

# IN-SITU ZIRCONIA OXYGEN ANALYZER FOR HAZARDOUS LOCATION

DATA SHEET

ZFKE, ZKME

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.



Detector (ZFKE)



Converter (ZKME)

## FEATURES

1. **Gas sampling device is unnecessary**  
For quick response, insert the detector directly into the stack. 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 isolating 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.

## SPECIFICATIONS

### General Specifications

<b>Measuring object:</b>	Oxygen in noncombustible gas
<b>Measuring method:</b>	Directly insert type zirconia system
<b>Measuring range:</b>	0 to 2 ... 0 to 50 vol% O <sub>2</sub> 2 ranges available in 1 vol% O <sub>2</sub> steps
<b>Repeatability:</b>	Within $\pm 0.5\%$ FS
<b>Linearity:</b>	Within $\pm 2\%$ FS
<b>Response time:</b>	Within 4 to 7 sec, for 90% (from calibration gas inlet)
<b>Warmup time:</b>	approx. 10 min
<b>Analog output:</b>	4 to 20mA DC (allowable load resistance less than 500 $\Omega$ ) or 0 to 1V DC (output resistance more than 100 $\Omega$ )
<b>Power supply:</b>	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
<b>Power consumption:</b>	Maximum 240VA (Detector: approx. 200VA, Converter: approx. 40VA) Normal 70VA (Detector: approx. 50VA, Converter: approx. 20VA)

**Detector Specifications (ZFKE)**

- Measured gas temperature:**  
Flow guide tube system; -10 to +600°C  
(for general-use, corrosive gas)
- Measured gas pressure:**  
-3 to +3kPa (-306 to +306mmH<sub>2</sub>O)
- Flow guide tube:** With or without blow-down nozzle  
Flange; JIS5K 65A FF  
(JIS5K-80AFF for high particulate gas)  
Insertion length; 0.3, 0.5, 0.75, 1m  
Other: See. Code Symbols
- Ejector (general-use):**  
Probe for vacuuming up measured gas  
to detector (option)
- Operating temperature:**  
-10 to +60°C for Primary detecting element  
125°C or less at detector flange surface  
with power applied
- Storage temperature:**  
Sensing element: -20 to +70°C
- Structure:** Dust/rain-proof structure(IEC IP66  
equivalent)
- Flame proof:** See Table 1.
- Filter:** SUS316 (filtering accuracy 60μm)
- Main materials of gas-contacting parts:**  
Detector; Zirconia, SUS316, platinum  
Flow guide tube; SUS316
- Calibration gas inlet:**  
φ6mm tube join or φ1/4-inch tube join (as  
specified)
- Reference gas inlet (option):**  
φ6mm tube join or φ1/4-inch tube join (as  
specified)
- Detector mounting:**  
Horizontal plane ±45°, ambient sur-  
rounding air should be clean.
- Outer dimensions:** (L × max. dia.) 215mm × 164mm (de-  
tector)
- Mass (approx.) {weight}:**  
Detector; 3.0kg  
Flow guide tube (for corrosive gas, 1m);  
6kg
- Finish color:** Case: Silver and SUS metallic color  
Cover: Blue
- Ejector air inlet flow rate:**  
5 to 10 L/min
- Calibration gas flow:**  
1.5 to 2 L/min
- Blowdown air inlet pressure:**  
200 to 300kPa {2 to 3 kgf/cm<sup>2</sup>}

Table 1

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

**Converter specification (ZKME)**

- Concentration value indication:**  
Digital indication in 4 digits
- Contact output signal:**  
(1) Contact specification; 6 points, 1a 250V AC/3A or 30V  
DC/3A  
(2) Contact function;
- Under maintenance
  - Under blowdown Note3)
  - Span calibrating gas
  - Zero calibration gas
  - Instrument anomalies Note1)
  - Alarm Note2)
- Note1) The following Instrument errors (1) Thermocou-  
ples break (2) Sensor break (3) Temperature fault  
(4) Calibration fault (5) Zero/span adjustment fault  
(6) Output error turn the contact-ON
- Note2) Alarm selects just one as mentioned below (1)  
High (2) Low (3) Upper and Lower (4) High-high  
(5) Low-low, it turns ON while operating.
- Note3) Under blow down is available in case of option,  
and it turns ON while operating.
- Contact input signal:**  
(1) Contact specification; 3points (the following option)  
ON; 0V (10mA or less), OFF; 5V  
(2) Contact function;
- External hold
  - Calculation reset
  - Heater OFF
  - Blow down (option)
  - Inhibition of calibration
  - Calibration start
  - Range change
- Calibration method:**  
(a) Manual calibration with key opera-  
tion  
(b) Auto. calibration (option)  
Calibration cycle; 00 day 00 hour to  
99 days 23 hours  
(c) All calibration
- Calibration gas:**
- Range settings  
Zero gas; 0.010 to 25.00% O<sub>2</sub>  
Span gas; 0.010 to 50.00% O<sub>2</sub>
  - Recommended calibration gas concen-  
tration  
Zero gas; 0.25 to 2.0% O<sub>2</sub>  
Span gas; 20.6 to 21.0% O<sub>2</sub>  
(oxygen concentration in the  
air)
- Blowdown:**  
(option)  
A function for blowing out with com-  
pressed air dust that has deposited in  
the flow guide tube. Blowdown can  
be performed for a predetermined time  
and at predetermined intervals.  
Blowdown cycle; 00 hour 00 minute to  
99 hours 59 minutes  
Blowdown time; 0 minute 00 second  
to 0 minutes 999  
seconds

**Output signal hold:** Output signal is held during calibration, 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 meter (option):** Selects zero or span gas during manual zero or span calibration.

**Communication function:**  
 RS232C (MODBUS) standard specification  
 RS485 (MODBUS) (option)

**Combustion efficiency 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 temperature. Thermocouple (R) is required for temperature measurement.

**Operating temperature:**  
 -20 to +55°C

**Operating humidity:**  
 95% RH or less, non condensing

**Storage temperature:**  
 -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 x W x 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

**Electrical Safety:**

**CE**

**Overvoltage category**  
 ; II power supply input  
 ; I relay interfaces  
 (IEC1010-1)

**External overcurrent protective device**  
 ; 10A

**Equipment interfaces are safety separated (SELV)**

ZFKE, ZKME

**Table 2**

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



## SCOPE OF DELIVERY

**Detector:** Detector main unit × 1, Viton Packing × 1, thermo seal × 1, mounting screw (M5mm × 25) × 6, flow guide tube (as specified) × 1, Wrench × 1, Instruction manual × 1

**Converter:** Converter main unit × 1, mounting screw (M12 × 50) × 4, Cock (option) × 1, flowmeter (option) × 1, Accessories (AC250V 500mA T fuse × 2, AC250V 2.5A T fuse × 2), Wrench × 1, Instruction manual × 1

**Ejector:** With detector main unit (option)

### Items to be prepared separately:

(1) Standard gas for calibration

Type ZBM□NSH4-01 (up to 5% O<sub>2</sub> range)

Type ZBM□NSJ4-01 (over 5% O<sub>2</sub> range)

(2) Reduction valve for standard gas (type ZBD61003)

(3) Flowmeter

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; 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). Blow-down 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.

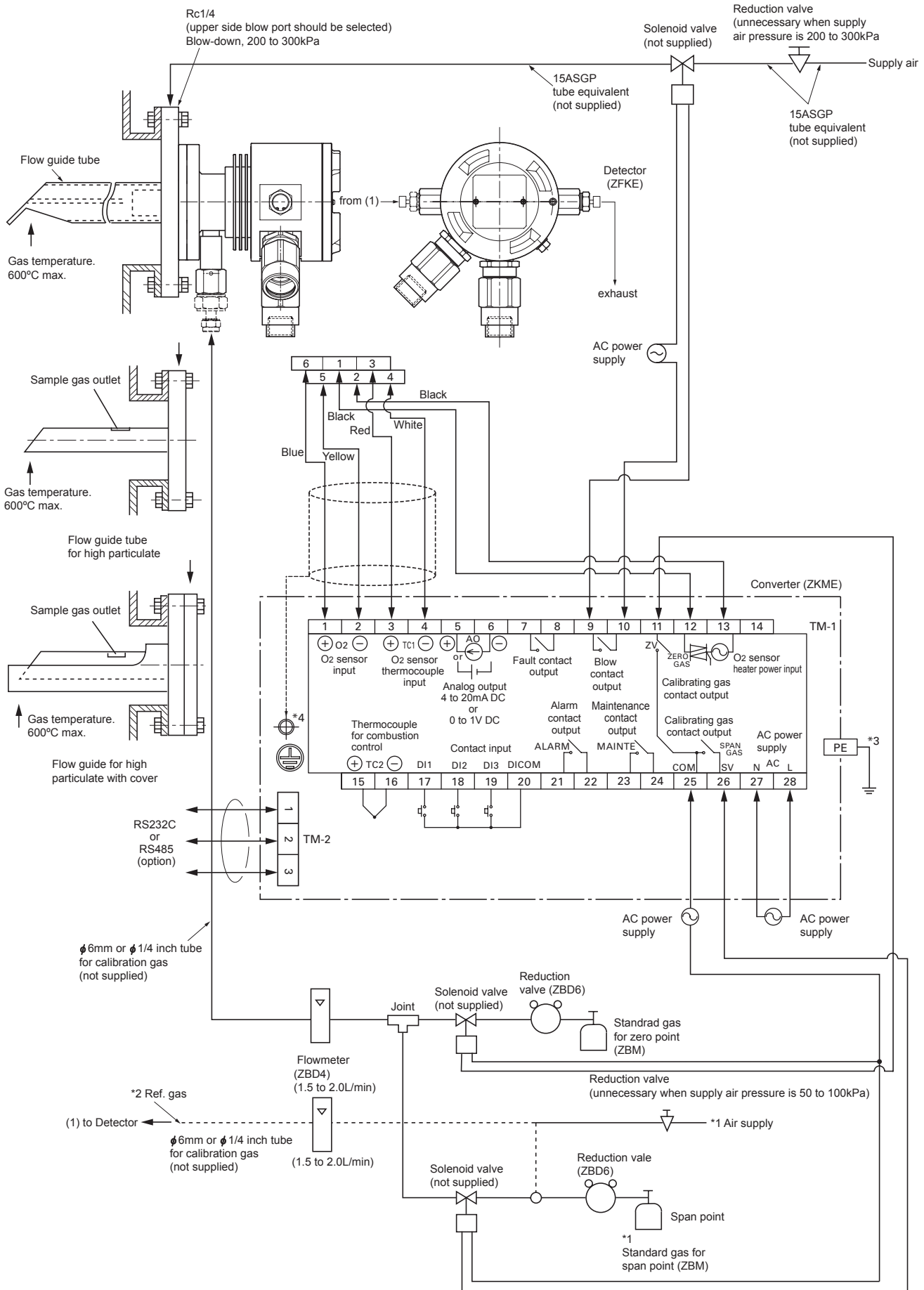
Measured gas					Device configuration	
Application	Temperature	Gas Flow	DUST	Note	Detector type	Converter type
General-use (boiler)	600°C or less	5 to 20m/s	Less than 0.2g/Nm <sup>3</sup>	Fuel; gas, oil	ZFKER□□5-□□FY□□□□	ZKME
			Less than 10g/Nm <sup>3</sup>	Fuel: coal with blow down	ZFKER□□5-□□GY□□□□	ZKME
For corrosive gas (refuse incinerator)	600°C or less	5 to 20m/s	Less than 1g/Nm <sup>3</sup>	Included low moisture	ZFKER□□5-□□FY□□□□	ZKME
			Less than 10g/Nm <sup>3</sup>	Included low moisture with blow down	ZFKER□□5-□□GY□□□□	ZKME
			Less than 25g/Nm <sup>3</sup>	Included low moisture with blow down	ZFKER□□5-□□KY□□□□ M	ZKME
			Less than 25g/Nm <sup>3</sup>	Included high moisture with blow down	ZFKER□□5-□□LY□□□□ N	ZKME

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.

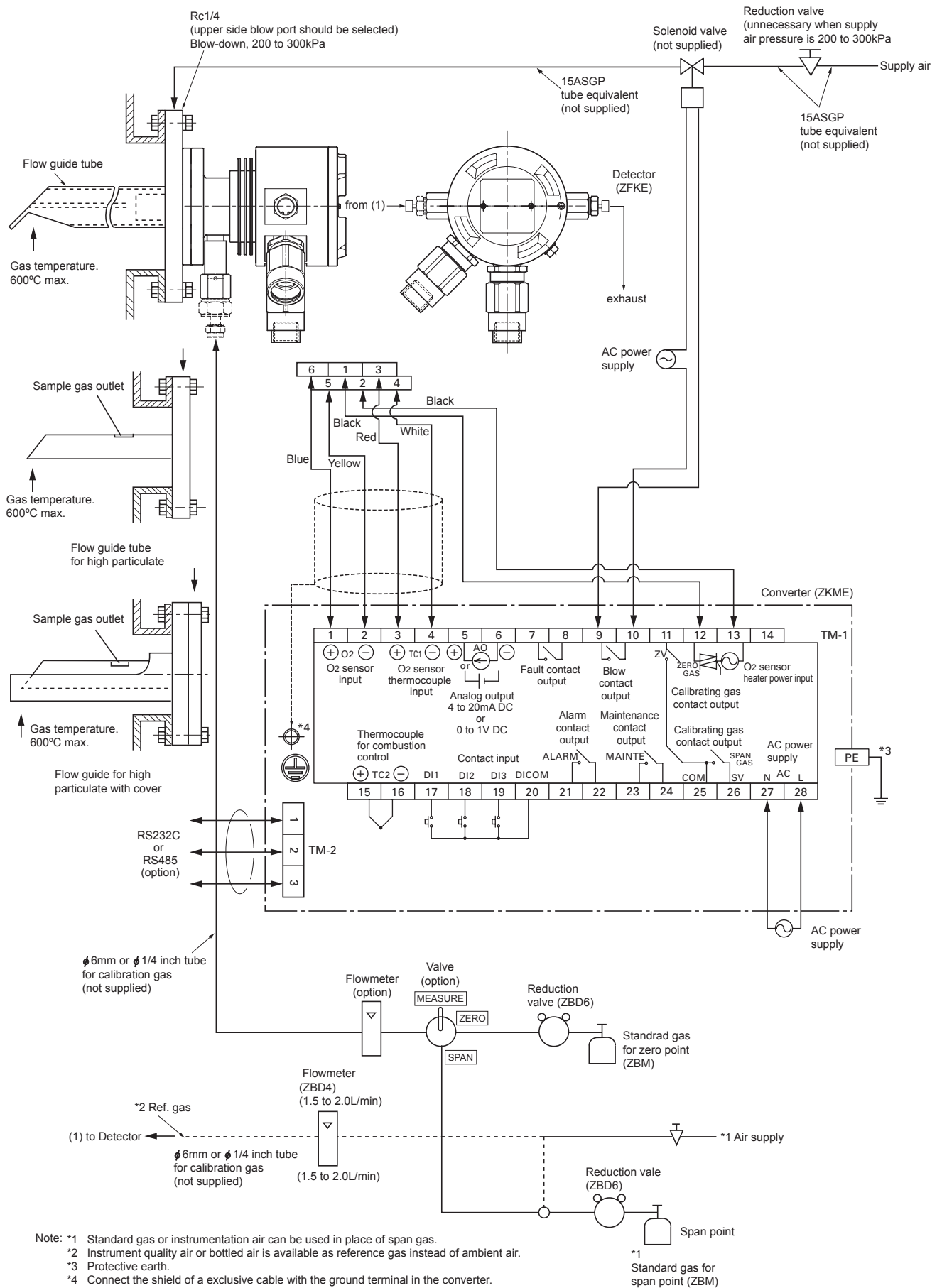
# CONFIGURATION

## Flow guide tube system

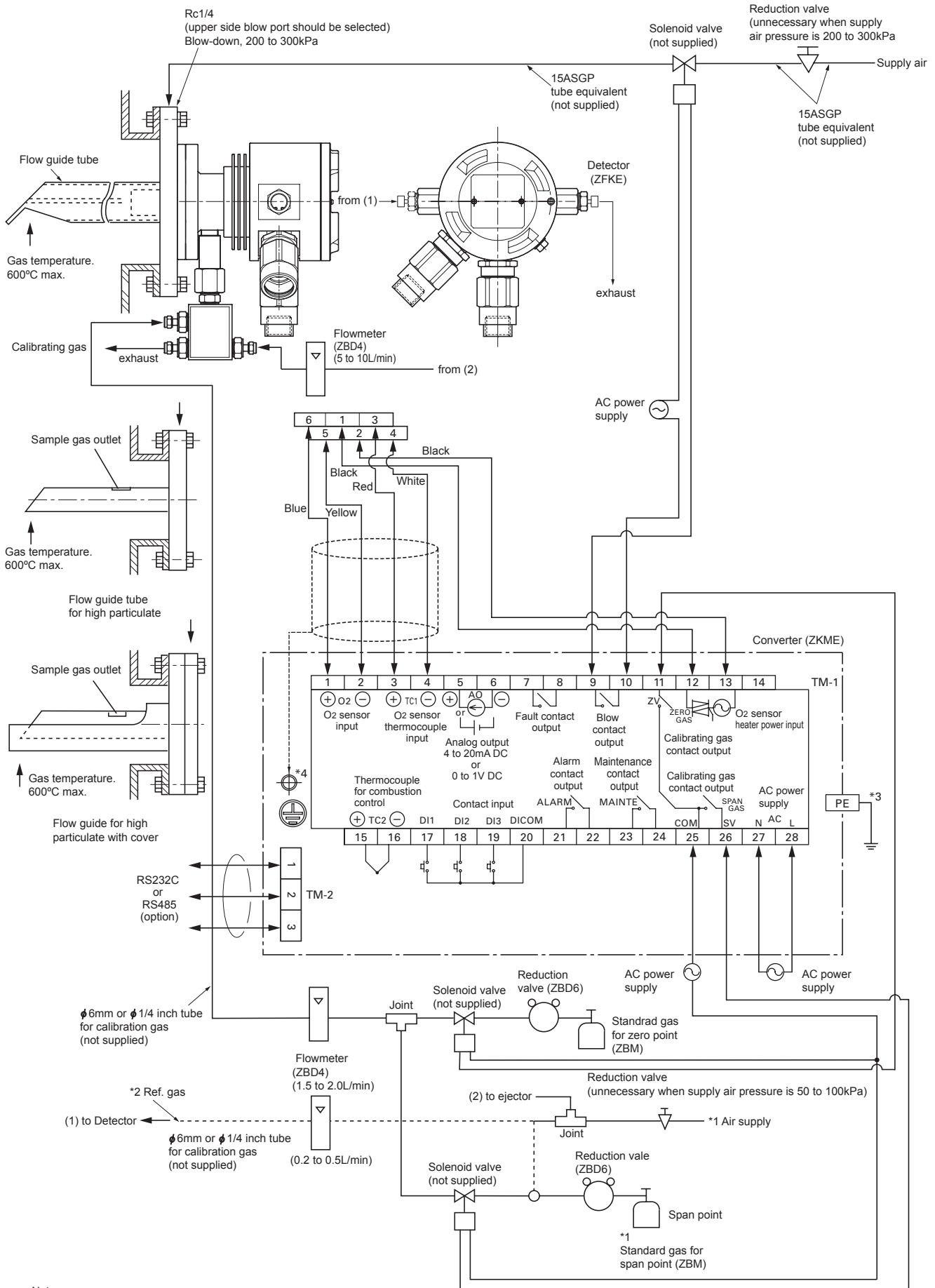


Note: \*1 Standard gas or instrumentation air can be used in place of span gas.  
 \*2 Instrument quality air or bottled air is available as reference gas instead of ambient air.  
 \*3 Protective earth.  
 \*4 Connect the shield of a exclusive cable with the ground terminal in the converter.

# Flow guide tube system (with valve)



Flow guide tube system (with ejector)



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

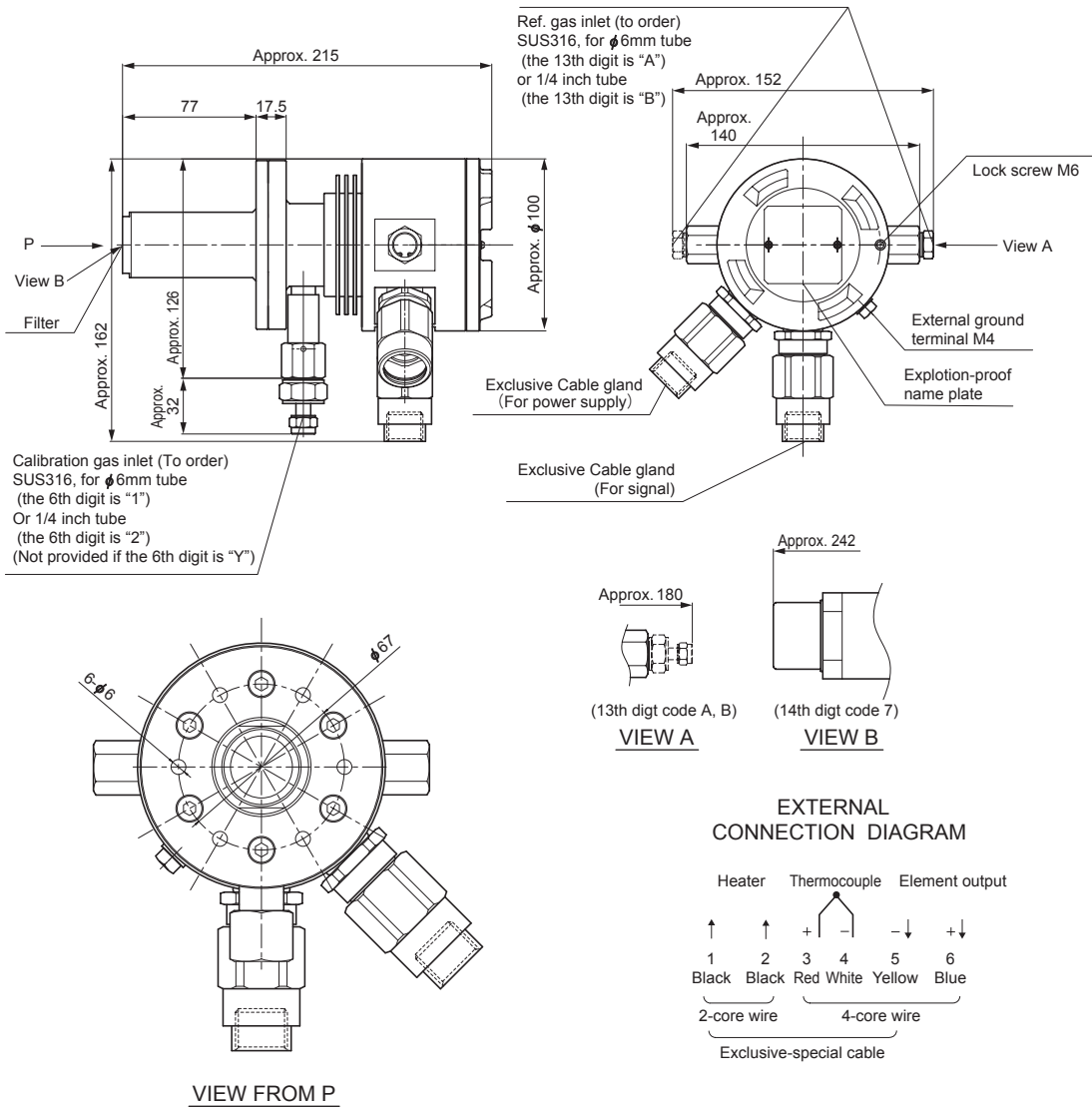




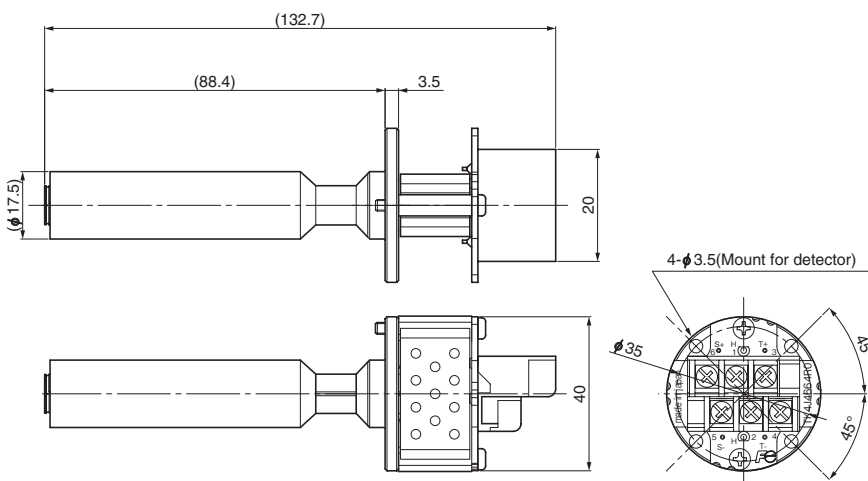
OUTLINE DIAGRAM (Unit:mm)

Detector (ZFKER

Y  
1  
2

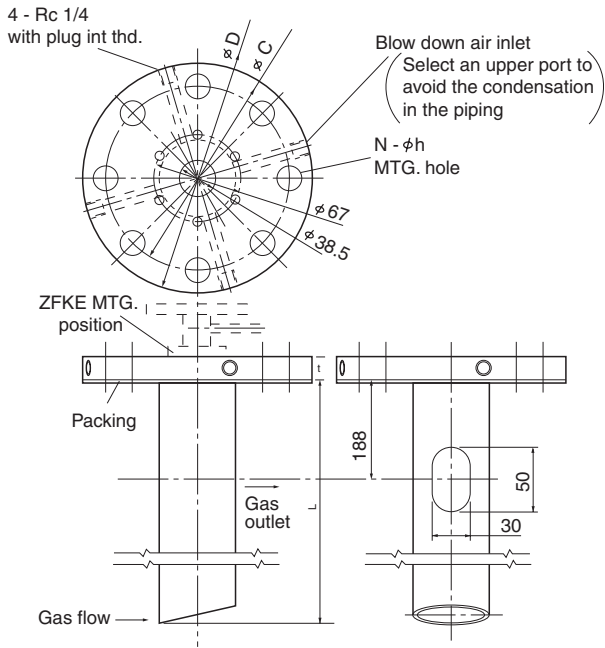


Sensor unit (ZFK8YY)





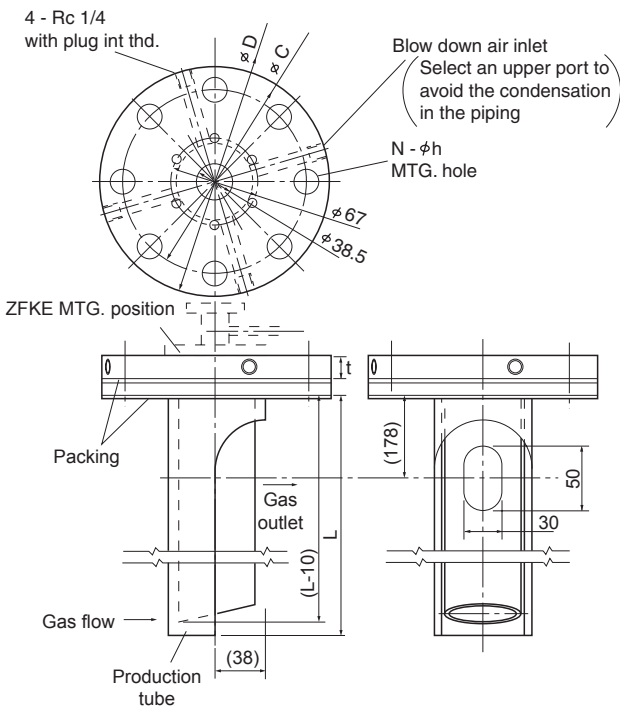
Flow guide tube (for high particulate) (ZFKE: 10th digit code. H, K, M)



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

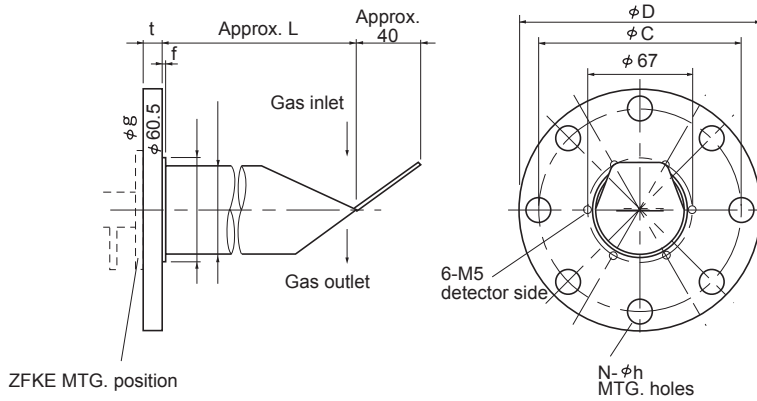
Flange size	Code 9th	D	C	t	f	g	N	h
JIS 5K 65A	7	155	130	14	2	110	4	15
JIS 5K 80A	8	180	145	14	2	121	4	19
JIS 5K 100A	9	200	165	16	2	141	8	19
JIS 10K 65A	A	175	140	18	2	116	4	19
JIS 10K 80A	B	185	150	18	2	126	8	19
JIS 10K 100A	C	210	175	18	2	151	8	19
ANSI 150LB 2B	D	150	120.7	17.5	2	92.1	4	19.1
ANSI 150LB 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	H	200	160	20	0	0	4	18

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



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

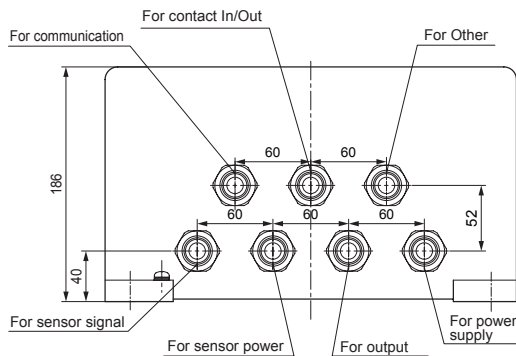
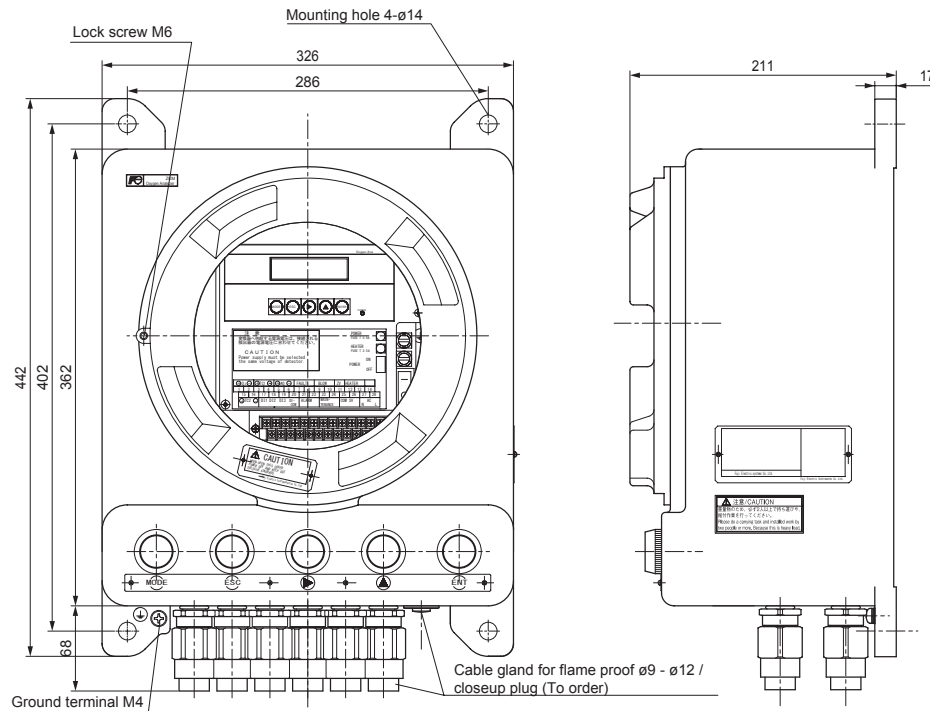
## Flow guide tube (ZFKE: 10th digit code. F)



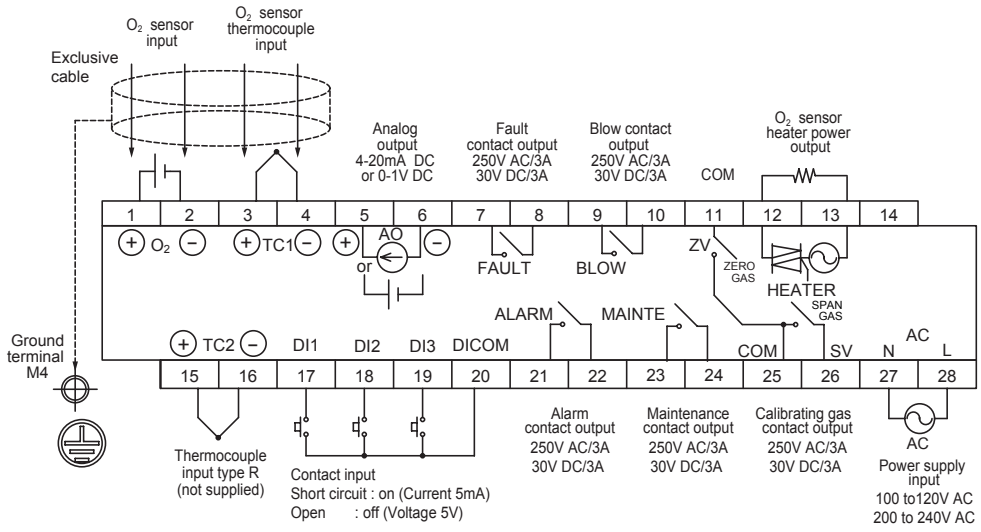
Code 11th	3	5	7	1	Z
L (m)	0.3	0.5	0.75	1.0	L= (to order)
MASS Approx. (kg)	3.3	4.5	6.1	7.6	

Flange size	Code 9th	D	C	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	A	175	140	18	2	116	4	19
JIS 10K 80A	B	185	150	18	2	126	8	19
JIS 10K 100A	C	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	H	200	160	20	0	0	4	18

## Coverter (ZKME)



EXTERNAL TERMINAL (TM1) /M3



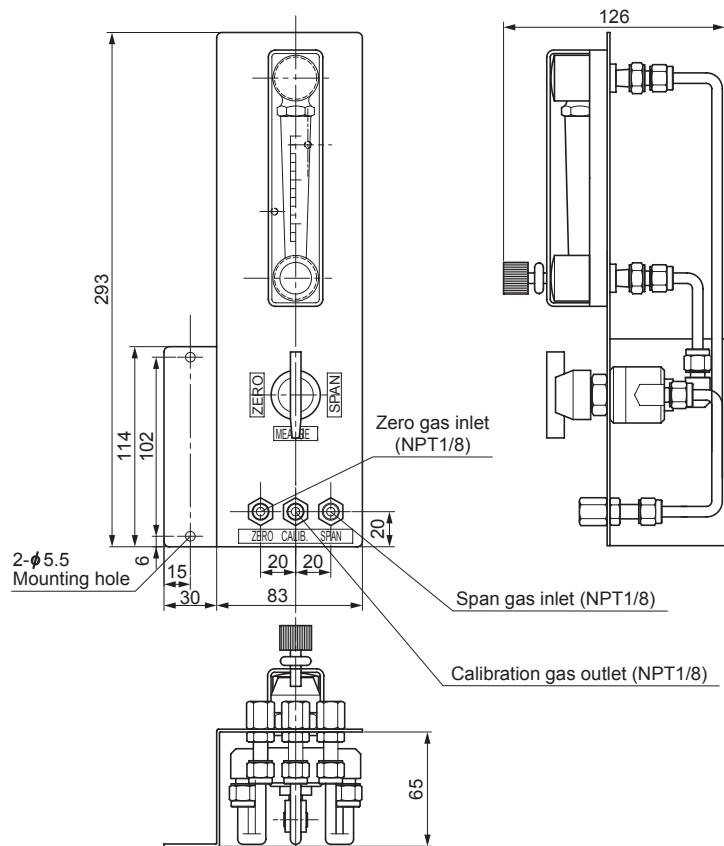
COMMUNICATION TERMINAL (TM2) /INSERTION TERMINAL

	Terminal number			Remarks
	1	2	3	
RS232C	TXD	RXD	GND	Standard
RS485	TRX+	TRX-	GND	Option

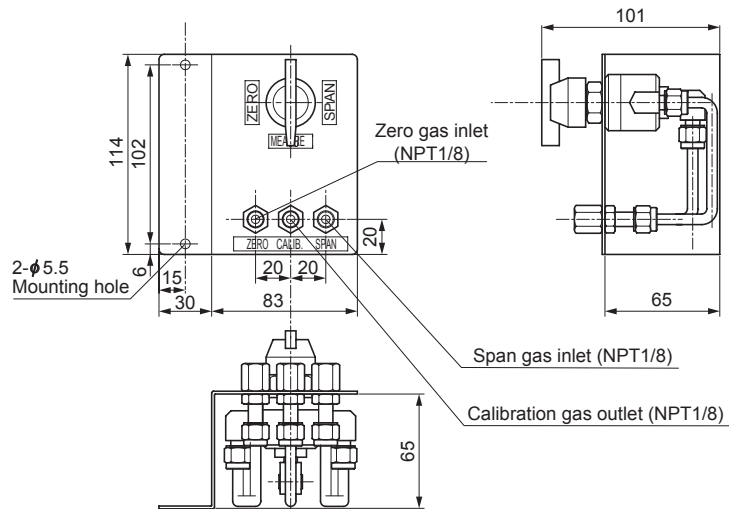
# OUTLINE DIAGRAM (Unit:mm)

<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.

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## Fuji Electric Systems Co., Ltd.

**International Sales Div.1**

**Sales Group**

Gate City Ohsaki, East Tower, 11-2, Osaki 1-chome,  
Shinagawa-ku, Tokyo 141-0032, Japan

<http://www.fesys.co.jp/eng>

Phone: 81-3-5435-7280, 7281 Fax: 81-3-5435-7425

<http://www.fic-net.jp/eng>