintenance.

ppm CO + O<sub>2</sub>  
(high-temperature)

vol% CO + O<sub>2</sub>

ppm CO + O<sub>2</sub>  
(instrument air purge)

CO + CO<sub>2</sub>

### Zero Point Stability: $\pm 2.0\%$ FS per 6 Months

Purge system reduces the risk of zero drift due to contamination

### Instrument Air Purge Available

O<sub>2</sub> analyzer for combustion control accepts instrument air purge.

### Energy Efficient and Low Maintenance

The analyzer consumes only 80 VA at maximum, and yearly or half-yearly maintenance work is enough.

**No gas sampling**  
**No filter**

**No preconditioning**  
**No catalyst**

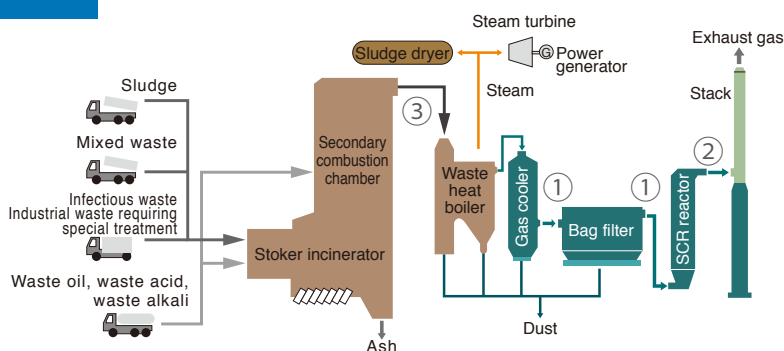
### Tolerant to Temperature and Dust

ZSS can measure high temperature gas up to 1200°C, and at the upstream of a bag filter where the gas sampling is usually difficult.

# Applications

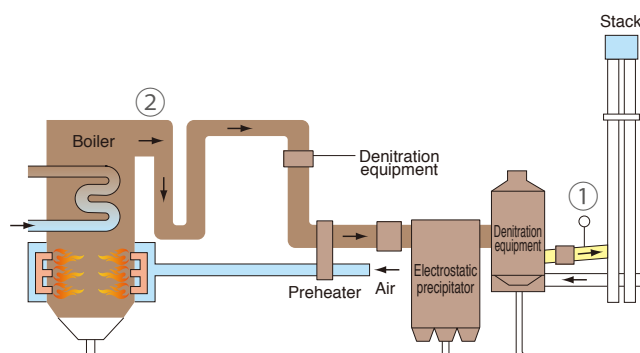
## Waste Incineration Plants

- ① Measurement of HCl in stack and before bag filter—Optimal control of injection amount of slaked lime
- ② Continuous monitoring of HCl and O<sub>2</sub> in flue gas
- ③ CO and O<sub>2</sub> measurement for combustion control



## Large-Scale Boilers

- ① Control of ammonia injection amount for NO<sub>x</sub> reduction
- ② CO and O<sub>2</sub> measurement for combustion control



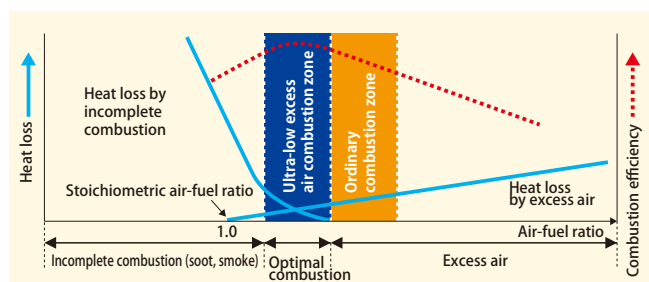
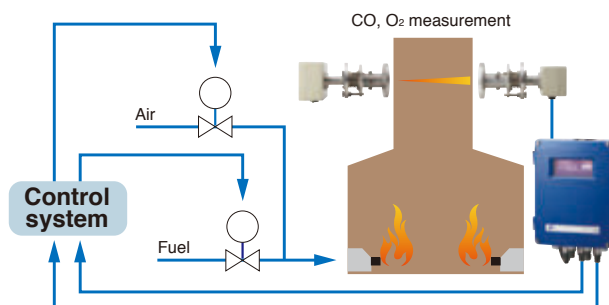
## Boiler Combustion Efficiency Monitoring

### Ultra-low excess air combustion

Most of the combustion control systems for boilers control the air-fuel ratio by measuring O<sub>2</sub> only (zone ■ in the graph). But these systems cannot eliminate the possibility of heat loss due to incomplete combustion.

The most efficient combustion can be achieved by lowering the air-fuel ratio to the point just before incomplete combustion occurs, which we call the ultra-low excess air combustion (zone ■ in the graph). The laser gas analyzer ZSS enables the ultra-low excess air combustion by detecting CO and O<sub>2</sub> simultaneously.

### CO and O<sub>2</sub> based combustion control system



### Other applications

#### Direct measurement of process gas

HCl, NH<sub>3</sub>, CO, CO<sub>2</sub>, CH<sub>4</sub>

#### Plant safety monitoring

O<sub>2</sub> in combustible gas

#### Combustion process control

O<sub>2</sub> and CO in furnace

#### Denitrification equipment

NH<sub>3</sub> leak detection

#### Converter gas recovery efficiency

O<sub>2</sub> and CO high-speed analysis

#### Safety in silos and plants

CO measurement

### Table 1 Measurable components and ranges

	Measurable components		Min. range*	Max. range*	Gas temperature	Purge gas	4th code
Single beam 1 component analyzer	HCl		10 ppm	5000 ppm	≤ 400°C	Instrument air	C
	NH <sub>3</sub>		15 ppm	5000 ppm	≤ 450°C		W
	CO (high range)		2.0 vol%	100 vol%	≤ 300°C		A
	CO (low range)		200 ppm	1 vol%	≤ 400°C		M
	CO <sub>2</sub>		2.0 vol%	100 vol%	≤ 300°C		G
	CH <sub>4</sub>		100 ppm	100 vol%	≤ 300°C		R
	O <sub>2</sub>		10 vol%	100 vol%	≤ 300°C	N <sub>2</sub>	P
	O <sub>2</sub> (high temperature)		4 vol%	100 vol%	≤ 1200°C		Q
	O <sub>2</sub> (instrument air purge)		25 vol%	100 vol%	400°C ... 1200°C		Instrument air
Single beam 2 component analyzer	CO + CO <sub>2</sub>		2.5 vol%	100 vol%	≤ 300°C	Instrument air	K
	Dual beam 2 component analyzer	ppm CO + O <sub>2</sub> (instrument air purge)	CO	200 ppm	2 vol%	400°C ... 1200°C	Instrument air
O <sub>2</sub>			25 vol%	100 vol%			
ppm CO + O <sub>2</sub> (high temperature)		CO	200 ppm	2 vol%	≤ 1200°C	N <sub>2</sub>	U
		O <sub>2</sub>	5 vol%	50 vol%			
vol% CO + O <sub>2</sub>		CO	2 vol%	50 vol%	≤ 300°C		S
		O <sub>2</sub>	10 vol%	100 vol%			

\*:Min. and Max. measuring range in the above table are for measuring path length (stack diameter) of 1m. See below on the ranges for other path lengths.

### Calculation method of measuring range for optical path lengths other than 1 m

Example 1) HCl analyzer, path length 5 m

Upper limit:  $5000 \text{ ppm} \div 5 \text{ m} = 1000 \text{ ppm}$

Lower limit:  $10 \text{ ppm} \div 5 \text{ m} = 2 \text{ ppm}$

Therefore, measuring range is between 0 to 2...1000 ppm.

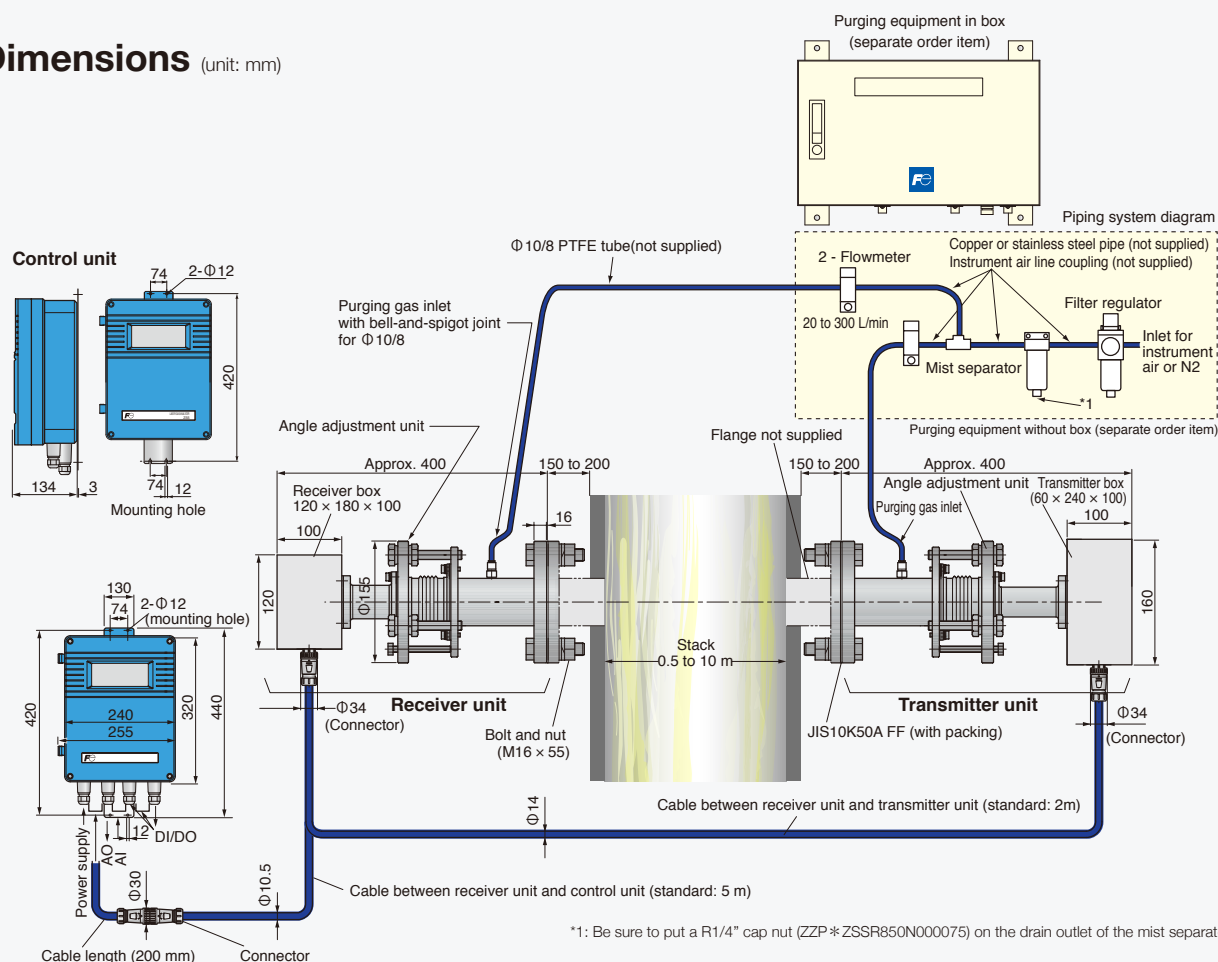
Example 2) HCl analyzer, path length 0.5 m

Upper limit:  $5000 \text{ ppm} \div 0.5 \text{ m} = 10000 \text{ ppm}$

Lower limit:  $10 \text{ ppm} \div 0.5 \text{ m} = 20 \text{ ppm}$

Therefore, measuring range is between 0 to 20...10000 ppm.

### Dimensions (unit: mm)



\*1: Be sure to put a R1/4" cap nut (ZPP\*ZSSR850N000075) on the drain outlet of the mist separator.

# SPECIFICATIONS

## General

Principle	Non-dispersive infrared (NDIR)
Principle	Cross-stack
Measurable components and ranges	See Table 1 on Page 5
Light source	Near-infrared semiconductor laser
Laser class	CLASS 1 (O <sub>2</sub> analyzers of high-temperature version and instrument air purge version fall under CLASS 3B)
Power supply voltage	100–240 V AC, 50/60 Hz
Power consumption	80 VA
Calibration interval	every 6 months (depending on the operating environment)
Display	Backlit LCD
Display contents	Component, concentration (instantaneous value, average, O <sub>2</sub> corrected instantaneous value, O <sub>2</sub> corrected average value), alarm
Weight	Receiver unit and transmitter unit: approx. 10 kg each, control unit: approx. 8 kg
Dimensions (D × W × H)	Receiver unit (400 × 180 × 155 mm) Receiver unit (400 × 240 × 160 mm) Control unit (137 × 255 × 440 mm)
IP rating	IP65

## Performance

Response	≤ 4 s (≤ 2 s in high-speed version)
Repeatability	±1.0% FS (depending on components and ranges) CO + O <sub>2</sub> measurement: ±2% FS
Linearity	±1.0% FS (depending on components and ranges) CO + O <sub>2</sub> measurement: ±3% FS
Zero drift	±2.0% FS per 6 months (depending on component and range) CO + O <sub>2</sub> measurement: ±4% FS per 6 months
Interference effect	±2.0% FS
Detection limit	1% of the minimum range

## Scope of delivery

- Control unit
- Receiver box
- Transmitter box
- Angle adjustment units  
(two units, one for transmitter unit and the other for receiver unit)
- Cable between the receiver unit and the control unit (specified length)
- Cable between the receiver unit and the transmitter unit (specified length)
- Standard accessories
- Instruction manual

## Separate order items

- Purging equipment (essential)
- Zero/span calibration equipment (essential)\*
- Optical axis adjustment tool (essential)\*
- Spare parts for one year (ZBN1SS12)
- Standard gas (ZBM)
- Recorder (as needed. For example, Fuji Electric recorder PHR)

\* The calibration equipment and the optical axis adjustment tool are not required for every gas analyzer, but required at least one set for one site.

## Input/output signal

Analog output	4–20 mA DC or 1–5 V DC, 2 or 4 points Measured value and O <sub>2</sub> corrected value. Switchable between instantaneous value and average value
Analog input	4–20 mA DC, 2 points Sample gas pressure, temperature, velocity, O <sub>2</sub> concentration, water concentration, air purge pressure *Inputs are used for compensating concentration, O <sub>2</sub> correction, and alarm output.
Digital output	Relay contact output, 6 points Low light transmission, H/L limit alarm, analyzer error, during calibration / during hold, power interruption, environmental error
Digital input (option)	Voltage input received by photocoupler, 3 points Average value reset, switchover between instantaneous value and moving average value, remote hold

## Installation environment

Ambient temperature	–20 to +55°C (Receiver unit, transmitter unit) –5 to +45°C (Control unit)
Ambient humidity	≤ 90% RH
Optical path length	0.5 to 10 m (0.5 to 5 m in CO + O <sub>2</sub> measurement)
Flange rating	DN50/PN10, ANSI 150 2B, JIS10K 50A, JIS10K 100A
Purge gas	See Table 1 on Page 5. Purge gas pressure: ≥ 0.3 MPa
Purge gas flow rate	≥ 20 L/min
Gas conditions	Temperature: See Table 1 on Page 5. Moisture: ≤ 50 vol% (no condensation) Pressure: ±10 kPa (Consult us for pressures above the limit.) Dust: Standard version: ≤ 5 g/m <sup>3</sup> (N) Dust resistant version: ≤ 20 g/m <sup>3</sup> (N)

Conforms to JIS B 7993: Automated measuring systems for flue gas using non-extractive methods.

## Standard accessories

Item	Q'ty	Specification
Bolt	8 or 16 <sup>*1</sup>	M16 × 55 (70) <sup>*2</sup> , stainless steel
Nut	8 or 16 <sup>*1</sup>	M16, stainless steel
Spring washer	8 or 16 <sup>*1</sup>	M16, stainless steel
Flat washer	8 or 16 <sup>*1</sup>	M16, stainless steel
Companion flange packing or flange packing specified for use in high temperature	2	According to flange specification
Bolt for angle fine adjustment	6	Hex socket bolt, M8 × 70
Power supply fuse	2	
Bolt for connecting the receiving unit and the transmitter unit	12	Hex socket bolt, M5 × 12

\*1: When the 9th code is "B", 16 pieces are provided. For other cases, 8 pieces are provided.

\*2: When the 9th code is "B", "C", or "D", the length of the bolt is 70 mm. When the 9th code is "A", the length is 55 mm. Inch-sized bolts are not supplied.

## Spare parts for one year (ZBN1SS12)

Name	Q'ty	Specification
Silicone packing A	2	For bellows (ZZP * ZSSTQ505205P1)
O-ring	2	(ZZP * ZSSR8552850)

# Ordering Code

ZSS 

4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
				8			A					0					N	

## Single beam (1 or 2 component analyzer)

Digit	Specification	Note	Code
4	Components		A
	CO		M
	CO (low-range)		C
	HCl	Note 1	F
	HCl + H <sub>2</sub> O (50 vol%)		G
	CO <sub>2</sub>		K
	CO + CO <sub>2</sub>		P
	O <sub>2</sub>		Q
	O <sub>2</sub> (high temperature)		T
	O <sub>2</sub> (instrument air purge)		R
	CH <sub>4</sub>	Note 1	W
	NH <sub>3</sub>		X
	NH <sub>3</sub> + H <sub>2</sub> O (50 vol%)	Note 1	X
5	Unit		1
	ppm		3
	mg/m <sup>3</sup>		5
	vol%		7
	ppm (1st comp), vol% (2nd comp)		9
6	Measurement range (1st component)	Note 2, 3	K
	0 to 2		Q
	0 to 2.5		S
	0 to 4		L
	0 to 5		V
	0 to 10		0
	0 to 15		1
	0 to 20		T
	0 to 25		A
	0 to 50		B
	0 to 100		C
	0 to 200		D
	0 to 250		J
	0 to 400		E
	0 to 500		F
	0 to 1000		G
	0 to 2000		H
	0 to 5000		M
	0 to 6000		X
	Others		X
7	Measurement range (2nd component)	Note 7	Y
	-		K
	0 to 2		Q
	0 to 2.5		S
	0 to 5		L

Digit	Specification	Note	Code
7	Measurement range (2st component)		V
	0 to 10		0
	0 to 15		1
	0 to 20		T
	0 to 25		A
	0 to 50		B
	0 to 100		C
	0 to 200		D
	0 to 250		J
	0 to 400		E
	0 to 500		F
	0 to 1000		G
	0 to 2000		H
	0 to 5000		M
	0 to 6000		X
9	Flange rating		A
	10K 50A (JIS B 2212)		B
	10K 100A		C
	DN50 / PN10		D
10	Number of analog outputs		0
	4		1
11	Number of analog inputs		A
	2		A
12	Analog output signal		1
	4~20 mA DC		5
13	Digital input/output		0
	6 outputs, no input		1
14	Cable between receiver unit and control unit	Note 4	A
	5 m		B
	10 m		C
	20 m		D
	30 m		E
	40 m		F
	50 m		G
	80 m		H
	100 m		X
	Others		X
15	Cable between receiver unit and transmitter unit	Note 5	A
	2 m		B
	5 m		C
	10 m		D
	15 m		E

Digit	Specification	Note	Code
15	Cable between receiver unit and transmitter unit		F
	25 m		X
16	Language		J
	Japanese		E
	English		C
	Chinese		C
17	-		0
	-		0
18	Optical path length (ones place)	Note 6	0
	0 m		1
	1 m		2
	2 m		3
	3 m		4
	4 m		5
	5 m		6
	6 m		7
	7 m		8
	8 m		9
19	Optical path length (tenths place)	Note 6	0
	0.0 m		1
	0.1 m		2
	0.2 m		3
	0.3 m		4
	0.4 m		5
	0.5 m		6
	0.6 m		7
	0.7 m		8
	0.8 m		9
20	Optical path length (hundredths place)	Note 6	0
	0.00 m		5
	0.05 m (Used only when 10 m is specified)		9
21	-		N
	-		N
22	High-dust (high-speed AGC) version		N
	No		H
	Yes		H

Note 1) Contact us when selecting CH<sub>4</sub> or H<sub>2</sub>O measurement.  
 Note 2) Specify the same range for CO and CO<sub>2</sub>.  
 Note 3) Specify the measuring range within the limit calculated based on the optical path length (See Page 1).  
 Note 4) Cable length between the receiver unit and the control unit: when you select the code "X", available length is 10 m or longer.  
 Note 5) Cable length between the receiver unit and the transmitter unit: when you select the code "X", available length is 5 m or longer.  
 Note 6) When the optical path length is 10 m, select "9" in 18th, 19th, and 20th codes.  
 Note 7) For single component analyzer, select "Y". For two-component analyzer, select a range for the second component.

## Dual beam (2 component analyzer)

ZSS 

4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
				8			A					0					N	

Digit	Specification	Note	Code
4	Components		V
	ppm CO + O <sub>2</sub> (instrument air purge)		U
	ppm CO + O <sub>2</sub> (high temperature)		S
	vol% CO + O <sub>2</sub>		7
5	Unit		9
	ppm (1st comp), vol% (2nd comp)		9
6	Measurement range (CO)	Note 1	K
	0 to 2		Q
	0 to 2.5		S
	0 to 4		L
	0 to 5		V
	0 to 10		0
	0 to 15		1
	0 to 20		T
	0 to 25		A
	0 to 50		B
	0 to 100		C
	0 to 200		D
	0 to 250		J
	0 to 400		E
	0 to 500		F
	0 to 1000		G
	0 to 2000		H
	0 to 5000		M
	0 to 6000		X
	Others		X
7	Measurement range (O <sub>2</sub> )	Note 1	L
	0 to 5		V
	0 to 10		0
	0 to 15		1
	0 to 20		T
	0 to 25		A
	0 to 50		B
	0 to 100		C
	Others		X

Digit	Specification	Note	Code
9	Flange rating		A
	10K 50A (JIS B 2212)		B
	10K 100A		C
	DN50 / PN10		D
10	Number of analog outputs		0
	4		1
11	Number of analog inputs		A
	2		A
12	Analog output signal		1
	4~20mA DC		5
13	Digital input/output		0
	6 outputs, no input		1
14	Cable between receiver unit and control unit	Note 2	A
	5 m		B
	10 m		C
	20 m		D
	30 m		E
	40 m		F
	50 m		G
	80 m		H
	100 m		X
	Others		X
15	Cable between receiver unit and transmitter unit	Note 3	A
	2 m		B
	5 m		C
	10 m		D
	15 m		E
	20 m		F
16	Language		J
	Japanese		E
	English		C
	Chinese		C
17	-		0
	-		0

Digit	Specification	Note	Code
18	Optical path length (ones place)	Note 4	0
	0 m		1
	1 m		2
	2 m		3
	3 m		4
19	Optical path length (tenths place)	Note 4	0
	0.0 m		1
	0.1 m		2
	0.2 m		3
	0.3 m		4
20	Optical path length (hundredths place)	Note 4	0
	0.00 m		5
	0.05 m (Used only when 10 m is specified)		9
21	-		N
	-		N
22	High-dust (high-speed AGC) version		N
	No		H
	Yes		H

Note 1) Specify the measuring range within the limit calculated based on the optical path length.  
 Note 2) Cable length between the receiver unit and the control unit: when you select the code "X", available length is 10 m or longer.  
 Note 3) Cable length between the receiver unit and the transmitter unit: when you select the code "X", available length is 5 m or longer.  
 Note 4) When the optical path length is 5 m, select "5" in the 18th code, and "0" in the 19th and 20th codes.  
 Note 5) Specify the code "H" for dust tolerant version, fast response version, and/or O<sub>2</sub> analyzer for combustion control.



# NDIR Gas Analyzer System ZSU-7

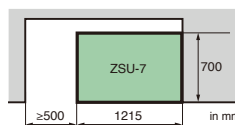
## Simultaneous Measurement of 7 Components in Flue Gas

### Space-saving design

Contains everything you need for measurement up to 7 components: NO<sub>x</sub>, SO<sub>2</sub>, CO, CO<sub>2</sub>, O<sub>2</sub>, HCl, and dust

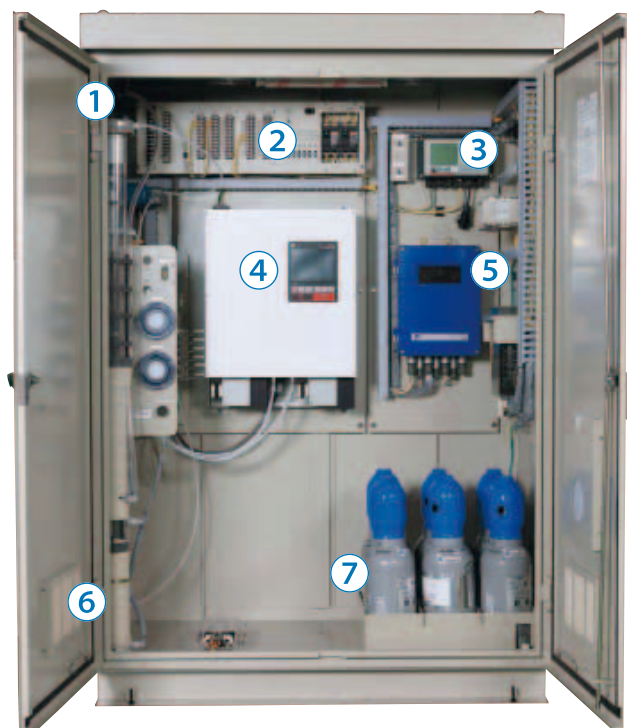
### Designed for ease of maintenance

Allows maintenance from front side







### Designed for ease of maintenance

Signal and power terminals are in one place



Dimensions in mm

- ① **Gas inlet**  
for NO<sub>x</sub>, SO<sub>2</sub>, CO, CO<sub>2</sub>, O<sub>2</sub>
- ② **External wiring terminals**  
for gas concentration output signals or power supply
- ③ **Dust analyzer**  
No sampling involved  

- ④ **NDIR gas analyzer (ZKJ)**  
Real-time monitoring of 5 components: NO<sub>x</sub>, SO<sub>2</sub>, CO, CO<sub>2</sub>, (O<sub>2</sub>)  
  

- ⑤ **HCl analyzer**  
No sampling involved You can install the HCl analyzer later on.  

- ⑥ **Gas conditioner**  
removes dust and water from flue gas.
- ⑦ **Six 3.4 L standard gas cylinders**  
for zero and span calibration can be stored.

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

**Fuji Electric Co., Ltd.**

**Instrumentation & Sensors Planning Dept.**

1, Fuji-machi, Hino-city, Tokyo 191-8502, Japan

<http://www.fujielectric.com>

Phone: +81-42-514-8930 Fax: +81-42-583-8275

<http://www.fujielectric.com/products/instruments/>