

# IN-SITU ZIRCONIA OXYGEN ANALYZER FOR HAZARDOUS LOCATION

#### DATA SHEET

This oxygen analyzer is used to continuously measure oxygen concentration in noncombustible exhaust gas of industrial boilers or furnaces, and is ideally suited for combustion management and control.

The analyzer system is comprised of the detector and converter coupled together as a complete system. Detector setting configuration includes the flow guide tube and detector sensor. The flow guide tube is inserted directly into the gas and directs gas to the sensor for measurement. The converter (ZKME) is comprised of the signal processor, input/output and communications, display and system controls.

The converter is equipped with advanced functionality such as performing the sensor diagnostics and sensor recovery function, so the detector can be used within long term stability.

### **FEATURES**

1. Gas sampling device is unnecessary

For quick response, insert the detector directly into the staek. Gas sampling functions such as a gas aspirator and a dehumidifier are not required.

2. Easy maintenance

The sensor equipped with the detector, has unit construction, it is easy to replace.

By separating the detector and the flow guide tube, filter replacement is easy.

3. More reliable than sensor diagnosis, sensor recoverable function

Depending on the components in the measurement gas, the characteristics of the sensor might deteriorate. The equipment includes sensor recovery function electronically, checking the deterioration status of the sensor depletion.

Therefore, it has high reliability and long-lasting stability.

4. Safe and secure

System detects thermocouple break for heater control on the sensor side. Safety functions of isolating power supply to the detector or isoralting power via external contact input are also.

5. Easy operation

The operation and setting for the converter can be performed interactively, and available as English, Japanese or Chinese for language display.



Detector (ZFKE)



Converter (ZKME)

### **SPECIFICATIONS**

General Specifica	tions							
Measuring object:	Oxygen in noncombustible gas							
Measuring method:								
-	Directly insert type zirconia system							
Measuring range:	0 to 2 … 0 to 50 vol% O2							
	2 ranges available in 1 vol% O <sub>2 steps</sub>							
Repeatability:	Within $\pm 0.5\%$ FS							
Linearity:	Within $\pm 2\%$ FS							
Response time:	Within 4 to 7 sec, for 90% (from calibra-							
	tion gas inlet)							
Warmup time:	approx. 10 min							
Analog output:	4 to 20mA DC (allowable load resis-							
	tance less than 500 $\Omega$ ) or 0 to 1V DC							
	(output resistance more than 100 $\Omega$ )							
Power supply:	Rated voltage;							
	100 to 120V AC (operating voltage 90							
	to 132V AC)							
	200 to 240V AC (operating voltage							
	190 to 264V AC)							
	Rated frequency; 50/60Hz							
Power consumptio								
	Maximum 240VA (Detector: approx.							
	200VA, Converter: approx. 40VA)							
	Normal 70VA (Detector: approx. 50VA,							
	Converter: approx. 20VA							

ZFKE, ZKME

Detector Specif	ications (ZFKE)	Converter specification (ZKME)
Measured gas te		Concentration value indication:
0	Flow guide tube system; -10 to +600°C	Digital indication in 4 digits
	(for general-use, corrosive gas)	Contact output signal:
Measured gas pr		(1) Contact specification; 6 points, 1a 250V AC/3A or 30V
5 1	−3 to +3kPa (−306 to +306mmH₂O)	DC/3A
Flow guide tube:		(2) Contact function;
riow guido tabol	Flange; JIS5K 65A FF	Under maintenance
	(JIS5K-80AFF for high particulate gas)	Under Maintenance     Under blowdown_Note3)
	Insertion length; 0.3, 0.5, 0.75, 1m	,
	Other: See. Code Symbols	Span calibrating gas
Ejector (general-		Zero calibration gas
Ejector (general-	Probe for vacumming up measured gas	<ul> <li>Instrument anomalies Note1)</li> </ul>
	to detector (option)	• Alarm Note2)
Operating temps		Note1) The following Instrument errors (1) Thermocou-
Operating tempe		ples break (2) Sensor break (3) Temperature fault
	-10 to +60°C for Primary detecting ele-	(4) Calibration fault (5) Zero/span adjustment fault
	ment	(6) Output error turn the contact-ON
	125°C or less at detector flange surface	Note2) Alarm selects just one as mentioned below (1)
0.	with power applied	High (2) Low (3) Upper and Lower (4) High-high
Storage tempera		(5) Low-low, it turns ON while operating.
_	Sensing element: $-20$ to $+70^{\circ}$ C	Note3) Under blow down is available in case of option,
Structure:	Dust/rain-proof structure(IEC IP66	and it turns ON while operating.
	equivalent)	Contact input signal:
Flame proof:	See Table 1.	(1) Contact specification; 3points (the following option)
Filter:	SUS316 (filtering accuracy 60 $\mu$ m)	ON; 0V (10mA or less), OFF; 5V
Main materials o	f gas-contacting parts:	(2) Contact function;
	Detector; Zirconia, SUS316, platinum	External hold
	Flow guide tube; SUS316	Calculation reset
Calibration gas ir	nlet:	Heater OFF
	φ6mm tube join or φ1/4-inch tube join (as	<ul> <li>Blow down (option)</li> </ul>
	specified)	Inhibition of calibration
Reference gas in	let (option):	Calibration start
	φ6mm tube join or φ1/4-inch tube join (as	Range change
	specified)	Calibration method:
Detector mounti	ng:	(a) Manual calibration with key opera-
	Horizontal plane $\pm 45^{\circ}$ , ambient sur-	tion
	rounding air should be clean.	(b) Auto. calibration (option)
Outer dimension	<b>s:</b> (L × max. dia.) 215mm × 164mm (de-	Calibration cycle; 00 day 00 hour to
	tector)	99 days 23 hours
Mass (approx.) {		(c) All calibration
	Detector; 3.0kg	Calibration gas: • Range settings
	Flow guide tube (for corrosive gas, 1m);	
	6kg	Zero gas; 0.010 to 25.00% O <sub>2</sub> Span gas: 0.010 to 50.00% O <sub>2</sub>
Finish color:	Case: Silver and SUS metallic color	
	Cover: Blue	Recommended calibration gas concen- textion
Ejector air inlet fl		tration
	5 to 10 L/min	Zero gas; 0.25 to 2.0% O <sub>2</sub>
Collibration and fl		Span gas; 20.6 to 21.0% O <sub>2</sub>
Calibration gas fl		(oxygen concentration in the
Ploudour de la la	1.5 to 2 L/min	air)
Blowdown air inl		Blowdown: A function for blowing out with com-
	200 to 300kPa {2 to 3 kgf/cm <sup>2</sup> }	pressed air dust that has deposited in
		(option) the flow guide tube. Blowdown can
Table 1		be performed for a predetermined time
	Detector	and at predetermined intervals.
TIIS	Exd IIB T4	Blowdown cycle; 00 hour 00 minute to
(pending)		99 hours 59 minutes
NEDCI	EEVILIE TE EVILLE	

	Detector				
TIIS (pending)	Exd IIB T4				
NEPSI	EExd IIC T5 Ex II2G				

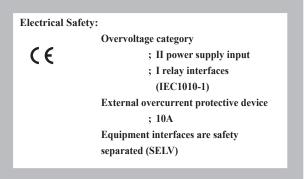
to 0 minutes 999 seconds

Blowdown time; 0 minute 00 second

Output signal hold:						
	Output signal is held during cali-					
	bration, processing recoverable					
	sensor, processing diagnosis of sensor,					
	warm-up, PID auto tuning, under set					
	up maintenance mode " available" and					
	blowdown. The hold function can also					
	be released.					
Valve and flow	Selects zero or span gas during manual					
meter (option):	zero or span calibration.					
Communication fu						
Communication iu	RS232C (MODBUS) standard specifica-					
	tion					
	RS485 (MODBUS) (option)					
Combustion officia						
Compustion enicle	ncy display (option):					
	When you select this display, "rich mode					
	display" will be an simultaneous display.					
	This function calculates and displays					
	combustion efficiency from oxygen					
	concentration and measured gas tem-					
	perature.					
	Thermocouple (R) is required for tem-					
	perature measurement.					
Operating tempera						
	-20 to +55°C					
Operating humidity	/:					
	95% RH or less, non condensing					
Storage temperatu						
	-30 to +70°C					
Storage humidity:	95% RH or less, non condensing					
Construction:	Dust-proof, rainproof construction					
	(corresponding to IP65)					
Explosion proof:	See Table 2					
Material:	Aluminum case					
Outer dimensions	$(H \times W \times D)$ :					
	470 X 326 X 211mm (IP65)					
Mass {weight}:	IP65: Approx.22kg (excluding cable and					
	detector)					
Finish color:	Case: Silver					
	Cover: blue					
Mounting method:	Mounted flush on panel					

#### Table 2

	Converter			
TIIS (pending)	Exd IIB T6			
NEPSI	EExd IIC T6 Ex II2G			



ZFKE, ZKME

## CODE SYMBOLS

(Detector)		(Converter)						
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 Z F K E R 5 - 1 1	Description	1 2 3 4 5 6 7 8 9 10 Z K M E 1 1 -	0 11 12 13 14	Description				
	Cal. gas inlet			Output signal				
Y	Non (G3/8 female screw)	В		4 to 20mA DC				
1	For φ6mm tube For φ1/4 inch tube	E		0 to 1V DC Communication function				
Â	Ejector for 66mm tube	1		RS-232C				
В	Ejector for φ1/4 inch tube	2		RS-485 Optional Functions				
	Power supply 100 to 120VAC 50/60Hz	Y		None				
3	200 to 240VAC 50/60Hz (€	1		Combustion efficiency display function Blowdown	on Note1)			
	Flow guide tube	3		Auto calibration				
0 Y 0	None	4		Combustion efficiency indication				
7	<flange size="">  JIS 5K 65A</flange>	5		+ Blowdown Note1) Combustion efficiency indication				
8	JIS 5K 80A			+ Auto calibration Note1) Blowdown + Auto calibration				
9	JIS 5K100A	6		Combustion efficiency indication + E	Blowdown			
B	JIS 10K 65A JIS 10K 80A			+ Auto calibration Note1) Instruction manual language				
c	JIS 10K 100A	J	]	Japanese				
D	ANSI 150LB 2B ANSI 150LB 3B	E		English				
F	ANSI 150LB 4B			Chinese Mounting Option				
G	DIN DN50 PN10		Y	None (Mounting on panel surface	e)			
	DIN DN80 PN10 <application meterial=""></application>	-	2	With valve With valve + flowmeter				
F	For corrosive gas / SUS316			Specification name plate				
G	With blow-down nozzle / SUS316		1+-+	Standard Number of Cable Gland				
	For high particular / SUS316 For high particular with cover / SUS316		3	3				
K	For high particular / SUS310S		4	4				
	For high particular with cover / SUS310S		5	5 6				
MI	For high particular / titanium For high particular with cover / titanium		7	7				
	<length></length>	-	N	Ex Standard NEPSI				
3	300mm		T	TIIS (pending)				
7	500mm 750mm		Note1) When	n you select this display, rich mode	e			
1	1000mm			e a simultaneous display.				
	Reference gas inlet Non (G1/8 female screw)							
A	for ¢6mm tube	(Exclusive-special o	vablo)					
B	For φ1/4 inch tube		able)					
5	Filter Standard	1 2 3 4 5 6 7 8 9 Z R Z E R 1 -		Description				
7	For high particular		Connectable					
	Instruction manual language	E	- For ZKME					
U E	Japanese English		Types					
C	Chinese	R	For R thermo					
	Specification name plate	YA	Cable length	1				
	Standard							
1	Standard Ex. Standard	YB	- 10m					
N	Ex. Standard NEPSI	YB YC	10m 15m					
N	Ex. Standard	YB	- 10m					

ΥF YG

ΥH

YJ

YK YL

ΥM

50m

60m

70m

80m 90m

100m

None

Both sides

0 1

2

Cable end treatment

One side (detector side)

#### (Replacement Detector element)

Power supply	Code symbols
100 to 120V AC	ZFK8YY15-0Y0YY-0YY
200 to 240V AC	ZFK8YY35-0Y0YY-0YY



4

## SCOPE OF DELIVERY

Detector	: Detector main unit $ imes$ 1, Viton Packing
	imes 1, thermo seal $ imes$ 1, mounting screw
	(M5mm $ imes$ 25) $ imes$ 6, flow guide tube (as
	specified) $\times$ 1, Wrench $\times$ 1, Instruction
	manual $\times$ 1
Converte	r: Converter main unit × 1, mounting
	screw (M12 $ imes$ 50) $ imes$ 4, Cock (option) $ imes$
	1, flowmeter (option) $\times$ 1,
	Accessories (AC250V 500mA T fuse $ imes$
	2, AC250V 2.5A T fuse $ imes$ 2), Wrench $ imes$
	1, Instruction manual $ imes$ 1
Ejector:	With detector main unit (option)
Items to	be prepared separately:
(1) Standa	ard gas for calibration
Туре	ZBM <sup>_</sup> NSH4-01 (up to 5% O <sub>2</sub> range)
Туре	ZBM <sup>O</sup> NSJ4-01 (over 5% O <sub>2</sub> range)
(2) Reduc	tion valve for standard gas (type ZBD61003)
(3) Flown	neter
Type;	ZBD42203, 0.2 to 2L/min (for calibrating gas)
	(unnecessary when the code 11th of ZKME is 2)
Type;	ZBD42403, 1 to 10L/min (for ejector)
(4) Opner	
Type;	ZZP*TK7N9329P2 (for detector; ZFKE)
Type	77P*TK7N9329P1 (for converter: 7KMF)

Type; ZZP\*TK7N9329P1 (for converter; ZKME)

## CAUTIONS

- If combustible gas (CO, H<sub>2</sub> etc.) exists in the measured gas, error will occur due to burning at the sensor section. The inclusion of corrosive gas (Si vapor, alkaline metal, P, Pb etc.) will shorten the life of the sensor.
- When the measured gas temperature is high (+300°C or higher), the flange should be separated from the furnace wall in order to bring the detector flange surface temperature below the specified value +125°C). The flow guide should be attached in the direction in which the gas flow to the detector decreases.
- When much dust is included in the gas, the flow guide tube should be attached at an inclination so that the flow goes from below to above. And the flow guide should be attached in the direction in which the gas flow to the detector decreases.
- In the case of a refuse incinerator, automatic blow down of the flow guide should not be performed (to prevent corrosion of the flow guide tube due to drainage). Blowdown should be performed manually when change in the indication has become very little with the furnace stopped.

## **DEVICE CONFIGURATION**

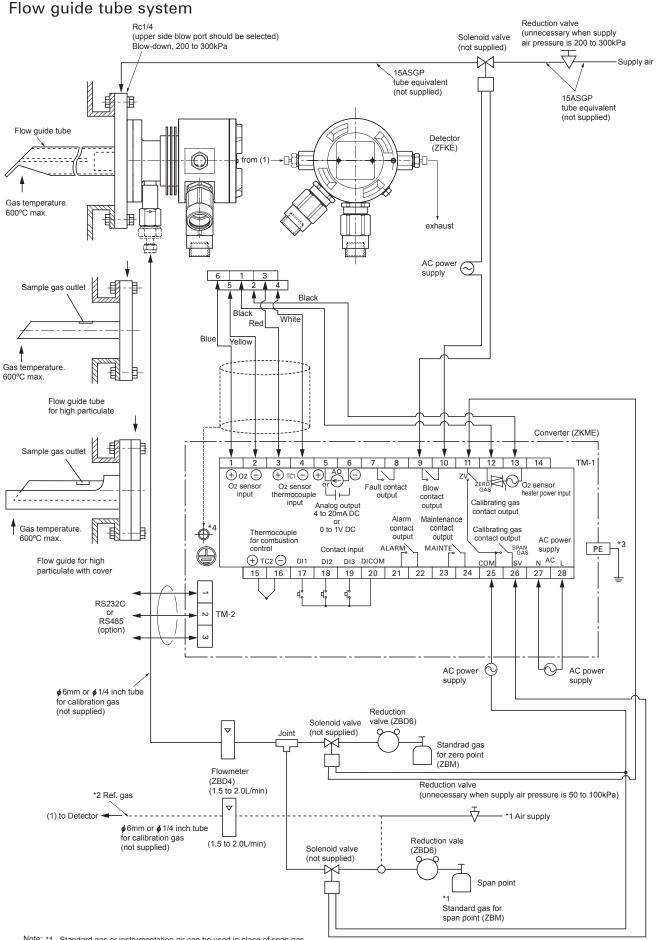
The device to be combined differ according to the conditions of the gas to be measured. Select the devices to be combined with reference to the following table.

		Me	easured gas		Device configuration		
Application Temperatur		Gas Flow	DUST Note De		Detector type	Converter type	
General-use	600°C or	5 to 20m/s	Less than 0.2g/Nm <sup>3</sup>	Fuel; gas, oil	ZFKER	ZKME	
(boiler)	less		Less than 10g/Nm <sup>3</sup>	Fuel: coal	ZFKER	ZKME	
				with blow down			
For corrosive	rrosive 600°C or 5 to 20m/s Less than 1g/Nm <sup>3</sup>		Less than 1g/Nm <sup>3</sup>	Included low moisture	ZFKERDD5-DFDYD-DD	ZKME	
gas (refuse	use less Less than 10g/Nm <sup>3</sup> Incl		Included low moisture	ZFKERDD5-DGDYD-DD	ZKME		
incinerator)	ator) with blow down		with blow down				
			Less than 25g/Nm <sup>3</sup>	Included low moisture		ZKME	
				with blow down	ZFKER		
			Less than 25g/Nm <sup>3</sup>	Included high moisture	J	ZKME	
				with blow down	ZFKER		

Note (1) Dust volume is approximate value.

(2) Instrument quality air or bottled air is available as reference air by selecting detector with reference air inlet.

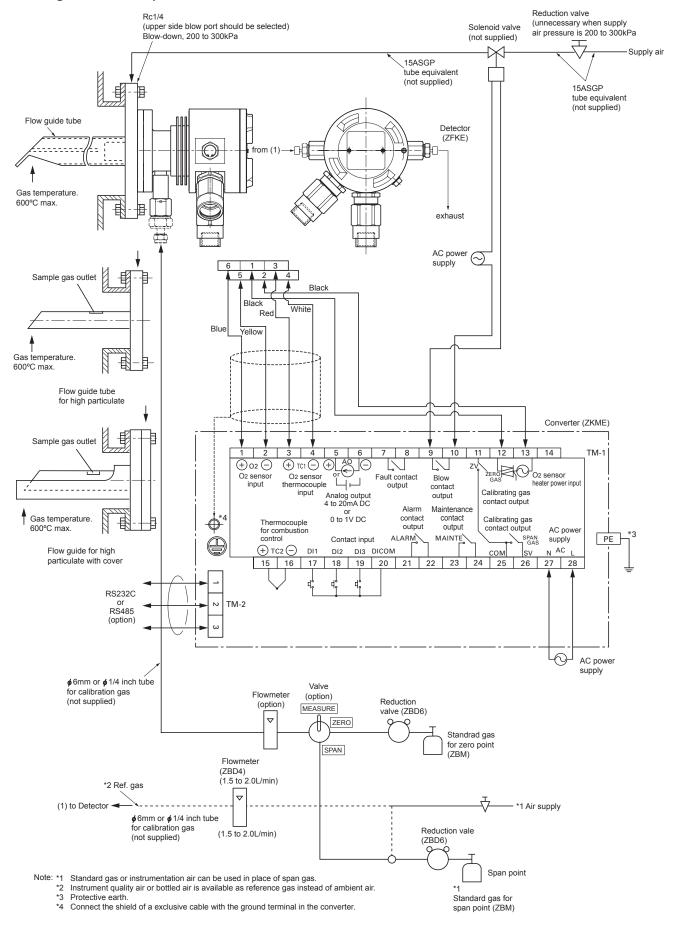
## CONFIGURATION



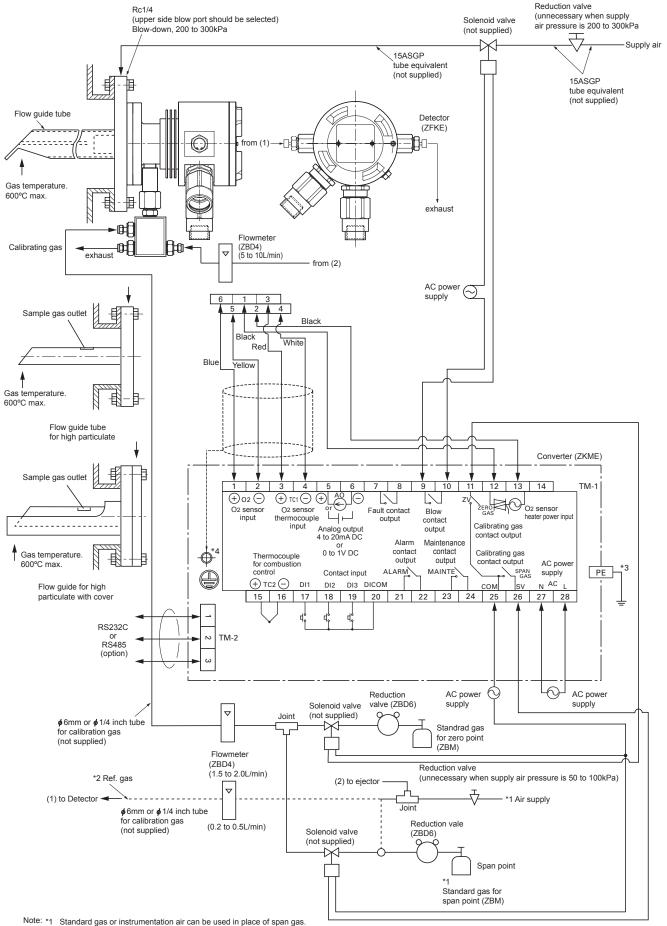
Note: \*1 Standard gas or instrumentation air can be used in place of span gas. \*2 Instrument quality air or bottled air is available as reference gas instead of ambient air. \*3 Protective earth.

- \*3 Protective earth.
   \*4 Connect the shield of a exclusive cable with the ground terminal in the converter.

#### Flow guide tube system (with valve)

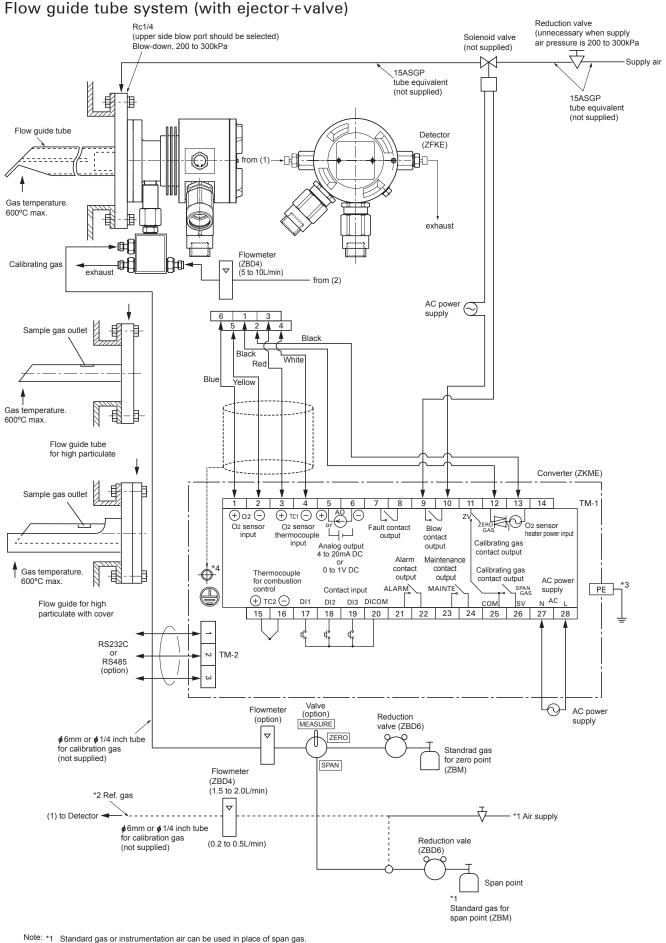


Flow guide tube system (with ejector)



 <sup>\*2</sup> Instrument quality air or bottled air is available as reference gas instead of ambient air.

- \*3 Protective earth
  - \*4 Connect the shield of a exclusive cable with the ground terminal in the converter.



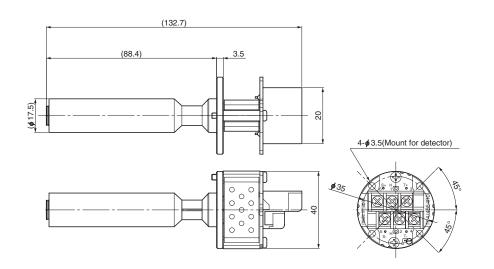
\*2 Instrument quality air or bottled air is available as reference gas instead of ambient air.

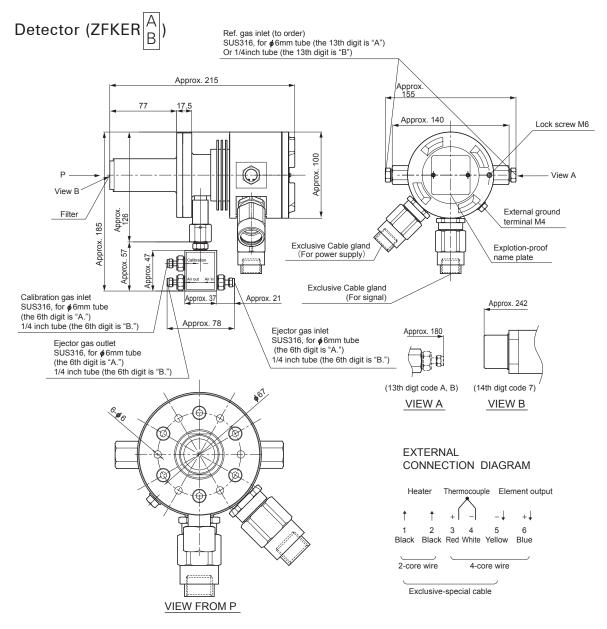
- \*3 Protective earth.
- \*4 Connect the shield of a exclusive cable with the ground terminal in the converter.

ZFKE, ZKME

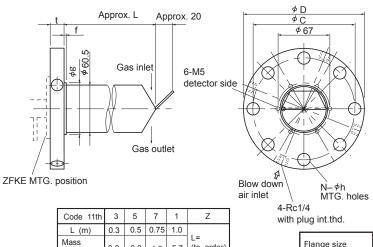
OUTLINE DIAGRAM (Unit:mm) Υ Detector (ZFKER 1) 2 Ref. gas inlet (to order) SUS316, for ø6mm tube (the 13th digit is "A") Approx. 215 Approx. 152 or 1/4 inch tube (the 13th digit is "B") 77 17.5 Approx. 140 Lock screw M6 Approx. # 100 Р - View A View B 126 External ground terminal M4 Filter 162 DDLOX Approx. Explotion-proof Exclusive Cable gland vpprox. 32 name plate (For power supply) Calibration gas inlet (To order) SUS316, for ∳6mm tube (the 6th digit is "1") Or 1/4 inch tube Exclusive Cable gland (For signal) (the 6th digit is "2") (Not provided if the 6th digit is "Y") Approx. 242 Approx. 180 **b**61 134 ø Ŕ (13th digt code A, B) (14th digt code 7)  $\mathfrak{D}$ VIEW A VIEW B EXTERNAL Ø CONNECTION DIAGRAM Heater Thermocouple Element output +↓ t 1 + 3 2 5 6 4 Black Black Red White Yellow Blue 2-core wire 4-core wire Exclusive-special cable VIEW FROM P

#### Sensor unit (ZFK8YY)





Flow guide tube (with blow-down nozzle) (ZFKE: 10th digit code. G)



5.7

(to order)

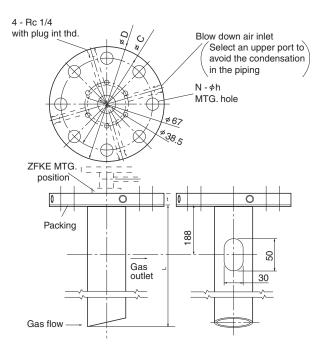
3.0

Approx.(kg)

3.8 4.8

Flange size	Code 9th	D	С	t	f	g	N	h
JIS 5K 65A	7	155	130	14	2	110	4	15
JIS 5K 80A	8	180	145	14	2	121	4	19
JIS 5K 100A	9	200	165	16	2	141	8	19
JIS 10K 65A	Α	175	140	18	2	116	4	19
JIS 10K 80A	В	185	150	18	2	126	8	19
JIS 10K 100A	С	210	175	18	2	151	8	19
ANSI 150LB 2B	D	150	120.7	17.5	2	92.1	4	19.1
ANSI 150LB 3B	E	190	152.4	22.3	2	127	4	19.1
ANSI 150LB 4B	F	230	190.5	22.3	2	157.2	8	19.1
DIN DN50 PN10	G	165	125	18	0	0	4	18
DIN DN80 PN10	Н	200	160	20	0	0	4	18

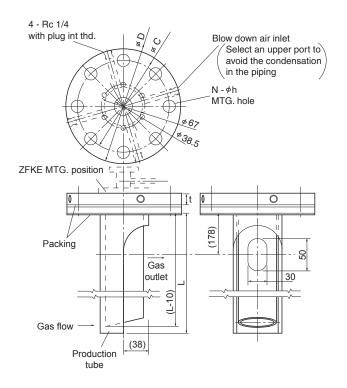
Flow guide tube (for high particulate) (ZFKE: 10th dight code. H, K, M)



Code 11th	3	5	7	1	Z
L (m)	0.3	0.5	0.75	1.0	
Mass Approx.(kg)	4.5	5.6	7.0	8.3	L= (to order)

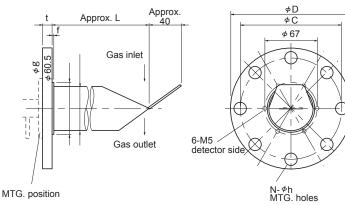
Flange size	Code 9th	D	С	t	f	g	Ν	h
JIS 5K 65A	7	155	130	14	2	110	4	15
JIS 5K 80A	8	180	145	14	2	121	4	19
JIS 5K 100A	9	200	165	16	2	141	8	19
JIS 10K 65A	A	175	140	18	2	116	4	19
JIS 10K 80A	В	185	150	18	2	126	8	19
JIS 10K 100A	С	210	175	18	2	151	8	19
ANSI 150LB 2B	D	150	120.7	17.5	2	92.1	4	19.1
ANSI 150LB 3B	E	190	152.4	22.3	2	127	4	19.1
ANSI 150LB 4B	F	230	190.5	22.3	2	157.2	8	19.1
DIN DN50 PN10	G	165	125	18	0	0	4	18
DIN DN80 PN10	Н	200	160	20	0	0	4	18

Flow guide tube (for high particulate with cover) (ZFKE: 10th dight code. J, L, N)



Code 11th	3	5	7	1	Z
L (m)	0.3	0.5	0.75	1.0	
Mass Approx.(kg)	7.1	9.0	11.4	13.6	L= (to order)

## Flow guide tube (ZFKE: 10th dight code. F)

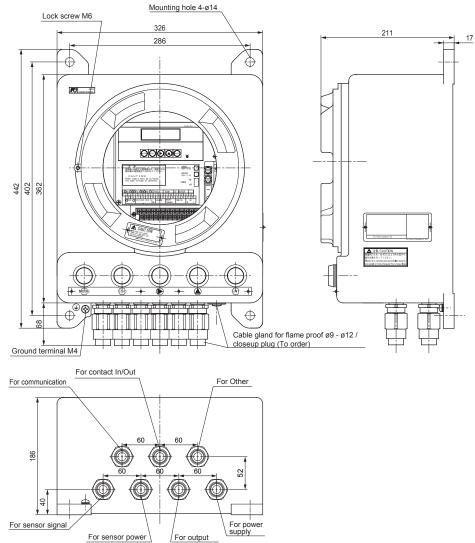


ZFKE MTG. position

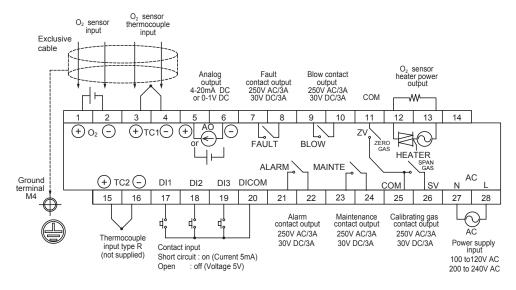
Code 11th	3	5	7	1	Z
L (m)	0.3	0.5	0.75	1.0	
MASS Approx.(kg)	3.3	4.5	6.1	7.6	L= (to order)

Flange size	Code 9th	D	С	t	f	g	Ν	h
JIS 5K 65A	7	155	130	14	2	110	4	15
JIS 5K 80A	8	180	145	14	2	121	4	19
JIS 5K 100A	9	200	165	16	2	141	8	19
JIS 10K 65A	Α	175	140	18	2	116	4	19
JIS 10K 80A	В	185	150	18	2	126	8	19
JIS 10K 100A	С	210	175	18	2	151	8	19
ANSI 150LB 2B	D	150	120.7	17.5	2	92.1	4	19.1
ANSI 150LB 3B	E	190	152.4	22.3	2	127	4	19.1
ANSI 150LB 4B	F	230	190.5	22.3	2	157.2	8	19.1
DIN DN50 PN10	G	165	125	18	0	0	4	18
DIN DN80 PN10	Н	200	160	20	0	0	4	18

#### Coverter (ZKME)



#### EXTERNAL TERMINAL (TM1) /M3



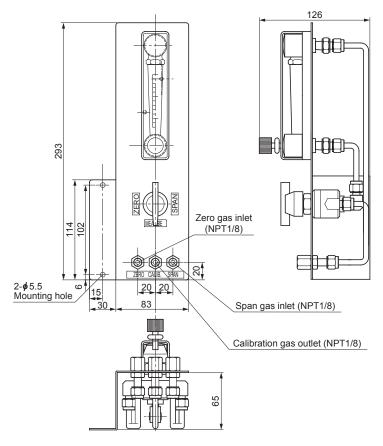
#### COMMUNICATION TERMINAL (TM2) /INSERTION TERMINAL

	Tern	ninal nui	Remarks	
	1	2	3	Remarks
RS232C	TXD	RXD	GND	Standard
RS485	TRX+	TRX-	GND	Option

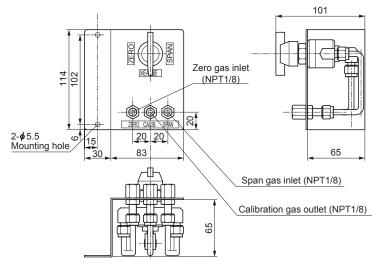
## OUTLINE DIAGRAM (Unit:mm)

<Option>

SELECTOR VALVES + FLOWMETER (IN CASE OF 11TH DIGIT CODE "2" )



SELECTOR VALVES (IN CASE OF 11TH DIGIT CODE "1")



▲ Caution on Safety \*Before using this product, be sure to read its instruction manual in advance.

## Fuji Electric Systems Co., Ltd.

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